SUBARU

IMPREZA

2004 Model Year

PDF Service Manual

GENERAL INFORMATION SECTION (Pub.No.G1870BE1)

ENGINE SECTION 1 (Pub.No.G1870BE2)

ENGINE SECTION 2 (Pub.No.G1870BE3)

ENGINE SECTION 3 (Pub.No.G1870BE4)

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GENERAL INFORMATION SECTION

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This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

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

FUJI HEAVY INDUSTRIES LTD. G1870BE1

FOREWORD

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1. Foreword

A: FOREWORD

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

Applied model: GD*****, GG***** from 2004 MY

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

HOW TO USE THIS MANUALS

HU

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1. How to Use This Manual

A: HOW TO USE THIS MANUAL

1. STRUCTURE

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

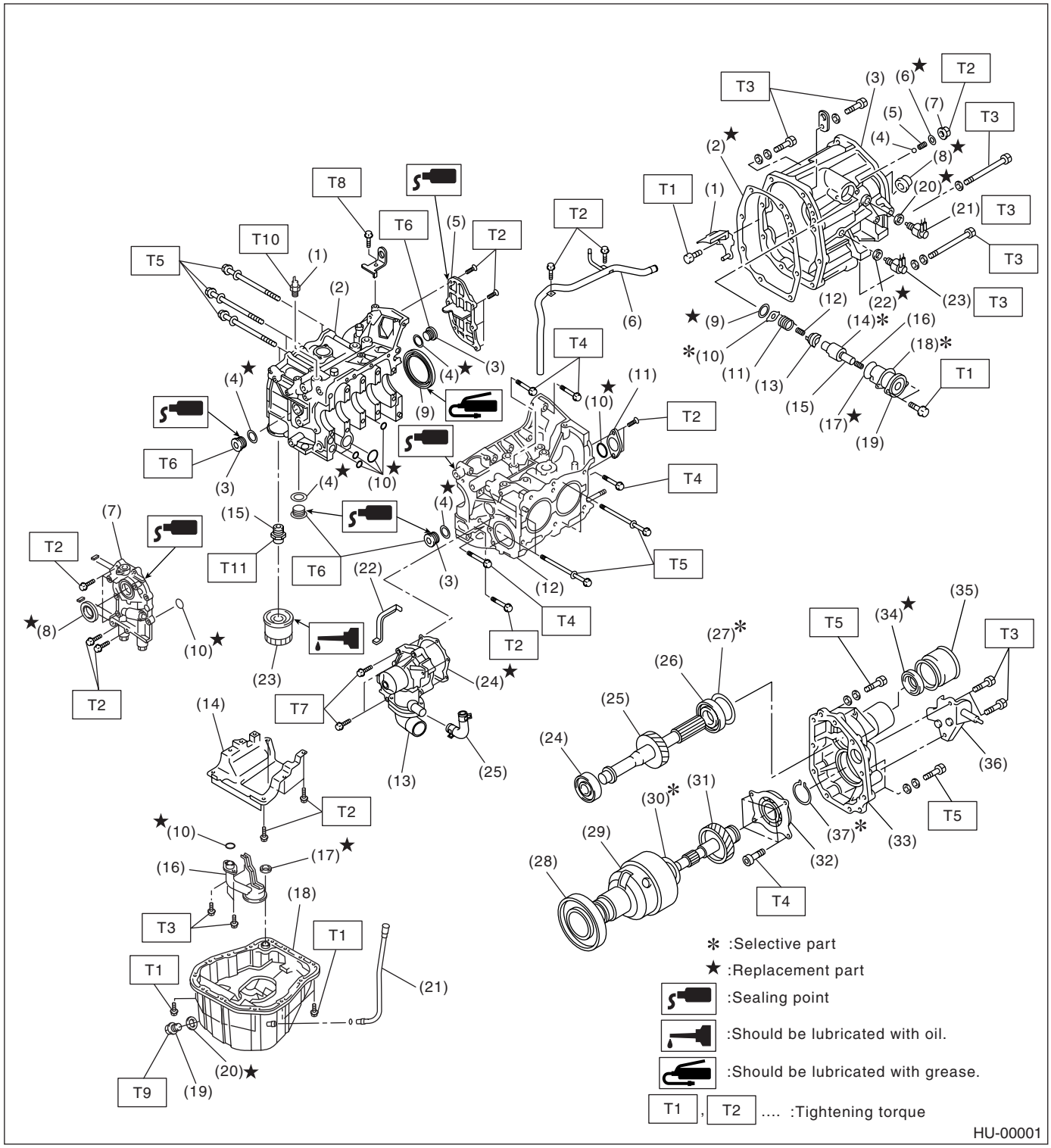
2. INDEX

The first page has an index with tabs.

3. COMPONENTS

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

Example:



4. SPECIFICATIONS

If necessary, specifications are also included.

5. INSPECTION

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

6. MAINTENANCE

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

Example:

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

A: REMOVAL (B)

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

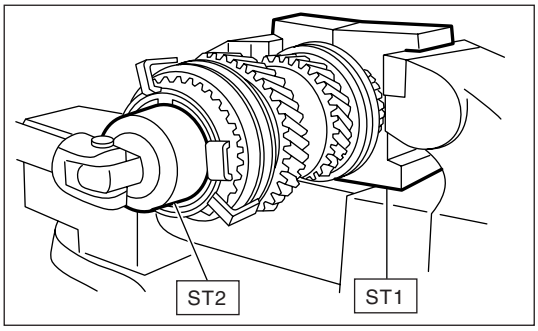
---

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

NOTE: (D)
Secure the lock nuts in two Places affer tightening.

ST2 499987003 SOCKET WRENCH
ST1 498937000 (E) TRANSMISSION HOLDER (F)

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



(H)

HU-00002

(A) Component
(B) Process
(C) Reference
(D) Caution
(E) Tool number of special tool
(F) Name of special tool
(G) Tightening torque
(H) Illustration

7. DIAGNOSIS

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

8. SI UNITS

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

Tightening torque:
44 N·m (4.5 kgf-m, 33 ft-lb)

SPECIFICATIONS

SPC

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1. Impreza

A: DIMENSIONS

Model			Sedan	Wagon	OUTBACK	STi
Overall length		mm (in)	4,415 (173.8)			
Overall width		mm (in)	1,740 (68.4)	1,695 (66.7)	1,710 (67.3)	1,740 (68.1)
Overall height (at C.W.)		mm (in)	1,440 (56.7)	1,485 (58.5)	1,495 (58.9)	1,430 (56.3)
Compartment	Length	mm (in)	1,890 (74.4)	1,845 (72.6)		1,890 (74.4)
	Width	mm (in)	1,380 (54.3)			
	Height	mm (in)	1,180 (46.5), 1,125 (44.3)★2	1,200 (47.2), 1,150 (45.3)★2	1,200 (47.2), 1,150 (45.3)★2	1,180 (46.5)
Wheelbase		mm (in)	2,525 (99.4)			2,540 (100.0)
Tread	Front	mm (in)	1,485 (58.5)	1,465 (57.7)	1,460 (57.5)	1,490 (58.7)
	Rear	mm (in)	1,475 (58.1), 1,480 (58.3)★1	1,455 (57.3)	1,455 (57.3)	1,485 (58.5)
Minimum road clearance		mm (in)	150 (5.9), 155 (6.1)★1	150 (5.9), 155 (6.1)★1	160 (6.3)	145 (5.7)

★1: WRX
★2: With sun roof

B: ENGINE

Model	Turbo 2.0 L	2.5 L	STi
Engine type	Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine		
Valve arrangement	Overhead camshaft type		
Bore × Stroke mm (in)	92 × 75 (3.62 × 2.95)	99.5 × 79 (3.92 × 3.11)	
Displacement cm^3 (cu in)	1,994 (121.67)	2,457 (149.9)	
Compression ratio	8.0±0.2	10.0±0.2	8.2±0.2
Firing order	1 — 3 — 2 — 4		
Idle speed at Park/Neutral position rpm	750±100	MT: 650±100 AT: 700±100	700±100
Maximum output kW (HP)/rpm	169 (227)/6,000	123 (165)/5,600	224 (300)/6,000
Maximum torque N·m (kgf-m, ft-lb)/rpm	294 (30.0, 217)/4,000	226 (23.0, 166)/4,000	407 (41.5, 300)/4,000

C: ELECTRICAL

Model		Turbo 2.0 L	2.5 L	STi
Ignition timing at idling BTDC		12°±10°	MT: 10°±8° AT: 15°±8°	17°±10°
Spark plug	Type and manufacturer	NGK: PFR6G	CHAMPION: RC10YC4 (standard) NGK: BKR5E-11 NGK: BKR6E-11	NGK: IFLR6B
Generator		12 V — 75 A		12 V — 90 A
Battery	Type and capacity (5HR)	MT: 12 V — 48 AH (55D23L) AT: 12 V — 52 AH (65D23L)	MT: 12 V — 48 AH (55D23L) AT: 12 V — 52 AH (75D23L)	12 V — 48 AH (55D23L)

D: TRANSMISSION

Model			Turbo 2.0 L		2.5 L		STi
Transmission type			5MT	4AT	5MT	4AT	6MT
Clutch type			DSPD	TCC	DSPD	TCC	DSPD
Gear ratio		1st	3.454	2.785	3.454	2.785, 3.027★1	3.636
		2nd	1.947	1.545	2.062	1.545, 1.619★1	2.375
		3rd	1.366	1.000	1.448	1.000	1.761
		4th	0.972	0.694	1.088	0.694	1.346
		5th	0.738	—	0.780	—	0.971
		6th	—	—	—	—	0.756
		Reverse	3.333	2.272	3.333	2.272	3.545
		Dual range	—	—	—	—	—
Reduction gear (Front drive)	1st reduction	Type of gear	—	Helical	—	Helical	—
		Gear ratio	—	1.000	—	1.000	—
	Final reduction	Type of gear	Hypoid	Hypoid	Hypoid	Hypoid	Hypoid
		Gear ratio	3.900	4.111	3.900, 4.111★1	4.111, 4.444★1	3.900
Reduction gear (Rear drive)	Transfer reduction	Type of gear	Helical	—	Helical	—	Helical
		Gear ratio	1.100	—	1.000	—	1.000
	Final reduction	Type of gear	Hypoid	Hypoid	Hypoid	Hypoid	Hypoid
		Gear ratio	3.545	4.111	3.900, 4.111★1	4.111, 4.444★1	3.900

5MT: 5-forward speeds with synchromesh and 1-reverse
4AT: Electronically controlled fully-automatic, 4-forward speeds and 1-reverse
6MT: 6-forward speeds with synchromesh and 1-reverse
DSPD: Dry Single Plate Diaphragm
TCC: Torque Converter Clutch
★1: Sedan model

E: STEERING

Model		TS	RS, OUTBACK, WRX	STi
Type		Rack and Pinion		
Turns, lock to lock		3.2	3.0	2.7
Minimum turning circle m (ft)	Curb to curb	10.2 (33.5)	10.8 (35.4)	
	Wall to wall	11.1 (36.3)	11.7 (38.3)	

F: SUSPENSION

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

G: BRAKE

Model	Turbo 2.0 L, 2.5 L	STi
Service brake system	Dual circuit hydraulic with vacuum suspended power unit	
Front	Ventilated disc brake	
Rear	Disc brake	Ventilated disc brake
Parking brake	Mechanical on rear brakes	

H: TIRE

Model	TS	RS, OUTBACK, WRX	STi
Rim size	15 × 6JJ	16 × 6 1/2JJ	17 × 7 1/2JJ
Tire size	P195/60R15 87H	P205/55R16 89V	225/45R17 90W
Type	Steel belted radial, Tubeless		

I: CAPACITY

Model			Turbo 2.0 L		2.5 L		STi
			5MT	4AT	5MT	4AT	6MT
Fuel tank		ℓ (US gal, Imp gal)	60 (15.9, 13.2)				
Engine oil	Total capacity	ℓ (US qt, Imp qt)	4.5 (4.8, 4.0)		4.0 (4.2, 3.5)		
	Engine oil amount for refill	ℓ (US qt, Imp qt)	Approx. 4.5 (4.8, 4.0)		Approx. 4.0 (4.2, 3.5)		
Transmission gear oil		ℓ (US qt, Imp qt)	3.5 (3.7, 3.1)	—	3.5 (3.7, 3.1)	—	4.1 (4.3, 3.6)
ATF		ℓ (US qt, Imp qt)	—	9.3 (9.8, 8.2)	—	9.3 (9.8, 8.2)	—
Front differential gear oil		ℓ (US qt, Imp qt)	—	1.2 (1.3, 1.1)	—	1.2 (1.3, 1.1)	—
Rear differential gear oil		ℓ (US qt, Imp qt)	0.8 (0.8, 0.7)				1.0 (1.1, 0.9)
Power steering fluid		ℓ (US qt, Imp qt)	0.7 (0.7, 0.6)				
Engine coolant		ℓ (US qt, Imp qt)	7.7 (8.1, 6.8)	7.6 (8.0, 6.7)	7.0 (7.4, 6.2)	6.9 (7.3, 6.1)	7.7 (8.1, 6.8)

J: WEIGHT

1. FOR U.S. MODEL

Sedan

Model			2.5 L		Turbo 2.0L		
			RS		WRX		
			5MT	4AT	5MT		
Curb weight (C.W.)	Front	kgf (lb)	778 (1,715)	803 (1,770)	826 (1,820)	832 (1,834)	833 (1,836)
	Rear	kgf (lb)	567 (1,250)	567 (1,250)	573 (1,265)	586 (1,292)	588 (1,297)
	Total	kgf (lb)	1,345 (2,965)	1,370 (3,020)	1,399 (3,085)	1,418 (3,126)	1,421 (3,133)
Gross axle weight (G.A.W.)	Front	kgf (lb)	939 (2,070)	939 (2,070)	998 (2,200)	998 (2,200)	998 (2,200)
	Rear	kgf (lb)	907 (2,000)	907 (2,000)	916 (2,020)	916 (2,020)	916 (2,020)
	Total	kgf (lb)	1,778 (3,920)	1,778 (3,920)	1,837 (4,050)	1,837 (4,050)	1,837 (4,050)
Option	Power window		❍	❍	❍	❍	❍
	Power door lock		❍	❍	❍	❍	❍
	Cruise control		❍	❍	❍	❍	❍
	ABS		❍	❍	❍	❍	❍
	Air conditioner		❍	❍	❍	❍	❍
	Cold W package		—	—	—	❍	❍
	Sun roof		—	—	—	❍	❍
	Dual airbag		❍	❍	❍	❍	❍
	Side airbag		—	—	❍	❍	❍
	Rear spoiler		—	—	—	❍	❍
	Seat in pure hide		—	—	—	—	❍
	Front LSD		—	—	—	—	—
	Aluminum wheel	Gold color	—	—	—	—	—
		Silver color	—	—	—	—	—

Model			Turbo 2.0 L			Turbo 2.5 L	
			WRX			STi	
			4AT			6MT	
Curb weight (C.W.)	Front	kgf (lb)	850 (1,875)	857 (1,889)	858 (1,891)	863 (1,903)	863 (1,903)
	Rear	kgf (lb)	574 (1,265)	586 (1,292)	588 (1,297)	613 (1,351)	613 (1,351)
	Total	kgf (lb)	1,424 (3,140)	1,443 (3,181)	1,446 (3,188)	1,476 (3,254)	1,476 (3,254)
Gross axle weight (G.A.W.)	Front	kgf (lb)	998 (2,200)	998 (2,200)	998 (2,200)	1,030 (2,271)	1,030 (2,271)
	Rear	kgf (lb)	916 (2,020)	916 (2,020)	916 (2,020)	920 (2,028)	920 (2,028)
	Total	kgf (lb)	1,837 (4,050)	1,837 (4,050)	1,837 (4,050)	1,880 (4,145)	1,880 (4,145)
Option	Power window		❍	❍	❍	❍	❍
	Power door lock		❍	❍	❍	❍	❍
	Cruise control		❍	❍	❍	❍	❍
	ABS		❍	❍	❍	❍	❍
	Air conditioner		❍	❍	❍	❍	❍
	Cold W package		—	❍	❍	—	—
	Sun roof		—	❍	❍	—	—
	Dual airbag		❍	❍	❍	❍	❍
	Side airbag		❍	❍	❍	❍	❍
	Rear spoiler		—	❍	❍	—	—
	Seat in pure hide		—	—	❍	—	—
	Front LSD		—	—	—	❍	❍
	Aluminum wheel	Gold color	—	—	—	❍	—
		Silver color	—	—	—	—	❍

Wagon

Model			2.5 L TS		2.5 L OUTBACK	
			5MT	4AT	5MT	4AT
Curb weight (C.W.)	Front	kgf (lb)	778 (1,715)	801 (1,765)	783 (1,725)	805 (1,775)
	Rear	kgf (lb)	603 (1,330)	605 (1,335)	601 (1,325)	603 (1,330)
	Total	kgf (lb)	1,381 (3,045)	1,406 (3,100)	1,384 (3,050)	1,408 (3,105)
Gross axle weight (G.A.W.)	Front	kgf (lb)	939 (2,070)	939 (2,070)	939 (2,070)	939 (2,070)
	Rear	kgf (lb)	953 (2,100)	953 (2,100)	953 (2,100)	953 (2,100)
	Total	kgf (lb)	1,833 (4,040)	1,833 (4,040)	1,833 (4,040)	1,833 (4,040)
Option	Power window		❍	❍	❍	❍
	Power door lock		❍	❍	❍	❍
	Cruise control		❍	❍	❍	❍
	ABS		❍	❍	❍	❍
	Air conditioner		❍	❍	❍	❍
	Cold W package		—	—	—	—
	Sun roof		—	—	—	—
	Dual airbag		❍	❍	❍	❍
	Side airbag		—	—	—	—
	Rear spoiler		—	—	—	—
	Seat in pure hide		—	—	—	—
	Roof rail		❍	❍	❍	❍

Model			Turbo 2.0 L WRX			
			5MT		4AT	
Curb weight (C.W.)	Front	kgf (lb)	826 (1,820)	826 (1,820)	851 (1,875)	851 (1,875)
	Rear	kgf (lb)	610 (1,345)	610 (1,345)	610 (1,345)	610 (1,345)
	Total	kgf (lb)	1,436 (3,165)	1,436 (3,165)	1,461 (3,220)	1,461 (3,220)
Gross axle weight (G.A.W.)	Front	kgf (lb)	998 (2,200)	998 (2,200)	998 (2,200)	998 (2,200)
	Rear	kgf (lb)	953 (2,100)	953 (2,100)	953 (2,100)	953 (2,100)
	Total	kgf (lb)	1,901 (4,190)	1,901 (4,190)	1,901 (4,190)	1,901 (4,190)
Option	Power window		❍	❍	❍	❍
	Power door lock		❍	❍	❍	❍
	Cruise control		❍	❍	❍	❍
	ABS		❍	❍	❍	❍
	Air conditioner		❍	❍	❍	❍
	Cold W package		—	❍	❍	—
	Sun roof		—	—	—	—
	Dual airbag		❍	❍	❍	❍
	Side airbag		❍	❍	❍	❍
	Rear spoiler		—	—	—	—
	Seat in pure hide		—	—	—	—
	Roof rail		❍	❍	❍	❍

2. FOR CANADA MODEL

Sedan

Model			2.5 L		Turbo 2.0 L		
			RS		WRX		
			5MT	4AT	5MT		
Curb weight (C.W.)	Front	kgf (lb)	780 (1,720)	805 (1,775)	825 (1,820)	832 (1,834)	833 (1,836)
	Rear	kgf (lb)	570 (1,256)	570 (1,256)	576 (1,270)	586 (1,292)	588 (1,297)
	Total	kgf (lb)	1,350 (2,976)	1,375 (3,031)	1,401 (3,090)	1,418 (3,126)	1,421 (3,133)
Gross axle weight (G.A.W.)	Front	kgf (lb)	939 (2,070)	939 (2,070)	998 (2,200)	998 (2,200)	998 (2,200)
	Rear	kgf (lb)	907 (2,000)	907 (2,000)	916 (2,020)	916 (2,020)	916 (2,020)
	Total	kgf (lb)	1,778 (3,920)	1,778 (3,920)	1,837 (4,050)	1,837 (4,050)	1,837 (4,050)
Option	Power window		❍	❍	❍	❍	❍
	Power door lock		❍	❍	❍	❍	❍
	Cruise control		❍	❍	❍	❍	❍
	ABS		❍	❍	❍	❍	❍
	Air conditioner		❍	❍	❍	❍	❍
	Cold W package		—	—	—	—	—
	Sun roof		—	—	—	❍	❍
	Dual airbag		❍	❍	❍	❍	❍
	Side airbag		—	—	❍	❍	❍
	Rear spoiler		❍	❍	❍	❍	❍
	Seat in pure hide		—	—	—	—	❍
	Front LSD		—	—	—	—	—
	Aluminum wheel	Gold color	—	—	—	—	—
		Silver color	—	—	—	—	—

Model			Turbo 2.0 L			Turbo 2.5 L	
			WRX			STi	
			4AT			6MT	
Curb weight (C.W.)	Front	kgf (lb)	851 (1,875)	857 (1,889)	858 (1,891)	866 (1,909)	866 (1,909)
	Rear	kgf (lb)	576 (1,270)	586 (1,292)	588 (1,297)	618 (1,363)	618 (1,363)
	Total	kgf (lb)	1,427 (3,145)	1,443 (3,181)	1,446 (3,188)	1,484 (3,272)	1,484 (3,272)
Gross axle weight (G.A.W.)	Front	kgf (lb)	998 (2,200)	998 (2,200)	998 (2,200)	1,030 (2,271)	1,030 (2,271)
	Rear	kgf (lb)	916 (2,020)	916 (2,020)	916 (2,020)	920 (2,028)	920 (2,028)
	Total	kgf (lb)	1,837 (4,050)	1,837 (4,050)	1,837 (4,050)	1,880 (4,145)	1,880 (4,145)
Option	Power window		❍	❍	❍	❍	❍
	Power door lock		❍	❍	❍	❍	❍
	Cruise control		❍	❍	❍	❍	❍
	ABS		❍	❍	❍	❍	❍
	Air conditioner		❍	❍	❍	❍	❍
	Cold W package		—	—	—	—	—
	Sun roof		—	❍	❍	—	—
	Dual airbag		❍	❍	❍	❍	❍
	Side airbag		❍	❍	❍	❍	❍
	Rear spoiler		❍	❍	❍	—	—
	Seat in pure hide		—	—	❍	—	—
	Front LSD		—	—	—	❍	❍
	Aluminum wheel	Gold color	—	—	—	❍	—
		Silver color	—	—	—	—	❍

Wagon

Model			2.5 L TS		2.5 L OUTBACK	
			5MT	4AT	5MT	4AT
Curb weight (C.W.)	Front	kgf (lb)	778 (1,715)	801 (1,765)	783 (1,725)	805 (1,775)
	Rear	kgf (lb)	603 (1,330)	605 (1,335)	601 (1,325)	603 (1,330)
	Total	kgf (lb)	1,381 (3,045)	1,406 (3,100)	1,384 (3,050)	1,408 (3,105)
Gross axle weight (G.A.W.)	Front	kgf (lb)	939 (2,070)	939 (2,070)	939 (2,070)	939 (2,070)
	Rear	kgf (lb)	953 (2,100)	953 (2,100)	953 (2,100)	953 (2,100)
	Total	kgf (lb)	1,833 (4,040)	1,833 (4,040)	1,833 (4,040)	1,833 (4,040)
Option	Power window		❍	❍	❍	❍
	Power door lock		❍	❍	❍	❍
	Cruise control		❍	❍	❍	❍
	ABS		❍	❍	❍	❍
	Air conditioner		❍	❍	❍	❍
	Cold W package		—	—	—	—
	Sun roof		—	—	—	—
	Dual airbag		❍	❍	❍	❍
	Side airbag		—	—	—	—
	Rear spoiler		—	—	—	—
	Seat in pure hide		—	—	—	—
	Roof rail		❍	❍	❍	❍

Model			Turbo 2.0 L WRX			
			5MT			4AT
Curb weight (C.W.)	Front	kgf (lb)	826 (1,820)	832 (1,834)	833 (1,836)	851 (1,875)
	Rear	kgf (lb)	610 (1,345)	620 (1,367)	622 (1,372)	610 (1,345)
	Total	kgf (lb)	1,436 (3,165)	1,452 (3,201)	1,455 (3,208)	1,461 (3,220)
Gross axle weight (G.A.W.)	Front	kgf (lb)	998 (2,200)	998 (2,200)	998 (2,200)	998 (2,200)
	Rear	kgf (lb)	953 (2,100)	953 (2,100)	953 (2,100)	953 (2,100)
	Total	kgf (lb)	1,901 (4,190)	1,901 (4,190)	1,901 (4,190)	1,901 (4,190)
Option	Power window		❍	❍	❍	❍
	Power door lock		❍	❍	❍	❍
	Cruise control		❍	❍	❍	❍
	ABS		❍	❍	❍	❍
	Air conditioner		❍	❍	❍	❍
	Cold W package		—	—	—	—
	Sun roof		—	❍	❍	—
	Dual airbag		❍	❍	❍	❍
	Side airbag		❍	❍	❍	❍
	Rear spoiler		—	—	—	—
	Seat in pure hide		—	—	❍	—
	Roof rail		❍	❍	❍	❍

PRECAUTION

PC

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1. Precaution 2

1. Precaution

A: PRECAUTION

Please clearly understand and adhere to the following general precautions. They must be strictly followed to avoid minor or serious injury to the person doing the work or people in the area.

1. ABS

Handle the ABS as a total system. Do not disassemble or attempt to repair individual parts. Doing so could prevent the ABS system from operating when needed or cause it to operate incorrectly and result in injury.

2. BRAKE FLUID

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

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

3. RADIATOR FAN

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

4. ROAD TESTS

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

5. AIRBAG

To prevent bodily injury from unexpected deployment of airbags and unnecessary maintenance, follow the instructions in this manual when performing maintenance on airbag components or nearby, and airbag wiring harnesses or nearby.
To prevent unexpected deployment, perform one of the steps below and then wait at least 20 seconds to discharge electricity before beginning work.

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

6. AIRBAG DISPOSAL

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

7. AIRBAG MODULE

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

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

8. AIRBAG SPECIAL TOOLS

To prevent unexpected deployment, only use special tools.

9. WINDOW

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

10.WINDOW ADHESIVE

Always use the recommended or alternative adhesive when attaching glass to prevent it from coming loose and falling, resulting in accidents and injury.

11.HOSE REMOVAL/INSTALLATION PROCEDURES

1. Hose Removal/Installation Pre-Procedures

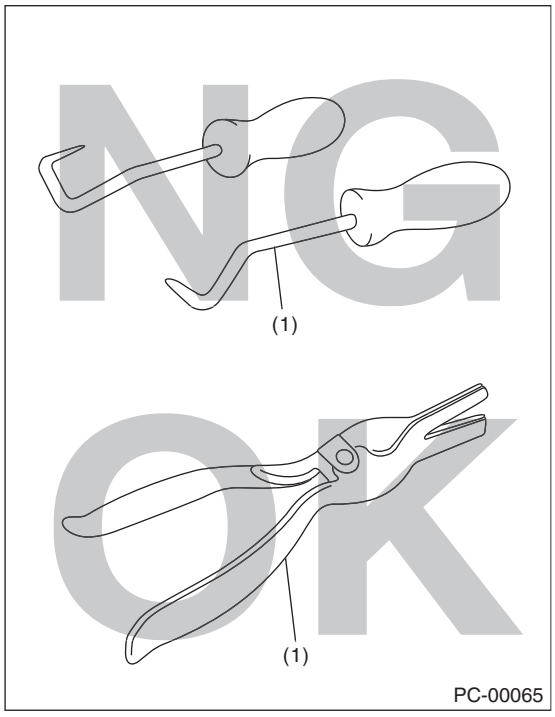
• Be careful to inspect hoses so as not to use damaged or deformed hoses. Using such hoses could cause leakage or loss of oil, with leaked oil splashing on exhaust pipes or other hot parts, resulting in smoke or fire.

• Always remove hoses when performing work. Not removing the hoses and moving parts out of the way when performing procedures may damage the inside of hoses and cause other negative affects.

2. Hose Removal/Installation Procedures and Inspection

• Remove hoses according to the following instructions.

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

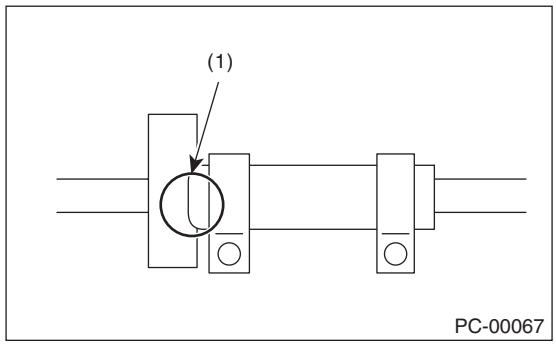


(1) Hose remover

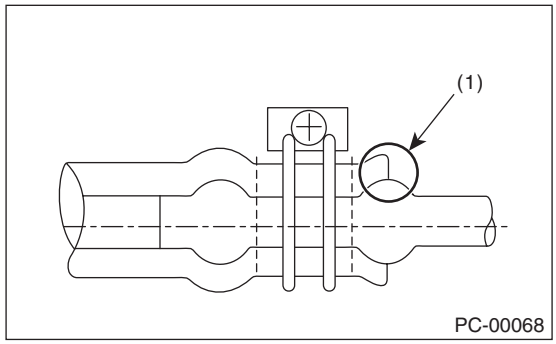
• When using pliers to make hose removal easier, always be sure to use a cloth to protect the hose, slightly rotate the hose, and then pull straight out by hand.

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

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



(1) Hose riding over a stay

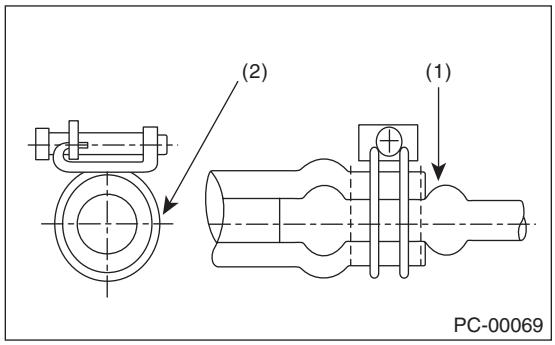


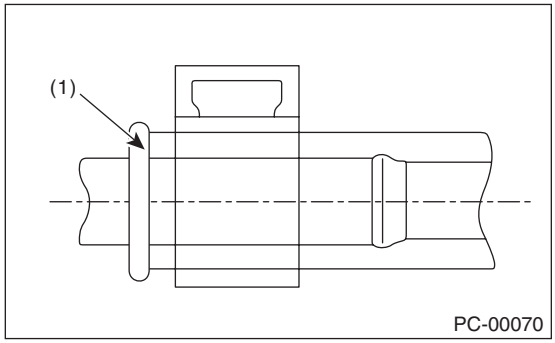
(1) Hose riding over a spool

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

• Install hoses according to the following instructions.

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





(1) Contacting the spool. (Do not excessively insert the hose to prevent the hose from becoming wrinkled up.)

(2) Apply an equal clamping force all around the hose periphery.

- Check that the position and orientation of hose clamps, and the hose layout are correct. (Check that the position and orientation are matching, they are not excessively short/long, there are no differences with before performing the procedures, and that there is clearance between hoses and surrounding parts.)
- After installing, check that there are no disconnection of hoses or leakage from hoses. (Check that hoses are securely fixed by the clamps.)

• Inspect the hose clips and clamps according to the following points, and replace any parts that are damaged or defective with new parts.

- Check for deformations, rust, damage, and adhering of foreign matter.
- For clips, check that the spring functions and has clamping force.
- For clamps, check that the screw can clinch, the clamp has not become oval shaped, and the screw is not damaged.

• Inspect the pipes according to the following points, and replace any parts that are damaged or defective with new parts.

Check that the pipes do not have any damage, rust, peeling (including peeling plating), foreign matter adhering, twisting, crushing, bending, or cracks.

• Replace the following parts with new parts if the hoses have been removed or their installation positions have been changed.

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

NOTE

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1. Note

A: NOTE

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

1. FASTENER NOTICE

Fasteners are used to prevent parts from damage and dislocation due to looseness. Fasteners must be tightened to the specified torque.
Do not apply paint, lubricant, rust retardant, or other substances to the surface around bolts, fasteners, etc. Doing so will make it difficult to obtain the correct torque and result in looseness and other problems.

2. STATIC ELECTRICITY DAMAGE

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

3. BATTERY

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

4. SERVICE PARTS

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

5. PROTECTING VEHICLE UNDER MAINTENANCE

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

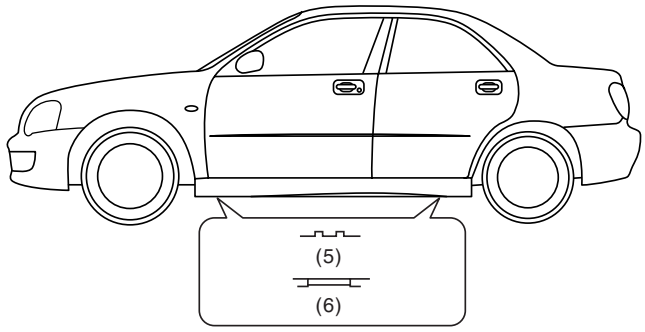
6. ENSURING SAFETY DURING WORK

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

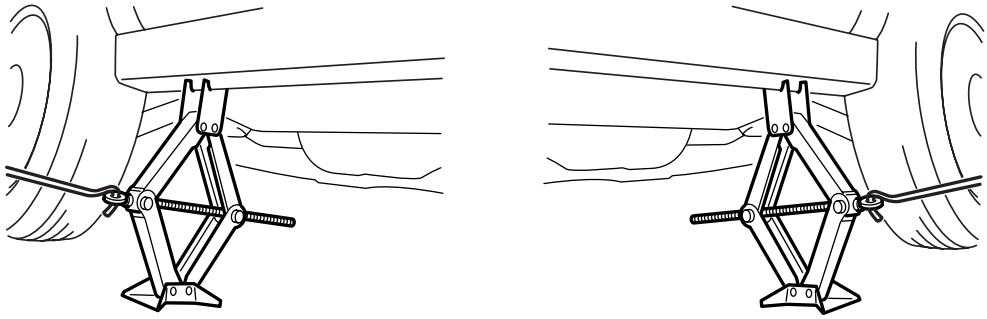
7. LIFTS AND JACKS

When using a lift or jack to raise a vehicle, always follow instructions concerning jack-up points and weight limits to prevent the vehicle from falling, which could result in injury. Be especially careful to make sure the vehicle is balanced before raising it.
Be sure to set the wheel stoppers when jacking-up only the front or rear of the vehicle.

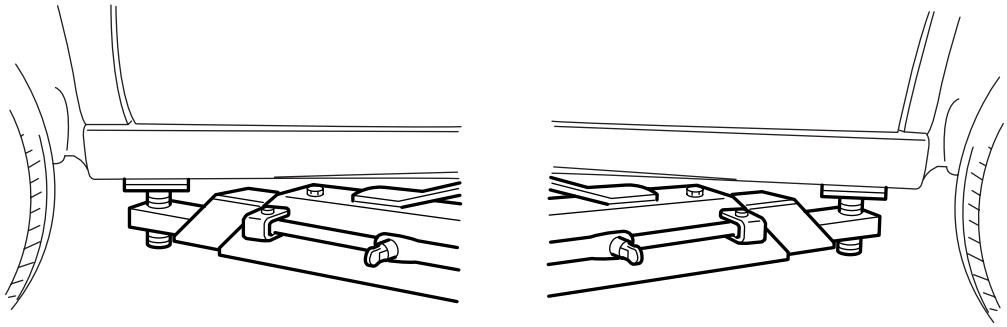
(1)



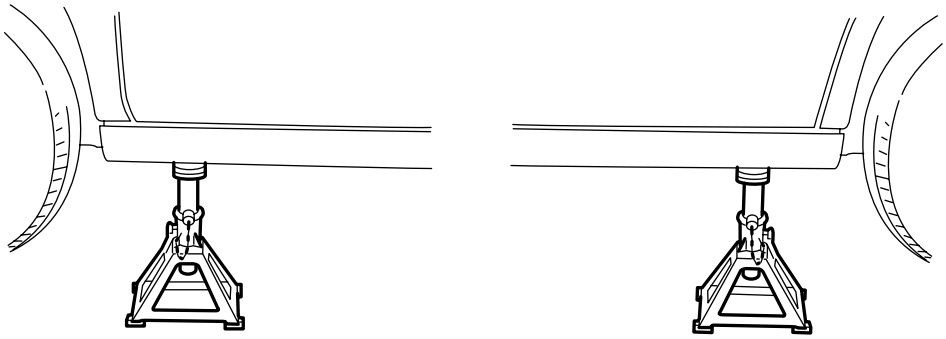
(2)



(3)

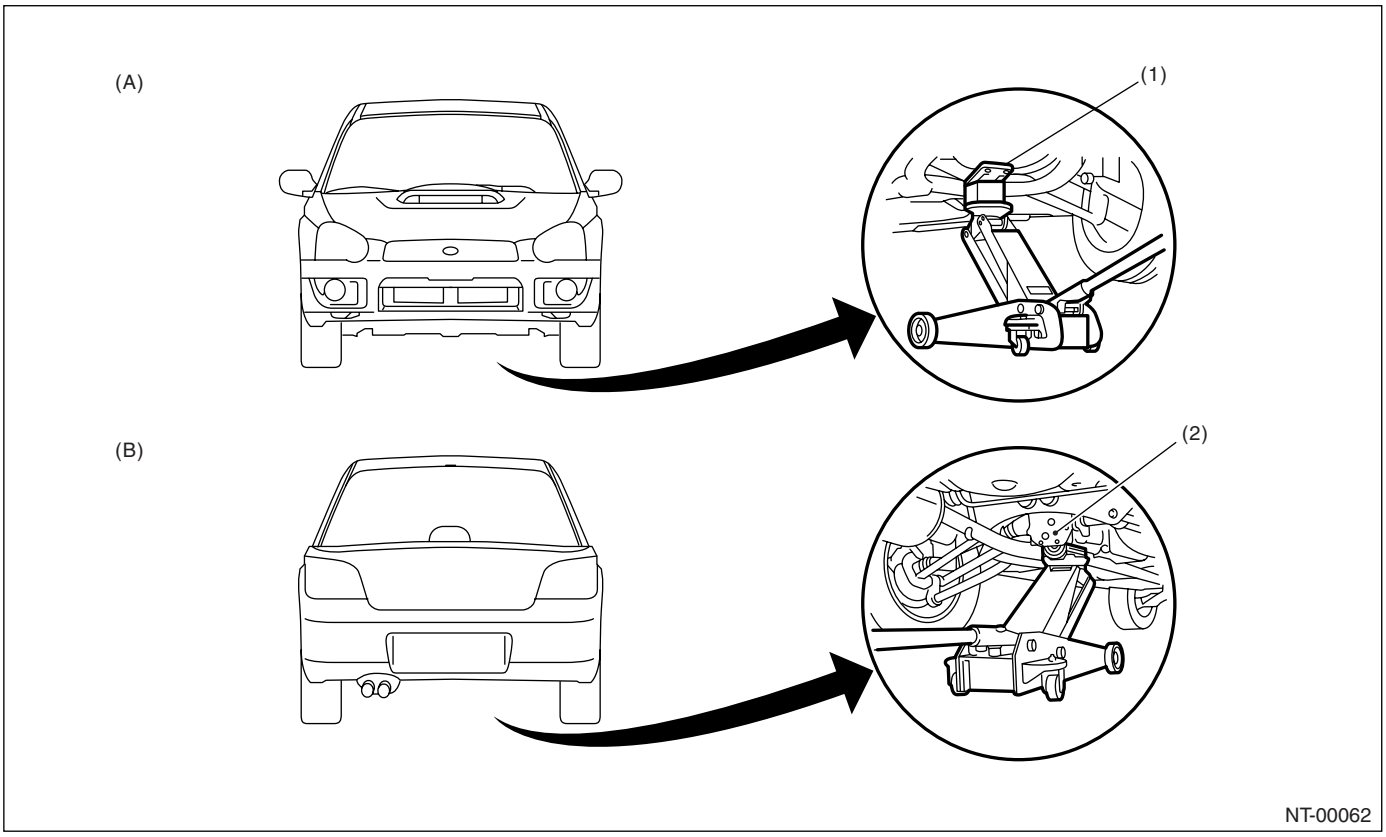


(4)



NT-00060

(1) Support locations
(2) Pantograph jack
(3) Lift
(4) Rigid rack
(5) Without side sill cover
(6) With side sill cover

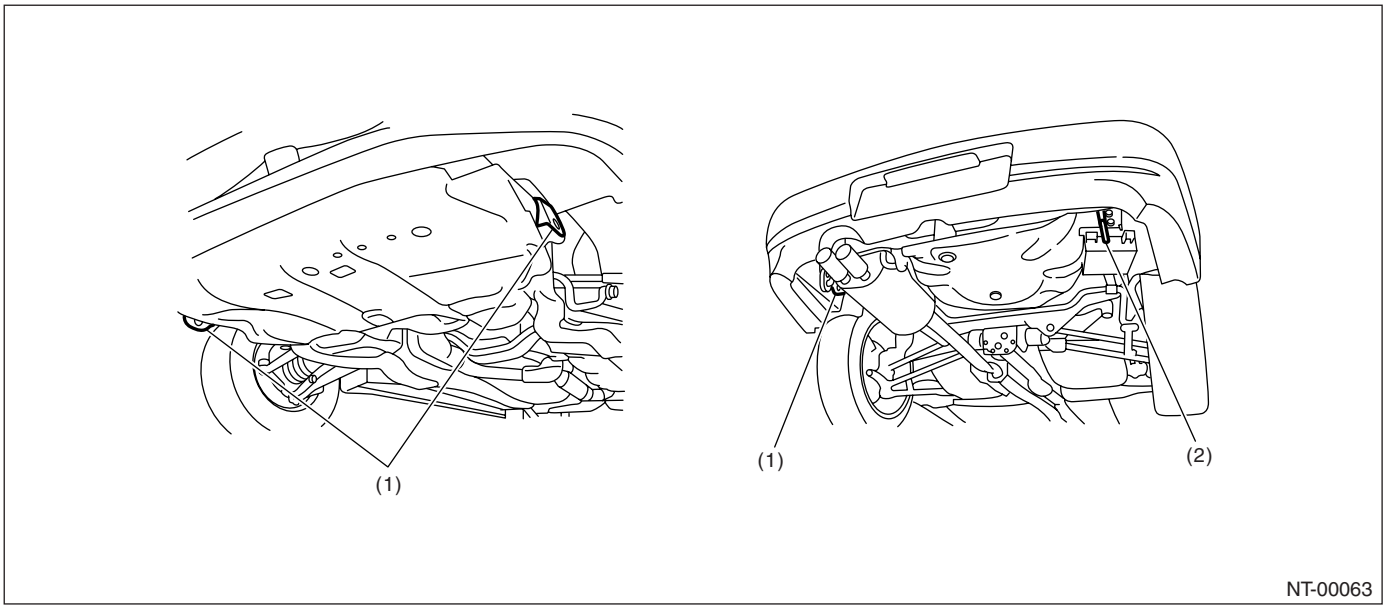


(A) Front
(B) Rear
(1) Front crossmember
(2) Rear differential

8. TIE-DOWNS

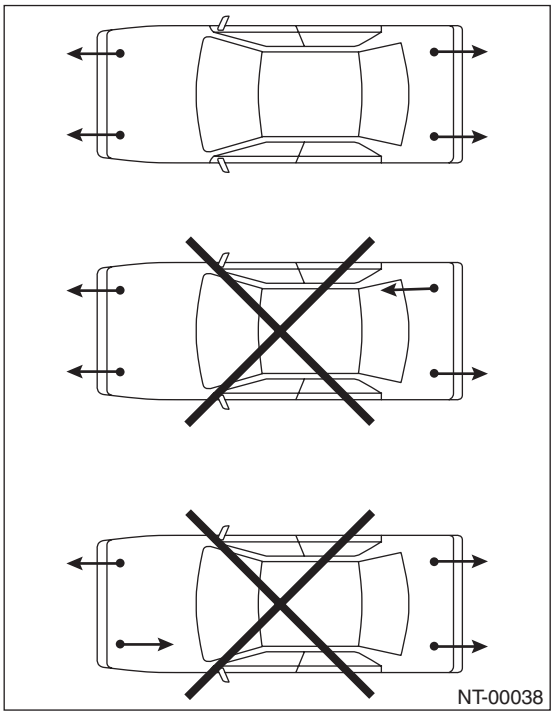
Tie downs are used when transporting vehicles and when using the chassis dynamo. Attach tie downs only to the specified points on the vehicle.

• Tie-down point

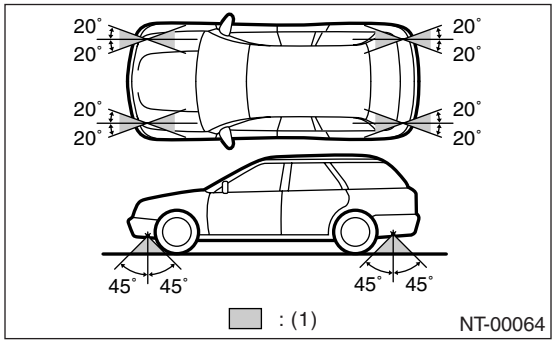


(1) Hook for tie-down
(2) Hook for towing and tie-down

• Chain direction at tie-down condition



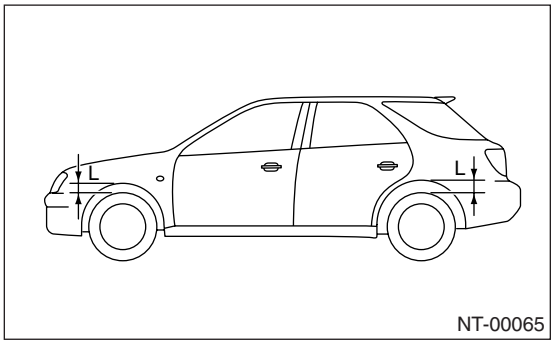
• Chain pulling range at tie-down condition



(1) Chain pulling range at tie-down condition

• Vehicle sinking volume at tie-down condition

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



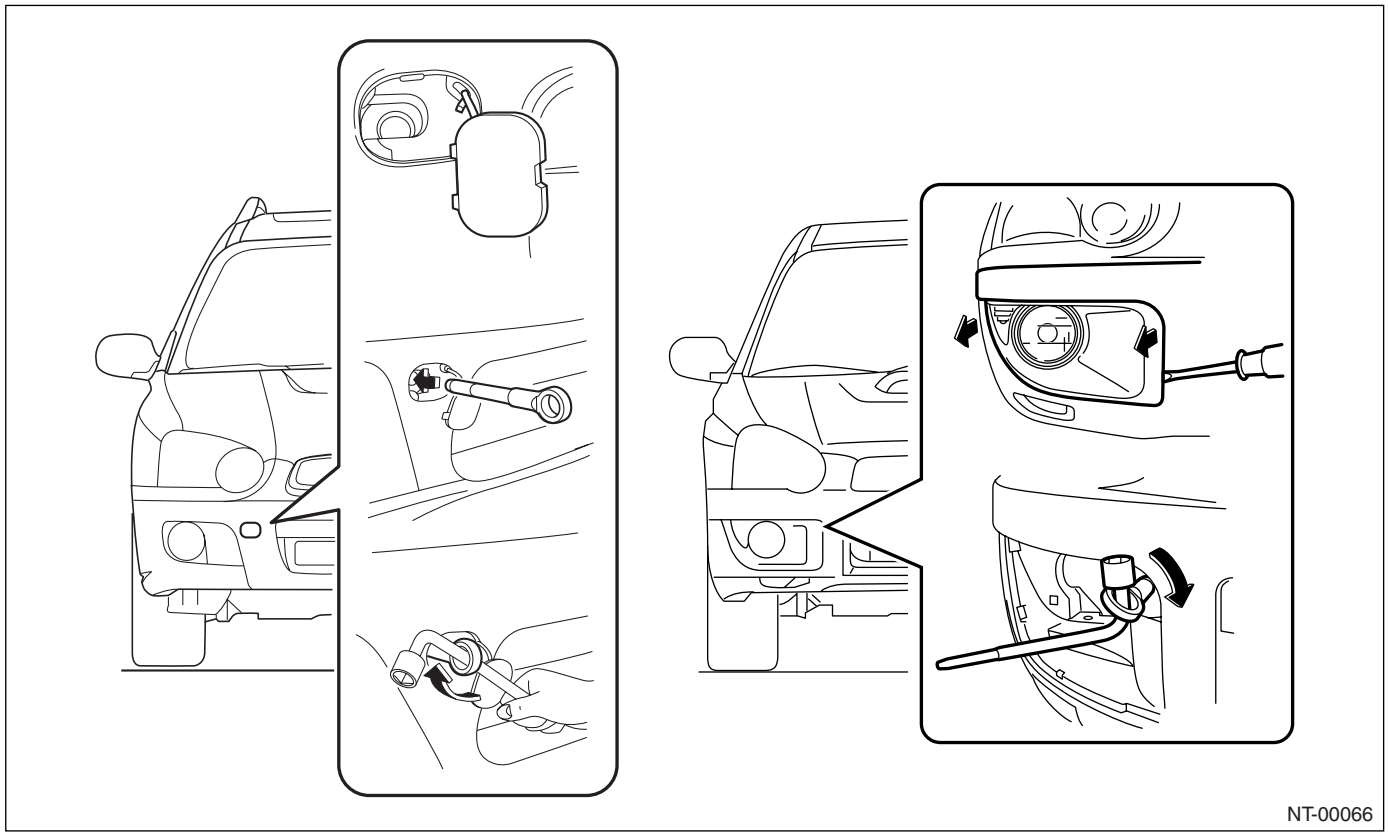
NOTE

9. TOWING

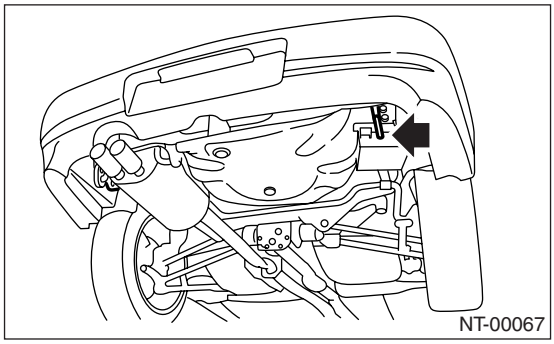
Avoid towing vehicles except when the vehicle cannot be driven. For models with AWD, AT, or VTD, use a loader instead of towing. When towing other vehicles, to prevent excessive weight from damaging the hook or vehicle:

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

• Front

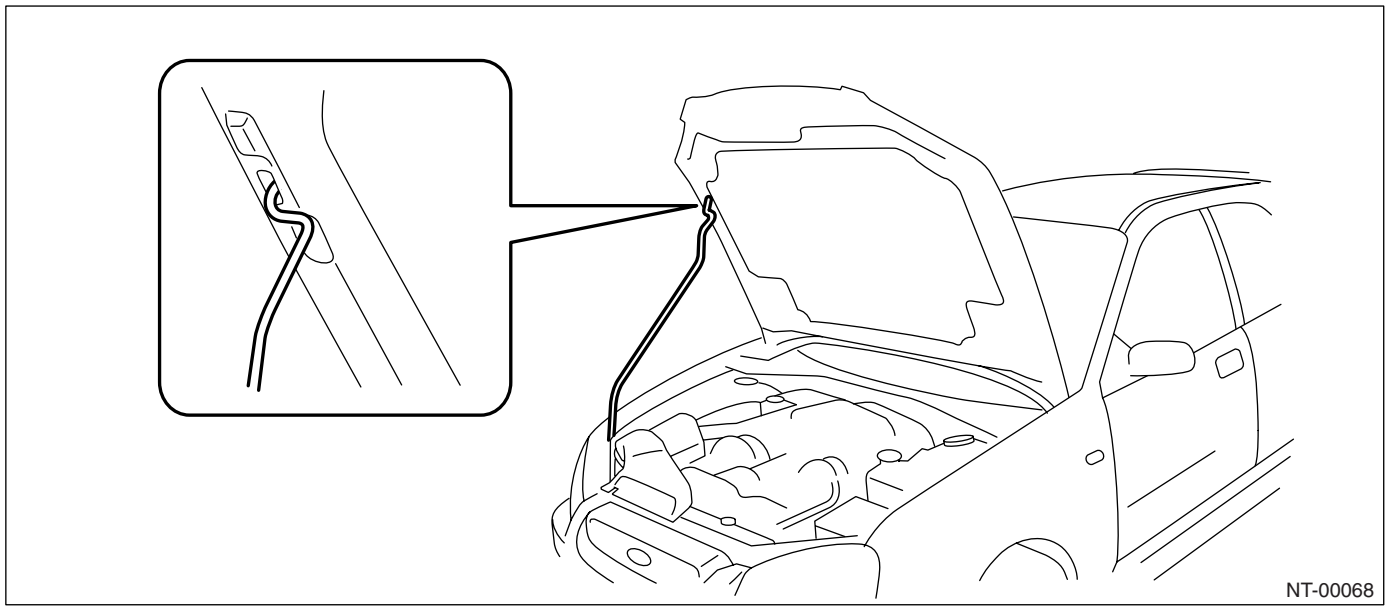


• Rear



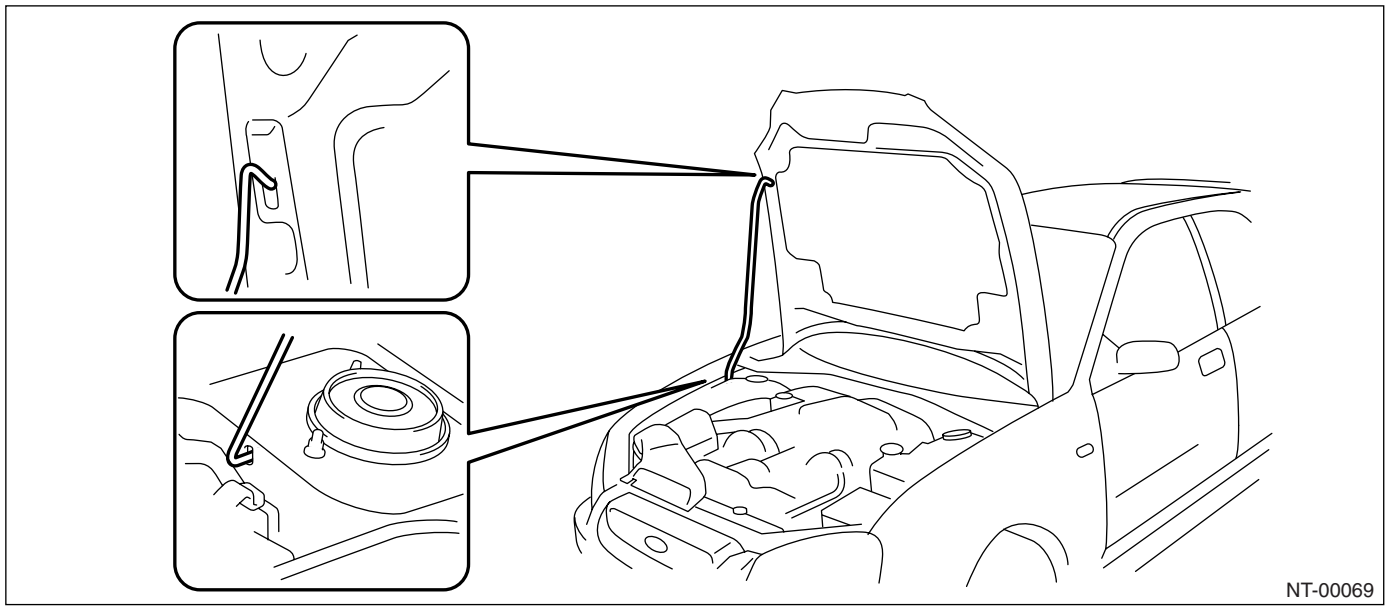
10.FRONT HOOD STAY INSTALLATION

• At the check and general maintenance



• When wider hood opening is necessary

Set stay into the hole of hood inner as shown in the figure below.



11.TRAINING

For information about training, contact a dealer or agent.

12.GENERAL SCAN TOOL

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

NOTE

IDENTIFICATION

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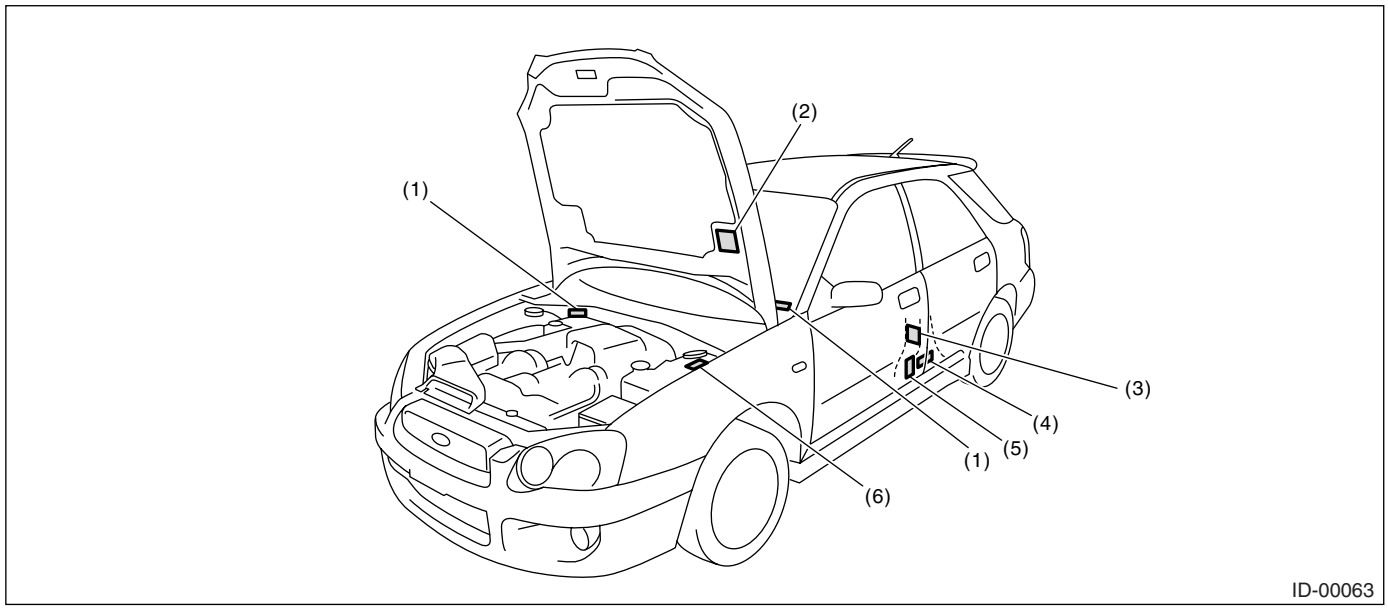
1. Identification

A: IDENTIFICATION

1. IDENTIFICATION NUMBER AND LABEL LOCATIONS

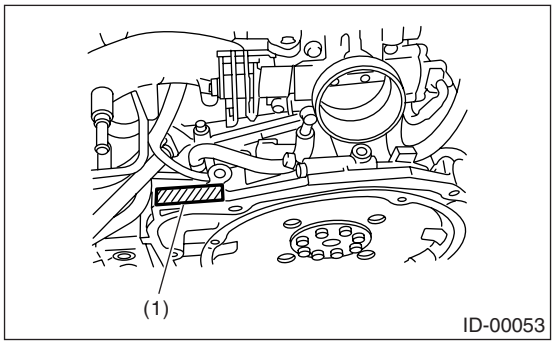
The VIN (Vehicle Identification Numbers) is used to classify the vehicle.

- **POSITIONING OF THE PLATE LABEL FOR IDENTIFICATION**



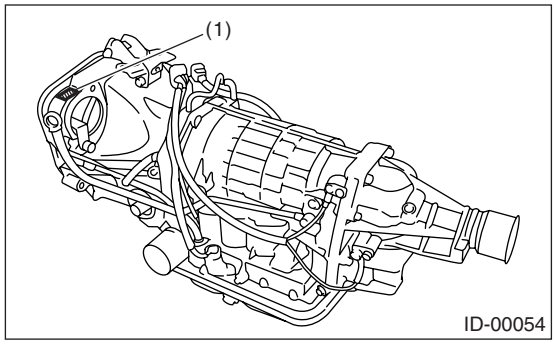
(1) Vehicle identification number (VIN)
(2) Emission control label
(3) Tire inflation pressure label
(4) Certification plate
(5) Bar code label (USA model)
(6) Model number plate

- **ENGINE**



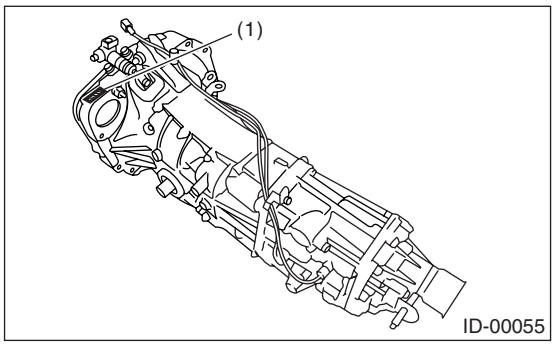
(1) Engine serial number

- **AUTOMATIC TRANSMISSION**



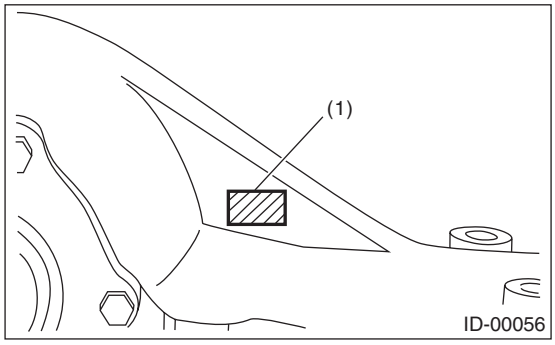
(1) Transmission serial number

- **MANUAL TRANSMISSION**



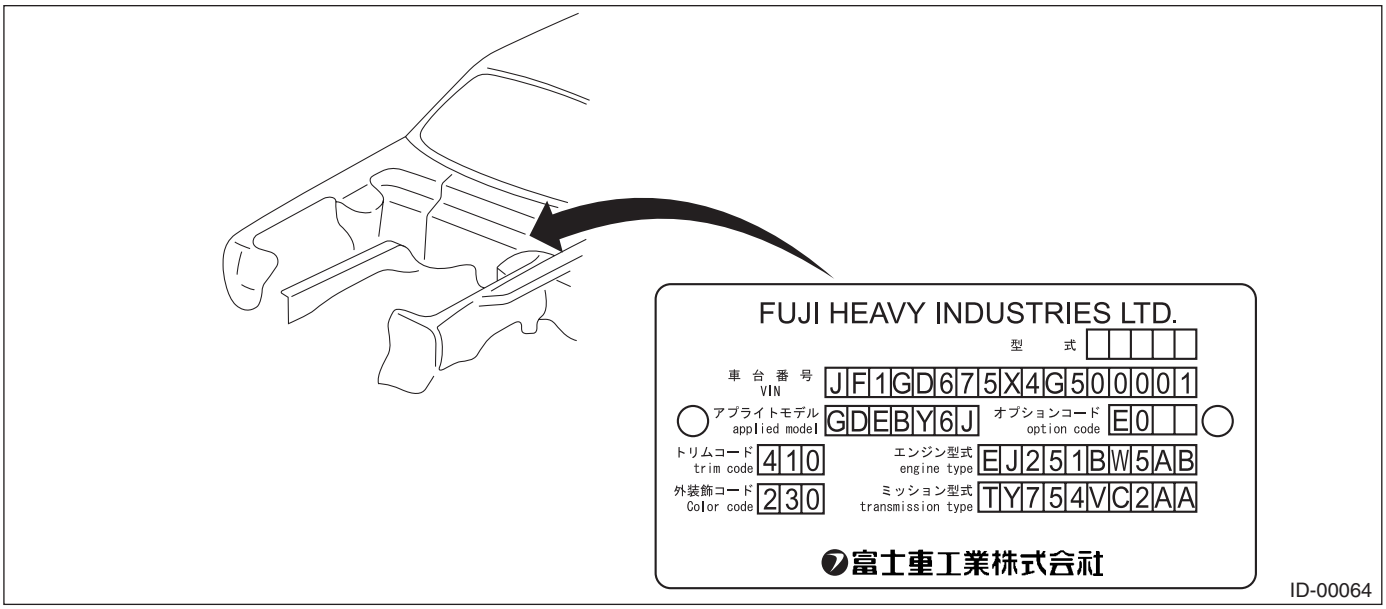
(1) Transmission serial number

- **REAR DIFFERENTIAL**



(1) Type (white paint)

- **MODEL NUMBER PLATE**



2. MEANING OF V.I.N.

The meaning of the VIN is as follows:
]JF1GD675X4G500001[
The starting and ending brackets ( ][ ) are stop marks.

Digits	Code	Meaning	Details
1 to 3	JF1	Manufacturer body area	JF1: Passenger car, FHI made
4	G	Car line	IMPREZA
5	D	Body type	D: 4 Door Sedan G: Wagon
6	6	Displacement	2: 2.0 L AWD Turbo 6: 2.5 L AWD 7: 2.5 L AWD Turbo
7	7	Grade	5: TS 7: RS 8: OUTBACK 9: WRX 0: STi
8	5	Restraint	5: Manual belts, dual airbag 6: Manual belts, dual airbag, side airbag
9	X	Check digit	0 to 9 & X
10	4	Model year	4: 2004MY
11	G	Transmission type	G: Full-time AWD 5-speed MT single range H: Full-time AWD 4-speed AT L: Full-time AWD 6-speed MT
12 to 17	500001	Serial number	500001 or more: 4-Door Sedan 800001 or more: Wagon

3. MODEL NUMBER PLATE

The model number plate indicates: the applied model, the option code, the trim code, the engine type, the transmission type, and the exterior color code. This information is helpful when placing orders for parts.
GDECY6J

Digits	Code	Meaning	Details
1	G	Series	IMPREZA
2	D	Body style	D: 4 Door Sedan G: Wagon
3	E	Engine displacement Drive system Suspension system	A: 2.0 L AWD Turbo E: 2.5 L AWD F: 2.5 L AWD Turbo
4	C	Model year	C: 2004MY
5	Y	Destination	Y: Left-hand drive model for North America and Canada
6	6	Grade	4: TS 6: RS 7: OUTBACK 8: WRX E: STi
7	J	Transmission, fuel feed system	R: SOHC MPI 4-speed AT P: DOHC B MPI 4-speed AT J: SOHC MPI 5-speed MT AWD D: DOHC B MPI 5-speed MT AWD H: DOHC B MPI 6-speed MT AWD

The engine and transmission type are as follows:

• Engine

EJ251BW5AB

Digits	Code	Meaning	Details
1 and 2	EJ	Engine type	EJ: 4 cylinders
3 and 4	25	Displacement	20: 2.0 L 25: 2.5 L
5	1	Fuel feed system	1: D-MPI SOHC-A 5: MPI Turbo 7: MPI High power turbo
6	B	Exhaust regulations	—
7	W	Transmission	W: MT X: AT
8	5	Minor change	5: “5” is impressed on this vehicle.
9 to 10	AB	Detailed specifications	Used when ordering parts. See the parts catalog for details.

• Transmission

TY754VC2AA

Digits	Code	Meaning	Details	
1	T	Transmission	T: Transmission	
2	Y	Transmission type	Y: Full-time AWD MT center differential V: Full-time AWD AT center differential Z: Full-time AWD AT MPT	
3 and 4	75	Classification	75: 5MT 85: 6MT 1A: AT	
5	4	Series	MT	4: 5MT 6: 6MT
			AT	4: AT
6	V	Transmission specifications	V: Full-time AWD 5-speed MT with viscous coupling center differential single range W: Full-time AWD single range 6-speed MT Z: Full-time AWD 4-speed AT with MPT Y: Full-time AWD 4-speed AT with VTD	
7	C	Engine type	V, N: 920 DOHC Turbo C, F: 925 SOHC H: 925 DOHC Turbo	
8 to 10	2AA	Detailed specifications	Used when ordering parts. See the parts catalog for details.	

• Rear differential

EG

Code	Reduction gear ratio	LSD
EG	3.900	No
EH	4.111	No
EL	4.444	No
EF	3.545	Viscous
EJ	4.111	Viscous
HK	3.900	Mechanical

• Option code

U4FL

Digits	Code	Meaning	Details
1 and 2	U4	Destination	U4: USA CO: Canada
3 and 4	FL	Main option of vehicle	—

RECOMMENDED MATERIALS

RM

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1. Recommended Materials 2

1. Recommended Materials

A: RECOMMENDED MATERIALS

1. GENERAL

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

2. FUEL

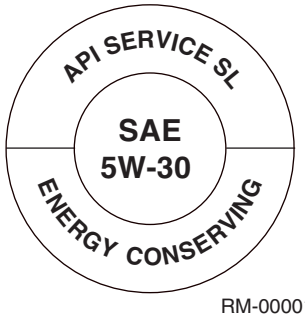
Always use a gasoline of the same or higher octane value than specified in the owner's manual. Ignoring the specifications below will result in damage or poor operation of the engine and fuel injection system. Use the specified gasoline to correct performance.

• Unleaded gasoline

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

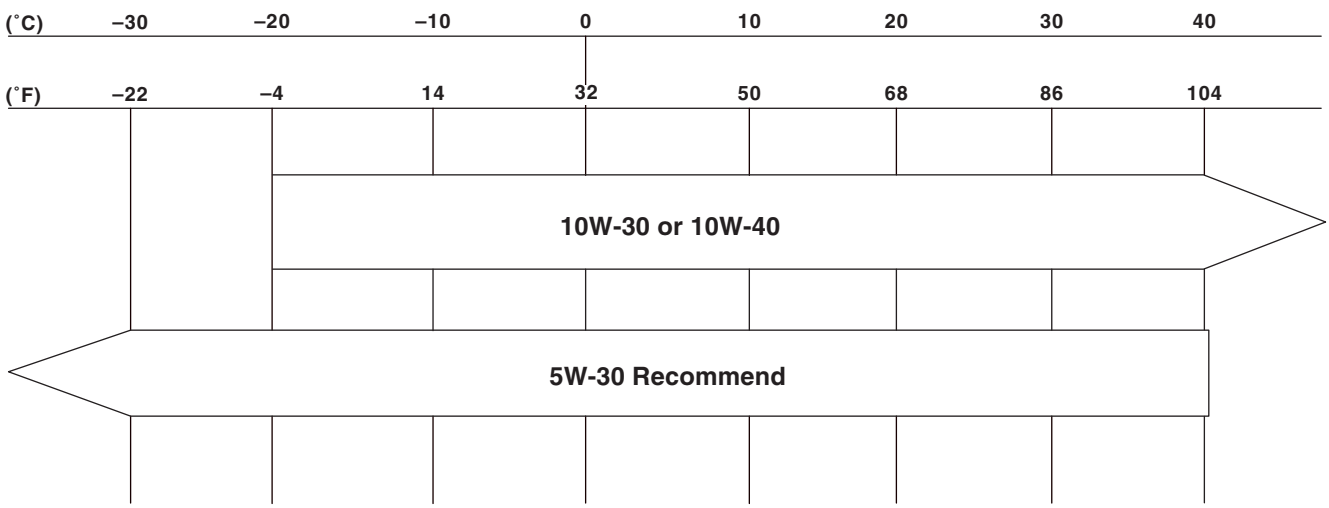
3. LUBRICANTS

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

Lubricant	Recommended			Alternative
	API Spec.		ILSAC Spec.	API Spec.
Engine oil	SL Grade "Energy conserving"  RM-00001 RM-00002		GF-3	SJ
Manual transmission oil	GL-5		—	—
AT front differential gear oil	GL-5		—	—
Rear differential gear oil	Except STi model	GL-5	—	—
	STi model	GL-5 (For mechanical LSD)		

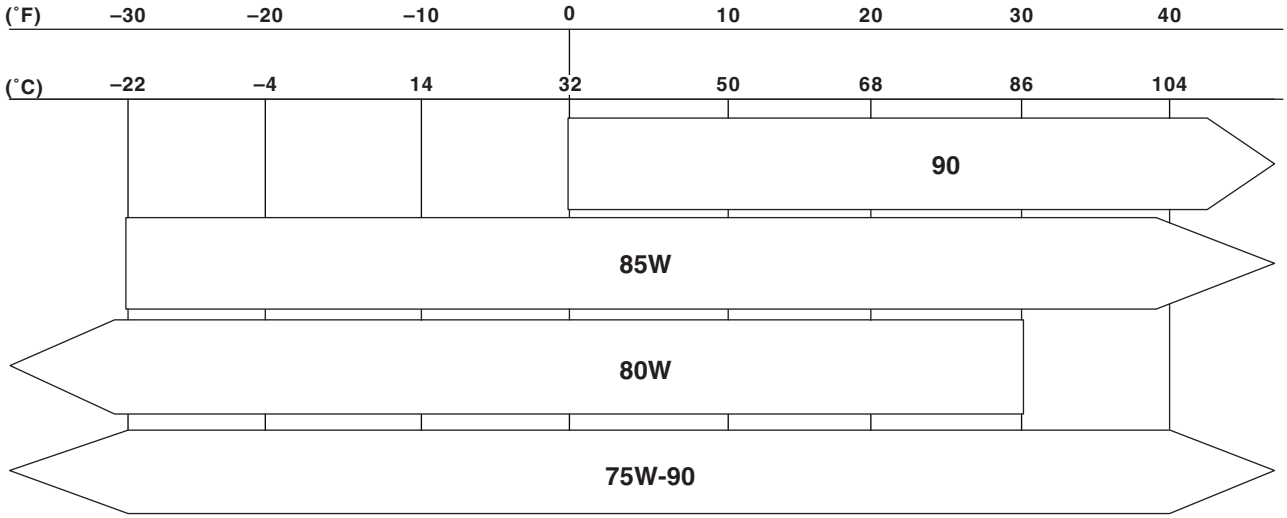
SAE viscosity No. and applicable temperature

Engine oil



RM-00003

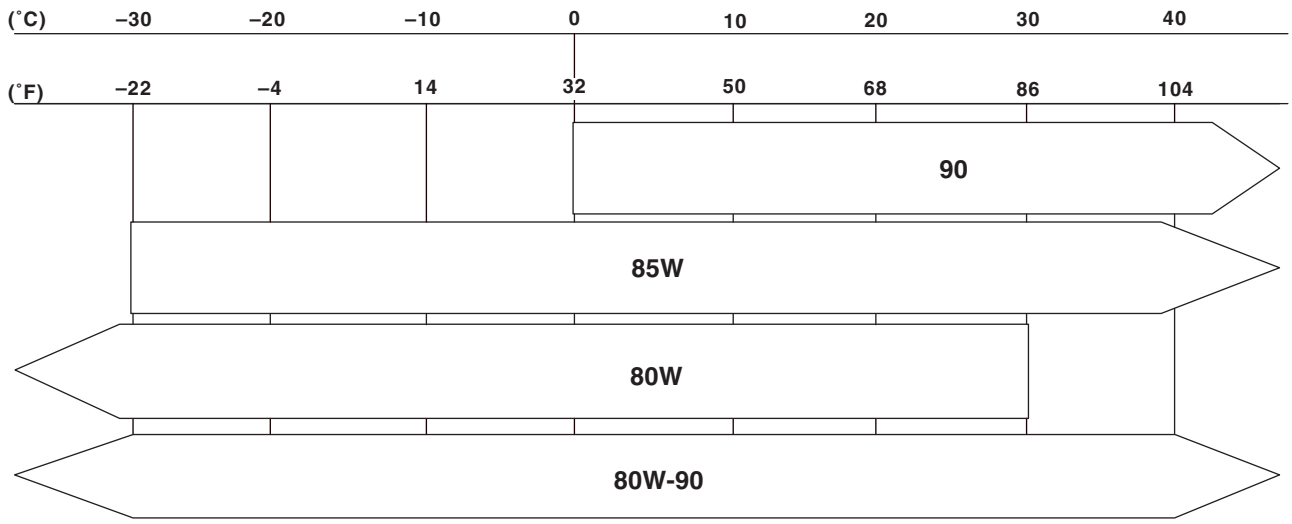
Manual transmission oil and rear differential gear oil



RM-00004

SAE viscosity No. and applicable temperature

AT front differential gear oil



RM-00005

4. FLUID

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

Fluid	Recommended	Alternative	Remarks
Automatic transmission fluid	DEXRON III	—	—
Power steering fluid	DEXRON III	—	—
Brake fluid	FMVSS No. 116 DOT3	—	—
Clutch fluid	FMVSS No. 116 DOT3	FMVSS No. 116 DOT4	—

5. COOLANT

Use genuine coolant to protect the engine.

Coolant	Recommended	Item number	Alternative
Coolant	SUBARU coolant	000016218	None
Water for dilution	Distilled water	—	Tap water (Soft water)

6. REFRIGERANT

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

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

7. GREASE

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

Grease	Application point	Recommended	Item number	Alternative
Supplementary lubricants	• O_2 sensor • Bolts, etc.	SUBARU CRC	004301003	—
Grease	MT main shaft	NICHIMOLY N-130	—	—
	Clutch master cylinder push rod	Silicolube G-40M	004404003	—
	• Gear shift lever • Select lever • Clutch operating cylinder • Accelerator pedal • Clutch pedal • Brake pedal • Clutch bearing • Clutch release lever	KOPR-KOTE	003603001	—
	Steering gear box	Valiant grease M-2	003608001	—
	Disc brake	Niglube RX-2	K0779GA102	—
	Brake pad	Molykote AS-880N	K0777YA010	—
	Front axle SFJ	SSG-6003	28093TA000	—
	• Front axle EBJ • Front axle BJ • Rear axle EBJ	NTG2218	28093AA000	—
	Rear axle BJ87	NTG2218-M	28395FE010	—
	Rear axle BJ	Molylex No. 2	003601001	—
	• Rear axle DOJ • Front axle DOJ	VU-3A702	23223GA050	—
	• Throttle cable end • Door latch • Door striker	Silicolube G-30M	004404002	—

8. ADHESIVES

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

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

9. SEAL MATERIAL

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

Seal material	Application point	Recommended	Item number	Alternative
Seal material	• Cylinder block • Torque converter clutch case • Transmission oil pan (6MT model)	Three Bond 1215	004403007	Dow Corning's No. 7038
	Transmission oil pan (AT model)	Three Bond 1217B	K0877YA020	—
	Rear differential	Three Bond 1324	004403042	—
	Rear differential	Three Bond 1105	004403010	Dow Corning's No. 7038
	Steering adjusting screw	Three Bond 1141	004403006	—
	Camshaft cap	Three Bond 1280B	K0877YA018	—
	• Front sealing cover • Rear sealing cover	3M Butyl Rubber 8626	—	—

PRE-DELIVERY INSPECTION

PI

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1. Pre-delivery Inspection.....2

1. Pre-delivery Inspection

A: GENERAL

The purposes of the pre-delivery inspection (PDI) are as follows.
- Remove the additional parts used for ensuring the vehicle quality during transportation and restore the vehicle to its normal state.
- check that the vehicle before delivery is in a normal state.
- Check for any damage or missing parts that may have taken place during transportation or storage.
- Make sure to provide a complete vehicle to the customer.

Because of the above reasons, all SUBARU distributor service must always carry out the PDIs before delivering a vehicle.
In addition, all franchised shops and PDI centers must check the status of every vehicle received to identify who is responsible for any possible defects.

B: PDI PROCEDURE

Follow the procedures shown in the table below.
Static Checks Just After Vehicle Receipt

Step	Check point
1. Appearance check	(1) If the vehicle is covered with protective coating, visually check the vehicle body for damage and dents. If the protective coating has been removed, visually check the body paints for small areas of damage or stains. (2) Visually check the glass and light lenses for any damage and cracks or excessive gaps to the body sheet metal. (3) Visually check the plated parts for any damage.
2. Tire check	(1) Check the tires for damage, abnormal conditions, and dents on the wheels. (2) Check the tire air pressure.
3. Fuse installation	If the vehicle is about to be delivered to the customer, attach a room light fuse.
4. Connection of air conditioner harness	If the vehicle is about to be delivered to the customer, connect the air conditioner harness.
5. Check the doors for lock/unlock and open/close operations.	(1) Using the key, check that the door can be locked and unlocked normally. (2) Open and close all doors to see that there are no abnormal conditions.
6. Operation check of the child safety lock system	Check that the child safety lock system operates normally.
7. Check the trunk lid for open/close operations.	(1) Operate the trunk lock release lever to check that the trunk opens normally. (2) Using the key, check that the trunk lid can be unlocked normally. (3) Open and close the trunk lid to see that there are no abnormal conditions.
8. Check the rear gate for lock/unlock and open/close operations.	(1) Check if the rear gate can be unlocked normally through the emergency hole. (2) Open and close the rear gate to see that there are no abnormal conditions. (3) Operate the power door locking switch to check that the rear gate is locked and unlocked normally.
9. Operation check of trunk lid release handle.	Operate the trunk lid release handle to check that the trunk lock opens normally.
10. Operation check of fuel lid opener lock release lever	Operate the fuel lid opener to check that the fuel lid is unlocked normally.
11. Accessory check	Check that the following accessories are provided: • Owner's manual • Warranty booklet • Service booklet • Spare key • Jack • Tool set • Spare tire
12. Operation check of hood lock release system	Operate the hood lock release lever to check that the hood opens normally.

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

Checks with the Engine Running

Step	Check point
27. Test mode connector	Test mode connector.
28. Starting condition	Start the engine and check that the engine starts smoothly.
29. Exhaust system	Check that the exhaust noise is normal and no leaks are found.
30. Indicator light	Check that all the indicator lights operate normally.
31. Clock	Check that the clock operates normally.
32. Radio	Check that the radio system operates normally.
33. Front accessory power supply socket	Check that the front accessory power supply socket operates normally.
34. Lighting system	Check that the lighting systems operate normally.
35. Window washer	Check that the window washer system operates normally.
36. Wiper	Check that the wiper system operates normally.
37. Power window operation check	Check the power window for correct operations.

Dynamic Test with the Vehicle Running

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

Checks after Dynamic Test

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

1. APPEARANCE CHECK

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

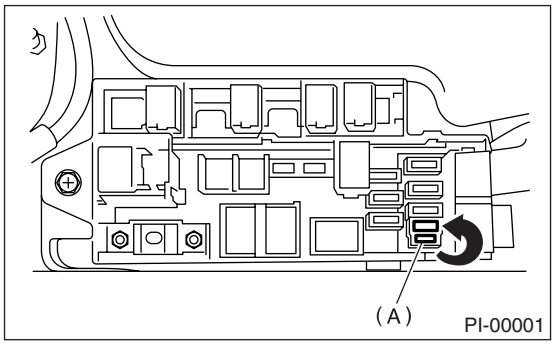
2. TIRE CHECK

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

Tire size	Tire inflation pressure kPa (kg/cm^2, psi)	
	Front	Rear
P195/60R15	220 (2.2, 32)	200 (2.0, 29)
P205/55R16	220 (2.2, 32)	200 (2.0, 29)
215/45R17	230 (2.3, 33)	220 (2.2, 32)
225/45ZR17	250 (2.5, 36)	210 (2.1, 30)

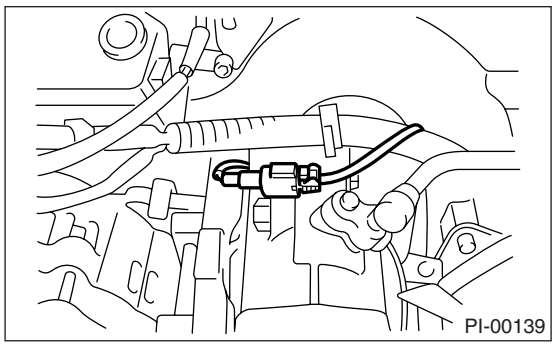
3. FUSE INSTALLATION

A vehicle just delivered has no fuse for the room light circuit to prevent battery discharge. Attach a 15 A fuse (A) as shown in the figure.



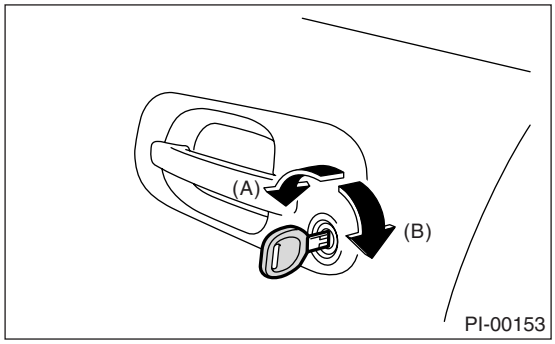
4. CONNECTION OF AIR CONDITIONER HARNESS

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



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

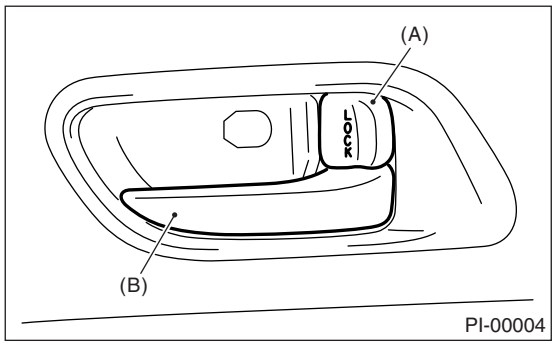
1) Using the key, lock and unlock the door several times to check for normal operation. Open and close the door several times for smooth movement.



(A) Unlock
(B) Lock

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

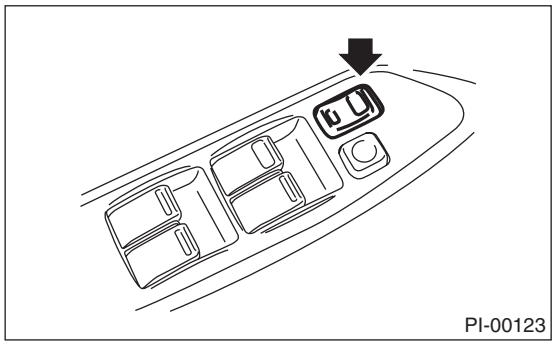
For other doors, place the door lock knob (A) to the lock positions and then pull the inner remote to ensure that the doors will not open.



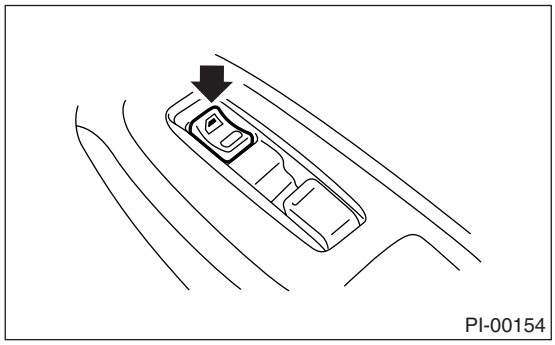
(A) Door lock knob
(B) Inner remote

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

- Driver's side

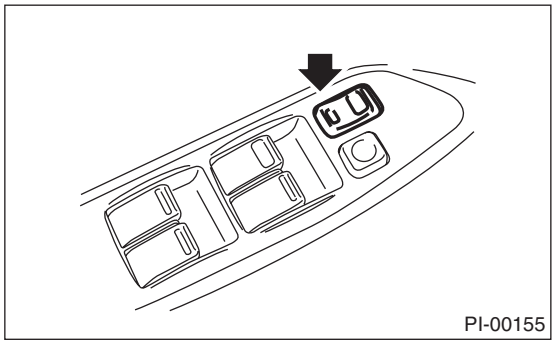


- Passenger's side

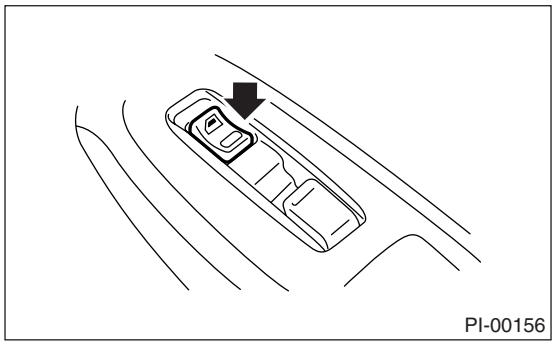


4) Press the driver's and passenger's side power door lock switch to unlock side. Check that all doors including rear gate are unlocked.

- Driver's side

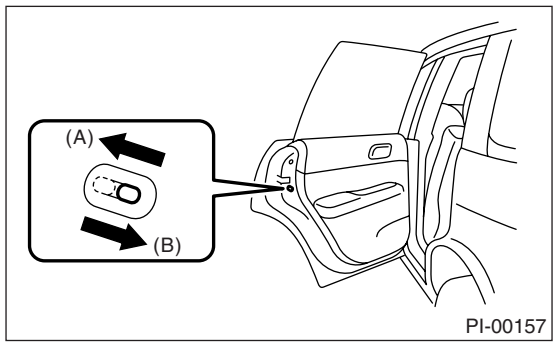


- Passenger's side



6. CHECK THE OPERATION OF CHILD SAFETY LOCKS SYSTEM

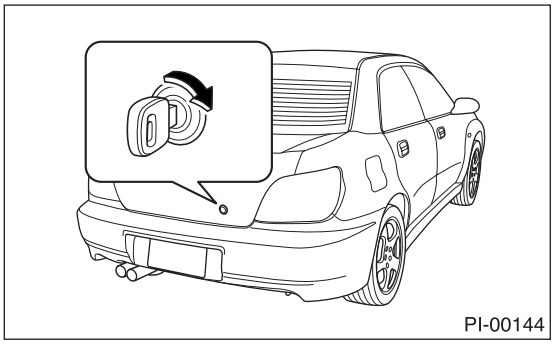
1) Set the child safety lock on both rear doors to the lock positions.
2) Close the rear doors completely.
3) Check that the lock levers of the rear doors are in the unlock positions. Then, pull the inner remotes of the rear doors to ensure that the doors will not open.
4) Next, pull the outside door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



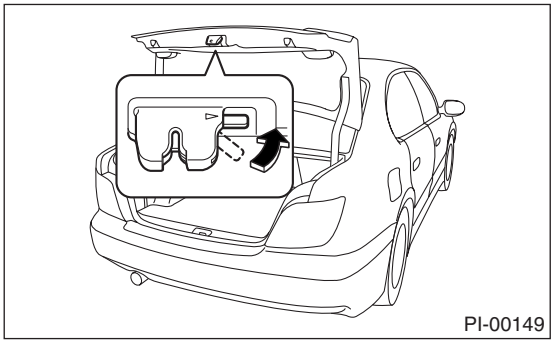
(A) Unlock
(B) Lock

7. CHECK THE TRUNK LID FOR OPEN/ CLOSE OPERATIONS

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

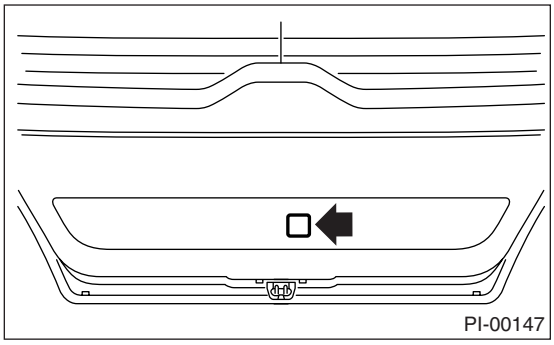

PI-00144

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

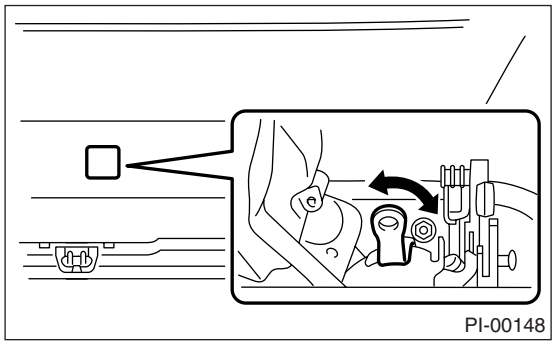

PI-00149

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

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

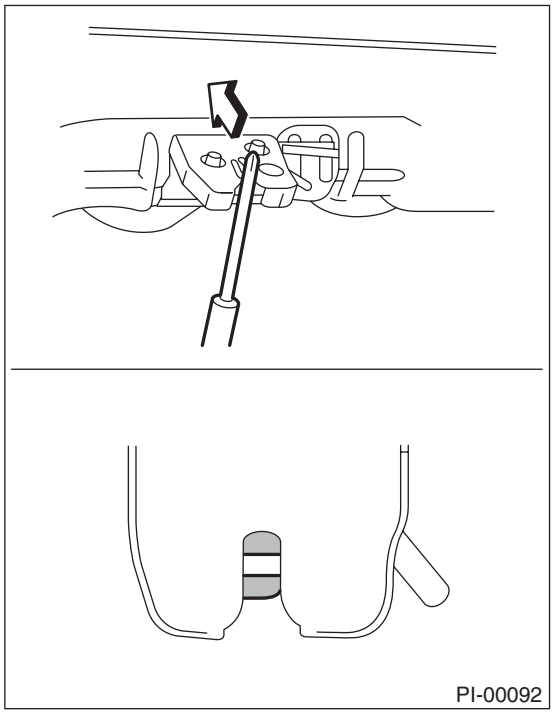

PI-00147

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


PI-00148

9. OPERATION CHECK OF TRUNK LID RELEASE HANDLE

1) Use a flat-tip screwdriver. Slide the screwdriver blade from the slit aperture of the lock assembly fully to the end until you hear a click. This places the latch in the locked position.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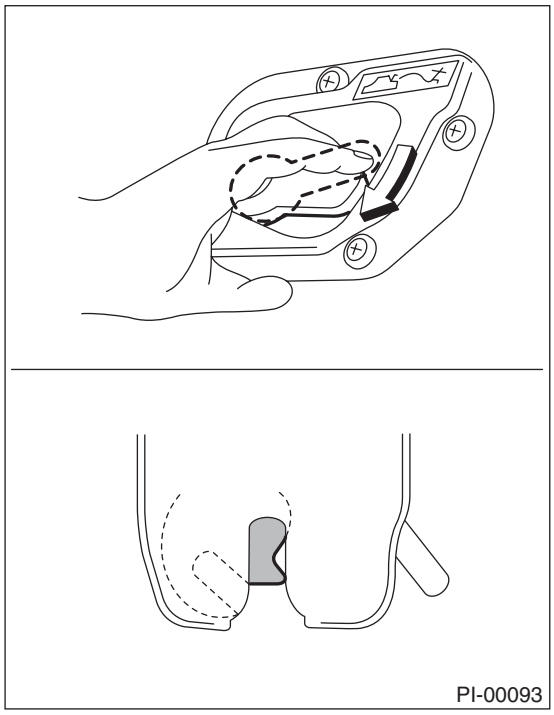
2) Move the release handle from outside the vehicle in the direction of the arrow to check if the latch is released.



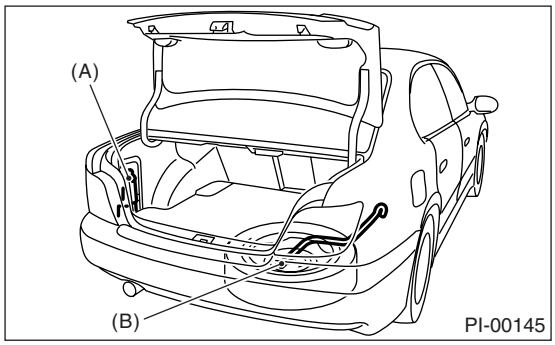
10.OPERATION CHECK OF FUEL LID OPENER LOCK RELEASE LEVER

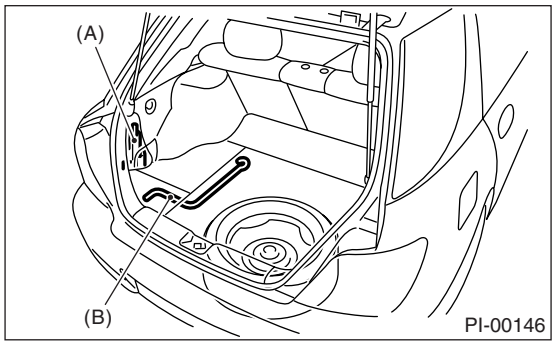
Operate the fuel lid opener and verify that the fuel lid opens normally. Check that the filler cap is securely closed.

11.ACCESSORY CHECK

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

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

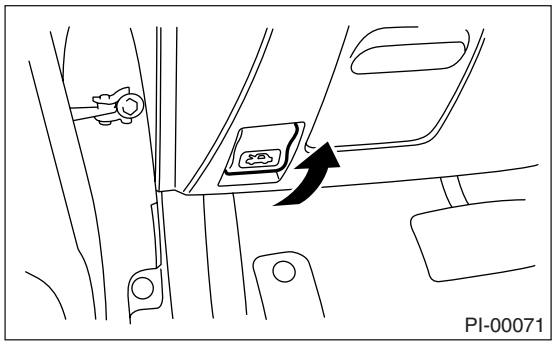




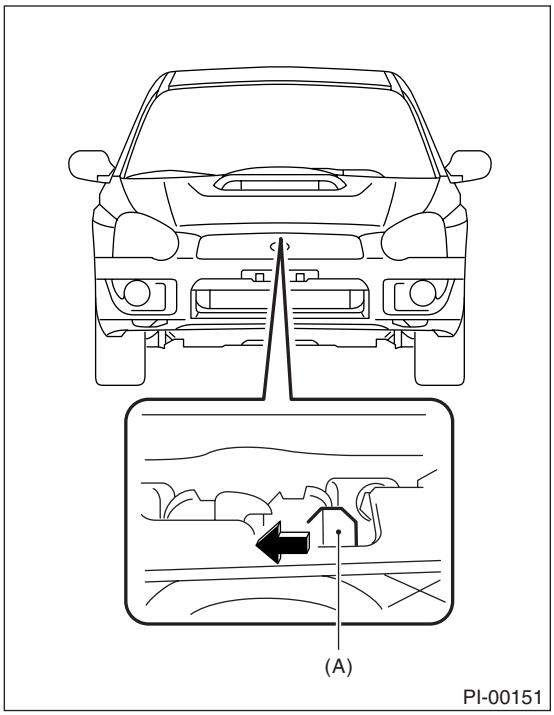
(A) Jack
(B) Jack handle

12.OPERATION CHECK OF HOOD LOCK RELEASE SYSTEM

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

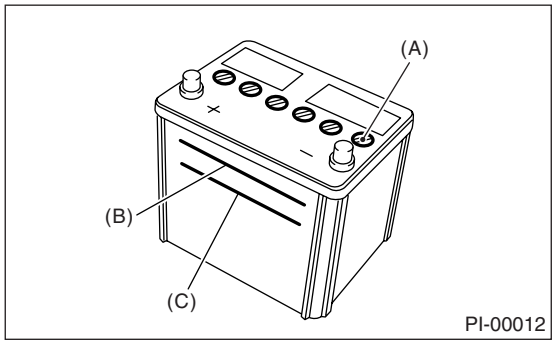


Operate the lever (A) and check that the hood is opened normally. Then support the hood with hood stay.



13.BATTERY

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



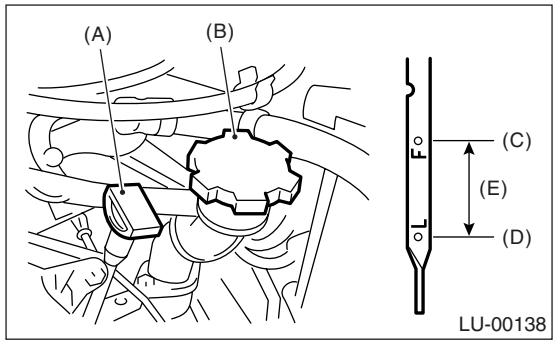
(A) Cap
(B) Upper level
(C) Lower level

14.BRAKE FLUID

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

15.ENGINE OIL

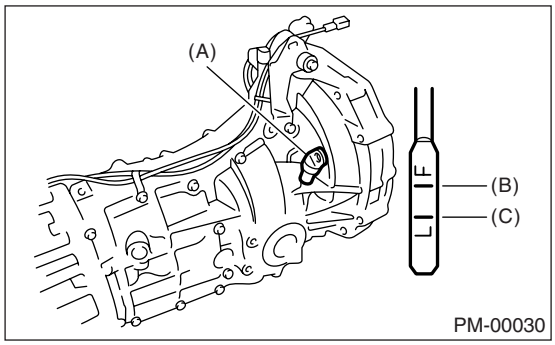
Check the engine oil amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of the specified engine oil.



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

16.TRANSMISSION FLUID

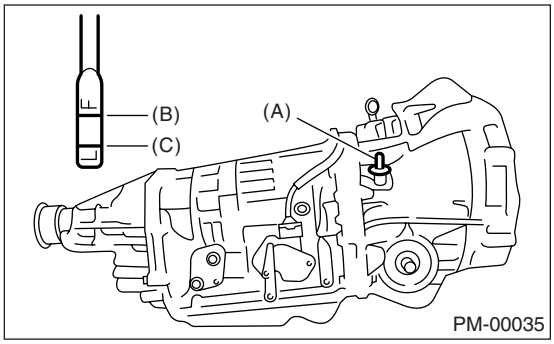
Check the transmission fluid amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of the specified fluid.



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

17.AT FRONT DIFFERENTIAL OIL

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



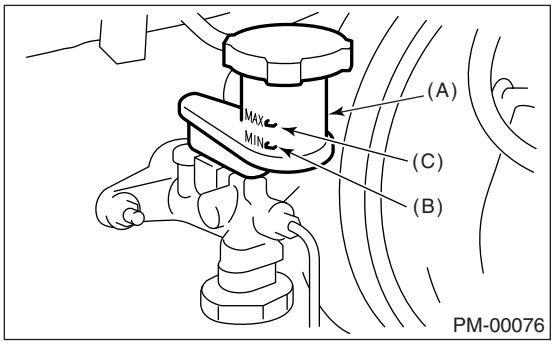
(A) Oil level gauge
(B) Upper level
(C) Lower level

18.COOLANT

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

19.CLUTCH FLUID

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



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

20.WINDOW WASHER FLUID

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

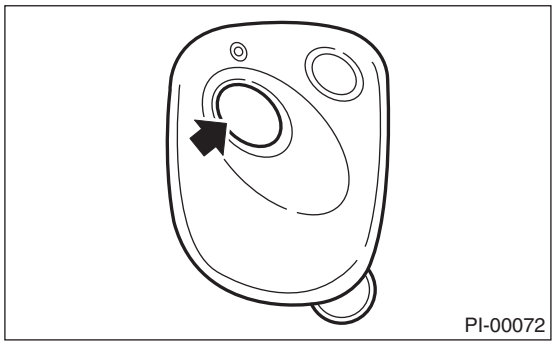
21.HOOD LATCH CHECK

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

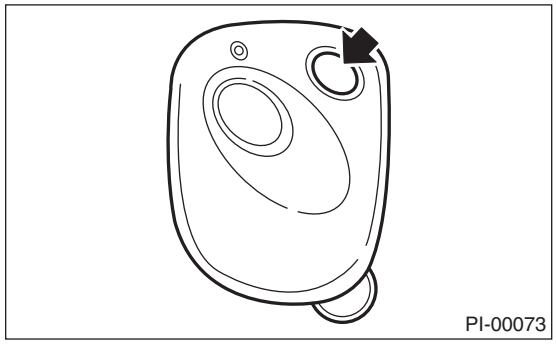
22.KEYLESS ENTRY SYSTEM

Check the keyless entry system operations as follows:

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



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

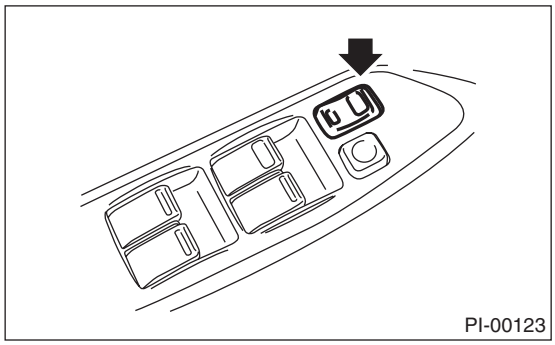


- Press the “UNLOCK/DISARM” button on the transmitter momentarily once again within five seconds and check if all the doors including the rear gate on wagon are unlocked.
- Press the “LOCK/ARM” button on the transmitter a little bit of time (approx. 2 sec.) and check if a panicking condition occurs;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

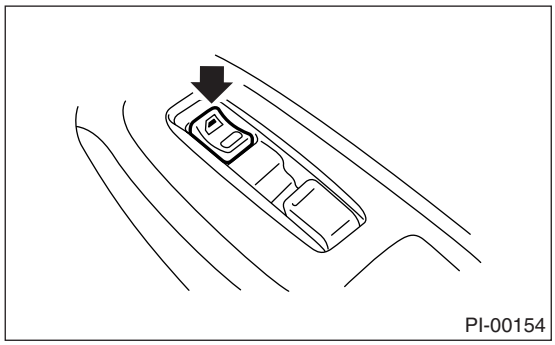
Then, bring all the doors including the rear gate in closed condition and check if all the doors are locked, the buzzer chirps once, and the hazard light flashes once.

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

• Driver’s seat


PI-00123

• Passenger’s seat


PI-00154

Check selecting audible signal operation.

• Using the buzzer, the system will give you an audible signal when the doors lock and unlock.

If desired, you may turn the audible signal off.

To turn the audible signal off, carry out the unlocking procedure of keyless entry system, then simultaneously depress LOCK/ARM and UNLOCK/DISARM buttons for more than two seconds.

The buzzer will sound twice, and hazard light will flash twice to inform you that the audible signal has been turned off.

To turn the audible signal on, carry out the unlocking procedure of keyless entry system, then simultaneously depress LOCK/ARM and UNLOCK/DISARM buttons for more than two seconds.

The buzzer will sound once and hazard light will flash once to inform you that the audible signal has been turned on.

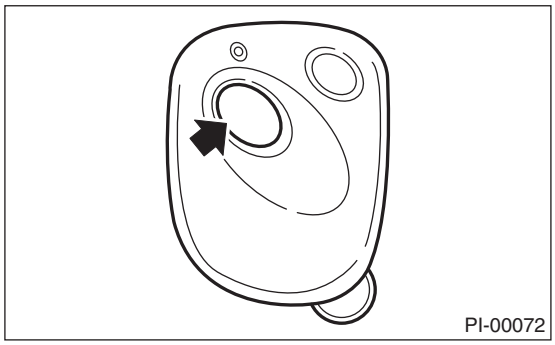
23.SECURITY SYSTEM

Check the security system operations as follows:

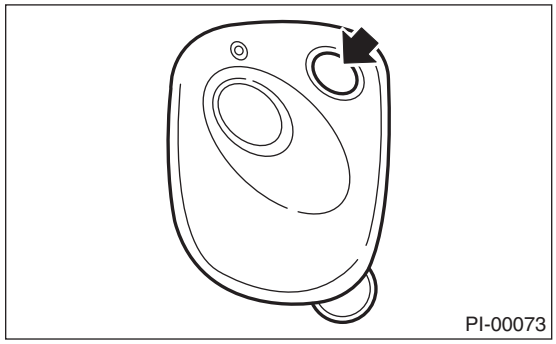
• Fully open all the door windows.

• Remove the key from the ignition switch and close all the doors including rear gate.

• Press the “LOCK/ARM” button on the transmitter momentarily once and check if all the doors are locked, the buzzer chirps once, the hazard lights flash once and the security indicator light flashes slowly to ensure that the security system has been brought into the arming state.


PI-00072

• Press the “UNLOCK/DISARM” button on the transmitter momentarily once and check if the driver’s door is unlocked, the buzzer chirps twice, the hazard light flash twice, the dome light illuminates and the security indicator light goes off to ensure that the system has been brought into the disarming state.


PI-00073

• Press the “UNLOCK/DISARM” button on the transmitter momentarily once again within five seconds and check if all the doors including the rear gate on wagon are unlocked.

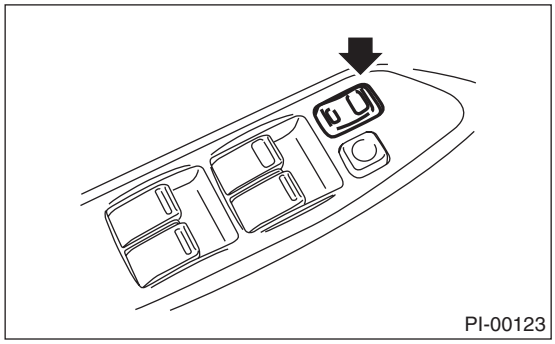
• Press the “LOCK/ARM” button on the transmitter a little bit of time (approx. 2 sec.) and check if a panicking condition occurs; the horn sounds continuously, the hazard lights flash and the security indicator light flashes rapidly. Also, check if that condition lasts for 30 seconds or until any button of the transmitter is pressed.

• Press the “LOCK/ARM” button on the transmitter momentarily once with one of the doors including the rear gate open and check if the buzzer chirps five times to warn of a door ajar.

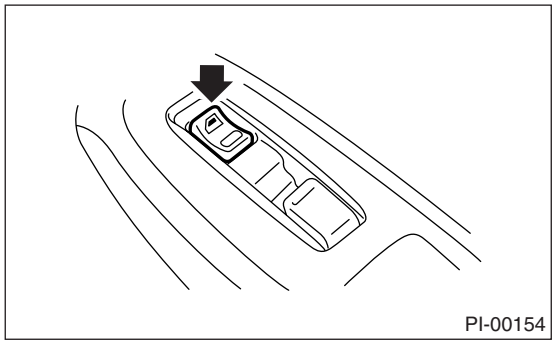
Then, bring all the doors including the rear gate in closed condition and check if the arming condition is brought about; all the doors are locked, the buzzer chirps once and the hazard lights flash once.

• Press the “LOCK” side of the power door locking switch with any one of the doors including the rear gate open. Check the buzzer chirps five times to warn door ajar. Then, bring all the doors including the rear gate in the closed condition and check if all the doors are locked, the buzzer chirps once and the hazard lights flash once to ensure that the security system has been brought into the arming state.

• Driver’s seat



• Passenger’s seat



• Unlock a door using the inner lock knob or the key and open the door while the security system is in the arming state. Check to ensure that the alarming condition occurs, i.e. the horn sounds continuously, the hazard lights flash and security indicator light flashes rapidly, and that it lasts for 30 seconds or until the “UNLOCK/DISARM” button on the transmitter is pressed. Also, check to ensure that turning the ignition key to the “START” position in the arming state does not cause the starter motor to turn, thus the engine being prevented from starting.

• Apply a shock to the vehicle body with the security system in arming state, and check to ensure that the alarming condition occurs.

• Troubleshoot the security system if any one of the above-mentioned checks does not meet the requirements.

24.SEAT

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

25.SEAT BELT

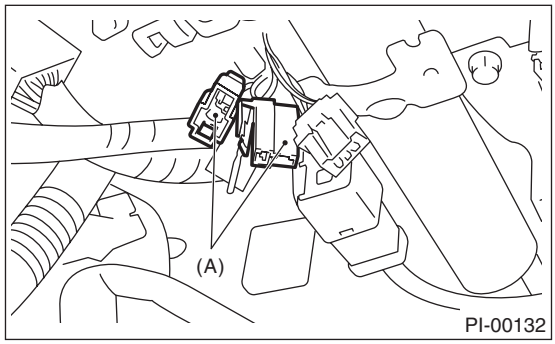
Pull out the seat belt and then release it. Check that the belt webbing retracts smoothly.

26.WHEEL ALIGNMENT

Check the wheel alignments. <Ref. to FS-6, Wheel Alignment.> and <Ref. to RS-8, Wheel Alignment.>

27.TEST MODE CONNECTOR

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



(A) Test mode connector (Green)

28.STARTING CONDITION

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

29.EXHAUST SYSTEM

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

30.INDICATOR LIGHT

Check that all the indicator lights are off.

31.CLOCK

Check the clock for normal operations and enough accuracy.

32.RADIO

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

33.FRONT ACCESSORY POWER SUPPLY SOCKET

Check the front accessory power supply socket operations.

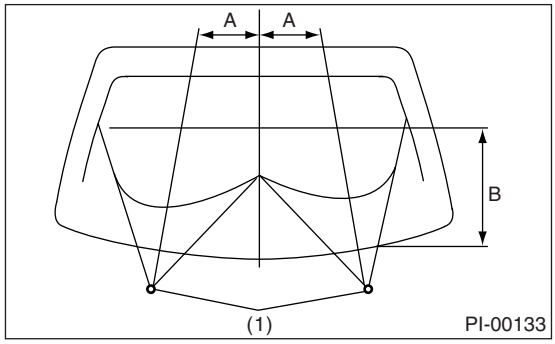
34.LIGHTING SYSTEM

- Check the headlight operations.
- Check the stop light operations.
- Check the other lights for normal operations.

35.WINDOW WASHER

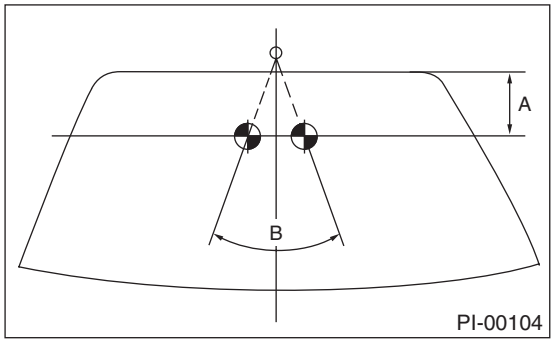
Check that the window washer system injects washer fluid to the specified area of windshield shown in the figure.

Front injection position:
A: 257 mm (10.12 in)
B: 512 mm (20.16 in)



(1) Nozzle

Rear injection position:
A: 39 mm (2.36 in)
B: 72°



36.WIPER

Check the front and rear wipers for normal operations.

37.POWER WINDOW OPERATION CHECK

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

38.BRAKE TEST

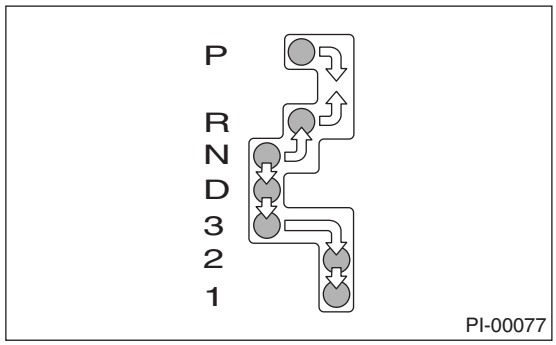
Check the foot brake for normal operations.

39.PARKING BRAKE

Check the parking brake for normal operations.

40.AT SHIFT CONTROL

Set the AT select lever to each gear position while checking that the demanded gear position is correctly attained.



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

41.HEATER & VENTILATION

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

42.AIR CONDITIONER

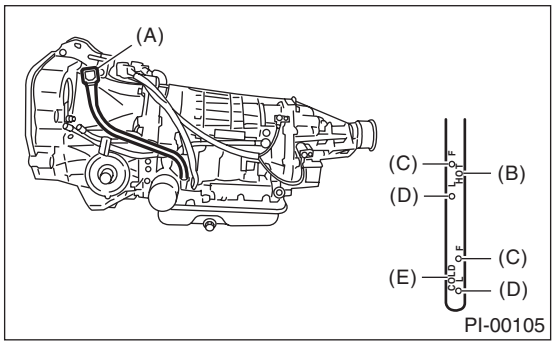
Operate the air conditioner. Check that the A/C compressor operates normally and enough cooling is provided.

43.CRUISE CONTROL

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

44.ATF LEVEL

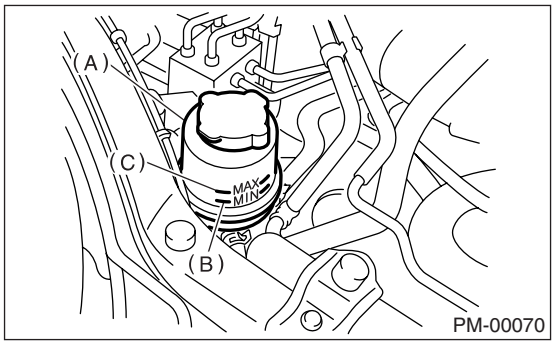
Check that the ATF level is normal. If insufficient, check that no leaks are found. Then add the necessary amount of the specified ATF.



(A) Level gauge
(B) Check position when “HOT”
(C) Upper level
(D) Lower level
(E) Check position when “COLD”

45.POWER STEERING FLUID LEVEL

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



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

46.FLUID LEAK CHECK

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

47.WATER LEAK TEST

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

• Before performing the water leakage test, remove anything that may obstruct the operation or which must be kept dry.

• Close all windows completely, and then close all doors tightly. Close the hood and trunk lid before starting the test.

• Connect a hose to a tap, and spray water on the vehicle. The rate of water discharge must be approx. 20 — 25 ℓ (5.3 — 6.6 US gal, 4.4 — 5.5 Imp gal) per minute.

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

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

Check the following areas:

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

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

48.APPEARANCE CHECK 2

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

NOTE:

• Use of steam eases peeling off the warp guard.

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

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

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

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

• If the coated surface is swollen out due to seams or moisture, expose the vehicle to the sun light for a few hours. Otherwise, heat the portion with seams or moisture using a dryer, etc.

• Dispose of the peeled wrap guard as burnable industrial garbage.

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

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

3) Carefully check each window glass for scratches. Slight damage may be removed by polishing with cerium oxide. (Half-fill a cup with cerium oxide, and add warm water to it. Then agitate the content until it turn to wax. Apply this wax to a soft cloth, and polish the glass.)
4) Check each portion of the vehicle body and underside components for the formation of rust. If rust is discovered, remove it with #80 — #180 emery paper, and treat the surface with rust preventive. After this treatment is completed, flush the portion thoroughly, and prepare the surface for repair painting.
5) Check each portion of the body and all of the chrome parts for deformation or distortion. Also check each lamp lens for cracks.

PERIODIC MAINTENANCE SERVICES

PM

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1. General Description

A: GENERAL

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

2. Schedule

A: MAINTENANCE SCHEDULE 1

		MAINTENANCE INTERVAL [Number of months or km (miles), whichever occurs first]																	
	Months	3	7.5	15	22.5	30	37.5	45	52.5	60	67.5	75	82.5	90	97.5	105	112.5	120	Remarks
	× 1,000 km	4.8	12	24	36	48	60	72	81.4	96	108	120	132	144	156	168	180	192	
	× 1,000 miles	3	7.5	15	22.5	30	37.5	45	52.5	60	67.5	75	82.5	90	97.5	105	112.5	120	
1	Engine oil	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
2	Engine oil filter	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
3	Spark plugs					R				R				R				R	For 2.5 L
										R								R	For Turbo
4	Drive belt(s)					I				I				I		R			
5	Camshaft Drive belt					I				I				I		R			
6	Fuel line					(I)				(I)				(I)				I	Note (1)
7	Fuel filter					(R)				(R)				(R)				R	Except for STi Note (1)
										(R)								R	For STi Note (1)
8	Air cleaner element					R				R				R				R	Note (2)
9	Cooling system					I				I				I				I	
10	Coolant					R				R				R				R	
11	Clutch system			I		I		I		I		I		I		I		I	
12	Transmission oil					I				I				I				I	
13	ATF					I				I				I				I	Note (3)
14	Front & rear differential oil					I				I				I				I	
15	Brake line			I		I		I		I		I		I		I		I	
16	Brake fluid					R				R				R				R	
17	Disc brake pads & discs			I		I		I		I		I		I		I		I	
18	Parking brake			I		I		I		I		I		I		I		I	
19	Suspension			I		I		I		I		I		I		I		I	
20	Wheel bearing									(I)								(I)	
21	Axle boots & joints			I		I		I		I		I		I		I		I	
22	Tire rotation		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	Note (4)
23	Steering system (Power steering)			I		I		I		I		I		I		I		I	
24	Supplement restraint system	Inspect every 10 years																	

Symbols used:
R: Replace
I: Inspection
(R) or (I): Recommended service for safe vehicle operation.

NOTE:
(1) This inspection is not required to maintain emission warranty eligibility and it dose not affect the manufacturer's obligations under EPA's in-use compliance program.
(2) When the vehicle is used in extremely dusty conditions, the air cleaner element should be replaced more often.
(3) ATF filter is maintenance free part. ATF filter needs replacement, when it has physically damaged or ATF leaked.
(4) A tire should be replaced when the tread wear indicator appears as a solid band across the tread. The indicators appear when the remaining tread has been worn to 1.6 mm (0.063 in) or less.

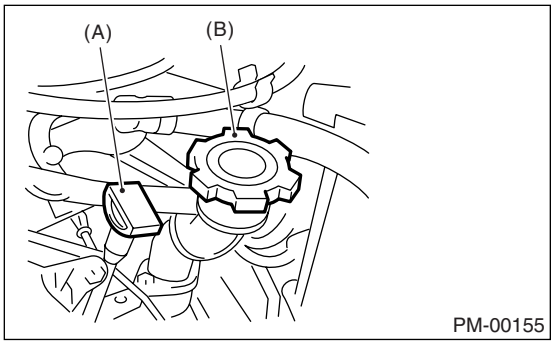
B: MAINTENANCE SCHEDULE 2

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

3. Engine Oil

A: REPLACEMENT

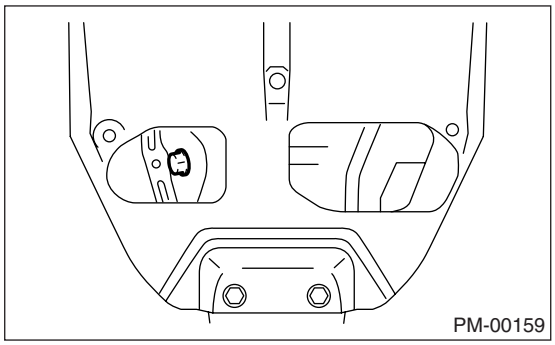
1) Open the engine oil filler cap for quick draining of the engine oil.



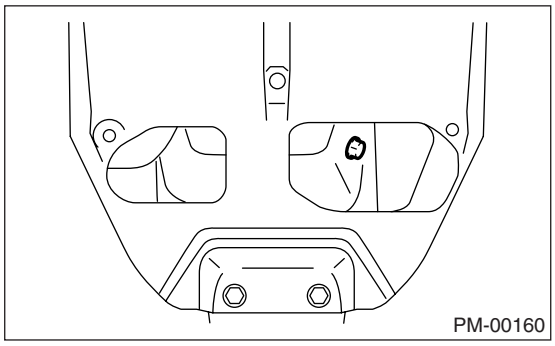
(A) Oil level gauge
(B) Oil filler cap

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

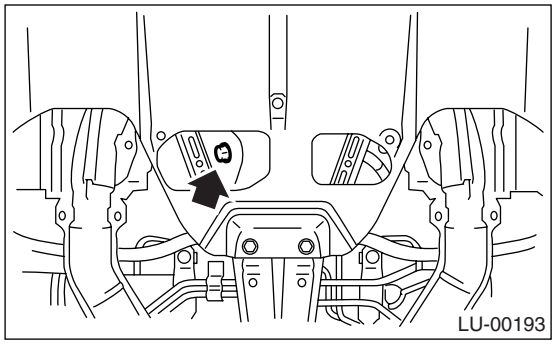
- TURBO MODEL



- STi MODEL



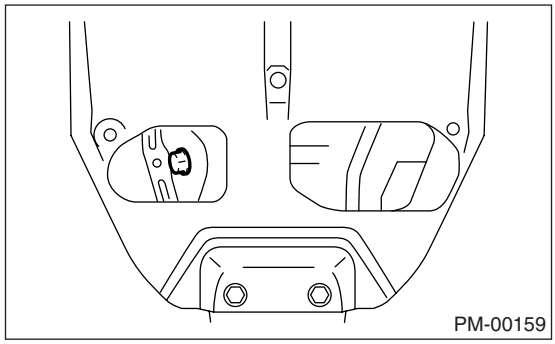
- NON-TURBO MODEL



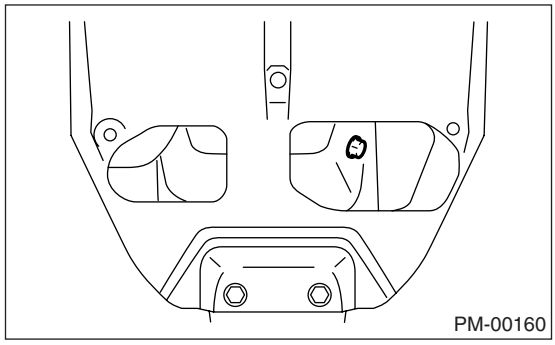
3) Replace the drain plug gasket.
4) Tighten the engine oil drain plug after draining engine oil.

Tightening torque:
44 N·m (4.5 kgf-m, 33 ft-lb)

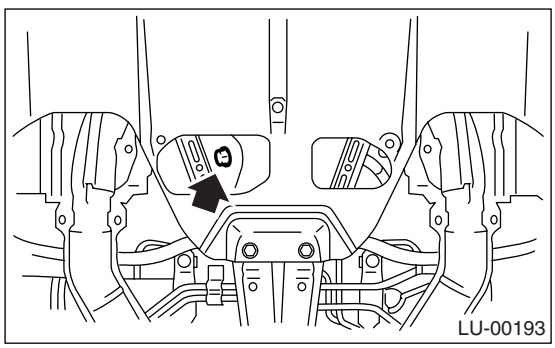
- TURBO MODEL



- STi MODEL



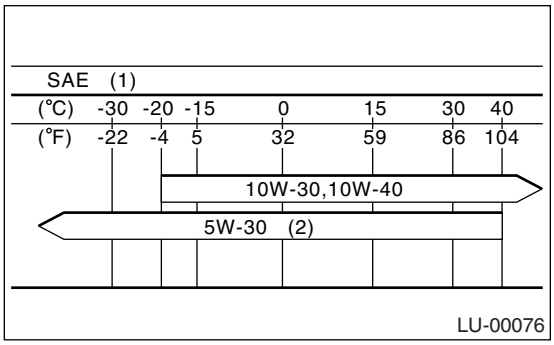
- NON-TURBO MODEL



5) Fill engine oil through the filler pipe up to center between upper level and lower level. Make sure that the vehicle is placed level when checking oil level. Use engine oil of proper quality and viscosity, selected in accordance with the table in figure.

Recommended oil
API classification
SL with the words "Energy Conserving or Energy conserving II" or New API mark displayed on the container (If it is impossible to get SL grade, you may use SJ grade.)
ILSAC classification
GF-3

Engine oil capacity
Non-turbo model (Upper level):
Approx. 4.0 ℓ (4.2 US qt, 3.5 Imp qt)
Non-turbo model (Lower level):
Approx. 3.0 ℓ (3.2 US qt, 2.6 Imp qt)
Turbo model (Upper level):
Approx. 4.5 ℓ (4.8 US qt, 4.0 Imp qt)
Turbo model (Lower level):
Approx. 3.5 ℓ (3.7 US qt, 3.1 Imp qt)
STi model (Upper level):
Approx. 4.0 ℓ (4.2 US qt, 3.5 Imp qt)
STi model (Lower level):
Approx. 3.0 ℓ (3.2 US qt, 2.6 Imp qt)



(1) Viscosity No. and applicable temperature
(2) Preferred

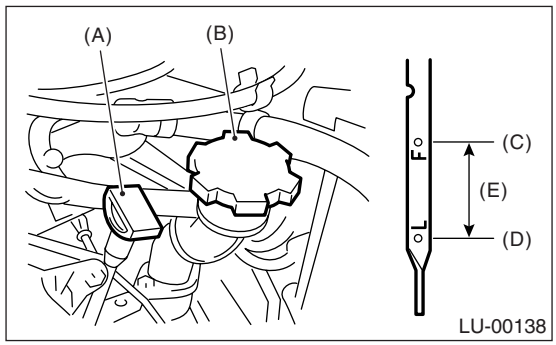
The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

NOTE:
• When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the API classification and SAE viscosity No. designated by SUBARU.
• If vehicle is used in desert areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used:
API classification: SL or SJ.
ILSAC classification: GF-3.
SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50

6) Close the engine oil filler cap.
7) Start the engine and warm it up for a time.
8) After the engine stops, recheck the oil level. <Ref. to PM-6, INSPECTION, Engine Oil.>

B: INSPECTION

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe it clean.
3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
4) Remove it again and note the reading. If the engine oil level is below the "L" line, add oil to bring the level up to the "F" line.



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

5) After turning off the engine, wait a few minutes for the oil to drain back into oil pan before checking the level.
6) Just after driving or while the engine is warm, engine oil level may show in the range between the "F" line and the notch mark. This is caused by thermal expansion of the engine oil.
7) To prevent overfilling the engine oil, do not add oil above the "F" line when the engine is cold.

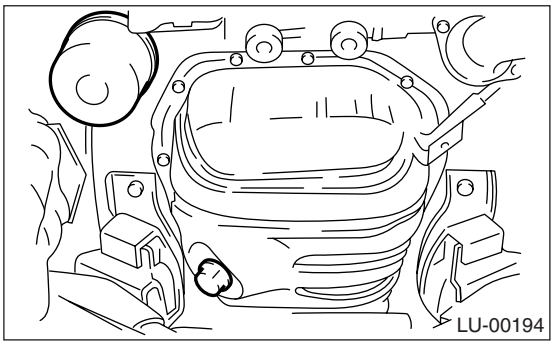
4. Engine Oil Filter

A: REPLACEMENT

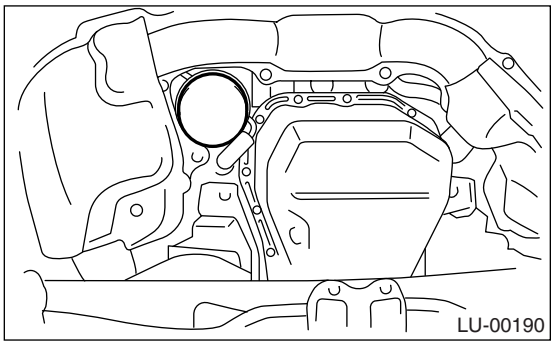
1) Remove the under cover.
2) Remove the oil filter with ST.

ST	498547000	OIL FILTER WRENCH (Outer diameter: 80 mm (3.15 in))
ST	18332AA000	OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))
ST	18332AA010	OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))

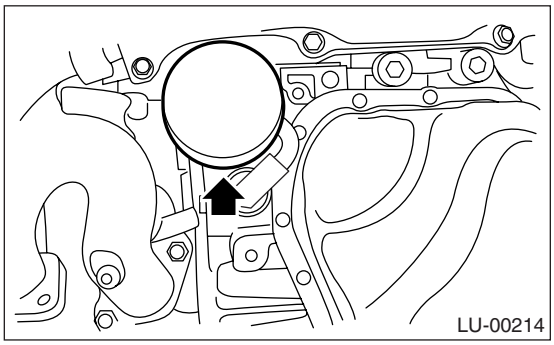
- NON-TURBO MODEL



- TURBO MODEL



- STi MODEL



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

CAUTION:
Be careful not to use the oil filter 80 mm (3.15 in) in diameter to STi model.

5) Install the oil filter by turning it by hand, being careful not to damage the seal rubber.
- Tighten the oil filter 80 mm (3.15 in) or 65 mm (2.56 in) in diameter by approx. 2/3 — 3/4 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler.
- Tighten the oil filter 68 mm (2.68 in) in diameter by approx. 1 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler.

CAUTION:
Do not tighten excessively, or oil may leak.

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

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

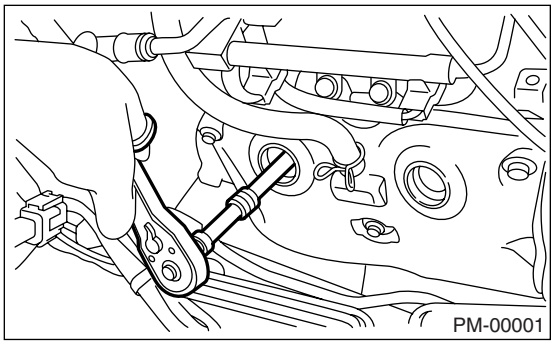
7) Check the engine oil level. <Ref. to PM-6, INSPECTION, Engine Oil.>

5. Spark Plugs

A: REPLACEMENT

1. SOHC MODEL

1) Remove the intake duct and intake chamber.
2) Remove the washer tank and put it aside.
3) Disconnect the spark plug cord.
4) Remove the spark plug with a plug-wrench.



5) Set the new spark plugs.

Recommended spark plug:
CHAMPION: RC10YC4 (Standard)
NGK: BKR5E-11 (Alternate)
NGK: BKR6E-11 (Alternate)

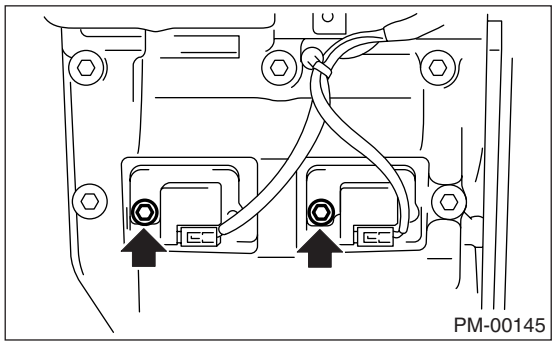
6) Tighten the spark plug lightly with hand, and then secure with a plug-wrench to the specified torque.

Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)

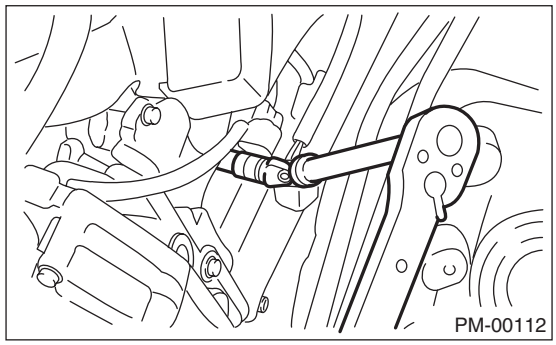
NOTE:
• Be sure to place the gasket between the cylinder head and spark plug.
• If a torque wrench is not available, tighten the spark plug until gasket contacts cylinder head; then tighten further 1/4 to 1/2 turns.

2. DOHC MODEL

1) Disconnect the battery cables, and then remove the battery and battery carrier.
2) Remove the washer tank and put it aside.
3) Remove the air cleaner lower case.
4) Disconnect the connector from ignition coil.
5) Remove the ignition coil.



6) Remove the spark plug with a spark plug socket.



7) Set new spark plugs.

Recommended spark plug:
2.0 L Turbo model
NGK: PFR6G
STi model
NGK: ILFR6B

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

Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)

9) Tighten the ignition coil.

Tightening torque:
16 N·m (1.6 kgf-m, 11.7 ft-lb)

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

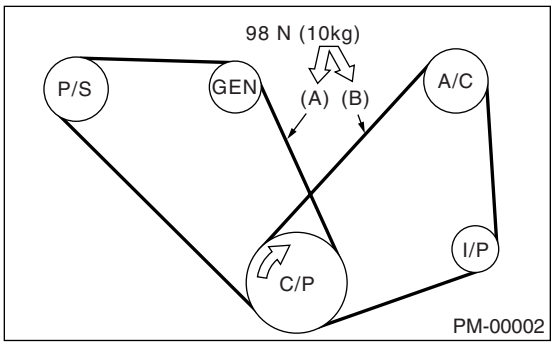
6. V-belt

A: INSPECTION

1. WITHOUT USING BELT TENSION GAUGE

1) Replace the belts, if cracks, fraying or wear is found.
2) Check the V-belt tension and adjust it if necessary by changing the generator installing position and/or idler pulley installing position. <Ref. to PM-9, REPLACEMENT, V-belt.>

Belt tension
(A)
Replaced: 7 — 9 mm (0.276 — 0.354 in)
Reused: 9 — 11 mm (0.354 — 0.433 in)
(B)
Replaced: 7.5 — 8.5 mm (0.295 — 0.335 in)
Reused: 9.0 — 10.0 mm (0.354 — 0.394 in)

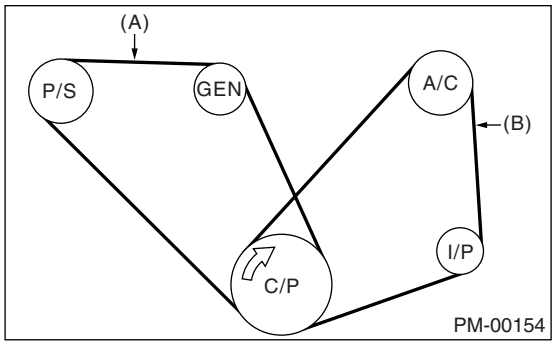


(A) Front side belt
(B) Rear side belt
C/P Crankshaft pulley
GEN Generator
P/S Power steering oil pump pulley
A/C Air conditioning compressor pulley
I/P Idler pulley

2. WITH USING BELT TENSION GAUGE

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

Belt tension
(A) 490 — 640 N (50 — 65 kgf, 110 — 144 lb)
(B) 350 — 450 N (36 — 46 kgf, 79 — 101 lb)

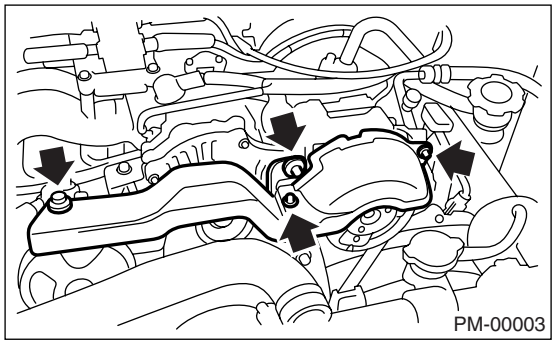


(A) Front side belt
(B) Rear side belt
C/P Crank pulley
GEN Generator
P/S Power steering oil pump pulley
A/C A/C compressor pulley
I/P Idler pulley

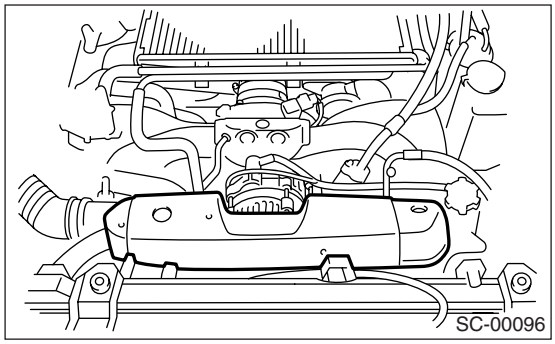
B: REPLACEMENT

1. V-BELT COVER

Remove the V-belt cover.
NON-TURBO MODEL



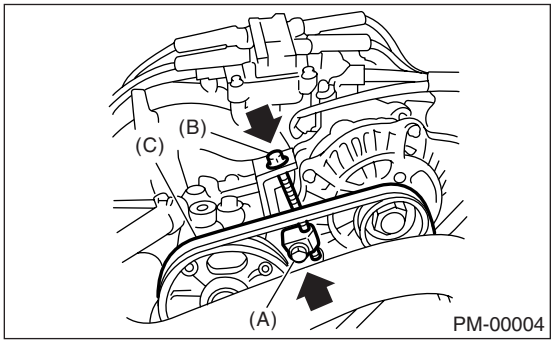
TURBO MODEL



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

NOTE:
Wipe off any oil or water on the belt and pulley.
1) Loosen the lock bolt (A).
2) Loosen the slider bolt (B).
3) Remove the front side belt (C).
4) Install a new belt, and tighten the slider bolt so as to obtain the specified belt tension.
5) Tighten the lock bolt (A).
6) Tighten the slider bolt (B).

Tightening torque:
Lock bolt:
25 N·m (2.5 kgf-m, 18 ft-lb)
Slider bolt:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

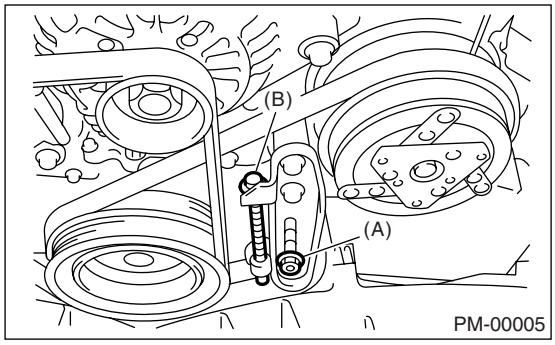


7) Idle the engine for approx. 5 min. to normalize the V-belt. (With using tension gauge)
8) Stop the engine, and then check the belt tension and adjust it. (With using tension gauge)
9) Idle the engine for approx. 1 min. to normalize the V-belt. (With using tension gauge)
10) Stop the engine, and then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

3. REAR SIDE BELT (DRIVING AIR CONDITIONER)

NOTE:
Wipe off any oil or water on the belt and pulley.
1) Remove the front side belt.
2) Loosen the lock nut (A).
3) Loosen the slider bolt (B).
4) Remove the rear side belt.
5) Install a new belt, and tighten the slider bolt so as to obtain the specified belt tension.
6) Tighten the lock nut (A).
7) Install the front side belt.
Non-turbo model
<Ref. to ME(H4SO)-39, FRONT SIDE BELT, INSTALLATION, V-belt.>
Turbo model
<Ref. to ME(H4DOTC)-42, FRONT SIDE BELT, INSTALLATION, V-belt.>

Tightening torque:
23 N·m (2.3 kgf-m, 17.0 ft-lb)



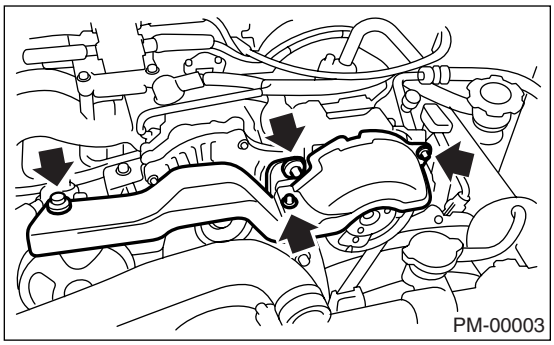
8) Idle the engine for approx. 5 min. to normalize the V-belt. (With using tension gauge)
9) Stop the engine, and then check the belt tension and adjust it. (With using tension gauge)
10) Idle the engine for approx. 1 min. to normalize the V-belt. (With using tension gauge)
11) Stop the engine, and then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

7. Timing Belt

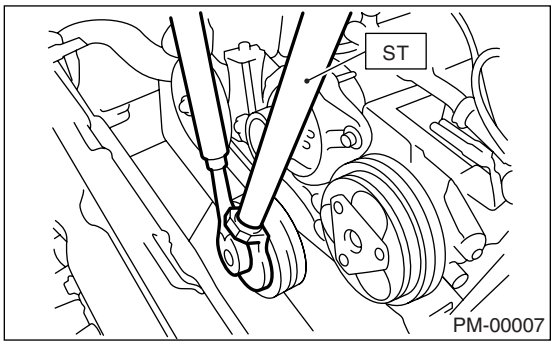
A: REPLACEMENT

1. SOHC MODEL

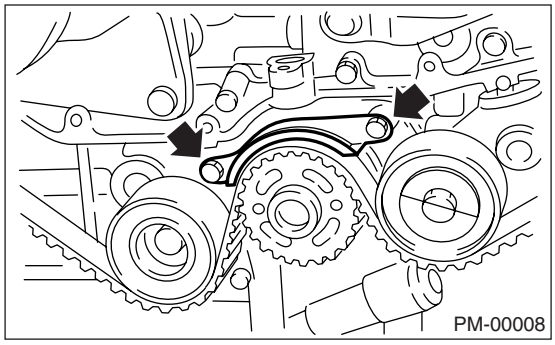
1) Remove the radiator fan and air conditioner fan. <Ref. to CO(H4SO)-22, Radiator Main Fan and Fan Motor.>, <Ref. to CO(H4SO)-23, Radiator Sub Fan and Fan Motor.>
2) Shield the radiator from any damage using cardboard and blanket.
3) Remove the V-belt cover.



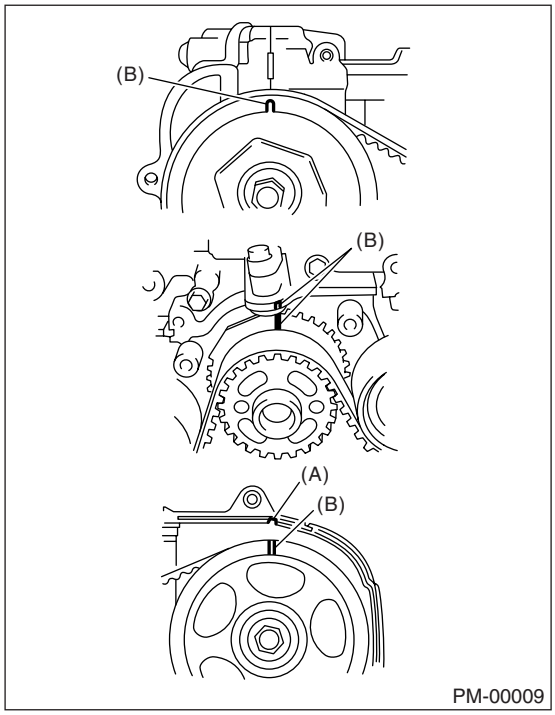
4) Remove the V-belts. <Ref. to ME(H4SO)-39, V-belt.>
5) Remove the air conditioning compressor drive belt tensioner.
6) To lock the crankshaft, use ST. Remove the pulley bolt.
ST 499977100 CRANKSHAFT PULLEY WRENCH



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

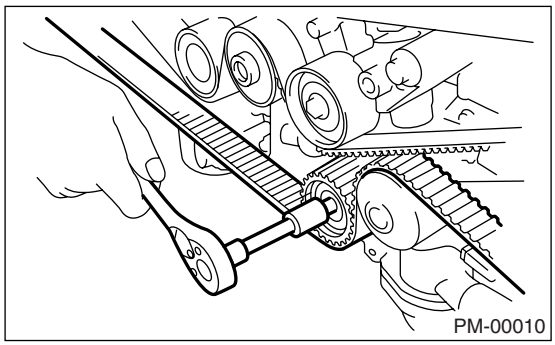


11) Turn the crankshaft and align alignment marks on crankshaft, and right and left camshaft sprockets with notches of belt cover and cylinder block.
ST 499987500 CRANKSHAFT SOCKET



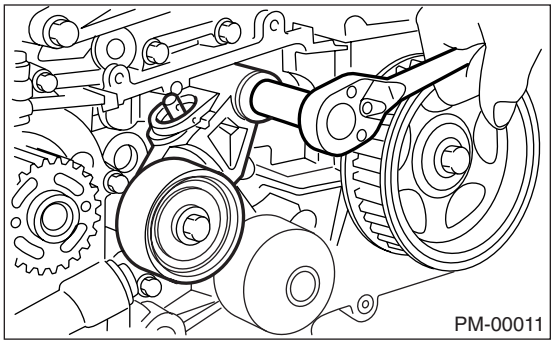
(A) Notch
(B) Alignment mark

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



14) Remove the timing belt.

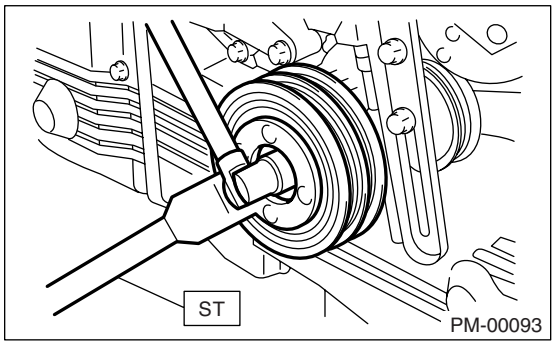
15) Remove the automatic belt tension adjuster assembly.



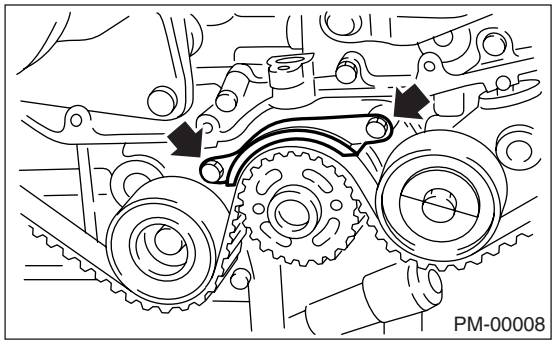
16) Install in the reverse order of removal. <Ref. to ME(H4SO)-45, INSTALLATION, Timing Belt Assembly.>

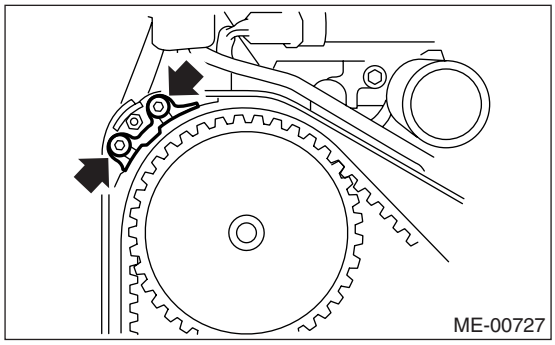
2. DOHC MODEL

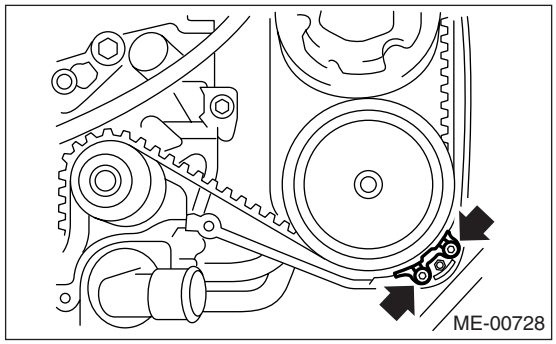
1) Remove the radiator fan and air conditioner fan. <Ref. to CO(H4DOTC)-27, Radiator Main Fan and Fan Motor.>, <Ref. to CO(H4DOTC)-29, Radiator Sub Fan and Fan Motor.>
2) Protect the radiator with cardboard and blanket.
3) Remove the V-belts. <Ref. to ME(H4DOTC)-42, V-belt.>
4) Remove the air conditioning compressor drive belt tensioner.
5) Remove the pulley bolt. To lock the crankshaft use ST.
Except for STi model:
ST 499977400 CRANKSHAFT PULLEY WRENCH
STi model:
ST 499977100 CRANKSHAFT PULLEY WRENCH

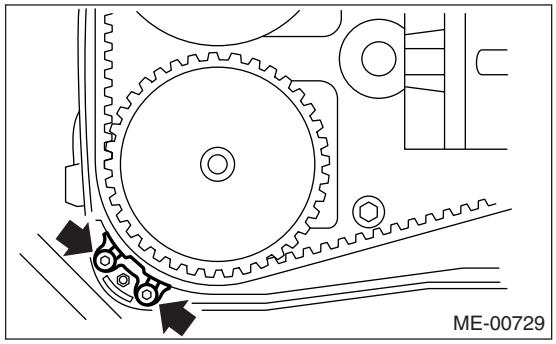


6) Remove the crankshaft pulley.
7) Remove the air conditioning compressor drive belt tensioner.
8) Remove the belt cover (LH).
9) Remove the belt cover (RH).
10) Remove the front belt cover.
11) Remove the timing belt guide. (MT model)



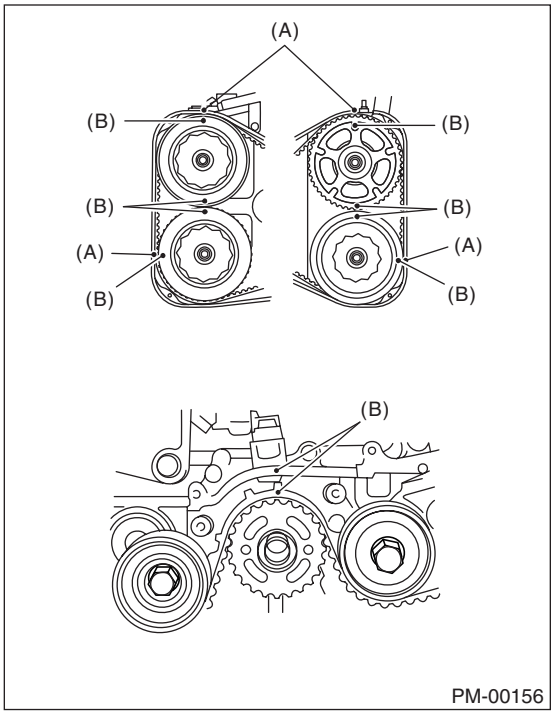






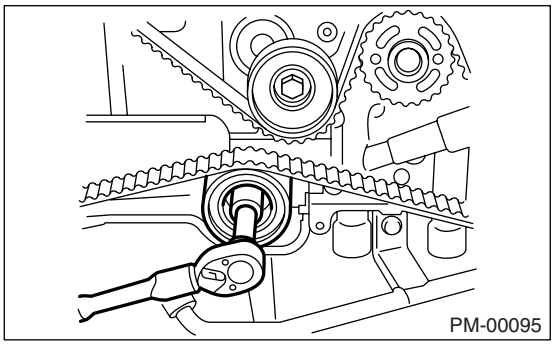
12) Turn the crankshaft and align alignment marks on crankshaft, and right and left camshaft sprockets with notches of belt cover and cylinder block. To turn the crankshaft, use ST.

ST 499987500 CRANKSHAFT SOCKET

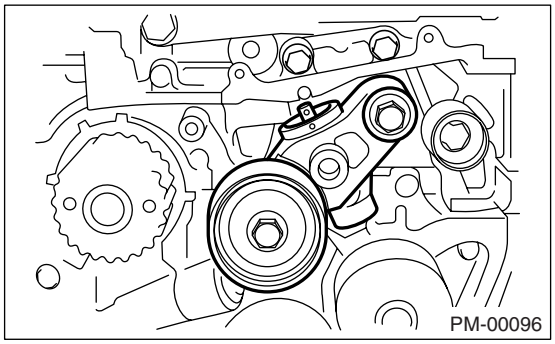


(A) Notch
(B) Alignment mark

13) Remove the belt idler.



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



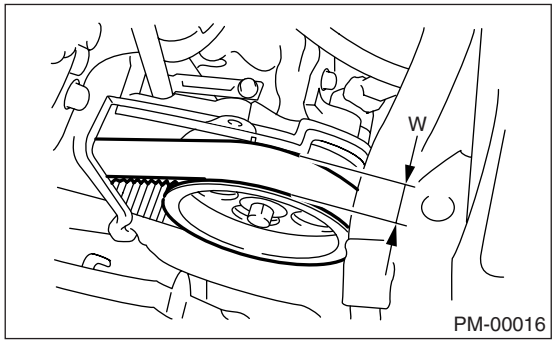
16) Install in the reverse order of removal. <Ref. to ME(H4DOTC)-46, Timing Belt Assembly.>

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

B: INSPECTION

1. SOHC MODEL

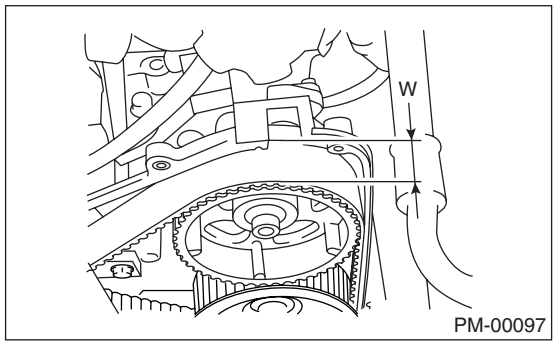
1) Remove the front timing belt cover and timing belt cover (LH).
2) While cranking the engine at least four rotations, check the timing belt back surface for cracks or damage. Replace the faulty timing belt as needed.
3) Measure the timing belt width W. If it is less than 27 mm (1.06 in), check idlers, tensioner, water pump pulley and cam sprocket to determine idler alignment (squareness). Replace the worn timing belt.



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

2. DOHC MODEL

1) Remove the timing belt cover (LH).
2) While cranking the engine at least four rotations, check the timing belt back surface for cracks or damage. Replace the faulty timing belt as needed.
3) Measure the timing belt width W. If it is less than 30 mm (1.18 in), check idlers, tensioner, water pump pulley and cam sprocket to determine idler alignment (squareness). Replace the worn timing belt.
4) Install the timing belt cover (LH).



8. Fuel Line

A: INSPECTION

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

Non-turbo model

<Ref. to FU(H4SO)-62, Fuel Delivery, Return and Evaporation lines.>

Turbo model

<Ref. to FU(H4DOTC)-69, Fuel Delivery, Return and Evaporation Lines.>

9. Fuel Filter

A: REPLACEMENT

For fuel filter replacement procedures, refer to “FU” section.
Non-turbo model
<Ref. to FU(H4SO)-59, Fuel Filter.>
Turbo model
<Ref. to FU(H4DOTC)-66, Fuel Filter.>
STi model
<Ref. to FU(STi)-57, Fuel Filter.>

B: INSPECTION

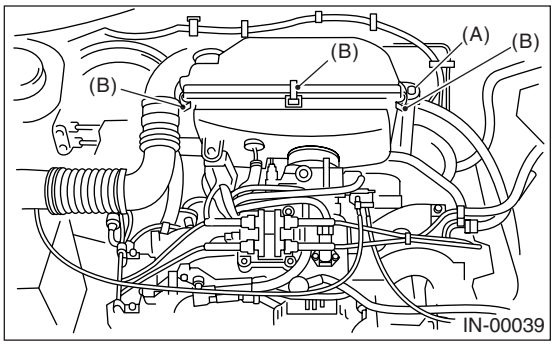
1) If it is clogged, or if replacement interval has been reached, replace it.
2) If water is found in it, shake and expel the water from inlet port.

10.Air Cleaner Element

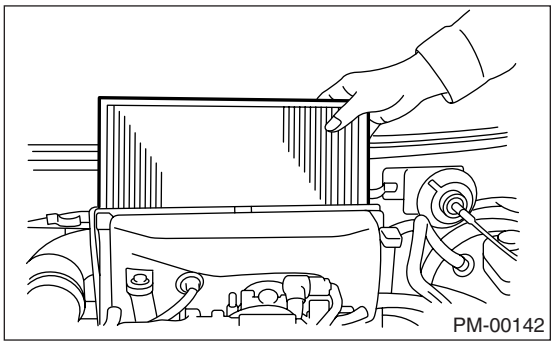
A: REPLACEMENT

1. NON-TURBO MODEL

1) Remove the air intake duct from air cleaner case.
2) Remove the bolt (A) which installs air cleaner case to stays.
3) Remove the clip (B) above the air cleaner case.



4) Remove the air cleaner.

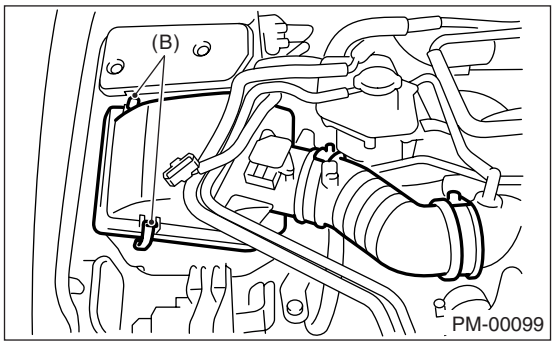


5) Install in the reverse order of removal.

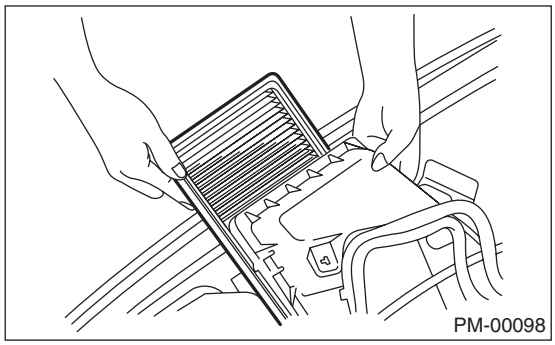
NOTE:
Fasten with a clip after inserting the lower tab of the case.

2. TURBO MODEL

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

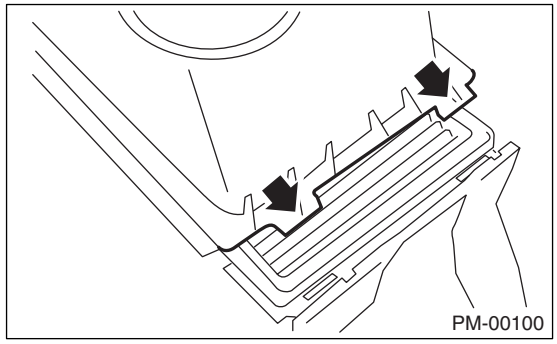


2) Remove the air cleaner.



3) Install in the reverse order of removal.

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



11.Cooling System

A: INSPECTION

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

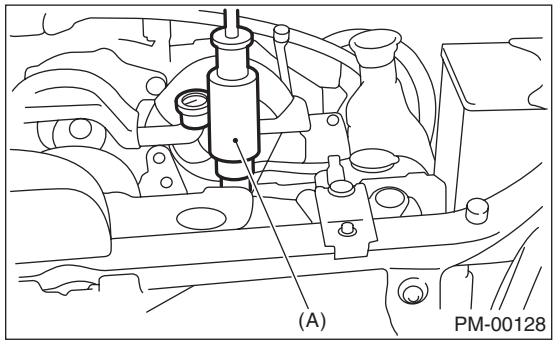
Non-turbo model
157 kPa (1.6 kg/cm^2, 23 psi)

Turbo model
122 kPa (1.2 kg/cm^2, 18 psi)

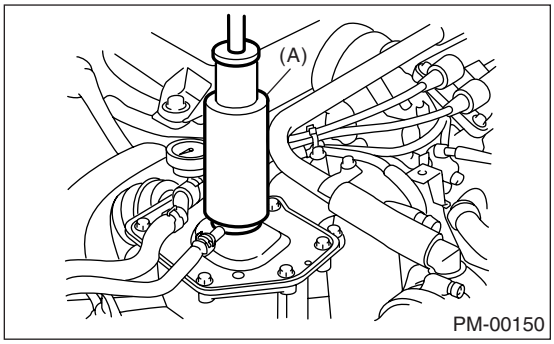
- Each portion of radiator for leakage
- Hose joints and other connections for leakage

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

NON-TURBO MODEL



TURBO MODEL



- When performing this check, be sure to keep the engine stationary and fill the radiator with coolant.
- Wipe off check points before applying pressure.
- Use care not to spill coolant when detaching the tester from radiator.
- Do not remove the radiator side cap. (Turbo model)

2) Check the radiator cap valve open pressure using radiator cap tester.

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

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

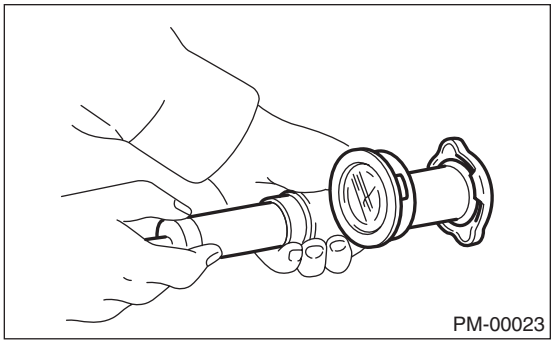
Radiator cap valve open pressure

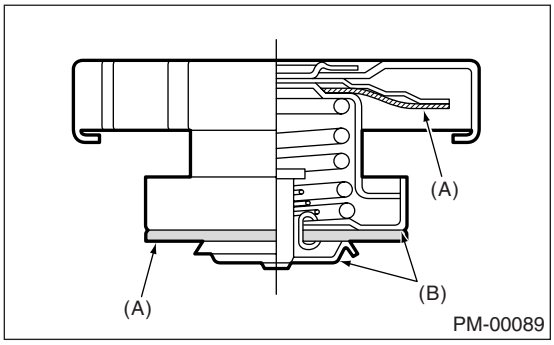
Non-turbo model
Standard value:
93 — 123 kPa (0.95 — 1.25 kg/cm^2, 14 — 18 psi)
Service limit:
83 kPa (0.85 kg/cm^2, 12 psi)

Turbo model

Filler tank side:
Standard value:
93 — 123 kPa (0.95 — 1.25 kg/cm^2, 14 — 18 psi)
Service limit:
83 kPa (0.85 kg/cm^2, 12 psi)

Radiator side:
Standard value:
122 — 152 kPa (1.24 — 1.55 kg/cm^2, 18 — 22 psi)
Service limit:
112 kPa (1.14 kg/cm^2, 16 psi)





(A) Deformation
(B) Deformation, damage, rust

3) Start the engine, and then check it does not overheat or it is cooled excessively. If it overheats or it is cooled excessively, check the cooling system.
Non-turbo model
<Ref. to CO(H4SO)-14, Water Pump.>
<Ref. to CO(H4SO)-17, Thermostat.>
<Ref. to CO(H4SO)-18, Radiator.>
<Ref. to CO(H4SO)-21, Radiator Cap.>
Turbo model
<Ref. to CO(H4DOTC)-19, Water Pump.>
<Ref. to CO(H4DOTC)-21, Thermostat.>
<Ref. to CO(H4DOTC)-22, Radiator.>
<Ref. to CO(H4DOTC)-26, Radiator Cap.>
4) Check the electric fan operates using Subaru Select Monitor, when the coolant temperature exceeds 95°C (203°F). If not operate, check the electric fan system.
Non-turbo model
<Ref. to CO(H4SO)-6, Radiator Main Fan System.>
<Ref. to CO(H4SO)-9, Radiator Sub Fan System.>
Turbo model
<Ref. to CO(H4DOTC)-7, Radiator Main Fan System.>
<Ref. to CO(H4DOTC)-12, Radiator Sub Fan System.>

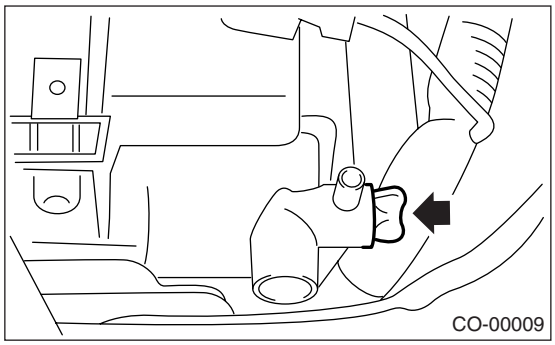
12.Coolant

A: REPLACEMENT

1. REPLACEMENT OF COOLANT

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

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



5) For quick draining, open the radiator cap.

NOTE:
• In the case of turbo model, be sure to open the radiator cap of filler tank side.
• Be careful not to spill coolant on the floor.

6) Drain the coolant from reservoir tank.
7) Tighten the radiator drain cock securely after draining coolant.
8) Slowly pour the coolant into radiator. Pour the coolant up to air bleeder hole, and then install the cap. (Turbo model)
9) Pour the coolant from radiator filler port to neck of filler, then pour into reservoir tank up to “FULL” level.

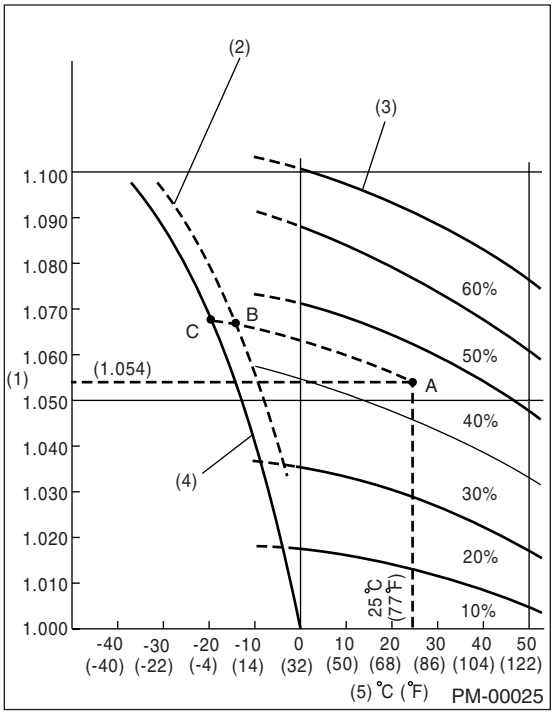
Coolant capacity (fill up to “FULL” level)
2.0 L Turbo AT model:
Approx. 7.6 ℓ (8.0 US qt, 6.7 Imp qt)
2.0 L Turbo MT model:
Approx. 7.7 ℓ (8.1 US qt, 6.8 Imp qt)
2.5 L AT model:
Approx. 6.9 ℓ (7.3 US qt, 6.1 Imp qt)
2.5 L MT model:
Approx. 7.0 ℓ (7.4 US qt, 6.2 Imp qt)
STi model:
Approx. 7.7 ℓ (8.1 US qt, 6.8 Imp qt)

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

10) Securely install the radiator cap.
11) Run the engine for more than 5 minutes at 2,000 to 3,000 rpm. (Run the engine until radiator becomes hot in order to purge the air trapped in cooling system.)
12) Stop the engine and wait until coolant temperature lowers. Then open the radiator cap to check coolant level and add coolant up to radiator filler neck. Next, add coolant into reservoir tank up to “FULL” level.
13) After adding coolant, securely install the radiator and reservoir tank caps.

2. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

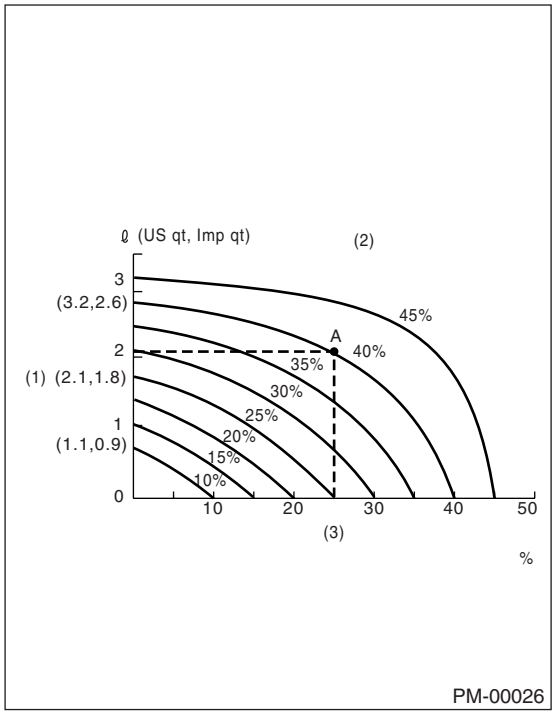
The concentration and safe operating temperature of the SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the coolant will provide this information.
[Example]
If the coolant temperature is 25°C (77°F) and its specific gravity is 1.054, the concentration is 35% (point A), the safe operating temperature is −14°C (7°F) (point B), and the freezing temperature is −20°C (−4°F) (point C).



(1) Coolant gravity
(2) Safe operating temperature
(3) Concentration of coolant
(4) Freezing temperature
(5) Coolant temperature

3. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50%).
The amount of coolant that should be replaced can be determined using the diagram.
[Example]
Assume that the coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of coolant concentration intersects with the 40% curve of the necessary coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 ℓ (2.2 US qt, 1.8 Imp qt). Drain 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.
If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.



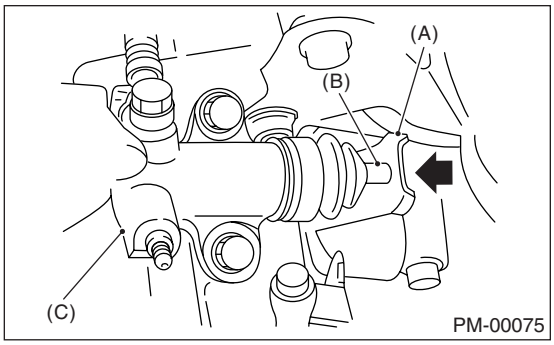
(1) Quantity of coolant to be drained
(2) Necessary concentration of coolant
(3) Concentration of coolant in vehicle cooling system

13.Clutch System

A: INSPECTION AND ADJUSTMENT

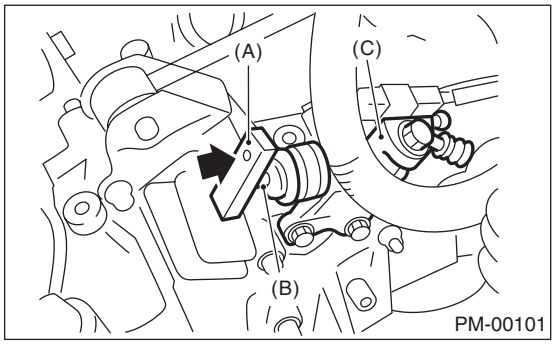
1) Push the release lever to retract the push rod of the operating cylinder and check if the fluid level in the clutch reservoir tank rises or not.

NON-TURBO MODEL



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

TURBO MODEL



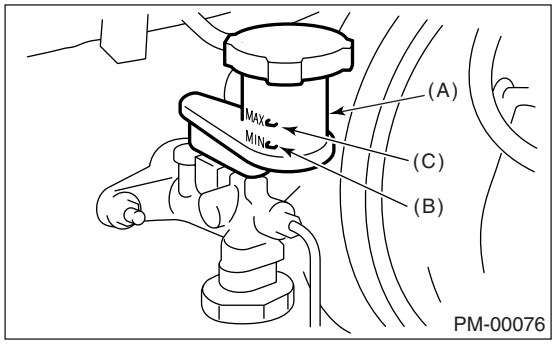
(A) Release lever
(B) Push rod
(C) Operating cylinder

2) If the fluid level rises, pedal free play is correct.
3) If the fluid level does not rise, or the push rod cannot be retracted, adjust the clutch pedal. <Ref. to CL-25, Clutch Pedal.>
4) Check the fluid level using the scale on the outside of the clutch master cylinder tank (A). If the level is below “MIN” (B), inspect the clutch master cylinder, operating cylinder and hydraulic line for fluid leaks. If fluid leaks are found, repair or replace. If fluid leaks are not found, add clutch fluid to bring it up to “MAX” (C) of clutch reservoir tank.

Recommended clutch fluid:
FMVSS No. 116, fresh DOT3 or DOT4 brake fluid

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

NOTE:
• Avoid mixing different brakes of brake fluid to prevent degradation of the fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.



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

14.Transmission Gear Oil

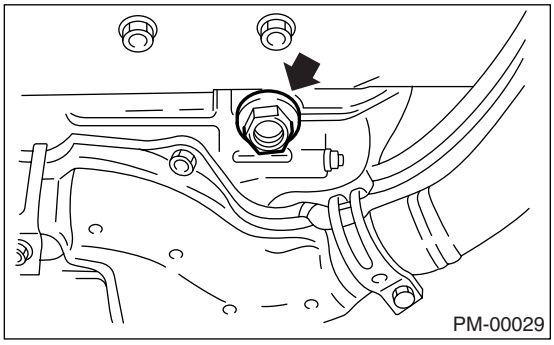
A: REPLACEMENT

1. MANUAL TRANSMISSION

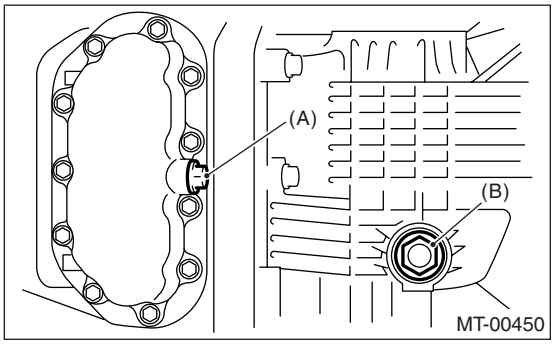
1) Drain the gear oil by removing drain plug.

NOTE:
• Before starting work, cool off the transmission gear oil well.
• If transmission gear oil adheres to the exhaust pipe, wipe it off completely.

5MT



6MT



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

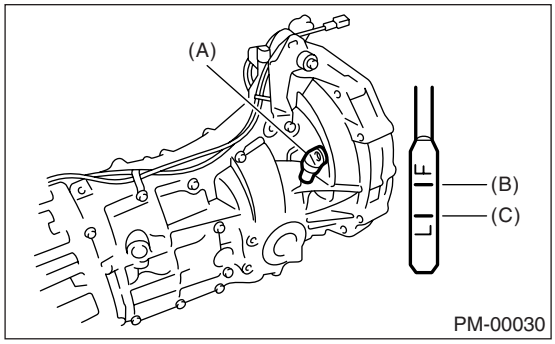
2) Replace the gasket with new one, and then tighten it to the specified torque.

Tightening torque:
5MT
70 N·m (7.1 kgf-m, 51.6 ft-lb)
6MT (Oil pan side):
44 N·m (4.5 kgf-m, 32.5ft-lb)
6MT (Clutch housing side):
70 N·m (7.1 kgf-m, 51.6 ft-lb)

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

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

Gear oil capacity:
5MT model
3.5 L (3.7 US qt, 3.1 Imp qt)
6MT model
4.1 L (4.3 US qt, 3.6 Imp qt)



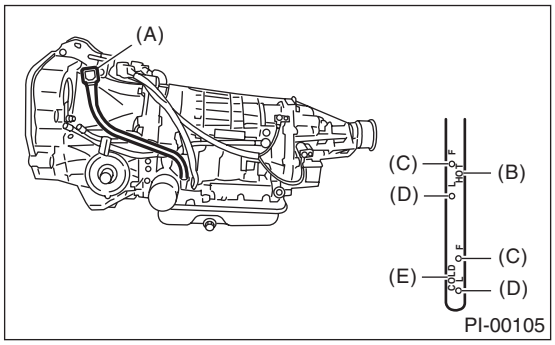
(A) Oil level gauge
(B) Upper level
(C) Lower level

15.ATF

A: INSPECTION

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

1) Raise the ATF temperature by driving a distance of 5 to 10 km (3 to 6 miles). Otherwise, idle the engine to raise ATF temperature to 70 — 80°C (158 — 176°F) on Subaru Select Monitor. <Ref. to 4AT(diag)-22, READ CURRENT DATA, OPERATION, Subaru Select Monitor.>
2) Make sure the vehicle is level.
3) After selecting all positions (P, R, N, D, 3, 2, 1), set the select lever in "P" range. Measure the ATF level with the engine idling for one or two minutes.



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

4) Make sure that ATF level is above the center of upper and lower marks.

NOTE:
When the transmission is hot, the level should be above the center of upper and lower marks, and when it is cold, the level should be found below the center of these two marks.

5) If the ATF level is below the center between upper and lower marks, add the recommended ATF until the ATF level is found above the center between upper and lower marks.

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

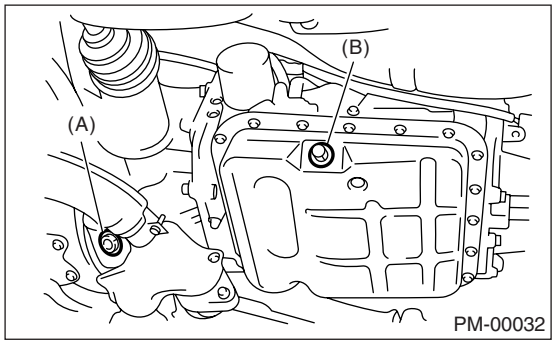
6) Check ATF level after raising ATF temperature to 70 — 80°C (158 —176°F) by running the vehicle or by idling the engine again.
7) Check the ATF for leaks.
Check for leaks in the transmission. If there are leaks, it is necessary to repair or replace gasket, oil seals, plugs or other parts.

B: REPLACEMENT

1. AUTOMATIC TRANSMISSION FLUID

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

NOTE:
Before starting work, cool off the ATF well.



(A) Front differential drain plug
(B) ATF drain plug

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

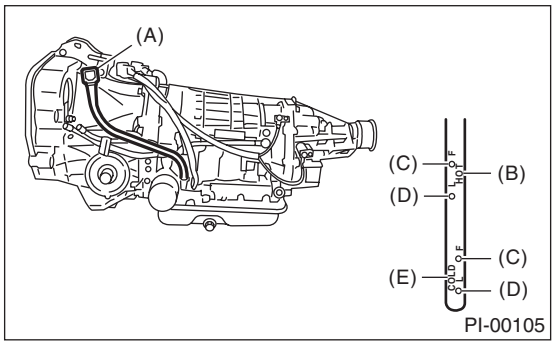
Tightening torque:
25 N·m (2.55 kgf-m, 18.4 ft-lb)

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

Recommended fluid:
Dexron III type automatic transmission fluid

Fluid capacity:
Fill the same amount drained from ATF drain plug hole.

4) Check the ATF level. <Ref. to PM-23, INSPECTION, ATF.>



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

2. ATF FILTER

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

For the replacement procedures of the ATF filter: <Ref. to 4AT-66, ATF Filter.>

16. Front & Rear Differential Gear Oil

A: REPLACEMENT

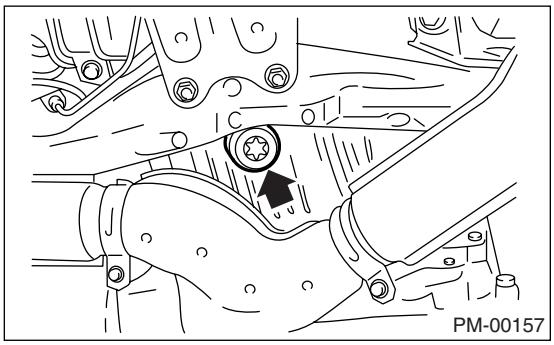
1. FRONT DIFFERENTIAL (MT MODEL)

For MT vehicle, differential oil works as manual transmission oil to lubricate differential. Refer to "Transmission Oil". <Ref. to PM-22, Transmission Gear Oil.>

2. FRONT DIFFERENTIAL (AT MODEL)

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

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



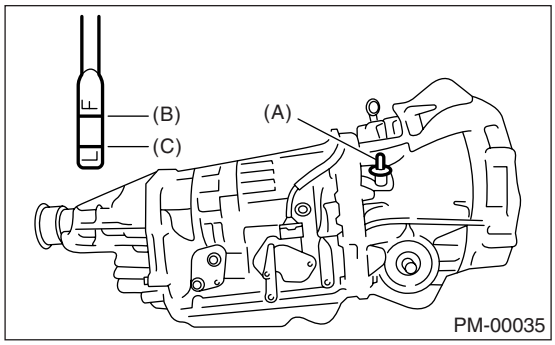
2) Replace the gasket with a new one, and then tighten the drain plug to specified torque.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)

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

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

Differential gear oil capacity:
1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)



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

3. REAR DIFFERENTIAL

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

NOTE:
Apply fluid packing to the drain plug threads.

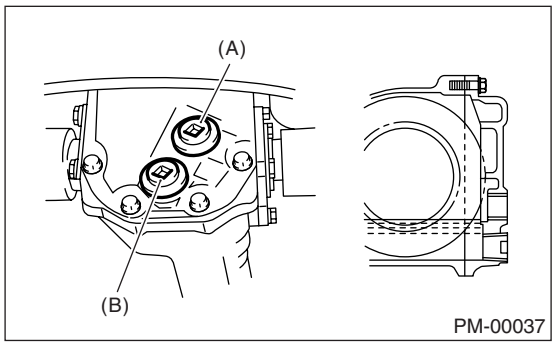
Fluid packing:
Three Bond 1105 (Part No. 004403010)

Tightening torque:
49.0 N·m (5.0 kgf-m, 36.2 ft-lb)

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

CAUTION:
Mechanical LSD oil must be used for STi model.

Recommended gear oil:
Except STi model
GL-5 (75W-90) or equivalent
STi model
Gear oil LSD (Part No. K0904AA080) or equivalent



(A) Filler plug
(B) Drain plug

Oil capacity:
Except for STi model:
0.8 ℓ (0.8 US qt, 0.7 Imp qt)
STi model:
0.9 — 1.1 ℓ (1.0 — 1.2 US qt, 0.8 — 1.0 Imp qt)

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

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

NOTE:
Apply fluid packing to the filler plug or rear differential oil temperature switch threads.

Fluid packing:
Three Bond 1105 (Part No. 004403010)

Tightening torque:
49.0 N·m (5.0 kgf-m, 36.2 ft-lb)

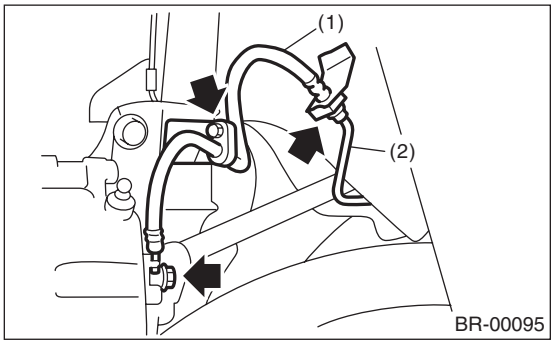
17.Brake Line

A: INSPECTION

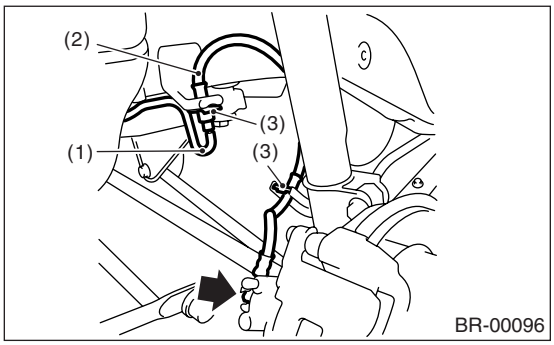
1. BRAKE LINE

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

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



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



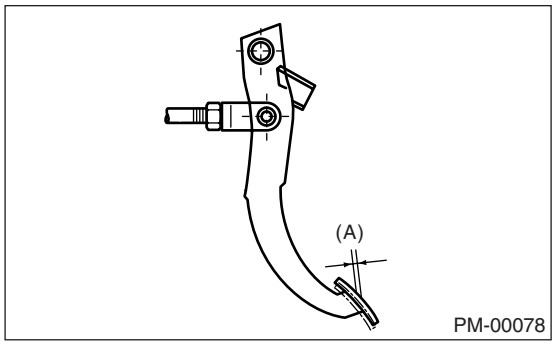
(1) Rear brake pipe
(2) Brake hose
(3) Clamp

B: CHECKING

1. SERVICE BRAKE

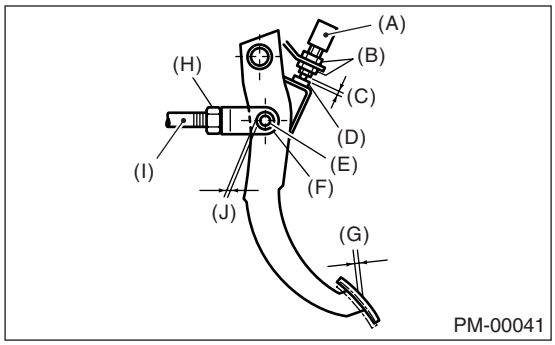
1) Check the free play of brake pedal with a force of less than 10 N (1 kgf, 2 lb).

Brake pedal free play:
0.5 — 2.0 mm (0.02 — 0.08 in)



(A) Brake pedal free play

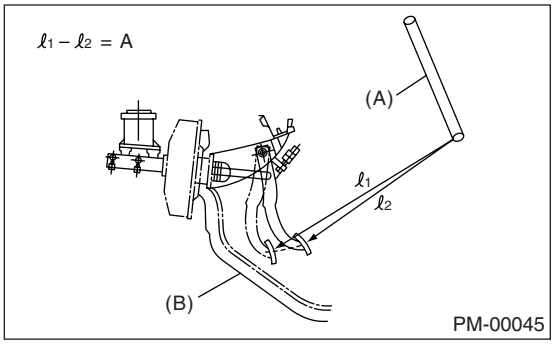
2) If the free play is out of specifications above, adjust the brake pedal as follows:
(1) Be sure the engine is off. (No vacuum is applied to brake booster.)
(2) There should be play between brake booster clevis and pin at brake pedal installing portion.
[Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lb) to a stroke of 0.5 to 2.0 mm (0.02 to 0.08 in).]
(3) Depress the surface of brake pad by hand.
(4) If there is no free play between clevis pin and clevis, turn the brake switch adjusting nut until the clearance between stopper and screw of brake switch becomes 0.3 mm (0.012 in).



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

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

Brake pedal reserve distance: A
Turbo AT model
105 mm (4.13 in) / 490 N (50 kgf, 110 lb) or less
Except turbo AT model
90 mm (3.54 in) / 490 N (50 kgf, 110 lb) or less

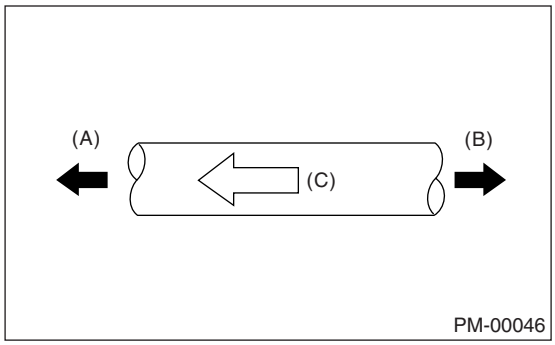


(A) Steering wheel
(B) Toe board

4) Check to see if air is in the hydraulic brake line by the feel of pedal operation. If air appears to exist in the line, bleed it from the system.
5) Check for even operation of all brakes, using a brake tester or by driving the vehicle for a short distance on a straight road.

2. BRAKE SERVO SYSTEM

1) With the engine off, depress the brake pedal several times applying the same pedal force: Make sure the travel distance should not change.
2) With the brake pedal depressed, start the engine: Make sure the pedal should move slightly toward the floor.
3) With the brake pedal depressed, stop the engine and keep the pedal depressed for 30 seconds: Make sure the pedal height should not change.
4) Check valve is built into the vacuum hose. Disconnect the vacuum hose to inspect function of check valve.
Blow air into the vacuum hose from its brake booster side end: Air must flow out of engine side end of hose. Next blow air into the hose from engine side: Air should not flow out of hose.
Replace both check valve and vacuum hose if the check valve is faulty. Engine side of vacuum hose is indicated by marking “ENG” as shown.



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

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

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

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

18.Brake Fluid

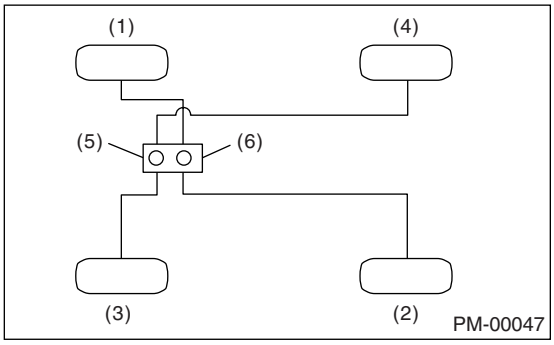
A: REPLACEMENT

1) Either jack-up the vehicle and place a safety stand under it, or lift-up the vehicle.
2) Remove both front and rear wheels.
3) Draw out the brake fluid from master cylinder with syringe.
4) Refill the reservoir tank with recommended brake fluid.

Recommended brake fluid:
FMVSS No. 116, fresh DOT3 brake fluid

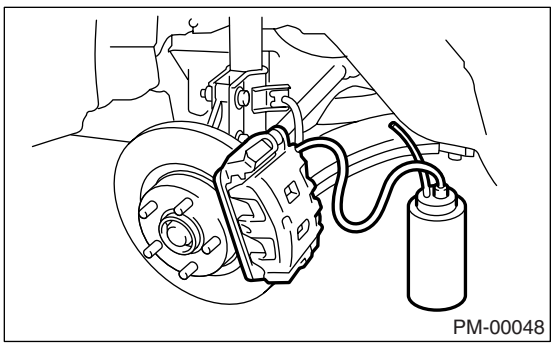
NOTE:
• Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.

Bleeding sequence (1) → (2) → (3) → (4)



(1) Front right
(2) Rear left
(3) Front left
(4) Rear right
(5) Secondary
(6) Primary

5) Install one end of a vinyl tube onto the air bleeder and insert the other end of the tube into a container to collect the brake fluid.



NOTE:
• Cover the bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
• During the bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
• The brake pedal operating must be very slow.
• For convenience and safety, two people should do the work.
• The amount of brake fluid required is approx. 500 mℓ (16.9 US fl oz, 17.6 Imp fl oz) for total brake system.

6) Instruct your co-worker to depress the brake pedal slowly two or three times and then hold it depressed.
7) Loosen the bleeder screw approx. 1/4 turn until a small amount of brake fluid drains into container, and then quickly tighten the screw.
8) Repeat steps 6) and 7) above until there are no air bubbles in the drained brake fluid and new fluid flows through vinyl tube.

NOTE:
Add brake fluid as necessary while performing the air bleed operation, in order to prevent the tank from running short of brake fluid.

9) After completing the bleeding operation, hold brake pedal depressed and tighten the screw and install bleeder cap.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

10) Bleed air from each wheel cylinder by following the previous 5 steps.
11) Depress the brake pedal with a force of approx. 294 N (30 kgf, 66 lb) and hold it there for approx. 20 seconds. At this time check the pedal to see if it makes any unusual movement. Visually inspect the bleeder screws and brake pipe joints to make sure that there is no fluid leakage.
12) Install the wheels, and drive the vehicle for a short distance between 2 to 3 km (1 to 2 miles) to make sure that brakes are operating properly.

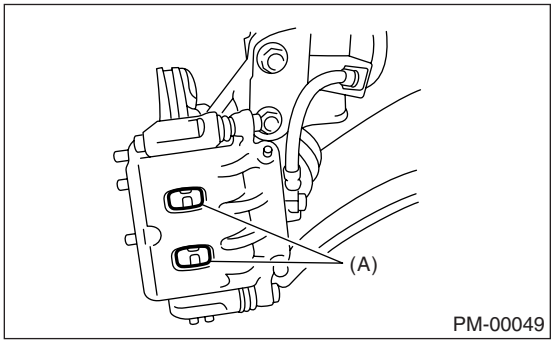
19.Disc Brake Pads and Discs

A: INSPECTION

1. DISC BRAKE PAD AND DISC

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

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



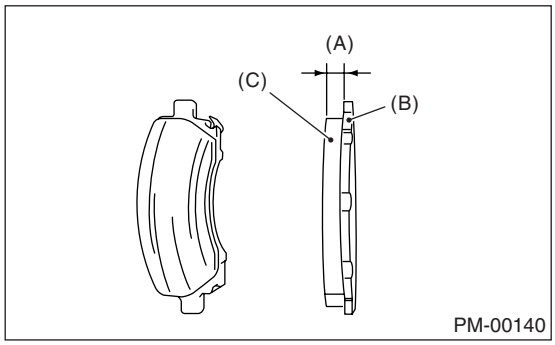
(A) Inspection hole

- Front

	Pad thickness	mm (in)
Standard	15 inch	11 (0.43)
	16 inch	11 (0.43)
	17 inch	9.2 (0.36)
Service limit	15 inch	1.5 (0.059)
	16 inch	1.5 (0.059)
	17 inch	1.2 (0.047)

- Rear

	Pad thickness	mm (in)
Standard	14 inch	9 (0.35)
	17 inch	9 (0.35)
Service limit	14 inch	1.5 (0.059)
	17 inch	1.2 (0.047)



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

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

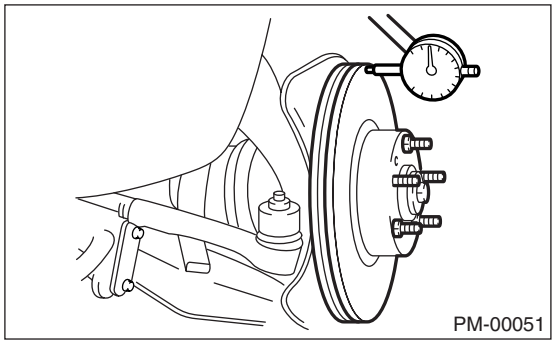
	Disc rotor thickness	mm (in)
Standard	15, 16 inch	24 (0.94)
	17 inch	30 (1.18)
Service limit	15, 16 inch	22 (0.87)
	17 inch	28 (1.10)

- Rear

	Disc rotor thickness	mm (in)
Standard	14 inch	10 (0.39)
	17 inch	20 (0.79)
Service limit	14 inch	8.5 (0.34)
	17 inch	18 (0.71)

4) Remove the caliper body. <Ref. to BR-22, Front Disc Brake Assembly.>, <Ref. to BR-32, Rear Disc Brake Assembly.>
5) Tighten the wheel nuts to secure disk rotor.
6) Set a dial gauge at a point less than 10 mm (0.39 in) from outer periphery of rotor, and then measure the disk rotor runout.

Disc rotor runout limit:
Front: 0.075 mm (0.0030 in)
Rear: 0.070 mm (0.0028 in)



20.Parking Brake

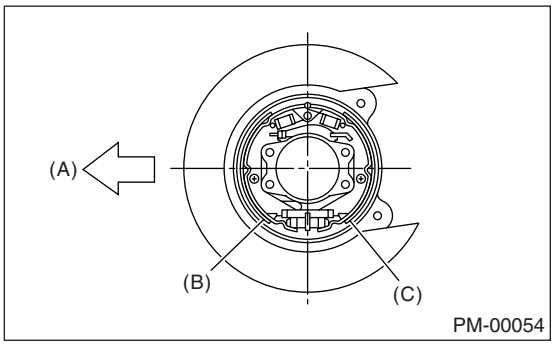
A: INSPECTION

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

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

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

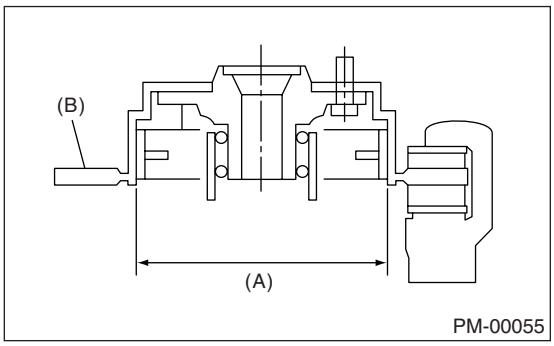
Brake lining thickness (except back metal)
Standard value: 3.2 mm (0.126 in)
Wear limit: 1.5 mm (0.059 in)



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

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

Brake drum inside diameter
Except for STi model
Standard value: 170 mm (6.69 in)
Wear limit: 171 mm (6.73 in)
STi model
Standard value: 190 mm (7.48 in)
Wear limit: 191 mm (7.52 in)



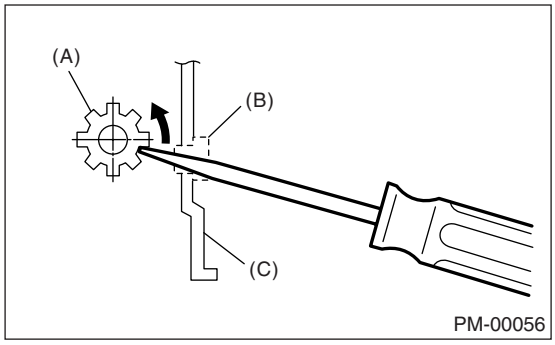
(A) Inside diameter
(B) Disk

3) If the deformation or wear of back plate, shoe, etc. is noticeable, replace them.
4) When the shoe return spring tension is excessively weakened, replace it.

B: ADJUSTMENT

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

1) Remove the rear cover (rubber) installed at back plate.
2) Turn the adjuster toward arrow mark (upward) until it is locked slightly, by using a flat tip screwdriver as shown in illustration.



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

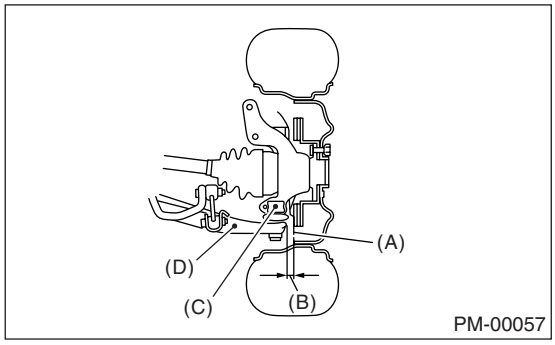
3) Turn back (downward) the adjuster 3 to 4 notches.
4) Install the cover (rubber) at original position correctly.

21.Suspension

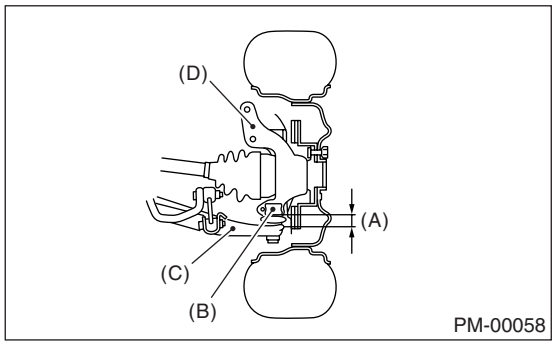
A: INSPECTION

1. SUSPENSION BALL JOINT

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



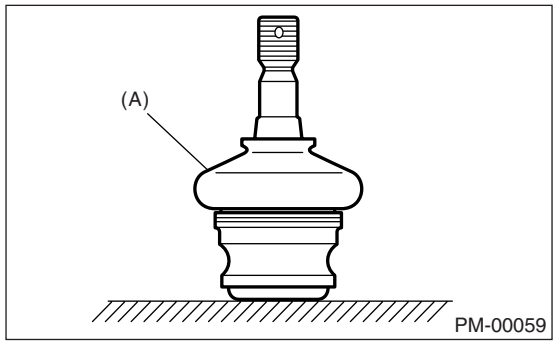
3) Next, grasp the end of transverse link and move it up and down. Relative movement (A) between the housing (D) and transverse link (C) boss indicates ball joint (B) may be excessively worn.



4) If relative movement is observed in the immediately preceding two steps, remove and inspect the ball joint. If free play exceeds standard, replace the ball joint. <Ref. to FS-18, Front Ball Joint.>
5) Damage of dust seal
Visually inspect the ball joint dust seal. If it is damaged, remove the transverse link. <Ref. to FS-15, Front Transverse Link.> And measure free play of ball joint. <Ref. to FS-18, Front Ball Joint.>

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

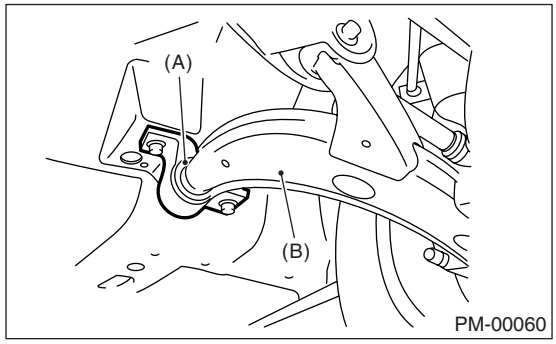
NOTE:
When the transverse link ball joint has been removed or replaced, check the toe-in of front wheel. If the front wheel toe-in is not at specified value, adjust the toe-in. <Ref. to FS-6, Wheel Alignment.>



(A) Dust seal

2. TRANSVERSE LINK'S REAR BUSHING

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



(A) Rear bushing
(B) Transverse link

3. WHEEL ARCH HEIGHT

1) Unload cargoes and set the vehicle in curb weight (empty) condition.
2) Then, check the wheel arch height of front and rear suspensions to ensure that they are within specified values. <Ref. to FS-6, Wheel Alignment.>
3) When the wheel arch height is out of standard, visually inspect the following components and replace deformed parts.
• Suspension components [Front strut assembly and rear shock absorber assembly]
• Parts connecting between suspension and body.
4) When no components are deformed, adjust the wheel arch height by replacing coil spring in the suspension which wheel arch height is out of standard. <Ref. to FS-6, Wheel Alignment.> <Ref. to RS-8, Wheel Alignment.>

4. WHEEL ALIGNMENT OF FRONT SUSPENSION

1) Check the alignment of front suspension to ensure that following items conform to standard values.
- Toe-in
- Camber angle
- Caster angle
- Steering angle

<Ref. to FS-6, Wheel Alignment.>
2) When the caster angle does not conform to reference, visually inspect the following components and replace deformed parts.
- Suspension components [Strut assembly, crossmember, transverse link, etc.]
- Body parts to which suspensions are installed.

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

5. WHEEL ALIGNMENT OF REAR SUSPENSION

1) Check the alignment of rear suspension to ensure that following items are within standard values.
- Toe-in
- Camber angle
- Thrust angle

<Ref. to RS-8, Wheel Alignment.>
2) When the camber angle does not conform to reference, visually inspect parts listed below. If deformation is observed, replace the damaged parts.
- Suspension components [Shock absorber, link F, link R, link UPR, arm R, sub frame, etc.]
- Body parts to which suspensions are installed.

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

6. OIL LEAKAGE OF STRUT

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

7. TIGHTNESS OF BOLTS AND NUTS

Check the bolts and nuts shown in the figure for looseness. Retighten the bolts and nuts to specified torque. If the self-lock nuts and bolts are removed, replace them with new ones.
Front suspension: <Ref. to FS-2, General Description.>
Rear suspension: <Ref. to RS-2, General Description.>

8. DAMAGE TO SUSPENSION PARTS

Check the following parts and the fastening portion of the vehicle body for deformation or excessive rusting which impairs the suspension. If necessary, replace the damaged parts with new ones. If minor rust formation, pitting, etc. are noted, remove the rust and apply remedial anti-corrosion measures.
- Front suspension
  - Transverse link
  - Crossmember
  - Strut
- Rear suspension
  - Crossmember
  - Lateral links
  - Trailing link
  - Strut
- In the district where salt is sprayed to melt snow on a road in winter, check suspension parts for damage caused by rust every 12 months after lapse of 60 months. Take rust prevention measure as required.

22.Wheel Bearing

A: INSPECTION

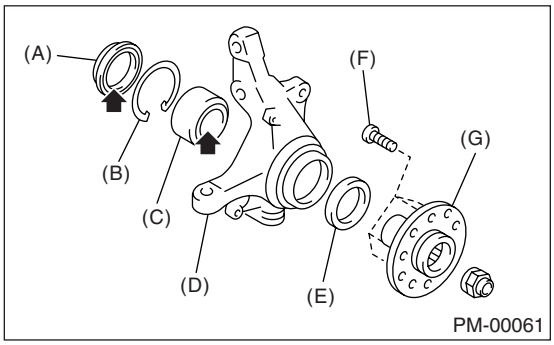
1. FRONT WHEEL BEARING

NOTE:
Inspect the condition of front wheel bearing grease.

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

Service limit:
Straight-ahead position within 0.05 mm (0.0020 in)

5) Remove the bolts and self-locking nuts, and extract transverse link from front crossmember.
6) Remove the SFJ of front drive shaft from transmission. <Ref. to DS-17, Front Axle.>
7) While supporting the front drive shaft horizontally with one hand, turn the hub with the other to check for noise or binding.
If the hub is noisy or binds, disassemble the front axle and check condition of oil seals, bearing, etc.



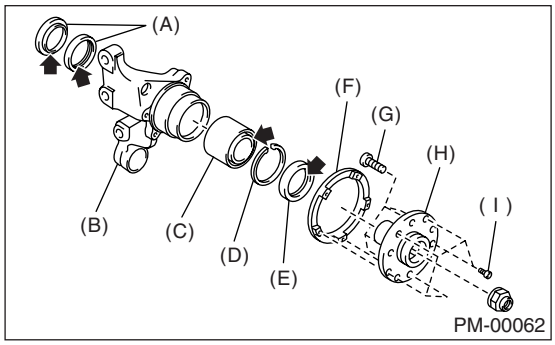
(A) Inner oil seal
(B) Snap ring
(C) Bearing
(D) Housing
(E) Outer oil seal
(F) Hub bolt
(G) Hub

2. REAR WHEEL BEARING

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

Service limit:
Straight-ahead position within 0.05 mm (0.0020 in)

5) Remove the DOJ of rear drive shaft from rear differential. <Ref. to DS-32, Rear Drive Shaft.>
6) While supporting the rear drive shaft horizontally with one hand, turn the hub COMPL with the other to check for noise or binding.
If the hub COMPL is noisy or binds, disassemble the rear axle and check condition of oil seals, bearings, etc.



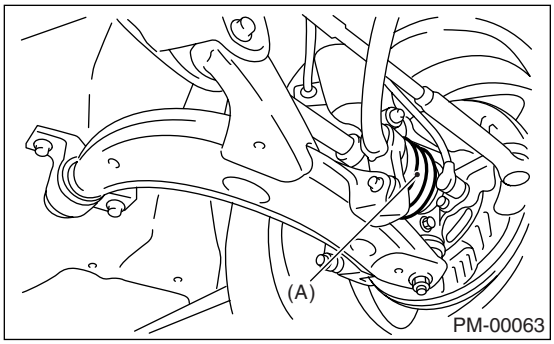
(A) Inner oil seal
(B) Rear housing
(C) Bearing
(D) Snap ring
(E) Outer oil seal
(F) Tone wheel
(G) Hub bolt
(H) Hub
(I) Socket bolt

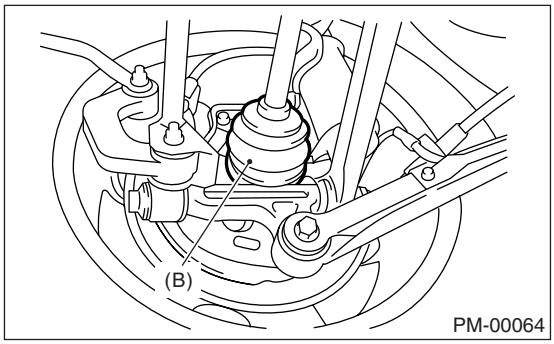
23.Axle Boots & Joints

A: INSPECTION

1. FRONT AND REAR AXLE BOOTS

Inspect the front axle boots (A) and rear axle boots (B) for deformation, damage or failure. If faulty, replace them with new ones. <Ref. to DS-27, Front Drive Shaft.> <Ref. to DS-32, Rear Drive Shaft.>





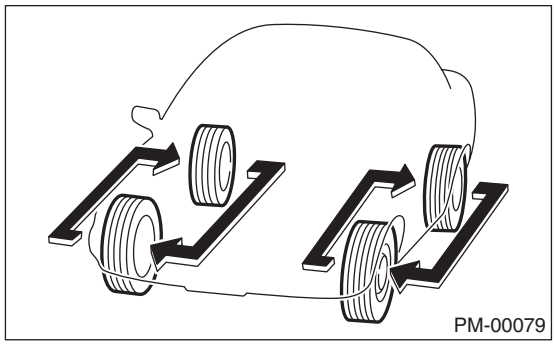
2. PROPELLER SHAFT

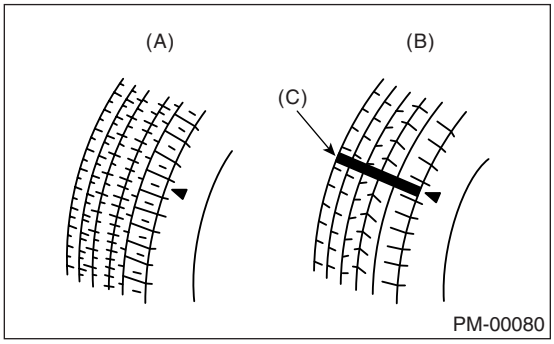
Inspect the propeller shaft for damage or failure. If faulty, replace with a new one. <Ref. to DS-14, Propeller Shaft.>

24.Tire Rotation

A: INSPECTION

1) When the tread has worn down to 1.6 mm (2/32 in) or the wear indicator appears across the tread, replace the tire. (It is recommended to replace both left and right tires as a set.)
2) If abnormal uneven wear is found on the tire, adjust the wheel alignment.
3) Also, tire rotations should be done by interchanging front and rear tires as shown to ensure even wear of the tires.


PM-00079



PM-00080

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

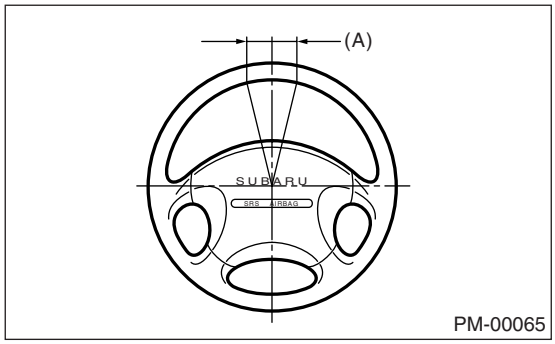
25. Steering System (Power Steering)

A: INSPECTION

1. STEERING WHEEL

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

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



(A) Steering wheel free play

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

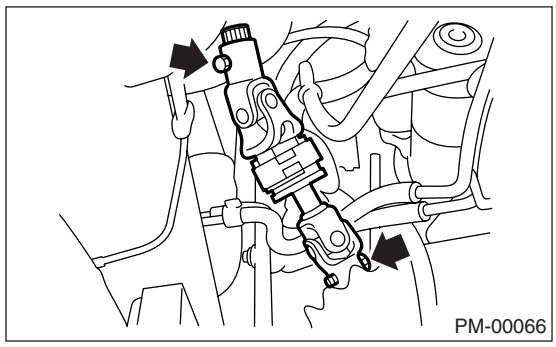
Maximum permissible play:
0.5 mm (0.020 in)

3) Drive the vehicle and check the following items during operation.
(1) Steering force:
The effort required for steering should be smooth and even at all points, and should not vary.
(2) Pull to one side:
Steering wheel should not be pulled to either side while driving on a level surface.
(3) Wheel runout:
Steering wheel should not be runout.
(4) Return factor:
Steering wheel should return to its original position after it has been turned and then released.

2. STEERING SHAFT JOINT

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

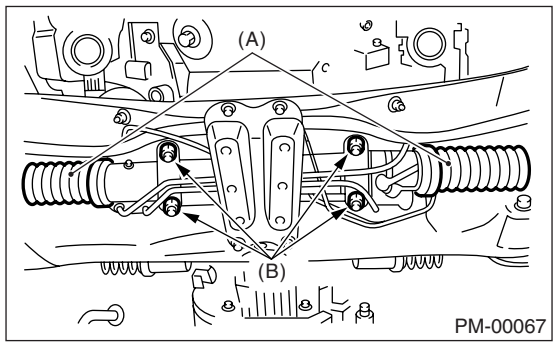
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)



3. GEARBOX

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

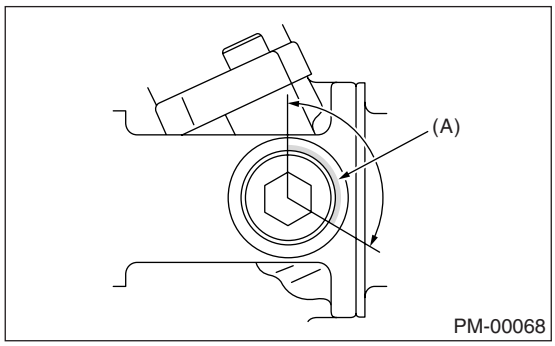
Tightening torque:
59 N·m (6.0 kgf-m, 43.4 ft-lb)



(A) Boot
(B) Gear box mounting bolt

2) Check the boot for damage, cracks or deterioration.
3) With the vehicle on a level surface, quickly turn the steering wheel to the right and left.
While the steering wheel is being rotated, check the gear backlash. If any unusual noise is noticed, adjust the gear backlash in the following manner.
(1) Tighten the adjusting screw to 7.4 N·m (0.75 kgf-m, 5.4 ft-lb) and then loosen. Repeat this operation twice.

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



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

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

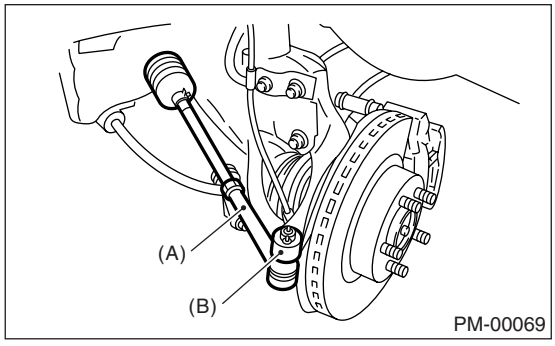
ST 926230000 SPANNER

Tightening torque (Lock nut):
39 N·m (4.0 kgf-m, 29 ft-lb)

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

4. TIE-ROD

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



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

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

Tightening torque:
27 N·m (2.75 kgf-m, 19.9 ft-lb)

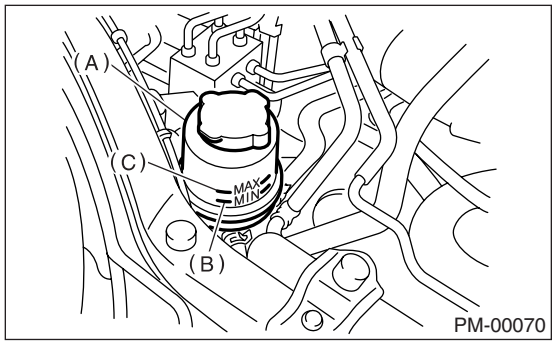
3) Check the lock nut on tie-rod end for tightness. If it is loose, retighten it to the specified torque.

Tightening torque:
83 N·m (8.5 kgf-m, 61.5 ft-lb)

5. POWER STEERING FLUID LEVEL

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

1) Place the vehicle with engine “OFF” on a flat and level surface.
2) Check the fluid level using the scale on the outside of reservoir tank (A). If the level is below “MIN” (B), add fluid to bring it up to “MAX” (C).



NOTE:
If the fluid level is at MAX level or above, drain fluid to keep the level in specified range of indicator by using a syringe or the like.

Recommended fluid:
Dexron III

Fluid capacity:
0.7 ℓ (0.7 US qt, 0.6 Imp qt)

6. POWER STEERING FLUID FOR LEAKS

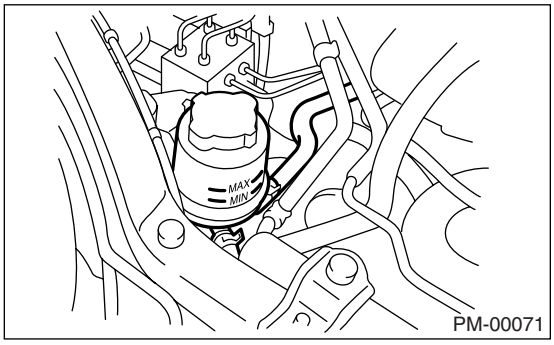
Inspect the underside of oil pump and gearbox for power steering system, hoses, piping and their couplings for fluid leaks.
If fluid leaks are found, correct them by retightening their fitting bolts (or nuts) and/or replacing their parts.

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

7. HOSES OF OIL PUMP FOR DAMAGES

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

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



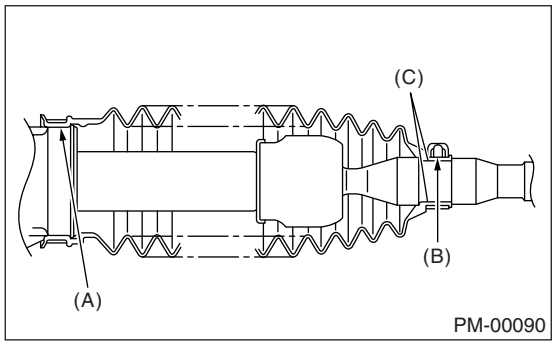
8. POWER STEERING PIPES FOR DAMAGE

Check the power steering pipes for corrosion and damage.
Replace the pipes with a new one if necessary.

9. GEARBOX BOOTS

Inspect both sides of gearbox boots as follows, and correct the defects if necessary.
1) (A) and (B) positions of gearbox boot are fitted correspondingly in (A) and (B) grooves of gearbox and the rod (C).
2) Clips are fitted outside of (A) and (B) positions of boot.
3) Boot does not have crack and hole.

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



10.FITTING BOLTS AND NUTS

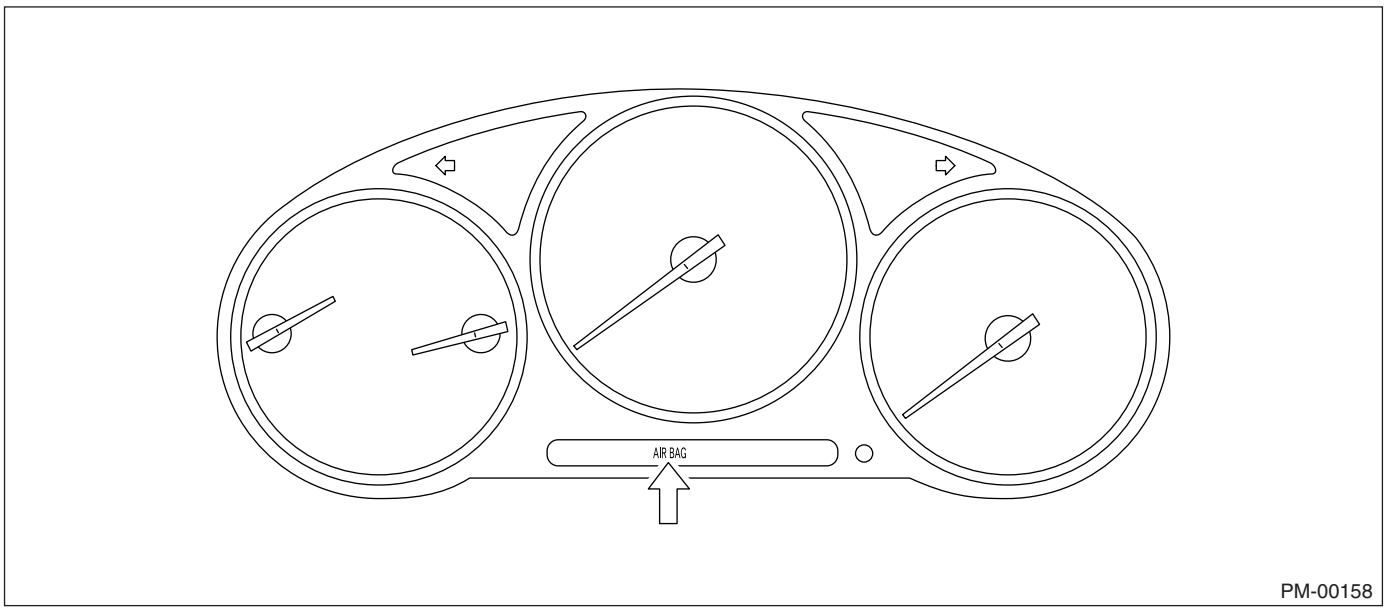
Inspect the fitting bolts and nuts of oil pump and bracket for looseness, and retighten them if necessary.
Inspect and/or retighten them when engine is cold.

26.Supplemental Restraint System

A: INSPECTION

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

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



2) Turn the ignition switch ON, and connect the airbag diagnosis terminal of the service connector (located below lower cover) to the ground terminal.

3) The warning light blinks to indicate a DTC (a fault is identified). When the airbag system is in good order (no trouble codes are stored in the memory), the warning light blinks on and off at 0.6 second intervals (as long as the diagnosis terminal is connected to the ground terminal).

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

ENGINE SECTION 1

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

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

FUEL INJECTION (FUEL SYSTEMS)	FU(H4SO)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(H4SO)
INTAKE (INDUCTION)	IN(H4SO)
MECHANICAL	ME(H4SO)
EXHAUST	EX(H4SO)
COOLING	CO(H4SO)
LUBRICATION	LU(H4SO)
SPEED CONTROL SYSTEMS	SP(H4SO)
IGNITION	IG(H4SO)
STARTING/CHARGING SYSTEMS	SC(H4SO)
ENGINE (DIAGNOSTICS)	EN(H4SO)(diag)
GENERAL DESCRIPTION	GD(H4SO)

FUEL INJECTION (FUEL SYSTEMS)

FU(H4SO)

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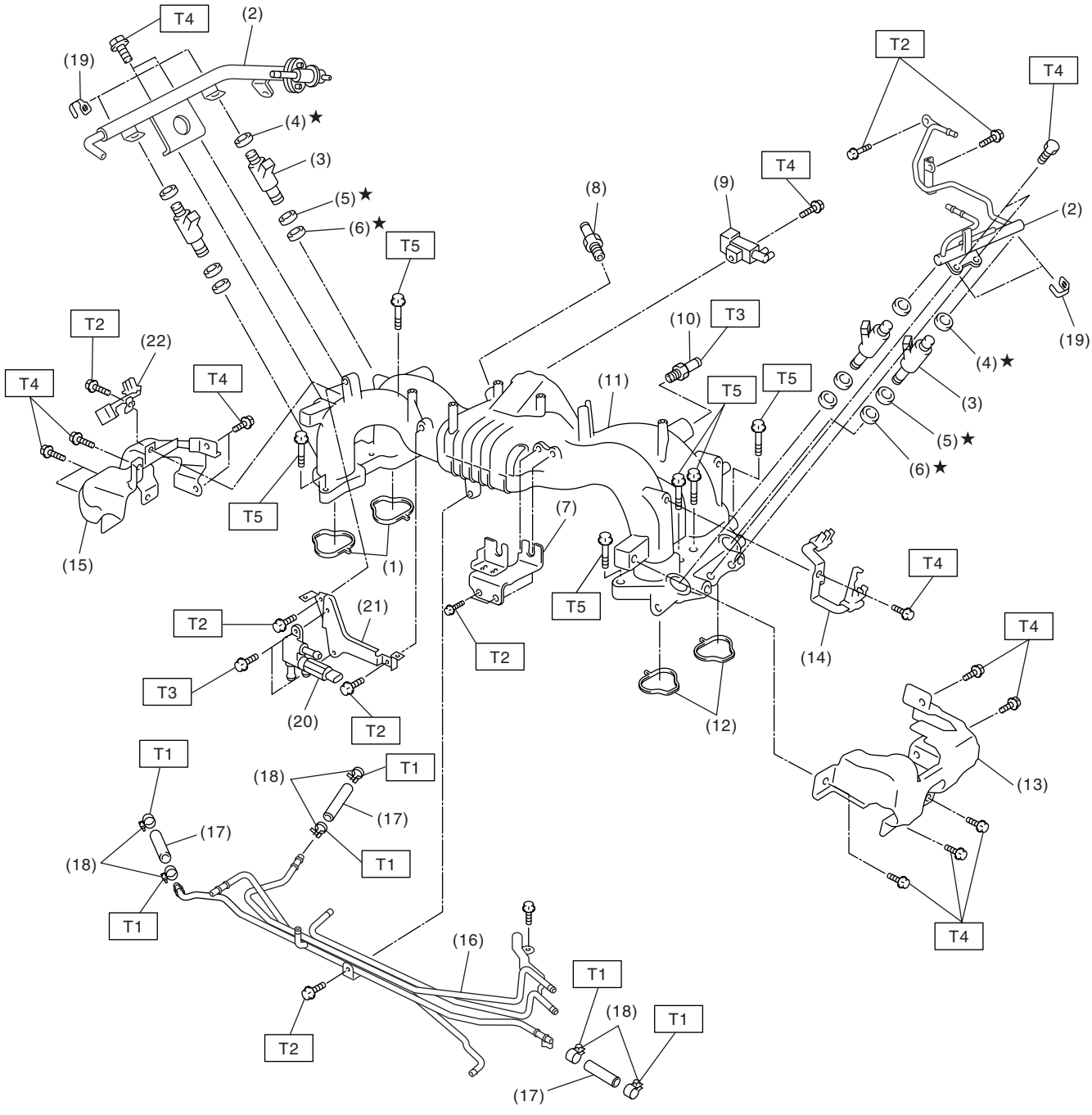
1. General Description

A: SPECIFICATIONS

Item		Specification
Fuel tank	Capacity	60 ℓ (15.9 US gal, 13.2 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	370 — 677 kPa (3.77 — 6.9 kg/cm^2, 53.6 — 98 psi)
	Discharge flow	More than 65 ℓ (17.2 US gal, 14.3 Imp gal)/h [12 V at 300 kPa (3.06 kg/cm^2, 43.5 psi)]
Fuel filter		Cartridge type

B: COMPONENT

1. INTAKE MANIFOLD

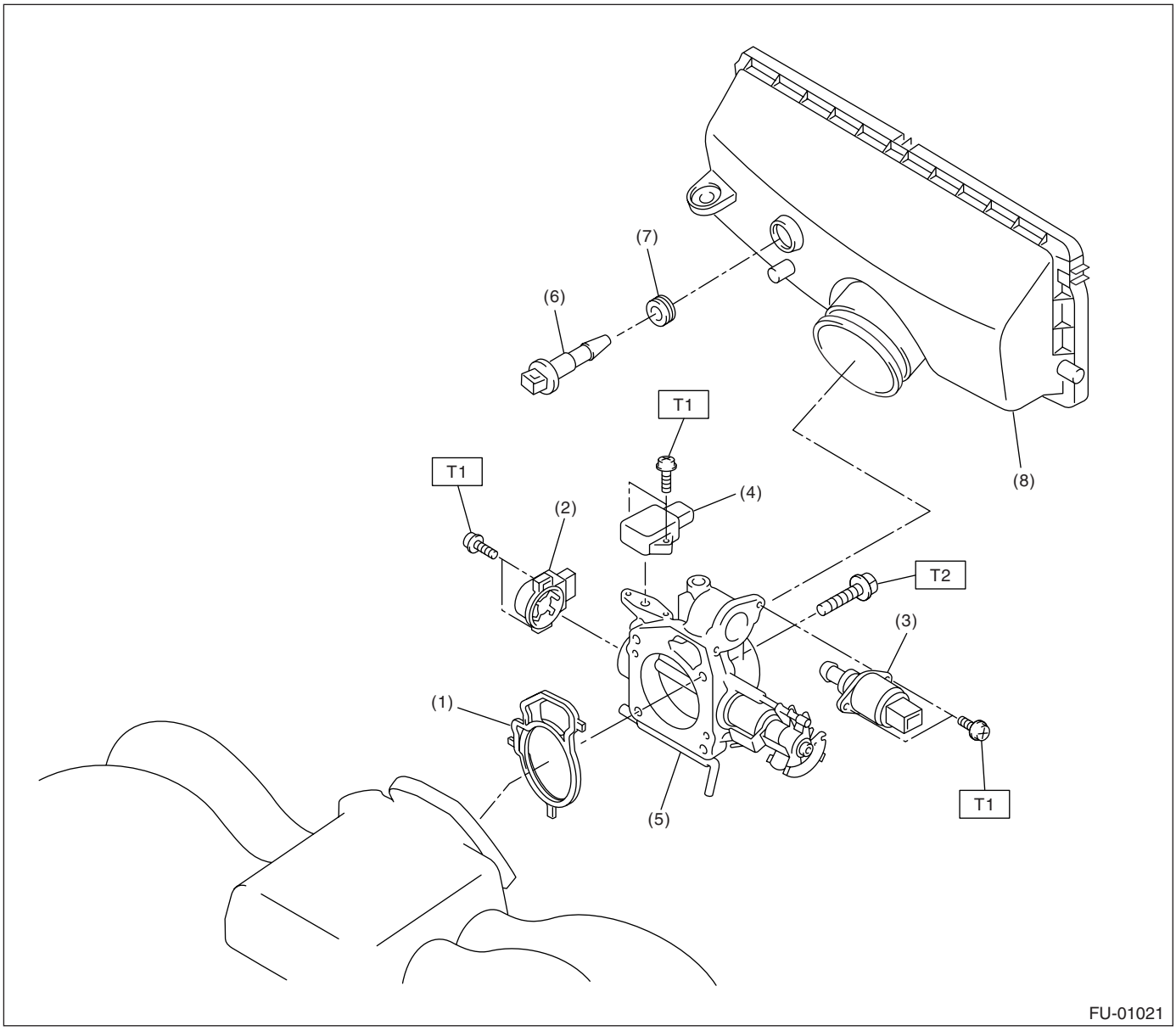


FU-01020

(1) Intake manifold gasket RH
(2) Fuel injector pipe
(3) Fuel injector
(4) O-ring
(5) O-ring
(6) O-ring
(7) Plug
(8) Nipple
(9) Purge control solenoid valve
(10) Nipple
(11) Intake manifold
(12) Intake manifold gasket LH
(13) Fuel pipe protector LH
(14) Plug cord holder LH
(15) Fuel pipe protector RH
(16) Fuel pipe assembly
(17) Fuel hose
(18) Clip
(19) Clip
(20) Air assist injector solenoid valve
(21) Air assist injector solenoid valve bracket
(22) Plug cord holder RH

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.5 (0.15, 1.1)
T2: 5.0 (0.51, 3.7)
T3: 17 (1.7, 12.5)
T4: 19 (1.9, 13.7)
T5: 25 (2.5, 18.1)

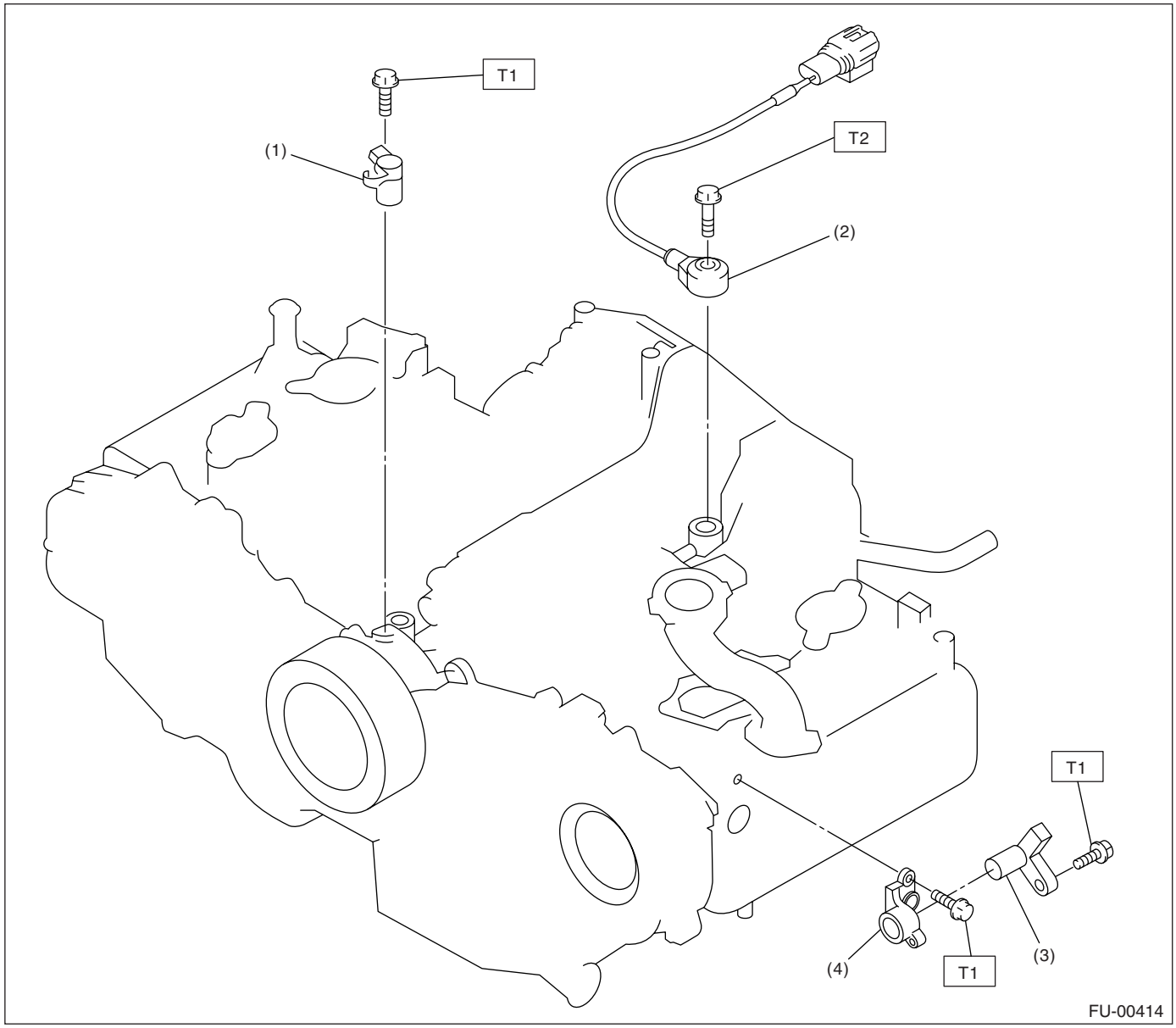
2. AIR INTAKE SYSTEM



(1) Gasket
(2) Throttle position sensor
(3) Idle air control solenoid valve
(4) Manifold absolute pressure sensor
(5) Throttle body
(6) Intake air temperature sensor
(7) Grommet
(8) Air cleaner case

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.6 (0.16, 1.2)
T2: 22 (2.2, 15.9)

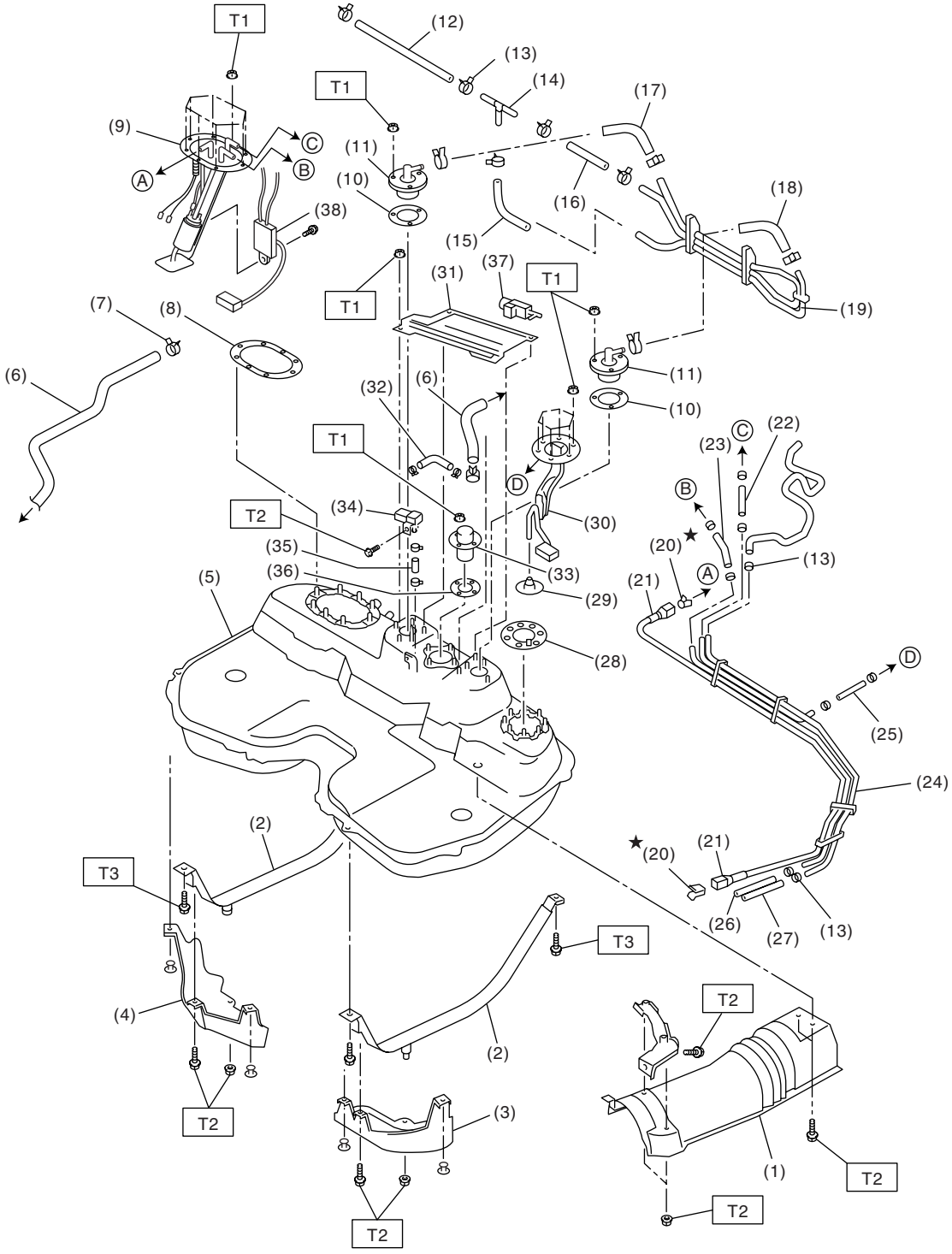
3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



(1) Crankshaft position sensor
(2) Knock sensor
(3) Camshaft position sensor
(4) Camshaft position sensor support

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 24 (2.4, 17.4)

4. FUEL TANK


T1
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(28)
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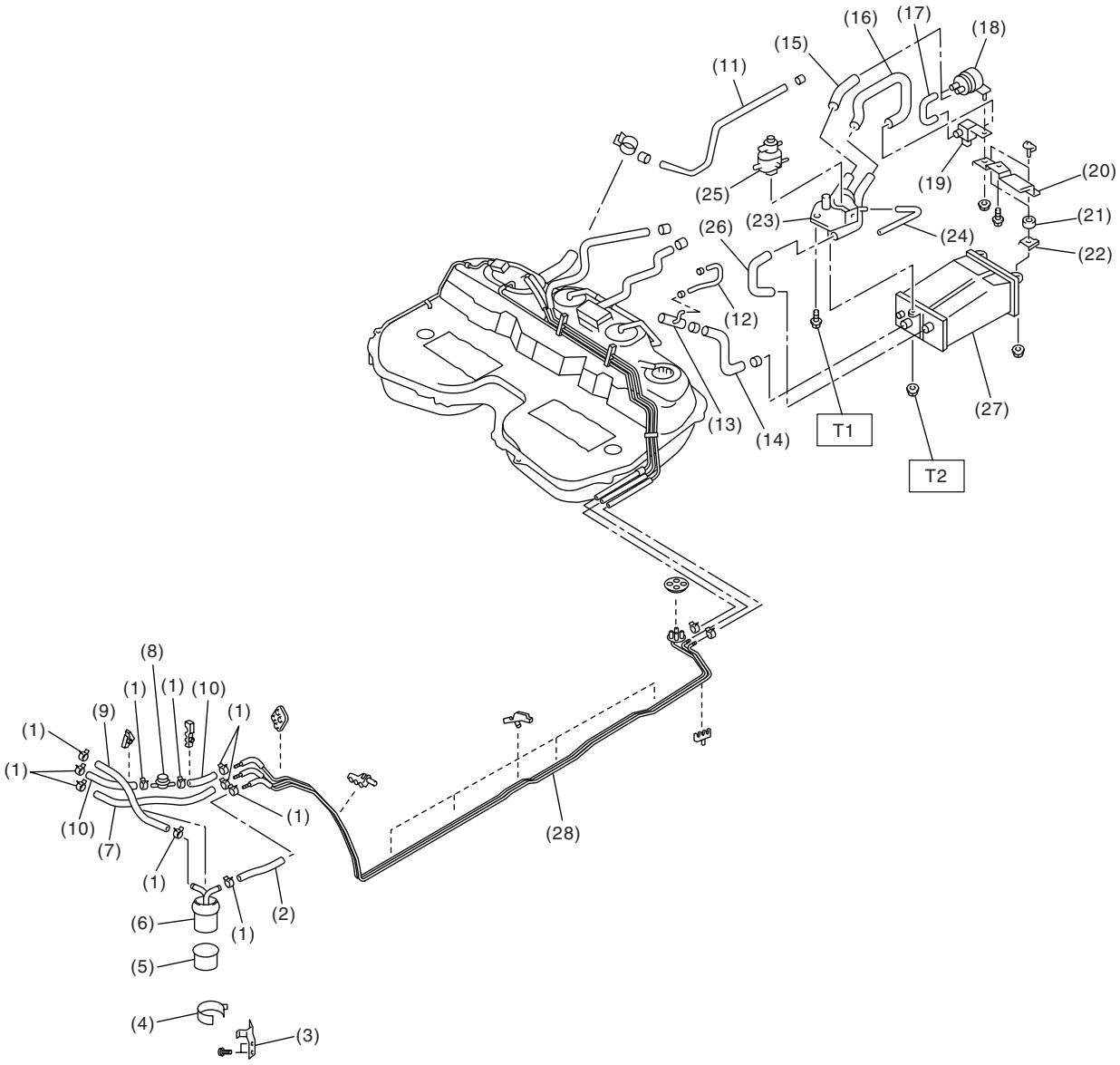
(24)
(2)
(26)
(27)
(4)
(3)
(1)
T2
T3
FU-01030

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

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

5. FUEL LINE

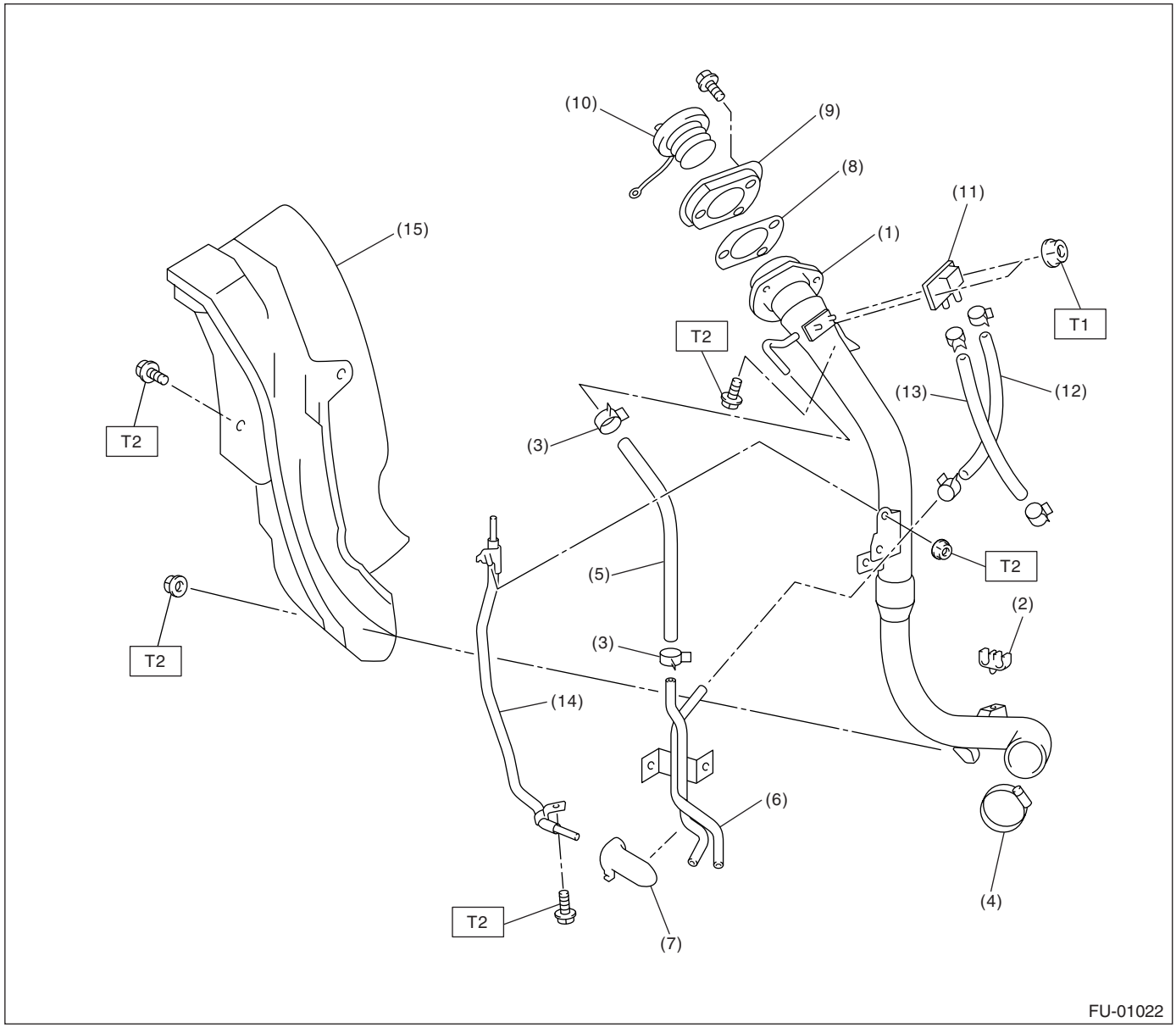


FU-00250

(1) Clip
(2) Fuel delivery hose A
(3) Fuel filter bracket
(4) Fuel filter holder
(5) Fuel filter cup
(6) Fuel filter
(7) Evaporation hose
(8) Fuel damper
(9) Fuel delivery hose B
(10) Fuel return hose
(11) Evaporation hose A
(12) Evaporation hose B
(13) Joint pipe
(14) Canister hose A
(15) Drain filter hose A
(16) Drain valve hose
(17) Drain filter hose B
(18) Drain filter
(19) Drain valve
(20) Canister upper bracket
(21) Cushion rubber
(22) Canister lower bracket
(23) Canister holder
(24) Evaporation hose C
(25) Pressure control solenoid valve
(26) Canister hose B
(27) Canister
(28) Fuel pipe assembly

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)
T2: 23 (2.3, 16.6)

6. FUEL FILLER PIPE



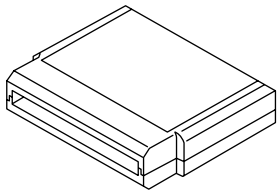
(1) Fuel filler pipe ASSY
(2) Evaporation hose holder
(3) Clamp
(4) Clamp
(5) Evaporation hose A
(6) Evaporation pipe
(7) Evaporation pipe holder
(8) Filler pipe packing
(9) Filler ring
(10) Filler cap
(11) Shut valve
(12) Evaporation hose B
(13) Evaporation hose C
(14) Joint pipe
(15) Fuel filler pipe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

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 7.5 (0.76, 5.53)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

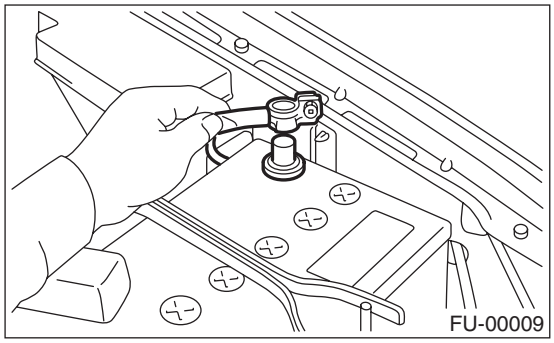
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

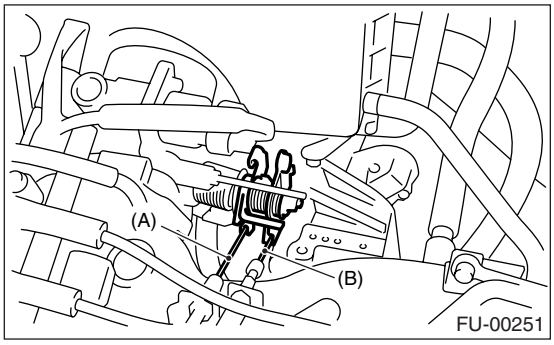
2. Throttle Body

A: REMOVAL

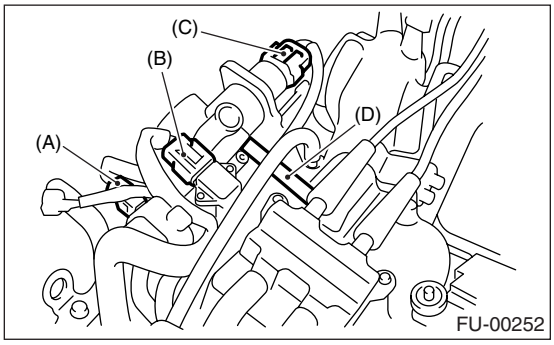
1) Disconnect the ground cable from battery.



2) Remove the air cleaner case. <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
3) Disconnect the accelerator cable (A).
4) Disconnect the cruise control cable (B). (Model with cruise control)

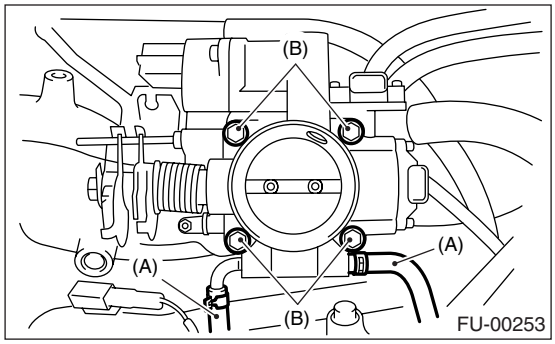


5) Disconnect the connectors from idle air control solenoid valve, throttle position sensor and manifold absolute pressure sensor.
6) Disconnect the air by-pass hose from the throttle body.



(A) Throttle position sensor
(B) Manifold absolute pressure sensor
(C) Idle air control solenoid valve
(D) Air by-pass hose

7) Disconnect the engine coolant hoses (A) from the throttle body.
8) Remove the bolts (B) which install throttle body to the intake manifold.



B: INSTALLATION

1) Install in the reverse order of removal.

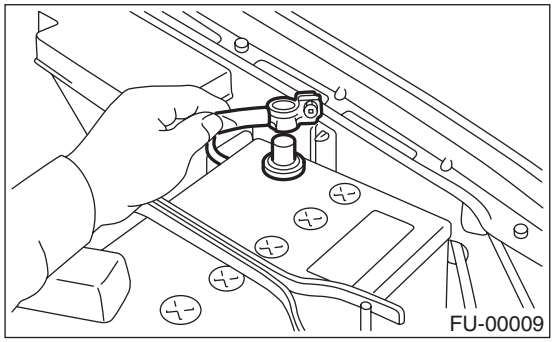
NOTE:
For tightening torque, refer to “COMPONENT”. <Ref. to FU(H4SO)-3, COMPONENT, General Description.>

2) Adjust the accelerator cable play. <Ref. to SP(H4SO)-6, INSTALLATION, Accelerator Control Cable.>

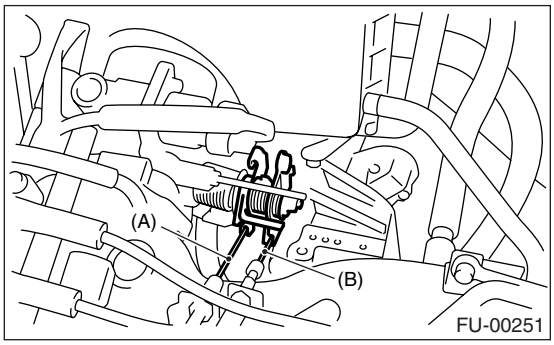
3. Intake Manifold

A: REMOVAL

1) Release fuel pressure. <Ref. to FU(H4SO)-47, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel flap lid, and remove the fuel filler cap.
3) Disconnect the ground cable from battery.

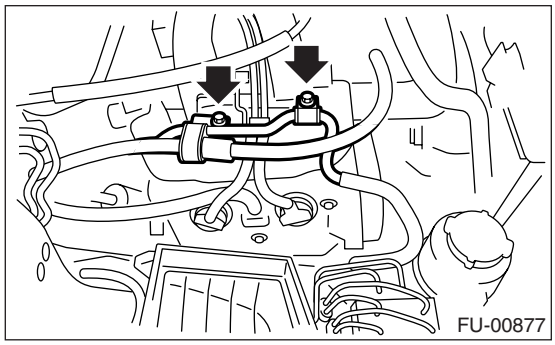


4) Remove the air intake duct and air cleaner case. <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.> A <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
5) Disconnect the accelerator cable (A).
6) Disconnect the cruise control cable (B). (vehicles with cruise control)

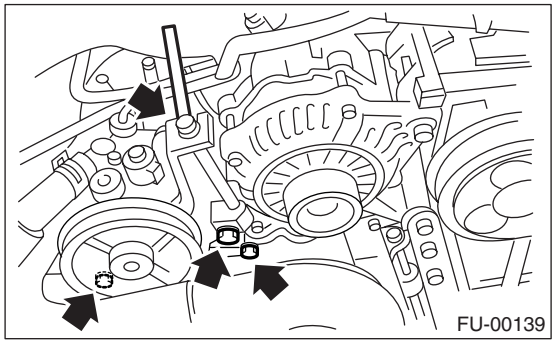


7) Remove the power steering pump and reservoir tank from bracket.
   (1) Remove the resonator chamber. <Ref. to IN(H4SO)-7, REMOVAL, Resonator Chamber.>
   (2) Remove the front side V-belt. <Ref. to ME(H4SO)-39, REMOVAL, V-belt.>
   (3) Remove the bolts which hold power steering pipes onto the intake manifold protector.

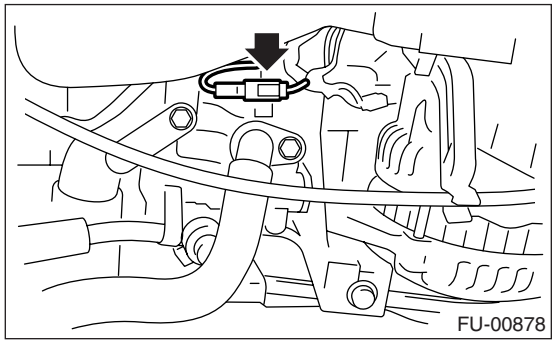
NOTE:
Do not disconnect the power steering hose.



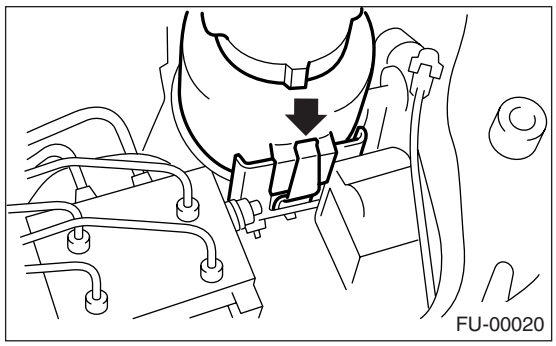
(4) Remove the bolts which install power steering pump bracket.



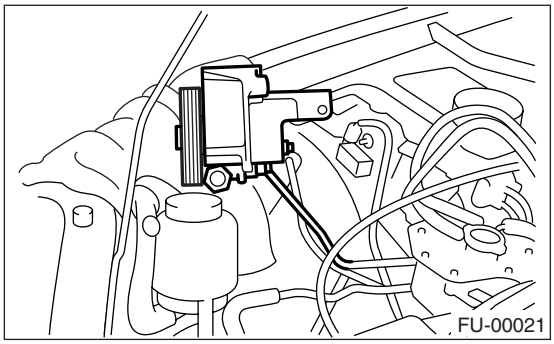
(5) Disconnect the connector from the power steering pump switch.



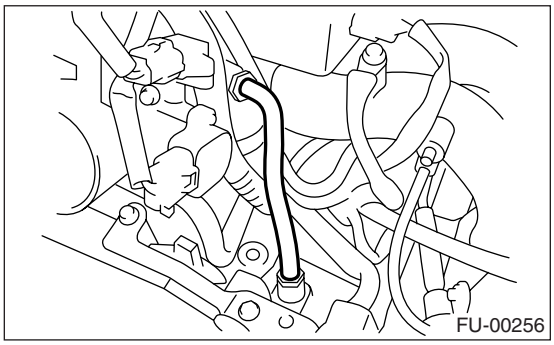
(6) Remove the reservoir tank from the bracket by pulling it upwards.



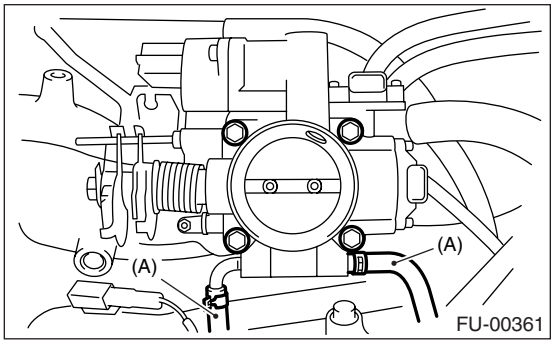
(7) Place the power steering pump on the right side wheel apron.



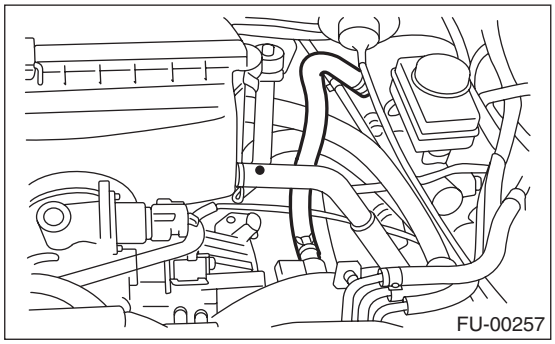
8) Disconnect the spark plug cords from the spark plugs.
9) Disconnect the PCV hose from the intake manifold.



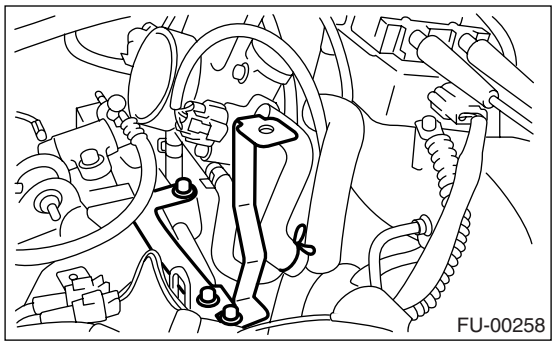
10) Disconnect the engine coolant hoses (A) from the throttle body.



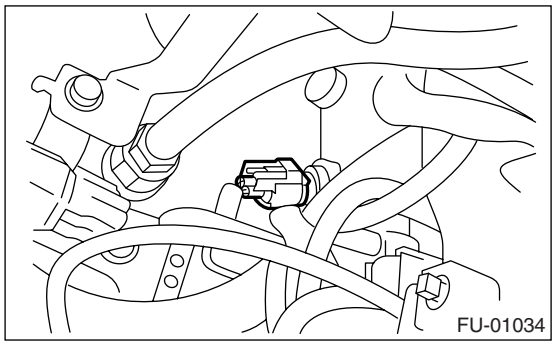
11) Disconnect the brake booster hose.



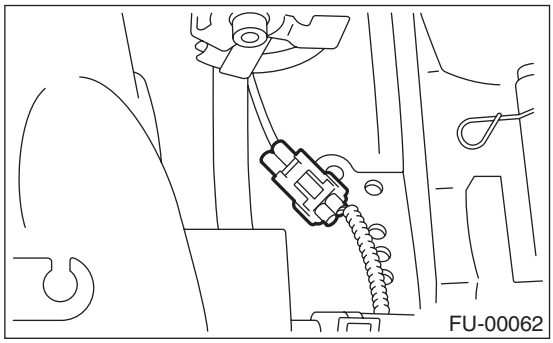
12) Remove the air cleaner case stay RH and engine harness bracket, and disconnect the engine harness connectors from the bulkhead harness connectors.



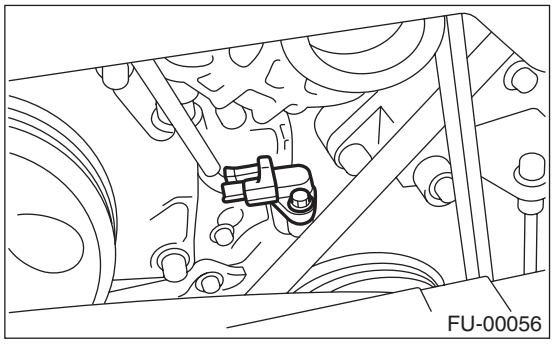
13) Disconnect the connector from engine coolant temperature sensor.



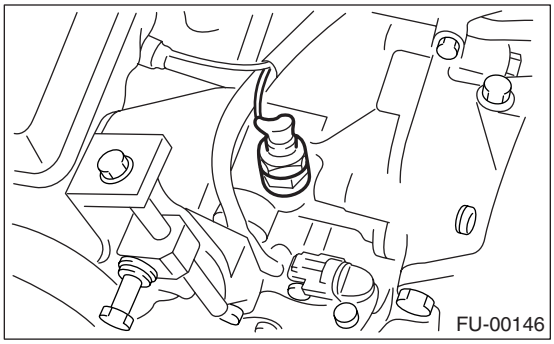
14) Disconnect the knock sensor connector.



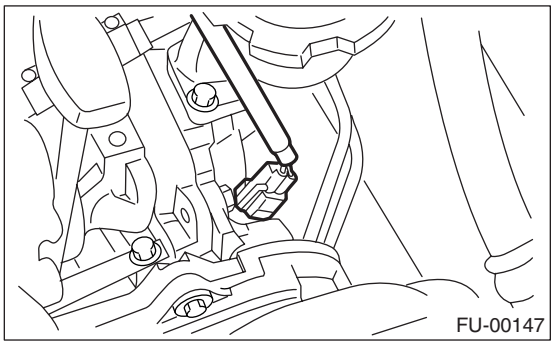
15) Disconnect the connector from crankshaft position sensor.



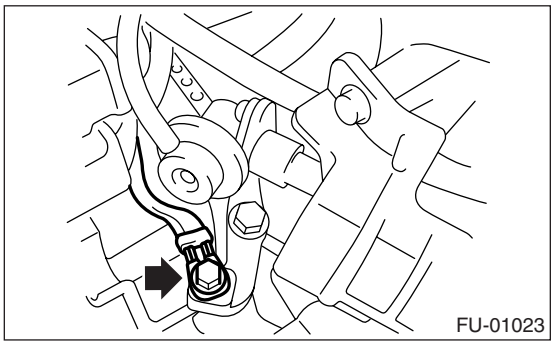
16) Disconnect the connector from oil pressure switch.



17) Disconnect the connector from the camshaft position sensor.

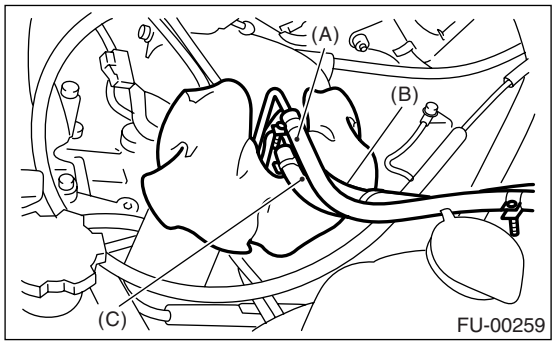


18) Disconnect the engine ground terminal from ground stay.



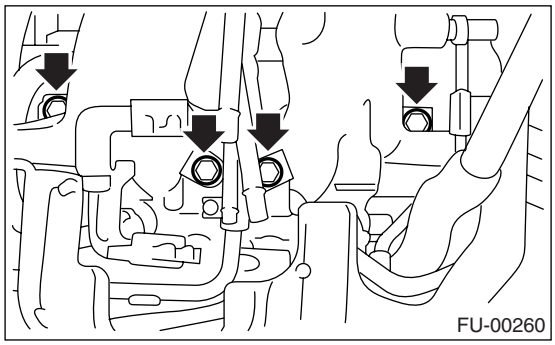
19) Disconnect the fuel hoses from the fuel pipes.

WARNING:
- **Do not spill fuel.**
- **Catch fuel from hoses in a container or cloth.**



(A) Fuel delivery hose
(B) Return hose
(C) Evaporation hose

20) Remove the bolts which hold intake manifold onto the cylinder heads.

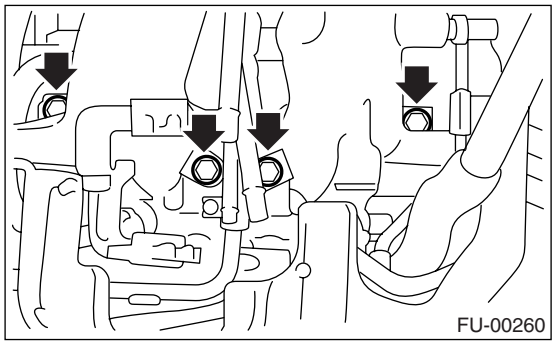


21) Remove the intake manifold.

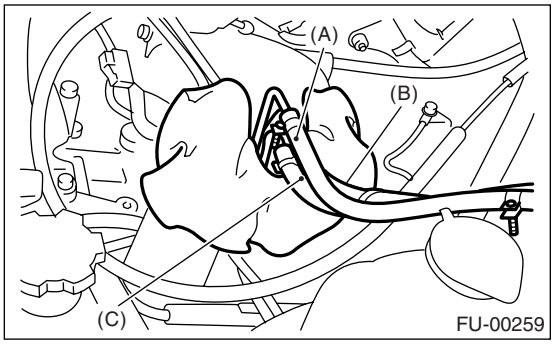
B: INSTALLATION

1) Install the intake manifold onto the cylinder heads.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



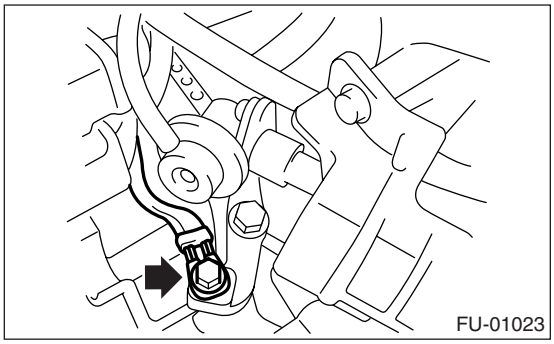
2) Connect the fuel hoses.



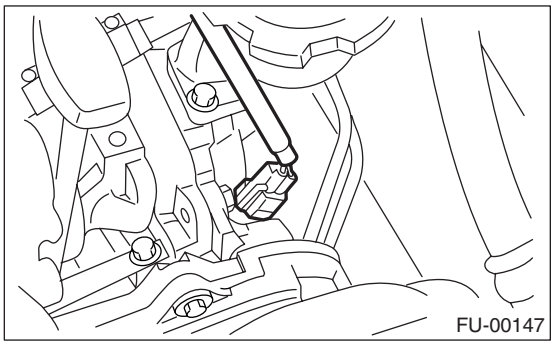
(A) Fuel delivery hose
(B) Return hose
(C) Evaporation hose

3) Connect the engine ground terminal to ground stay.

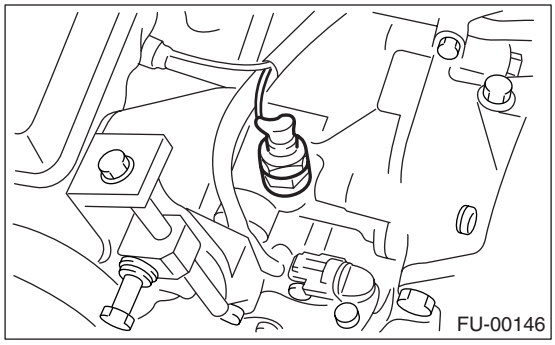
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



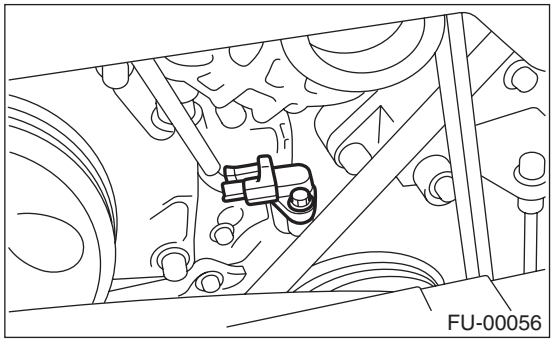
4) Connect the connector to the camshaft position sensor.



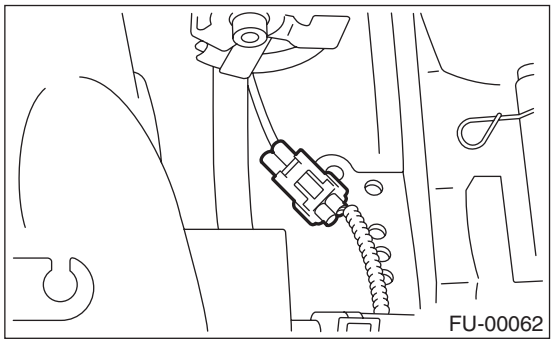
5) Connect the connector to the oil pressure switch.



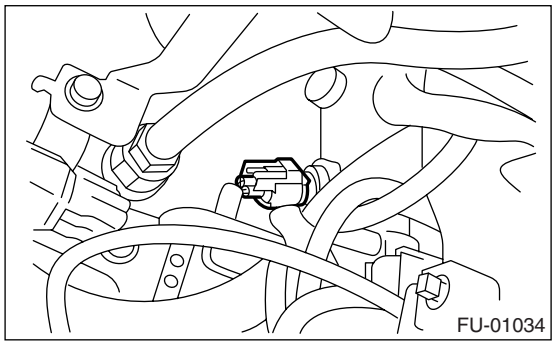
6) Connect the connector to the crankshaft position sensor.



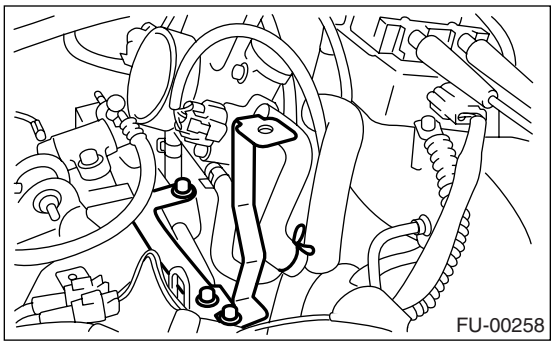
7) Connect the knock sensor connector.



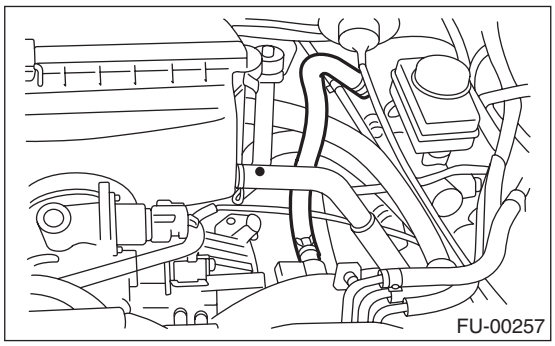
8) Connect the connectors to the engine coolant temperature sensor.



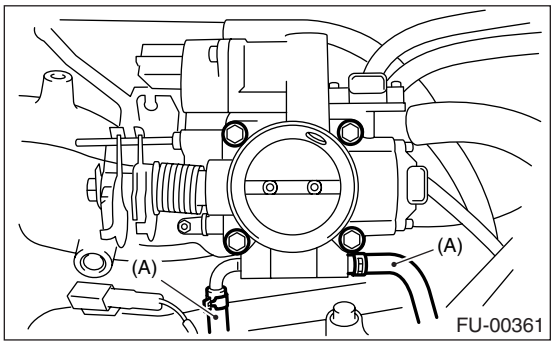
9) Install the air cleaner case stay RH and engine harness bracket, and connect the engine harness connectors to the bulkhead connectors.



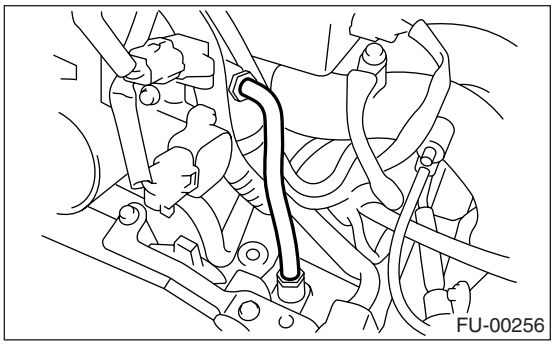
10) Connect the brake booster hose.



11) Connect the engine coolant hose (A) to the throttle body.



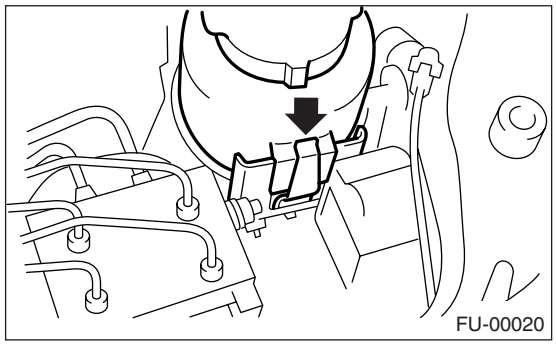
12) Connect the PCV hose to the intake manifold.



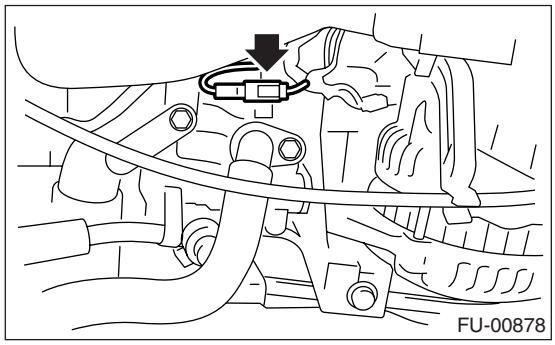
13) Connect the spark plug cords to the spark plugs.

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

(1) Install the reservoir tank to bracket.

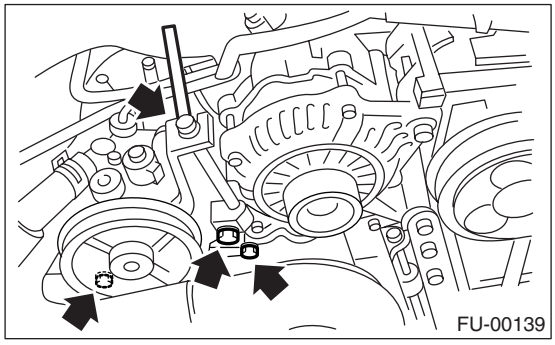


(2) Connect the connector to the power steering pump switch.

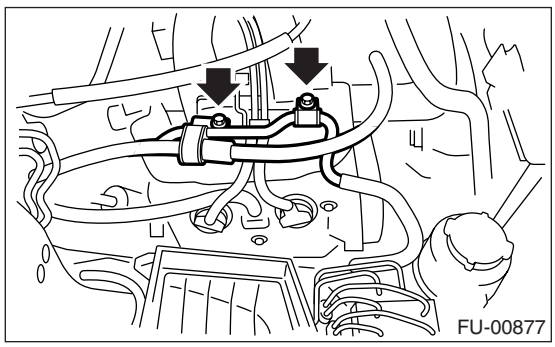


(3) Tighten the bolts which install power steering pump bracket.

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



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

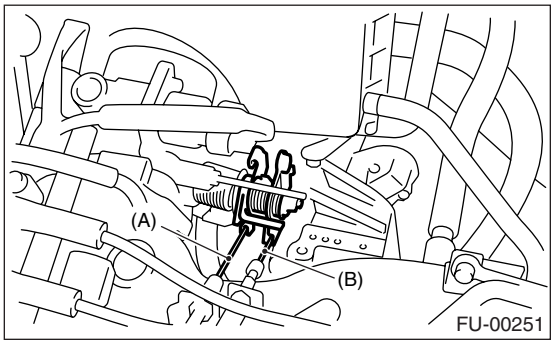


(5) Install the front side V-belt. <Ref. to ME(H4SO)-39, INSTALLATION, V-belt.>

(6) Install the resonator chamber. <Ref. to IN(H4SO)-7, INSTALLATION, Resonator Chamber.>

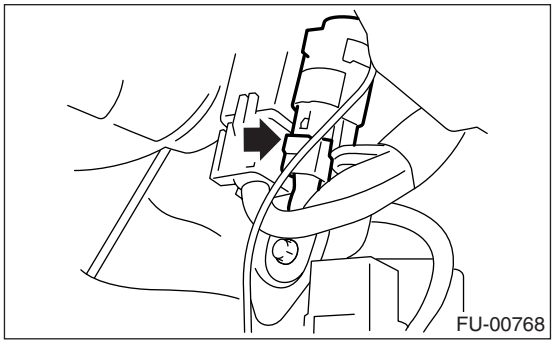
15) Connect the accelerator cable (A).

16) Connect the cruise control cable (B). (Model with cruise control)

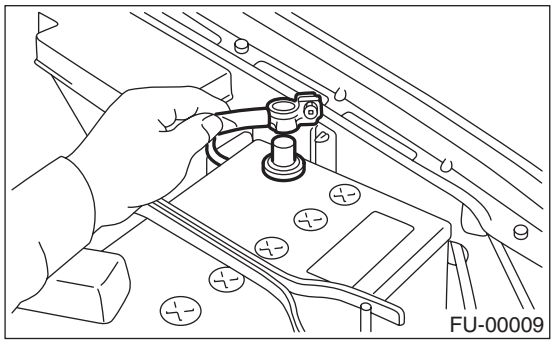


17) Install the air intake duct and air cleaner case. <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Duct.>, <Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>

18) Connect the connector to the fuel pump relay.



19) Connect the battery ground cable to battery.



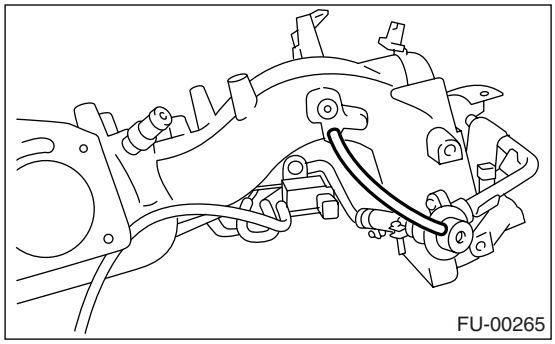
C: DISASSEMBLY

1) Remove the ignition coil & ignitor ASSY. <Ref. to IG(H4SO)-7, REMOVAL, Ignition Coil & Ignitor ASSY.>

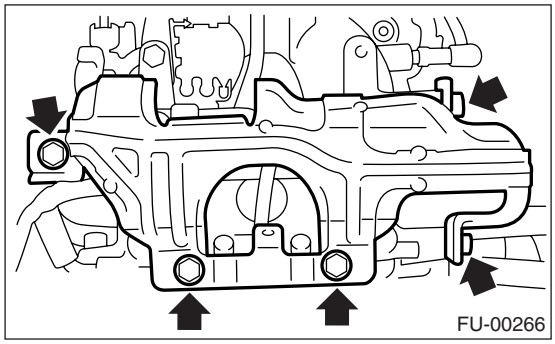
2) Remove the throttle body. <Ref. to FU(H4SO)-12, REMOVAL, Throttle Body.>

3) Remove the air assist injector solenoid valve from the intake manifold. <Ref. to FU(H4SO)-33, REMOVAL, Air Assist Injector Solenoid Valve.>

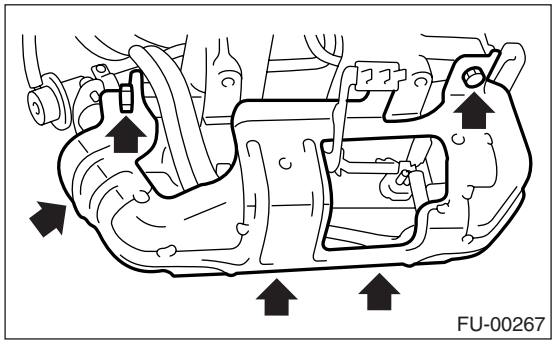
4) Disconnect the pressure regulator vacuum hose from the intake manifold.



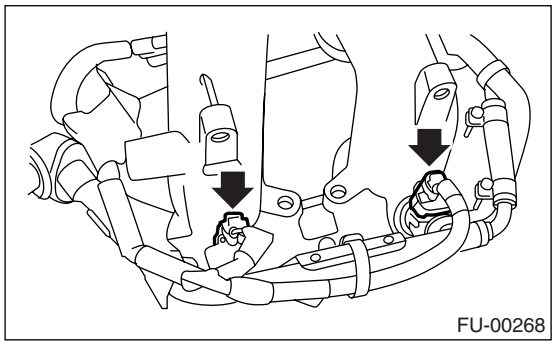
5) Remove the fuel pipe protector LH.



6) Remove the fuel pipe protector RH.

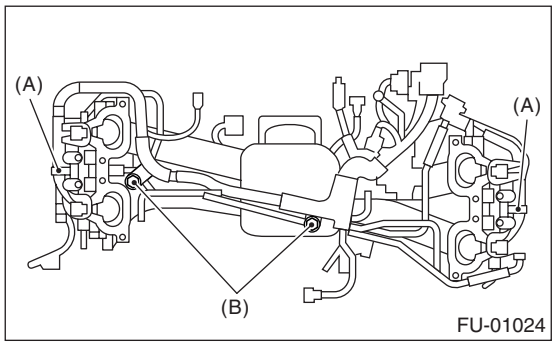


7) Disconnect the connectors from the fuel injectors.



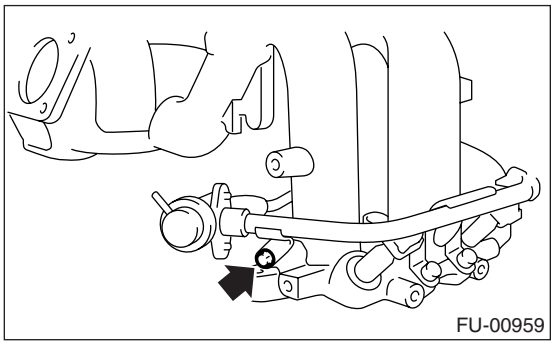
8) Disconnect the purge control solenoid valve. <Ref. to EC(H4SO)-6, REMOVAL, Purge Control Solenoid Valve.>

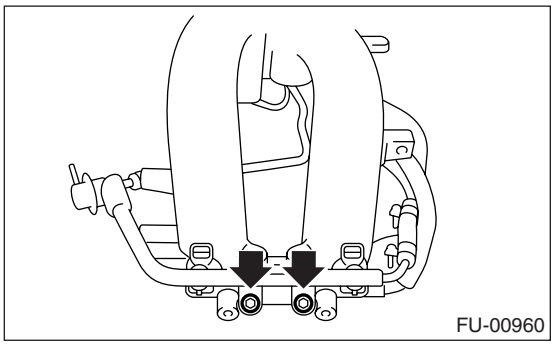
9) Remove the harness bands (A) and bolts (B) which hold the engine harness onto intake manifold.



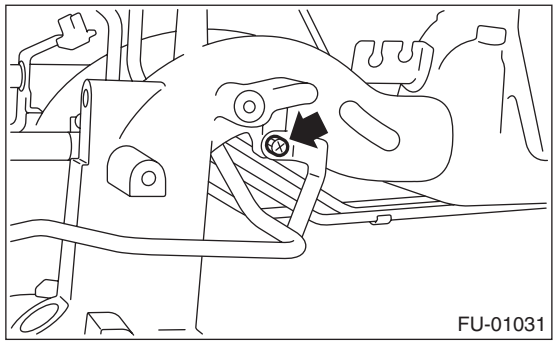
10) Remove the engine harness from the intake manifold.
11) Remove the bolt which installs injector pipe on the intake manifold as shown in figure.

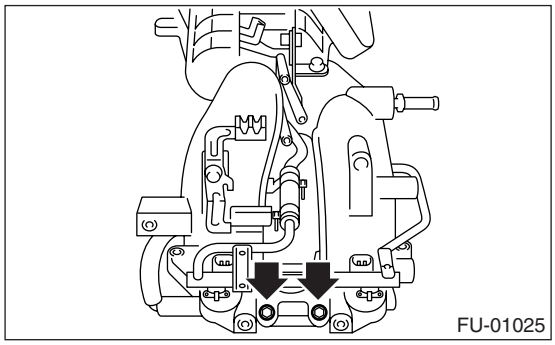
- **RH SIDE**



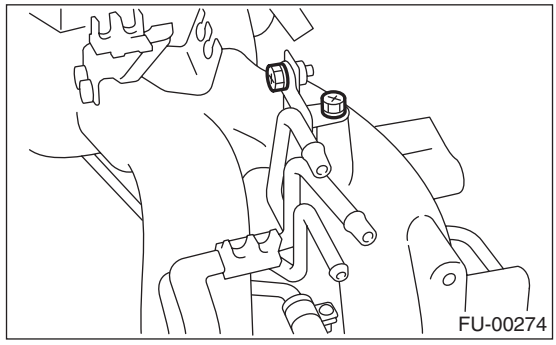


- **LH SIDE**

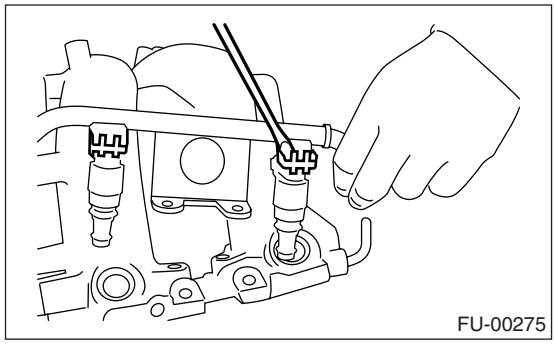




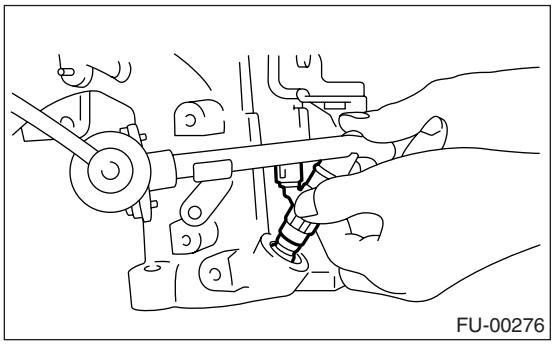
12) Remove the two bolts which hold fuel pipes on the left side of intake manifold.



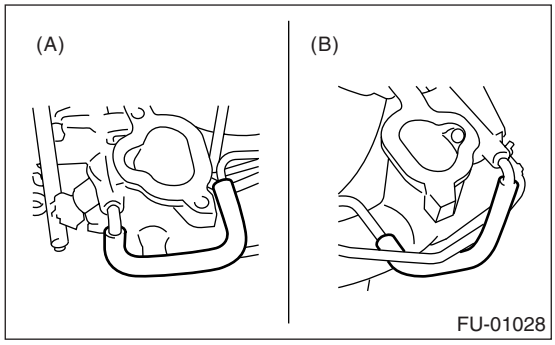
13) Remove the fuel injector.
(1) Remove the fuel injector securing clip.



(2) Remove the fuel injector while lifting up the fuel injector pipe.

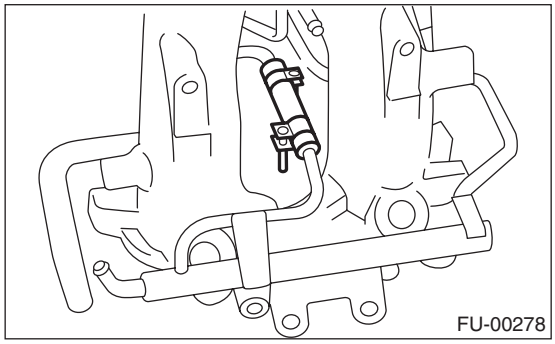


14) Disconnect the air by-pass hoses from the intake manifold.

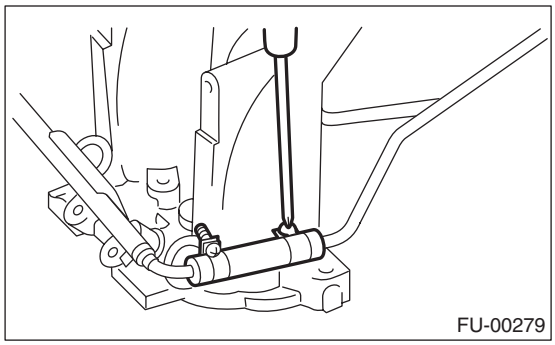


(A) LH side
(B) RH side

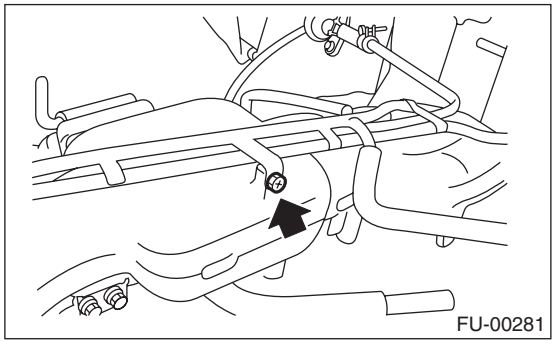
15) Loosen the clamp which holds the fuel injector pipe LH to fuel hose, and then remove the fuel injector pipe LH from fuel hose.



16) Loosen the clamp which holds the fuel injector pipe RH to fuel hose, and then remove the fuel injector pipe RH from fuel hose.



17) Remove the fuel injector pipe.
18) Remove the bolt which installs the fuel pipes on the intake manifold.

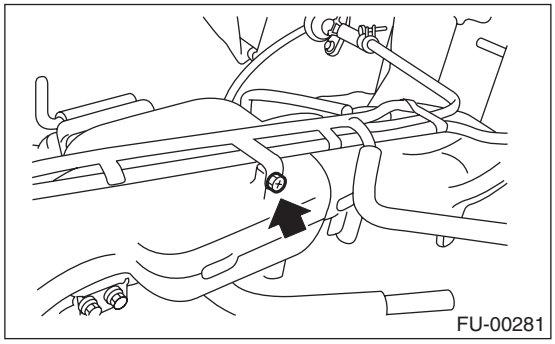


19) Remove the fuel pipe assembly and pressure regulator, from the intake manifold.

D: ASSEMBLY

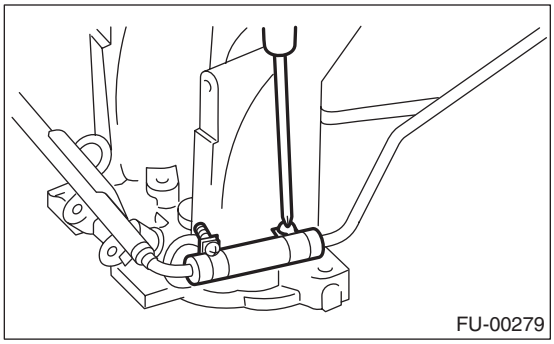
1) Install the fuel pipe assembly and pressure regulator to the intake manifold.
2) Tighten the bolt which installs the fuel pipes on the intake manifold.

Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)

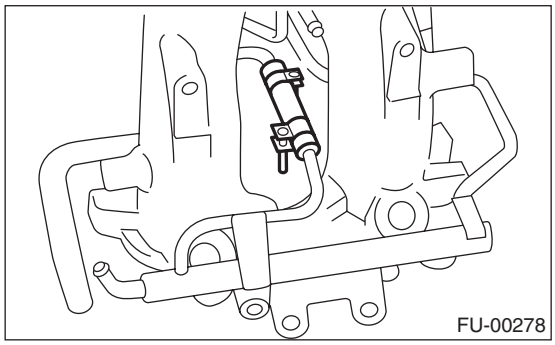


3) Install the fuel injector pipe.

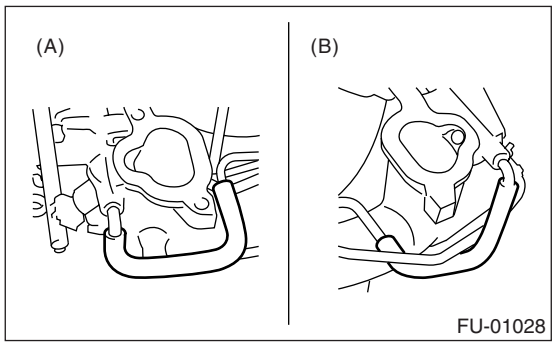
4) Connect the fuel injector pipe RH to fuel hose, and then tighten the clamp screw.



5) Connect the fuel injector pipe LH to fuel hose, and then tighten the clamp screw.



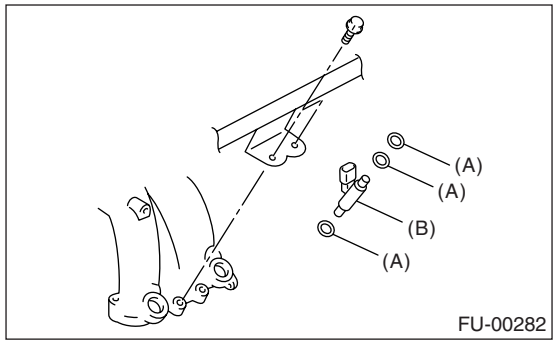
6) Connect the air by-pass hoses.



(A) LH side
(B) RH side

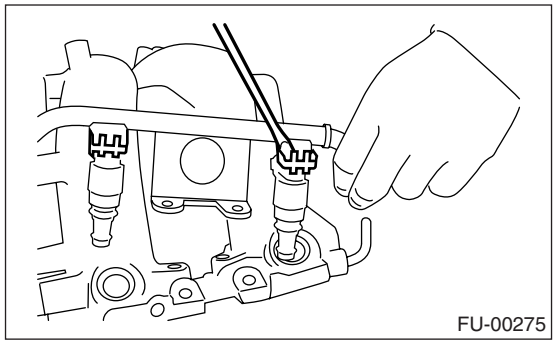
7) Install the fuel injectors.

NOTE:
• Replace the O-rings with new ones.



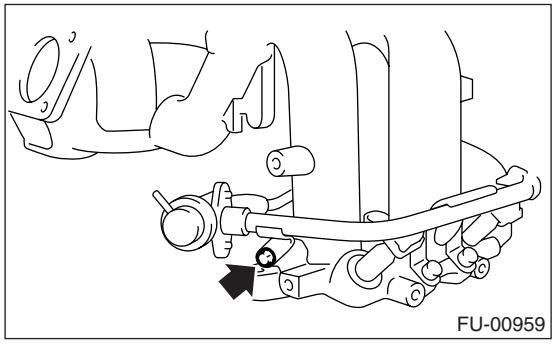
(A) O-ring
(B) Fuel injector

• Do not forget to install the fuel injector securing clip.

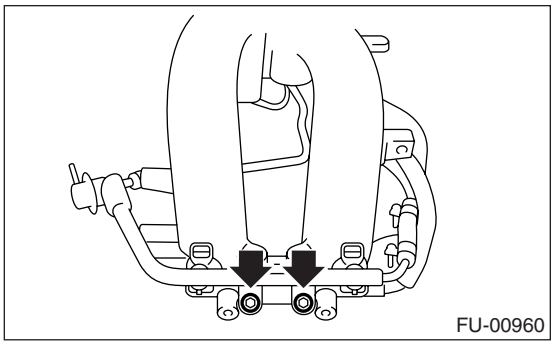


8) Tighten the bolt which installs the injector pipe on the intake manifold.
• **RH SIDE**

Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)

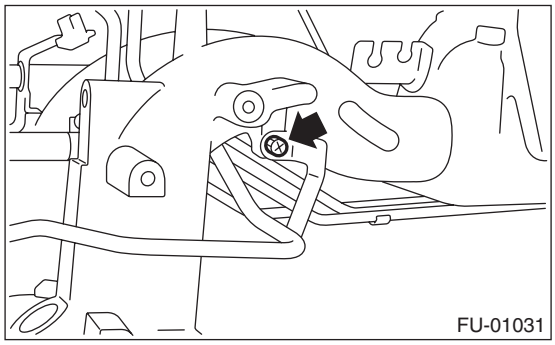


Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

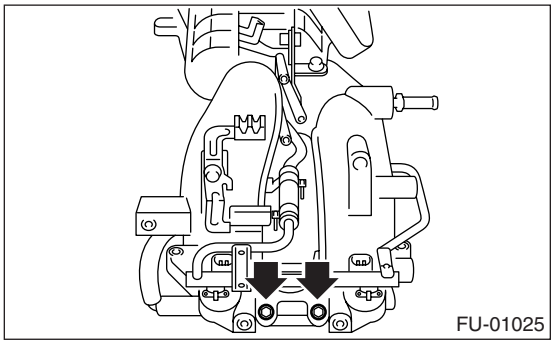


- **LH SIDE**

Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)

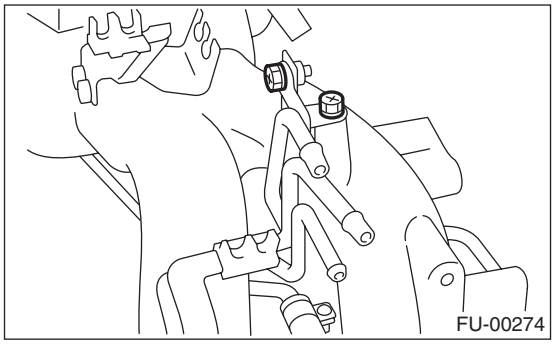


Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



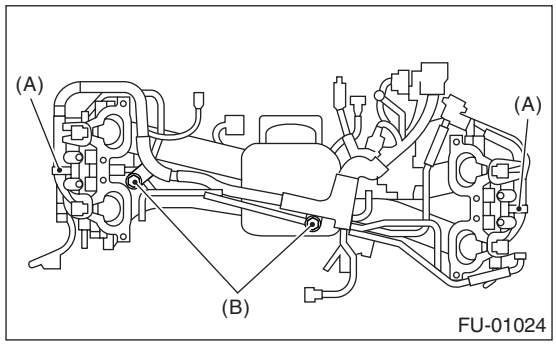
9) Tighten the two bolts which install the fuel pipes on intake manifold.

Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



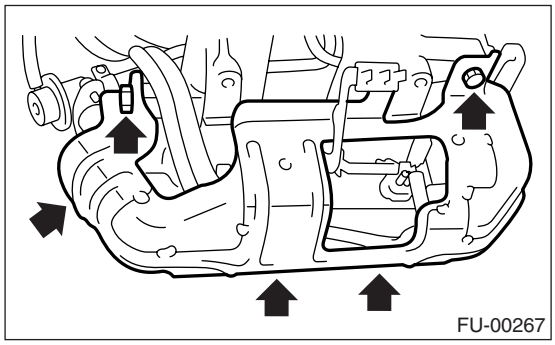
10) Install the engine harness onto the intake manifold.
11) Hold the engine harness by harness band (A) and bolts (B).

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



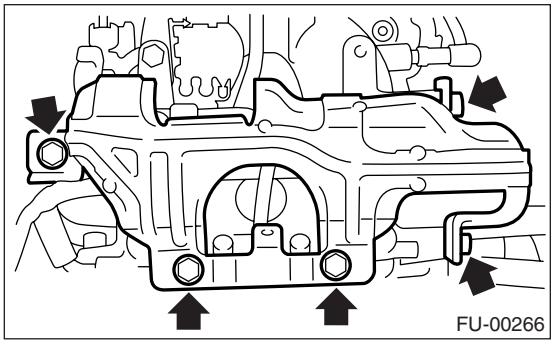
12) Connect the connector to fuel injector
13) Install the fuel pipe protector RH.

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

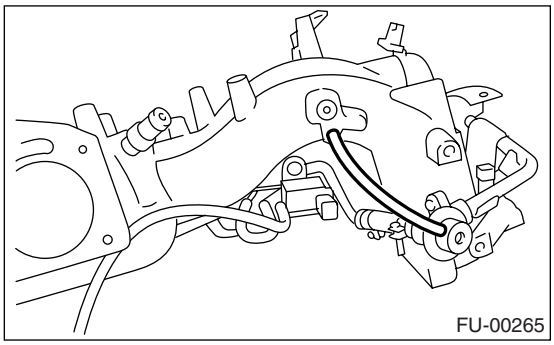


14) Install the fuel pipe protector LH.

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



15) Install the purge control solenoid valve. <Ref. to EC(H4SO)-6, INSTALLATION, Purge Control Solenoid Valve.>
16) Connect the pressure regulator vacuum hose to the intake manifold.



17) Install the air assist injector solenoid valve to the bracket. <Ref. to FU(H4SO)-33, INSTALLATION, Air Assist Injector Solenoid Valve.>
18) Install the throttle body to the intake manifold. <Ref. to FU(H4SO)-12, INSTALLATION, Throttle Body.>
19) Install the ignition coil & ignitor ASSY. <Ref. to IG(H4SO)-7, INSTALLATION, Ignition Coil & Ignitor ASSY.>

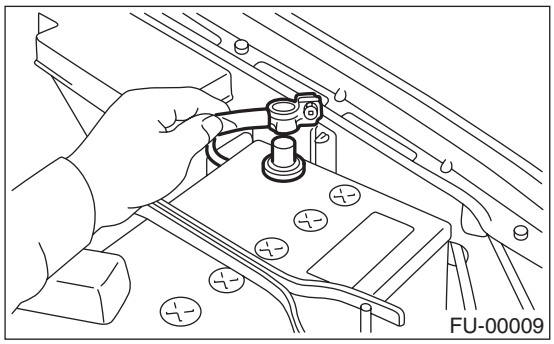
E: INSPECTION

Make sure the fuel pipe and fuel hoses are not cracked and that connections are tight.

4. Engine Coolant Temperature Sensor

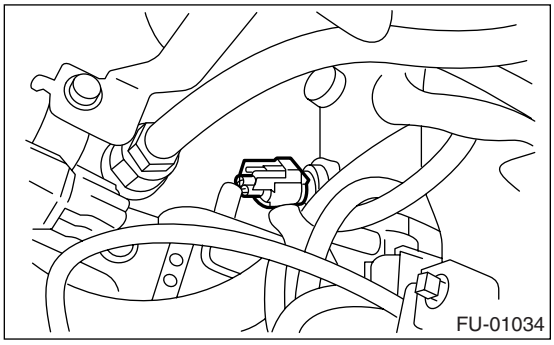
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the air intake duct and air cleaner assembly. <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>, <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>

3) Disconnect the connector from engine coolant temperature sensor.



4) Remove the engine coolant temperature sensor.

B: INSTALLATION

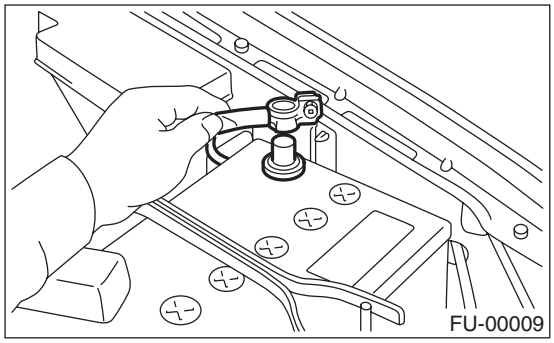
Install in the reverse order of removal.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

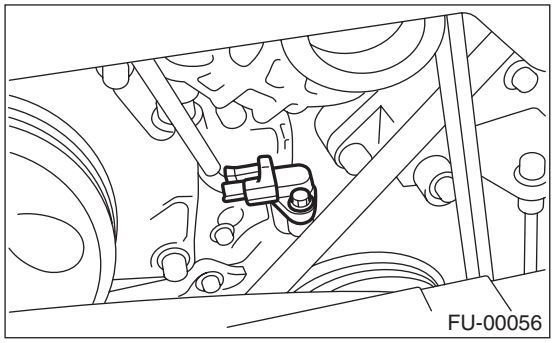
5. Crankshaft Position Sensor

A: REMOVAL

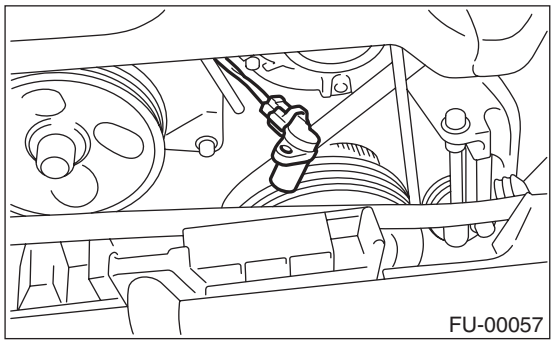
1) Disconnect the ground cable from battery.



2) Remove the bolt which install crankshaft position sensor to the cylinder block.



3) Remove the crankshaft position sensor, and disconnect the connector from the sensor.



B: INSTALLATION

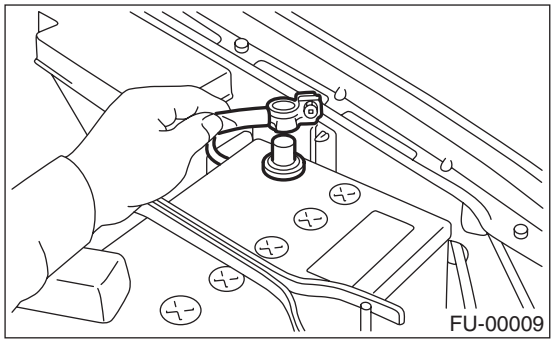
Install in the reverse order of removal.

NOTE:
For tightening torque, refer to “COMPONENT”. <Ref. to FU(H4SO)-3, COMPONENT, General Description.>

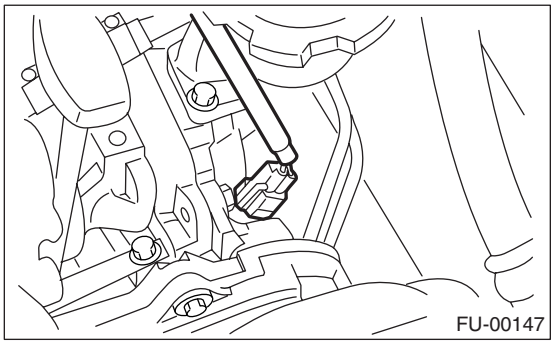
6. Camshaft Position Sensor

A: REMOVAL

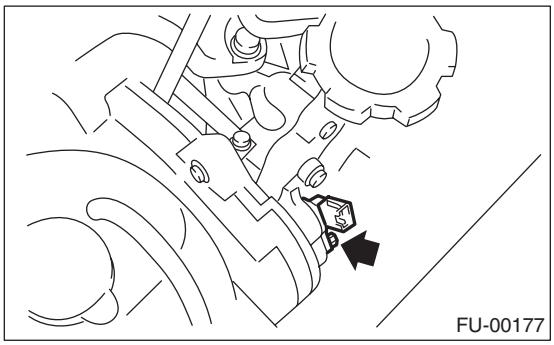
1) Disconnect the ground cable from battery.



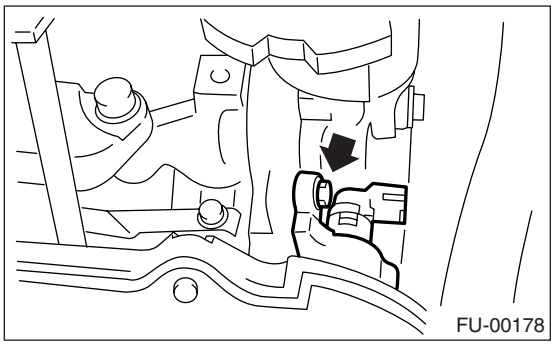
2) Disconnect the connector from the camshaft position sensor.



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

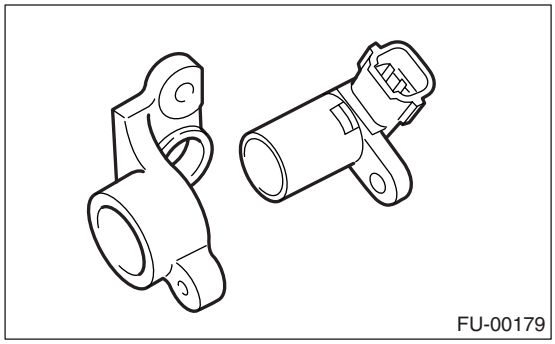


4) Remove the bolt which installs camshaft position sensor support to the camshaft cap LH.



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

6) Remove the camshaft position sensor itself.



B: INSTALLATION

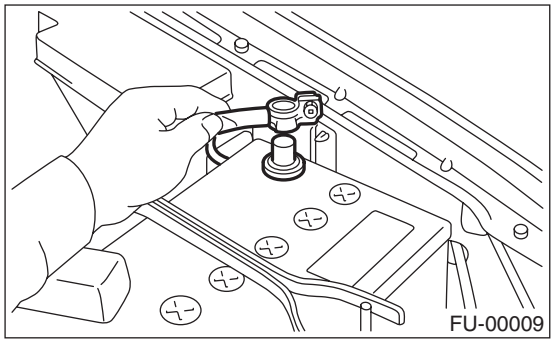
Install in the reverse order of removal.

NOTE:
For tightening torque, refer to “COMPONENT”. <Ref. to FU(H4SO)-3, COMPONENT, General Description.>

7. Knock Sensor

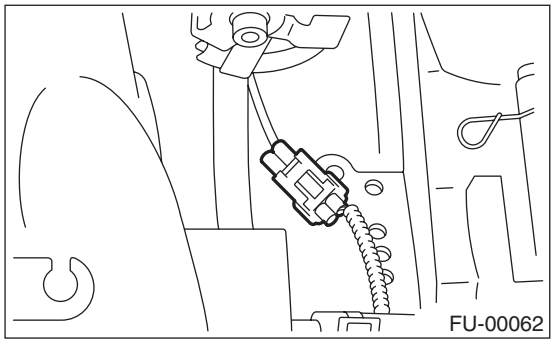
A: REMOVAL

1) Disconnect the ground cable from battery.

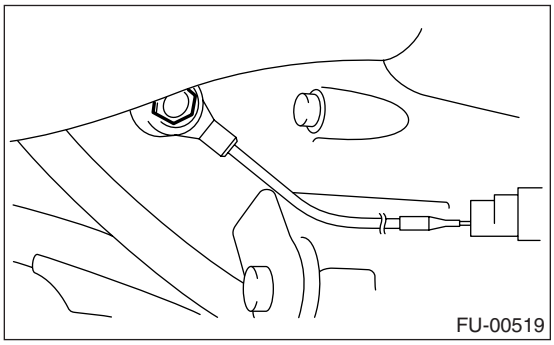


2) Remove the air cleaner case. <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>

3) Disconnect the knock sensor connector.



4) Remove the knock sensor from the cylinder block.



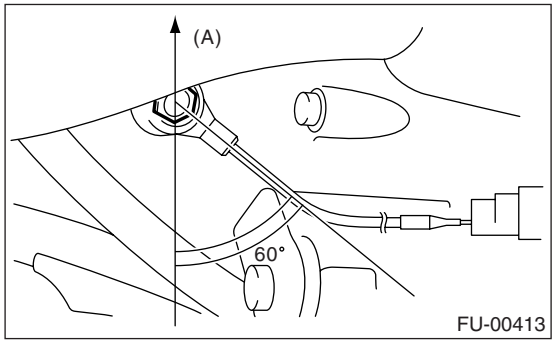
B: INSTALLATION

1) Install the knock sensor to the cylinder block.

NOTE:

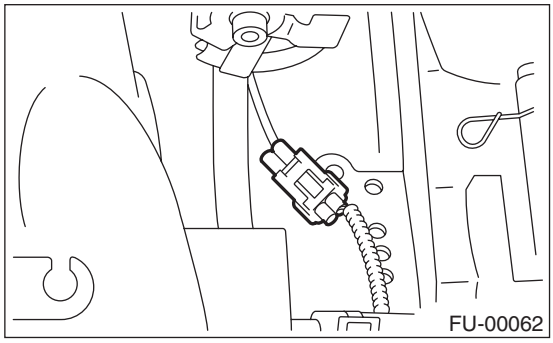
• The extraction area of the knock sensor cord must be positioned at a 60 angle relative to the engine rear.

• For tightening torque, refer to “COMPONENT”. <Ref. to FU(H4SO)-3, COMPONENT, General Description.>



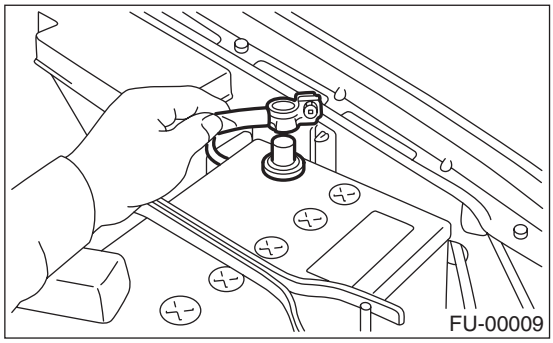
(A) Front

2) Connect the knock sensor connector.



3) Install the air cleaner case.
<Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>

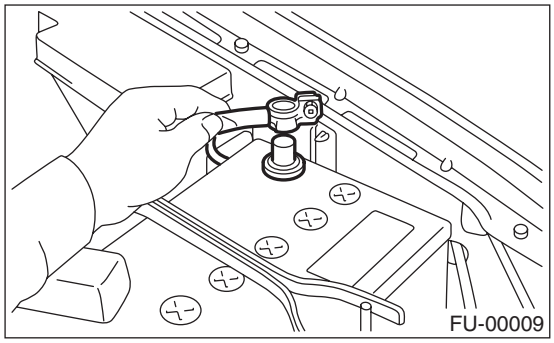
4) Connect the battery ground cable to battery.



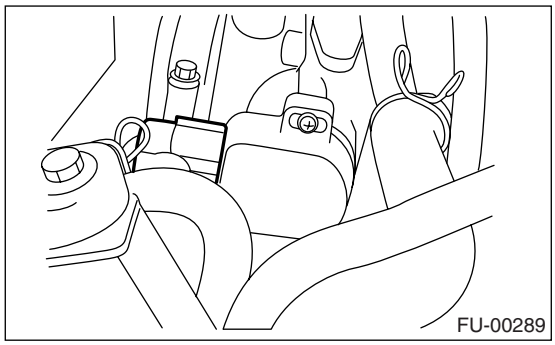
8. Throttle Position Sensor

A: REMOVAL

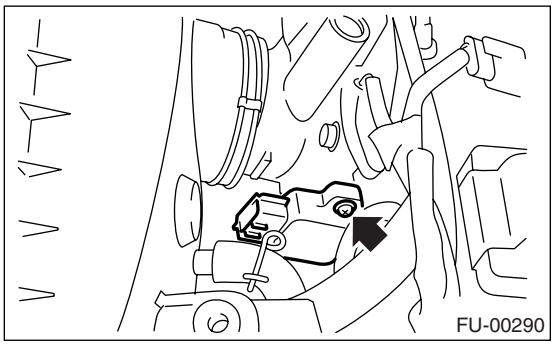
1) Disconnect the ground cable from battery.



2) Disconnect the connectors from throttle position sensor.



3) Remove the throttle position sensor holding screws, and remove it.



B: INSTALLATION

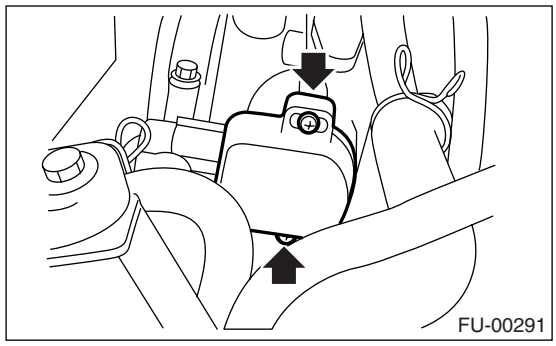
Install in the reverse order of removal.

NOTE:
For tightening torque, refer to “COMPONENT”. <Ref. to FU(H4SO)-3, COMPONENT, General Description.>

CAUTION:
When installing throttle position sensor, adjust to the specified data.

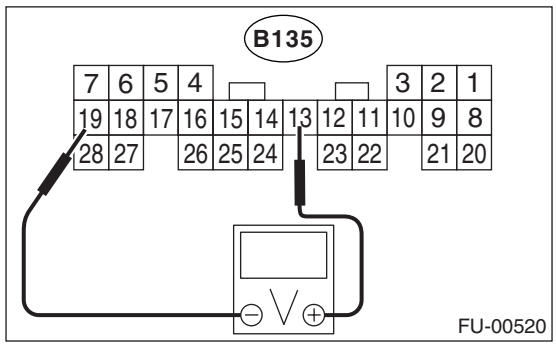
C: ADJUSTMENT

1) Turn the ignition switch to OFF.
2) Loosen the throttle position sensor holding screws.



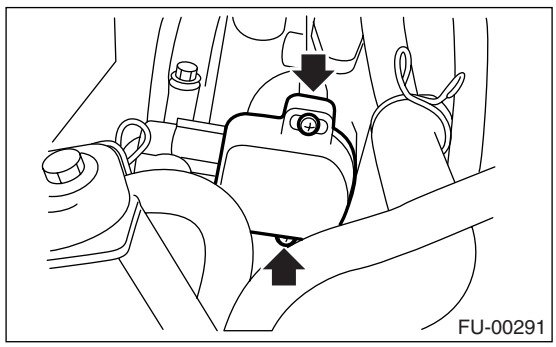
3) When using a voltmeter;
(1) Take out the ECM.
(2) Turn the ignition switch to ON.
(3) Adjust the throttle position sensor to the proper position to allow the voltage signal to the ECM to be in specification.

Connector & terminal / Specified voltage
(B135) No. 13 (+) — (B135) No. 19 (–) / 0.45 — 0.55 V
[Fully closed.]



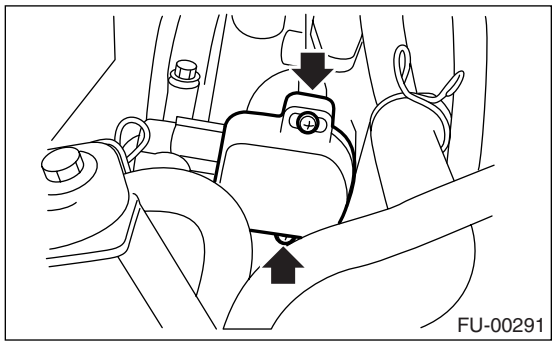
(4) Tighten the throttle position sensor holding screws.

Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



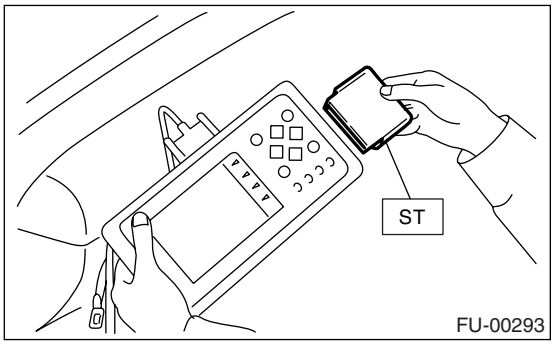
4) When using Subaru Select Monitor;
(1) Turn the ignition switch to OFF.

(2) Loosen the throttle position sensor holding screws.

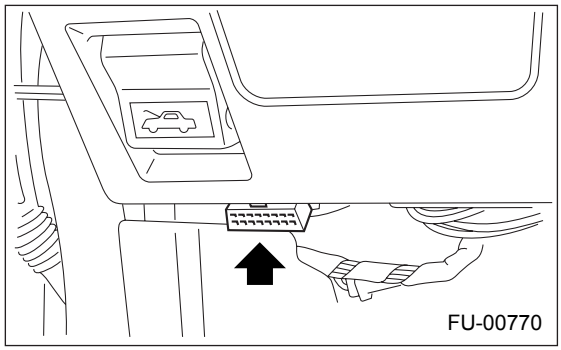


NOTE:
For detailed operation procedures, refer to the Subaru Select Monitor Operation Manual.

(3) Insert the cartridge to the Subaru Select Monitor.



(4) Connect the Subaru Select Monitor to the data link connector.

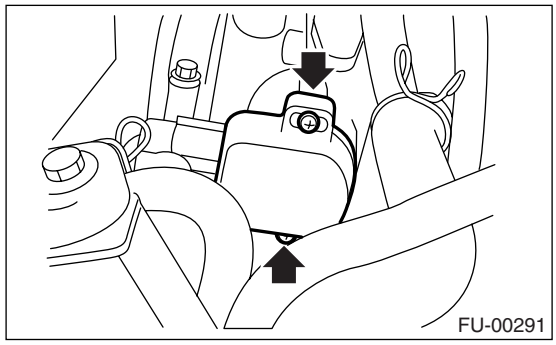


(5) Turn the ignition switch to ON, and the Subaru Select Monitor switch to ON.
(6) Select {2. Each System Check} in Main Menu.
(7) Select {Engine Control System} in Selection Menu.
(8) Select {1. Current Data Display & Save} in Engine Control System Diagnosis.
(9) Select {1.12 Data Display} in Data Display Menu.
(10)Adjust the throttle position sensor to the proper position to match with the following specifications.

Condition: Throttle fully closed
Throttle opening angle 0.00%
Throttle sensor voltage 0.50 V

(11)Tighten the throttle position sensor holding screws.

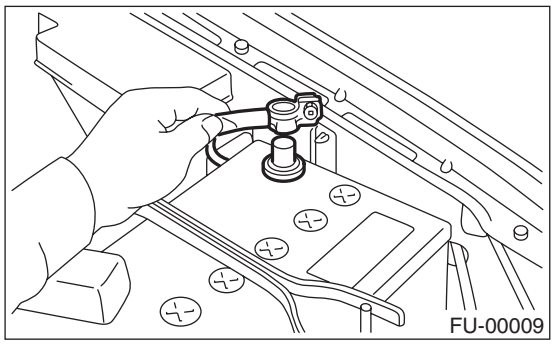
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



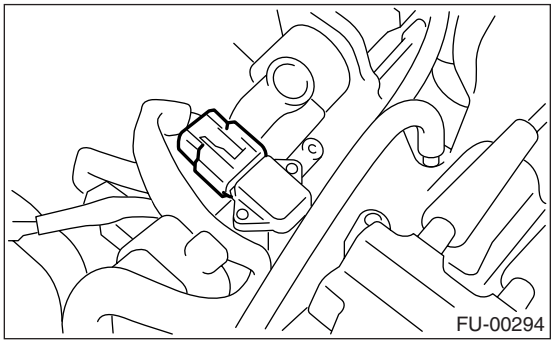
9. Manifold Absolute Pressure Sensor

A: REMOVAL

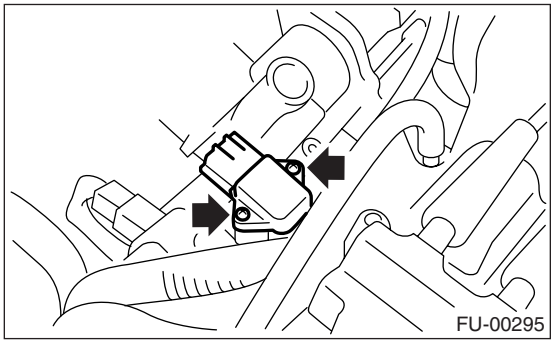
1) Disconnect the ground cable from battery.



2) Disconnect the connector from the manifold absolute pressure sensor.



3) Remove the manifold absolute pressure sensor.



B: INSTALLATION

Install in the reverse order of removal.

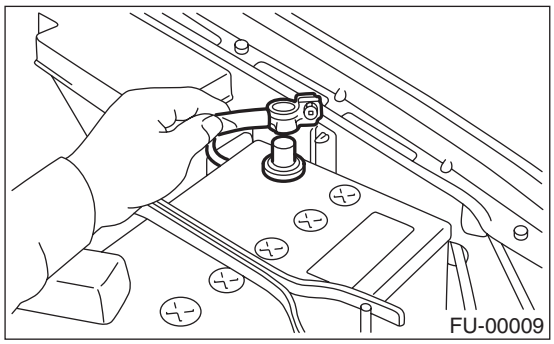
NOTE:

- Replace the O-rings with new ones.
- For tightening torque, refer to “COMPONENT”. <Ref. to FU(H4SO)-3, COMPONENT, General Description.>

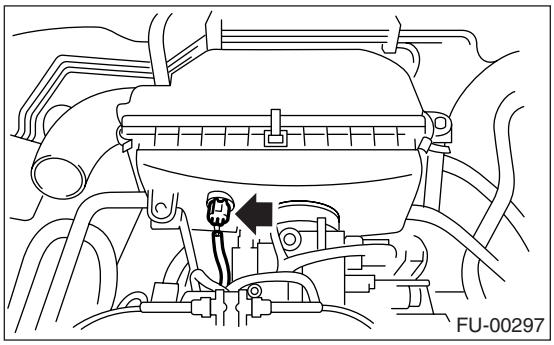
10.Intake Air Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector from intake air temperature sensor.
3) Remove the intake air temperature sensor from air cleaner case.



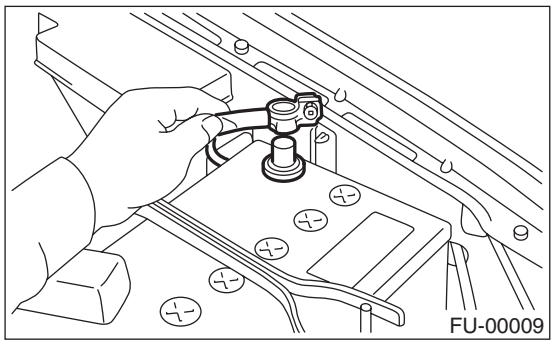
B: INSTALLATION

Install in the reverse order of removal.

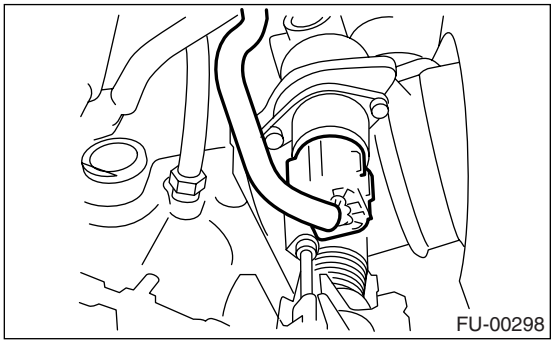
11.Idle Air Control Solenoid Valve

A: REMOVAL

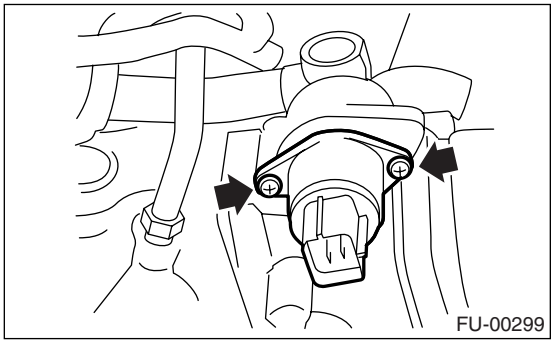
1) Disconnect the ground cable from battery.



2) Disconnect the connector from idle air control solenoid valve.



3) Remove the idle air control solenoid valve from throttle body.



B: INSTALLATION

Install in the reverse order of removal.

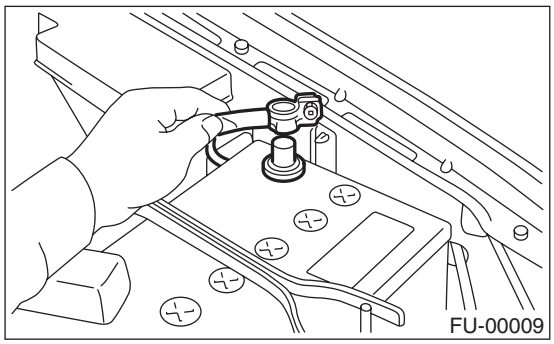
NOTE:

- Replace the gaskets with new ones.
- For tightening torque, refer to “COMPONENT”. <Ref. to FU(H4SO)-3, COMPONENT, General Description.>

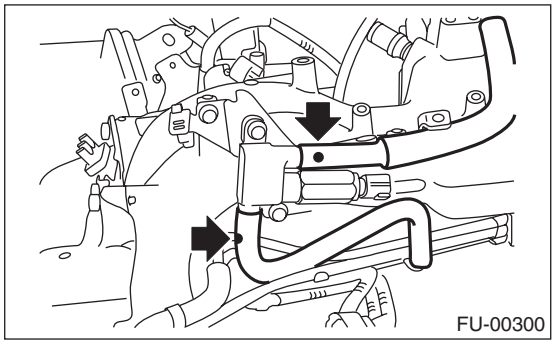
12. Air Assist Injector Solenoid Valve

A: REMOVAL

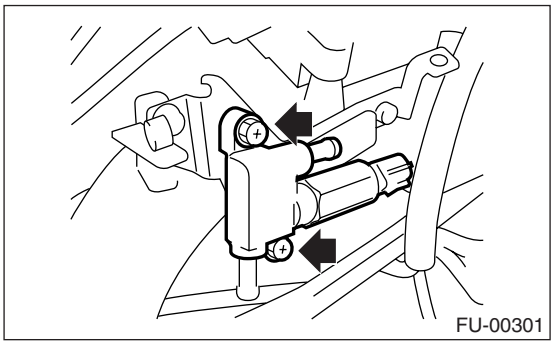
1) Disconnect the ground cable from battery.



2) Disconnect the connector from the air assist injector solenoid valve and disconnect the air bypass hoses.



3) Remove the air assist injector solenoid valve from the intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

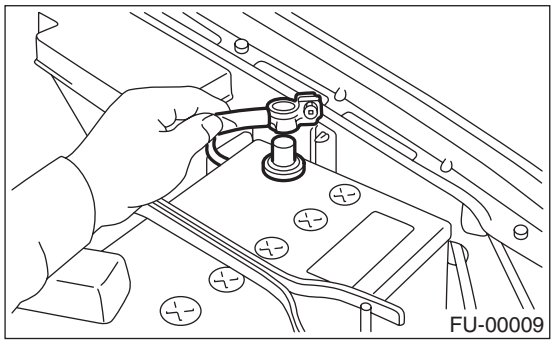
NOTE:
For tightening torque, refer to “COMPONENT”. <Ref. to FU(H4SO)-3, COMPONENT, General Description.>

13.Fuel Injector

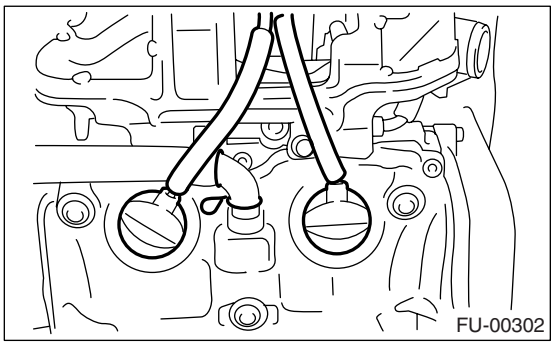
A: REMOVAL

1. RH SIDE

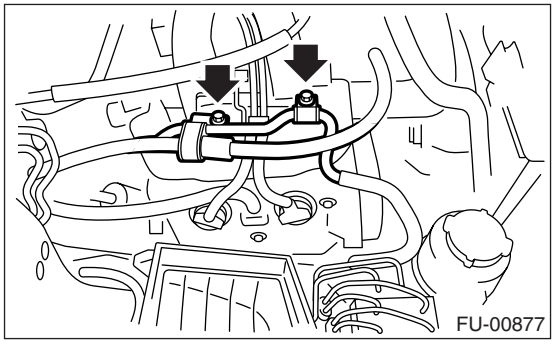
1) Release fuel pressure. <Ref. to FU(H4SO)-47, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel flap lid, and remove the fuel filler cap.
3) Disconnect the ground cable from battery.


FU-00009

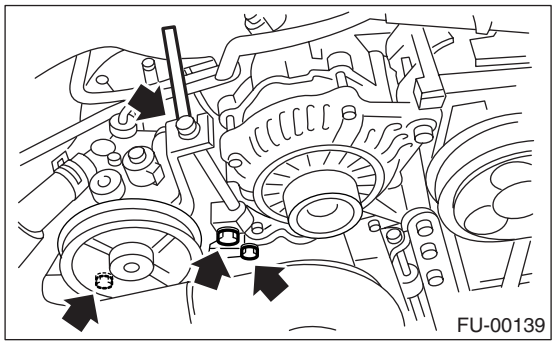
4) Remove the resonator chamber. <Ref. to IN(H4SO)-7, REMOVAL, Resonator Chamber.>
5) Remove the spark plug cords from the spark plugs (#1 and #3 cylinders).


FU-00302

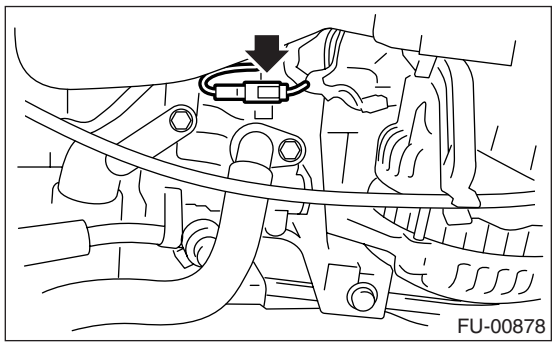
6) Remove the power steering pump and tank from the brackets.
(1) Remove the front side V-belt. <Ref. to ME(H4SO)-39, REMOVAL, V-belt.>
(2) Remove the bolts which hold the power steering pipes onto the intake manifold protector.


FU-00877

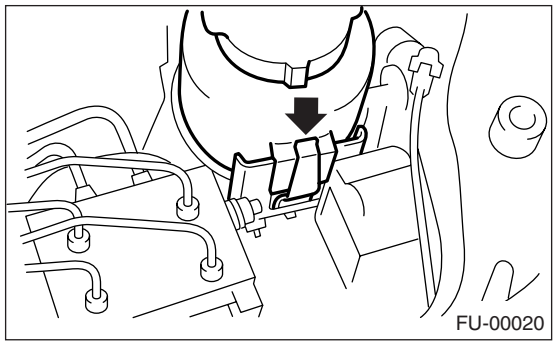
(3) Remove the bolts which install the power steering pump to the bracket.


FU-00139

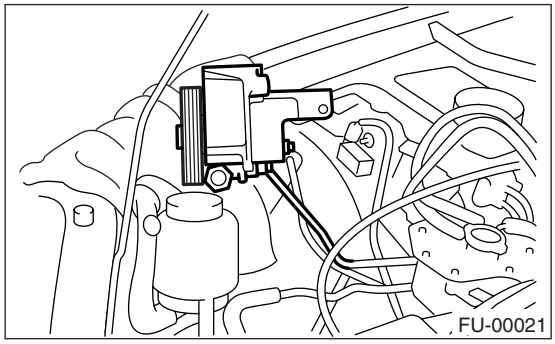
(4) Disconnect the connector from the power steering pump switch.


FU-00878

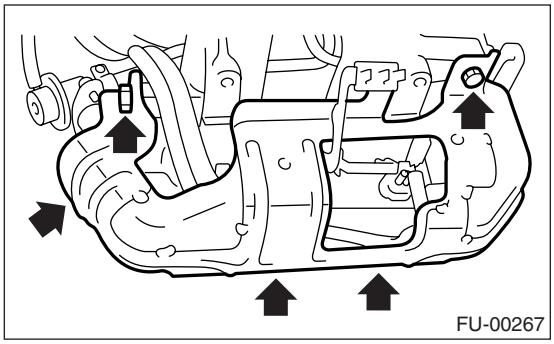
(5) Remove the reservoir tank from the bracket by pulling it upwards.


FU-00020

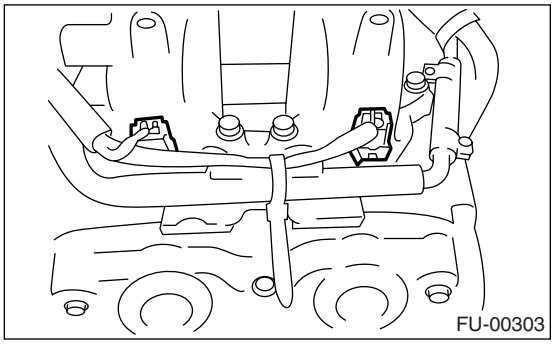
(6) Place the power steering pump and tank on the right side wheel apron.


FU-00021

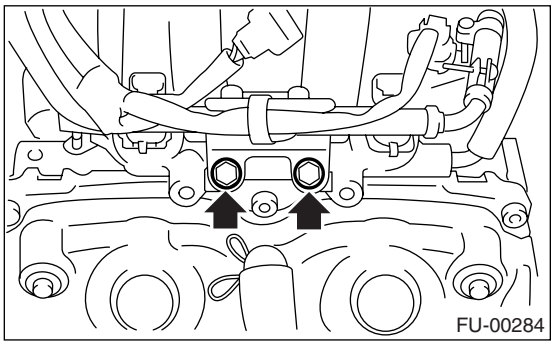
7) Remove the fuel pipe protector RH.

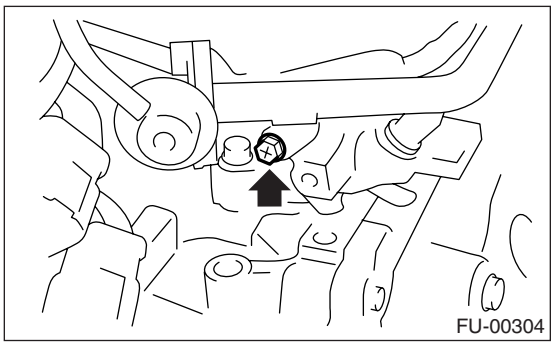

FU-00267

8) Disconnect the connectors from the fuel injectors.


FU-00303

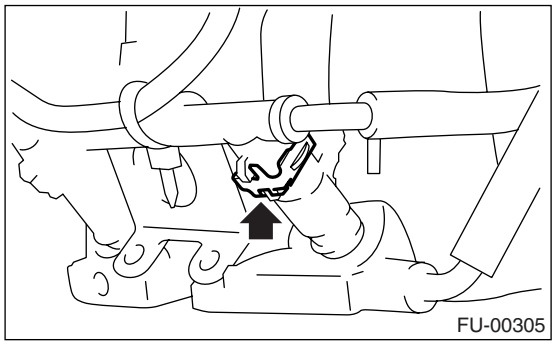
9) Remove the bolt which holds the fuel injector pipe to the intake manifold.


FU-00284

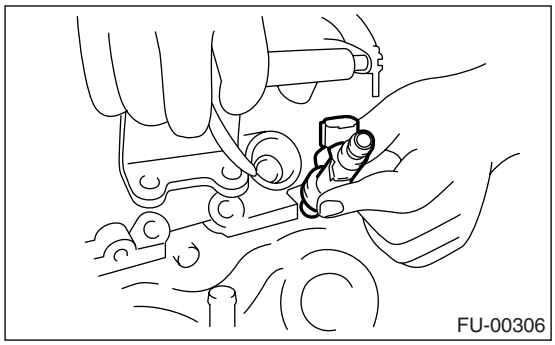

FU-00304

10) Remove the fuel injector from the intake manifold.

(1) Remove the fuel injector securing clip.

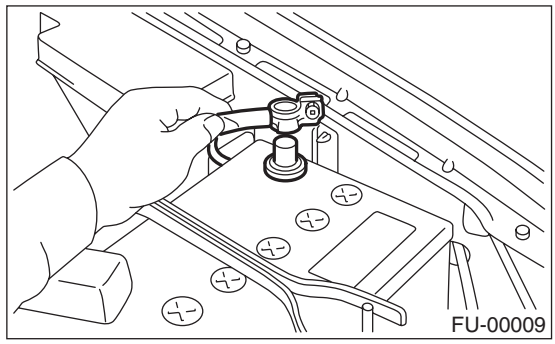

FU-00305

(2) Remove the fuel injector while lifting up the fuel injector pipe.

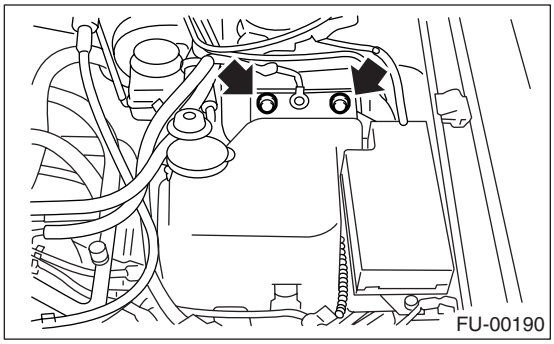

FU-00306

2. LH SIDE

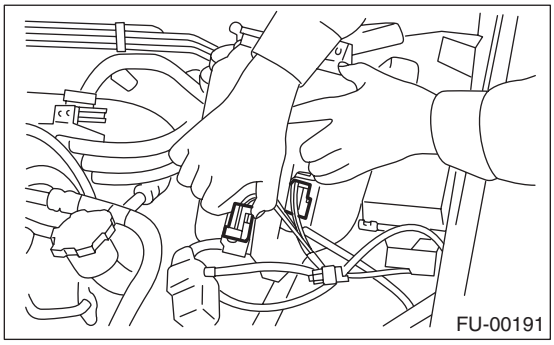
1) Release the fuel pressure. <Ref. to FU(H4SO)-47, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel flap lid, and remove the fuel filler cap.
3) Disconnect the ground cable from battery.


FU-00009

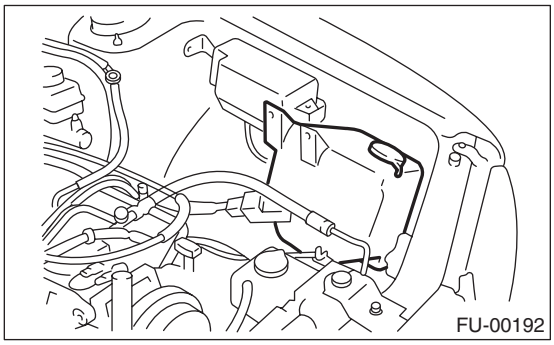
4) Remove the two bolts which install the washer tank on the body.



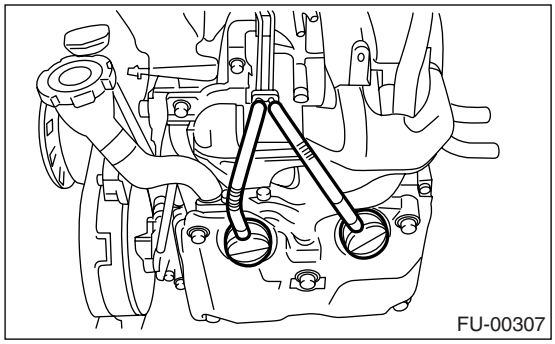
5) Disconnect the connector from the front window washer motor.
6) Disconnect the connector from the rear gate glass washer motor.



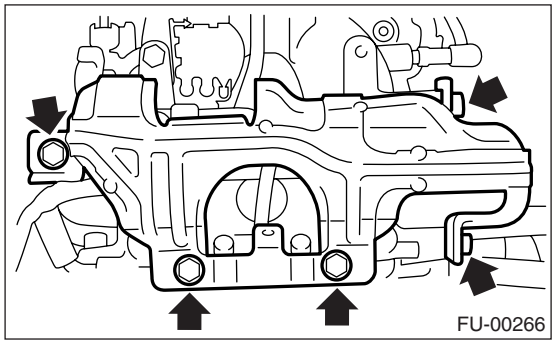
7) Disconnect the rear window glass washer hose from the washer motor, then plug the connection with a suitable cap.
8) Move the washer tank, and secure it away from the working area.



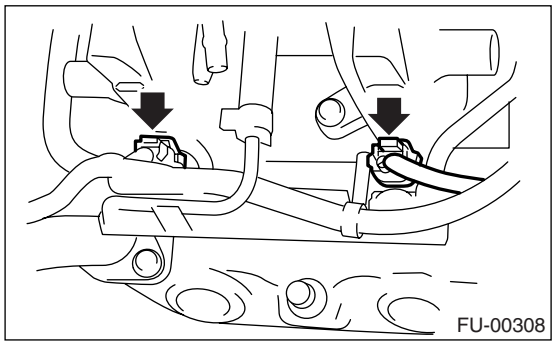
9) Remove the spark plug cords from the spark plugs (#2 and #4 cylinders).



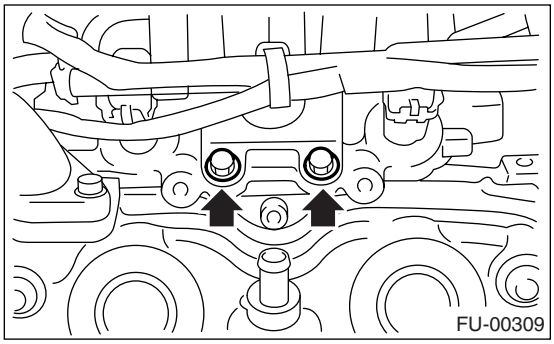
10) Remove the fuel pipe protector LH.

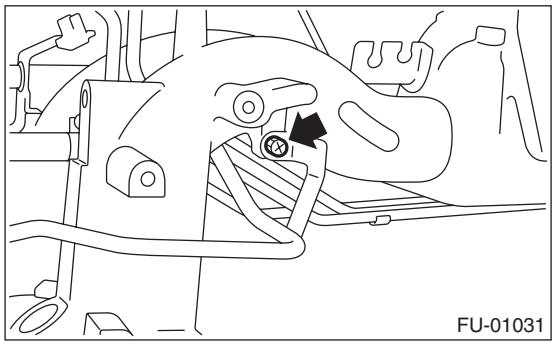


11) Disconnect the connectors from the fuel injectors.

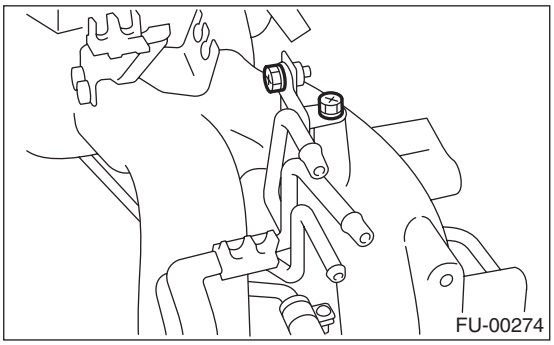


12) Remove the bolt which holds the fuel injector pipe to the intake manifold.


FU-00309

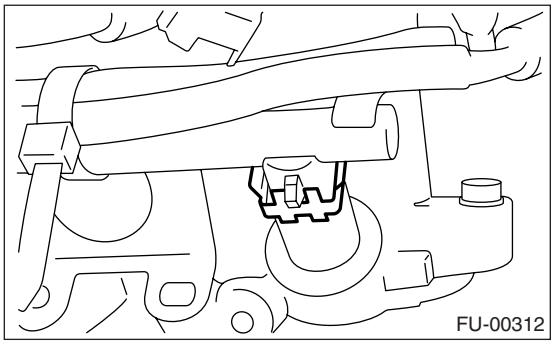

FU-01031

13) Remove the bolt which holds the fuel pipe on the left side intake manifold.

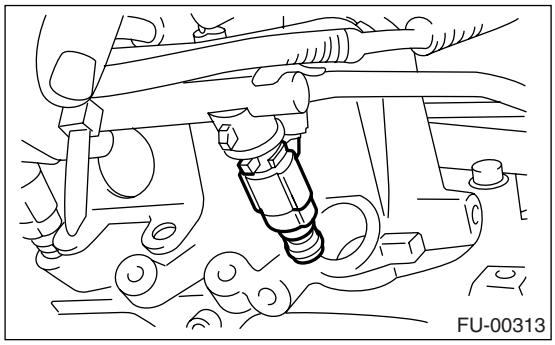

FU-00274

14) Remove the fuel injector from the intake manifold.

(1) Remove the fuel injector securing clip.


FU-00312

(2) Remove the fuel injector while lifting up the fuel injector pipe.

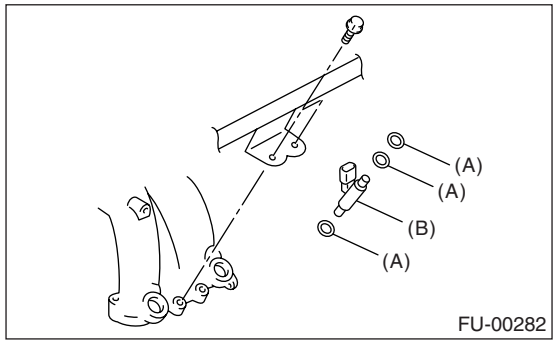

FU-00313

B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

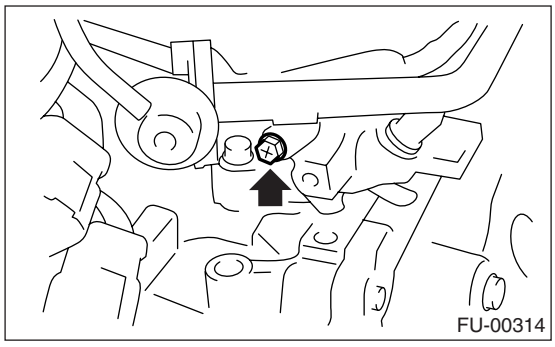
CAUTION:
Replace the O-rings with new ones.



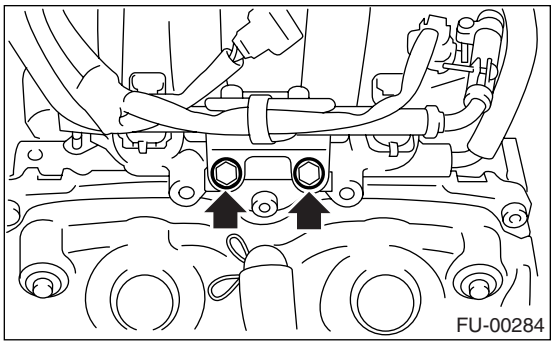
FU-00282

(A) O-ring
(B) Fuel injector

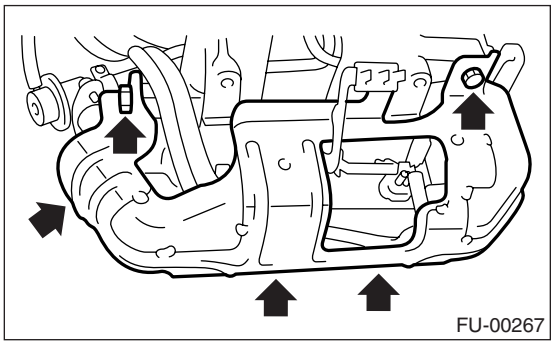
Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)


FU-00314

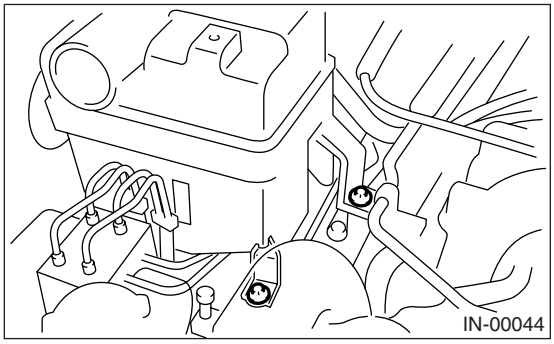
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



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



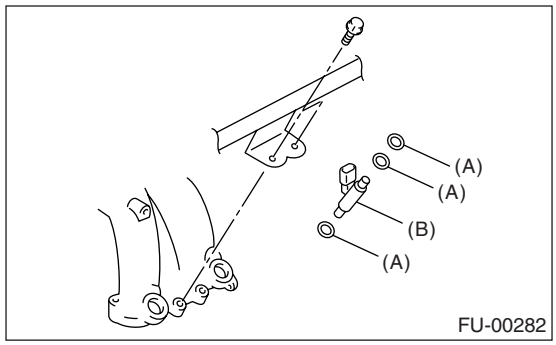
Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)



2. LH SIDE

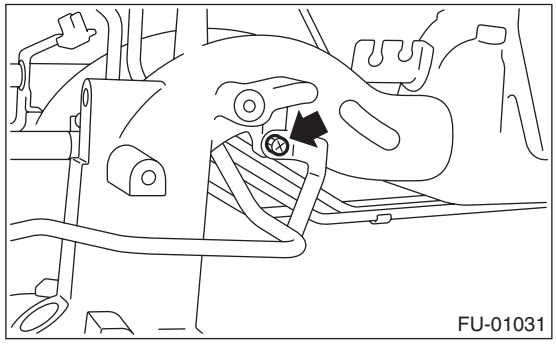
Install in the reverse order of removal.

CAUTION:
Replace the O-rings with new ones.

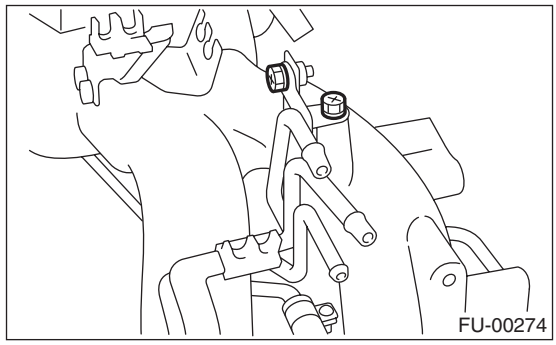


(A) O-ring
(B) Fuel injector

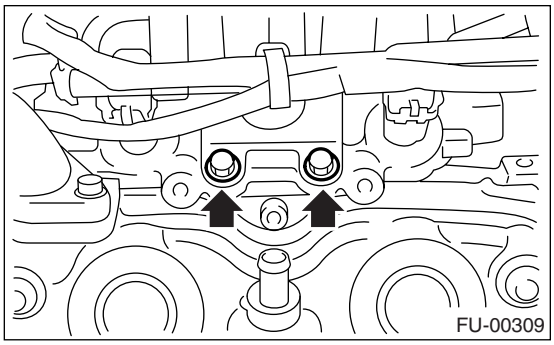
Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



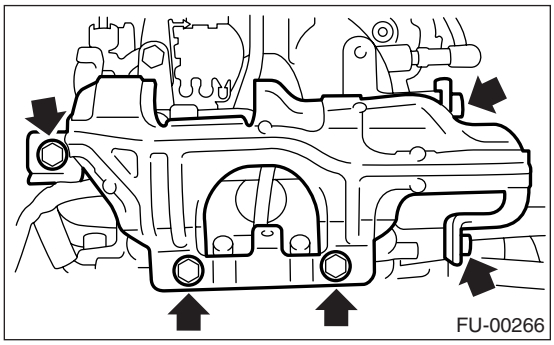
Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



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



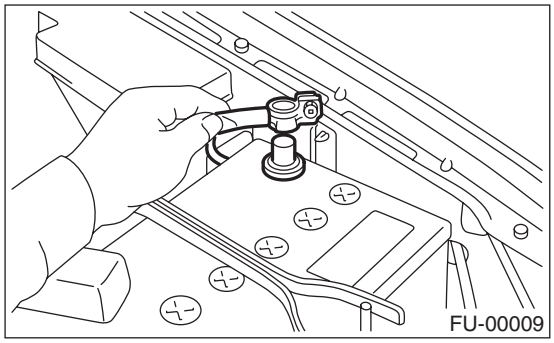
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



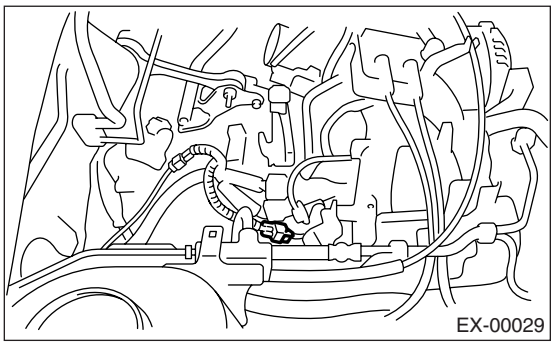
14.Front Oxygen (A/F) Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector from engine hanger, and then disconnect the front oxygen (A/F) sensor connector.

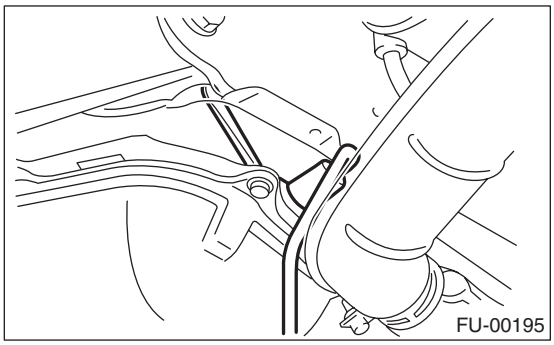


3) Lift up the vehicle.
4) Apply SUBARU CRC or its equivalent to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

5) Remove the front oxygen (A/F) sensor.

CAUTION:
When removing the oxygen (A/F) sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.

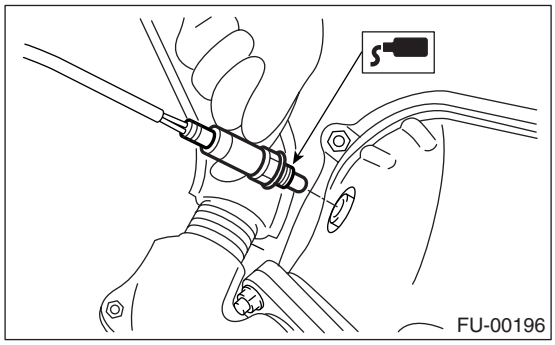


B: INSTALLATION

1) Before installing front oxygen (A/F) sensor, apply the anti-seize compound only to the threaded portion of front oxygen (A/F) sensor to make the next removal easier.

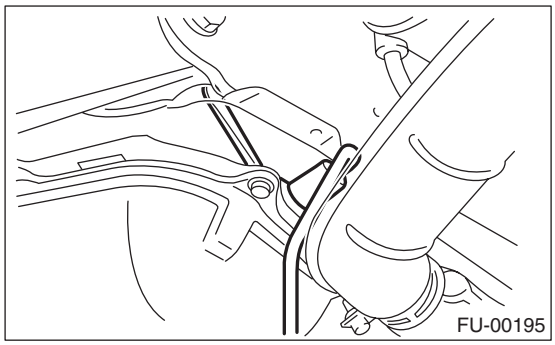
Anti-seize compound:
SS-30 by JET LUBE

CAUTION:
Never apply anti-seize compound to protector of front oxygen (A/F) sensor.

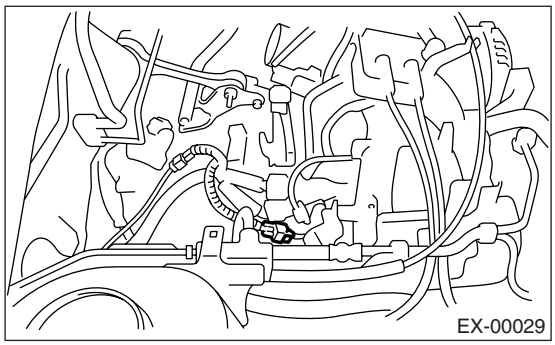


2) Install the front oxygen (A/F) sensor.

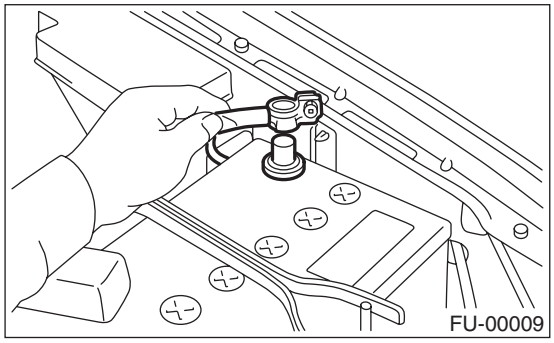
Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



3) Lower the vehicle.
4) Connect the connector to front oxygen (A/F) sensor, and then connect the connector to engine hanger.



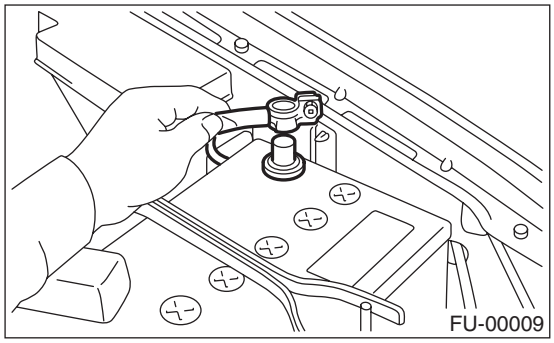
5) Connect the battery ground cable to battery.



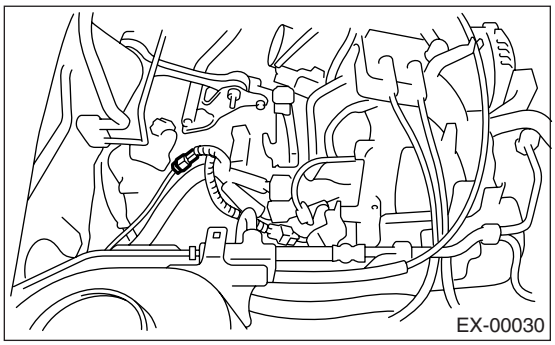
15.Rear Oxygen Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector from securing bracket, and then disconnect the connector of rear oxygen sensor.

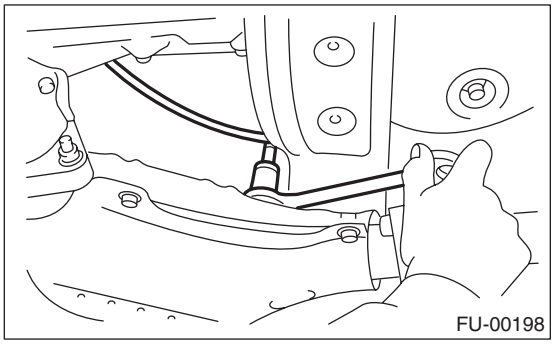


3) Lift up the vehicle.
4) Apply SUBARU CRC or its equivalent to the threaded portion of rear oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

5) Remove the rear oxygen sensor.

CAUTION:
When removing the rear oxygen sensor, wait until the exhaust pipe cools, otherwise it will damage the exhaust pipe.

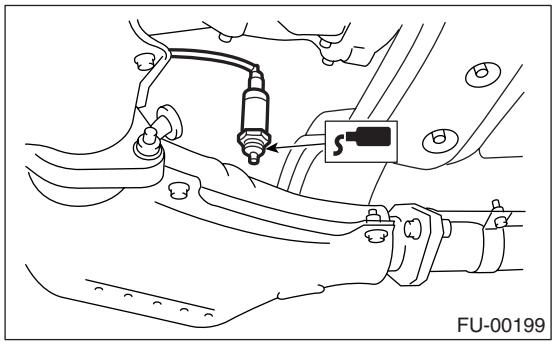


B: INSTALLATION

1) Before installing the rear oxygen (A/F) sensor, apply the anti-seize compound only to the threaded portion of the rear oxygen (A/F) sensor to make the next removal easier.

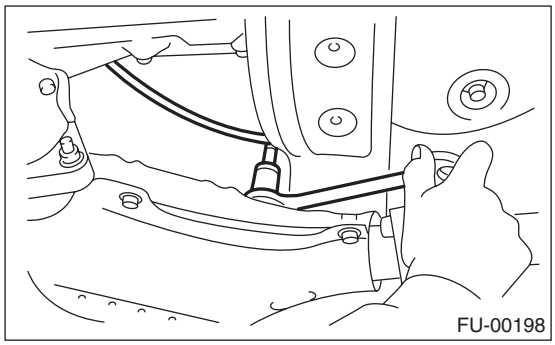
CAUTION:
Never apply anti-seize compound to protector of rear oxygen sensor.

Anti-seize compound:
SS-30 by JET LUBE

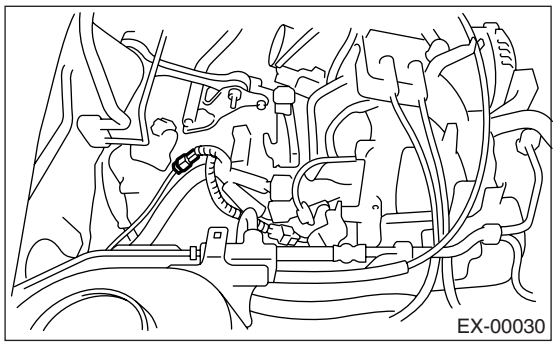


2) Install the rear oxygen sensor.

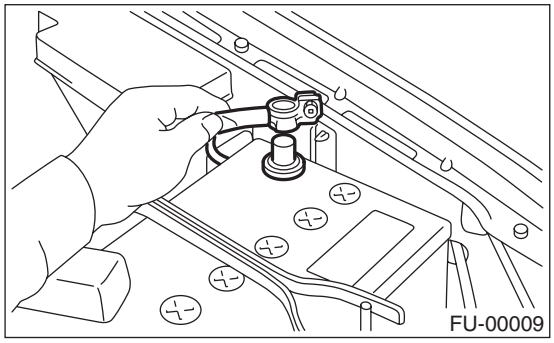
Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



3) Lower the vehicle.
4) Connect the connector to the rear oxygen sensor, and then install the connector to securing bracket.



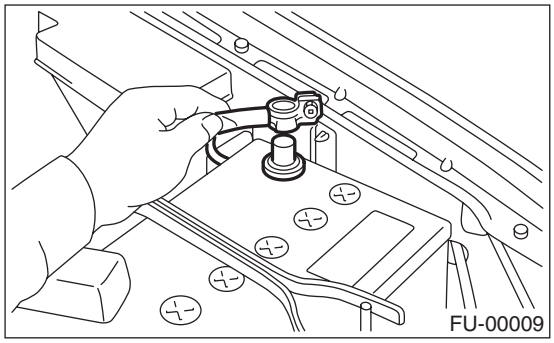
5) Connect the battery ground cable to battery.



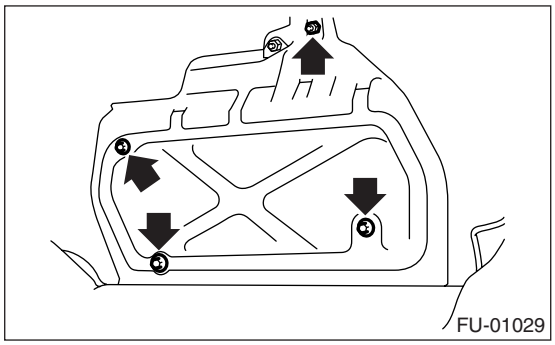
16.Engine Control Module (ECM)

A: REMOVAL

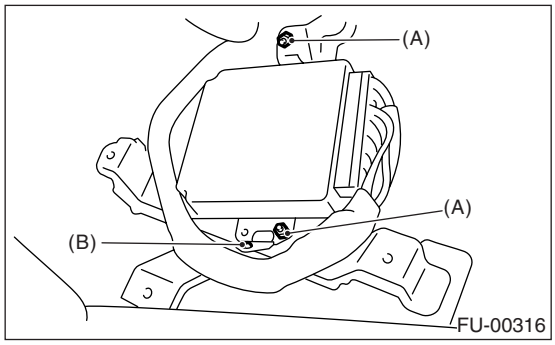
1) Disconnect the ground cable from battery.



2) Remove the lower inner trim of passenger side.
<Ref. to EI-49, REMOVAL, Lower Inner Trim.>
3) Detach the floor mat of front passenger seat.
4) Remove the protect cover.



5) Remove the nuts (A) which hold ECM to the bracket.
6) Remove the clip (B) from the bracket.



7) Disconnect the ECM connectors and take out the ECM.

B: INSTALLATION

Install in the reverse order of removal.

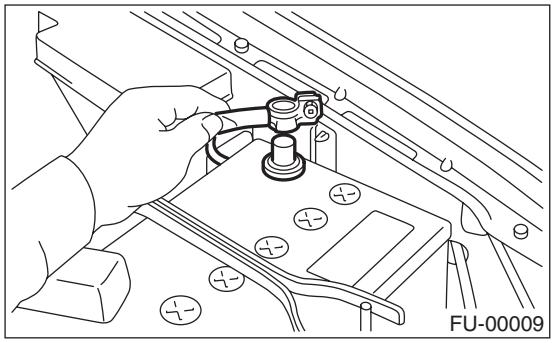
CAUTION:
When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on fuel injection system.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

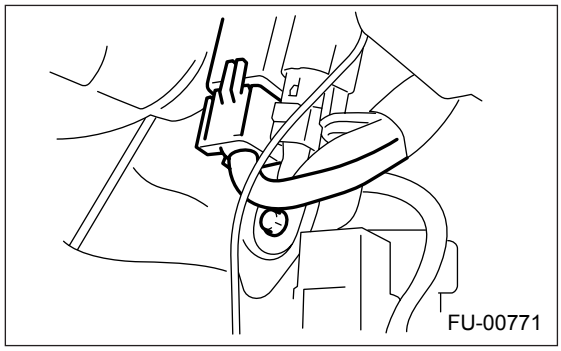
17.Main Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the passenger's side front side sill cover.
3) Remove the bolt which holds main bracket on the body.
4) Disconnect the connectors from the main relay.



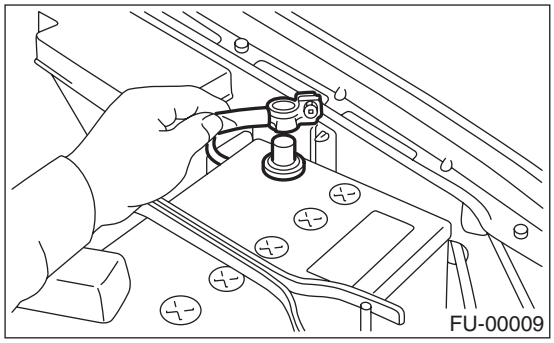
B: INSTALLATION

Install in the reverse order of removal.

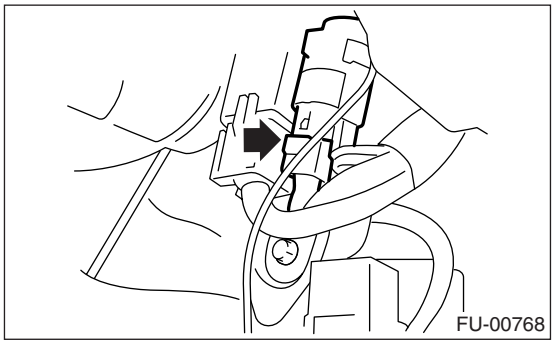
18.Fuel Pump Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the passenger's side front side sill cover.
3) Remove the bolt which holds the fuel pump relay bracket on the body.
4) Disconnect the connector from fuel pump.



5) Remove the fuel pump relay from the mounting bracket.

B: INSTALLATION

Install in the reverse order of removal.

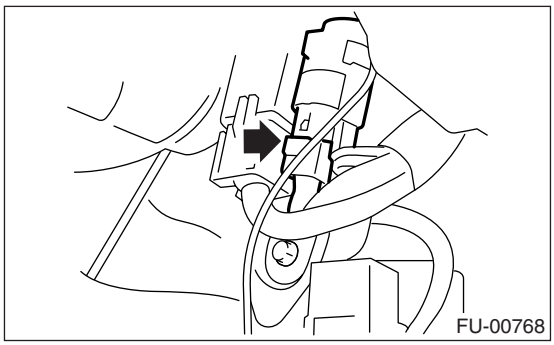
19.Fuel

A: PROCEDURE

1. RELEASING OF FUEL PRESSURE

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Disconnect the connector from the fuel pump relay.

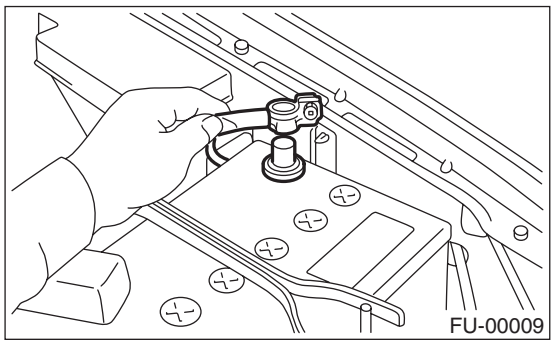


2) Start the engine and run it until it stalls.
3) After the engine stalls, crank it for five more seconds.
4) Turn the ignition switch to OFF.

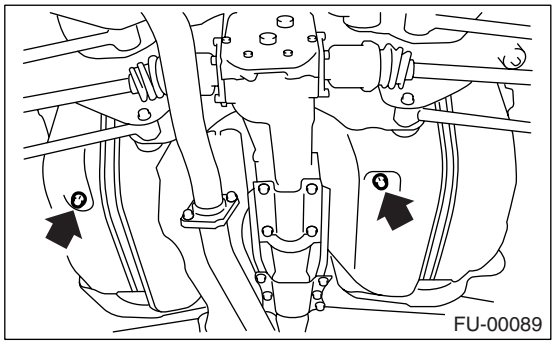
2. DRAINING FUEL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



3) Open the fuel filler flap lid, and then remove the fuel filler cap.
4) Lift up the vehicle.
5) Drain the fuel from the fuel tank.
Set a container under the vehicle and remove the drain plug from the fuel tank.



6) Tighten the fuel drain plug.

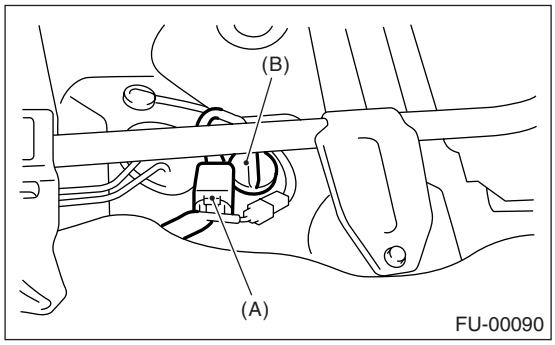
Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)

20.Fuel Tank

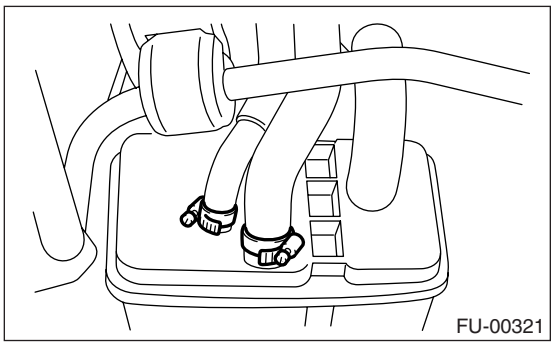
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

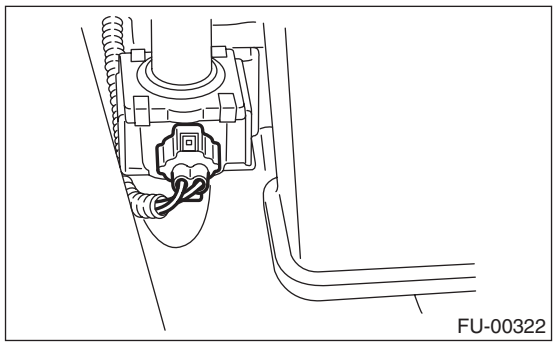
1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(H4SO)-47, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Drain the fuel from the fuel tank. <Ref. to FU(H4SO)-47, DRAINING FUEL, PROCEDURE, Fuel.>
4) Remove the rear seat.
5) Disconnect the connector (A) of fuel tank cord to the rear harness.
6) Push the grommet (B) which holds the fuel tank cord on floor panel into under the body.



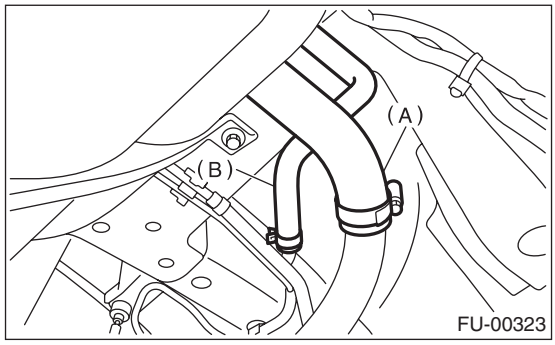
7) Remove the rear crossmember. <Ref. to RS-18, REMOVAL, Rear Crossmember.>
8) Move the clamp, and disconnect the evaporation hose from canister.



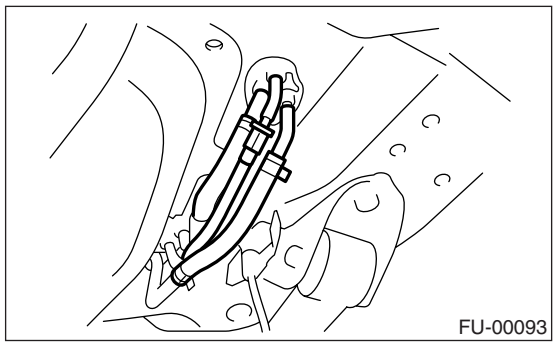
9) Disconnect the connector from pressure control solenoid valve.
10) Disconnect the connector from drain valve.



11) Loosen the clamp and disconnect the fuel filler hose (A) and evaporation hose (B) from the fuel filler pipe.

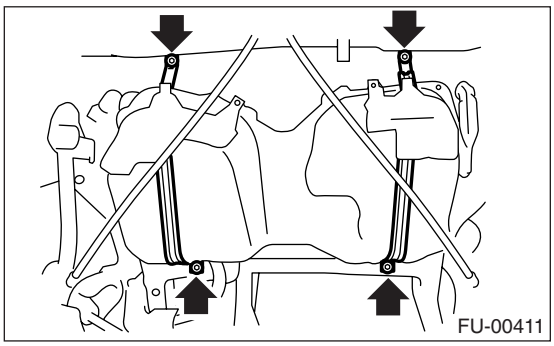


12) Move the clips, and disconnect the quick connector. <Ref. to FU(H4SO)-62, REMOVAL, Fuel Delivery, Return and Evaporation lines.>
13) Disconnect the fuel hoses.



14) Support the fuel tank with a transmission jack, remove the bolts from bands and dismount the fuel tank from the vehicle.

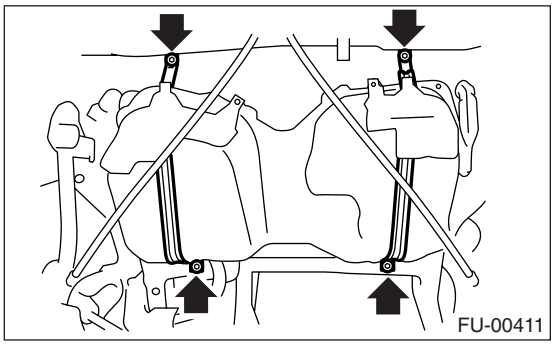
WARNING:
An assistant is required to perform this work.



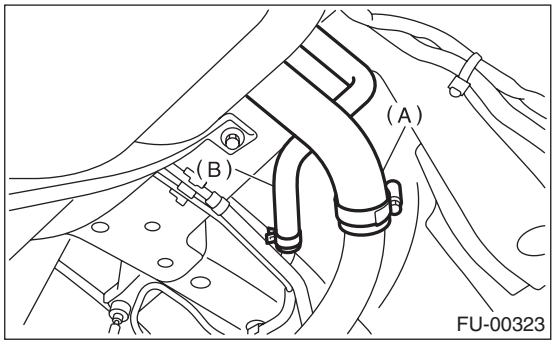
B: INSTALLATION

1) Support the fuel tank with a transmission jack and push the fuel tank harness into the access hole with the grommet.
2) Set the fuel tank and temporarily tighten the bolts of fuel tank bands.

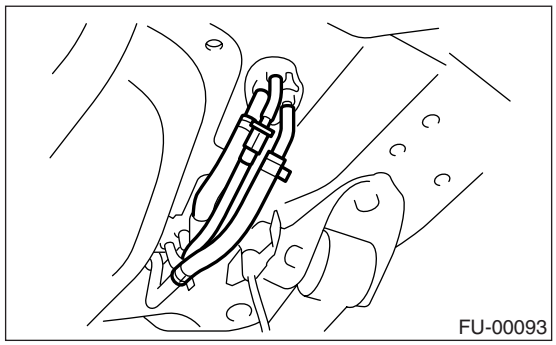
WARNING:
An assistant is required to perform this work.



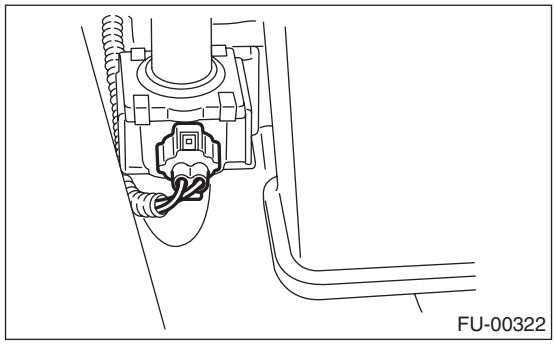
3) Connect the fuel filler hose (A) and air vent hose (B).



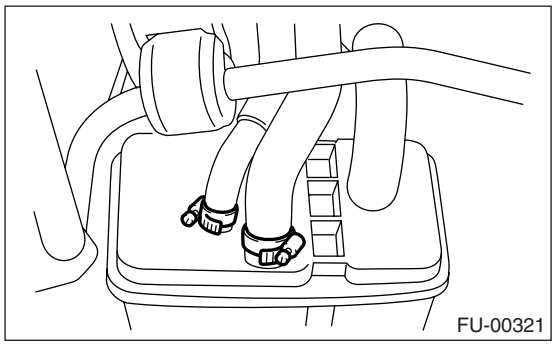
4) Connect the fuel hoses, and hold them with clips and quick connector. <Ref. to FU(H4SO)-62, REMOVAL, Fuel Delivery, Return and Evaporation lines.>



5) Connect the connector to the drain valve.

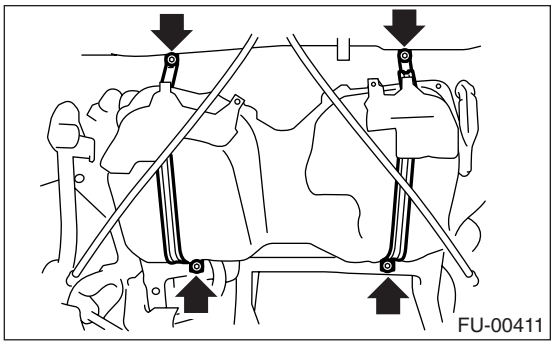


6) Connect the connector to the pressure control solenoid valve.
7) Connect the evaporation hose to the canister and secure with the clamp.

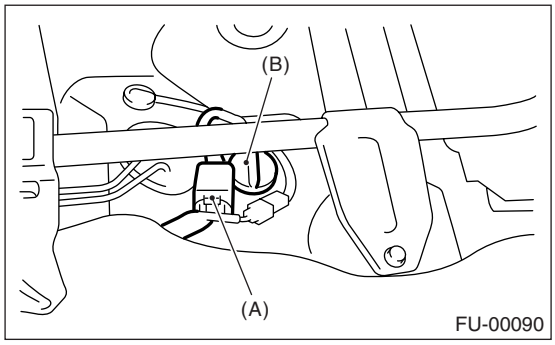


8) Tighten the band mounting bolts.

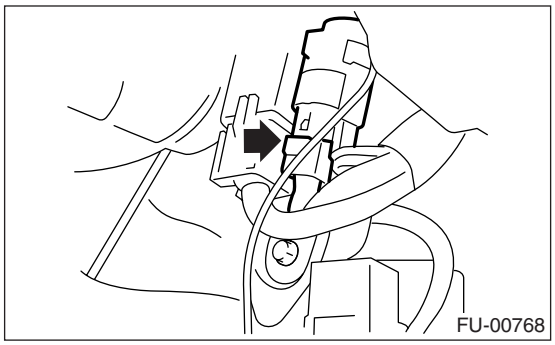
Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



9) Install the rear crossmember. <Ref. to RS-18, INSTALLATION, Rear Crossmember.>
10) Connect the connectors (A) to the fuel tank cord and plug the service hole with grommet (B).



11) Set the rear seat and floor mat.
12) Connect the connector to the fuel pump relay.



C: INSPECTION

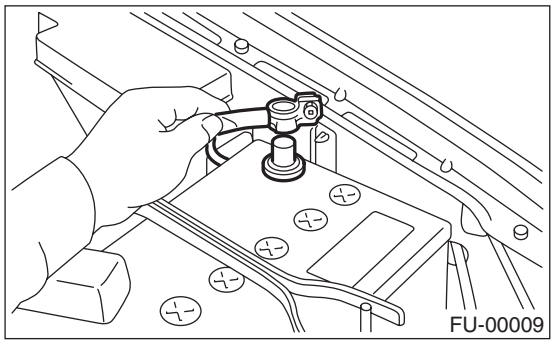
1) Make sure there are no cracks, holes, or other damage on the fuel tank.
2) Make sure that the fuel hoses and fuel pipes are not cracked and the connections are tight.

21.Fuel Filler Pipe

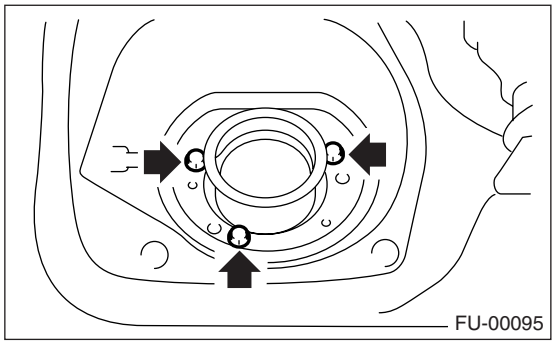
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

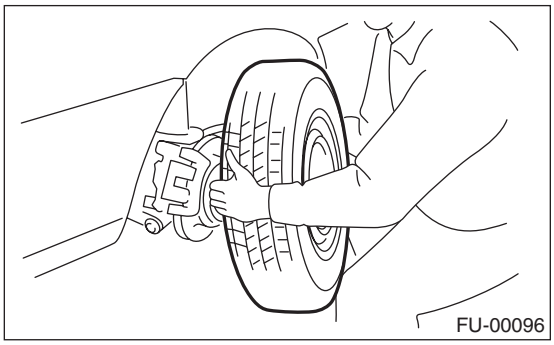
1) Release the fuel pressure. <Ref. to FU(H4SO)-47, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler flap lid and remove the filler cap.
3) Disconnect the ground cable from battery.


FU-00009

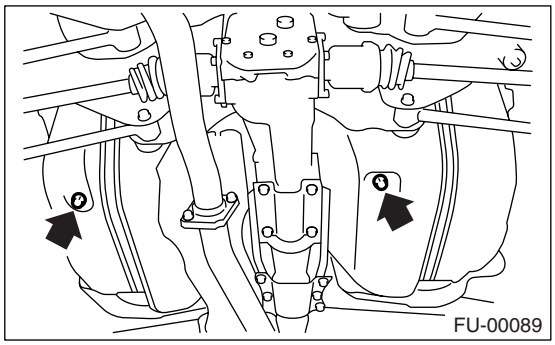
4) Remove the screws holding packing in place.


FU-00095

5) Lift up the vehicle.
6) Remove the rear right side wheel nuts.
7) Remove the rear right side wheel.


FU-00096

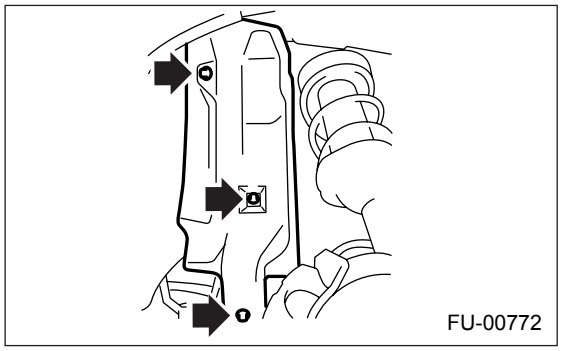
8) Drain the fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from the fuel tank.


FU-00089

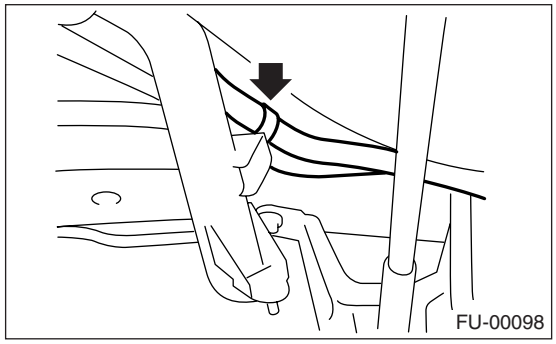
9) Tighten the fuel drain plug.

Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)

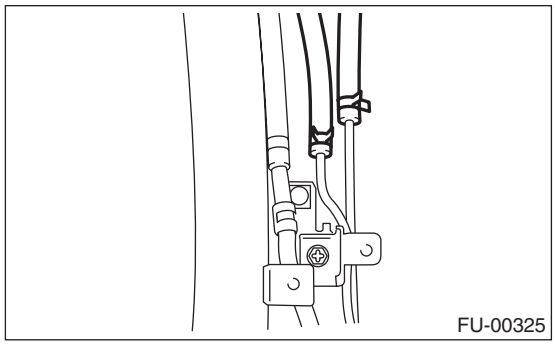
10) Remove the fuel filler pipe protector.


FU-00772

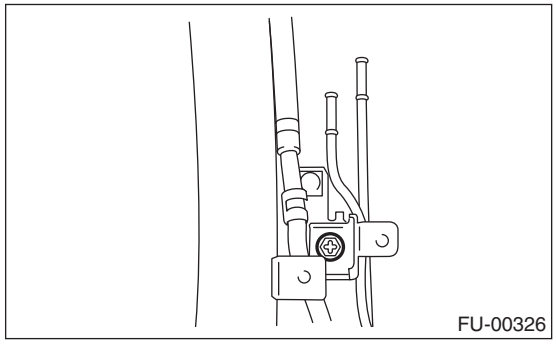
11) Separate the evaporation hoses from the clip of fuel filler pipe.


FU-00098

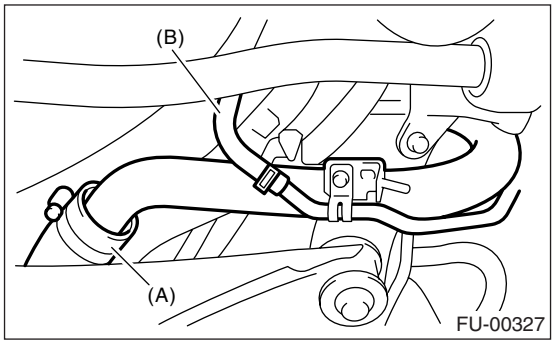
12) Disconnect the evaporation hoses from the pipes.


FU-00325

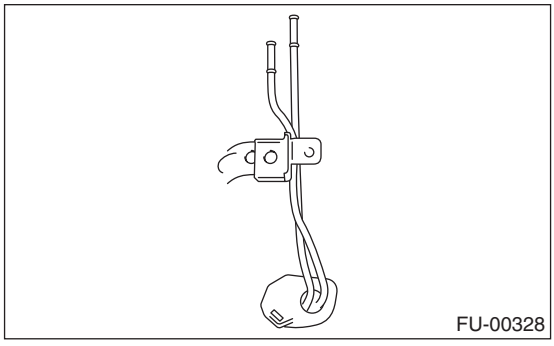
13) Remove the bolts which hold the fuel filler pipe bracket on the body.



14) Loosen the clamp and separate the fuel filler hose (A) from the fuel filler pipe.
15) Move the clip and separate the evaporation hose (B).



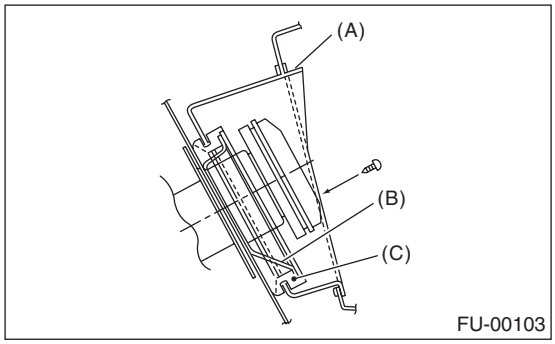
16) Remove the fuel filler pipe to under side of the vehicle.
17) Remove the evaporation pipe together with clip from the body.



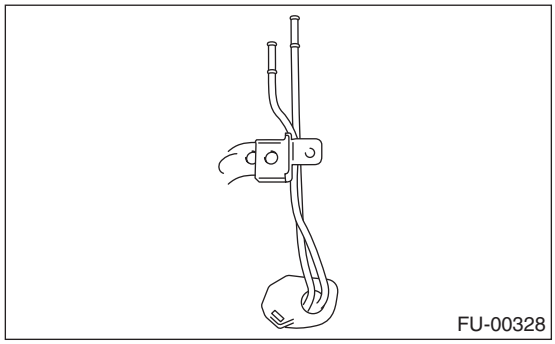
B: INSTALLATION

1) Open the fuel filler flap lid.
2) Set the fuel saucer (A) with rubber packing (C) and insert the fuel filler pipe into hole from the inner side of apron.
3) Align the holes in fuel filler pipe neck and set the cup (B), and tighten the screws.

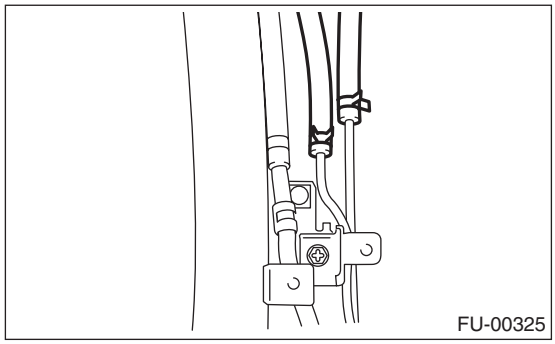
NOTE:
If the edges of rubber packing are folded toward the inside, straighten it with a screwdriver.



4) Install the evaporation pipe.

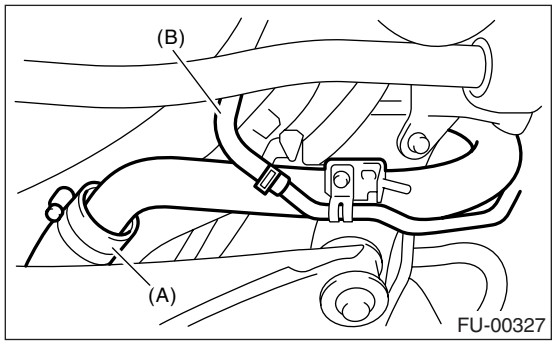


5) Connect the evaporation hose to the pipe.



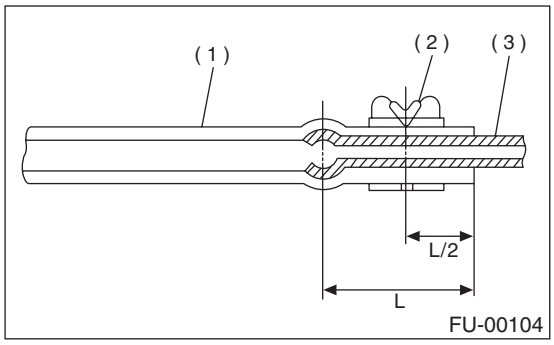
6) Insert the fuel filler hose (A) approximately 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.

CAUTION:
Do not allow clips to touch evaporation hose (B) and rear suspension crossmember.



7) Insert the evaporation hose approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe and hold the clip.

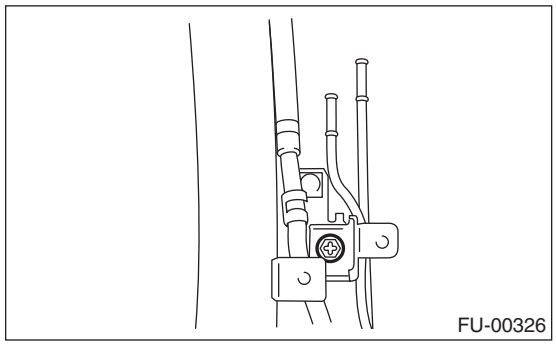
L = 27.5±2.5 mm (1.083±0.098 in)



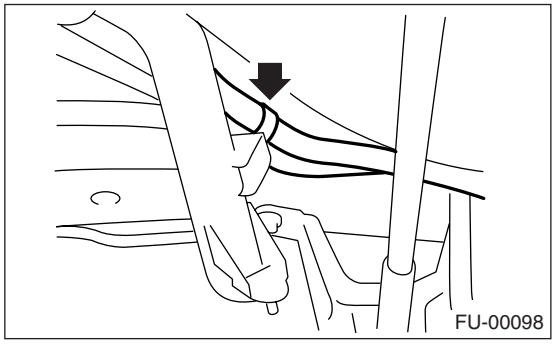
(1) Hose
(2) Clip
(3) Pipe

8) Tighten the bolt which holds the fuel filler pipe bracket on the body.

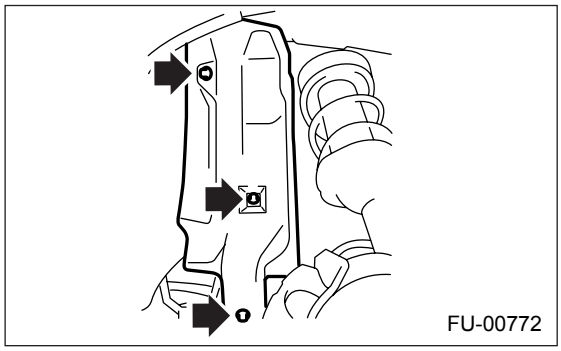
Tightening torque:
7.5 N·m (0.75 kgf-m, 5.4 ft-lb)



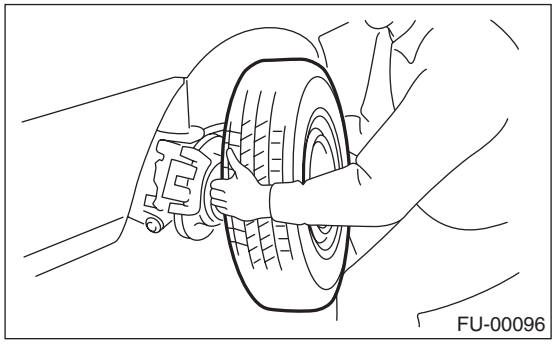
9) Secure the evaporation hose to clip of fuel filler pipe.



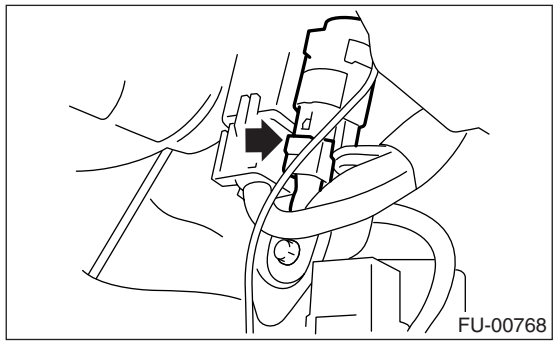
10) Install the fuel filler pipe protector.



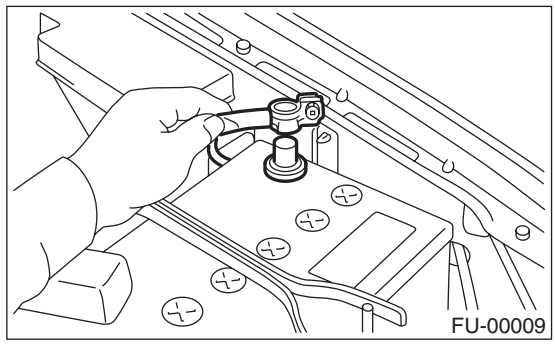
11) Install the rear right wheel.



12) Lower the vehicle.
13) Tighten the wheel nuts.
14) Connect the connector to the fuel pump relay.

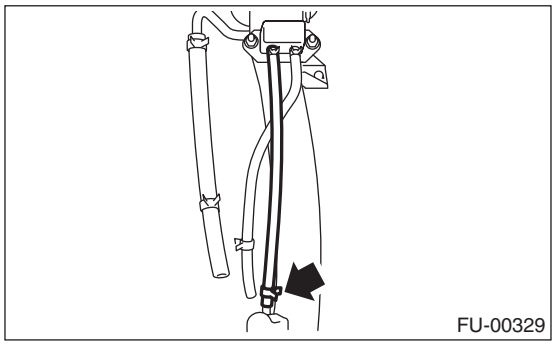


15) Connect the battery ground cable to battery.

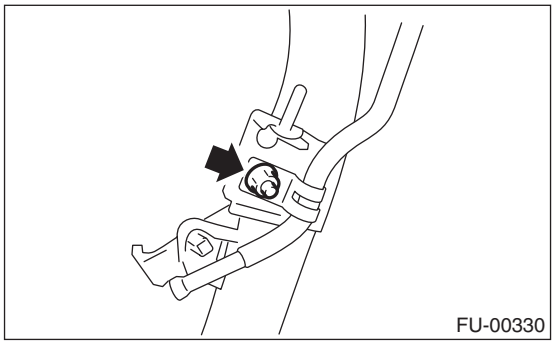


C: DISASSEMBLY

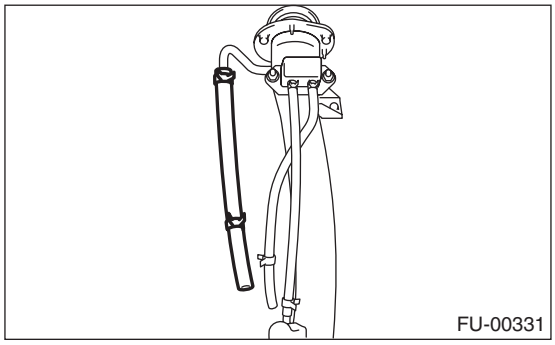
1) Move the clamp, and disconnect the evaporation hose from the joint pipe.



2) Remove the bolt which installs the joint pipe on the fuel filler pipe.



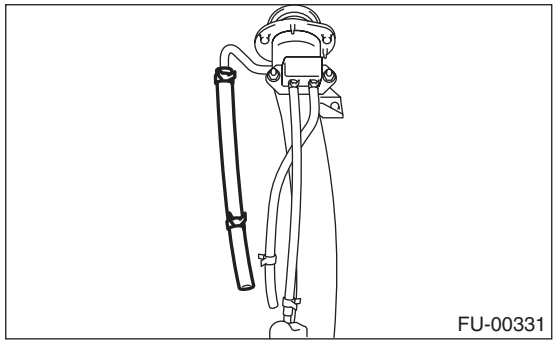
3) Disconnect the evaporation hose from the fuel filler pipe.



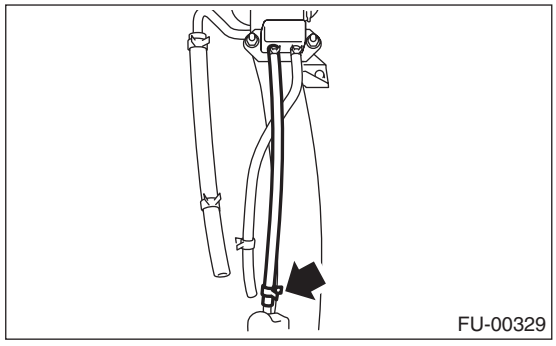
4) Remove the shut valve from the fuel filler pipe. <Ref. to EC(H4SO)-17, REMOVAL, Shut Valve.>

D: ASSEMBLY

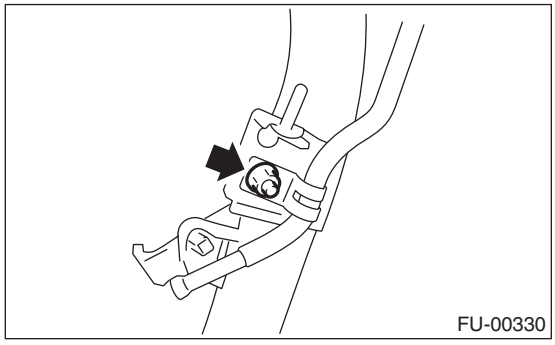
1) Install the shut valve on the fuel filler pipe. <Ref. to EC(H4SO)-17, INSTALLATION, Shut Valve.>
2) Connect the evaporation hose to the fuel filler pipe.



3) Connect the evaporation hose to the evaporation pipe.



4) Install the evaporation pipe to the fuel filler pipe.



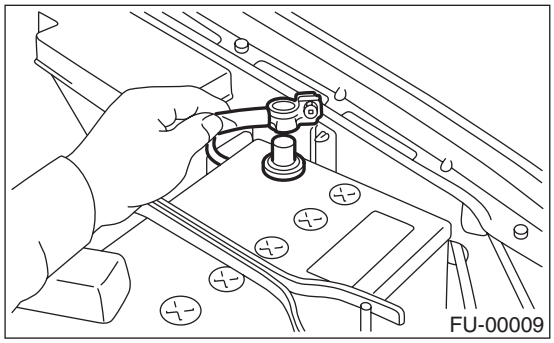
22.Fuel Pump

A: REMOVAL

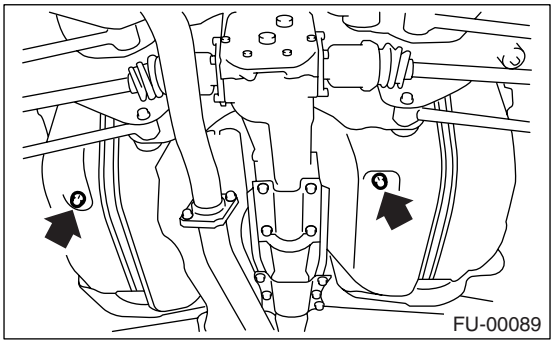
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

NOTE:
The fuel pump assembly consists of a fuel pump and a fuel level sensor.

1) Release the fuel pressure. <Ref. to FU(H4SO)-47, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler flap lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.


FU-00009

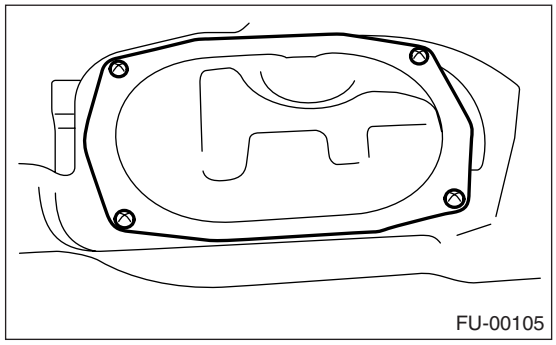
4) Lift up the vehicle.
5) Drain the fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from the fuel tank.


FU-00089

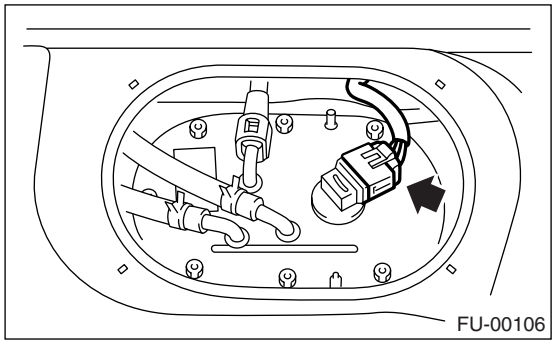
6) Tighten the fuel drain plug.

Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)

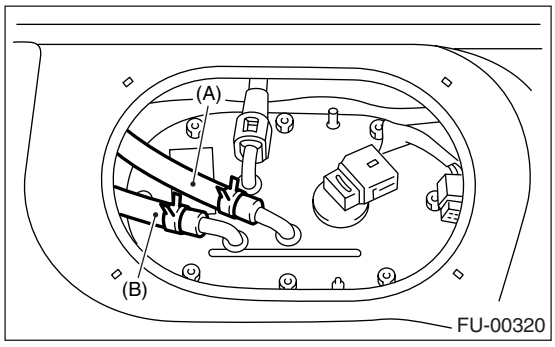
7) Raise the rear seat and turn the floor mat up.
8) Remove the access hole lid.


FU-00105

9) Disconnect the connector from fuel pump.

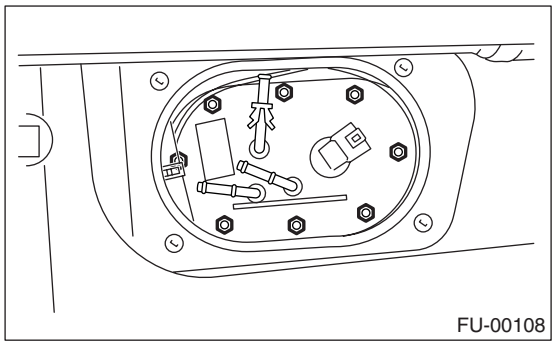

FU-00106

10) Disconnect the quick connector and then disconnect the fuel delivery hose. <Ref. to FU(H4SO)-62, REMOVAL, Fuel Delivery, Return and Evaporation lines.>
11) Move the clip and then disconnect the fuel return hose (A) and jet pump hose (B).



FU-00320

12) Remove the nuts which install the fuel pump assembly onto the fuel tank.


FU-00108

13) Take off the fuel pump assembly from the fuel tank.

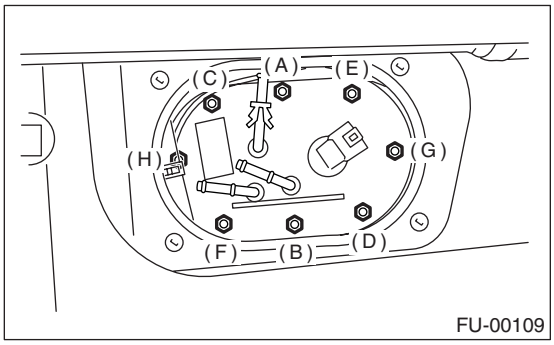
B: INSTALLATION

Install in the reverse order of removal. Do the following:

NOTE:
Replace the gaskets with new ones.

(1) Ensure the sealing portion is free from fuel or foreign particles before installation.
(2) Tighten the nuts in alphabetical sequence shown in figure to specified torque.

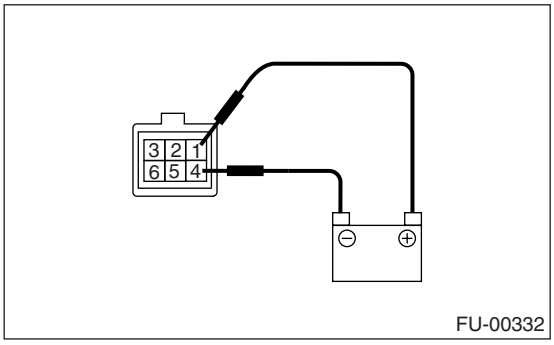
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

Connect the lead harness to the connector terminal of fuel pump and apply the battery power supply to check whether the pump operates.

WARNING:
• Wipe off the fuel completely.
• Keep battery as far apart from fuel pump as possible.
• Be sure to turn the battery supply ON and OFF on the battery side.
• Do not run fuel pump for a long time under non-load condition.



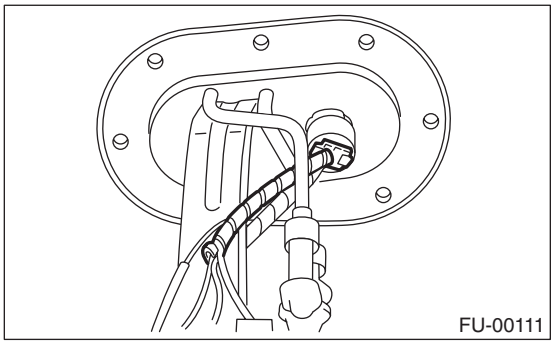
23.Fuel Level Sensor

A: REMOVAL

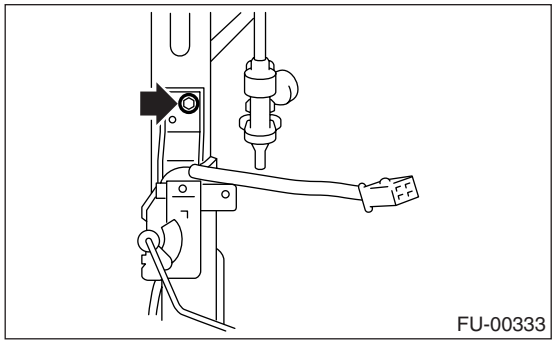
WARNING:
- **Place “NO FIRE” signs near the working area.**
- **Be careful not to spill fuel on the floor.**

NOTE:
The fuel level sensor is built in the fuel pump assembly.

1) Remove the fuel pump assembly. <Ref. to FU(H4SO)-55, REMOVAL, Fuel Pump.>
2) Disconnect the connector from the fuel pump bracket.



3) Remove the bolt which installs the fuel level sensor on the mounting bracket.



B: INSTALLATION

Install in the reverse order of removal.

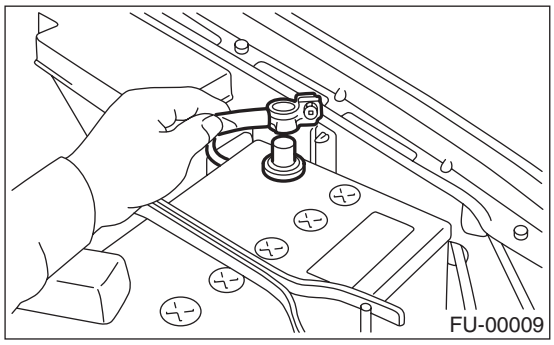
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

24.Fuel Sub Level Sensor

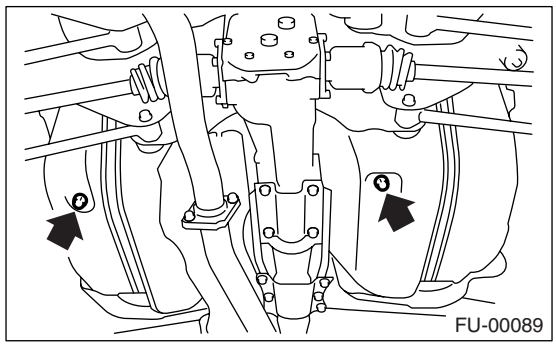
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Disconnect the ground cable from battery.



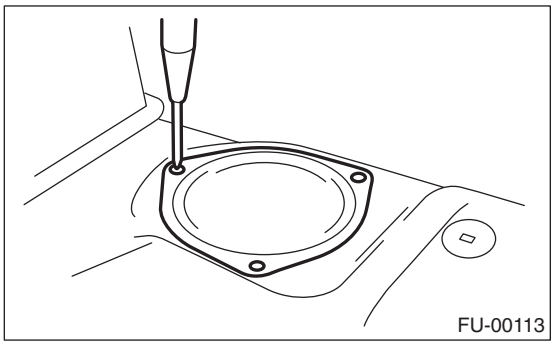
2) Lift up the vehicle.
3) Drain the fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from the fuel tank.



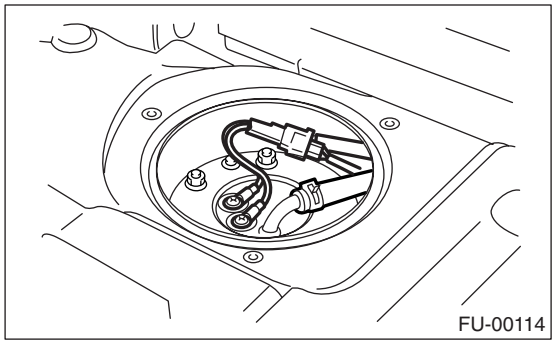
4) Tighten the fuel drain plug.

Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)

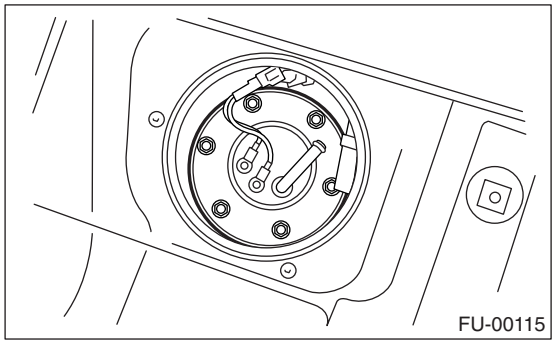
5) Remove the rear seat.
6) Remove the service hole cover.



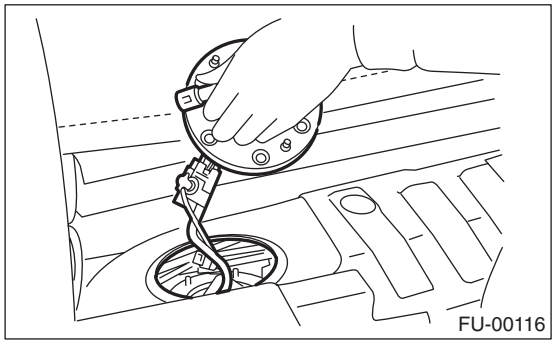
7) Disconnect the connector from the fuel sub level sensor.
8) Disconnect the fuel jet pump hose.



9) Remove the bolts which install the fuel sub level sensor on the fuel tank.



10) Remove the fuel sub level sensor.



B: INSTALLATION

Install in the reverse order of removal.

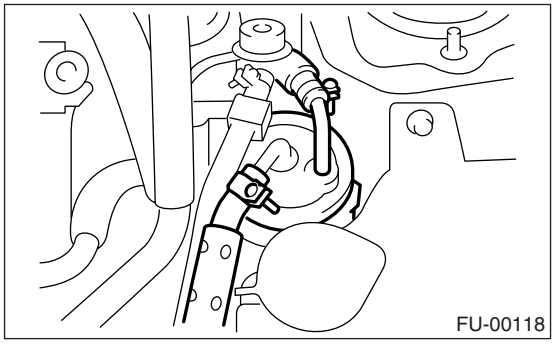
NOTE:
For tightening torque, refer to "COMPONENT". <Ref. to FU(H4SO)-3, COMPONENT, General Description.>

25.Fuel Filter

A: REMOVAL

WARNING:
- **Place “NO FIRE” signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Release the fuel pressure. <Ref. to FU(H4SO)-47, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Disconnect the fuel delivery hoses from the fuel filter.



3) Remove the filter from the holder.

B: INSTALLATION

1) Install in the reverse order of removal.
2) Tighten the hose clamp screws.

Tightening torque:
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)

C: INSPECTION

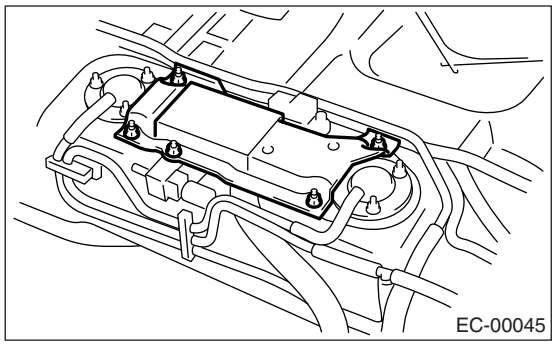
1) Check the inside of fuel filter for dirt and water sediment.
2) If it is clogged, or if the replacement interval has been reached, replace it.
3) If the water is found in it, shake and expel the water from the inlet port.
4) If fuel hoses are damaged at the connecting portion, replace them with new ones.
5) If clamps are badly damaged, replace them with new ones.

26.Fuel Cut Valve

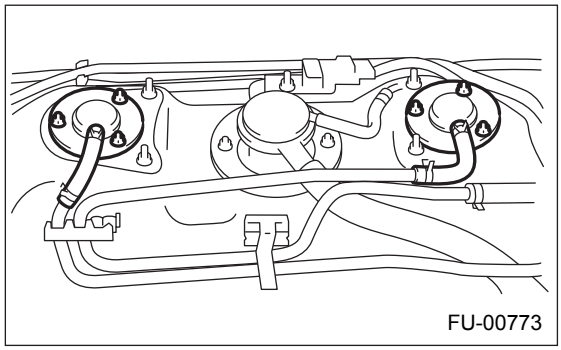
A: REMOVAL

WARNING:
- **Place “NO FIRE” signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Remove the fuel tank. <Ref. to FU(H4SO)-48, REMOVAL, Fuel Tank.>
2) Remove the protect cover.



3) Move the clip and disconnect the evaporation hose from the fuel cut valve.



4) Remove the bolts which install the fuel cut valve.

B: INSTALLATION

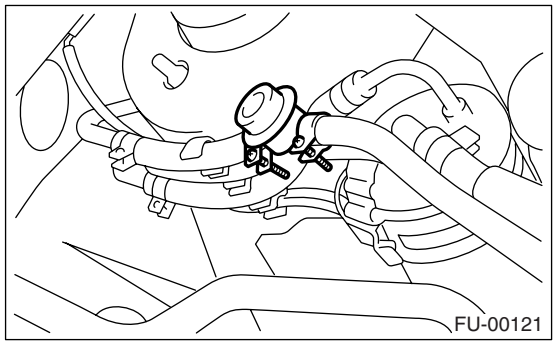
Install in the reverse order of removal.

NOTE:
For tightening torque, refer to “COMPONENT”. <Ref. to FU(H4SO)-3, COMPONENT, General Description.>

27.Fuel Damper Valve

A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(H4SO)-47, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Remove the fuel damper valve from the fuel return line.



B: INSTALLATION

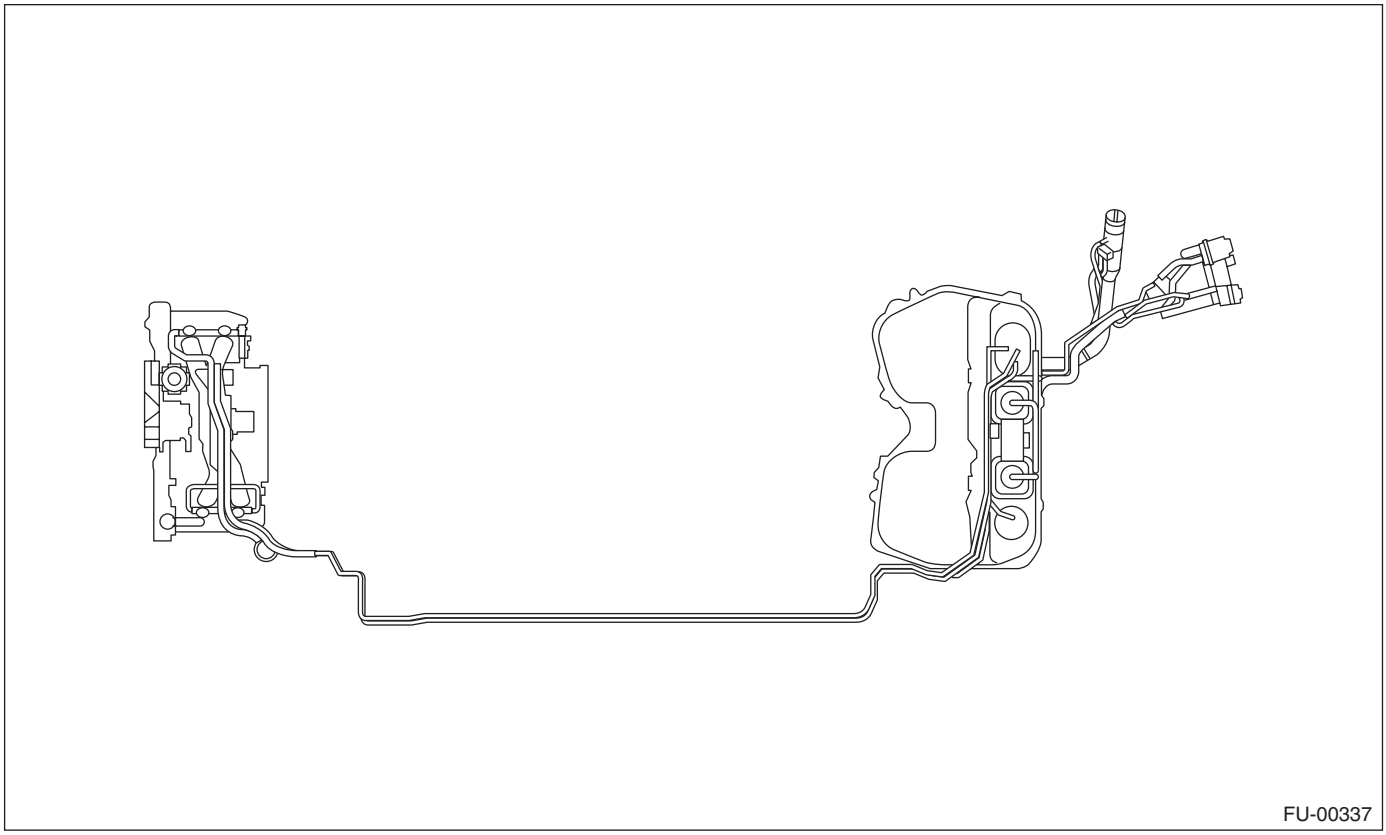
Install in the reverse order of removal.

Tightening torque:
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)

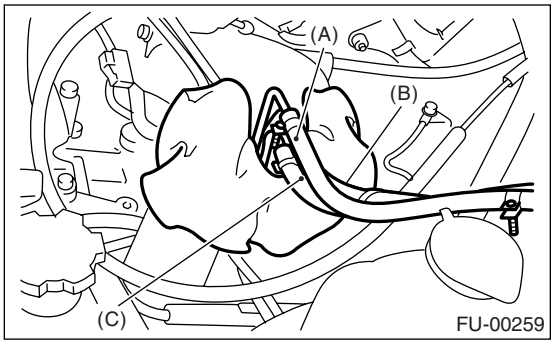
28.Fuel Delivery, Return and Evaporation lines

A: REMOVAL

1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(H4SO)-47, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Open the fuel filler flap lid and remove the fuel filler cap.
4) Remove the floor mat. <Ref. to EI-57, REMOVAL, Floor Mat.>
5) Remove the fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.



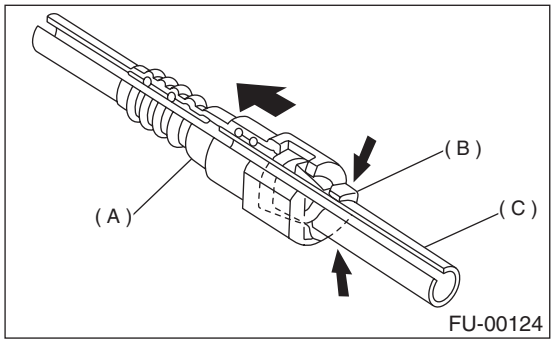
6) In engine compartment, detach the fuel delivery hoses, return hoses and evaporation hose.



(A) Fuel delivery hose
(B) Return hose
(C) Evaporation hose

7) Lift up the vehicle.
8) Separate the quick connector on the fuel delivery line.
(1) Clean the pipe and connector, if they are covered with dust.
(2) Hold the connector (A) and push retainer (B) down.
(3) Pull out the connector (A) from retainer (B).

CAUTION:
Always use a new retainer.

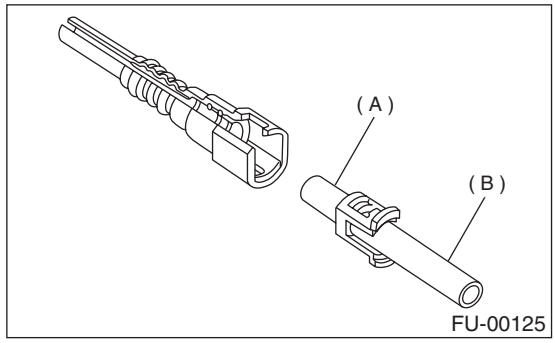


(A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

1) Connect the quick connector on fuel delivery line.

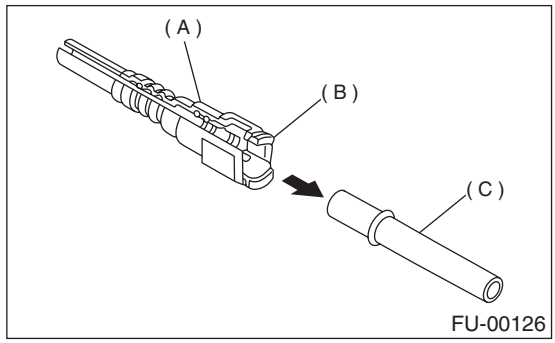
CAUTION:
• Always use a new retainer.
• Make sure that the connected portion is not damaged or has dust. If necessary, clean seal surface of pipe.



(A) Seal surface
(B) Pipe

(1) Set the new retainer (B) to connector (A).
(2) Push the pipe into the connector completely.

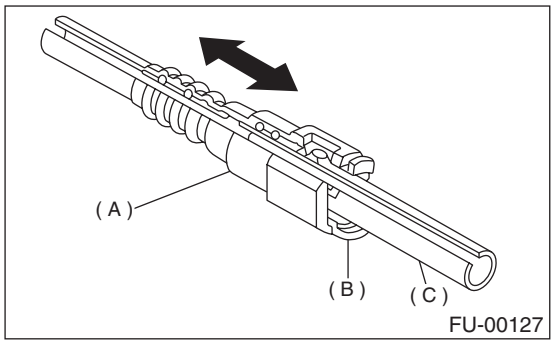
NOTE:
At this time, two clicking sounds are heard.



(A) Connector
(B) Retainer
(C) Pipe

CAUTION:
• Pull the connector to ensure it is connected securely.
• Ensure the two retainer pawls are engaged in their mating positions in the connector.

• Be sure to inspect hoses and their connections for any leakage of fuel.

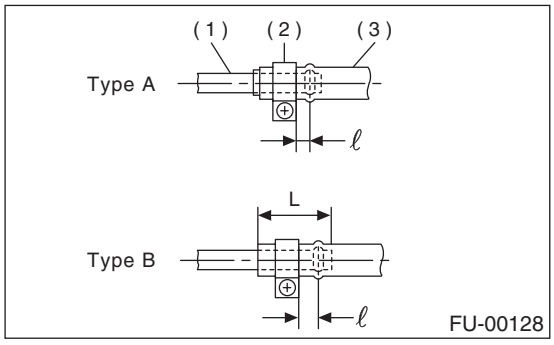


(A) Connector
(B) Retainer
(C) Pipe

2) Connect the fuel delivery hose to the pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).
Type A: When the fitting length is specified.
Type B: When the fitting length is not specified.

ℓ : 2.5±1.5 mm (0.098±0.059 in)

L: 22.5±2.5 mm (0.886±0.098 in)



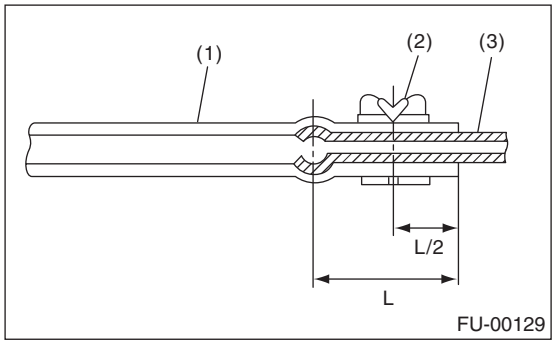
(1) Pipe
(2) Clamp
(3) Hose

3) Connect the return hose and evaporation hose to pipe by approx. 15 mm (0.59 in) from the hose end.

Fuel return hose:
L = 22.5±2.5 mm (0.885±0.098 in)

Fuel evaporation hose:
L = 17.5±2.5 mm (0.689±0.098 in)

CAUTION:
Be sure to inspect hoses and their connections for any leakage of fuel.



(1) Hose
(2) Clip
(3) Pipe

C: INSPECTION

1) Make sure that there are no cracks on the fuel pipes and fuel hoses.
2) Make sure that the fuel pipe and fuel hose connections are tight.

29.Fuel System Trouble in General

A: INSPECTION

Trouble and possible cause		Corrective action
1. Insufficient fuel supply to the injector		
1)	Fuel pump will not operate.	
	❍ Defective terminal contact.	Inspect connections, especially ground, and tighten securely.
	❍ Trouble in electromagnetic or electronic circuit parts.	Replace the fuel pump.
2)	Lowering of fuel pump function.	Replace the fuel pump.
3)	Clogged dust or water in the fuel filter.	Replace fuel filter, clean or replace fuel tank.
4)	Clogged or bent fuel pipe or hose.	Clean, correct or replace fuel pipe or hose.
5)	Air is mixed in the fuel system.	Inspect or retighten each connection part.
6)	Clogged or bent breather tube or pipe.	Clean, correct or replace air breather tube or pipe.
7)	Damaged diaphragm of pressure regulator.	Replace.
2. Leakage or blow out fuel		
1)	Loosened joints of the fuel pipe.	Retighten.
2)	Cracked fuel pipe, hose and fuel tank.	Replace.
3)	Defective welding part on the fuel tank.	Replace.
4)	Defective drain packing of the fuel tank.	Replace.
5)	Clogged or bent air breather tube or air vent tube.	Clean, correct or replace air breather tube or air vent tube.
3. Gasoline odor inside compartment		
1)	Loose joints at air breather tube, air vent tube and fuel filler pipe.	Retighten.
2)	Defective packing air tightness on the fuel saucer.	Correct or replace packing.
3)	Cracked fuel separator.	Replace separator.
4)	Inoperative fuel pump modulator or circuit.	Replace.
4. Defective fuel meter indicator		
1)	Defective operation of fuel level sensor.	Replace.
2)	Defective operation of fuel meter.	Replace.
5. Noise		
1)	Large operation noise or vibration of fuel pump.	Replace.

NOTE:

• When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank.

To prevent water condensation,

(1) Top off the fuel tank or drain the fuel completely.

(2) Drain the water condensation from the fuel filter.

• Refilling the fuel tank.

Refill the fuel tank while there is still some fuel left in the tank.

• Protecting the fuel system against freezing and water condensation.

(3) Cold areas

In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use an anti-freeze solution in the cooling system. Refueling will also complement the effect of anti-freeze solution each time the fuel level drops to about one-half. After the winter season, drain the water which may have accumulated in the fuel filter and fuel tank in the manner same as that described under Affected areas below.

(4) Affected areas

When the water condensation is notched in the fuel filter, drain the water from both the fuel filter and fuel tank or use a water removing agent (or anti-freeze solution) in the fuel tank.

• Observe the instructions, notes, etc., indicated on the label affixed to the anti-freeze solution (water removing agent) container before use.

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

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7. Fuel Temperature Sensor 8
8. Fuel Sub Level Sensor 9
9. Fuel Tank Pressure Sensor 10
10. Fuel Tank Sensor Control Valve 11
11. Pressure Control Solenoid Valve 12
12. Drain Filter 14
13. Vent Valve 16
14. Shut Valve 17
15. Drain Valve 18

1. General Description

A: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Front Catalytic Converter

A: REMOVAL

Front and rear catalytic converters and center exhaust pipe are integrated into one unit; therefore, the removal procedure is the same as that for center exhaust pipe. <Ref. to EX(H4SO)-7, REMOVAL, Center Exhaust Pipe.>

B: INSTALLATION

Front and rear catalytic converters and center exhaust pipe are integrated into one unit; therefore, the installation procedure is the same as that for center exhaust pipe. <Ref. to EX(H4SO)-7, INSTALLATION, Center Exhaust Pipe.>

C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

3. Rear Catalytic Converter

A: REMOVAL

Front and rear catalytic converters and center exhaust pipe are integrated into one unit; therefore, the removal procedure is the same as that for front catalytic converter. <Ref. to EX(H4SO)-7, REMOVAL, Center Exhaust Pipe.>

B: INSTALLATION

Front and rear catalytic converters and center exhaust pipe are integrated into one unit; therefore, the installation procedure is the same as that for front catalytic converter. <Ref. to EX(H4SO)-7, INSTALLATION, Center Exhaust Pipe.>

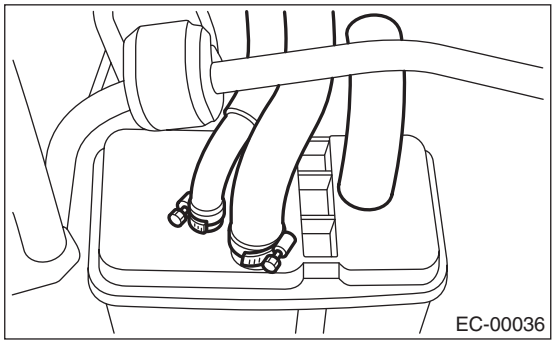
C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

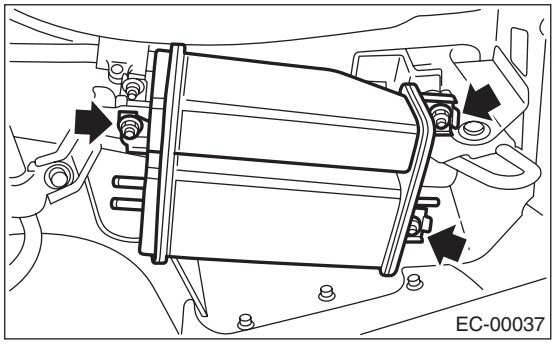
4. Canister

A: REMOVAL

1) Lift up the vehicle.
2) Loosen the two clamps which hold two canister hoses, and disconnect the evaporation hose from canister.



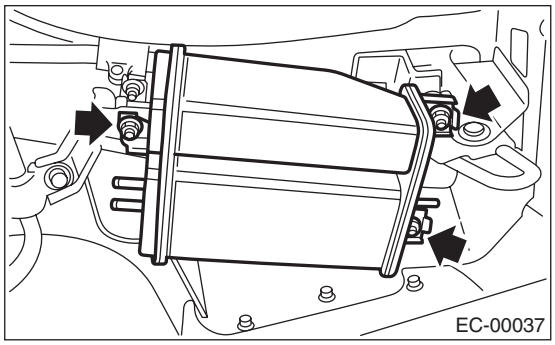
3) Remove the canister from body.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
23 N·m (2.3 kgf-m, 17 ft-lb)



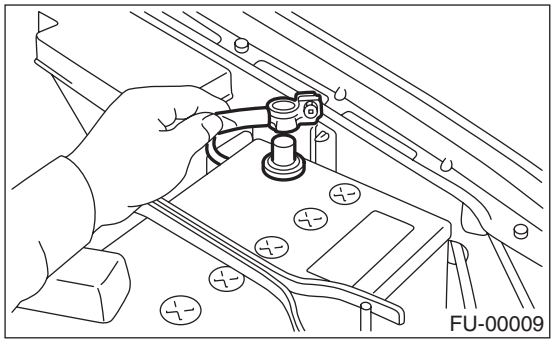
C: INSPECTION

Make sure the canister and canister hoses are not cracked or loose.

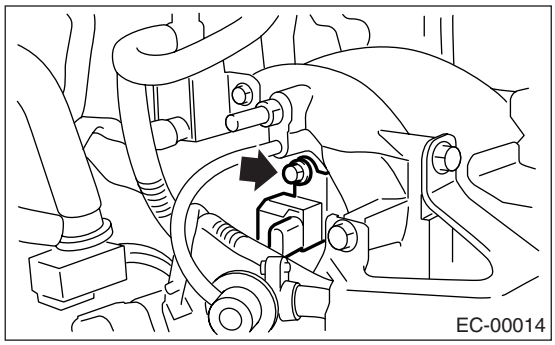
5. Purge Control Solenoid Valve

A: REMOVAL

1) Disconnect the ground cable from battery.



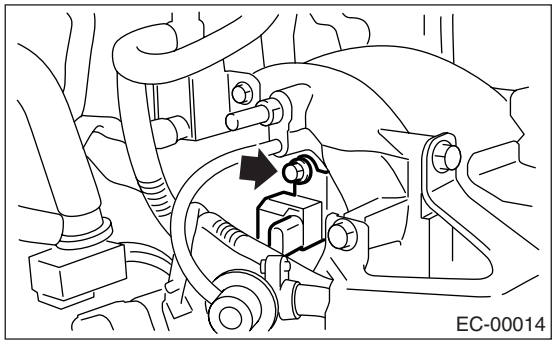
2) Disconnect the connector and hoses from purge control solenoid valve, and then remove the purge control solenoid valve.



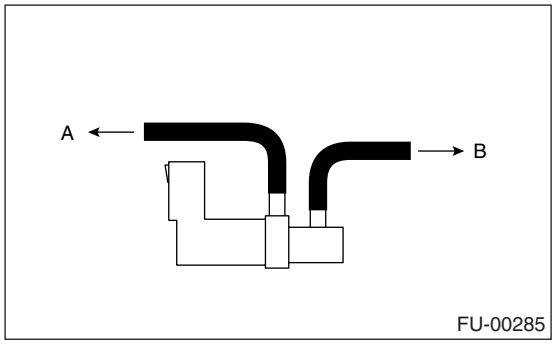
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



NOTE:
Connect the evaporation hose as shown in the following figure.



(A) To fuel pipe
(B) To intake manifold

C: INSPECTION

Make sure the hoses are not cracked or loose.

6. Fuel Level Sensor

A: REMOVAL

For removal procedure, refer to “FU” section. <Ref. to FU(H4SO)-57, REMOVAL, Fuel Level Sensor.>

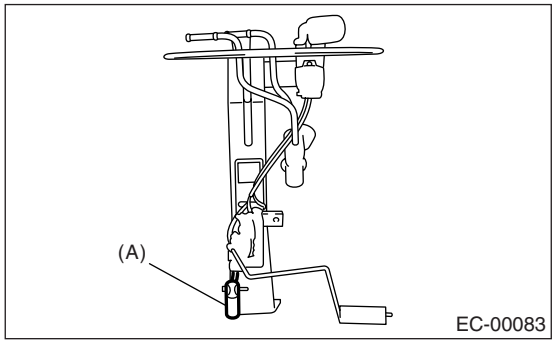
B: INSTALLATION

For installation procedure, refer to “FU” section. <Ref. to FU(H4SO)-57, INSTALLATION, Fuel Level Sensor.>

7. Fuel Temperature Sensor

A: REMOVAL

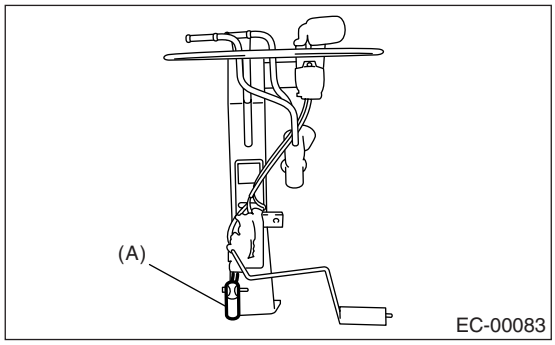
Fuel temperature sensor and fuel level sensor are integrated into one unit; therefore, the removal procedure is the same as that for fuel level sensor. <Ref. to FU(H4SO)-57, REMOVAL, Fuel Level Sensor.>



(A) Fuel temperature sensor

B: INSTALLATION

Fuel temperature sensor and fuel level sensor are integrated into one unit; therefore, the installation procedure is the same as that for fuel level sensor. <Ref. to FU(H4SO)-57, INSTALLATION, Fuel Level Sensor.>



(A) Fuel temperature sensor

8. Fuel Sub Level Sensor

A: REMOVAL

For removal procedure, refer to “FU” section. <Ref. to FU(H4SO)-58, REMOVAL, Fuel Sub Level Sensor.>

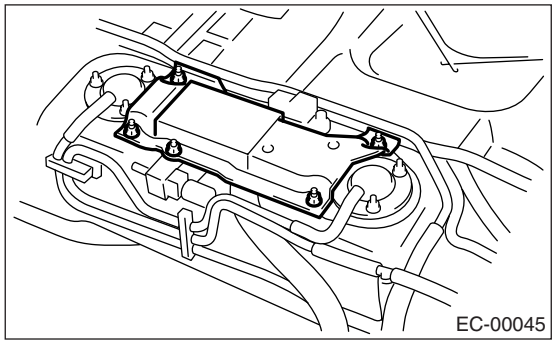
B: INSTALLATION

For installation procedure, refer to “FU” section. <Ref. to FU(H4SO)-58, INSTALLATION, Fuel Sub Level Sensor.>

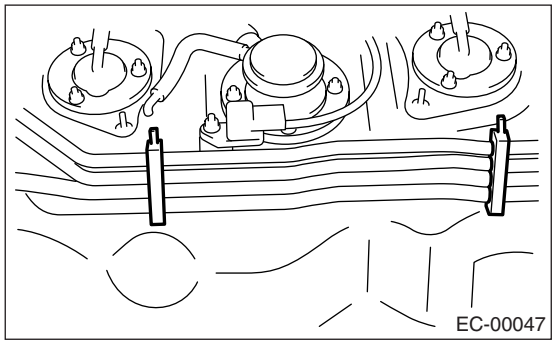
9. Fuel Tank Pressure Sensor

A: REMOVAL

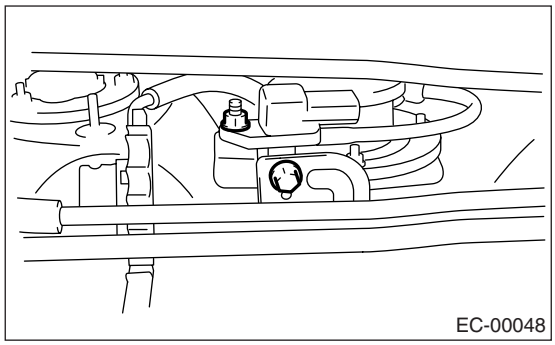
1) Remove the fuel tank. <Ref. to FU(H4SO)-48, REMOVAL, Fuel Tank.>
2) Remove the protector cover.



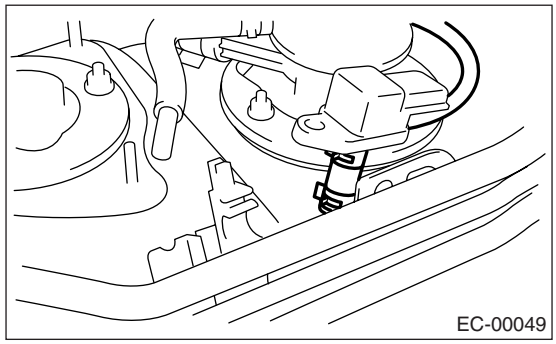
3) Disconnect the connector from fuel tank pressure sensor.
4) Release the clips which hold the fuel pipes onto fuel tank.



5) Remove the nuts and bolts which install the fuel tank pressure sensor on bracket.



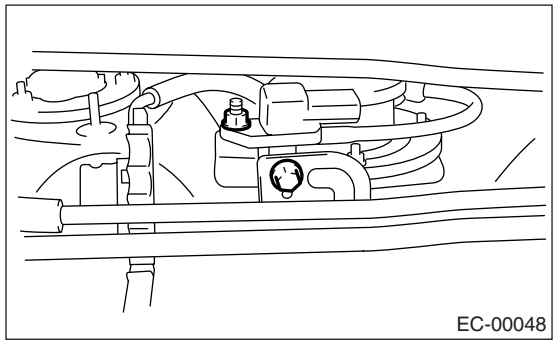
6) Disconnect the pressure hose from fuel tank pressure sensor.



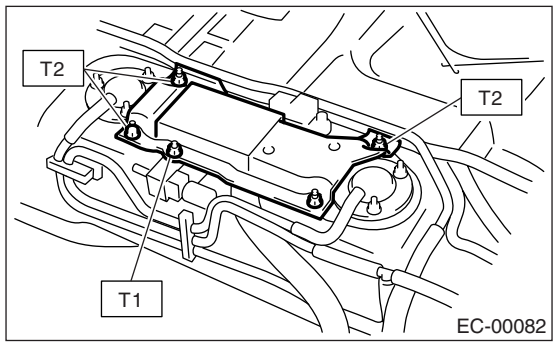
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



Tightening torque:
T1: 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)
T2: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



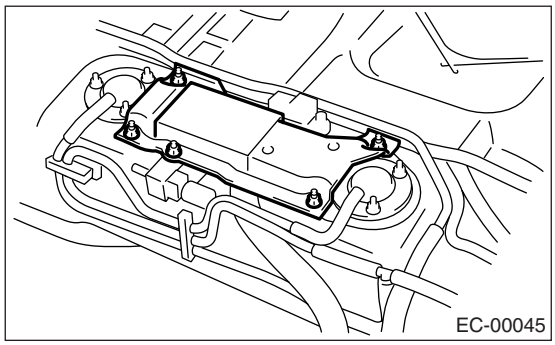
C: INSPECTION

Make sure the hoses are not cracked or loose.

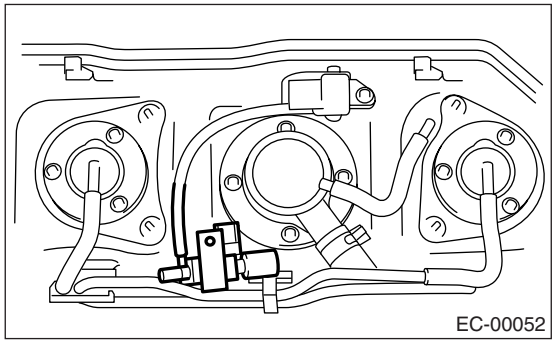
10.Fuel Tank Sensor Control Valve

A: REMOVAL

1) Remove the fuel tank. <Ref. to FU(H4SO)-48, REMOVAL, Fuel Tank.>
2) Remove the protector cover.



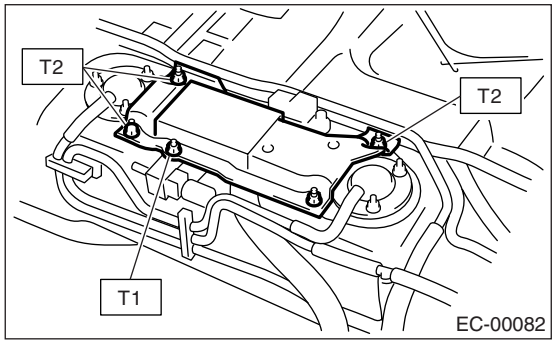
3) Disconnect the connector from fuel tank sensor control valve.
4) Disconnect the hose, and then remove the fuel tank sensor control valve.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
T1: 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)
T2: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



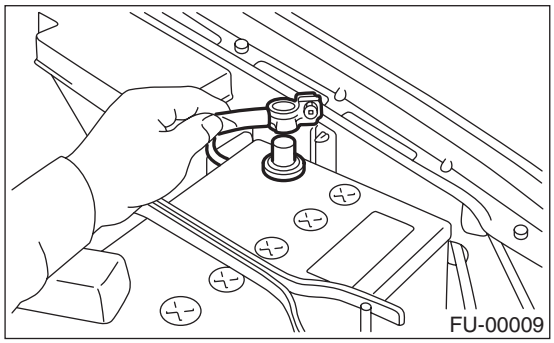
C: INSPECTION

Make sure the hoses are not cracked or loose.

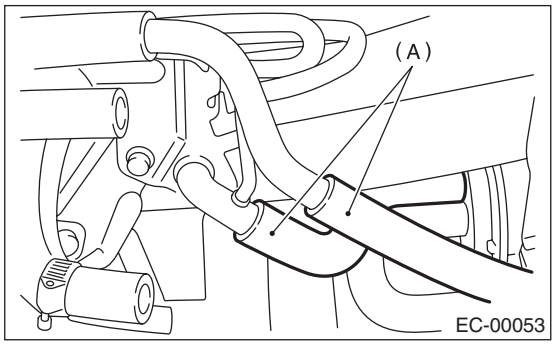
11.Pressure Control Solenoid Valve

A: REMOVAL

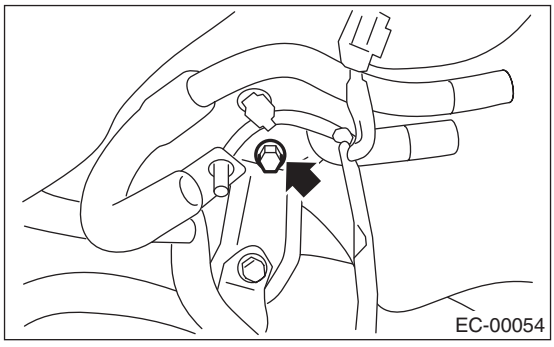
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



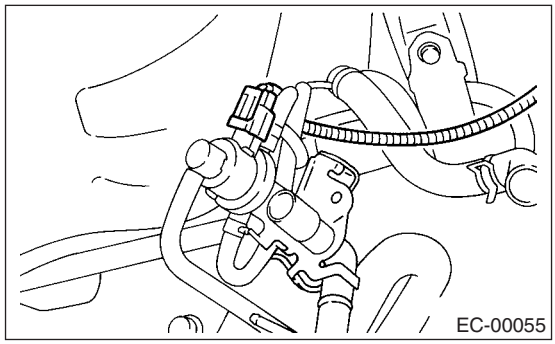
3) Lift up the vehicle.
4) Remove the canister. <Ref. to EC(H4SO)-5, REMOVAL, Canister.>
5) Disconnect the evaporation hoses (A) from joint pipes.



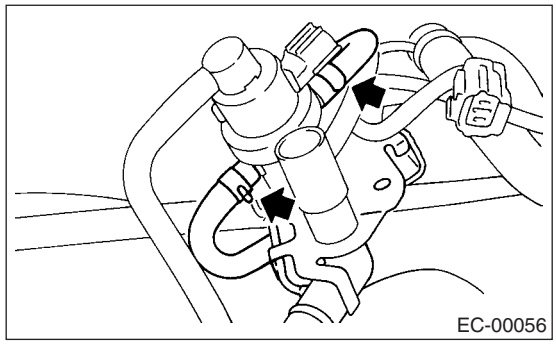
6) Remove the bolt which installs the pressure control solenoid valve holding bracket on body.



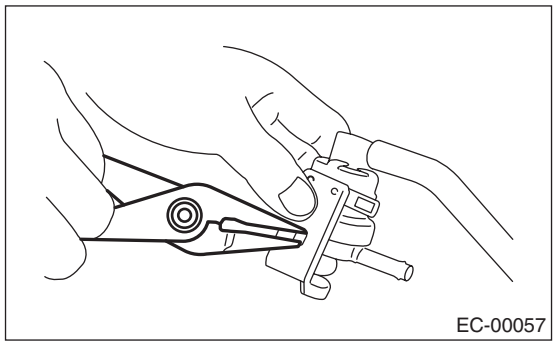
7) Disconnect the connector from pressure control solenoid valve.



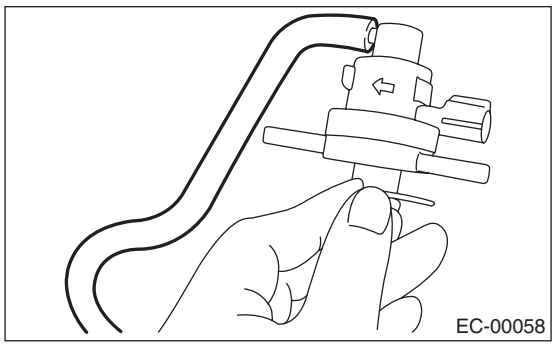
8) Disconnect the two evaporation hoses from pressure control solenoid valve.
9) Remove the pressure control solenoid valve with bracket.



10) Remove the pressure control solenoid valve from bracket.



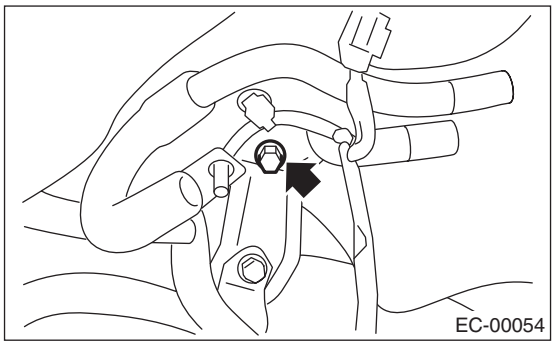
11) Disconnect the vacuum hose from pressure control solenoid valve.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
17.6 N·m (1.8 kgf-m, 13.0 ft-lb)



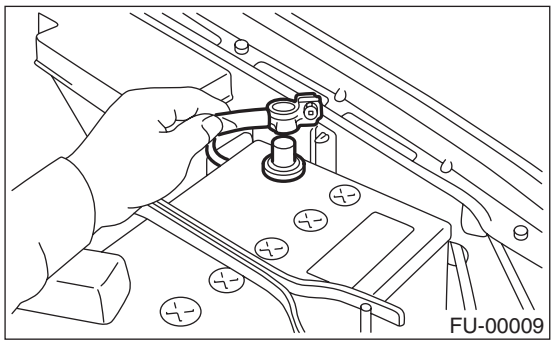
C: INSPECTION

Make sure the hoses are not cracked or loose.

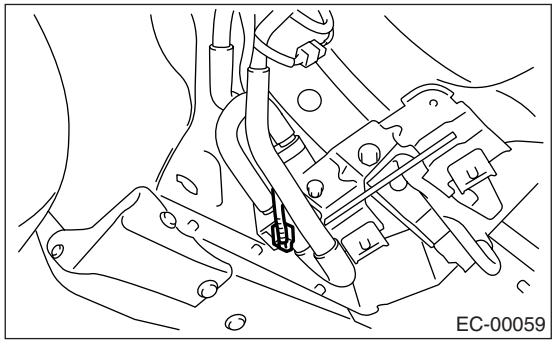
12.Drain Filter

A: REMOVAL

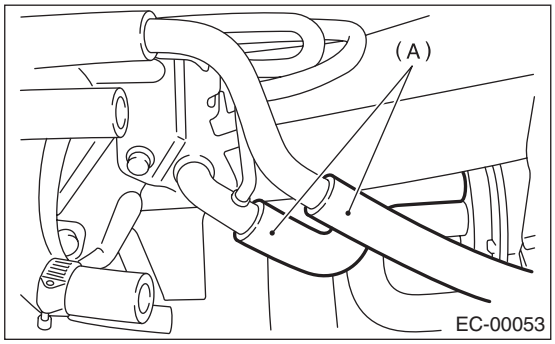
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



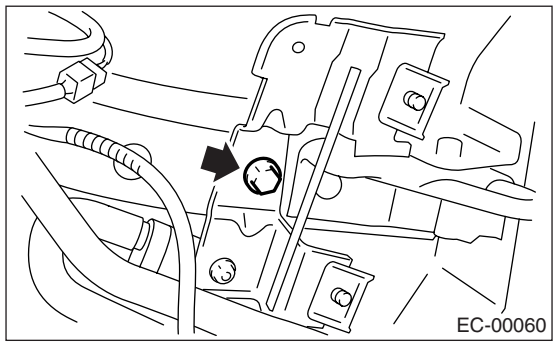
3) Lift up the vehicle.
4) Remove the canister. <Ref. to EC(H4SO)-5, REMOVAL, Canister.>
5) Disconnect the connector from drain valve.



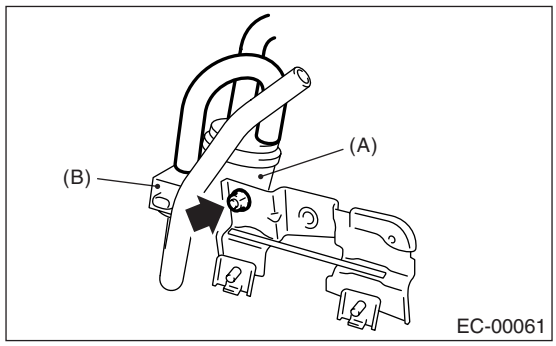
6) Disconnect the evaporation hoses (A) from joint pipes.



7) Remove the bolt which installs the drain filter and drain valve brackets on body, and remove them as a unit.



8) Disconnect the evaporation hoses from drain filter.
9) Remove the nuts, and then remove the drain filter.

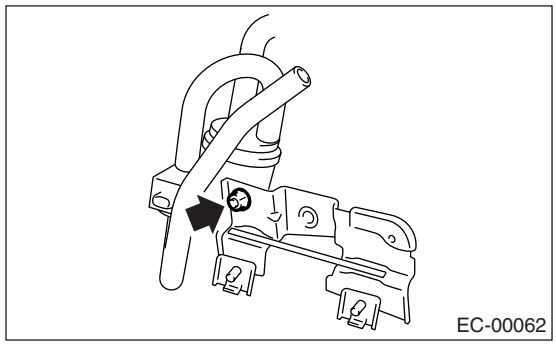


(A) Drain filter
(B) Drain valve

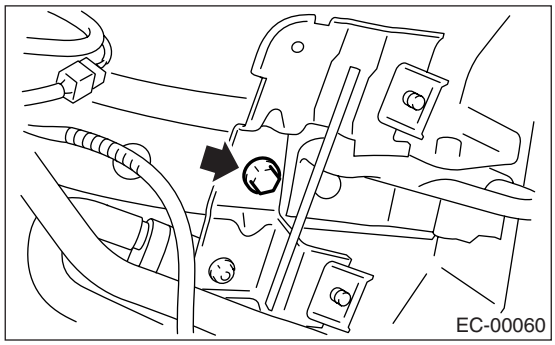
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
23 N·m (2.3 kgf-m, 16.6 ft-lb)



Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



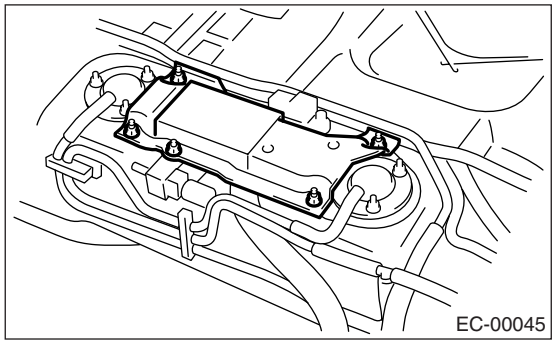
C: INSPECTION

1) Make sure all hoses are installed correctly.
2) Make sure the hoses are not cracked or loose.

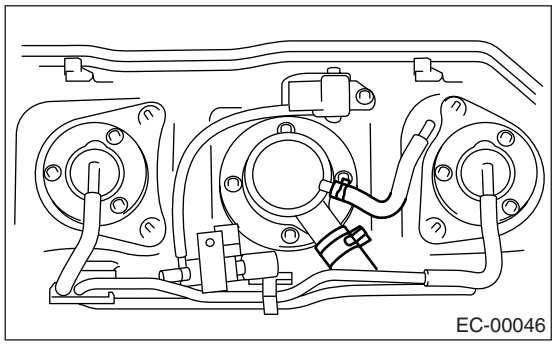
13.Vent Valve

A: REMOVAL

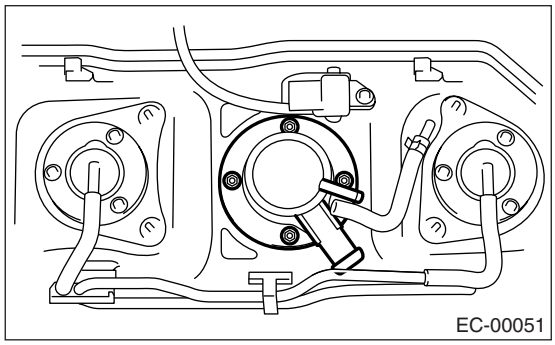
1) Remove the fuel tank. <Ref. to FU(H4SO)-48, REMOVAL, Fuel Tank.>
2) Remove the protector cover.



3) Remove the clips, and disconnect the hoses from vent valve.



4) Remove the nuts, and then remove the vent valve.

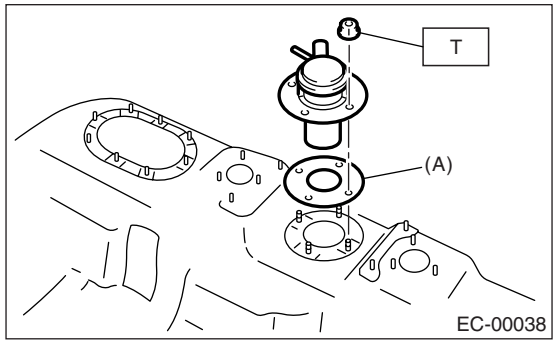


B: INSTALLATION

Install in the reverse order of removal.

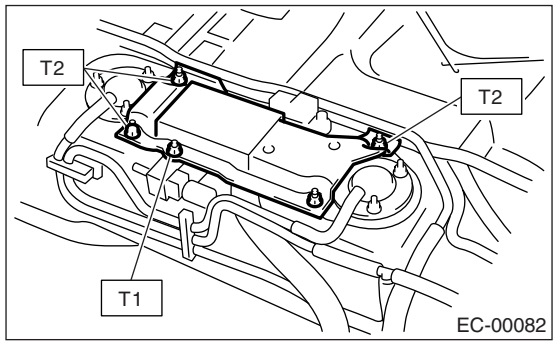
NOTE:
Replace the rubber seat with a new one.

Tightening torque:
T: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



(A) Rubber seat

Tightening torque:
T1: 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)
T2: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



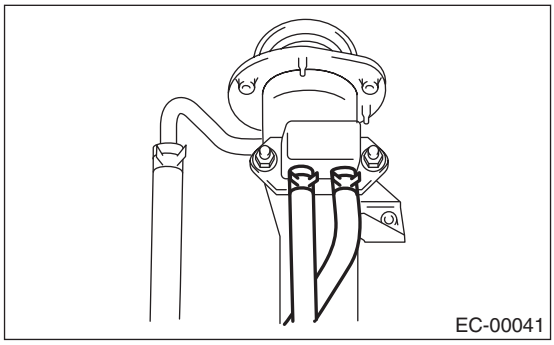
C: INSPECTION

Make sure the hoses are not cracked or loose.

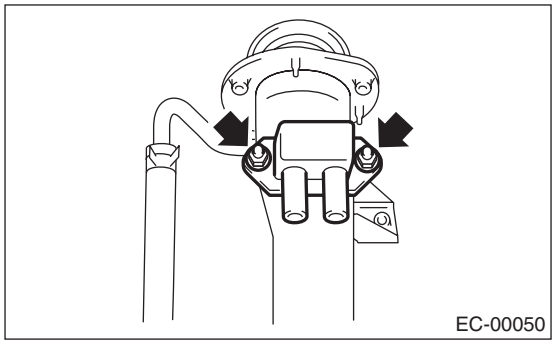
14.Shut Valve

A: REMOVAL

1) Remove the fuel filler pipe.
<Ref. to FU(H4SO)-51, REMOVAL, Fuel Filler Pipe.>
2) Disconnect the evaporation hoses from shut valve.



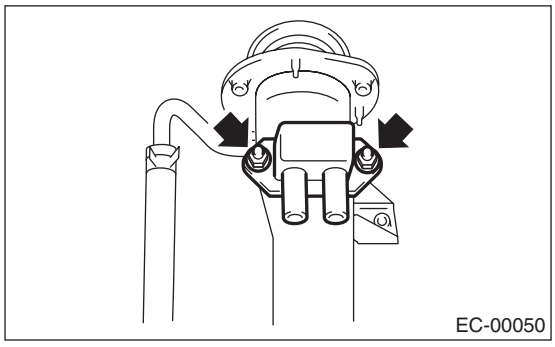
3) Remove the shut valve from fuel filler pipe.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.5 N·m (0.46 kgf-m, 3.3 ft-lb)



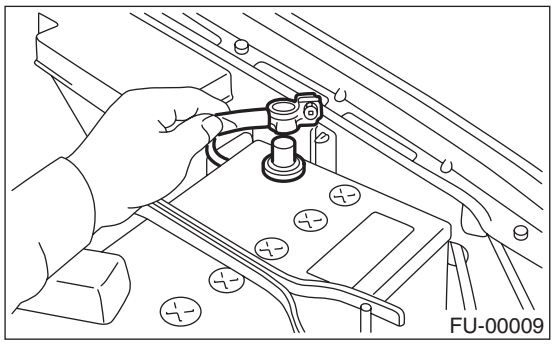
C: INSPECTION

Make sure the hoses are not cracked or loose.

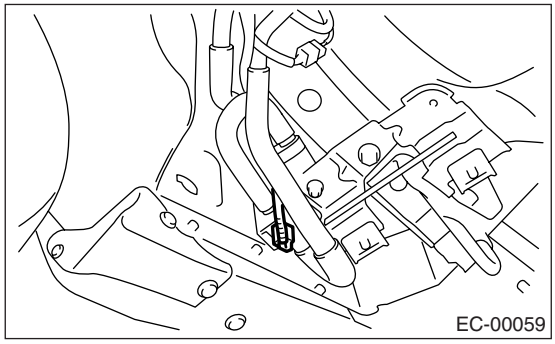
15.Drain Valve

A: REMOVAL

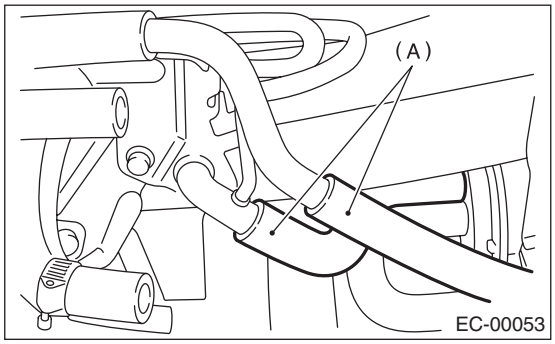
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



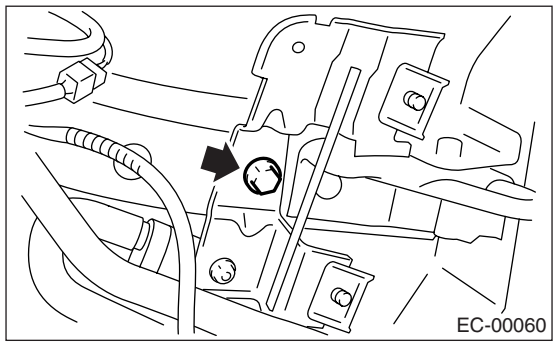
3) Lift up the vehicle.
4) Remove the canister. <Ref. to EC(H4SO)-5, REMOVAL, Canister.>
5) Disconnect the connector from drain valve.



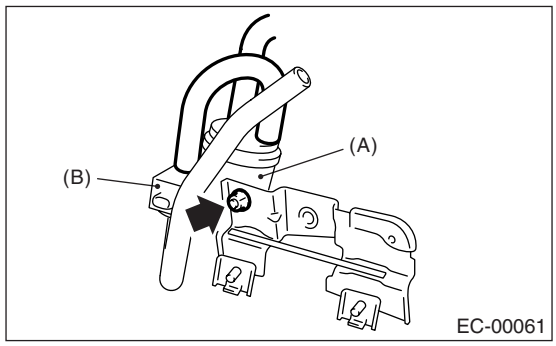
6) Disconnect the evaporation hoses (A) from joint pipes.



7) Remove the bolt which installs the drain filter and drain valve brackets on body, and remove them as a unit.



8) Disconnect the evaporation hoses from drain valve.
9) Remove the nuts, and then remove the drain valve.

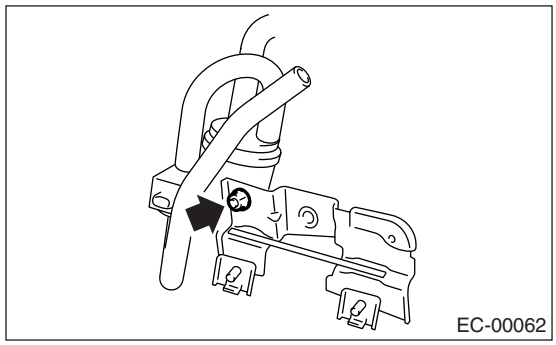


(A) Drain filter
(B) Drain valve

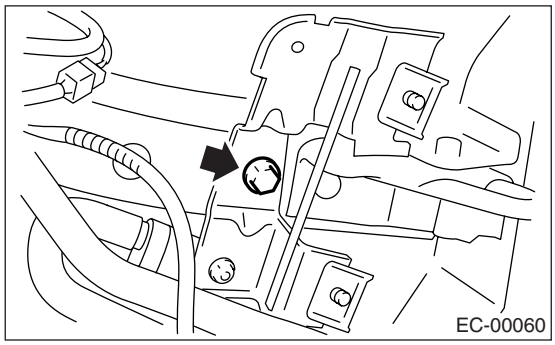
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
23 N·m (2.3 kgf-m, 16.6 ft-lb)



Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



C: INSPECTION

1) Make sure all hoses are installed correctly.
2) Make sure the hoses are not cracked or loose.

INTAKE (INDUCTION)

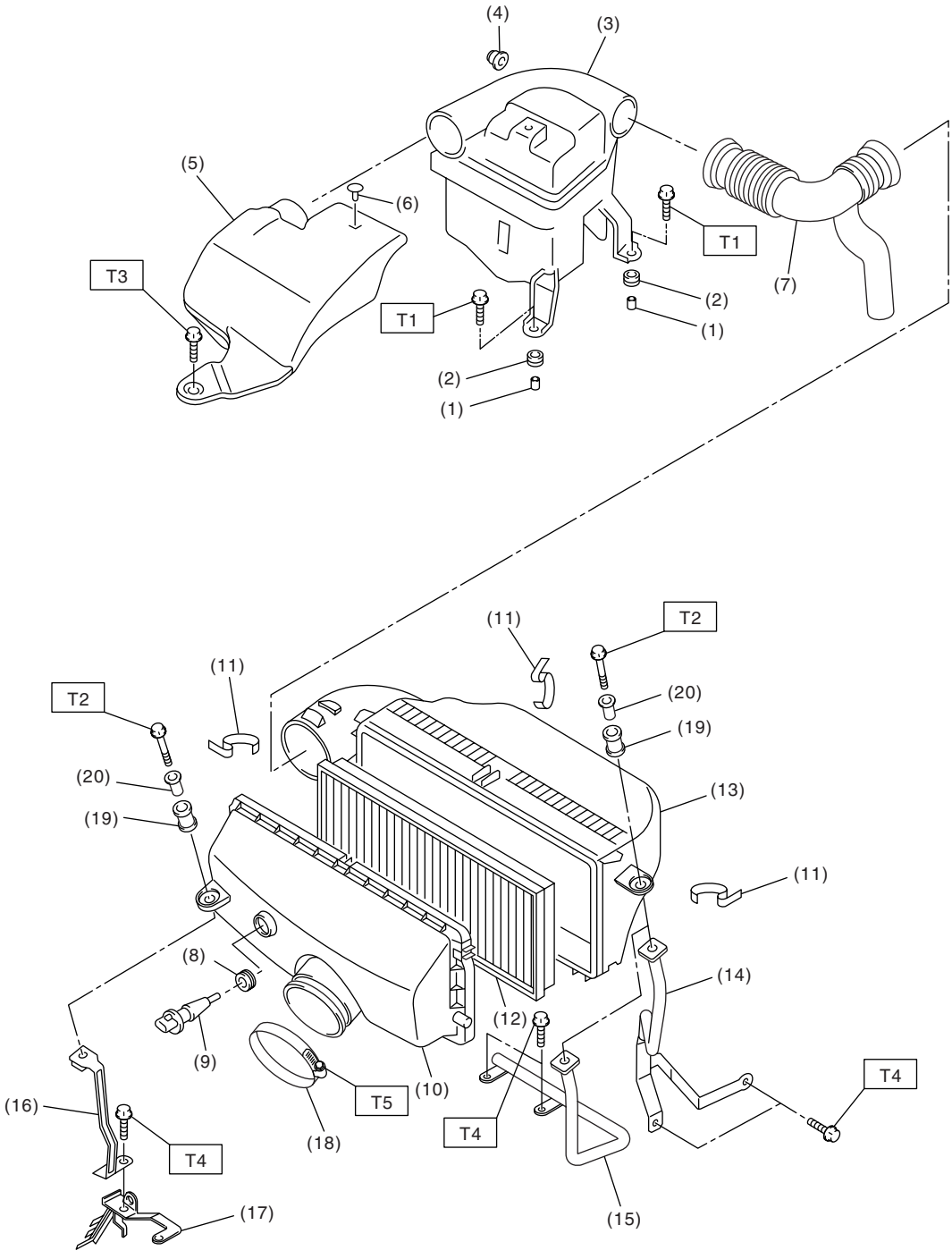
IN(H4SO)

Page

1. General Description 2
2. Air Cleaner Element 4
3. Air Cleaner Case 5
4. Air Intake Duct 6
5. Resonator Chamber 7

1. General Description

A: COMPONENT



IN-00188

(1) Spacer
(2) Bush
(3) Resonator chamber
(4) Cushion
(5) Air intake duct A
(6) Clip
(7) Air intake duct B
(8) Bush
(9) Intake air temperature sensor
(10) Air cleaner case A
(11) Clip
(12) Air cleaner element
(13) Air cleaner case B
(14) Stay LH (MT model)
(15) Stay LH (AT model)
(16) Stay RH
(17) Engine harness bracket
(18) Clamp
(19) Bush
(20) Spacer

Tightening torque: N·m (kgf-m, ft-lb)
T1: 33 (3.4, 24.6)
T2: 6.5 (0.66, 4.8)
T3: 7.5 (0.76, 5.5)
T4: 16 (1.6, 11.6)
T5: 3 (0.3, 2.2)

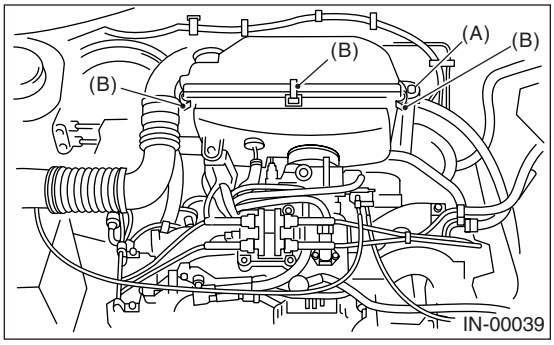
B: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensor or units, be sure to disconnect the ground cable from battery.

2. Air Cleaner Element

A: REMOVAL

1) Remove the air intake duct from air cleaner case.
2) Remove the bolt (A) which secures the air cleaner case to stay.
3) Remove the clip (B) above the air cleaner case.



4) Remove the air cleaner element.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
• Fasten with a clip after inserting the lower tab of case.
• Refer to “COMPONENT” for tightening torque. <Ref. to IN(H4SO)-2, COMPONENT, General Description.>

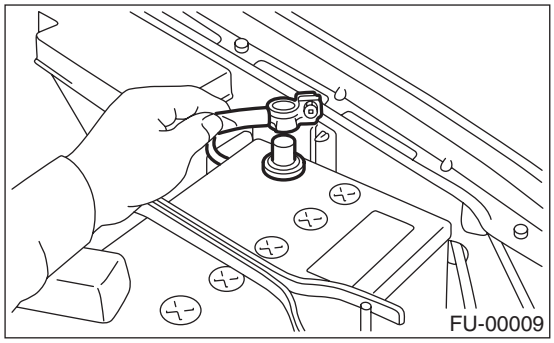
C: INSPECTION

Replace if excessively damaged or dirty.

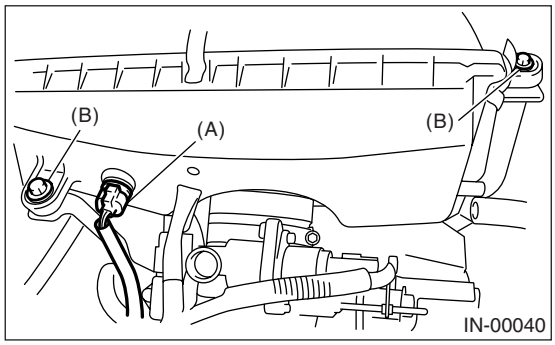
3. Air Cleaner Case

A: REMOVAL

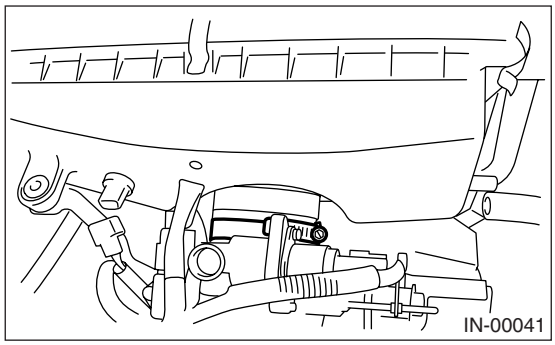
1) Disconnect the ground cable from battery.



2) Disconnect the connector (A) of intake air temperature sensor.
3) Remove the bolt (B) which installs the air cleaner case to the stay.



4) Disconnect the hoses and intake duct from the air cleaner case.
5) Loosen the clamp which connects the air cleaner case to throttle body.



6) Remove the air cleaner case.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Refer to “COMPONENT” for tightening torque. <Ref. to IN(H4SO)-2, COMPONENT, General Description.>

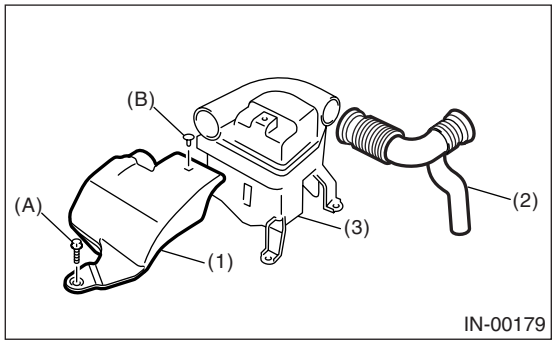
C: INSPECTION

Inspect for cracks and loose connections.

4. Air Intake Duct

A: REMOVAL

1) Remove the bolt (A) which installs the air intake duct A on front side of body.
2) Remove the clip (B) which connects the air intake duct A to resonator chamber.
3) Remove the air intake duct A.
4) Remove the air intake duct B from the resonator chamber and air cleaner case.



(1) Air intake duct A
(2) Air intake duct B
(3) Resonator chamber

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Refer to “COMPONENT” for tightening torque. <Ref. to IN(H4SO)-2, COMPONENT, General Description.>

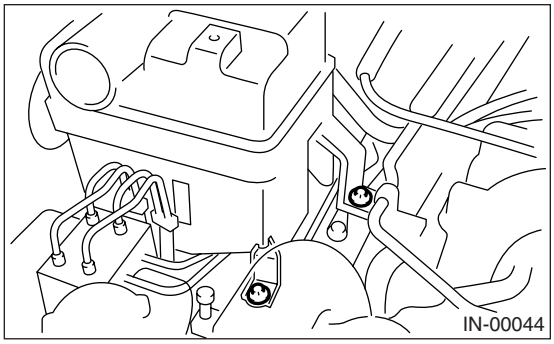
C: INSPECTION

1) Inspect for cracks and loose connections.
2) Inspect that no foreign objects are mixed in the air intake duct.

5. Resonator Chamber

A: REMOVAL

1) Remove the air intake duct. <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
2) Remove the resonator chamber.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Refer to “COMPONENT” for tightening torque. <Ref. to IN(H4SO)-2, COMPONENT, General Description.>

C: INSPECTION

Inspect for cracks and loose connections.

MECHANICAL

ME(H4SO)

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1. General Description

A: SPECIFICATIONS

Engine	Model			2.5 L
	Type			Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine
	Valve arrangement			Belt driven, single over-head camshaft, 4-valve/cylinder
	Bore × Stroke		mm (in)	99.5 × 79.0 (3.917 × 3.110)
	Displacement		cm^3 (cu in)	2,457 (150)
	Compression ratio			10.0
	Compression pressure (at 350 rpm)		kPa (kg/cm^2, psi)	1,020 — 1,275 (10.4 — 13.0, 148 — 185)
	Number of piston rings			Pressure ring: 2, Oil ring: 1
	Intake valve timing	Opening		1° BTDC
		Closing		51° ABDC
	Exhaust valve timing	Opening		50° BBDC
		Closing		6° ATDC
	Valve clearance	STD	Intake mm (in)	0.20±0.02 (0.0079±0.0008)
			Exhaust mm (in)	0.25±0.02 (0.0098±0.0008)
		Limit	Intake mm (in)	0.20±0.04 (0.0079±0.0016)
			Exhaust mm (in)	0.25±0.04 (0.0098±0.0016)
	Idling speed [At neutral position on MT, or “P” or “N” position on AT]	rpm	No load	650±100 (MT model) 700±100 (AT model)
			A/C ON	850±100
	Firing order			1 → 3 → 2 → 4
	Ignition timing		BTDC/rpm	10°±8°/650 (MT model) 15°±8°/700 (AT model)

NOTE:
STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter US: Undersize OS: Oversize

Belt tensioner adjuster	Protrusion of adjuster rod			5.2 — 6.2 mm (0.205 — 0.244 in)
Belt tensioner	Spacer O.D.			17.955 — 17.975 mm (0.7069 — 0.7077 in)
	Tensioner bush I.D.			18.00 — 18.08 mm (0.7087 — 0.7118 in)
	Clearance between spacer and bush		STD	0.025 — 0.125 mm (0.0010 — 0.0049 in)
			Limit	0.175 mm (0.0069 in)
	Side clearance of spacer		STD	0.20 — 0.55 mm (0.0079 — 0.0217 in)
			Limit	0.81 mm (0.0319 in)
Valve rocker arm	Clearance between shaft and arm		STD	0.020 — 0.054 mm (0.0008 — 0.0021 in)
			Limit	0.10 mm (0.0039 in)
Camshaft	Bend limit			0.025 mm (0.00098 in)
	Thrust clearance		STD	0.030 — 0.090 mm (0.0012 — 0.0035 in)
			Limit	0.10 mm (0.0039 in)
	Cam lobe height	Intake	STD	39.485 — 39.585 mm (1.5545 — 1.5585 in)
			Limit	39.385 mm (1.5506 in)
		Exhaust	STD	39.257 — 39.357 mm (1.5455 — 1.5495 in)
			Limit	39.157 mm (1.5416 in)
	Camshaft journal O.D.			31.928 — 31.945 mm (1.2570 — 1.2577 in)
	Camshaft journal hole I.D.			32.000 — 32.018 mm (1.2598 — 1.2605 in)
	Oil clearance		STD	0.055 — 0.090 mm (0.0022 — 0.0035 in)
			Limit	0.10 mm (0.0039 in)

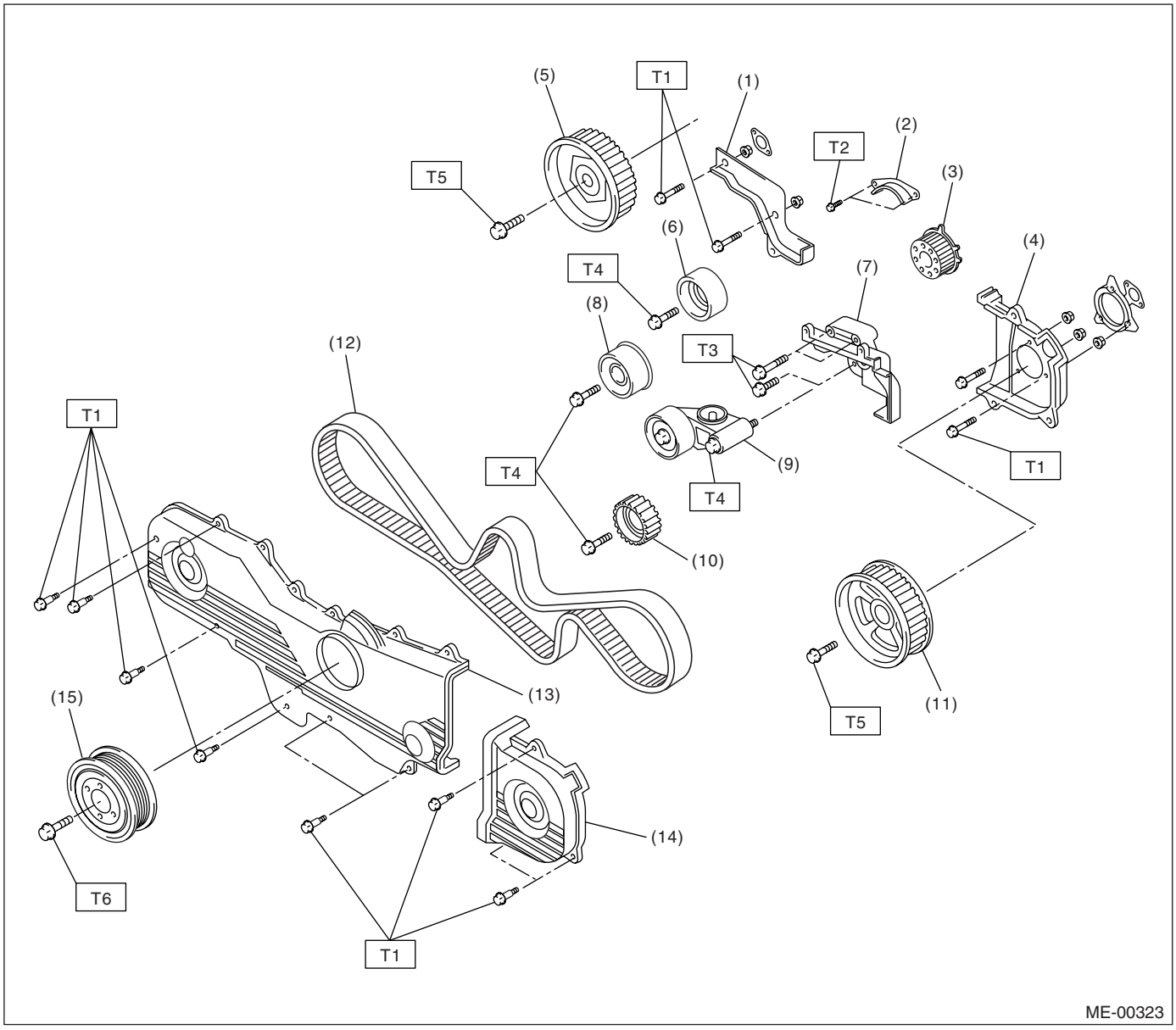
Cylinder head	Surface warpage limit			0.05 mm (0.0020 in)
	Surface grinding limit			0.1 mm (0.004 in)
	Standard height			97.5 mm (3.84 in)
Valve seat	Refacing angle			90°
	Contacting width	Intake	STD	1.0 mm (0.039 in)
			Limit	1.7 mm (0.067 in)
		Exhaust	STD	1.5 mm (0.059 in)
			Limit	2.2 mm (0.087 in)
Valve guide	Inner diameter			6.000 — 6.012 mm (0.2362 — 0.2367 in)
	Protrusion above head		Intake	20.0 — 20.5 mm (0.787 — 0.807 in)
			Exhaust	16.5 — 17.0 mm (0.650 — 0.669 in)
Valve	Head edge thickness	Intake	STD	1.0 mm (0.039 in)
			Limit	0.6 mm (0.024 in)
		Exhaust	STD	1.2 mm (0.047 in)
			Limit	0.6 mm (0.024 in)
	Stem diameter		Intake	5.950 — 5.965 mm (0.2343 — 0.2348 in)
			Exhaust	5.945 — 5.960 mm (0.2341 — 0.2346 in)
	Stem oil clearance	STD	Intake	0.035 — 0.062 mm (0.0014 — 0.0024 in)
			Exhaust	0.040 — 0.067 mm (0.0016 — 0.0026 in)
		Limit	—	0.15 mm (0.0059 in)
	Overall length		Intake	120.6 mm (4.75 in)
			Exhaust	121.7 mm (4.79 in)
Valve spring	Free length			54.30 mm (2.1378 in)
	Squareness			2.5°, 2.4 mm (0.094 in)
	Tension/spring height		Set	214 — 246 N (22 — 25 kgf, 48 — 55 lb)/ 45.0 mm (1.772 in)
			Lift	526 — 582 N (54 — 59 kgf, 119 — 130 lb)/ 34.7 mm (1.366 in)
Cylinder block	Surface warpage limit (mating with cylinder head)			0.05 mm (0.0020 in)
	Surface grinding limit			0.1 mm (0.004 in)
	Standard height			201.0 mm (7.91 in)
	Cylinder bore	STD	A	99.505 — 99.515 mm (3.9175 — 3.9179 in)
			B	99.495 — 99.505 mm (3.9171 — 3.9175 in)
	Taper		STD	0.015 mm (0.0006 in)
			Limit	0.050 mm (0.0020 in)
	Out-of-roundness		STD	0.010 mm (0.0004 in)
			Limit	0.050 mm (0.0020 in)
	Piston clearance		STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.050 mm (0.0020 in)
	Enlarging (boring) limit			0.5 mm (0.020 in)
Piston	Outer diameter	STD	A	99.485 — 99.495 mm (3.9167 — 3.9171 in)
			B	99.475 — 99.485 mm (3.9163 — 3.9167 in)
		0.25 mm (0.0098 in) OS		99.725 — 99.735 mm (3.9262 — 3.9266 in)
		0.50 mm (0.0197 in) OS		99.975 — 99.985 mm (3.9360 — 3.9364 in)
	Standard inner diameter of piston pin hole			23.000 — 23.006 mm (0.9055 — 0.9057 in)
Piston pin	Outer diameter			22.994 — 23.000 mm (0.9053 — 0.9055 in)
	Standard clearance between piston pin and hole in piston			0.004 — 0.008 mm (0.0002 — 0.0003 in)
	Degree of fit			Piston pin must be fitted into position with thumb at 20°C (68°F).

Piston ring	Piston ring gap	Top ring	STD	0.20 — 0.35 mm (0.0079 — 0.0138 in)
			Limit	1.0 mm (0.039 in)
		Second ring	STD	0.35 — 0.50 mm (0.0138 — 0.0197 in)
			Limit	1.0 mm (0.039 in)
		Oil ring	STD	0.20 — 0.50 mm (0.0079 — 0.0197 in)
			Limit	1.5 mm (0.059 in)
	Clearance between piston ring and piston ring groove	Top ring	STD	0.040 — 0.080 mm (0.0016 — 0.0031 in)
			Limit	0.15 mm (0.0059 in)
		Second ring	STD	0.030 — 0.070 mm (0.0012 — 0.0028 in)
			Limit	0.15 mm (0.0059 in)
Connecting rod	Bend twist per 100 mm (3.94 in) in length		Limit	0.10 mm (0.0039 in)
	Side clearance		STD	0.070 — 0.330 mm (0.0028 — 0.0130 in)
			Limit	0.4 mm (0.016 in)
Connecting rod bearing	Oil clearance		STD	0.012 — 0.038 mm (0.0005 — 0.0014 in)
			Limit	0.05 mm (0.0020 in)
	Thickness at center portion		STD	1.490 — 1.502 mm (0.0587 — 0.0591 in)
			0.03 mm (0.0012 in) US	1.504 — 1.512 mm (0.0592 — 0.0595 in)
			0.05 mm (0.0020 in) US	1.514 — 1.522 mm (0.0596 — 0.0599 in)
			0.25 mm (0.0098 in) US	1.614 — 1.622 mm (0.0635 — 0.0639 in)
Connecting rod bushing	Clearance between piston pin and bushing		STD	0 — 0.022 mm (0 — 0.0009 in)
			Limit	0.030 mm (0.0012 in)

Crankshaft	Bend limit			0.035 mm (0.0014 in)
	Crank pin and crank journal	Out-of-roundness		0.020 mm (0.0008 in) or less
		Grinding limit		0.250 mm (0.0098 in)
	Crank pin outer diameter		STD	51.984 — 52.000 mm (2.0466 — 2.0472 in)
			0.03 mm (0.0012 in) US	51.954 — 51.970 mm (2.0454 — 2.0461 in)
			0.05 mm (0.0020 in) US	51.934 — 51.950 mm (2.0446 — 2.0453 in)
			0.25 mm (0.0098 in) US	51.734 — 51.750 mm (2.0368 — 2.0374 in)
	Crank journal outer diameter	#1, #3	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
		#2, #4, #5	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
	Thrust clearance		STD	0.030 — 0.115 mm (0.0012 — 0.0045 in)
			Limit	0.25 mm (0.0098 in)
	Oil clearance	#1	STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#2	STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.045 mm (0.0018 in)
		#3	STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#4	STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.045 mm (0.0018 in)
		#5	STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
Crankshaft bearing	Crankshaft bearing thickness	#1, #3	STD	1.998 — 2.011 mm (0.0787 — 0.0792 in)
			0.03 mm (0.0012 in) US	2.017 — 2.020 mm (0.0794 — 0.0795 in)
			0.05 mm (0.0020 in) US	2.027 — 2.030 mm (0.0798 — 0.0799 in)
			0.25 mm (0.0098 in) US	2.127 — 2.130 mm (0.0837 — 0.0839 in)
		#2, #4, #5	STD	2.000 — 2.013 mm (0.0787 — 0.0793 in)
			0.03 mm (0.0012 in) US	2.019 — 2.022 mm (0.0795 — 0.0796 in)
			0.05 mm (0.0020 in) US	2.029 — 2.032 mm (0.0799 — 0.0800 in)
			0.25 mm (0.0098 in) US	2.129 — 2.132 mm (0.0838 — 0.0839 in)

B: COMPONENT

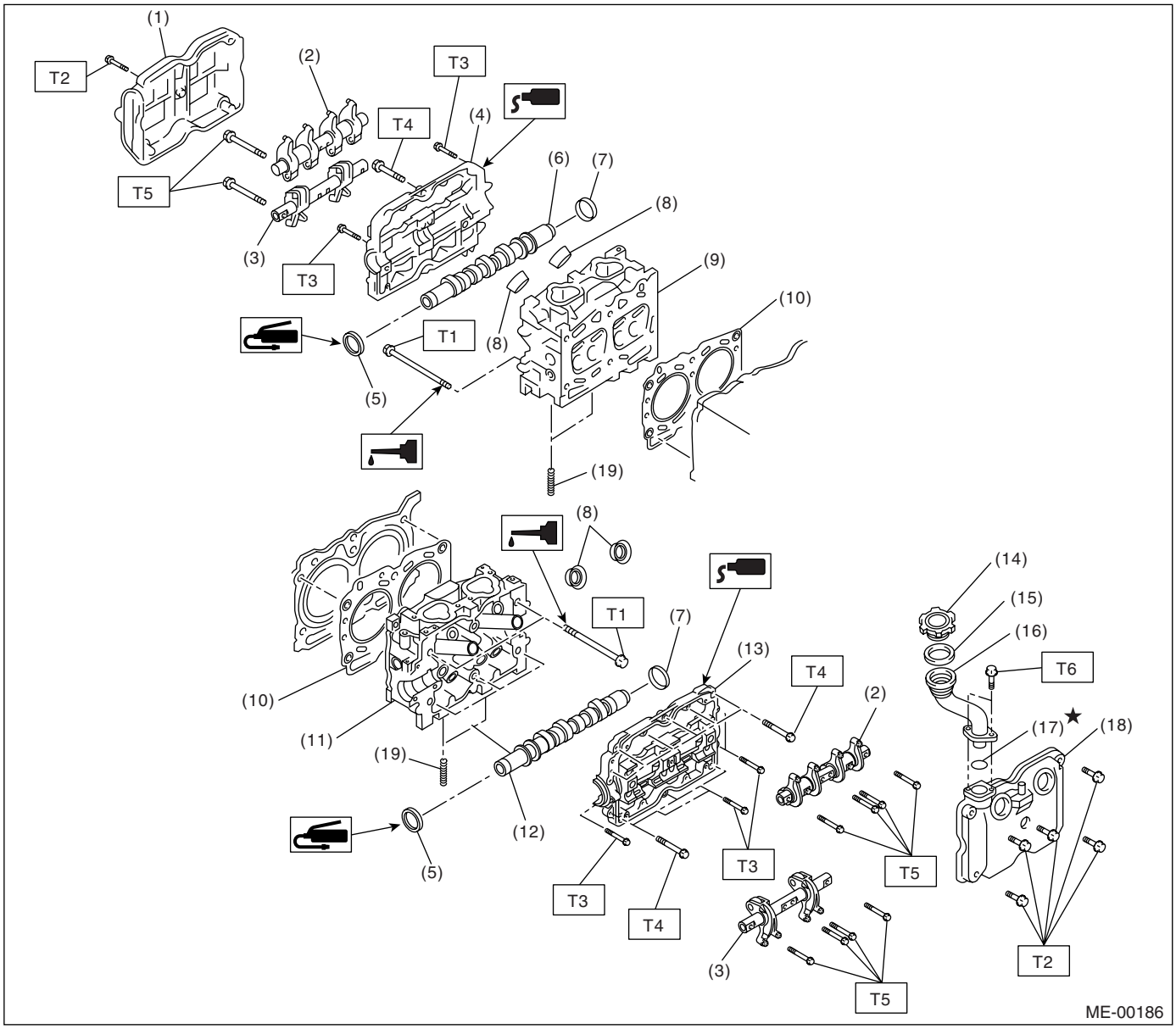
1. TIMING BELT



(1) Timing belt cover No. 2 (RH)
(2) Timing belt guide (MT model)
(3) Crankshaft sprocket
(4) Timing belt cover No. 2 (LH)
(5) Camshaft sprocket No. 1
(6) Belt idler (No. 1)
(7) Tensioner bracket
(8) Belt idler (No. 2)
(9) Automatic belt tension adjuster ASSY
(10) Belt idler No. 2
(11) Camshaft sprocket No. 2
(12) Timing belt
(13) Front timing belt cover
(14) Timing belt cover (LH)
(15) Crankshaft pulley

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 10 (1.0, 7.2)
T3: 25 (2.5, 18.1)
T4: 39 (4.0, 28.9)
T5: 78 (8.0, 57.9)
T6: <Ref. to ME(H4SO)-42, INSTALLATION, Crankshaft Pulley.>

2. CYLINDER HEAD AND CAMSHAFT

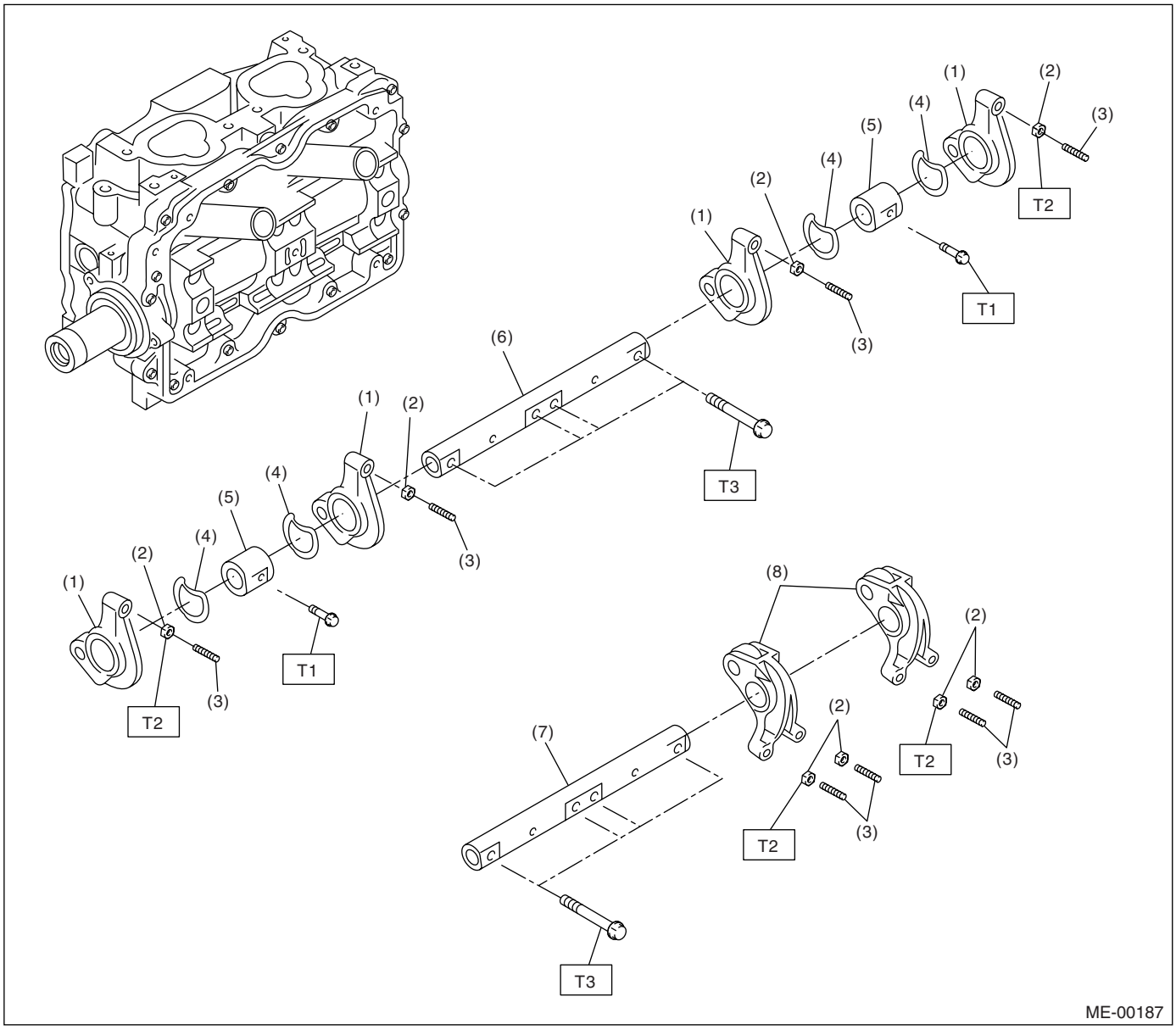


(1) Rocker cover (RH)
(2) Intake valve rocker ASSY
(3) Exhaust valve rocker ASSY
(4) Camshaft cap (RH)
(5) Oil seal
(6) Camshaft (RH)
(7) Plug
(8) Spark plug pipe gasket
(9) Cylinder head (RH)
(10) Cylinder head gasket
(11) Cylinder head (LH)
(12) Camshaft (LH)
(13) Camshaft cap (LH)
(14) Oil filler cap
(15) Gasket
(16) Oil filler duct
(17) O-ring
(18) Rocker cover (LH)
(19) Stud bolt

Tightening torque: N·m (kgf-m, ft-lb)

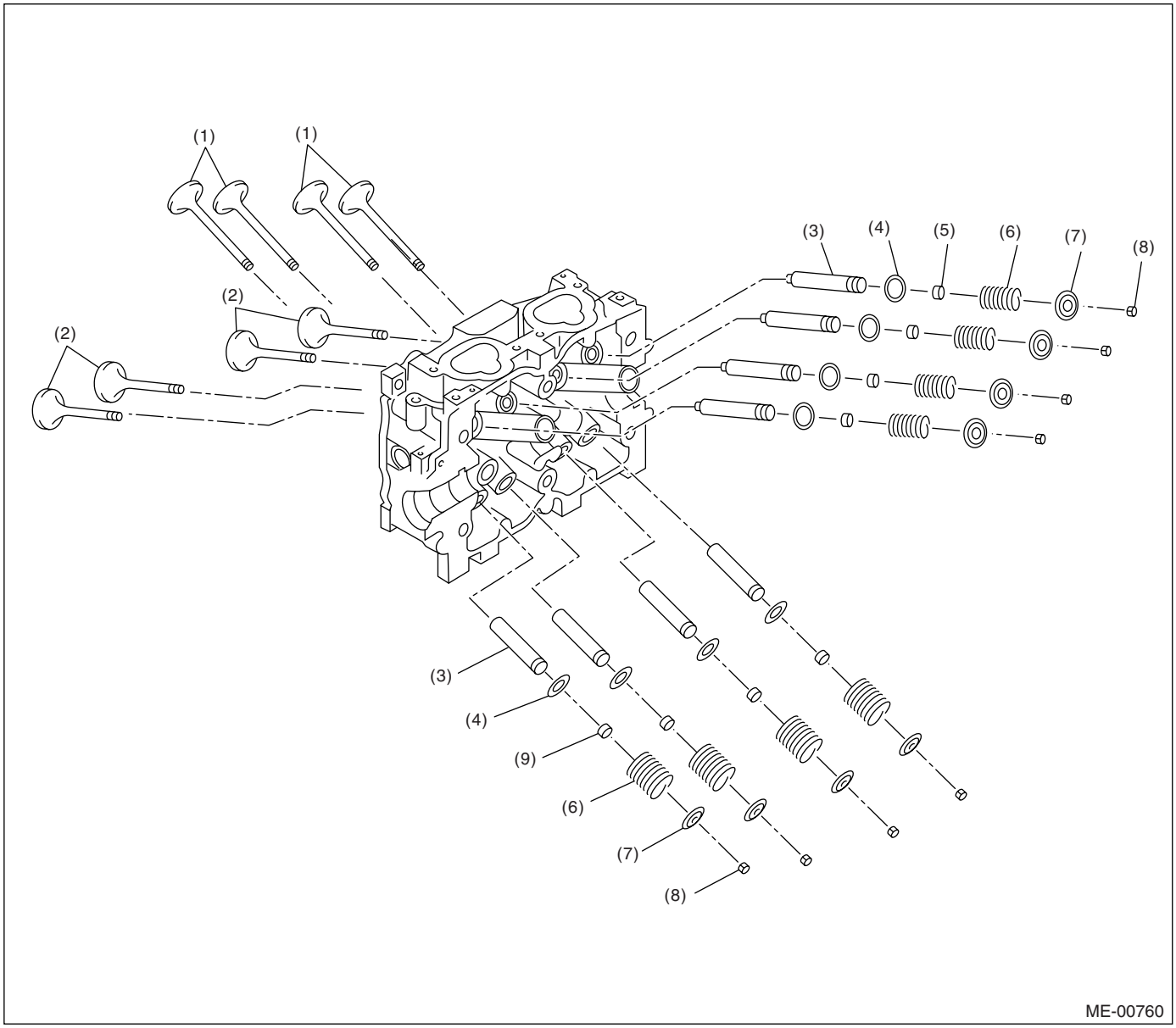
T1: <Ref. to ME(H4SO)-58, INSTALLATION, Cylinder Head Assembly.>
T2: 5 (0.5, 3.6)
T3: 10 (1.0, 7.2)
T4: 18 (1.8, 13.0)
T5: 25 (2.5, 18.1)
T6: 6.4 (0.65, 4.7)

3. VALVE ROCKER ASSEMBLY



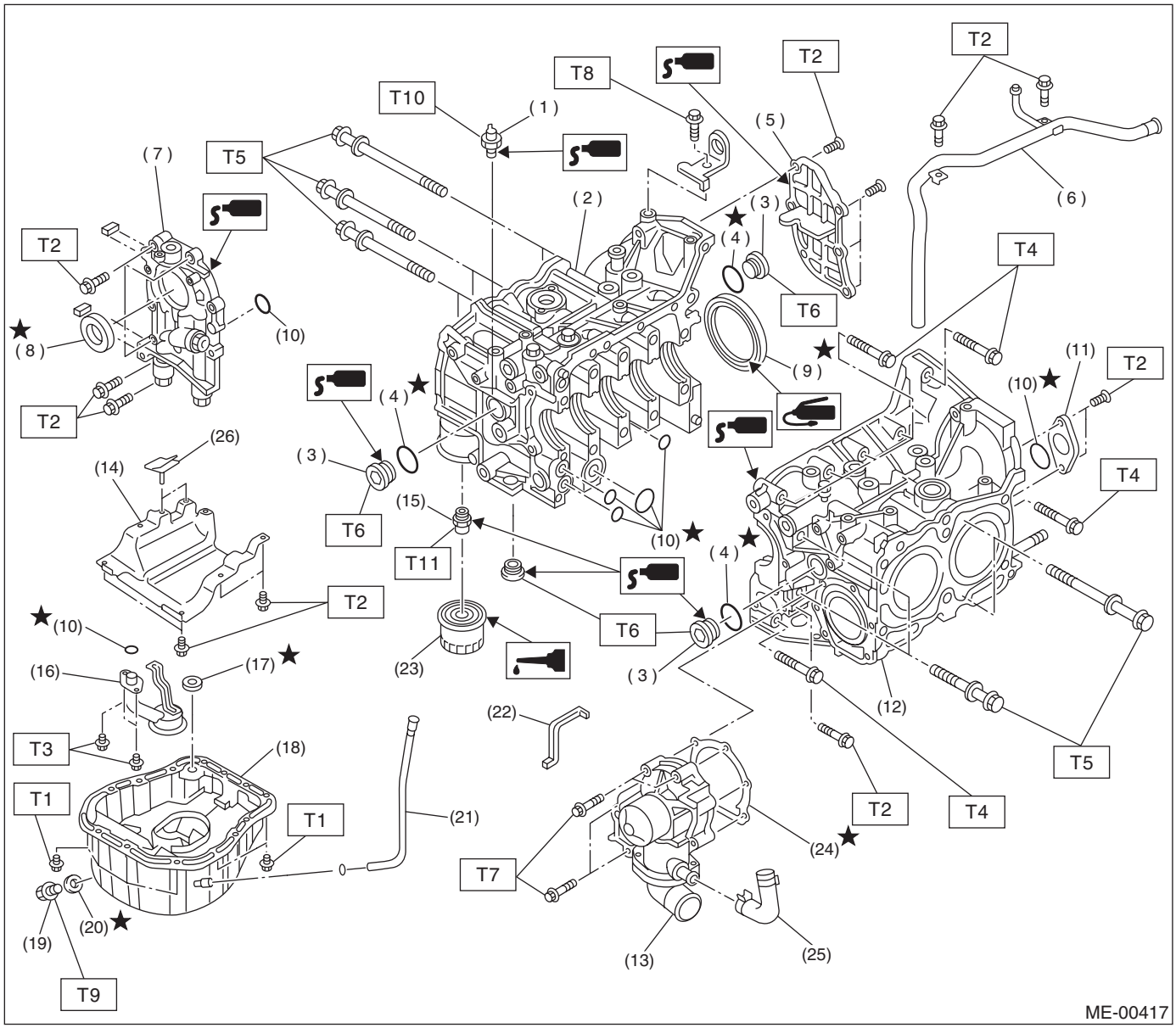
(1)	Intake valve rocker arm	(5)	Rocker shaft support	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Valve rocker nut	(6)	Intake rocker shaft	***T1: 5 (0.5, 3.6)***
(3)	Valve rocker adjust screw	(7)	Exhaust rocker shaft	***T2: 10 (1.0, 7.2)***
(4)	Spring	(8)	Exhaust valve rocker arm	***T3: 25 (2.5, 18.1)***

4. CYLINDER HEAD AND VALVE ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Valve guide
(4) Valve spring seat
(5) Intake valve oil seal
(6) Valve spring
(7) Retainer
(8) Retainer key
(9) Exhaust valve oil seal

5. CYLINDER BLOCK

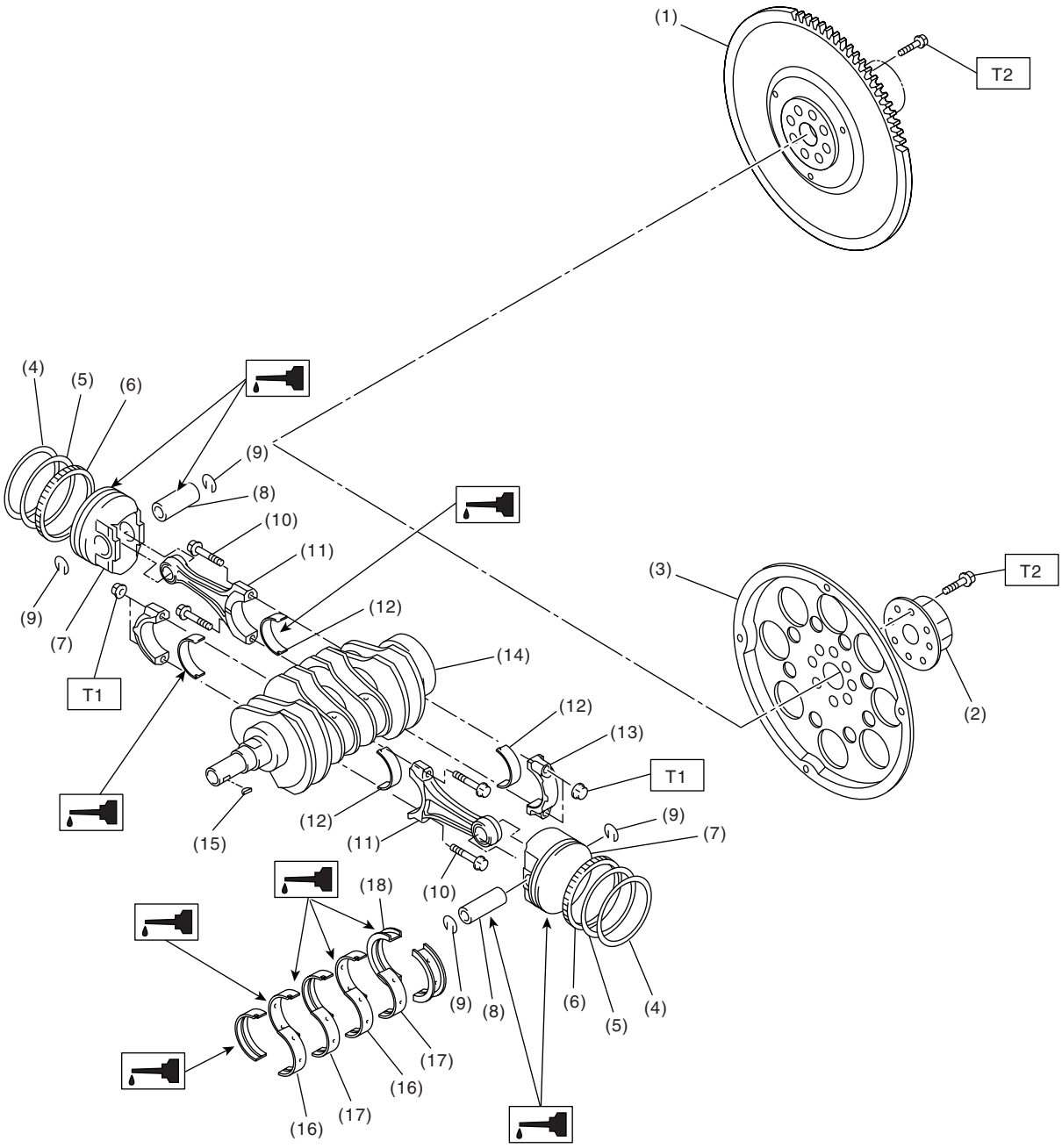


(1) Oil pressure switch
(2) Cylinder block (RH)
(3) Service hole plug
(4) Gasket
(5) Oil separator cover
(6) Water by-pass pipe
(7) Oil pump
(8) Front oil seal
(9) Rear oil seal
(10) O-ring
(11) Service hole cover
(12) Cylinder block (LH)
(13) Water pump
(14) Baffle plate
(15) Oil filter connector
(16) Oil strainer
(17) Gasket
(18) Oil pan
(19) Drain plug
(20) Metal gasket
(21) Oil level gauge guide
(22) Water pump sealing
(23) Oil filter
(24) Gasket
(25) Water pump hose
(26) Seal

Tightening torque: N·m (kgf-m, ft-lb)

T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7.2)
T4: 25 (2.5, 18.1)
T5: <Ref. to ME(H4SO)-68, INSTALLATION, Cylinder Block.>
T6: 70 (7.1, 50.6)
T7: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)
T8: 16 (1.6, 11.6)
T9: 44 (4.5, 33)
T10: 25 (2.5, 18.1)
T11: 45 (4.6, 33.3)

6. CRANKSHAFT AND PISTON

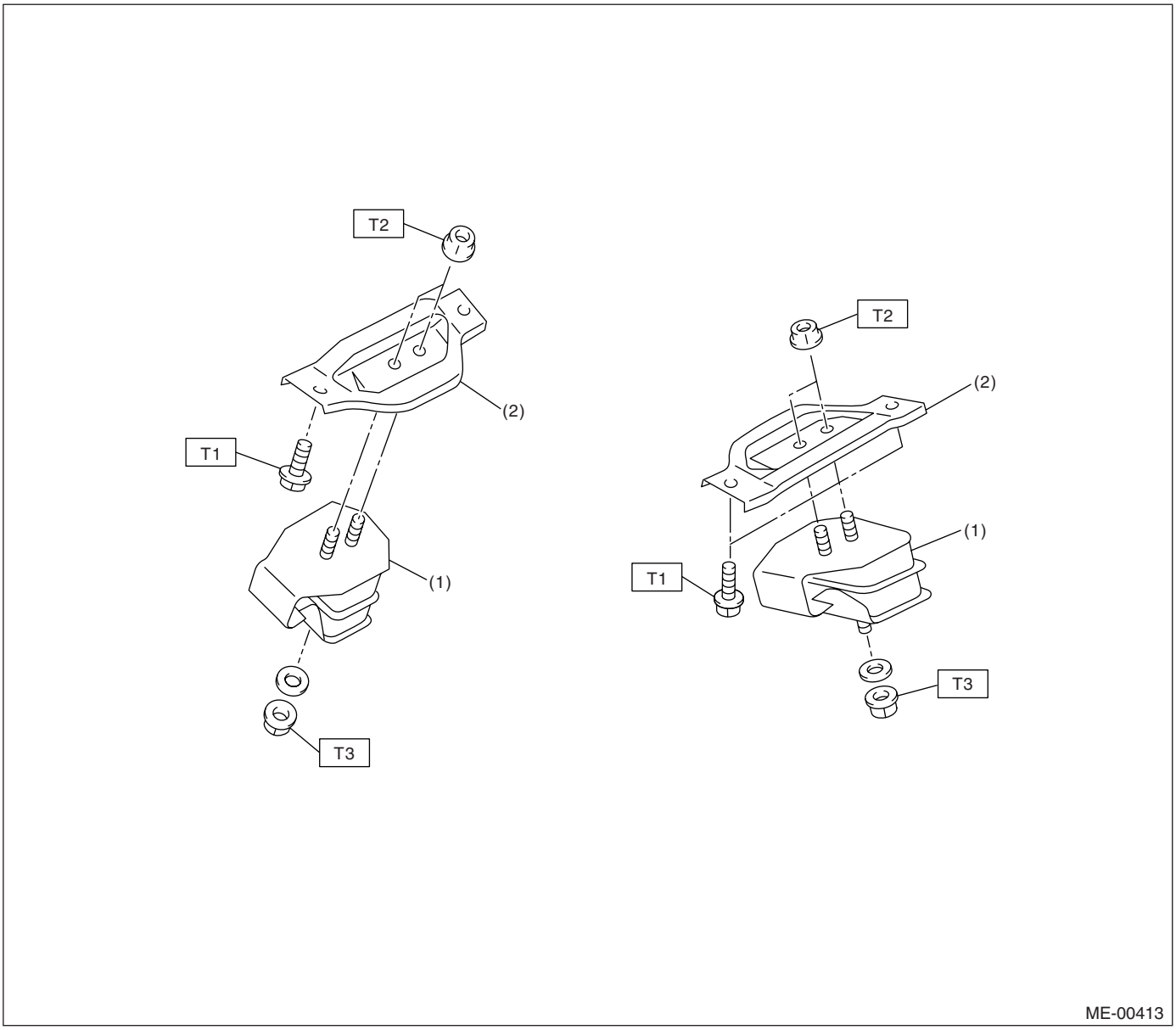


ME-00190

(1) Flywheel (MT model)
(2) Reinforcement (AT model)
(3) Drive plate (AT model)
(4) Top ring
(5) Second ring
(6) Oil ring
(7) Piston
(8) Piston pin
(9) Circlip
(10) Connecting rod bolt
(11) Connecting rod
(12) Connecting rod bearing
(13) Connecting rod cap
(14) Crankshaft
(15) Woodruff key
(16) Crankshaft bearing #1, #3
(17) Crankshaft bearing #2, #4
(18) Crankshaft bearing #5

Tightening torque: N·m (kgf-m, ft-lb)
T1: 45 (4.6, 33.3)
T2: 72 (7.3, 52.8)

7. ENGINE MOUNTING



(1) Front cushion rubber
(2) Front engine mounting bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 25.8)
T2: 42 (4.3, 31.0)
T3: 85 (8.7, 63)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
• All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
• Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
• Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
• All removed parts, if to be reused, should be reinstalled in the original positions and directions.
• Bolts, nuts and washers should be replaced with new ones as required.
• Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
• Remove or install engine in an area where chain hoists, lifting devices, etc. are available for ready use.
• Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
• Prior to starting work, prepare the following:
Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
• Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

D: PREPARATION TOOL

1. SPECIAL TOOLS

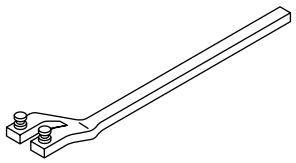
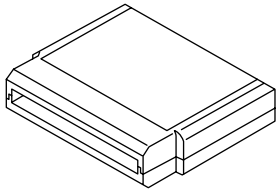
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18231AA010	18231AA010	CAMSHAFT SPROCKET WRENCH	• Used for removing and installing camshaft sprocket. (LH side) • Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.

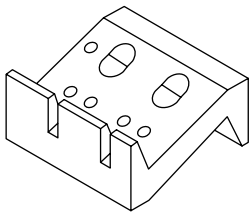
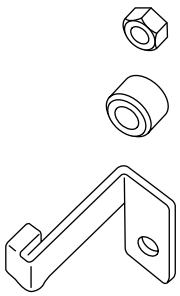
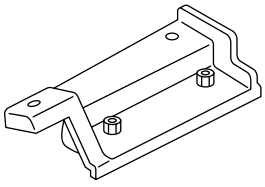
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.
 ST-498267800	498267800	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve springs.
 ST-498277200	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 ST-498457000	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817100).

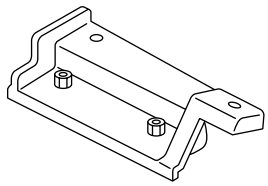
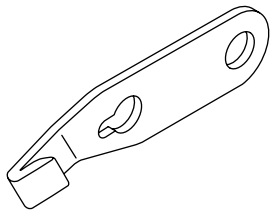
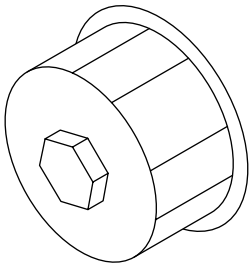
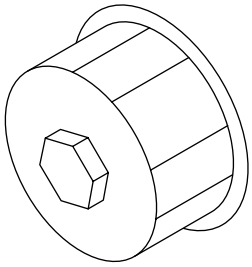
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498457100	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817100).
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crankshaft pulley bolt, etc.
 ST-498547000	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 80 mm (3.15 in))
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in))

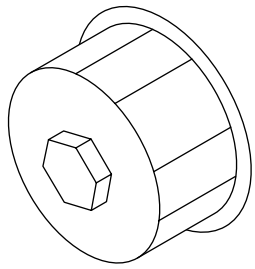
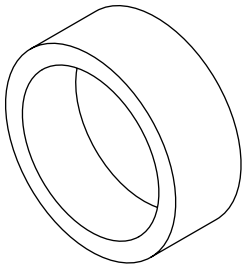
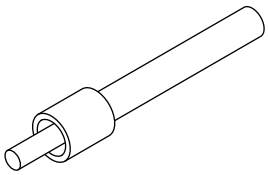
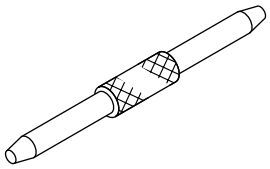
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18332AA010	18332AA010	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in))
 ST-498747300	498747300	PISTON GUIDE	Used for installing piston in cylinder. (2.5 L model)
 ST-498857100	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 ST-499017100	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.

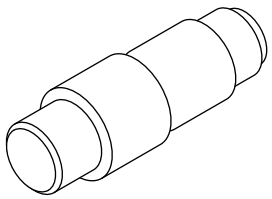
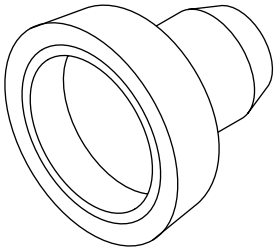
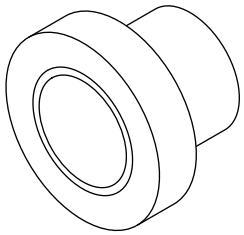
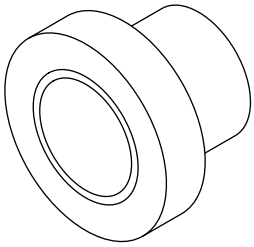
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499037100	499037100	CONNECTING ROD BUSHING REMOVER & INSTALLER	Used for removing and installing connecting rod bushing.
 ST-499587200	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).
 ST-499587500	499587500	OIL SEAL INSTALLER	• Used for installing camshaft oil seal. • Used with OIL SEAL GUIDE (499597000).
 ST-499587700	499587700	CAMSHAFT OIL SEAL INSTALLER	Used for installing cylinder head plug.

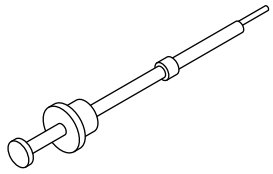
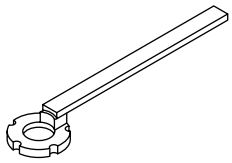
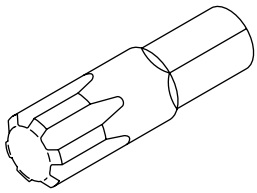
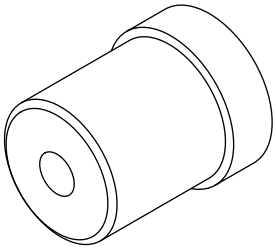
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499097700	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 ST-499207400	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket. (RH side)
 ST-499497000	499497000	TORX® PLUS	Used for removing and installing camshaft cap.
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.

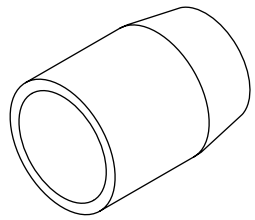
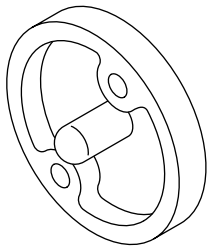
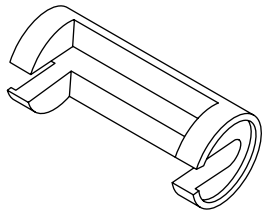
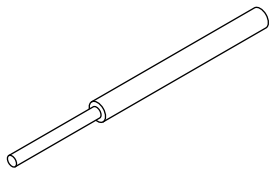
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499597000	499597000	OIL SEAL GUIDE	• Used for installing camshaft oil seal. • Used with CAMSHAFT OIL SEAL INSTALLER (499587500).
 ST-499597100	499597100	CRANKSHAFT OIL SEAL GUIDE	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 ST-499767200	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.

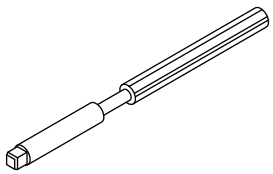
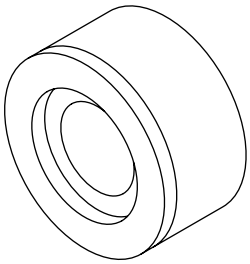
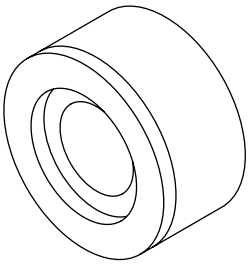
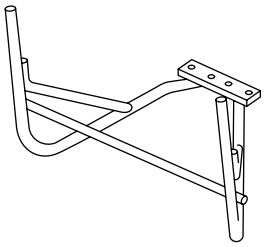
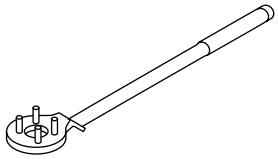
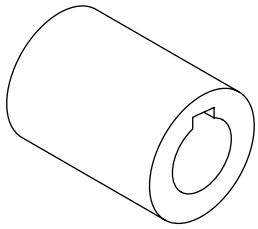
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499767400	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST-499767700	499767700	VALVE GUIDE ADJUSTER	Used for installing valve guide. (Intake side)
 ST-499767800	499767800	VALVE GUIDE ADJUSTER	Used for installing valve guide. (Exhaust side)
 ST-499817100	499817100	ENGINE STAND	• Stand used for engine disassembly and assembly. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	499977100	CRANKSHAFT PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts. (2.5 L model)
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Compression Gauge	Used for measuring compression.
Tachometer (Secondary pick-up type)	Used for measuring idle speed.
Timing Light	Used for measuring ignition timing.

E: PROCEDURE

It is possible to conduct the following service procedures with engine on the vehicle; however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- V-belt
- Timing Belt
- Valve Rocker Assembly
- Camshaft
- Cylinder Head

2. Compression

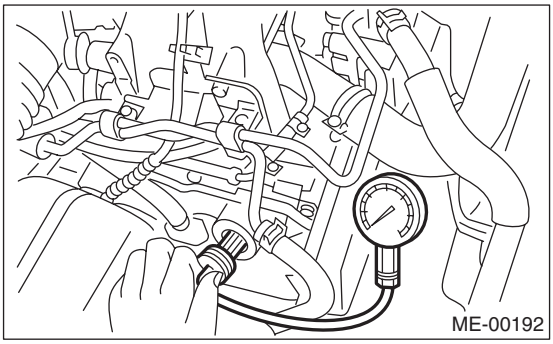
A: INSPECTION

CAUTION:
After warming up, engine becomes very hot. Be careful not to burn yourself during measurement.

1) After warming up the engine, turn the ignition switch to OFF.
2) Make sure that the battery is fully charged.
3) Release the fuel pressure. <Ref. to FU(H4SO)-47, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
4) Remove all the spark plugs. <Ref. to IG(H4SO)-4, REMOVAL, Spark Plug.>
5) Fully open the throttle valve.
6) Check the starter motor for satisfactory performance and operation.
7) Hold the compression gauge tight against spark plug hole.

NOTE:
When using a screw-in type compression gauge, the screw (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.

8) Crank the engine by means of starter motor, and then read the maximum value on the gauge when the pointer is steady.



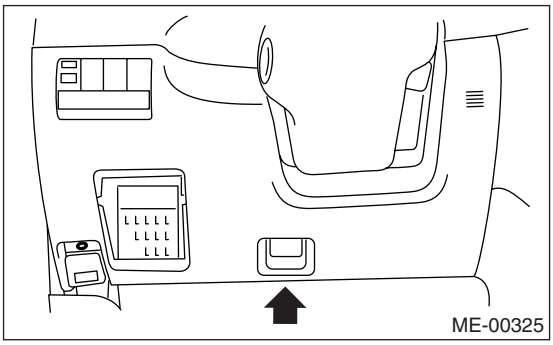
9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):
Standard;
1,275 kPa (13.0 kgf/cm^2, 185 psi)
Limit;
1,020 kPa (10.4 kgf/cm^2, 148 psi)
Difference between cylinders;
49 kPa (0.5 kgf/cm^2, 7 psi), or less

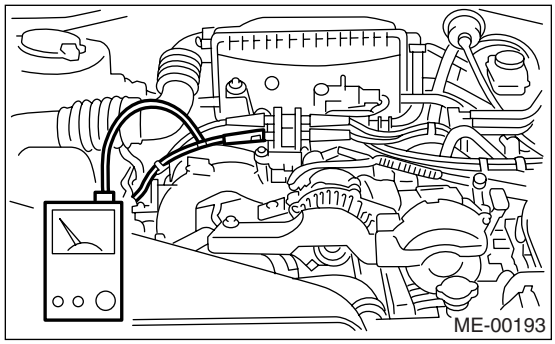
3. Idle Speed

A: INSPECTION

1) Before checking idle speed, check the following:
   (1) Ensure the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and the hoses are connected properly.
   (2) Ensure the malfunction indicator light does not illuminate.
2) Warm up the engine.
3) Stop the engine, and then turn the ignition switch to OFF.
4) When using the SUBARU SELECT MONITOR, refer to the following. <Ref. to ME(H4SO)-13, SPECIAL TOOLS, PREPARATION TOOL, General Description.>
   (1) Insert the cartridge to SUBARU SELECT MONITOR.
   (2) Connect the SUBARU SELECT MONITOR to data link connector.


ME-00325

   (3) Turn the ignition switch to ON, and turn the SUBARU SELECT MONITOR switch to ON.
   (4) Select the {2. Each System Check} in Main Menu.
   (5) Select the {Engine Control System} in Selection Menu.
   (6) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.
   (7) Select the {1.12 Data Display} in Data Display Menu.
   (8) Start the engine, and then read the engine idle speed.
5) When using the tachometer (Secondary pick-up type).
   (1) Attach the pick-up clip to No. 1 cylinder spark plug cord.
   (2) Start the engine, and then read the engine idle speed.


ME-00193

NOTE:
• When using the OBD-II general scan tool, carefully read its operation manual.
• This ignition system provides simultaneous ignition for #1 and #2 plugs. It must be noted that some tachometers may register twice that of actual engine speed.

6) Check the idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF)

Idle speed [No load and gears in neutral (MT model), or N or P (AT model) range]:
650±100 rpm (MT model)
700±100 rpm (AT model)

7) Check the idle speed when loaded. (Turn the air conditioning switch to “ON” and operate the compressor for at least 1 minute before measurement.)

Idle speed [A/C “ON” and gears in neutral (MT model) or N or P (AT model) range]:
850±100 rpm

NOTE:
Idle speed can not be adjusted manually, because the idle speed is automatically adjusted.
If the specified idle speed can not be maintained, refer to General On-board Diagnosis Table under “Engine Control System”. <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>

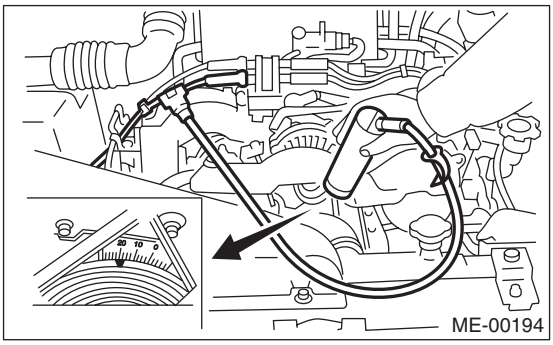
4. Ignition Timing

A: INSPECTION

CAUTION:
After warming up, engine becomes very hot. Be careful not to burn yourself during measurement.

1) Warm up the engine.
2) To check the ignition timing, connect a timing light to #1 cylinder spark plug cord, and illuminate the timing mark with timing light.
3) Start the engine at idle speed and check the ignition timing.

Ignition timing [BTDC/rpm]:
10°±8°/650 (MT model)
15°±8°/700 (AT model)



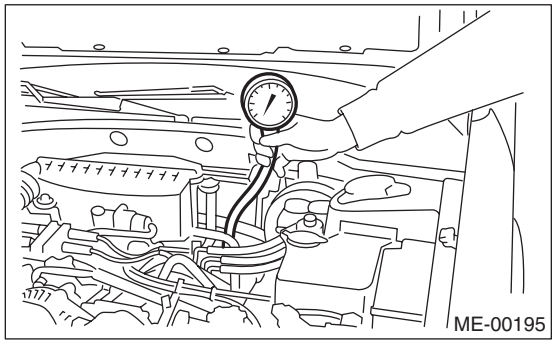
If the timing is not correct, check the ignition control system.
Refer to Engine Control System. <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>

5. Intake Manifold Vacuum

A: INSPECTION

1) Warm up the engine.
2) Disconnect the brake vacuum hose from manifold, and then install the vacuum gauge to the hose fitting on manifold.
3) Keep the engine at idle speed, and then read the vacuum gauge indication.

By observing the gauge needle movement, the internal condition of engine can be diagnosed as described below.



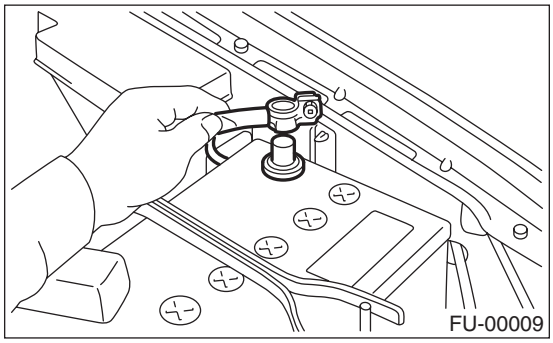
Vacuum pressure (at idling, A/C "OFF"):
Less than −60.0 kPa (−450 mmHg, −17.72 in-Hg)

Diagnosis of engine condition by measurement of manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket or disconnection or damaged vacuum hose
2. When engine speed is reduced slowly from higher speed, needle stops temporarily when it is lowering or becomes steady above normal position.	Back pressure too high, or exhaust system clogged
3. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
4. Needle drops suddenly and intermittently from normal position.	Sticky valves
5. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve springs
6. Needle vibrates above and below normal position in narrow range.	Defective ignition system

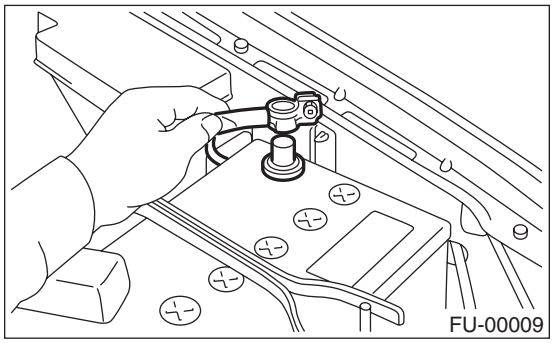
6. Engine Oil Pressure

A: INSPECTION

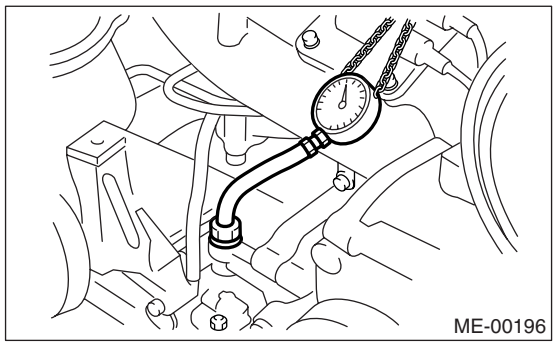
1) Disconnect the ground cable from battery.



2) Remove the generator from bracket. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>
3) Disconnect the connector from oil pressure switch.
4) Remove the oil pressure switch from engine cylinder block. <Ref. to LU(H4SO)-17, REMOVAL, Oil Pressure Switch.>
5) Connect the oil pressure gauge hose to cylinder block.
6) Connect the battery ground cable to battery.



7) Start the engine, and then measure the oil pressure.



Oil pressure:
88 kPa (0.9 kg/cm^2, 13 psi) or more at 800 rpm
294 kPa (3.0 kg/cm^2, 43 psi) or more at 5,000 rpm

CAUTION:
• If the oil pressure is out of specification, check the oil pump, oil filter and lubrication line. <Ref. to LU(H4SO)-19, INSPECTION, Engine Lubrication System Trouble in General.>
• If the oil pressure warning light is turned ON and oil pressure is in specification, replace the oil pressure switch. <Ref. to LU(H4SO)-19, INSPECTION, Engine Lubrication System Trouble in General.>

NOTE:
The specified data is based on an engine oil temperature of 80°C (176°F).

8) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU(H4SO)-17, INSTALLATION, Oil Pressure Switch.>

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

9) Install the generator and V-belt in the reverse order of removal, and then adjust the V-belt deflection. <Ref. to ME(H4SO)-39, INSTALLATION, V-belt.>

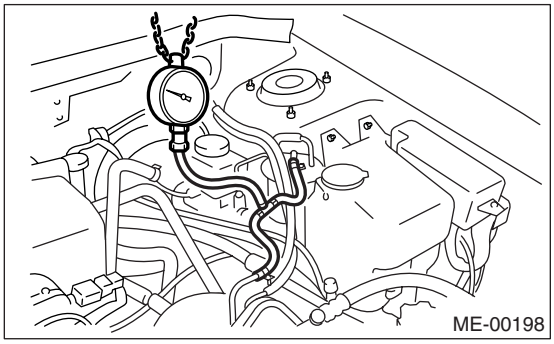
7. Fuel Pressure

A: INSPECTION

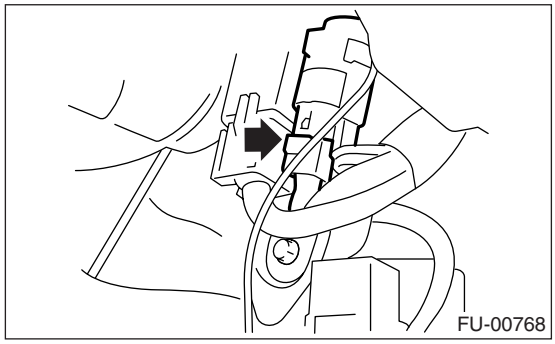
WARNING:
Before removing the fuel pressure gauge, lower the fuel pressure.

NOTE:
If out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.

1) Release the fuel pressure. <Ref. to FU(H4SO)-47, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel flap lid, and then remove the fuel filler cap.
3) Disconnect the fuel delivery hoses from fuel damper, and then connect the fuel pressure gauge.



4) Connect the connector of fuel pump relay.



5) Start the engine.
6) Measure the fuel pressure while disconnecting the pressure regulator vacuum hose from intake manifold.

Fuel pressure:
Standard; 284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)

7) After connecting the pressure regulator vacuum hose, measure the fuel pressure.

Fuel pressure:
Standard; 206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)

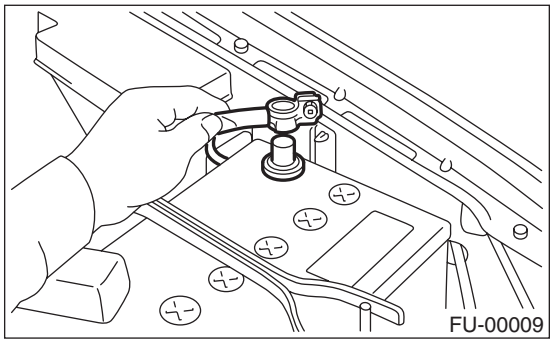
NOTE:
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kg/cm^2, 1 to 3 psi) higher than standard values during high-altitude operations.

8. Valve Clearance

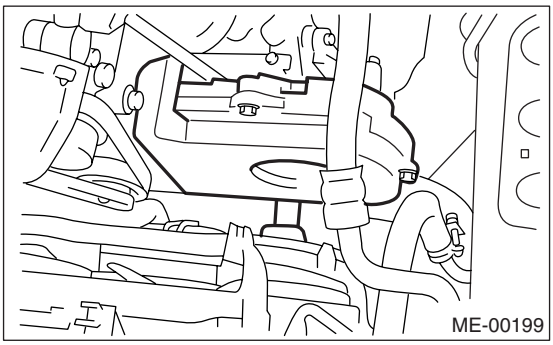
A: INSPECTION

NOTE:
Inspection and adjustment of the valve clearance should be performed while engine is cold.

1) Set the vehicle on a lift.
2) Lift-up the vehicle.
3) Remove the under cover.
4) Lower the vehicle.
5) Disconnect the ground cable from battery.

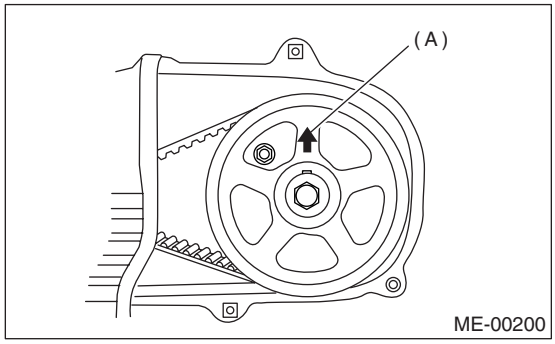


6) Remove the timing belt cover (LH).



7) When inspecting the #1 and #3 cylinders;
   (1) Disconnect the spark plug cords from spark plugs RH side. <Ref. to IG(H4SO)-4, RH SIDE, REMOVAL, Spark Plug.>
   (2) Disconnect the PCV hose from rocker cover (RH).
   (3) Remove the bolts, and then remove the rocker cover (RH).
8) When inspecting the #2 and #4 cylinders;
   (1) Disconnect the spark plug cords from spark plugs (LH Side). <Ref. to IG(H4SO)-4, LH SIDE, REMOVAL, Spark Plug.>
   (2) Disconnect the PCV hose from rocker cover (LH).
   (3) Remove the bolts, and then remove the rocker cover (LH).
9) Set the #1 cylinder piston to top dead center of compression stroke by rotating crankshaft pulley clockwise using a socket wrench.

NOTE:
When arrow mark (A) on the camshaft sprocket (LH) comes exactly to the top, #1 cylinder piston is brought to the top dead center of compression stroke.

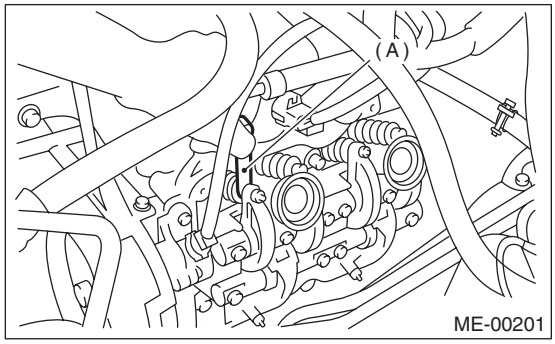


10) Measure the #1 cylinder valve clearance by using thickness gauge.

CAUTION:
• Insert the thickness gauge (A) in as horizontal a direction as possible with respect to the valve stem end face.
• Measure the exhaust valve clearances while lifting up the vehicle.

Valve clearance (Standard):
Intake:
0.20±0.02 mm (0.0079±0.0008 in)
Exhaust:
0.25±0.02 mm (0.0098±0.0008 in)

Valve clearance (Limit):
Intake:
0.20±0.04 mm (0.0079±0.0016 in)
Exhaust:
0.25±0.04 mm (0.0098±0.0016 in)



11) If necessary, adjust the valve clearance. <Ref. to ME(H4SO)-29, ADJUSTMENT, Valve Clearance.>
12) Similar to measurement procedures used for #1 cylinder, measure the cylinder valve clearances in the following sequence: #3, #2 and #4 cylinder.

NOTE:
• Be sure to set the cylinder pistons to their respective top dead centers on compression stroke before measuring valve clearances.
• To set each cylinder piston to its top dead center on compression stroke in the following sequence: #3, #2 and #4 cylinder, turn the crankshaft pulley clockwise by every 180° at starting with #1 cylinder piston being on top dead center on compression stroke.

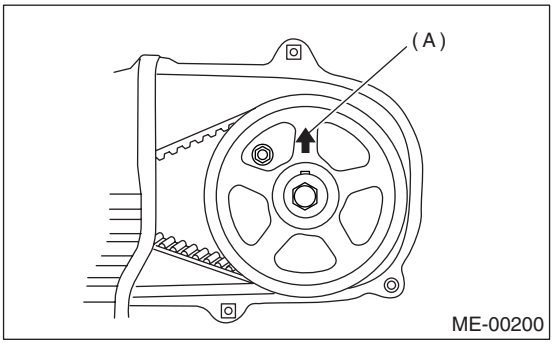
13) After inspection, install the related parts in the reverse order of removal.

B: ADJUSTMENT

NOTE:
Adjustment of the valve clearance should be performed while engine is cold.

1) Set the #1 cylinder piston to top dead center of compression stroke by rotating crankshaft pulley clockwise using socket wrench.

NOTE:
When arrow mark (A) on the camshaft sprocket (LH) comes exactly to the top, #1 cylinder piston is brought to the top dead center of compression stroke.

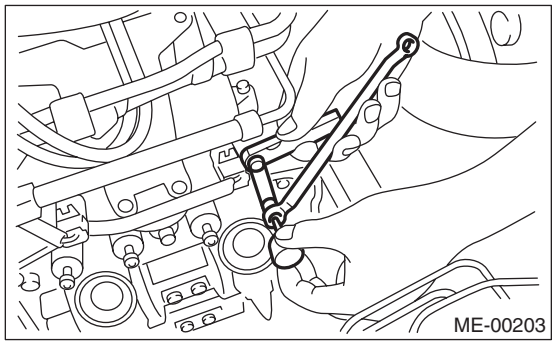


2) Adjust the #1 cylinder valve clearance.
(1) Loosen the valve rocker nut and screw.
(2) Place suitable thickness gauge.
(3) While noting the valve clearance, tighten the valve rocker adjust screw.
(4) When specified valve clearance is obtained, tighten the valve rocker nut.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)

CAUTION:
• Insert the thickness gauge in as horizontal a direction as possible with respect to the valve stem end face.
• Adjust the exhaust valve clearances while lifting up the vehicle.

Valve clearance:
Intake;
0.20±0.02 mm (0.0079±0.0008 in)
Exhaust;
0.25±0.02 mm (0.0098±0.0008 in)



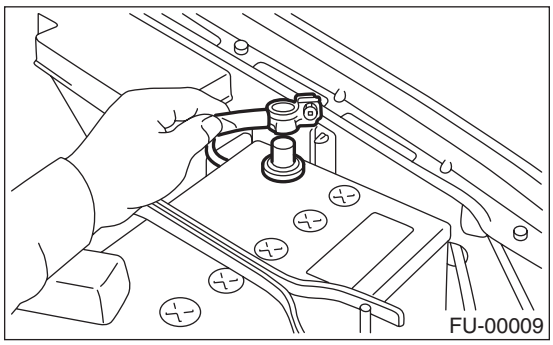
3) Ensure the valve clearances are within specifications.
4) Turn the crankshaft two complete rotations until #1 cylinder piston is again set to the top dead center on compression stroke.
5) Ensure the valve clearances are within specifications. If necessary, readjust the valve clearances.
6) Similar to adjustment procedures used for #1 cylinder, adjust the #2, #3 and #4 cylinder valve clearances.

NOTE:
• Be sure to set the cylinder pistons to their respective top dead centers on compression stroke before adjusting valve clearances.
• To set each cylinder piston to its top dead center on compression stroke in the following sequence: #3, #2 and #4 cylinder, turn the crankshaft pulley clockwise by every 180° at starting with #1 cylinder piston being on top dead center on compression stroke.

9. Engine Assembly

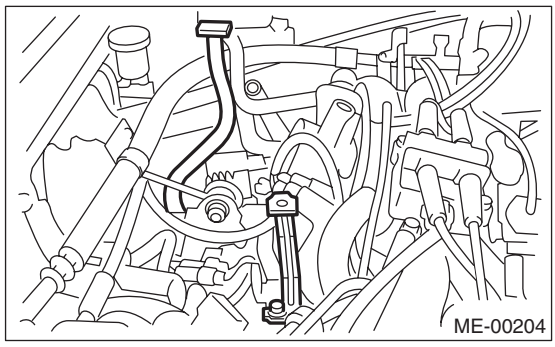
A: REMOVAL

1) Set the vehicle on a lift.
2) Open the front hood fully, and then support with the hood stay.
3) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-20, PROCEDURE, Refrigerant Recovery Procedure.>
4) Release the fuel pressure. <Ref. to FU(H4SO)-47, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
5) Remove the fuel filler cap.
6) Disconnect the ground cable from battery.

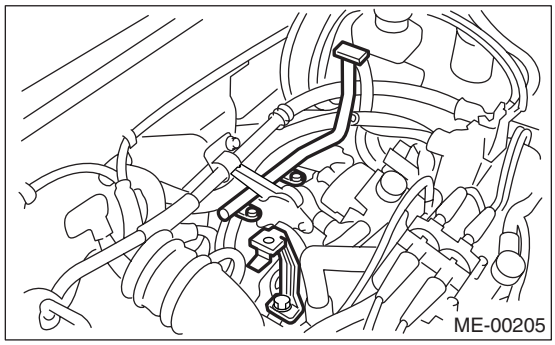

FU-00009

7) Remove the air intake duct and air cleaner case. <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.> and <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
8) Remove the under cover.
9) Remove the radiator from vehicle. <Ref. to CO(H4SO)-18, REMOVAL, Radiator.>
10) Disconnect the A/C pressure hoses from A/C compressor.
11) Remove the air intake chamber stay.

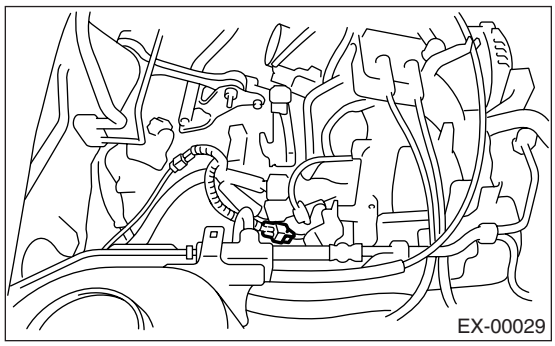
- MT MODEL


ME-00204

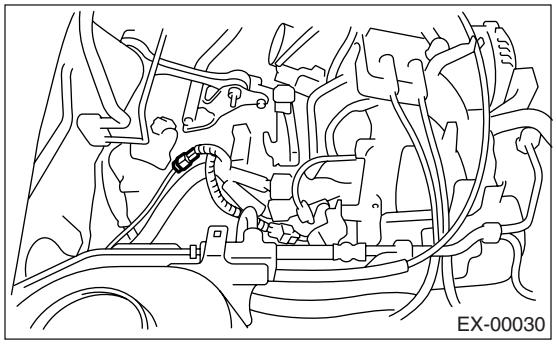
- AT MODEL


ME-00205

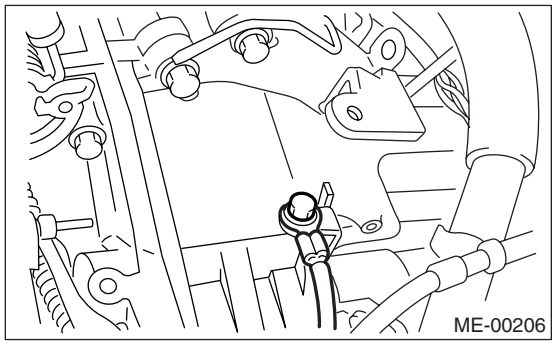
12) Disconnect the following connectors and cables.
(1) Front oxygen (A/F) sensor connector


EX-00029

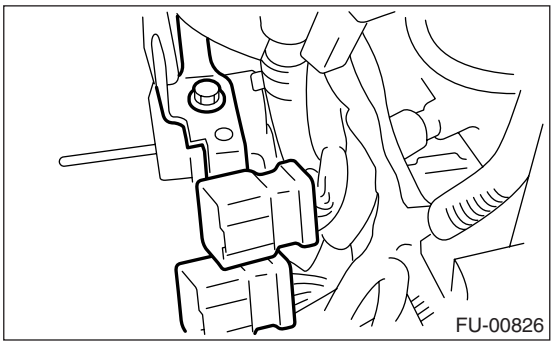
(2) Rear oxygen sensor connector


EX-00030

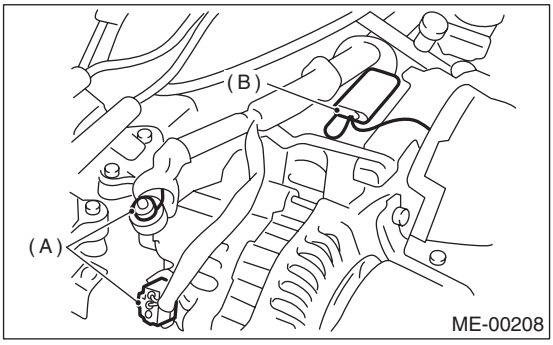
(3) Engine ground cable


ME-00206

(4) Engine harness connectors

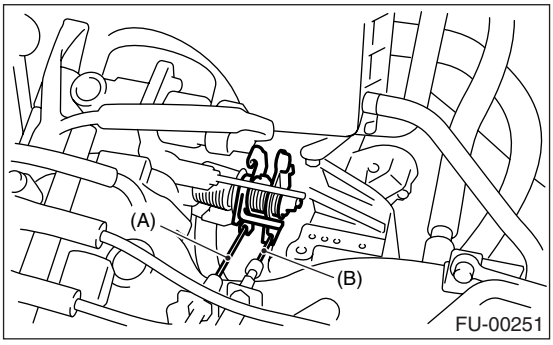


(5) Generator connector, terminal and A/C compressor connector

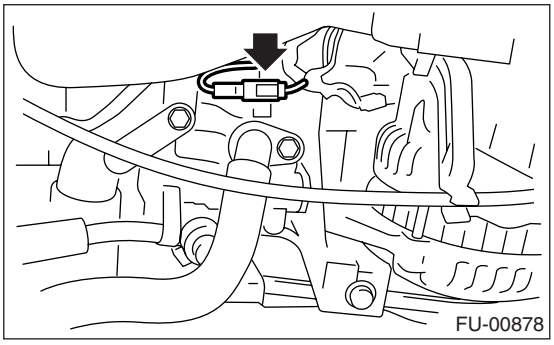


(A) Generator connector and terminal
(B) A/C compressor connector

(6) Accelerator cable (A) and cruise control cable (B) (Model with cruise control)

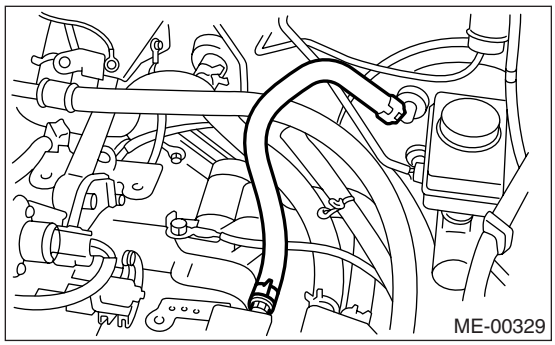


(7) Power steering switch connector

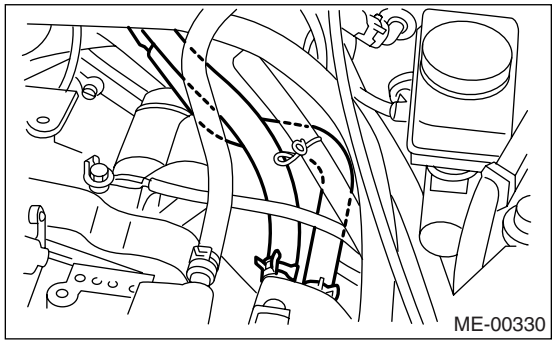


13) Disconnect the following hoses.

(1) Brake booster vacuum hose

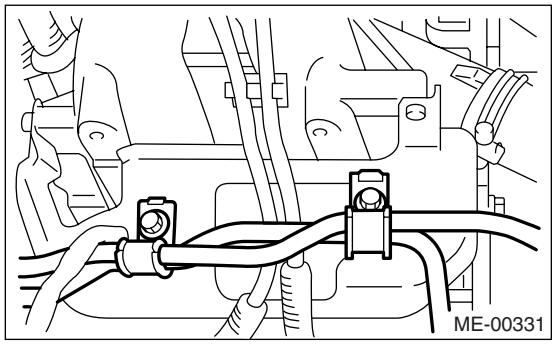


(2) Heater inlet outlet hose

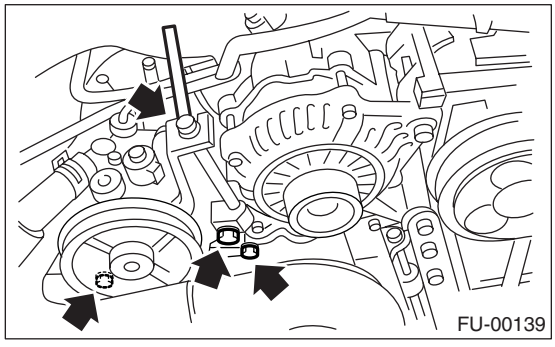


14) Remove the power steering pump from bracket.

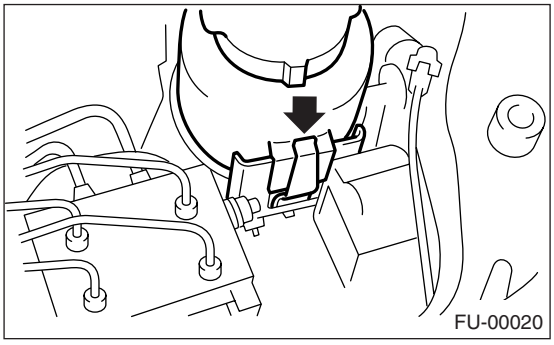
(1) Remove the resonator chamber.
(2) Loosen the lock bolt and slider bolt, and then remove the front side V-belt. <Ref. to ME(H4SO)-39, FRONT SIDE BELT, REMOVAL, V-belt.>
(3) Remove the pipe with bracket.



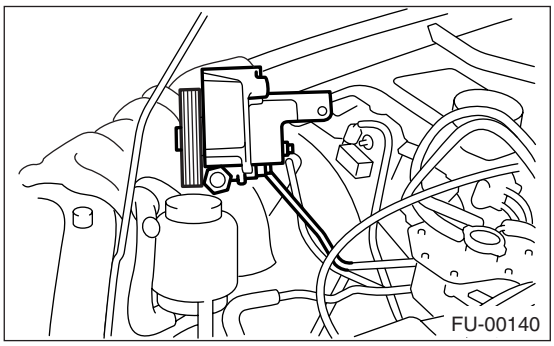
(4) Remove the bolts which install the power steering pump bracket.



(5) Remove the power steering tank from bracket by pulling it upward.

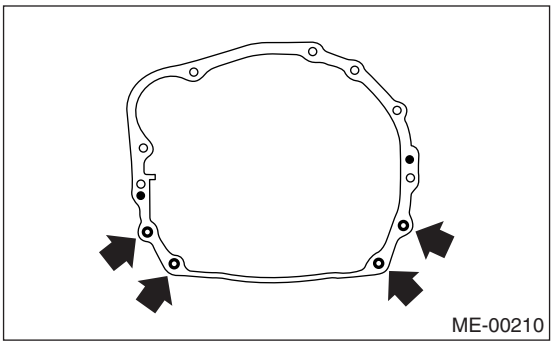


(6) Place the power steering pump on right side wheel apron.

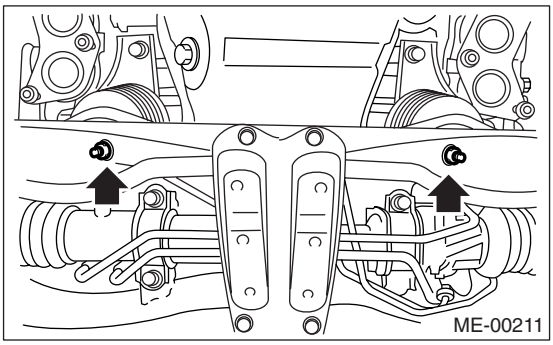


15) Remove the front and center exhaust pipe. <Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>

16) Remove the nuts which hold the lower side of transmission to engine.



17) Remove the nuts which install the front cushion rubber onto front crossmember.



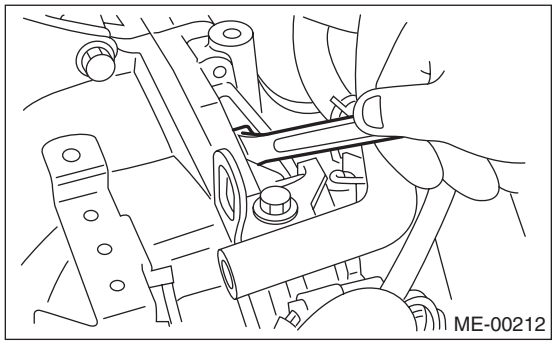
18) Separate the torque converter clutch from drive plate. (AT model)

(1) Lower the vehicle.

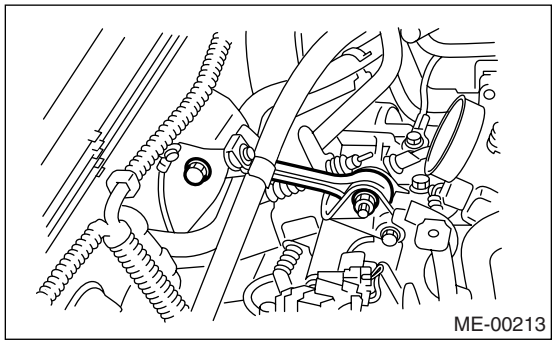
(2) Remove the service hole plug.

(3) Remove the bolts which hold the torque converter clutch to drive plate.

(4) Remove other bolts while rotating the engine using socket wrench.



19) Remove the pitching stopper.

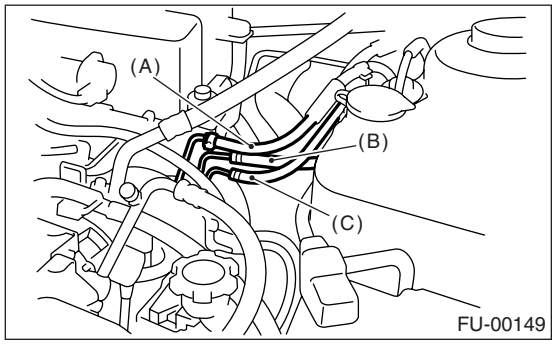


20) Disconnect the fuel delivery hose (A), return hose (B) and evaporation hose (C).

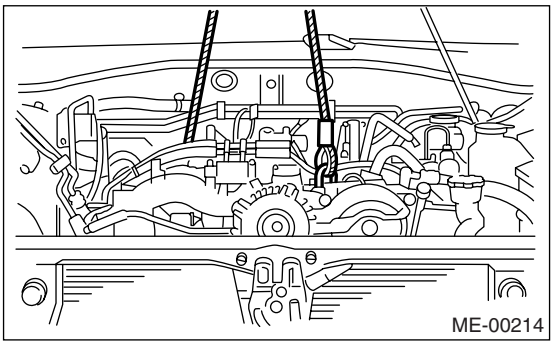
CAUTION:

• Disconnect the hose with its end wrapped with cloth to prevent fuel from splashing.

• Catch fuel from the hose into container.

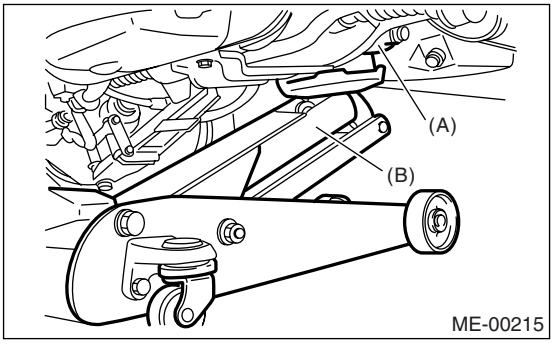


21) Support the engine with a lifting device and wire ropes.



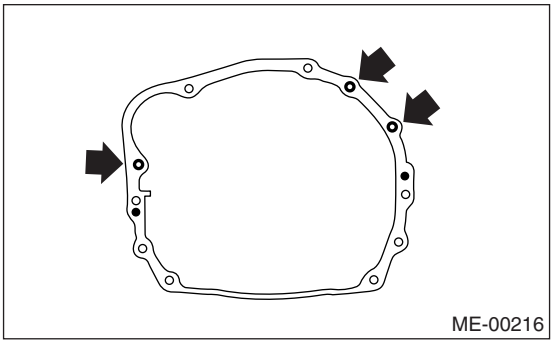
22) Support the transmission with a garage jack.

CAUTION:
Before moving the engine away from transmission, check to be sure no work has been overlooked. Doing this is very important in order to facilitate re-installation and because the transmission lowers under its own weight.



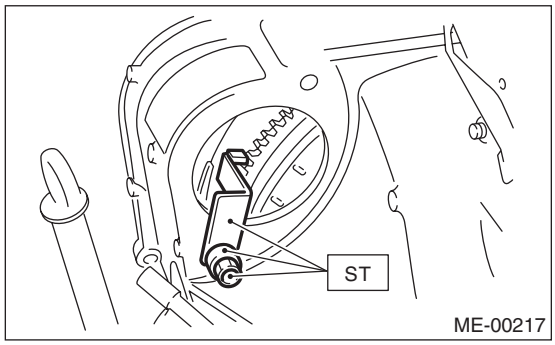
(A) Transmission
(B) Garage jack

23) Separation of the engine and transmission.
(1) Remove the starter. <Ref. to SC(H4SO)-7, REMOVAL, Starter.>
(2) Remove the bolts which hold the upper side of transmission to engine.



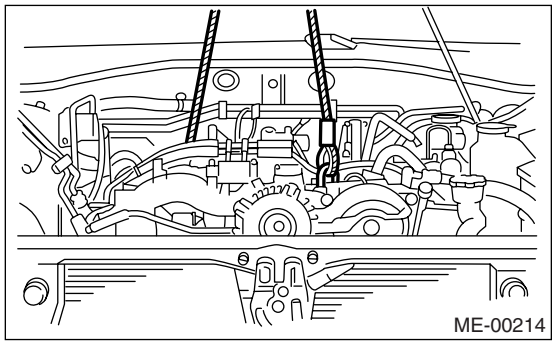
24) Install the ST to torque converter clutch case. (AT model)

ST 498277200 STOPPER SET



25) Remove the engine from vehicle.
(1) Slightly raise the engine.
(2) Raise the transmission with garage jack.
(3) Move the engine horizontally until main shaft is withdrawn from clutch cover.
(4) Slowly move the engine away from engine compartment.

NOTE:
Be careful not to damage the adjacent parts or body panels with crank pulley, oil level gauge, etc.



26) Remove the front cushion rubbers.

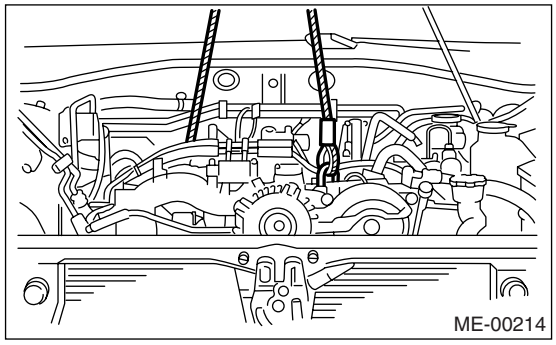
B: INSTALLATION

1) Install the front cushion rubbers.

Tightening torque:
34 N·m (3.5 kgf-m, 25.3 ft-lb)

2) Install the engine onto transmission.
(1) Position the engine in engine compartment and align it with transmission.

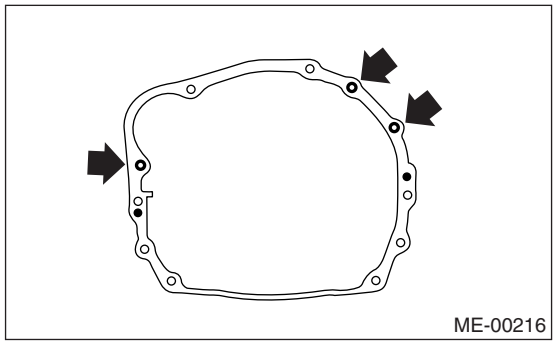
NOTE:
Be careful not to damage the adjacent parts or body panels with crank pulley, oil level gauge, etc.



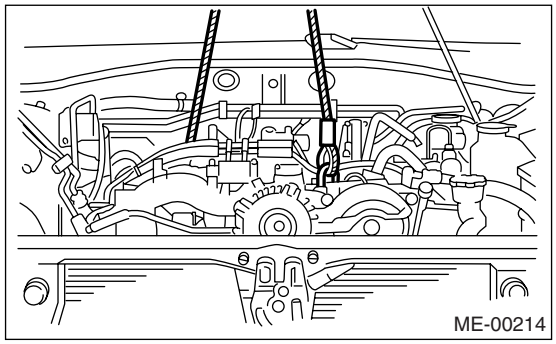
(2) Apply a small amount of grease to the spline of main shaft. (MT model)

3) Tighten the bolts which hold the upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

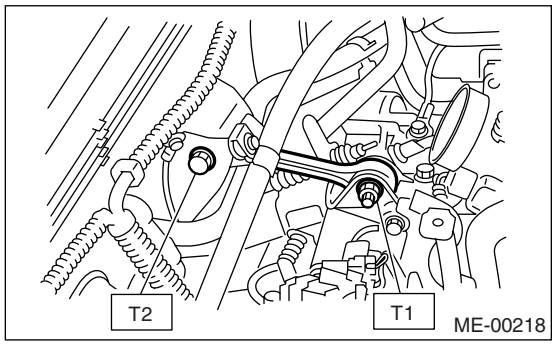


4) Remove the lifting device and wire ropes.



5) Remove the garage jack.
6) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



7) Remove the ST from torque converter clutch case. (AT model)

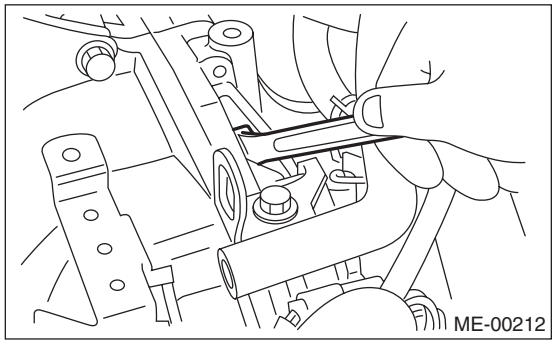
NOTE:
Be careful not to drop the ST into torque converter clutch case when removing ST.

ST 498277200 STOPPER SET

8) Install the starter. <Ref. to SC(H4SO)-7, INSTALLATION, Starter.>
9) Install the torque converter clutch onto drive plate. (AT model)
(1) Tighten the bolts which hold the torque converter clutch to drive plate.
(2) Tighten other bolts while rotating the engine by using a socket wrench.

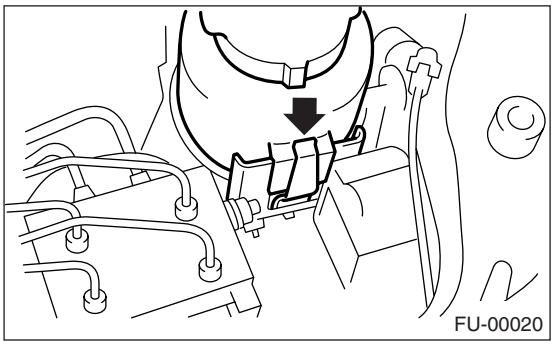
NOTE:
Be careful not to drop the bolts into torque converter clutch housing.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



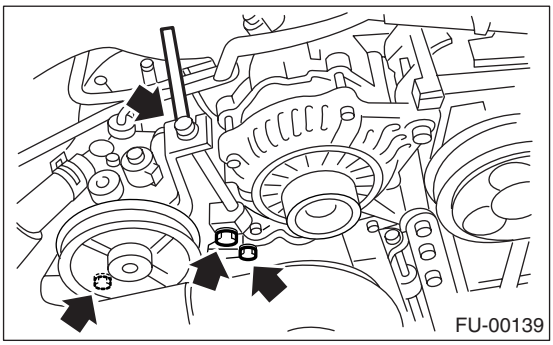
(3) Clog the plug onto service hole.

10) Install the power steering pump on bracket.
(1) Install the power steering tank on bracket.

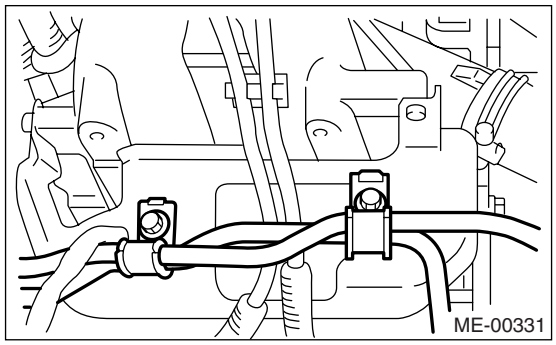


(2) Install the power steering pump on bracket, and then tighten the bolts.

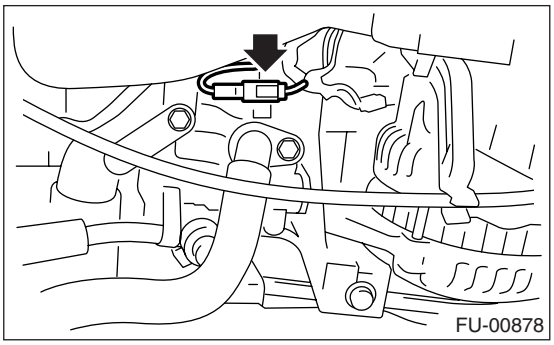
Tightening torque:
20.1 N·m (2.05 kgf-m, 14.8 ft-lb)



(3) Tighten the bolts which install the power steering pipe bracket, and then install the spark plug cords.

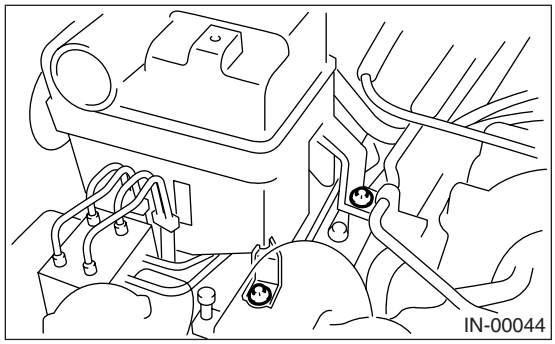


(4) Connect the power steering switch connector.



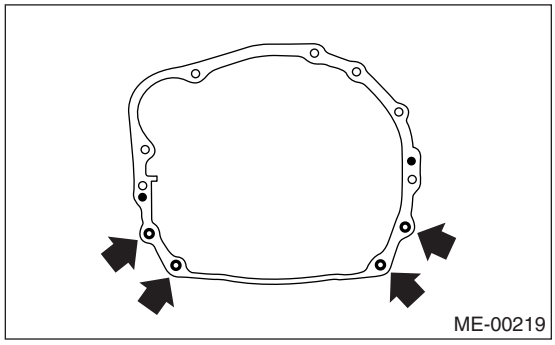
(5) Install the front side V-belt, and adjust it. <Ref. to ME(H4SO)-39, FRONT SIDE BELT, INSTALLATION, V-belt.>
(6) Install the resonator chamber.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)



11) Tighten the nuts which hold the lower side of transmission to engine.

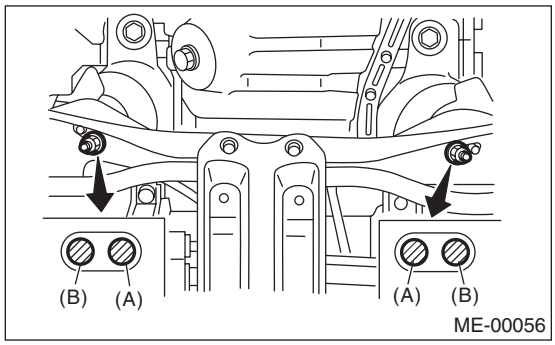
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



12) Tighten the nuts which install the front cushion rubber onto crossmember.

Tightening torque:
85 N·m (8.7 kgf-m, 63 ft-lb)

NOTE:
Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



13) Install the front and center exhaust pipe. <Ref. to EX(H4SO)-5, INSTALLATION, Front Exhaust Pipe.>

14) Connect the following hoses.
(1) Fuel delivery hose, return hose and evaporation hose
(2) Heater inlet and outlet hoses
(3) Brake booster vacuum hose
15) Connect the following connectors.
(1) Engine ground cables

Tightening torque:
14 N·m (1.4 kgf-m, 10.1 ft-lb)

(2) Engine harness connectors
(3) Generator connector and terminal
(4) A/C compressor connectors
16) Connect the following cables.
(1) Accelerator cable
(2) Cruise control cable (Model with cruise control)
17) Adjust each connected cable.
18) Install the air cleaner case stay.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)

19) Install the A/C pressure hoses. <Ref. to AC-36, INSTALLATION, Hose and Tube.>
20) Install the radiator to vehicle. <Ref. to CO(H4SO)-19, INSTALLATION, Radiator.>
21) Install the air intake duct and air cleaner case. <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Duct.> and <Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>
22) Install the under cover.
23) Install battery in the vehicle, and then connect the cables.
24) Fill engine coolant.
<Ref. to CO(H4SO)-12, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
25) Check the ATF level and correct if necessary. (AT model)
<Ref. to 4AT-30, INSPECTION, Automatic Transmission Fluid.>
26) Charge the A/C system with refrigerant.
<Ref. to AC-21, PROCEDURE, Refrigerant Charging Procedure.>
27) Remove the front hood stay, and then close the front hood.
28) Take off the vehicle from lift arms.

C: INSPECTION

1) Make sure the pipes and hoses are installed correctly.
2) Make sure the engine coolant and ATF are at specified levels.

10.Engine Mounting

A: REMOVAL

1) Remove the engine assembly. <Ref. to ME(H4SO)-30, REMOVAL, Engine Assembly.>
2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Engine mounting;
35 N·m (3.6 kgf-m, 25.8 ft-lb)

C: INSPECTION

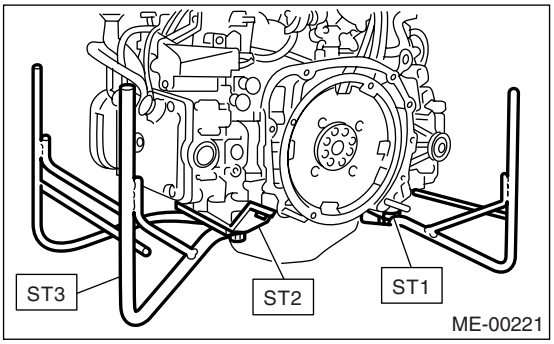
Make sure there are no cracks or other damage.

11.Preparation for Overhaul

A: PROCEDURE

1) After removing the engine from body, secure it in the ST shown below.

ST1	498457000	ENGINE STAND ADAPTER RH
ST2	498457100	ENGINE STAND ADAPTER LH
ST3	4998171 00	ENGINE STAND



2) In this section the procedures described under each index are all connected and stated in order. It will be the complete procedure for overhauling of the engine itself when you go through all steps in the process.
Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

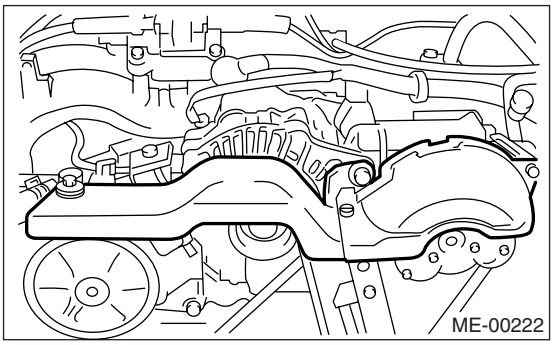
12.V-belt

A: REMOVAL

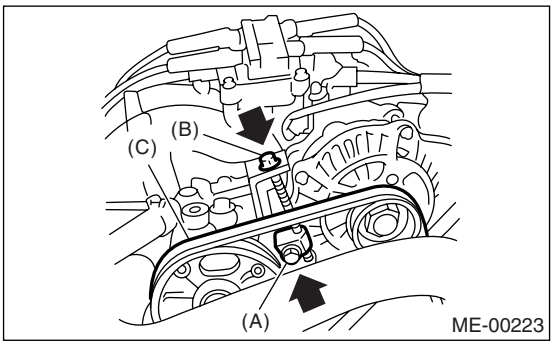
1. FRONT SIDE BELT

NOTE:
Perform the following procedures 1) to 4) with the engine installed to body.

1) Remove the V-belt cover.

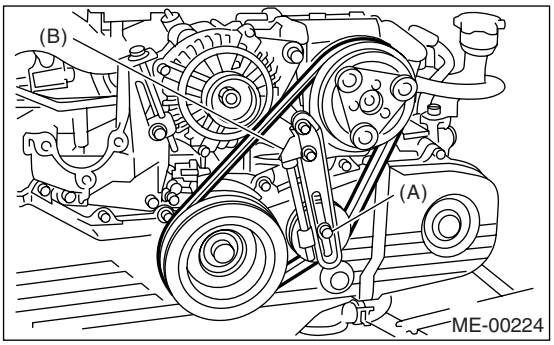


2) Loosen the lock bolt (A).
3) Loosen the slider bolt (B).
4) Remove the front side belt (C).

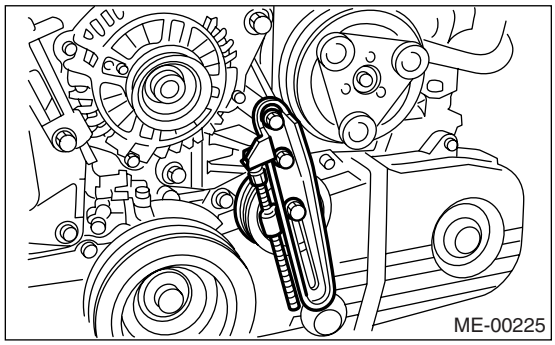


2. REAR SIDE BELT

1) Loosen the lock nut (A).
2) Loosen the slider bolt (B).



3) Remove the rear side belt.
4) Remove the belt tensioner.



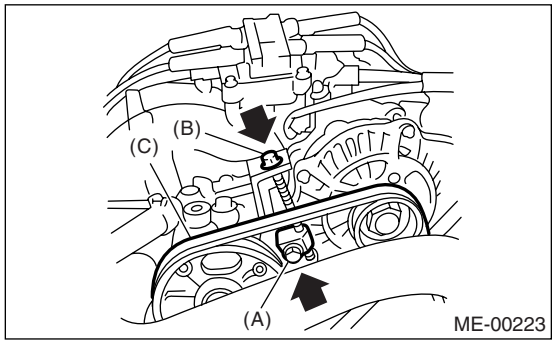
B: INSTALLATION

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

1. FRONT SIDE BELT

1) Install the belt (C), and tighten the slider bolt so as to obtain the specified belt tension. <Ref. to ME(H4SO)-40, INSPECTION, V-belt.>
2) Tighten the lock bolt (A).
3) Tighten the slider bolt (B).

Tightening torque:
Lock bolt (A):
25 N·m (2.5 kgf-m, 18.1 ft-lb)
Slider bolt (B):
8 N·m (0.8 kgf-m, 5.5 ft-lb)

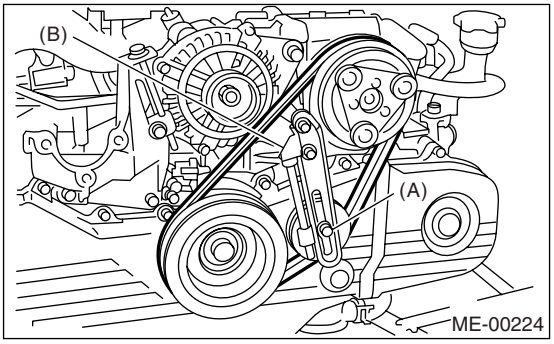


4) Idle the engine for approx. 5 min. to normalize the V-belt. (With using tension gauge)
5) Stop the engine, and then check the belt tension and adjust it. (With using tension gauge)
6) Idle the engine for approx. 1 min. to normalize the V-belt. (With using tension gauge)
7) Stop the engine, and then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

2. REAR SIDE BELT

1) Install the belt tensioner.
2) Install the belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(H4SO)-40, INSPECTION, V-belt.>
3) Tighten the lock nut (A).

Tightening torque:
Lock nut (A);
23 N·m (2.3 kgf-m, 17.0 ft-lb)



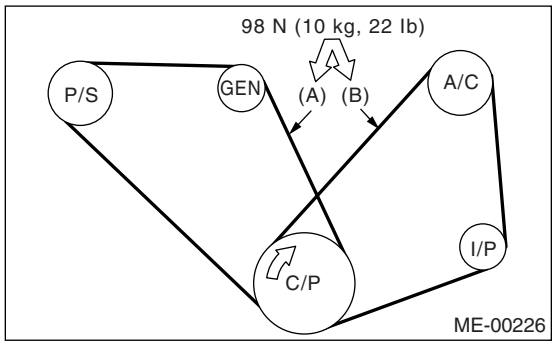
4) Idle the engine for approx. 5 min. to normalize the V-belt. (With using tension gauge)
5) Stop the engine, and then check the belt tension and adjust it. (With using tension gauge)
6) Idle the engine for approx. 1 min. to normalize the V-belt. (With using tension gauge)
7) Stop the engine, and then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

C: INSPECTION

1. PROCEDURES WITHOUT BELT TENSION GAUGE

1) Replace the belts; if cracks, fraying or wear is found.
2) Check the drive belt tension and adjust it if necessary by changing the generator installing position and/or idler pulley installing position.

Belt tension
(A)
replaced: 7 — 9 mm (0.276 — 0.354 in)
reused: 9 — 11 mm (0.354 — 0.433 in)
(B)
replaced: 7.5 — 8.5 mm (0.295 — 0.335 in)
reused: 9.0 — 10.0 mm (0.354 — 0.394 in)

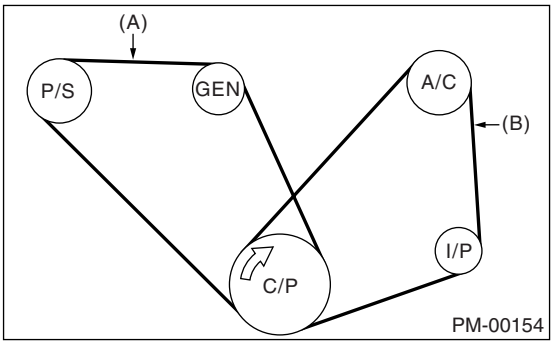


C/P	Crankshaft pulley
GEN	Generator
P/S	Power steering oil pump pulley
A/C	Air conditioning compressor pulley
I/P	Idler pulley

2. PROCEDURES WITH BELT TENSION GAUGE

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

Belt tension
(A)
490 — 640 N (50.0 — 65.3 kgf, 110.2 — 143.9 lb)
(B)
350 — 450 N (35.7 — 45.9 kgf, 78.7 — 101.2 lb)



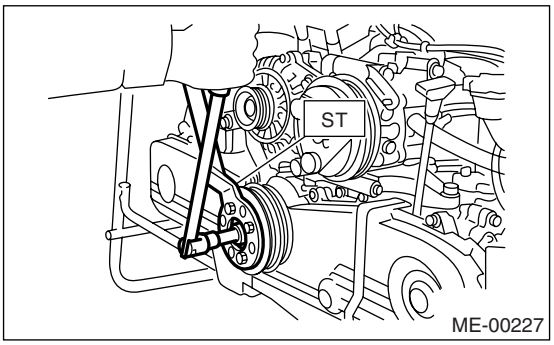
C/P	Crankshaft pulley
GEN	Generator
P/S	Power steering oil pump pulley
A/C	Air conditioning compressor pulley
I/P	Idler pulley

13.Crankshaft Pulley

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4SO)-39, REMOVAL, V-belt.>
2) Remove the crankshaft pulley bolt. To lock the crankshaft, use ST.

ST 499977100 CRANKSHAFT PULLEY WRENCH



3) Remove the crankshaft pulley.

B: INSTALLATION

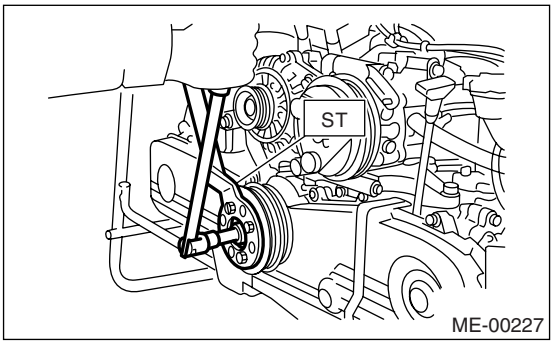
1) Install the crankshaft pulley.
2) Install the pulley bolt.

To lock the crankshaft, use ST.

ST 499977100 CRANKSHAFT PULLEY WRENCH

(1) Clean the crankshaft pulley thread using an air gun.
(2) Apply engine oil to the crankshaft pulley bolt seat and thread.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crankshaft pulley bolts.

Tightening torque:
177 N·m (18.0 kgf-m, 130.2 ft-lb)



3) Confirm that the tightening angle of crankshaft pulley bolt is 65 degrees or more. If the tightening angle of crankshaft pulley bolt is less than 65 degrees, conduct the following procedures.

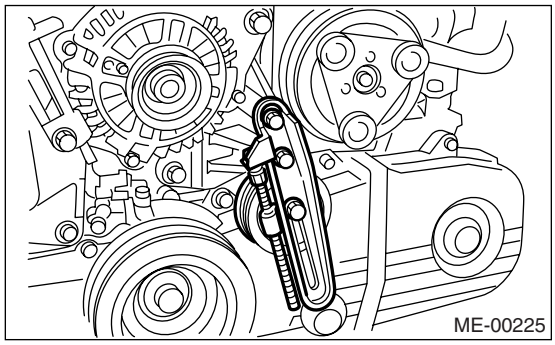
(1) Replace the crankshaft pulley bolts and clean them.

Crankshaft pulley bolt:
12369AA011

(2) Clean the crankshaft thread using an air gun.
(3) Apply engine oil to the crankshaft pulley bolt seal and thread.
(4) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(5) Tighten the crankshaft pulley bolts keeping them in an angle between 65 degrees and 75 degrees.

NOTE:
Conduct the tightening procedures by confirming the turning angle of crankshaft pulley bolt referring to the gauge indicated on timing belt cover.

4) Install the A/C belt tensioner.



5) Install the V-belt. <Ref. to ME(H4SO)-39, INSTALLATION, V-belt.>

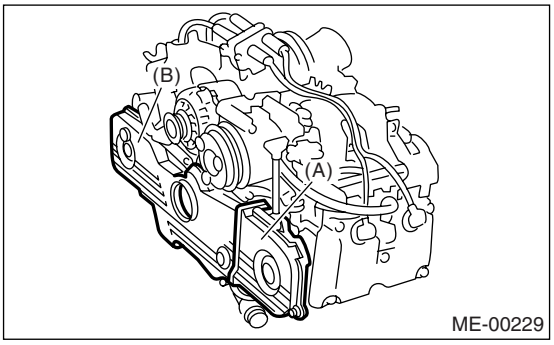
C: INSPECTION

1) Make sure the V-belt is not worn or otherwise damaged.
2) Check the tension of the belt. <Ref. to ME(H4SO)-40, INSPECTION, V-belt.>

14.Timing Belt Cover

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4SO)-39, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover (LH).
4) Remove the front timing belt cover.



(A) Timing belt cover (LH)
(B) Front timing belt cover

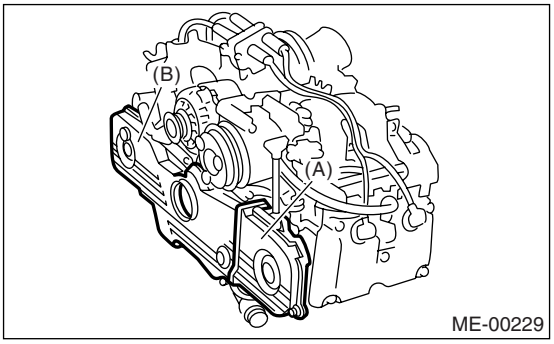
B: INSTALLATION

1) Install the front timing belt cover.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

2) Install the timing belt cover (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



(A) Timing belt cover (LH)
(B) Front timing belt cover

3) Install the crankshaft pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crankshaft Pulley.>
4) Install the V-belt. <Ref. to ME(H4SO)-39, INSTALLATION, V-belt.>

C: INSPECTION

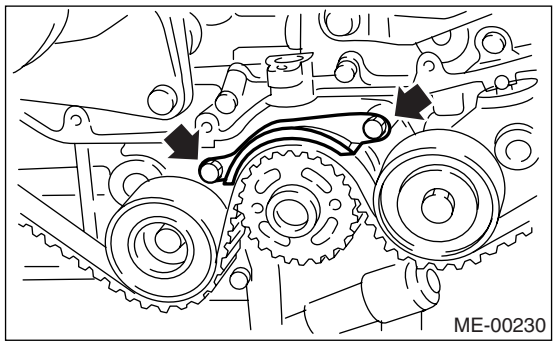
Make sure the cover is not damaged.

15.Timing Belt Assembly

A: REMOVAL

1. TIMING BELT

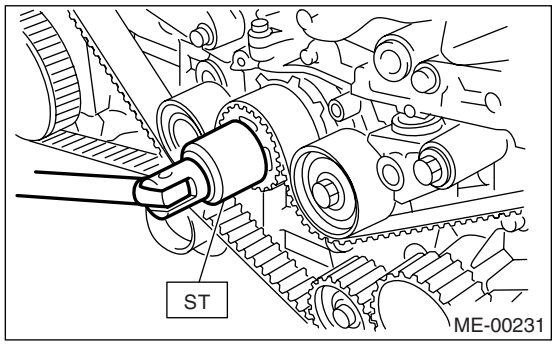
1) Remove the V-belt. <Ref. to ME(H4SO)-39, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt guide. (MT model)

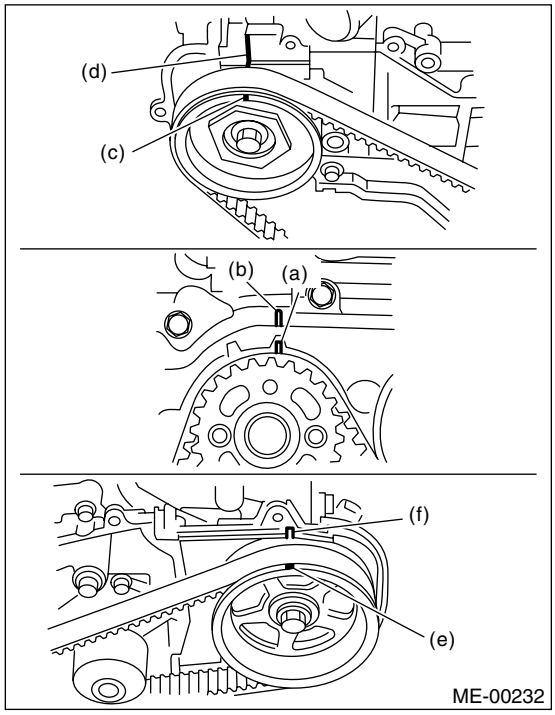


5) If the alignment mark (a) and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing the timing belt as shown in procedures below.

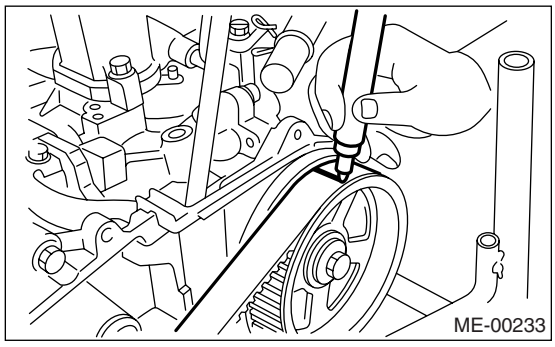
(1) Turn the crankshaft using ST. Align the mark (a) of sprocket to cylinder block notch (b) and ensure the right side cam sprocket mark (c), cam cap and cylinder head matching surface (d) and/or left side cam sprocket mark (e) and timing belt cover notch (f) are properly adjusted.

ST 499987500 CRANKSHAFT SOCKET

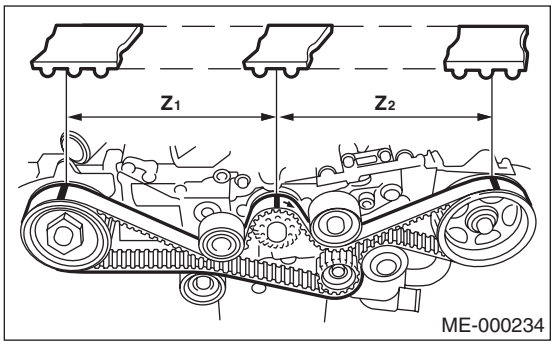




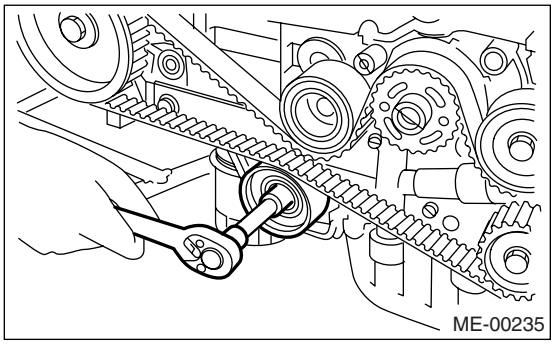
(2) Using white paint, put alignment and/or arrow marks on the timing belts in relation to crank sprocket and cam sprockets.



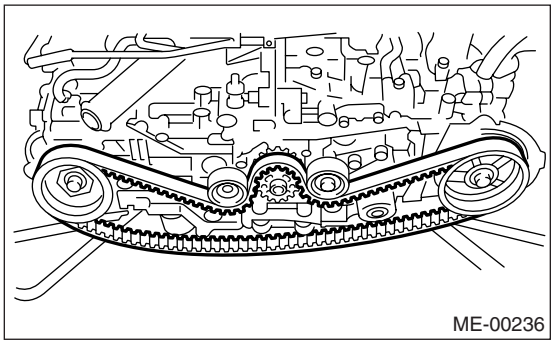
Specified data:
Z_1: 46.8 tooth length
Z_2: 43.7 tooth length



6) Remove the belt idler (No. 2).
7) Remove the belt idler No. 2.

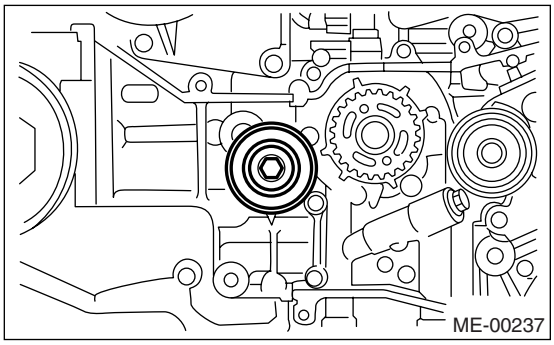


8) Remove the timing belt.

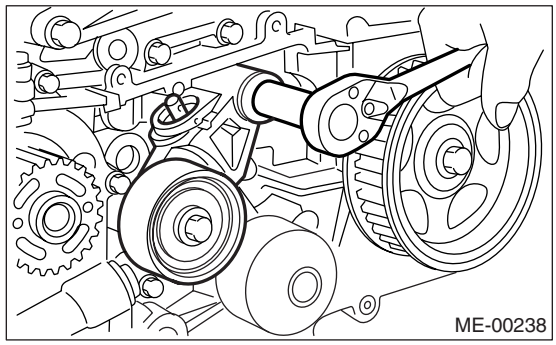


2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

1) Remove the belt idler (No. 1).



2) Remove the automatic belt tension adjuster assembly.



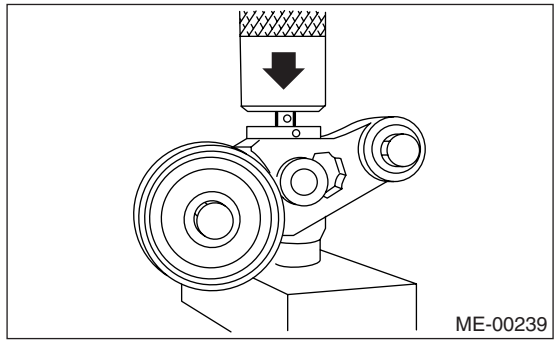
B: INSTALLATION

1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

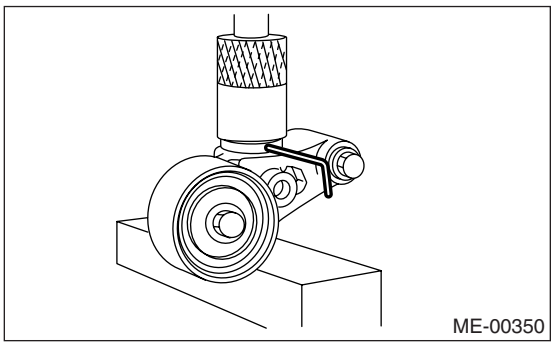
1) Preparation for installation of automatic belt tension adjuster assembly;

CAUTION:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push the adjuster rod vertically.
• Press-in the push adjuster rod gradually taking more than 3 minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
• Press the adjuster rod as far as the end surface of cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
• Do not release the press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to the vertical pressing tool.
(2) Slowly move the adjuster rod down with a pressure of 165 N (16.8 kgf, 37.1 lb) or more until the adjuster rod is aligned with the stopper pin hole in the cylinder.

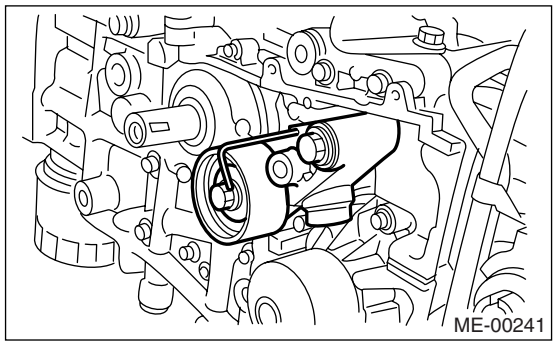


(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (0.08 in) (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.



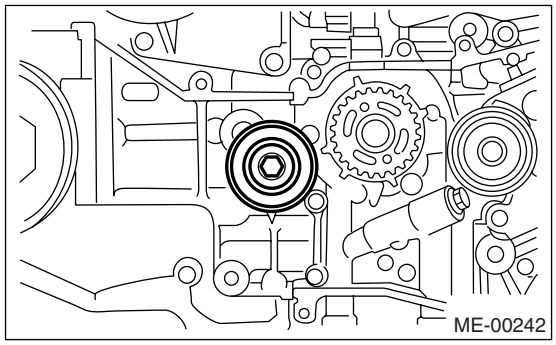
2) Install the automatic belt tension adjuster assembly.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



3) Install the belt idler (No. 1).

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



2. TIMING BELT

1) Preparation for the installation of automatic belt tension adjuster assembly. <Ref. to ME(H4SO)-45, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>

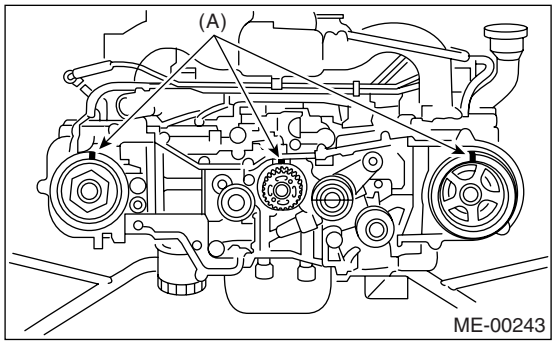
2) Installation of timing belt

(1) Turn the camshaft sprocket No. 2 using ST1, and then turn the camshaft sprocket No. 1 using ST2 so that their alignment marks (A) come to top positions.

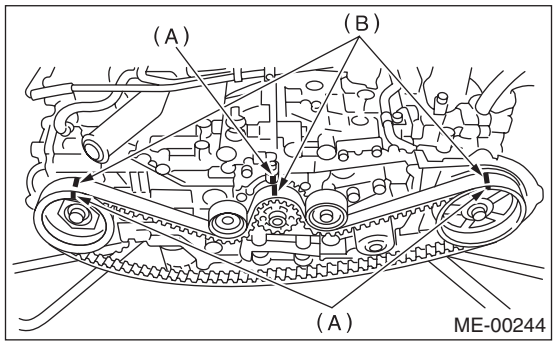
ST1 18231AA010 CAMSHAFT SPROCKET WRENCH

NOTE:
Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.

ST2 499207400 CAMSHAFT SPROCKET WRENCH



(2) While aligning alignment marks (B) on the timing belt with marks (A) on sprockets, position the timing belt properly.

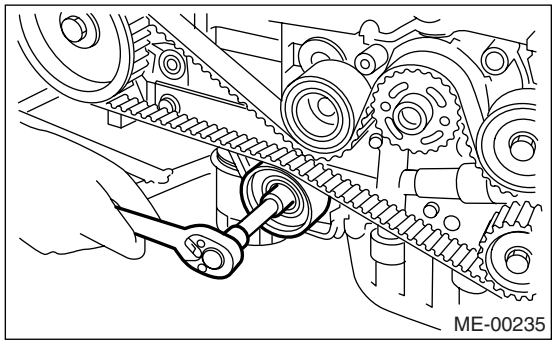


3) Install the belt idler No. 2.

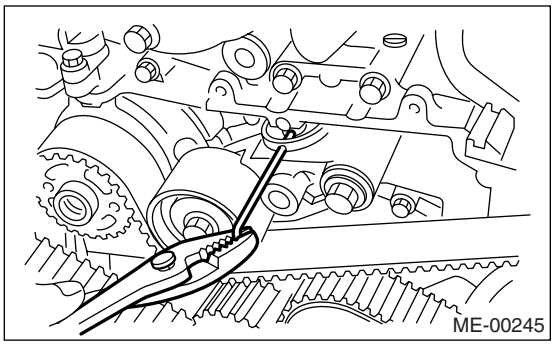
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

4) Install the belt idler (No. 2).

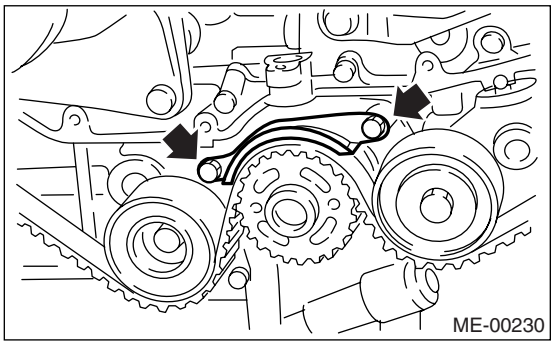
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



5) After ensuring that the marks on timing belt and camshaft sprockets are aligned, remove the stopper pin from belt tension adjuster.

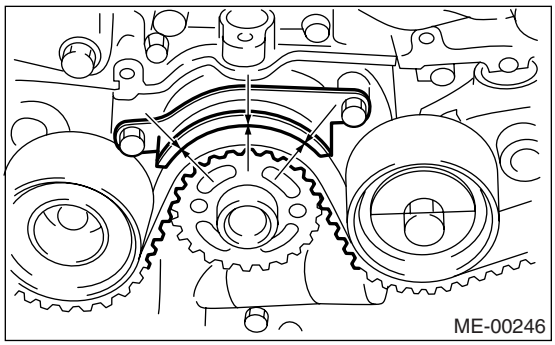


6) Install the timing belt guide. (MT model)
(1) Temporarily tighten the timing belt guide mounting bolts.



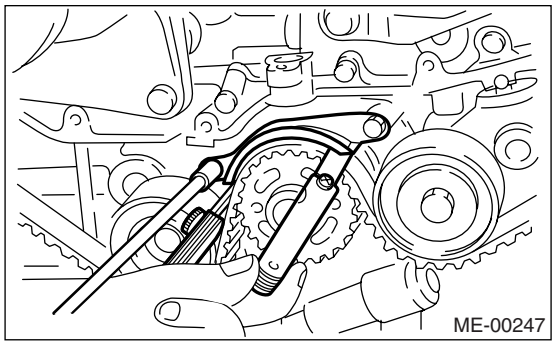
(2) Check and adjust the clearance between timing belt and timing belt guide by using thickness gauge.

Clearance:
1.0±0.5 mm (0.039±0.020 in)



(3) Tighten the timing belt guide mounting bolts.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



7) Install the timing belt cover. <Ref. to ME(H4SO)-43, INSTALLATION, Timing Belt Cover.>
8) Install the crankshaft pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crankshaft Pulley.>
9) Install the V-belt. <Ref. to ME(H4SO)-39, INSTALLATION, V-belt.>

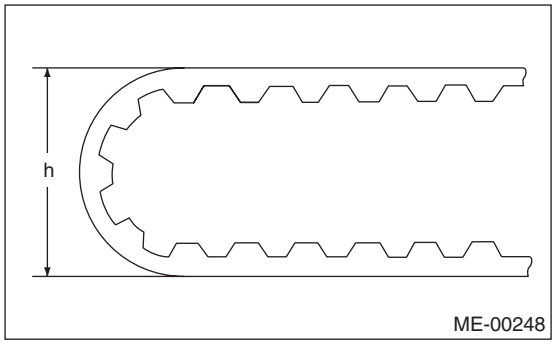
C: INSPECTION

1. TIMING BELT

1) Check the timing belt teeth for breaks, cracks, and wear. If any fault is found, replace the belt.
2) Check the condition of back side of belt; if any crack is found, replace the belt.

CAUTION:
• Be careful not to let oil, grease or coolant contact the belt. Remove quickly and thoroughly if this happens.
• Do not bend the belt sharply.

Bending radius: h
60 mm (2.36 in) or more



2. AUTOMATIC BELT TENSION ADJUSTER

1) Visually check oil seals for leaks, and rod ends for abnormal wear or scratches. If necessary, replace faulty parts.
2) Check that the adjuster rod does not move when a pressure of 165 N (16.8 kgf, 37.1 lb) is applied to it. This is to check adjuster rod stiffness.

3) If the adjuster rod is not stiff and moves freely when applying 165 N (16.8 kgf, 37.1 lb), check it using the following procedures:

(1) Slowly press the adjuster rod down to the end surface of the cylinder. Repeat this motion 2 or 3 times.

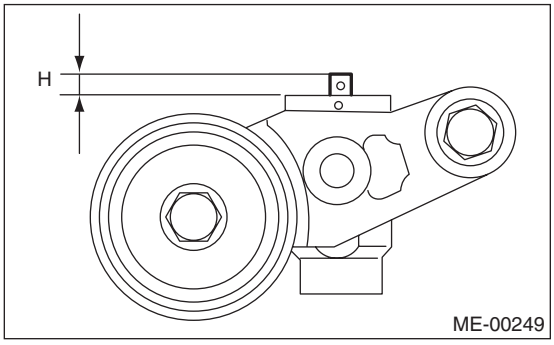
(2) With the adjuster rod moved all the way up, apply a pressure of 165 N (16.8 kgf, 37.1 lb) to it. Check adjuster rod stiffness.

(3) If the adjuster rod is not stiff and moves down, replace the automatic belt tension adjuster assembly with a new one.

CAUTION:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push the adjuster rod vertically.
• Press-in the adjuster rod gradually taking more than 3 minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
• Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.

4) Measure the extension of rod beyond the body. If it is not within specifications, replace with a new one.

Rod extension: H
5.7±0.5 mm (0.224±0.020 in)



3. BELT TENSION PULLEY

1) Check the mating surfaces of timing belt and contact point of adjuster rod for abnormal wear or scratches. Replace the automatic belt tension adjuster assembly if faulty.
2) Check the tension pulley for smooth rotation. Replace if noise or excessive play is noted.
3) Check the tension pulley for grease leakage.

4. BELT IDLER

1) Check the belt idler for smooth rotation. Replace if noise or excessive play is noted.
2) Check the belt outer contacting surfaces of idler pulley for abnormal wear and scratches.
3) Check the belt idler for grease leakage.

16.Camshaft Sprocket

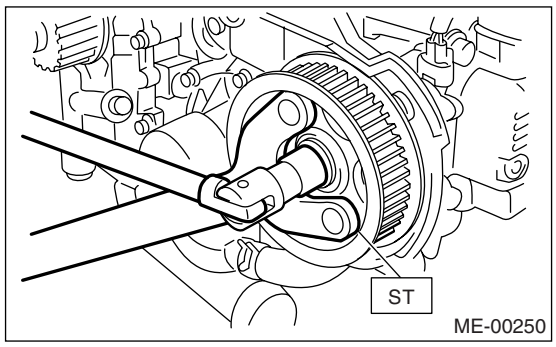
A: REMOVAL

1. REMOVAL

1) Remove the V-belt. <Ref. to ME(H4SO)-39, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(H4SO)-44, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft position sensor. <Ref. to FU(H4SO)-26, REMOVAL, Camshaft Position Sensor.>
6) Remove the camshaft sprocket No. 2. To lock the camshaft, use ST.

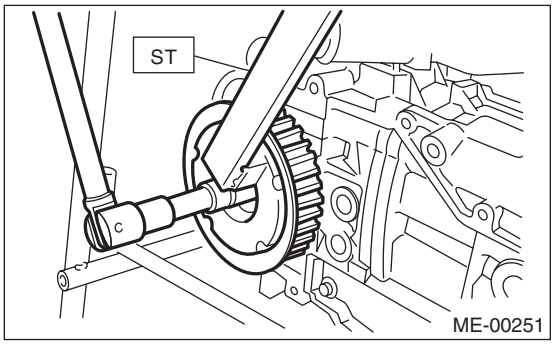
ST 18231AA010 CAMSHAFT SPROCKET WRENCH

NOTE:
Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.



7) Remove the camshaft sprocket No. 1. To lock the camshaft, use ST.

ST 499207400 CAMSHAFT SPROCKET WRENCH



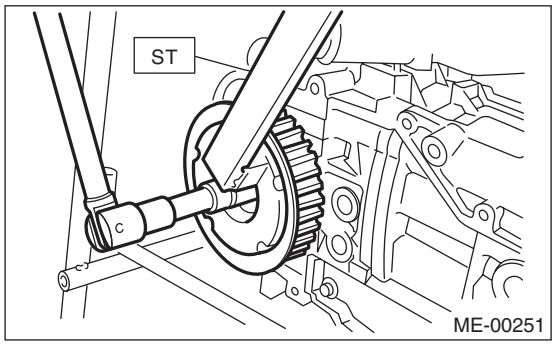
B: INSTALLATION

1) Install the camshaft sprocket No. 1. To lock the camshaft, use ST.

ST 499207400 CAMSHAFT SPROCKET WRENCH

Tightening torque:
78 N·m (8.0 kgf-m, 57.9 ft-lb)

NOTE:
Do not confuse the right and left side camshaft sprockets during installation. The camshaft sprocket No. 2 is identified by a projection used to monitor camshaft position sensor.

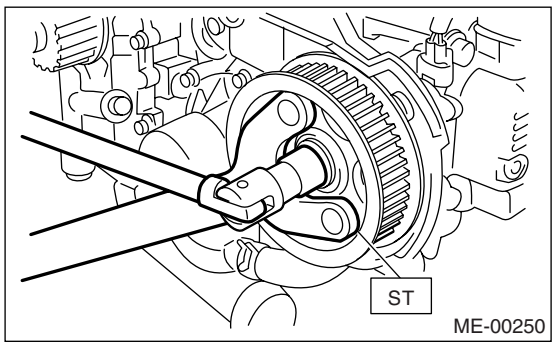


2) Install the camshaft sprocket No. 2. To lock camshaft, use ST.

ST 18231AA010 CAMSHAFT SPROCKET WRENCH

NOTE:
Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.

Tightening torque:
78 N·m (8.0 kgf-m, 57.9 ft-lb)



3) Install the camshaft position sensor. <Ref. to FU(H4SO)-26, INSTALLATION, Camshaft Position Sensor.>
4) Install the timing belt assembly. <Ref. to ME(H4SO)-45, INSTALLATION, Timing Belt Assembly.>
5) Install the timing belt cover. <Ref. to ME(H4SO)-43, INSTALLATION, Timing Belt Cover.>
6) Install the crankshaft pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crankshaft Pulley.>

7) Install the V-belt. <Ref. to ME(H4SO)-39, INSTALLATION, V-belt.>

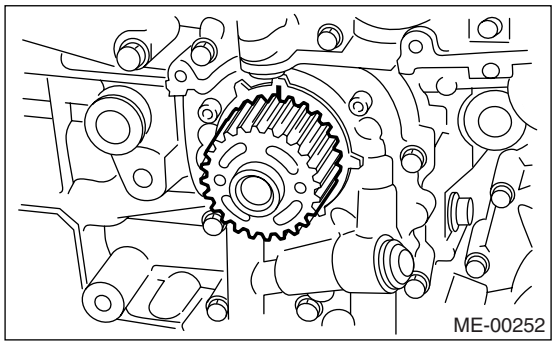
C: INSPECTION

1) Check the sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.
3) Check the camshaft sprocket notch for sensor for damage and contamination of foreign matter.

17.Crankshaft Sprocket

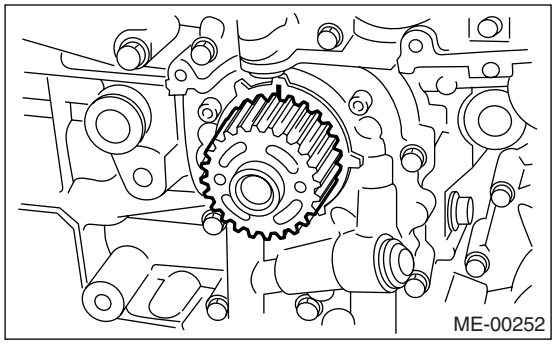
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4SO)-39, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(H4SO)-44, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(H4SO)-49, REMOVAL, Camshaft Sprocket.>
6) Remove the crankshaft sprocket.



B: INSTALLATION

1) Install the crankshaft sprocket.



2) Install the camshaft sprocket. <Ref. to ME(H4SO)-49, INSTALLATION, Camshaft Sprocket.>
3) Install the timing belt assembly. <Ref. to ME(H4SO)-45, INSTALLATION, Timing Belt Assembly.>
4) Install the timing belt cover. <Ref. to ME(H4SO)-43, INSTALLATION, Timing Belt Cover.>
5) Install the crankshaft pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crankshaft Pulley.>
6) Install the V-belt. <Ref. to ME(H4SO)-39, INSTALLATION, V-belt.>

C: INSPECTION

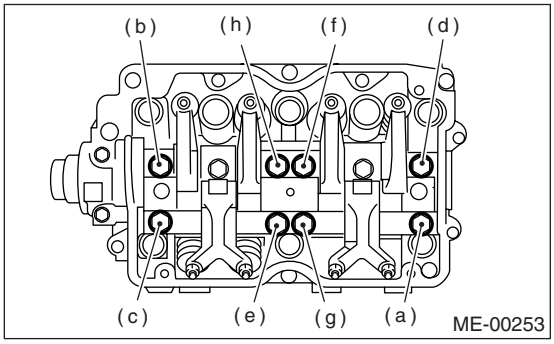
1) Check the sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.
3) Check the crankshaft sprocket notch for sensor for damage and contamination of foreign matter.

18.Valve Rocker Assembly

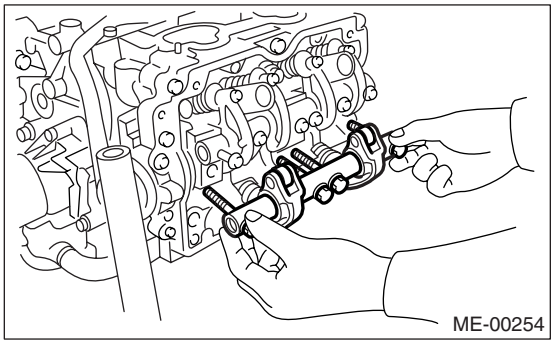
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4SO)-39, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(H4SO)-44, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(H4SO)-49, REMOVAL, Camshaft Sprocket.>
6) Disconnect the PCV hose and remove rocker cover.
7) Removal of valve rocker assembly
   (1) Remove the bolts (a) through (h) in alphabetical sequence.

NOTE:
Leave two or three threads of bolts (g and h) engaged to retain the valve rocker assembly.



   (2) Remove the valve rocker assembly.



B: INSTALLATION

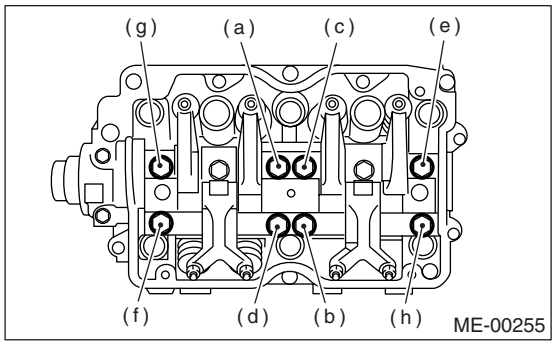
1) Installation of valve rocker assembly
   (1) Temporarily tighten the bolts (a) through (d) equally as shown in the figure.

NOTE:
Do not allow the valve rocker assembly to gouge knock pins.

   (2) Tighten the bolts (e) through (h) to specified torque.

   (3) Tighten the bolts (a) through (d) to specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



2) Adjust the valve clearances. <Ref. to ME(H4SO)-29, ADJUSTMENT, Valve Clearance.>
3) Install the rocker cover and connect PCV hose.
4) Install the camshaft sprocket. <Ref. to ME(H4SO)-49, INSTALLATION, Camshaft Sprocket.>
5) Install the timing belt assembly. <Ref. to ME(H4SO)-45, INSTALLATION, Timing Belt Assembly.>
6) Install the timing belt cover. <Ref. to ME(H4SO)-43, INSTALLATION, Timing Belt Cover.>
7) Install the crankshaft pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crankshaft Pulley.>
8) Install the V-belt. <Ref. to ME(H4SO)-39, INSTALLATION, V-belt.>

C: DISASSEMBLY

1) Remove the bolts which secure the rocker shaft.
2) Extract the rocker shaft. Remove the valve rocker arms, springs and shaft supports from rocker shaft.

NOTE:
Arrange all removed parts in order so that they can be installed in their original positions.

3) Remove the nut and adjuster screw from valve rocker.

D: ASSEMBLY

1) Install the adjuster screw and nut to valve rocker.
2) Arrange the valve rocker arms, springs and shaft supports in assembly order and insert valve rocker shaft.

Tightening torque (Shaft supports installing bolts):
5 N·m (0.5 kgf-m, 3.6 ft-lb)

NOTE:
Valve rocker arms, rocker shaft and shaft supports have identification marks. Ensure the parts with same markings are properly assembled.

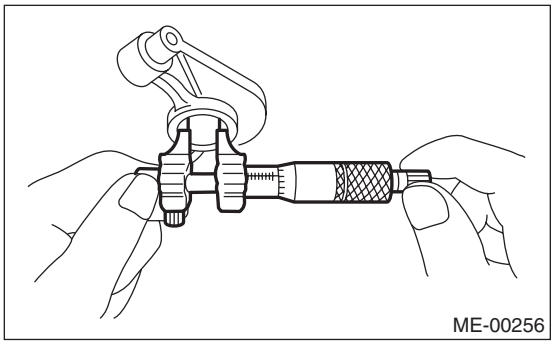
3) Install the valve rocker shaft securing bolts.

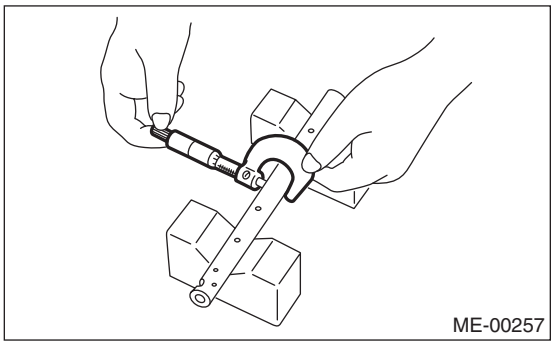
E: INSPECTION

1. VALVE ROCKER ARM AND ROCKER SHAFT

1) Measure the inside diameter of valve rocker arm and outside diameter of valve rocker shaft, and determine the difference between the two (= oil clearance).

Clearance between arm and shaft:
Standard
0.020 — 0.054 mm (0.0008 — 0.0021 in)
Limit
0.10 mm (0.0039 in)


ME-00256


ME-00257

2) If oil clearance exceeds the limit, replace the valve rocker arm or shaft, whichever shows greater amount of wear.

Rocker arm inside diameter:
22.020 — 22.041 mm (0.8669 — 0.8678 in)

Rocker shaft diameter:
21.987 — 22.000 mm (0.8656 — 0.8661 in)

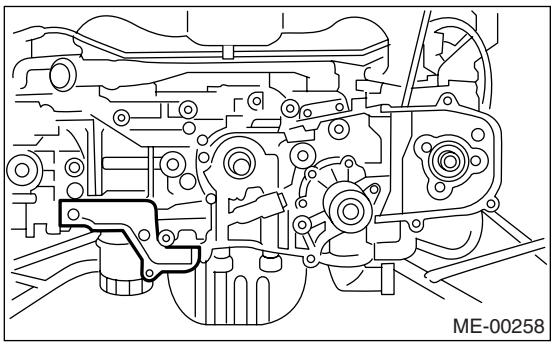
3) If cam or valve contact surface of valve rocker arm is worn or dented excessively, replace the valve rocker arm.
4) Check that the valve rocker arm roller rotates smoothly. If not, replace the valve rocker arm.

19.Camshaft

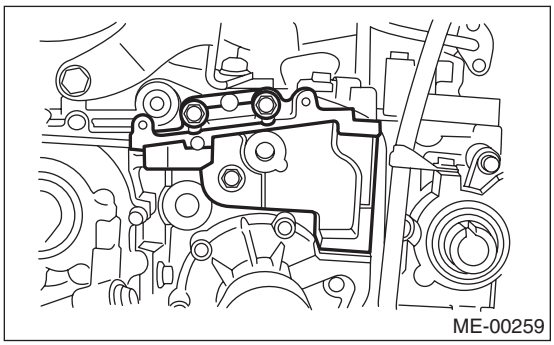
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4SO)-39, INSTALLATION, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(H4SO)-44, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(H4SO)-49, REMOVAL, Camshaft Sprocket.>
6) Remove the crankshaft sprocket. <Ref. to ME(H4SO)-51, REMOVAL, Crankshaft Sprocket.>
7) Remove the timing belt cover No. 2 (LH).
8) Remove the timing belt cover No. 2 (RH).

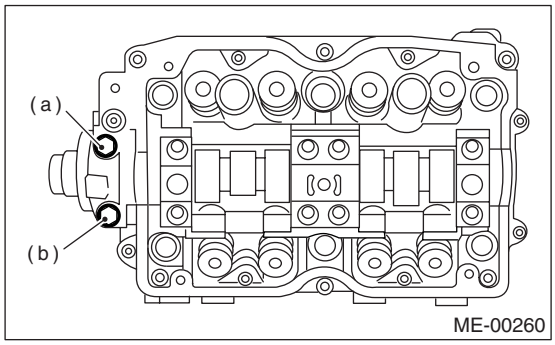
NOTE:
Do not damage or lose the seal rubber when removing the timing belt covers.


ME-00258

9) Remove the tensioner bracket.

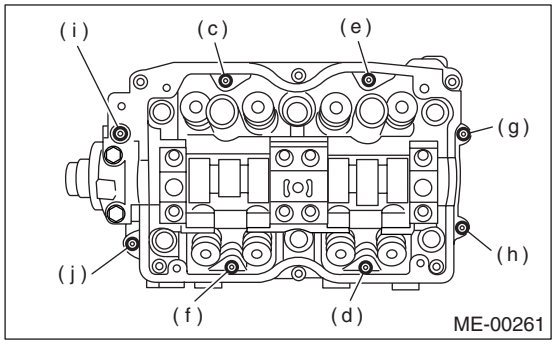

ME-00259

10) Remove the camshaft position sensor support. (LH side only)
11) Remove the oil level gauge guide. (LH side only)
12) Remove the valve rocker assembly. <Ref. to ME(H4SO)-52, REMOVAL, Valve Rocker Assembly.>
13) Remove the camshaft cap.
(1) Remove the bolts (a) through (b) in alphabetical sequence.



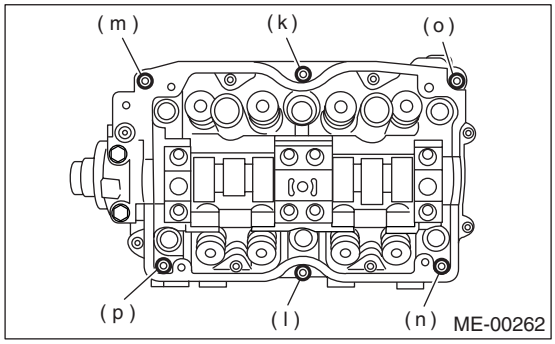
ME-00260

(2) Equally loosen the bolts (c) through (j) all the way in alphabetical sequence.



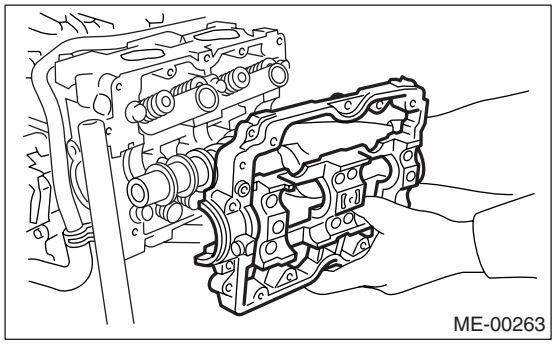
ME-00261

(3) Remove the bolts (k) through (p) in alphabetical sequence using ST.
ST 499497000 TORX® PLUS



ME-00262

(4) Remove the camshaft cap.


ME-00263

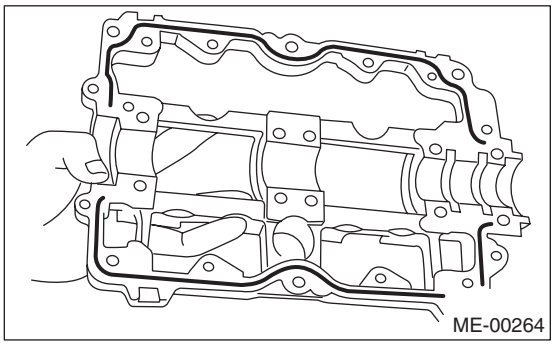
14) Remove the camshaft.
15) Remove the oil seal.
16) Remove the plug from rear side of camshaft.

CAUTION:
- **Do not remove the oil seal unless necessary.**
- **Do not scratch the journal surface when removing oil seal.**

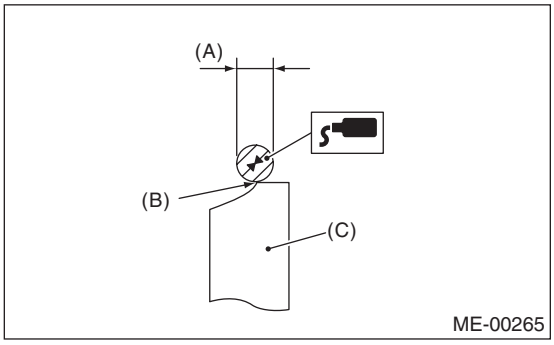
B: INSTALLATION

1) Apply a coat of engine oil to the camshaft journals, and then install the camshaft.
2) Install the camshaft cap.
   (1) Apply liquid gasket on the around of camshaft cap.

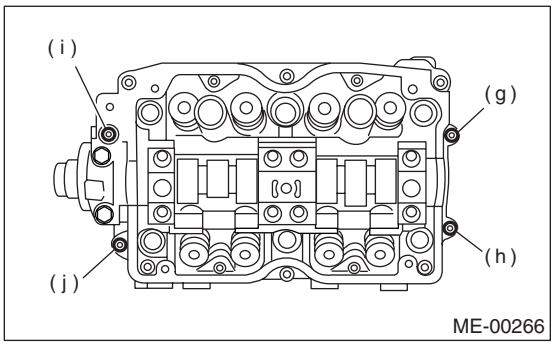
Liquid gasket:
THREE BOND 1280B
Part No. K0877YA018



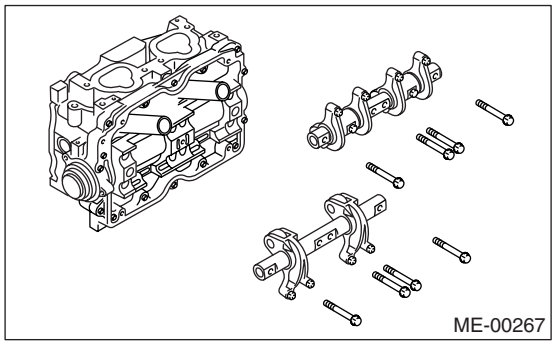
NOTE:
Apply a coat of 3 mm (0.12 in) dia. (A) liquid gasket along edge (B) of the camshaft cap (C) mating surface.



(2) Temporarily tighten the bolts (g) through (j) in alphabetical sequence.

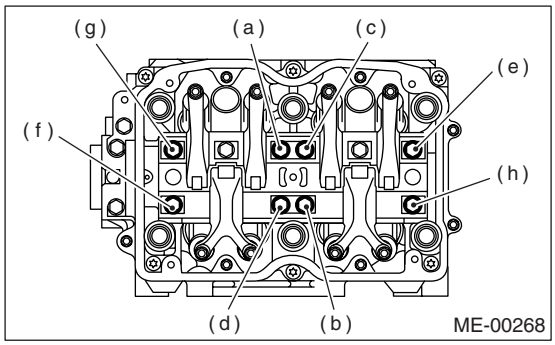


(3) Install the valve rocker assembly.



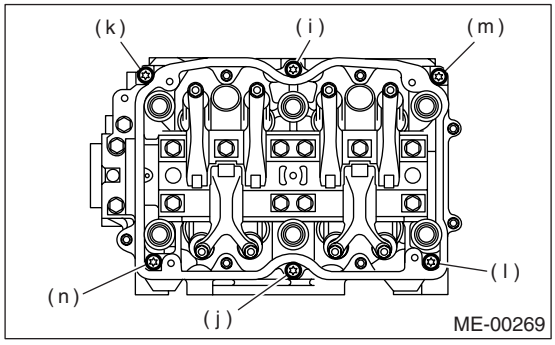
(4) Tighten the bolts (a) through (h) in alphabetical sequence.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



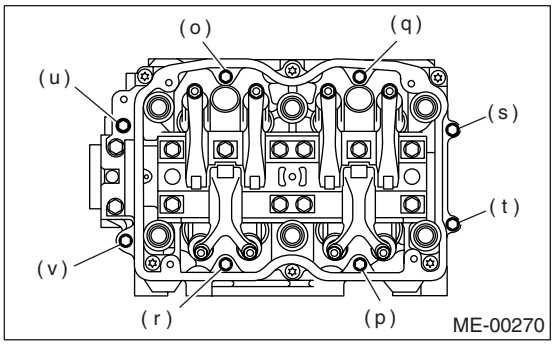
(5) Tighten the TORX® bolts (i) through (n) in alphabetical sequence using ST.
ST 499497000 TORX® PLUS

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



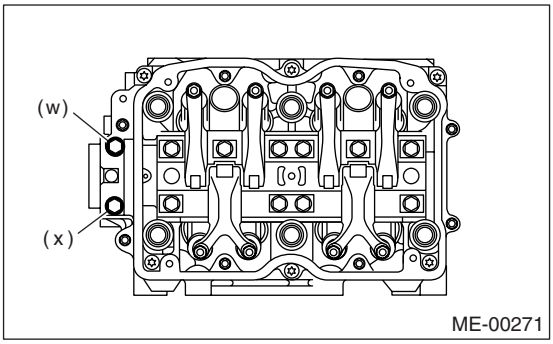
(6) Tighten the bolts (o) through (v) in alphabetical sequence.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



(7) Tighten the bolts (w) through (x) in alphabetical sequence.

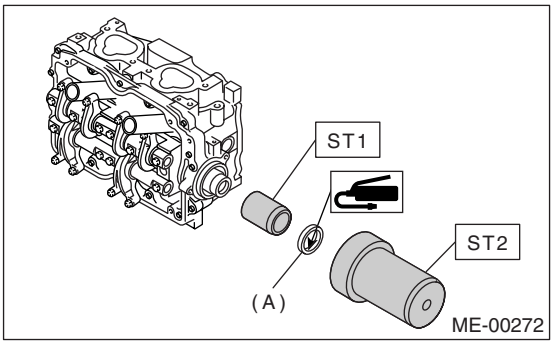
Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



3) Apply a coat of grease to oil seal lips, and then install the oil seal (A) on camshaft using ST1 and ST2.

NOTE:
Use a new oil seal.

ST1 499597000 OIL SEAL GUIDE
ST2 499587500 OIL SEAL INSTALLER



4) Install the plug using ST.

ST 499587700 CAMSHAFT OIL SEAL INSTALLER

5) Adjust the valve clearance. <Ref. to ME(H4SO)-29, ADJUSTMENT, Valve Clearance.>

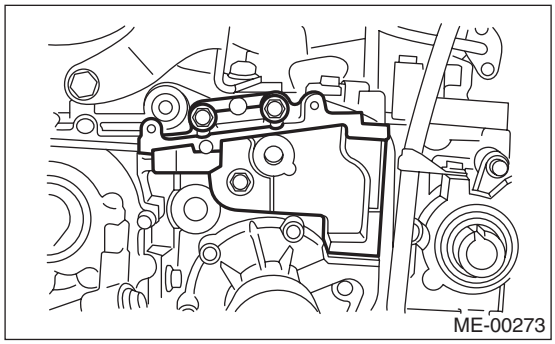
6) Install the rocker cover and connect PCV hose.

7) Install the oil level gauge guide. (LH side only)

8) Install the camshaft position sensor support. (LH side only)

9) Install the tensioner bracket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

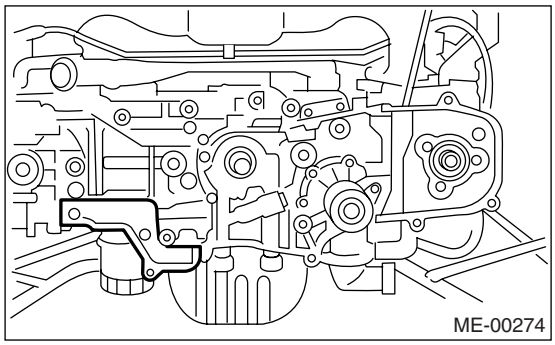


10) Install the timing belt cover No. 2 (RH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

11) Install the timing belt cover No. 2 (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



12) Install the crankshaft sprocket. <Ref. to ME(H4SO)-51, INSTALLATION, Crankshaft Sprocket.>

13) Install the camshaft sprocket. <Ref. to ME(H4SO)-49, INSTALLATION, Camshaft Sprocket.>

14) Install the timing belt assembly. <Ref. to ME(H4SO)-45, INSTALLATION, Timing Belt Assembly.>

15) Install the timing belt cover. <Ref. to ME(H4SO)-43, INSTALLATION, Timing Belt Cover.>

16) Install the crankshaft pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crankshaft Pulley.>

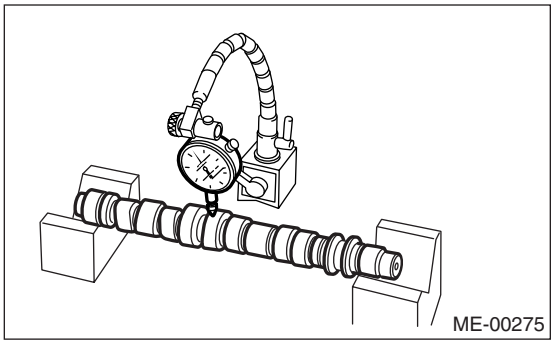
17) Install the V-belt. <Ref. to ME(H4SO)-39, INSTALLATION, V-belt.>

C: INSPECTION

1. CAMSHAFT

1) Measure the bend, and repair or replace if necessary.

Limit:
0.025 mm (0.00098 in)



2) Check the journal for damage and wear. Replace if faulty.
3) Measure the outside diameter of camshaft journal and inside diameter of cylinder head journal, and determine the difference between two (= oil clearance). If the oil clearance exceeds specifications, replace the camshaft or cylinder head as necessary.

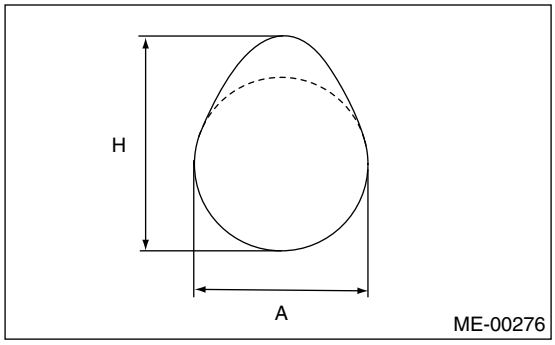
		Unit: mm (in)
Clearance at journal	Standard	0.055 — 0.090 (0.0022 — 0.0035)
	Limit	0.10 (0.0039)
Camshaft journal O.D.		31.928 — 31.945 (1.2570 — 1.2577)
Journal hole I.D.		32.000 — 32.018 (1.2598 — 1.2605)

4) Check the cam face condition; remove the minor faults by grinding with oil stone. Measure the cam height H; replace if the limit has been exceeded.

Cam height: H

Item		Unit: mm (in)
Intake	STD	39.485 — 39.585 (1.5545 — 1.5585)
	Limit	39.385 (1.5506)
Exhaust	STD	39.257 — 39.357 (1.5455 — 1.5495)
	Limit	39.157 (1.5416)

Cam base circle diameter A:
IN: 34.00 mm (1.3386 in)
EX: 34.00 mm (1.3386 in)

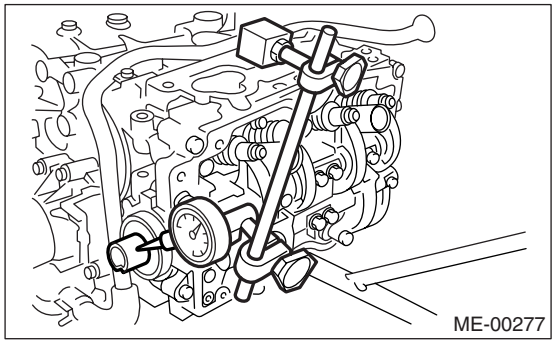


2. CAMSHAFT SUPPORT

Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace the camshaft support.

Standard:
0.030 — 0.090 mm (0.0012 — 0.0035 in)

Limit:
0.10 mm (0.0039 in)

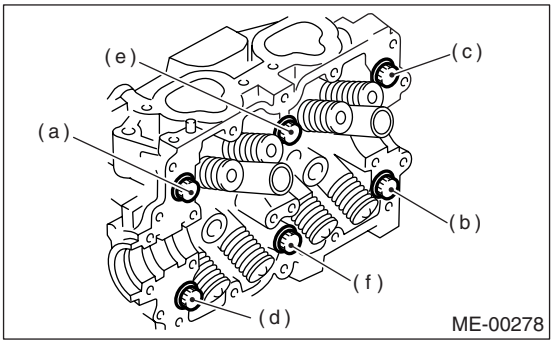


20.Cylinder Head Assembly

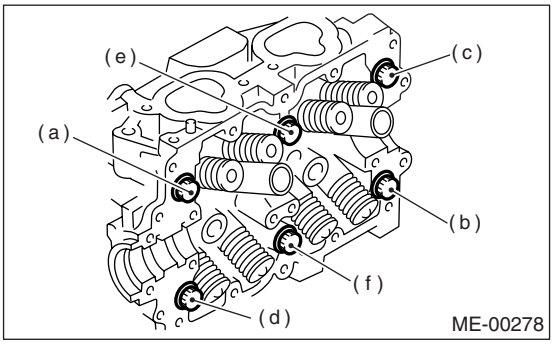
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4SO)-39, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(H4SO)-44, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(H4SO)-49, REMOVAL, Camshaft Sprocket.>
6) Remove the intake manifold. <Ref. to FU(H4SO)-13, REMOVAL, Intake Manifold.>
7) Remove the bolt which installs the A/C compressor bracket on cylinder head.
8) Remove the valve rocker assembly. <Ref. to ME(H4SO)-52, REMOVAL, Valve Rocker Assembly.>
9) Remove the camshaft. <Ref. to ME(H4SO)-54, REMOVAL, Camshaft.>
10) Remove the cylinder head bolts in alphabetical sequence shown in the figure.

NOTE:
Leave the bolts (a) and (c) engaged by three or four threads to prevent cylinder head from falling.



11) While tapping the cylinder head with a plastic hammer, separate it from cylinder block.
12) Remove the bolts (a) and (c) to remove cylinder head.



13) Remove the cylinder head gasket.

CAUTION:
Do not scratch the mating surface of cylinder head and cylinder block.

14) Similarly, remove the right side cylinder head.

B: INSTALLATION

1) Install the cylinder head and gaskets on cylinder block.

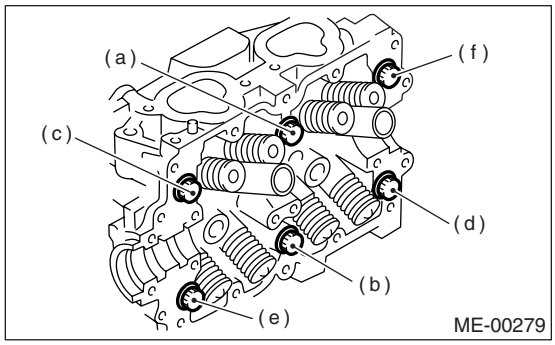
CAUTION:
- **Use new cylinder head gaskets.**
- **Be careful not to scratch the mating surface of cylinder block and cylinder head.**

2) Tighten the cylinder head bolts.
(1) Apply a coat of engine oil to the washers and bolt threads.
(2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence.
Then tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence.
(3) Back off all bolts by 180° first; back them off by 180° again in reverse order of installation.
(4) Tighten the bolts (a) and (b) to 34 N·m (3.5 kgf-m, 25 ft-lb) in reverse order of installation.
(5) Tighten the bolts (c), (d), (e) and (f) to 15 N·m (1.5 kgf-m, 11 ft-lb).
(6) Tighten all bolts by 80° to 90° in alphabetical sequence.

CAUTION:
Do not tighten bolts more than 90°.

(7) Further tighten all bolts by 80° to 90° in alphabetical sequence shown in figure below.

CAUTION:
Ensure that the total "re-tightening angle" [in the former two steps], do not exceed 180°.



3) Install the camshaft. <Ref. to ME(H4SO)-55, INSTALLATION, Camshaft.>
4) Install the valve rocker assembly. <Ref. to ME(H4SO)-52, INSTALLATION, Valve Rocker Assembly.>
5) Install the A/C compressor bracket on cylinder head.
6) Install the intake manifold. <Ref. to FU(H4SO)-15, INSTALLATION, Intake Manifold.>

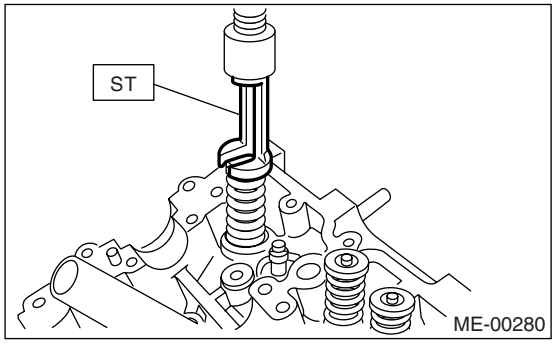
7) Install the camshaft sprocket. <Ref. to ME(H4SO)-49, INSTALLATION, Camshaft Sprocket.>
8) Install the timing belt assembly. <Ref. to ME(H4SO)-45, INSTALLATION, Timing Belt Assembly.>
9) Install the timing belt cover. <Ref. to ME(H4SO)-43, INSTALLATION, Timing Belt Cover.>
10) Install the crankshaft pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crankshaft Pulley.>
11) Install the V-belt. <Ref. to ME(H4SO)-39, INSTALLATION, V-belt.>

C: DISASSEMBLY

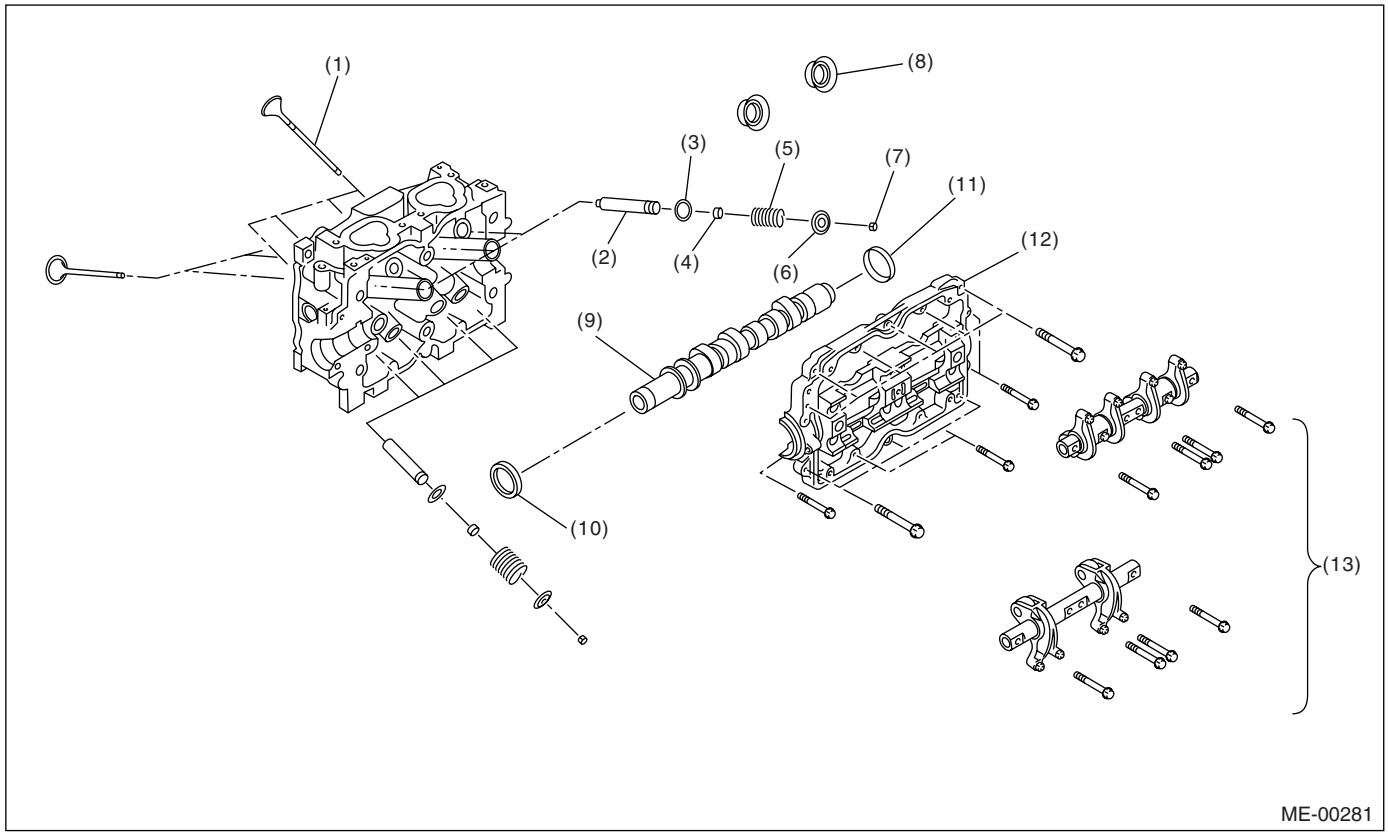
1) Place the cylinder head on ST.
ST 498267800 CYLINDER HEAD TABLE

2) Set the ST on valve spring. Compress the valve spring, and then remove the valve spring retainer key. Remove each valve and valve spring.
ST 499718000 VALVE SPRING REMOVER

CAUTION:
- **Mark each valve to prevent confusion.**
- **Use extreme care not to damage the lips of intake valve oil seals and exhaust valve oil seals.**



D: ASSEMBLY



(1) Valve
(2) Valve guide
(3) Valve spring seat
(4) Oil seal
(5) Valve spring
(6) Retainer
(7) Retainer key
(8) Spark plug gasket
(9) Camshaft
(10) Oil seal
(11) Plug
(12) Camshaft cap
(13) Valve rocker ASSY

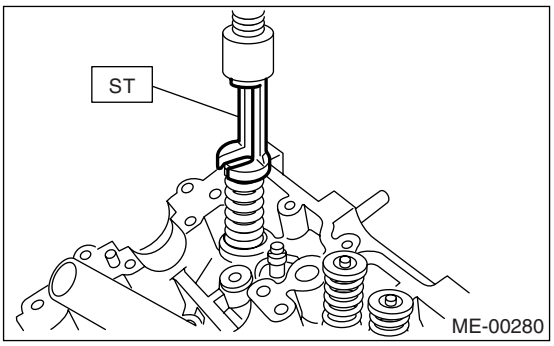
1) Installation of valve spring and valve
(1) Place the cylinder head on ST.
ST 4982678 00 CYLINDER HEAD TABLE
(2) Coat the stem of each valve with engine oil and insert valve into valve guide.

NOTE:
When inserting the valve into valve guide, use special care not to damage the oil seal lip.

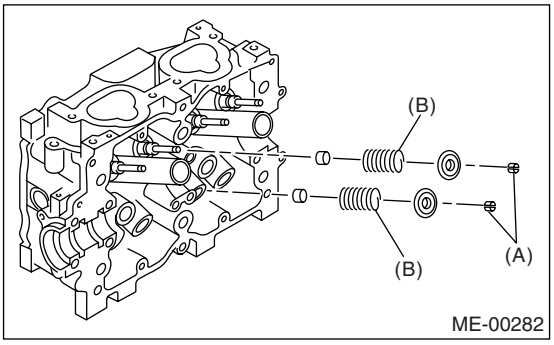
(3) Install the valve spring and retainer.

NOTE:
Be sure to install the valve springs with their close-coiled end facing the seat on the cylinder head.

(4) Set the ST on valve spring.
ST 499718000 VALVE SPRING REMOVER



(5) Compress the valve spring, and then fit the valve spring retainer key.



(A) Retainer key
(B) Valve spring

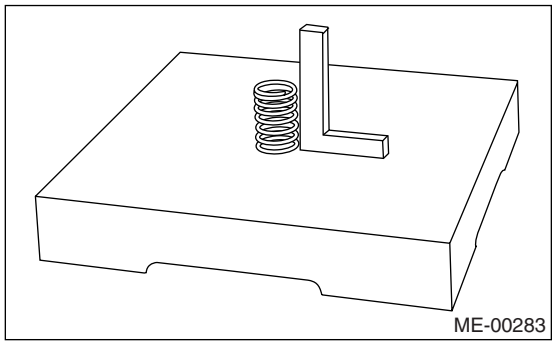
(6) After installing, tap the valve spring retainers lightly with plastic hammer for better seating.

E: INSPECTION

1. VALVE SPRING

1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not to the specifications presented below.
2) To measure the squareness of valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

Free length		54.30 mm (2.1378 in)
Squareness		2.5°, 2.4 mm (0.094 in)
Tension/spring height	Set	214 — 246 N (22 — 25 kgf, 48 — 55 lb)/ 45.0 mm (1.772 in)
	Lift	526 — 582 N (54 — 59 kgf, 119 — 130 lb)/ 34.7 mm (1.366 in)



2. INTAKE AND EXHAUST VALVE OIL SEAL

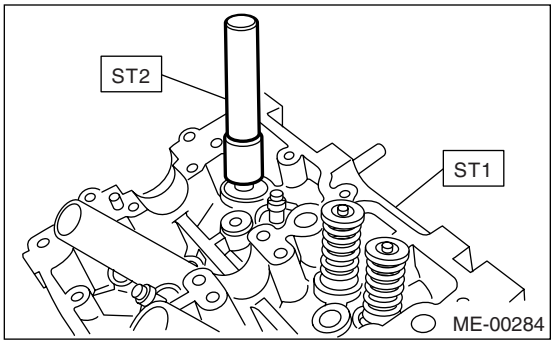
Replace the oil seal with new one, if lip is damaged or spring out of place, or when the surfaces of intake valve and valve seat are reconditioned or intake valve guide is replaced. Use pliers to pinch and remove oil seal from valve.
1) Place the cylinder head on ST1.
2) Press-fit oil seal using ST2.

CAUTION:
• Apply engine oil to oil seal before press-fitting.
• When press-fitting oil seal, do not use hammer or strike in.
• Differentiate between intake valve oil seal and exhaust valve oil seal by noting their difference in color.

ST1 498267800 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE

Color of rubber part:
Intake [Black]
Exhaust [Brown]

Color of spring part:
Intake [Silver]
Exhaust [Silver]



F: ADJUSTMENT

1. CYLINDER HEAD

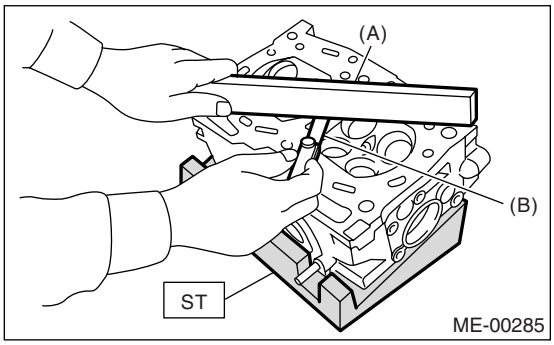
1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect important areas by means of red lead check.
Also make sure that gasket installing surface shows no trace of gas and water leaks.
2) Place the cylinder head on ST.
ST 498267800 CYLINDER HEAD TABLE
3) Measure the warping of the cylinder head surface that mates with crankcase using a straight edge and thickness gauge.
If the warping exceeds 0.05 mm (0.0020 in), regrind the surface with a surface grinder.

Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.1 mm (0.004 in)

Standard height of cylinder head:
97.5 mm (3.839 in)

NOTE:
Uneven torque for the cylinder head bolts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.

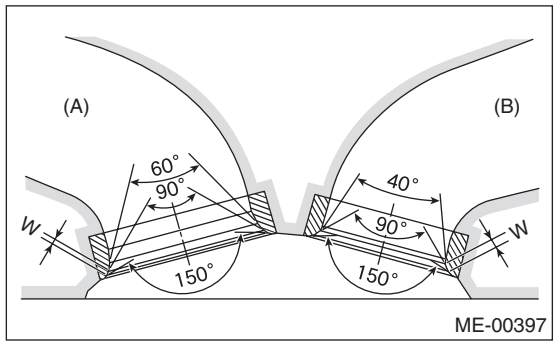


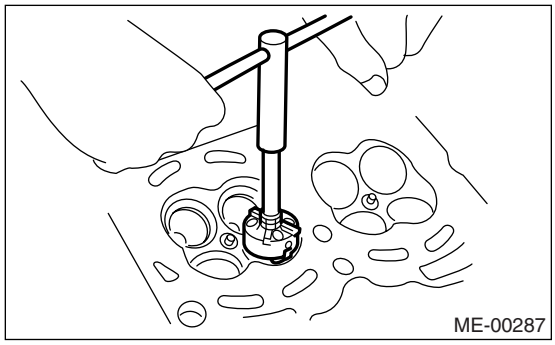
(A) Straight edge
(B) Thickness gauge

2. VALVE SEAT

Inspect the intake and exhaust valve seats, and then correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

Valve seat width: W
Intake (A)
Standard 1.0 mm (0.039 in)
Limit 1.7 mm (0.067 in)
Exhaust (B)
Standard 1.5 mm (0.059 in)
Limit 2.2 mm (0.087 in)

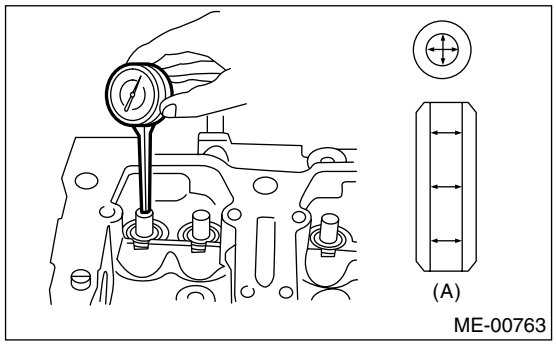




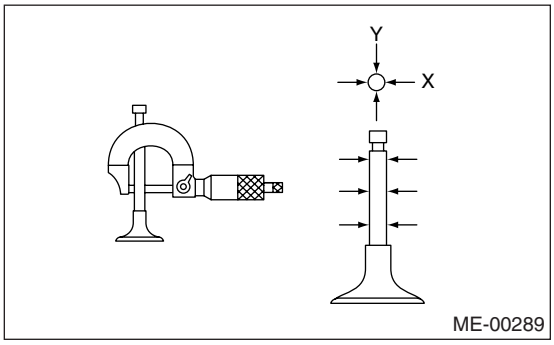
3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

Clearance between the valve guide and valve stem:
Standard
Intake 0.035 — 0.062 mm (0.0014 — 0.0024 in)
Exhaust 0.040 — 0.067 mm (0.0016 — 0.0026 in)
Limit
0.15 mm (0.0059 in)



(A) Valve guide



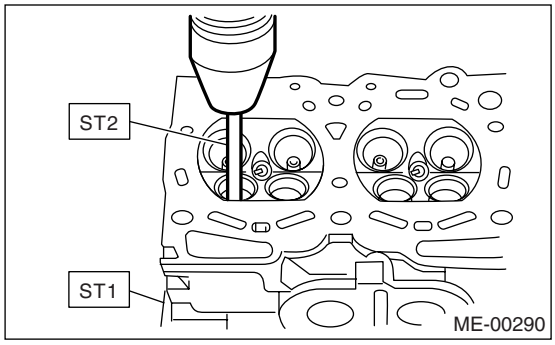
2) If the clearance between valve guide and stem exceeds the limit, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

Valve guide inner diameter:
6.000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameters:
Intake
5.950 — 5.965 mm (0.2343 — 0.2348 in)
Exhaust
5.945 — 5.960 mm (0.2341 — 0.2346 in)

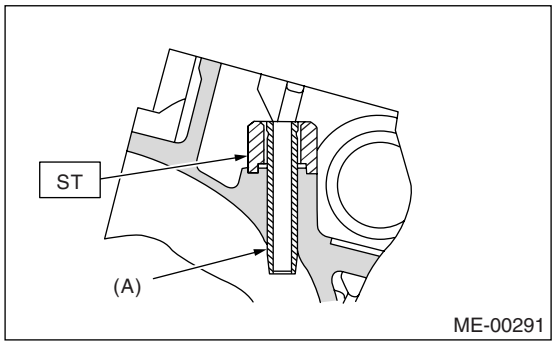
(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.
(2) Insert the ST2 into valve guide and press it down to remove valve guide.

ST1 498267800 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



(3) Turn the cylinder head upside down and place ST as shown in the figure.

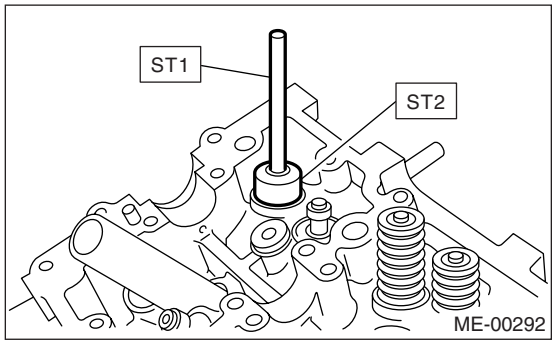
Intake side:
ST 499767700 VALVE GUIDE ADJUSTER
Exhaust side:
ST 499767800 VALVE GUIDE ADJUSTER



(A) Valve guide

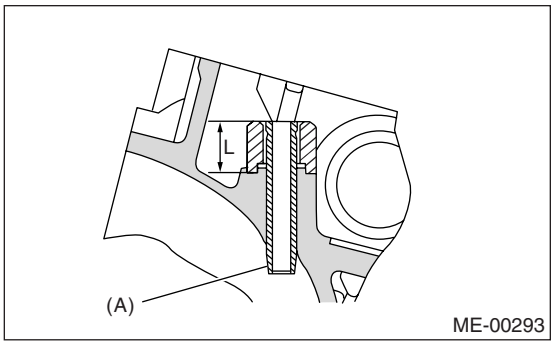
(4) Before installing new oversize valve guide, make sure that neither scratches nor damages exist on the inside surface of valve guide holes in cylinder head.
(5) Put new valve guide, coated with sufficient oil, in the cylinder, and then insert the ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER
Intake side:
ST2 499767700 VALVE GUIDE ADJUSTER
Exhaust side:
ST2 499767800 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion: L
Intake
20.0 — 20.5 mm (0.787 — 0.807 in)
Exhaust
16.5 — 17.0 mm (0.650 — 0.669 in)

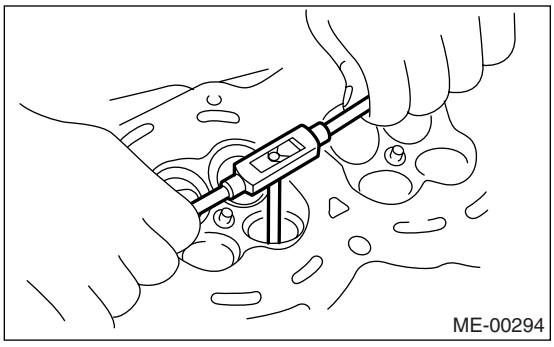


(A) Valve guide

(7) Ream the inside of valve guide with ST. Gently rotate the reamer clockwise while pressing it lightly into valve guide, and return it also rotating clockwise. After reaming, clean the valve guide to remove chips.

CAUTION:
• Apply engine oil to the reamer when reaming.
• If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
• If the inner surface of the valve guide becomes lustrous and the reamer does not chips, use a new reamer or remedy the reamer.

ST 499767400 VALVE GUIDE REAMER



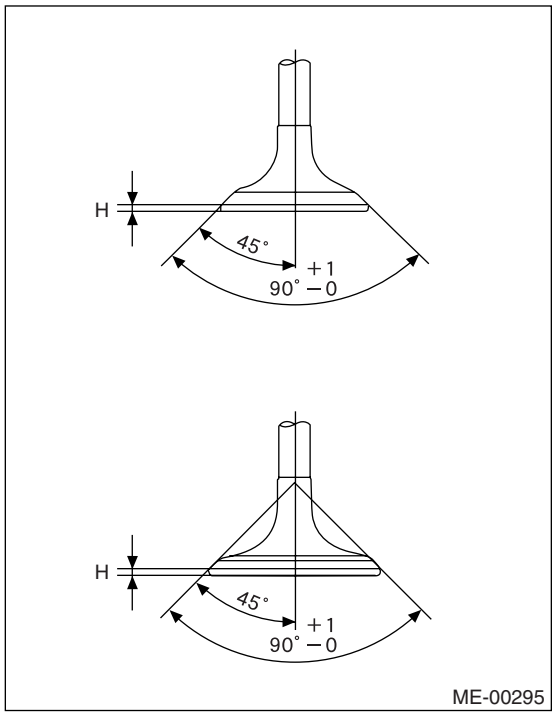
(8) Recheck the contact condition between valve and valve seat after replacing valve guide.

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if "H" is less than the specified limit.

H:
Intake
Standard 1.0 mm (0.039 in)
Limit 0.6 mm (0.024 in)
Exhaust
Standard 1.2 mm (0.047 in)
Limit 0.6 mm (0.024 in)

Valve overall length:
Intake
120.6 mm (4.75 in)
Exhaust
121.7 mm (4.79 in)



2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. <Ref. to ME(H4SO)-61, VALVE SEAT, ADJUSTMENT, Cylinder Head Assembly.> Install a new intake valve oil seal after lapping.

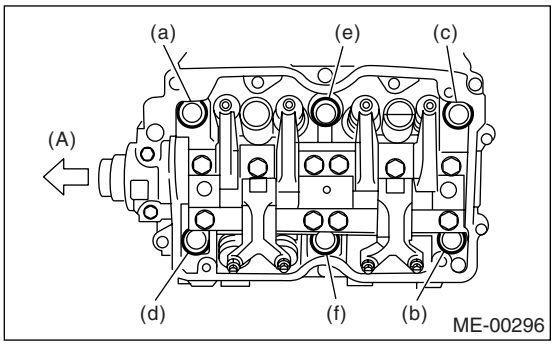
21.Cylinder Block

A: REMOVAL

NOTE:
Before conducting this procedure, drain the engine oil completely if applicable.

1) Remove the intake manifold. <Ref. to FU(H4SO)-13, REMOVAL, Intake Manifold.>
2) Remove the V-belt. <Ref. to ME(H4SO)-39, REMOVAL, V-belt.>
3) Remove the crankshaft pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crankshaft Pulley.>
4) Remove the timing belt cover. <Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>
5) Remove the timing belt assembly. <Ref. to ME(H4SO)-44, REMOVAL, Timing Belt Assembly.>
6) Remove the camshaft sprocket. <Ref. to ME(H4SO)-49, REMOVAL, Camshaft Sprocket.>
7) Remove the crankshaft sprocket. <Ref. to ME(H4SO)-42, REMOVAL, Crankshaft Pulley.>
8) Remove the generator and A/C compressor with their brackets.
9) Remove the rocker cover.
10) Remove the cylinder head bolts in alphabetical sequence shown in the figure.

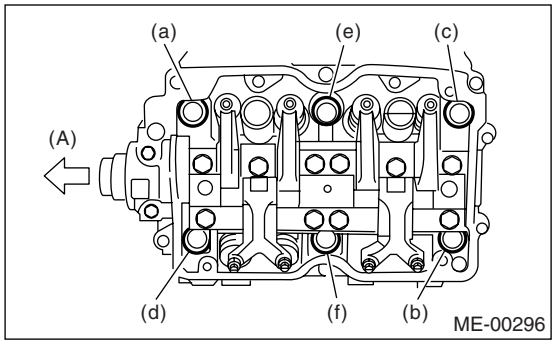
NOTE:
Leave bolts (a) and (c) engaged by three or four threads to prevent cylinder head from falling.



(A) Front

11) While tapping the cylinder head with a plastic hammer, separate it from cylinder block.

12) Remove the bolts (a) and (c) to remove cylinder head.



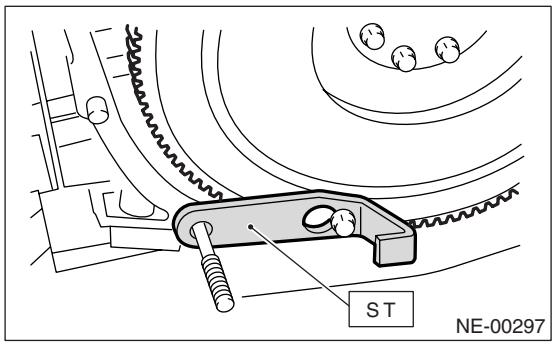
(A) Front

13) Remove the cylinder head gasket.

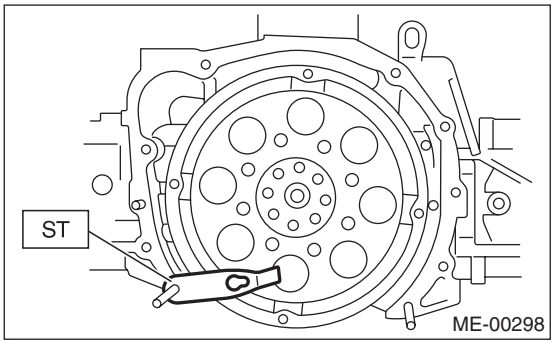
NOTE:
Do not scratch the mating surface of cylinder head and cylinder block.

14) Similarly, remove the right side cylinder head.
15) Remove the clutch housing cover. (MT model)
16) Remove the flywheel (MT model) or drive plate (AT model).
Using the ST, lock the crankshaft.
ST 498497100 CRANKSHAFT STOPPER

- MT MODEL

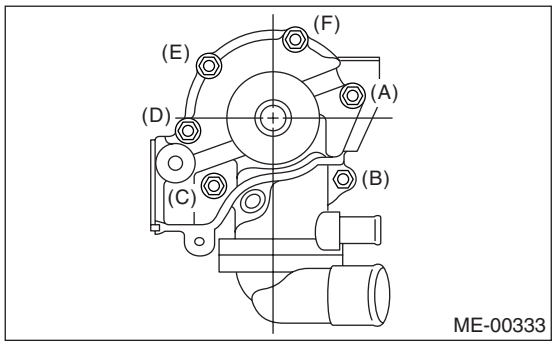


- AT MODEL



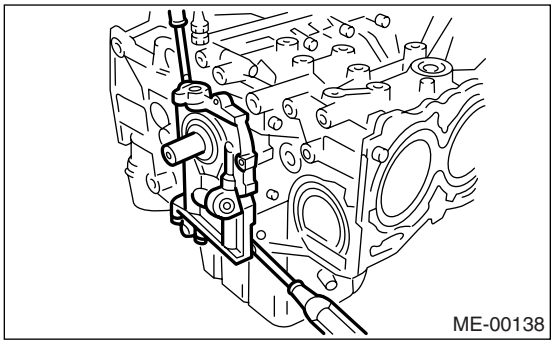
17) Remove the oil separator cover.
18) Remove the water by-pass pipe for heater.

19) Loosen the bolts in alphabetical sequence as shown in the figure, and then remove the water pump.



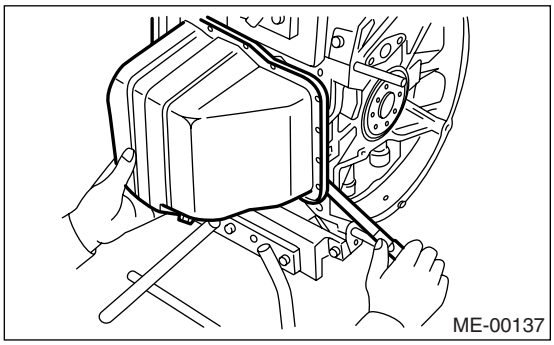
20) Remove the oil pump from cylinder block.
Use a flat-bladed screwdriver as shown in the figure when removing oil pump.

CAUTION:
Be careful not to scratch the mating surface of cylinder block and oil pump.



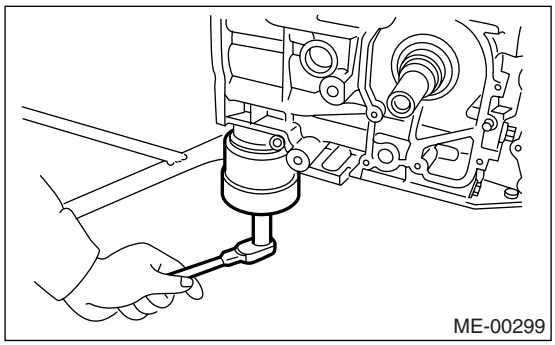
21) Removal of oil pan
(1) Turn the cylinder block to face the #2 and #4 piston sides upward.
(2) Remove the bolts which secure the oil pan to cylinder block.
(3) Insert a oil pan cutter blade between cylinder block-to-oil pan clearance, and then remove the oil pan.

NOTE:
Do not use a screwdriver or similar tool in place of oil pan cutter.

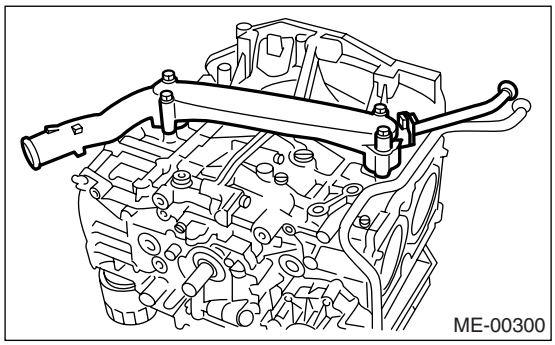


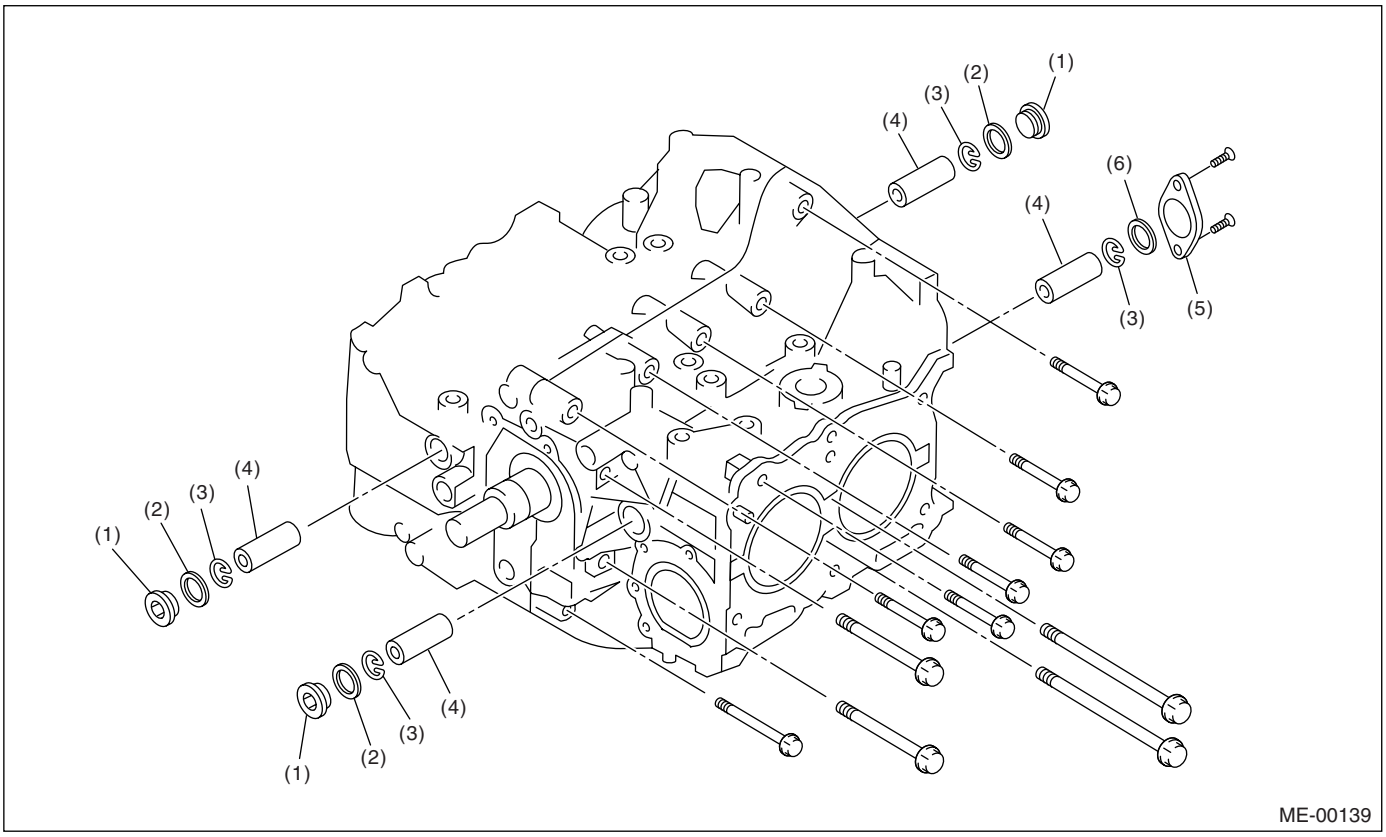
22) Remove the oil strainer stay.
23) Remove the oil strainer.
24) Remove the baffle plate.
25) Remove the oil filter using ST.

ST	498547000	OIL FILTER WRENCH (Outer diameter: 80 mm (3.15 in))
ST	18332AA000	OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))
ST	18332AA010	OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))



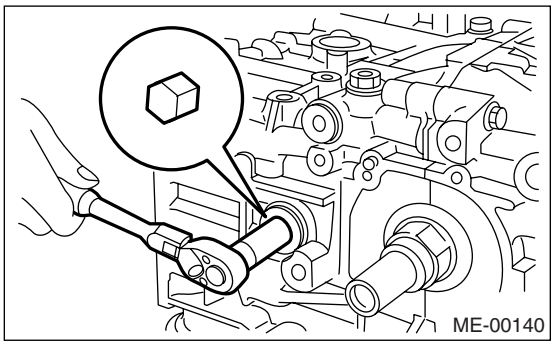
26) Remove the water pipe.



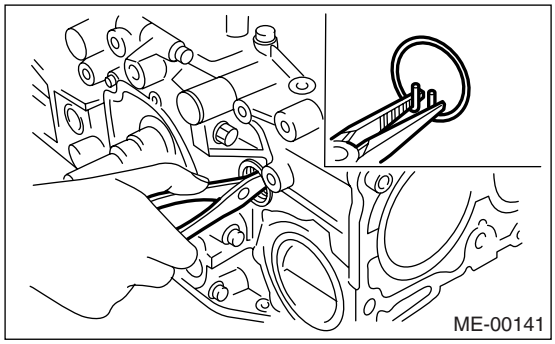


(1) Service hole plug
(2) Gasket
(3) Circlip
(4) Piston pin
(5) Service hole cover
(6) O-ring

27) Remove the service hole cover and service hole plugs using hexagon wrench [14 mm (0.55 in)].

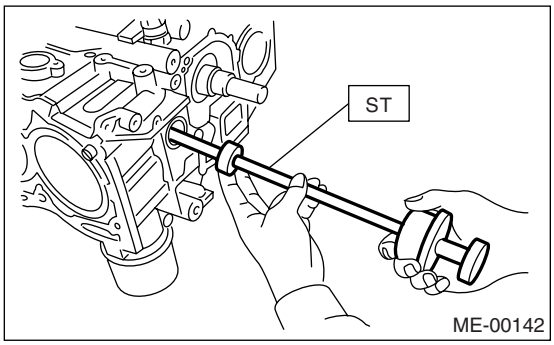


28) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, and then remove the piston circlip through service hole of #1 and #2 cylinders.



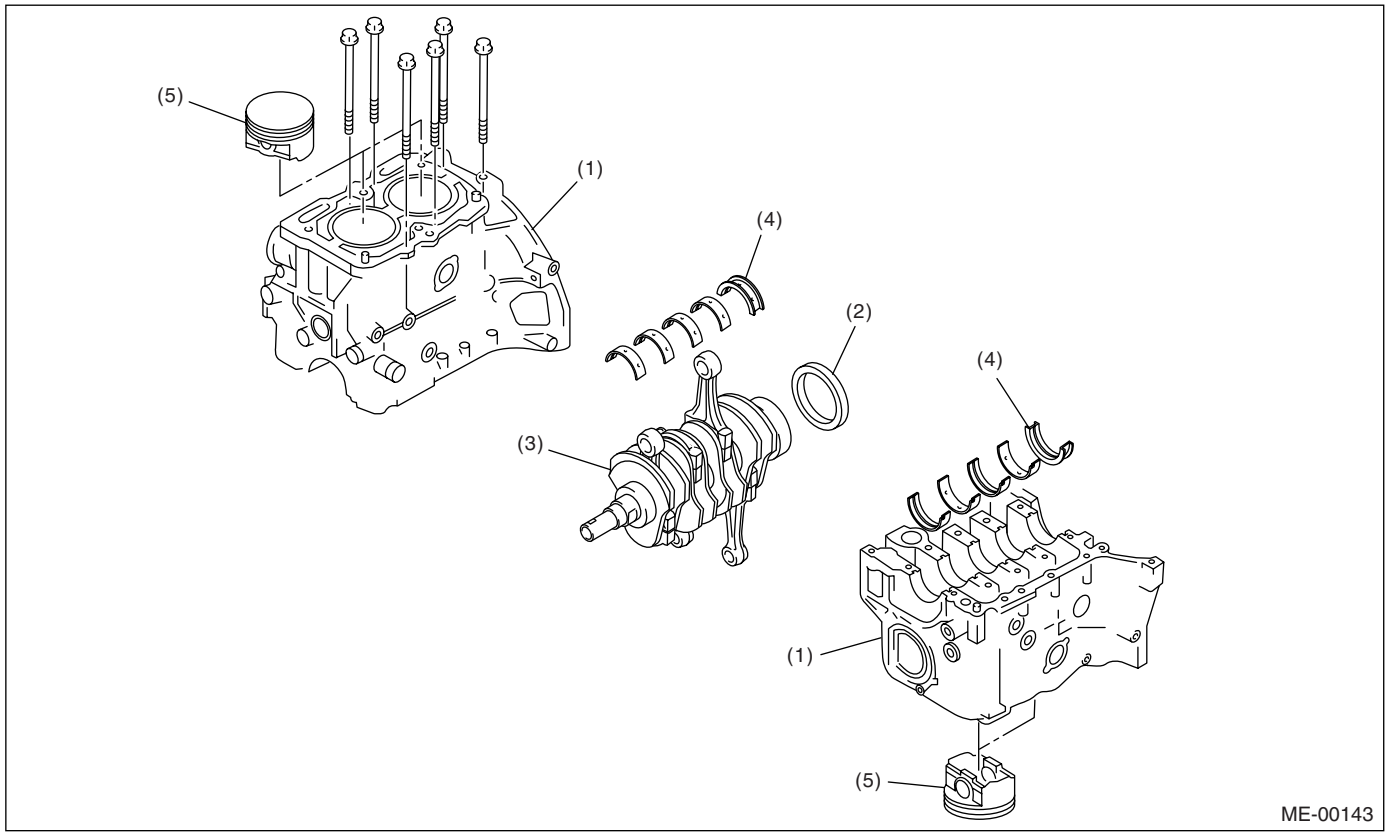
29) Draw out the piston pin from #1 and #2 pistons using ST.
ST 499097700 PISTON PIN REMOVER

NOTE:
Be careful not to confuse the original combination of piston, piston pin and cylinder.



30) Similarly remove the piston pins from #3 and #4 pistons.
31) Remove the bolts which connect the cylinder block on the side of #2 and #4 cylinders.
32) Back off the bolts which connect the cylinder block on the side of #1 and #3 cylinders two or three turns.
33) Set up the cylinder block so that #1 and #3 cylinders are on the upper side, and then remove the cylinder block connecting bolts.
34) Separate the cylinder blocks (RH) and (LH).

NOTE:
When separating the cylinder block, do not allow the connecting rod to fall and damage the cylinder block.



(1) Cylinder block
(2) Rear oil seal
(3) Crankshaft
(4) Crankshaft bearing
(5) Piston

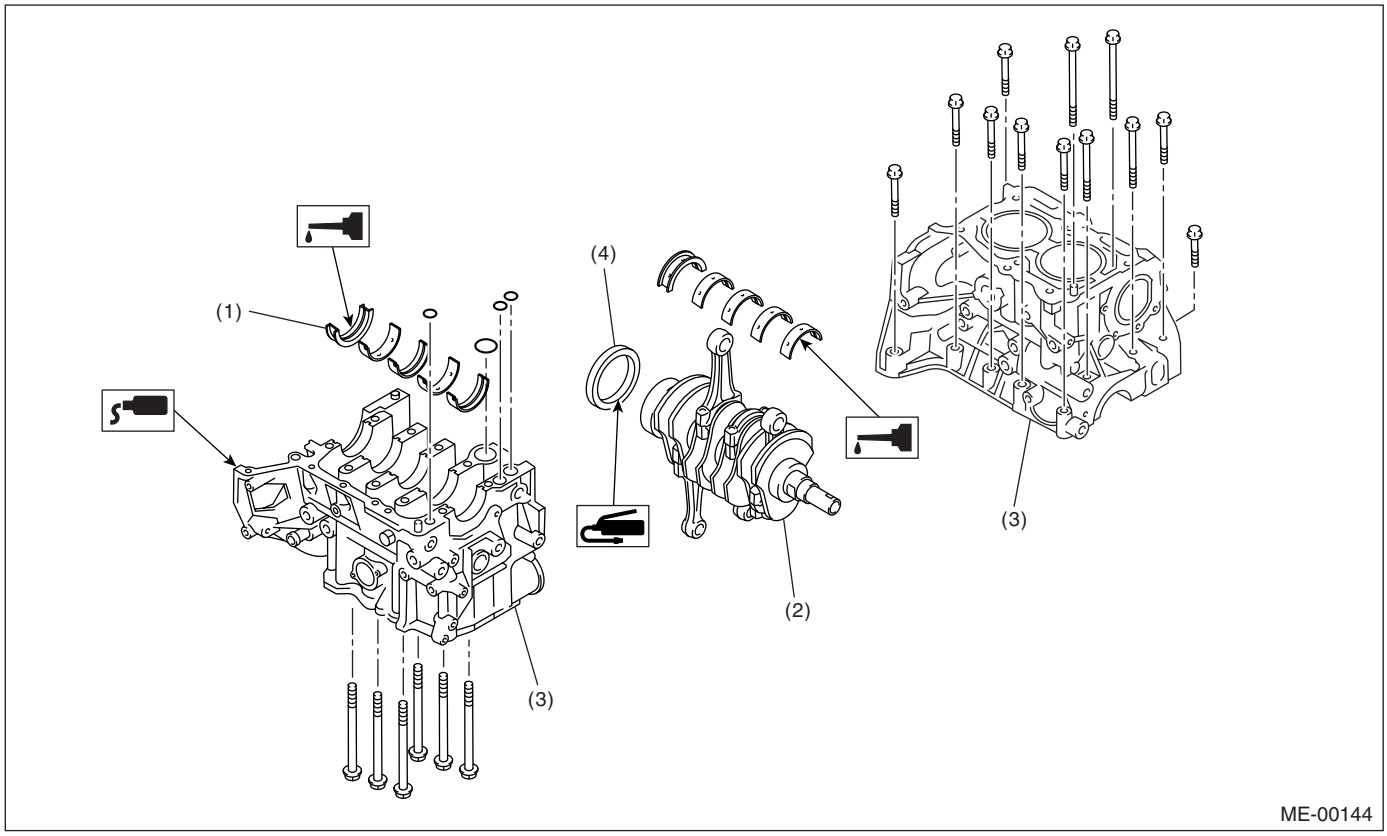
35) Remove the rear oil seal.
36) Remove the crankshaft together with connecting rod.
37) Remove the crankshaft bearings from cylinder block using hammer handle.

NOTE:
Do not confuse the combination of crankshaft bearings. Press bearing at the end opposite to locking lip.

38) Draw out each piston from cylinder block using wooden bar or hammer handle.

NOTE:
Do not confuse the combination of piston and cylinder.

B: INSTALLATION



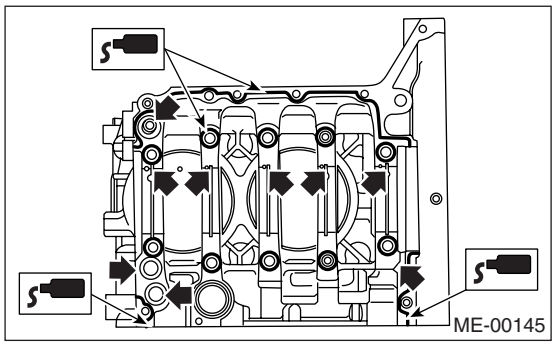
(1) Crankshaft bearing
(2) Crankshaft
(3) Cylinder block
(4) Rear oil seal

NOTE:
Remove oil in the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.

1) Position the crankshaft on #2 and #4 cylinder block.
2) Apply fluid packing to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

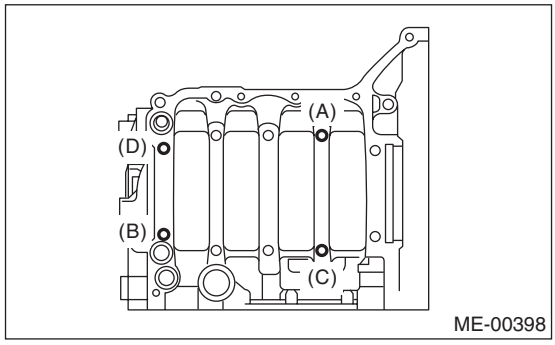
Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent

NOTE:
Do not allow fluid packing to jut into O-ring grooves, oil passages, bearing grooves, etc.



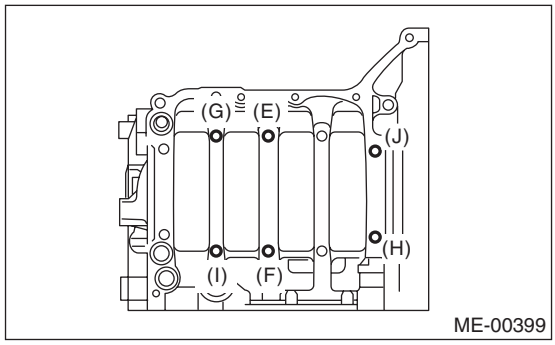
3) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (LH side)

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

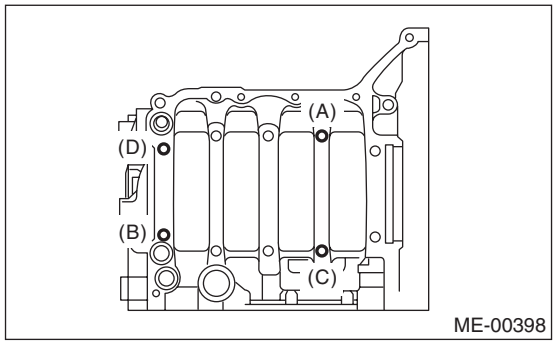


4) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (RH side)

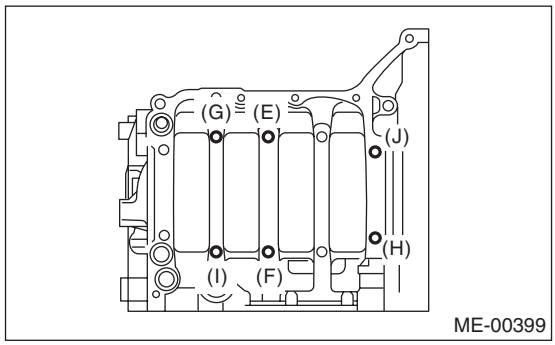
Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)



5) Further tighten the LH side bolts (A — D) to 90° in alphabetical sequence.

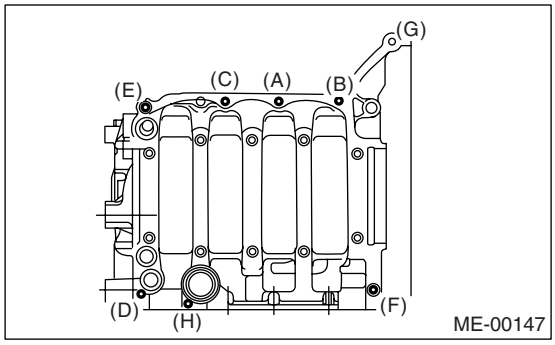


6) Further tighten the RH side bolts (E — J) to 90° in alphabetical sequence.

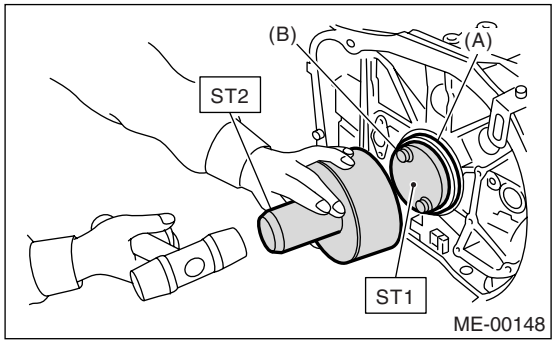


7) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

Tightening torque:
(A) — (G): 25 N·m (2.5 kgf-m, 18.1 ft-lb)
(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

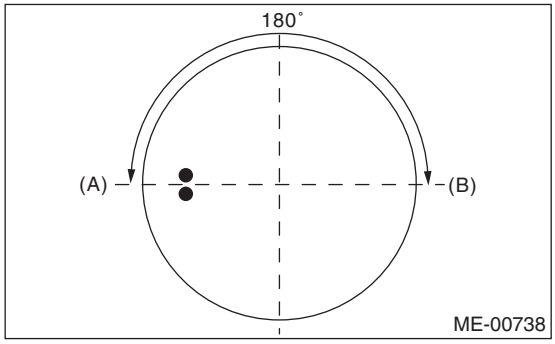


8) Install the rear oil seal using ST1 and ST2.
ST1 499597100 OIL SEAL GUIDE
ST2 499587200 OIL SEAL INSTALLER

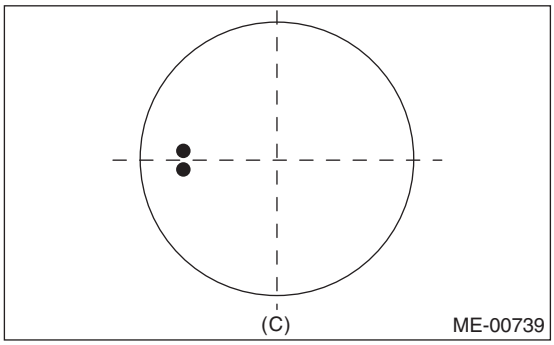


(A) Rear oil seal
(B) Flywheel attaching bolt

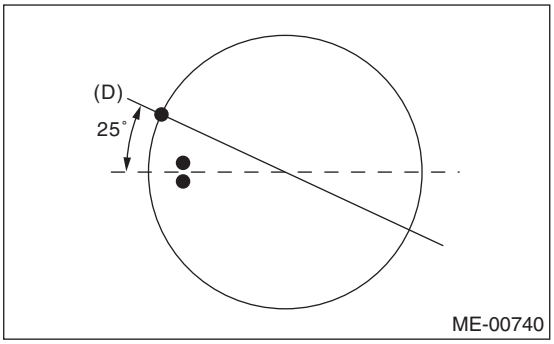
9) Position the top ring gap at (A) or (B) in the figure.
10) Position the second ring gap at 180° on the reverse side for top ring gap.



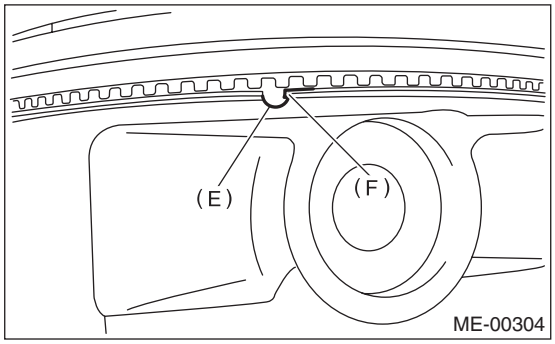
11) Position the expander gap at (C) in the figure.



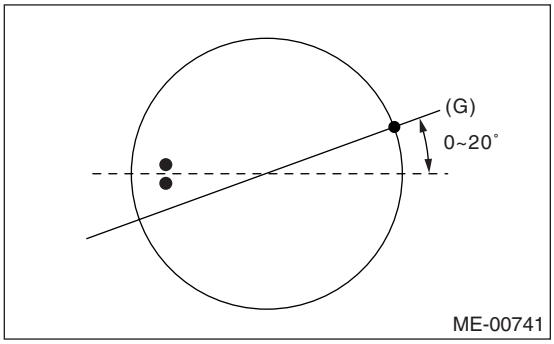
12) Position the lower rail gap at (D) in the figure.



NOTE:
Align the lower rail stopper (F) to the lateral hole (E) on the piston.



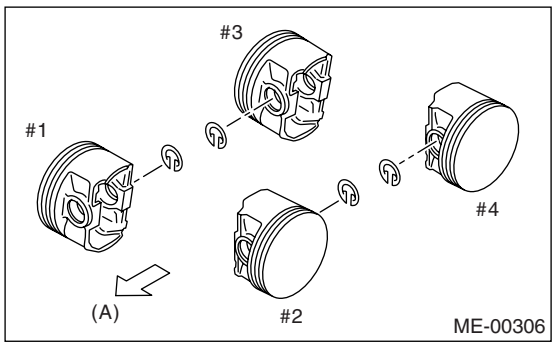
13) Position the upper rail gap at (G) in the figure.



CAUTION:
• Ensure ring gaps do not face the same direction.
• Ensure ring gaps are not within the piston skirt area.

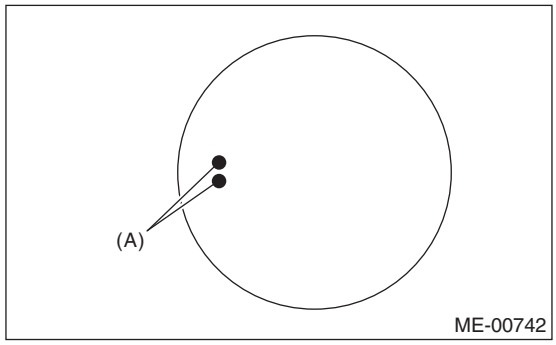
14) Install the circlip.
Install circlips in the piston holes located opposite service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

NOTE:
Use new circlips.

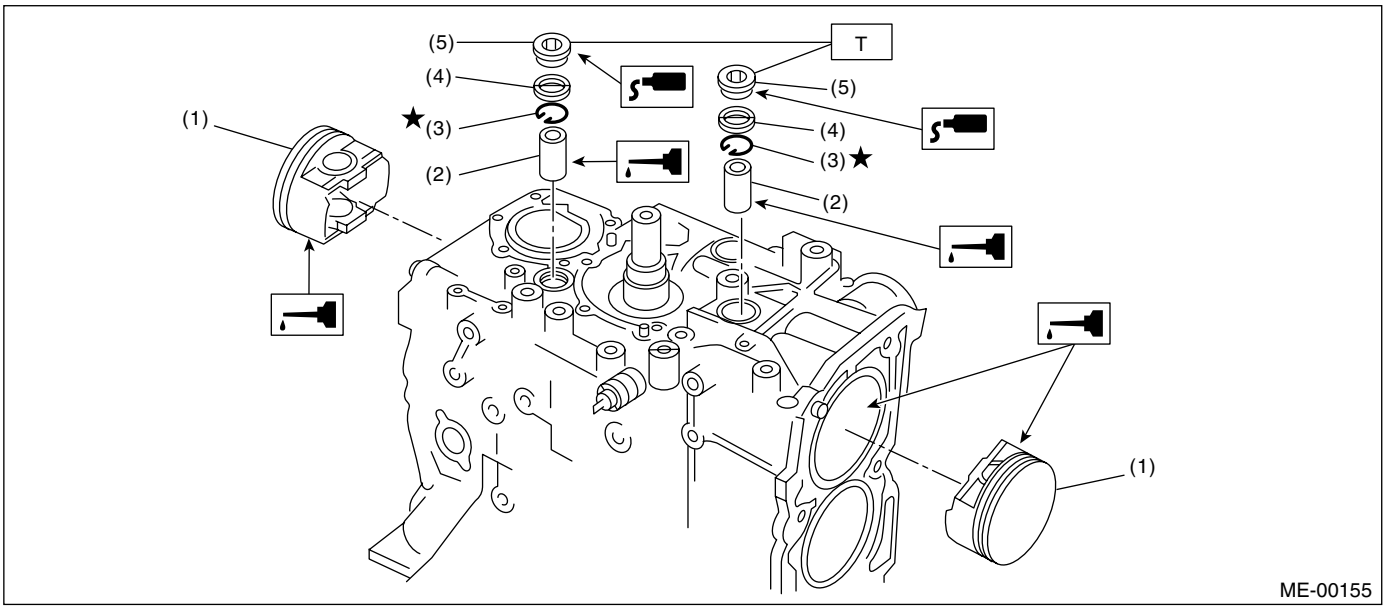


(A) Front side

CAUTION:
Piston front mark faces towards the front of the engine.



(A) Front mark



(1) Piston
(2) Piston pin
(3) Circlip
(4) Gasket
(5) Service hole plug

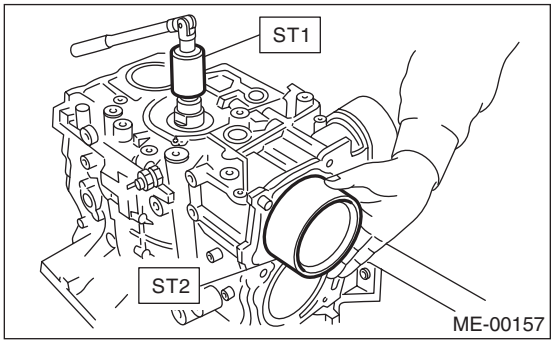
Tightening torque: N·m (kgf-m, ft-lb)
T: 70 (7.0, 50.6)

15) Installing piston
(1) Turn the cylinder block to face the #1 and #2 piston side upward.
(2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

ST1 499987500 CRANKSHAFT SOCKET

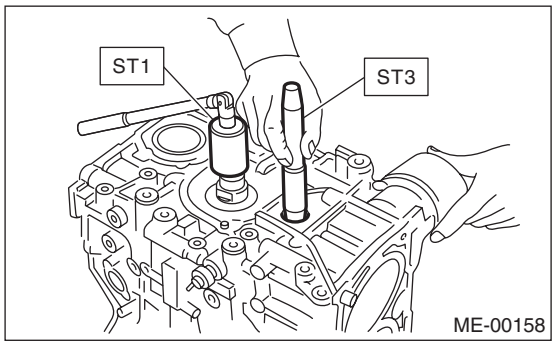
(3) Apply a coat of engine oil to pistons and cylinders, and then insert the pistons in their cylinders using ST2.

ST2 498747300 PISTON GUIDE



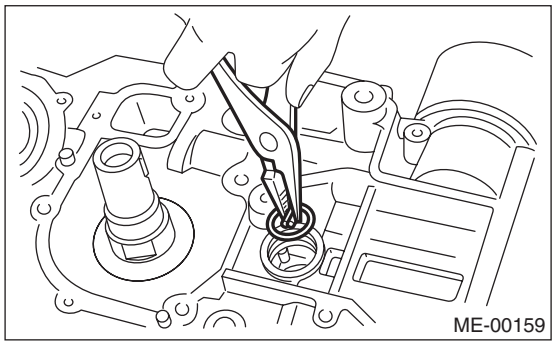
16) Installing piston pin
(1) Apply a coat of engine oil to the ST3 before insertion.
(2) Insert the ST3 into service hole to align piston pin hole with connecting rod small end.

ST3 499017100 PISTON PIN GUIDE



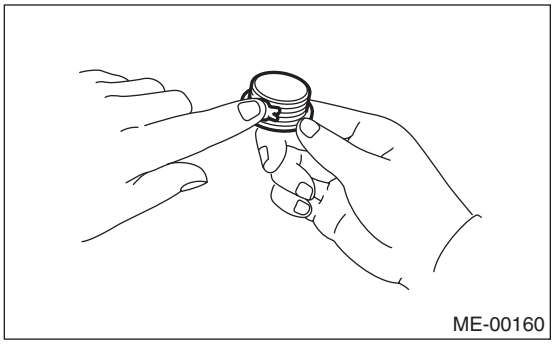
(3) Apply a coat of engine oil to the piston pin, and then insert the piston pin into piston and connecting rod through service hole.
(4) Install the circlip.

NOTE:
Use new circlips.



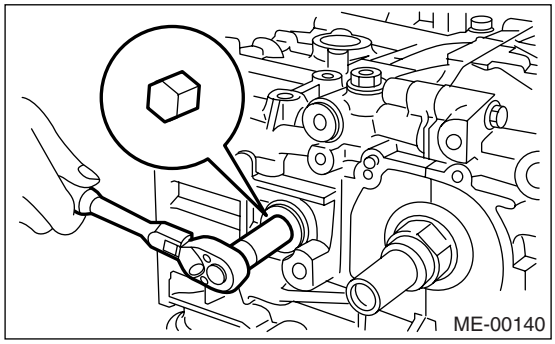
(5) Apply fluid packing around the service hole plug.

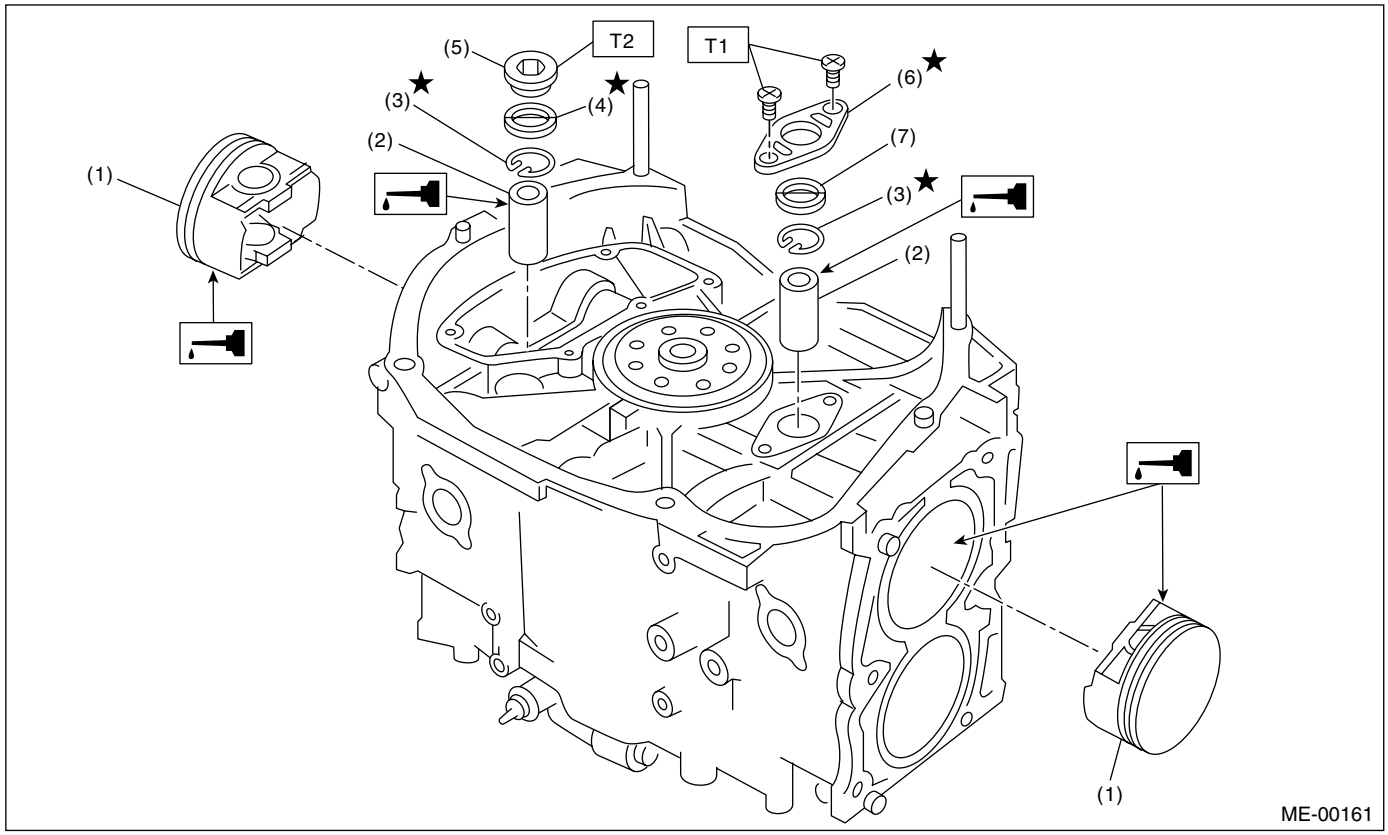
Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



(6) Install the service hole plug and gasket.

NOTE:
Use a new gasket.



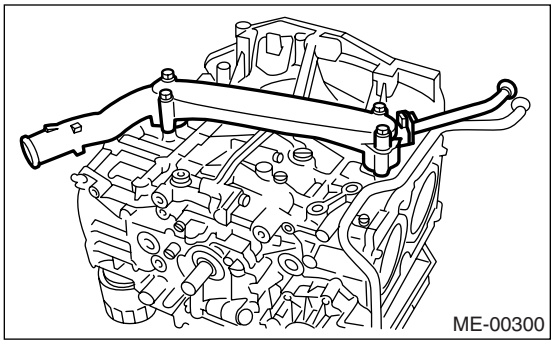


(1) Piston
(2) Piston pin
(3) Circlip
(4) Gasket
(5) Service hole plug
(6) Service hole cover
(7) O-ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 70 (7.1, 51.4)

(7) Turn the cylinder block to face the #3 and #4 piston side upward. Using the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.

17) Install the water pipe.



18) Install the baffle plate.

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

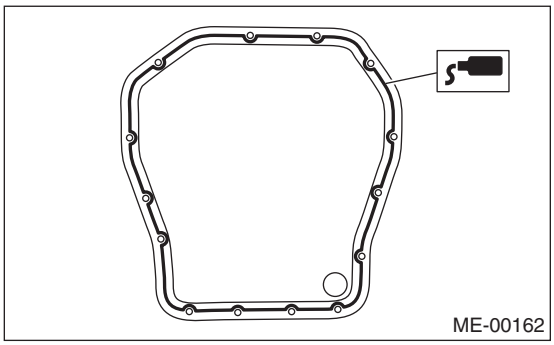
19) Install the oil strainer and O-ring.

Tightening torque:
10 N·m (1.0 kgf-m, 7 ft-lb)

20) Install the oil strainer stay.

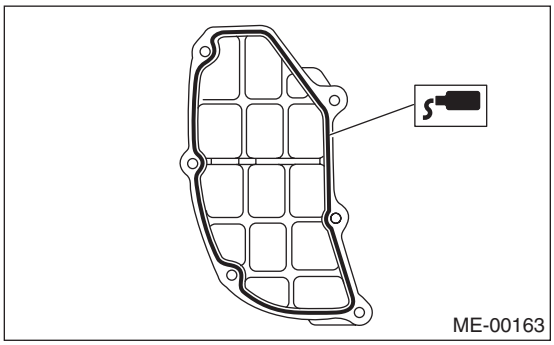
21) Apply fluid packing to the matching surfaces, and then install the oil pan.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



22) Apply fluid packing to the matching surfaces, and then install the oil separator cover.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent

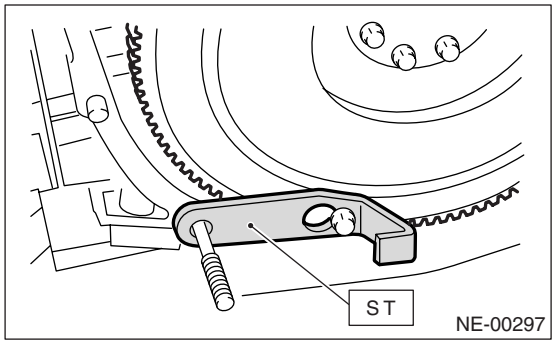


23) Install the flywheel or drive plate.
To lock the crankshaft, use ST.

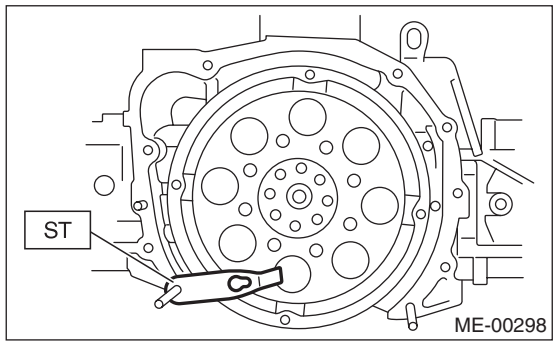
ST 498497100 CRANKSHAFT STOPPER

Tightening torque:
72 N·m (7.3 kgf-m, 52.8 ft-lb)

- MT MODEL



- AT MODEL

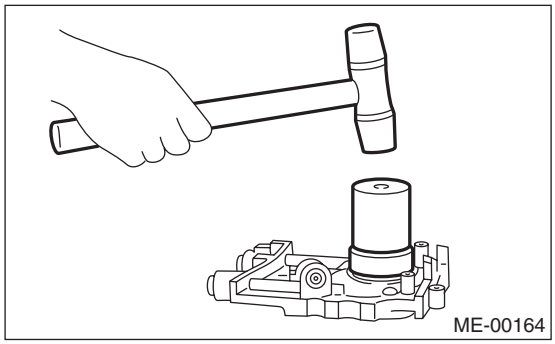


24) Install the housing cover.

25) Installation of oil pump

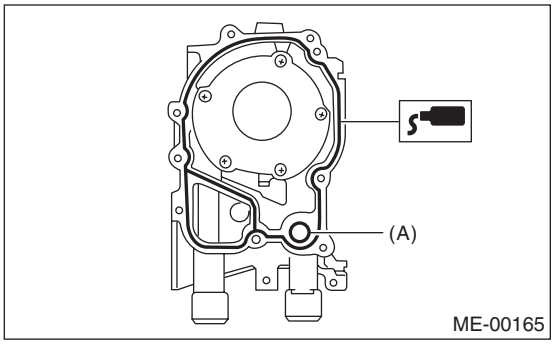
(1) Discard the front oil seal after removal. Replace with a new one using the ST.

ST 499587100 OIL SEAL INSTALLER



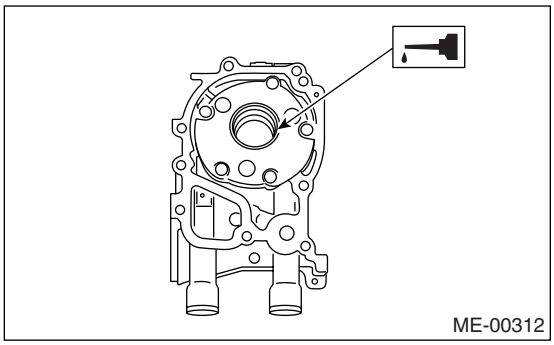
(2) Apply fluid packing to the matching surface of oil pump.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



(A) O-ring

(3) Apply a coat of engine oil to the inside of oil seal.



(4) Install the oil pump on cylinder block. Be careful not to damage the oil seal during installation.

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

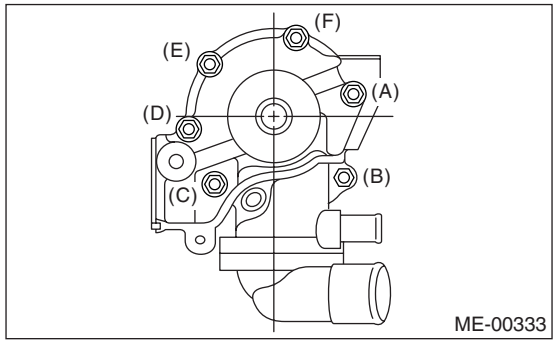
CAUTION:
• Do not forget to the install the O-ring and seal when installing oil pump.
• Align flat surface of oil pump's inner rotor with crankshaft before installation.

26) Install the water pump and gasket.

Tightening torque:
First; 12 N·m (1.2 kgf-m, 8.7 ft-lb)
Second; 12 N·m (1.2 kgf-m, 8.7 ft-lb)

CAUTION:
• Be sure to use a new gasket.

• When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in the figure.



27) Install the water by-pass pipe for heater.
28) Install the oil filter using ST.

ST	498547000	OIL FILTER WRENCH (Outer diameter: 80 mm (3.15 in))
ST	18332AA000	OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))
ST	18332AA010	OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))

Install the oil filter by turning it by hand, being careful not to damage the seal rubber.
• Tighten the oil filter 80 mm (3.15 in) or 65 mm (2.56 in) in diameter by approx. 2/3 - 3/4 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler.
• Tighten the oil filter 68 mm (2.68 in) in diameter by approx. 1 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler.

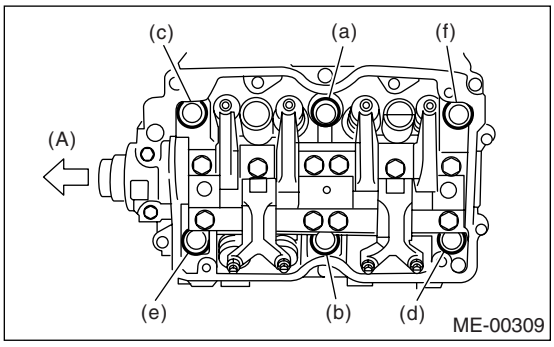
CAUTION:
Do not tighten excessively, or oil may leak.

29) Tighten the cylinder head bolts.
(1) Apply a coat of engine oil to the washers and bolt threads.
(2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence.
Then tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence.
(3) Back off all bolts by 180° first; back them off by 180° again.
(4) Tighten the bolts (a) and (b) to 34 N·m (3.5 kgf-m, 25 ft-lb).
(5) Tighten the bolts (c), (d), (e) and (f) to 15 N·m (1.5 kgf-m, 11 ft-lb).
(6) Tighten all bolts by 80° to 90° in alphabetical sequence.

CAUTION:
Do not tighten bolts more than 90°.

(7) Further tighten all bolts by 80° to 90° in alphabetical sequence.

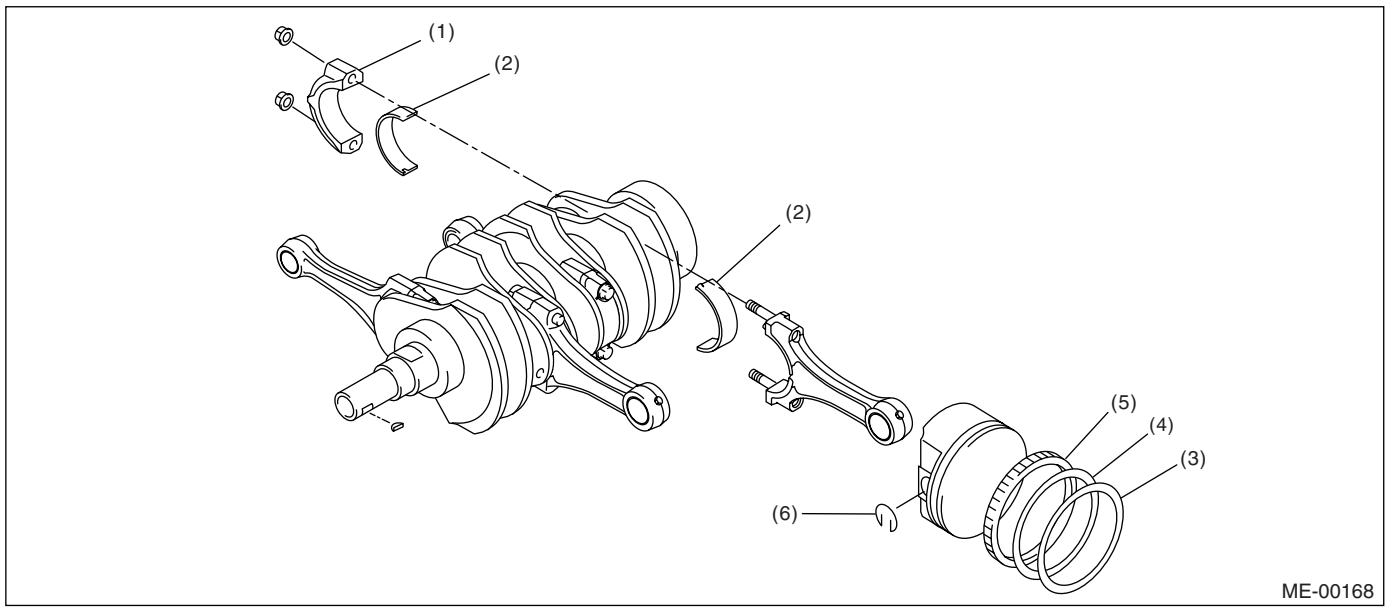
CAUTION:
Ensure that the total "re-tightening angle" [in the former two steps], do not exceed 180°.



(A) Front

30) Install the oil level gauge guide, and then tighten the attaching bolt (left side only).
31) Install the rocker cover.
32) Install the crankshaft sprocket. <Ref. to ME(H4SO)-51, INSTALLATION, Crankshaft Sprocket.>
33) Install the camshaft sprocket. <Ref. to ME(H4SO)-49, INSTALLATION, Camshaft Sprocket.>
34) Install the timing belt assembly. <Ref. to ME(H4SO)-45, INSTALLATION, Timing Belt Assembly.>
35) Install the timing belt cover. <Ref. to ME(H4SO)-43, INSTALLATION, Timing Belt Cover.>
36) Install the crankshaft pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crankshaft Pulley.>
37) Install the generator and A/C compressor brackets on cylinder head.
38) Install the V-belt. <Ref. to ME(H4SO)-39, INSTALLATION, V-belt.>
39) Install the intake manifold. <Ref. to FU(H4SO)-15, INSTALLATION, Intake Manifold.>

C: DISASSEMBLY



(1) Connecting rod cap
(2) Connecting rod bearing
(3) Top ring
(4) Second ring
(5) Oil ring
(6) Circlip

1) Remove the connecting rod cap.
2) Remove the connecting rod bearing.

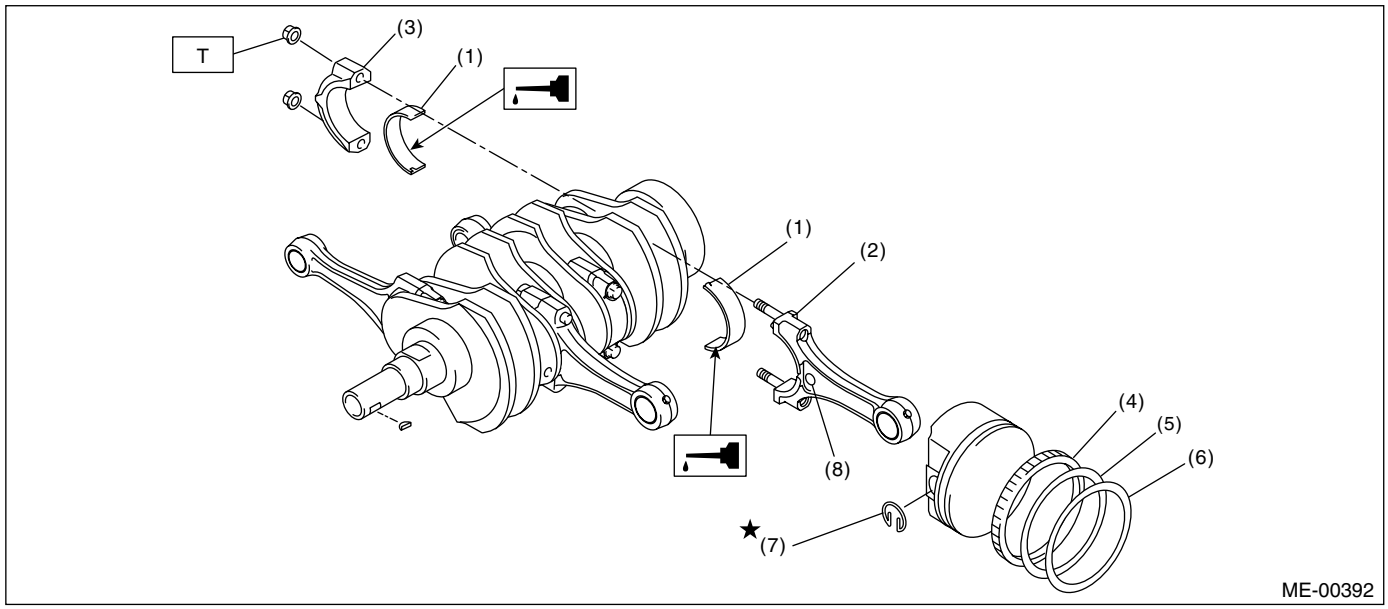
NOTE:
Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

3) Remove the piston rings using the piston ring expander.
4) Remove the oil ring by hand.

NOTE:
Arrange the removed piston rings in good order to prevent confusion.

5) Remove the circlip.

D: ASSEMBLY



(1) Connecting rod bearing
(2) Connecting rod
(3) Connecting rod cap
(4) Oil ring
(5) Second ring
(6) Top ring
(7) Circlip
(8) Side mark

Tightening torque: N·m (kgf-m, ft-lb)
T: 45 (4.6, 33)

1) Apply oil to the surfaces of the connecting rod bearings.
2) Install the connecting rod bearings on connecting rods and connecting rod caps.
3) Position each connecting rod with the marked side facing forward, and then install them.
4) Install the connecting rod cap with connecting rod nut.
Ensure the arrow on connecting rod cap faces the front during installation.

CAUTION:
• Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
• When tightening the connecting rod nuts, apply oil on the threads.

5) Install the expander, lower rail and upper rail in this order by hand. Then install the second ring and top ring using piston ring expander.

E: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks and damage. Especially, inspect the important parts by means of red lead check.
2) Check the oil passages for clogging.
3) Inspect the crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.1 mm (0.004 in)

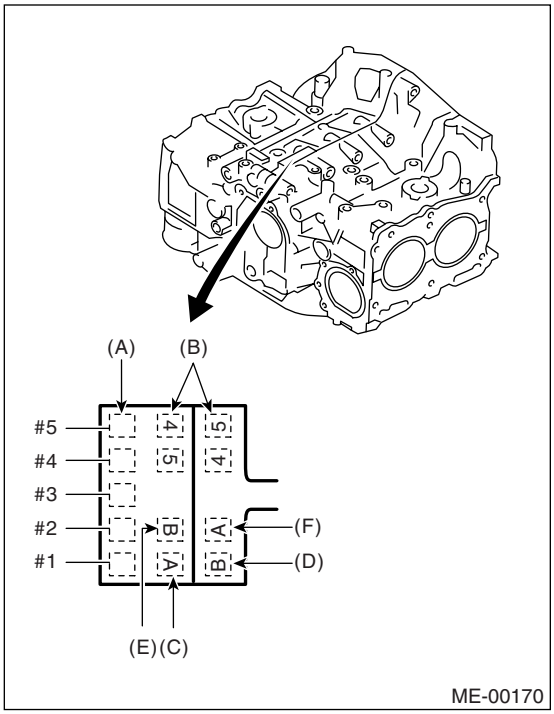
Standard height of cylinder block:
201.0 mm (7.91 in)

2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on cylinder block's front upper surface.

NOTE:
• Measurement should be performed at a temperature 20°C (68°F).
• Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as a guide line in selecting a standard piston.

Standard diameter:
A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)
B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)



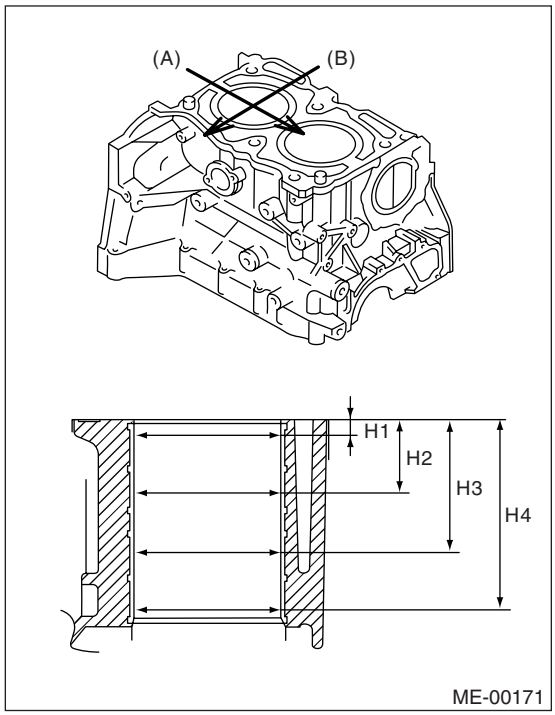
(A) Main journal size mark
(B) Cylinder block RH-LH combination mark
(C) #1 cylinder bore size mark
(D) #2 cylinder bore size mark
(E) #3 cylinder bore size mark
(F) #4 cylinder bore size mark

2) How to measure the inner diameter of each cylinder
Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the figure, using a cylinder bore gauge.

NOTE:
Measurement should be performed at a temperature 20°C (68°F).

Taper:
Standard
0.015 mm (0.0006 in)
Limit
0.050 mm (0.0020 in)

Out-of-roundness:
Standard
0.010 mm (0.0004 in)
Limit
0.050 mm (0.0020 in)



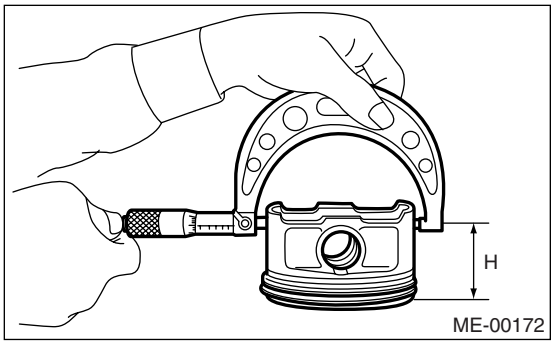
(A) Piston pin direction
(B) Thrust direction
H1 10 mm (0.39 in)
H2 45 mm (1.77 in)
H3 80 mm (3.15 in)
H4 115 mm (4.35 in)

3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.
4) How to measure the outer diameter of each piston
Measure the outer diameter of each piston at the height shown in the figure. (Thrust direction)

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Piston grade point H:
37.0 mm (1.457 in)

Standard
A: 99.485 — 99.495 mm (3.9167 — 3.9171 in)
B: 99.475 — 99.485 mm (3.9163 — 3.9167 in)
0.25 mm (0.0098 in) oversize
99.725 — 99.735 mm (3.9262 — 3.9266 in)
0.50 mm (0.0197 in) oversize
99.975 — 99.985 mm (3.9360 — 3.9364 in)



5) Calculate the clearance between cylinder and piston.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Cylinder to piston clearance at 20°C (68°F):
Standard
0.010 — 0.030 mm (0.0004 — 0.0012 in)
Limit
0.050 mm (0.0020 in)

6) Boring and honing
(1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the specified limit or if there is any damage on the cylinder wall, reboring it to use an oversize piston.

CAUTION:
When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons. Do not perform boring on one cylinder only, nor use an oversize piston for one cylinder only.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the crankcase.

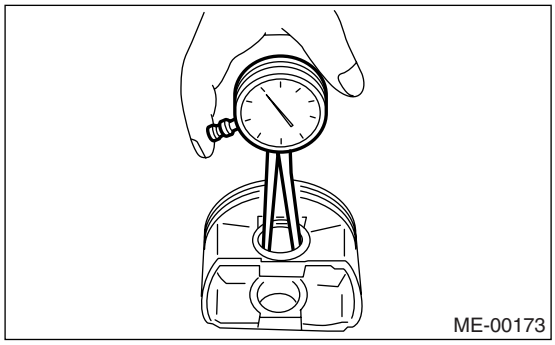
NOTE:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

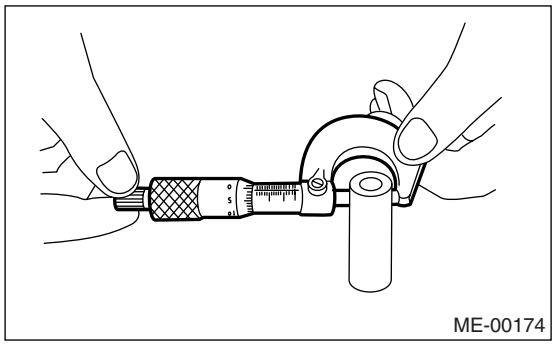
Limit of cylinder enlarging (boring):
0.5 mm (0.020 in)

3. PISTON AND PISTON PIN

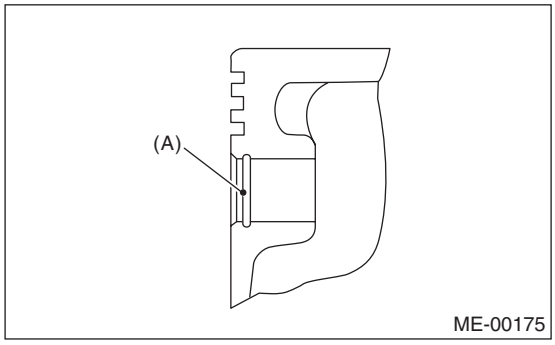
1) Check the pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.
2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(H4SO)-76, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not to specification, replace the piston or bore the cylinder to use an oversize piston.
3) Make the sure that piston pin can be inserted into piston pin hole with a thumb at 20°C (68°F). Replace if defective.

Standard clearance between piston pin and hole in piston:
Standard
0.004 — 0.008 mm (0.0002 — 0.0003 in)
Limit
0.020 mm (0.0008 in)





4) Check the circlip installation groove on piston for burr (A). If necessary, remove the burr from groove so that piston pin can lightly move.

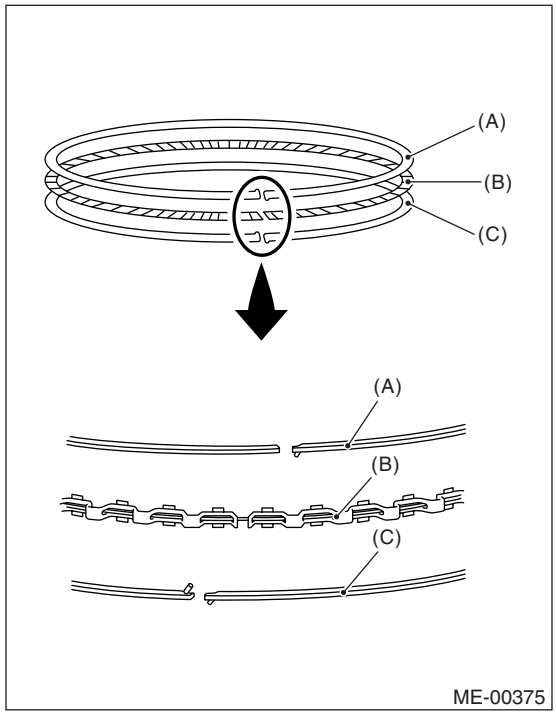


5) Check the piston pin circlip for distortion, cracks and wear.

4. PISTON RING

1) If the piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new one of the same size as the piston.

CAUTION:
• Marks are shown on the end of top and second rings. When installing the rings to piston, face these marks upward.
• Oil ring is composed of upper rail, expander and lower rail. Be careful of the rail direction when installing oil ring to the piston.

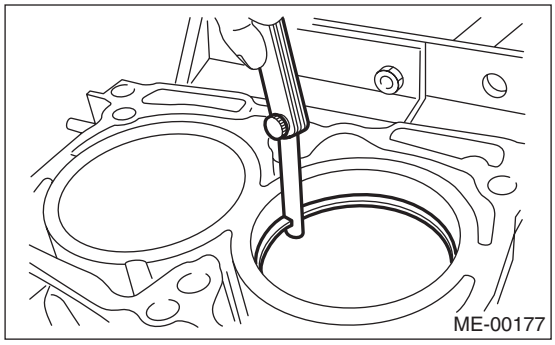


(A) Upper rail
(B) Expander
(C) Lower rail

2) Clean the piston ring groove and piston ring.
3) Squarely place the piston ring and oil ring in cylinder, and then measure the piston ring gap with a thickness gauge.

Unit: mm (in)

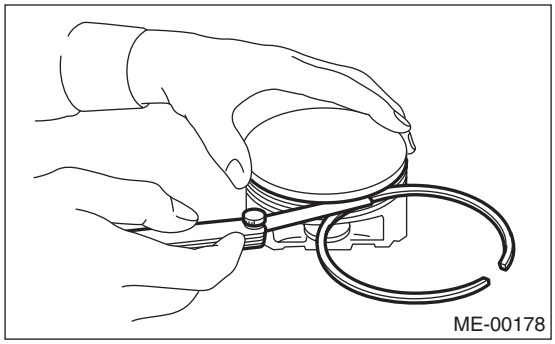
		Standard	Limit
Piston ring gap	Top ring	0.20 — 0.35 (0.0079 — 0.0138)	1.0 (0.039)
	Second ring	0.35 — 0.50 (0.0138 — 0.0197)	1.0 (0.039)
	Oil ring rail	0.20 — 0.50 (0.0079 — 0.0197)	1.5 (0.059)



4) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

Unit: mm (in)

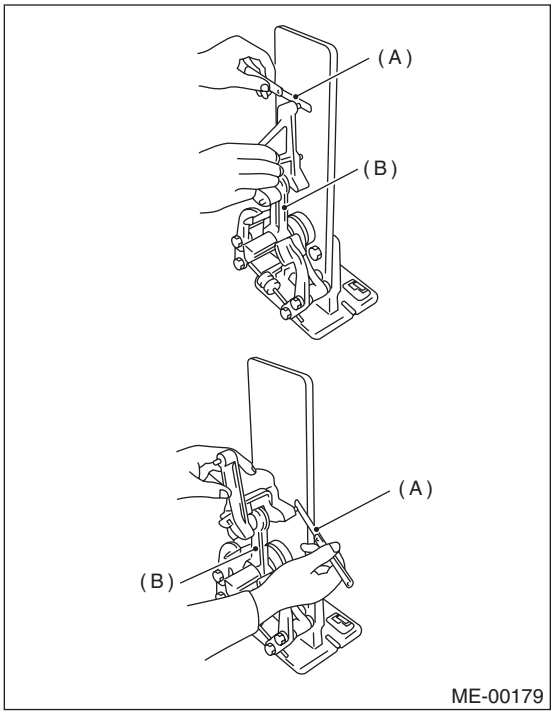
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)



5. CONNECTING ROD

1) Replace the connecting rod, if the large or small end thrust surface is damaged.
2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

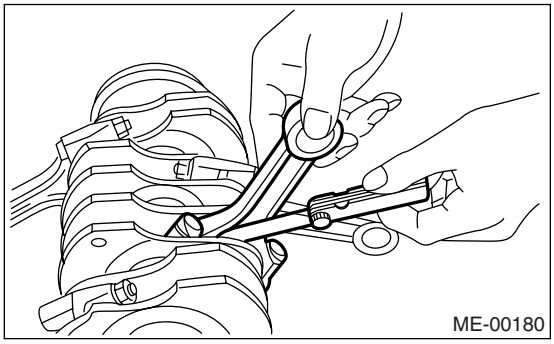
Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)



(A) Thickness gauge
(B) Connecting rod

3) Install the connecting rod fitted with bearing to crankshaft, and then measure the side clearance (thrust clearance). Replace the connecting rod if the side clearance exceeds the specified limit.

Connecting rod side clearance:
Standard
0.070 — 0.330 mm (0.0028 — 0.0130 in)
Limit
0.4 mm (0.016 in)



4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.
5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

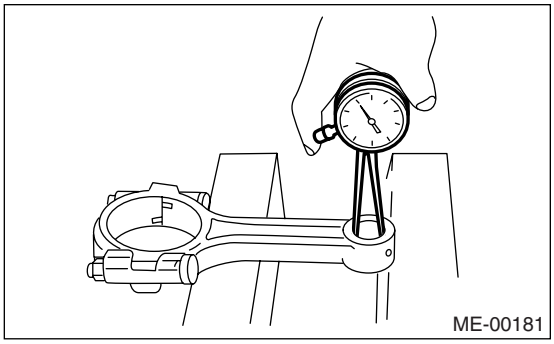
Connecting rod oil clearance:
Standard
0.012 — 0.038 mm (0.0005 — 0.0014 in)
Limit
0.05 mm (0.0020 in)

Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.490 — 1.502 (0.0587 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.504 — 1.512 (0.0592 — 0.0595)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.514 — 1.522 (0.0596 — 0.0599)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) undersize	1.614 — 1.622 (0.0635 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

6) Inspect the bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at connecting rod small end.

Clearance between piston pin and bushing:
Standard
0 — 0.022 mm (0 — 0.0009 in)
Limit
0.030 mm (0.0012 in)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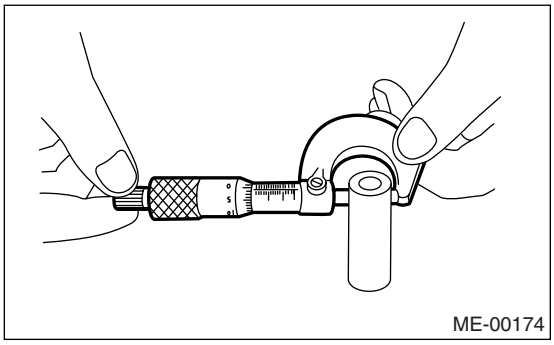
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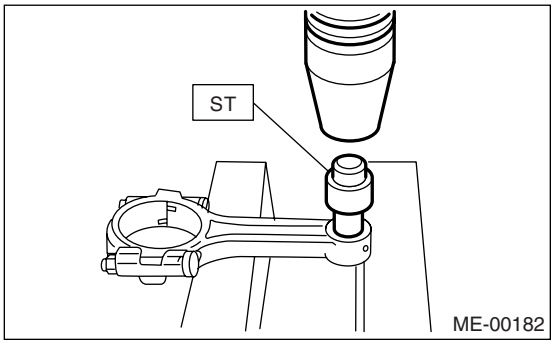
7) Replacement procedure is as follows.
(1) Remove the bushing from connecting rod with ST and press.
(2) Press the bushing with ST after applying oil on the periphery of bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



ME-00182

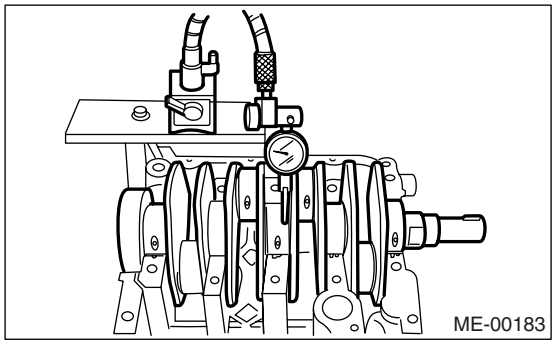
(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
(4) After the completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean the crankshaft completely and check for cracks by means of red lead check etc., and replace if defective.
2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

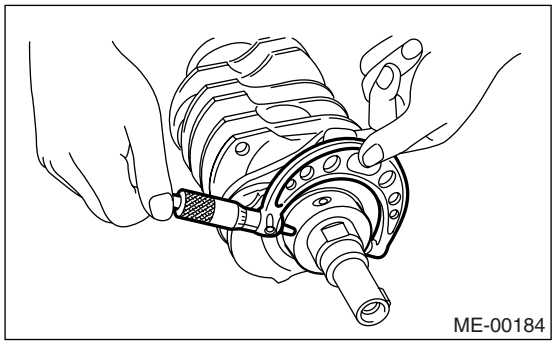
NOTE:
If a suitable V-block is not available, install the #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings and measure the crankshaft bend using a dial gauge.

Crankshaft bend limit:
0.035 mm (0.0014 in)


ME-00183

3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace the bearing with a suitable (undersize) one, and then replace or recondition the crankshaft as necessary. When grinding the crank journal or crank pin, finish them to specified dimensions according to the undersize bearing to be used.

Crank pin and crank journal:
Out-of-roundness
0.020 mm (0.0008 in) or less
Taper limit
0.07 mm (0.0028 in)
Grinding limit
0.250 mm (0.0098 in)


ME-00184

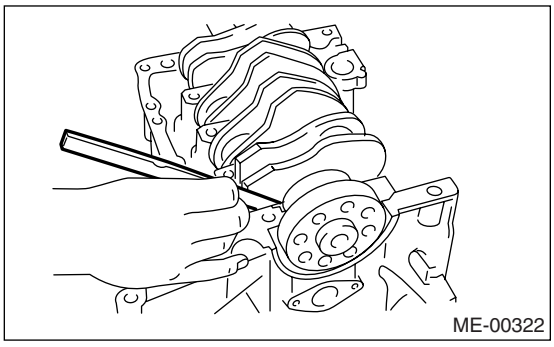
Unit: mm (in)

		Crank journal diameter		Crank pin diameter
		#1, #3	#2, #4, #5	2.5 L
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.490 — 1.502 (0.0587 — 0.0591)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.504 — 1.512 (0.0592 — 0.0595)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	51.934 — 51.950 (2.0446 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.514 — 1.522 (0.0596 — 0.0599)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.614 — 1.622 (0.0635 — 0.0639)

O.D.: Outer Diameter

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace bearing.

Crankshaft thrust clearance:
Standard
0.030 — 0.115 mm (0.0012 — 0.0045 in)
Limit
0.25 mm (0.0098 in)



5) Inspect the individual crankshaft bearings for signs of flaking, seizure, melting, and wear.

6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace the defective bearing with an undersize one, and then replace or recondition the crankshaft as necessary.

Unit: mm (in)

Crankshaft oil clearance		
#1	Standard	0.010 — 0.030 (0.0004 — 0.0012)
	Limit	0.040 (0.0016)
#2	Standard	0.010 — 0.030 (0.0004 — 0.0012)
	Limit	0.045 (0.0018)
#3	Standard	0.010 — 0.030 (0.0004 — 0.0012)
	Limit	0.040 (0.0016)
#4	Standard	0.010 — 0.030 (0.0004 — 0.0012)
	Limit	0.045 (0.0018)
#5	Standard	0.010 — 0.030 (0.0004 — 0.0012)
	Limit	0.040 (0.0016)

22.Engine Trouble in General

A: INSPECTION

NOTE:
"RANK" shown in the chart refer to the possibility of reason for the trouble in order ("Very often" to "Rarely")
A — Very often
B — Sometimes
C — Rarely

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
1. Engine will not start.			
1) Starter does not turn.	• Starter	• Defective battery-to-starter harness	B
		• Defective starter switch	C
		• Defective inhibitor switch or neutral switch	C
		• Defective starter	B
	• Battery	• Poor terminal connection	A
		• Run-down battery	A
		• Defective charging system	B
	• Friction	• Seizure of crankshaft and connecting rod bearing	C
		• Seized camshaft	C
		• Seized or stuck piston and cylinder	C
2) Initial combustion does not occur.	• Starter	• Defective starter	C
	• Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	• Fuel line	• Defective fuel pump and relay	A
		• Lack of or insufficient fuel	B
	• Belt	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	B
		• Improper engine oil (low viscosity)	B
3) Initial combustion occurs.	• Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
	• Fuel line	• Defective fuel pump and relay	C
		• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Belt	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	B
		• Improper engine oil (low viscosity)	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
4) Engine stalls after initial combustion.	• Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	B
		• Loosened or cracked PCV hose	C
		• Loosened or cracked vacuum hose	C
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Dirty air cleaner element	C
	• Fuel line	• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Belt	• Defective	B
		• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	B
		• Improper engine oil (low viscosity)	B
2. Rough idle and engine stall	• Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	A
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	C
		• Loosened oil filler cap	B
		• Dirty air cleaner element	C
	• Fuel line	• Defective fuel pump and relay	C
		• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Belt	• Defective timing	C
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	B
		• Loosened cylinder head bolts or defective gasket	B
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	B
		• Incorrect valve timing	A
		• Improper engine oil (low viscosity)	B
	• Lubrication system	• Incorrect oil pressure	B
		• Defective rocker cover gasket	C
	• Cooling system	• Overheating	C
	• Others	• Malfunction of evaporative emission control system	A
		• Stuck or damaged throttle valve	B
		• Accelerator cable out of adjustment	C

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
3. Low output, hesitation and poor acceleration	• Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	B
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	B
		• Loosened oil filler cap	B
		• Dirty air cleaner element	A
	• Fuel line	• Defective fuel pump and relay	B
		• Clogged fuel line	B
		• Lack of or insufficient fuel	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	B
		• Loosened cylinder head bolts or defective gasket	B
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
		• Improper engine oil (low viscosity)	B
	• Lubrication system	• Incorrect oil pressure	B
	• Cooling system	• Overheating	C
		• Over cooling	C
	• Others	• Malfunction of evaporative emission control system	A
4. Surging	• Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	A
		• Loosened or cracked PCV hose	A
		• Loosened or cracked vacuum hose	A
		• Defective intake manifold gasket	B
		• Defective throttle body gasket	B
		• Defective PCV valve	B
		• Loosened oil filler cap	B
		• Dirty air cleaner element	B
	• Fuel line	• Defective fuel pump and relay	B
		• Clogged fuel line	B
		• Lack of or insufficient fuel	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
		• Improper engine oil (low viscosity)	B
	• Cooling system	• Overheating	B
	• Others	• Malfunction of evaporative emission control system	C

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
5. Engine does not return to idle.	• Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked vacuum hose	A
	• Others	• Stuck or damaged throttle valve	A
		• Accelerator cable out of adjustment	B
6. Dieseling (Run-on)	• Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	• Cooling system	• Overheating	B
	• Others	• Malfunction of evaporative emission control system	B
7. After burning in exhaust system	• Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened or cracked intake duct	C
		• Loosened or cracked PCV hose	C
		• Loosened or cracked vacuum hose	B
		• Defective PCV valve	B
		• Loosened oil filler cap	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
	• Lubrication system	• Incorrect oil pressure	C
	• Cooling system	• Over cooling	C
	• Others	• Malfunction of evaporative emission control system	C
8. Knocking	• Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened oil filler cap	B
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Incorrect valve timing	B
	• Cooling system	• Overheating	A
9. Excessive engine oil consumption	• Intake system	• Loosened or cracked PCV hose	A
		• Defective PCV valve	B
		• Loosened oil filler cap	C
	• Compression	• Defective valve stem	A
		• Worn or stuck piston rings, cylinder and piston	A
	• Lubrication system	• Loosened oil pump attaching bolts and defective gasket	B
		• Defective oil filter seal	B
		• Defective crankshaft oil seal	B
		• Defective rocker cover gasket	B
		• Loosened oil drain plug or defective gasket	B
		• Loosened oil pan fitting bolts or defective oil pan	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
10. Excessive fuel consumption	• Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Dirty air cleaner element	A
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	B
		• Incorrect valve timing	B
	• Lubrication system	• Incorrect oil pressure	C
	• Cooling system	• Over cooling	C
	• Others	• Accelerator cable out of adjustment	B

23.Engine Noise

A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	• Valve mechanism is defective. • Incorrect valve clearance • Worn valve rocker • Worn camshaft • Broken valve spring
Heavy and dull clank	Oil pressure is low.	• Worn crankshaft main bearing • Worn connecting rod bearing (big end)
	Oil pressure is normal.	• Loose flywheel mounting bolts • Damaged engine mounting
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload.	• Ignition timing advanced • Accumulation of carbon inside combustion chamber • Wrong spark plug • Improper gasoline
Clank when engine speed is medium (1,000 to 2,000 rpm).	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn crankshaft main bearing • Worn bearing at crankshaft end of connecting rod
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn cylinder liner and piston ring • Broken or stuck piston ring • Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	• Unusually worn valve lifter • Worn cam gear • Worn camshaft journal bore in crankcase
Squeaky sound	—	• Insufficient generator lubrication
Rubbing sound	—	• Defective generator brush and rotor contact
Gear scream when starting engine	—	• Defective ignition starter switch • Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	• Loose drive belt • Defective water pump shaft
Hissing sound	—	• Loss of compression • Air leakage in air intake system, hoses, connections or manifolds
Timing belt noise	—	• Loose timing belt • Belt contacting case/adjacent part
Valve tappet noise	—	• Incorrect valve clearance

NOTE*:
When disconnecting the fuel injector connector, Malfunction Indicator Light illuminates and DTC is stored in ECM memory. Therefore, carry out the CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.> after connecting fuel injector connector.

EXHAUST

EX(H4SO)

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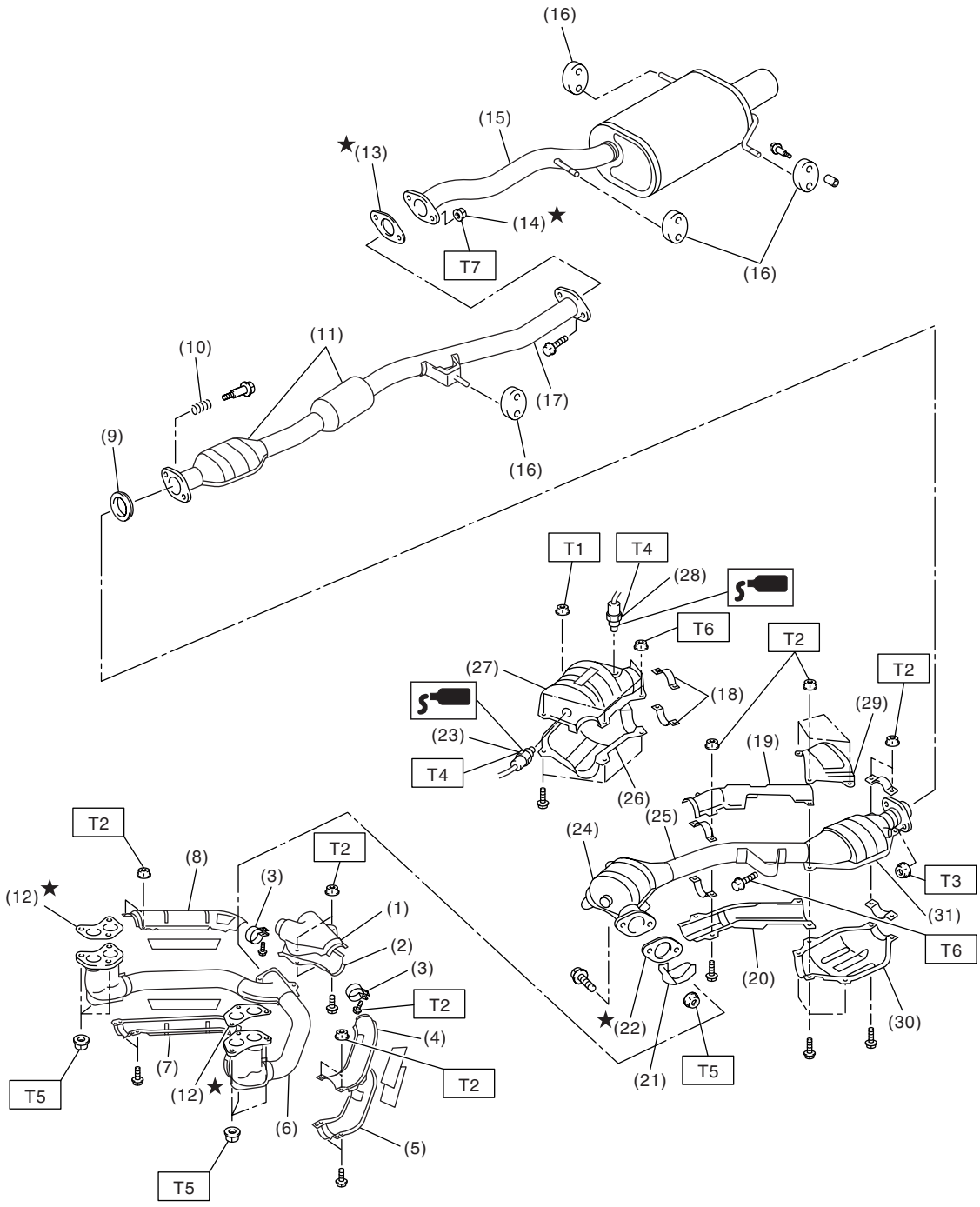
2. Front Exhaust Pipe 4
3. Center Exhaust Pipe 7
4. Rear Exhaust Pipe 8
5. Muffler 9

1. General Description

A: COMPONENT



EX-00196

(1) Front exhaust pipe upper cover
(2) Front exhaust pipe lower cover
(3) Clamp
(4) Front exhaust pipe upper cover LH
(5) Front exhaust pipe lower cover LH
(6) Front exhaust pipe
(7) Front exhaust pipe lower cover RH
(8) Front exhaust pipe upper cover RH
(9) Gasket
(10) Spring
(11) Chamber
(12) Gasket
(13) Gasket
(14) Self-locking nut
(15) Muffler
(16) Cushion rubber
(17) Rear exhaust pipe
(18) Clamp
(19) Center exhaust pipe upper cover
(20) Center exhaust pipe lower cover
(21) Protector
(22) Gasket
(23) Front oxygen (A/F) sensor
(24) Front catalytic converter
(25) Center exhaust pipe
(26) Front catalytic converter lower cover
(27) Front catalytic converter upper cover
(28) Rear oxygen sensor
(29) Rear catalytic converter upper cover
(30) Rear catalytic converter lower cover
(31) Rear catalytic converter

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 13 (1.3, 9.4)
T3: 18 (1.8, 13.0)
T4: 21 (2.1, 15.2)
T5: 30 (3.1, 22.4)
T6: 35 (3.6, 26.0)
T7: 48 (4.9, 35.4)

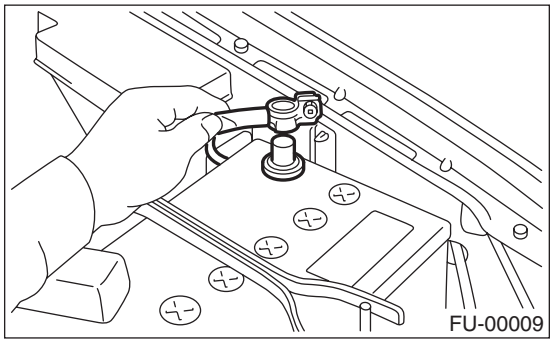
B: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

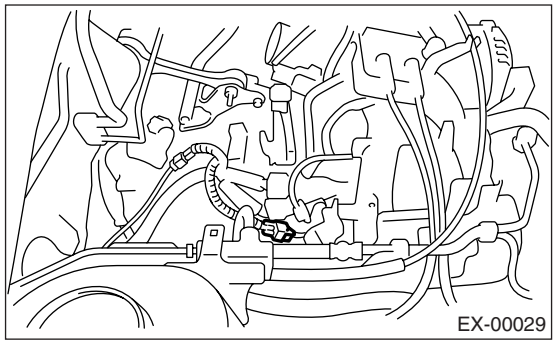
2. Front Exhaust Pipe

A: REMOVAL

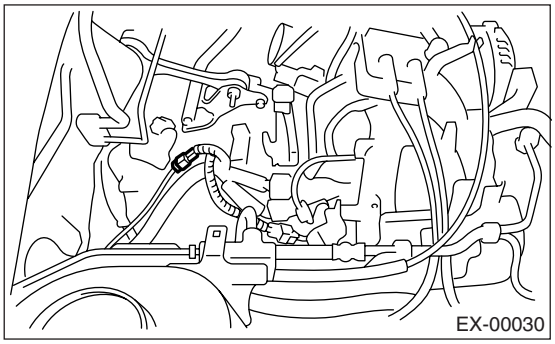
1) Disconnect the ground cable from battery.



2) Disconnect the front oxygen (A/F) sensor connector.



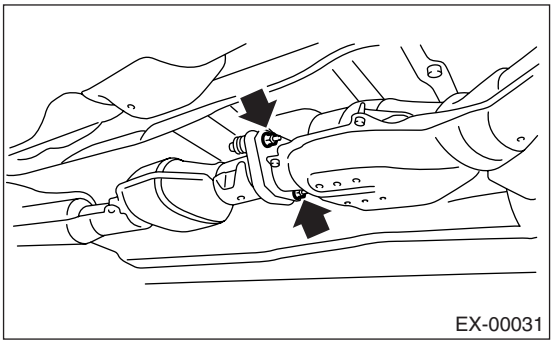
3) Disconnect the rear oxygen sensor connector.



4) Lift-up the vehicle.

5) Separate the front and center exhaust pipe assembly and rear exhaust pipe.

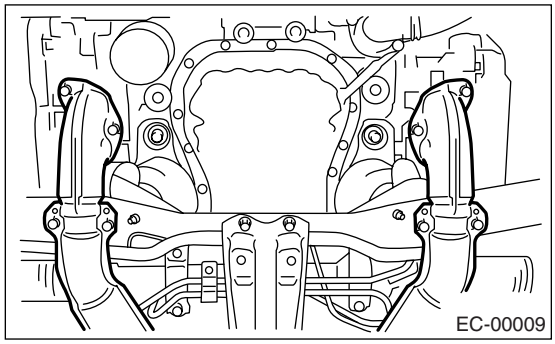
CAUTION:
Be careful, the exhaust pipe is hot.



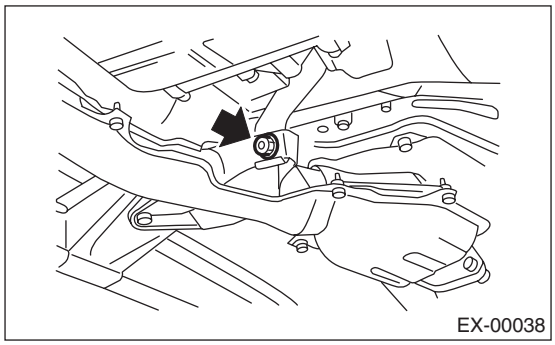
6) Remove the under cover.

7) Remove the nuts which hold the front exhaust pipe onto cylinder heads.

CAUTION:
Be careful not to pull down the front and center exhaust pipe assembly.



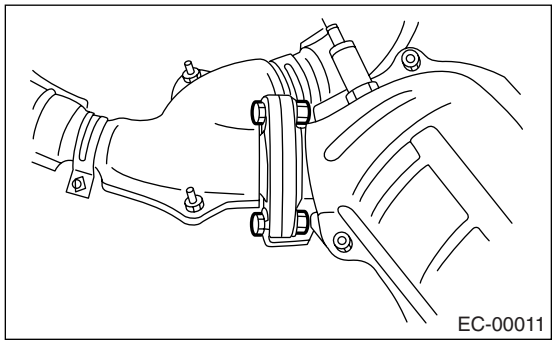
8) Remove the bolt which installs the front and center exhaust pipe assembly to hanger bracket.



9) Remove the front and center exhaust pipe assembly from vehicle.

CAUTION:
- **Be careful not to let the front and center exhaust pipe assembly fall off when removing as it is quite heavy.**
- **After removing the front and center exhaust pipe assembly, do not apply excessive pulling force on the rear exhaust pipe.**

10) Separate the front exhaust pipe from center exhaust pipe.



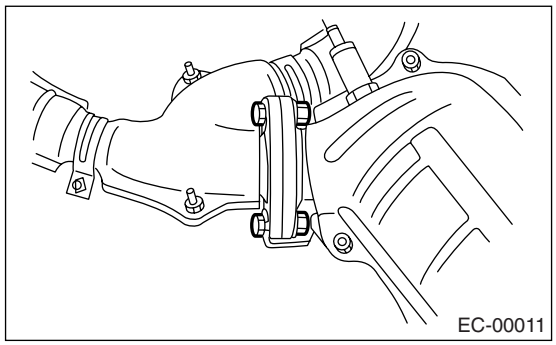
11) Remove the front oxygen (A/F) sensor and the rear oxygen sensor. <Ref. to FU(H4SO)-40, REMOVAL, Front Oxygen (A/F) Sensor.>and <Ref. to FU(H4SO)-42, REMOVAL, Rear Oxygen Sensor.>.

B: INSTALLATION

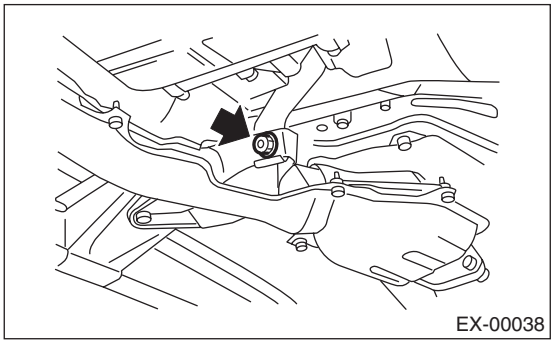
1) Install the front oxygen (A/F) sensor and the rear oxygen sensor. <Ref. to FU(H4SO)-40, INSTALLATION, Front Oxygen (A/F) Sensor.> and <Ref. to FU(H4SO)-42, INSTALLATION, Rear Oxygen Sensor.>.
2) Install the front exhaust pipe to center exhaust pipe.

NOTE:
Replace the gaskets with new ones.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)

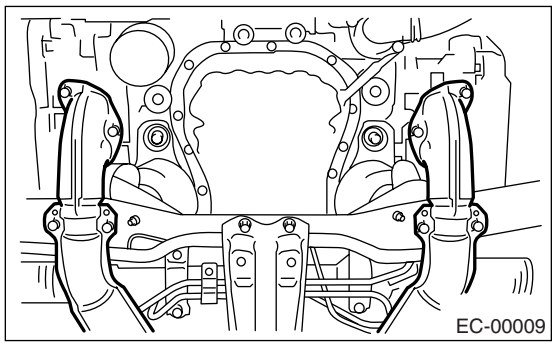


3) Install the front and center exhaust pipe assembly to vehicle.
4) Temporarily tighten the bolt which installs the front and center exhaust pipe assembly to hanger bracket.



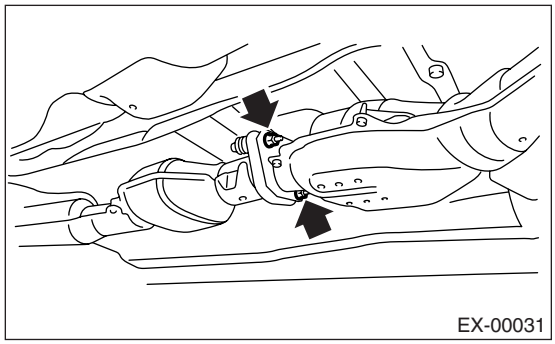
5) Tighten the nuts which hold the front exhaust pipe onto cylinder heads.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)



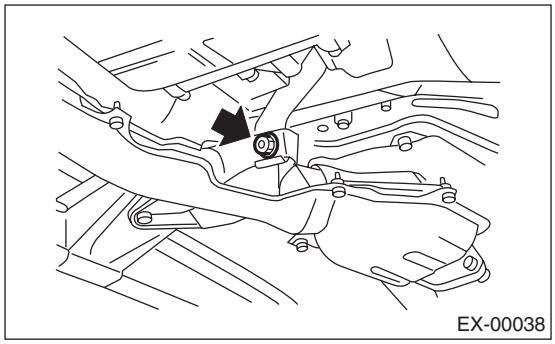
6) Install the under cover.
7) Tighten the bolts which install the front and center exhaust pipe assembly to rear exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



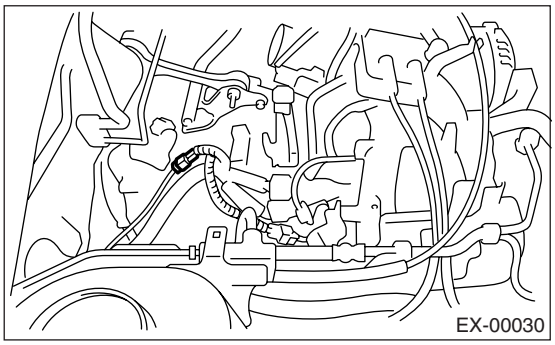
8) Tighten the bolt which holds the front and center exhaust pipe assembly to hanger bracket.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

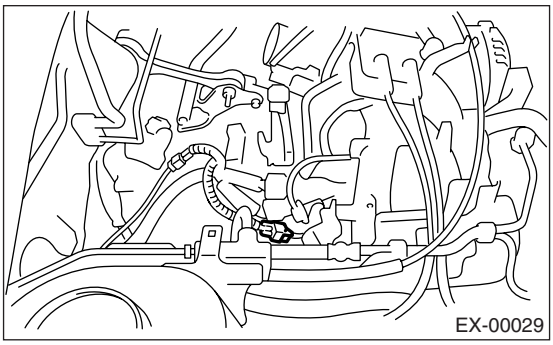


9) Lower the vehicle.

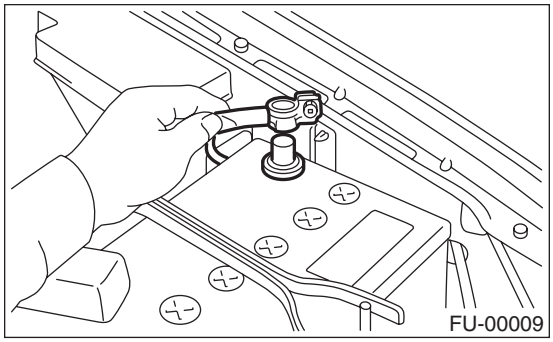
10) Connect the rear oxygen sensor connector.



11) Connect the front oxygen (A/F) sensor connector.



12) Connect the battery ground cable to battery.



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

3. Center Exhaust Pipe

A: REMOVAL

After removing the center and front exhaust pipes as one unit, separate them. Refer to the procedure for removing the front exhaust pipe. <Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>

B: INSTALLATION

Install the center exhaust pipe and front exhaust pipe as one unit. Refer to the procedure for installing the front exhaust pipe. <Ref. to EX(H4SO)-5, INSTALLATION, Front Exhaust Pipe.>

C: INSPECTION

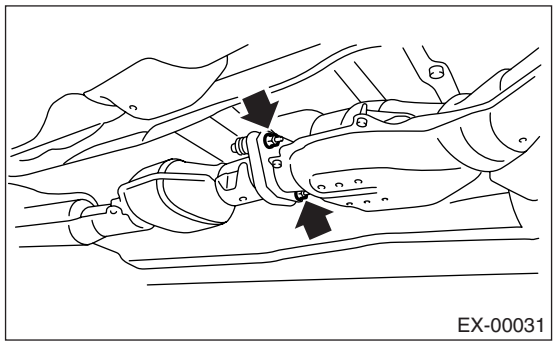
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

4. Rear Exhaust Pipe

A: REMOVAL

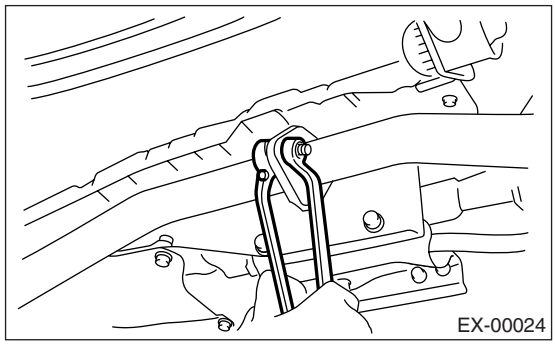
1) Separate the rear exhaust pipe from center exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.



2) Separate the rear exhaust pipe from muffler.

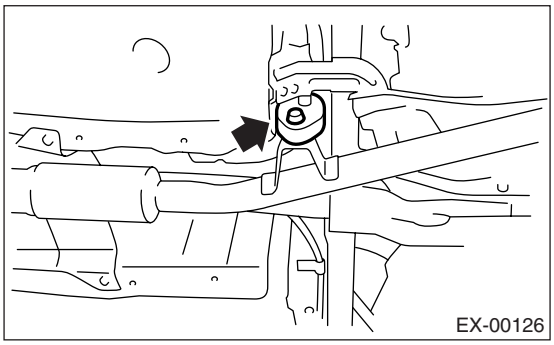
CAUTION:
Be careful not to pull down the rear exhaust pipe.



3) Apply a coat of SUBARU CRC to the mating area of cushion rubbers in advance.

SUBARU CRC (Part No. 004301003)

4) Remove the rear exhaust pipe bracket from cushion rubber.

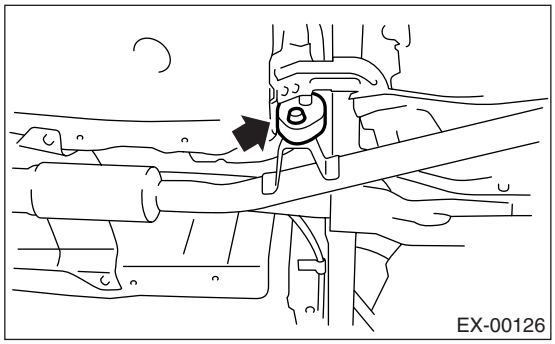


B: INSTALLATION

1) Apply a coat of SUBARU CRC to the mating area of cushion rubbers in advance.

SUBARU CRC (Part No. 004301003)

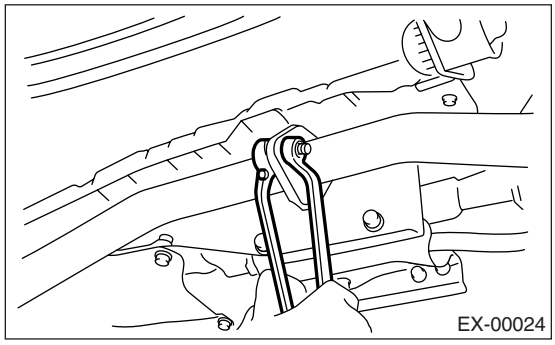
2) Install the rear exhaust pipe bracket to cushion rubber.



3) Install the rear exhaust pipe to muffler.

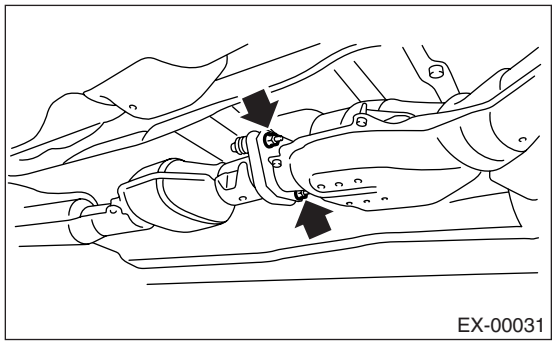
NOTE:
Replace the gaskets and self-locking nuts with new ones.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



4) Install the rear exhaust pipe to center exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



C: INSPECTION

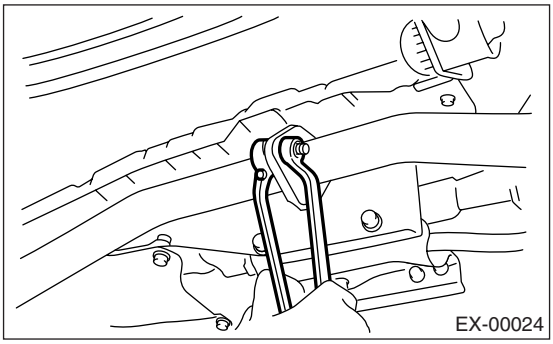
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

5. Muffler

A: REMOVAL

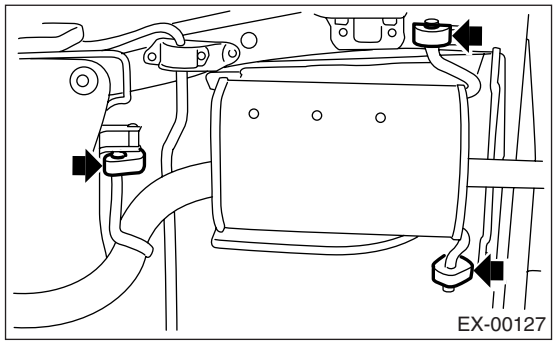
1) Separate the muffler from rear exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.



2) Apply a coat of SUBARU CRC to the mating area of cushion rubbers in advance.

SUBARU CRC (Part No. 004301003)



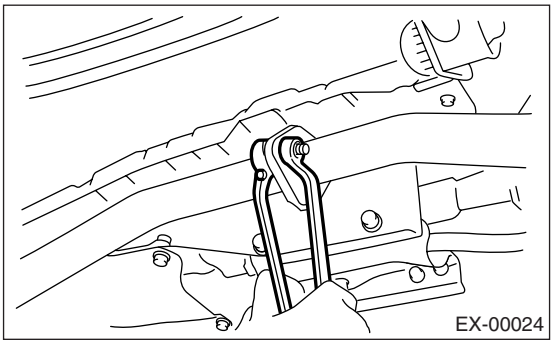
3) Remove the front, right and left cushion rubber, and detach the muffler assembly.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace the gasket and self-locking nuts with new ones.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

COOLING

CO(H4SO)

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6.	Thermostat	17
7.	Radiator	18
8.	Radiator Cap	21
9.	Radiator Main Fan and Fan Motor	22
10.	Radiator Sub Fan and Fan Motor	23
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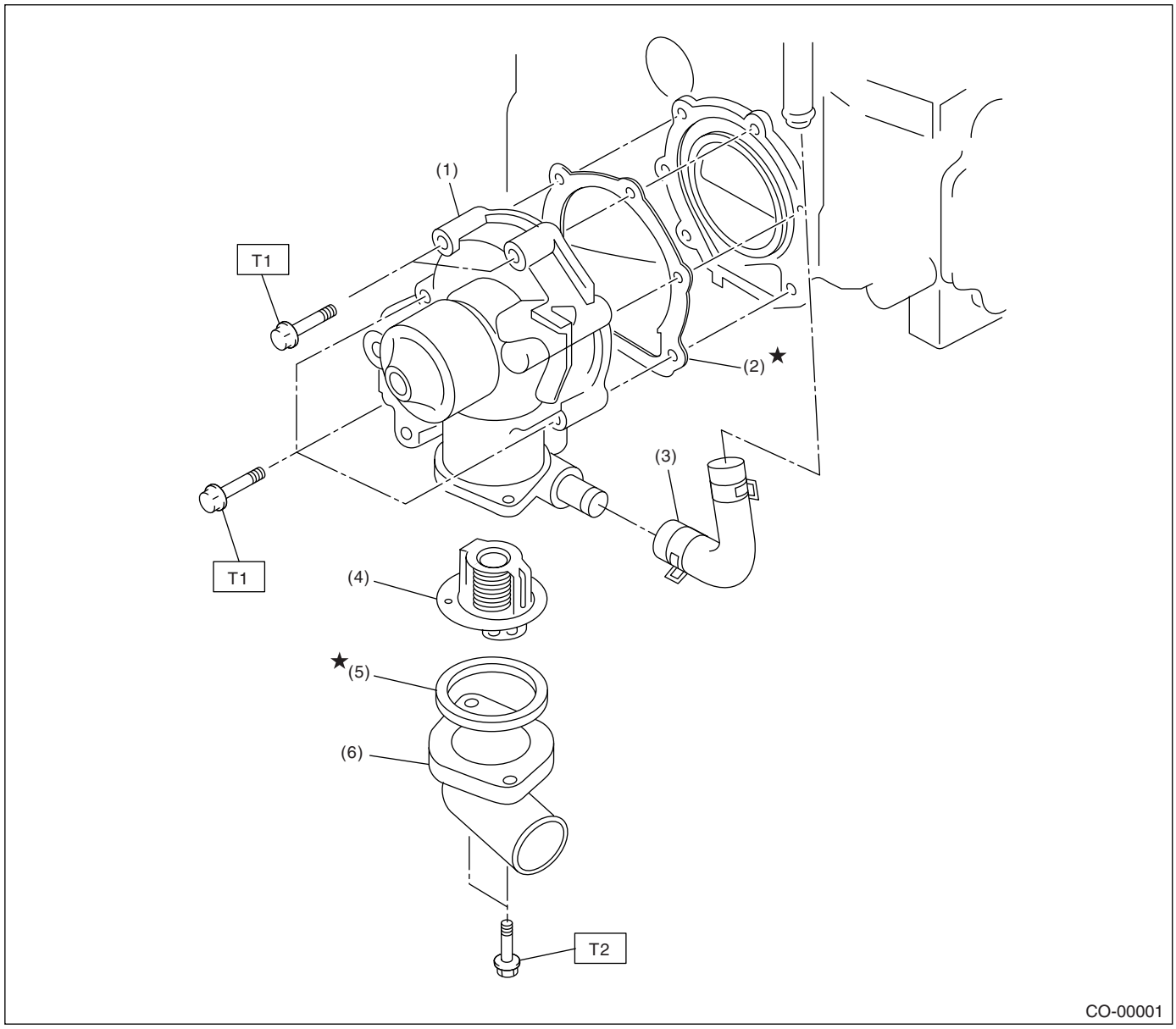
1. General Description

A: SPECIFICATIONS

Cooling system			Electric fan + Forced engine coolant circulation system
Total engine coolant capacity ℓ (US qt, Imp qt)			AT model: Approx. 6.9 (7.29, 6.07) MT model: Approx. 7.0 (7.4, 6.2)
Water pump	Type		Centrifugal impeller type
	Discharge performance I	Discharge	20 ℓ (5.3 US gal, 4.4 Imp gal)/min.
		Pump speed — Discharge pressure	760 rpm — 2.9 kPa (0.3 mAq)
		Engine coolant temperature	85°C (185°F)
	Discharge performance II	Discharge	100 ℓ (26.4 US gal, 22.0 Imp gal)/min.
		Pump speed — Discharge pressure	3,000 rpm — 49.0 kPa (5.0 mAq)
		Engine coolant temperature	85°C (185°F)
	Discharge performance III	Discharge	200 ℓ (52.8 US gal, 44.0 Imp gal)/min.
		Pump speed — Discharge pressure	6,000 rpm — 225.4 kPa (23.0 mAq)
		Engine coolant temperature	85°C (185°F)
	Impeller diameter		76 mm (2.99 in)
	Number of impeller vanes		8
	Pump pulley diameter		60 mm (2.36 in)
	Clearance between impeller and case	Standard	0.5 — 0.7 mm (0.020 — 0.028 in)
		Limit	1.0 mm (0.039 in)
	"Thrust" runout of impeller end		0.5 mm (0.020 in)
Thermostat	Type		Wax pellet type
	Starts to open		76 — 80°C (169 — 176°F)
	Fully opened		91°C (196°F)
	Valve lift		9.0 mm (0.354 in) or more
	Valve bore		35 mm (1.38 in)
Radiator fan	Motor	Main fan	70 W
		Sub fan	70 W
	Fan diameter × Blade		320 mm (12.60 in) × 5 (main fan) 320 mm (12.60 in) × 7 (sub fan)
Radiator	Type		Down flow, pressure type
	Core dimensions	Width × Height × Thickness	691.5 × 340 × 16 mm (27.22 × 13.39 × 0.63 in)
	Pressure range in which cap valve is open		Above: 108±15 kPa (1.1±0.15 kg/cm^2, 16±2 psi) Below: −1.0 to −4.9 kPa (−0.01 to −0.05 kg/cm^2, −0.1 to −0.7 psi)
	Fins		Corrugated fin type
Reservoir tank	Capacity		0.5 ℓ (0.5 US qt, 0.4 Imp qt)

B: COMPONENT

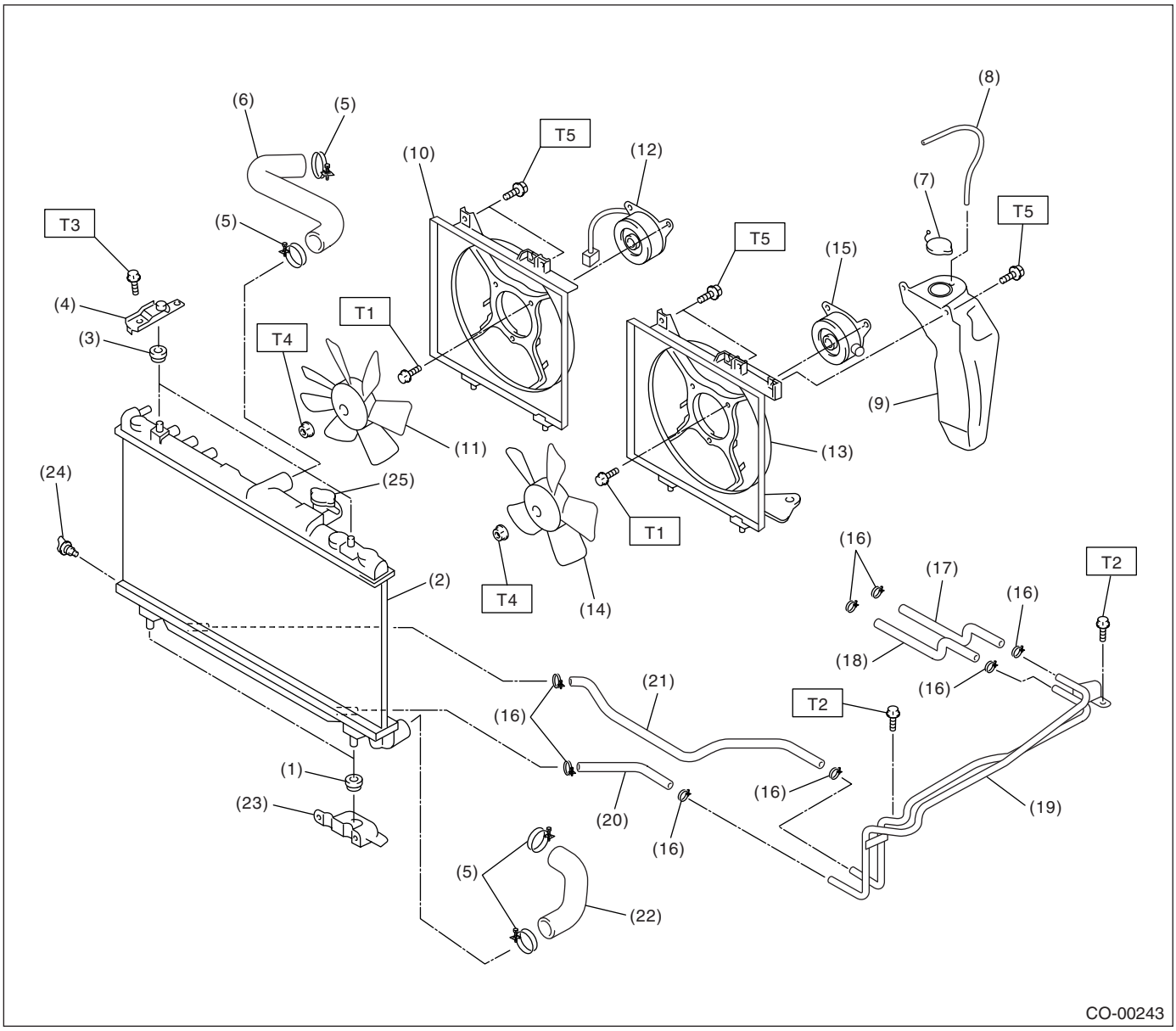
1. WATER PUMP



(1) Water pump ASSY
(2) Gasket
(3) Heater by-pass hose
(4) Thermostat
(5) Gasket
(6) Thermostat cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)
T2: 6.5 (0.66, 4.8)

2. RADIATOR AND RADIATOR FAN



(1) Radiator lower cushion
(2) Radiator
(3) Radiator upper cushion
(4) Radiator upper bracket
(5) Clamp
(6) Radiator inlet hose
(7) Engine coolant reservoir tank cap
(8) Overflow hose
(9) Engine coolant reservoir tank
(10) Radiator sub fan shroud
(11) Radiator sub fan
(12) Radiator sub fan motor
(13) Radiator main fan shroud
(14) Radiator main fan
(15) Radiator main fan motor
(16) ATF hose clamp (AT model)
(17) ATF inlet hose A (AT model)
(18) ATF outlet hose A (AT model)
(19) ATF pipe (AT model)
(20) ATF inlet hose B (AT model)
(21) ATF outlet hose B (AT model)
(22) Radiator outlet hose
(23) Radiator lower bracket
(24) Radiator drain plug
(25) Radiator cap

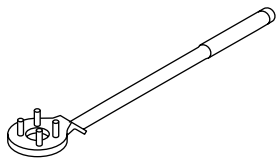
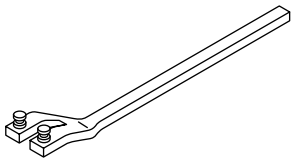
Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 12 (1.2, 8.7)
T3: 18 (1.8, 13.0)
T4: 3.4 (0.35, 2.5)
T5: 4.9 (0.50, 3.6)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

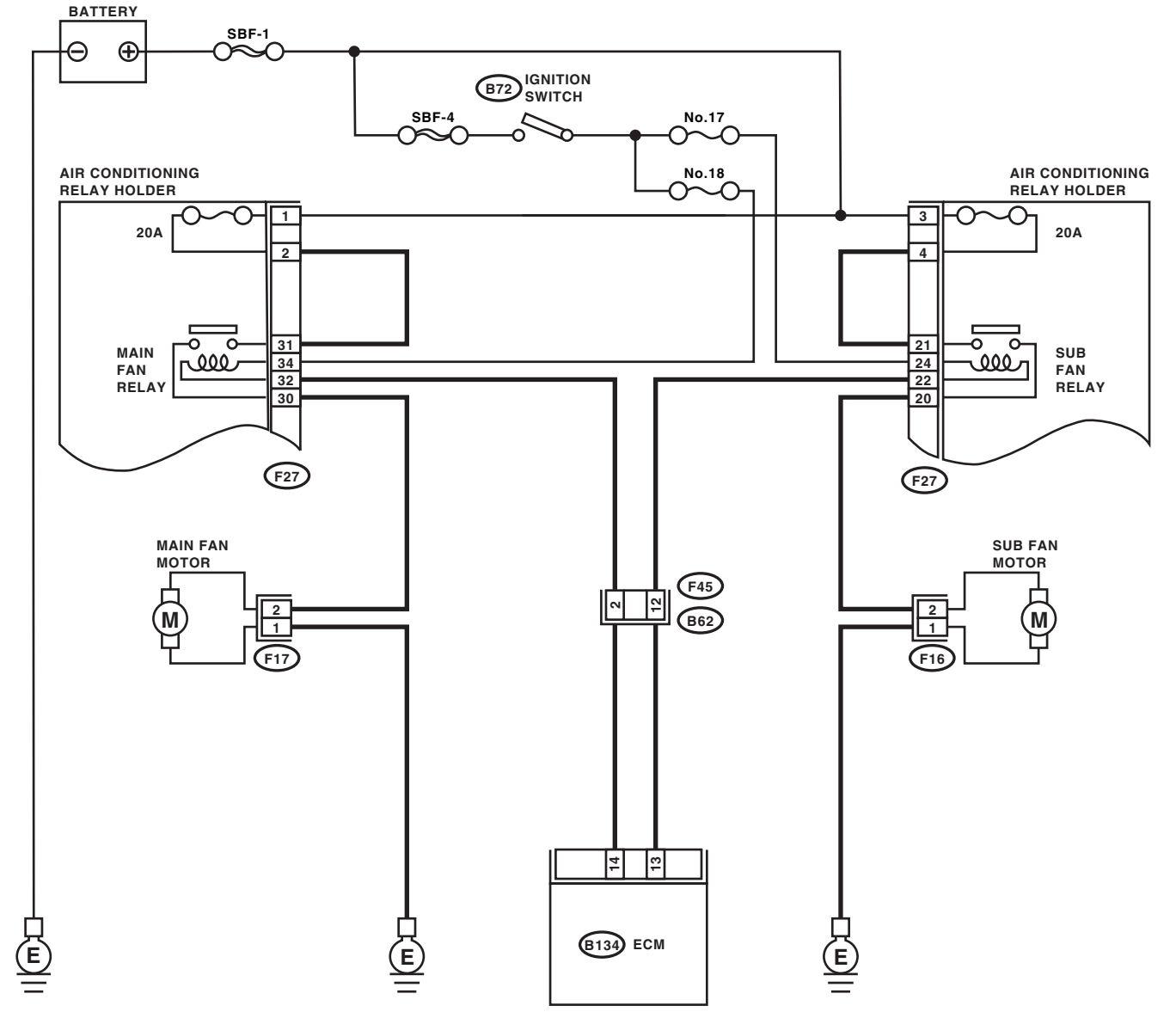
D: PREPARATION TOOL

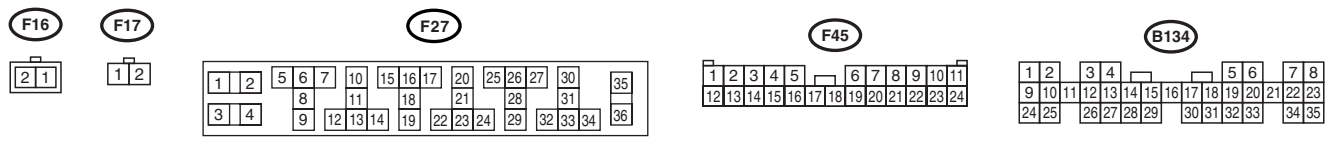
1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	49 9977100	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt. (2.5 L model)
 ST18231AA010	18231AA010	CAMSHAFT SPROCKET WRENCH	• Used for removing and installing camshaft sprocket. • Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.

2. Radiator Main Fan System

A: WIRING DIAGRAM





CO-00240

B: INSPECTION

DETECTING CONDITION:

- Engine coolant temperature is above 96°C (205°F).
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

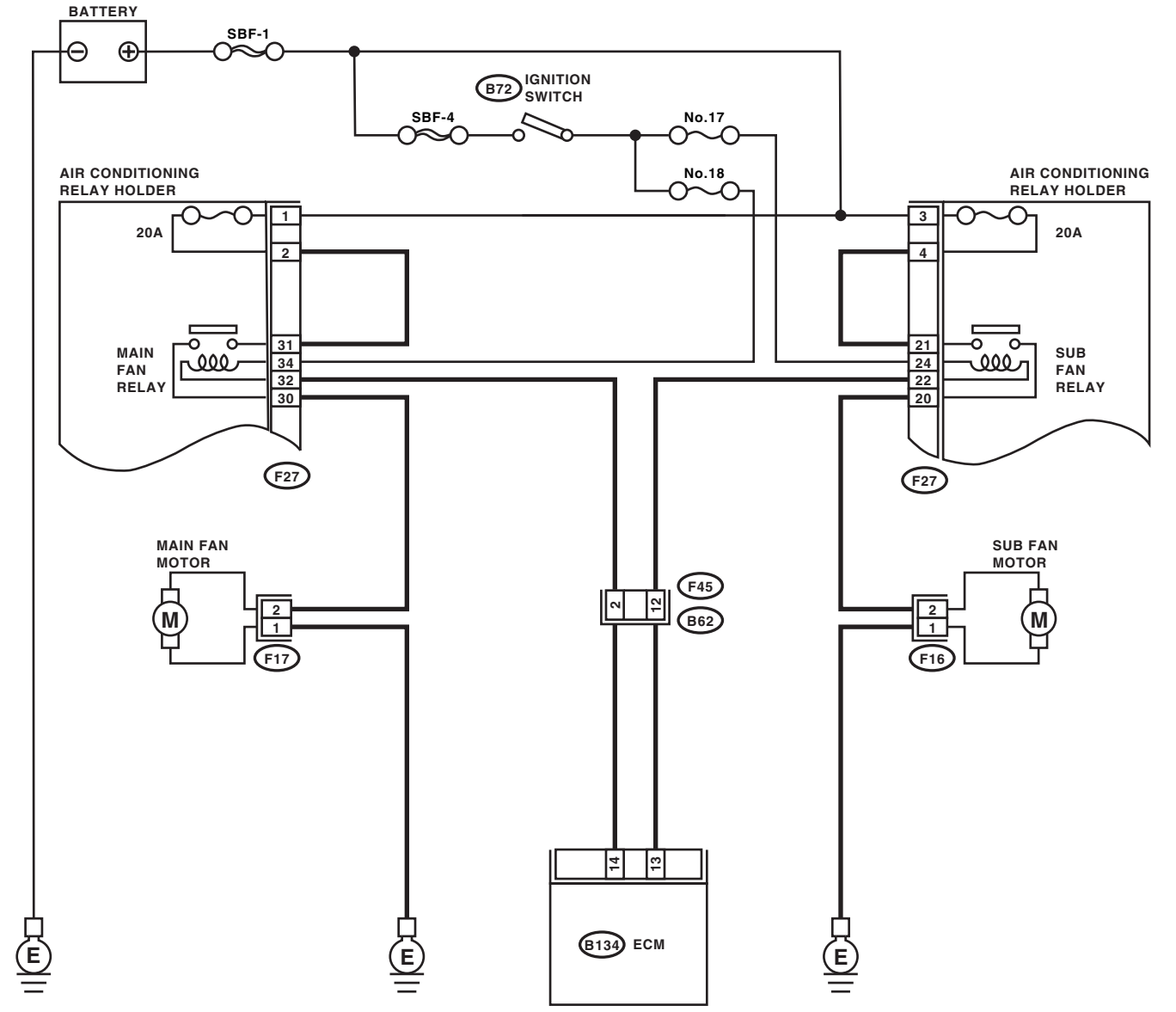
- Radiator main fan does not rotate under the above conditions.

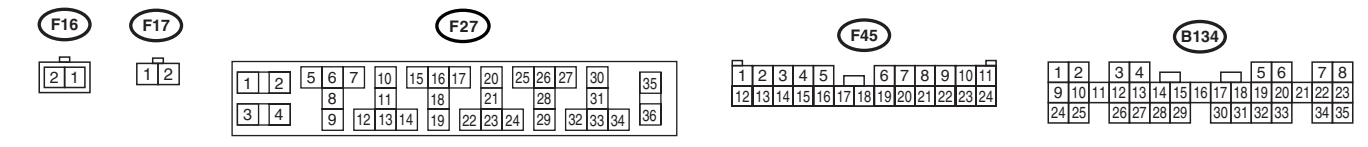
	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO MAIN FAN MOTOR.** **CAUTION:** **Be careful not to overheat the engine during repair.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from main fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 96°C (205°F). 4) Stop the engine and turn ignition switch to ON. 5) Measure the voltage between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **5.**
2	**CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 1 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the open circuit in harness between main fan motor connector and chassis ground.
3	**CHECK POOR CONTACT.** Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair the poor contact in main fan motor connector.	Go to step **4.**
4	**CHECK MAIN FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 2, and ground (–) terminal to terminal No. 1 of main fan motor connector.	Does the main fan rotate?	Repair the poor contact in main fan motor connector.	Replace the main fan motor with a new one.
5	**CHECK POWER SUPPLY TO MAIN FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay from A/C relay holder. 3) Measure the voltage between main fan relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 31 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **6.**	Go to step **7.**
6	**CHECK POWER SUPPLY TO MAIN FAN RELAY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between main fan relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 34 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **10.**	Go to step **9.**
7	**CHECK 20 A FUSE.** 1) Remove the 20 A fuse from A/C relay holder. 2) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step **8.**

	Step	Check	Yes	No
8	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL.** Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the open circuit in harness between 20 A fuse and main fan relay terminal.	Repair the open circuit in harness between main fuse box connector and 20 A fuse terminal.
9	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 18 from joint box. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the open circuit in harness between main fan relay and ignition switch.
10	**CHECK MAIN FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay. 3) Measure the resistance of main fan relay. ***Terminals*** ***No. 30 — No. 31:***	Is the resistance more than 1 MΩ?	Go to step **11.**	Replace the main fan relay.
11	**CHECK MAIN FAN RELAY.** 1) Connect the battery to terminals No. 32 and No. 34 of main fan relay. 2) Measure the resistance of main fan relay. ***Terminals*** ***No. 30 — No. 31:***	Is the resistance less than 1 Ω?	Go to step **12.**	Replace the main fan relay.
12	**CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR.** Measure the resistance of harness between main fan motor connector and main fan relay terminal. ***Connector & terminal*** ***(F17) No. 2 — (F27) No. 30:***	Is the resistance less than 1 Ω?	Go to step **13.**	Repair the open circuit in harness between main fan motor connector and main fan relay terminal.
13	**CHECK HARNESS BETWEEN MAIN FAN RELAY AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between main fan relay connector and ECM connector. ***Connector & terminal*** ***(F27) No. 32 — (B134) No. 14:***	Is the resistance less than 1 Ω?	Go to step **14.**	Repair the open circuit in harness between main fan relay and ECM.
14	**CHECK POOR CONTACT.** Check poor contact in connector between main fan and ECM.	Is there poor contact in connector between main fan motor and ECM?	Repair the poor contact connector.	Verify the DTC. Repair the trouble cause. <Ref. to EN(H4SO)(diag)-36, Read Diagnostic Trouble Code (DTC).>

3. Radiator Sub Fan System

A: WIRING DIAGRAM





CO-00240

B: INSPECTION

NOTE:
System for A/C equipped models only.

DETECTING CONDITION:

Condition (1):

- Engine coolant temperature is below 95°C (203°F).
- A/C switch is turned ON.
- Vehicle speed is below 19 km/h (12 MPH).

Condition (2):

- Engine coolant temperature is above 100°C (212°F).
- A/C switch is turned OFF.
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

- Radiator sub fan does not rotate under conditions (1) and (2) above.

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO SUB FAN MOTOR.** **CAUTION:** **Be careful not to overheat the engine during repair.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from sub fan motor and main fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 100°C (212°F). 4) Stop the engine and turn ignition switch to ON. 5) Measure the voltage between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **5.**
2	**CHECK GROUND CIRCUIT OF SUB FAN MOTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 1 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the open circuit in harness between sub fan motor connector and chassis ground.
3	**CHECK POOR CONTACT.** Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair the poor contact in sub fan motor connector.	Go to step **4.**
4	**CHECK SUB FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 2, and ground (–) terminal to terminal No. 1 of sub fan motor connector.	Does the sub fan rotate?	Repair the poor contact in sub fan motor connector.	Replace the sub fan motor with a new one.
5	**CHECK POWER SUPPLY TO SUB FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the sub fan relay from A/C relay holder. 3) Measure the voltage between sub fan relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 21 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **6.**	Go to step **7.**

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO SUB FAN RELAY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between sub fan relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 24 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **10.**	Go to step **9.**
7	**CHECK 20 A FUSE.** 1) Remove the 20 A fuse from A/C relay holder. 2) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step **8.**
8	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL.** Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the open circuit in harness between 20 A fuse and sub fan relay terminal.	Repair the open circuit in harness between main fuse box connector and 20 A fuse terminal.
9	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 17 from joint box. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the open circuit in harness between sub fan relay and ignition switch.
10	**CHECK SUB FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of sub fan relay. ***Terminals*** ***No. 20 — No. 21:***	Is the resistance more than 1 MΩ?	Go to step **11.**	Replace the sub fan relay.
11	**CHECK SUB FAN RELAY.** 1) Connect the battery to terminals No. 22 and No. 24 of sub fan relay. 2) Measure the resistance of sub fan relay. ***Terminals*** ***No. 20 — No. 21:***	Is the resistance less than 1 Ω?	Go to step **12.**	Replace the sub fan relay.
12	**CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.** Measure the resistance of harness between sub fan motor connector and sub fan relay terminal. ***Connector & terminal*** ***(F16) No. 2 — (F27) No. 20:***	Is the resistance less than 1 Ω?	Go to step **13.**	Repair the open circuit in harness between sub fan motor and sub fan relay connector.
13	**CHECK HARNESS BETWEEN SUB FAN RELAY AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between sub fan relay connector and ECM connector. ***Connector & terminal*** ***(F27) No. 22 — (B134) No. 13:***	Is the resistance less than 1 Ω?	Go to step **14.**	Repair the open circuit in harness between sub fan relay and ECM.
14	**CHECK POOR CONTACT.** Check poor contact in connector between sub fan and ECM.	Is there poor contact in connector between sub fan motor and ECM?	Repair the poor contact connector.	Verify the DTC. Repair the trouble cause. <Ref. to EN(H4SO)(diag)-36, Read Diagnostic Trouble Code (DTC).>

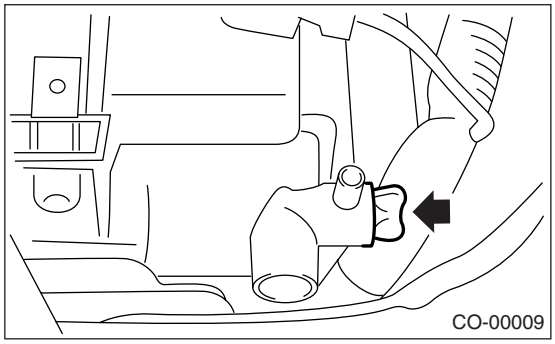
4. Engine Coolant

A: REPLACEMENT

1. DRAINING OF ENGINE COOLANT

1) Lift-up the vehicle.
2) Remove the under cover.
3) Remove the drain plug to drain engine coolant into container.

NOTE:
Remove the radiator cap so that engine coolant will drain faster.



4) Install the drain plug.

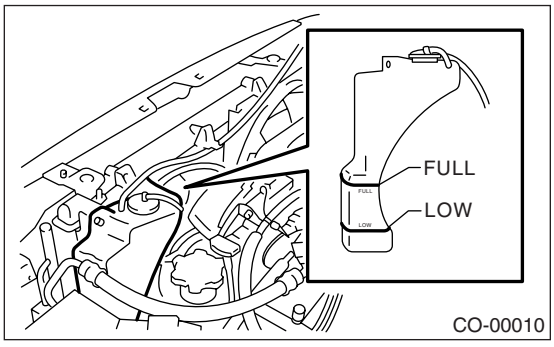
2. FILLING OF ENGINE COOLANT

1) Fill engine coolant into the radiator up to filler neck position.

Coolant capacity (fill up to "FULL" level):
AT model:
Approx. 6.9 ℓ (7.29 US qt, 6.07 Imp qt)
MT model:
Approx. 7.0 ℓ (7.4 US qt, 6.2 Imp qt)

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

2) Fill engine coolant into the reservoir tank up to Full level.

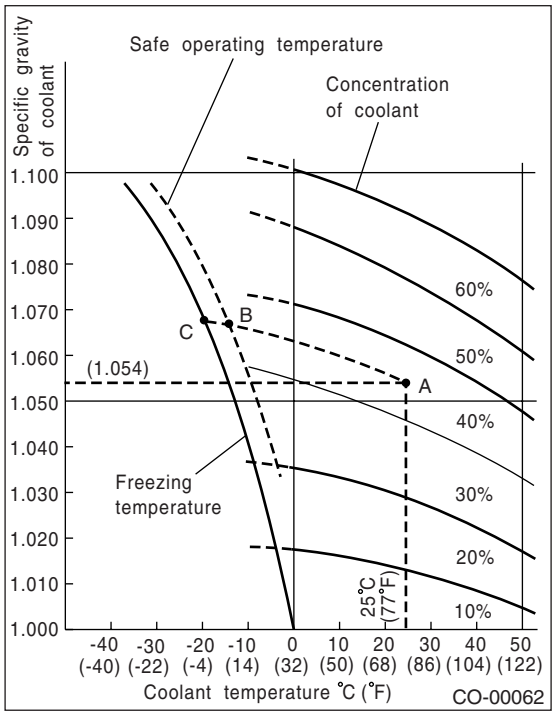


3) Warm-up the engine completely for more than 5 minutes at 2,000 to 3,000 rpm.
4) If the engine coolant level drops in radiator, add engine coolant to filler neck position.
5) If the engine coolant level drops from Full level of reservoir tank, add engine coolant to Full level.
6) Attach the radiator cap and reservoir tank cap properly.

B: INSPECTION

1. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

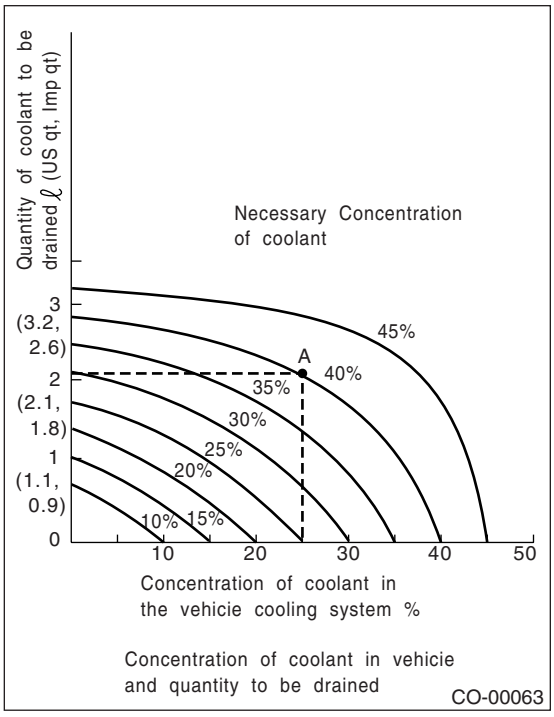
The concentration and safe operating temperature of the SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the coolant will provide this information.
[Example]
If the coolant temperature is 25°C (77°F) and its specific gravity is 1.054, the concentration is 35% (point A), the safe operating temperature is −14°C (7°F) (point B), and the freezing temperature is −20°C (−4°F) (point C).



2. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50%).
The amount of coolant that should be replaced can be determined using the diagram.

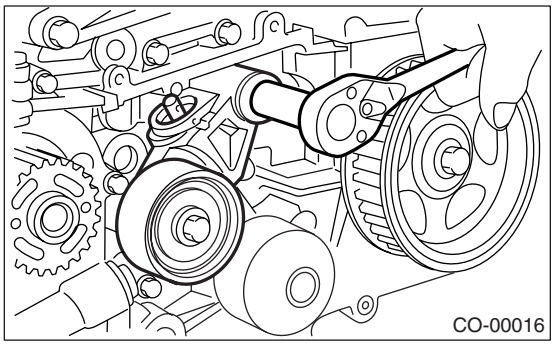
[Example]
Assume that the coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of coolant concentration intersects with the 40% curve of the necessary coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 ℓ (2.2 US qt, 1.8 Imp qt). Drain 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.
If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.



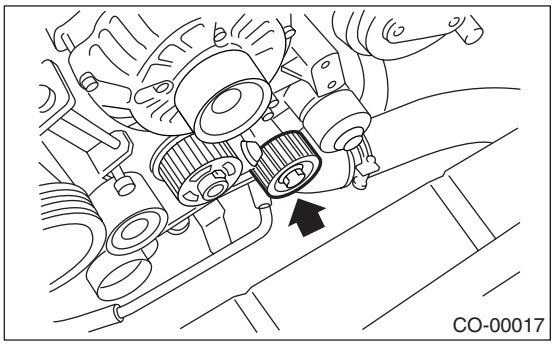
5. Water Pump

A: REMOVAL

1) Remove the radiator. <Ref. to CO(H4SO)-18, REMOVAL, Radiator.>
2) Remove the V-belts.
<Ref. to ME(H4SO)-39, REMOVAL, V-belt.>
3) Remove the timing belt.
<Ref. to ME(H4SO)-44, TIMING BELT, REMOVAL, Timing Belt Assembly.>
4) Remove the automatic belt tension adjuster.

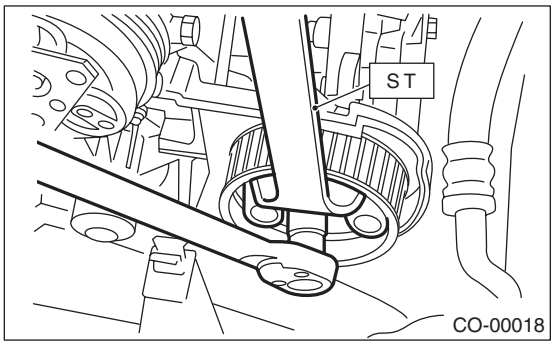


5) Remove the belt idler No. 2.

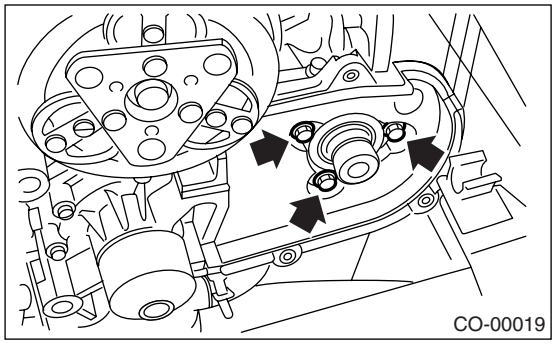


6) Remove the camshaft sprocket (LH) by using ST.
ST 18231AA010 CAMSHAFT SPROCKET WRENCH

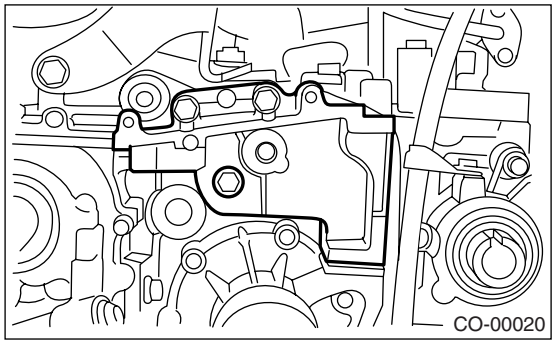
NOTE:
Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.



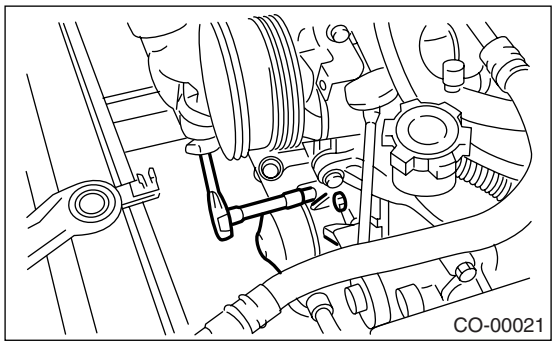
7) Remove the belt cover No. 2 (LH).



8) Remove the tensioner bracket.



9) Disconnect the hose from water pump.
10) Remove the water pump.

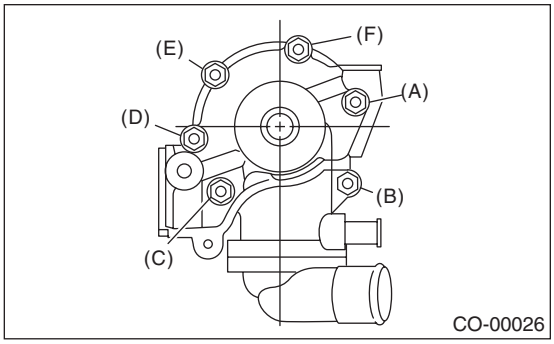


B: INSTALLATION

1) Install the water pump onto cylinder block (LH).

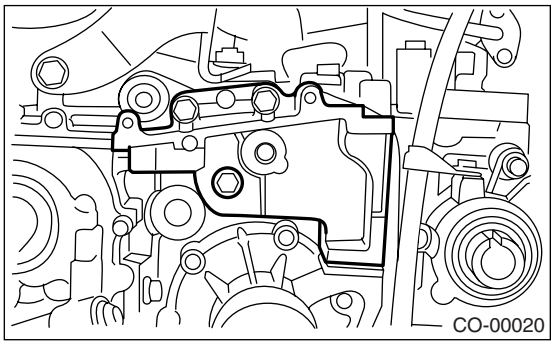
NOTE:
- Replace the gasket with a new one.
- When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in the figure.

Tightening torque:
First:
12 N·m (1.2 kgf-m, 8.7 ft-lb)
Second:
12 N·m (1.2 kgf-m, 8.7 ft-lb)



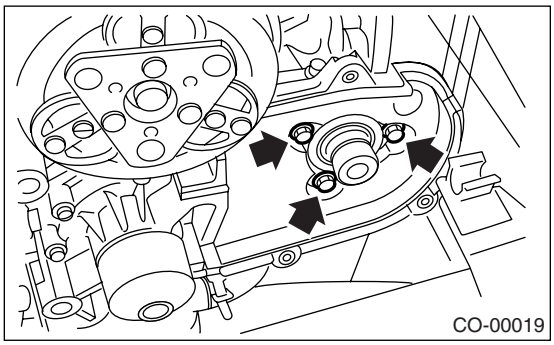
2) Connect the hose to water pump.
3) Install the tensioner bracket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



4) Install the belt cover No. 2 (LH).

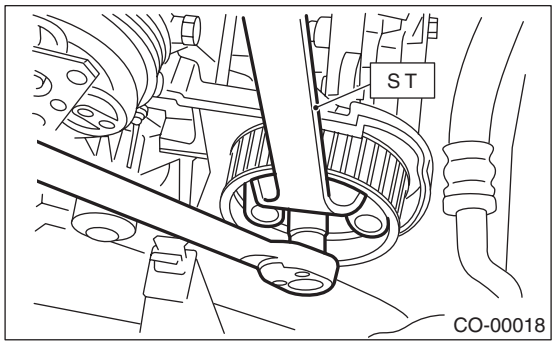
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



5) Install the camshaft sprockets (LH) by using ST.
ST 18231AA010 CAMSHAFT SPROCKET WRENCH

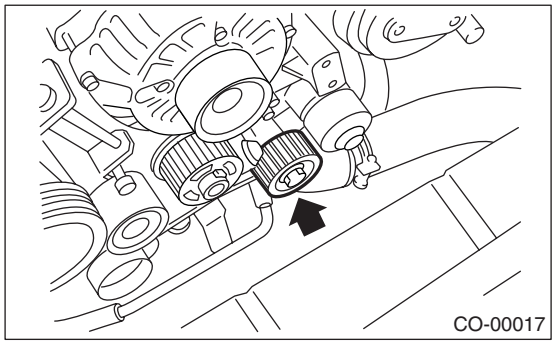
NOTE:
Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.

Tightening torque:
78 N·m (8.0 kgf-m, 57.9 ft-lb)



6) Install the belt idler No. 2.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

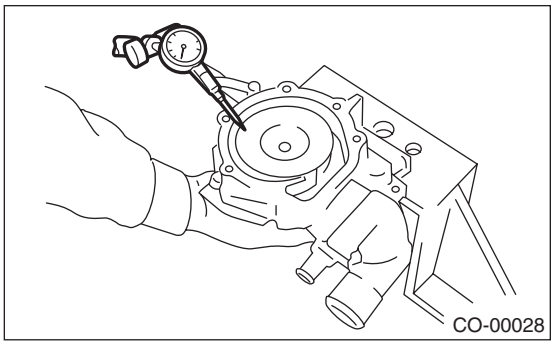


7) Install the automatic belt tension adjuster whose tension rod is held with pin. <Ref. to ME(H4SO)-45, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>
8) Install the timing belt. <Ref. to ME(H4SO)-46, TIMING BELT, INSTALLATION, Timing Belt Assembly.>
9) Install the V-belts. <Ref. to ME(H4SO)-39, INSTALLATION, V-belt.>
10) Install the radiator. <Ref. to CO(H4SO)-19, INSTALLATION, Radiator.>

C: INSPECTION

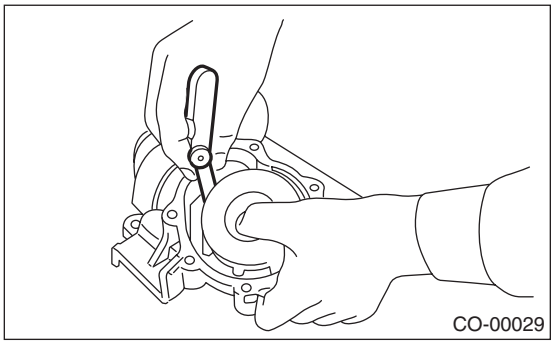
1) Check the water pump bearing for smooth rotation.
2) Check the water pump pulley for abnormalities.
3) Using a dial gauge, measure the impeller runout in thrust direction while rotating the pulley.

"Thrust" runout limit:
0.5 mm (0.020 in)



4) Check the clearance between impeller and pump case.

Clearance between impeller and pump case:
Standard
0.5 — 0.7 mm (0.020 — 0.028 in)
Limit
1.0 mm (0.039 in)

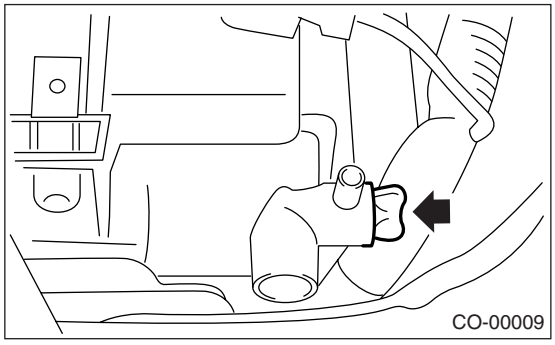


5) After water pump installation, check the pulley shaft for engine coolant leaks. If leaks are noted, replace the water pump assembly.

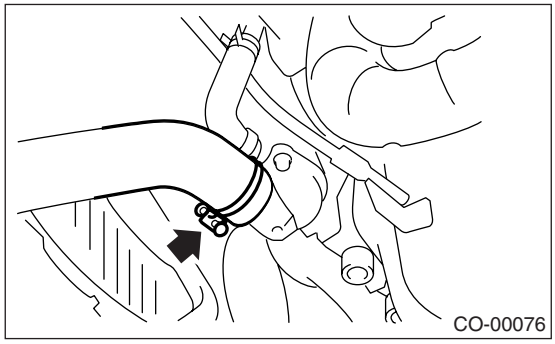
6. Thermostat

A: REMOVAL

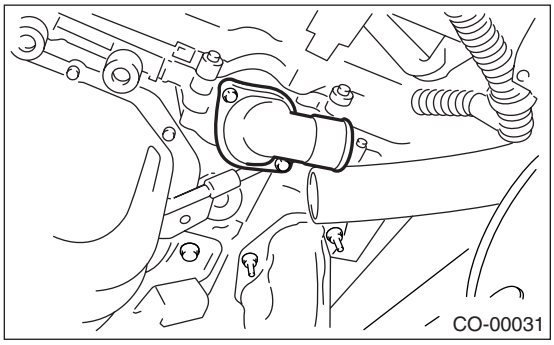
1) Set the vehicle on a lift.
2) Lift-up the vehicle.
3) Remove the under cover.
4) Drain the engine coolant completely. <Ref. to CO(H4SO)-12, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>



5) Disconnect the radiator outlet hose from thermostat cover.



6) Remove the thermostat cover and gasket, and then pull out the thermostat.

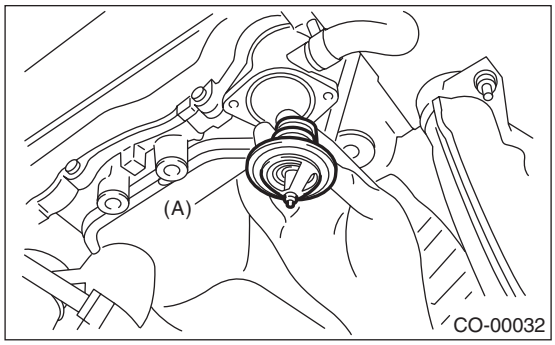


B: INSTALLATION

1) Install the thermostat in water pump, and then install the thermostat cover together with a gasket.

NOTE:
• When reinstalling the thermostat, use a new gasket.
• The thermostat must be installed with the jiggle pin (A) facing to front side.

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



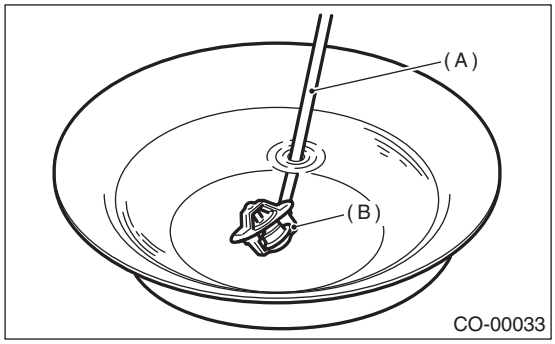
2) Fill engine coolant. <Ref. to CO(H4SO)-12, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.
Immerse the thermostat and thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measurement should be to the specification.

Starts to open:
76 — 80°C (169 — 176°F)

Fully opens:
91°C (196°F)

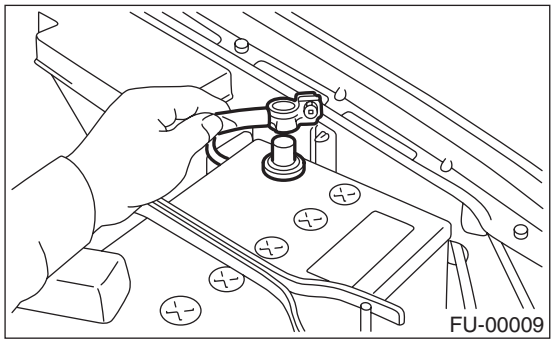


(A) Thermometer
(B) Thermostat

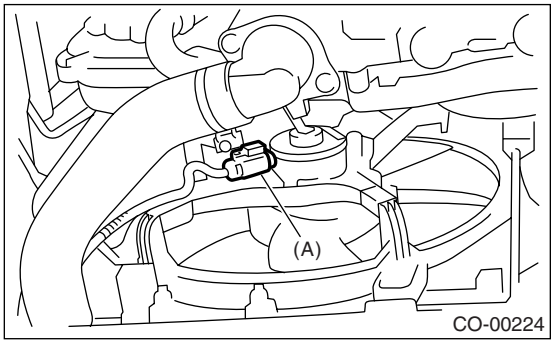
7. Radiator

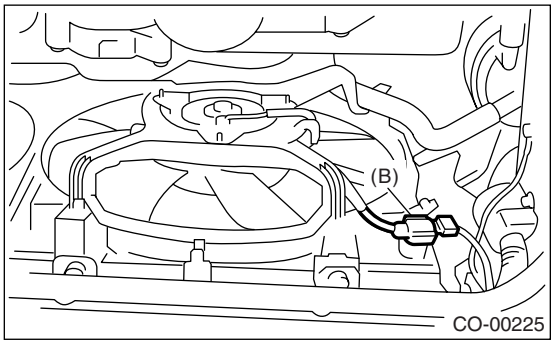
A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.

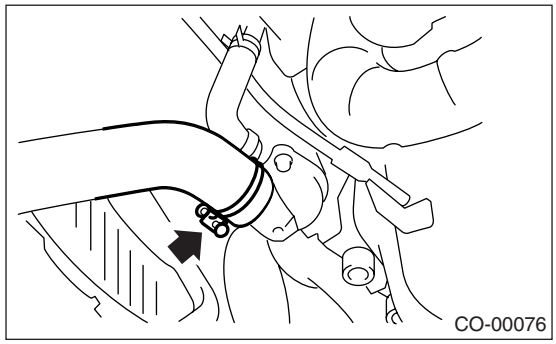


3) Lift-up the vehicle.
4) Remove the under cover.
5) Drain the engine coolant completely. <Ref. to CO(H4SO)-12, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
6) Disconnect the connectors of radiator main fan motor (A) and sub fan motor (B).

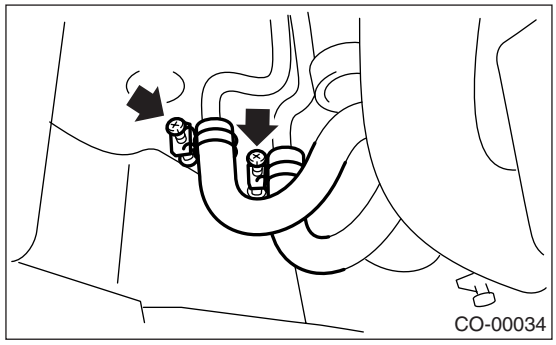




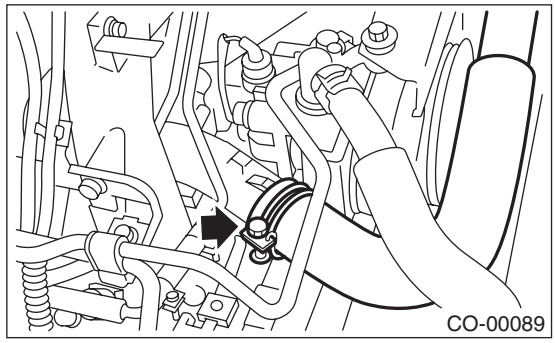
7) Disconnect the radiator outlet hose from water pump.



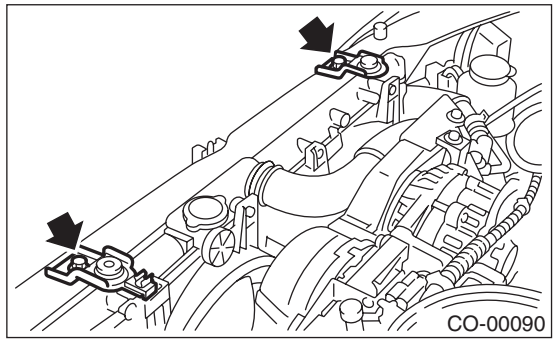
8) Disconnect the ATF cooler hoses from ATF pipe. (AT model) Plug the openings in the hose and radiator with caps in order to prevent ATF from leaking.



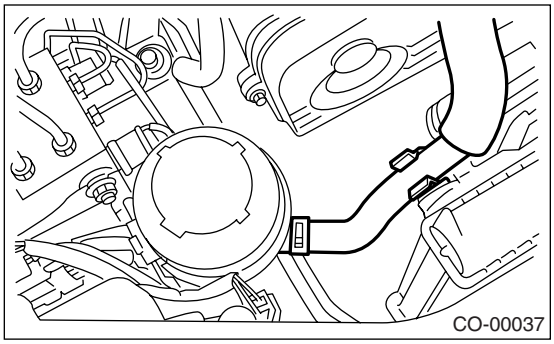
9) Lower the vehicle.
10) Disconnect the overflow hose.
11) Remove the reservoir tank. <Ref. to CO(H4SO)-24, REMOVAL, Reservoir Tank.>
12) Remove the air intake duct.
13) Disconnect the radiator inlet hose from engine.



14) Remove the radiator upper brackets.



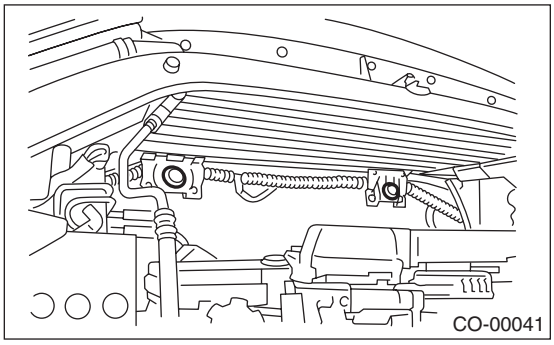
15) Detach the power steering hose from clip on radiator.



16) Lift the radiator up and away from the vehicle.

B: INSTALLATION

1) Attach the radiator lower cushions to holes on the radiator lower bracket.

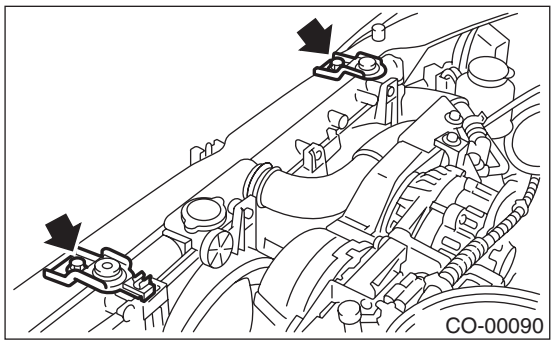


2) Install the radiator to vehicle.

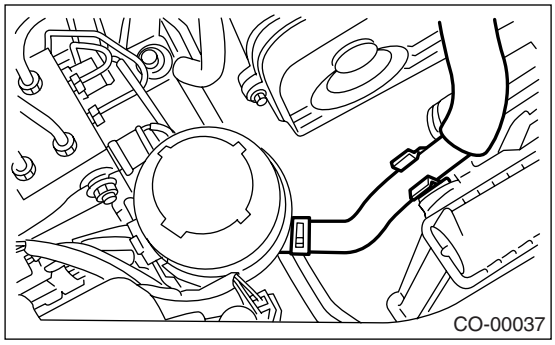
NOTE:
Fit the pins on lower side of radiator into the cushions on the body side.

3) Install the radiator upper brackets, and then tighten the bolts.

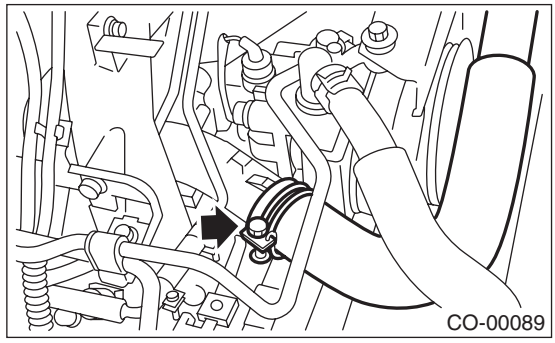
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



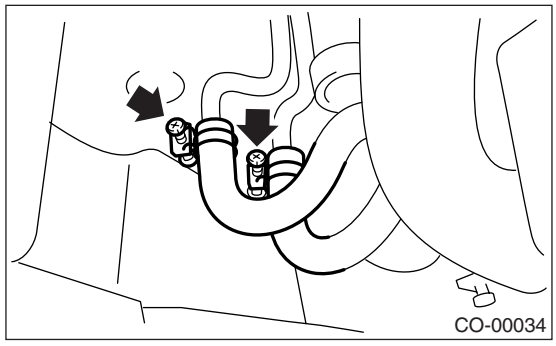
4) Attach the power steering hose to radiator.



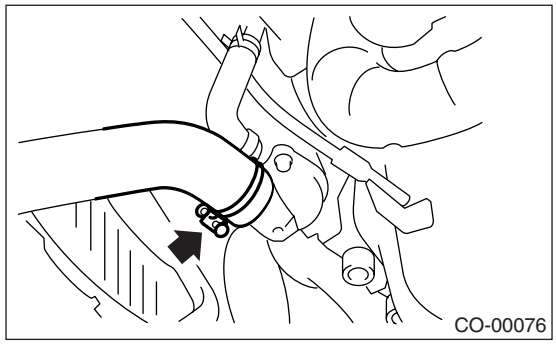
5) Connect the radiator inlet hose.



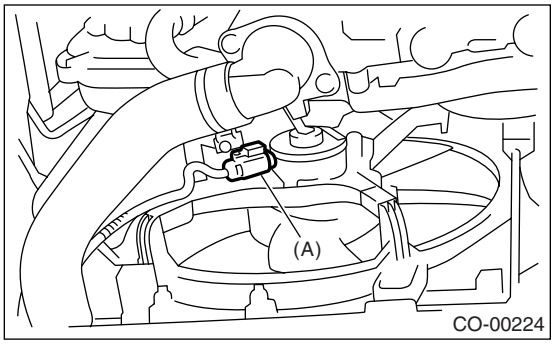
6) Install the air intake duct.
7) Install the reservoir tank.
8) Connect the overflow hose.
9) Lift-up the vehicle.
10) Connect the ATF cooler hoses. (AT model)

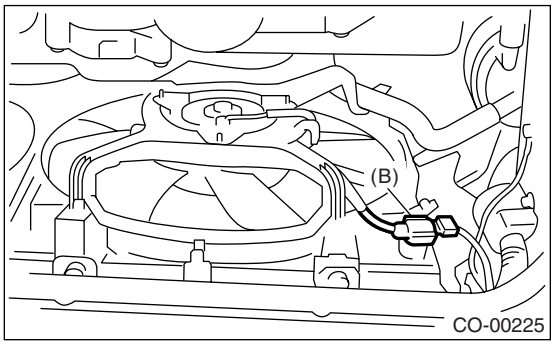


11) Connect the radiator outlet hose.

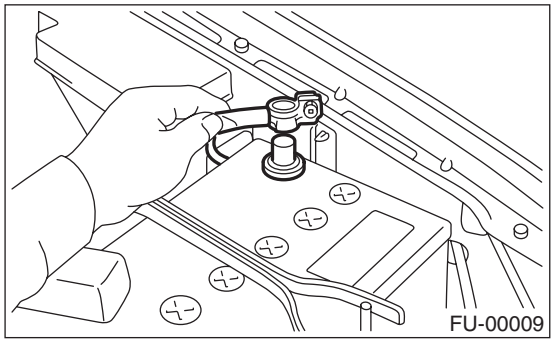


12) Connect the connectors to radiator main fan motor (A) and sub fan motor (B).





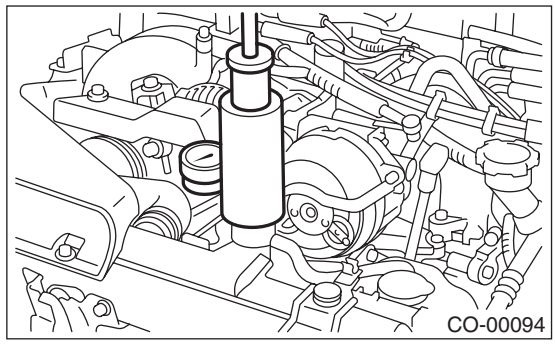
13) Install the under cover.
14) Lower the vehicle.
15) Connect the battery ground cable to battery.



16) Fill engine coolant. <Ref. to CO(H4SO)-12, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
17) Check the ATF level. <Ref. to 4AT-30, INSPECTION, Automatic Transmission Fluid.>

C: INSPECTION

1) Remove the radiator cap, top off radiator, and then attach the tester to radiator in place of cap.



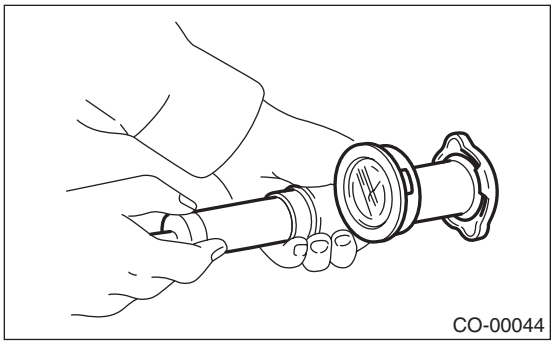
2) Apply a pressure of 157 kPa (1.6 kg/cm^2, 23 psi) to the radiator to check if:
   (1) Engine coolant leaks at/around radiator.
   (2) Engine coolant leaks at/around hoses or connections.

CAUTION:
• Engine should be turned off.
• Wipe engine coolant from check points in advance.
• Be careful to prevent engine coolant from spurting out when removing the tester.
• Be careful also not to deform the filler neck of radiator when installing or removing tester.

8. Radiator Cap

A: INSPECTION

1) Attach the radiator cap to tester.



2) Increase the pressure until tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for 5 to 6 seconds.

Standard pressure:
93 — 123 kPa (0.95 — 1.25 kg/cm^2, 14 — 18 psi)

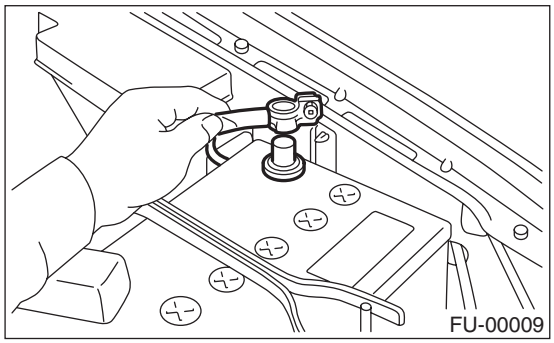
Service limit pressure:
83 kPa (0.85 kg/cm^2, 12 psi)

CAUTION:
Be sure to remove foreign matter and rust from the cap in advance otherwise, results of pressure test will be incorrect.

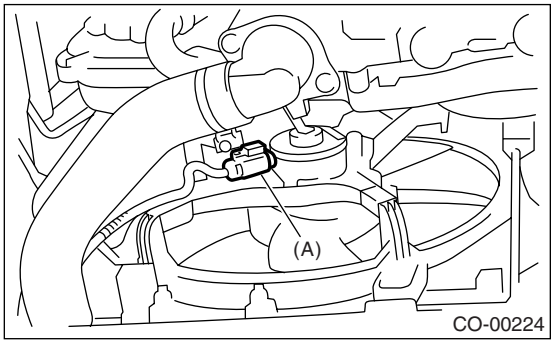
9. Radiator Main Fan and Fan Motor

A: REMOVAL

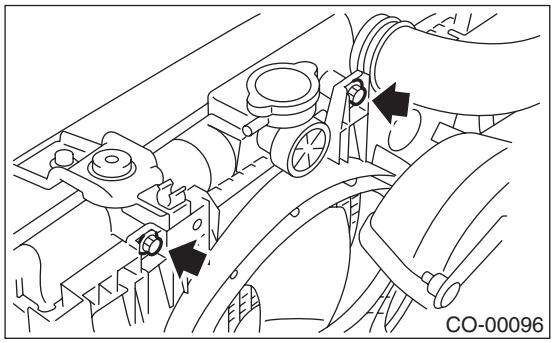
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



3) Lift-up the vehicle.
4) Remove the under cover.
5) Disconnect the connector of main fan motor (A).



6) Remove the ATF hose from clip of radiator main fan motor assembly. (AT model)
7) Lower the vehicle.
8) Disconnect the overflow hose.
9) Remove the reservoir tank. <Ref. to CO(H4SO)-24, REMOVAL, Reservoir Tank.>
10) Remove the bolts which secure the radiator main fan shroud to radiator.



11) Remove the radiator fan motor assembly.

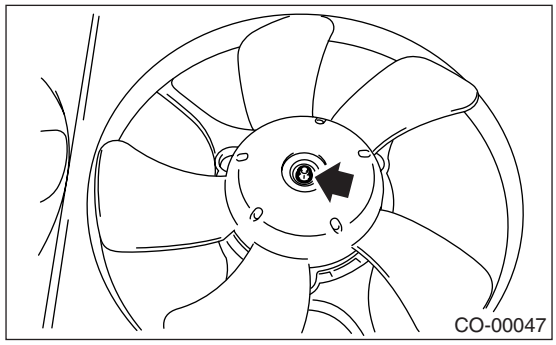
B: INSTALLATION

Install in the reverse order of removal.

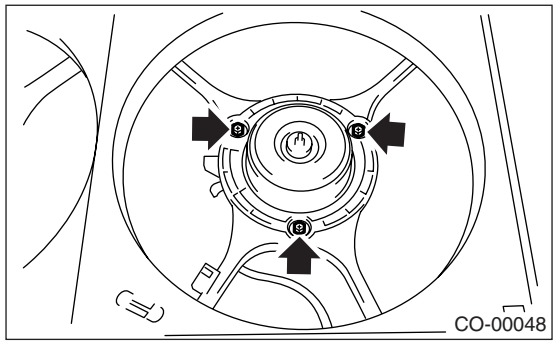
NOTE:
• If it is difficult to install the radiator main fan motor assembly, first loosen the bolts which hold the radiator sub fan motor assembly.
• Refer to COMPONENT for tightening torque. <Ref. to CO(H4SO)-3, COMPONENT, General Description.>

C: DISASSEMBLY

1) Remove the nut which holds the fan itself onto fan motor and shroud assembly.



2) Remove the bolts which install the fan motor.



D: ASSEMBLY

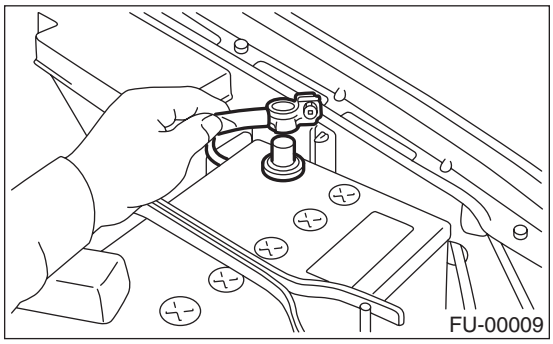
Assemble in the reverse order of disassembly.

NOTE:
Refer to COMPONENT for tightening torque. <Ref. to CO(H4SO)-3, COMPONENT, General Description.>

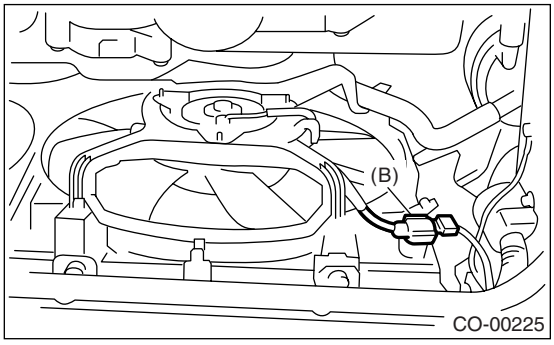
10. Radiator Sub Fan and Fan Motor

A: REMOVAL

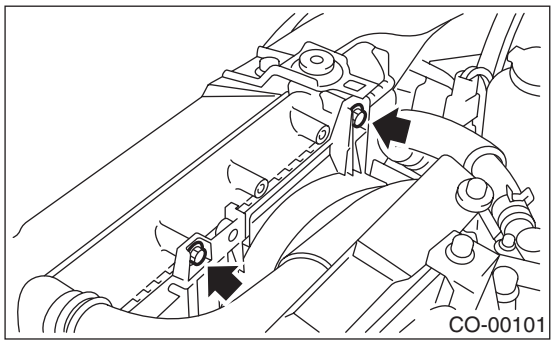
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



3) Lift-up the vehicle.
4) Remove the under cover.
5) Disconnect the connector of sub fan motor (B).



6) Remove the ATF hose from clips of radiator sub fan motor assembly. (AT model)
7) Lower the vehicle.
8) Remove the air intake duct.
9) Remove the bolts which hold the radiator sub fan shroud to radiator.



10) Remove the radiator sub fan motor assembly through the under side of vehicle.

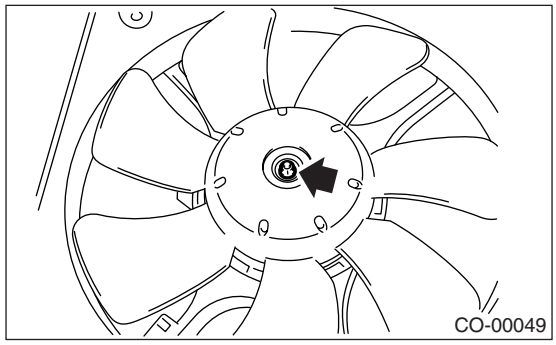
B: INSTALLATION

Install in the reverse order of removal.

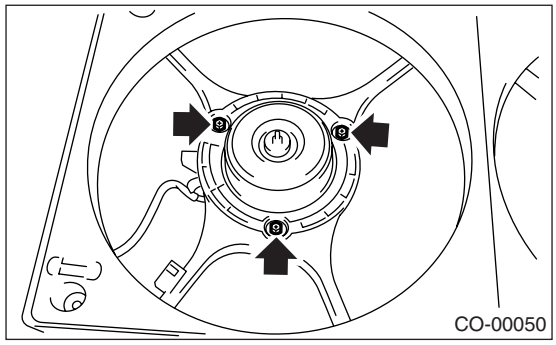
NOTE:
Refer to COMPONENT for tightening torque. <Ref. to CO(H4SO)-3, COMPONENT, General Description.>

C: DISASSEMBLY

1) Remove the clip which holds the motor connector onto shroud.
2) Remove the nut which holds the fan itself onto fan motor.



3) Remove the bolts which install the fan motor onto shroud.



D: ASSEMBLY

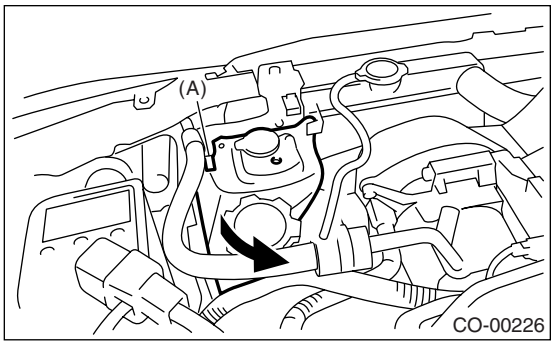
Assemble in the reverse order of disassembly.

NOTE:
Refer to COMPONENT for tightening torque. <Ref. to CO(H4SO)-3, COMPONENT, General Description.>

11.Reservoir Tank

A: REMOVAL

1) Disconnect the overflow hose from the radiator filler neck position.
2) Pressing the pawl (A), remove the reservoir tank by pulling in the direction indicated by the arrow.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Make sure the engine coolant level is between full and low.

12.Engine Cooling System Trouble in General

A: INSPECTION

Trouble	Possible cause	Corrective action
Over-heating	a. Insufficient engine coolant	Replenish the engine coolant, inspect for leakage, and repair.
	b. Loose timing belt	Repair or replace the timing belt tensioner.
	c. Oil on timing belt	Replace.
	d. Malfunction of thermostat	Replace.
	e. Malfunction of water pump	Replace.
	f. Clogged engine coolant passage	Clean.
	g. Improper ignition timing	Inspect and repair the ignition control system. <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>
	h. Clogged or leaking radiator	Clean or repair, or replace.
	i. Improper engine oil in engine coolant	Replace the engine coolant.
	j. Air/fuel mixture ratio too lean	Inspect and repair the fuel injection system. <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>
	k. Excessive back pressure in exhaust system	Clean or replace.
	l. Insufficient clearance between piston and cylinder	Adjust or replace.
	m. Slipping clutch	Repair or replace.
	n. Dragging brake	Adjust.
	o. Defective thermostat	Replace.
	p. Malfunction of radiator fan	Inspect the radiator fan relay, engine coolant temperature sensor or radiator motor and replace there.
Over-cooling	a. Atmospheric temperature extremely low	Partly cover the radiator front area.
	b. Defective thermostat	Replace.
Engine coolant leaks	a. Loosened or damaged connecting units on hoses	Repair or replace.
	b. Leakage from water pump	Replace.
	c. Leakage from water pipe	Repair or replace.
	d. Leakage around cylinder head gasket	Retighten the cylinder head bolts or replace gasket.
	e. Damaged or cracked cylinder head and crankcase	Repair or replace.
	f. Damaged or cracked thermostat case	Repair or replace.
	g. Leakage from radiator	Repair or replace.
Noise	a. Defective timing belt	Replace.
	b. Defective radiator fan	Replace.
	c. Defective water pump bearing	Replace the water pump.
	d. Defective water pump mechanical seal	Replace the water pump.

LUBRICATION

LU(H4SO)

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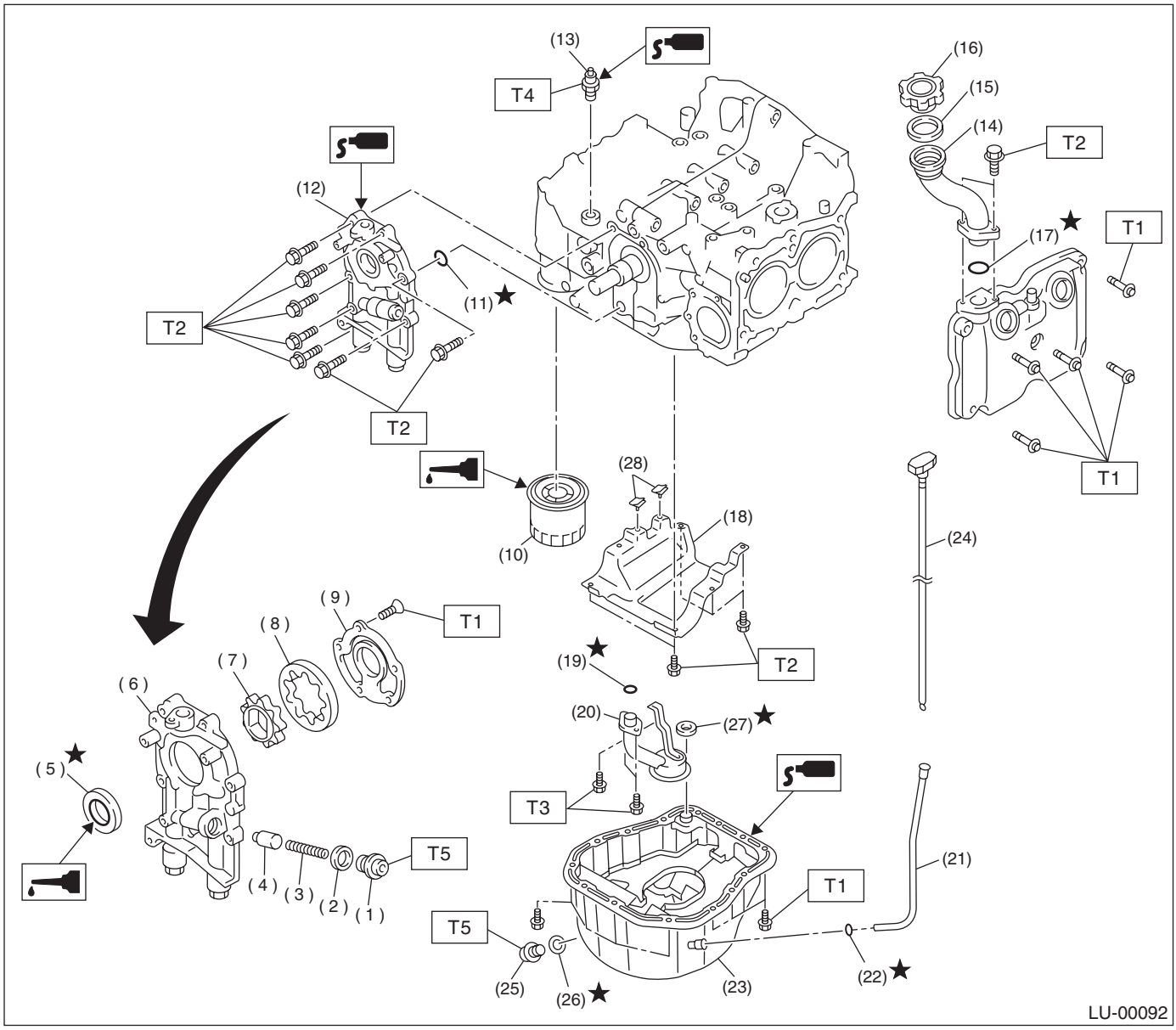
4. Oil Pump 10
5. Oil Pan and Strainer....14
6. Oil Pressure Switch....17
7. Engine Oil Filter....18
8. Engine Lubrication System Trouble in General....19

1. General Description

A: SPECIFICATIONS

Lubrication method				Forced lubrication
Oil pump	Pump type			Trochoid type
	Number of teeth	Inner rotor		9
		Outer rotor		10
	Outer rotor diameter × thickness			78 × 7 mm (3.07 × 0.28 in)
	Tip clearance between inner and outer rotor		STANDARD	0.04 — 0.14 mm (0.0016 — 0.0055 in)
			LIMIT	0.18 mm (0.0071 in)
	Side clearance between inner rotor and pump case		STANDARD	0.02 — 0.07 mm (0.0008 — 0.0028 in)
			LIMIT	0.12 mm (0.0047 in)
	Case clearance between outer rotor and pump case		STANDARD	0.10 — 0.175 mm (0.0039 — 0.0069 in)
			LIMIT	0.20 mm (0.0079 in)
	Capacity at 80°C (176°F)	600 rpm	Discharge pressure	98 kPa (1.0 kg/cm^2, 14 psi)
			Discharge quantity	3.2 ℓ (3.4 US qt, 2.8 Imp qt)/min.
		5,000 rpm	Discharge pressure	294 kPa (3.0 kg/cm^2, 43 psi)
			Discharge quantity	32.6 ℓ (34.4 US qt, 28.7 Imp qt)/min.
	Relief valve operation pressure			490 kPa (5.0 kg/cm^2, 71 psi)
Oil filter	Type			Full-flow filter type
	Filtration area	Diameter 80 mm (3.15 in)		760 cm^2 (118 sq in)
		Diameter 68 mm (2.68 in)		800 cm^2 (124 sq in)
		Diameter 65 mm (2.56 in)		470 cm^2 (73 sq in)
	By-pass valve opening pressure			157 kPa (1.60 kg/cm^2, 22.8 psi)
	Outer diameter × width	Diameter 80 mm (3.15 in)		80 × 70 mm (3.15 × 2.76 in)
		Diameter 68 mm (2.68 in)		68 × 65 mm (2.68 × 2.56 in)
		Diameter 65 mm (2.56 in)		65 × 74.4 mm (2.56 × 2.93 in)
	Oil filter to engine thread size			M 20 × 1.5
Oil pressure switch	Type			Immersed contact point type
	Working voltage — wattage			12 V — 3.4 W or less
	Warning light activation pressure			14.7 kPa (0.15 kg/cm^2, 2.1 psi)
	Proof pressure			More than 981 kPa (10 kg/cm^2, 142 psi)
Oil capacity (at replacement)				4.0 ℓ (4.2 US qt, 3.5 Imp qt)

B: COMPONENT



(1) Plug
(2) Gasket
(3) Relief valve spring
(4) Relief valve
(5) Oil seal
(6) Oil pump case
(7) Inner rotor
(8) Outer rotor
(9) Oil pump cover
(10) Oil filter
(11) O-ring
(12) Oil pump ASSY
(13) Oil pressure switch
(14) Oil filler duct
(15) O-ring
(16) Oil filler cap
(17) O-ring
(18) Baffle plate
(19) O-ring
(20) Oil strainer
(21) Oil level gauge guide
(22) O-ring
(23) Oil pan
(24) Oil level gauge
(25) Drain plug
(26) Metal gasket
(27) Gasket
(28) Seal

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7.2)
T4: 25 (2.5, 18.1)
T5: 44 (4.5, 32.5)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

D: PREPARATION TOOL

1. SPECIAL TOOLS

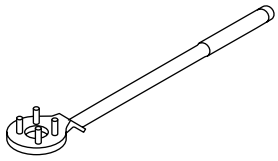
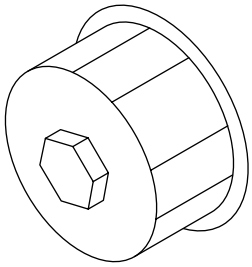
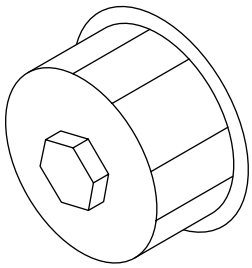
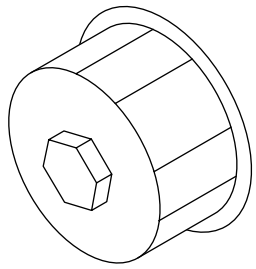
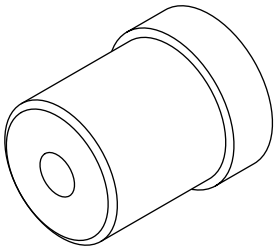
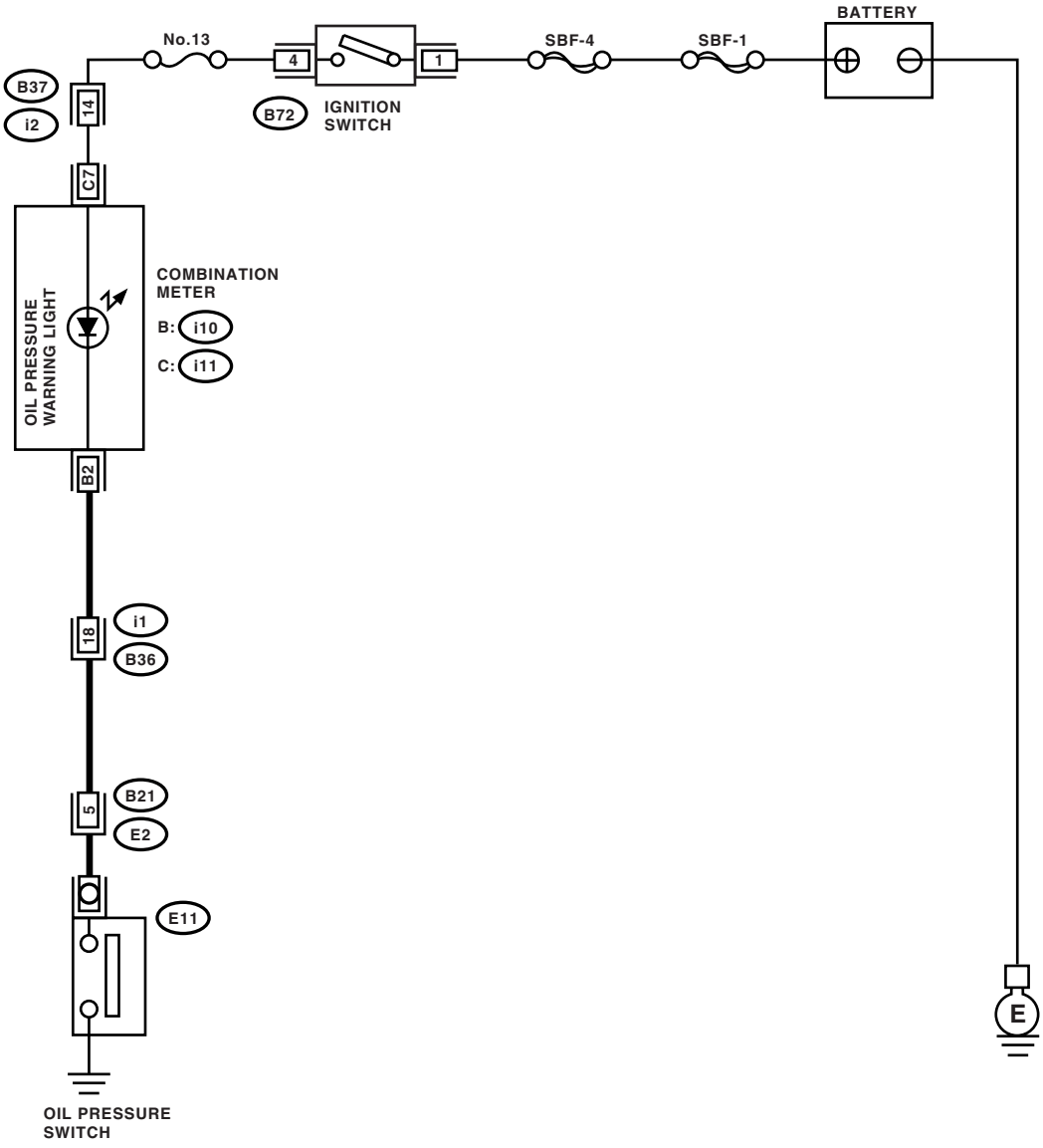
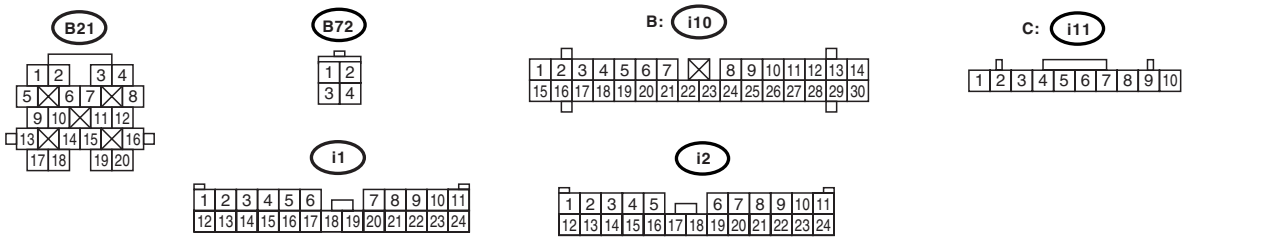
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	499977100	CRANKSHAFT PULLEY WRENCH	• Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt. • For 2.5 L model.
 ST-498547000	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 80 mm (3.15 in))
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in))

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18332AA010	18332AA010	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in))
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.

2. Oil Pressure System

A: WIRING DIAGRAM





LU-00210

B: INSPECTION

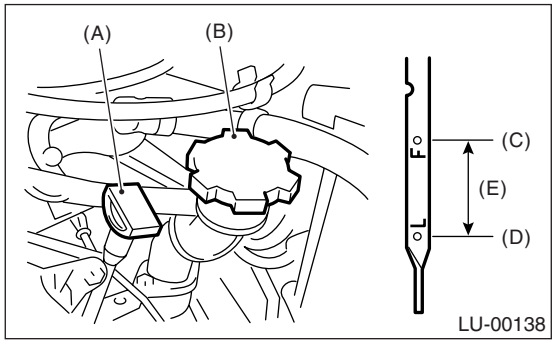
	Step	Check	Yes	No
1	**CHECK COMBINATION METER.** 1) Turn the ignition switch to ON (engine OFF). 2) Check other warning lights.	Does the warning lights go on?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-3, INSPECTION, Combination Meter System.>
2	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND OIL PRESSURE SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from oil pressure switch. 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between the oil pressure switch connector and chassis ground. ***Connector & terminal*** ***(E11) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Replace the oil pressure switch.	Go to step **3.**
3	**CHECK COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Measure the resistance of combination meter. ***Terminals*** ***(i11) No. 7 — (i10) No. 2:***	Is the resistance less than 10 Ω?	Replace the harness connector between combination meter and oil pressure switch.	Repair or replace the combination meter. <Ref. to IDI-3, INSPECTION, Combination Meter System.>

3. Engine Oil

A: INSPECTION

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe it clean.
3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
4) Remove it again and note the reading. If the engine oil level is below the “L” line, add oil to bring the level up to “F” line.
5) After turning off the engine, wait a few minutes for the oil to drain back into the oil pan before checking the level.
6) Just after driving or while the engine is warm, engine oil level may show in the range between the “F” line and notch mark. This is caused by thermal expansion of the engine oil.

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

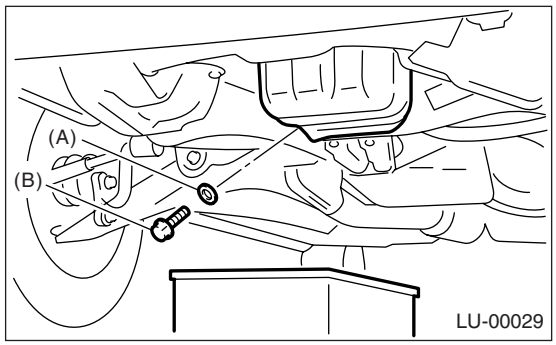


(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

B: REPLACEMENT

1) Open the engine oil filler cap for quick draining of the engine oil.
2) Lift up the vehicle.
3) Drain the engine oil by loosening the engine oil drain plug.

NOTE:
Prepare the container for draining of engine oil.



(A) Gasket
(B) Drain plug

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

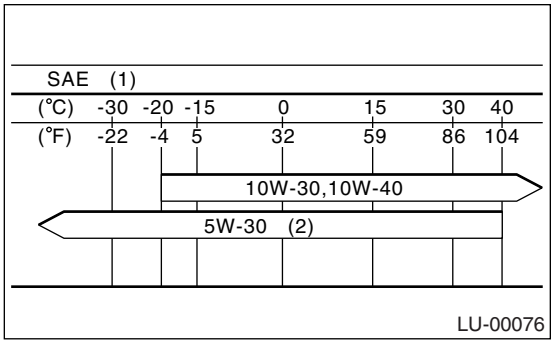
NOTE:
• Replace the drain plug gasket.
• Refer to COMPONENT of General Description for tightening torque. <Ref. to LU(H4SO)-3, COMPONENT, General Description.>

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

Recommended oil

API classification SL with the “Energy Conserving” logo is printed (if you cannot obtain the oil with SL grade, you may use SJ grade “ENERGY CONSERVING” oil.)
ILSAC specification, GF3 or new API certification mark (Star burst mark) label is on the container.

Engine oil capacity:
Upper level
4.0 ℓ (4.2 US qt, 3.5 Imp qt)
Lower level
3.0 ℓ (3.2 US qt, 2.6 Imp qt)



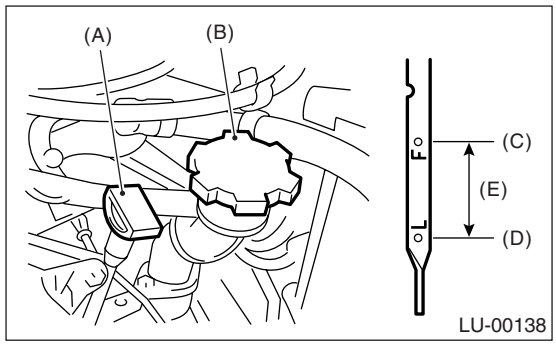
(1) SAE Viscosity No. and Applicable Temperature
(2) PREFERRED

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

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

NOTE:
If the vehicle is used in areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API classification: SL or SJ
SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50.

6) Close the engine oil filler cap.
7) Start the engine and warm it up for a time.
8) After the engine stops, recheck the oil level. If necessary, add engine oil up to the upper level on level gauge.

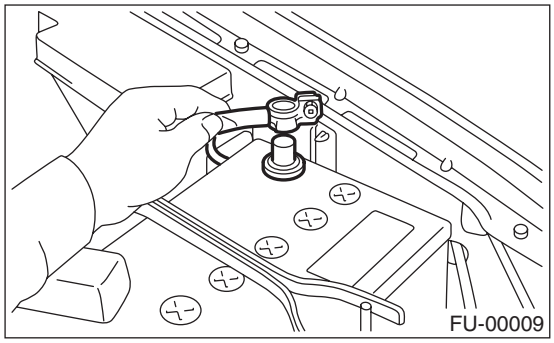


(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

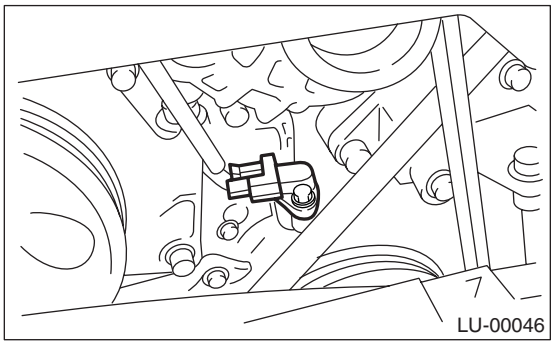
4. Oil Pump

A: REMOVAL

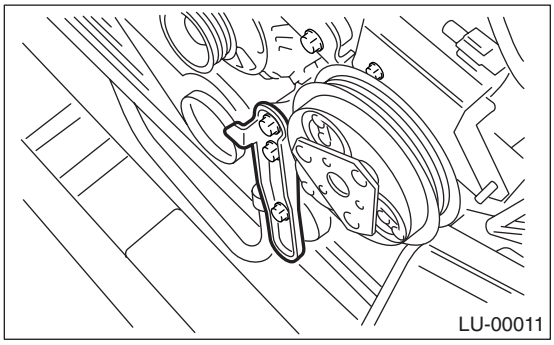
1) Disconnect the ground cable from battery.



2) Lift-up the vehicle.
3) Remove the under cover.
4) Lower the vehicle.
5) Remove the radiator. <Ref. to CO(H4SO)-18, REMOVAL, Radiator.>
6) Remove the crankshaft position sensor.

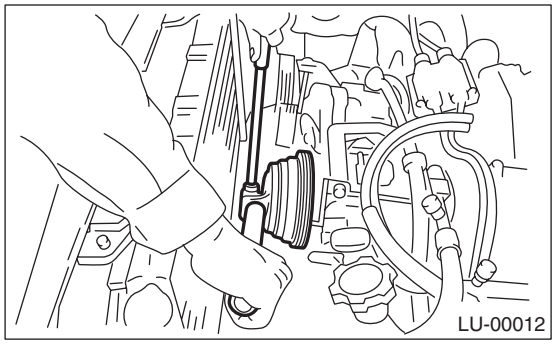


7) Remove the V-belts.
<Ref. to ME(H4SO)-39, REMOVAL, V-belt.>
8) Remove the belt tensioner.

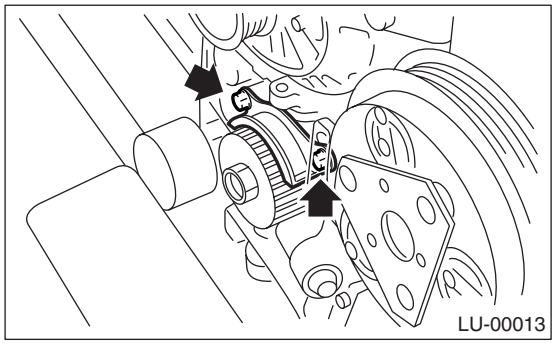


9) Remove the crankshaft pulley by using ST.

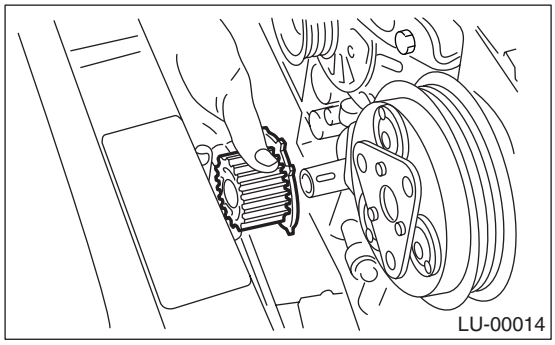
ST 499977100 CRANKSHAFT PULLEY WRENCH (2.5 L model)



10) Remove the water pump. <Ref. to CO(H4SO)-14, REMOVAL, Water Pump.>
11) Remove the timing belt guide. (MT model)

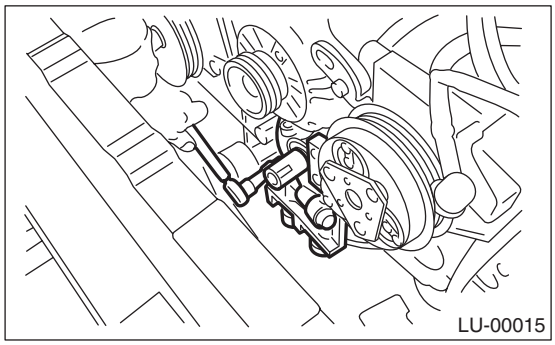


12) Remove the crankshaft sprocket.



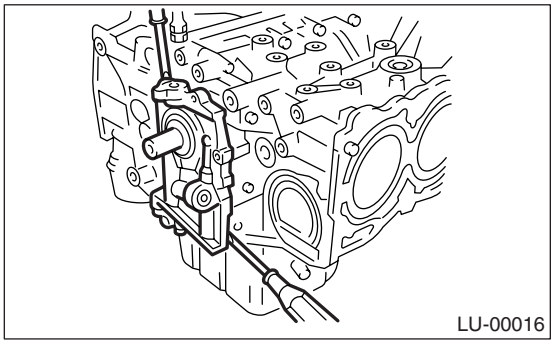
13) Remove the bolts which install the oil pump onto cylinder block.

NOTE:
If disassembling or inspecting the oil pump, loosen the plug of relief valve before removing the oil pump.



14) Remove the oil pump by using flat tip screwdriver.

CAUTION:
Be careful not to scratch the mating surfaces of cylinder block and oil pump.

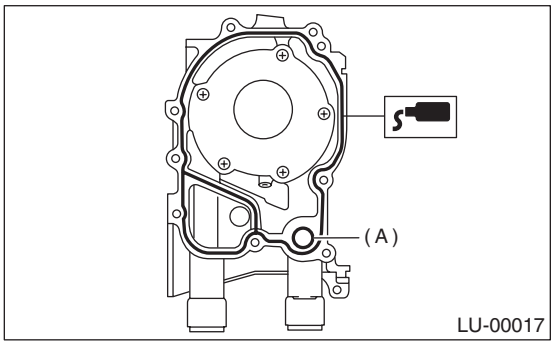

LU-00016

B: INSTALLATION

Install in the reverse order of removal.
Do the following:
1) Apply fluid packing to the matching surfaces of oil pump.

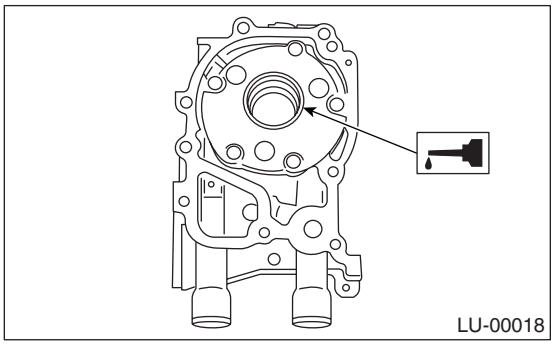
Fluid packing:
THREE BOND 1215 (Part No. 004403007) or equivalent

2) Replace the O-ring (A) with a new one.



LU-00017

3) Apply a coat of engine oil to the inside of oil seal.

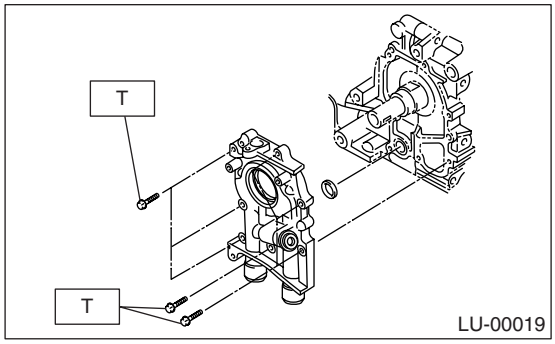

LU-00018

4) Be careful not to scratch the oil seal when installing oil pump on cylinder block.
5) Position the oil pump, aligning the notched area with crankshaft, and push the oil pump straight.

CAUTION:
Make sure the oil seal lip is not folded.

6) Install the oil pump.

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

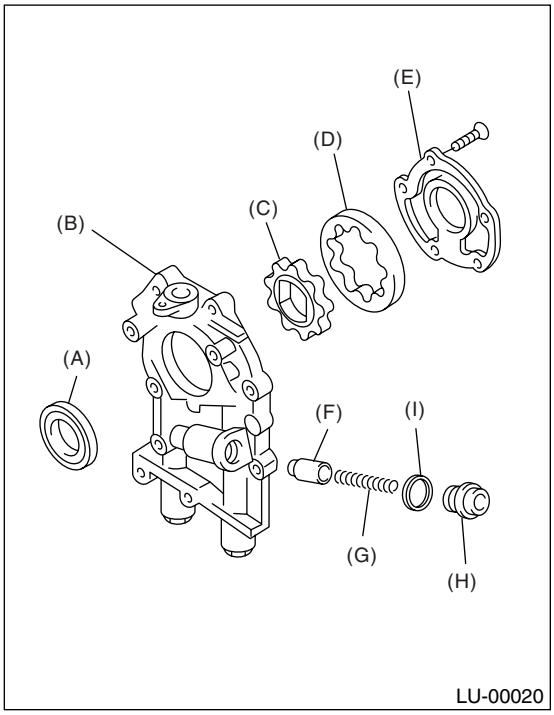


LU-00019

C: DISASSEMBLY

Remove the screws which secure the oil pump cover and disassemble oil pump. Inscribe alignment marks on the inner and outer rotors so that they can be replaced in their original positions during reassembly.

CAUTION:
Before disassembling the oil pump, remove the relief valve.

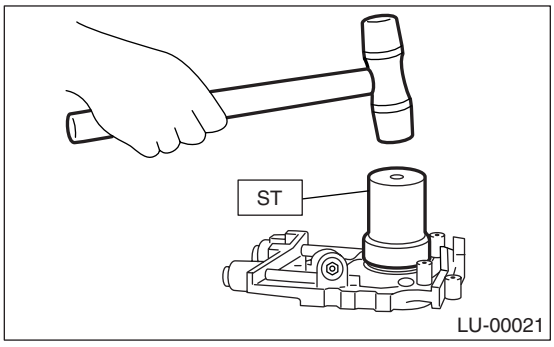


(A) Oil seal
(B) Oil pump case
(C) Inner rotor
(D) Outer rotor
(E) Oil pump cover
(F) Relief valve
(G) Relief valve spring
(H) Plug
(I) Gasket

D: ASSEMBLY

1) Install the front oil seal by using ST.
ST 499587100 OIL SEAL INSTALLER

NOTE:
Use a new oil seal.



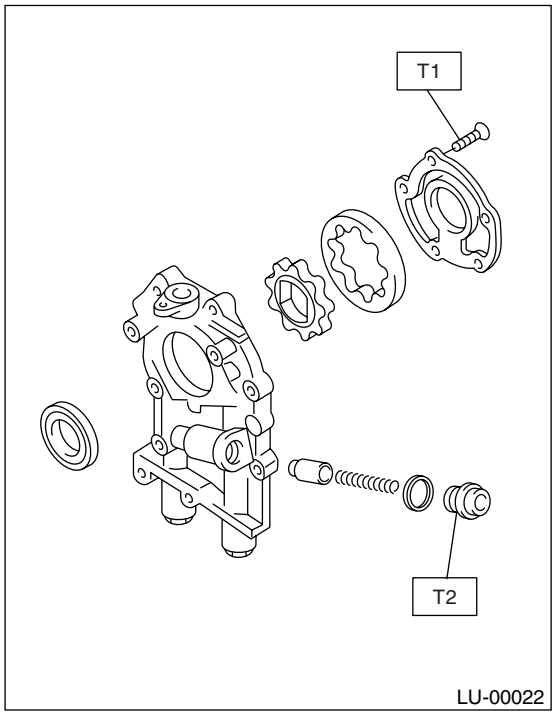
2) Apply a coat of engine oil to the inner and outer rotors.

3) Install the inner and outer rotors in their original positions.
4) Install the oil relief valve and relief valve spring and plug.

NOTE:
Use a new gasket.

5) Install the oil pump cover.

Tightening torque:
T1: 5 N·m (0.5 kgf-m, 3.6 ft-lb)
T2: 44 N·m (4.5 kgf-m, 32.5 ft-lb)

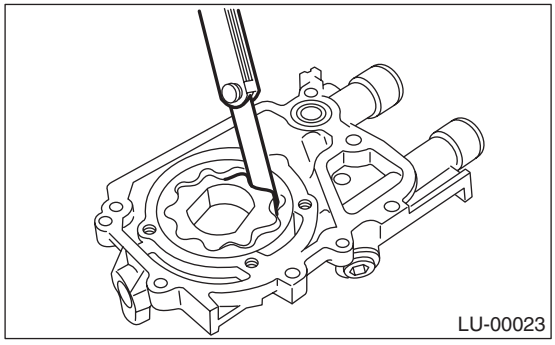


E: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. If clearance exceeds the limit, replace the rotors as a matched set.

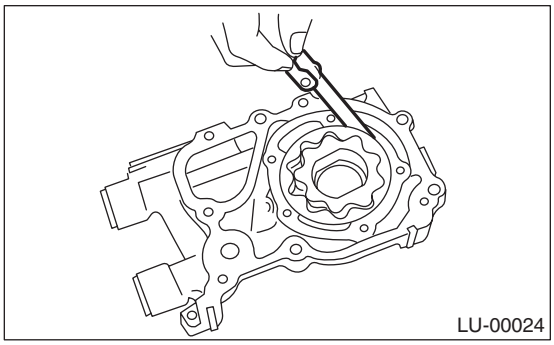
Tip clearance:
Standard
0.04 — 0.14 mm (0.0016 — 0.0055 in)
Limit
0.18 mm (0.0071 in)



2. CASE CLEARANCE

Measure the clearance between the outer rotor and oil pump rotor housing. If clearance exceeds the limit, replace the rotor.

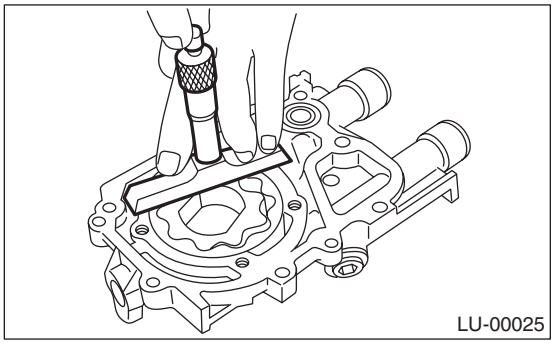
Case clearance:
Standard
0.10 — 0.175 mm (0.0039 — 0.0069 in)
Limit
0.20 mm (0.0079 in)


LU-00024

3. SIDE CLEARANCE

Measure the clearance between the oil pump inner rotor and pump cover. If clearance exceeds the limit, replace the rotor or pump body.

Side clearance:
Standard
0.02 — 0.07 mm (0.0008 — 0.0028 in)
Limit
0.12 mm (0.0047 in)


LU-00025

4. OIL RELIEF VALVE

Check the valve for fitting condition and damage, and the relief valve spring for damage and deterioration. Replace the parts if defective.

Relief valve spring:
Free length
72.8 mm (2.866 in)
Installed length
54.7 mm (2.154 in)
Load when installed
81.3 N (8.29 kgf, 18.24 lb)

5. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, worn rotor chamber, cracks, and other faults.

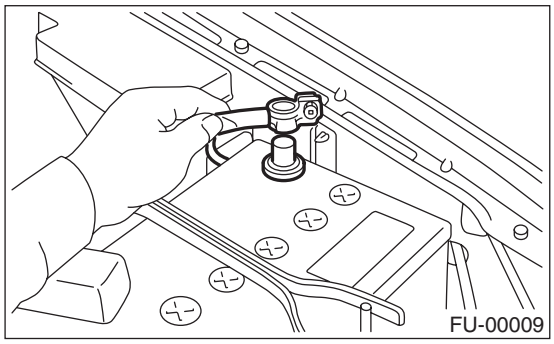
6. OIL SEAL

Check the oil seal lips for deformation, hardening, wear, etc. and replace if defective.

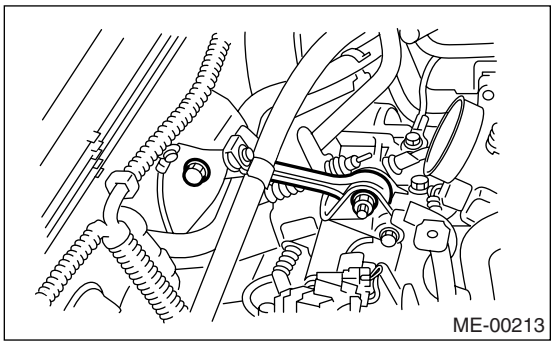
5. Oil Pan and Strainer

A: REMOVAL

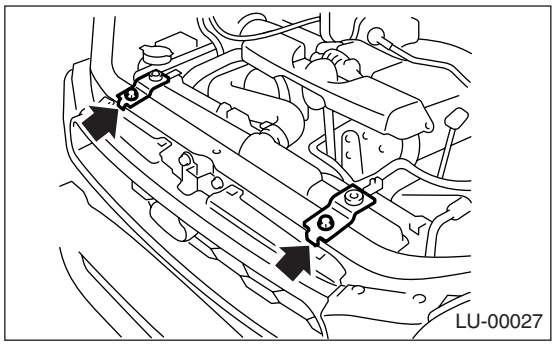
1) Set the vehicle on a lift.
2) Remove the front wheels.
3) Disconnect the ground cable from battery.



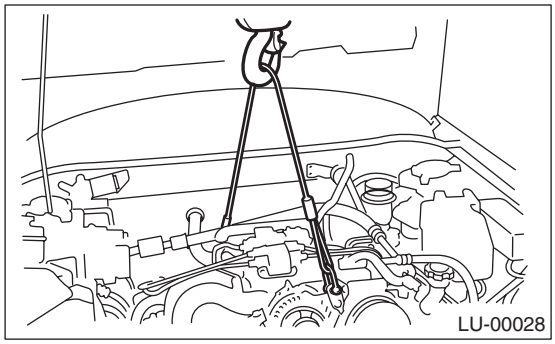
4) Remove the air intake duct and air cleaner case. <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.> and <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
5) Remove the resonator chamber. <Ref. to IN(H4SO)-7, REMOVAL, Resonator Chamber.>
6) Remove the pitching stopper.



7) Remove the radiator upper brackets.



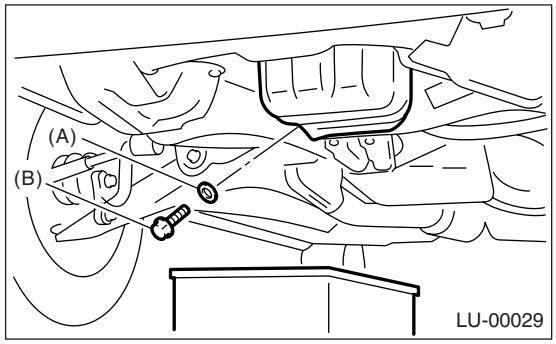
8) Support the engine with a lifting device and wire ropes.



9) Lift-up the vehicle.

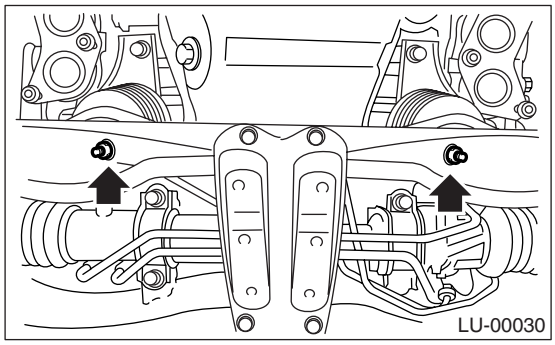
CAUTION:
When lifting up the vehicle, rise up the wire rope together.

10) Remove the under cover.
11) Drain the engine oil.
Set a container under the vehicle, and then remove the drain plug from oil pan.



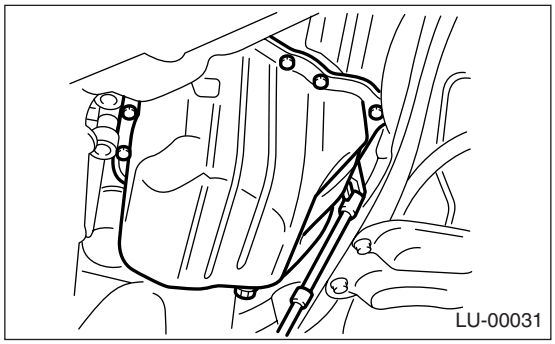
(A) Gasket
(B) Drain plug

12) Remove the front and center exhaust pipes. <Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>
13) Remove the nuts which install the front cushion rubber onto front crossmember.

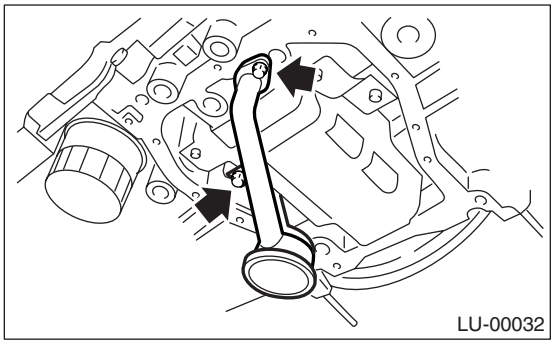


14) Remove the bolts which install the oil pan on cylinder block while raising up engine.
15) Insert the oil pan cutter blade to the clearance between the cylinder block and oil pan.

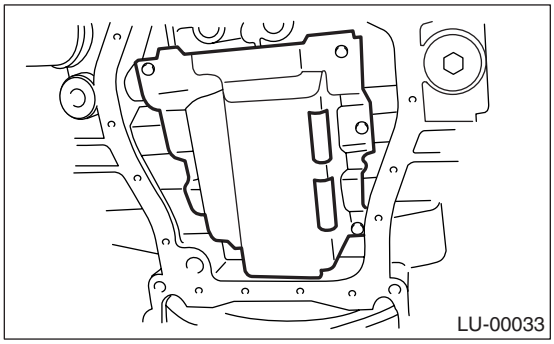
CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter.


LU-00031

16) Remove the oil strainer.


LU-00032

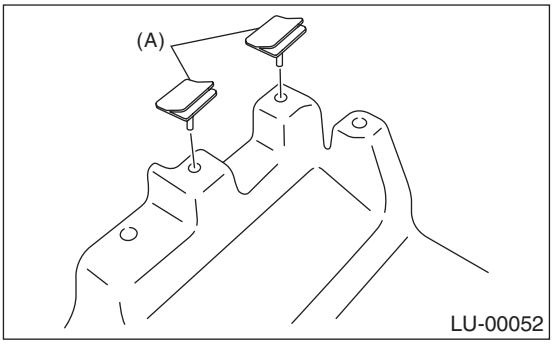
17) Remove the baffle plate.


LU-00033

B: INSTALLATION

CAUTION:
Before installing the oil pan, clean the sealant from oil pan and engine block.

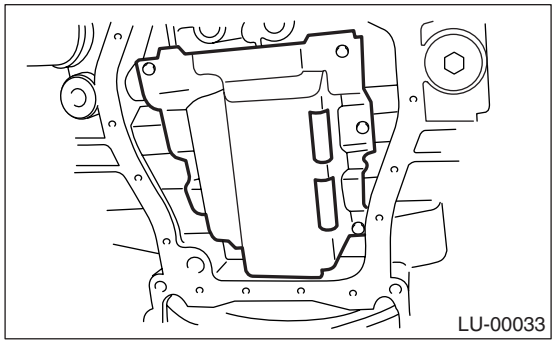
1) Check the seal (A) is securely installed in baffle plate in the direction as shown in the figure.



LU-00052

2) Install the baffle plate.

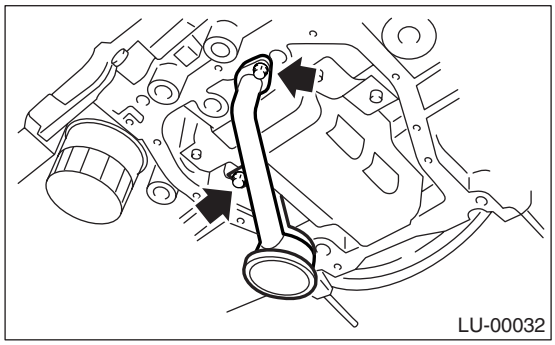
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)


LU-00033

3) Install the oil strainer onto baffle plate.

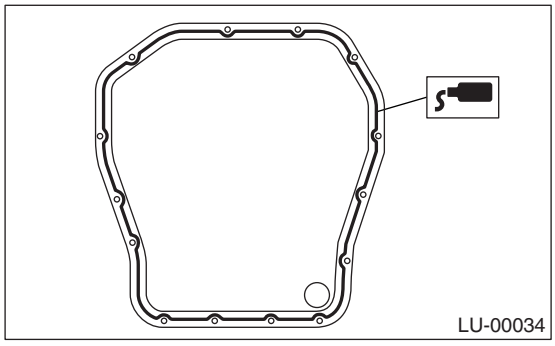
NOTE:
Replace the O-ring with a new one.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)


LU-00032

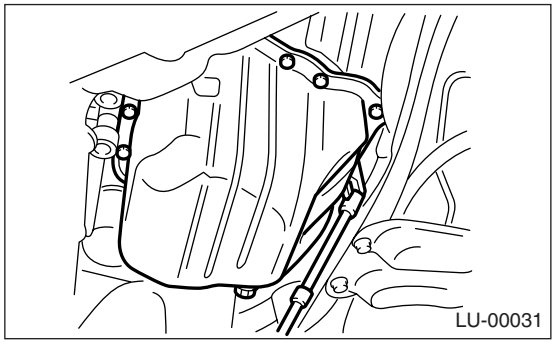
4) Apply fluid packing to the mating surfaces, and then install the oil pan.

Fluid packing:
THREE BOND 1215 (Part No. 004403007) or equivalent


LU-00034

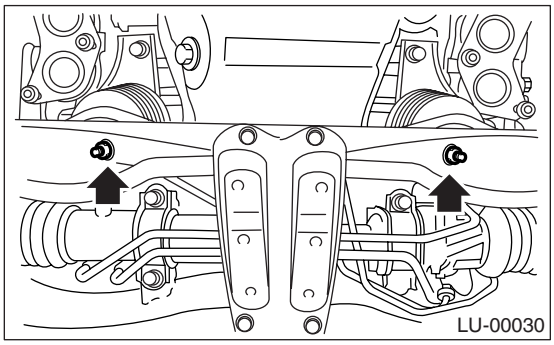
5) Tighten the bolts which install the oil pan onto engine block.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



6) Lower the engine onto front crossmember.
7) Tighten the nuts which install the front cushion rubber onto front crossmember.

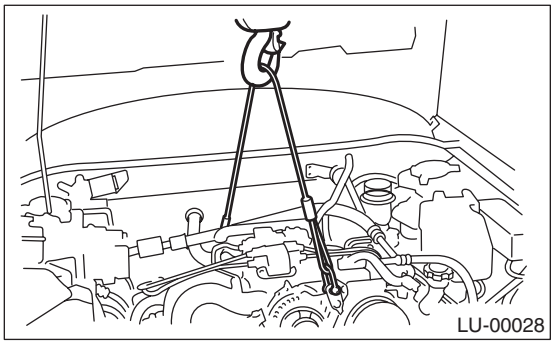
Tightening torque:
69 N·m (7.0 kgf-m, 50.9 ft-lb)



8) Install the front and center exhaust pipes. <Ref. to EX(H4SO)-5, INSTALLATION, Front Exhaust Pipe.>
9) Install the under cover.
10) Lower the vehicle.

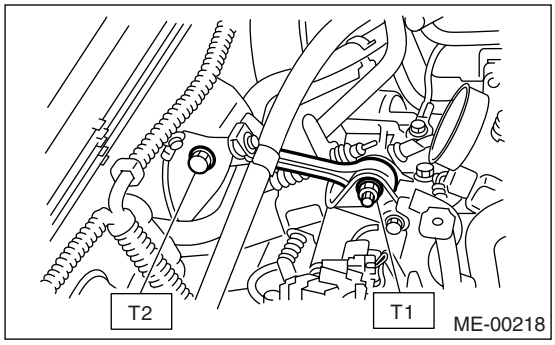
CAUTION:
When lowering the vehicle, lower the lifting device and wire rope together.

11) Remove the lifting device and steel cables.

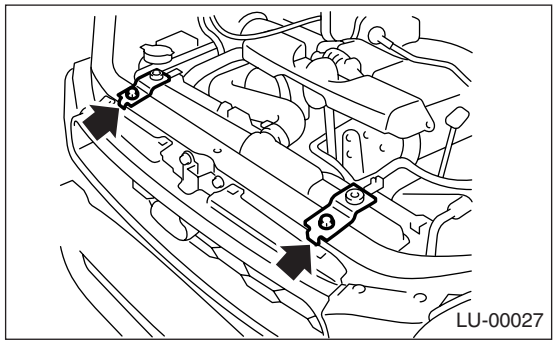


12) Install the pitching stopper.

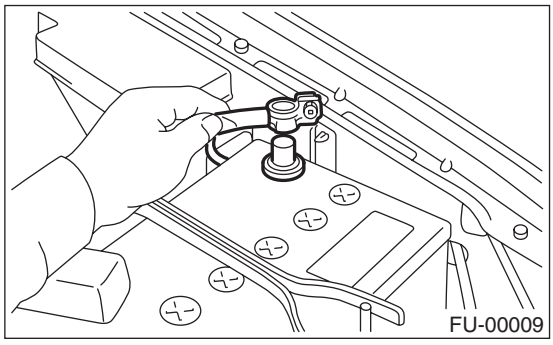
Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)



13) Install the radiator upper brackets.



14) Install the resonator chamber. <Ref. to IN(H4SO)-7, INSTALLATION, Resonator Chamber.>
15) Install the air intake duct and air cleaner case. <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Duct.> and <Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>
16) Install the front wheels.
17) Connect the battery ground cable to battery.



18) Fill engine oil. <Ref. to LU(H4SO)-8, INSPECTION, Engine Oil.>

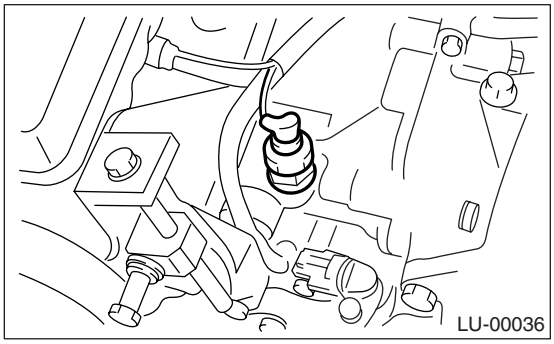
C: INSPECTION

By visual check, make sure the oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.

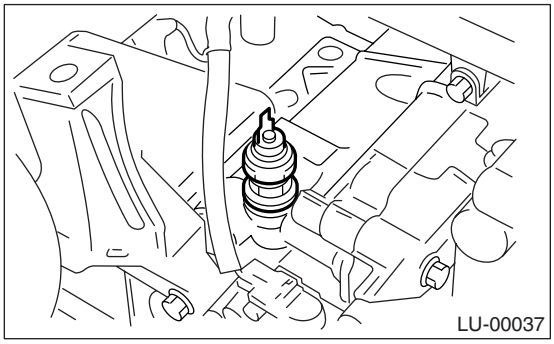
6. Oil Pressure Switch

A: REMOVAL

1) Remove the generator from bracket. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>
2) Disconnect the terminal from oil pressure switch.



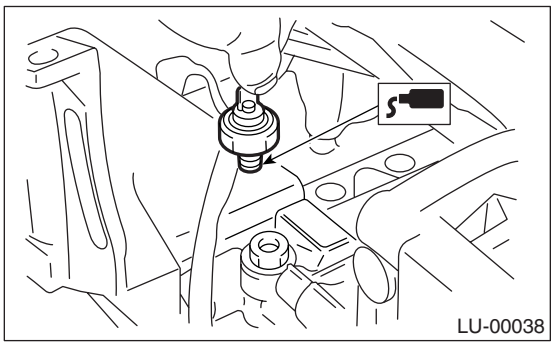
3) Remove the oil pressure switch.



B: INSTALLATION

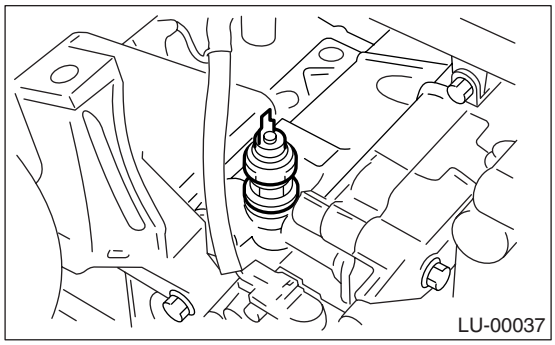
1) Apply fluid packing to the oil pressure switch threads.

Fluid packing:
THREE BOND 1324 (Part No. 004403007) or equivalent

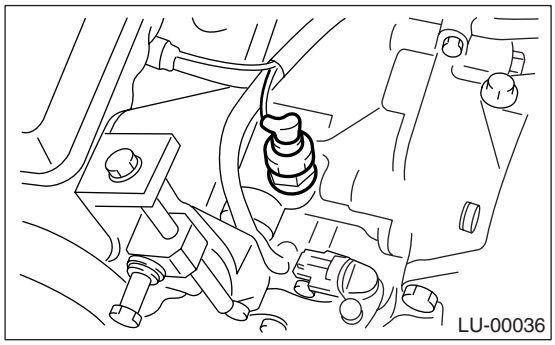


2) Install the oil pressure switch onto engine block.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



3) Connect the terminal of oil pressure switch.



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

C: INSPECTION

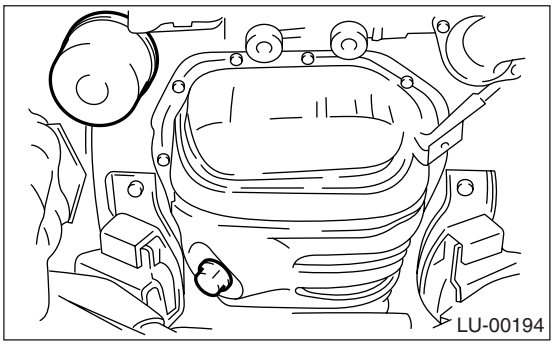
Make sure oil does not leak or seep from the place where the oil pressure switch is installed.

7. Engine Oil Filter

A: REMOVAL

1) Lift up the vehicle.
2) Remove the under cover.
3) Remove the oil filter with ST.

ST	498547000	OIL FILTER WRENCH (Outer diameter: 80 mm (3.15 in))
ST	18332AA000	OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))
ST	18332AA010	OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))



B: INSTALLATION

1) Get a new oil filter and apply a thin coat of engine oil to the seal rubber.
2) Install the oil filter by turning it by hand, being careful not to damage seal rubber.

- Tighten the oil filter 80 mm (3.15 in) or 65 mm (2.56 in) in diameter by approx. 2/3 — 3/4 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler.
- Tighten the oil filter 68 mm (2.68 in) in diameter by approx. 1 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler.

CAUTION:
Do not tighten excessively, or oil may leak.

C: INSPECTION

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

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

2) Check the engine oil level. <Ref. to LU(H4SO)-8, INSPECTION, Engine Oil.>

8. Engine Lubrication System Trouble in General

A: INSPECTION

Before performing diagnostics, make sure the engine oil level is correct and no oil leakage exists.

Trouble	Possible cause		Corrective action
1. Warning light remains on.	1) Oil pressure switch failure	Cracked diaphragm or oil leakage within switch	Replace.
		Broken spring or seized contacts	Replace.
	2) Low oil pressure	Clogged oil filter	Replace.
		Malfunction of oil by-pass valve of oil filter	Clean or replace.
		Malfunction of oil relief valve of oil pump	Clean or replace.
		Clogged oil passage	Clean.
		Excessive tip clearance and side clearance of oil pump rotor and gear	Replace.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Insufficient engine oil	Replenish.
		Broken pipe of oil strainer	Replace.
		Stuck oil pump rotor	Replace.
2. Warning light does not go on.	1) Malfunction of combination meter		Replace.
	2) Poor contact of switch contact points		Replace.
	3) Disconnection of wiring		Repair.
3. Warning light flickers momentarily.	1) Poor contact at terminals		Repair.
	2) Defective wiring harness		Repair.
	3) Low oil pressure		Check for the same possible causes as listed in 1.— 2).

SPEED CONTROL SYSTEMS

SP(H4SO)

Page

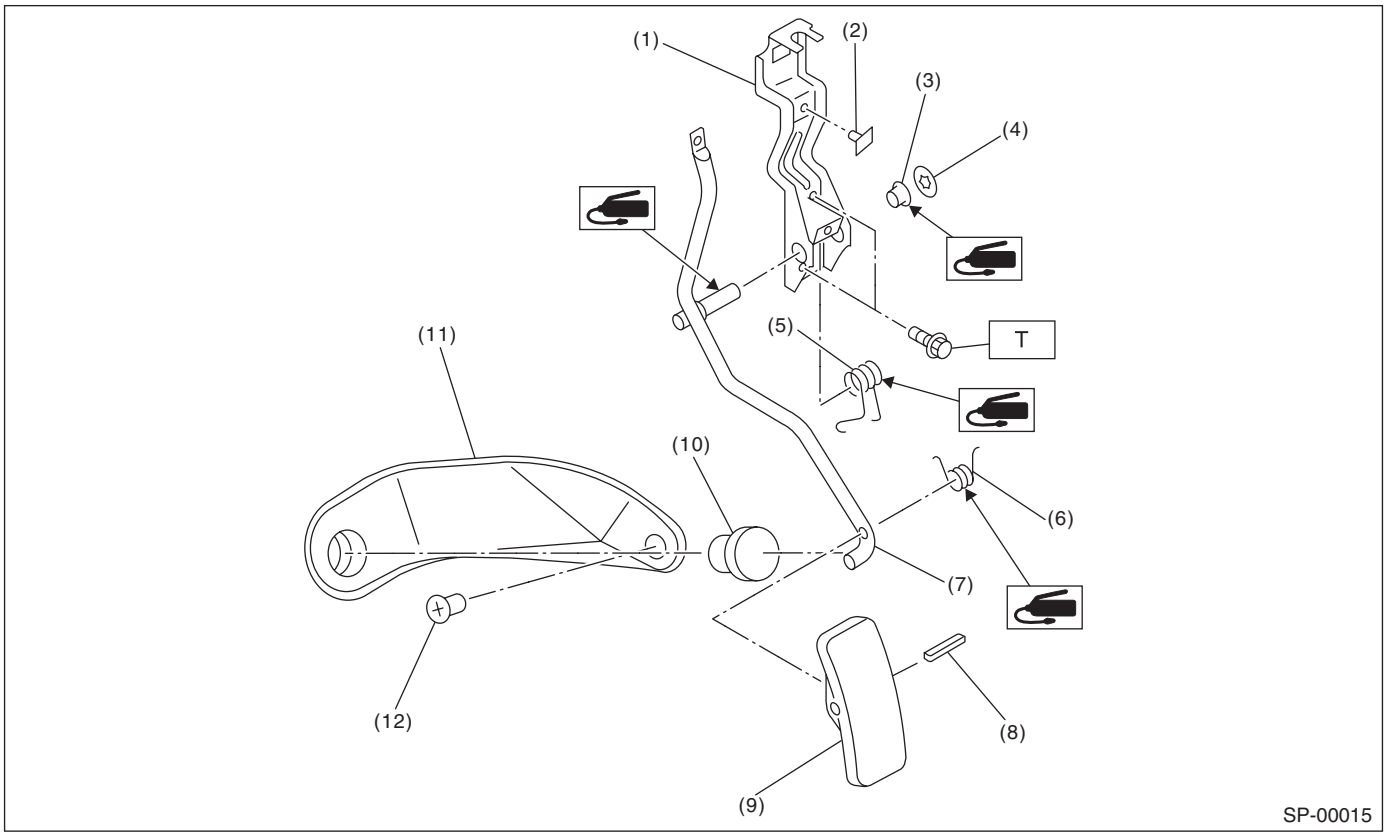
1. General Description 2
2. Accelerator Pedal....3
3. Accelerator Control Cable 6

1. General Description

A: SPECIFICATION

Accelerator pedal	Free play	At pedal pad	0 — 4 mm (0 — 0.16 in)
	Stroke	At pedal pad	52 — 57 mm (2.05 — 2.24 in)

B: COMPONENT



(1) Accelerator bracket
(2) Stopper
(3) Bushing
(4) Clip
(5) Accelerator spring
(6) Accelerator pedal spring
(7) Accelerator pedal lever
(8) Spring pin
(9) Accelerator pedal
(10) Accelerator stopper
(11) Accelerator plate
(12) Clip

Tightening torque: N·m (kgf-m, ft-lb)
T: 18 (1.8, 13.0)

C: CAUTION

• Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination, including dirt and corrosion, before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

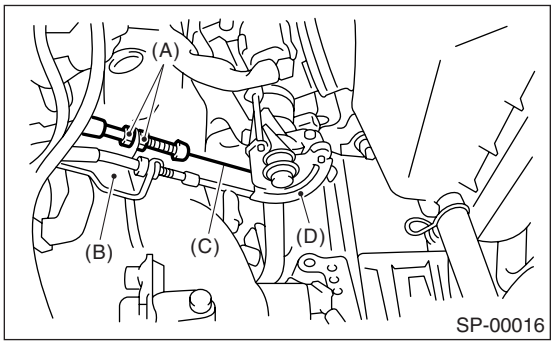
2. Accelerator Pedal

A: REMOVAL

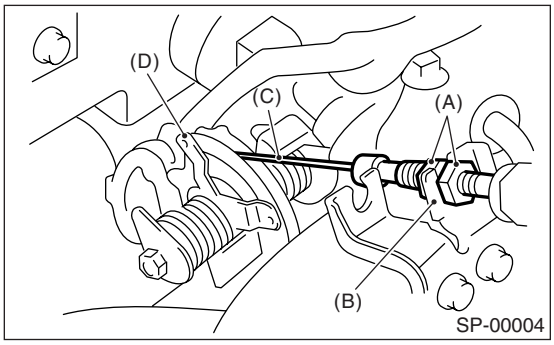
1) Disconnect the ground cable from battery.
2) Remove the lock nut from accelerator cable bracket.
3) Separate the accelerator cable from bracket.
4) Remove the accelerator cable end from throttle cam.

NOTE:
Be careful not to kink the accelerator cable.

- NON-TURBO MODEL



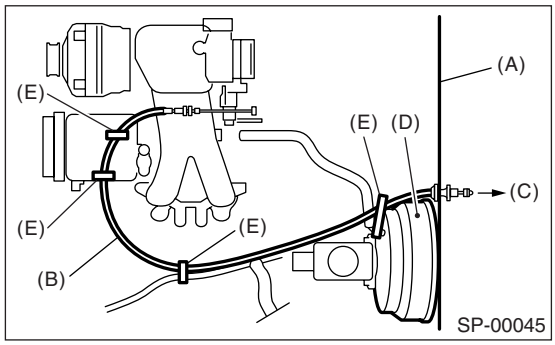
- TURBO MODEL



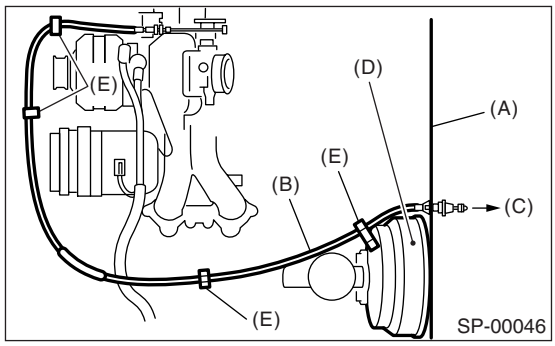
(A) Lock nut
(B) Accelerator cable bracket
(C) Accelerator cable
(D) Throttle cam

5) Remove the clip inside engine compartment.

- NON-TURBO MODEL

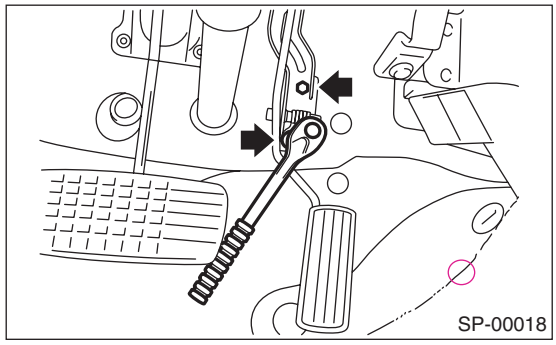


- TURBO MODEL



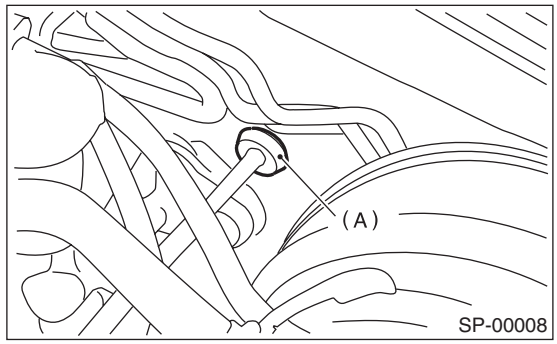
(A) Toe board
(B) Accelerator cable
(C) To accelerator pedal
(D) Brake booster
(E) Clip

6) Remove the instrument panel lower cover from instrument panel.
7) Remove the accelerator pedal connecting bolt from accelerator pedal bracket.



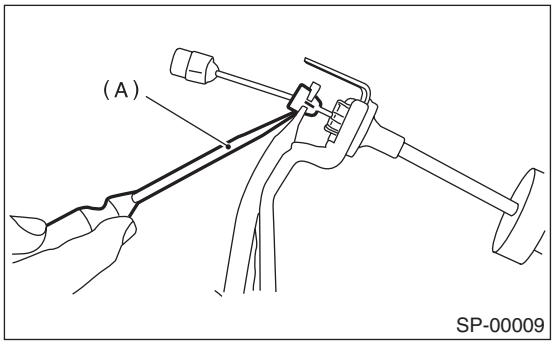
8) Disconnect the grommet from toe board.

NOTE:
From inside compartment, push the grommet (A) into hole.



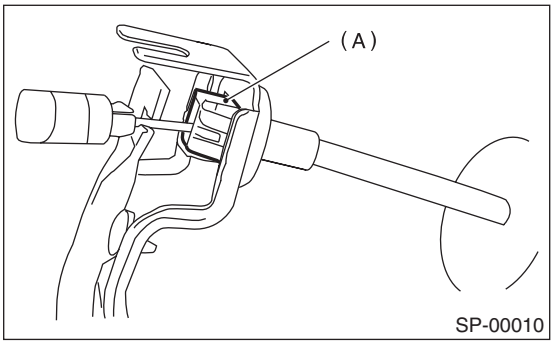
9) Pull out the cable from toe board hole.

10) Disconnect the accelerator cable bushing from accelerator pedal lever.



(A) Flat tip screwdriver

11) Disconnect the accelerator cable stopper (A) from bracket.



12) Separate the accelerator cable and bracket.

B: INSTALLATION

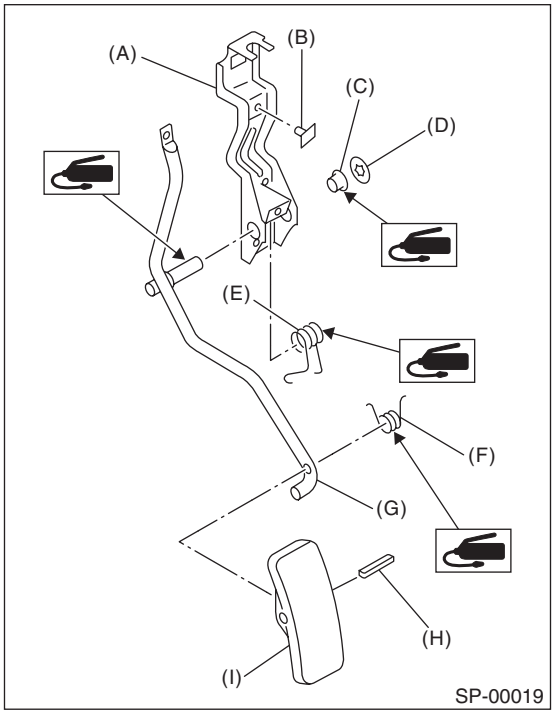
1) Install in the reverse order of removal.

NOTE:
- If the cable clamp is damaged, replace it with a new one.
- Never fail to cover the outer cable end with boot.
- Be careful not to kink the accelerator cable.
- For tightening torque, refer to “COMPONENT”. <Ref. to SP(H4SO)-2, COMPONENT, General Description.>

2) After the installation, adjust the pedal. <Ref. to SP(H4SO)-5, ADJUSTMENT, Accelerator Pedal.>

C: DISASSEMBLY

1) Remove the clip, and then remove the accelerator pedal lever from bracket.
2) Pull out the spring pin, and then remove the accelerator pedal from accelerator pedal lever.



(A) Accelerator bracket
(B) Stopper
(C) Bushing
(D) Clip
(E) Accelerator spring
(F) Accelerator pedal spring
(G) Accelerator pedal lever
(H) Spring pin
(I) Accelerator pedal

D: ASSEMBLY

Assemble in the reverse order of disassembly.

NOTE:
Clean and apply grease to the portions indicated in the figure.

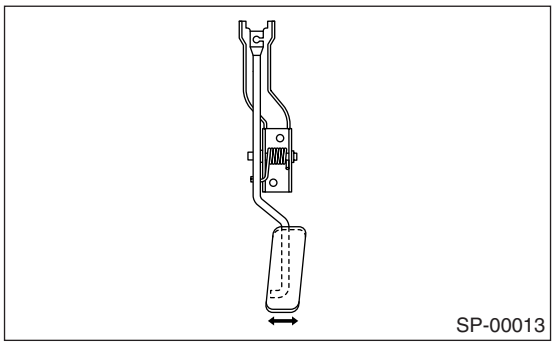
Grease:
SUNLIGHT No. 2 (Part No. 003602010)

E: INSPECTION

1. ACCELERATOR PEDAL

1) Lightly move the pedal pad in lateral direction to ensure that pedal deflection is in specified range.
2) If excessive deflection is noted, replace the bushing and clip with new ones.

Deflection of accelerator pedal:
Service limit
2.0 mm (0.079 in) or less

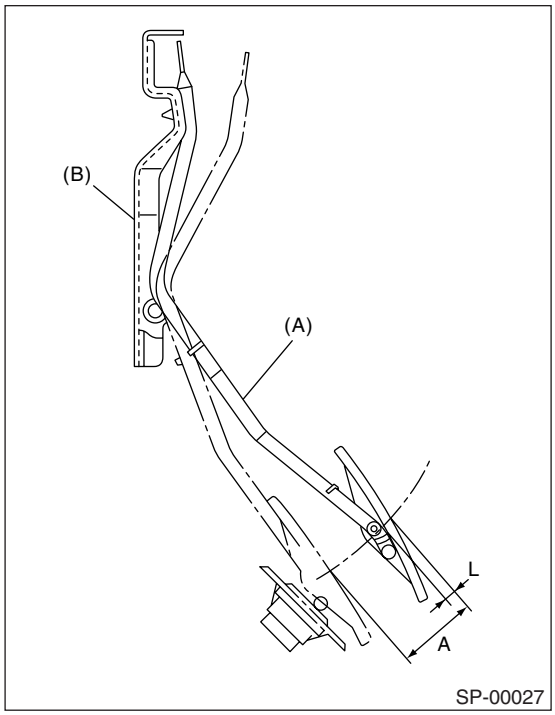


F: ADJUSTMENT

1) Check the pedal stroke and free play by operating the accelerator pedal by hand.
2) If it is not within specified value, adjust it by turning the nut connecting the accelerator cable to throttle body.

Free play at pedal pad: L
0 — 4 mm (0 — 0.16 in)

Stroke at pedal pad: A
52 — 57 mm (2.05 — 2.24 in)



(A) Accelerator pedal
(B) Accelerator pedal bracket

Accelerator cable lock nut tightening torque:
12 N·m (1.2 kgf-m, 9 ft-lb)

3. Accelerator Control Cable

A: REMOVAL

1) Remove the accelerator pedal.
<Ref. to SP(H4SO)-3, REMOVAL, Accelerator Pedal.>
2) Separate the accelerator cable and accelerator pedal.

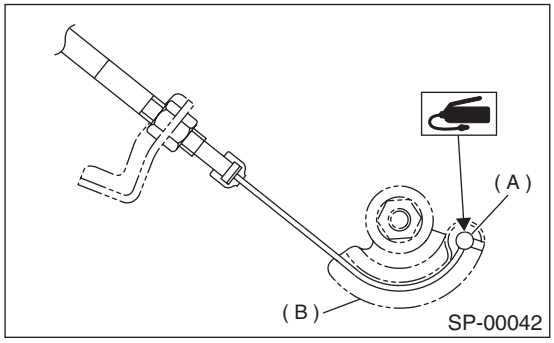
B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
- If the cable clamp is damaged, replace it with a new one.
- Never fail to cover the outer cable end with boot.
- Be careful not to kink the accelerator cable.
- Do not apply grease to except specified part.

2) Apply grease to engine side accelerator cable end.

Grease:
Silicolube G-30M (Part No. 004404002)



(A) Accelerator cable end
(B) Throttle cam

3) Adjustment after pedal installation. <Ref. to SP(H4SO)-5, ADJUSTMENT, Accelerator Pedal.>

C: INSPECTION

1) Make sure the inner cable is not twisted or worn.
2) Make sure the outer cable is not cracked.

IGNITION

IG(H4SO)

Page

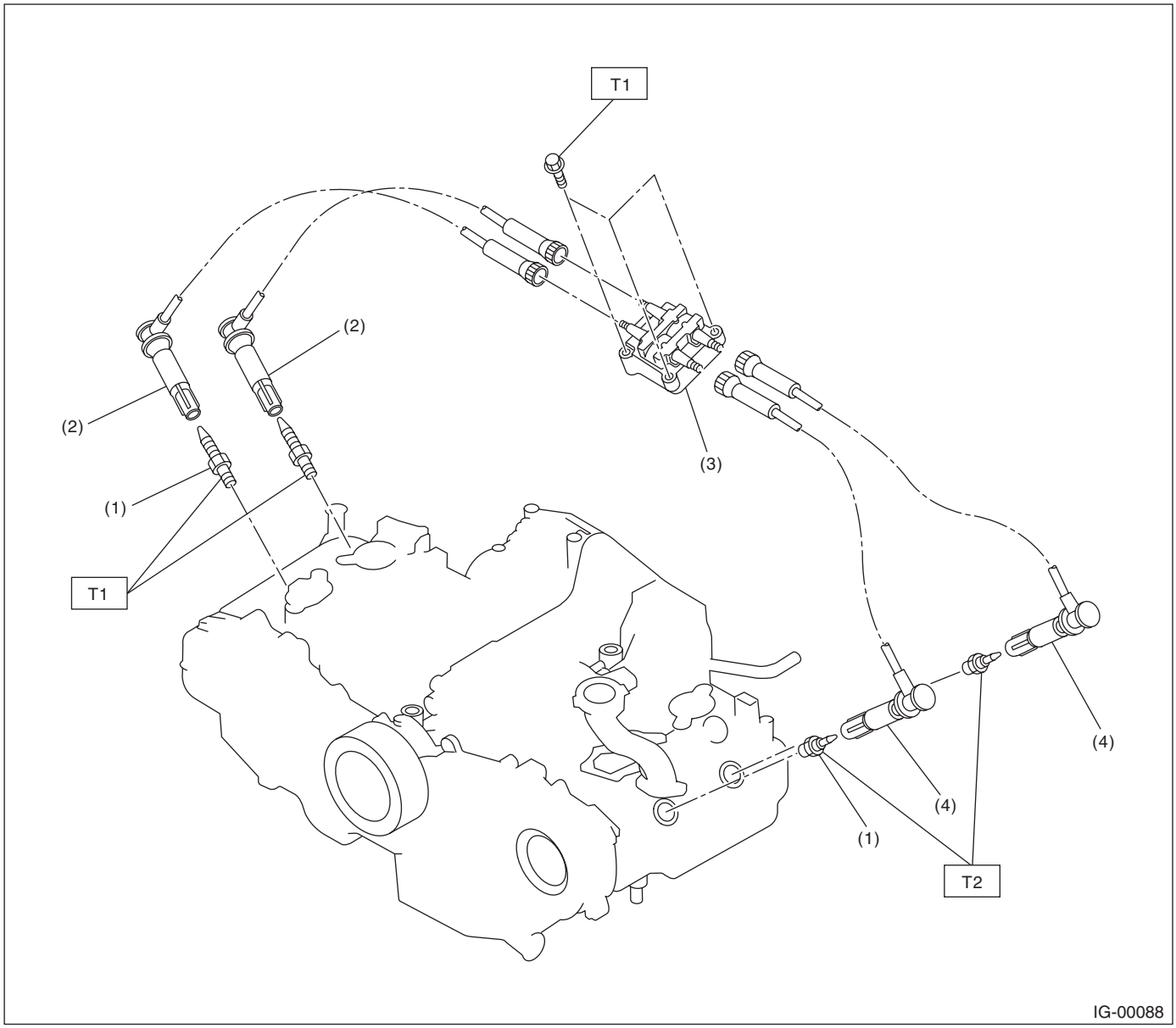
1. General Description 2
2. Spark Plug.....4
3. Ignition Coil & Ignitor ASSY 7
4. Spark Plug Cord.....8

1. General Description

A: SPECIFICATIONS

Item			Designation	
Ignition coil & ignitor ASSY	Model		FH0137	
	Manufacturer		DIAMOND	
	Secondary coil resistance		12.8 kΩ±15%	
Spark plug	Type and manufacturer		CHAMPION: RC10YC4	
			Equivalent	NGK: BKR5E-11
				NGK: BKR6E-11
	Thread size	mm	14, P = 1.25	
	Spark gap	mm (in)	1.0 — 1.1 (0.039 — 0.043)	

B: COMPONENT



(1) Spark plug
(2) Spark plug cord (#1, #3)
(3) Ignition coil & ignitor ASSY
(4) Spark plug cord (#2, #4)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 21 (2.1, 15.5)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Spark Plug

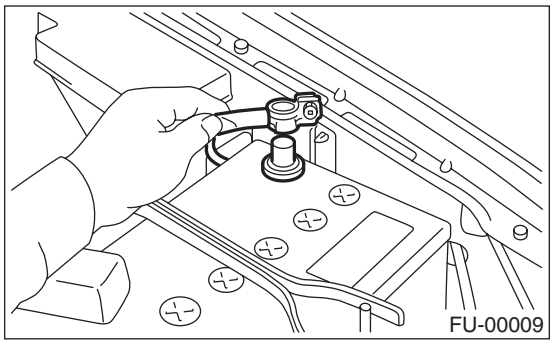
A: REMOVAL

CAUTION:
All spark plugs installed on an engine, must be of the same heat range.

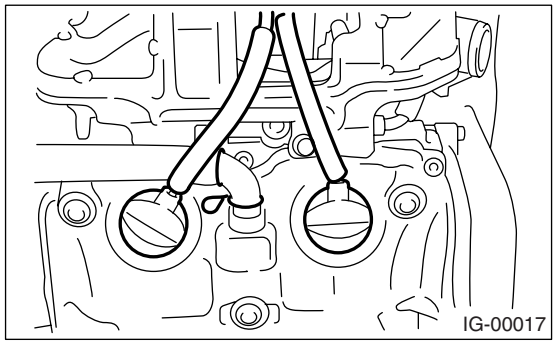
Spark plug	
CHAMPION: RC10YC4	
Equivalent	NGK: BKR5E-11
	NGK: BKR6E-11

1. RH SIDE

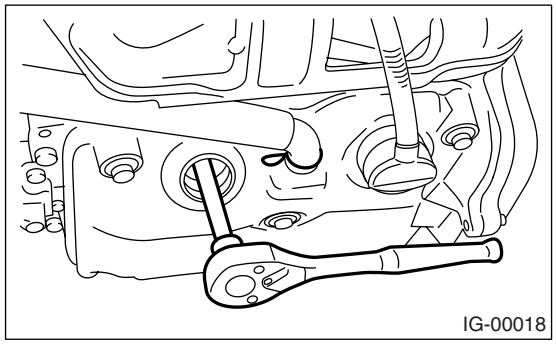
1) Disconnect the ground cable from battery.



2) Remove the resonator chamber. <Ref. to IN(H4SO)-7, REMOVAL, Resonator Chamber.>
3) Remove the spark plug cords by pulling the boot, not the cord itself.

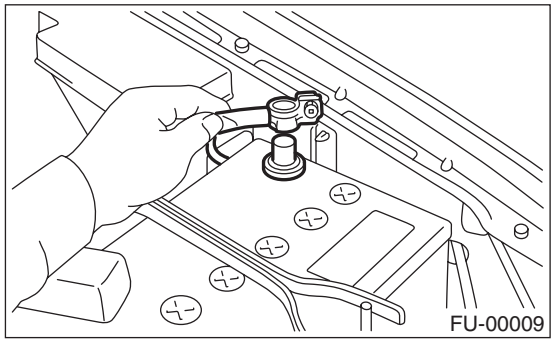


4) Remove the spark plugs using spark plug sockets.

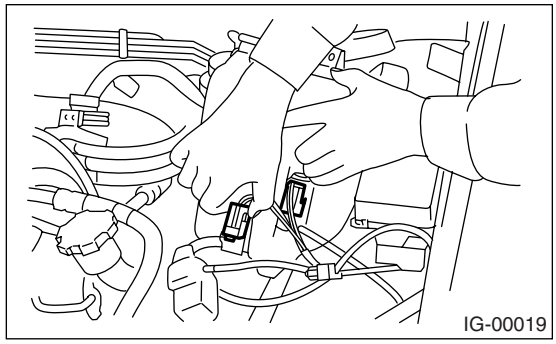


2. LH SIDE

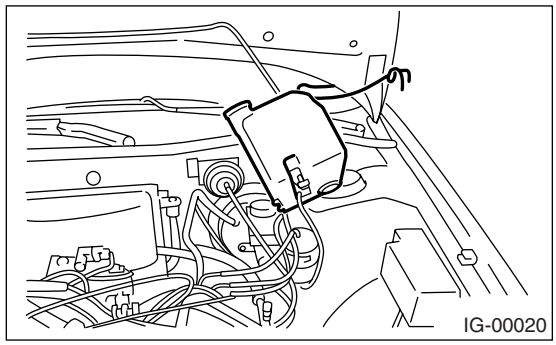
1) Disconnect the ground cable from battery.



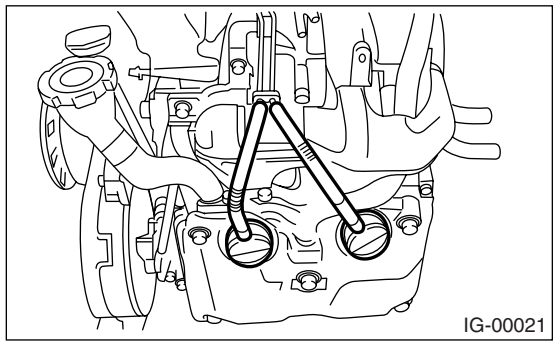
2) Disconnect the washer motor connector.



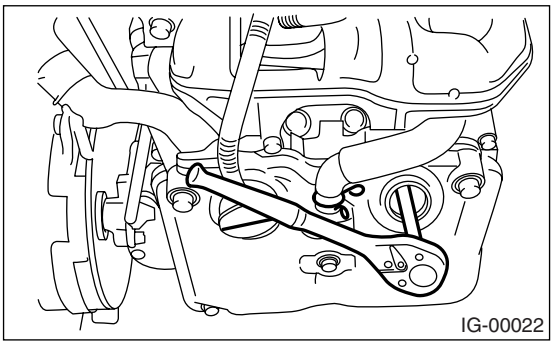
3) Disconnect the rear window glass washer hose from washer motor, then plug the connection with a suitable cap.
4) Remove the two bolts which hold the washer tank, then take the tank away from working area.



5) Remove the spark plug cords by pulling the boot, not the cord itself.



6) Remove the spark plugs with spark plug sockets.


IG-00022

B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

NOTE:
• For tightening torque, refer to “COMPONENT”. <Ref. to IG(H4SO)-2, COMPONENT, General Description.>
• The above torque should be only applied to new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

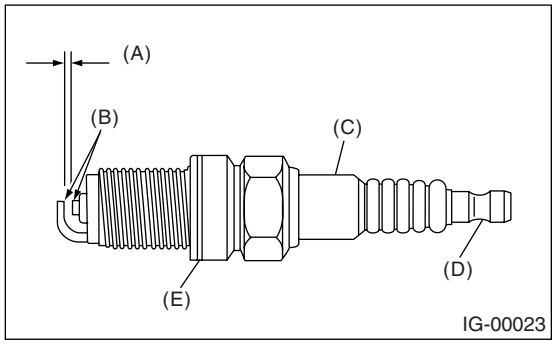
2. LH SIDE

Install in the reverse order of removal.

NOTE:
• For tightening torque, refer to “COMPONENT”. <Ref. to IG(H4SO)-2, COMPONENT, General Description.>
• The above torque should be only applied to new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

C: INSPECTION

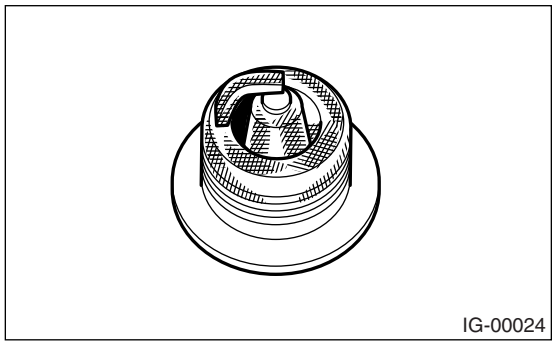
Check the electrodes and inner and outer ceramic insulator of plugs, noting the type of deposits and the degree of electrode erosion.



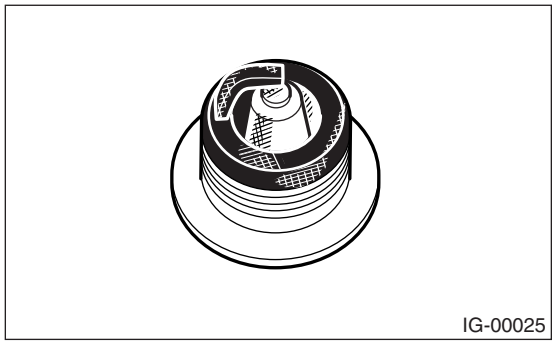
IG-00023

(A) Electrode gap
(B) Carbon accumulation or wear
(C) Cracks
(D) Damage
(E) Damaged gasket

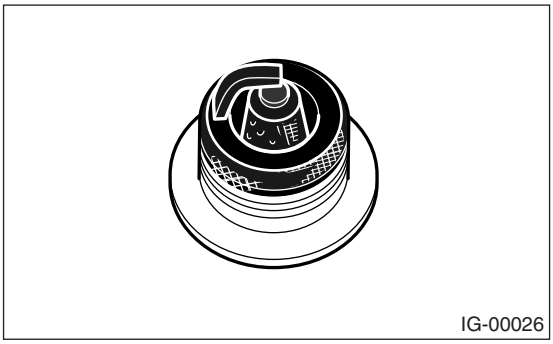
1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicates correct spark plug heat range.


IG-00024

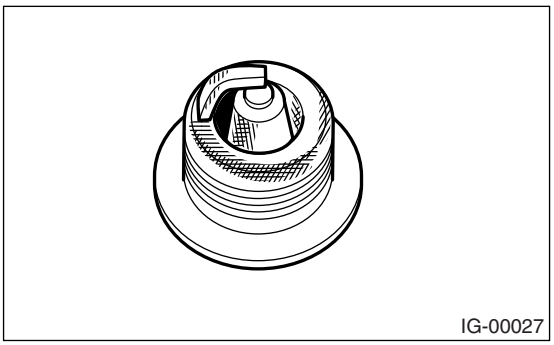
2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.
It is advisable to replace with plugs having hotter heat range.


IG-00025

3) Oil fouled:
Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems. If the same condition remains after repair, use a hotter plug.


IG-00026

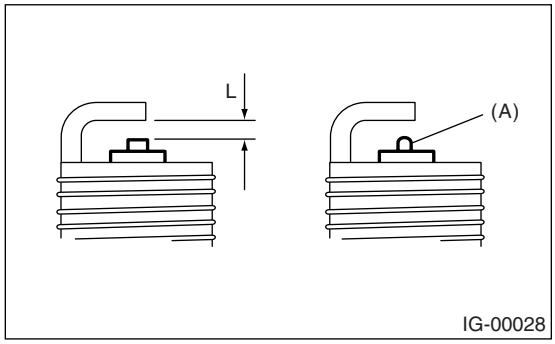
4) Overheating:
White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicates engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc. It is advisable to replace with plugs having colder heat range.


IG-00027

D: CLEANING
Clean the spark plugs in a sand blast type cleaner. Avoid excessive blasting. Clean and remove the carbon or oxide deposits, but do not wear away ceramic insulator.
If deposits are too stubborn, replace the plugs.

E: ADJUSTMENT
Correct it if the spark plug gap is measured with a gap gauge, and it is necessary.

Spark plug gap: L
1.0 — 1.1 mm (0.039 — 0.043 in)



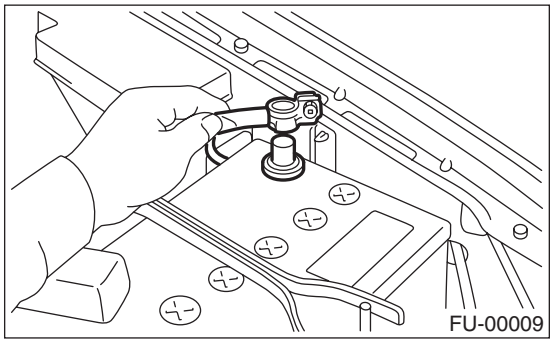
IG-00028

NOTE:
Replace with a new spark plug if this area (A) is worn to “ball” shape.

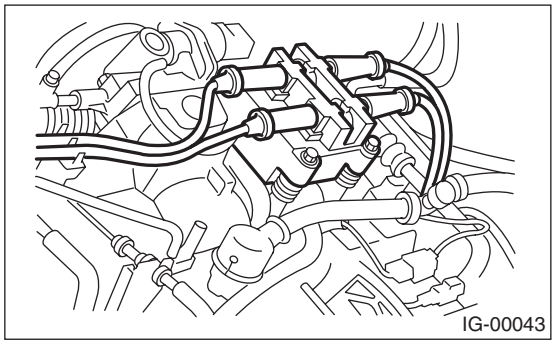
3. Ignition Coil & Ignitor ASSY

A: REMOVAL

1) Disconnect the ground cable from battery.

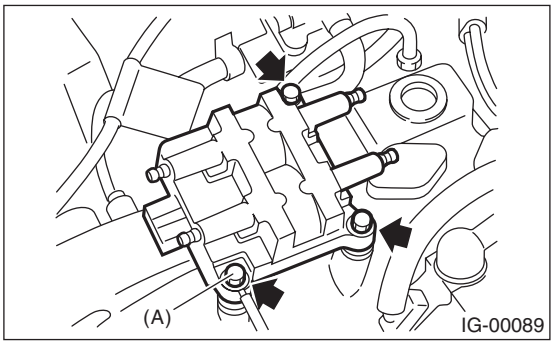


2) Disconnect the spark plug cords from ignition coil and ignitor ASSY.



3) Disconnect the connector from ignition coil and ignitor ASSY.
4) Remove the ignition coil and ignitor ASSY.

NOTE:
Both the coil ground and ignition coil and ignitor ASSY are tightened by the bolt (A).

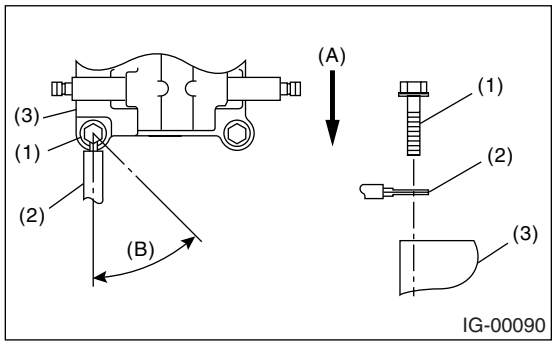


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
• For tightening torque, refer to “COMPONENT”. <Ref. to IG(H4SO)-2, COMPONENT, General Description.>

• Install the coil ground to the place shown in the following figure.



(1) Bolt
(2) Coil ground
(3) Ignition coil & ignitor ASSY
(A) Front side of engine
(B) 45°

CAUTION:
Connect the spark plugs to correct position. Misconnection may damage the unit.

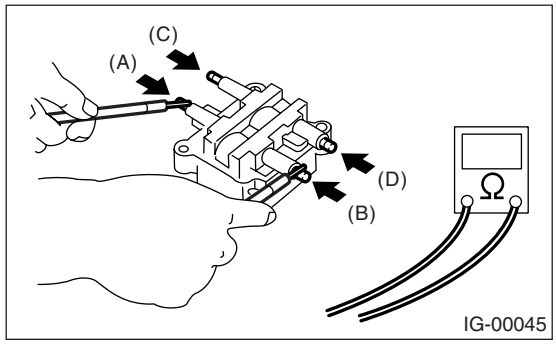
C: INSPECTION

Using the accurate tester, inspect the following items, and replace if defective.
• Secondary coil resistance

CAUTION:
• Ignitor is integrated in coil. Therefore, primary coil resistance can not be measured.
• If the resistance is extremely low, this indicates the presence of a short-circuit.

Specified resistance:

[Secondary side]
Between (A) and (B)
12.8 kΩ±15%
Between (C) and (D)
12.8 kΩ±15%

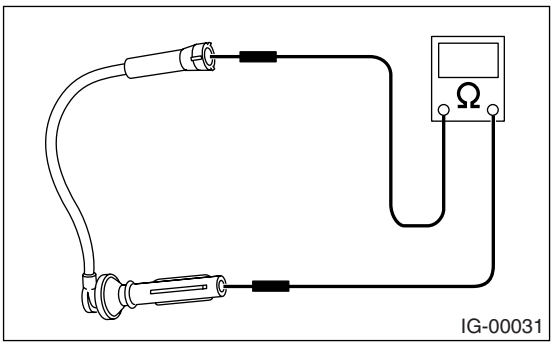


4. Spark Plug Cord

A: INSPECTION

Check for:
1) Damage to cords, deformation, burning or rust formation of terminals
2) Resistance values of cords

Resistance value:
#1 cord: 5.6 — 10.6 kΩ
#2 cord: 7.3 — 13.7 kΩ
#3 cord: 5.9 — 11.1 kΩ
#4 cord: 7.3 — 13.7 kΩ



STARTING/CHARGING SYSTEMS

SC(H4SO)

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1. General Description 2
2. Starter 7
3. Generator 14
4. Battery 20

1. General Description

A: SPECIFICATIONS

1. NON-TURBO MODEL

Item			Designation	
Starter	Type		Reduction type	
	Vehicle type		MT	AT
	Model		M000T30471	M000T20171
	Manufacturer		Mitsubishi Electric	
	Voltage and output		12 V — 1.0 kW	12 V — 1.4 kW
	Direction of rotation		Counterclockwise (when observed from pinion)	
	Number of pinion teeth		8	9
	No-load characteristics	Voltage	11 V	
		Current	95 A or less	90 A or less
		Rotating speed	2,500 rpm or more	2,000 rpm or more
	Load characteristics	Voltage	7.5 V	7.7 V
		Current	300 A	400 A
		Torque	8.84 N·m (0.90 kgf-m, 6.5 ft-lb) or more	16.7 N·m (1.70 kgf-m, 12.3 ft-lb) or more
		Rotating speed	870 rpm or more	710 rpm or more
	Lock characteristics	Voltage	4 V	3.5 V
		Current	680 A or less	960 A or less
		Torque	17 N·m (1.73 kgf-m, 12.5 ft-lb) or more	31 N·m (3.16 kgf-m, 22.9 ft-lb) or more
Generator	Type		Rotating-field three-phase, voltage regulator built-in type, with load response control system	
	Model		A2TB6291	
	Manufacturer		Mitsubishi Electric	
	Voltage and output		12 V — 75 A	
	Polarity on ground side		Negative	
	Direction of rotation		Clockwise (when observed from pulley side)	
	Armature connection		Three-phase Y-type	
	Output current		1,500 rpm — 30 A or more 2,500 rpm — 64 A or more 5,000 rpm — 76 A or more	
	Regulated voltage		14.1 — 14.8 V [20°C (68°F)]	
Battery	Type and capacity		12 V — 48 AH (55D 23L)	12 V — 52 AH (75D 23L)

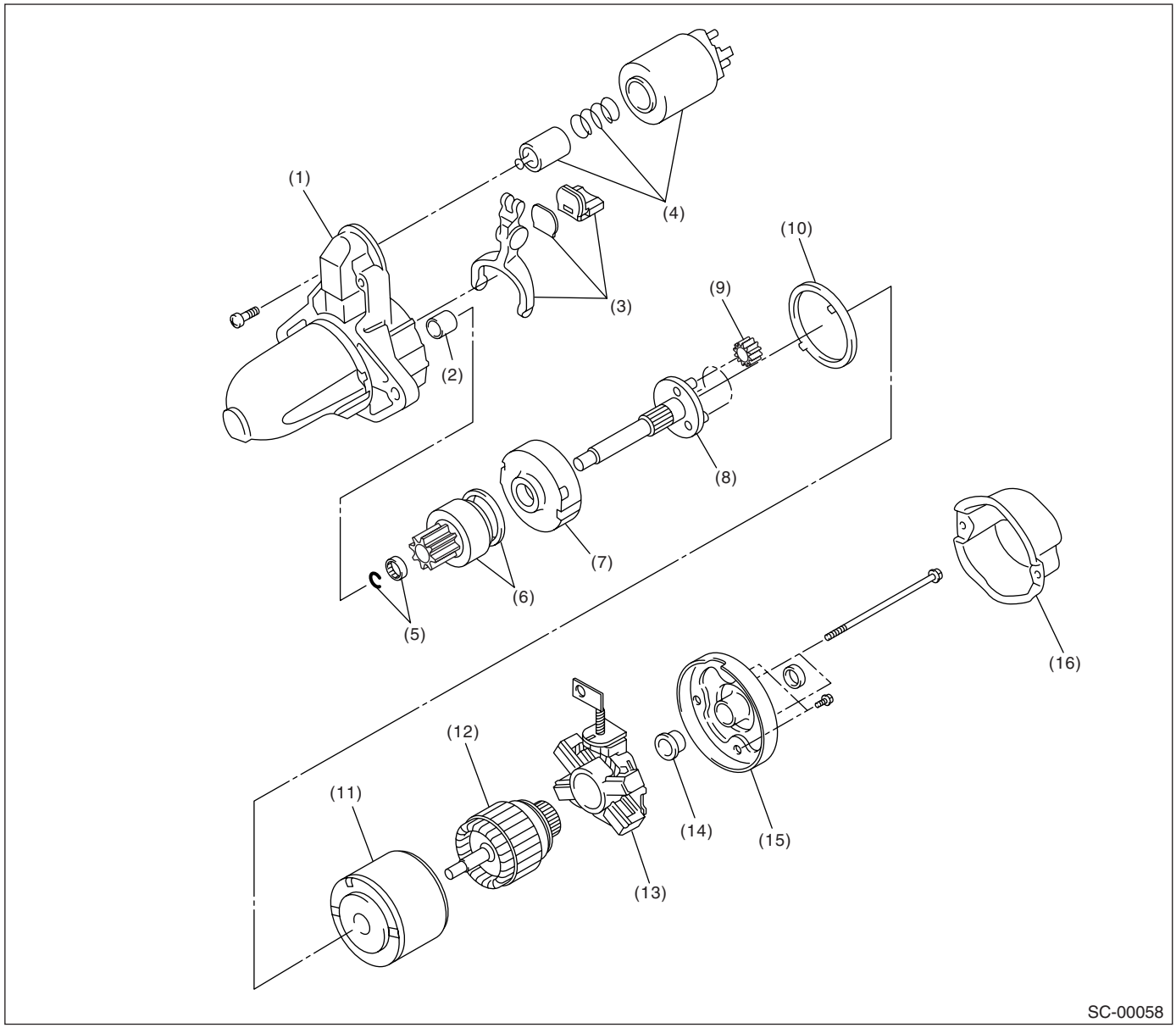
2. TURBO MODEL

Item			Designation	
Starter	Type		Reduction type	
	Vehicle type		MT	AT
	Model		228000 — 9270	M001T20171
	Manufacturer		DENSO	Mitsubishi Electric
	Voltage and output		12 V — 1.0 kW	12 V — 1.4 kW
	Direction of rotation		Counterclockwise (when observed from pinion)	
	Number of pinion teeth		9	
	No-load characteristics	Voltage	11 V	
		Current	90 A or less	
		Rotating speed	2,860 rpm or more	2,000 rpm or more
	Load characteristics	Voltage	8 V	7.7 V
		Current	280 A	400 A
		Torque	9.3 N·m (0.95 kgf-m, 6.9 ft-lb) or more	16.7 N·m (1.70 kgf-m, 12.3 ft-lb) or more
		Rotating speed	860 rpm or more	710 rpm or more
	Lock characteristics	Voltage	5 V	3.5 V
		Current	515 A or less	960 A or less
		Torque	16 N·m (1.63 kgf-m, 11.8 ft-lb) or more	31 N·m (3.16 kgf-m, 22.9 ft-lb) or more
Generator	Type		Rotating-field three-phase, voltage regulator built-in type, with load response control system	
	Model		A2TB6291	
	Manufacturer		Mitsubishi Electric	
	Voltage and output		12 V — 75 A	
	Polarity on ground side		Negative	
	Direction of rotation		Clockwise (when observed from pulley side)	
	Armature connection		Three-phase Y-type	
	Output current		1,500 rpm — 30 A or more 2,500 rpm — 64 A or more 5,000 rpm — 76 A or more	
	Regulated voltage		14.1 — 14.8 V [20°C (68°F)]	
Battery	Type and capacity		12 V — 48 AH (55D 23L)	12 V — 52 AH (65D 23L)

B: COMPONENT

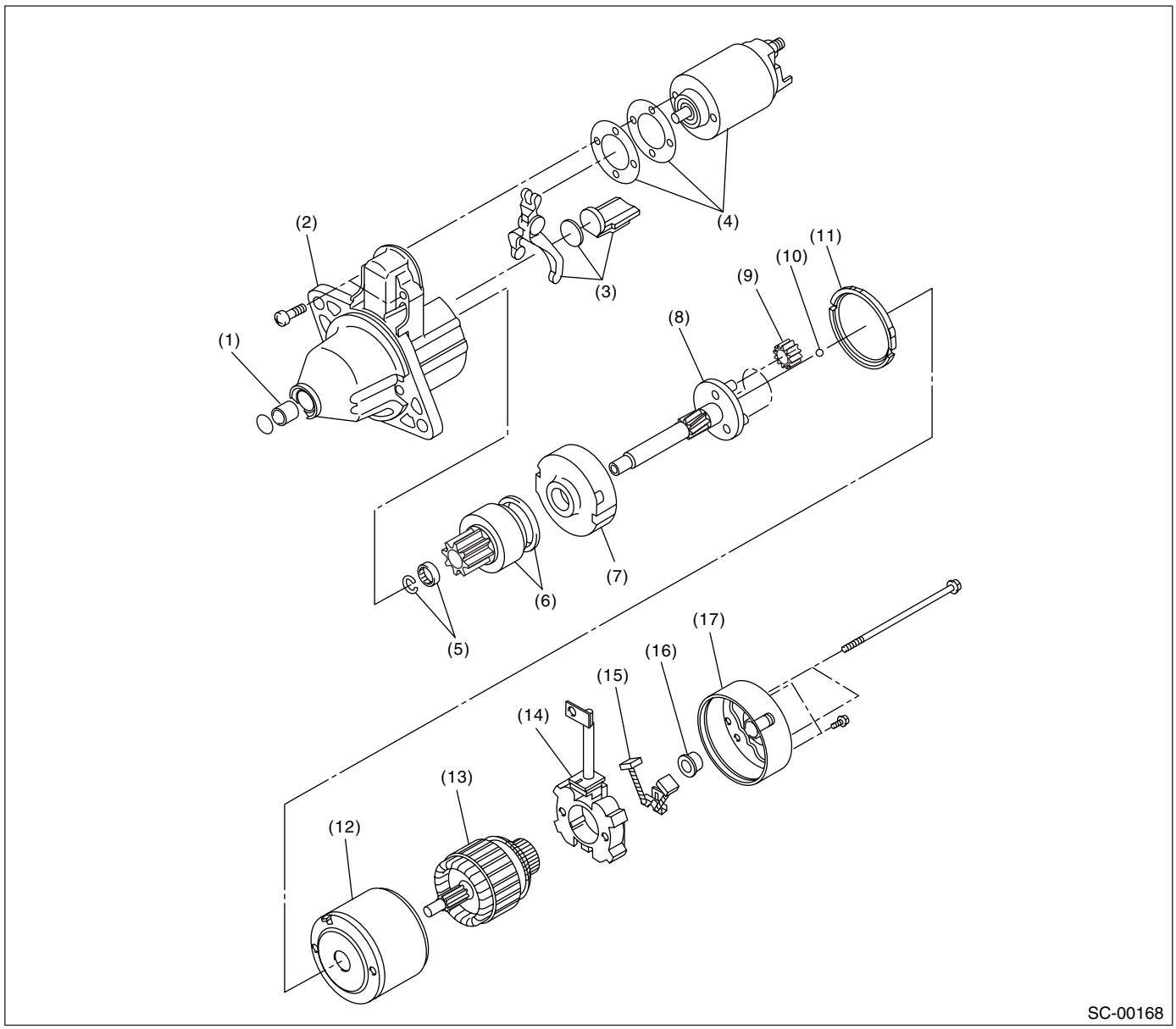
1. STARTER

• EXCEPT DOHC TURBO MT MODEL



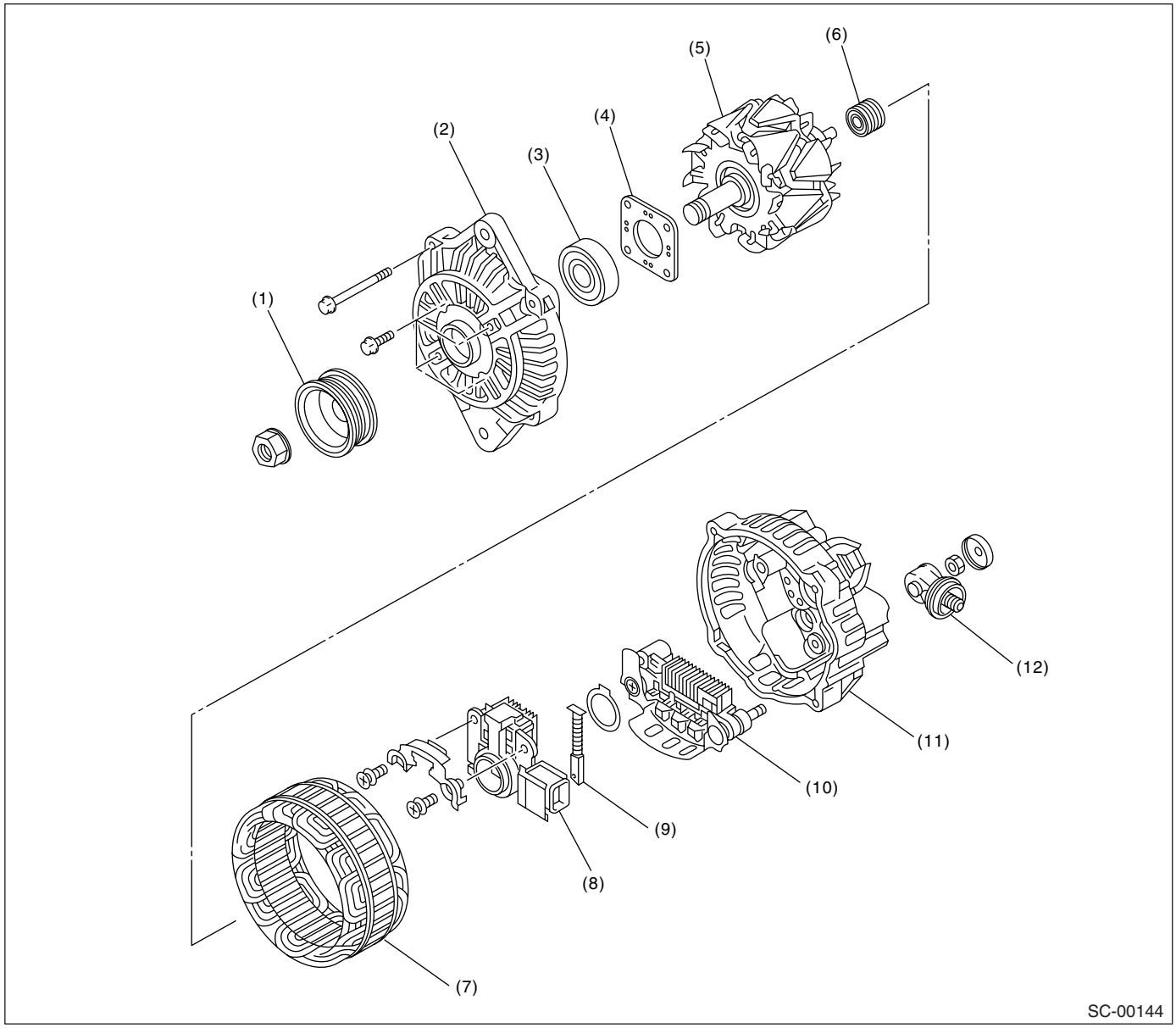
(1) Front bracket
(2) Sleeve bearing
(3) Lever set
(4) Magnet switch ASSY
(5) Stopper set
(6) Overrunning clutch
(7) Internal gear ASSY
(8) Shaft ASSY
(9) Gear ASSY
(10) Packing
(11) Yoke ASSY
(12) Armature
(13) Brush holder ASSY
(14) Sleeve bearing
(15) Rear cover
(16) Rear cover set

• DOHC TURBO MT MODEL



(1) Sleeve bearing
(2) Front bracket
(3) Lever set
(4) Magnet switch assembly
(5) Stopper set
(6) Overrunning clutch
(7) Internal gear assembly
(8) Shaft assembly
(9) Gear assembly
(10) Ball
(11) Packing
(12) Yoke assembly
(13) Armature
(14) Brush holder assembly
(15) Brush
(16) Sleeve bearing
(17) Rear bracket

2. GENERATOR



(1) Pulley
(2) Front cover
(3) Ball bearing
(4) Bearing retainer
(5) Rotor
(6) Bearing
(7) Stator coil
(8) IC regulator with brush
(9) Brush
(10) Rectifier
(11) Rear cover
(12) Terminal

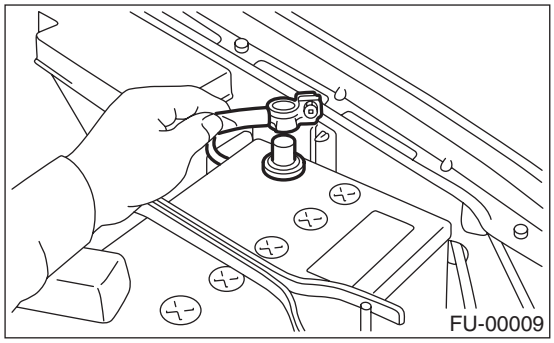
C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Starter

A: REMOVAL

1) Disconnect the ground cable from battery.

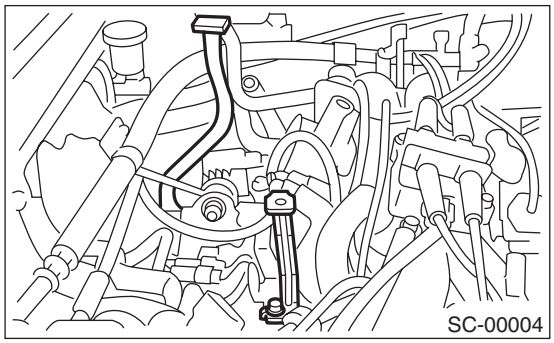


2) Remove the air cleaner case. (Non-turbo model) <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>

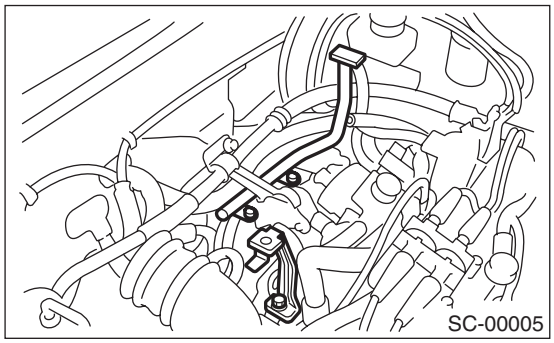
3) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>

4) Remove the air cleaner case stay. (Non-turbo model)

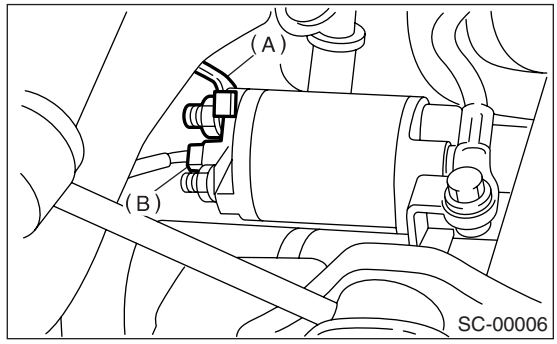
- MT MODEL



- AT MODEL

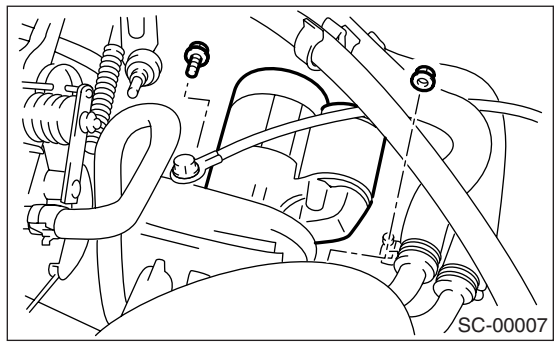


5) Disconnect the connector and terminal from starter.



(A) Terminal
(B) Connector

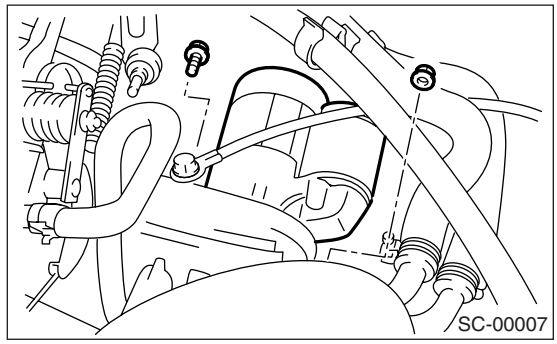
6) Remove the starter from transmission.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)



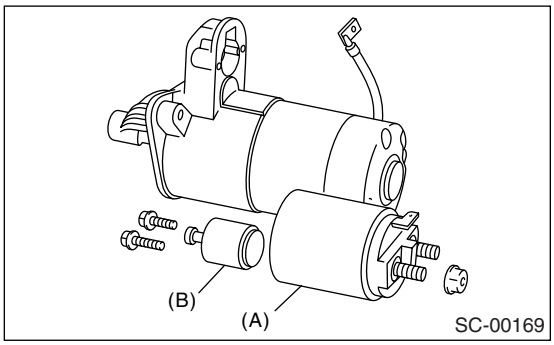
C: DISASSEMBLY

1. STARTER ASSEMBLY

1) Loosen the nut which holds the terminal M of switch assembly, and then disconnect the connector.

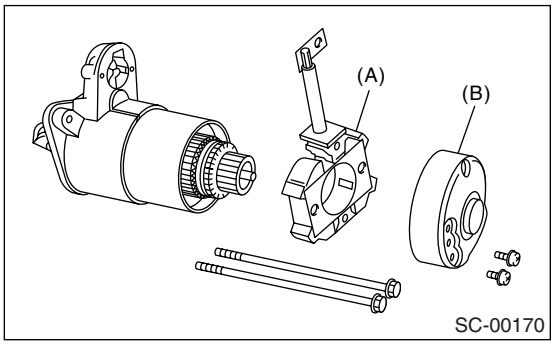
2) Remove the bolts which hold the switch assembly, and then remove switch assembly, plunger and plunger spring from starter as a unit.

NOTE:
Be careful because the pinion gap adjustment washer may sometimes be used on the mounting surface of switch assembly.



(A) Switch assembly
(B) Plunger

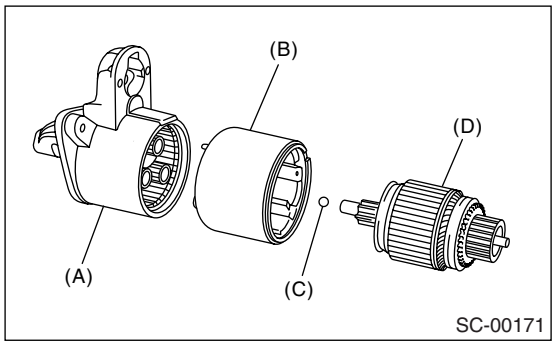
3) Remove both through-bolts and brush holder screws, and then detach the rear cover and brush holder.



(A) Brush holder
(B) Rear cover

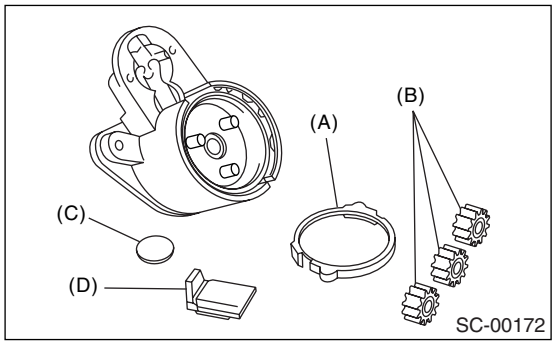
4) Remove the armature and yoke from front bracket. The ball used as a bearing will come off from the armature end.

NOTE:
Before removal of the yoke, put alignment marks on the yoke and front bracket.



(A) Front bracket
(B) Yoke
(C) Ball
(D) Armature

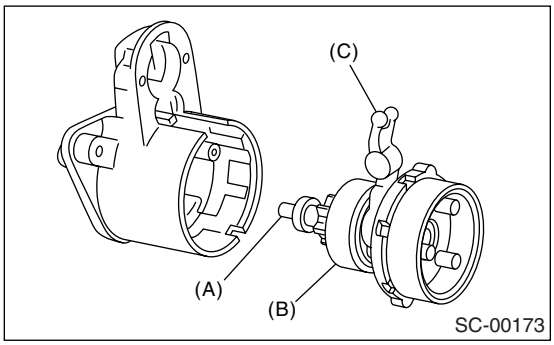
5) Remove packing A, planetary gears, packing B and plate.



(A) Packing A
(B) Planetary gear
(C) Plate
(D) Packing B

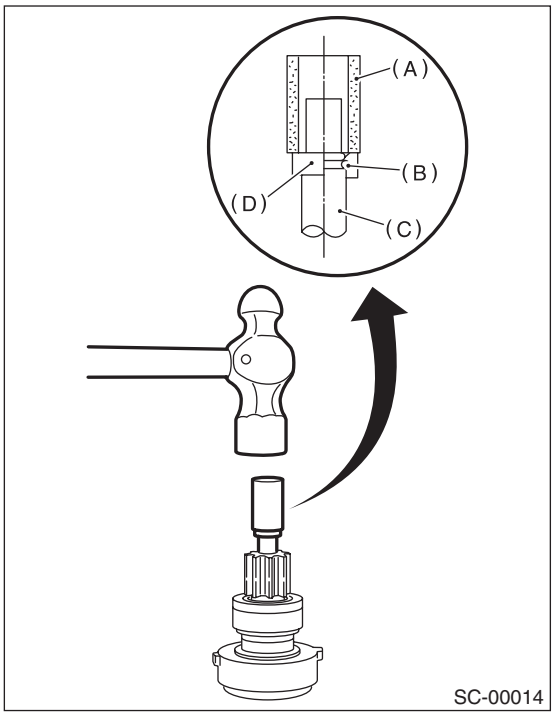
6) Remove the shaft assembly and overrunning clutch as a unit.

NOTE:
Note the direction of the lever before removing.



(A) Shaft assembly
(B) Overrunning clutch
(C) Lever

7) Remove the overrunning clutch from shaft assembly as follows:
(1) Remove the stopper from ring by lightly tapping the stopper with an appropriate tool (such as a fit socket wrench).
(2) Remove the ring, stopper and clutch from shaft.

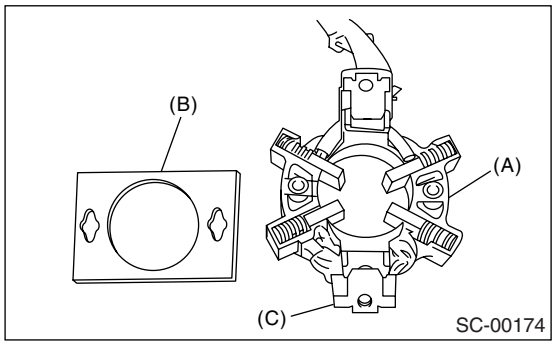


(A) Socket wrench
(B) Ring
(C) Shaft
(D) Stopper

2. BRUSH HOLDER

NOTE:
Only the brush holder of turbo MT model starter can be disassembled.

Slightly open the metal fitting while holding the insulating plate against the brush holder. Remove the insulating plate.
The brush and spring can be easily removed from the brush holder at this time.



(A) Brush holder
(B) Insulating plate
(C) Metal fitting

D: ASSEMBLY

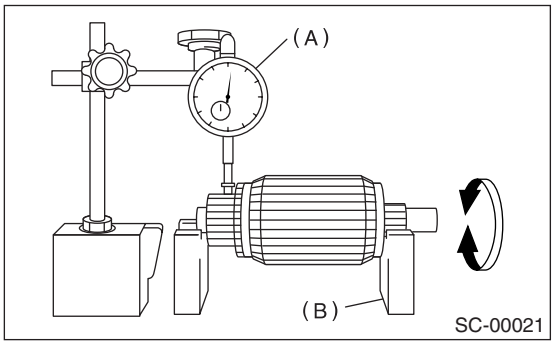
1) Assemble in the reverse order of disassembly.
2) Apply grease to the following parts before assembly.
- Front and rear bracket sleeve bearings
- Armature shaft gear
- Outer periphery of plunger
- Mating surfaces of plunger and lever
- Gear shaft splines
- Mating surfaces of lever and clutch
- Ball at armature shaft end
- Planetary gear

E: INSPECTION

1. ARMATURE

1) Check the commutator for any sign of burns of rough surfaces or stepped wear. If wear is of a minor nature, correct it by using sand paper.
2) Run-out test
Check the commutator run-out, and then replace if it exceeds the limit.

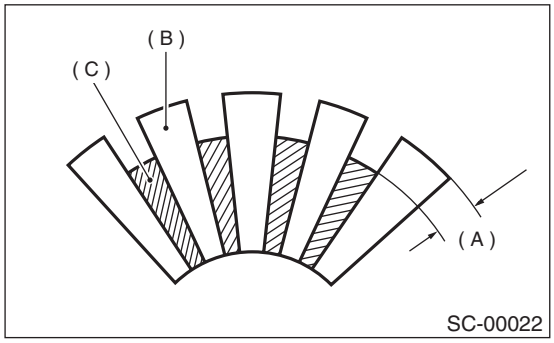
Commutator run-out:
Standard
0.05 mm (0.0020 in)
Service limit
Less than 0.10 mm (0.0039 in)



(A) Dial gauge
(B) V-block

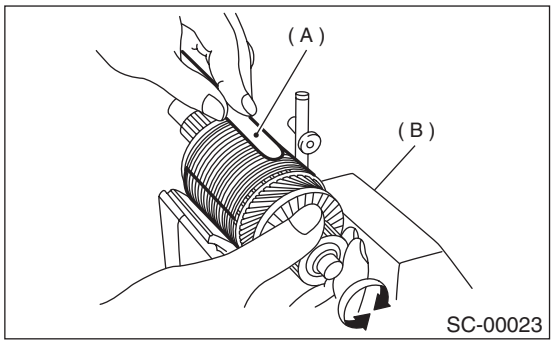
3) Depth of segment mold
Check the depth of segment mold.

Depth of segment mold:
0.5 mm (0.020 in)



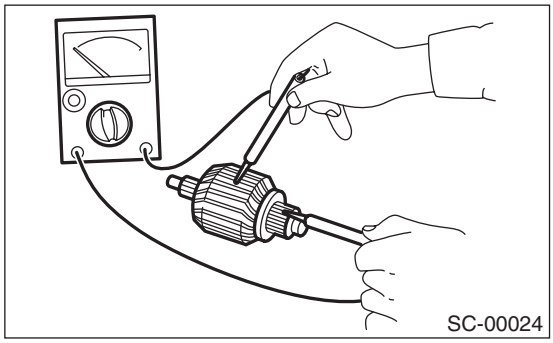
(A) Depth of mold
(B) Segment
(C) Mold

4) Armature short-circuit test
Check the armature for short-circuit by placing it on a growler tester. Hold an iron sheet against the armature core while slowly rotating armature. A short-circuited armature will cause the iron sheet to vibrate and to be attracted to core. If the iron sheet is attracted or vibrates, the armature, which is short-circuited, must be replaced or repaired.



(A) Iron sheet
(B) Grower tester

5) Armature ground test
Using a circuit tester, touch one probe to the commutator segment and the other to shaft. There should be no continuity. If there is continuity, the armature is grounded.
Replace the armature if it is grounded.



2. YOKE

Make sure the pole is set in position.

3. OVERRUNNING CLUTCH

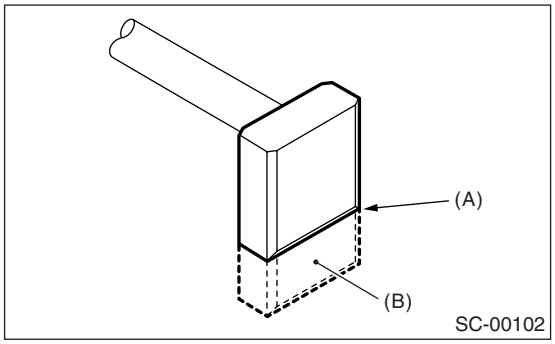
Inspect the teeth of pinion for wear and damage. Replace if it is damaged. It is normal if the pinion rotates smoothly in direction of rotation (counterclockwise) and does not rotate in the opposite direction.

CAUTION:
Do not clean the overrunning clutch with oil to prevent grease from flowing out.

4. BRUSH AND BRUSH HOLDER

1) Brush length
Measure the brush length, and then replace if it is worn down to under the service limit.
Replace if abnormal wear or cracks are noticed.

Brush length:
Standard
12.3 mm (0.484 in)
Service limit
7.0 mm (0.276 in)



(A) Service limit line
(B) Brush

2) Brush movement
Be sure the brush moves smoothly inside brush holder.
3) Brush spring force
Measure the brush spring force with a spring scale. If it is less than the service limit, replace the brush holder.

Brush spring force:

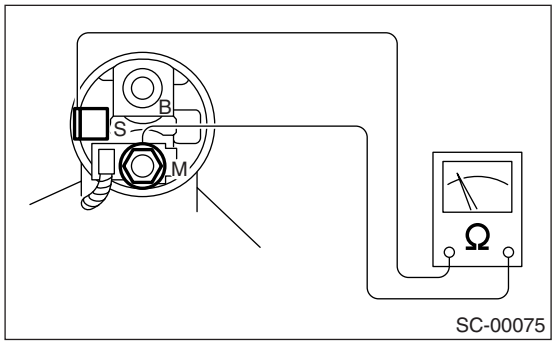
Standard
Except DOHC turbo MT model
15.9 — 19.5 N (1.62 — 1.99 kgf, 3.57 — 4.38 lb) (when new)
DOHC turbo MT model
21.6 N (2.2 kgf, 4.9 lb) (when new)

Service limit
Except DOHC turbo MT model
2.5 N (0.25 kgf, 0.56 lb)
DOHC turbo MT model
5.9 N (0.6 kgf, 1.3 lb)

5. SWITCH ASSEMBLY

Using a circuit tester (set in “ohm”), check that there is continuity between terminals S and M, and between terminal S and ground.
Also check to be sure there is no continuity between terminals M and B.

Terminal/Specified resistance:
S — M/Less than 1 Ω
S — Ground/Less than 1 Ω
M — B/More than 1 MΩ

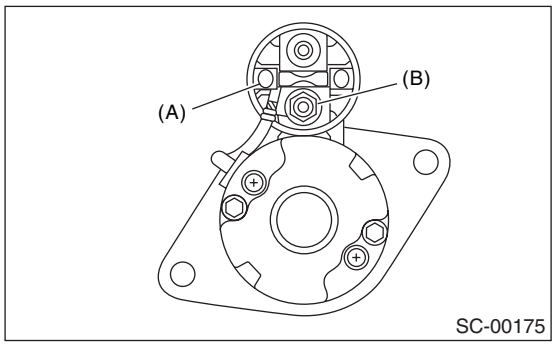


6. SWITCH ASSEMBLY OPERATION

1) Connect the terminal S of switch assembly to positive terminal of battery with a lead wire, and starter body to ground terminal of battery. The pinion should be forced endwise on shaft.

CAUTION:
With the pinion forced endwise on shaft, the starter motor may rotate because current flows through the pull-in coil to motor, however, this is not a problem.

2) Disconnect the connector from terminal M, and then connect the positive terminal of battery and terminal M using a lead wire and ground terminal to starter body.
In this test set up, the pinion should return to its original position even when it is pulled out with a screwdriver.

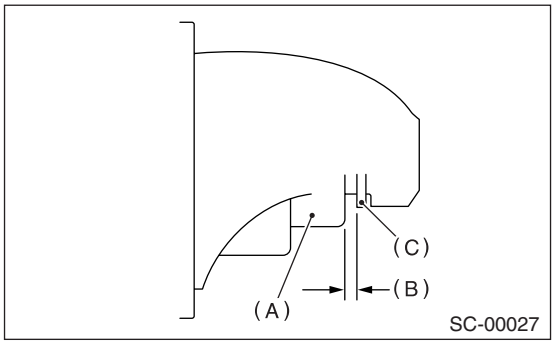


(A) Terminal S
(B) Terminal M

7. PINION GAP

1) Measure the pinion gap while the pinion is pulled out as shown in the figure.

Pinion gap:
0.5 — 2.0 mm (0.020 — 0.079 in)



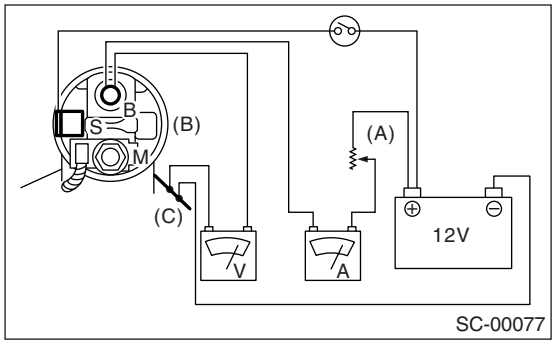
(A) Pinion
(B) Gap
(C) Stopper

If the motor is running with the pinion forced endwise on shaft, disconnect the connector from terminal M of switch assembly, and then connect terminal M to ground terminal (–) of battery with a lead wire. Next, gently push the pinion back with your fingertips, and then measure the pinion gap.
2) If the pinion gap is outside specified range, remove or add number of adjustment washers used on the mounting surface of switch assembly until correct pinion gap is obtained.

8. PERFORMANCE TEST

The starter should be submitted to performance tests whenever it has been overhauled, to assure its satisfactory performance when installed on the engine.
Three performance tests, no-load test, load test, and lock test, are presented here; however, if the load test and lock test cannot be performed, carry out at least the no-load test.

For these performance tests, use the circuit shown in figure.



(A) Variable resistor
(B) Magnetic switch
(C) Starter body

1) No-load test
With switch on, adjust the variable resistor to obtain 11 V, take the ammeter reading, and then measure the starter speed. Compare these values with the specifications.

No-load test (standards):

Voltage/Current
Non-turbo MT
MAX. 11 V/95 A
Turbo MT
MAX. 11 V/90 A
AT
MAX. 11 V/90 A

Rotating speed
Non-turbo MT
More than 2,500 rpm
Turbo MT
More than 2,860 rpm
AT
More than 2,000 rpm

2) Load test
Apply the specified braking torque to starter. The condition is satisfactory if the current draw and starter speed are within the specifications.

Load test (standards):

Voltage/Load
Non-turbo MT
7.5 V/8.84 N·m (0.90 kgf-m, 6.5 ft-lb)
Turbo MT
8 V/9.3 N·m (0.95 kgf-m, 6.9 ft-lb)
AT
7.7 V/16.7 N·m (1.70 kgf-m, 12.3 ft-lb)

Current/Speed
Non-turbo MT
More than 300 A/870 rpm
Turbo MT
More than 280 A/860 rpm
AT
More than 400 A/710 rpm

3) Lock test
With the starter stalled, or not rotating, measure the torque developed and current draw when the voltage is adjusted to the specified voltage.

Lock test (standards):

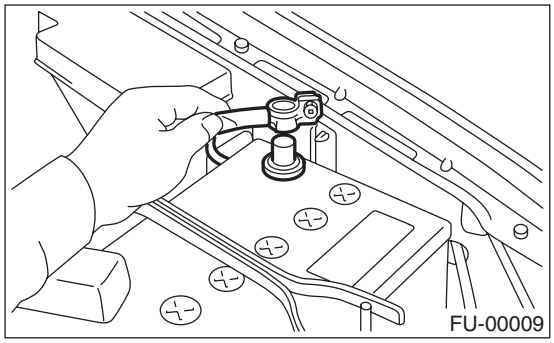
Voltage/Current
Non-turbo MT
Less than 4 V/680 A
Turbo MT
Less than 5 V/515 A
AT
Less than 3.5 V/960 A

Torque
Non-turbo MT
17 N·m (1.73 kgf-m, 12.5 ft-lb)
Turbo MT
16 N·m (1.63 kgf-m, 11.8 ft-lb)
AT
31 N·m (3.16 kgf-m, 22.9 ft-lb)

3. Generator

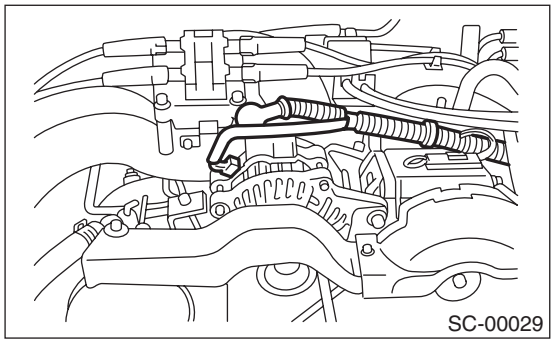
A: REMOVAL

1) Disconnect the ground cable from battery.

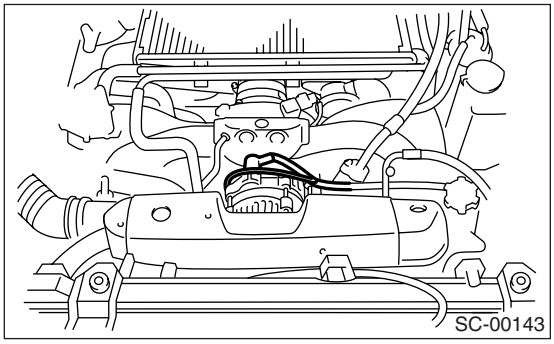


2) Disconnect the connector and terminal from generator.

- NON-TURBO MODEL



- TURBO MODEL

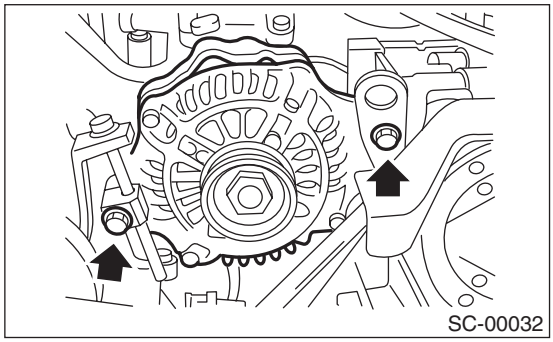


3) Remove the V-belt cover.

4) Remove the front side V-belt.

<Ref. to ME(H4SO)-39, FRONT SIDE BELT, REMOVAL, V-belt.> or <Ref. to ME(H4DOTC)-42, FRONT SIDE BELT, REMOVAL, V-belt.>

5) Remove the bolts which install generator onto bracket.

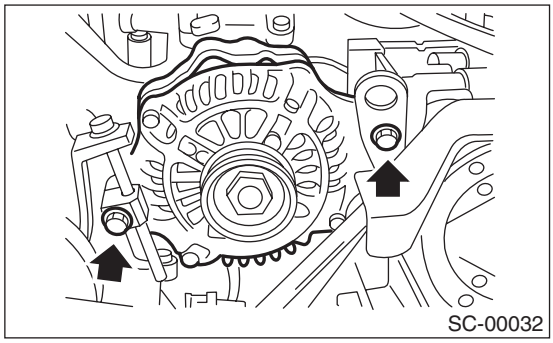


B: INSTALLATION

Install in the reverse order of removal.

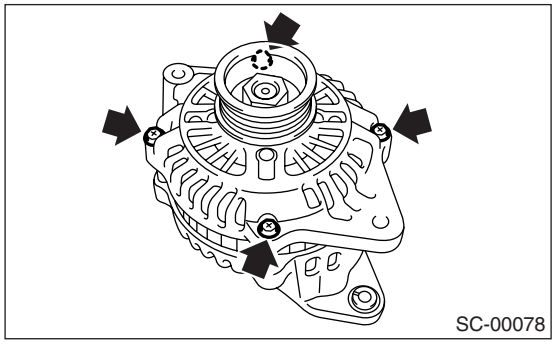
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

CAUTION:
Check and adjust the V-belt tension. <Ref. to ME(H4SO)-40, INSPECTION, V-belt.> or <Ref. to ME(H4DOTC)-43, INSPECTION, V-belt.>

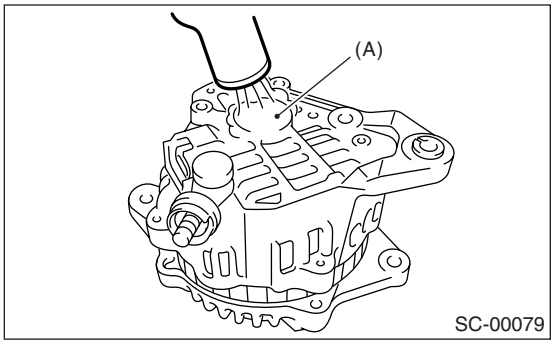


C: DISASSEMBLY

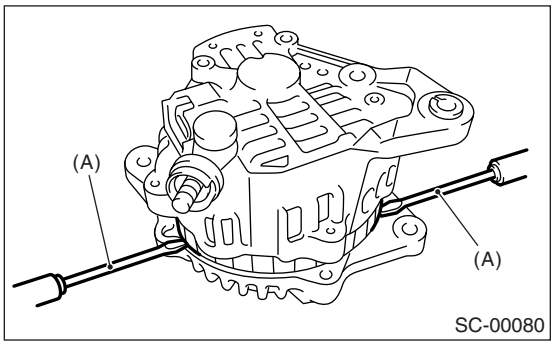
1) Remove the four through-bolts.



2) Heat portion (A) of rear cover to 50°C (122°F) with a heater drier.

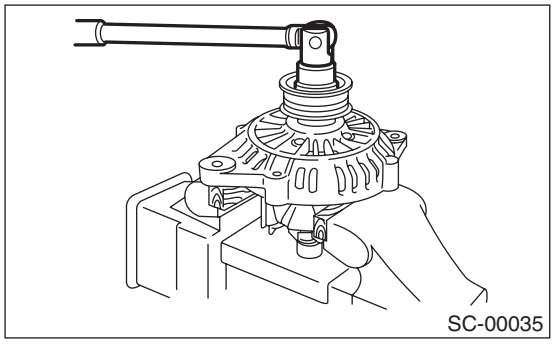


3) Then insert the tip of a flat tip screwdriver into the gap between stator core and front cover. Pry them apart to disassemble.

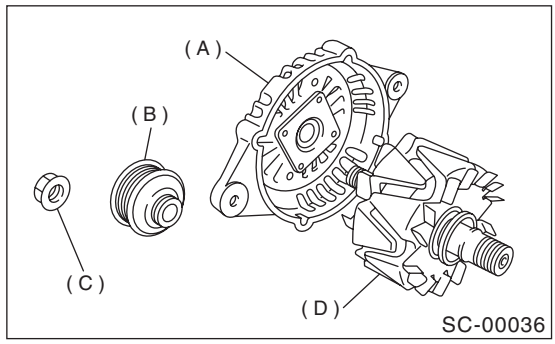


(A) Screwdriver

4) Hold the rotor with a vise and remove pulley nut.

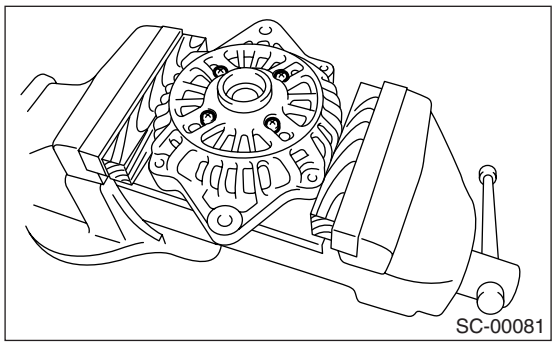


CAUTION:
When holding the rotor with a vise, place aluminum plates or wooden pieces on the vise jaws to prevent rotor from damage.

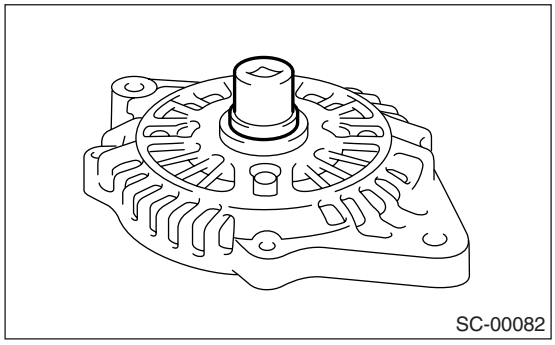


(A) Front cover
(B) Pulley
(C) Nut
(D) Rotor

5) Remove the ball bearing as follows.
(1) Remove the bolt, and then remove the bearing retainer.

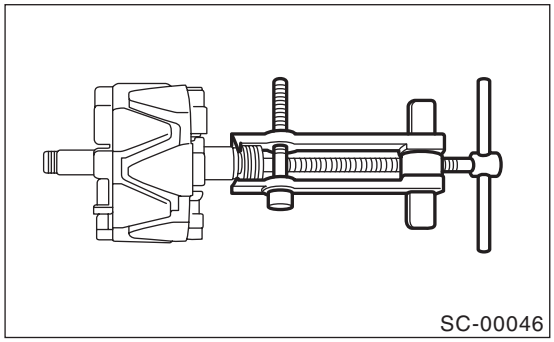


(2) Firmly install an appropriate tool (such as a fit socket wrench) to bearing inner race.



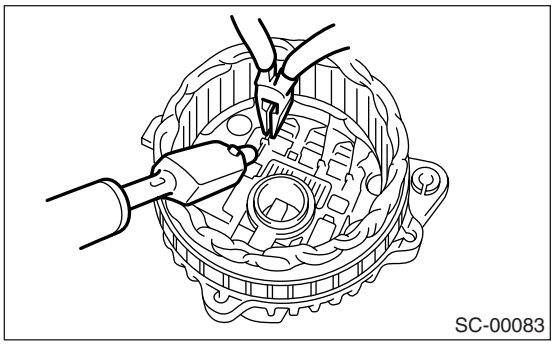
(3) Push the ball bearing off the front cover using a press.

6) Remove the bearing from rotor using a bearing puller.

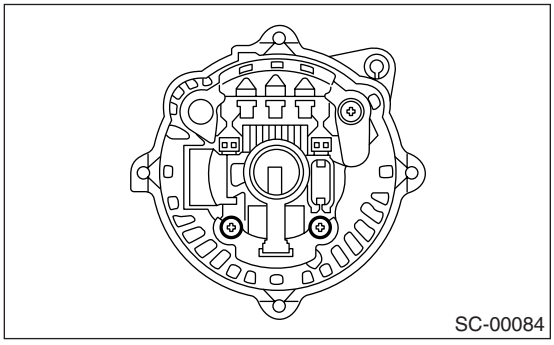

SC-00046

7) Unsolder connection between rectifier and stator coil to remove the stator coil.

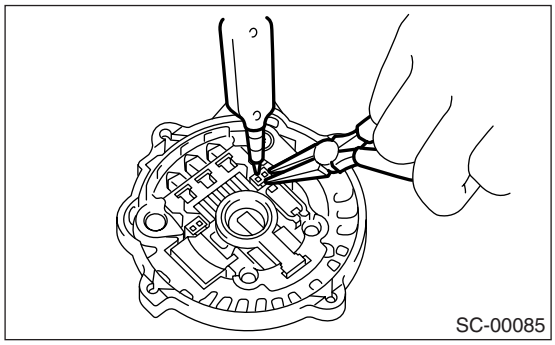
CAUTION:
Do not allow a 180 — 270 W soldering iron to contact the terminals for more than 5 seconds at once because the rectifier cannot withstand so much heat.


SC-00083

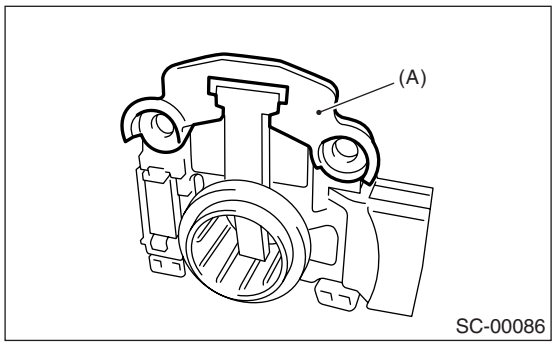
8) Remove the IC regulator as follows.
(1) Remove the screws which secure IC regulator to rear cover.


SC-00084

(2) Unsolder the connection between IC regulator and rectifier to remove the IC regulator.


SC-00085

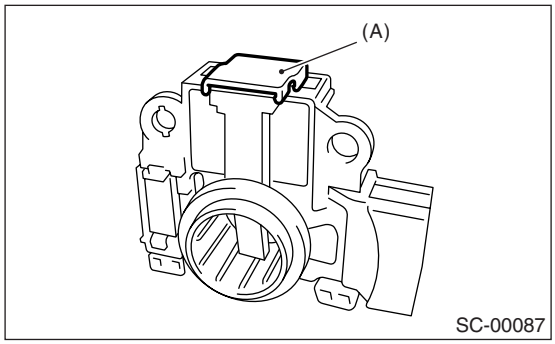
9) Remove the brush as follows.
(1) Remove cover A.



SC-00086

(A) Cover A

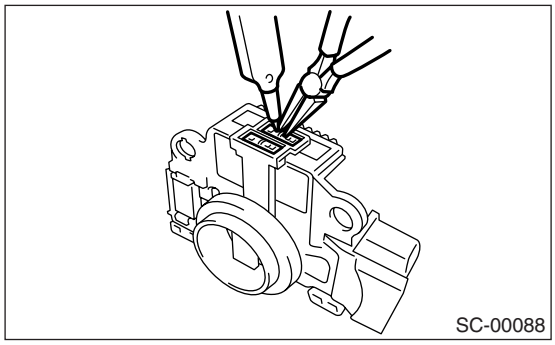
(2) Remove cover B.



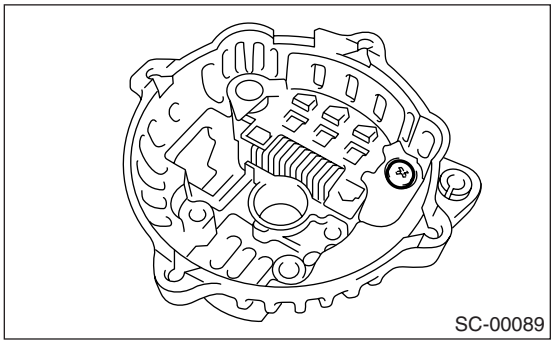
SC-00087

(A) Cover B

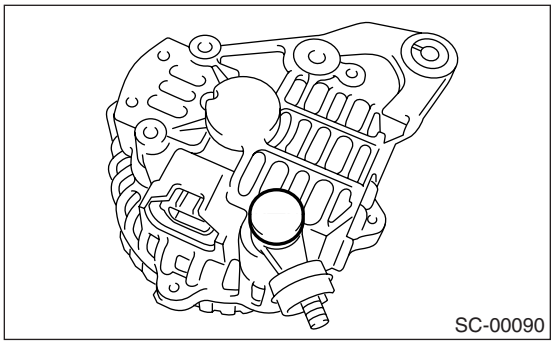
(3) Separate the brush from connection to remove.


SC-00088

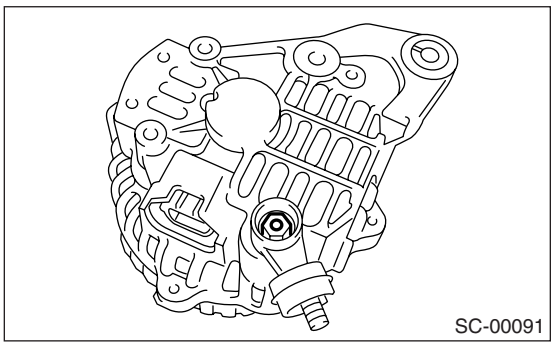
10) Remove the rectifier as follows.
(1) Remove the bolts which secure the rectifier.


SC-00089

(2) Remove the cover of terminal B.


SC-00090

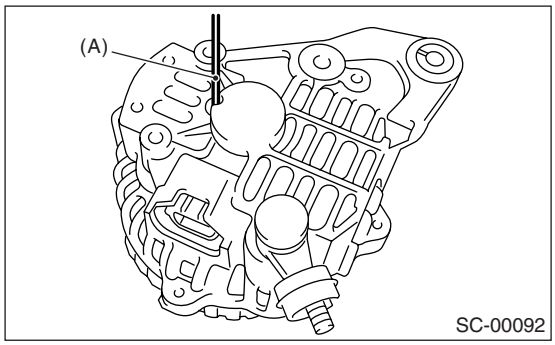
(3) Remove the nut of terminal B, and then remove the rectifier.


SC-00091

D: ASSEMBLY

Assemble in the reverse order of disassembly.
1) Pulling up brush
Before assembling, press the brush down into brush holder, and then fix them in that position by passing a [1 mm (0.08 in) dia. 40 to 50 mm (1.6 to 2.0 in) long] wire through the hole as shown in the figure.

CAUTION:
Be sure to remove the wire after reassembly.



SC-00092

(A) Wire

2) Install the ball bearing.
(1) Set the ball bearing on the front cover, and then securely install an appropriate tool (such as a fit socket wrench) to the bearing outer race.
(2) Press the ball bearing into the specified position using a press.
(3) Install the bearing retainer.
3) Press the bearing (rear side) into the rotor shaft using a press to install.
4) Heat the bearing box in rear cover [50 to 60°C (122 to 140°F)], and then press the rear bearing into rear cover.

CAUTION:
Grease should not be applied to rear bearing. Remove the oil completely if it is found on bearing box.

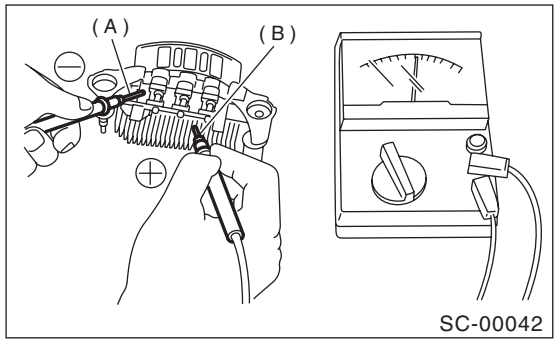
5) After reassembly, turn the pulley by hand to check that rotor turns smoothly.

E: INSPECTION

1. DIODE

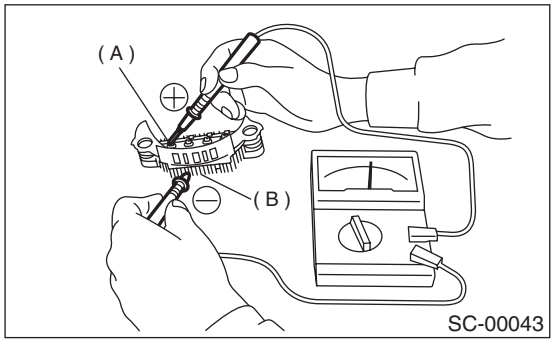
CAUTION:
Never use a mega tester (designed for reading high voltage) or any other similar instrument for this test; otherwise, the diodes may be damaged.

1) Checking positive diode
Check for continuity between the diode lead and positive side heat sink. The positive diode is in good condition if resistance is 1 Ω or less only in the direction from the diode lead to heat sink.



(A) Diode lead
(B) Heat sink (positive side)

2) Checking negative diode
Check for continuity between the negative side heat sink and diode lead. The negative diode is in good condition if resistance is 1 Ω or less only in the direction from the heat sink to diode lead.



(A) Diode lead
(B) Heat sink (negative side)

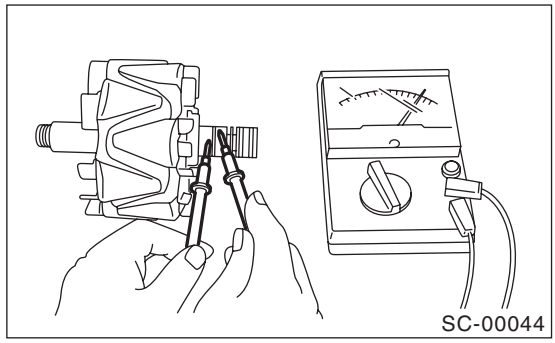
2. ROTOR

1) Slip ring surface
Inspect the slip rings for contamination or any roughness on the sliding surface. Repair the slip ring surface using a lathe or sand paper.
2) Slip ring outer diameter
Measure the slip ring outer diameter. If the slip ring is worn, replace the rotor assembly.

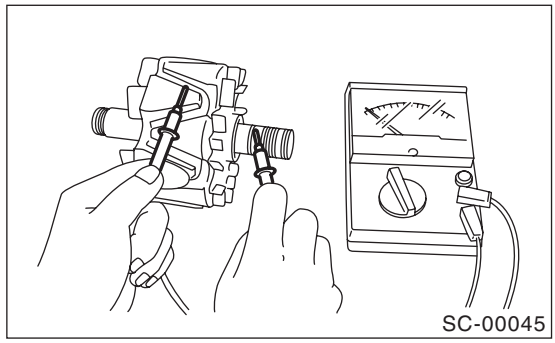
Slip ring outer diameter:
Standard
22.7 mm (0.894 in)
Limit
22.1 mm (0.870 in)

3) Continuity test
Check the resistance between slip rings using circuit tester.
If the resistance is not within the specified range, replace the rotor assembly.

Specified resistance:
Approx. 1.8 — 2.2 Ω



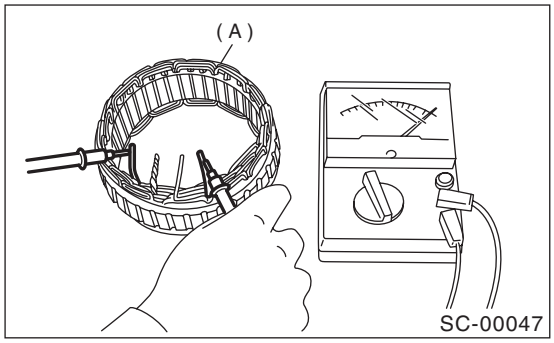
4) Insulation test
Check the continuity between slip ring and rotor core or shaft. If resistance is 1 Ω or less, the rotor coil is grounded, and so replace the rotor assembly.



5) Ball bearing (rear side)
Check the rear ball bearing. Replace if it is noisy or if the rotor does not turn smoothly.

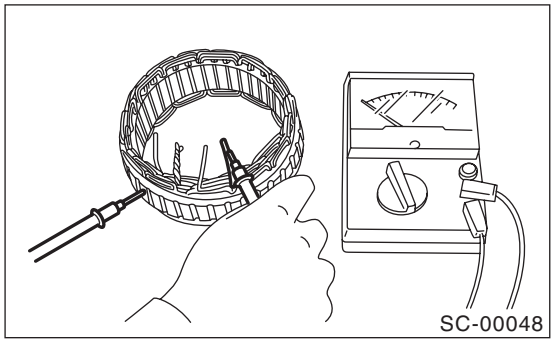
3. STATOR

1) Continuity test
Inspect the stator coil for continuity between each end of the lead wires. If resistance is 1 MΩ or more, the lead wire is broken, and so replace the stator assembly.



(A) Stator

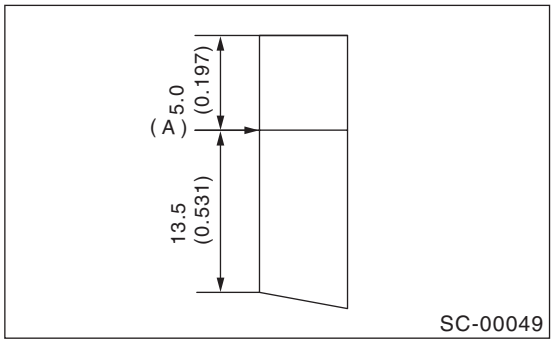
2) Insulation test
Inspect the stator coil for continuity between stator core and each end of lead wire. If resistance is 1 Ω or less, the stator coil is grounded, and so replace the stator assembly.



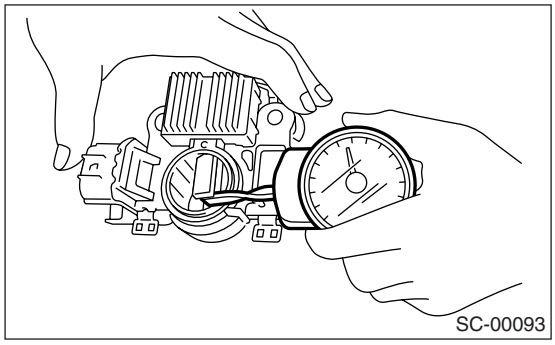
4. BRUSH

1) Measure the length of each brush. If wear exceeds the service limit, replace the brush. Each brush has the service limit mark (A) on it.

Brush length:
Standard
18.5 mm (0.728 in)
Service limit
5.0 mm (0.197 in)



2) Checking brush spring for proper pressure
Using a spring pressure indicator, push the brush into the brush holder until its tip protrudes 2 mm (0.08 in). Then measure the pressure of brush spring. If the pressure is less than 2.648 N (270 g, 9.52 oz), replace the brush spring with a new one. The new spring must have a pressure of 4.609 to 5.786 N (470 to 590 g, 16.58 to 20.810 oz).



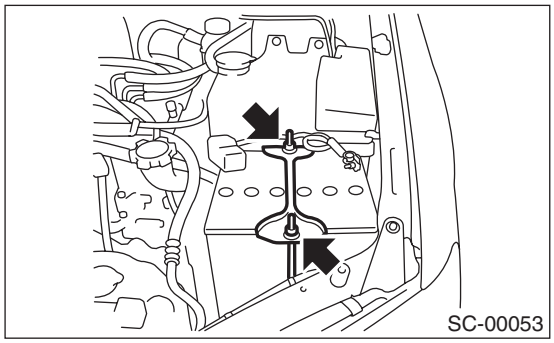
5. BEARING (FRONT SIDE)

Check the front ball bearing. If the resistance is felt while rotating, or if abnormal noise is heard, replace the ball bearing.

4. Battery

A: REMOVAL

1) Disconnect the positive (+) cable after disconnecting the ground (–) cable of battery.
2) Remove the flange nuts from battery rods, and then take off the battery holder.



3) Remove the battery.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)

NOTE:
• Clean the battery cable terminals, and then apply grease to retard formation of corrosion.
• Connect the positive (+) cable of battery and then the ground (–) cable of battery.

C: INSPECTION

WARNING:
• Electrolyte has toxicity; be careful handling the fluid.
• Avoid contact with skin, eyes or clothing. Especially at contact with eyes, flush with running water for 15 minutes and get prompt medical attention.
• Batteries produce explosive gasses. Keep sparks, flame, cigarettes away.
• Ventilate when charging or using in enclosed space.
• For safety, in case an explosion does occur, wear eye protection or shield your eyes when working near any battery. Never lean over a battery.
• Do not let the battery fluid contact eyes, skin, fabrics, or paint-work because battery fluid is corrosive acid.
• To lessen the risk of sparks, remove rings, metal watch-bands, and other metal jewelry. Never allow metal tools to contact the positive battery terminal and anything connected to it while you are at the same time in contact with any other metallic portion of the vehicle. This may cause a short circuit.

1. EXTERNAL PARTS:

Check for the existence of dirt or cracks on battery case, top cover, vent plugs, and terminal posts. If necessary, clean with water and wipe with a dry cloth.
Apply a thin coat of grease on the terminal posts to prevent corrosion.

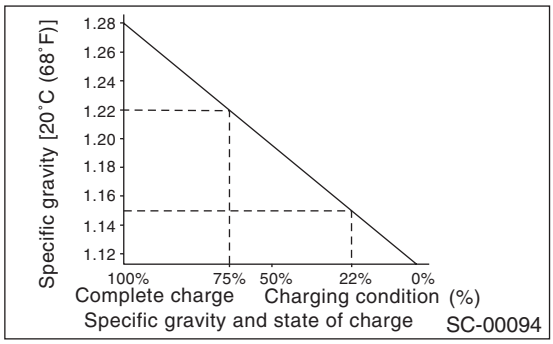
2. ELECTROLYTE LEVEL:

Check the electrolyte level in each cell. If the level is below MIN LEVEL, bring the level to MAX LEVEL by pouring distilled water into the battery cell. Do not fill beyond MAX LEVEL.

3. SPECIFIC GRAVITY OF ELECTROLYTE:

1) Measure the specific gravity of electrolyte using a hydrometer and a thermometer.
Specific gravity varies with temperature of electrolyte so that it must be corrected at 20°C (68°F) using the following equation:

S_{20} = St + 0.0007 × (t − 20)
S_{20}: Specific gravity corrected at electrolyte temperature of 20°C
St: Measured specific gravity
t: Measured temperature (°C)
Determine whether or not battery must be charged, according to corrected specific gravity.
Standard specific gravity: 1.220 — 1.290 [at 20°C (68°F)]



2) Measuring the specific gravity of the electrolyte in battery will disclose the state of charge of battery. The relation between specific gravity and state of charge is as shown in the figure.

D: MEASUREMENT

WARNING:
Do not bring an open flame close to the battery at this time.

CAUTION:
• Prior to charging, corroded terminals should be cleaned with a brush and common caustic soda solution.

• Be careful since the battery electrolyte overflows while charging the battery.
• Observe the instructions when handling battery charger.
• Before charging the battery on vehicle, disconnect battery ground terminal to prevent damage of generator diodes or other electrical units.

1. JUDGMENT OF BATTERY IN CHARGED CONDITION

1) Specific gravity of electrolyte is held within the specified range from 1.250 to 1.290 for more than one hour.
2) Voltage per battery cell is held at the specified range from 2.5 to 2.8 volts for more than one hour.

2. STATE OF CHARGE CHECK USING A HYDROMETER

Hydrometer indicator	State of charge	Corrective action
Green dot	Above 65%	Load test
Dark dot	Below 65%	Charge battery
Clear dot	Low electrolyte	Replace battery* (If cranking is difficult)
*: Check electrical system before replacement.		

3. NORMAL CHARGING

Charge the battery at current value specified by manufacturer or at approx. 1/10 of the battery's ampere-hour rating.

4. QUICK CHARGING

Quick charging is a method in which the battery is charged in a short period of time with a relatively large current by using a quick charger.
Since a large current flow raises electrolyte temperature, the battery is subject to damage if large current is used for prolonged time. For this reason, the quick charging must be carried out within a current range that will not increase the electrolyte temperature above 40°C (104°F).
It should be also remembered that the quick charging is a temporary means to bring battery voltage up to a fair value and, as a rule, a battery should be charged slowly with a low current.

CAUTION:
• Observe the items in 3. NORMAL CHARGING.
• Never use more than 10 amperes when charging the battery because that will shorten battery life.

ENGINE (DIAGNOSTICS)

EN(H4SO)(diag)

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1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

	Step	Check	Yes	No
1	**CHECK ENGINE START FAILURE.** 1) Ask the customer when and how the trouble occurred using the check list for interview. <Ref. to EN(H4SO)(diag)-4, CHECK, Check List for Interview.> 2) Start the engine.	Does the engine start?	Go to step **2.**	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(H4SO)(diag)-56, Diagnostics for Engine Starting Failure.>
2	**CHECK ILLUMINATION OF MALFUNCTION INDICATOR LIGHT.**	Does malfunction indicator light illuminate?	Go to step **3.**	Inspection using "General Diagnostics Table". <Ref. to EN(H4SO)(diag)-304, INSPECTION, General Diagnostic Table.>
3	**CHECK INDICATION OF DTC ON DISPLAY.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or the OBD-II general scan tool to data link connector. 3) Turn the ignition switch to ON and the Subaru Select Monitor or OBD-II general scan tool switch to ON. 4) Read the DTC on the Subaru Select Monitor or OBD-II general scan tool.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Record the DTC. Repair the trouble cause. <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).> Go to step **4.**	Repair the related parts. NOTE: If DTC is not shown on display although the malfunction indicator light illuminates, perform diagnostics of malfunction indicator light circuit or combination meter. <Ref. to EN(H4SO)(diag)-47, Malfunction Indicator Light.>
4	**PERFORM THE DIAGNOSIS.** 1) Perform the clear memory mode. <Ref. to EN(H4SO)(diag)-44, Clear Memory Mode.> 2) Perform the inspection mode. <Ref. to EN(H4SO)(diag)-37, Inspection Mode.>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-78, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

2. AUTOMATIC TRANSMISSION

When the DTC about automatic transmission is shown on display, carry out the following basic check. After that, carry out the replacement or repair work.

1) ATF level check <Ref. to 4AT-30, Automatic Transmission Fluid.>
2) Differential gear oil level check <Ref. to 4AT-31, Differential Gear Oil.>
3) ATF leak check <Ref. to 4AT-30, Automatic Transmission Fluid.>
4) Differential gear oil leak check <Ref. to 4AT-31, Differential Gear Oil.>
5) Stall test <Ref. to 4AT-33, Stall Test.>
6) Line pressure test <Ref. to 4AT-35, Line Pressure Test.>
7) Transfer clutch pressure test <Ref. to 4AT-36, Transfer Clutch Pressure Test.>
8) Time lag test <Ref. to 4AT-34, Time Lag Test.>
9) Road test <Ref. to 4AT-32, Road Test.>
10) Shift characteristics <Ref. to 4AT-36, Transfer Clutch Pressure Test.>

2. Check List for Interview

A: CHECK

1. CHECK LIST No. 1

Check the following items when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

<table>
<tr><td>Customer's name</td><td></td><td>Engine No.</td><td></td></tr>
<tr><td>Date of sale</td><td></td><td>Fuel brand</td><td></td></tr>
<tr><td>Date of repair</td><td></td><td rowspan="2">Odometer reading</td><td>km</td></tr>
<tr><td>VIN No.</td><td></td><td>miles</td></tr>
<tr><td>Weather</td><td colspan="3">❑ Fine
❑ Cloudy
❑ Rainy
❑ Snowy
❑ Various/Others:</td></tr>
<tr><td rowspan="2">Outdoor temperature</td><td>°C (°F)</td><td colspan="2"></td></tr>
<tr><td colspan="3">❑ Hot
❑ Warm
❑ Cool
❑ Cold</td></tr>
<tr><td>Place</td><td colspan="3">❑ Highway
❑ Suburbs
❑ Inner city
❑ Uphill
❑ Downhill
❑ Rough road
❑ Others:</td></tr>
<tr><td>Engine temperature</td><td colspan="3">❑ Cold
❑ Warming-up
❑ After warming-up
❑ Any temperature
❑ Others:</td></tr>
<tr><td>Engine speed</td><td>rpm</td><td colspan="2"></td></tr>
<tr><td>Vehicle speed</td><td>MPH</td><td colspan="2"></td></tr>
<tr><td>Driving conditions</td><td colspan="3">❑ Not affected
❑ At starting
❑ While idling
❑ At racing
❑ While accelerating
❑ While cruising
❑ While decelerating
❑ While turning (RH/LH)</td></tr>
<tr><td>Headlight</td><td>❑ ON / ❑ OFF</td><td>Rear defogger</td><td>❑ ON / ❑ OFF</td></tr>
<tr><td>Blower</td><td>❑ ON / ❑ OFF</td><td>Radio</td><td>❑ ON / ❑ OFF</td></tr>
<tr><td>A/C compressor</td><td>❑ ON / ❑ OFF</td><td>CD/Cassette</td><td>❑ ON / ❑ OFF</td></tr>
<tr><td>Radiator fan</td><td>❑ ON / ❑ OFF</td><td>Car phone</td><td>❑ ON / ❑ OFF</td></tr>
<tr><td>Front wiper</td><td>❑ ON / ❑ OFF</td><td>CB</td><td>❑ ON / ❑ OFF</td></tr>
<tr><td>Rear wiper</td><td>❑ ON / ❑ OFF</td><td colspan="2"></td></tr>
</table>

2. CHECK LIST No. 2

Check the following items about the vehicle's state when malfunction indicator light turns on.

NOTE:
Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. ❑ Yes / ❑ No
❑ Low fuel warning light ❑ Charge indicator light ❑ AT diagnostics indicator light ❑ ABS warning light ❑ Engine oil pressure warning light
b) Fuel level
• Lack of gasoline: ❑ Yes / ❑ No • Indicator position of fuel gauge:
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ❑ Yes / ❑ No
• What:
d) Intentional connecting or disconnecting of hoses: ❑ Yes / ❑ No
• What:
e) Installing of parts other than genuine parts: ❑ Yes / ❑ No
• What: • Where:
f) Occurrence of noise: ❑ Yes / ❑ No
• From where: • What kind:
g) Occurrence of smell: ❑ Yes / ❑ No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment:❑ Yes / ❑ No
i) Troubles occurred
❑ Engine does not start. ❑ Engine stalls during idling. ❑ Engine stalls while driving. ❑ Engine speed decreases. ❑ Engine speed does not decrease. ❑ Rough idling ❑ Poor acceleration ❑ Back fire ❑ After fire ❑ No shift ❑ Excessive shift shock

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the ECM, main relay and fuel pump relay.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
• Be careful not to damage the airbag system wiring harness when servicing the ECM, TCM, main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.
• The ECM will be destroyed instantly.
• The fuel injector and other part will be damaged in just a few minutes more.

3) Do not disconnect the battery terminals while the engine is running.
A large counter electromotive force will be generated in the generator, and this voltage may damage electronic parts such as ECM, etc.

4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn OFF the ignition switch.

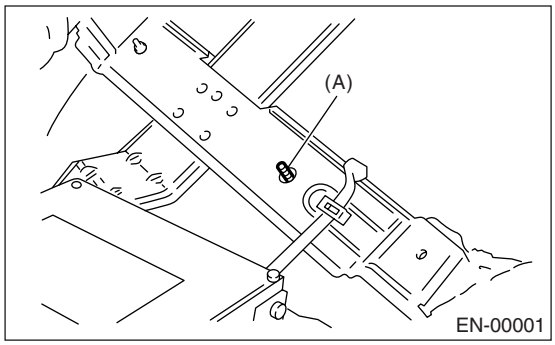
5) Poor contact has been identified as a primary cause of this problem. To measure the voltage and/or resistance of individual sensors or all electrical control modules at the harness side connector, use a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

6) Before removing the ECM from the located position, disconnect two cables on battery.
Otherwise, the ECM may be damaged.

CAUTION:
When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on fuel injection system.

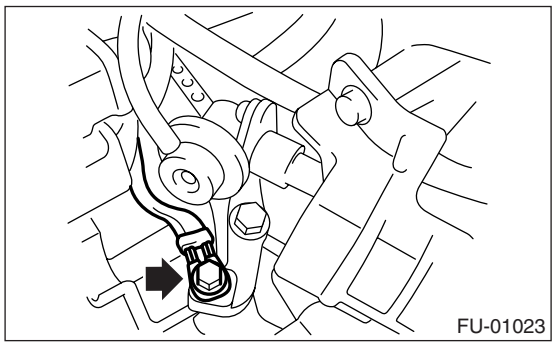
7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use ECM mounting stud bolts at the body side grounding point when measuring voltage and resistance inside the passenger compartment.

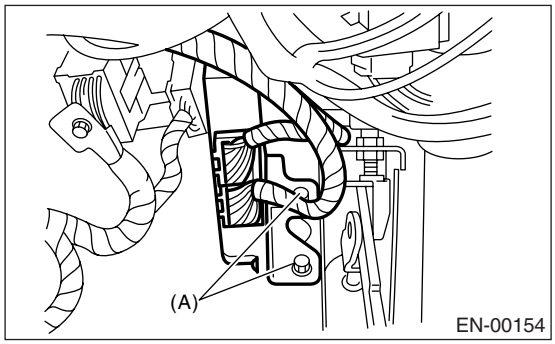


(A) Stud bolt

9) Use engine grounding terminal or engine proper as the grounding point to the body when measuring voltage and resistance in the engine compartment.



10) Use TCM mounting stud bolts at the body side grounding point when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

11) Every MFI-related part is a precision part. Do not drop them.

12) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:
• The antenna must be kept as far apart as possible from the control unit. (The ECM is located under the steering column, inside of the instrument panel lower trim panel.)
• The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.
• Carefully adjust the antenna for correct matching.
• When mounting a large power type radio, pay special attention to the three items above mentioned.
• Incorrect installation of the radio may affect the operation of the ECM.

13) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than five seconds to release pressure in the fuel system. If engine starts during this operation, run it until it stops.
14) Problems in the electronic-controlled automatic transmission may be caused by failure of the engine, the electronic control system, the transmission proper, or by a combination of these. These three causes must be distinguished clearly when performing diagnostics.
15) Diagnostics should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.
16) In AT models, do not continue the stall for more than five seconds at a time (from closed throttle, fully open throttle to stall engine speed).
17) On models with ABS, when performing driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between the front and rear wheels. After diagnosis of engine control system, perform the ABS memory clearance procedure of self-diagnosis system.

B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems:

1. BATTERY

1) Measure battery voltage and specific gravity of electrolyte.

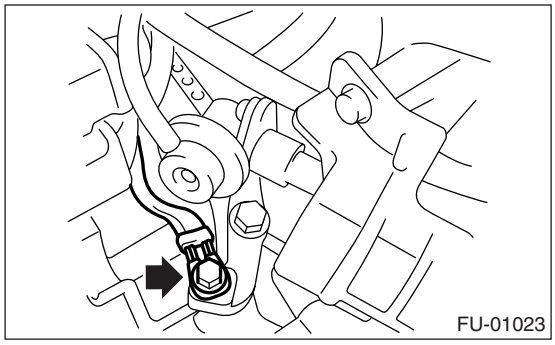
Standard voltage: 12 V

Specific gravity: Above 1.260

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUNDING

Make sure the engine grounding terminal is properly connected to the engine.



C: NOTE

1. DESCRIPTION

• The on-board diagnostics (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. Malfunction indicator light in the combination meter indicates occurrence of a fault or trouble.
• Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
• The OBD system incorporated with the vehicles within this engine family complies with Section 1968.1, California Code of Regulations (OBD-II regulation). The OBD system monitors the components and the system malfunction listed in Engine Section which affects on emissions.
• When the system decides that a malfunction occurs, malfunction indicator light illuminates. At the same time of the malfunction indicator light illumination or blinking, a DTC and a freeze frame engine conditions are stored into on-board computer.
• The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction first.
• If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
• When the malfunction does not occur again for three consecutive driving cycles, malfunction indicator light is turned off, but DTC remains at on-board computer.
• The OBD-II system is capable of communication with a general scan tool (OBD-II general scan tool) formed by ISO 9141 CARB.

• The OBD-II diagnostics procedure is different from the usual diagnostics procedure. When troubleshooting the models with OBD-II, connect Subaru Select Monitor or the OBD-II general scan tool to the vehicle.

2. ENGINE AND EMISSION CONTROL SYSTEM

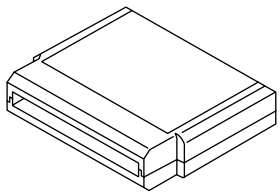
• The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.
With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.
• Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.

The MFI system also has the following features:
- Reduced emission of harmful exhaust gases.
- Reduction in fuel consumption.
- Increased engine output.
- Superior acceleration and deceleration.
- Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

3. AUTOMATIC TRANSMISSION AND ELECTRONIC-HYDRAULIC CONTROL SYSTEM

The electronic-hydraulic control system consists of various sensors and switches, the TCM and the hydraulic controller including solenoid valves. The system controls the transmission proper including shift control, lock-up control, overrunning clutch control, line pressure control and shift timing control. It also controls the AWD transfer clutch. In other words, the system detects various operating conditions from various input signals and sends output signals to shift solenoids 1, 2 and low clutch timing solenoid and 2-4 brake timing solenoid, line pressure duty solenoid, lock-up duty solenoid, transfer duty solenoid and 2-4 brake duty solenoid (a total of eight solenoids).

D: PREPARATION TOOL

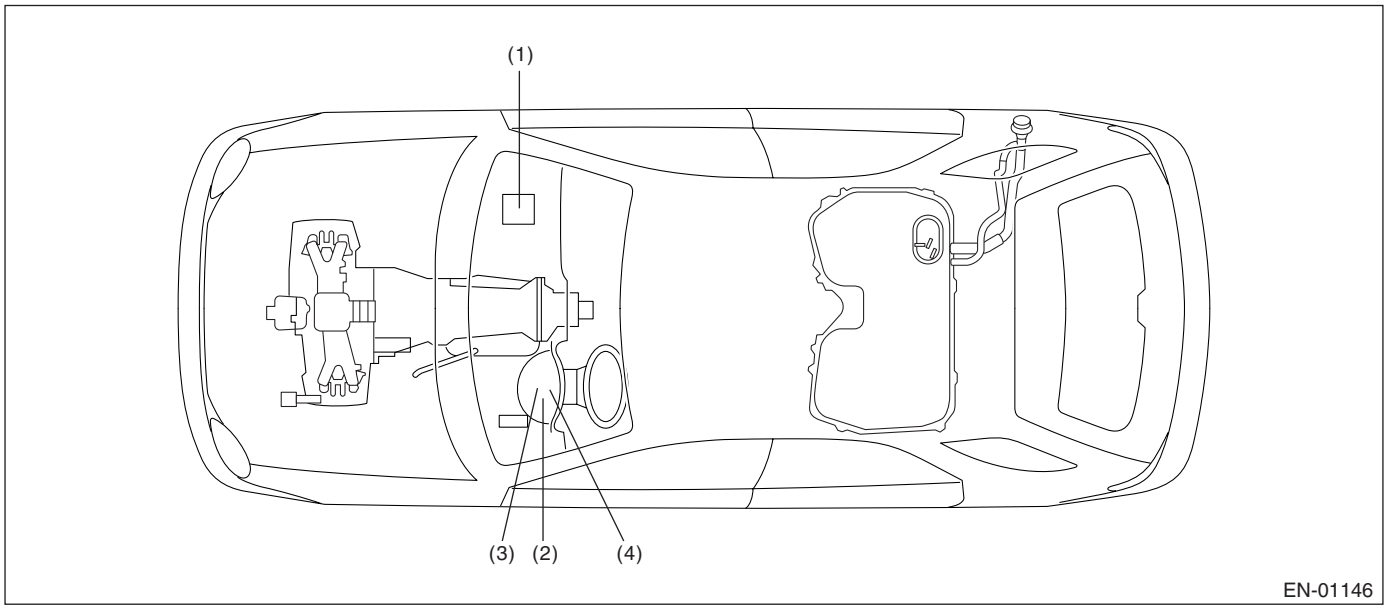
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

4. Electrical Components Location

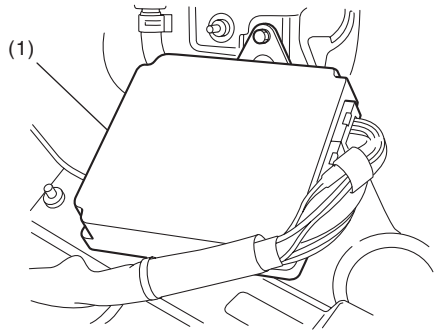
A: LOCATION

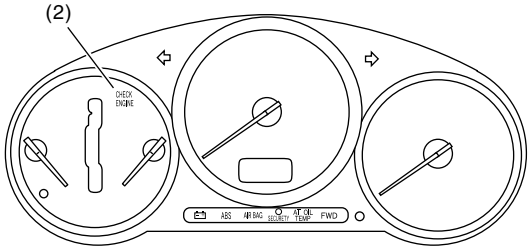
1. ENGINE

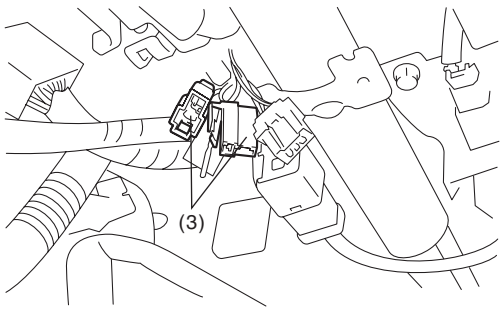
• MODULE

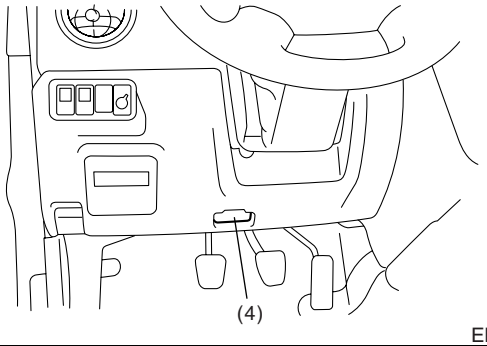


(1) Engine control module (ECM)
(2) Malfunction indicator light
(3) Test mode connector
(4) Data link connector

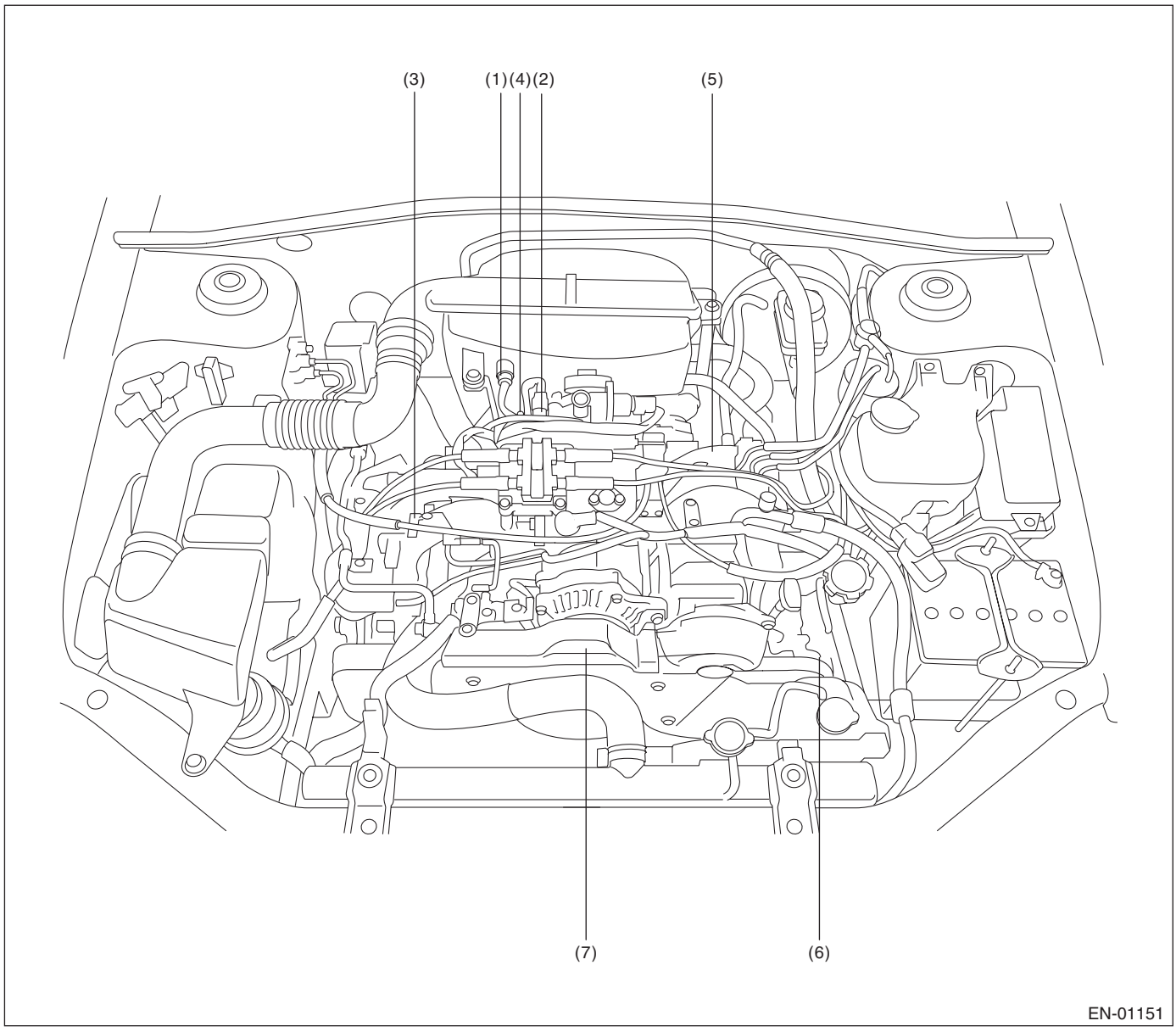








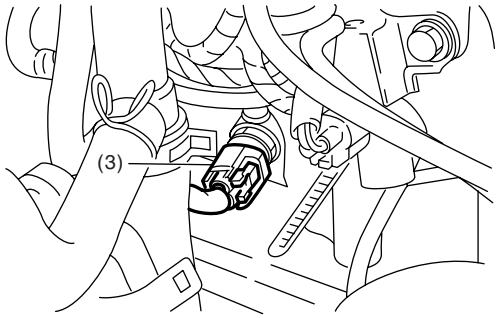
• SENSOR



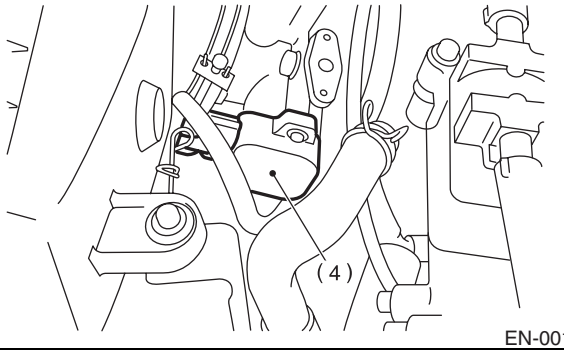
(1) Intake air temperature sensor
(2) Manifold absolute pressure sensor
(3) Engine coolant temperature sensor
(4) Throttle position sensor
(5) Knock sensor
(6) Camshaft position sensor
(7) Crankshaft position sensor

EN-00006

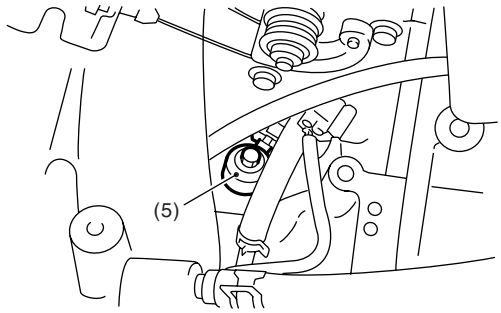
EN-00160



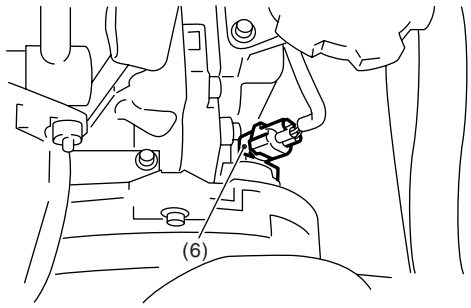
EN-00008



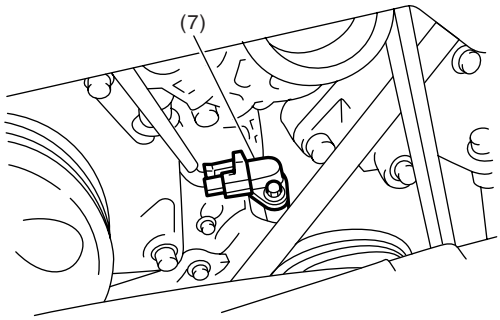
EN-00161



EN-00010

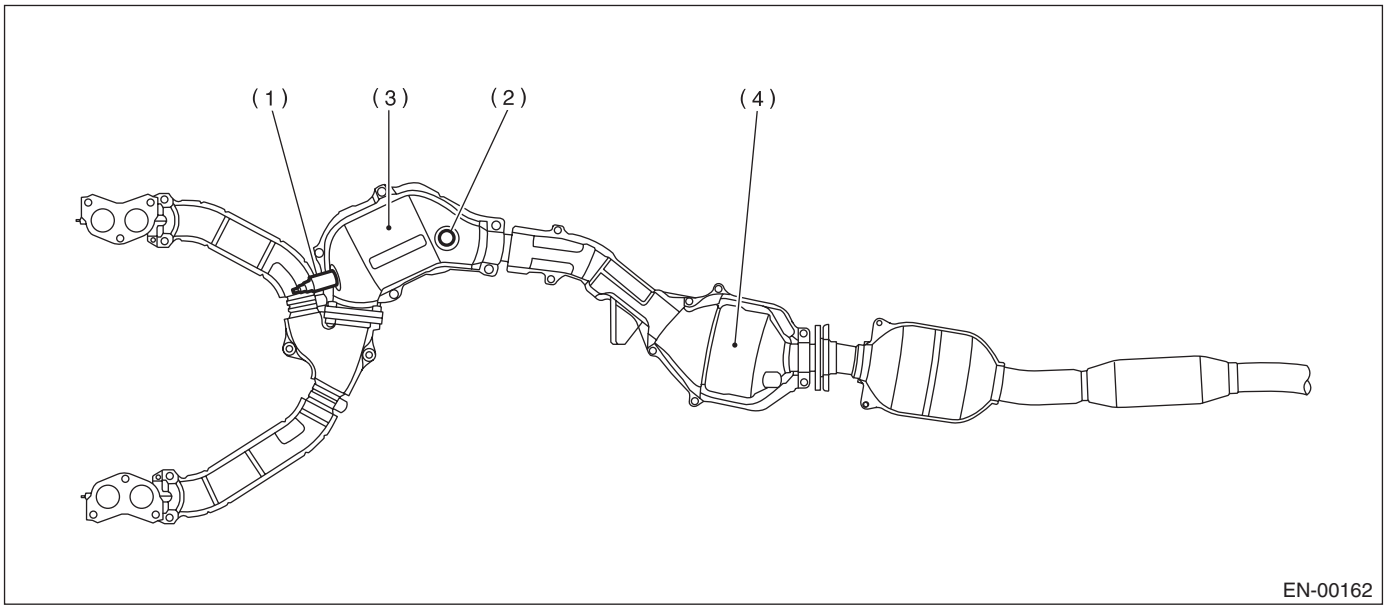


EN-00011

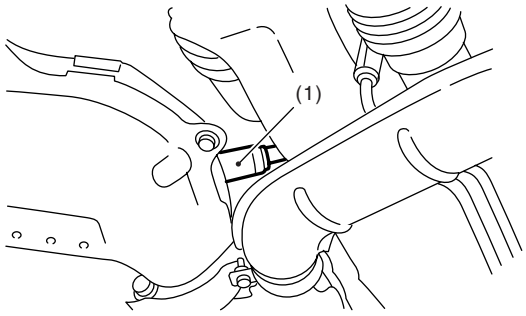


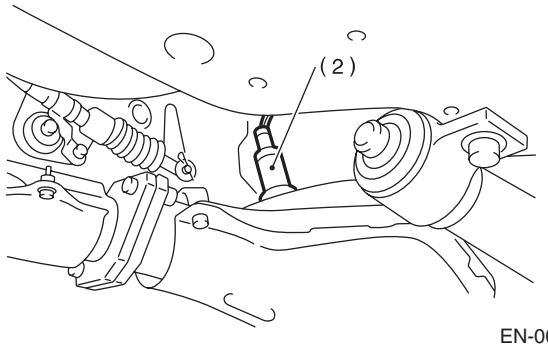
EN-00012

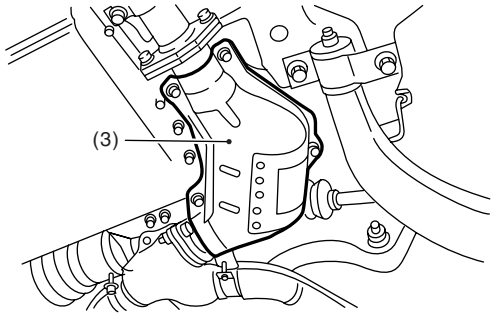
Electrical Components Location

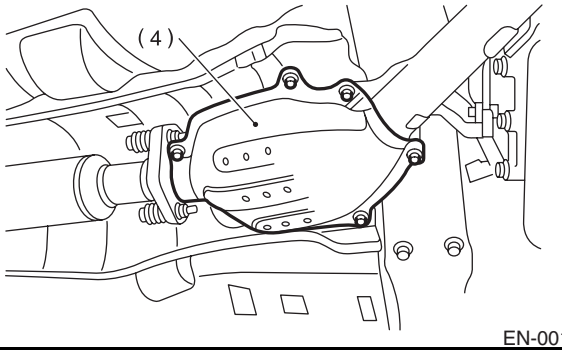


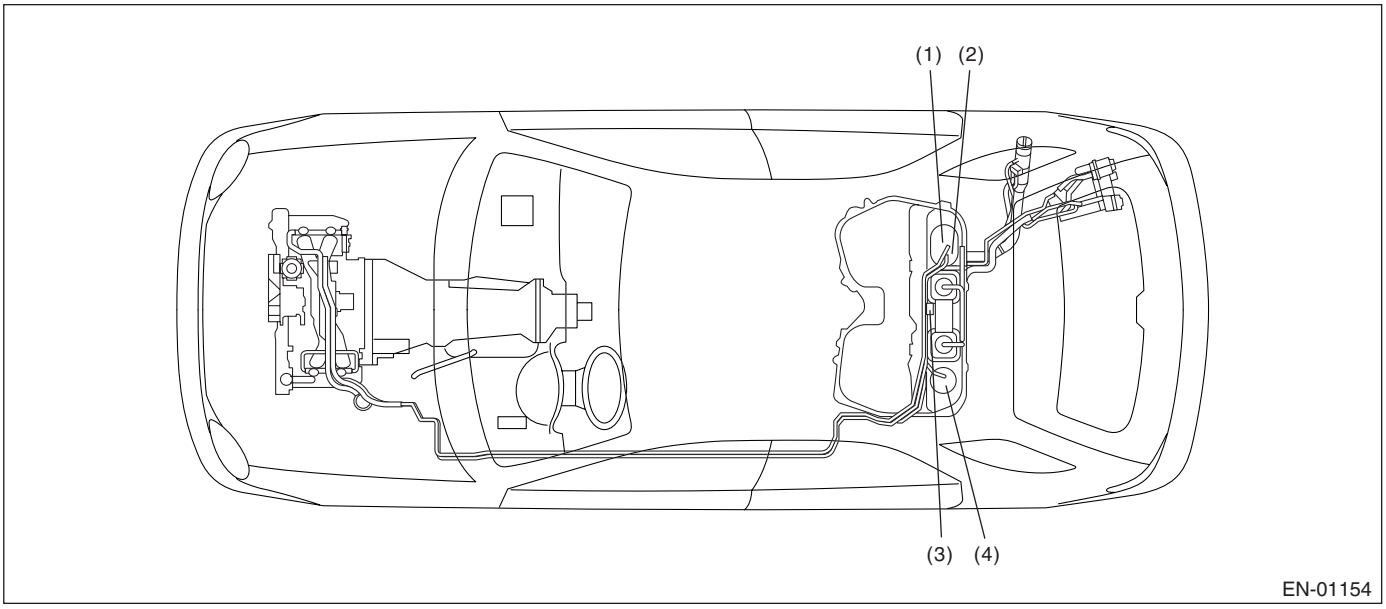
(1) Front oxygen (A/F) sensor
(2) Rear oxygen sensor
(3) Front catalytic converter
(4) Rear catalytic converter



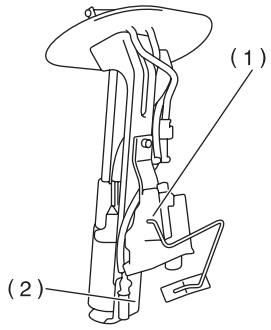


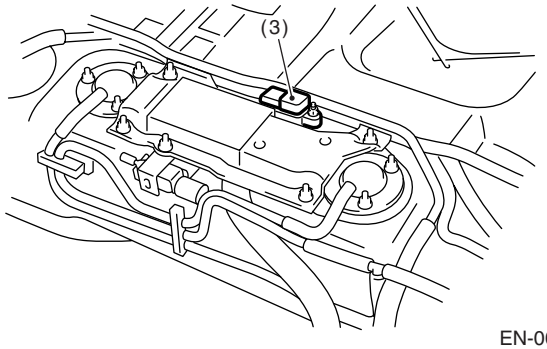


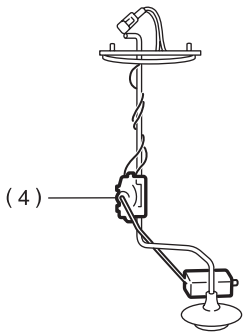




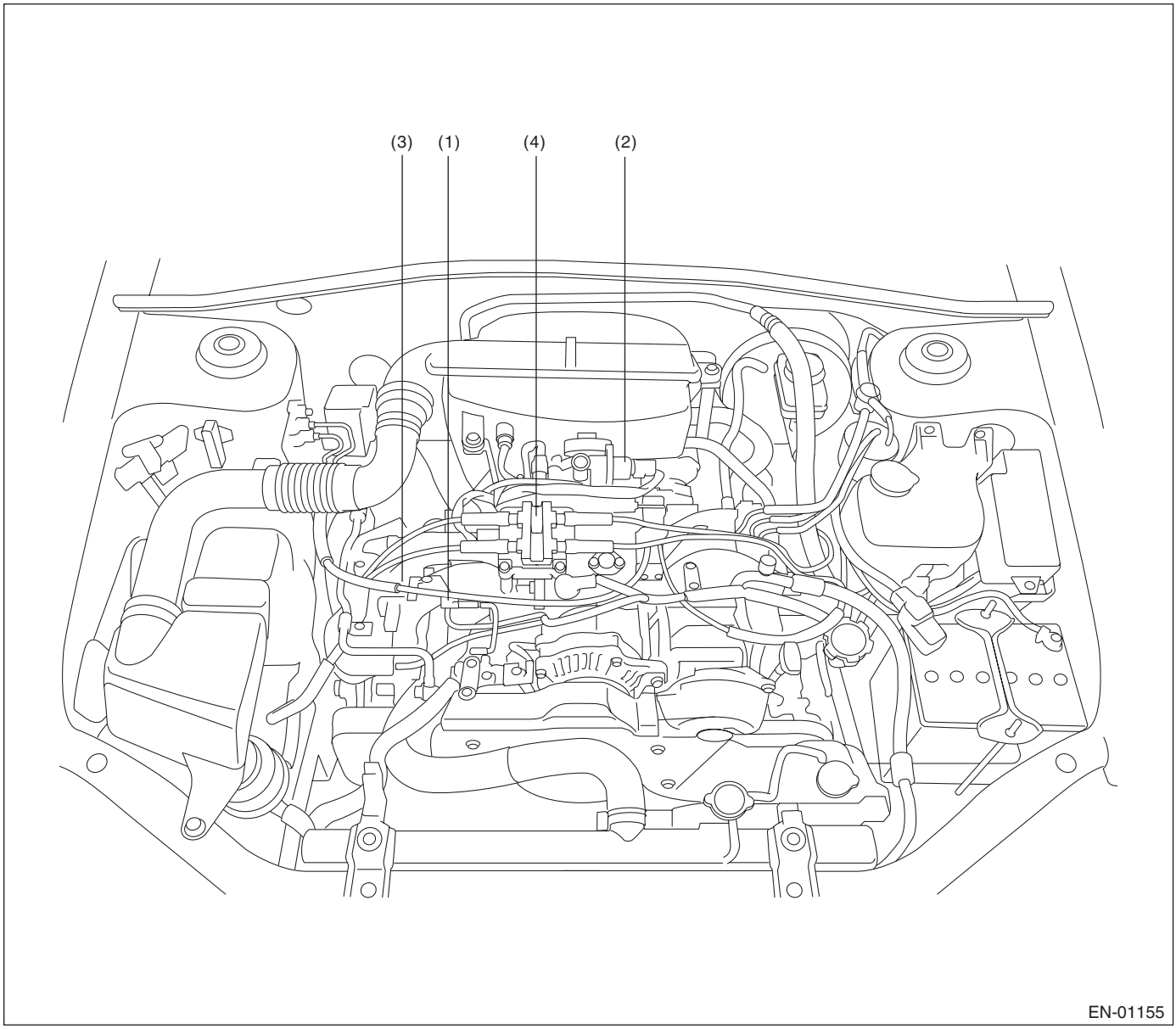
(1) Fuel level sensor
(2) Fuel temperature sensor
(3) Fuel tank pressure sensor
(4) Fuel sub level sensor



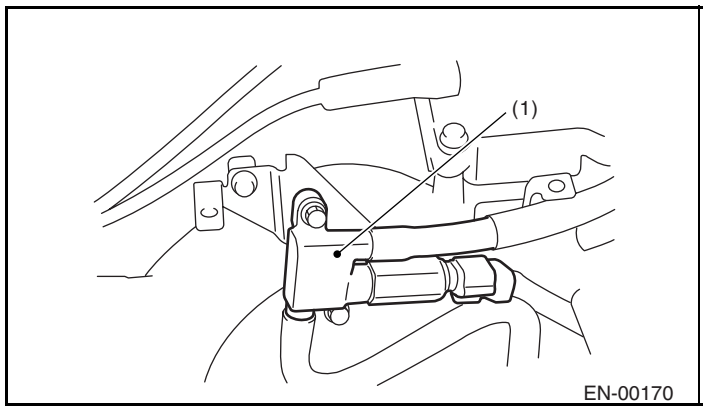


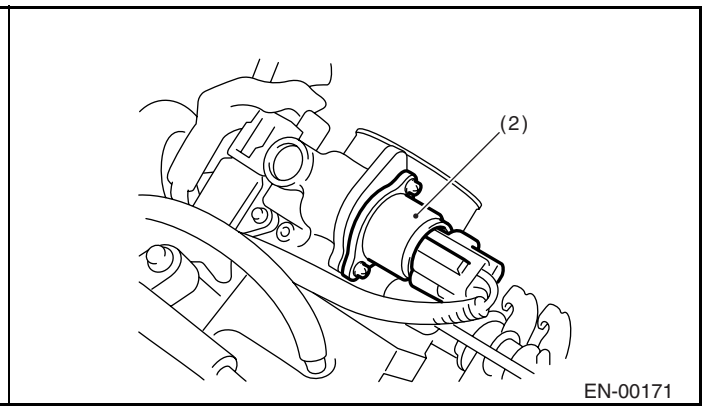


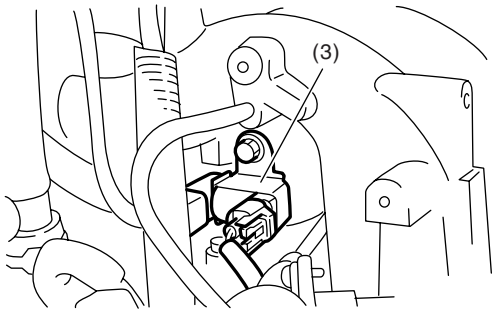
• SOLENOID VALVE, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



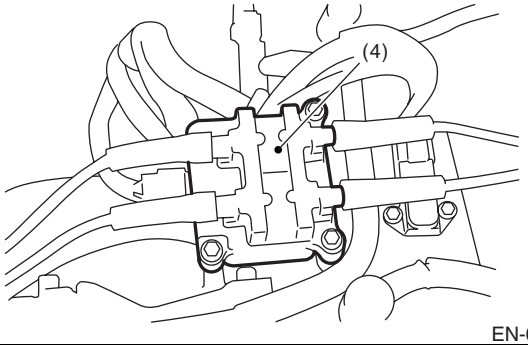
(1) Air assisted injector solenoid valve (3) Purge control solenoid valve (4) Ignition coil & ignitor ASSY
(2) Idle air control solenoid valve



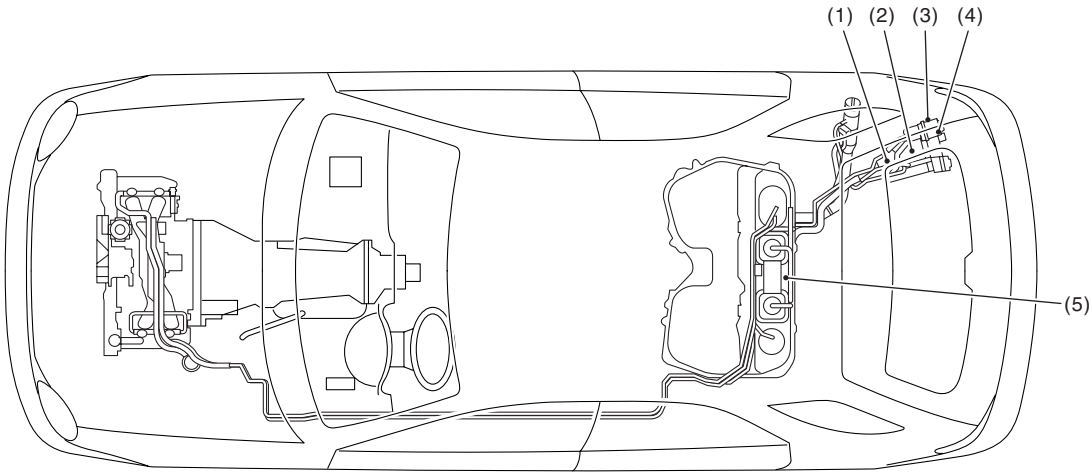




EN-00020

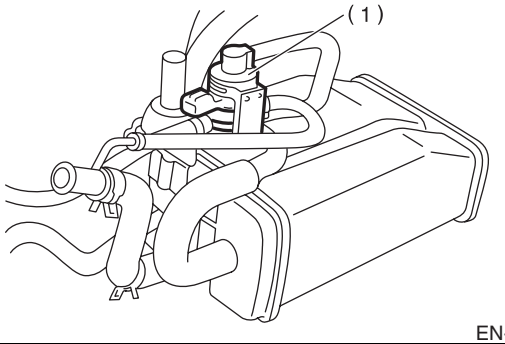


EN-00172

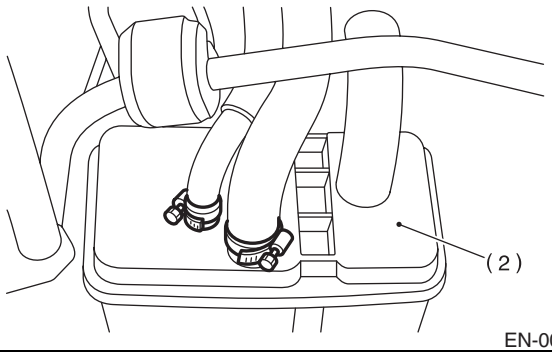


EN-01156

(1) Pressure control solenoid valve
(2) Canister
(3) Drain valve
(4) Drain filter
(5) Fuel tank sensor control valve

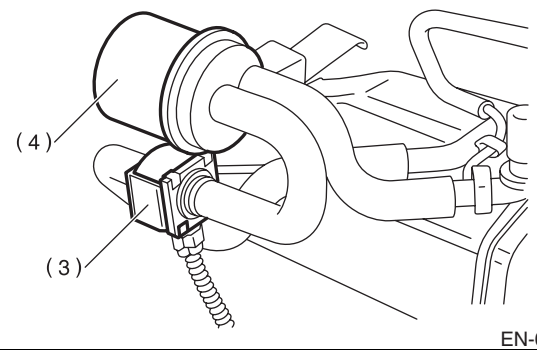


EN-00174

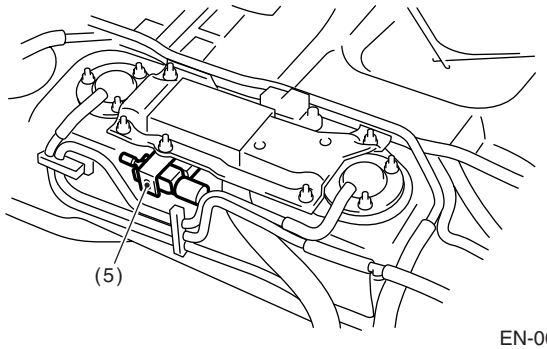


EN-00175

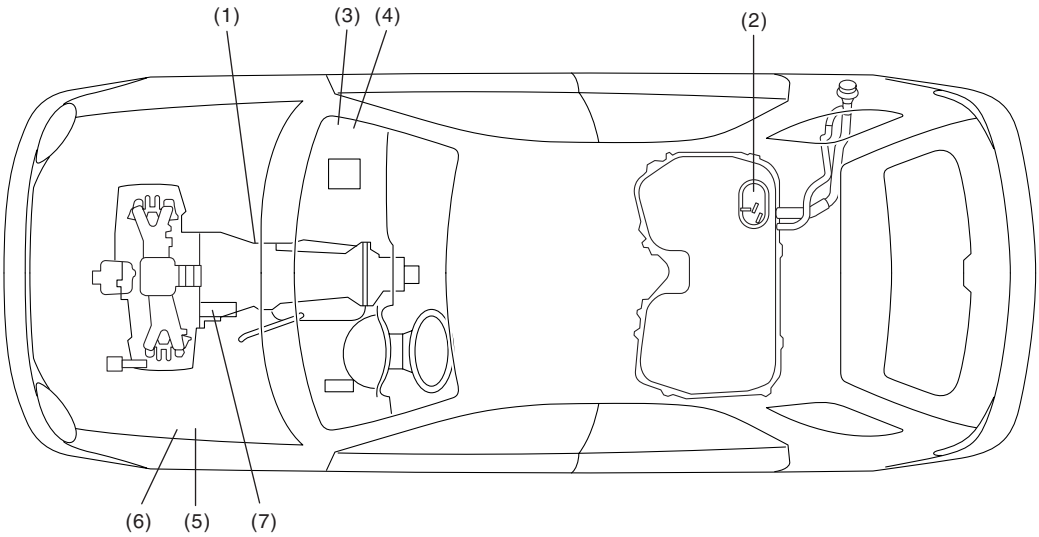
Electrical Components Location



EN-00176

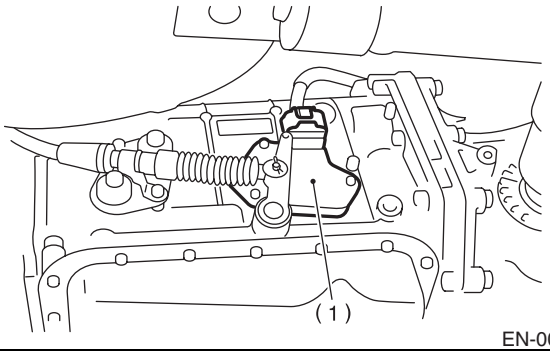


EN-00234

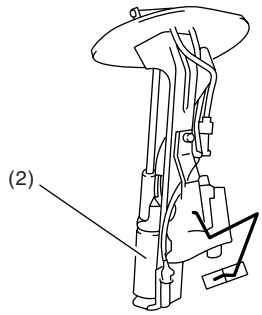


EN-01157

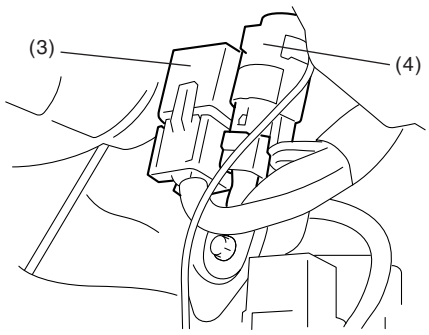
(1) Inhibitor switch
(2) Fuel pump
(3) Main relay
(4) Fuel pump relay
(5) Radiator main fan relay
(6) Radiator sub fan relay
(7) Starter



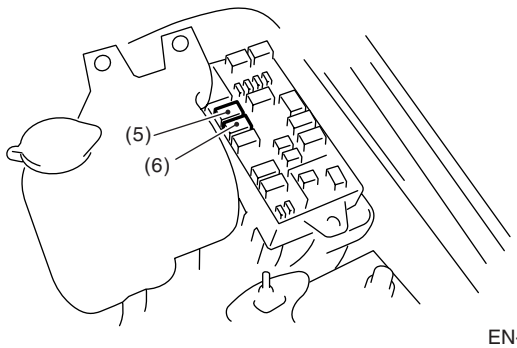
EN-00178



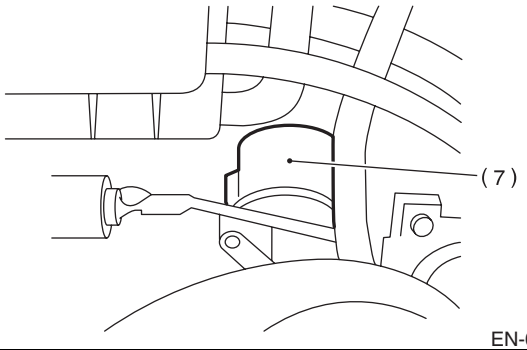
EN-00179



EN-01158



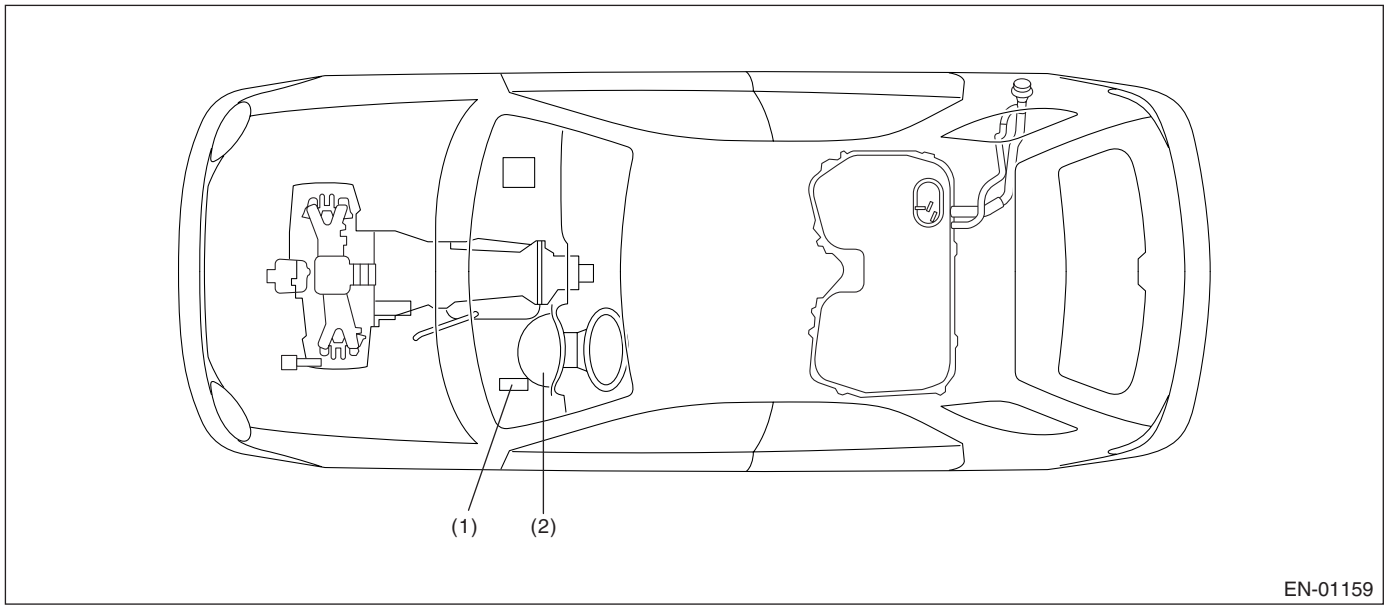
EN-01639



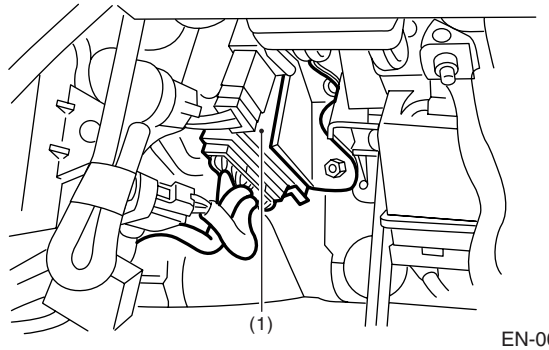
EN-00181

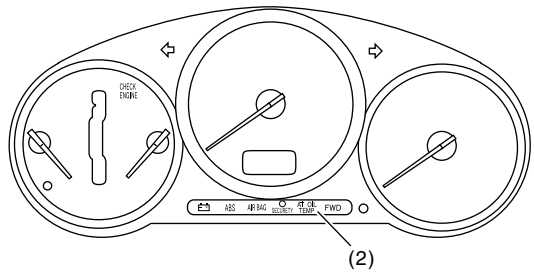
2. TRANSMISSION

• MODULE

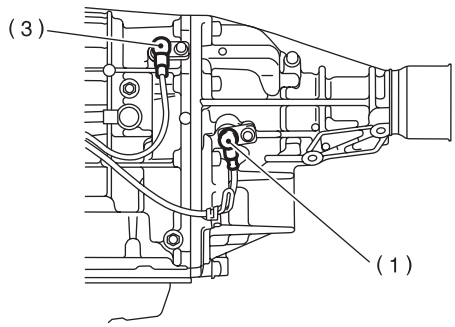


(1) Transmission control module (TCM) (AT model)
(2) AT diagnostic indicator light (AT model)

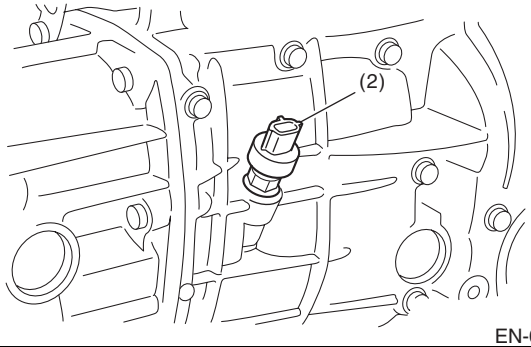




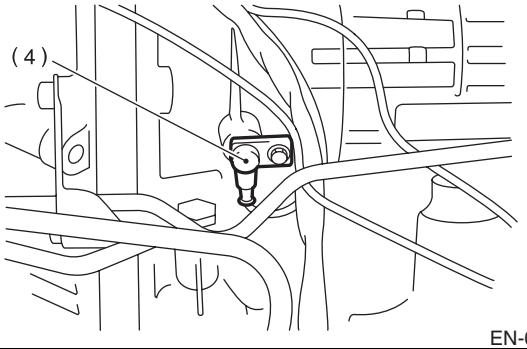
• SENSOR



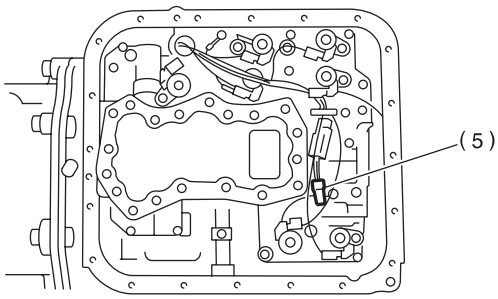
EN-00184



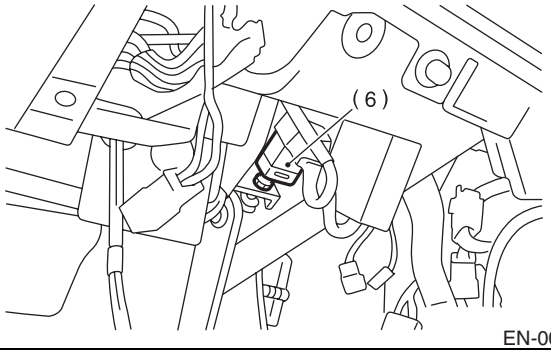
EN-01161



EN-00186



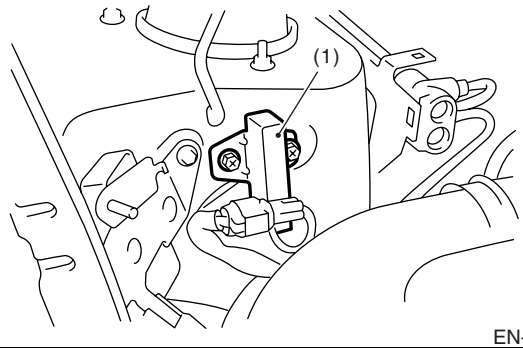
EN-00187



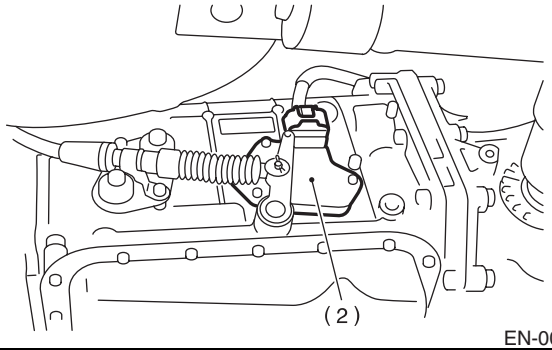
EN-00188

(1) Rear vehicle speed sensor (AT model)
(2) Front vehicle speed sensor (MT model)
(3) Front vehicle speed sensor (AT model)
(4) Torque converter turbine speed sensor
(5) ATF temperature sensor (AT model)
(6) Brake light switch

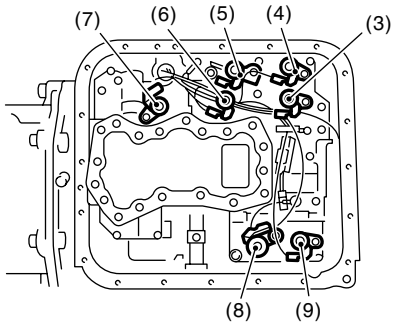
• SOLENOID VALVE AND SWITCH (AT MODELS)



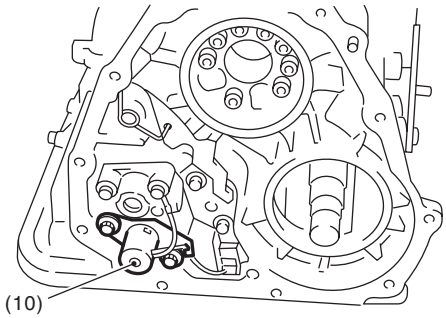
EN-00677



EN-00189



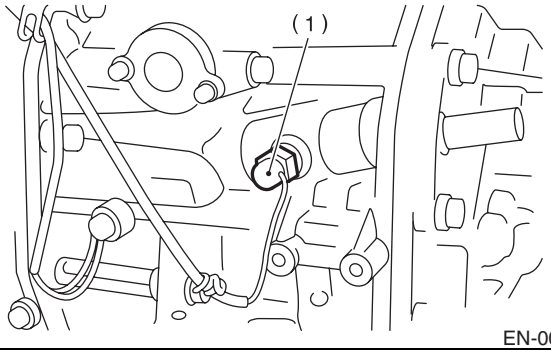
EN-00678



EN-00679

(1) Dropping resistor
(2) Inhibitor switch
(3) Shift solenoid valve 1
(4) Shift solenoid valve 2
(5) Line pressure duty solenoid
(6) Low clutch timing solenoid valve
(7) Lock up duty solenoid
(8) 2-4 brake duty solenoid
(9) 2-4 brake timing solenoid valve
(10) Transfer duty solenoid

• SOLENOID VALVE AND SWITCH (MT MODELS)

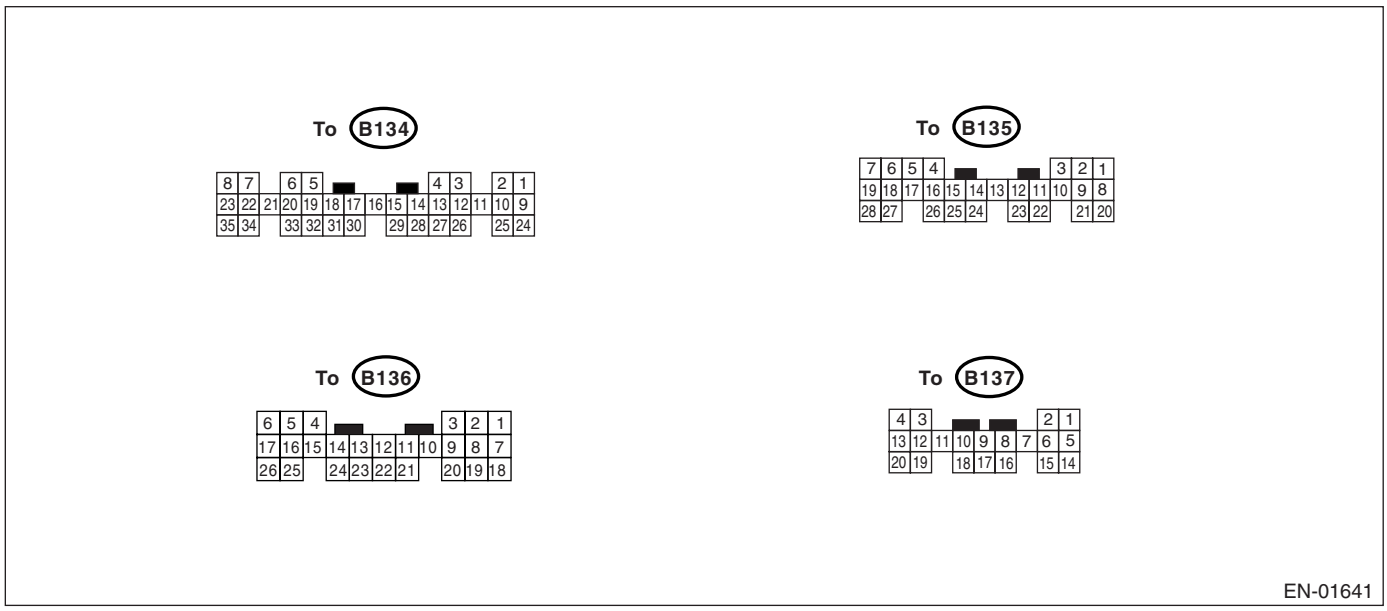


EN-00192

(1) Neutral position switch

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Crankshaft position sensor	Signal (+)	B135	7	0	−7 to +7	Sensor output waveform
	Signal (−)	B135	17	0	0	—
	Shield	B135	28	0	0	—
Camshaft position sensor	Signal (+)	B135	6	0	−7 to +7	Sensor output waveform
	Signal (−)	B135	18	0	0	—
	Shield	B135	28	0	0	—
Throttle position sensor	Signal	B135	13	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	B135	3	5	5	—
	GND (sensor)	B135	19	0	0	—
Rear oxygen sensor	Signal	B135	14	0	0 — 0.9	—
	Shield	B137	15	0	0	—
	GND (sensor)	B135	19	0	0	—
Front oxygen (A/F) sensor heater	Signal 1	B136	6	0 — 1.0	0 — 1.0	—
	Signal 2	B136	17	0 — 1.0	0 — 1.0	—
Rear oxygen sensor heater signal		B136	4	0 — 1.0	0 — 1.0	—
Engine coolant temperature sensor	Signal	B135	12	1.0 — 1.4	1.0 — 1.4	After warm-up the engine.
	GND (sensor)	B135	19	0	0	After warm-up the engine.
Vehicle speed signal		B137	10	0 or 5	0 or 5	“5” and “0” are repeatedly displayed when vehicle is driven.
Starter switch		B136	20	0	0	Cranking: 8 — 14

Engine Control Module (ECM) I/O Signal

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
A/C switch		B136	11	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		B136	10	10 — 13	13 — 14	—
Neutral position switch	MT	B136	21	ON: 12±0.5 OFF: 0		Switch is ON when gear is in neutral position.
	AT	B136	21	ON: 0 OFF: 12±0.5		Switch is ON when shift is in “N” or “P” position.
Test mode connector		B136	3	5	5	When connected: 0
Knock sensor	Signal	B135	16	2.8	2.8	—
	Shield	B135	27	0	0	—
Back-up power supply		B135	9	10 — 13	13 — 14	Ignition switch “OFF”: 10 — 13
Control unit power supply		B135	1	10 — 13	13 — 14	—
		B135	2	10 — 13	13 — 14	—
Sensor power supply		B135	3	5	5	—
Ignition control	#1, #2	B134	33	0	1 — 3.4	Waveform
	#3, #4	B134	32	0	1 — 3.4	Waveform
Fuel injector	#1	B134	34	10 — 13	1 — 14	Waveform
	#2	B134	23	10 — 13	1 — 14	Waveform
	#3	B134	22	10 — 13	1 — 14	Waveform
	#4	B134	8	10 — 13	1 — 14	Waveform
Idle air control solenoid valve	Signal 1	B134	20	—	1 — 13	Waveform
	Signal 2	B134	6	—	1 — 13	Waveform
	Signal 3	B134	5	—	1 — 13	Waveform
	Signal 4	B134	19	—	1 — 13	Waveform
Fuel pump relay control		B134	11	ON: 0.5 or less OFF: 10 — 13	0.5 or less	—
A/C relay control		B134	9	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	—
Radiator main fan relay control		B134	14	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	—
Radiator sub fan relay control		B134	13	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	Models with A/C
Self-shutoff control		B136	12	10 — 13	13 — 14	—
Malfunction indicator light		B134	28	—	—	Light “ON”: 1 or less Light “OFF”: 10 — 14
Engine speed output		B134	10	—	0 — 13, or more	Waveform
Torque control 1 signal		B136	1	5	5	—
Torque control 2 signal		B136	18	5	5	—
Torque control cut signal		B136	15	8	8	—
Purge control solenoid valve		B134	29	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
Air assisted injector solenoid valve		B134	12	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
Power steering switch		B136	9	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
Fuel tank sensor control valve		B134	1	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 10 — 13	—
Fuel temperature sensor		B137	5	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C (75°F)
Fuel level sensor		B135	25	0.12 — 4.75	0.12 — 4.75	—

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Fuel tank pressure sensor	Signal	B135	26	2.3 — 2.7	2.3 — 2.7	The valve obtained after the fuel filler cap was removed once and recapped.
	Power supply	B135	3	5	5	—
	GND (sensor)	B135	19	0	0	—
Pressure control solenoid valve		B134	4	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
Drain valve		B134	3	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
AT diagnosis input signal		B137	19	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	Waveform
Small light switch		B137	20	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Blower fan switch		B137	13	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Rear defogger switch		B137	4	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Front oxygen (A/F) sensor signal 1		B136	13	—	2.05 — 2.25	—
Front oxygen (A/F) sensor signal 2		B136	22	—	1.75 — 1.95	—
Front oxygen (A/F) sensor shield		B135	23	0	0	—
Manifold absolute pressure sensor		B135	15	4.0 — 4.8	1.1 — 1.9	—
Intake air temperature sensor		B137	6	3.15 — 3.33	3.15 — 3.33	Intake air temperature: 25°C (75°F)
SSM/GST communication line		B137	16	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	—
GND (sensors)		B135	19	0	0	—
GND (injectors)		B134	35	0	0	—
GND (ignition system)		B136	26	0	0	—
GND (power supply)		B134	7	0	0	—
GND (control systems)		B137	14	0	0	—
		B135	21	0	0	—
GND (oxygen sensor heater 1)		B136	5	0	0	—
GND (oxygen sensor heater 2)		B136	16	0	0	—

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Content	Specified data
Engine load	1.6 — 2.9 (%): Idling
	6.4 — 12.8 (%): 2,500 rpm racing

Measuring condition:
- After the engine is warmed-up.
- Gear position is in “N” or “P” range.
- A/C is turned OFF.
- All accessory switches are turned OFF.

7. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION

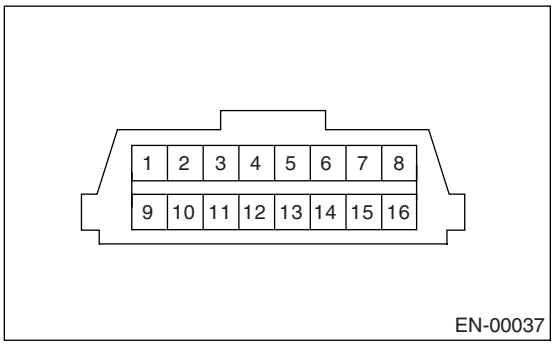
For electrical specification of TCM I/O signal, refer to 4AT section. <Ref. to 4AT(diag)-11, ELECTRICAL SPECIFICATION, Transmission Control Module (TCM) I/O Signal.>

8. Data Link Connector

A: NOTE

This connector is used both for OBD-II general scan tools and the Subaru Select Monitor.

CAUTION:
Do not connect any scan tools other than the OBD-II general scan tools and the Subaru Select Monitor, because the circuit for the Subaru Select Monitor may be damaged.



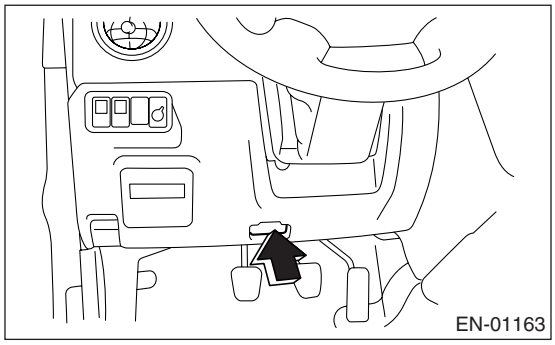
Terminal No.	Contents	Terminal No.	Contents
1	Power supply	9	Blank
2	Blank	10	Subaru Select Monitor signal
3	Blank	11	Blank
4	Blank	12	Ground
5	Blank	13	Ground
6	Test mode check signal 1	14	Blank
7	Blank	15	Blank
8	Test mode check signal 2	16	Blank

9. OBD-II General Scan Tool

A: OPERATION

1. HOW TO USE OBD-II GENERAL SCAN TOOL

1) Prepare a general scan tool (OBD-II general scan tool) required by SAE J1978.
2) Open the cover and connect the OBD-II general scan tool to data link connector located in the lower portion of instrument panel (on the driver's side).



3) Using the OBD-II general scan tool, call up DTC and freeze frame data.
OBD-II general scan tool functions consist of:
(1) MODE $01: Current powertrain diagnostic data
(2) MODE $02: Powertrain freeze frame data
(3) MODE $03: Emission-related powertrain DTC
(4) MODE $04: Clear/Reset emission-related diagnostic information
(5) MODE $06: Request on-board monitoring test results for non-continuously monitored systems
(6) MODE $07: Request on-board monitoring test results for continuously monitored systems
(7) MODE $09: Request vehicle information
Read out the data according to repair procedures. (For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual.)

NOTE:
For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>

2. MODE $01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refers to data denoting the current operating condition of analog input/output, digital input/output and/or the powertrain system.
A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
01	Number of emission-related powertrain DTC and malfunction indicator light status and diagnosis support information	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate from mass air flow sensor	g/sec
11	Throttle valve absolute opening angle	%
13	Check whether oxygen sensor is installed.	—
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor	V and %
1C	Supporting OBD system	—
24	A/F value and A/F sensor output voltage	— and V

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access generic OBD-II PIDs (MODE $01).

3. MODE $02 (POWERTRAIN FREEZE FRAME DATA)

Refers to data denoting the operating condition when trouble is sensed by the on-board diagnosis system. A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
02	DTC that caused CARB required freeze frame data storage	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate from mass air flow sensor	g/sec
11	Throttle valve opening angle	%

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access freeze frame data (MODE $02).

4. MODE $03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODE (DTC))

Refer to Read Diagnostic Trouble Code (DTC) for information about data denoting emission-related powertrain DTC. <Ref. to EN(H4SO)(diag)-36, Read Diagnostic Trouble Code (DTC).>

5. MODE $04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refers to the mode used to clear or reset emission-related diagnostic information (OBD-II trouble diagnostic information).

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE $04).

6. MODE $06

Refer to test value of troubleshooting and data of test limit on support data bit sequence table. List of support data is shown in the following table.

TID	CID	Test value & Test limit	Unit
$01	$01	Catalyst system efficiency below threshold	—
$02	$81	Exhaust gas recirculation control circuit range/performance	mmHg
	$02		
$03	$81	Evaporative emission control system (CPC open malfunction)	—
	$02	Evaporative emission control system small leak	pa
	$03	Evaporative emission control system small leak (Immediate normality judgment)	pa
	$04	Evaporative emission control system large leak	pa
	$05	Evaporative emission control system very small leak (Immediate normality judgment)	pa
	$06	Evaporative emission control system very small leak	pa
$05	$01	O_2 sensor circuit slow response (Bank 1 Sensor 1) Lean → Rich	millisecond
	$02	O_2 sensor circuit slow response (Bank 1 Sensor 1) Rich → Lean	
$06	$81	O_2 sensor circuit (Bank 1 Sensor 2) <$81 or $02>	V
	$02		
$07	$01	O_2 sensor circuit slow response (Bank 1 Sensor 2)	second
$0B	$81	O_2 sensor heater circuit (Bank 1 Sensor 2) <$81 or $02>	W
	$02		
$0C	$01	Coolant thermostat (Coolant temperature below thermostat regulating temperature)	°C
$0D	$01	Evaporative emission control system vent control circuit range/performance	Pa
	$82		

7. MODE $07

Refer to data of DTC (pending code) for troubleshooting result about emission in first time.

8. MODE $09

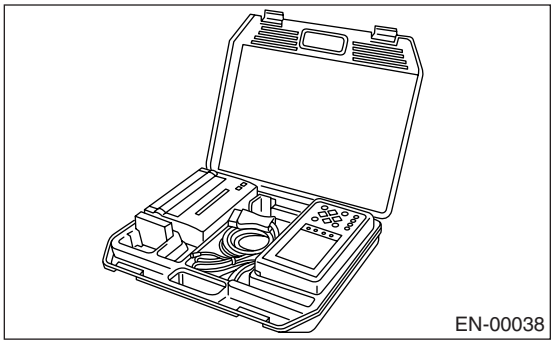
Refer to data of vehicle specification (VIN, calibration ID, etc.).

10.Subaru Select Monitor

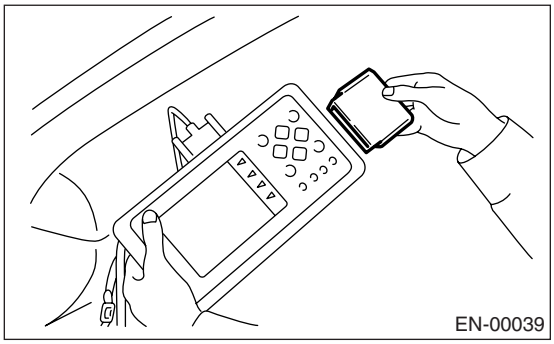
A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

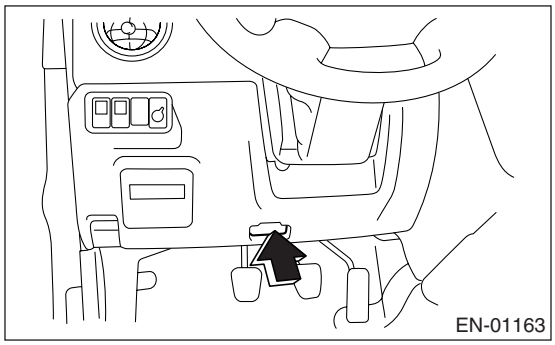
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4SO)(diag)-8, PREPARATION TOOL, General Description.>



2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4SO)(diag)-8, PREPARATION TOOL, General Description.>



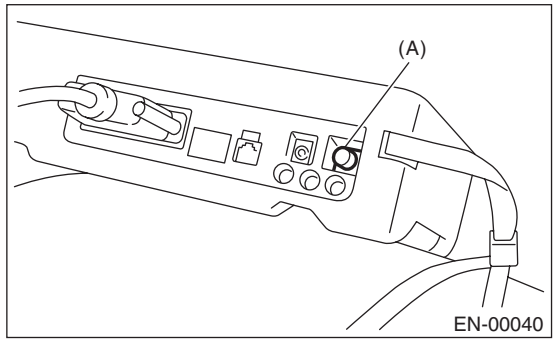
4) Connect the Subaru Select Monitor to data link connector.
(1) Data link connector located in the lower portion of instrument panel (on driver's side).



(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

6) Using the Subaru Select Monitor, call up DTC and various data, then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE (NORMAL MODE)

Refer to Read Diagnostic Trouble Code (DTC) for information about how to indicate DTC. <Ref. to EN(H4SO)(diag)-36, Read Diagnostic Trouble Code (DTC).>

3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE (OBD MODE)

Refer to Read Diagnostic Trouble Code (DTC) for information about how to indicate DTC. <Ref. to EN(H4SO)(diag)-36, Read Diagnostic Trouble Code (DTC).>

4. READ CURRENT DATA FOR ENGINE (NORMAL MODE)

1) On «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Vehicle speed signal	Vehicle Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Engine coolant temperature signal	Coolant Temp.	°C or °F
Ignition timing signal	Ignition Timing	deg
Throttle position signal	Throttle Opening Angle	%
Throttle position signal	Throttle Sensor Voltage	V
Injection pulse width	Fuel Injection #1 Pulse	ms
Idle air control signal	ISC Valve Step	STEP
Engine load data	Engine Load	%
Front oxygen (A/F) sensor output signal	A/F Sensor #1	—
Front oxygen (A/F) sensor resistance	A/F Sensor #1 Resistance	ohm
Rear oxygen sensor output signal	Rear O_2 Sensor	V
Short term fuel trim	A/F Correction #1	%
Knock sensor signal	Knocking Correction	deg
Atmospheric absolute pressure signal	Atmosphere Pressure	mmHg, kPa, inHg or psi
Intake manifold relative pressure signal	Mani. Relative Pressure	mmHg, kPa, inHg or psi
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psi
A/F correction (short term fuel trim) by rear oxygen sensor	A/F Correction #3	%
Long term whole fuel trim	A/F Learning #1	%
Front oxygen (A/F) sensor heater current	Front O_2 Heater #1	A
Rear oxygen sensor heater current	Rear O_2 Heater Current	A
Canister purge control solenoid valve duty ratio	CPC Valve Duty Ratio	%
Fuel level signal	Fuel Level	V
Fuel temperature signal	Fuel Temp	°C or °F
Fuel tank pressure signal	Fuel Tank Pressure	mmHg or kPa or inHg or psi
Intake air temperature signal	Intake Air Temp.	°C or °F
Learned ignition timing	Learned Ignition Timing	deg
Ignition switch signal	Ignition Switch	ON or OFF
Test mode connector signal	Test Mode Signal	ON or OFF
Neutral position switch signal	Neutral Position Switch	ON or OFF
Air conditioning switch signal	A/C Switch	ON or OFF
Air conditioning signal	A/C Compressor Signal	ON or OFF
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF
Fuel pump relay signal	Fuel Pump Relay	ON or OFF
Knocking signal	Knocking Signal	ON or OFF
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF
Power steering switch signal	P/S Switch	ON or OFF
Engine torque control signal #1	Torque Control Signal #1	ON or OFF
Engine torque control signal #2	Torque Control Signal #2	ON or OFF
Engine torque control permission signal	Torque Permission Signal	ON or OFF

Contents	Display	Unit of measure
Rear oxygen sensor rich signal	Rear O_2 Rich Signal	ON or OFF
Starter switch signal	Starter Switch Signal	ON or OFF
Idle switch signal	Idle Switch Signal	ON or OFF
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF
Rear defogger switch signal	Rear Defogger Switch	ON or OFF
Blower fan switch signal	Blower Fan Switch	ON or OFF
Small light switch signal	Light Switch	ON or OFF
Air assisted injector solenoid valve signal	Assist Air Sol. Valve	ON or OFF
AT/MT identification terminal	AT Model ID Signal	ON or OFF
Pressure control solenoid valve signal	PCV Solenoid Valve	ON or OFF
Vent control solenoid valve signal	Vent. Solenoid Valve	ON or OFF
Fuel tank sensor control valve signal	Tank Sensor Cntl Valve	ON or OFF

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

5. READ CURRENT DATA FOR ENGINE (OBD MODE)

1) On «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On «OBD Menu» display screen, select the {Current Data Display & Save} and press the [YES] key.
6) On «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
7) Using the scroll key, move the display screen up or down until the desired data is shown.

- A list of support data is shown in the following table.

Contents	Display	Unit of measure
Number of DTC	Number of DTC	—
Malfunction indicator light status	MI (MIL)	ON or OFF
Monitoring test of misfire	Misfire monitoring	Complete or incomplete
Monitoring test of fuel system	Fuel system monitoring	Complete or incomplete
Monitoring test of comprehensive component	Component monitoring	Complete or incomplete
Test of catalytic converter	Catalyst Diagnosis	Complete or incomplete
Test of heated catalytic converter	Heated catalyst	No support
Test of evaporative emission purge control system	Evaporative purge system	Complete or incomplete
Test of secondary air system	Secondary air system	No support
Test of air conditioning system refrigerant	A/C system refrigerant	No support
Test of oxygen sensor	Oxygen sensor	Complete or incomplete
Test of oxygen sensor heater	O_2 Heater Diagnosis	Complete or incomplete
Test of EGR system	EGR system	No support
Air fuel ratio control system for bank 1	Fuel System for Bank 1	—
Engine load data	Calculated load value	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Intake air amount	Mass Air Flow	g/s

Contents	Display	Unit of measure
Throttle position signal	Throttle Opening Angle	%
Rear oxygen sensor output signal	Oxygen Sensor #12	V
Air fuel ratio correction by rear oxygen sensor	Short term fuel trim #12	%
On-board diagnostic system	OBD System	—
A/F sensor check	A/F sensor	—
A/F sensor #11	A/F sensor #11	—
A/F sensor #11	A/F sensor #11	V

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

6. READ FREEZE FRAME DATA FOR ENGINE (OBD MODE)

1) On «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On «OBD Menu» display screen, select the {Freeze Frame Data} and press the [YES] key.
• A list of support data is shown in the following table.

Contents	Display	Unit of measure
DTC for freeze frame data	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank1	ON or OFF
Engine load data	Engine Load	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing signal	Ignition Timing	°
Intake air volume	Mass Air Flow	g/sec
Intake air temperature signal	Intake Air Temp	°C
Throttle position signal	Throttle Opening Angle	%

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

7. LED OPERATION MODE FOR ENGINE

1) On «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On «Data Display Menu» display screen, select the {Data & LED Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of support data is shown in the following table.

Contents	Display	Message	LED "ON" requirements
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is turned ON.
Test mode connector signal	Test Mode Signal	ON or OFF	When test mode connector is connected.
Neutral position switch signal	Neutral Position Switch	ON or OFF	When neutral position signal is entered.
Air conditioning switch signal	A/C Switch	ON or OFF	When air conditioning switch is turned ON.
Air conditioning relay signal	A/C Relay	ON or OFF	When air conditioning relay is in function.
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF	When radiator main fan relay is in function.
Fuel pump relay signal	Fuel Pump Relay	ON or OFF	When fuel pump relay is in function.
Knocking signal	Knocking Signal	ON or OFF	When knocking signal is entered.
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF	When radiator sub fan relay is in function.
Engine torque control signal #1	Torque Control Signal #1	ON or OFF	When engine torque control signal 1 is entered.
Engine torque control signal #2	Torque Control Signal #2	ON or OFF	When engine torque control signal 2 is entered.
Engine torque control permission signal	Torque Control Permit	ON or OFF	When engine torque control permission signal is entered.
Rear oxygen sensor rich signal	Rear O_2 Rich Signal	ON or OFF	When rear oxygen sensor mixture ratio is rich.
Starter switch signal	Starter Switch Signal	ON or OFF	When starter switch signal is entered.
Idle switch signal	Idle Switch Signal	ON or OFF	When idle switch signal is entered.
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF	When crankshaft position sensor signal is entered.
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF	When camshaft position sensor signal is entered.
Power steering switch signal	P/S Switch	ON or OFF	When power steering switch signal is entered.
Rear defogger switch signal	Rear Defogger Switch	ON or OFF	When rear defogger switch is turned ON.
Blower fan switch signal	Blower Fan Switch	ON or OFF	When blower fan switch is turned ON.
Small light switch signal	Light Switch	ON or OFF	When small light switch is turned ON.
Air assist injector solenoid valve signal	Assist Air Sol. Valve	ON or OFF	When air assist injector solenoid valve signal is input.
AT/MT identification terminal	AT Model ID Signal	ON or OFF	ON when vehicle is AT.
Pressure control solenoid valve signal	PCV Solenoid Valve	ON or OFF	When pressure control valve signal is entered.
Vent control solenoid valve signal	Vent Solenoid Valve	ON or OFF	When vent control valve signal is entered.
Fuel tank sensor control valve signal	Tank Sensor Cntl Valve	ON or OFF	When fuel tank sensor control signal entered.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

8. READ CURRENT DATA FOR AT

1) On «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
3) Press the [YES] key after the information of transmission type is displayed.
4) On «Transmission Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Vehicle Speed #1	km/h or MPH
Front vehicle speed sensor signal	Vehicle Speed #2	km/h or MPH
Engine speed signal	Engine Speed	rpm
Automatic transmission fluid temperature signal	ATF Temp.	°C or °F
Throttle position signal	Throttle Sensor Voltage	V
Gear position	Gear Position	—
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch control duty ratio	Lock Up Duty Ratio	%
Transfer clutch control duty ratio	Transfer Duty Ratio	%
Power supply for throttle position sensor	Throttle Sensor Power	V
Torque converter turbine speed signal	AT Turbine Speed	rpm
2-4 brake timing pressure control duty ratio	2-4B Duty Ratio	%
Manifold absolute pressure sensor voltage	Mani. Pressure Voltage	V
2 wheel drive switch signal	2WD Switch	ON or OFF
Kick down switch signal	Kick Down Switch	ON or OFF
Stop light switch signal	Stop light Switch	ON or OFF
Anti lock brake system signal	ABS Signal	ON or OFF
Cruise control system signal	Cruise Control Signal	ON or OFF
Neutral/Parking range signal	N/P Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
Shift control solenoid A	Shift Solenoid #1	ON or OFF
Shift control solenoid B	Shift Solenoid #2	ON or OFF
Torque control output signal #1	Torque Control Signal #1	ON or OFF
Torque control output signal #2	Torque Control Signal #2	ON or OFF
Torque control cut signal	Torque Control Cut Sig.	ON or OFF
2-4 brake timing control solenoid valve	2-4 Brake Timing Sol.	ON or OFF
Low clutch timing control solenoid valve	Low Clutch Timing Sol.	ON or OFF
Automatic transmission diagnosis indicator light	AT Diagnosis light	ON or OFF

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

11.Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On «Engine Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press the [YES] key.
5) On «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press the [YES] key.

NOTE:
• For detailed operation procedure, refer to SUBARU SELECT MONITOR OPERATION MANUAL.
• For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

1) On «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On «OBD Menu» display screen, select the {Diagnosis Code(s) Display} and press the [YES] key.
6) Make sure that a DTC is shown on display screen.

NOTE:
• For detailed operation procedure, refer to SUBARU SELECT MONITOR OPERATION MANUAL.
• For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>

3. OBD-II GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain DTC.
For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access emission-related powertrain DTC (MODE $03).

12.Inspection Mode

A: OPERATION

Carry out trouble diagnosis shown in the following DTC table.
When performing trouble diagnosis which is not shown in the DTC table, refer to the next item Drive cycle. <Ref. to EN(H4SO)(diag)-42, Drive Cycle.>

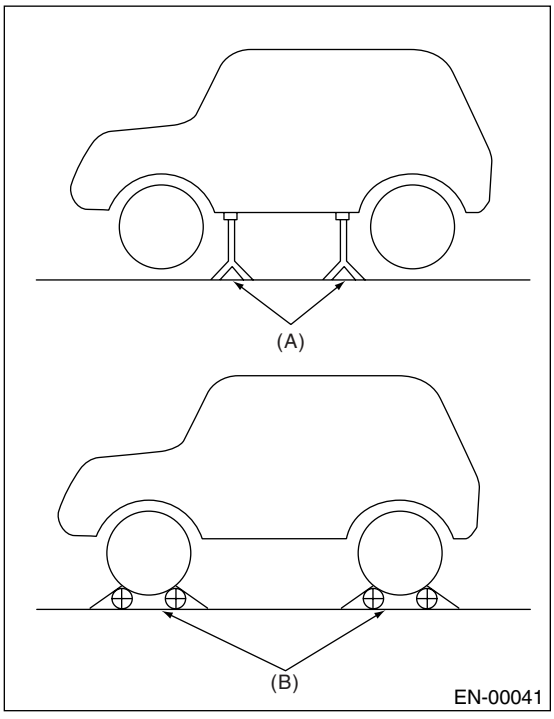
DTC	Item
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)
P0066	Air Assisted Injector Control Circuit or Circuit Low
P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance Problem
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input
P0112	Intake Air Temperature Circuit Low Input
P0113	Intake Air Temperature Circuit High Input
P0117	Engine Coolant Temperature Circuit Low Input
P0118	Engine Coolant Temperature Circuit High Input
P0122	Throttle/Pedal Position Sensor/Switch “A” Circuit Low Input
P0123	Throttle/Pedal Position Sensor/Switch “A” Circuit High Input
P0129	Atmospheric Pressure Sensor Circuit Range/Performance
P0130	O_2 Sensor Circuit (Bank 1 Sensor 1)
P0131	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)
P0132	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 1)
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)
P0182	Fuel Temperature Sensor “A” Circuit Low Input
P0183	Fuel Temperature Sensor “A” Circuit High Input
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)
P0335	Crankshaft Position Sensor “A” Circuit
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)
P0341	Camshaft Position Sensor “A” Circuit Range/Performance (Bank 1 or Single Sensor)
P0447	Evaporative Emission Control System Vent Control Circuit Open
P0448	Evaporative Emission Control System Vent Control Circuit Shorted
P0452	Evaporative Emission Control System Pressure Sensor Low Input
P0453	Evaporative Emission Control System Pressure Sensor High Input
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low
P0462	Fuel Level Sensor Circuit Low Input
P0463	Fuel Level Sensor Circuit High Input
P0502	Vehicle Speed Sensor Circuit Low Input
P0503	Vehicle Speed Sensor Intermittent/Erratic/High
P0512	Starter Request Circuit
P0519	Idle Control System Malfunction (Fail-Safe)
P0565	Cruise Control On Signal
P0604	Internal Control Module Random Access Memory (RAM) Error
P0691	Cooling Fan 1 Control Circuit Low
P0703	Torque Converter/Brake Switch “B” Circuit

DTC	Item
P0705	Transmission Range Sensor Circuit (PRNDL Input)
P0710	Transmission Fluid Temperature Sensor Circuit
P0716	Torque Converter Turbine Speed Sensor
P0720	Output Speed Sensor Circuit
P0726	Engine Speed Input Circuit Range/Performance
P0731	Gear 1 Incorrect Ratio
P0732	Gear 2 Incorrect Ratio
P0733	Gear 3 Incorrect Ratio
P0734	Gear 4 Incorrect Ratio
P0741	Torque Converter Clutch Circuit Performance or Stuck Off
P0743	Torque Converter Clutch Circuit Electrical
P0748	Pressure Control Solenoid “A” Electrical
P0753	Shift Solenoid “A” Electrical
P0758	Shift Solenoid “B” Electrical
P0771	Low Clutch Timing Solenoid
P0778	Pressure Control Solenoid “B” Electrical
P0785	Shift/Timing Solenoid
P0851	Neutral Switch Input Circuit Low
P0852	Neutral Switch Input Circuit High
P0864	TCM Communication Circuit Range/Performance
P0865	TCM Communication Circuit Low
P0866	TCM Communication Circuit High
P1110	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)
P1111	Atmospheric Pressure Sensor Circuit Malfunction (High Input)
P1134	A/F Sensor Micro-computer Problem
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low
P1420	Fuel Tank Pressure Control Solenoid Valve Circuit High
P1446	Fuel Tank Sensor Control Valve Circuit Low
P1447	Fuel Tank Sensor Control Valve Circuit High
P1510	ISC Solenoid Valve Signal #1 Circuit Malfunction (Low Input)
P1511	ISC Solenoid Valve Signal #1 Circuit Malfunction (High Input)
P1512	ISC Solenoid Valve Signal #2 Circuit Malfunction (Low Input)
P1513	ISC Solenoid Valve Signal #2 Circuit Malfunction (High Input)
P1514	ISC Solenoid Valve Signal #3 Circuit Malfunction (Low Input)
P1515	ISC Solenoid Valve Signal #3 Circuit Malfunction (High Input)
P1516	ISC Solenoid Valve Signal #4 Circuit Malfunction (Low Input)
P1517	ISC Solenoid Valve Signal #4 Circuit Malfunction (High Input)
P1518	Starter Switch Circuit Low Input
P1560	Back-up Voltage Circuit Malfunction
P1698	Engine Torque Control Cut Signal Circuit Low Input
P1699	Engine Torque Control Cut Signal Circuit High Input
P1700	Throttle Position Sensor
P1711	Engine Torque Control Signal 1 Circuit Malfunction
P1712	Engine Torque Control Signal 2 Circuit Malfunction

1. PREPARATION FOR THE INSPECTION MODE

1) Make sure the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)] and the battery voltage is 12 V or more.
2) Raise the vehicle using a garage jack and place on safety stands or drive the vehicle onto free rollers.

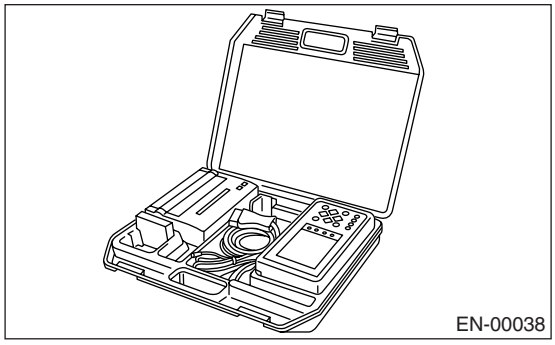
WARNING:
• Before raising the vehicle, ensure the parking brake is applied.
• Do not use a pantograph jack in place of a safety stand.
• Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
• Do not abruptly depress/release the clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
• In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.
• Since the rear wheels will also rotate, do not place anything near them. Also, make sure nobody goes in front of the vehicle.



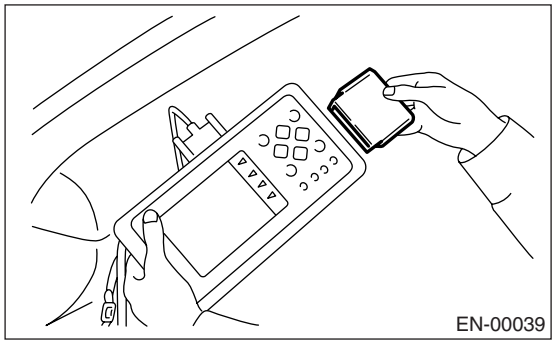
(A) Safety stand
(B) Free rollers

2. SUBARU SELECT MONITOR

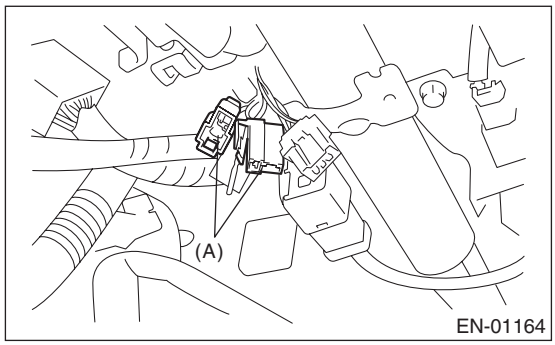
1) After clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4SO)(diag)-44, Clear Memory Mode.>
2) Warm up the engine.
3) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4SO)(diag)-8, PREPARATION TOOL, General Description.>



4) Connect the diagnosis cable to Subaru Select Monitor.
5) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4SO)(diag)-8, PREPARATION TOOL, General Description.>

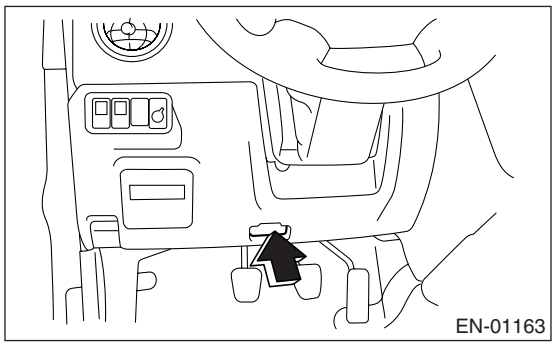


6) Connect the test mode connector (A) at the lower portion of instrument panel (on driver's side).



7) Connect the Subaru Select Monitor to data link connector.

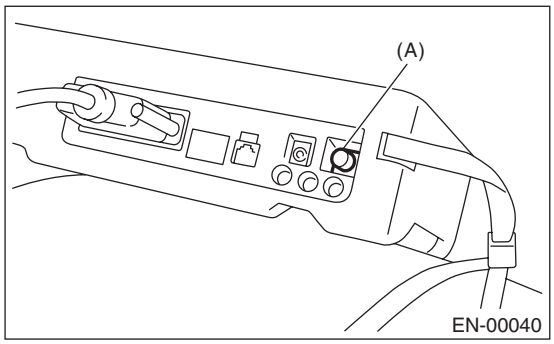
(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).



(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.

8) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

9) On «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
10) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
11) Press the [YES] key after the information of engine type is displayed.
12) On «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press the [YES] key.
13) When the "Perform Inspection (Dealer Check) Mode?" is shown on display screen, press the [YES] key.
14) Perform subsequent procedures as instructed on display screen.

• If trouble still remains in memory, the corresponding DTC appears on display screen.

NOTE:

• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

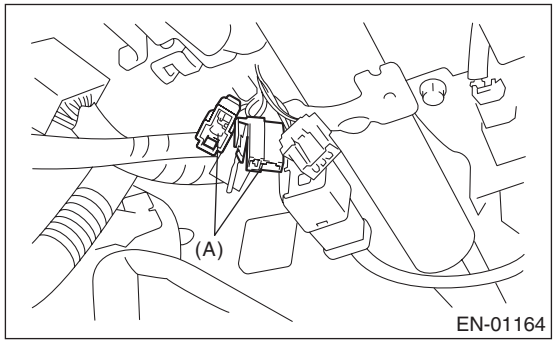
• For details concerning the DTC, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>

• Release the parking brake.

• The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

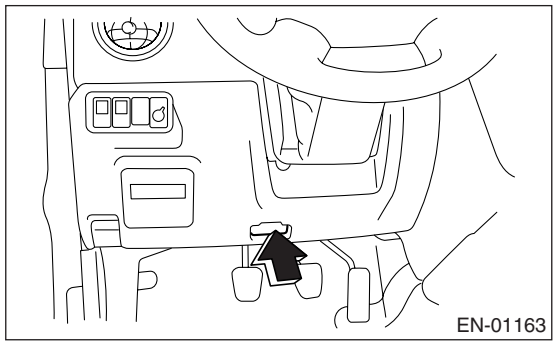
3. OBD-II GENERAL SCAN TOOL

1) After clearing memory, check for any remaining unresolved trouble data: <Ref. to EN(H4SO)(diag)-44, Clear Memory Mode.>
2) Warm up the engine.
3) Connect the test mode connector (A) at the lower side of instrument panel (on the driver's side).



4) Connect the OBD-II general scan tool to its data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.



5) Start the engine.

NOTE:

• Ensure the selector lever is placed in "P" position before starting. (AT models)

• Depress the clutch pedal when starting engine. (MT models)

6) Using the selector lever or shift lever, turn the "P" position switch and "N" position switch to ON.

7) Depress the brake pedal to turn brake switch ON. (AT models)
8) Keep the engine speed in 2,500 — 3,000 rpm range for 40 seconds.
9) Place the selector lever or shift lever in “D” position (AT models) or “1st” gear (MT models) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:
• On AWD vehicles, release the parking brake.
• The speed difference between front and rear wheels may light ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

10) Using the OBD-II general scan tool, check for DTC and record the result(s).

NOTE:
• For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.
• For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>

13.Drive Cycle

A: OPERATION

There are three drive patterns for the trouble diagnosis. Driving in the specified pattern allows to diagnose malfunctioning items listed below. After the malfunctioning items listed below are repaired, always check whether they correctly resume their functions by driving in the required drive pattern.

1. PREPARATION FOR DRIVE CYCLE

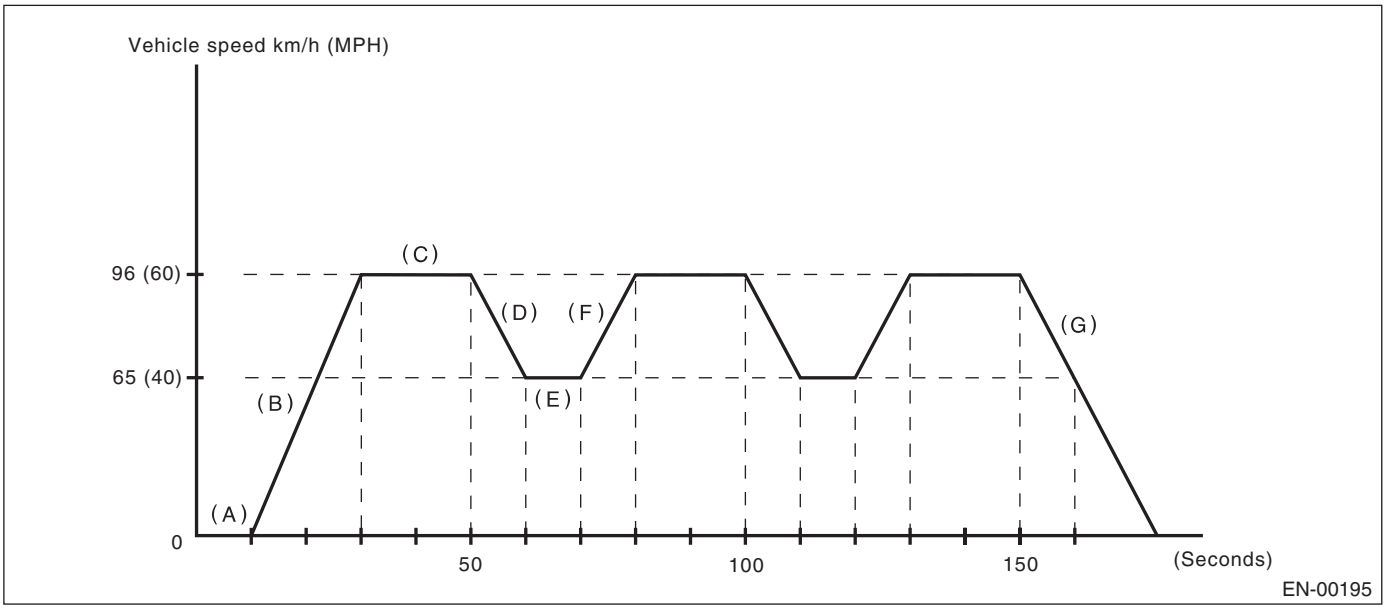
1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12 V or more.
2) After performing the diagnostics and cleaning memory, check for any remaining unresolved trouble data. <Ref. to EN(H4SO)(diag)-44, Clear Memory Mode.>
3) Separate the test mode connector.

NOTE:
• Except for the water temperature specified items at starting, the diagnosis is carried out after engine warm up.
• Carry out the diagnosis which is marked * on DTC twice, then, after finishing first diagnosis, stop the engine and do second time at the same condition.

2. AFTER RUNNING 20 MINUTES AT 80 KM/H (50 MPH), IDLE ENGINE FOR 1 MINUTE.

DTC	Item	Condition
P0067	Air Assisted Injector Control Circuit High	Coolant temperature at start is less than 60°C (140°F).
*P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	Coolant temperature at start is less than 20°C (68°F).
*P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	—
*P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	—
*P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	—
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
*P0442	Evaporative Emission Control System Leak Detected (small leak)	—
*P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	—
*P0456	Evaporative Emission Control System Leak Detected (very small leak)	—
*P0457	Evaporative Emission Control System Leak Detected (fuel cap loose/off)	—
*P0459	Evaporative Emission Control System Purge Control Valve Circuit High	—
*P0461	Fuel Level Sensor Circuit Range/Performance	—
*P0692	Cooling Fan 1 Control Circuit High	—
P1137	O_2 Sensor Circuit (Bank1 Sensor1)	—
P1443	Vent Control Solenoid Valve Function Problem	—
*P1448	Fuel Tank Sensor Control Valve Range/Performance Problem	—
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	—
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	—

3. DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN



(A) Idle engine for 1 minute.
(B) Accelerate to 96 km/h (60 MPH) within 20 seconds.
(C) Drive vehicle at 96 km/h (60 MPH) for 20 seconds.
(D) Decelerate with fully closed throttle to 65 km/h (40 MPH).
(E) Drive vehicle at 65 km/h (40 MPH) for 10 seconds.
(F) Accelerate to 96 km/h (60 MPH) within 10 seconds.
(G) Stop vehicle with throttle fully closed.

DTC	Item	Condition
*P0065	Air Assisted Injector Control Range/Performance	—
*P0121	Throttle/Pedal Position Sensor/Switch “A” Circuit Range/Performance	—
*P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	—
*P0301	Cylinder 1 Misfire Detected	Diagnosis frequency is different from misfire ratio.
*P0302	Cylinder 2 Misfire Detected	Diagnosis frequency is different from misfire ratio.
*P0303	Cylinder 3 Misfire Detected	Diagnosis frequency is different from misfire ratio.
*P0304	Cylinder 4 Misfire Detected	Diagnosis frequency is different from misfire ratio.

4. TEN MINUTES IDLING

NOTE:
Drive the vehicle at 10 km/h (6 MPH) or more before diagnosis.

DTC	Item	Condition
*P0111	Intake Air Temperature Circuit Range/Performance	Coolant temperature at start is less than 30°C (86°F).
*P0171	System Too Lean (Bank 1)	
*P0172	System Too Rich (Bank 1)	
*P0464	Fuel Level Sensor Circuit Intermittent	
*P0483	Cooling Fan Rationality Check	
*P0506	Idle Control System RPM Lower Than Expected	
*P0507	Idle Control System RPM Higher Than Expected	

14.Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On «Engine Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
5) When the 'Done' and 'Turn Ignition Switch OFF' are shown on display screen, turn the ignition switch to OFF, and then turn the Subaru Select Monitor to OFF.

NOTE:
• After the memory has been cleared, the idle air control solenoid valve must be initialized. To do this, turn the ignition switch to ON position. Wait 3 seconds before starting the engine.
• For detailed operation procedure, refer to SUBARU SELECT MONITOR OPERATION MANUAL.

2. SUBARU SELECT MONITOR (OBD MODE)

1) On «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On «OBD Menu» display screen, select the {4. Diagnosis Code(s) Cleared} and press the [YES] key.
6) When the 'Clear Diagnostic Code?' is shown on the display screen, press the [YES] key.
7) Turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
• After the memory has been cleared, the idle air control solenoid valve must be initialized. To do this, turn the ignition switch to ON position. Wait 3 seconds before starting the engine.
• For detailed operation procedure, refer to SUBARU SELECT MONITOR OPERATION MANUAL.

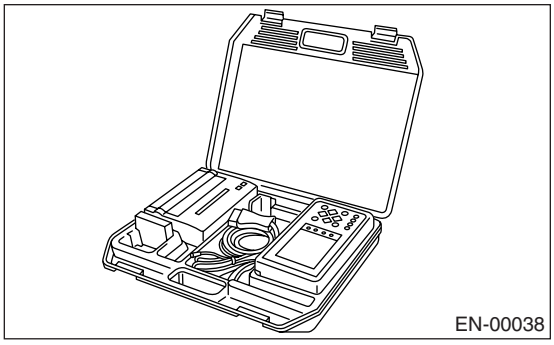
3. OBD-II GENERAL SCAN TOOL

For clear memory procedures using the OBD-II general scan tool, refer to OBD-II General Scan Tool Instruction Manual.
After the memory has been cleared, the idle air control solenoid valve must be initialized. To do this, turn the ignition switch to ON position. Wait 3 seconds before starting the engine.

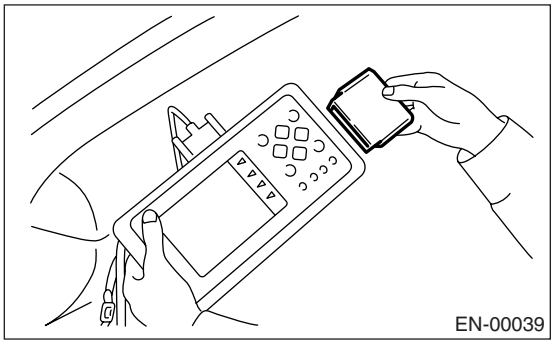
15. Compulsory Valve Operation Check Mode

A: OPERATION

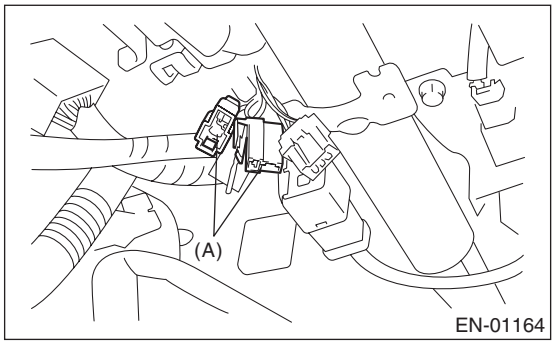
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4SO)(diag)-8, PREPARATION TOOL, General Description.>



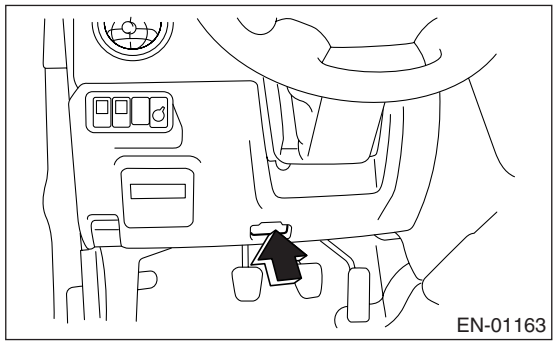
2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4SO)(diag)-8, PREPARATION TOOL, General Description.>



4) Connect the test mode connector (A) at the lower portion of instrument panel (on driver's side).



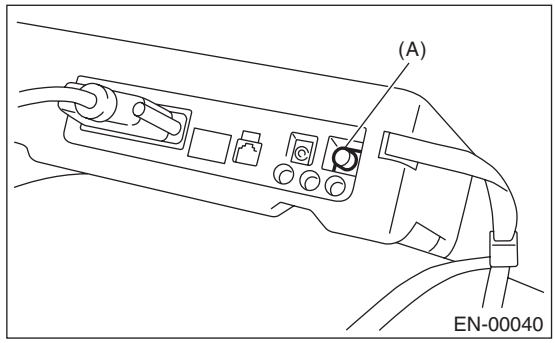
5) Connect the Subaru Select Monitor to data link connector.
(1) Data link connector is located in the lower portion of instrument panel (on driver's side).



(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

7) On «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
8) On «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
9) Press the [YES] key after the information of engine type is displayed.
10) On «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press the [YES] key.
11) On «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press the [YES] key.
12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press the [YES] key.
13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

• A list of support data is shown in the following table.

Contents	Display
Compulsory fuel pump relay operation check	Fuel Pump Relay
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Solenoid Valve
Compulsory air assist injector solenoid valve operation check	AAI Solenoid Valve
Compulsory pressure control solenoid valve operation check	PCV Solenoid Valve
Compulsory air assist vent control solenoid valve operation check	Vent Control Solenoid Valve
Compulsory fuel tank sensor control solenoid valve operation check	Fuel Tank Sensor Control Valve

NOTE:
• The following parts will be displayed but not functional because they are not installed on vehicle.

Display
Turbocharger Wastegate Solenoid
ASV Solenoid Valve
FICD Solenoid
Pressure Switching Sol. 1
Pressure Switching Sol. 2
Turbocharger Wastegate Solenoid

• For detailed operation procedure, refer to SUBARU SELECT MONITOR OPERATION MANUAL.

16.Malfunction Indicator Light

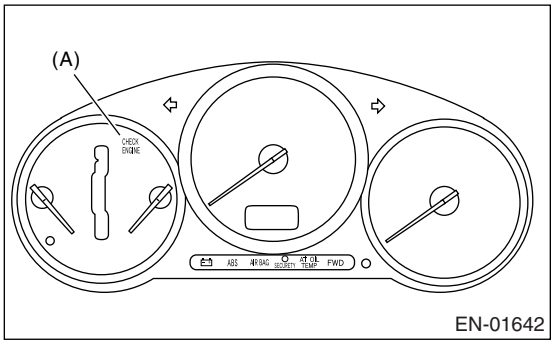
A: PROCEDURE

1. Activation of malfunction indicator light. <Ref. to EN(H4SO)(diag)-48, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Malfunction indicator light does not come on. <Ref. to EN(H4SO)(diag)-49, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON., Malfunction Indicator Light.>
↓
3. Malfunction indicator light does not go off. <Ref. to EN(H4SO)(diag)-51, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF., Malfunction Indicator Light.>
↓
4. Malfunction indicator light does not blink at a cycle of 3 Hz. <Ref. to EN(H4SO)(diag)-52, MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 HZ., Malfunction Indicator Light.>
↓
5. Malfunction indicator light remains blinking at a cycle of 3 Hz. <Ref. to EN(H4SO)(diag)-54, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 HZ., Malfunction Indicator Light.>

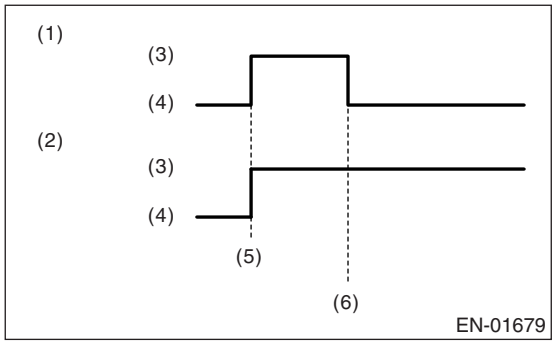
B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

1) When the ignition switch is turned to ON (engine off), the malfunction indicator light (A) in the combination meter illuminates.

NOTE:
If the malfunction indicator light does not illuminate, perform diagnostics of the malfunction indicator light circuit or the combination meter circuit. <Ref. to EN(H4SO)(diag)-49, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON., Malfunction Indicator Light.>

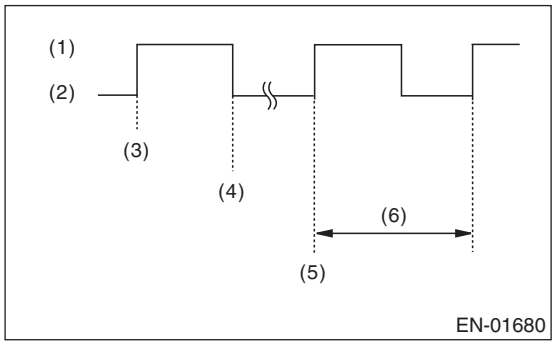


2) After starting the engine, the malfunction indicator light goes out. If it does not, either the engine or the emission control system is malfunctioning.



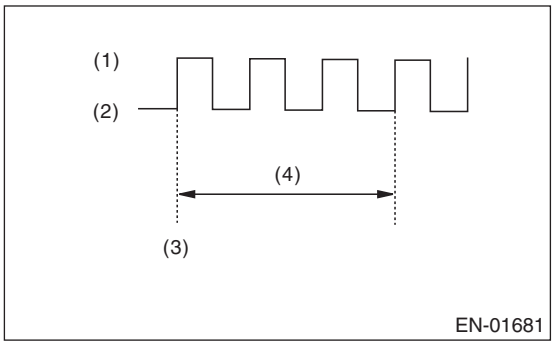
(1) No trouble
(2) Trouble occurs
(3) ON
(4) OFF
(5) Ignition switch ON
(6) Engine start

3) If the diagnosis system senses a misfire which could damage the catalyzer, the malfunction indicator light will blink at a cycle of 1 Hz.



(1) ON
(2) OFF
(3) Ignition switch ON
(4) Engine start
(5) Misfire start
(6) 1 second

4) When the ignition switch is turned to ON (engine off) or to “START” with test mode connector connected, the malfunction indicator light blinks at a cycle of 3 Hz.



(1) ON
(2) OFF
(3) Ignition switch ON
(4) 1 second

C: MALFUNCTION INDICATOR LIGHT DOES NOT COME ON.

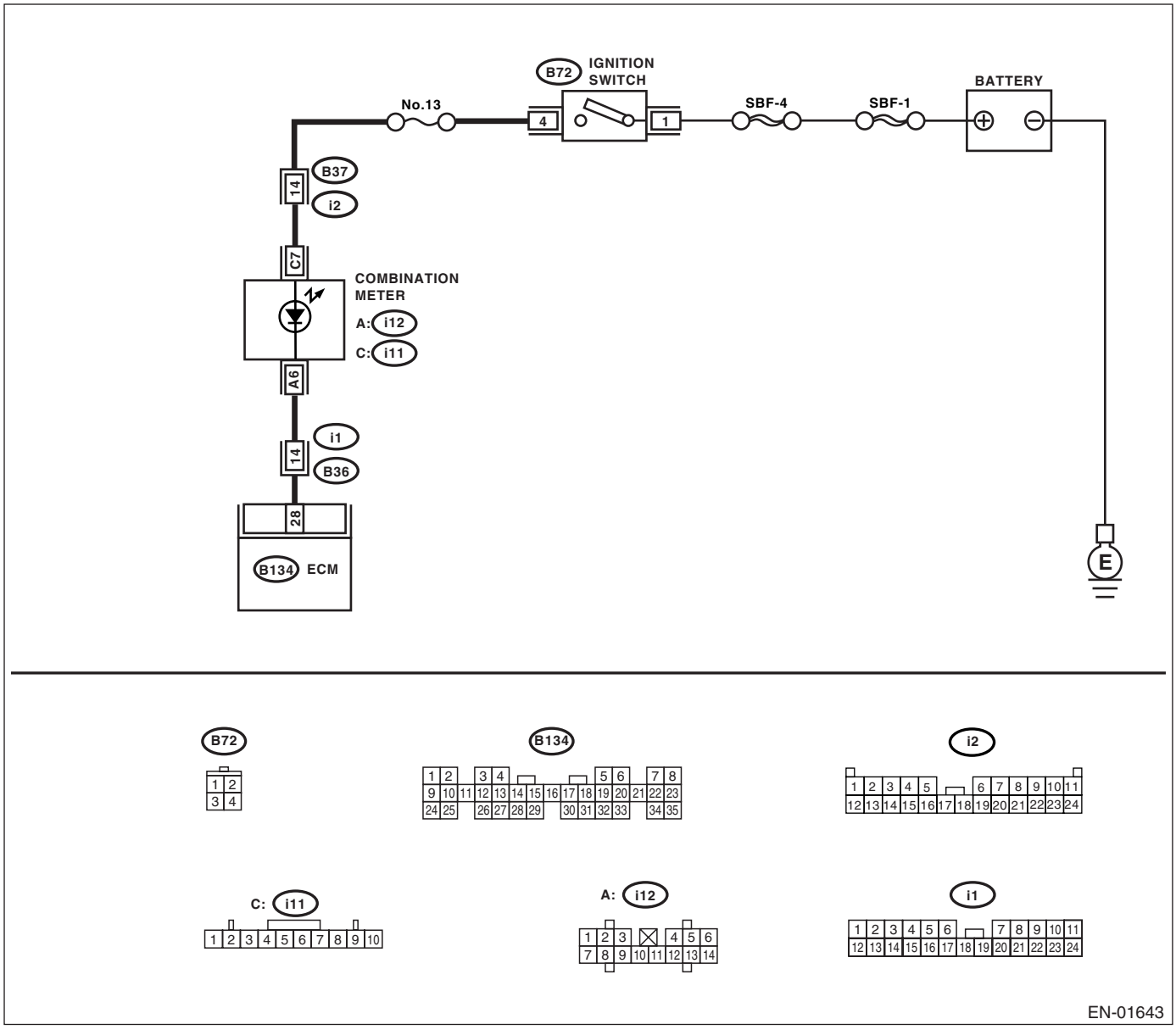
DIAGNOSIS:

The malfunction indicator light circuit is open or shorted.

TROUBLE SYMPTOM:

When the ignition switch is turned ON (engine OFF), malfunction indicator light does not come on.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 28 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **4.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check poor contact by shaking or pulling ECM connector and harness.	Does the malfunction indicator light illuminate?	Repair poor contact in ECM connector.	Go to step **3.**
3	**CHECK ECM CONNECTOR.** Check the ECM connector connection.	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Repair connection of ECM connector.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-10, Combination Meter Assembly.> 3) Disconnect the connector from ECM and combination meter. 4) Measure the resistance of harness between ECM and combination meter connector. ***Connector & terminal*** ***(B134) No. 28 — (i12) No. 6:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector
5	**CHECK POOR CONTACT.** Check poor contact in combination meter connector.	Is there poor contact in combination meter connector?	Repair poor contact in combination meter connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i11) No. 7 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Replace the combination meter circuit board. <Ref. to IDI-10, Combination Meter Assembly.>	Check the following and repair if necessary. NOTE: • Blown out fuse (No. 13). • Open or short circuit in harness between fuse (No. 13) and battery terminal • Poor contact in ignition switch connector

D: MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF.

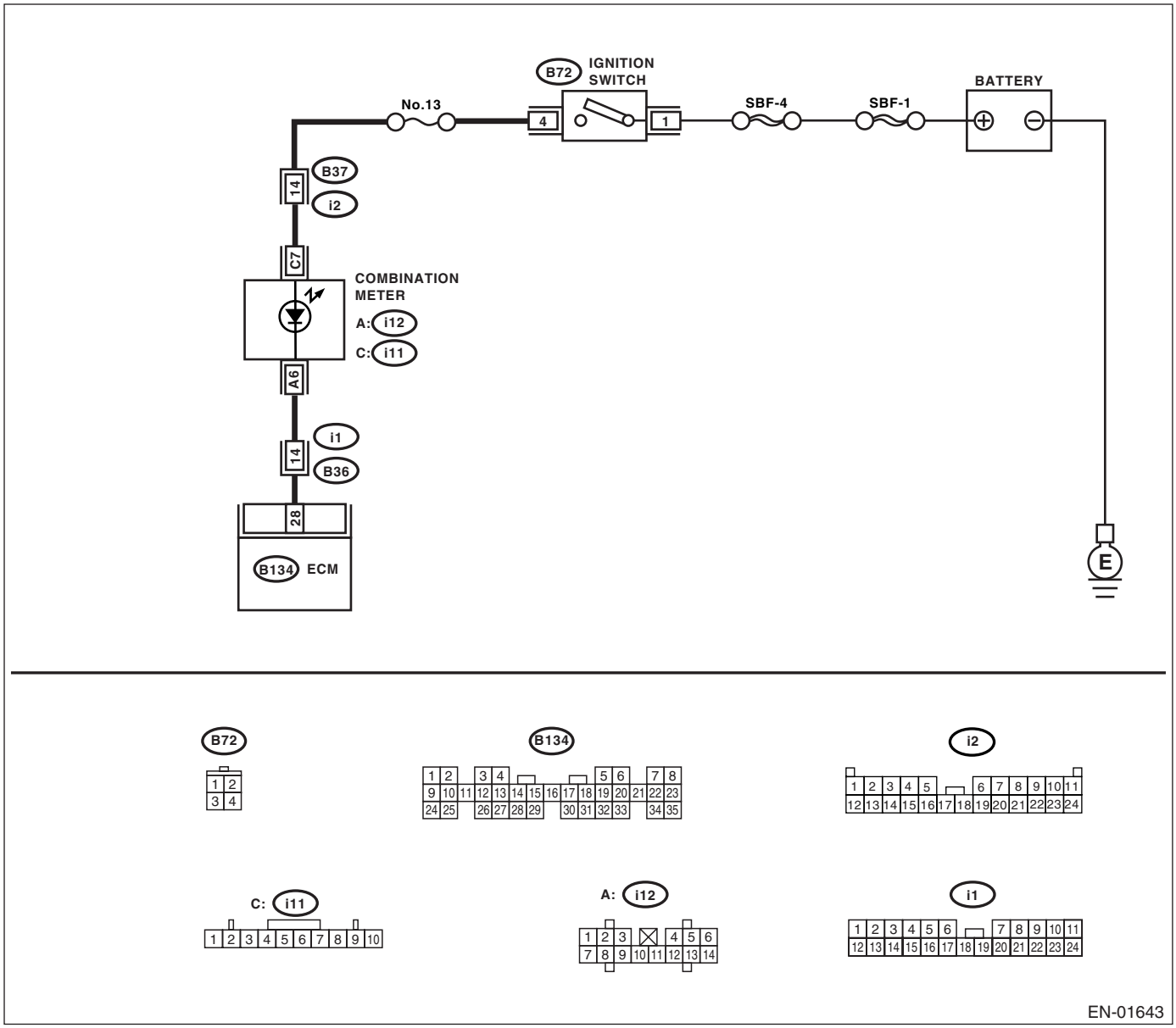
DIAGNOSIS:

The malfunction indicator light circuit is shorted.

TROUBLE SYMPTOM:

Although malfunction indicator light comes on when the engine runs, DTC is not shown on Subaru select monitor or OBD-II general scan tool display.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Dose the malfunction indicator light illuminate?	Repair short circuit in harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

E: MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 Hz.

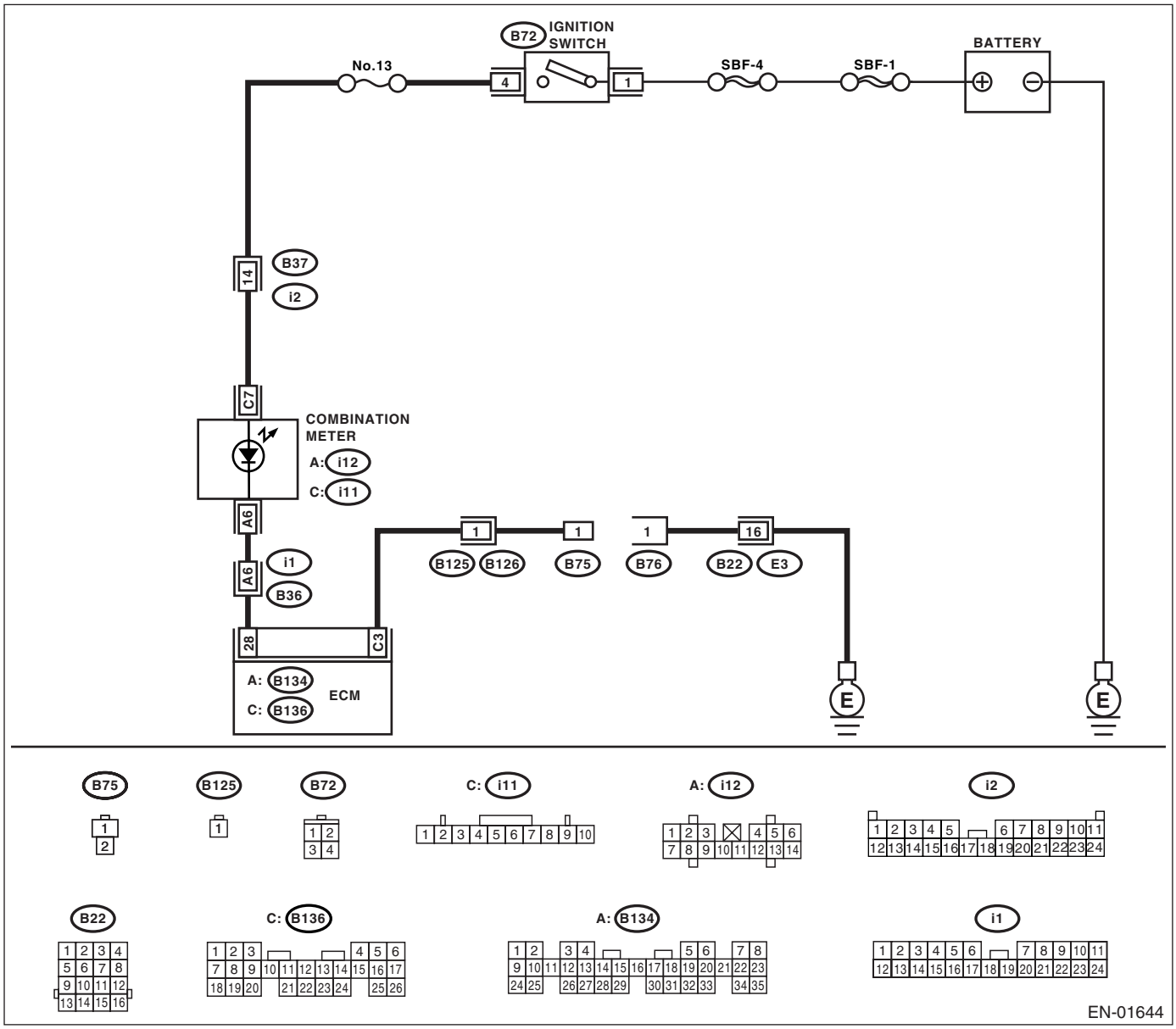
DIAGNOSIS:

- The malfunction indicator light circuit is open or shorted.
- Test mode connector circuit is in open.

TROUBLE SYMPTOM:

When in inspection mode, malfunction indicator light does not blink at a cycle of 3 Hz.

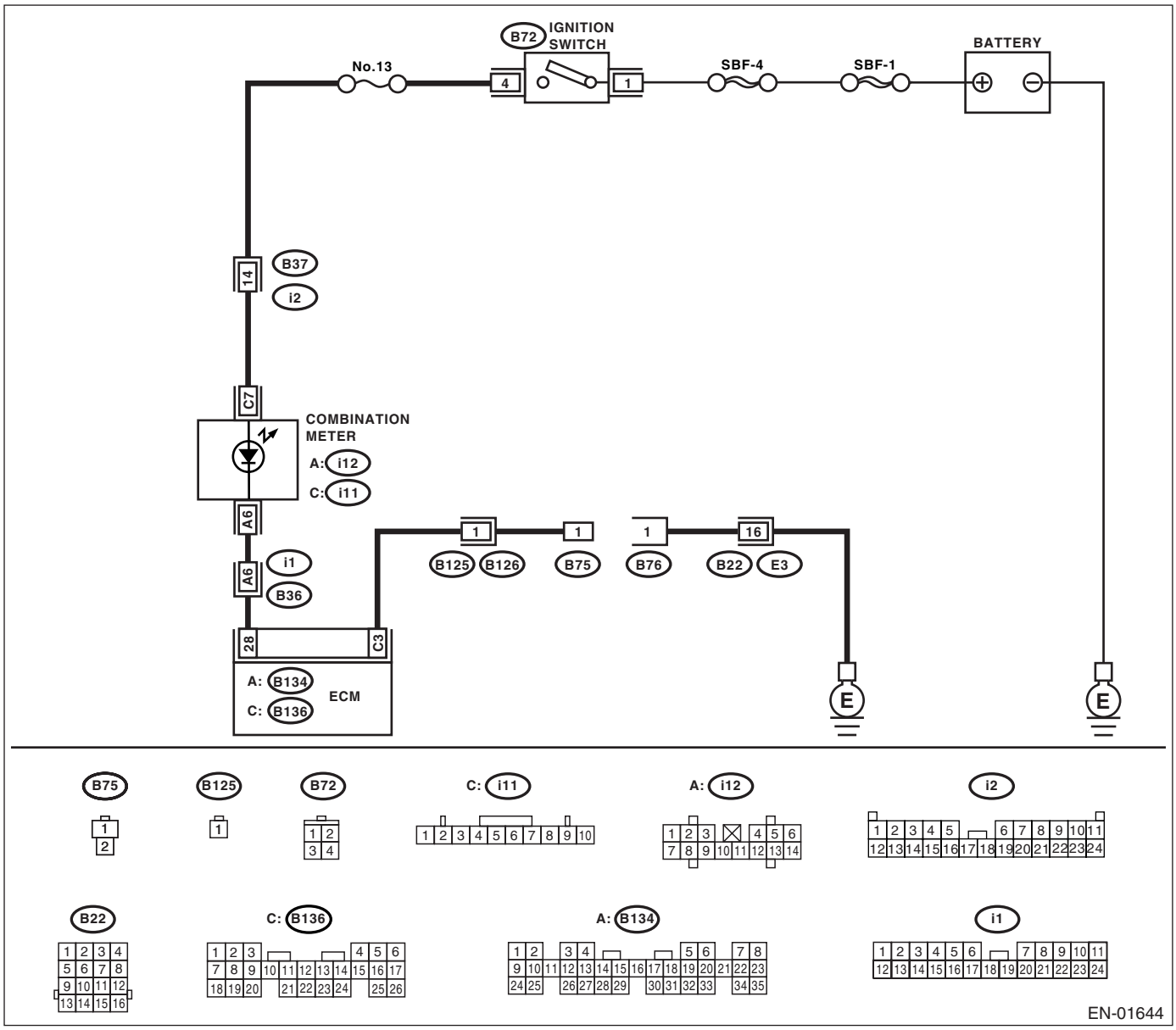
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Disconnect the test mode connector. 3) Turn the ignition switch to ON. (engine OFF)	Dose the malfunction indicator light illuminate?	Go to step **2.**	Repair the malfunction indicator light circuit. <Ref. to EN(H4SO)(diag)-49, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON., Malfunction Indicator Light.>
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Dose the malfunction indicator light illuminate?	Repair ground short circuit in harness between combination meter and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between test mode connector and chassis ground. ***Connector & terminal*** ***(B76) No. 1 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between test mode connector and chassis ground
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.** 1) Connect the test mode connector. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 3 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair open circuit in harness between ECM and test mode connector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

F: MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 Hz.

DIAGNOSIS:
Test mode connector circuit is shorted.
TROUBLE SYMPTOM:
Malfunction indicator light blinks at a cycle of 3 Hz when the ignition switch is turned to ON.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK TEST MODE CONNECTOR.** 1) Disconnect the test mode connector. 2) Turn the ignition switch to ON.	Dose the malfunction indicator light blink?	Go to step **2.**	System is in good order. NOTE: Malfunction indicator light blinks at a cycle of 3 Hz when test mode connector is connected.
2	**CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 3 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair short circuit in harness between ECM and test mode connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

17.Diagnostics for Engine Starting Failure

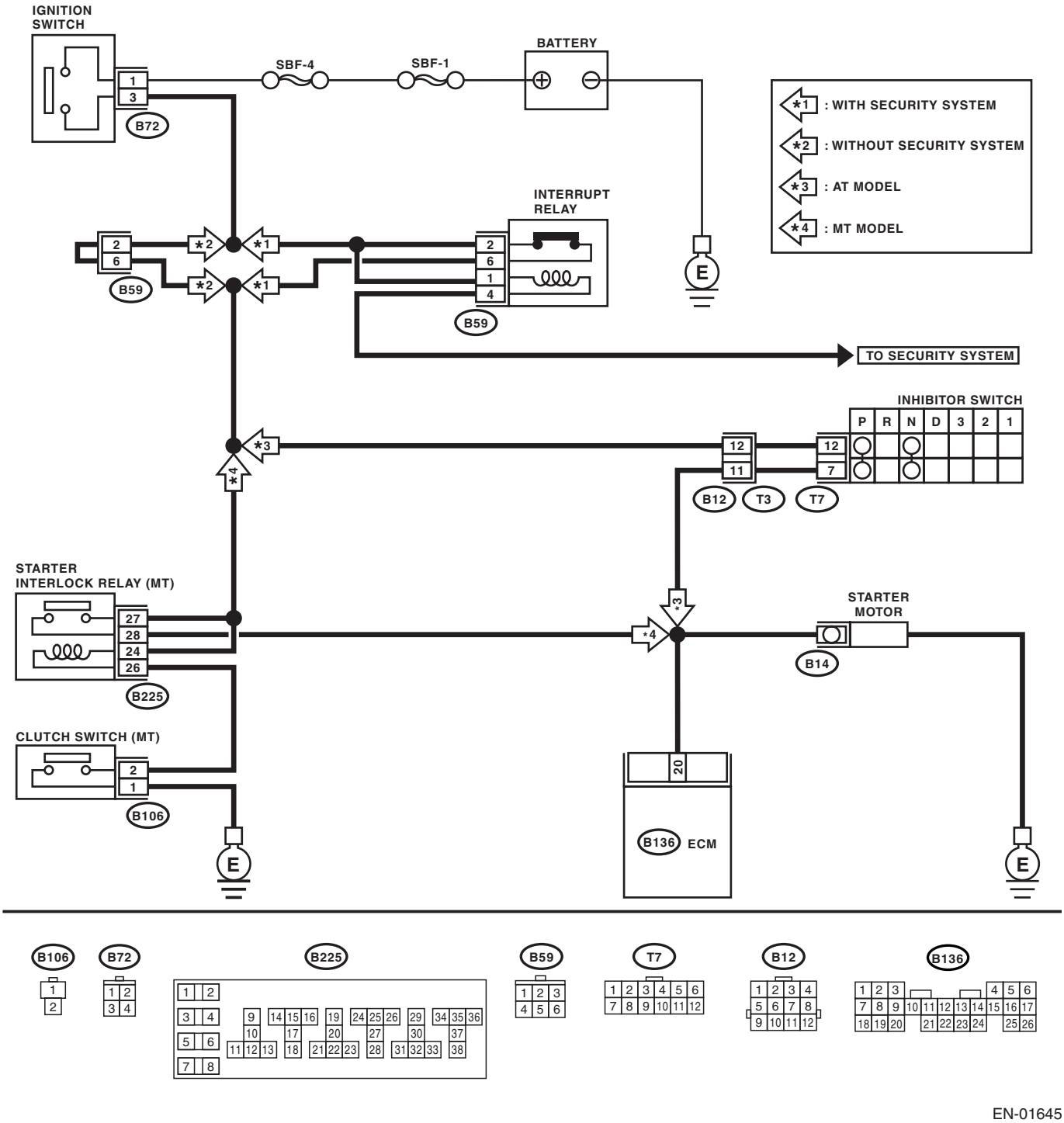
A: PROCEDURE

1. Inspection of starter motor circuit. <Ref. to EN(H4SO)(diag)-57, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN(H4SO)(diag)-60, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ignition control system. <Ref. to EN(H4SO)(diag)-63, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of fuel pump circuit. <Ref. to EN(H4SO)(diag)-66, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel injector circuit. <Ref. to EN(H4SO)(diag)-69, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

B: STARTER MOTOR CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



EN-01645

Diagnostics for Engine Starting Failure

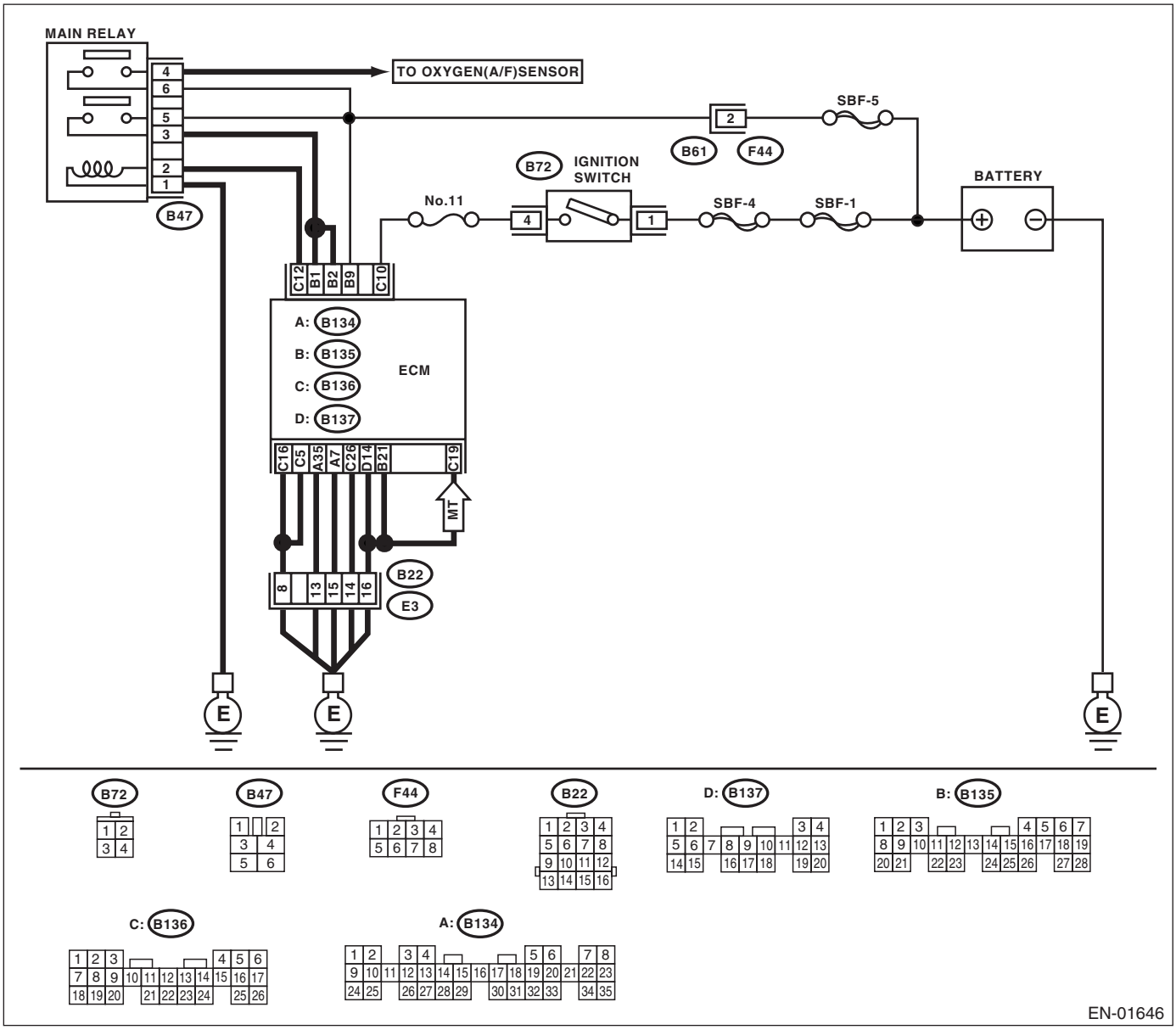
	Step	Check	Yes	No
1	**CHECK BATTERY.** Check the battery voltage.	Is the voltage more than 12 V?	Go to step **2.**	Charge or replace the battery.
2	**CHECK INPUT SIGNAL FOR STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Turn the ignition switch to ST. 4) Measure the power supply voltage between starter motor connector terminal and engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (–):*** NOTE: • On AT models, place the select lever in the "P" or "N" range. • On MT models, depress the clutch pedal.	Is the voltage more than 10 V?	Go to step **3.**	Go to step **4.**
3	**CHECK GROUND CIRCUIT OF STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the terminal from starter motor. 3) Measure the resistance of ground cable between ground cable terminal and engine ground.	Is the resistance less than 5 Ω?	Check the starter motor. <Ref. to SC(H4SO)-7, Starter.>	Repair open circuit of ground cable.
4	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1) Disconnect the connector from ignition switch. 2) Measure the power supply voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **5.**	Repair open circuit in harness between ignition switch and battery, and check fuse SBF No. 4 and SBF No. 1.
5	**CHECK IGNITION SWITCH.** 1) Disconnect the connector from ignition switch. 2) Measure the resistance between ignition switch terminals while turning ignition switch to the "ST" position. ***Terminals*** ***No. 1 — No. 3:***	Is the resistance less than 5 Ω?	Go to step **6.**	Replace the ignition switch.
6	**CHECK TRANSMISSION TYPE.**	Is the target AT model?	Go to step **7.**	Go to step **9.**
7	**CHECK INPUT VOLTAGE OF INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from inhibitor switch. 3) Connect the connector to ignition switch. 4) Measure the input voltage between inhibitor switch connector terminal and engine ground while turning ignition switch to ST. ***Connector & terminal*** ***(B12) No. 12 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **8.**	Repair open or ground short circuit in harness between inhibitor switch and ignition switch. NOTE: Check security system (if equipped). <Ref. to SL-20, Security System.>

	Step	Check	Yes	No
8	**CHECK INHIBITOR SWITCH.** 1) Place the select lever in the "P" or "N" range. 2) Measure the resistance between inhibitor switch terminals. ***Connector & terminal*** ***(T3) No. 11 — No. 12:***	Is the resistance less than 1 Ω?	Repair open or ground short circuit in harness between inhibitor switch and starter motor.	Replace the inhibitor switch. <Ref. to 4AT-46, Inhibitor Switch.>
9	**CHECK INPUT VOLTAGE OF STARTER INTERLOCK RELAY.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from starter interlock relay. 3) Connect the connector to ignition switch. 4) Measure the input voltage between starter interlock relay connector and chassis ground while turning ignition switch to ST. ***Connector & terminal*** ***(B225) No. 24 (+) — Chassis ground (–):*** ***(B225) No. 27 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **10.**	Repair open or short circuit to ground in harness between starter interlock relay and ignition switch. NOTE: Check security system (if equipped). <Ref. to SL-20, Security System.>
10	**CHECK STARTER INTERLOCK RELAY.** 1) Connect the battery to starter interlock relay terminals No. 26 and No. 24. 2) Measure the resistance between starter interlock relay terminals. ***Terminals*** ***No. 27 — No. 28:***	Is the resistance less than 1 Ω?	Go to step **11.**	Replace the starter interlock relay.
11	**CHECK GROUND CIRCUIT OF CLUTCH SWITCH.** 1) Disconnect the connector from clutch switch. 2) Measure the resistance between clutch switch connector and chassis ground. ***Connector & terminal*** ***(B106) No. 1 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair open circuit of ground cable.
12	**CHECK CLUTCH SWITCH.** Measure the resistance between clutch switch terminals while depressing the clutch pedal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Go to step **13.**	Replace the clutch switch. <Ref. to CL-28, Clutch Switch.>
13	**CHECK CLUTCH SWITCH CIRCUIT.** 1) Connect the connector to clutch switch. 2) Measure the resistance between starter interlock relay connector and chassis ground while depressing the clutch pedal. ***Connector & terminal*** ***(B225) No. 26 (+) — Chassis ground (–):***	Is the resistance less than 1 Ω?	Repair short circuit to ground in harness between starter interlock relay and starter motor.	Repair open circuit in harness between starter interlock relay and clutch switch.

C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



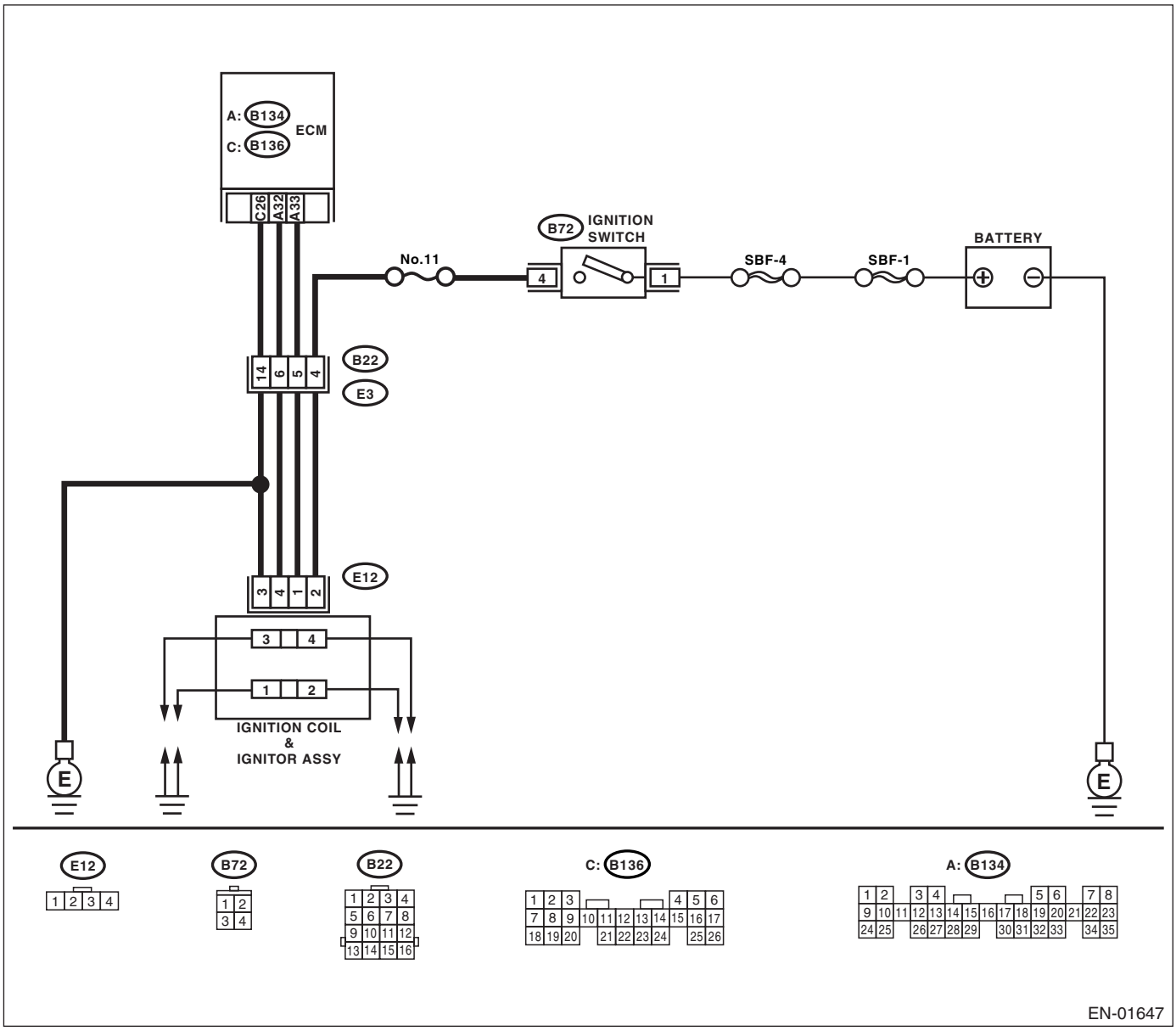
	Step	Check	Yes	No
1	**CHECK MAIN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 1 and No. 2. 4) Measure the resistance between main relay terminals. ***Terminals*** ***No. 3 — No. 5:*** ***No. 4 — No. 6:***	Is the resistance less than 10 Ω?	Go to step **2.**	Replace the main relay.
2	**CHECK GROUND CIRCUIT OF ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 7 — Chassis ground:*** ***(B134) No. 35 — Chassis ground:*** ***(B135) No. 21 — Chassis ground:*** ***(B136) No. 5 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:*** ***(B136) No. 26 — Chassis ground:*** ***(B137) No. 14 — Chassis ground:*** ***(B136) No. 19 — Chassis ground: (MT model)***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair open circuit in harness between ECM connector and engine grounding terminal.
3	**CHECK INPUT VOLTAGE OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair open or ground short circuit of power supply circuit.
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **5.**	Repair open or ground short circuit of power supply circuit.
5	**CHECK HARNESS BETWEEN ECM AND MAIN RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 12 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair ground short circuit in harness between ECM connector and main relay connector, then replace the ECM.
6	**CHECK OUTPUT VOLTAGE FROM ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 12 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **7.**	Replace the ECM.
7	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Check the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **8.**	Repair open circuit in harness between ECM connector and main relay connector.

	Step	Check	Yes	No
8	**CHECK GROUND CIRCUIT OF MAIN RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 1 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **9.**	Repair open circuit between main relay and chassis ground.
9	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 5 (+) — Chassis ground (−):*** ***(B47) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **10.**	Repair open or ground short circuit in harness of power supply circuit.
10	**CHECK INPUT VOLTAGE OF ECM.** 1) Connect the main relay connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 1 (+) — Chassis ground (−):*** ***(B135) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Check ignition control system. <Ref. to EN(H4SO)(diag)-63, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair open or ground short circuit in harness between ECM connector and main relay connector.

D: IGNITION CONTROL SYSTEM

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostics for Engine Starting Failure

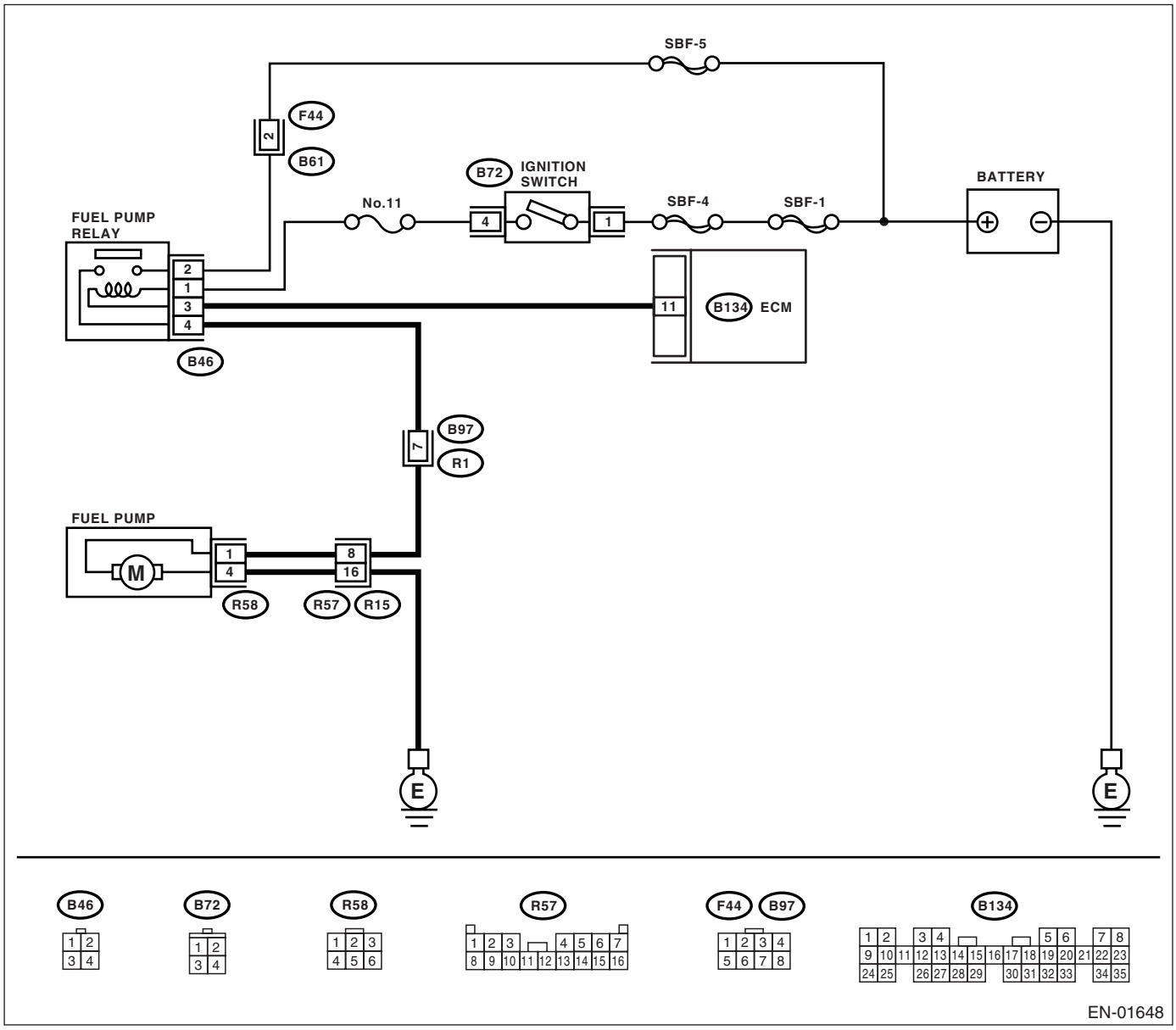
	Step	Check	Yes	No
1	**CHECK IGNITION SYSTEM FOR SPARKS.** 1) Remove the plug cord cap from each spark plug. 2) Install the new spark plug on plug cord cap. **CAUTION:** **Do not remove the spark plug from engine.** 3) Contact the spark plug's thread portion on engine. 4) While opening the throttle valve fully, crank the engine to check that spark occurs at each cylinder.	Does spark occur at each cylinder?	Check fuel pump system. <Ref. to EN(H4SO)(diag)-66, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **2.**
2	**CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition coil & ignitor ASSY. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between ignition coil & ignitor ASSY connector and engine ground. ***Connector & terminal*** ***(E12) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil & ignitor ASSY, and ignition switch connector • Poor contact in coupling connectors
3	**CHECK HARNESS OF IGNITION COIL & IGNITOR ASSY GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ignition coil & ignitor ASSY connector and engine ground. ***Connector & terminal*** ***(E12) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil & ignitor ASSY connector and engine grounding terminal
4	**CHECK IGNITION COIL & IGNITOR ASSY.** 1) Remove the spark plug cords. 2) Measure the resistance between spark plug cord contact portions to check secondary coil. ***Terminals*** ***No. 1 — No. 2:*** ***No. 3 — No. 4:***	Is the resistance 10 — 15 kΩ?	Go to step **5.**	Replace the ignition coil & ignitor ASSY. <Ref. to IG(H4SO)-7, Ignition Coil & Ignitor ASSY.>
5	**CHECK INPUT SIGNAL FOR IGNITION COIL & IGNITOR ASSY.** 1) Connect the connector to ignition coil & ignitor ASSY. 2) Check if voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignition coil & ignitor ASSY connector and engine ground. ***Connector & terminal*** ***(E12) No. 1 (+) — Engine ground (–):*** ***(E12) No. 4 (+) — Engine ground (–):***	Does the voltage vary more than 10 V?	Go to step **6.**	Replace the ignition coil & ignitor ASSY. <Ref. to IG(H4SO)-7, Ignition Coil & Ignitor ASSY.>

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from ignition coil & ignitor ASSY. 4) Measure the resistance of harness between ECM and ignition coil & ignitor ASSY connector. ***Connector & terminal*** ***(B134) No. 33 — (E12) No. 1:*** ***(B134) No. 32 — (E12) No. 4:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and ignition coil & ignitor ASSY connector • Poor contact in coupling connector
7	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSY CONNECTOR.** Measure the resistance of harness between ECM and engine ground. ***Connector & terminal:*** ***(B134) No. 33 — Engine ground:*** ***(B134) No. 32 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair ground short circuit in harness between ECM and ignition coil & ignitor ASSY connector.
8	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Check fuel pump circuit. <Ref. to EN(H4SO)(diag)-66, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>

E: FUEL PUMP CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



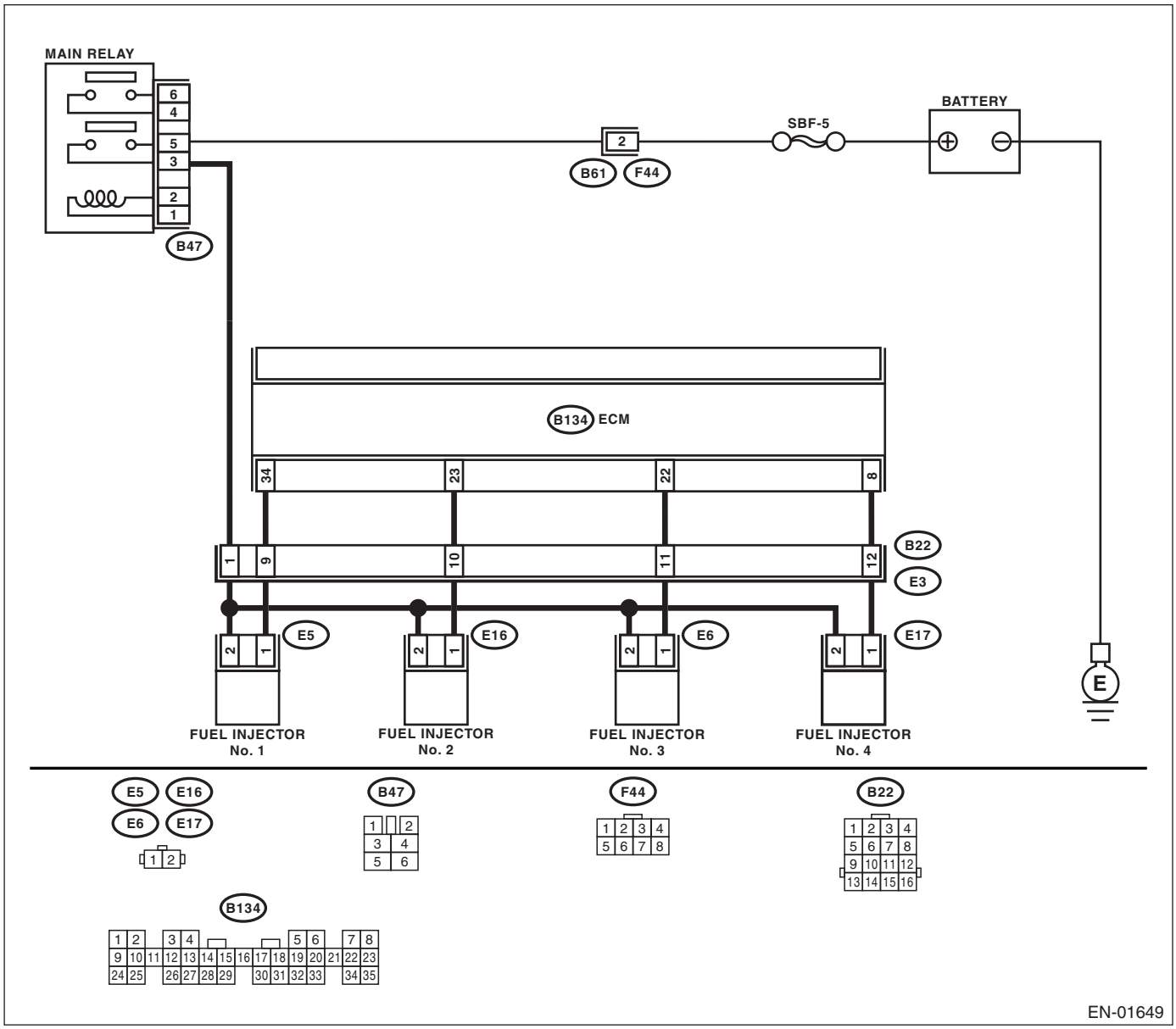
	Step	Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that fuel pump is in operation for two seconds when turning the ignition switch to ON. NOTE: Fuel pump operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Does the fuel pump produce operating sound?	Check fuel injector circuit. <Ref. to EN(H4SO)(diag)-69, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **2.**
2	**CHECK GROUND CIRCUIT OF FUEL PUMP.** 1) Turn the ignition switch to OFF. 2) Remove the fuel pump access hole lid. 3) Disconnect the connector from fuel pump. 4) Measure the resistance of harness connector between fuel pump and chassis ground. ***Connector & terminal*** ***(R58) No. 4 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between fuel pump connector and chassis grounding terminal • Poor contact in coupling connector
3	**CHECK POWER SUPPLY TO FUEL PUMP.** 1) Turn the ignition switch to ON. 2) Measure the voltage of power supply circuit between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Replace the fuel pump. <Ref. to FU(H4SO)-55, Fuel Pump.>	Go to step **4.**
4	**CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness connector between fuel pump and fuel pump relay. ***Connector & terminal*** ***(R58) No. 1 — (B46) No. 4:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between fuel pump connector and chassis grounding terminal • Poor contact in coupling connectors
5	**CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR.** Measure the resistance of harness between fuel pump and fuel pump relay connector. ***Connector & terminal*** ***(R58) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair short circuit in harness between fuel pump and fuel pump relay connector.

	Step	Check	Yes	No
6	**CHECK FUEL PUMP RELAY.** 1) Disconnect the connectors from fuel pump relay and main relay. 2) Remove the fuel pump relay and main relay with bracket. 3) Connect the battery to fuel pump relay connector terminals No. 1 and No. 3. 4) Measure the resistance between connector terminals of fuel pump relay. ***Terminals*** ***No. 2 — No. 4:***	Is the resistance less than 10 Ω?	Go to step **7.**	Replace the fuel pump relay. <Ref. to FU(H4SO)-46, Fuel Pump Relay.>
7	**CHECK HARNESS BETWEEN ECM AND FUEL PUMP RELAY CONNECTOR.** 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and fuel pump relay connector. ***Connector & terminal*** ***(B134) No. 11 — (B46) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between ECM and fuel pump relay connector.
8	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Check fuel injector circuit. <Ref. to EN(H4SO)(diag)-69, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

F: FUEL INJECTOR CIRCUIT

CAUTION:
- **Check or repair only faulty parts.**
- **After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.**

WIRING DIAGRAM:



Diagnostics for Engine Starting Failure

	Step	Check	Yes	No
1	**CHECK OPERATION OF EACH FUEL INJECTOR.** While cranking the engine, check that each fuel injector emits “operating” sound. Use a sound scope or attach a screwdriver to the injector for this check.	Dose the fuel injector operate?	Check the fuel pressure. <Ref. to ME(H4SO)-27, INSPECTION, Fuel Pressure.>	Go to step **2.**
2	**CHECK POWER SUPPLY TO EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between the fuel injector terminal and engine ground. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector (B22) • Poor contact in fuel injector connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***#1 (B134) No. 34 — (E5) No. 1:*** ***#2 (B134) No. 23 — (E16) No. 1:*** ***#3 (B134) No. 22 — (E6) No. 1:*** ***#4 (B134) No. 8 — (E17) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***#1 (B134) No. 34 — Chassis ground:*** ***#2 (B134) No. 23 — Chassis ground:*** ***#3 (B134) No. 22 — Chassis ground:*** ***#4 (B134) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair ground short circuit in harness between ECM and fuel injector connector.
5	**CHECK EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between each fuel injector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **6.**	Replace the faulty fuel injector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Inspection using “General Diagnostic Table”. <Ref. to EN(H4SO)(diag)-304, INSPECTION, General Diagnostic Table.>

18.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Index
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-78, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-80, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-83, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to EN(H4SO)(diag)-85, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to EN(H4SO)(diag)-88, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0065	Air Assisted Injector Control Range/ Performance	<Ref. to EN(H4SO)(diag)-90, DTC P0065 AIR ASSISTED INJECTOR CONTROL RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0066	Air Assisted Injector Control Circuit or Circuit Low	<Ref. to EN(H4SO)(diag)-92, DTC P0066 AIR ASSISTED INJECTOR CONTROL CIRCUIT OR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0067	Air Assisted Injector Control Circuit High	<Ref. to EN(H4SO)(diag)-94, DTC P0067 AIR ASSISTED INJECTOR CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance Problem	<Ref. to EN(H4SO)(diag)-96, DTC P0068 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to EN(H4SO)(diag)-98, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to EN(H4SO)(diag)-101, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0111	Intake Air Temperature Circuit Range/Performance	<Ref. to EN(H4SO)(diag)-104, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to EN(H4SO)(diag)-106, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake Air Temperature Circuit High Input	<Ref. to EN(H4SO)(diag)-108, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to EN(H4SO)(diag)-111, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to EN(H4SO)(diag)-113, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0121	Throttle/Pedal Position Sensor/ Switch “A” Circuit Range/Performance	<Ref. to EN(H4SO)(diag)-116, DTC P0121 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low Input	<Ref. to EN(H4SO)(diag)-118, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P0123	Throttle/Pedal Position Sensor/ Switch “A” Circuit High Input	<Ref. to EN(H4SO)(diag)-121, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to EN(H4SO)(diag)-123, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to EN(H4SO)(diag)-125, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0129	Atmospheric Pressure Sensor Circuit Range/Performance	<Ref. to EN(H4SO)(diag)-126, DTC P0129 ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0130	O_2 Sensor Circuit (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-127, DTC P0130 O_2 SENSOR CIRCUIT (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0131	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-130, DTC P0131 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-132, DTC P0132 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-134, DTC P0133 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-136, DTC P0134 O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4SO)(diag)-138, DTC P0137 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4SO)(diag)-141, DTC P0138 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to EN(H4SO)(diag)-144, DTC P0139 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System too Lean (Bank 1)	<Ref. to EN(H4SO)(diag)-145, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System too Rich (Bank 1)	<Ref. to EN(H4SO)(diag)-146, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	<Ref. to EN(H4SO)(diag)-148, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0182	Fuel Temperature Sensor “A” Circuit Low Input	<Ref. to EN(H4SO)(diag)-150, DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0183	Fuel Temperature Sensor “A” Circuit High Input	<Ref. to EN(H4SO)(diag)-152, DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 Misfire Detected	<Ref. to EN(H4SO)(diag)-154, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 Misfire Detected	<Ref. to EN(H4SO)(diag)-154, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 Misfire Detected	<Ref. to EN(H4SO)(diag)-154, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 Misfire Detected	<Ref. to EN(H4SO)(diag)-155, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to EN(H4SO)(diag)-162, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to EN(H4SO)(diag)-164, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to EN(H4SO)(diag)-166, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to EN(H4SO)(diag)-168, DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to EN(H4SO)(diag)-170, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0341	Camshaft Position Sensor “A” Circuit Range/Performance (Bank 1 or Single Sensor)	<Ref. to EN(H4SO)(diag)-172, DTC P0341 CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(H4SO)(diag)-175, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0442	Evaporative Emission Control System Leak Detected (small leak)	<Ref. to EN(H4SO)(diag)-176, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to EN(H4SO)(diag)-180, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to EN(H4SO)(diag)-183, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	<Ref. to EN(H4SO)(diag)-185, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to EN(H4SO)(diag)-187, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to EN(H4SO)(diag)-190, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0456	Evaporative Emission Control System Leak Detected (very small leak)	<Ref. to EN(H4SO)(diag)-193, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0457	Evaporative Emission Control System Leak Detected (fuel cap loose/off)	<Ref. to EN(H4SO)(diag)-196, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to EN(H4SO)(diag)-200, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to EN(H4SO)(diag)-203, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel Level Sensor Circuit Range/Performance	<Ref. to EN(H4SO)(diag)-205, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel Level Sensor Circuit Low Input	<Ref. to EN(H4SO)(diag)-207, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Item	Index
P0463	Fuel Level Sensor Circuit High Input	<Ref. to EN(H4SO)(diag)-210, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to EN(H4SO)(diag)-213, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling Fan Rationality Check	<Ref. to EN(H4SO)(diag)-214, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to EN(H4SO)(diag)-216, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0503	Vehicle Speed Sensor Intermittent/ Erratic/High	<Ref. to EN(H4SO)(diag)-217, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle Control System RPM Lower Than Expected	<Ref. to EN(H4SO)(diag)-219, DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0507	Idle Control System RPM Higher Than Expected	<Ref. to EN(H4SO)(diag)-221, DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter Request Circuit	<Ref. to EN(H4SO)(diag)-222, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to EN(H4SO)(diag)-225, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0565	Cruise Control On Signal	<Ref. to EN(H4SO)(diag)-227, DTC P0565 CRUISE CONTROL ON SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(H4SO)(diag)-229, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to EN(H4SO)(diag)-230, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0692	Cooling Fan 1 Control Circuit High	<Ref. to EN(H4SO)(diag)-233, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0703	Torque Converter/Brake Switch “B” Circuit	<Ref. to EN(H4SO)(diag)-236, DTC P0703 TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0705	Transmission Range Sensor Circuit (PRNDL Input)	<Ref. to EN(H4SO)(diag)-238, DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0710	Transmission Fluid Temperature Sensor Circuit	<Ref. to EN(H4SO)(diag)-238, DTC P0710 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0716	Torque Converter Turbine Speed Sensor	<Ref. to EN(H4SO)(diag)-238, DTC P0716 OUTPUT/TURBINE SPEED SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0720	Output Speed Sensor Circuit	<Ref. to EN(H4SO)(diag)-238, DTC P0720 OUTPUT SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0726	Engine Speed Input Circuit Range/ Performance	<Ref. to EN(H4SO)(diag)-238, DTC P0726 ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0731	Gear 1 Incorrect Ratio	<Ref. to EN(H4SO)(diag)-238, DTC P0731 GEAR 1 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0732	Gear 2 Incorrect Ratio	<Ref. to EN(H4SO)(diag)-238, DTC P0732 GEAR 2 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0733	Gear 3 Incorrect Ratio	<Ref. to EN(H4SO)(diag)-238, DTC P0733 GEAR 3 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P0734	Gear 4 Incorrect Ratio	<Ref. to EN(H4SO)(diag)-239, DTC P0734 GEAR 4 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0741	Torque Converter Clutch Circuit Performance or Stuck Off	<Ref. to EN(H4SO)(diag)-240, DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0743	Torque Converter Clutch Circuit Electrical	<Ref. to EN(H4SO)(diag)-242, DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0748	Pressure Control Solenoid “A” Electrical	<Ref. to EN(H4SO)(diag)-242, DTC P0748 PRESSURE CONTROL SOLENOID “A” ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0753	Shift Solenoid “A” Electrical	<Ref. to EN(H4SO)(diag)-242, DTC P0753 SHIFT SOLENOID “A” ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0758	Shift Solenoid “B” Electrical	<Ref. to EN(H4SO)(diag)-242, DTC P0758 SHIFT SOLENOID “B” ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0771	Shift Solenoid “E” Performance or Stuck Off	<Ref. to EN(H4SO)(diag)-242, DTC P0771 SHIFT SOLENOID “E” PERFORMANCE OR STUCK OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0778	Pressure Control Solenoid “B” Electrical	<Ref. to EN(H4SO)(diag)-242, DTC P0778 PRESSURE CONTROL SOLENOID “B” ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0785	Shift/Timing Solenoid	<Ref. to EN(H4SO)(diag)-242, DTC P0785 SHIFT/TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Neutral Switch Input Circuit Low	<Ref. to EN(H4SO)(diag)-243, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to EN(H4SO)(diag)-245, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Neutral Switch Input Circuit High	<Ref. to EN(H4SO)(diag)-247, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to EN(H4SO)(diag)-250, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0864	TCM Communication Circuit Range/Performance	<Ref. to EN(H4SO)(diag)-253, DTC P0864 TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0865	TCM Communication Circuit Low	<Ref. to EN(H4SO)(diag)-255, DTC P0865 TCM COMMUNICATION CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0866	TCM Communication Circuit High	<Ref. to EN(H4SO)(diag)-257, DTC P0866 TCM COMMUNICATION CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1110	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)	<Ref. to EN(H4SO)(diag)-259, DTC P1110 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1111	Atmospheric Pressure Sensor Circuit Malfunction (High Input)	<Ref. to EN(H4SO)(diag)-259, DTC P1111 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1134	A/F Sensor Micro-computer Problem	<Ref. to EN(H4SO)(diag)-260, DTC P1134 A/F SENSOR MICRO-COMPUTER PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1137	O_2 Sensor Circuit (Lamda=1) (Bank1 Sensor1)	<Ref. to EN(H4SO)(diag)-262, DTC P1137 O_2 SENSOR CIRCUIT (LAMDA=1) (BANK1 SENSOR1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to EN(H4SO)(diag)-265, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Item	Index
P1420	Fuel Tank Pressure Control Solenoid Valve Circuit High	<Ref. to EN(H4SO)(diag)-268, DTC P1420 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to EN(H4SO)(diag)-270, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1446	Fuel Tank Sensor Control Valve Circuit Low	<Ref. to EN(H4SO)(diag)-272, DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1447	Fuel Tank Sensor Control Valve Circuit High	<Ref. to EN(H4SO)(diag)-275, DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1448	Fuel Tank Sensor Control Valve Range/Performance Problem	<Ref. to EN(H4SO)(diag)-277, DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1510	ISC Solenoid Valve Signal #1 Circuit Malfunction (Low Input)	<Ref. to EN(H4SO)(diag)-279, DTC P1510 ISC SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1511	ISC Solenoid Valve Signal #1 Circuit Malfunction (High Input)	<Ref. to EN(H4SO)(diag)-279, DTC P1511 ISC SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1512	ISC Solenoid Valve Signal #2 Circuit Malfunction (Low Input)	<Ref. to EN(H4SO)(diag)-279, DTC P1512 ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1513	ISC Solenoid Valve Signal #2 Circuit Malfunction (High Input)	<Ref. to EN(H4SO)(diag)-279, DTC P1513 ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1514	ISC Solenoid Valve Signal #3 Circuit Malfunction (Low Input)	<Ref. to EN(H4SO)(diag)-279, DTC P1514 ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1515	ISC Solenoid Valve Signal #3 Circuit Malfunction (High Input)	<Ref. to EN(H4SO)(diag)-279, DTC P1515 ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1516	ISC Solenoid Valve Signal #4 Circuit Malfunction (Low Input)	<Ref. to EN(H4SO)(diag)-280, DTC P1516 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1517	ISC Solenoid Valve Signal #4 Circuit Malfunction (High Input)	<Ref. to EN(H4SO)(diag)-282, DTC P1517 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter Switch Circuit Low input	<Ref. to EN(H4SO)(diag)-283, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-up Voltage Circuit Malfunction	<Ref. to EN(H4SO)(diag)-286, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1698	Engine Torque Control Cut Signal Circuit Low Input	<Ref. to EN(H4SO)(diag)-288, DTC P1698 ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1699	Engine Torque Control Cut Signal Circuit High Input	<Ref. to EN(H4SO)(diag)-290, DTC P1699 ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1700	Throttle Position Sensor	<Ref. to 4AT(diag)-46, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1711	Engine Torque Control Signal 1 Circuit Malfunction	<Ref. to EN(H4SO)(diag)-292, DTC P1711 ENGINE TORQUE CONTROL SIGNAL 1 CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P1712	Engine Torque Control Signal 2 Circuit Malfunction	<Ref. to EN(H4SO)(diag)-294, DTC P1712 ENGINE TORQUE CONTROL SIGNAL 2 CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
*P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to EN(H4SO)(diag)-296, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to EN(H4SO)(diag)-300, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

: DTC with can be detected only on OBD mode. <Ref. to EN(H4SO)(diag)-36, Read Diagnostic Trouble Code (DTC).>

19.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

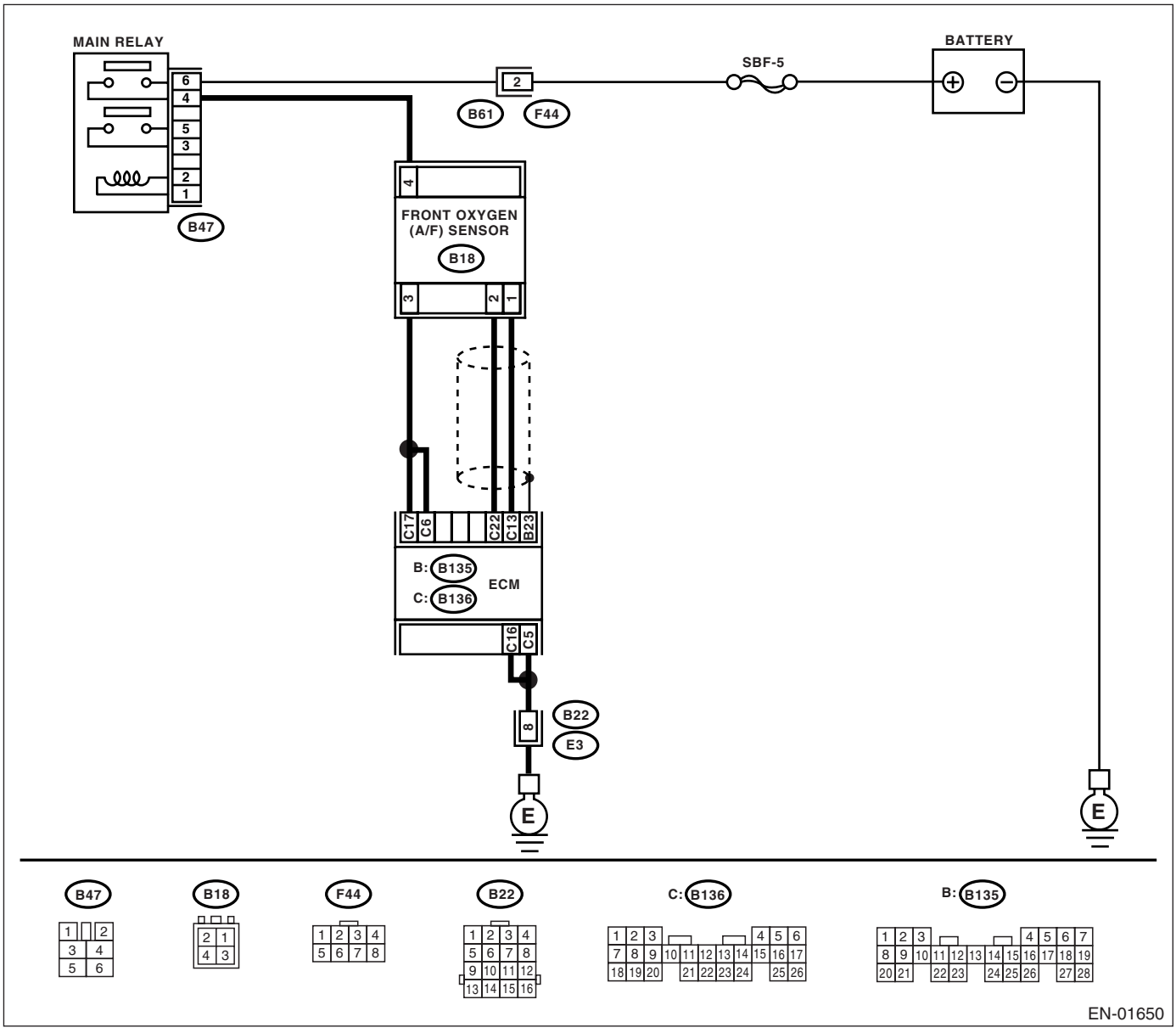
A: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-8, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start the engine and warm-up engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 4) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 6 — (B18) No. 3:*** ***(B136) No. 17 — (B18) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 13 — (B18) No. 1:*** ***(B136) No. 22 — (B18) No. 2:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between main relay and front oxygen (A/F) sensor connector.
3	**CHECK HARNESS BETWEEN MAIN RELAY AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between main relay and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B47) No. 4 — (B18) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between main relay and front oxygen (A/F) sensor connector.
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance less than 5 Ω?	Go to step **5.**	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-40, Front Oxygen (A/F) Sensor.>
5	**CHECK POOR CONTACT.** Check the poor contact in ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair the poor contact in ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-40, Front Oxygen (A/F) Sensor.>

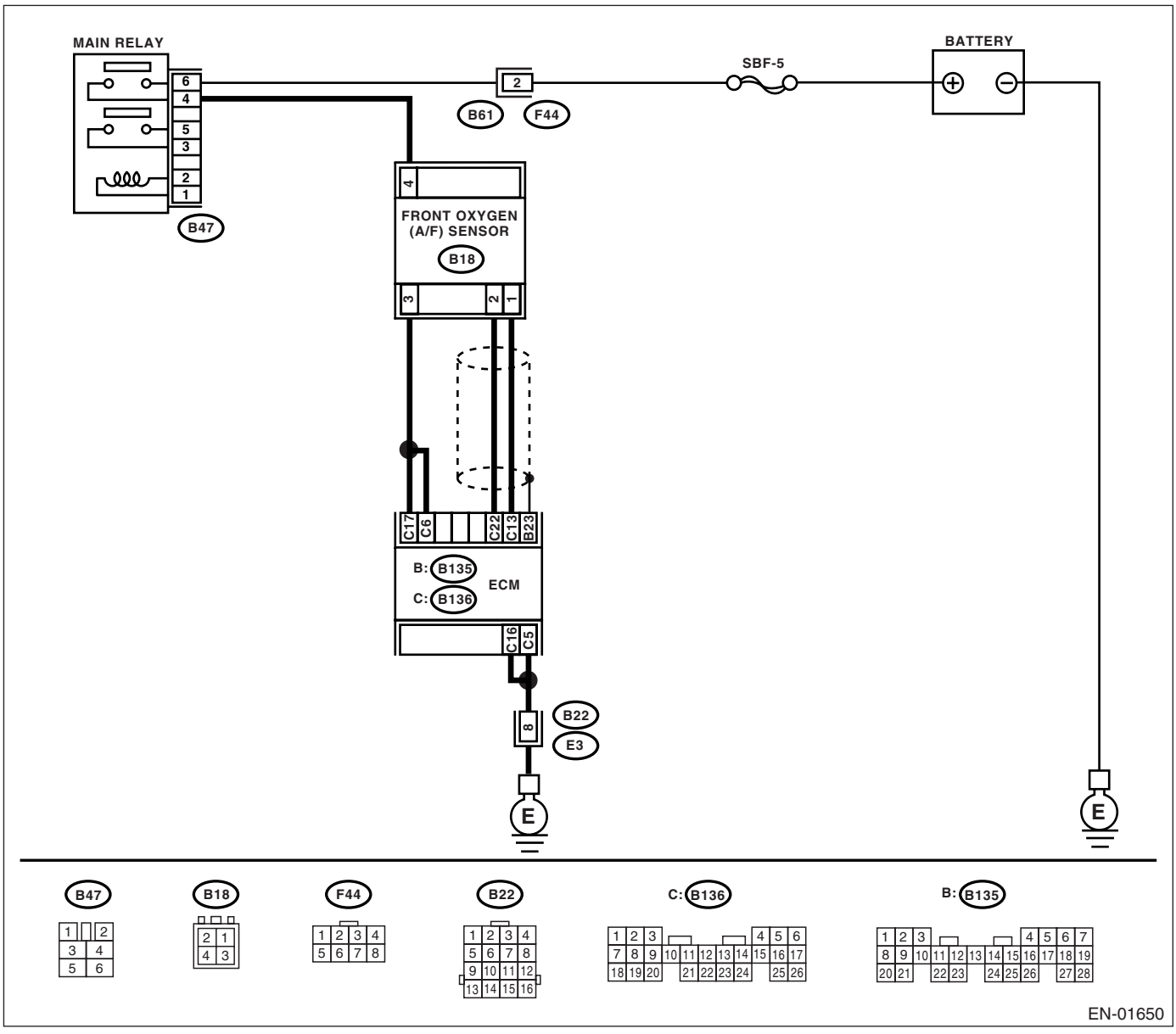
B: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-10, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool display DTC P0031 and P0037 at the same time?	Go to step **2.**	Go to step **5.**
2	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & terminal*** ***(B18) No. 4 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Repair power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in main relay connector • Malfunction in main relay
3	**CHECK GROUND CIRCUIT OF ECM.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 5 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground terminal • Poor contact in ECM connector Poor contact in coupling connector
4	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the current more than 0.2 A?	Repair poor contact in connector. NOTE: In this case, repair the following: • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Go to step **5.**
5	**CHECK INPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 6 (+) — Chassis ground (–):*** ***(B136) No. 17 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **7.**	Go to step **6.**
6	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 6 (+) — Chassis ground (–):*** ***(B136) No. 17 (+) — Chassis ground (–):***	Does the voltage change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step **7.**

	Step	Check	Yes	No
7	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance less than 10 Ω?	Repair harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-40, Front Oxygen (A/F) Sensor.>

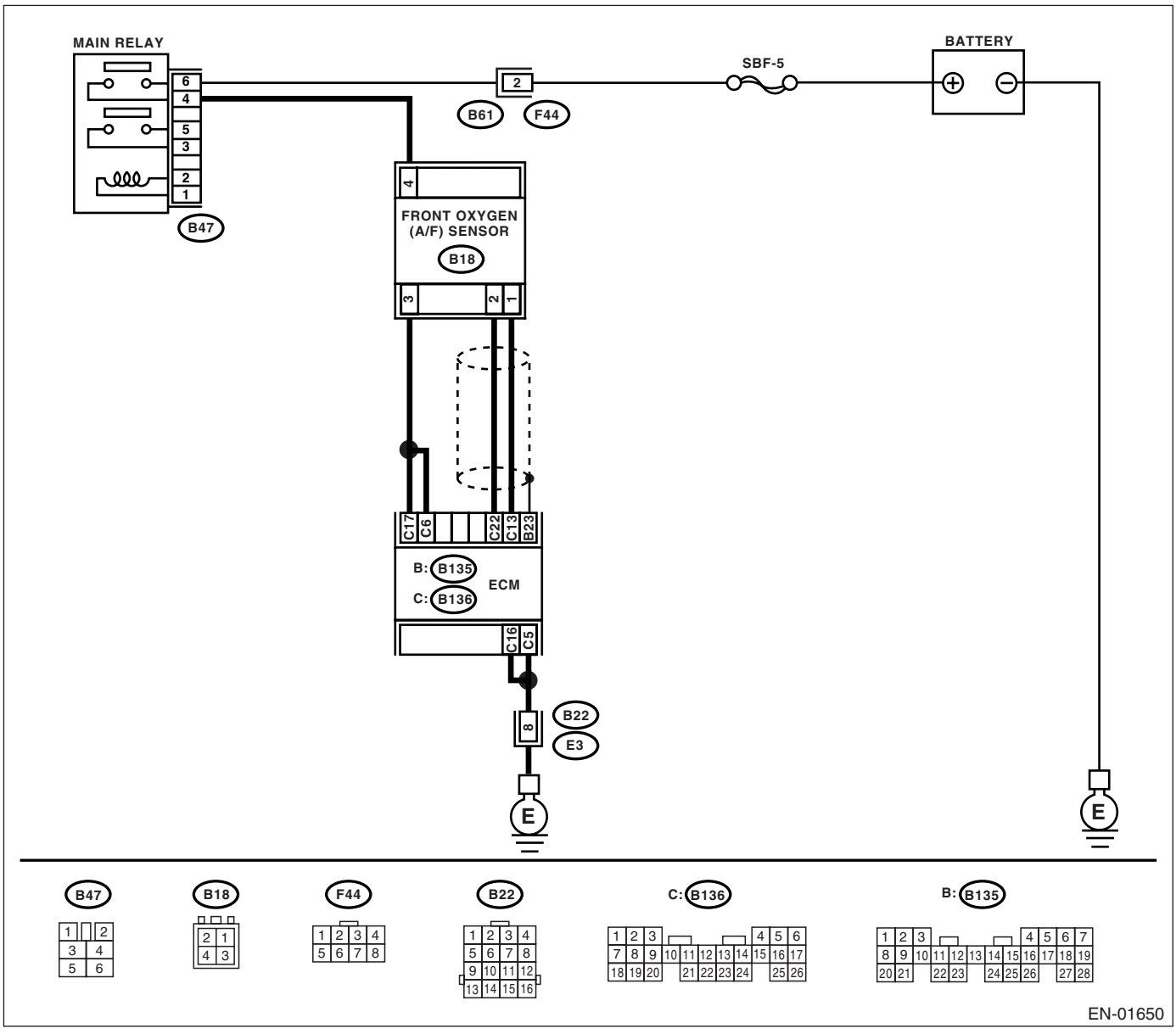
C: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-12, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 6 (+) — Chassis ground (−):*** ***(B136) No. 17 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.** 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the current more than 2.3 A?	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	END
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 6 (+) — Chassis ground (−):*** ***(B136) No. 17 (+) — Chassis ground (−):***	Does the voltage change by shaking the ECM harness and connector?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

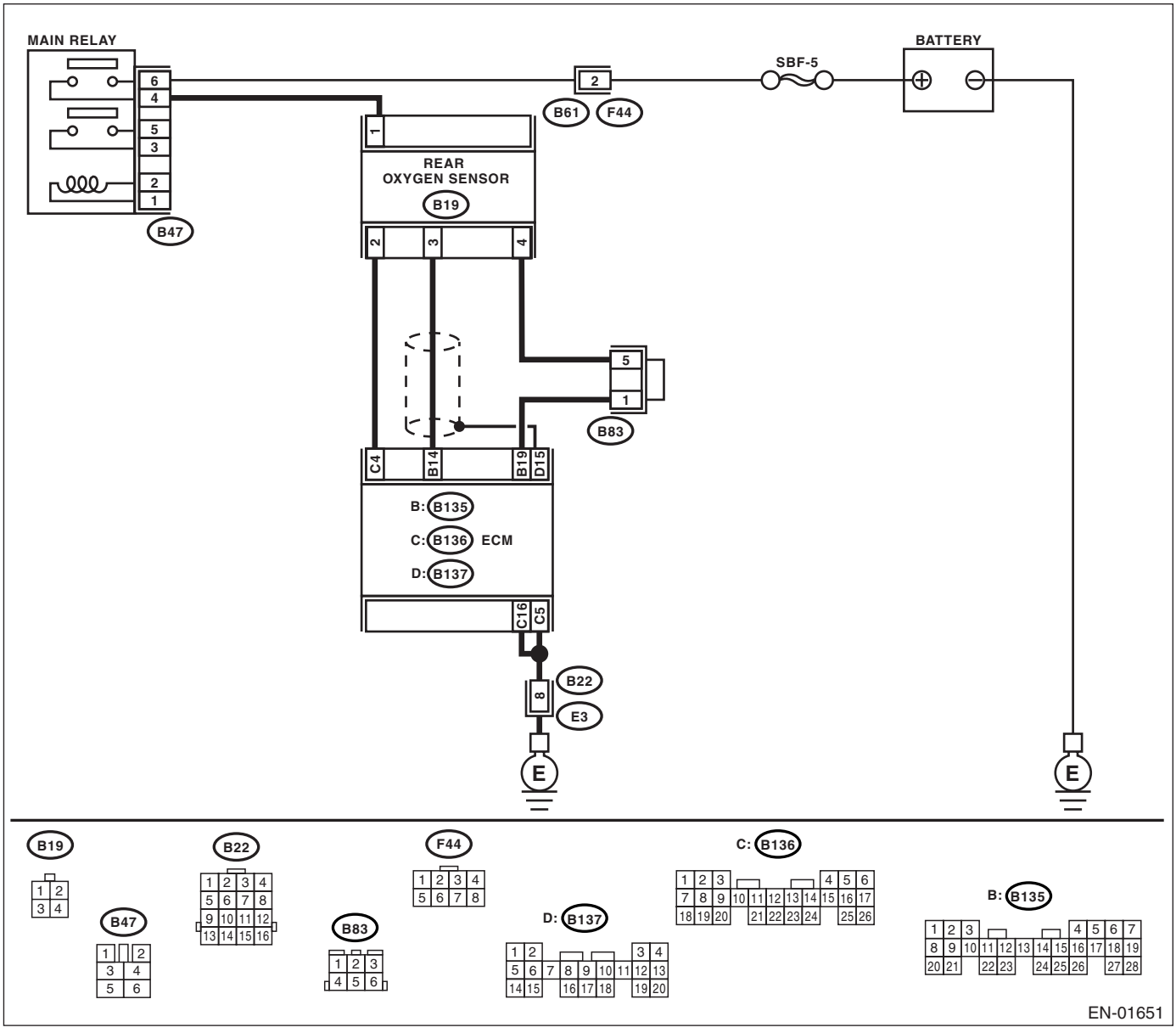
D: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-14, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 5 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the current more than 0.2 A?	Repair the connector. NOTE: In this case, repair the following: • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **6.**	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):***	Does the voltage change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Disconnect the connector from rear oxygen sensor. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Repair battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and engine ground or chassis ground. ***Connector & terminal*** ***(B19) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **7.**	Repair power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in main relay connector • Malfunction in main relay
7	**CHECK REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between rear oxygen sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 30 Ω?	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Replace the rear oxygen sensor. <Ref. to FU(H4SO)-42, Rear Oxygen Sensor.>

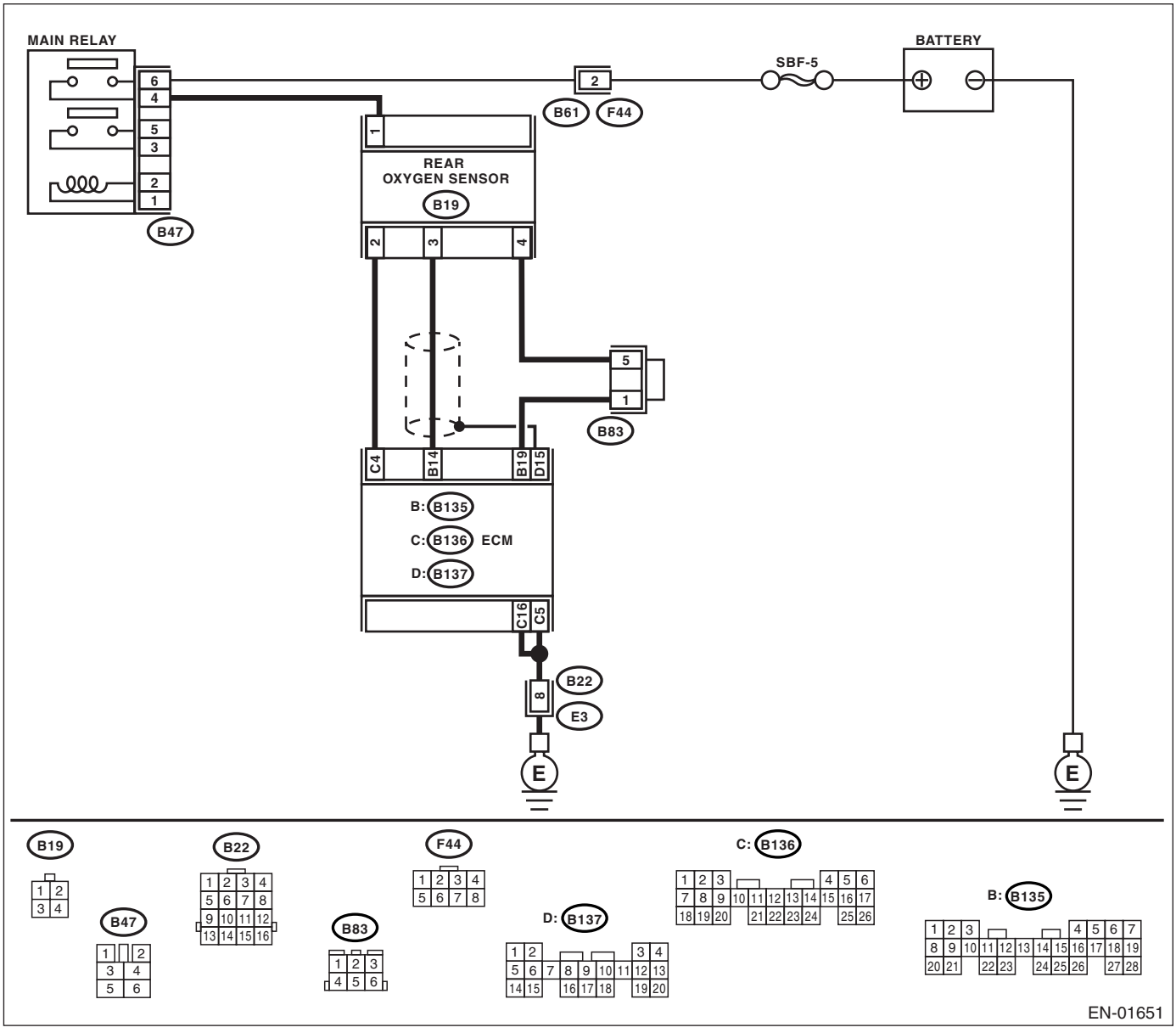
E: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-16, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK CURRENT DATA.** 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the current more than 7 A?	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	END
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	END

F: DTC P0065 AIR ASSISTED INJECTOR CONTROL RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-18, DTC P0065 AIR ASSISTED INJECTOR CONTROL RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

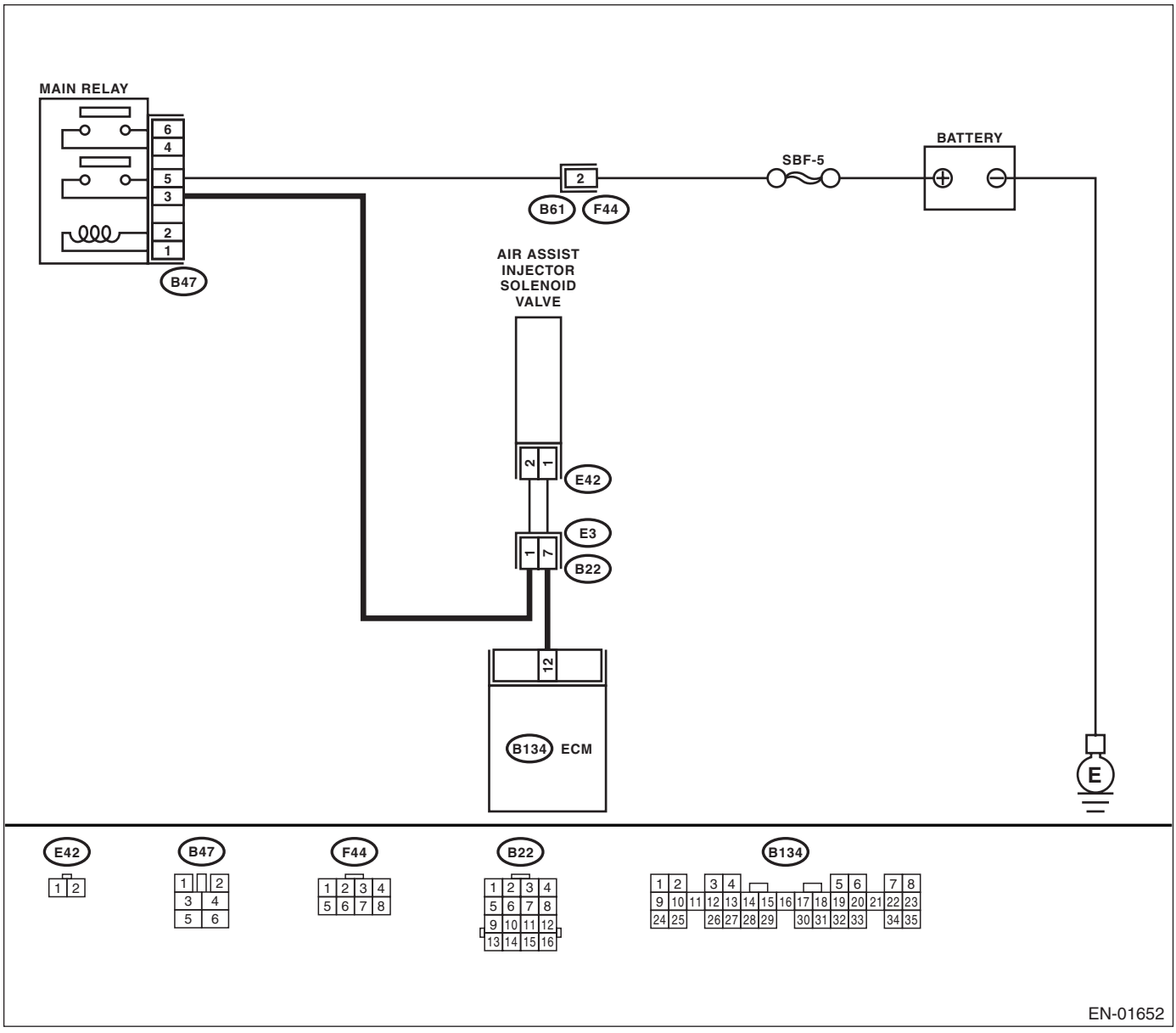
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK AIR ASSISTED INJECTOR SOLENOID VALVE OPERATION.** 1) Turn ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) Operate the air assisted injector solenoid valve. NOTE: Air assisted injector solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Does air assisted injector solenoid valve operate?	Go to step **3.**	Replace the air assisted injector solenoid valve. <Ref. to FU(H4SO)-33, Air Assist Injector Solenoid Valve.>
3	**CHECK AIR BYPASS HOSES.** Use your mouth to blow through the air bypass hose to make sure that there is a smooth air flow (no clogging).	Is there damage or clog at air bypass hose?	Repair or replace the air bypass hoses.	Go to step **4.**
4	**CHECK FUEL INJECTOR.** 1) Turn ignition switch to OFF. 2) Remove the fuel injector. <Ref. to FU(H4SO)-34, REMOVAL, Fuel Injector.> 3) Check for clogged fuel injectors.	Is the fuel injector clogged?	Replace the fuel injector. <Ref. to FU(H4SO)-37, INSTALLATION, Fuel Injector.>	Replace the air assisted injector solenoid valve. <Ref. to FU(H4SO)-33, Air Assist Injector Solenoid Valve.>

G: DTC P0066 AIR ASSISTED INJECTOR CONTROL CIRCUIT OR CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-21, DTC P0066 AIR ASSISTED INJECTOR CONTROL CIRCUIT OR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

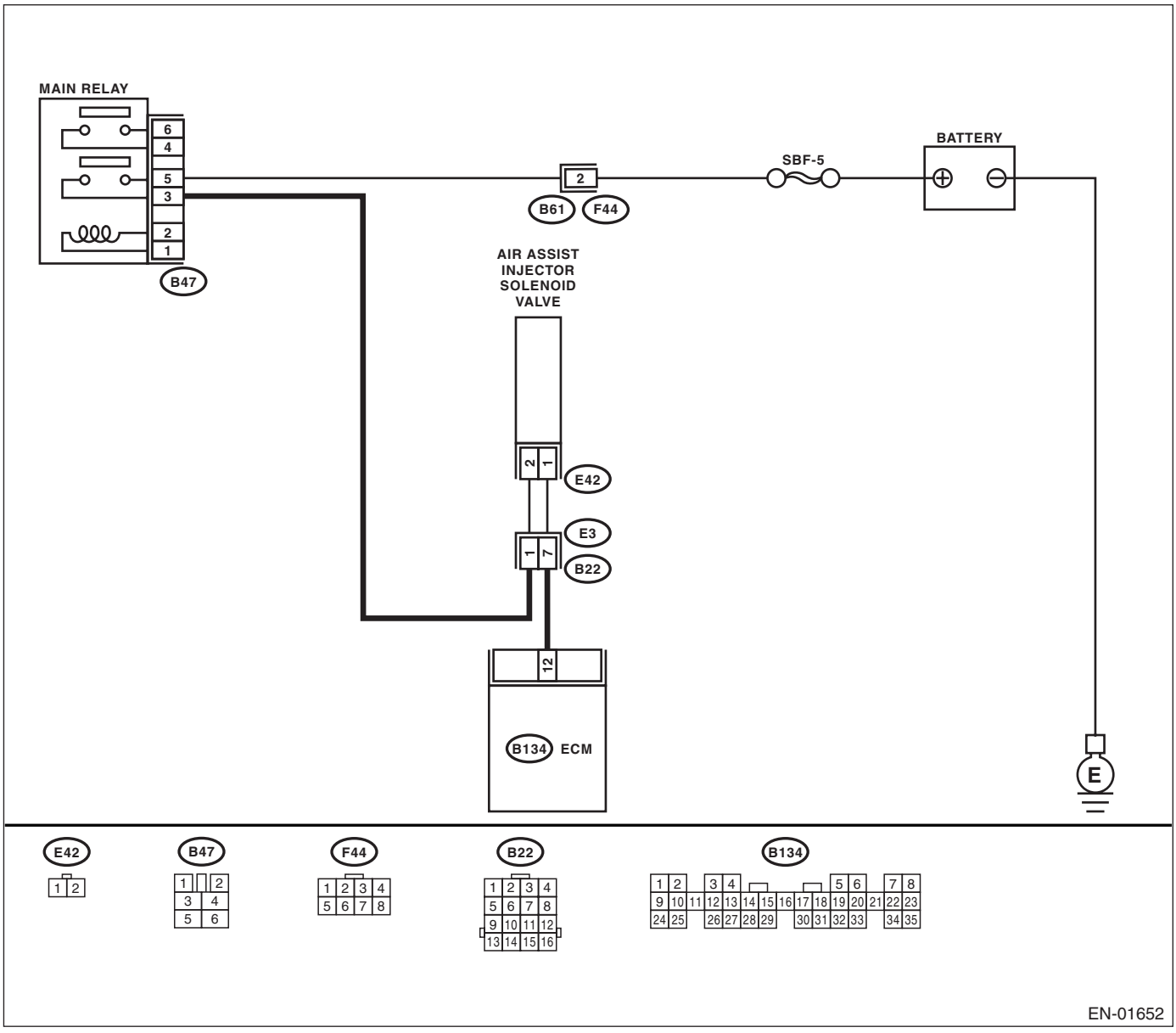
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 12 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK POWER SUPPLY TO AIR ASSIST INJECTOR SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Disconnect connector from air assist injector solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between air assist injector solenoid valve and engine ground. ***Connector & terminal*** ***(E42) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between air assist injector solenoid valve and main relay connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND AIR ASSIST INJECTOR SOLENOID VALVE CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between ECM and air assist injector solenoid valve connector. ***Connector & terminal*** ***(B134) No. 12 — (E42) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and air assist injector solenoid valve connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND AIR ASSIST INJECTOR SOLENOID VALVE CONNECTOR.** Measure resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 12 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair ground short circuit in harness between ECM and air assist injector solenoid valve connector.
5	**CHECK POOR CONTACT.** Check poor contact in ECM and air assist injector solenoid valve connectors.	Is there poor contact in ECM and air assist injector solenoid valve connectors?	Repair poor contact in ECM and air assist injector solenoid valve connectors.	Replace air assist injector solenoid valve. <Ref. to FU(H4SO)-33, Air Assist Injector Solenoid Valve.>

H: DTC P0067 AIR ASSISTED INJECTOR CONTROL CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-23, DTC P0067 AIR ASSISTED INJECTOR CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

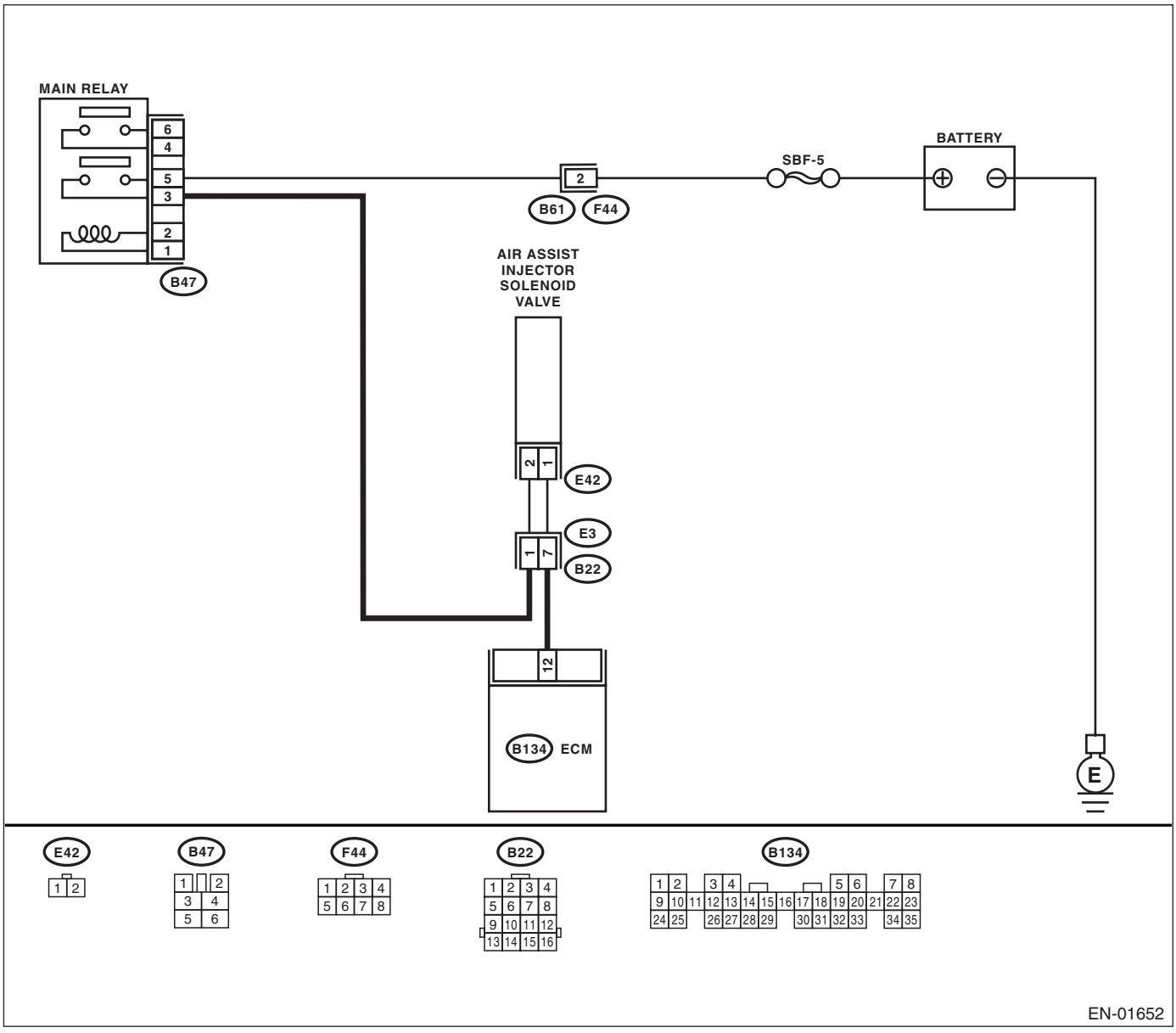
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 12 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to OFF. 2) Disconnect connector from air assist injector solenoid valve. 3) Turn ignition switch to ON. 4) Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 12 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and air assist injector solenoid valve connector. After repair, replace ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Replace air assist injector solenoid valve <Ref. to FU(H4SO)-33, Air Assist Injector Solenoid Valve.> and ECM <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 12 (+) — Chassis ground (−):***	Does the voltage change by shaking the ECM harness and connector?	Repair battery short circuit in harness between ECM and air assist injector solenoid valve connector. After repair, replace ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

I: DTC P0068 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE PROBLEM

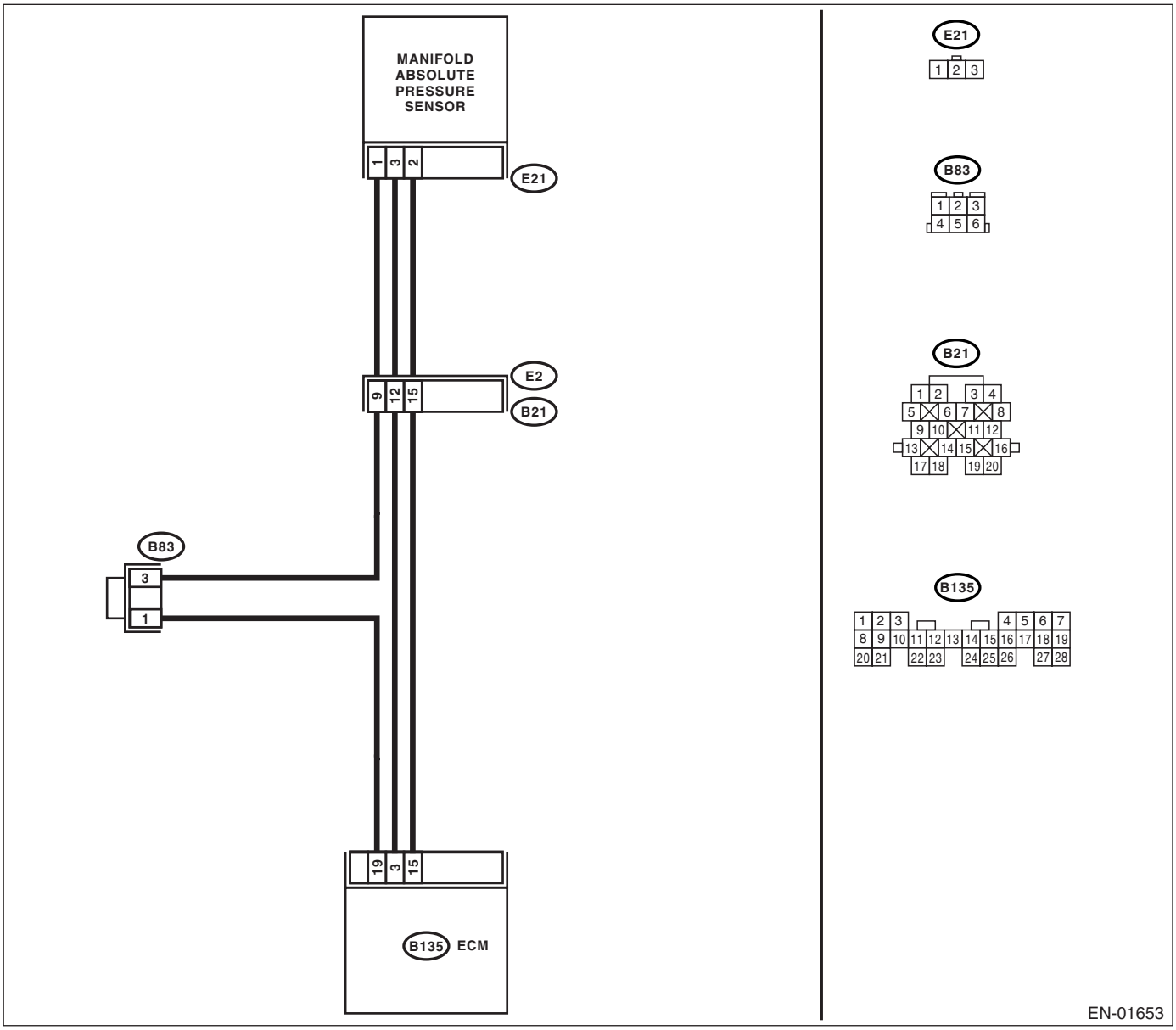
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-25, DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step **3.**
3	**CHECK PRESSURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the selector lever or shift lever in "P" or "N" position. 3) Turn the A/C switch to OFF. 4) All accessory switches OFF. 5) Read the data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Ignition ON: Is the measured value 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg)? Idling: Is the measured value 20.0 — 46.7 kPa (150 — 350 mmHg, 5.91 — 13.78 inHg)?	Go to step **4.**	Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO)-30, Manifold Absolute Pressure Sensor.>
4	**CHECK THROTTLE POSITION.** Read the data of throttle position signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than 5% when throttle is fully closed?	Go to step **5.**	Adjust or replace the throttle position sensor. <Ref. to FU(H4SO)-28, Throttle Position Sensor.>
5	**CHECK THROTTLE POSITION.**	Is the measured value more than 85% when throttle is wide open?	Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO)-30, Manifold Absolute Pressure Sensor.>	Replace the throttle position sensor. <Ref. to FU(H4SO)-28, Throttle Position Sensor.>

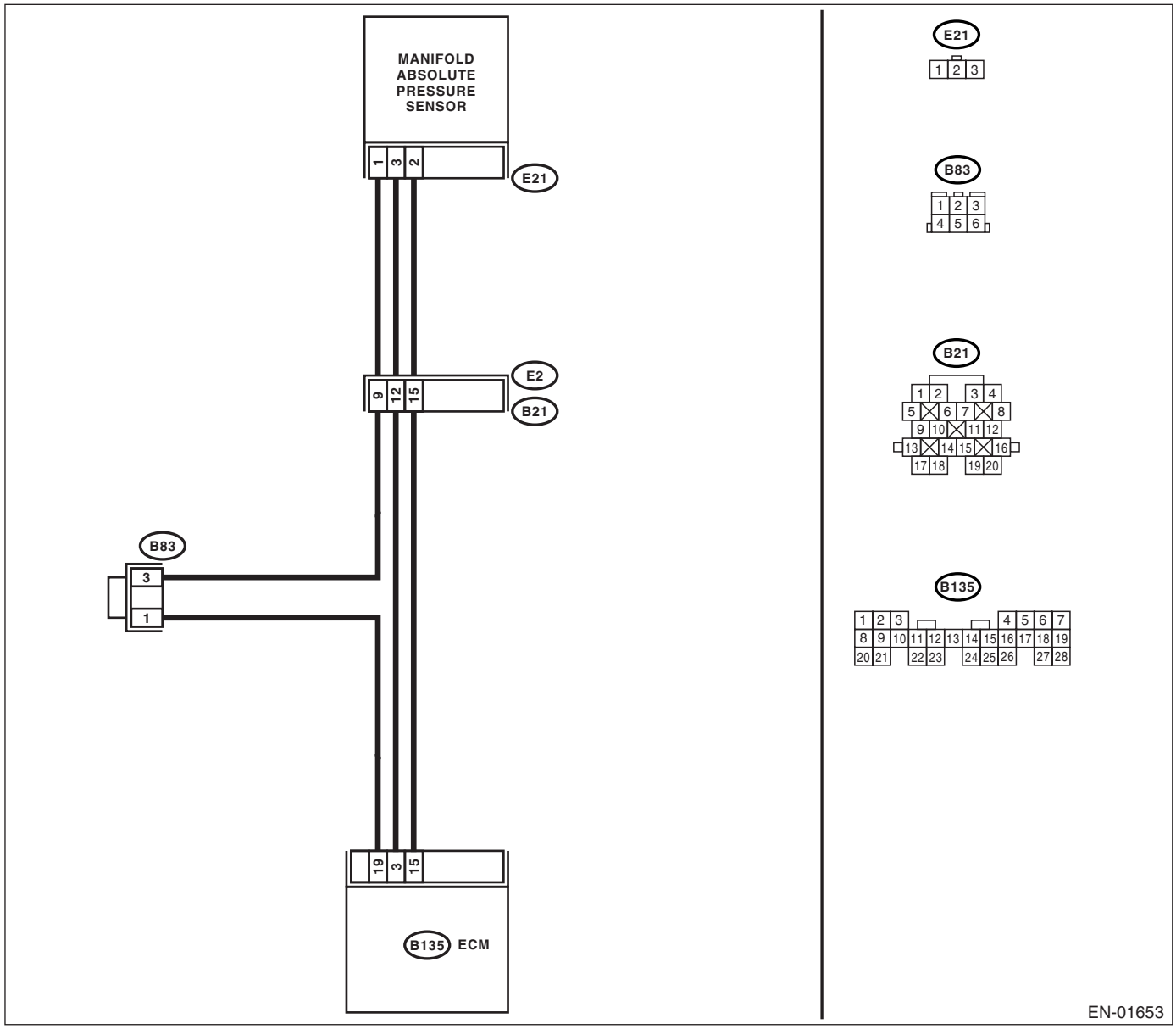
J: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-27, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than 13.3 kPa (100 mmHg, 3.94 inHg)?	Go to step **3.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM and manifold absolute pressure sensor connector.	Is there poor contact in ECM or manifold absolute pressure sensor connector?	Repair poor contact in ECM or manifold absolute pressure sensor connector.	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.
3	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **5.**	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):***	Does the voltage change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 15 (+) — Chassis ground (–):***	Is the voltage less than 0.2 V?	Go to step **7.**	Go to step **6.**
6	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)** Read the data of atmospheric absolute pressure signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.>	Is the measured value more than 13.3 kPa (100 mmHg, 3.94 inHg) by shaking the harness and connector of ECM?	Repair poor contact in ECM connector.	Go to step **7.**

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN MANIFOLD ABSOLUTE PRESSURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **8.**	Repair open circuit in harness between ECM and manifold absolute pressure sensor connector.
8	**CHECK HARNESS BETWEEN MANIFOLD ABSOLUTE PRESSURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B135) No. 19 — (E21) No. 1:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair open circuit in harness between ECM and manifold absolute pressure sensor connector.
9	**CHECK POOR CONTACT.** Check poor contact in manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair poor contact in manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO)-30, Manifold Absolute Pressure Sensor.>

K: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

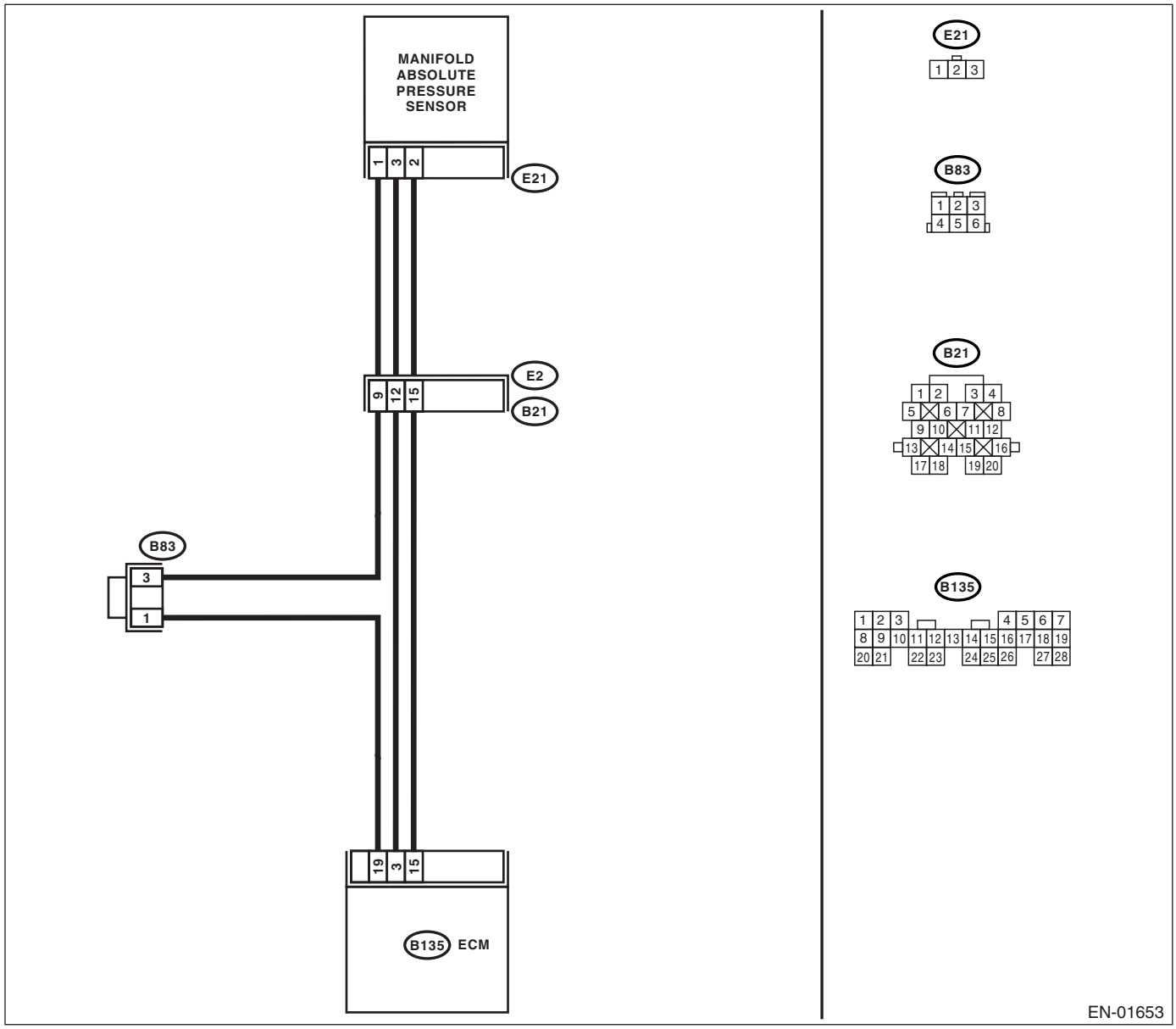
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-29, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 119.5 kPa (896.5 mmHg, 35.29 inHg)?	Go to step **10.**	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (−):***	Does the voltage change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 15 (+) — Chassis ground (−):***	Is the voltage less than 0.2 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)** Read the data of atmospheric absolute pressure signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.>	Is the measured value more than 13.3 kPa (100 mmHg, 3.94 inHg) by shaking the harness and connector of ECM?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN MANIFOLD ABSOLUTE PRESSURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair open circuit in harness between ECM and manifold absolute pressure sensor connector.

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN MANIFOLD ABSOLUTE PRESSURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B135) No. 15 — (E21) No. 2:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between ECM and manifold absolute pressure sensor connector.
8	**CHECK HARNESS BETWEEN MANIFOLD ABSOLUTE PRESSURE SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B135) No. 19 — (E21) No. 1:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair open circuit in harness between ECM and manifold absolute pressure sensor connector.
9	**CHECK POOR CONTACT.** Check poor contact in manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair poor contact in manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO)-30, Manifold Absolute Pressure Sensor.>
10	**CHECK HARNESS BETWEEN MANIFOLD ABSOLUTE PRESSURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF and Subaru Select Monitor or the OBD-II general scan tool switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON. 4) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 119.5 kPa (896.5 mmHg, 35.29 inHg)?	Repair battery short circuit in harness between ECM and manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO)-30, Manifold Absolute Pressure Sensor.>

L: DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-31, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

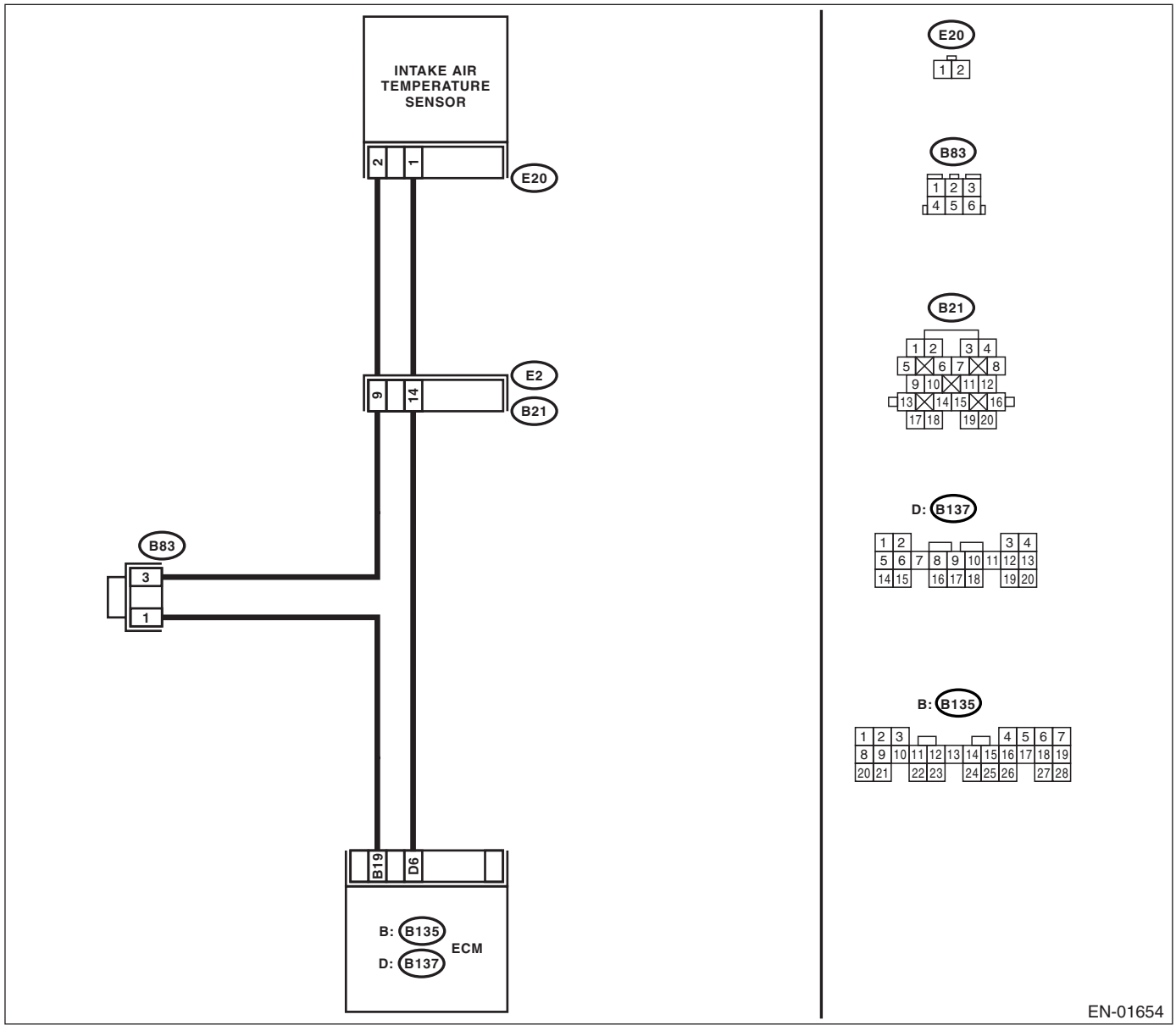
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0111.	Replace the intake air temperature sensor. <Ref. to FU(H4SO)-31, Intake Air Temperature Sensor.>

M: DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-33, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

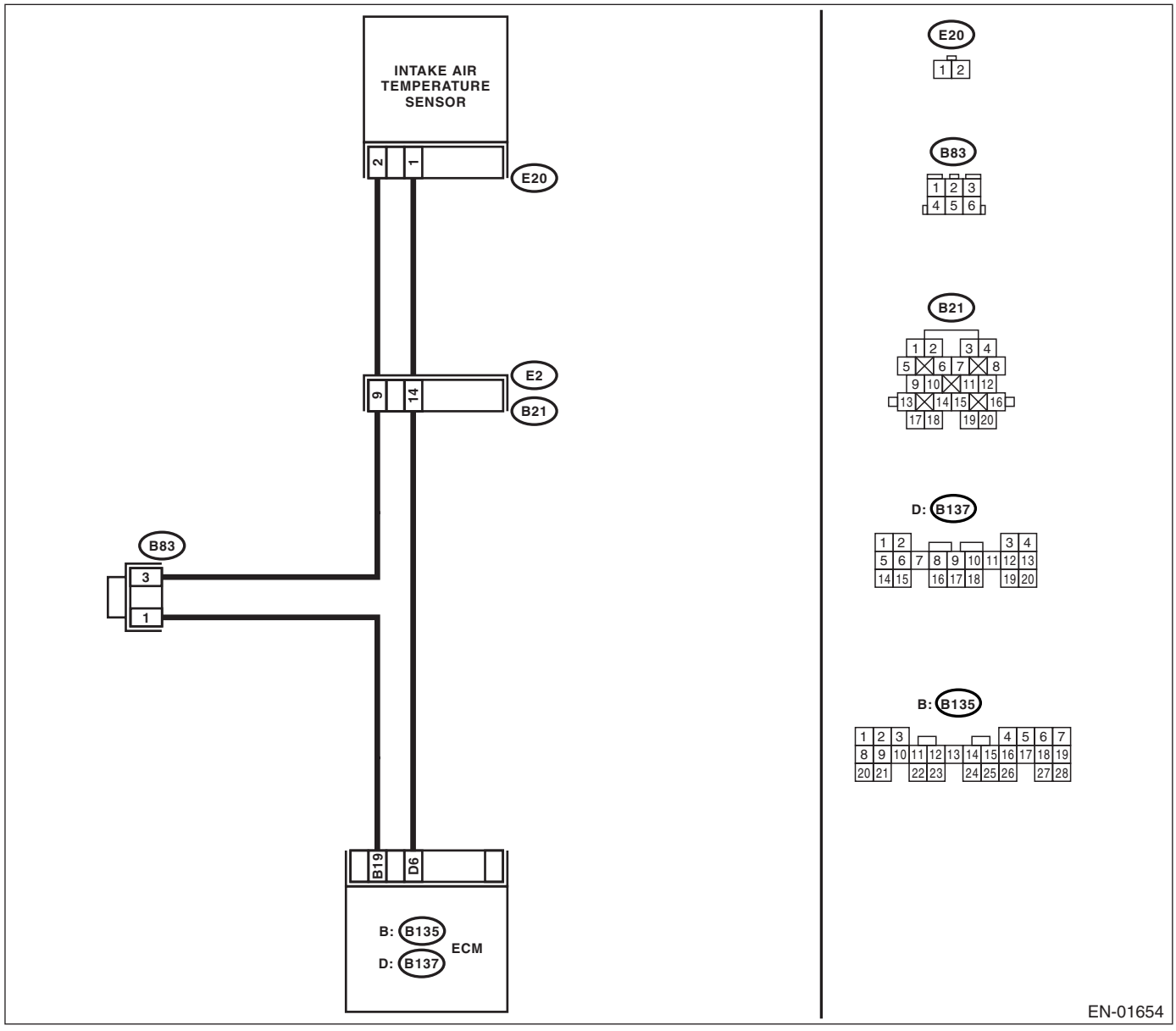
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the intake air temperature more than 120°C (248°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from intake air temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the intake air temperature less than −40°C (−40°F)?	Replace the intake air temperature sensor. <Ref. to FU(H4SO)-31, Intake Air Temperature Sensor.>	Repair ground short circuit in harness between intake air temperature sensor and ECM connector.

N: DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-35, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

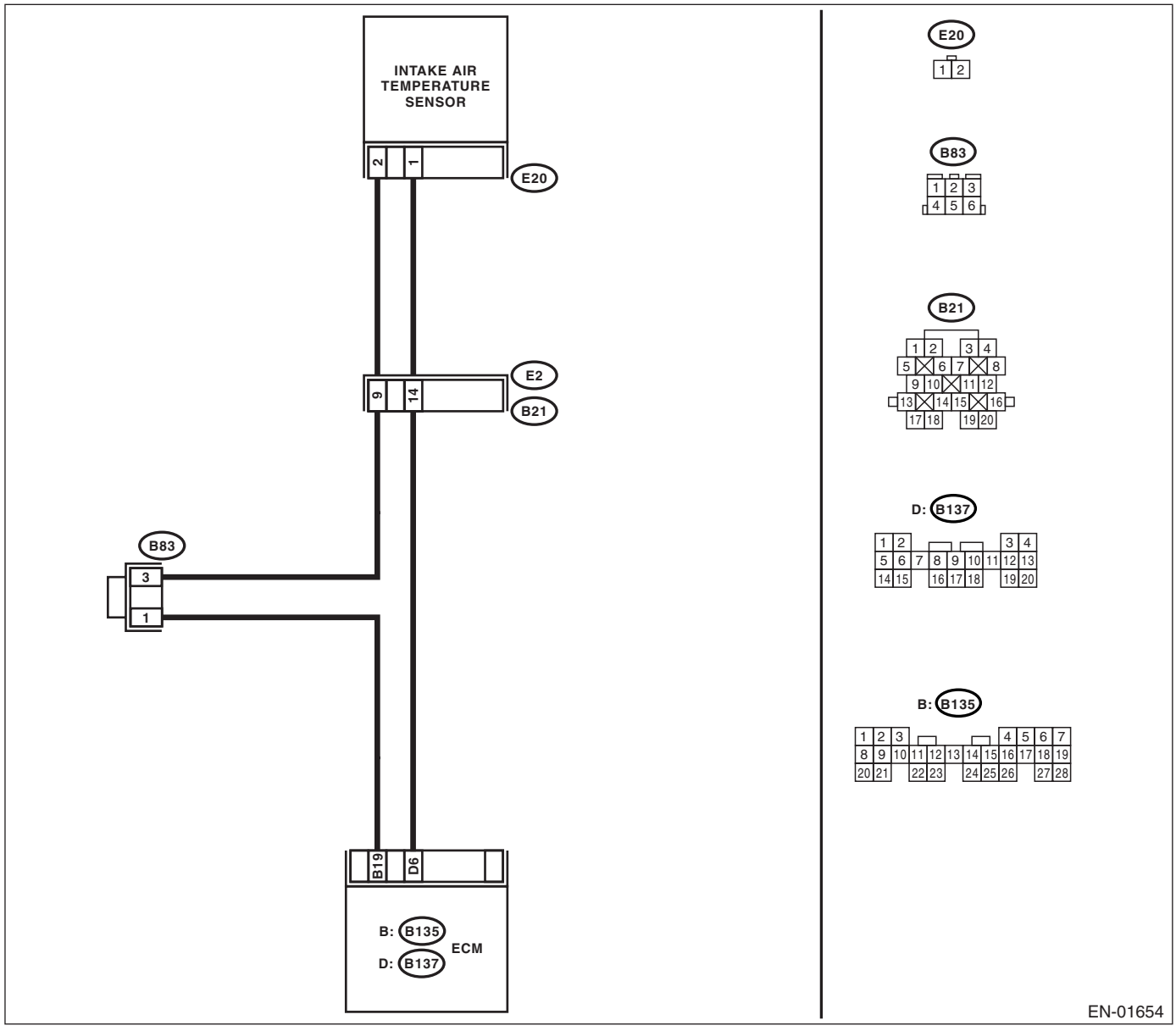
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the intake air temperature less than −40°C (−40°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from intake air temperature sensor. 3) Measure the voltage between intake air temperature and manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between intake air temperature sensor and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between intake air temperature sensor and ECM connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 1 (+) — Engine ground (−):***	Is the voltage more than 3 V?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between intake air temperature sensor and ECM connector • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the intake air temperature sensor. <Ref. to FU(H4SO)-31, Intake Air Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between intake air temperature sensor and ECM connector • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector

O: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-37, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

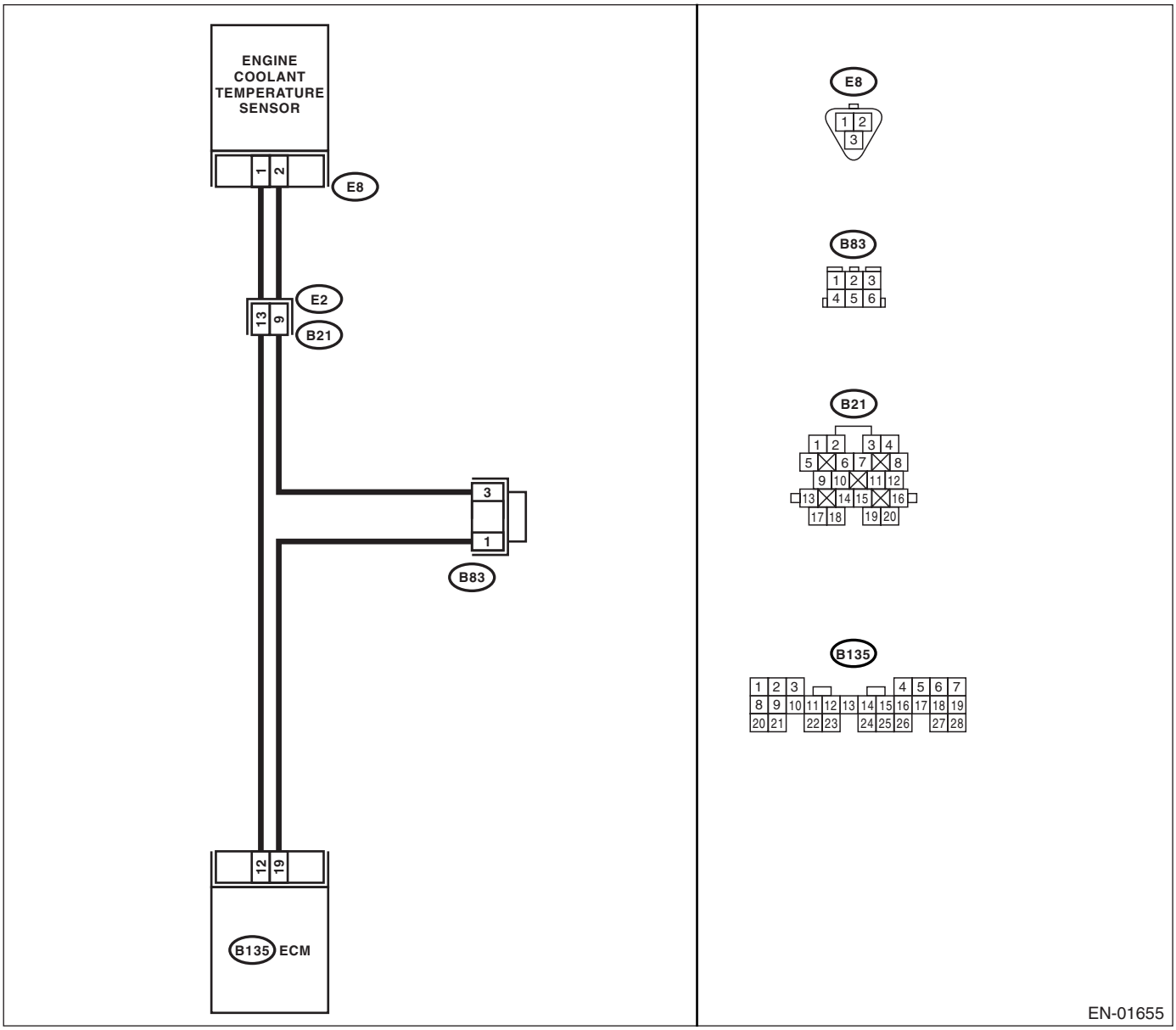
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the engine coolant temperature more than 150°C (302°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from engine coolant temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the engine coolant temperature less than −40°C (−40°F)?	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-24, Engine Coolant Temperature Sensor.>	Repair ground short circuit in harness between engine coolant temperature sensor and ECM connector.

P: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-39, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

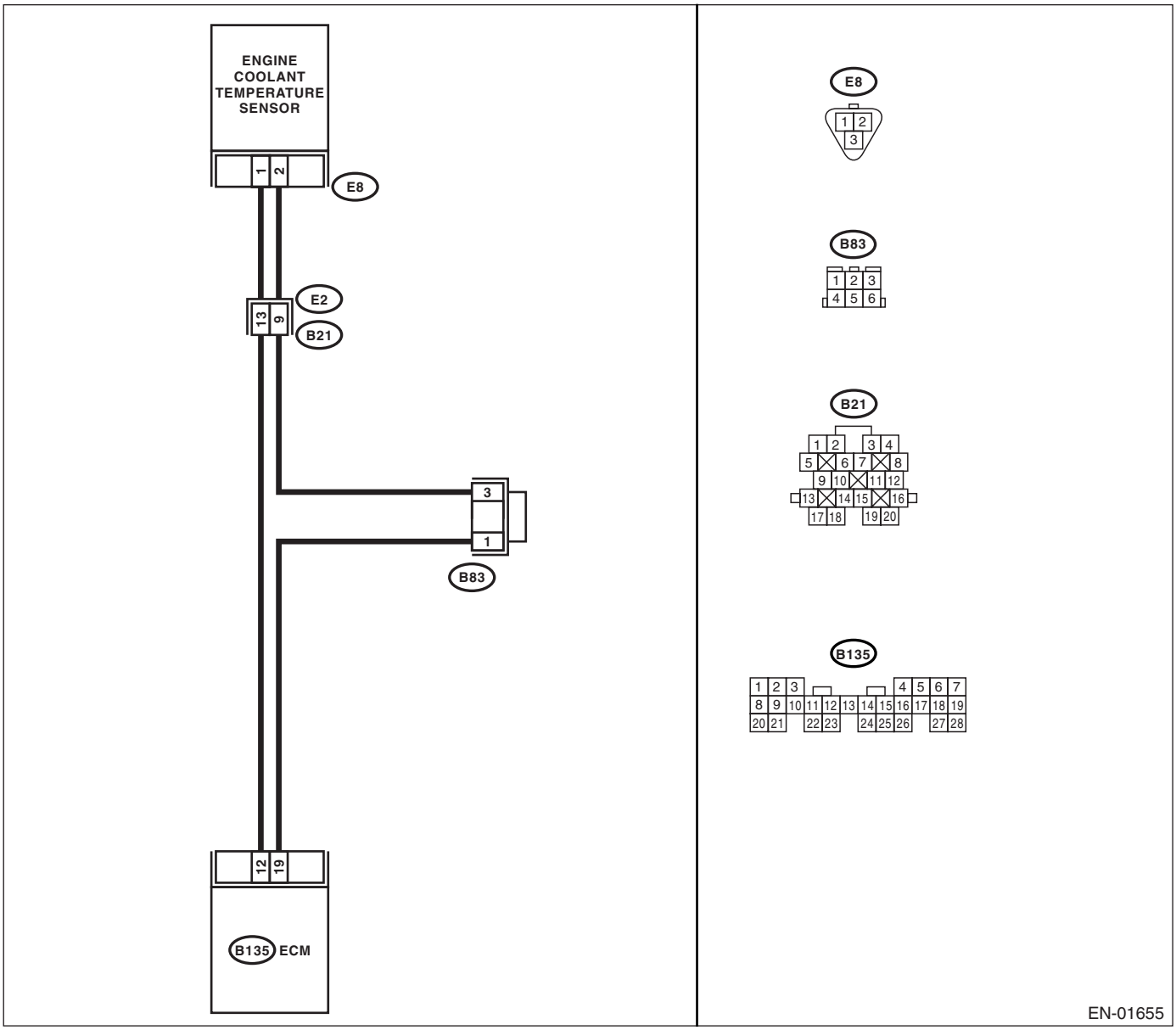
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the engine coolant temperature less than −40°C (−40°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from engine coolant temperature sensor. 3) Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 (+) — Engine ground (−):***	Is the voltage more than 4 V?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-24, Engine Coolant Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

Q: DTC P0121 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-41, DTC P0121 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

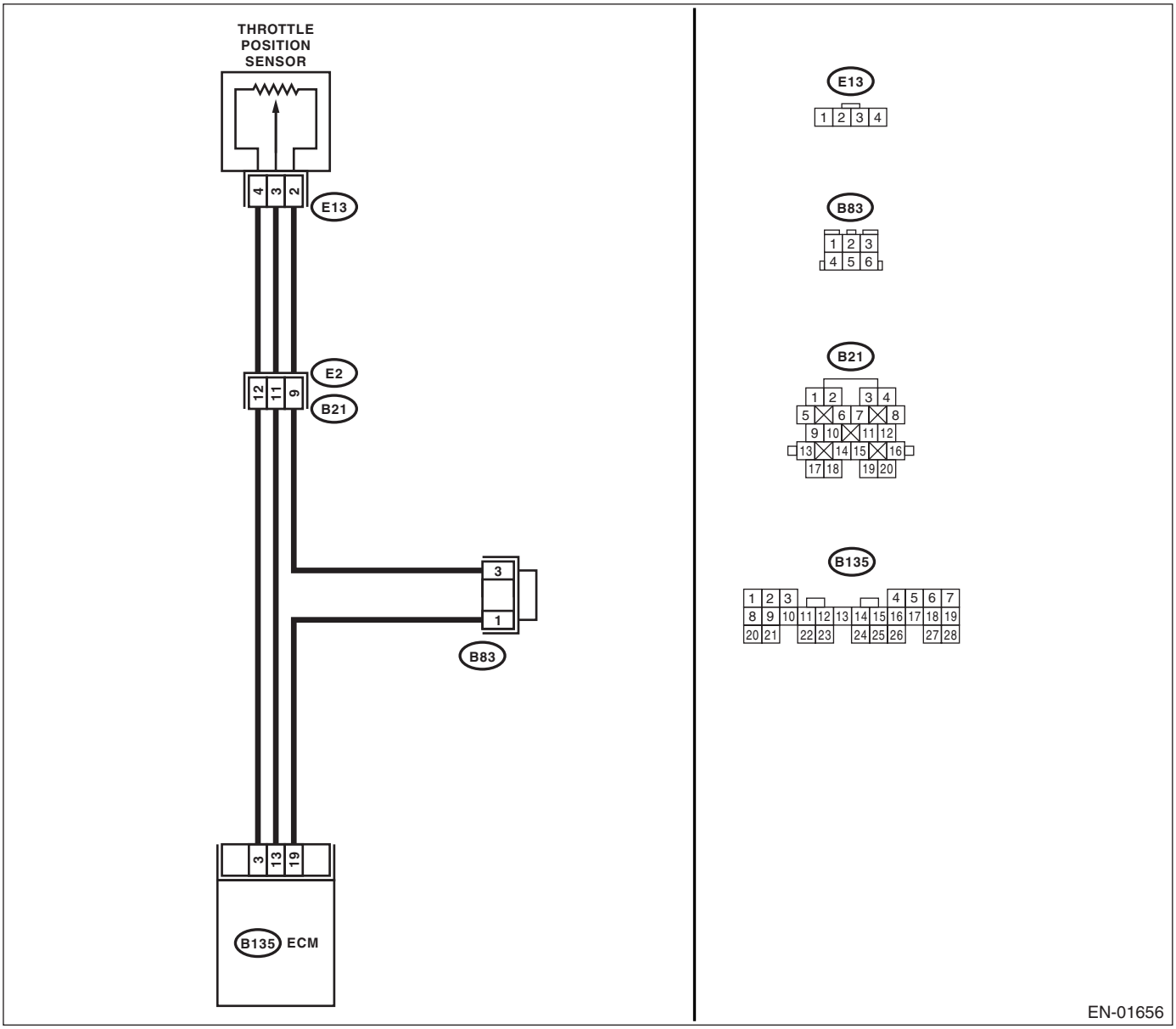
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0121.	Replace the throttle position sensor. <Ref. to FU(H4SO)-28, Throttle Position Sensor.>

R: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

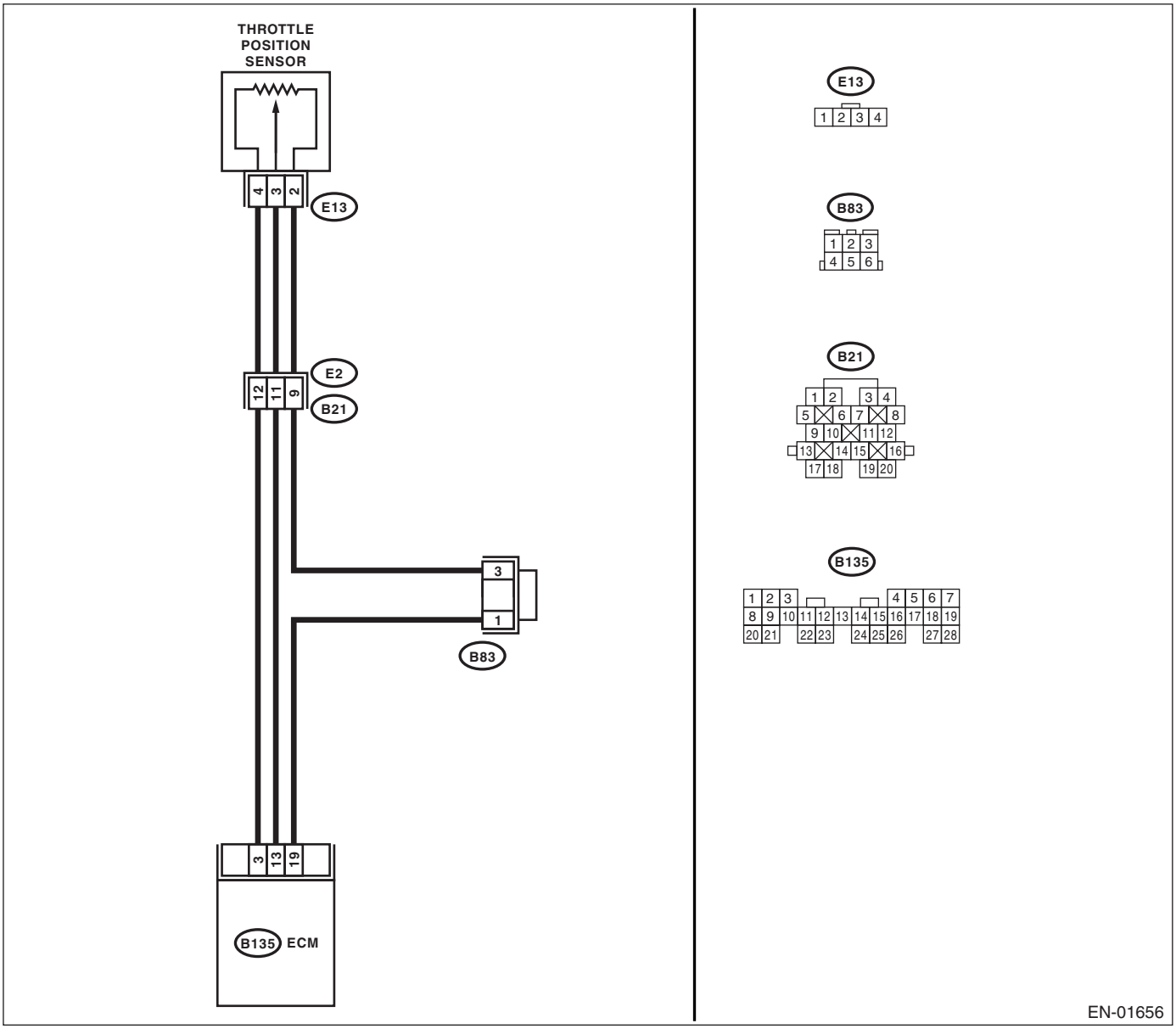
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-43, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage less than 0.1 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground while throttle valve is fully closed. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):***	Does the voltage change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 13 (+) — Chassis ground (–):***	Is the voltage more than 0.1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 13 (+) — Chassis ground (–):***	Does the voltage change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from throttle position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 4 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and throttle position sensor connector. ***Connector & terminal*** ***(B135) No. 13 — (E13) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in ECM connector • Poor contact in throttle position sensor connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** Measure the resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair ground short circuit in harness between throttle position sensor and ECM connector.
9	**CHECK POOR CONTACT.** Check poor contact in throttle position sensor connector.	Is there poor contact in throttle position sensor connector?	Repair poor contact in throttle position sensor connector.	Replace the throttle position sensor. <Ref. to FU(H4SO)-28, Throttle Position Sensor.>

S: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

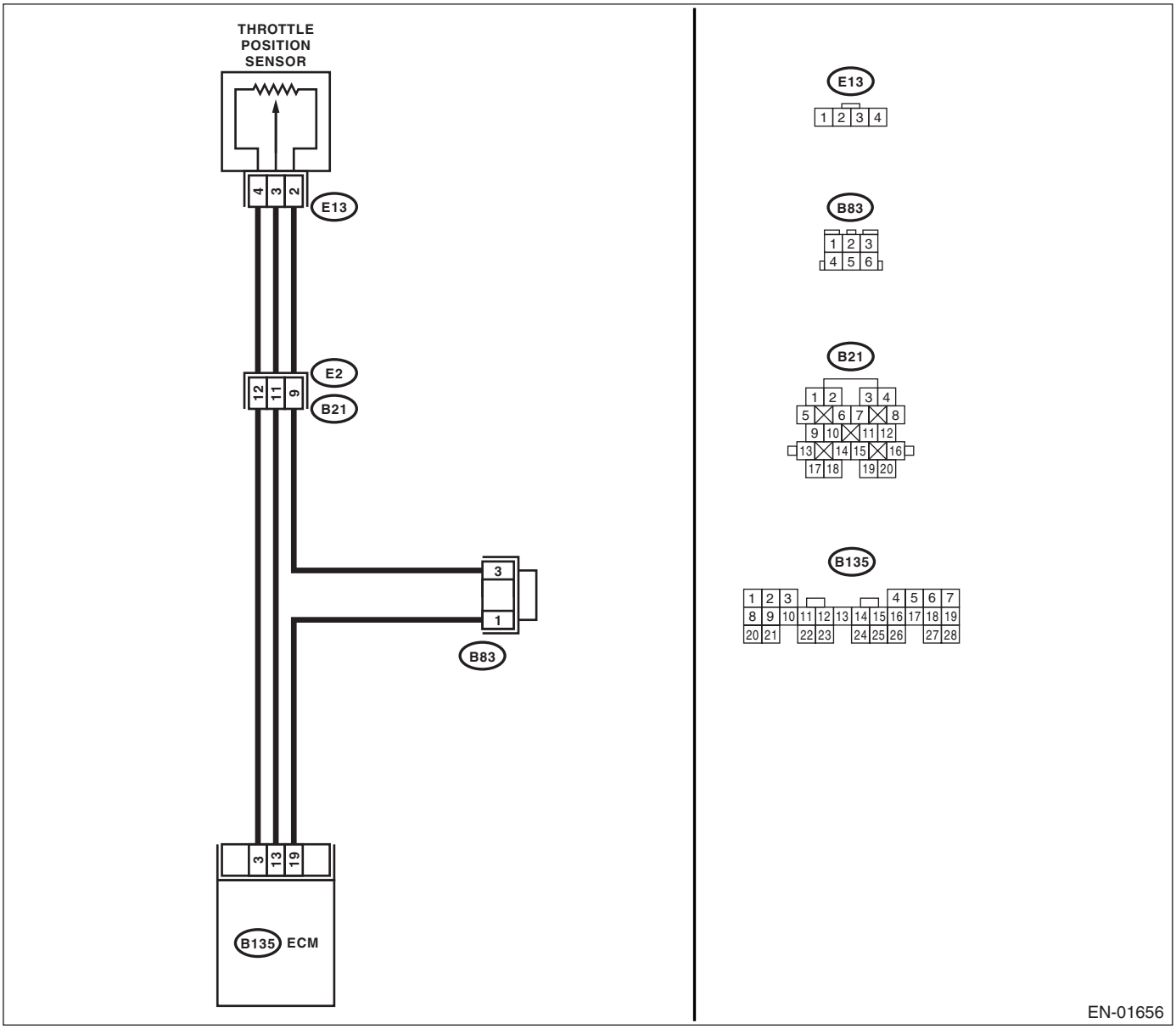
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-45, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage more than 4.9 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from throttle position sensor. 3) Measure the resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.9 V?	Repair battery short circuit in harness between throttle position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Replace the throttle position sensor. <Ref. to FU(H4SO)-28, Throttle Position Sensor.>

T: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-47, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

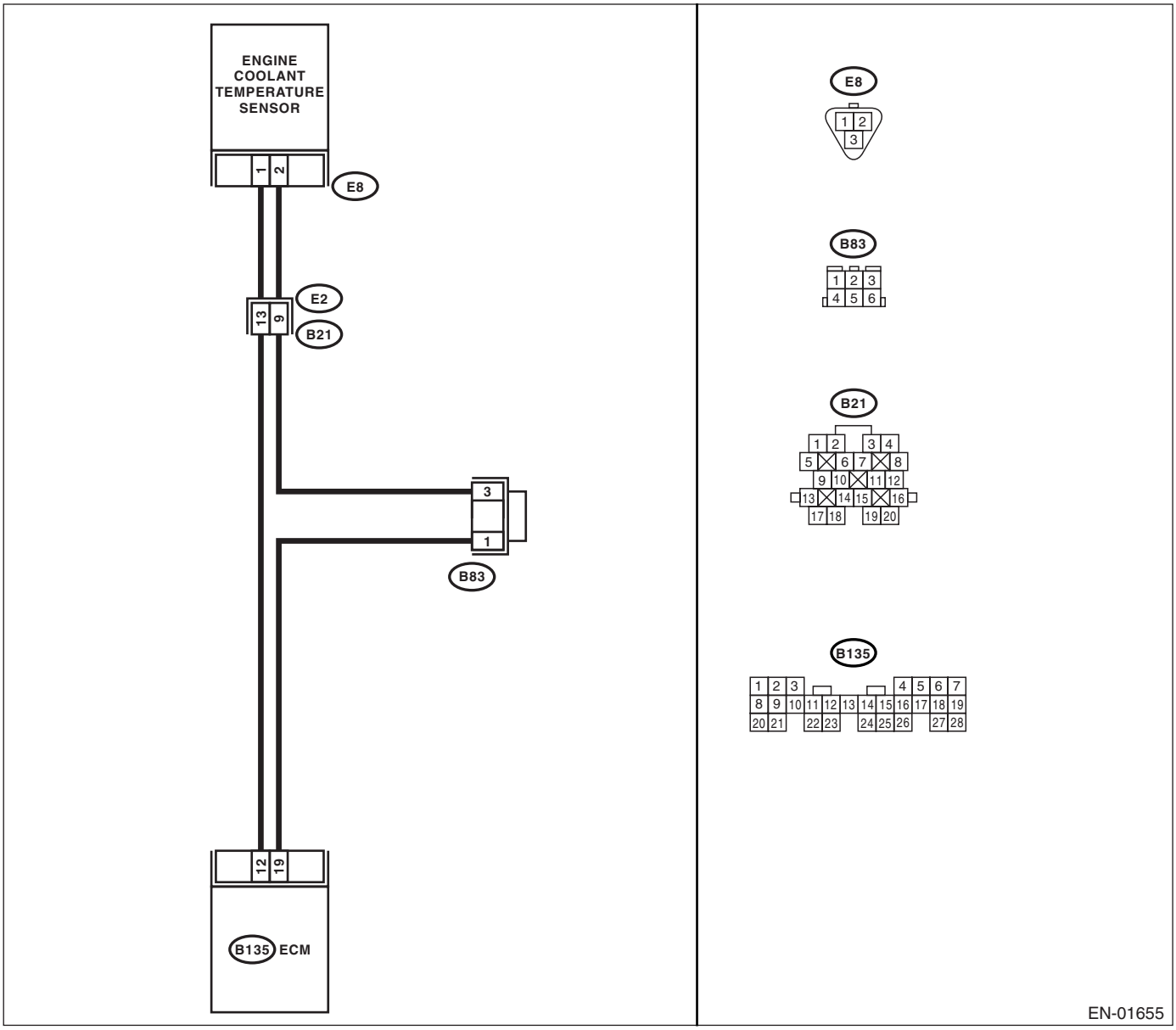
TROUBLE SYMPTOM:

Engine would not return to idling.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step **2.**
2	**CHECK THERMOSTAT.**	Does the thermostat remain opened?	Replace the thermostat. <Ref. to CO(H4SO)-17, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-24, Engine Coolant Temperature Sensor.>

U: DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-48, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Thermostat remains open.

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>

	Step	Check	Yes	No
1	**CHECK VEHICLE CONDITION.**	Was the vehicle driven or idled with the engine partially submerged under water?	In this case, it is not necessary to inspect DTC P0128.	Go to step **2.**
2	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK ENGINE COOLANT.**	Are coolant level and mixture ratio of cooling water to antifreeze solution correct?	Go to step **4.**	Replace the engine coolant. <Ref. to CO(H4SO)-12, REPLACEMENT.>
4	**CHECK RADIATOR FAN.** 1) Start the engine. 2) Check radiator fan operation.	Does the radiator fan continuously rotate for more than 3 minutes during idling?	Repair radiator fan circuit. <Ref. to CO(H4SO)-22, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-23, Radiator Sub Fan and Fan Motor.>	Replace the thermostat. <Ref. to CO(H4SO)-17, Thermostat.>

V: DTC P0129 ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-50, DTC P0129 BAROMETRIC PRESSURE TOO LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

Step	Check	Yes	No
1 **CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: It is not necessary to inspect DTC P0129.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

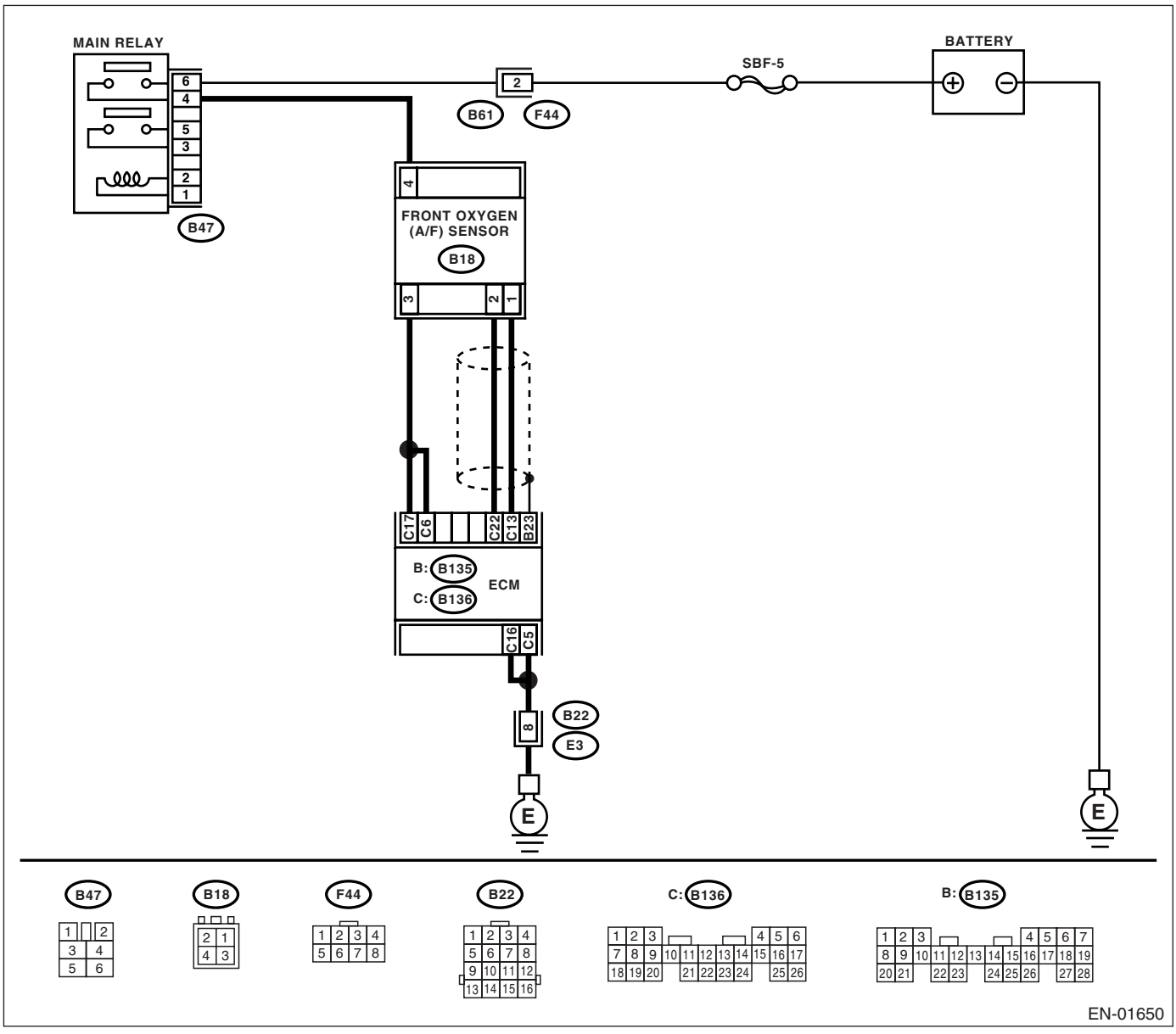
W: DTC P0130 O_2 SENSOR CIRCUIT (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-51, DTC P0130 O_2 SENSOR CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR DATA.** 1) Start the engine. 2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 70°C (160°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read the data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage 0.85 — 1.15 V?	Go to step **3.**	Go to step **4.**
3	**CHECK FRONT OXYGEN (A/F) SENSOR DATA.** 1) Race the engine at speeds from idling to 5,000 rpm for a total of 5 cycles. 2) Read the data of front oxygen (A/F) sensor signal during racing using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Air fuel ratio is rich at normal condition or during racing. • To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed.	Is the voltage more than 1.1 V?	Go to step **6.**	Go to step **4.**
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance between ECM and front oxygen (A/F) sensor. ***Connector & terminals*** ***(B136) No. 13 — (B18) No. 1:*** ***(B136) No. 22 — (B18) No. 2:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair open circuit between ECM and front oxygen (A/F) sensor.
5	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminals*** ***(B136) No. 13 — Chassis ground:*** ***(B136) No. 22 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair ground short circuit between ECM and front oxygen (A/F) sensor.

	Step	Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness of front oxygen (A/F) sensor • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-40, Front Oxygen (A/F) Sensor.>

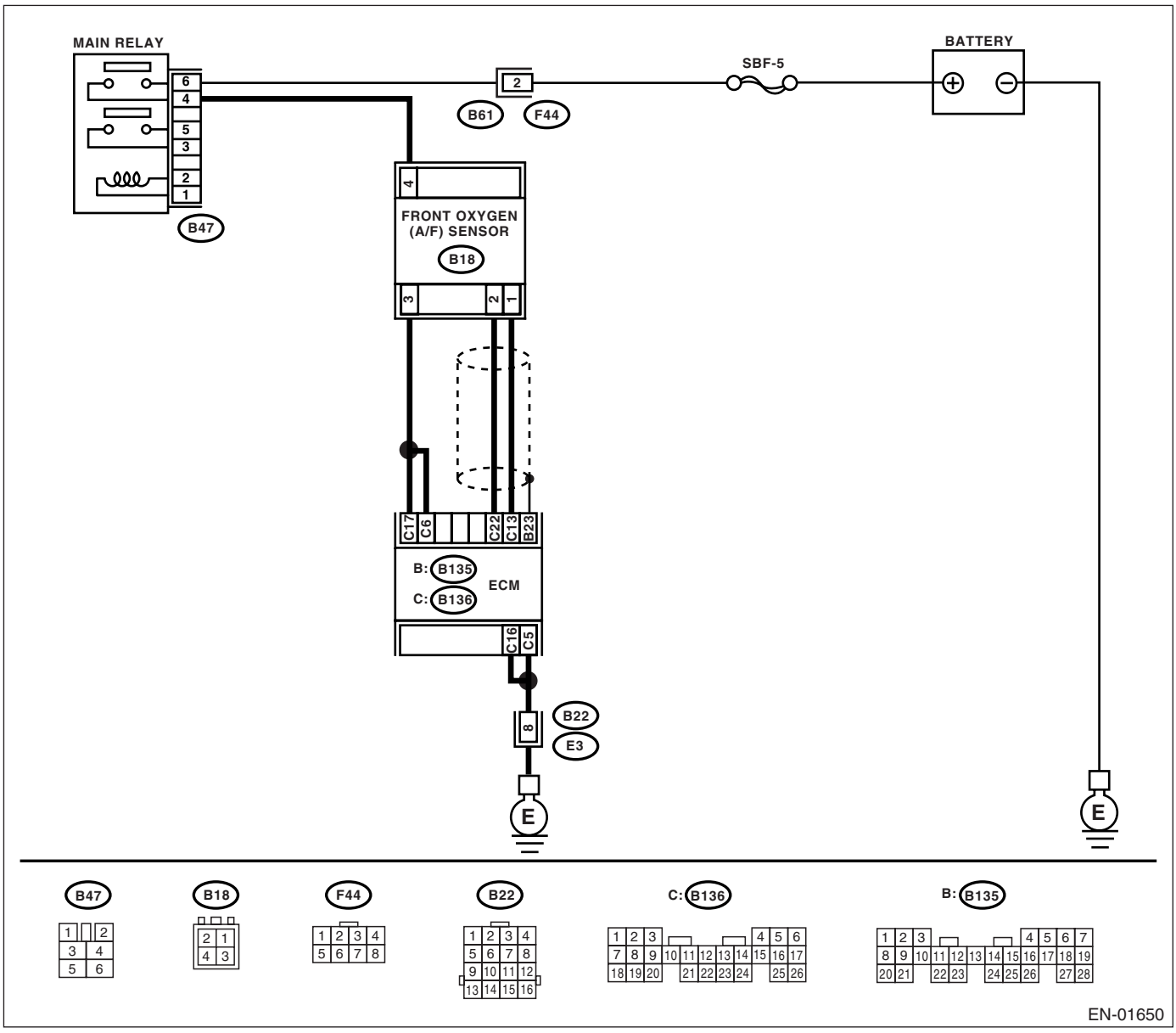
X: DTC P0131 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-53, DTC P0131 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 13 — Chassis ground:*** ***(B136) No. 22 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-40, Front Oxygen (A/F) Sensor.>	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.

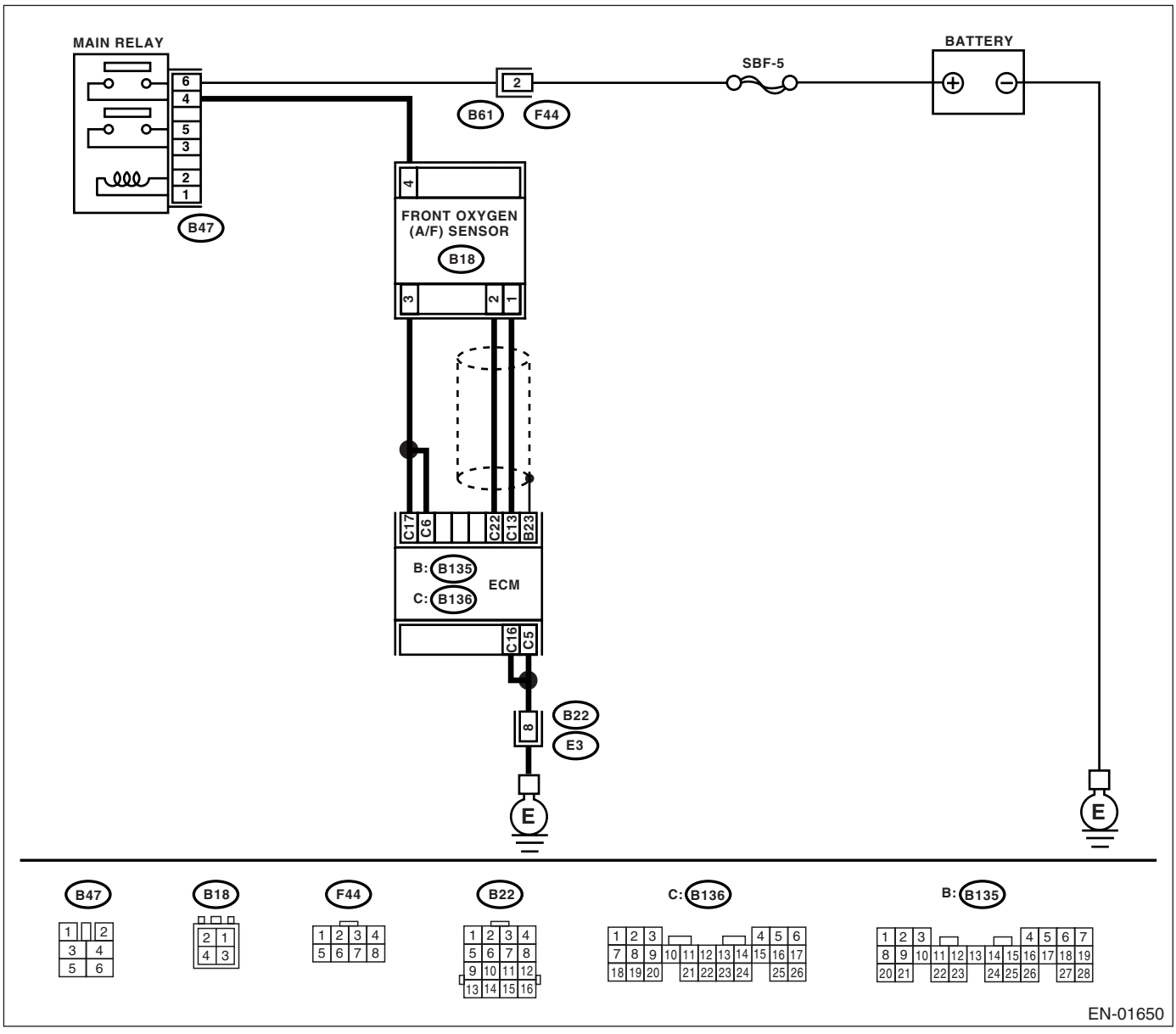
Y: DTC P0132 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-55, DTC P0132 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to ON. 2) Disconnect the connectors from front oxygen (A/F) sensor. 3) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 13 (+) — Chassis ground (−):*** ***(B136) No. 22 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-40, Front Oxygen (A/F) Sensor.>	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.

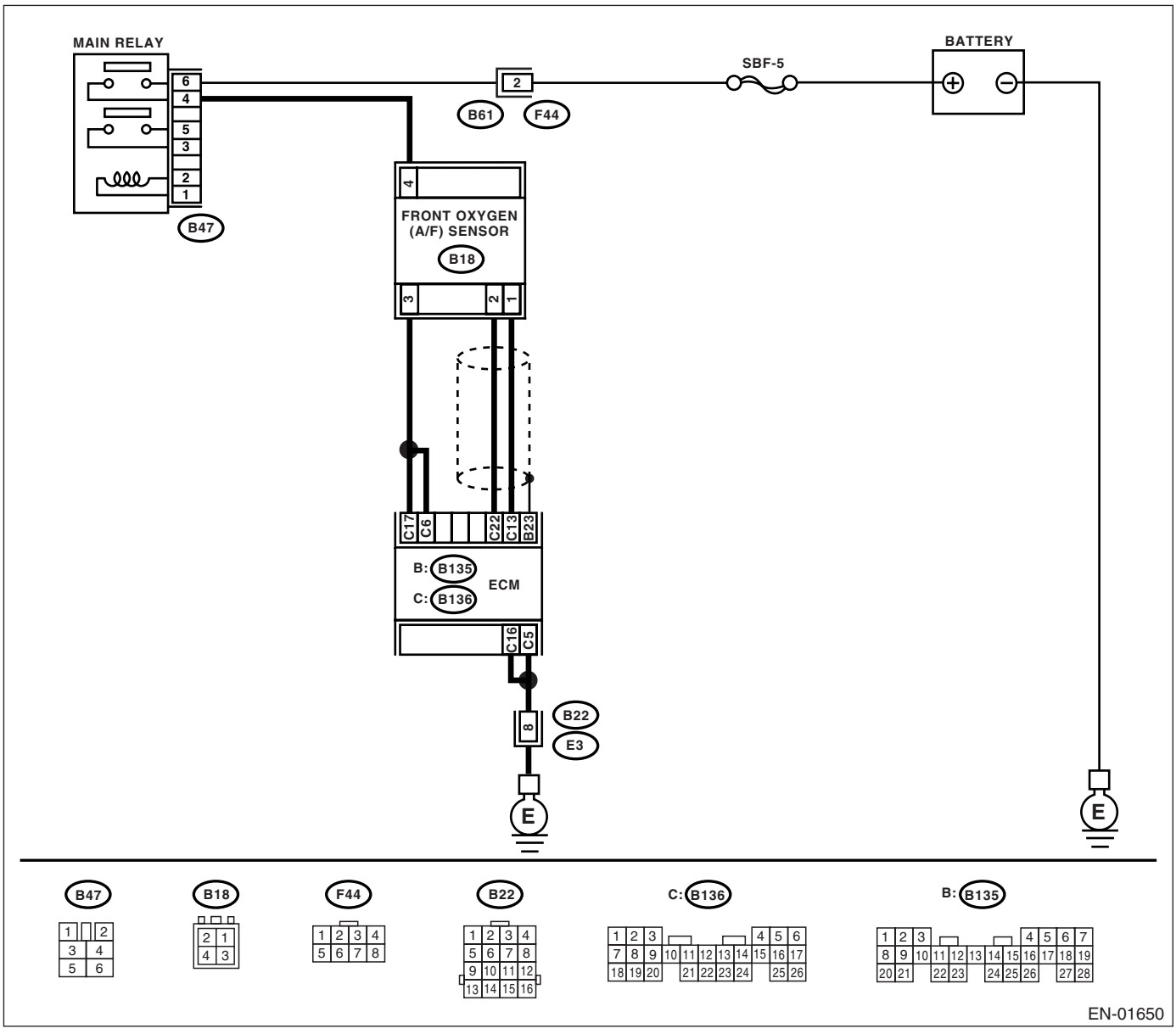
Z: DTC P0133 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-57, DTC P0133 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** NOTE: Check the following items. • Loose installation of front portion of exhaust pipe onto cylinder heads • Loose connection between front exhaust pipe and front catalytic converter • Damage of exhaust pipe resulting in a hole	Is there a fault in exhaust system?	Repair exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-40, Front Oxygen (A/F) Sensor.>

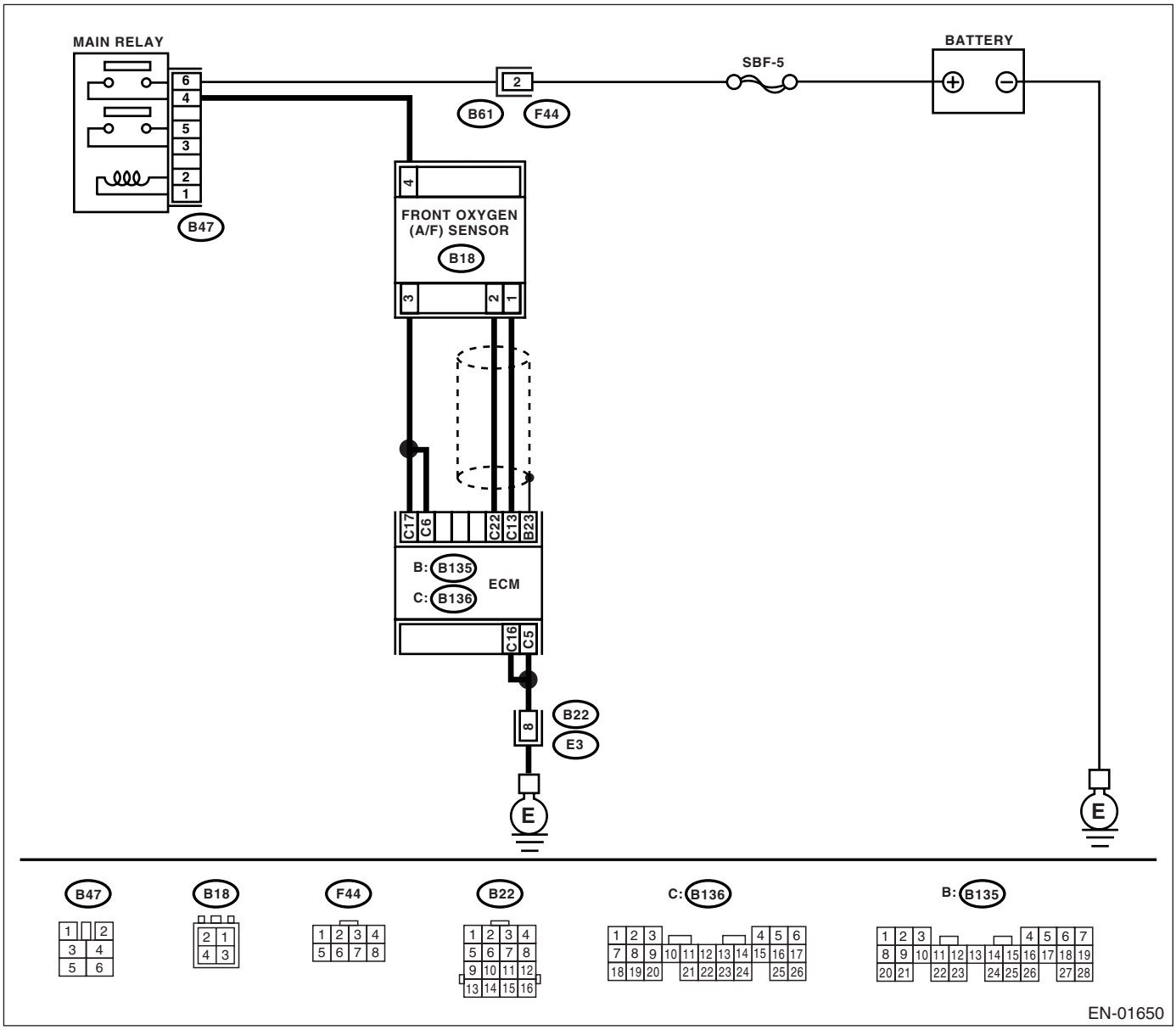
AA:DTC P0134 O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-61, DTC P0134 O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 13 — (B18) No. 1:*** ***(B136) No. 22 — (B18) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
2	**CHECK POOR CONTACT.** Check poor contact in front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair poor contact in front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-40, Front Oxygen (A/F) Sensor.>

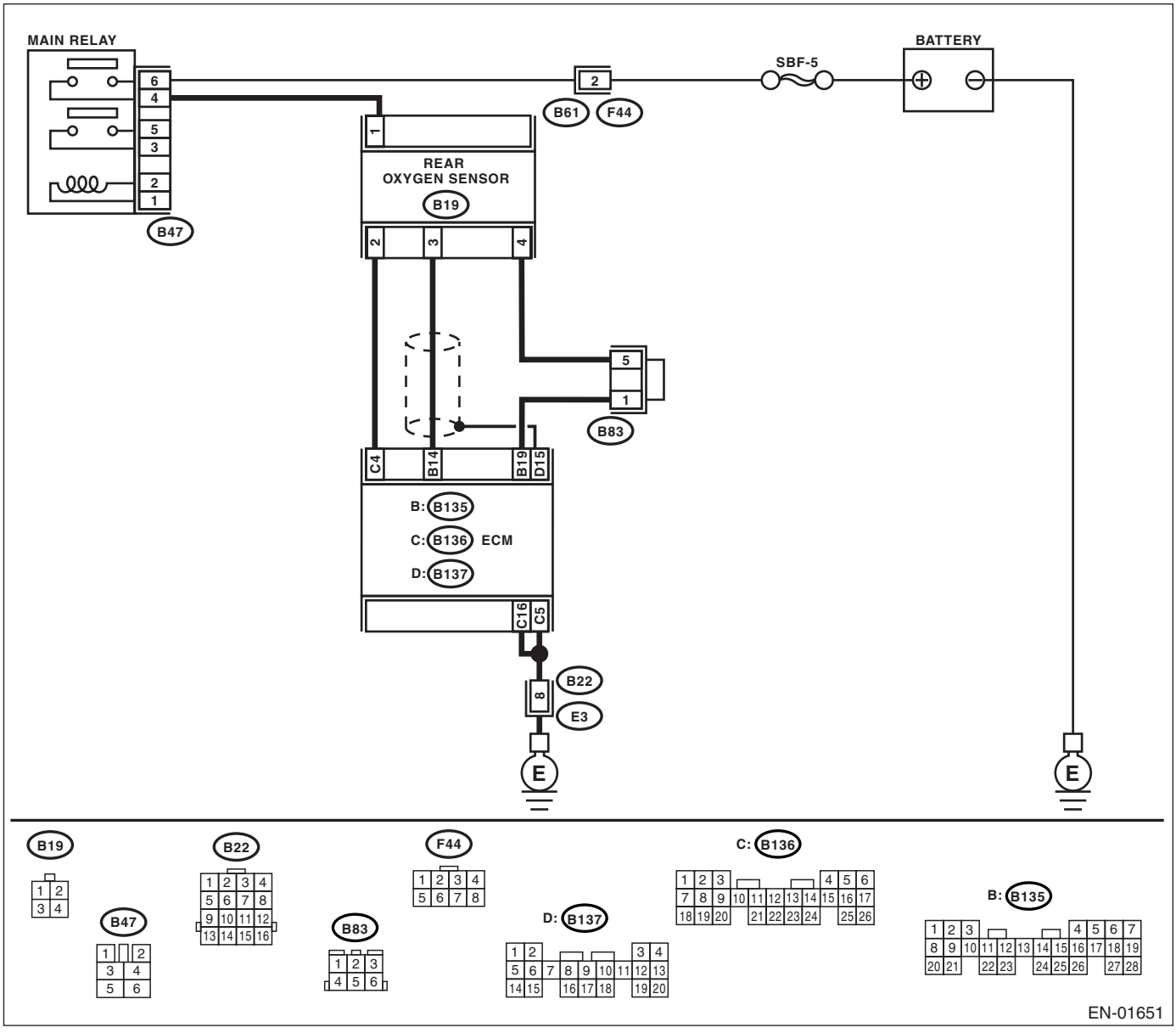
AB:DTC P0137 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-63, DTC P0137 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0137.	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 5,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage 490 mV?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 14 — (B19) No. 3:*** ***(B135) No. 19 — (B19) No. 4:***	Is the resistance more than 3 Ω?	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(B19) No. 3 (+) — Engine ground (−):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4SO)-42, Rear Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

Step		Check	Yes	No
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4SO)-42, Rear Oxygen Sensor.>

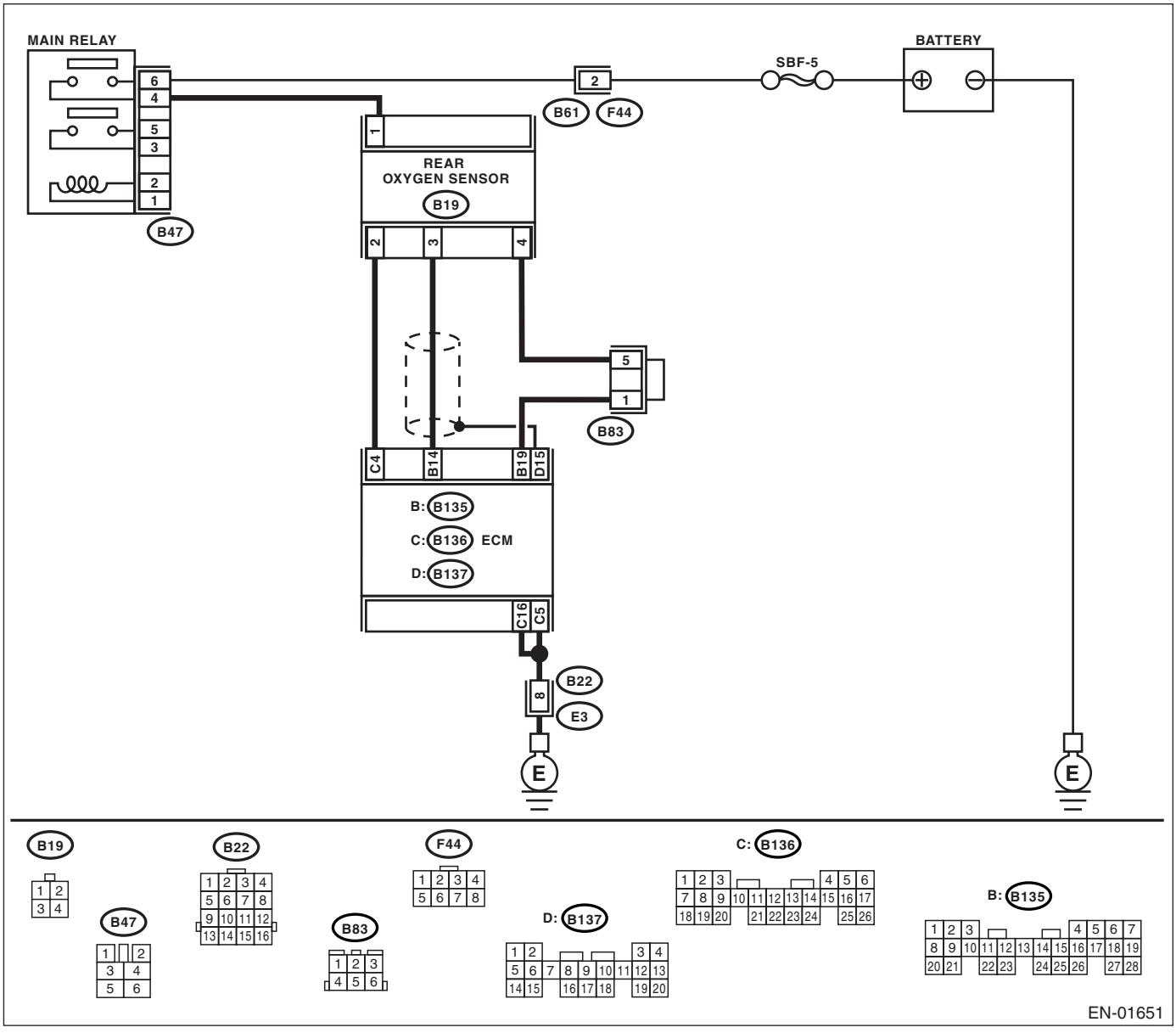
AC:DTC P0138 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-65, DTC P0138 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0138.	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and immediately decrease the engine speed from 5,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage 250 mV?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 14 — (B19) No. 3:*** ***(B135) No. 19 — (B19) No. 4:***	Is the resistance more than 3 Ω?	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(B19) No. 3 (+) — Engine ground (−):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4SO)-42, Rear Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

	Step	Check	Yes	No
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4SO)-42, Rear Oxygen Sensor.>

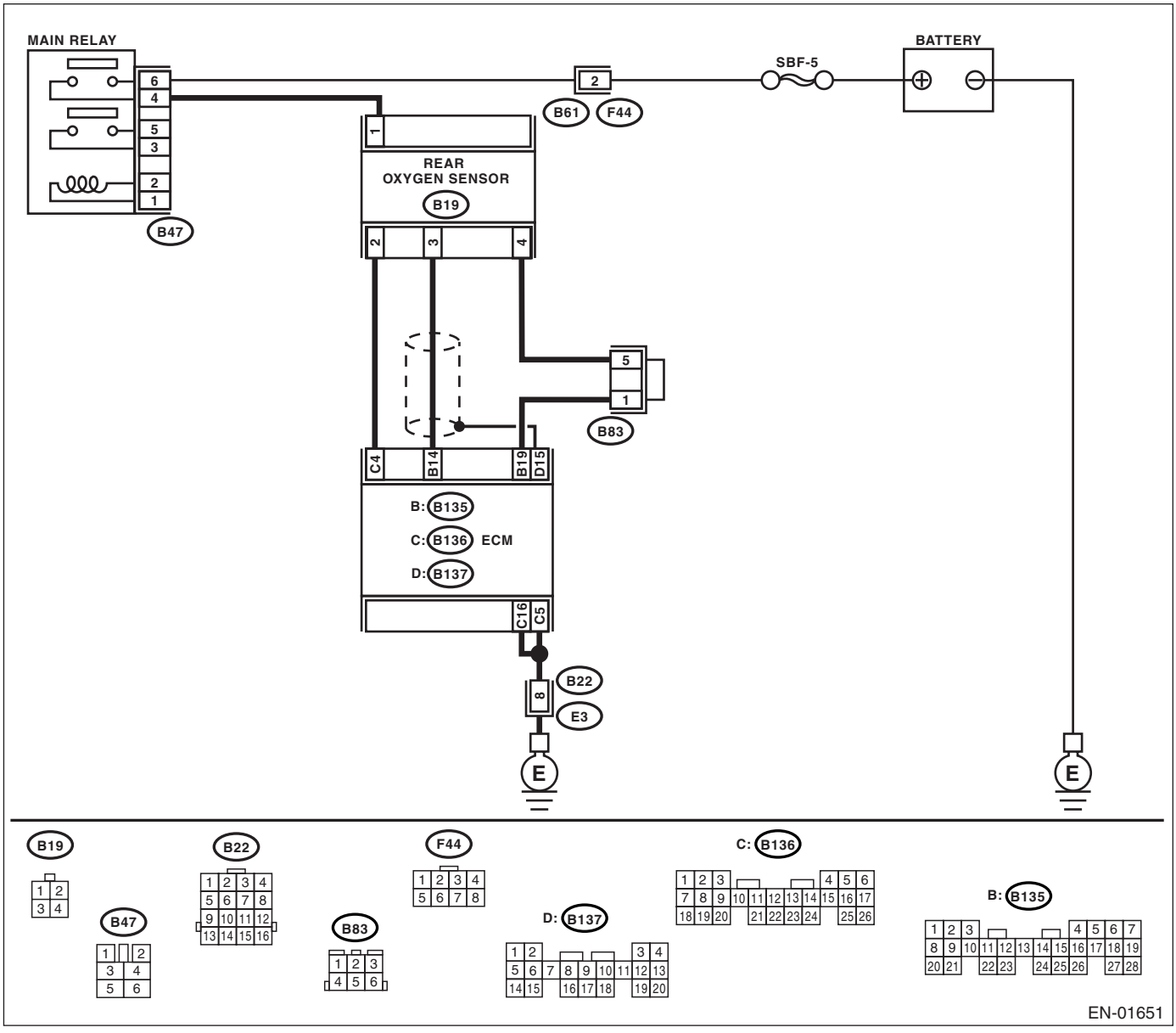
AD:DTC P0139 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-67, DTC P0139 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Replace the rear oxygen sensor. <Ref. to FU(H4SO)-42, Rear Oxygen Sensor.>

AE:DTC P0171 SYSTEM TOO LEAN (BANK 1)

Refer to DTC P0172 for diagnostic procedure. <Ref. to EN(H4SO)(diag)-146, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AF:DTC P0172 SYSTEM TOO RICH (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-73, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair exhaust system.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step **3.**
3	**CHECK PURGE CONTROL SOLENOID VALVE OR PRESSURE CONTROL SOLENOID VALVE.**	Is the purge control solenoid valve or pressure control solenoid valve stuck?	Replace the purge control solenoid valve or pressure control solenoid valve.	Go to step **4.**
4	**CHECK FUEL PRESSURE.** **Warning:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel on the floor.** 1) Release fuel pressure. (1)Disconnect the connector from fuel pump relay. (2)Start the engine and run it until it stalls. (3)After the engine stalls, crank it for five more seconds. (4)Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install the fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the fuel pressure 284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)?	Go to step **5.**	Repair the following items. Fuel pressure too high • Clogged fuel return line or bent hose Fuel pressure too low • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
5	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: • If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If out of specification as measured at this step, check or replace pressure regulator and pressure regulator vacuum hose.	Is the fuel pressure 206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)?	Go to step **6.**	Repair the following items. Fuel pressure too high • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
6	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the engine coolant temperature 70 — 100°C (158 — 212°F)?	Go to step **7.**	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-24, Engine Coolant Temperature Sensor.>
7	**CHECK PRESSURE SENSOR SIGNAL.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the select lever in "N" or "P" range. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read the data of pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Idling: Is the measured value 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg), Ignition ON: Is the measured value 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg)?	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Replace the Pressure sensor. <Ref. to FU(H4SO)-30, Manifold Absolute Pressure Sensor.>

AG:DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE

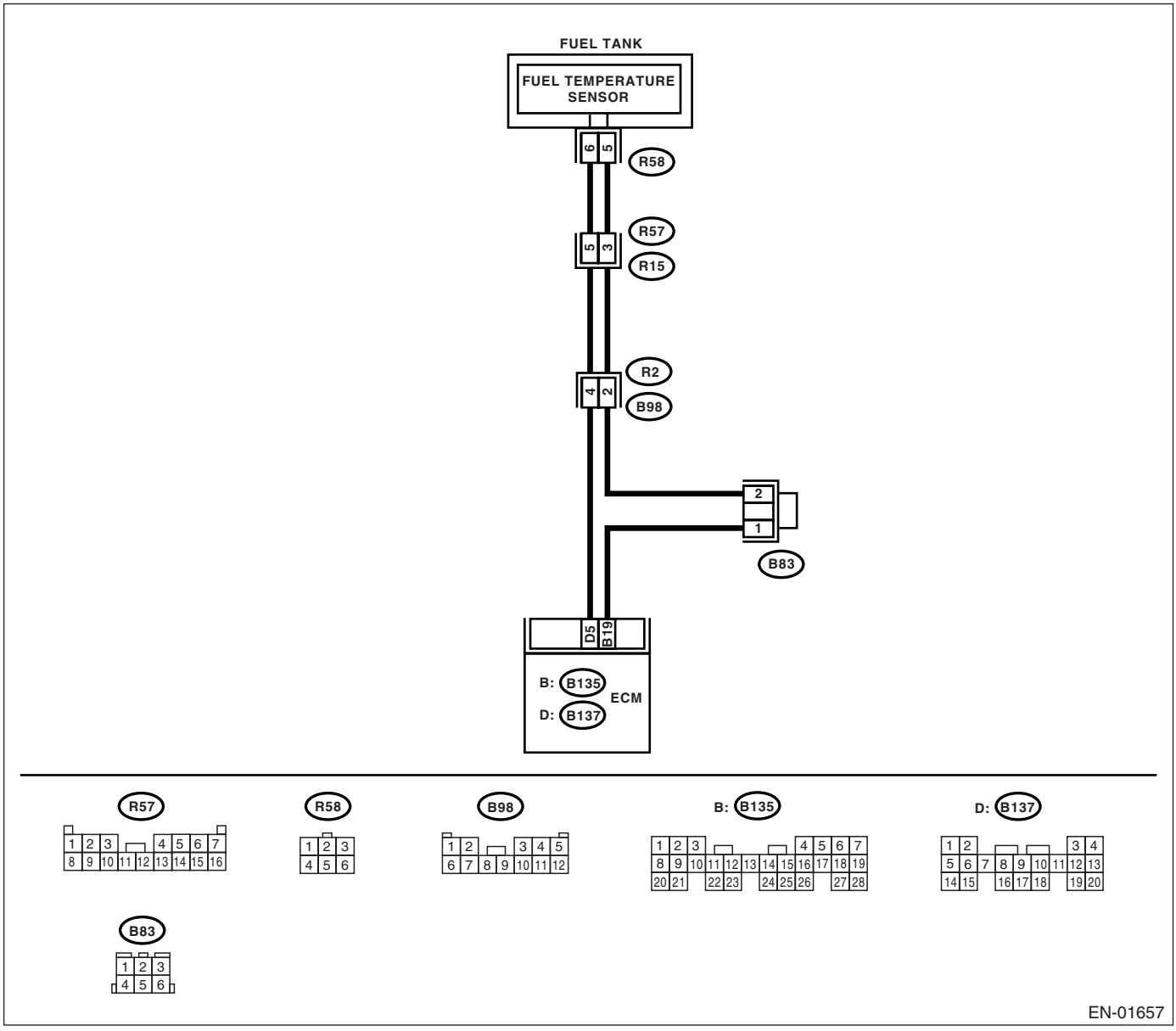
DTC DETECTING CONDITION:

- Fault occurs in two consecutive driving cycles
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-75, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0181.	Replace the fuel temperature sensor. <Ref. to EC(H4SO)-8, Fuel Temperature Sensor.>

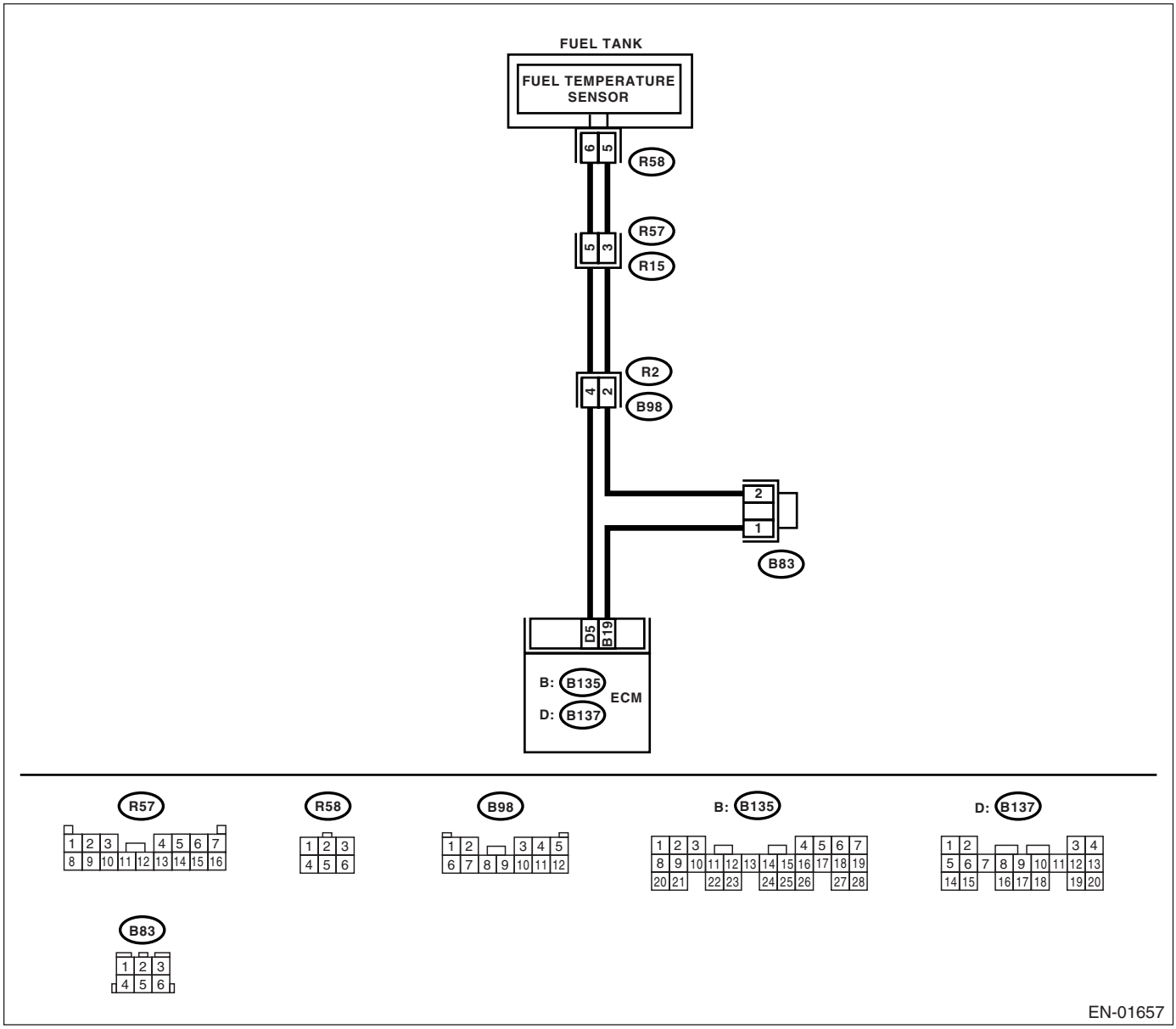
AH:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-77, DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the fuel temperature 150°C (302°F)?	Go to step **2.**	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.
2	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove the access hole lid. 3) Disconnect the connector from fuel pump. 4) Turn ignition switch to ON. 5) Read the data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the fuel temperature −40°C (−40°F)?	Replace the fuel temperature sensor. <Ref. to EC(H4SO)-8, Fuel Temperature Sensor.>	Repair short circuit to ground in harness between fuel pump and ECM connector.

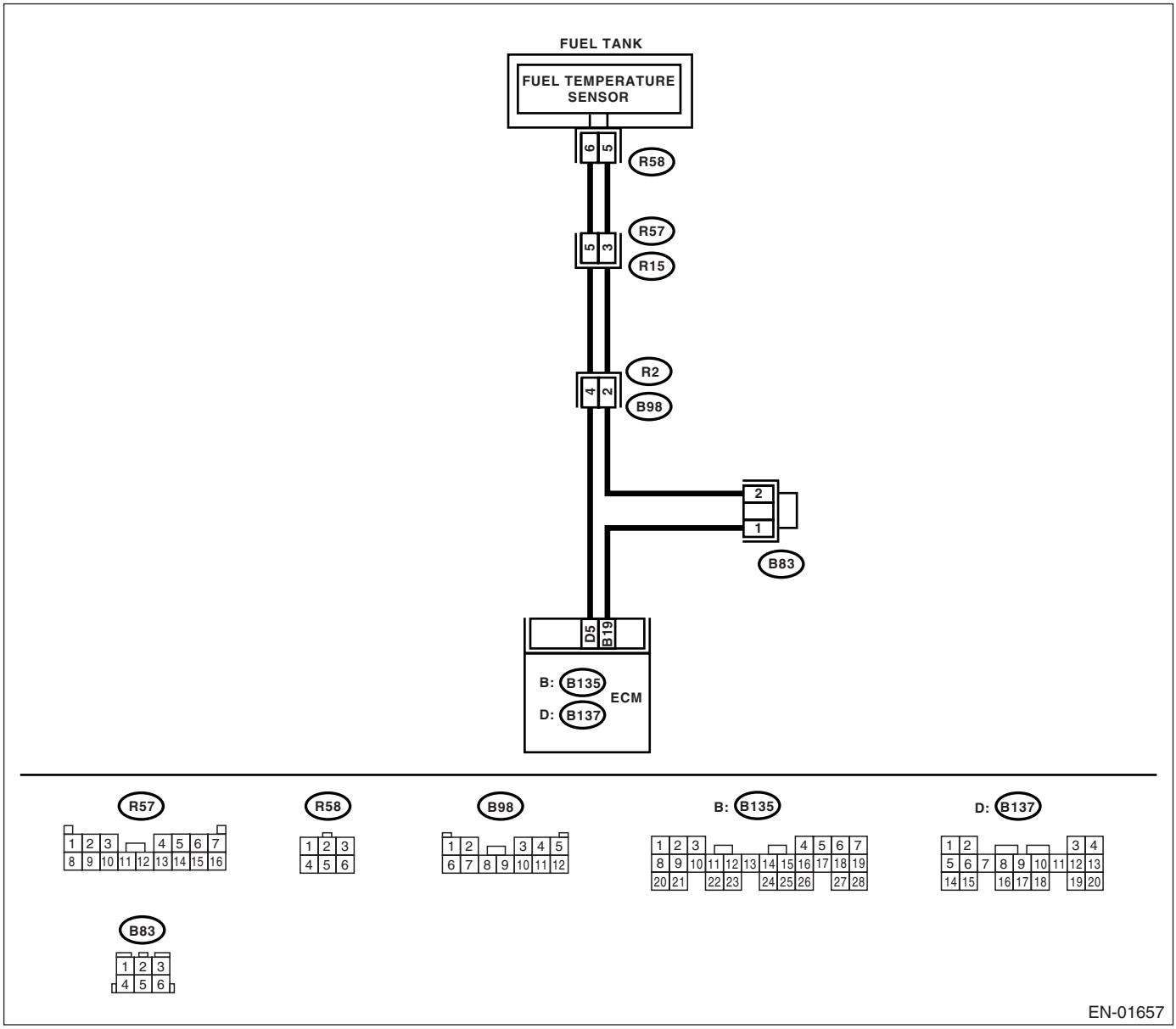
AI: DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-79, DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the fuel temperature −40°C (−40°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Remove the access hole lid. 3) Disconnect the connector from fuel pump. 4) Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and fuel pump connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and fuel pump connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 4 V?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between fuel pump connector and ECM. ***Connector & terminal*** ***(R58) No. 5 — (B135) No. 19:***	Is the resistance less than 1 Ω?	Replace the fuel temperature sensor. <Ref. to EC(H4SO)-8, Fuel Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

AJ:DTC P0301 CYLINDER 1 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4SO)(diag)-155, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AK:DTC P0302 CYLINDER 2 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4SO)(diag)-155, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AL:DTC P0303 CYLINDER 3 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4SO)(diag)-155, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AM:DTC P0304 CYLINDER 4 MISFIRE DETECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-86, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

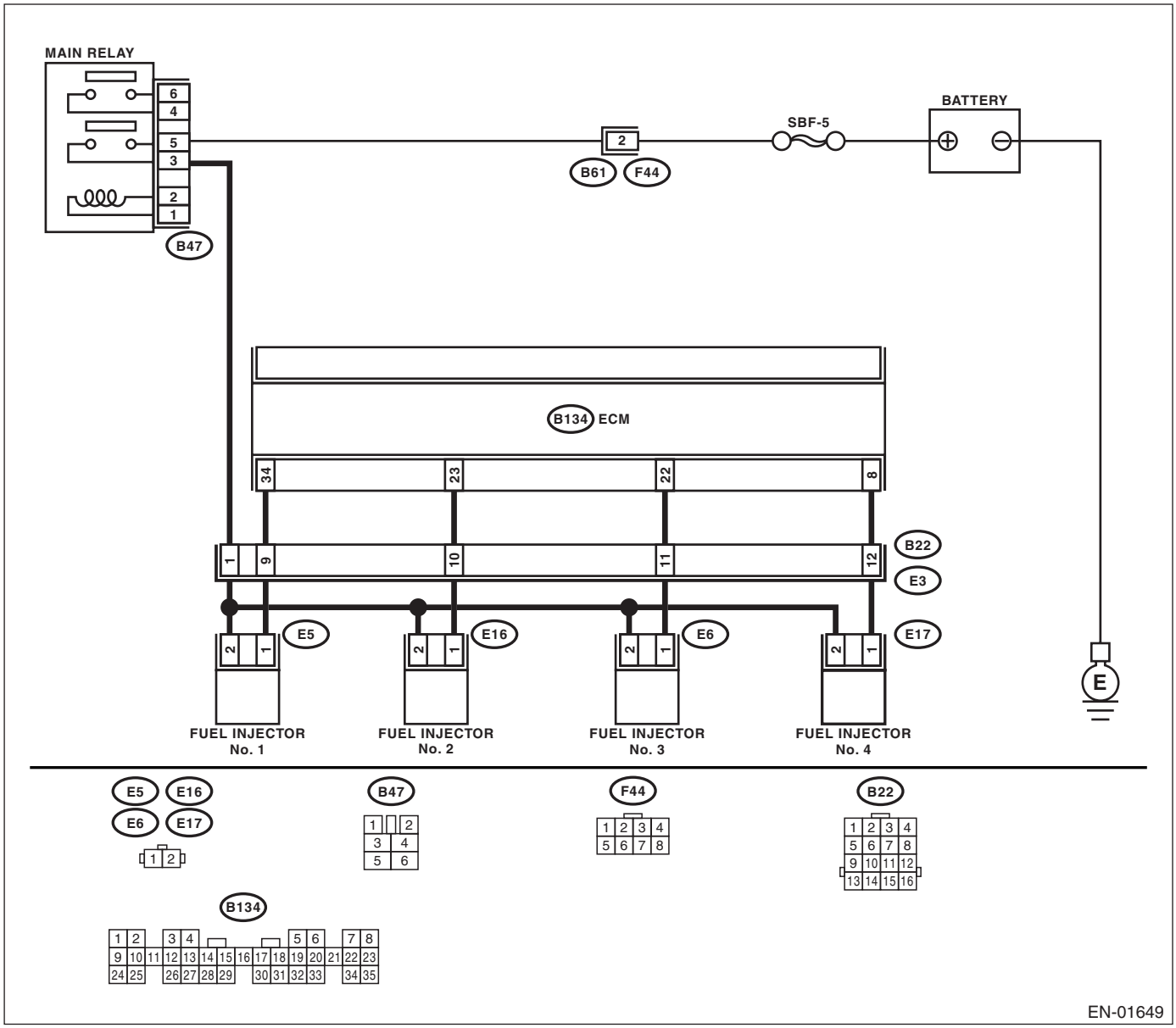
TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling
- Rough driving

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0301, P0302, P0303 and P0304.	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 34 (+) — Chassis ground (–):*** ***#2 (B134) No. 23 (+) — Chassis ground (–):*** ***#3 (B134) No. 22 (+) — Chassis ground (–):*** ***#4 (B134) No. 8 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **7.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Measure the resistance between ECM connector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 1 — Engine ground:*** ***#2 (E16) No. 1 — Engine ground:*** ***#3 (E6) No. 1 — Engine ground:*** ***#4 (E17) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between fuel injector and ECM connector.
4	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 34 — (E5) No. 1:*** ***#2 (B134) No. 23 — (E16) No. 1:*** ***#3 (B134) No. 22 — (E6) No. 1:*** ***#4 (B134) No. 8 — (E17) No. 1:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
5	**CHECK FUEL INJECTOR.** Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **6.**	Replace the faulty fuel injector. <Ref. to FU(H4SO)-34, Fuel Injector.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY LINE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel injector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair poor contact in all connectors in fuel injector circuit.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel injector connector on faulty cylinders • Poor contact in coupling connector • Poor contact in main relay connector • Poor contact in fuel injector connector on faulty cylinders
7	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinder. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 34 (+) — Chassis ground (–):*** ***#2 (B134) No. 23 (+) — Chassis ground (–):*** ***#3 (B134) No. 22 (+) — Chassis ground (–):*** ***#4 (B134) No. 8 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and fuel injector. After repair, replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Go to step **8.**
8	**CHECK FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the faulty fuel injector <Ref. to FU(H4SO)-34, Fuel Injector.> and ECM <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Go to step **9.**
9	**CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.**	Is the camshaft position sensor or crankshaft position sensor loosely installed?	Tighten camshaft position sensor or crankshaft position sensor.	Go to step **10.**
10	**CHECK CRANKSHAFT SPROCKET.** Remove the timing belt cover.	Is the crankshaft sprocket rusted or does it have broken teeth?	Replace the crankshaft sprocket. <Ref. to ME(H4SO)-51, Crankshaft Sprocket.>	Go to step **11.**
11	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block. ST 499987500 CRANKSHAFT SOCKET	Is the timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(H4SO)-44, Timing Belt Assembly.>	Go to step **12.**

	Step	Check	Yes	No
12	**CHECK FUEL LEVEL.**	Is the fuel meter indication higher than the “Lower” level?	Go to step **13.**	Replenish fuel so fuel meter indication is higher than the “Lower” level. After replenishing fuel, Go to step **13.**
13	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Clear the memory using Subaru Select Monitor. <Ref. to EN(H4SO)(diag)-44, Clear Memory Mode.> 2) Start the engine, and drive the vehicle more than 10 minutes.	Does the malfunction indicator light illuminate or blink?	Go to step **16.**	Go to step **14.**
14	**CHECK CAUSE OF MISFIRE DIAGNOSED.**	Was the cause of misfire identified when the engine is running? Ex. Disconnection of spark plug cord.	Finish diagnostics operation, if the engine has no abnormality.	Go to step **15.**
15	**CHECK FOR POOR CONTACT.**	Is there poor contact in the ignition coil, fuel injector, ECM and coupling connector?	Repair poor contact.	Contact your SOA Service Center after checking followings. NOTE: In this case, check the following: • Condition of fuel • Fuel additive used or not • Visually check spark plug • Visually check spark plug cord • Condition of engine oil
16	**CHECK AIR INTAKE SYSTEM.**	Is there a fault in air intake system?	Repair air intake system. NOTE: Check the following items: • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses?	Go to step **17.**

	Step	Check	Yes	No
17	**CHECK MISFIRE SYMPTOM.** 1) Turn the ignition switch to ON. 2) Read the DTC. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual. NOTE: Perform diagnosis according to the items listed below.	Does the Subaru Select Monitor or OBD-II general scan tool display only one DTC?	Go to step **22.**	Go to step **18.**
18	**CHECK DTC ON DISPLAY.** Is any other DTC displayed?	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0301 and P0302?	Go to step **23.**	Go to step **19.**
19	**CHECK DTC ON DISPLAY.** Is any other DTC displayed?	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0303 and P0304?	Go to step **24.**	Go to step **20.**
20	**CHECK DTC ON DISPLAY.** Is any other DTC displayed?	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0301 and P0303?	Go to step **25.**	Go to step **21.**
21	**CHECK DTC ON DISPLAY.** Is any other DTC displayed?	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0302 and P0304?	Go to step **26.**	Go to step **27.**
22	**ONLY ONE CYLINDER**	Is there a fault in that cylinder?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Spark plug cord • Fuel injector • Compression ratio	Go to DTC P0171. <Ref. to EN(H4SO)(diag)-145, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Step		Check	Yes	No
23	GROUP OF #1 AND #2 CYLINDERS	Are there faults in #1 and #2 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. • Spark plugs • Fuel injectors • Ignition coil • Compression ratio • If no abnormal is discovered, check for “IGNITION CONTROL SYSTEM” of #1 and #2 cylinders side. <Ref. to EN(H4SO)(diag)-63, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Go to DTC P0171. <Ref. to EN(H4SO)(diag)-145, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	GROUP OF #3 AND #4 CYLINDERS	Are there faults in #3 and #4 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. • Spark plugs • Fuel injectors • Ignition coil • If no abnormal is discovered, check for “IGNITION CONTROL SYSTEM” of #3 and #4 cylinders side. <Ref. to EN(H4SO)(diag)-63, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Go to DTC P0171. <Ref. to EN(H4SO)(diag)-145, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25	GROUP OF #1 AND #3 CYLINDERS	Are there faults in #1 and #3 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Skipping timing belt teeth	Go to DTC P0171. <Ref. to EN(H4SO)(diag)-145, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Step		Check	Yes	No
26	GROUP OF #2 AND #4 CYLINDERS	Are there faults in #2 and #4 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio • Skipping timing belt teeth	Go to DTC P0171. <Ref. to EN(H4SO)(diag)-145, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
27	CYLINDER AT RANDOM	Is the engine idle rough?	Go to DTC P0171. <Ref. to EN(H4SO)(diag)-145, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio

AN:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-87, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

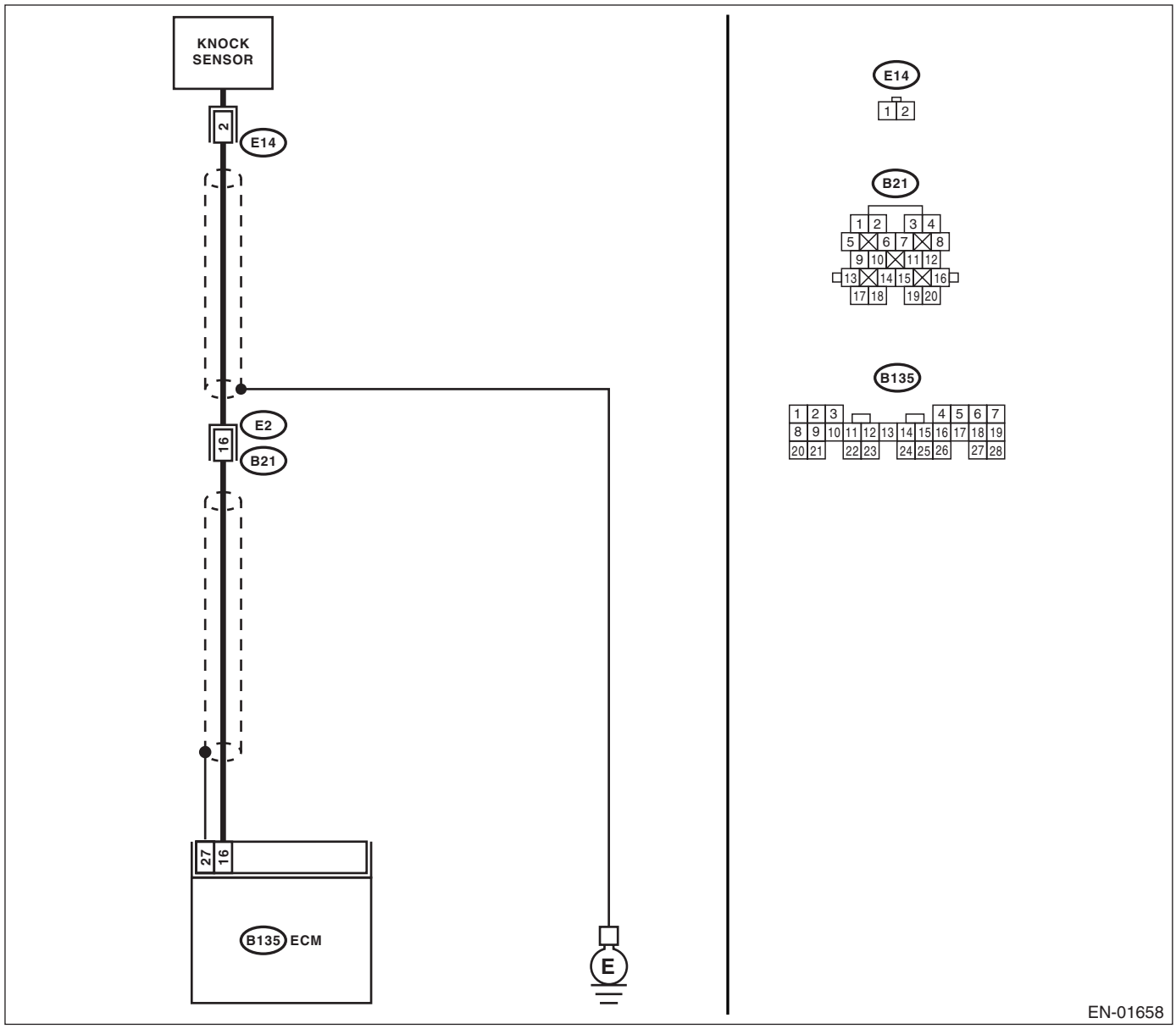
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM harness connector and chassis ground. ***Connector & terminal*** ***(B135) No. 16 — Chassis ground:***	Is the resistance more than 700 kΩ?	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. ***Terminals*** ***No. 2 — Engine ground:***	Is the resistance more than 700 kΩ?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Poor contact in knock sensor connector
3	**CHECK CONDITION OF KNOCK SENSOR INSTALLATION.**	Is the knock sensor installation bolt tightened securely?	Replace the knock sensor. <Ref. to FU(H4SO)-27, Knock Sensor.>	Tighten knock sensor installation bolt securely.

AO:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-89, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

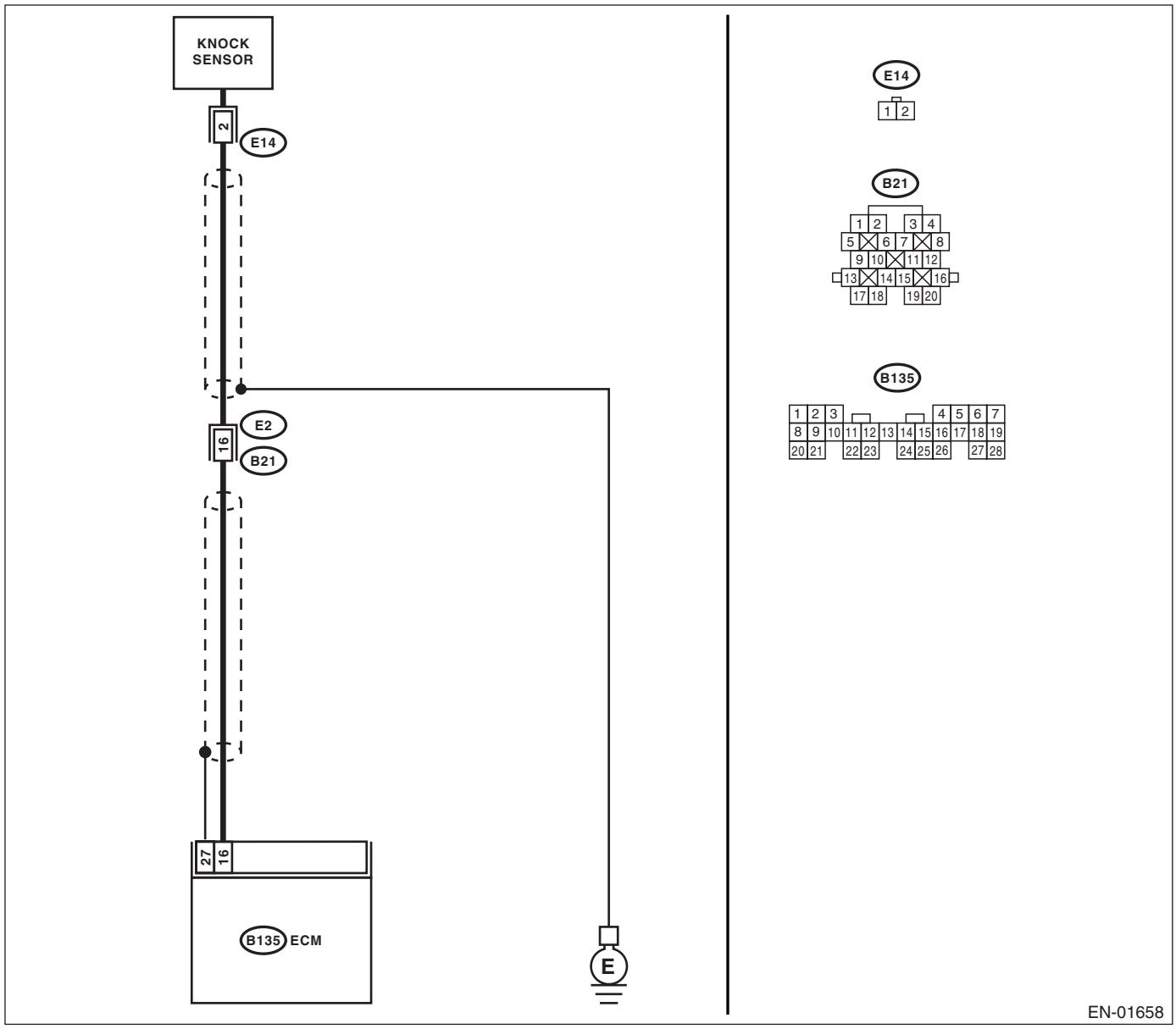
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 16 — Chassis ground:***	Is the resistance less than 400 kΩ?	Go to step **2.**	Go to step **3.**
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. ***Terminals*** ***No. 2 — Engine ground:***	Is the resistance less than 400 kΩ?	Replace the knock sensor. <Ref. to FU(H4SO)-27, Knock Sensor.>	Repair ground short circuit in harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors is shielded. Repair short circuit of harness together with shield.
3	**CHECK INPUT SIGNAL FOR ECM.** 1) Connect the connectors to ECM and knock sensor. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 2 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in knock sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Repair poor contact in ECM connector.

AP:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-91, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

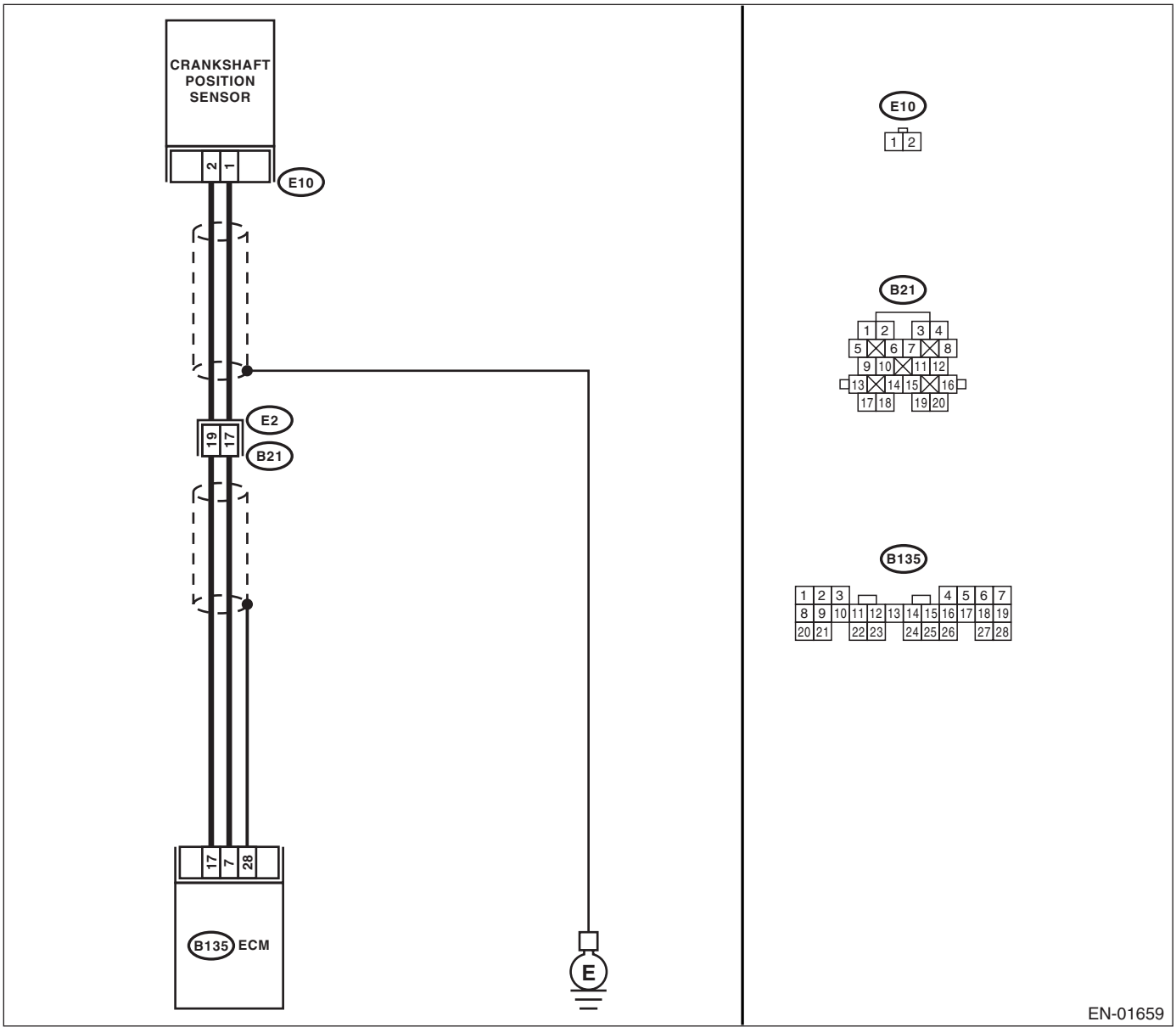
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from crankshaft position sensor. 3) Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the resistance more than 100 kΩ?	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **2.**
2	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between crankshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step **3.**
3	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
4	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.**	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **5.**	Tighten crankshaft position sensor installation bolt securely.
5	**CHECK CRANKSHAFT POSITION SENSOR.** 1) Remove the crankshaft position sensor. 2) Measure the resistance between connector terminals of crankshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 — 4 kΩ?	Repair poor contact in crankshaft position sensor connector.	Replace the crankshaft position sensor. <Ref. to FU(H4SO)-25, Crankshaft Position Sensor.>

AQ:DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

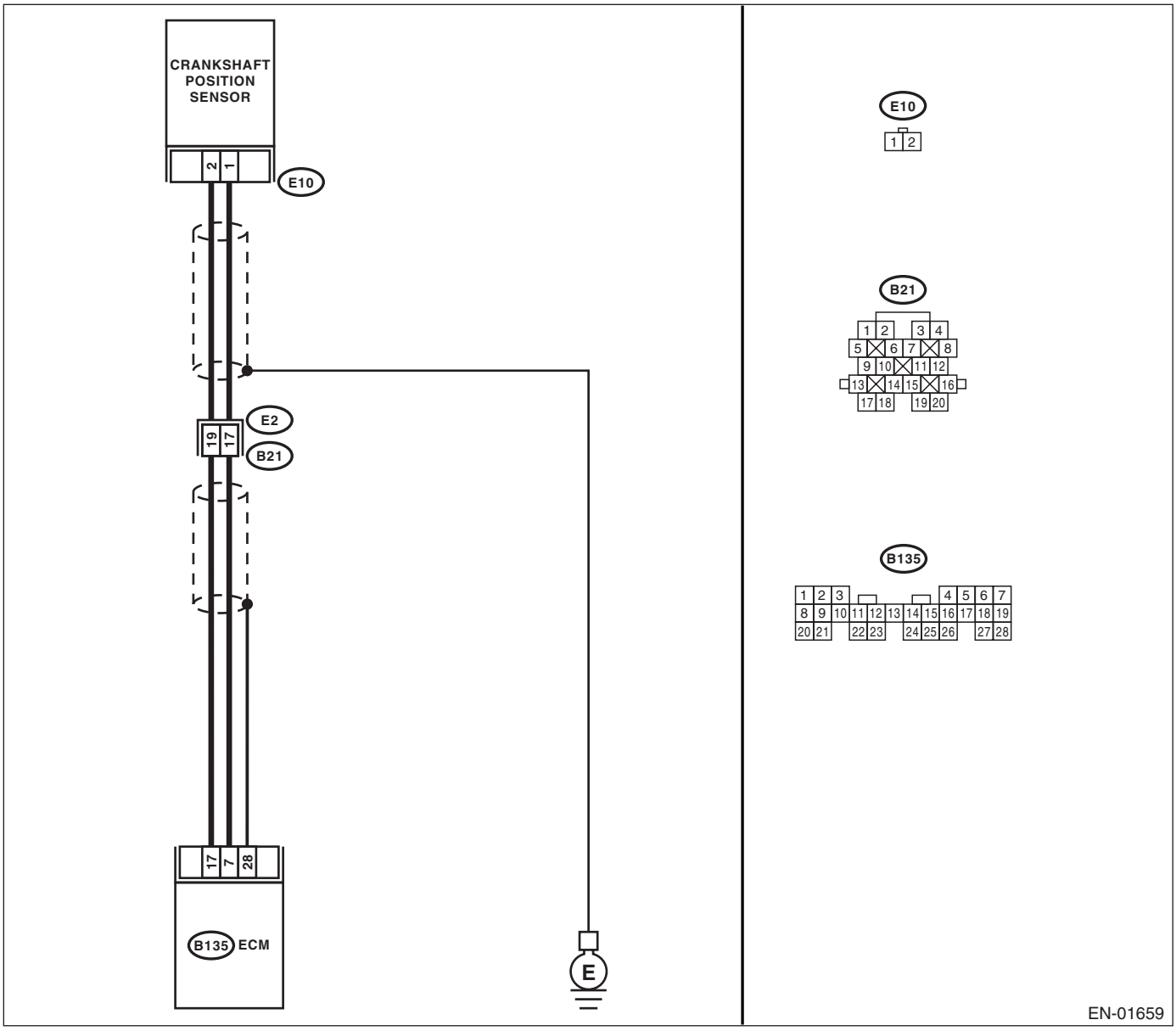
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-93, DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Turn the ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **3.**	Tighten crankshaft position sensor installation bolt securely.
3	**CHECK CRANKSHAFT SPROCKET.** Remove the timing belt cover.	Are crankshaft sprocket teeth cracked or damaged?	Replace the crankshaft sprocket. <Ref. to ME(H4SO)-51, Crankshaft Sprocket.>	Go to step **4.**
4	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block. ST 499987500 CRANKSHAFT SOCKET	Is the timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(H4SO)-44, Timing Belt Assembly.>	Replace the crankshaft position sensor. <Ref. to FU(H4SO)-25, Crankshaft Position Sensor.>

AR:DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-96, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

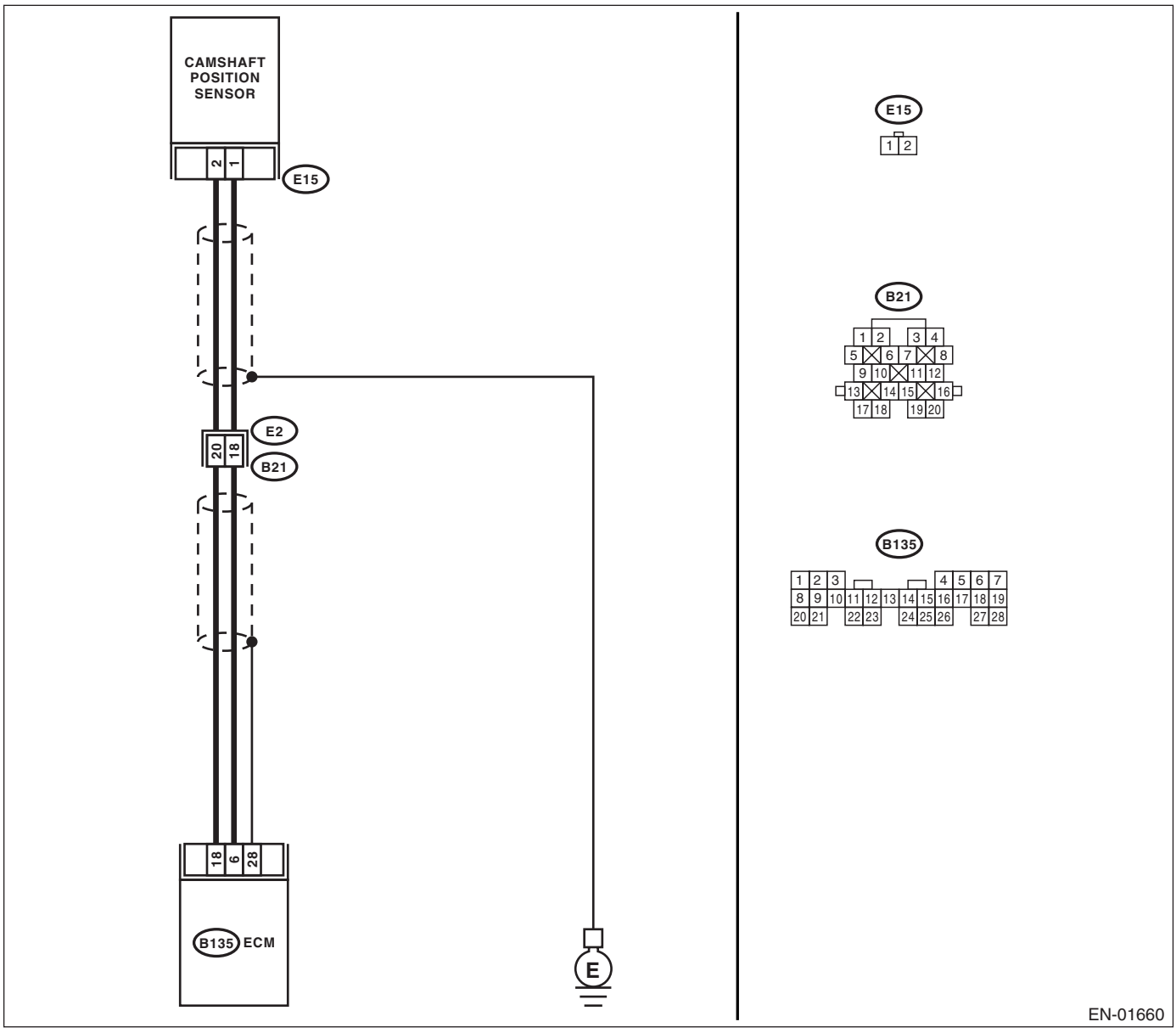
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the resistance more than 100 kΩ?	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **2.**
2	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step **3.**
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
4	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **5.**	Tighten camshaft position sensor installation bolt securely.
5	**CHECK CAMSHAFT POSITION SENSOR.** 1) Remove the camshaft position sensor. 2) Measure the resistance between connector terminals of camshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 — 4 kΩ?	Repair poor contact in camshaft position sensor connector.	Replace the camshaft position sensor. <Ref. to FU(H4SO)-26, Camshaft Position Sensor.>

AS:DTC P0341 CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-98, DTC P0341 CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

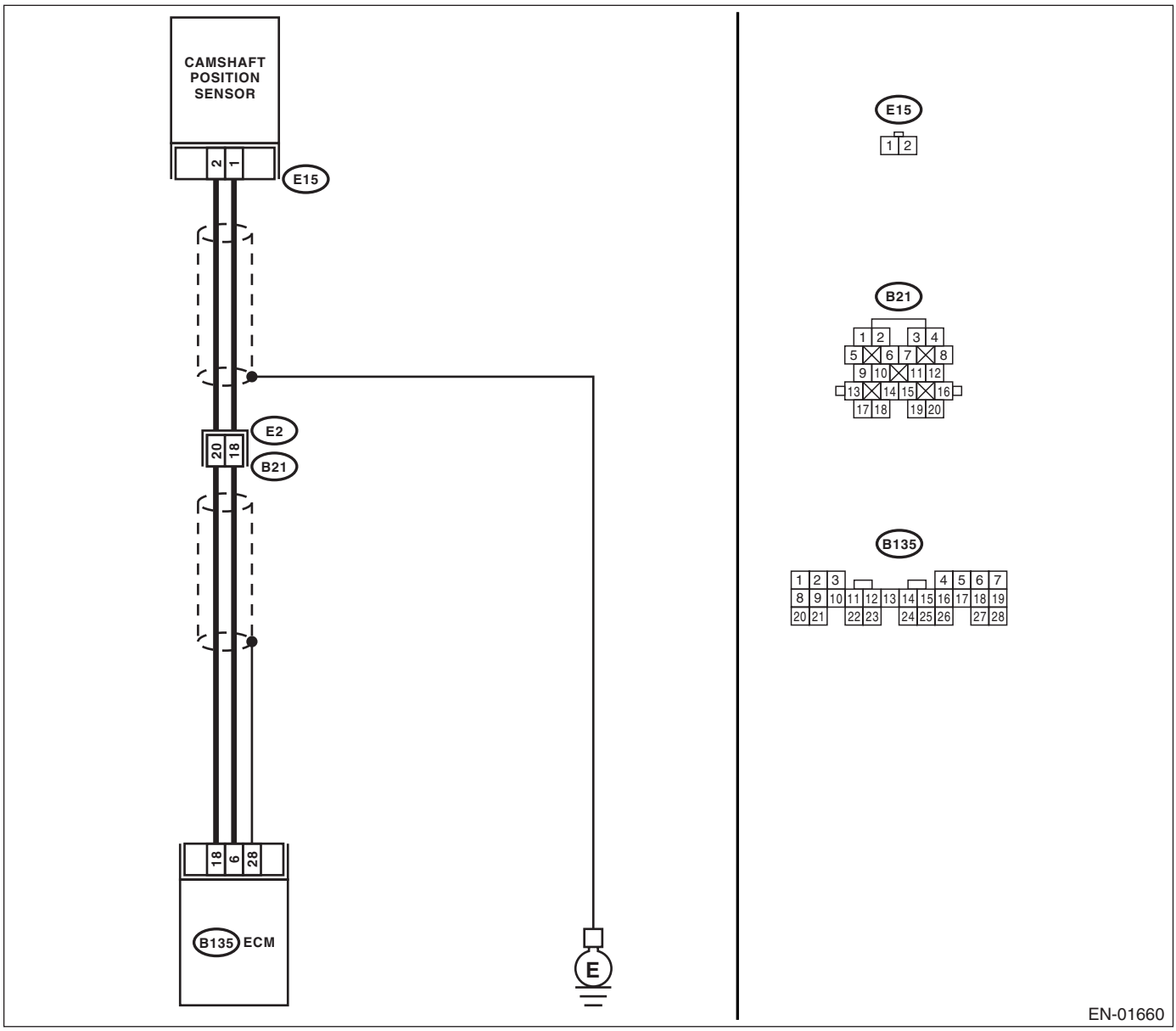
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the resistance more than 100 kΩ?	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **3.**
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step **4.**
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **6.**	Tighten camshaft position sensor installation bolt securely.

	Step	Check	Yes	No
6	**CHECK CAMSHAFT POSITION SENSOR.** 1) Remove the camshaft position sensor. 2) Measure the resistance between connector terminals of camshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 — 4 kΩ?	Go to step **7.**	Replace the camshaft position sensor. <Ref. to FU(H4SO)-26, Camshaft Position Sensor.>
7	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.** Turn the ignition switch to OFF.	Is the camshaft position sensor installation bolt tightened securely?	Go to step **8.**	Tighten camshaft position sensor installation bolt securely.
8	**CHECK CAMSHAFT SPROCKET.** Remove the timing belt cover. <Ref. to ME(H4SO)-43, Timing Belt Cover.>	Are camshaft sprocket teeth cracked or damaged?	Replace the camshaft sprocket. <Ref. to ME(H4SO)-49, Camshaft Sprocket.>	Go to step **9.**
9	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the camshaft using ST, and align alignment mark on camshaft sprocket with alignment mark on timing belt cover LH. ST 499987500 CAMSHAFT SOCKET	Is the timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(H4SO)-44, Timing Belt Assembly.>	Replace the camshaft position sensor. <Ref. to FU(H4SO)-26, Camshaft Position Sensor.>

AT:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-100, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

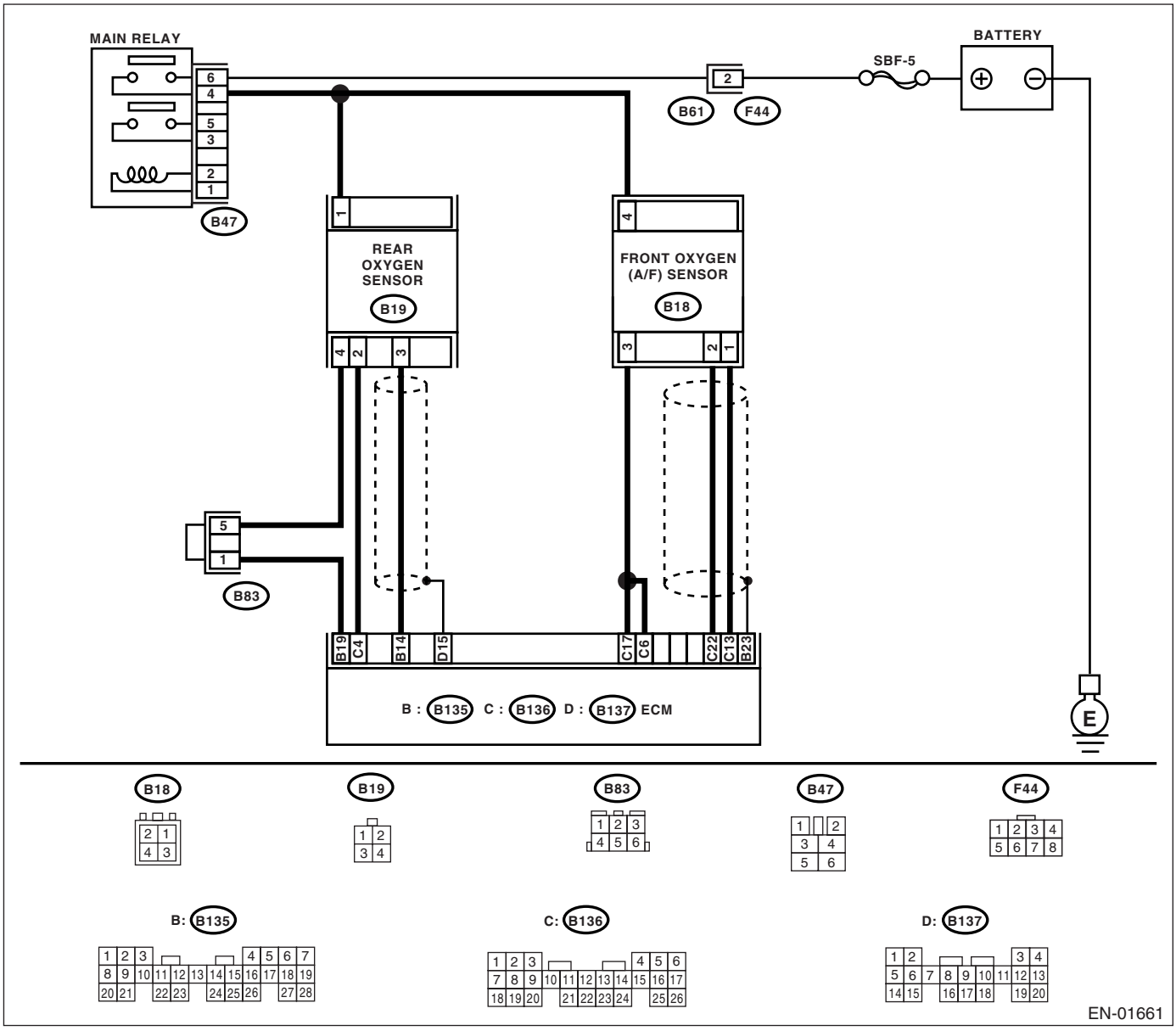
TROUBLE SYMPTOM:

- Engine stalls.
- Idle mixture is out of specifications.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. NOTE: Check the following positions. • Between cylinder head and front exhaust pipe • Between front exhaust pipe and front catalytic converter • Between front catalytic converter and rear catalytic converter	Is there a fault in exhaust system?	Repair or replace the exhaust system. <Ref. to EX(H4SO)-2, General Description.>	Go to step **3.**
3	**CHECK CATALYTIC CONVERTER.**	Is there damage at rear face or front face of front catalyst?	Replace the catalytic converter. <Ref. to EC(H4SO)-3, Front Catalytic Converter.>	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AU:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

DTC DETECTING CONDITION:

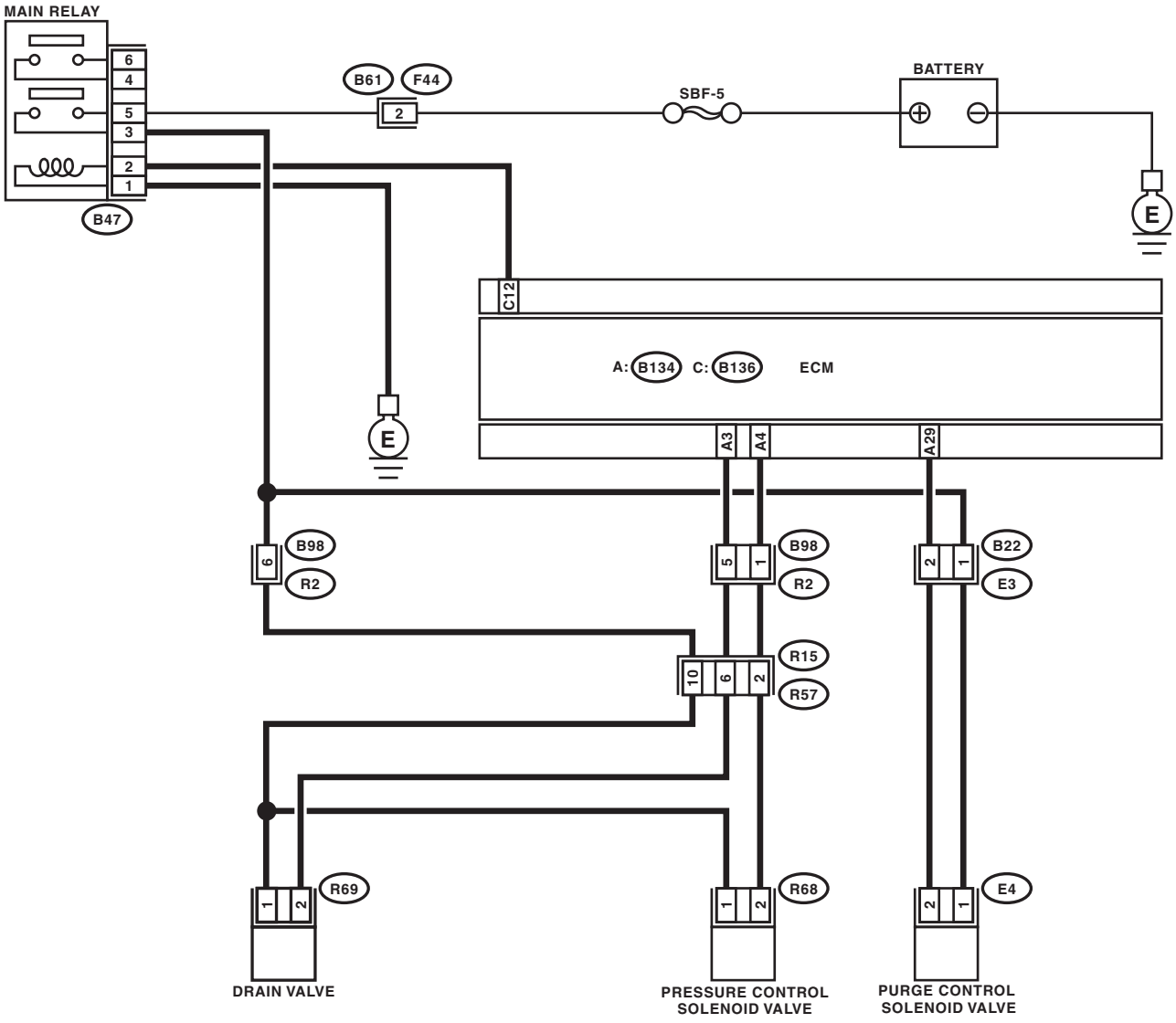
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-105, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Fuel odor
- There is a hole of more than 1.0 mm (0.04 in) dia. in evaporation system or fuel tank.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



EN-01662

	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap SUBARU genuine?	Go to step **4.**	Replace with a SUBARU genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4SO)-51, Fuel Filler Pipe.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **6.**	Replace the drain valve. <Ref. to EC(H4SO)-18, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **7.**	Replace the purge control solenoid valve. <Ref. to EC(H4SO)-6, Purge Control Solenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **8.**	Replace the pressure control solenoid valve. <Ref. to EC(H4SO)-12, Pressure Control Solenoid Valve.>

	Step	Check	Yes	No
8	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn ignition switch to OFF.	Is there a hole of more than 1.0 mm (0.04 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4SO)-62, Fuel Delivery, Return and Evaporation lines.>	Go to step **9.**
9	**CHECK CANISTER.**	Is the canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the canister. <Ref. to EC(H4SO)-5, Canister.>	Go to step **10.**
10	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4SO)-48, Fuel Tank.>	Is the fuel tank damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(H4SO)-48, Fuel Tank.>	Go to step **11.**
11	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 1.0 mm (0.04 in) dia., cracks, clogging, disconnections or bend of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AV:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

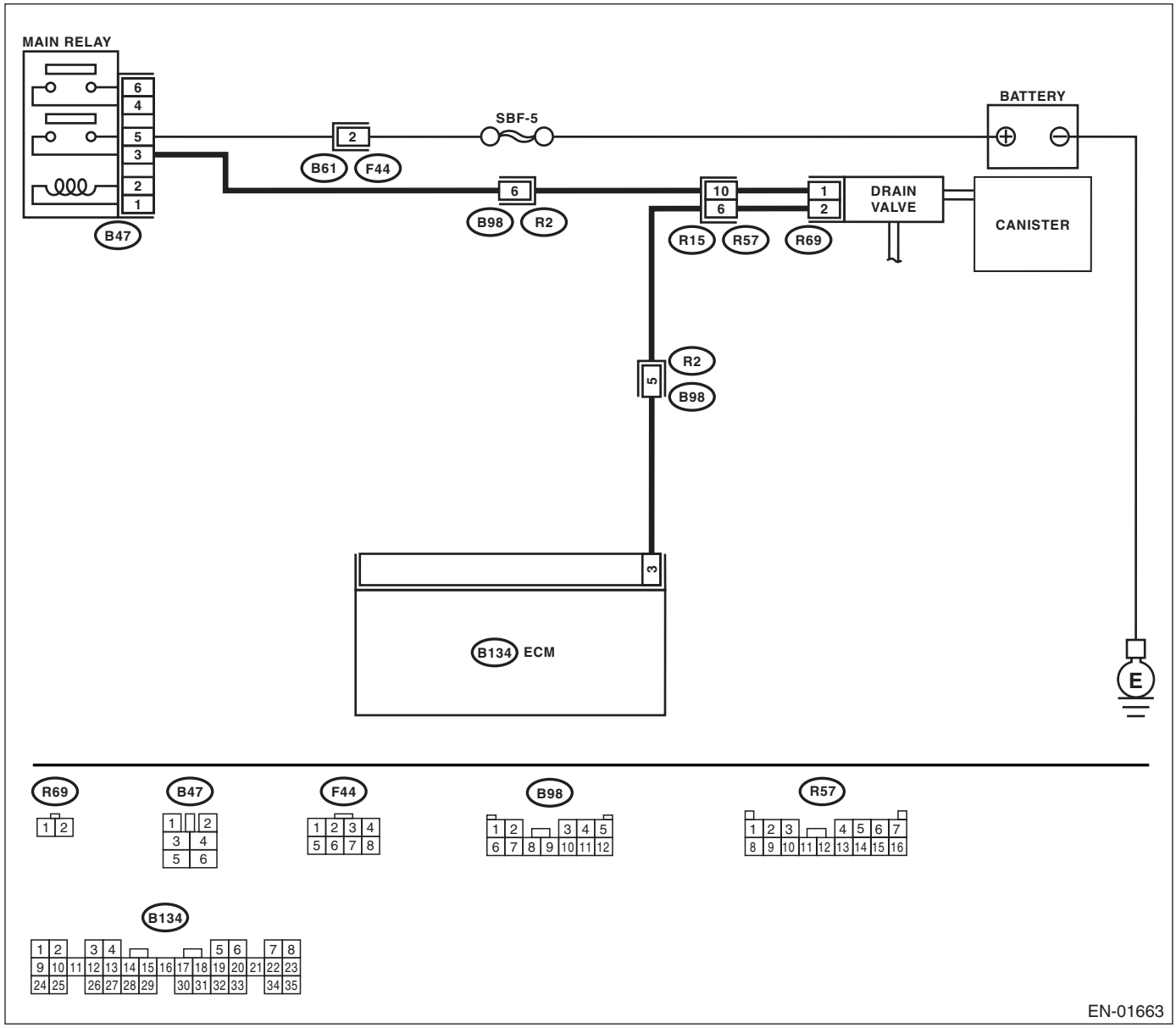
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-130, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in drain valve connector • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connectors from drain valve and ECM. 3) Measure the resistance of harness between drain valve connector and chassis ground. ***Connector & terminal*** ***(R69) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair short circuit to ground in harness between ECM and drain valve connector.
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and drain valve connector. ***Connector & terminal*** ***(B134) No. 3 — (R69) No. 2:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and drain valve connector • Poor contact in coupling connector
5	**CHECK DRAIN VALVE.** Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Go to step **6.**	Replace the drain valve. <Ref. to EC(H4SO)-18, Drain Valve.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO DRAIN VALVE.** 1) Turn ignition switch to ON. 2) Measure the voltage between drain valve and chassis ground. ***Connector & terminal*** ***(R69) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and drain valve • Poor contact in coupling connector • Poor contact in main relay connector
7	**CHECK FOR POOR CONTACT.** Check for poor contact in drain valve connector.	Is there poor contact in drain valve connector?	Repair poor contact in drain valve connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AW:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

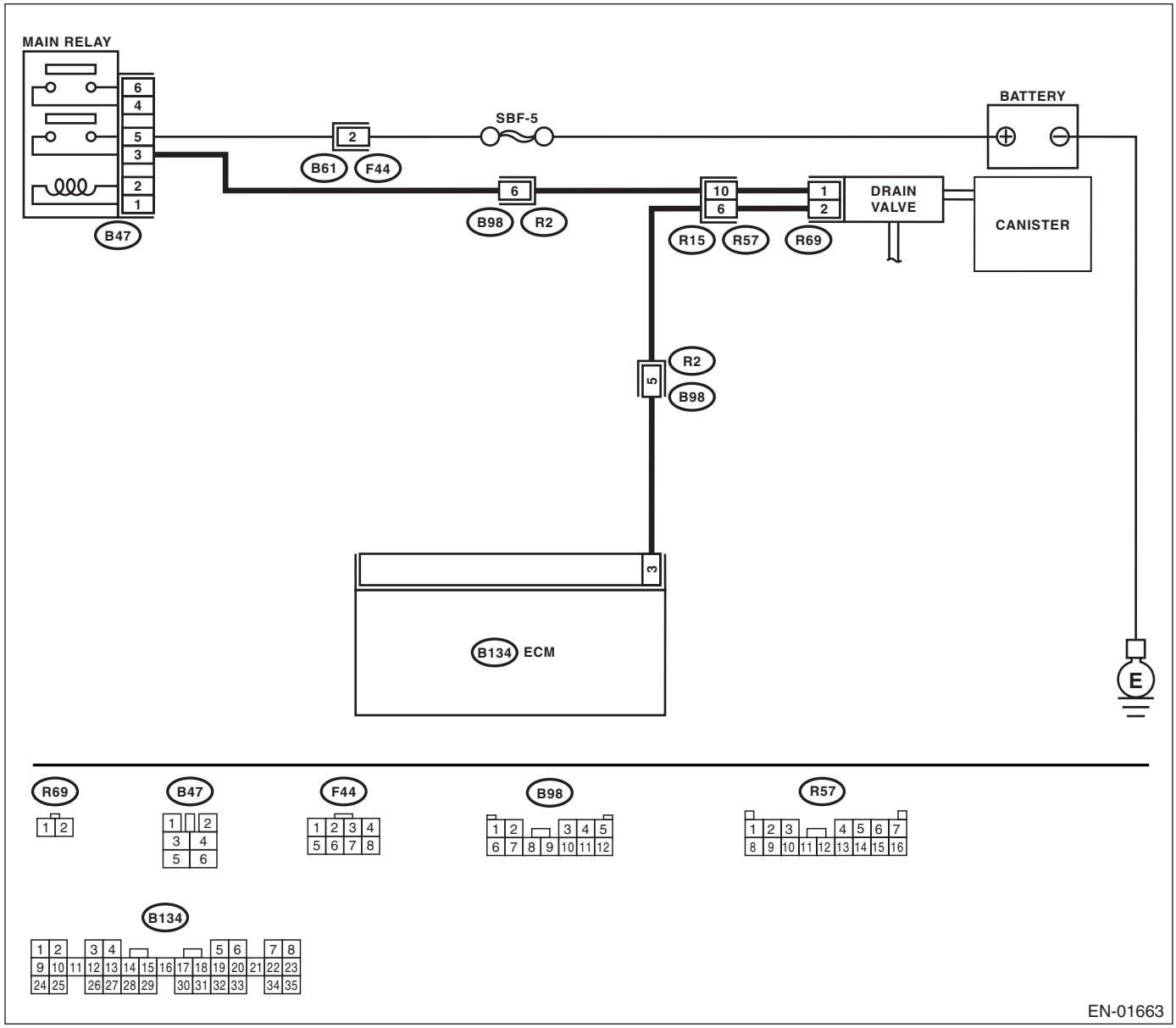
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-132, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) While operating the drain valve, measure voltage between ECM and chassis ground. NOTE: Drain valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 3 (+) — Chassis ground (–):***	Is the voltage 0 — 10 V?	Go to step **2.**	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. In this case, repair poor contact in ECM connector.
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from drain valve. 3) Turn ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and drain valve connector. After repair, replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Turn ignition switch to OFF. 2) Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the drain valve <Ref. to EC(H4SO)-18, Drain Valve.> and ECM <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>.	Go to step **6.**
6	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

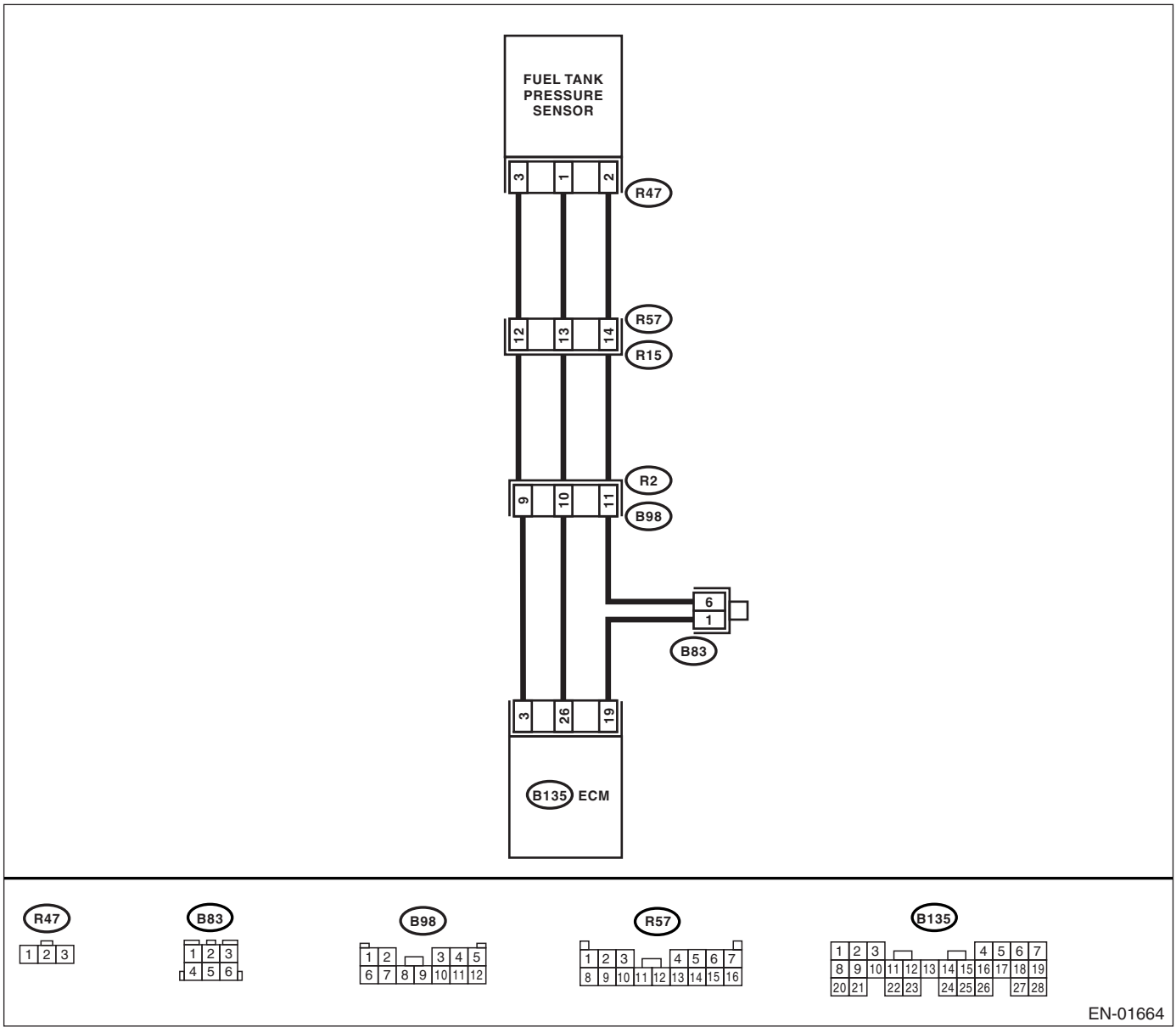
AX:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-134, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK PRESSURE/VACUUM LINE.** NOTE: Check the following items. • Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank • Disconnection, leakage and clogging of air ventilation hoses and pipes between fuel filler pipe and fuel tank	Is there a fault in pressure/vacuum line?	Repair or replace the hoses and pipes.	Replace the fuel tank pressure sensor. <Ref. to EC(H4SO)-10, Fuel Tank Pressure Sensor.>

AY:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

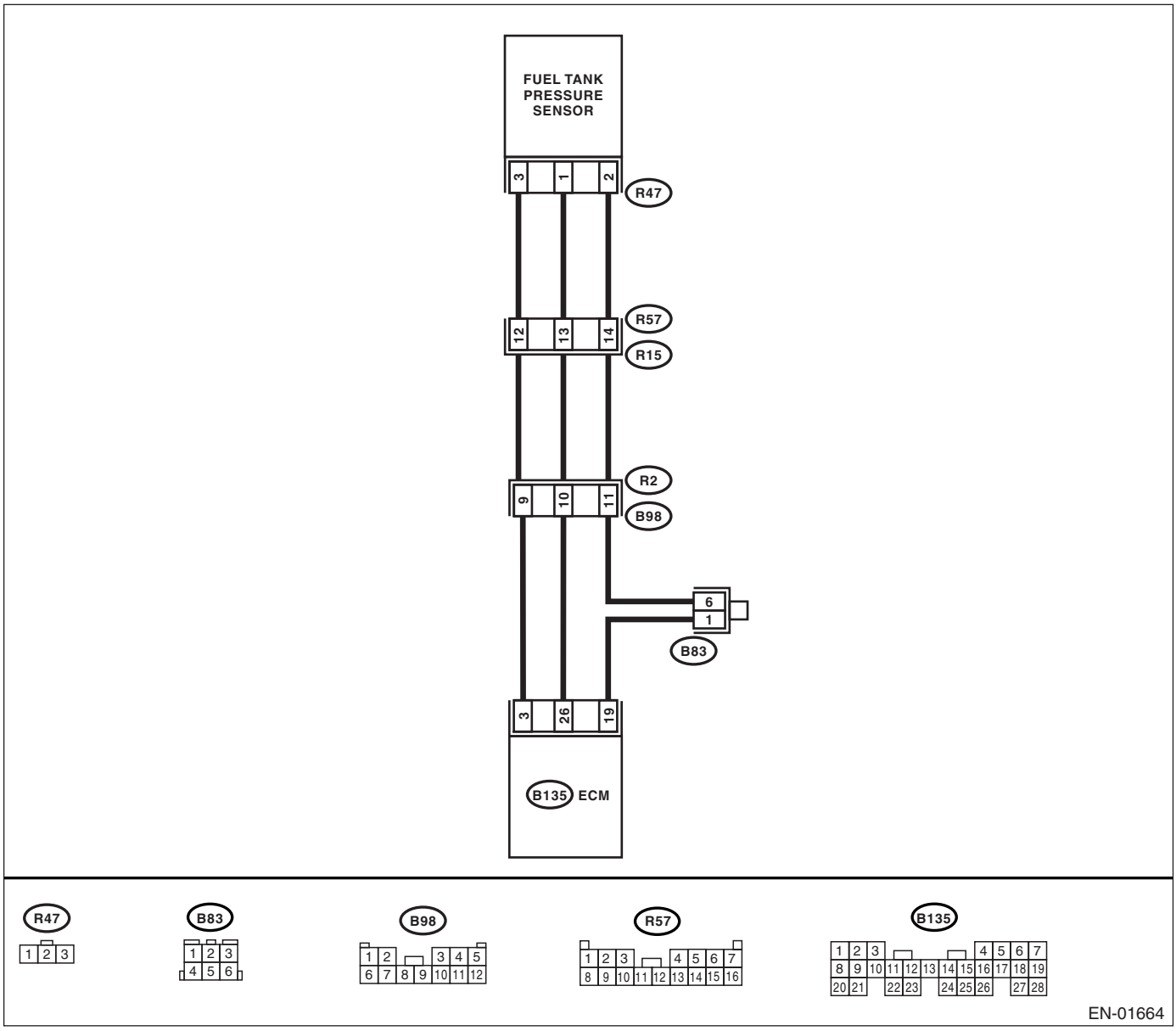
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-137, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove the fuel filler cap. 3) Install the fuel filler cap. 4) Turn ignition switch to ON. 5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value less than −2.8 kPa (−21.0 mmHg, −0.827 inHg)?	Go to step **2.**	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.
2	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (−):***	Does the voltage change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 26 (+) — Chassis ground (−):***	Is the voltage less than 0.2 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read the data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.>	Does the measured value change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Remove the rear seat cushion. 3) Separate rear wiring harness and fuel tank cord. 4) Turn ignition switch to ON. 5) Measure the voltage between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R15) No. 12 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B135) No. 19 — (R15) No. 14:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector • Poor contact in joint connector
8	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** Measure the resistance of harness between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R15) No. 14 (+) — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair short circuit to ground in harness between ECM and rear wiring harness connector.
9	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel tank pressure sensor. 2) Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 12 — (R47) No. 3:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair open circuit in fuel tank cord.
10	**CHECK FUEL TANK CORD.** Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 14 — (R47) No. 2:***	Is the resistance less than 1 Ω?	Go to step **11.**	Repair open circuit in fuel tank cord.
11	**CHECK FUEL TANK CORD.** Measure the resistance of harness between fuel tank pressure sensor connector and engine ground. ***Connector & terminal*** ***(R47) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **12.**	Repair short circuit to ground in fuel tank cord.
12	**CHECK FOR POOR CONTACT.** Check for poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4SO)-10, Fuel Tank Pressure Sensor.>

AZ:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

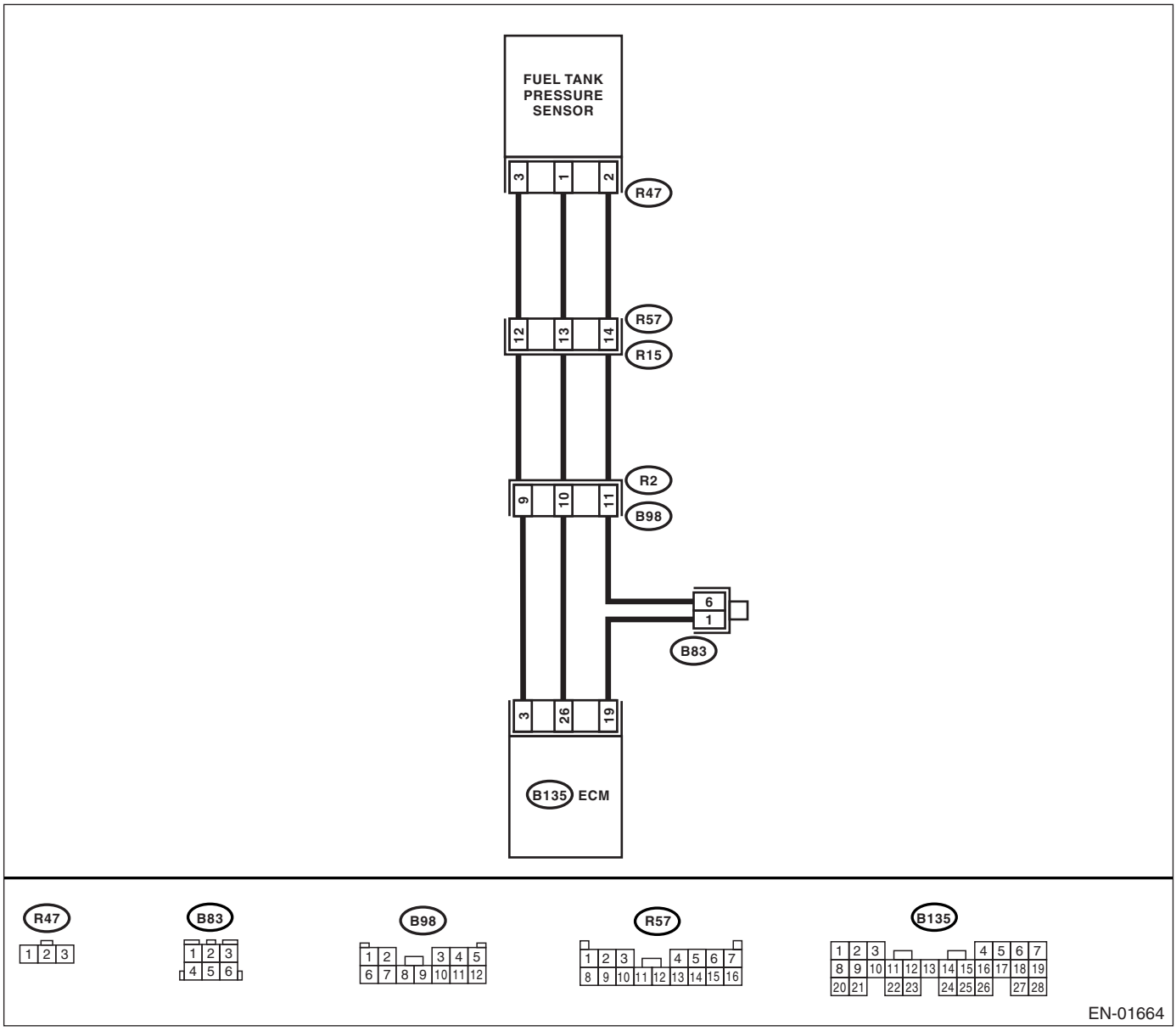
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-139, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove the fuel filler cap. 3) Install the fuel filler cap. 4) Turn ignition switch to ON. 5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)?	Go to step **11.**	Go to step **2.**
2	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (−):***	Does the voltage change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 26 (+) — Chassis ground (−):***	Is the voltage less than 0.2 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read the data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.>	Does the measured value change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Remove the rear seat cushion. 3) Separate rear wiring harness and fuel tank cord. 4) Turn ignition switch to ON. 5) Measure the voltage between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R15) No. 12 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B135) No. 26 — (R15) No. 13:*** ***(B135) No. 19 — (R15) No. 14:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector
8	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel tank pressure sensor. 2) Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 13 — (R47) No. 1:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair open circuit in fuel tank cord.
9	**CHECK FUEL TANK CORD.** Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 14 — (R47) No. 2:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair open circuit in fuel tank cord.
10	**CHECK FOR POOR CONTACT.** Check for poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4SO)-10, Fuel Tank Pressure Sensor.>
11	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from fuel tank pressure sensor. 3) Turn ignition switch to ON. 4) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)?	Repair short circuit to battery in harness between ECM and fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4SO)-10, Fuel Tank Pressure Sensor.>

BA:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

DTC DETECTING CONDITION:

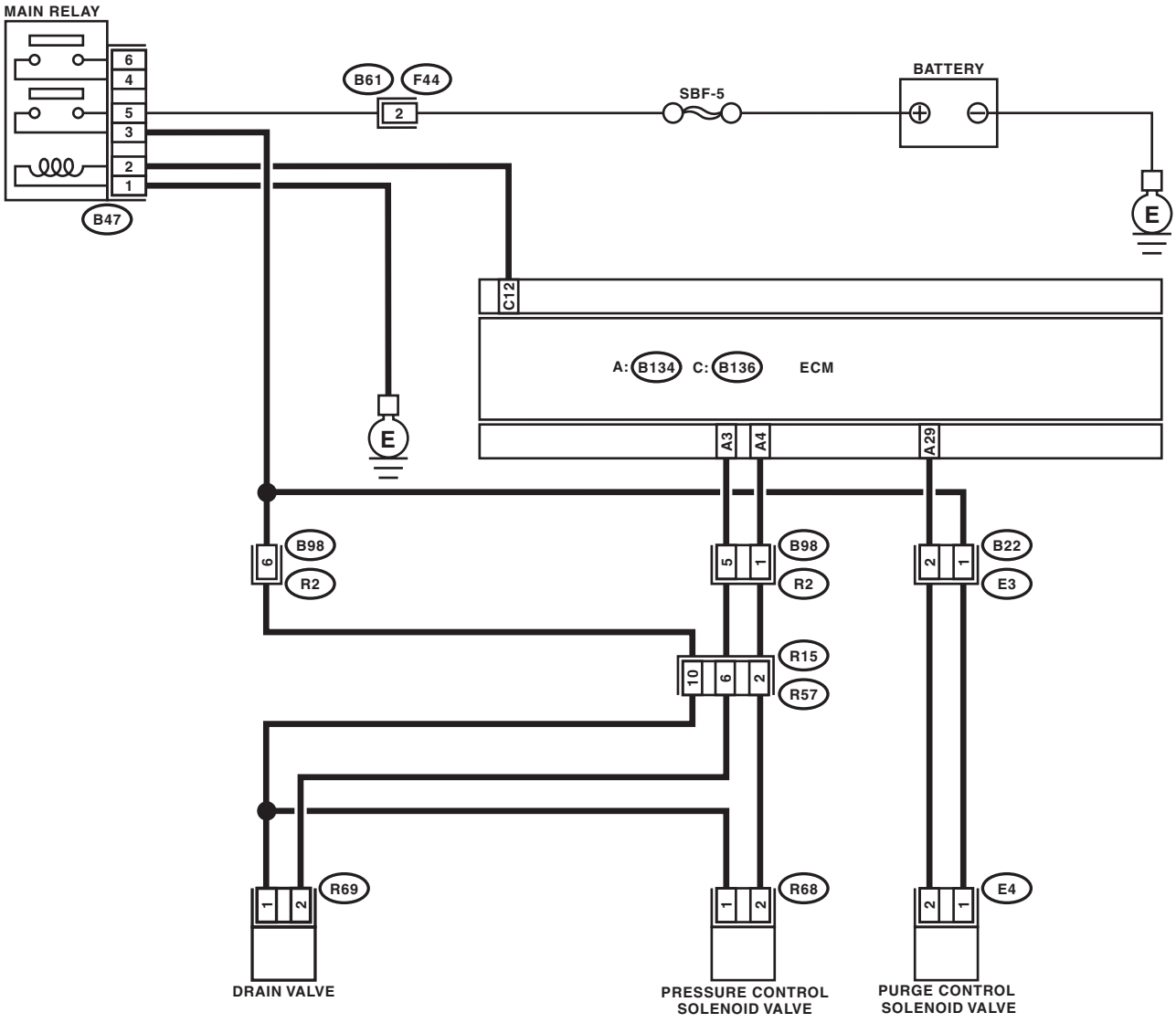
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-140, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

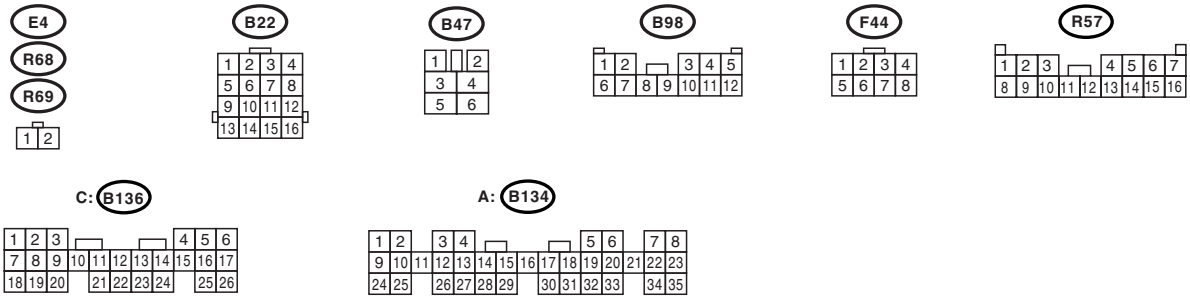
TROUBLE SYMPTOM:

- Fuel odor
- There is a hole of more than 0.5 mm (0.020 in) dia. in evaporation system or fuel tank.

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap SUBARU genuine?	Go to step **4.**	Replace with a SUBARU genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4SO)-51, Fuel Filler Pipe.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **6.**	Replace the drain valve. <Ref. to EC(H4SO)-18, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **7.**	Replace the purge control solenoid valve. <Ref. to EC(H4SO)-6, Purge Control Solenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **8.**	Replace the pressure control solenoid valve. <Ref. to EC(H4SO)-6, Purge Control Solenoid Valve.>

	Step	Check	Yes	No
8	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn ignition switch to OFF.	Is there a hole of more than 0.5 mm (0.020 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4SO)-62, Fuel Delivery, Return and Evaporation lines.>	Go to step **9.**
9	**CHECK CANISTER.**	Is the canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the canister. <Ref. to EC(H4SO)-5, Canister.>	Go to step **10.**
10	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4SO)-48, Fuel Tank.>	Is the fuel tank damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(H4SO)-48, Fuel Tank.>	Go to step **11.**
11	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging, disconnections or bend of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BB:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-140, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>

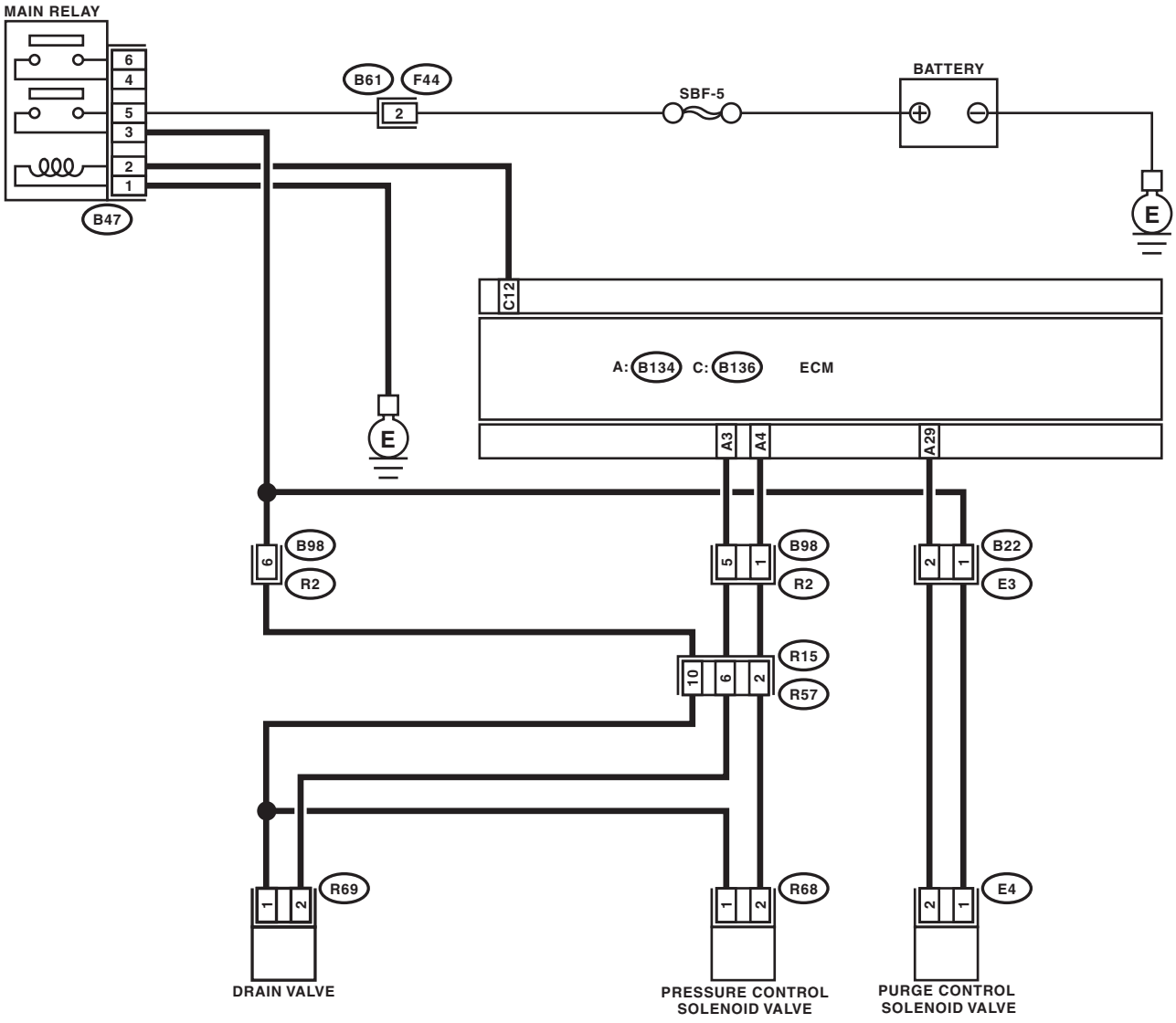
TROUBLE SYMPTOM:

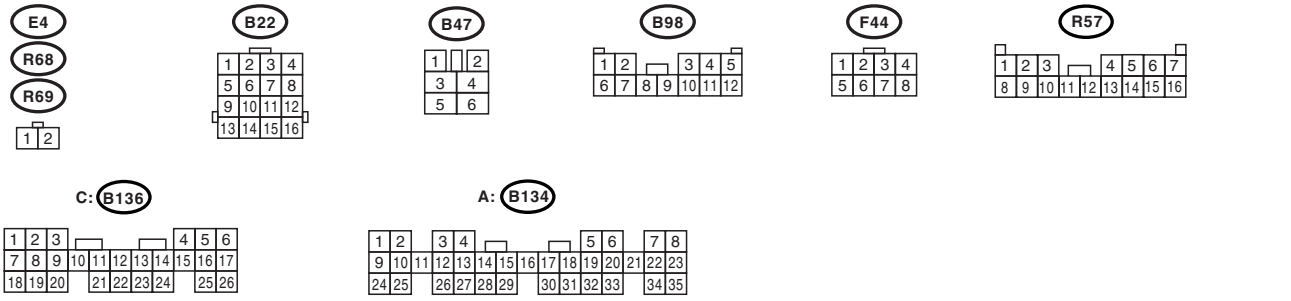
- Fuel odor
- Fuel filler cap is loose or not installed.

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap SUBARU genuine?	Go to step **4.**	Replace with a SUBARU genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4SO)-51, Fuel Filler Pipe.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **6.**	Replace the drain valve. <Ref. to EC(H4SO)-18, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **7.**	Replace the purge control solenoid valve. <Ref. to EC(H4SO)-6, Purge Control Solenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **8.**	Replace the pressure control solenoid valve. <Ref. to EC(H4SO)-6, Purge Control Solenoid Valve.>

	Step	Check	Yes	No
8	**CHECK CANISTER.**	Is the canister damaged?	Repair or replace the canister. <Ref. to EC(H4SO)-5, Canister.>	Go to step **9.**
9	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4SO)-48, Fuel Tank.>	Is the fuel tank damaged?	Repair or replace the fuel tank. <Ref. to FU(H4SO)-48, Fuel Tank.>	Go to step **10.**
10	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging or disconnections of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BC:DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-141, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

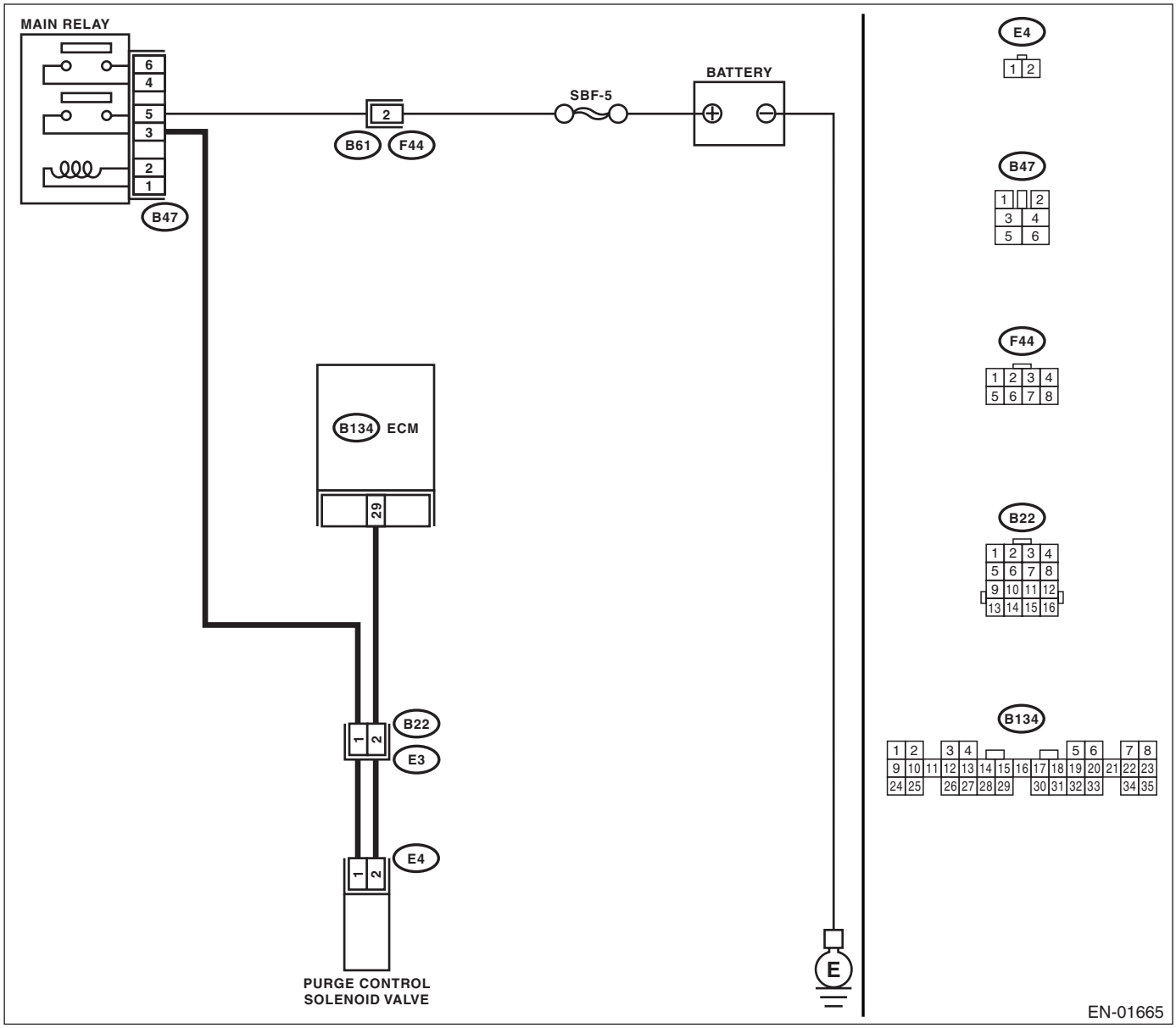
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 29 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step **2.**
2	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from purge control solenoid valve and ECM. 3) Measure the resistance of harness between purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in harness between ECM and purge control solenoid valve connector.
3	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and purge control solenoid valve of harness connector. ***Connector & terminal*** ***(B134) No. 29 — (E4) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between ECM and purge control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector
4	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Remove the purge control solenoid valve. 2) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Go to step **5.**	Replace the purge control solenoid valve. <Ref. to EC(H4SO)-6, Purge Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve and engine ground. ***Connector & terminal*** ***(E4) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Repair open circuit in harness between main relay and purge control solenoid valve connector.

	Step	Check	Yes	No
6	**CHECK POOR CONTACT.** Check poor contact in purge control solenoid valve connector.	Is there poor contact in purge control solenoid valve connector?	Repair poor contact in purge control solenoid valve connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BD:DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-143, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

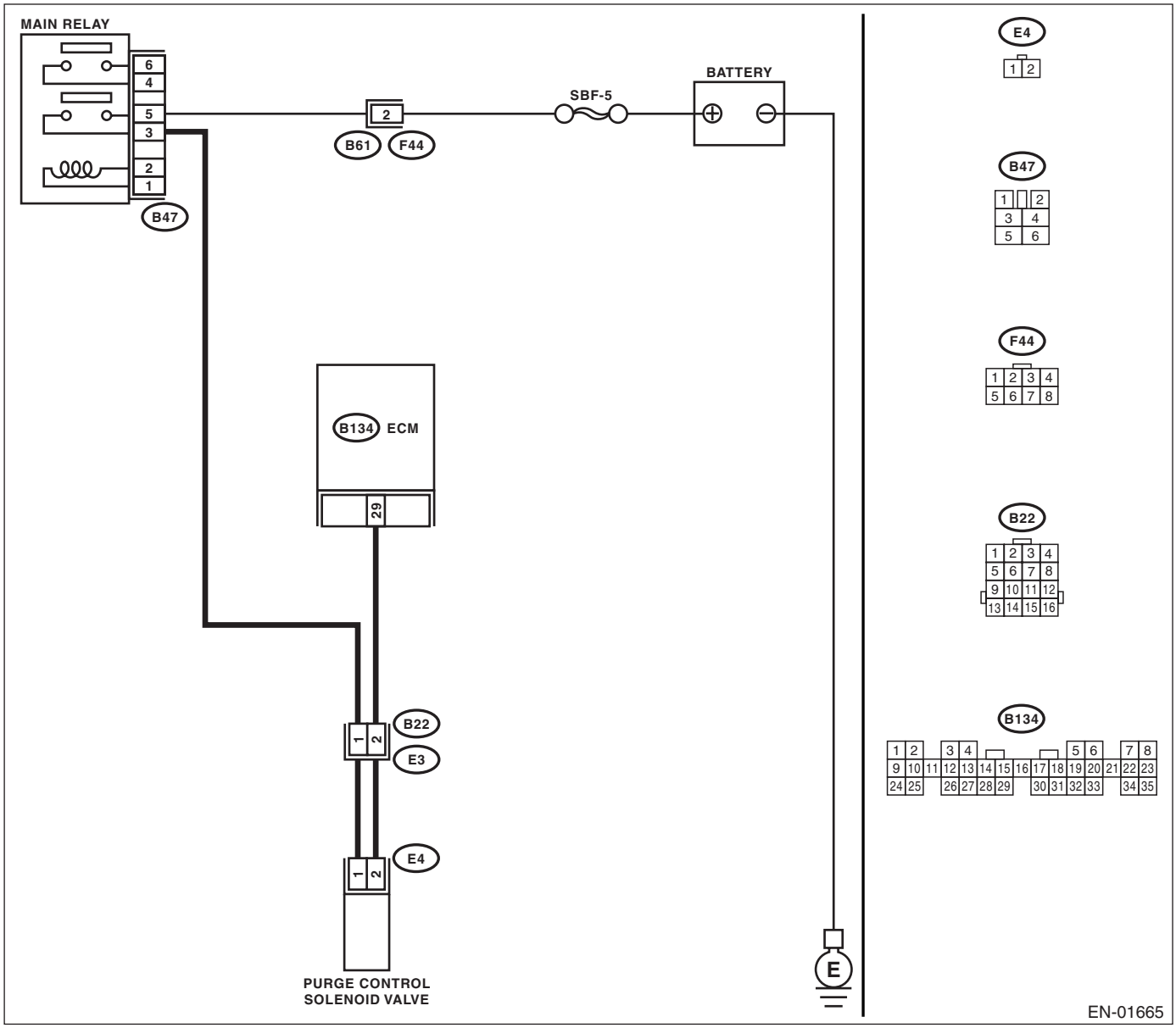
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) While operating the purge control solenoid valve, measure voltage between ECM and chassis ground. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 29 (+) — Chassis ground (–):***	Is the voltage 0 — 10 V?	Go to step **2.**	Even if malfunction indicator light light up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 29 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 29 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the purge control solenoid valve <Ref. to EC(H4SO)-6, Purge Control Solenoid Valve.> and ECM <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

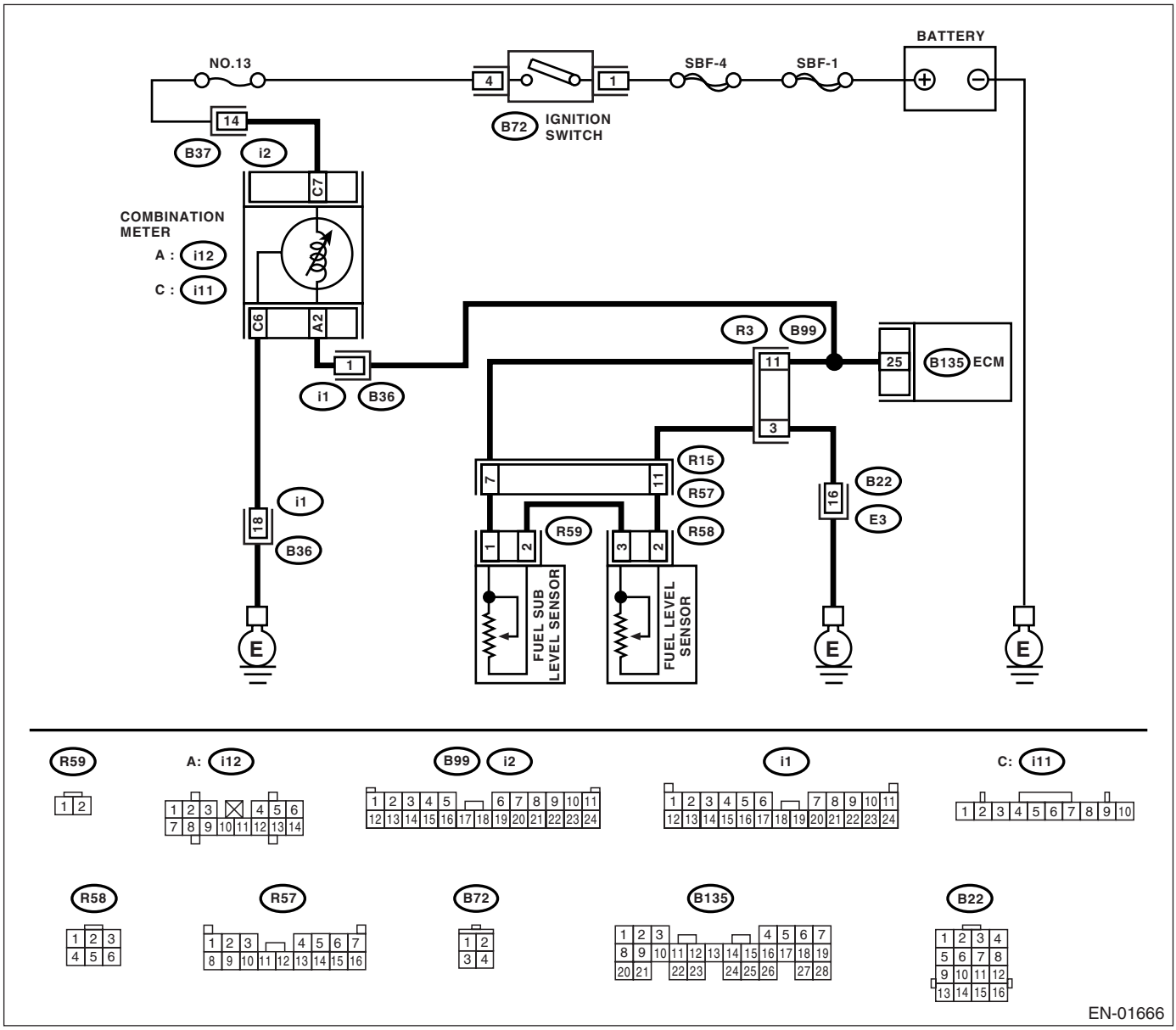
BE:DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-145, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect this trouble.	Replace the fuel level sensor <Ref. to FU(H4SO)-57, Fuel Level Sensor.> and fuel sub level sensor. <Ref. to FU(H4SO)-57, Fuel Level Sensor.>

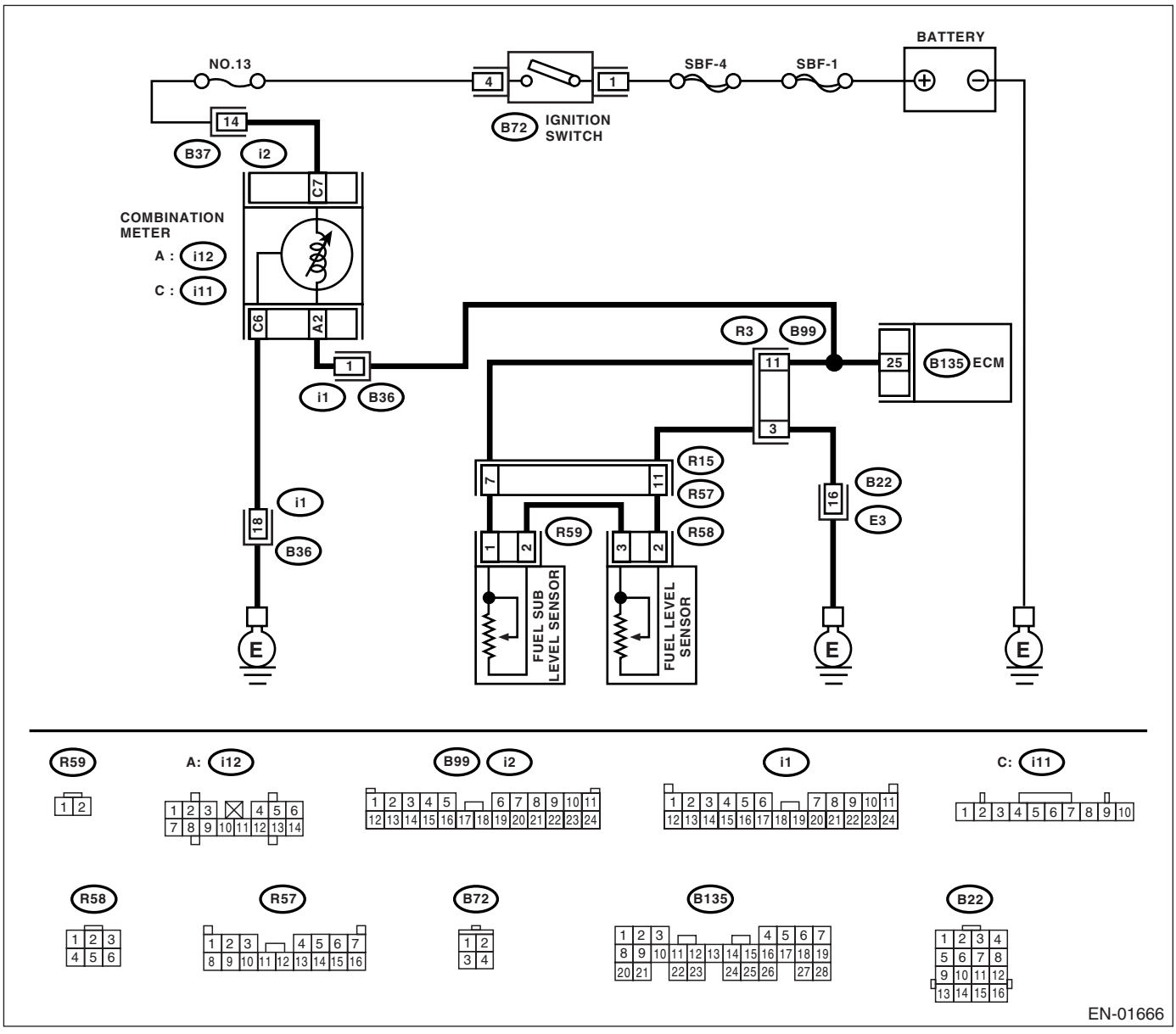
BF:DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-147, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does the speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. (Engine OFF) 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (−):***	Is the voltage less than 0.12 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read the data of fuel level sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.>	Is the voltage less than 0.12 V by shaking the harness and connector of ECM?	Repair poor contact in ECM connector.	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in combination meter connector • Poor contact in ECM connector • Poor contact in coupling connectors
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (−):***	Is the voltage more than 0.12 V?	Go to step **5.**	Go to step **6.**
5	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from connector (i12) and ECM connector. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 25 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair ground short circuit in harness between ECM and combination meter connector.
6	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** Measure the resistance between ECM and combination meter connector. ***Connector & terminal*** ***(B135) No. 25 — (i12) No. 2:***	Is the resistance less than 10 Ω?	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>	Repair open circuit between ECM and combination meter connector. NOTE: In this case, repair the following: Poor contact in coupling connector

	Step	Check	Yes	No
7	**CHECK FUEL TANK CORD.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from fuel sub level sensor. 3) Measure the resistance between fuel sub level sensor and chassis ground. ***Connector & terminal*** ***(R59) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair short circuit to ground in fuel tank cord.
8	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel pump assembly. 2) Measure the resistance between fuel pump assembly and chassis ground. ***Connector & terminal*** ***(R59) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair ground short circuit in fuel tank cord.
9	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(H4SO)-55, Fuel Pump.> 2) Measure the resistance between fuel level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 3 — No. 2:***	Is the resistance 0.5 — 2.5 Ω?	Go to step **10.**	Replace the fuel level sensor.
10	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4SO)-58, Fuel Sub Level Sensor.> 2) Measure the resistance between fuel sub level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 0.5 — 2.5 Ω?	Repair poor contact in harness between ECM and combination meter connector.	Replace the fuel sub level sensor.

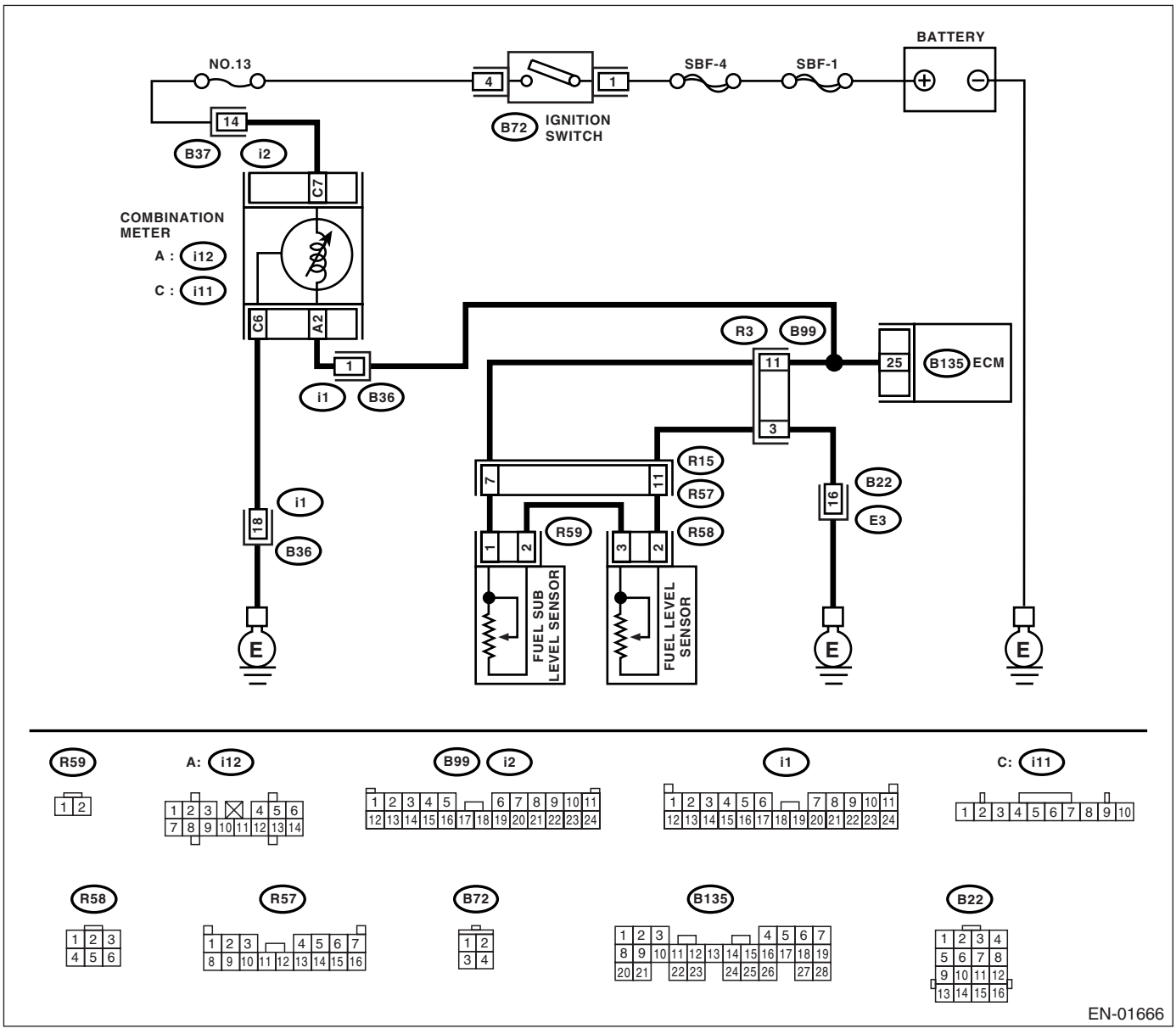
BG:DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-149, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does the speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. (Engine OFF) 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (−):***	Is the voltage more than 4.75 V?	Go to step **3.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in fuel pump connector • Poor contact in coupling connector
3	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter connector (i12) and ECM connector. 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (−):***	Is the voltage more than 4.75 V?	Go to step **4.**	Repair battery short circuit between ECM and combination meter connector.
4	**CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD.** 1) Turn the ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Measure the resistance between ECM and fuel tank cord. ***Connector & terminal*** ***(B135) No. 25 — (R15) No. 7:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair open circuit between ECM and fuel tank cord.
5	**CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND.** Measure the resistance between fuel tank cord and chassis ground. ***Connector & terminal*** ***(R15) No. 11 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **6.**	Repair open circuit between fuel tank cord and chassis ground. NOTE: In this case, repair the following: Poor contact in coupling connectors
6	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel level sensor. 2) Measure the resistance between fuel level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 11 — (R58) No. 2:***	Is the resistance less than 10 Ω?	Go to step **7.**	Repair open circuit between coupling connector and fuel level sensor.

	Step	Check	Yes	No
7	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel sub level sensor. 2) Measure the resistance between fuel level sensor and fuel sub level sensor. ***Connector & terminal*** ***(R58) No. 3 — (R59) No. 2:***	Is the resistance less than 10 Ω?	Go to step **8.**	Repair open circuit between fuel level sensor and fuel sub level sensor.
8	**CHECK FUEL TANK CORD.** Measure the resistance between fuel level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 7 — (R59) No. 1:***	Is the resistance less than 10 Ω?	Go to step **9.**	Repair open circuit between coupling connector and fuel level sensor.
9	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(H4SO)-55, Fuel Pump.> 2) While moving the fuel level sensor float up and down, measure resistance between fuel level sensor terminals. ***Terminals*** ***No. 3 — No. 2:***	Is the resistance more than 54.5 Ω?	Replace the fuel level sensor. <Ref. to FU(H4SO)-57, Fuel Level Sensor.>	Go to step **10.**
10	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4SO)-58, Fuel Sub Level Sensor.> 2) While moving the fuel sub level sensor float up and down, measure resistance between fuel sub level sensor terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance more than 41.5 Ω?	Replace the fuel sub level sensor. <Ref. to FU(H4SO)-58, Fuel Sub Level Sensor.>	Replace the combination meter. <Ref. to IDI-10, Combination Meter Assembly.>

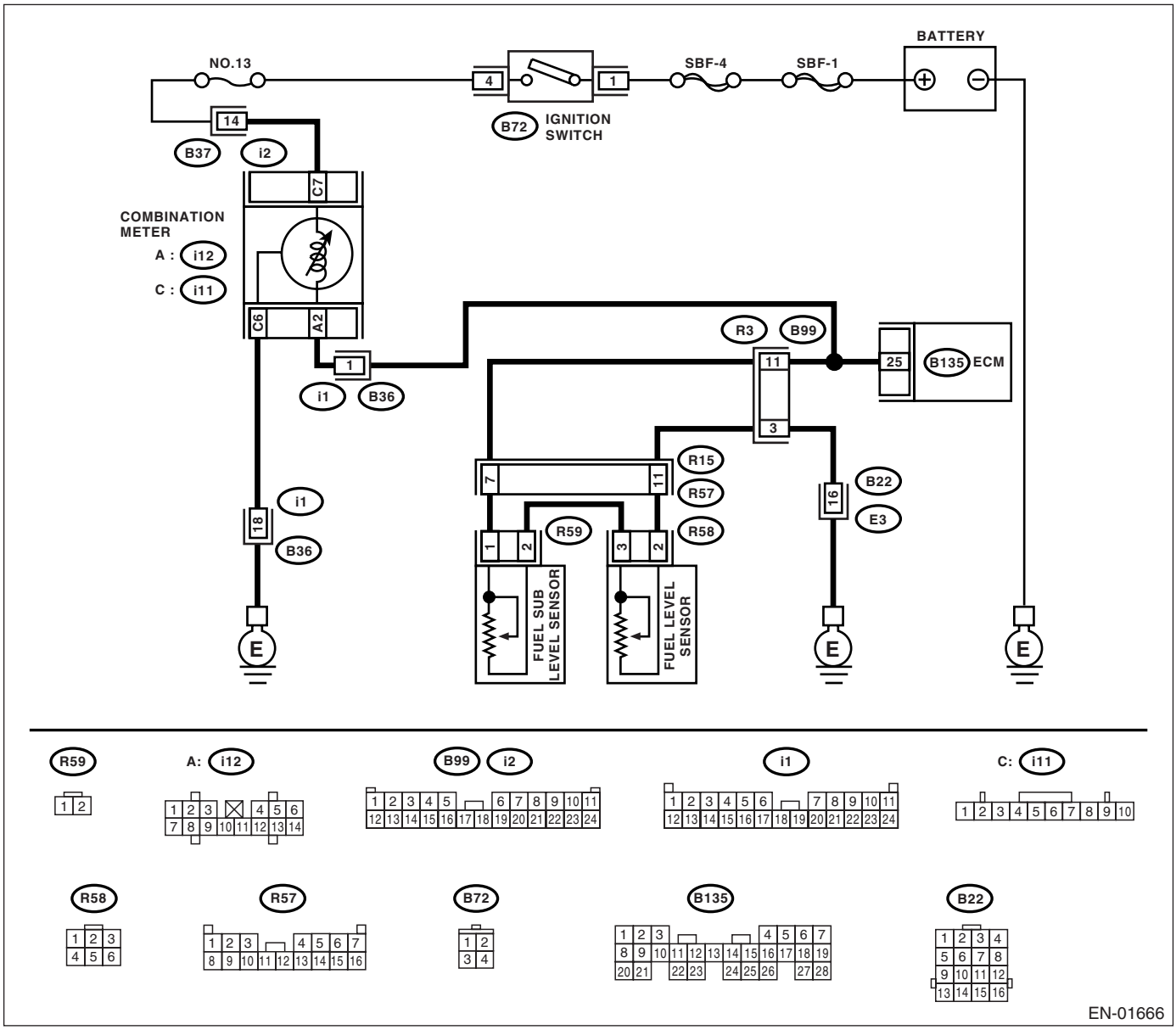
BH:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-151, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC P0462 or P0463 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(H4SO)-55, Fuel Pump.> 2) While moving the fuel level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 3 — No. 2:***	Does the resistance change smoothly?	Go to step **3.**	Replace the fuel level sensor. <Ref. to FU(H4SO)-57, Fuel Level Sensor.>
3	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4SO)-57, Fuel Level Sensor.> 2) While moving the fuel sub level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 1 — No. 2:***	Does the resistance change smoothly?	Repair poor contact in ECM, combination meter and coupling connectors.	Replace the fuel sub level sensor. <Ref. to FU(H4SO)-57, Fuel Level Sensor.>

BI: DTC P0483 COOLING FAN RATIONALITY CHECK

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-154, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>

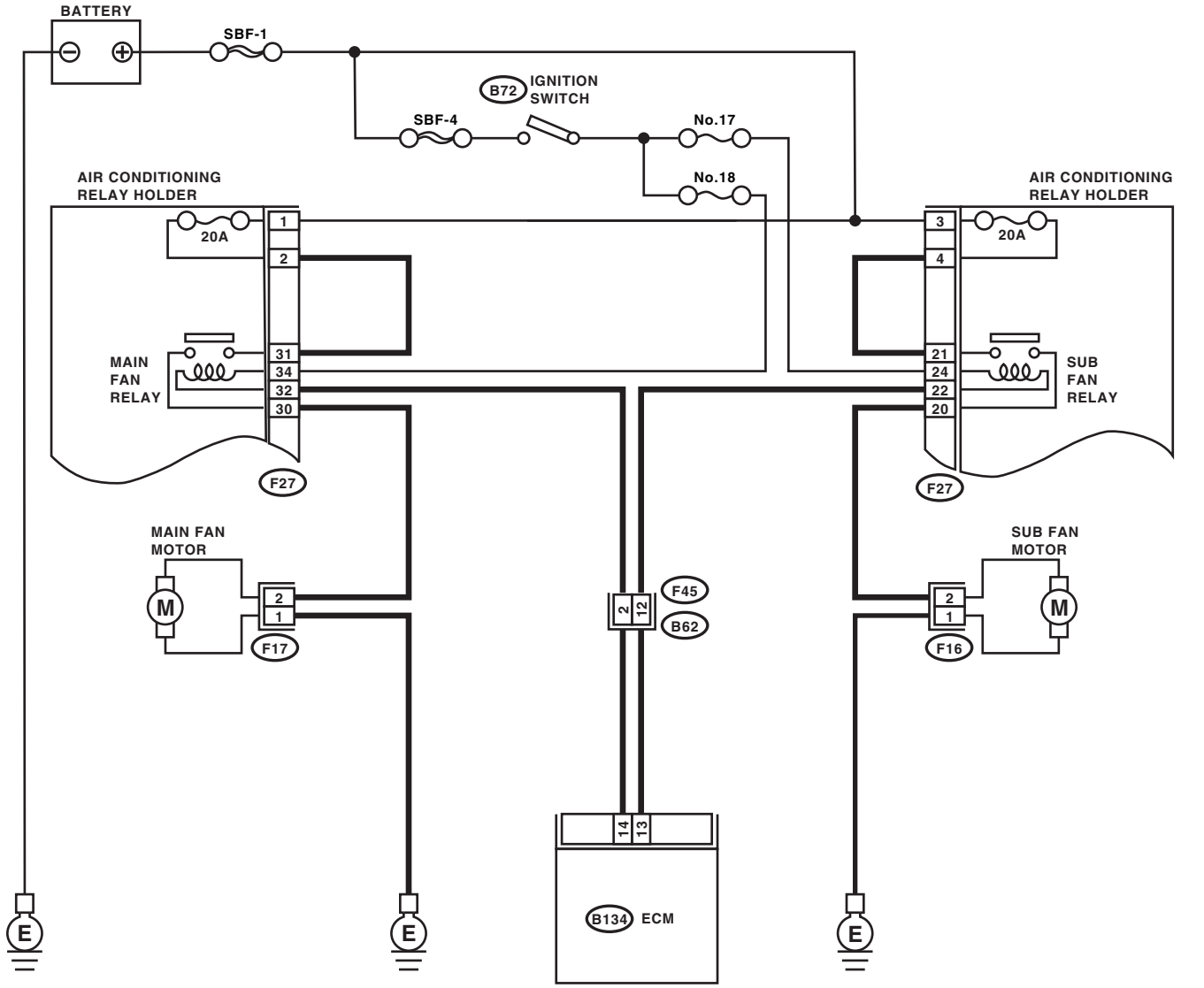
TROUBLE SYMPTOM:

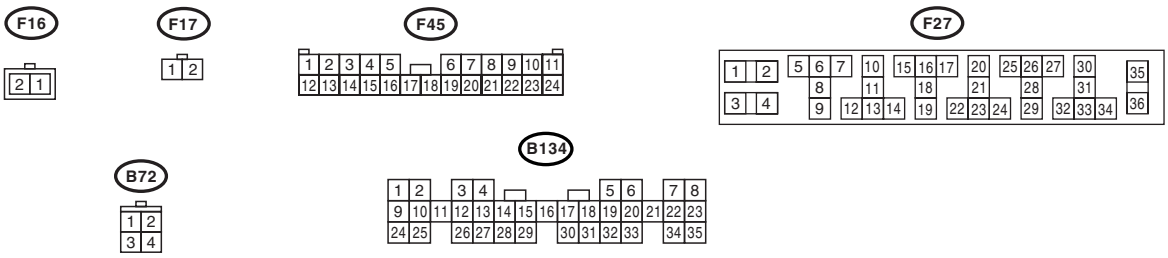
- Occurrence of noise
- Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

NOTE:
If the vehicle, with the engine idling, is placed very close to a wall or another vehicle, preventing normal cooling function, the OBD system may detect malfunction.

WIRING DIAGRAM:





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Step		Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Check radiator fan and fan motor. <Ref. to CO(H4SO)-22, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-23, Radiator Sub Fan and Fan Motor.>

BJ:DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT

NOTE:
For the diagnostic procedure, refer to DTC P0503. <Ref. to EN(H4SO)(diag)-217, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

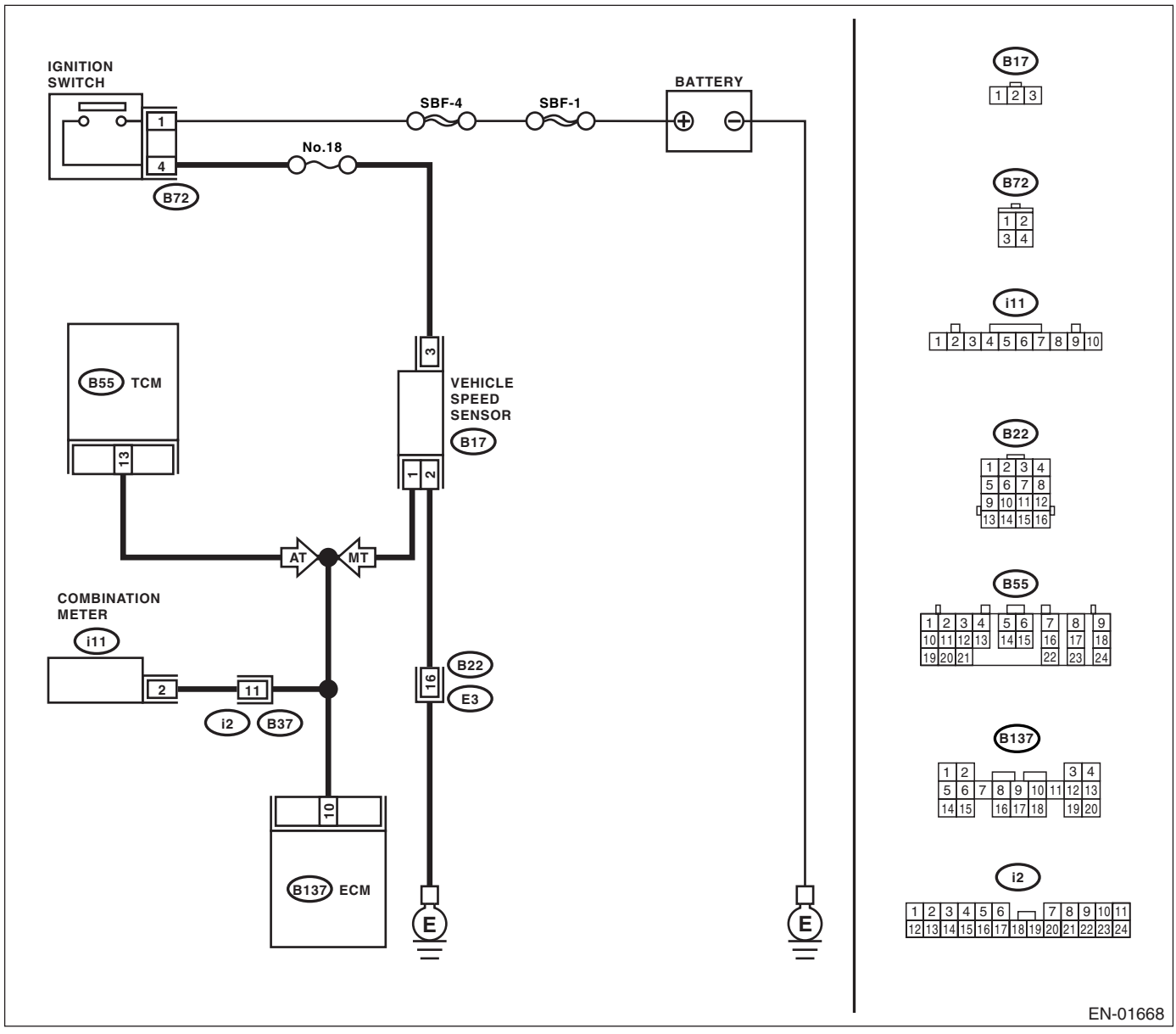
BK:DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-157, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the target AT model?	Go to step **2.**	Go to step **3.**
2	**CHECK DTC P0720 ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0720?	Check front vehicle speed sensor signal circuit. <Ref. to 4AT(diag)-52, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK SPEEDOMETER OPERATION IN COMBINATION METER.**	Does the speedometer operate normally?	Go to step **4.**	Check speedometer and vehicle speed sensor. <Ref. to IDI-14, Speedometer.> and <Ref. to 4AT-49, Front Vehicle Speed Sensor.> and <Ref. to 4AT-53, Rear Vehicle Speed Sensor.> and <Ref. to 4AT-54, Torque Converter Turbine Speed Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from combination meter. 3) Measure the resistance between ECM and combination meter. ***Connector & terminal*** ***(B137) No. 10 — (i11) No. 2:***	Is the resistance less than 10 Ω?	Repair poor contact in ECM connector.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in ECM connector • Poor contact in combination meter connector • Poor contact in coupling connector

BL:DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-158, DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

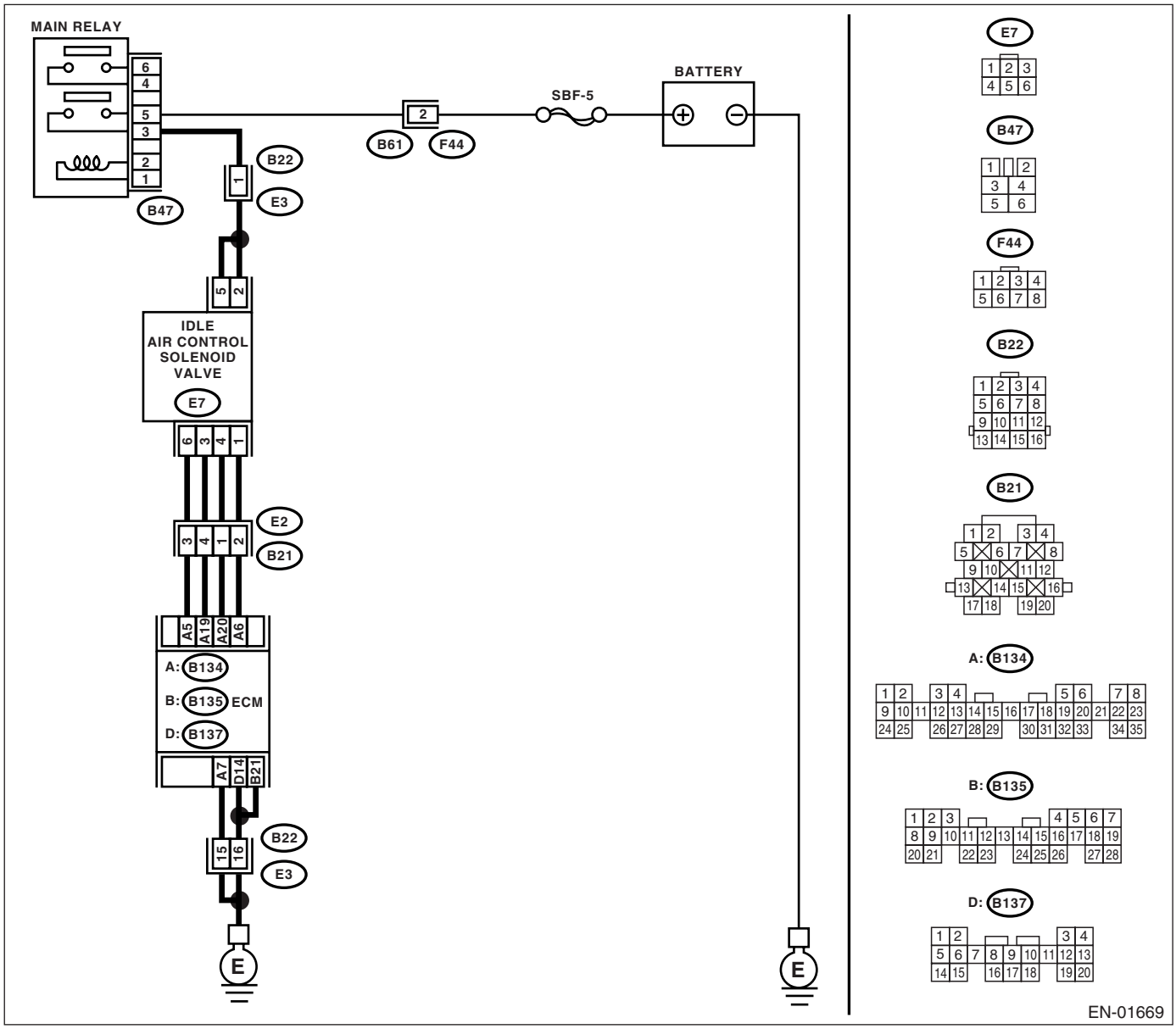
TROUBLE SYMPTOM:

- Engine is difficult to start.
- Engine does not start.
- Erroneous idling
- Engine stalls.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	Go to step **2.**
2	**CHECK AIR BY-PASS LINE.** 1) Turn the ignition switch to OFF. 2) Remove the idle air control solenoid valve from throttle body. <Ref. to FU(H4SO)-32, REMOVAL, Idle Air Control Solenoid Valve.> 3) Remove the throttle body from intake manifold. <Ref. to FU(H4SO)-12, REMOVAL, Throttle Body.> 4) Using an air gun, force air into the idle air control solenoid valve installation area. Confirm that forced air subsequently escapes from throttle body interior.	Does air flow out?	Replace the idle air control solenoid valve. <Ref. to FU(H4SO)-32, INSTALLATION, Idle Air Control Solenoid Valve.>	Replace the throttle body. <Ref. to FU(H4SO)-12, INSTALLATION, Throttle Body.>

BM:DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-160, DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

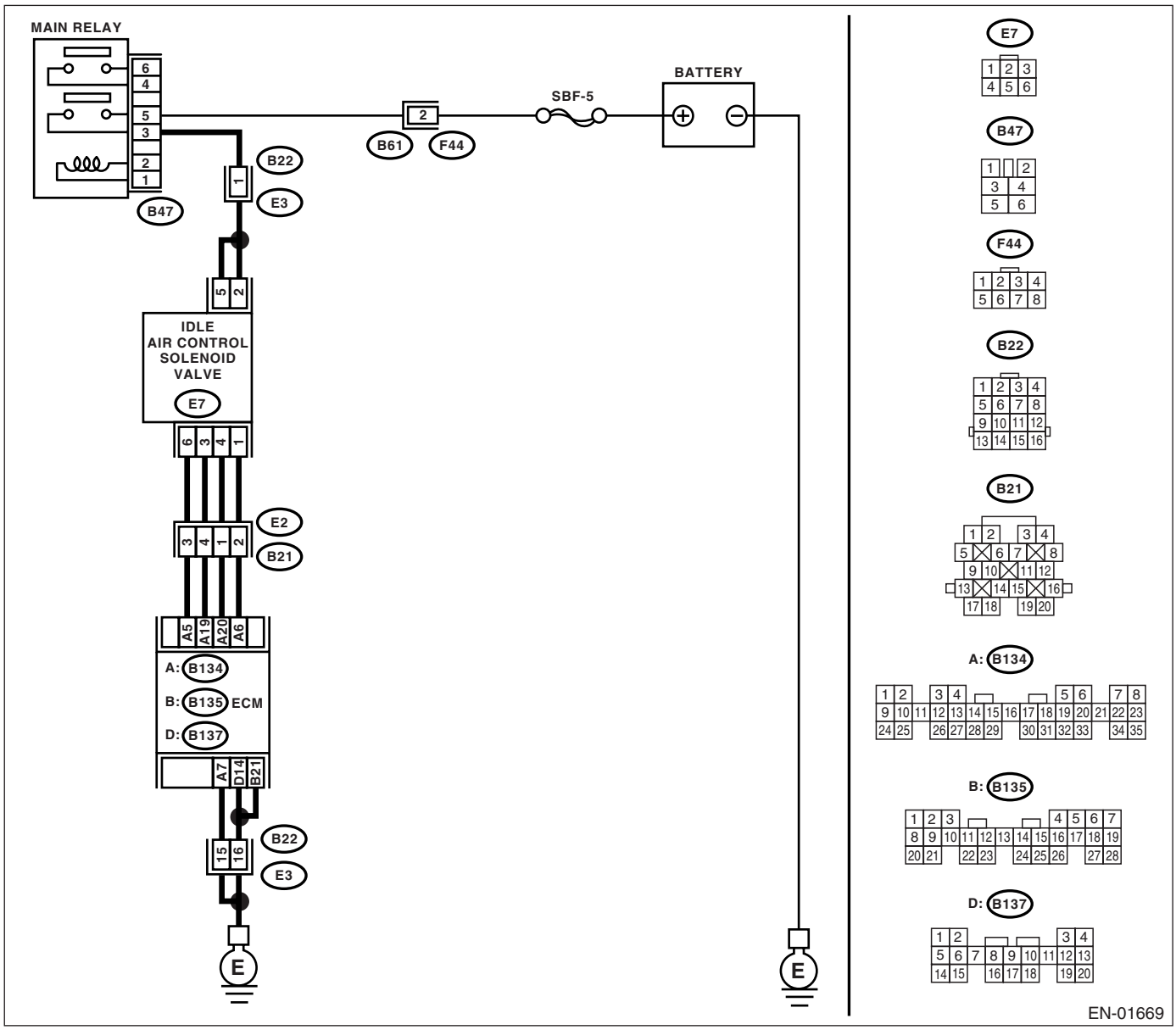
TROUBLE SYMPTOM:

Engine keeps running at higher revolution than specified idling revolution.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1) Turn the ignition switch to ON. 2) Start the engine, and idle it. 3) Check the following items. • Loose installation of intake manifold, idle air control solenoid valve and throttle body • Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket • Disconnections of vacuum hoses	Is there a fault in air intake system?	Repair air suction and leaks.	Go to step **3.**
3	**CHECK THROTTLE CABLE.**	Is throttle cable play correct?	Go to step **4.**	Adjust throttle cable. <Ref. to SP(H4SO)-6, INSTALLATION, Accelerator Control Cable.>
4	**CHECK AIR BY-PASS LINE.** 1) Turn the ignition switch to OFF. 2) Remove the idle air control solenoid valve from throttle body. <Ref. to FU(H4SO)-32, REMOVAL, Idle Air Control Solenoid Valve.> 3) Confirm that there are no foreign particles in air by-pass line.	Is air by-pass line clogged by foreign particles?	Remove foreign particles from air by-pass line.	Replace the idle air control solenoid valve. <Ref. to FU(H4SO)-32, INSTALLATION, Idle Air Control Solenoid Valve.>

BN:DTC P0512 STARTER REQUEST CIRCUIT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-162, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

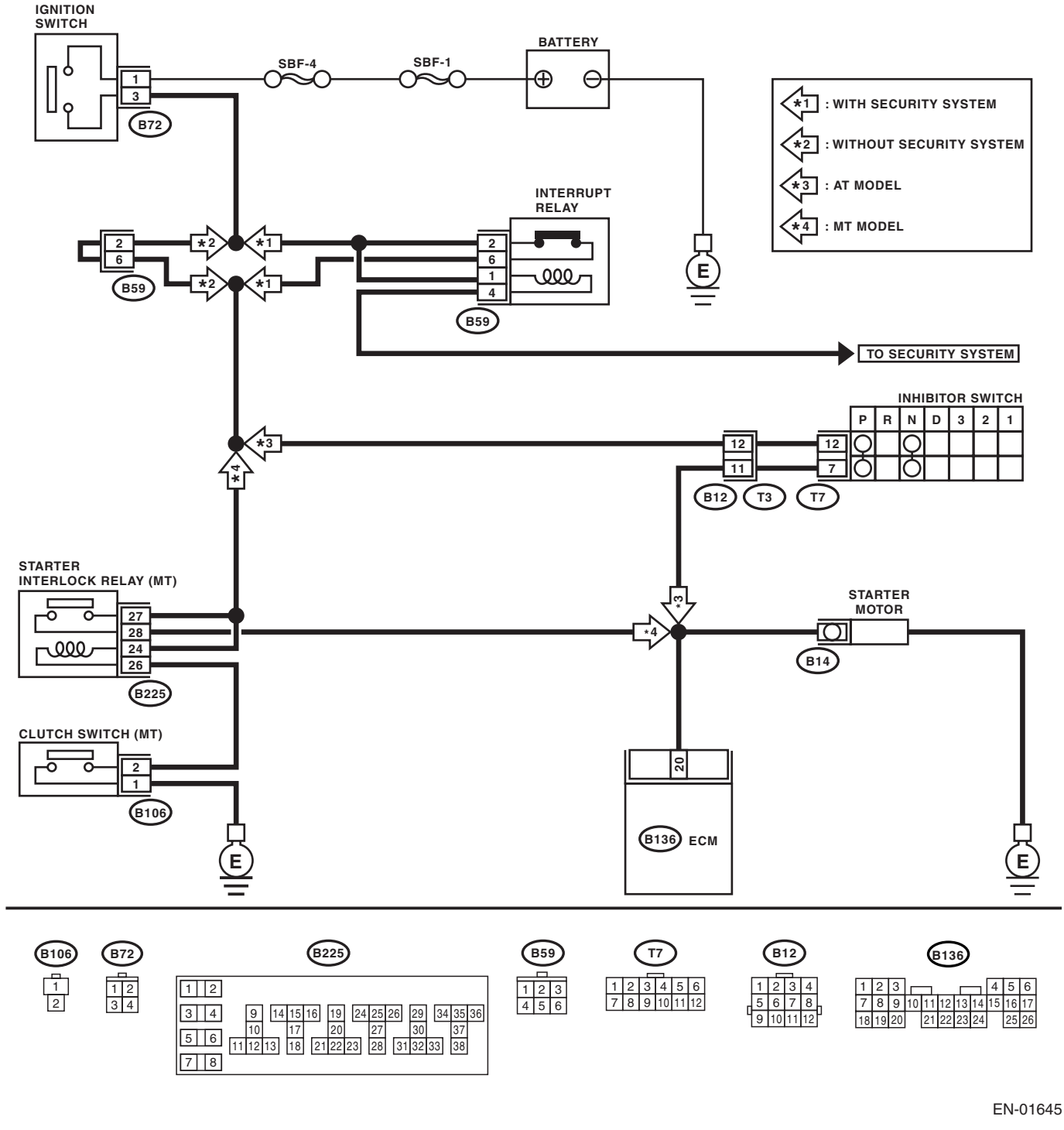
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



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	Step	Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** Turn the ignition switch to ON. NOTE: Place the inhibitor switch in each position. (AT model) Depress or release the clutch pedal. (MT model)	Dose the starter motor operate?	Repair battery short circuit in starter motor circuit.	Check starter motor circuit. <Ref. to EN(H4SO)(diag)-57, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

BO:DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-163, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

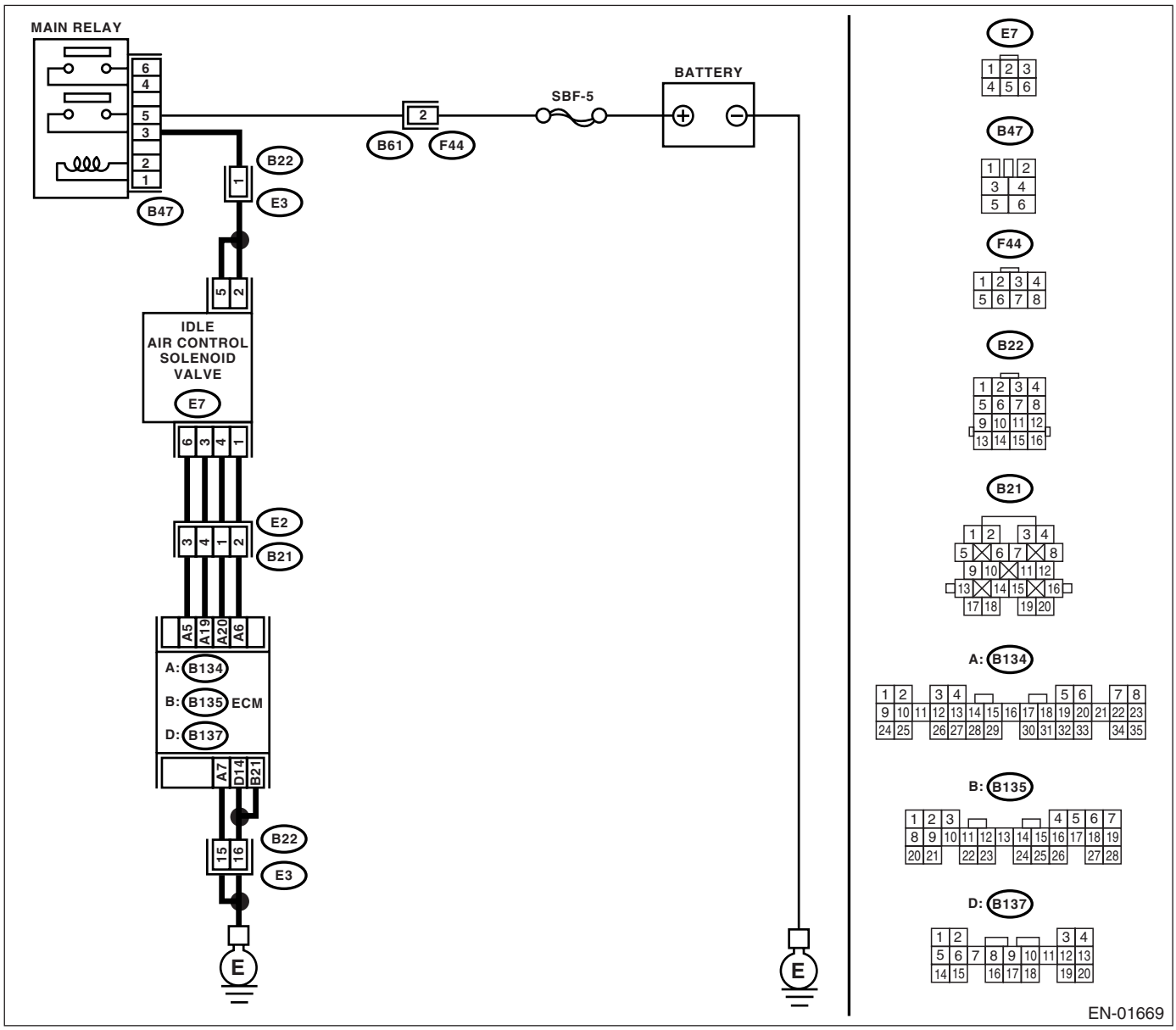
TROUBLE SYMPTOM:

Engine keeps running at higher revolution than specified idling revolution.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0519.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1) Turn the ignition switch to ON. 2) Start the engine, and idle it. 3) Check the following items. • Loose installation of intake manifold, idle air control solenoid valve and throttle body • Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket • Disconnections of vacuum hoses	Is there a fault in air intake system?	Repair air suction and leaks.	Go to step **3.**
3	**CHECK THROTTLE CABLE.**	Is throttle cable play correct?	Go to step **4.**	Adjust throttle cable. <Ref. to SP(H4SO)-6, INSTALLATION, Accelerator Control Cable.>
4	**CHECK AIR BY-PASS LINE.** 1) Turn the ignition switch to OFF. 2) Remove the idle air control solenoid valve from throttle body. <Ref. to FU(H4SO)-32, Idle Air Control Solenoid Valve.> 3) Confirm that there are no foreign particles in air by-pass line.	Is air by-pass line clogged by foreign particles?	Remove foreign particles from air by-pass line.	Replace the idle air control solenoid valve. <Ref. to FU(H4SO)-32, Idle Air Control Solenoid Valve.>

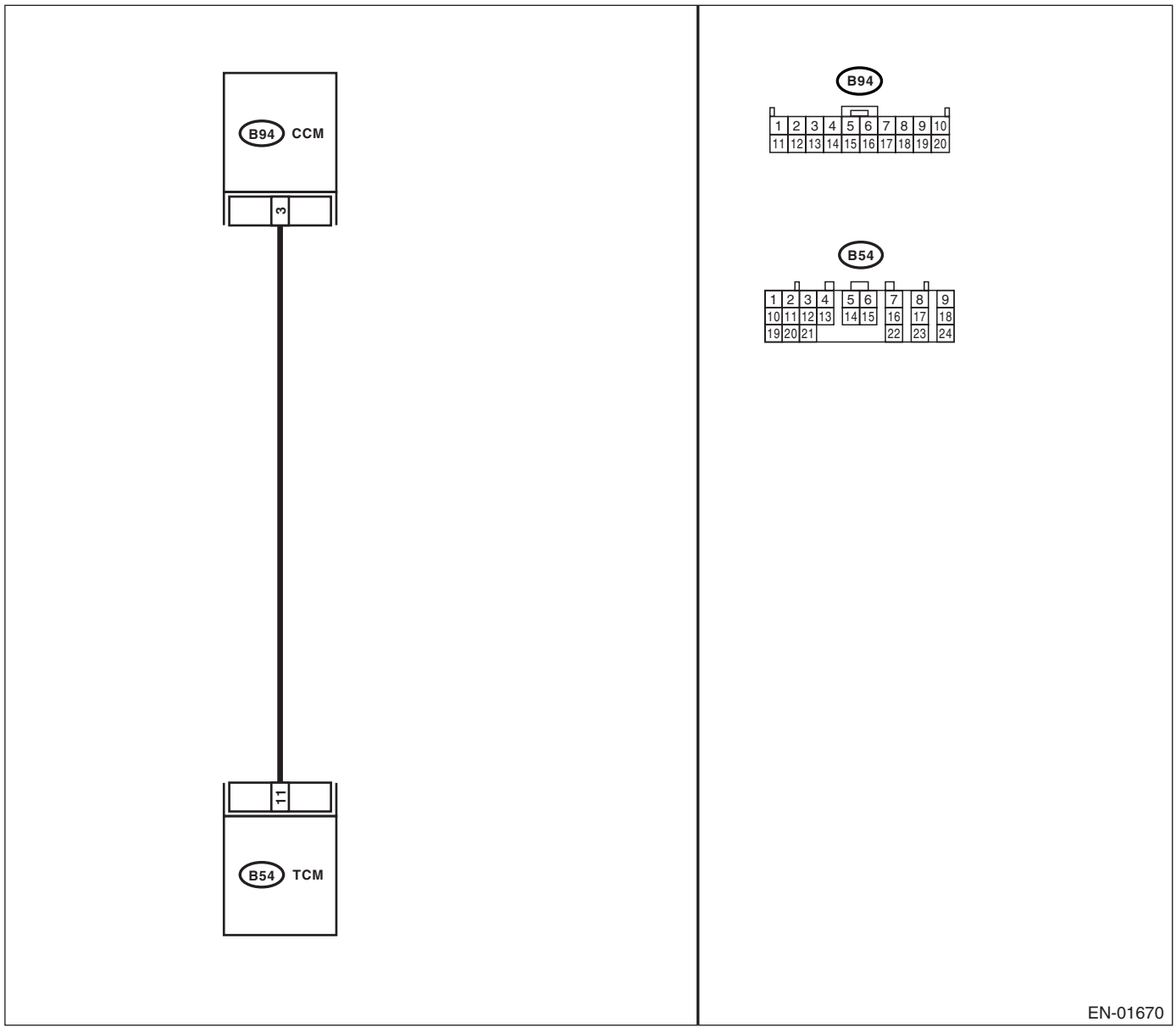
BP:DTC P0565 CRUISE CONTROL ON SIGNAL

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-164, DTC P0565 CRUISE CONTROL ON SIGNAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and CCM. 3) Measure the resistance of harness between TCM and CCM connector. ***Connector & terminal*** ***(B54) No. 11— (B94) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between TCM and CCM connector.
2	**CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 11 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair short circuit in harness between TCM and CCM connector.
3	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connector to TCM and CCM. 2) Lift-up the vehicle or set the vehicle on free rollers. **CAUTION:** **On AWD models, raise all wheels off ground.** 3) Start the engine. 4) Turn the cruise control main switch to ON. 5) Increase vehicle speed to 50 km/h (31 MPH). 6) Turn the cruise control command switch to ON. 7) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 11 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **4.**	Check cruise control command switch circuit. <Ref. to CC-7, INSPECTION, Cruise Control Command Switch.>
4	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

BQ:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-165, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

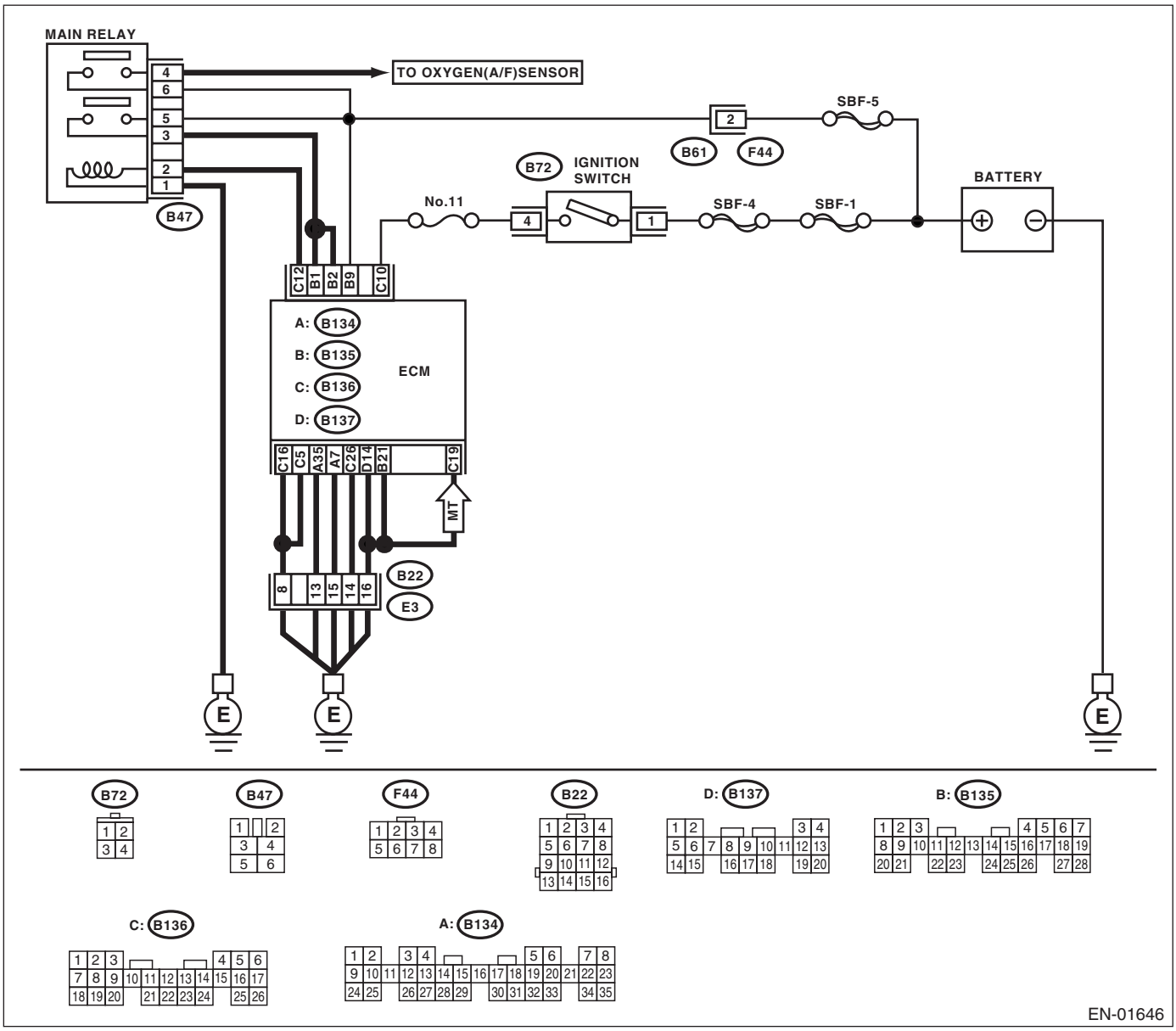
TROUBLE SYMPTOM:

- Engine does not start.
- Engine stalls.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the relevant DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>	A temporary poor contact occurs.

BR:DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW

DTC DETECTING CONDITION:

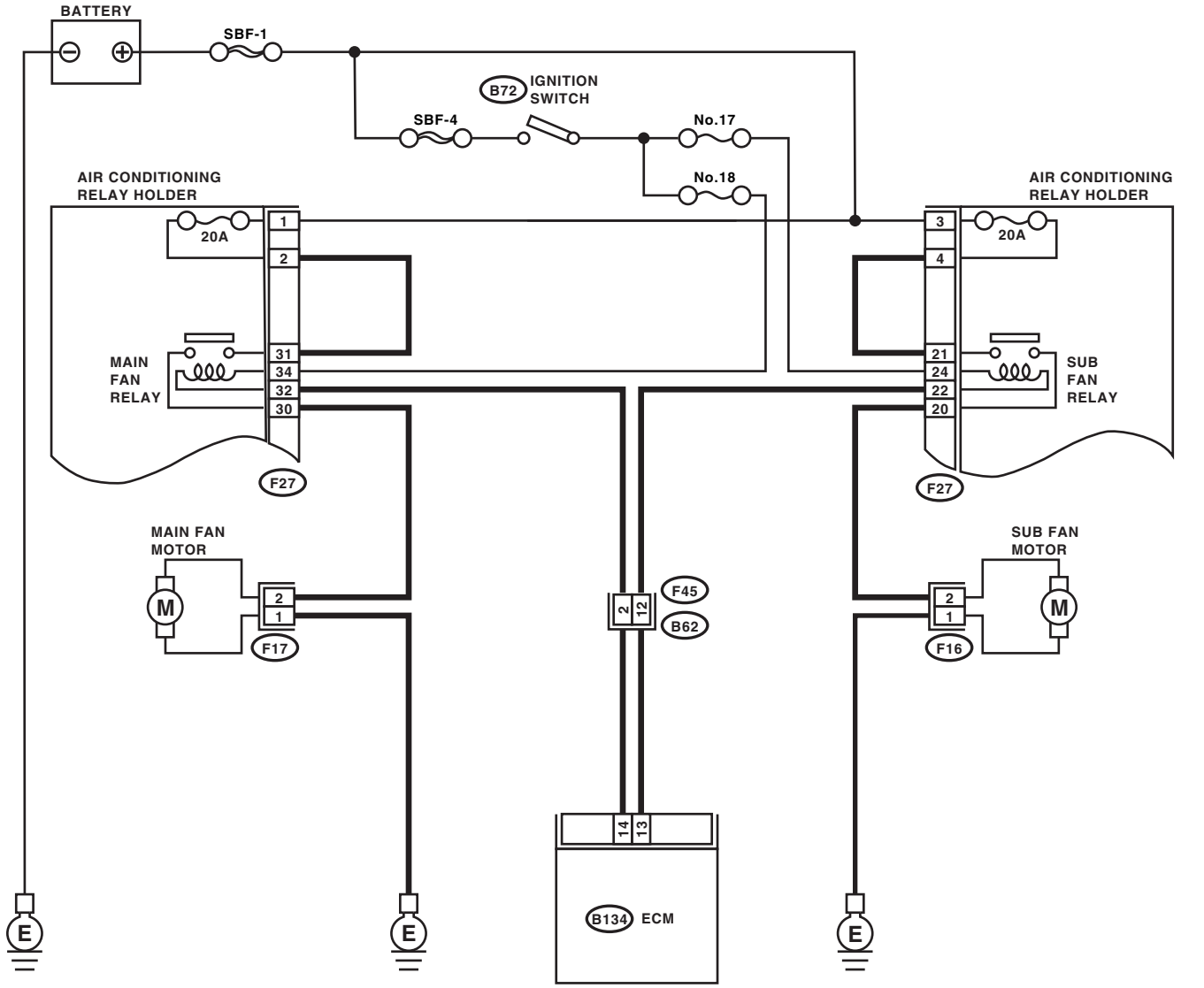
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-166, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

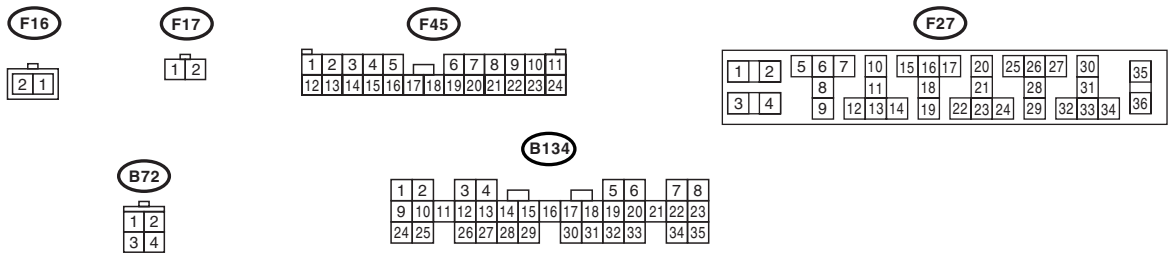
TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) While operating the radiator fan relay, measure voltage between ECM terminal and ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> ***Connector & terminal*** ***(B134) No. 13 (+) — Chassis ground (−):*** ***(B134) No. 14 (+) — Chassis ground (−):***	Is the voltage 0 — 10 V?	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK GROUND SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 13 — Chassis ground:*** ***(B134) No. 14 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in radiator fan relay control circuit.	Go to step **3.**
3	**CHECK POWER SUPPLY FOR RELAY.** 1) Remove the radiator fan relay from A/C relay holder. 2) Turn the ignition switch to ON. 3) Measure the voltage between fuse and relay box (F/B) connector and chassis ground. ***Connector & terminal*** ***(F27) No. 24 (+) — Chassis ground (−):*** ***(F27) No. 34 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.
4	**CHECK RADIATOR FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between radiator fan relay terminals. ***Terminals*** ***No. 22 — No. 24:*** ***No. 32 — No. 34:***	Is the resistance 87 — 107 Ω?	Go to step **5.**	Replace the radiator fan relay.
5	**CHECK OPEN CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** Measure the resistance of harness between ECM and radiator fan relay connector. ***Connector & terminal*** ***(B134) No. 14 — (F27) No. 32:*** ***(B134) No. 13 — (F27) No. 22:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and radiator fan relay connector • Poor contact in coupling connector
6	**CHECK POOR CONTACT.** Check poor contact in ECM or radiator fan relay connector.	Is there poor contact in ECM or radiator fan relay connector?	Repair poor contact in ECM or radiator fan relay connector.	Contact SOA Service Center.

BS:DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-167, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

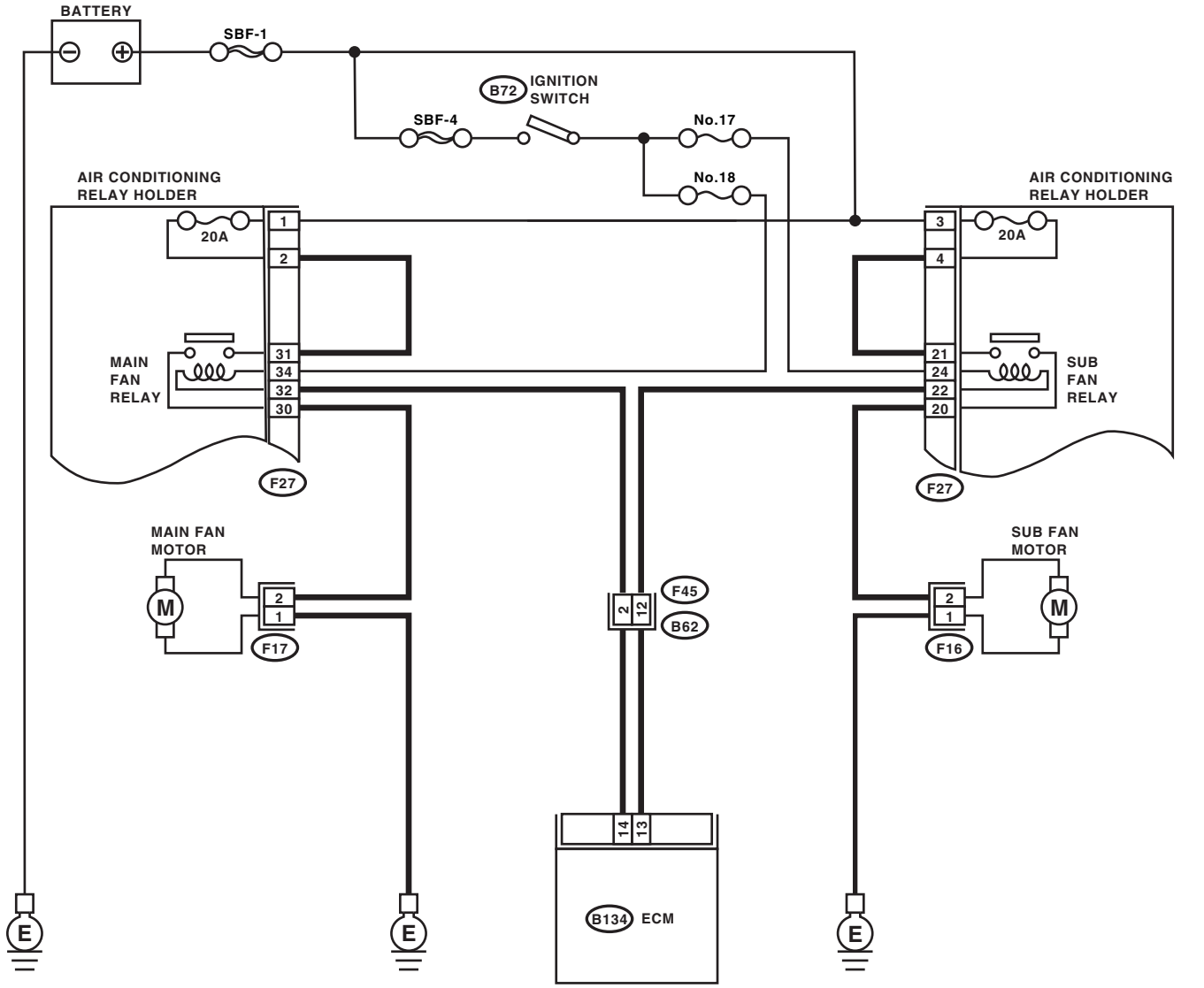
TROUBLE SYMPTOM:

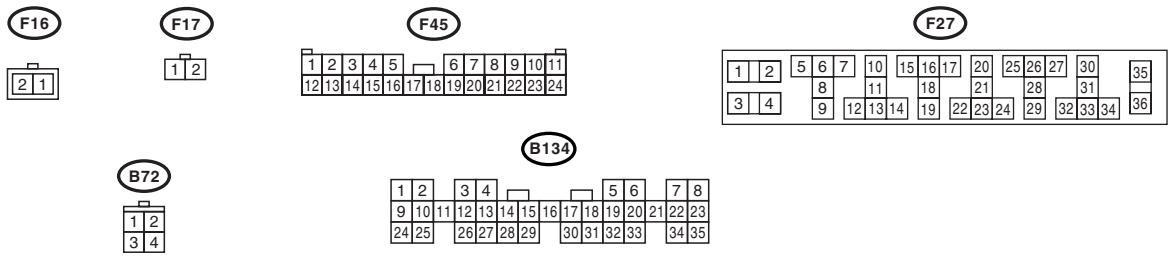
- Radiator fan does not operate properly.
- Overheating

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the drive's side). 3) Turn the ignition switch to ON. 4) While operating the radiator fan relay, measure voltage between ECM and chassis ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (−):*** ***(B134) No. 13 (+) — Chassis ground (−):***	Is the voltage 0 — 10 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay and sub fan relay. (with A/C models) 3) Disconnect the test mode connector. 4) Turn the ignition switch to ON. 5) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (−):*** ***(B134) No. 13 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in radiator fan relay control circuit. After repair, replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Go to step **3.**
3	**CHECK MAIN FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay. 3) Measure the resistance between main fan relay terminals. ***Terminals*** ***No. 30 — No. 31:***	Is the resistance less than 1 Ω?	Replace the main fan relay and ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Go to step **4.**
4	**CHECK SUB FAN RELAY.** 1) Remove the sub fan relay. 2) Measure the resistance between sub fan relay terminals. ***Terminals*** ***No. 20 — No. 21:***	Is the resistance less than 1 Ω?	Replace the sub fan relay and ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

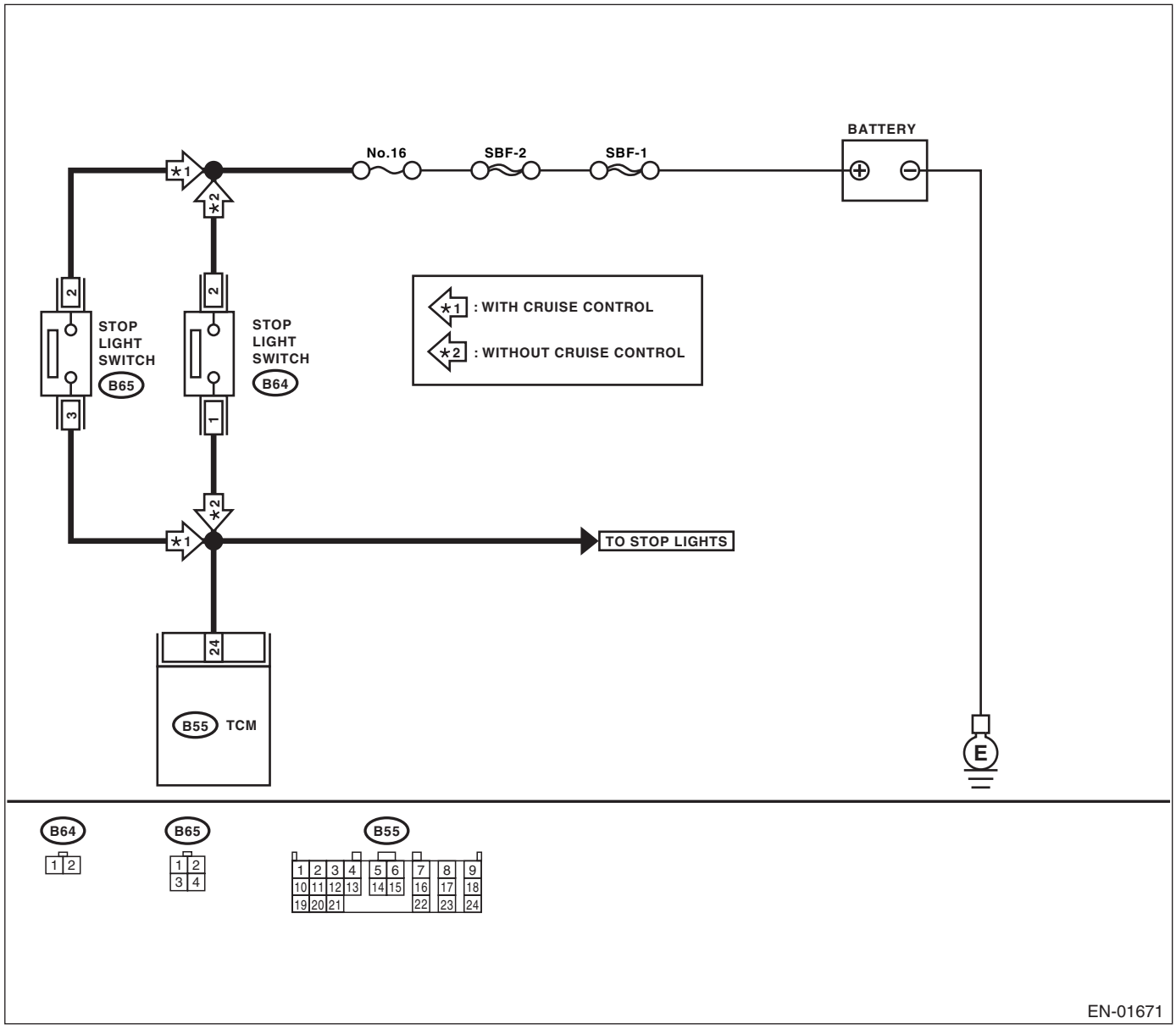
BT:DTC P0703 TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-168, DTC P0703 TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OPERATION OF BRAKE LIGHT.**	Does the brake light illuminate when depressing the brake pedal?	Go to step **2.**	Repair or replace the brake light circuit.
2	**CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.** 1) Disconnect the connectors from TCM and brake light switch. 2) Measure the resistance of harness between TCM and brake light switch connector. ***Connector & terminal*** ***Without cruise control*** ***(B55) No. 24 — (B64) No. 1:*** ***With cruise control*** ***(B55) No. 24 — (B65) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair or replace the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between TCM and brake light switch connector • Poor contact in TCM connector • Poor contact in brake light switch connector
3	**CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 24 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between TCM and brake light switch connector.
4	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and brake light switch. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 24 (+) — Chassis ground (−):***	Is the voltage less than 1 V when releasing the brake pedal?	Go to step **5.**	Adjust or replace the brake light switch. <Ref. to LI-7, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
5	**CHECK INPUT SIGNAL FOR TCM.** Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 24 (+) — Chassis ground (−):***	Is the voltage more than 10 V when depressing the brake pedal?	Go to step **6.**	Adjust or replace the brake light switch. <Ref. to LI-7, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

BU:DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT)

GENERAL DESCRIPTION <Ref. to GD(H4SO)-169, DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(diag)-104, CHECK INHIBITOR SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>

BV:DTC P0710 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT

GENERAL DESCRIPTION <Ref. to GD(H4SO)-170, DTC P0710 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(diag)-43, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BW:DTC P0716 OUTPUT/TURBINE SPEED SENSOR CIRCUIT RANGE/PERFORMANCE

GENERAL DESCRIPTION <Ref. to GD(H4SO)-171, DTC P0716 INPUT/TURBINE SPEED SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(diag)-57, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BX:DTC P0720 OUTPUT SPEED SENSOR CIRCUIT

GENERAL DESCRIPTION <Ref. to GD(H4SO)-172, DTC P0720 OUTPUT SPEED SENSOR CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(diag)-52, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BY:DTC P0726 ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE

GENERAL DESCRIPTION <Ref. to GD(H4SO)-173, DTC P0726 ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(diag)-39, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BZ:DTC P0731 GEAR 1 INCORRECT RATIO

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H4SO)(diag)-239, DTC P0734 GEAR 4 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CA:DTC P0732 GEAR 2 INCORRECT RATIO

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H4SO)(diag)-239, DTC P0734 GEAR 4 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CB:DTC P0733 GEAR 3 INCORRECT RATIO

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H4SO)(diag)-239, DTC P0734 GEAR 4 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CC:DTC P0734 GEAR 4 INCORRECT RATIO

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-177, DTC P0734 GEAR 4 INCORRECT RATIO, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Shift point too high or too low; engine brake not effected in “3” range; excessive shift shock; excessive tight corner “braking”

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK THROTTLE POSITION SENSOR CIRCUIT.** Check throttle position sensor circuit. <Ref. to 4AT(diag)-46, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in throttle position sensor circuit?	Repair or replace the throttle position sensor circuit.	Go to step **3.**
3	**CHECK FRONT VEHICLE SPEED SENSOR CIRCUIT.** Check front vehicle speed sensor circuit. <Ref. to 4AT(diag)-52, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in front vehicle speed sensor circuit?	Repair or replace the front vehicle speed sensor circuit.	Go to step **4.**
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.** Check torque converter turbine speed sensor circuit. <Ref. to 4AT(diag)-57, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in torque converter turbine speed sensor circuit?	Repair or replace the torque converter turbine speed sensor circuit.	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Go to step **6.**
6	**CHECK MECHANICAL TROUBLE.** Check mechanical trouble in automatic transmission.	Is there any mechanical trouble in automatic transmission?	Repair or replace the automatic transmission. <Ref. to 4AT-32, INSPECTION, Road Test.>	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

CD:DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-178, DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- No lock-up (after engine warm-up)
- No shift or excessive tight corner “braking”

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK LOCK-UP DUTY SOLENOID CIRCUIT.** Check lock-up duty solenoid circuit. <Ref. to 4AT(diag)-87, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in lock-up duty solenoid circuit?	Repair or replace the lock-up duty solenoid circuit.	Go to step **3.**
3	**CHECK THROTTLE POSITION SENSOR CIRCUIT.** Check throttle position sensor circuit. <Ref. to 4AT(diag)-46, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in throttle position sensor circuit?	Repair or replace the throttle position sensor circuit.	Go to step **4.**
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.** Check torque converter turbine speed sensor circuit. <Ref. to 4AT(diag)-57, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in torque converter turbine speed sensor circuit?	Repair or replace the torque converter turbine speed sensor circuit.	Go to step **5.**
5	**CHECK ENGINE SPEED INPUT CIRCUIT.** Check engine speed input circuit. <Ref. to 4AT(diag)-39, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in engine speed input circuit?	Repair or replace the engine speed input circuit.	Go to step **6.**
6	**CHECK INHIBITOR SWITCH CIRCUIT.** Check inhibitor switch circuit. <Ref. to 4AT(diag)-104, CHECK INHIBITOR SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Is there any trouble in inhibitor switch circuit?	Repair or replace the inhibitor switch circuit.	Go to step **7.**

	Step	Check	Yes	No
7	**CHECK BRAKE LIGHT SWITCH CIRCUIT.** Check brake light switch circuit. <Ref. to 4AT(diag)-103, CHECK BRAKE SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Is there any trouble in brake light switch circuit?	Repair or replace the brake light switch circuit.	Go to step **8.**
8	**CHECK ATF TEMPERATURE SENSOR CIRCUIT.** Check ATF temperature sensor circuit. <Ref. to 4AT(diag)-43, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in ATF temperature sensor circuit?	Repair or replace the ATF temperature sensor circuit.	Go to step **9.**
9	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Go to step **10.**
10	**CHECK MECHANICAL TROUBLE.** Check mechanical trouble in automatic transmission.	Is there any mechanical trouble in automatic transmission?	Repair or replace the automatic transmission. <Ref. to 4AT-32, INSPECTION, Road Test.>	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

CE:DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL

GENERAL DESCRIPTION <Ref. to GD(H4SO)-179, DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(diag)-87, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CF:DTC P0748 PRESSURE CONTROL SOLENOID “A” ELECTRICAL

GENERAL DESCRIPTION <Ref. to GD(H4SO)-180, DTC P0748 PRESSURE CONTROL SOLENOID “A” ELECTRICAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(diag)-78, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CG:DTC P0753 SHIFT SOLENOID “A” ELECTRICAL

GENERAL DESCRIPTION <Ref. to GD(H4SO)-181, DTC P0753 SHIFT SOLENOID “A” ELECTRICAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(diag)-65, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CH:DTC P0758 SHIFT SOLENOID “B” ELECTRICAL

GENERAL DESCRIPTION <Ref. to GD(H4SO)-182, DTC P0758 SHIFT SOLENOID “B” ELECTRICAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(diag)-68, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CI: DTC P0771 SHIFT SOLENOID “E” PERFORMANCE OR STUCK OFF

GENERAL DESCRIPTION <Ref. to GD(H4SO)-183, DTC P0771 SHIFT SOLENOID “E” PERFORMANCE OR STUCK OFF, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(diag)-71, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CJ:DTC P0778 PRESSURE CONTROL SOLENOID “B” ELECTRICAL

GENERAL DESCRIPTION <Ref. to GD(H4SO)-184, DTC P0778 PRESSURE CONTROL SOLENOID “B” ELECTRICAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(diag)-83, DTC 76 2-4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CK:DTC P0785 SHIFT/TIMING SOLENOID

GENERAL DESCRIPTION <Ref. to GD(H4SO)-185, DTC P0785 SHIFT/TIMING SOLENOID, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(diag)-74, DTC 74 2-4 BRAKE TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CL:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-186, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

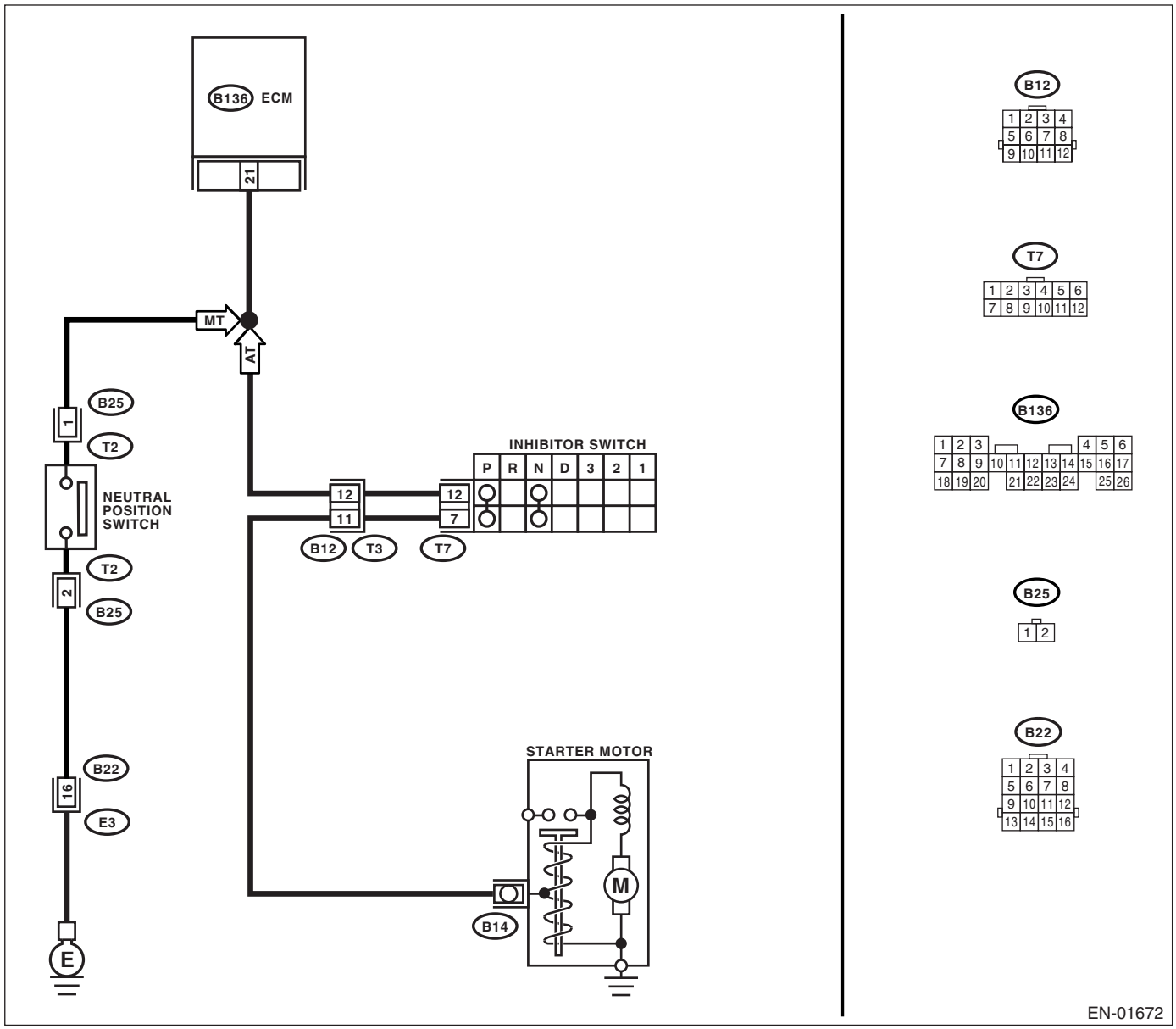
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC P0705 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. 2) Place the select lever except for "N" and "P" ranges. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (−):***	Is the voltage 4.5 — 5.5 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T3). 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 21 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between ECM and transmission harness connector.
4	**CHECK TRANSMISSION HARNESS CONNECTOR.** 1) Disconnect the connector from inhibitor switch. 2) Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(T3) No. 12 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair ground short circuit in harness between transmission harness and inhibitor switch connector.
5	**CHECK INHIBITOR SWITCH.** Measure the resistance between inhibitor switch connector the receptacle's terminals in select lever except for "N" and "P" range. ***Terminals*** ***No. 7 — No. 12:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Replace the inhibitor switch. <Ref. to 4AT-46, Inhibitor Switch.>
6	**CHECK SELECTOR CABLE CONNECTION.**	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-26, INSPECTION, Select Cable.>	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

CM:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-186, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

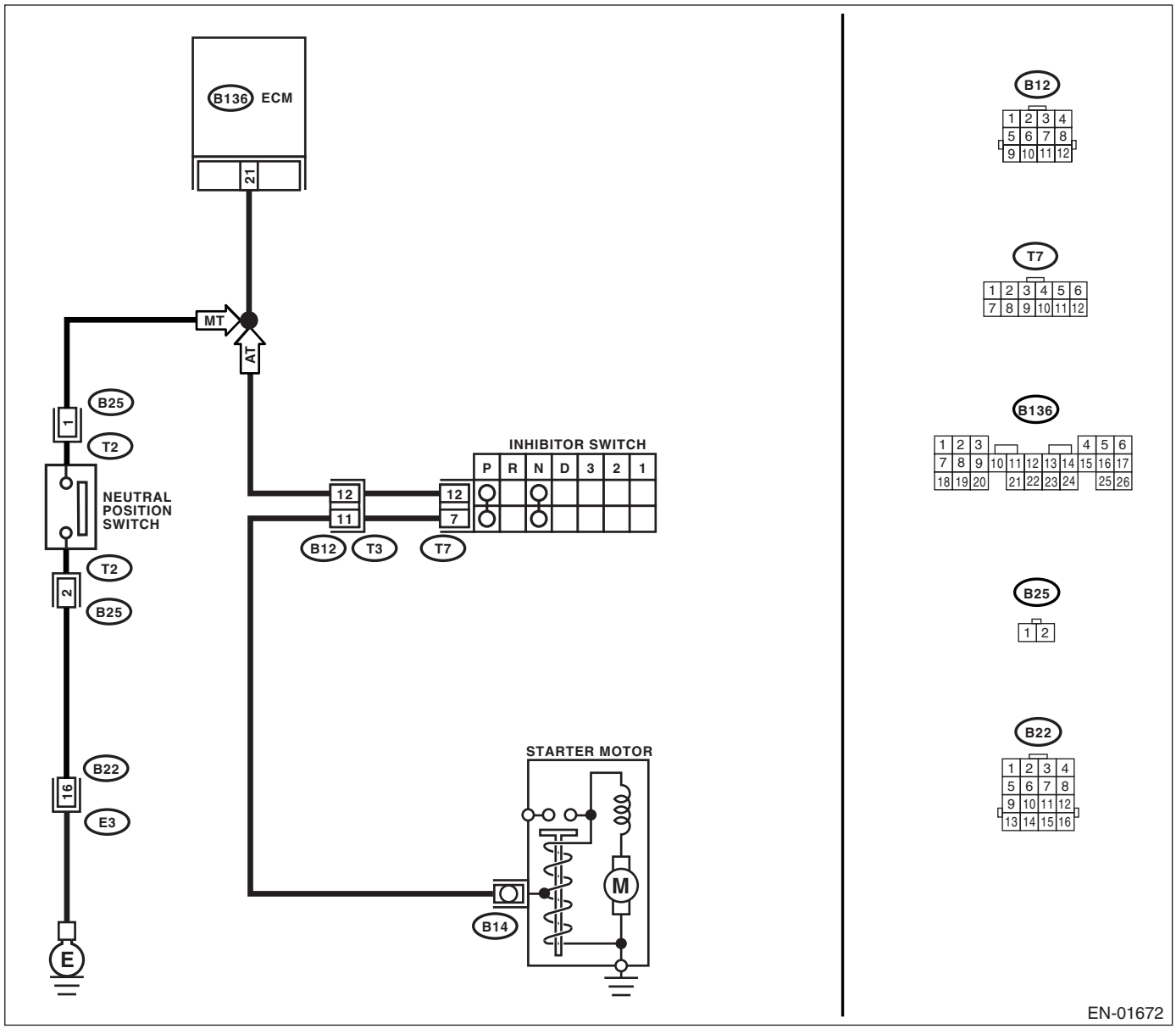
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. 2) Place the shift lever in neutral. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Place the shift lever in a position except for neutral. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact SOA Service Center.
4	**CHECK NEUTRAL POSITION SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission harness. 3) Place the shift lever in neutral. 4) Measure the resistance between transmission harness and connector terminals. ***Connector & terminal*** ***(T2) No. 1 — No. 2:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair short circuit in transmission harness or replace neutral position switch.
5	**CHECK NEUTRAL POSITION SWITCH.** 1) Place the shift lever in a position except for neutral. 2) Measure the resistance between transmission harness connector terminals. ***Connector & terminal*** ***(T2) No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair short circuit in transmission harness or replace neutral position switch.
6	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair ground short circuit in harness between ECM and transmission harness connector.
7	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and transmission harness connector. ***Connector & terminal*** ***(B136) No. 21 — (B25) No. 1:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between ECM and transmission harness connector.
8	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(B25) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **9.**	Repair open circuit between transmission harness connector and engine ground terminal.

	Step	Check	Yes	No
9	**CHECK POOR CONTACT.** Check poor contact in transmission harness connector.	Is there poor contact in transmission harness connector?	Repair poor contact in transmission harness connector.	Contact SOA Service Center.

CN:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-188, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

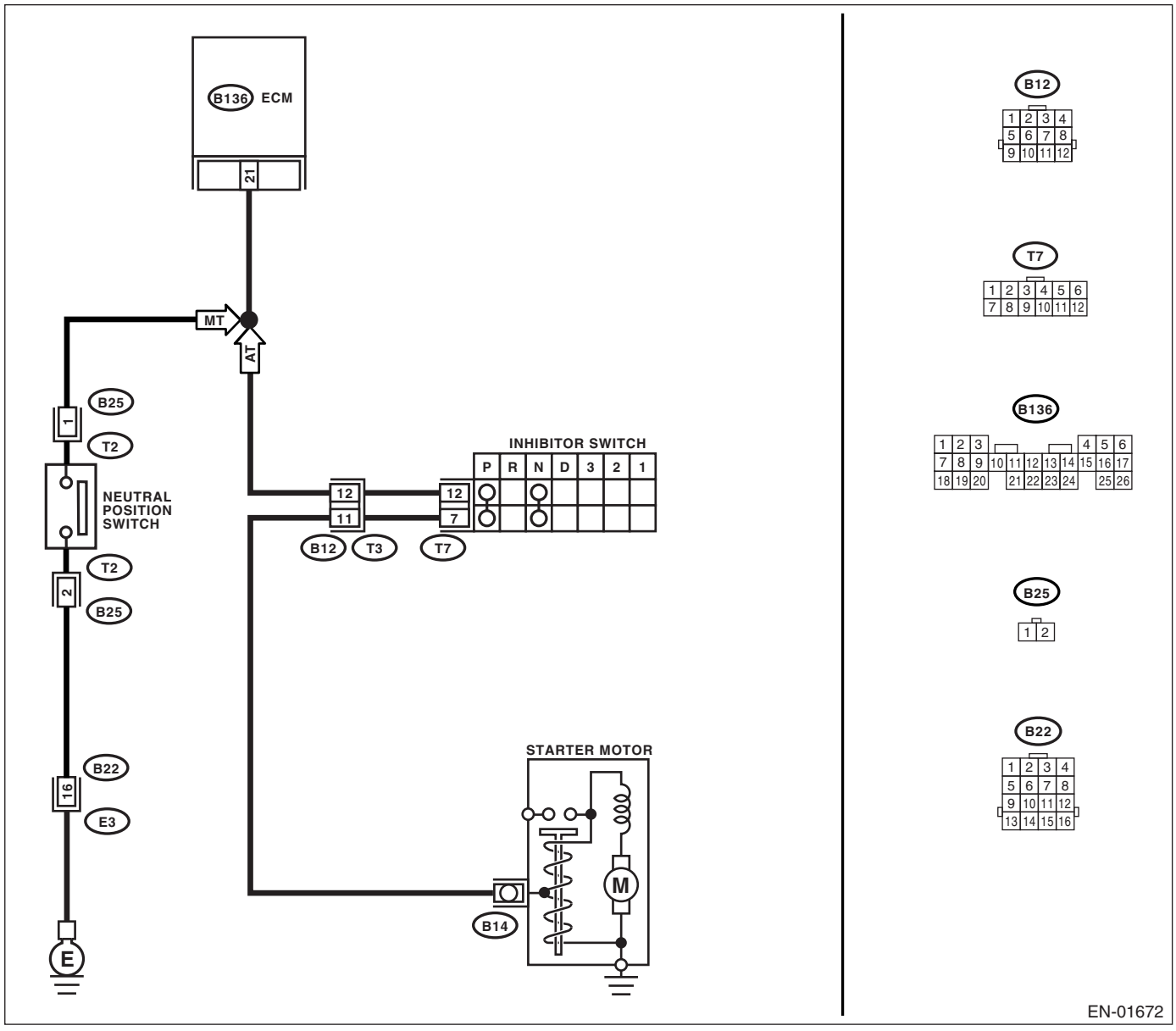
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground in select lever "N" and "P" ranges. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **3.**	Go to step **5.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground in select lever except for "N" and "P" ranges. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (−):***	Is the voltage 4.5 — 5.5 V?	Go to step **4.**	Go to step **5.**
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and inhibitor switch connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and inhibitor switch. 3) Measure the resistance of harness between ECM and inhibitor switch connector. ***Connector & terminal*** ***(B136) No. 21 — (T7) No. 12:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and inhibitor switch connector • Poor contact in coupling connector • Poor contact in inhibitor switch connector • Poor contact in ECM connector

	Step	Check	Yes	No
7	**CHECK INHIBITOR SWITCH GROUND LINE.** Measure the resistance of harness between inhibitor switch connector and engine ground. ***Connector & terminal*** ***(T7) No. 12 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **8.**	Repair open circuit in harness between inhibitor switch connector and starter motor ground line. NOTE: In this case, repair the following: • Open circuit in harness between inhibitor switch connector and starter motor ground line • Poor contact in starter motor connector • Poor contact in starter motor ground • Starter motor
8	**CHECK INHIBITOR SWITCH.** Measure the resistance between inhibitor switch connector receptacle's terminals in select lever "N" and "P" ranges. ***Terminals*** ***No. 7 — No. 12:***	Is the resistance less than 1 Ω?	Go to step **9.**	Replace the inhibitor switch. <Ref. to 4AT-46, Inhibitor Switch.>
9	**CHECK SELECTOR CABLE CONNECTION.**	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-26, INSPECTION, Select Cable.>	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

CO:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-188, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

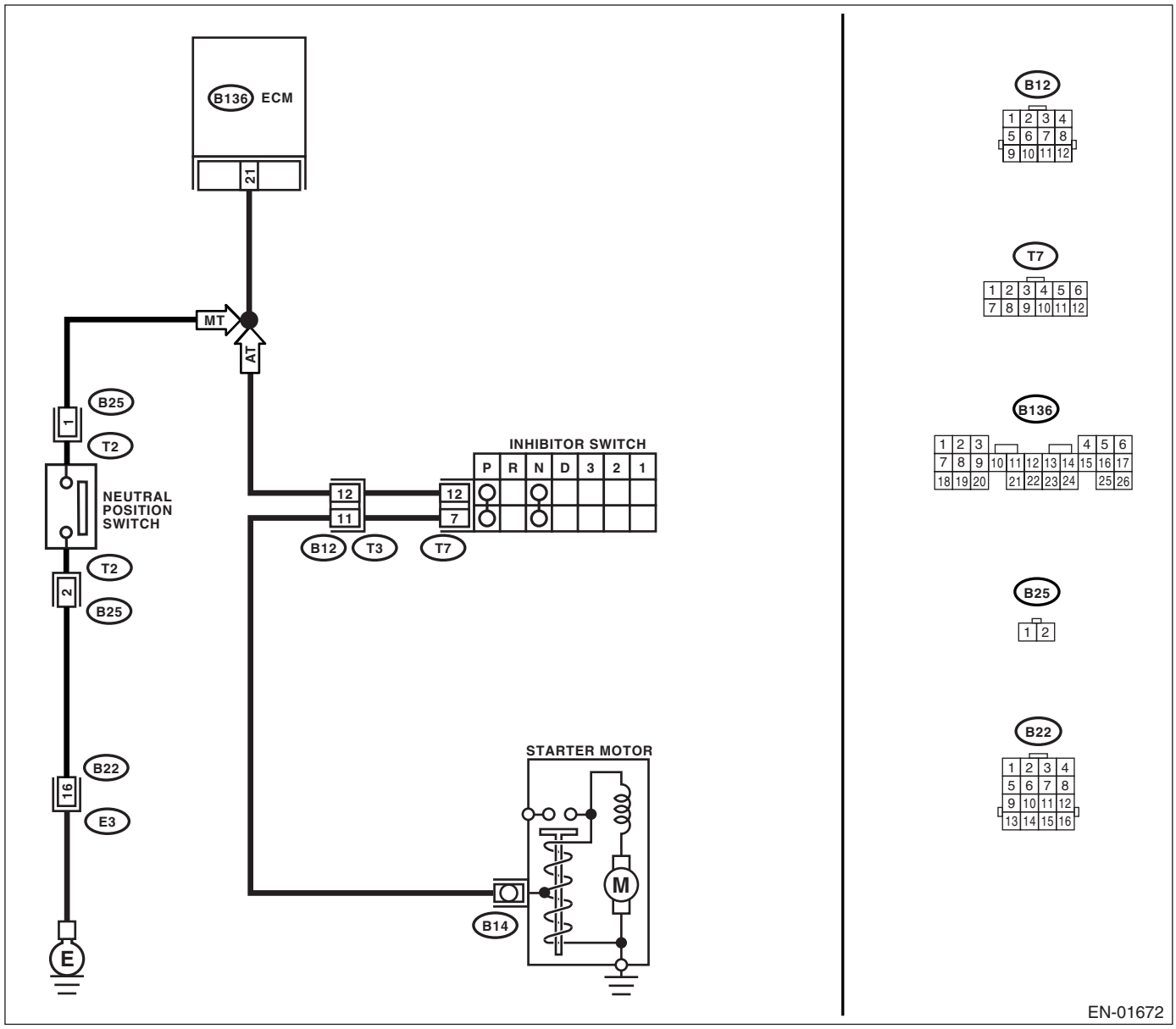
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Place the shift lever in neutral. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (−):***	Is the voltage more than 5 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Place the shift lever in a position except for neutral. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **3.**	Go to step **5.**
3	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK NEUTRAL SWITCH.** 1) Place the shift lever in a position except for neutral. 2) Measure the resistance between transmission harness connector terminals. ***Connector & terminal*** ***(T2) No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair open circuit in transmission harness or replace neutral switch.
5	**CHECK HARNESS BETWEEN ECM AND NEUTRAL SWITCH CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and transmission harness connector. ***Connector & terminal*** ***(B136) No. 21 — (B25) No. 1:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair open circuit in harness between ECM and transmission harness connector.
6	**CHECK HARNESS BETWEEN ECM AND NEUTRAL SWITCH CONNECTOR.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(B25) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between transmission harness connector and engine ground. • Poor contact in coupling connector

	Step	Check	Yes	No
7	**CHECK FOR POOR CONTACT.** Check for poor contact in transmission harness connector.	Is there a poor contact in the transmission harness connector?	Repair poor contact in transmission harness connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

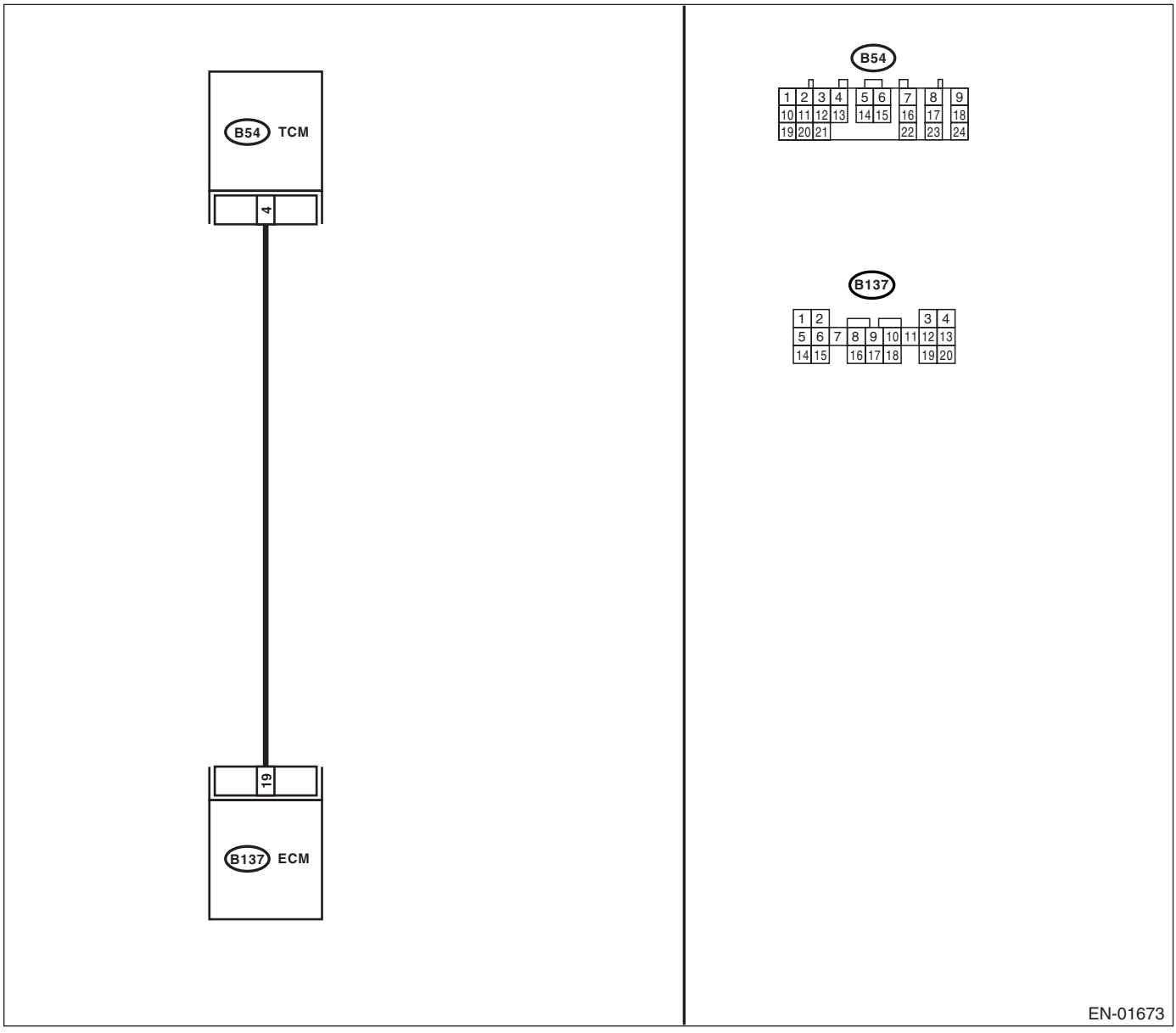
CP:DTC P0864 TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-190, DTC P0864 TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DRIVING CONDITION.** 1) Start and warm-up the engine until the radiator fan makes one complete rotation. 2) Drive the vehicle.	Is the AT shift control functioning properly?	Go to step **2.**	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>
2	**CHECK ACCESSORY.**	Are car phone and/or CB installed on vehicle?	Repair grounding line of car phone or CB system.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

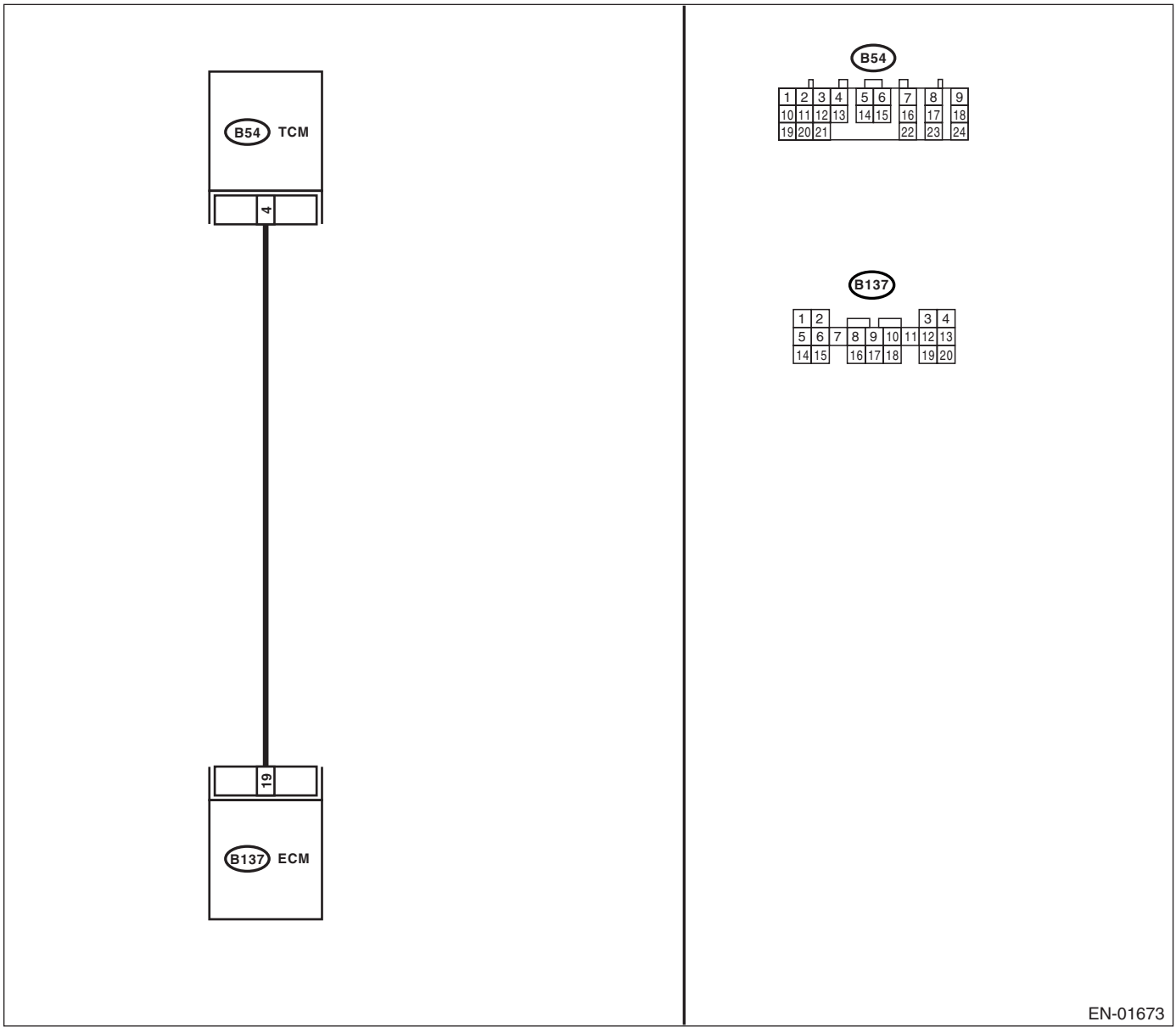
CQ:DTC P0865 TCM COMMUNICATION CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-191, DTC P0865 TCM COMMUNICATION CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. NOTE: In this case, repair the following: • Poor contact in ECM connector • Poor contact in TCM connector
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and TCM. 3) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 19 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in harness between ECM and TCM connector.
3	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 5 V?	Go to step **4.**	Repair poor contact in ECM connector.
4	**CHECK DTC FOR AUTOMATIC TRANSMISSION.** Read the DTC for automatic transmission. <Ref. to 4AT(diag)-24, Read Diagnostic Trouble Code (DTC).>	Does the DTC appear for automatic transmission?	Check DTC for automatic transmission. <Ref. to 4AT(diag)-39, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

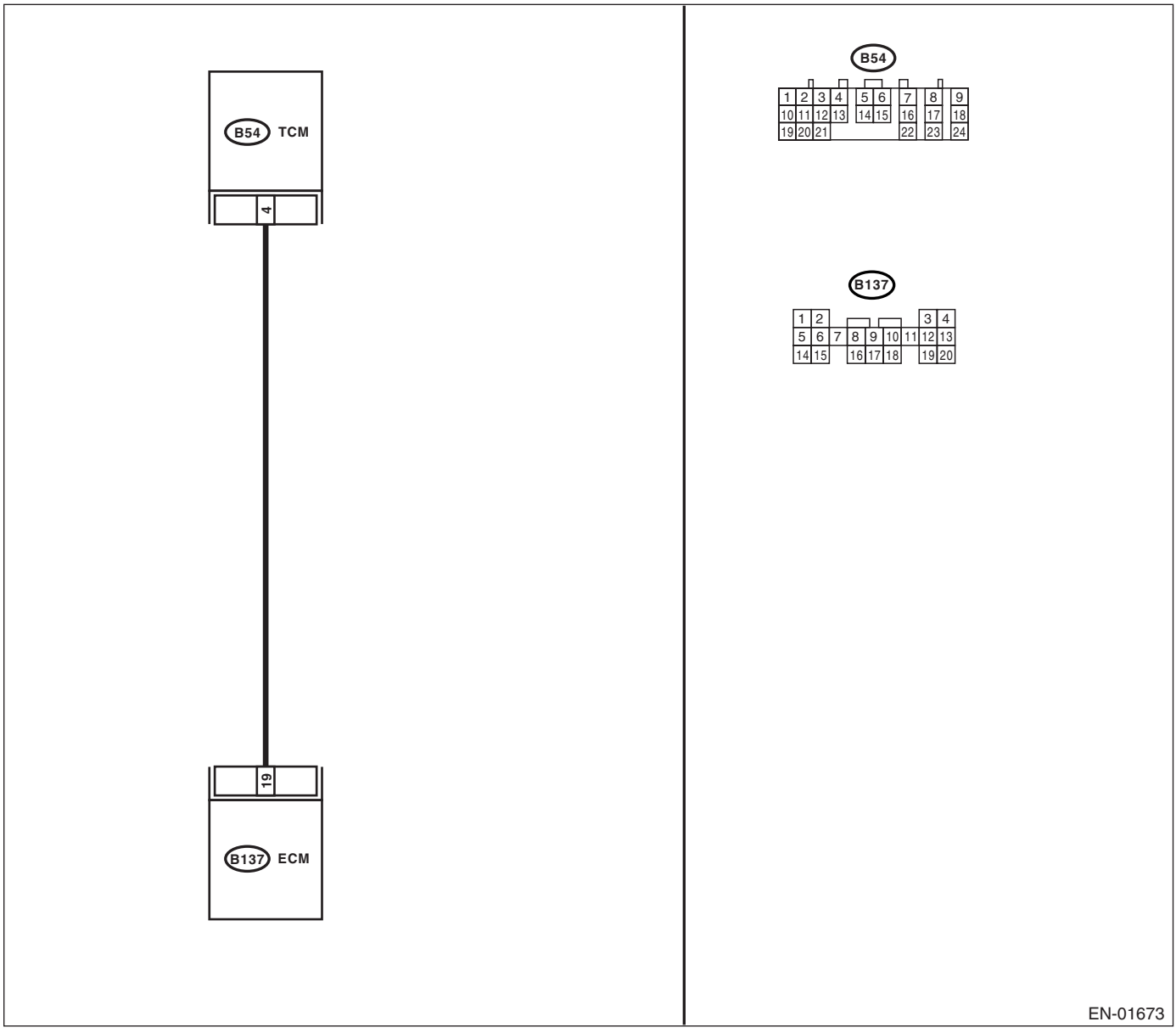
CR:DTC P0866 TCM COMMUNICATION CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-192, DTC P0866 TCM COMMUNICATION CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and TCM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 4 V?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Repair poor contact in ECM connector.	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (−):***	Is the voltage 1 — 4 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. NOTE: In this case, repair the following: • Poor contact in ECM connector • Poor contact in TCM connector	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 4 (+) — Chassis ground (−):***	Is the voltage more than 4 V?	Go to step **6.**	Repair open circuit in harness between ECM and TCM connector.
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Check TCM power supply line and grounding line.

CS:DTC P1110 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-193, DTC P1110 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

Step	Check	Yes	No
1 **CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: It is not necessary to inspect DTC P1110.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

CT:DTC P1111 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-194, DTC P1111 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

Step	Check	Yes	No
1 **CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: It is not necessary to inspect DTC P1111.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

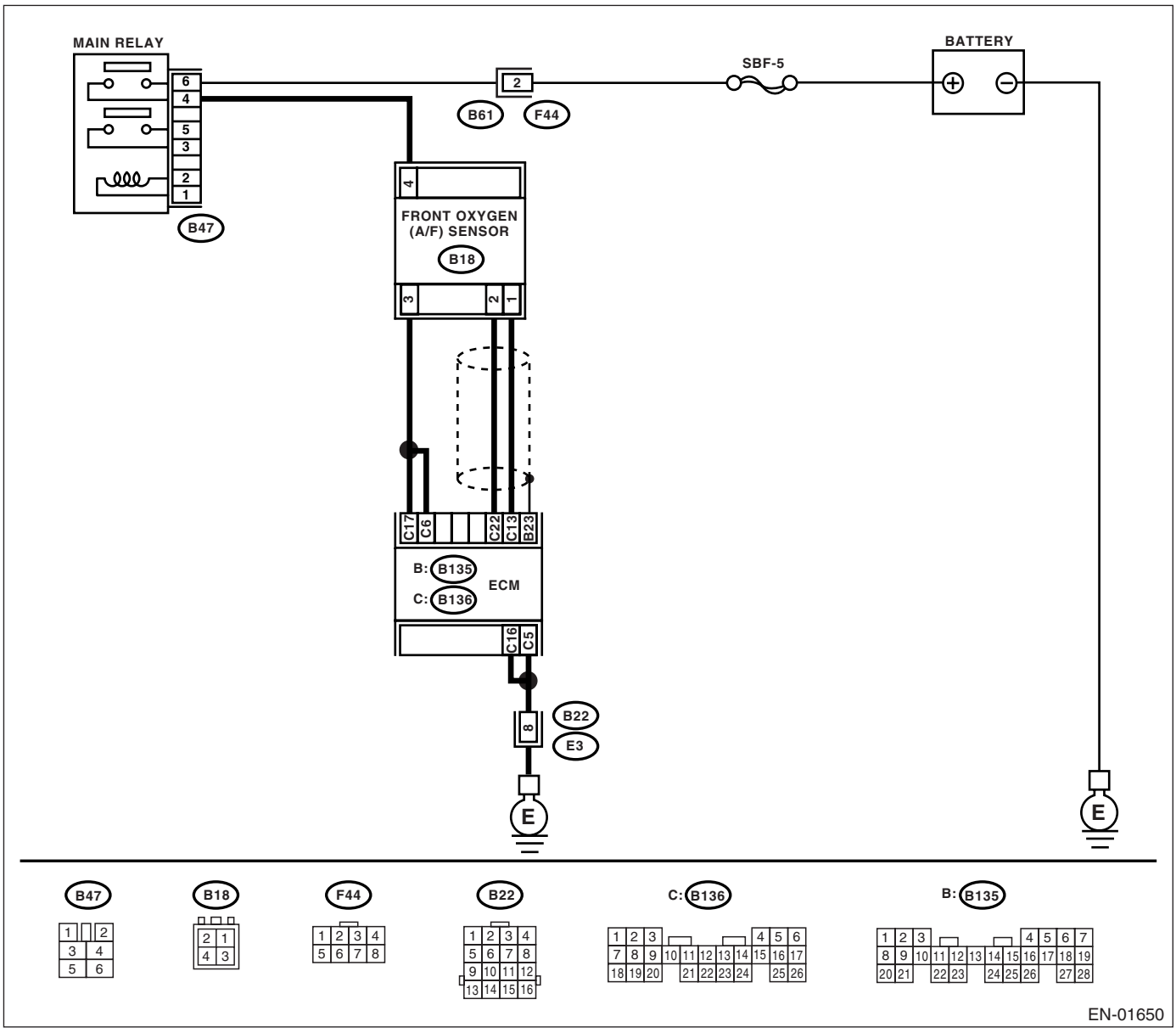
CU:DTC P1134 A/F SENSOR MICRO-COMPUTER PROBLEM

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-195, DTC P1134 A/F SENSOR MICRO-COMPUTER PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: It is not necessary to inspect DTC P1134.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

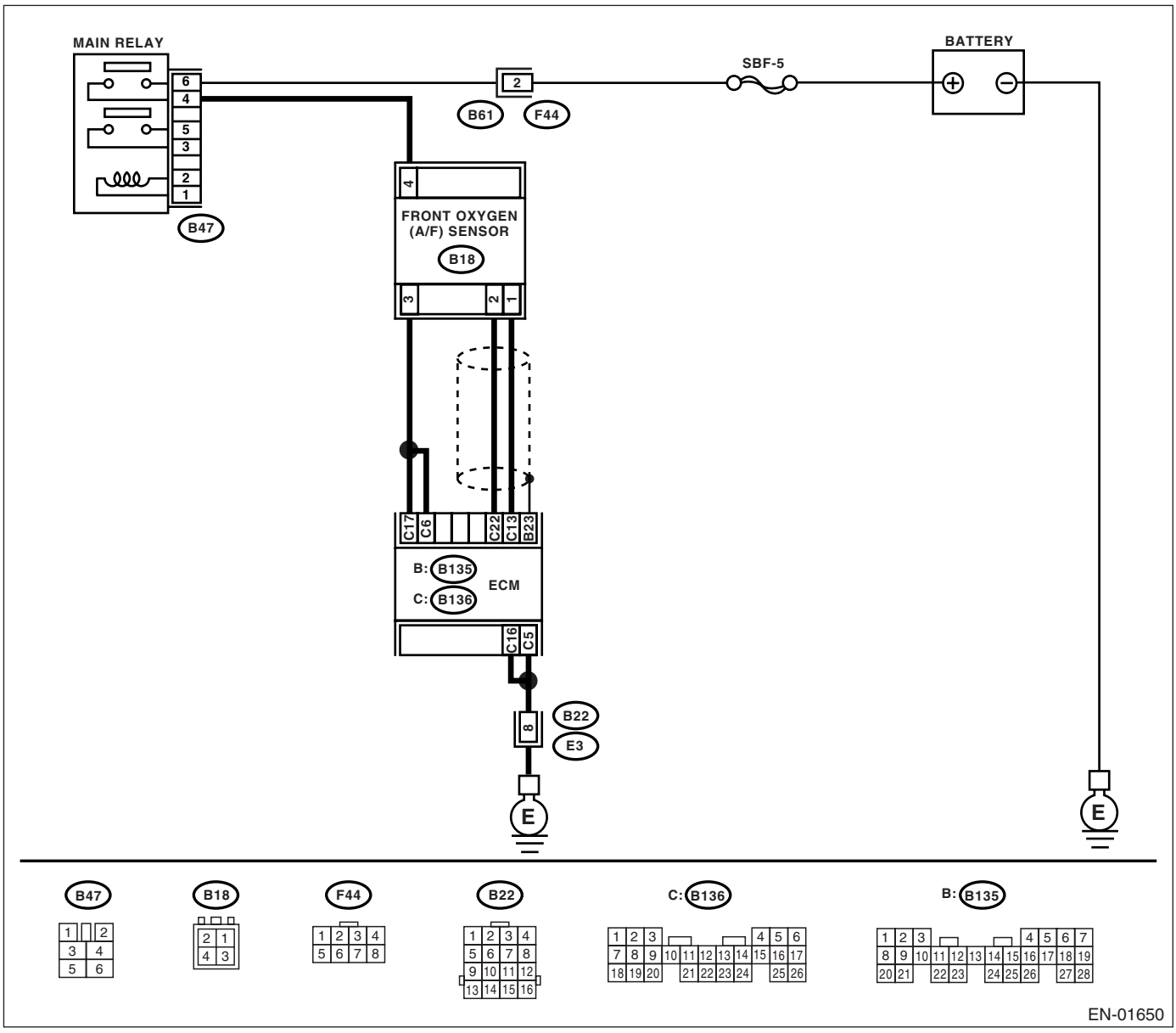
CV:DTC P1137 O_2 SENSOR CIRCUIT (LAMDA=1) (BANK1 SENSOR1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-197, DTC P1137 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR DATA.** 1) Start the engine. 2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 70°C (160°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read the data of front oxygen (A/F) sensor signal during idling using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage 0.85 — 1.15 V?	Go to step **3.**	Go to step **4.**
3	**CHECK FRONT OXYGEN (A/F) SENSOR DATA.** Race the engine at speeds from idling to 5,000 rpm for a total of 5 cycles. NOTE: • Air fuel ratio is rich at normal condition or during racing. • To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed.	Is the voltage more than 1.1 V?	Go to step **6.**	Go to step **4.**
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance between ECM and front oxygen (A/F) sensor. ***Connector & terminals*** ***(B136) No. 13 — (B18) No. 1:*** ***(B136) No. 22 — (B18) No. 2:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair open circuit between ECM and front oxygen (A/F) sensor.
5	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminals*** ***(B136) No. 13 — Chassis ground:*** ***(B136) No. 22 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair ground short circuit between ECM and front oxygen (A/F) sensor.

Step		Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness of front oxygen (A/F) sensor • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace faulty parts.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-40, Front Oxygen (A/F) Sensor.>

CW:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

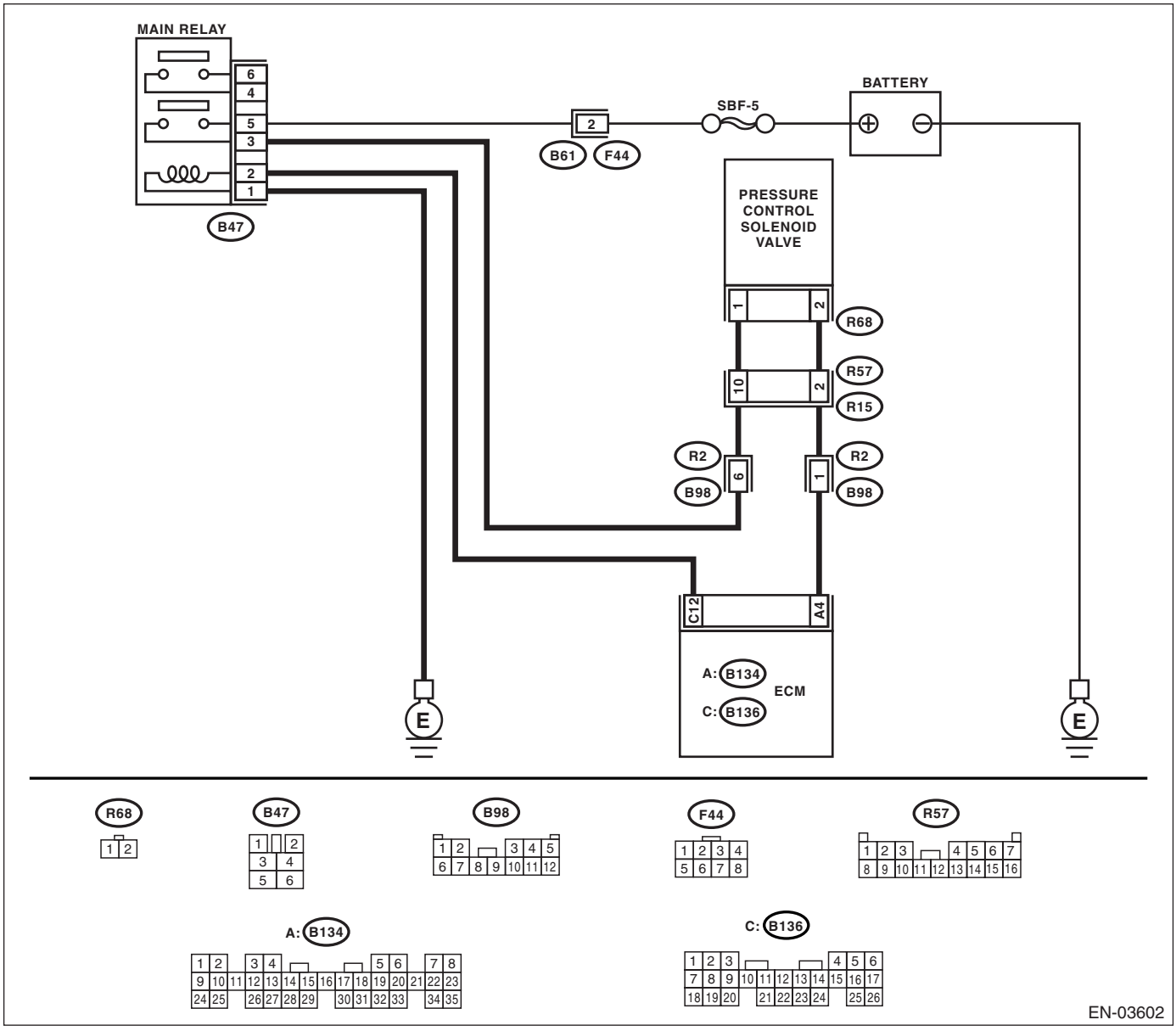
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-199, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 4 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
3	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connectors from pressure control solenoid valve and ECM. 3) Measure the resistance of harness between pressure control solenoid valve connector and chassis ground. ***Connector & terminal*** ***(R68) No. 2 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair short circuit to ground in harness between ECM and pressure control solenoid valve connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and pressure control solenoid valve connector. ***Connector & terminal*** ***(B134) No. 4 — (R68) No. 2:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and pressure control solenoid valve connector • Poor contact in coupling connector
5	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Measure the resistance between pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Go to step **6.**	Replace the pressure control solenoid valve. <Ref. to EC(H4SO)-12, Pressure Control Solenoid Valve.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO PRESSURE CONTROL SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure the voltage between pressure control solenoid valve and chassis ground. ***Connector & terminal*** ***(R68) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and pressure control solenoid valve connector • Poor contact in coupling connector • Poor contact in main relay connector
7	**CHECK FOR POOR CONTACT.** Check for poor contact in pressure control solenoid valve connector.	Is there poor contact in pressure control solenoid valve connector?	Repair poor contact in pressure control solenoid valve connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

CX:DTC P1420 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT HIGH

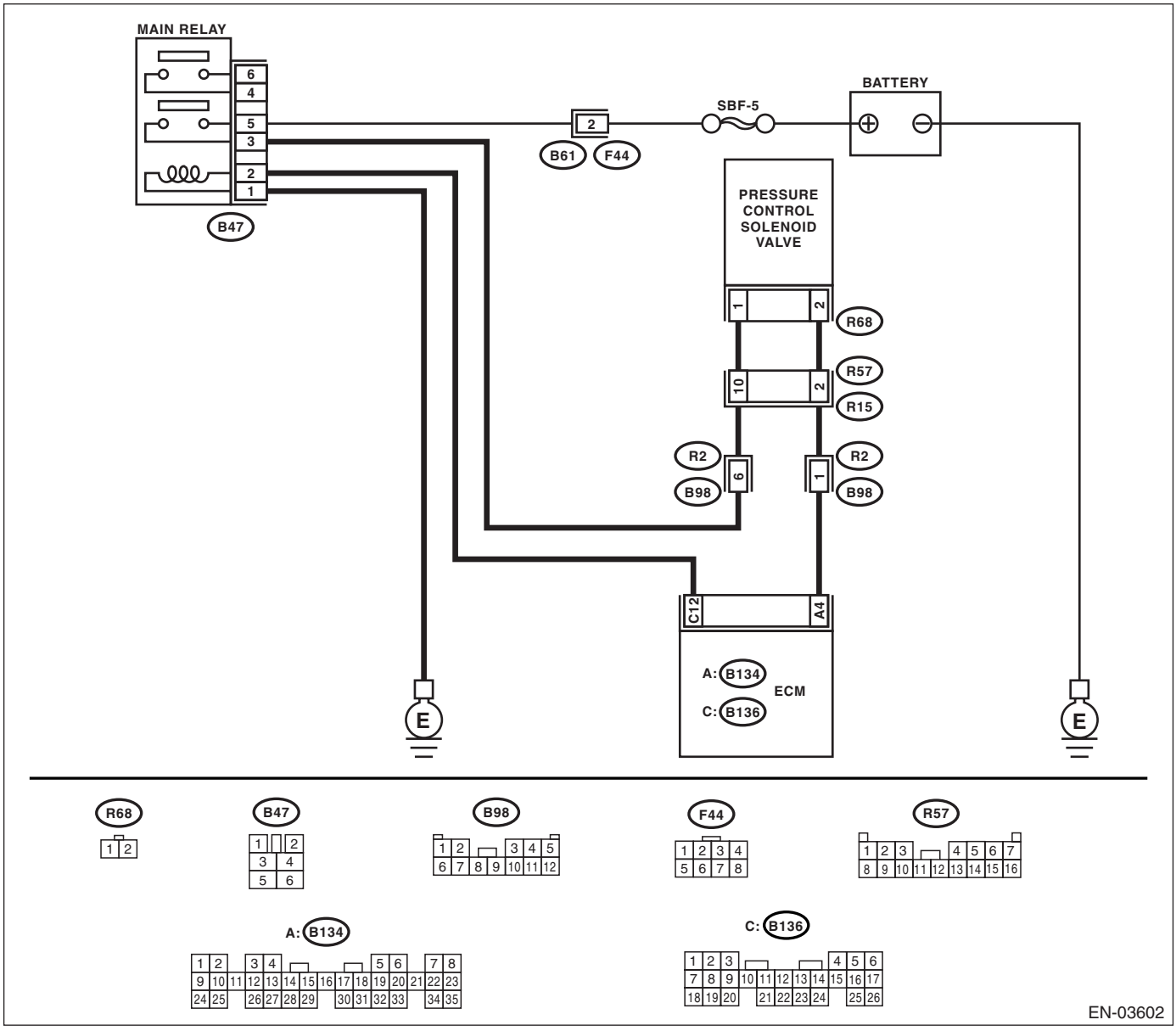
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-201, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) While operating the pressure control solenoid valve, measure voltage between ECM and chassis ground. NOTE: Pressure control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 4 (+) — Chassis ground (–):***	Is the voltage 0 — 10 V?	Go to step **2.**	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. In this case, repair poor contact in ECM connector.
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from pressure control solenoid valve. 3) Turn ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and pressure control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK PRESSURE CONTROL SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Measure the resistance between pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the pressure control solenoid valve <Ref. to EC(H4SO)-12, Pressure Control Solenoid Valve.> and the ECM <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>.	Go to step **6.**
6	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

CY:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-202, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

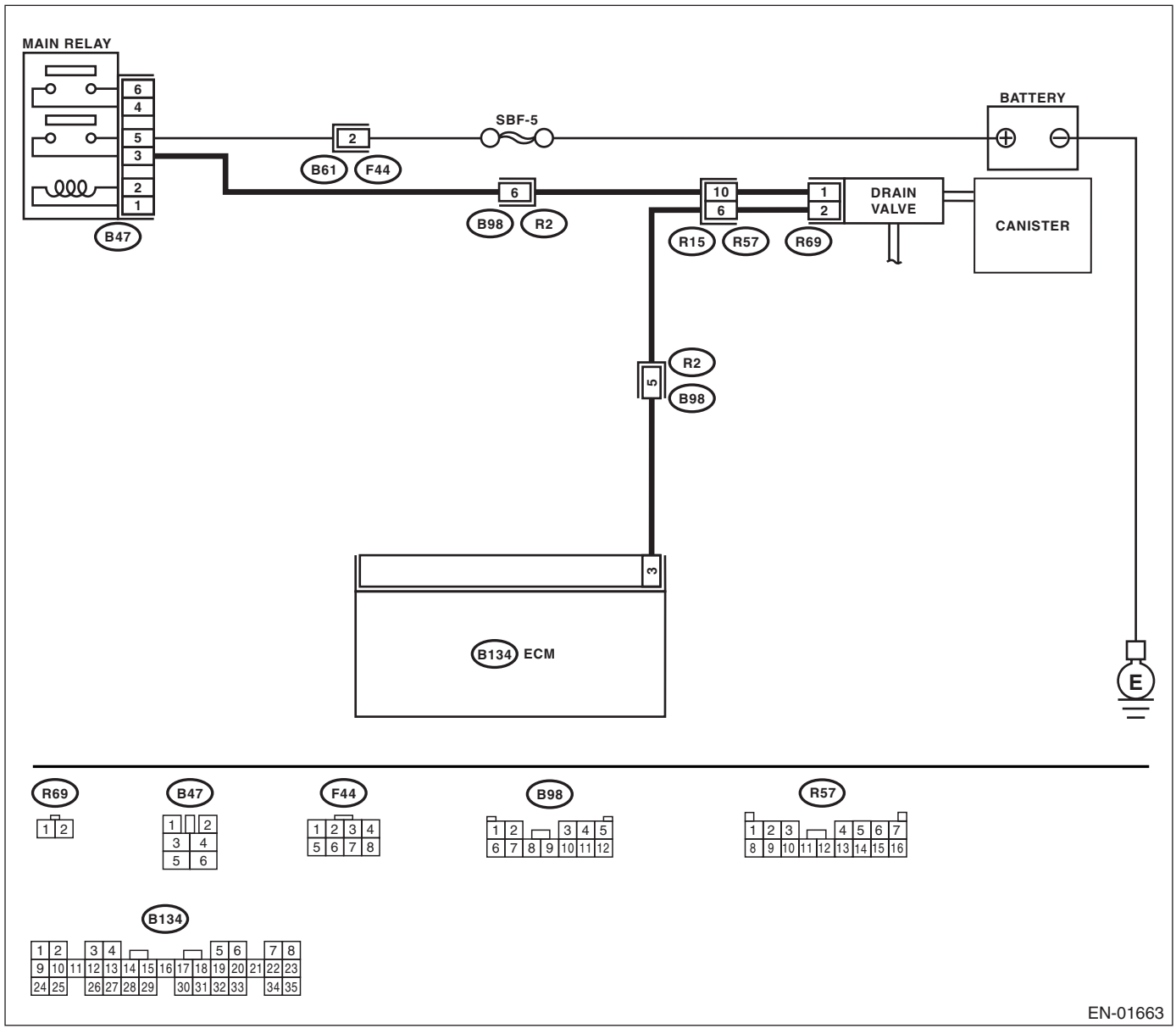
TROUBLE SYMPTOM:

Improper fuel supply

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK VENT LINE HOSES.** Check the following items. • Clogging of vent hoses between canister and drain valve • Clogging of vent hose between drain valve and air filter • Clogging of drain filter	Is there a fault in vent line?	Repair or replace faulty parts.	Go to step **3.**
3	**CHECK DRAIN VALVE OPERATION.** 1) Turn ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Replace the drain valve. <Ref. to EC(H4SO)-18, Drain Valve.>

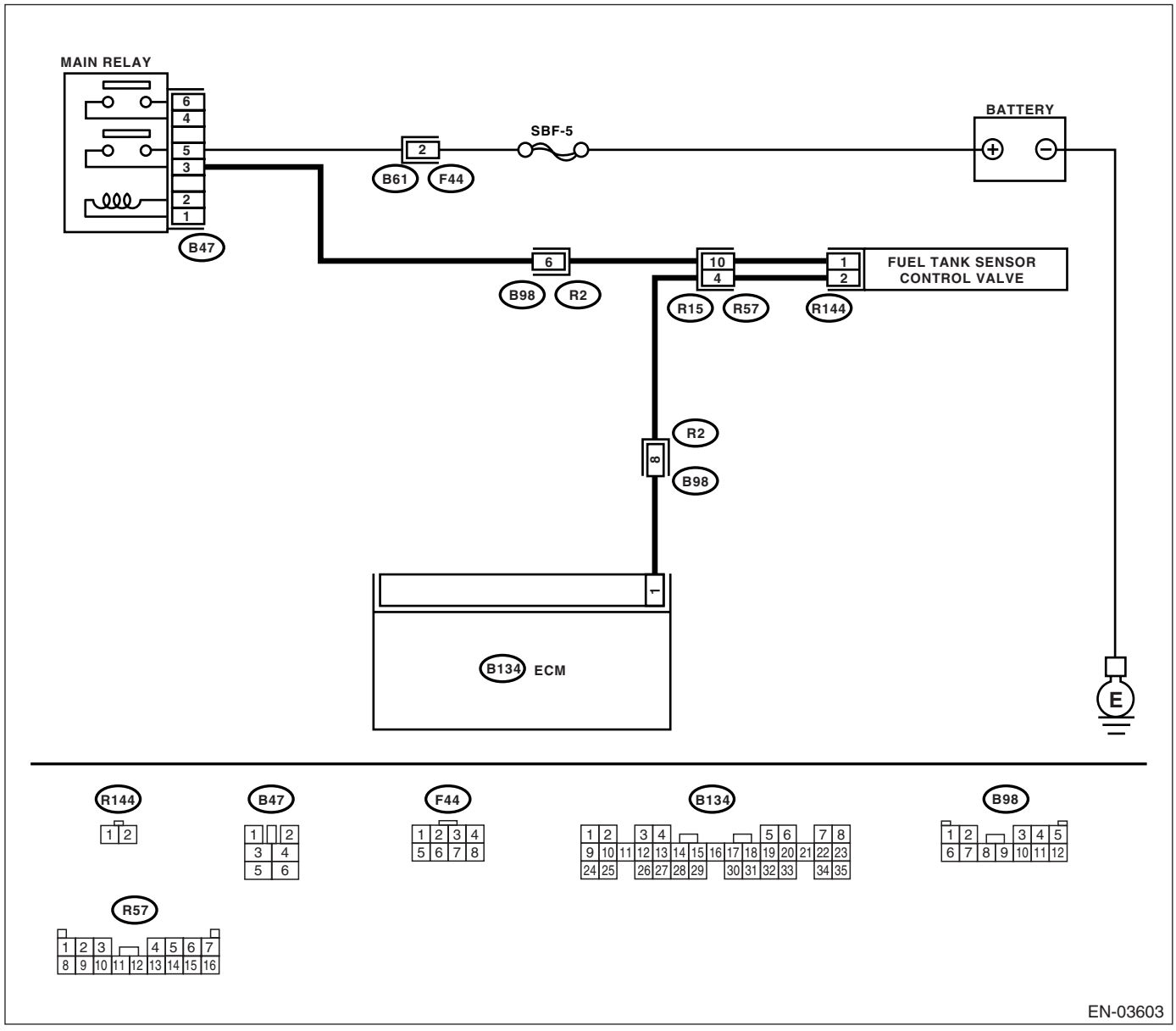
CZ:DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-203, DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in fuel tank sensor control valve connector • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connectors from fuel tank sensor control valve and ECM. 3) Measure the resistance of harness between fuel tank sensor control valve connector and chassis ground. ***Connector & terminal*** ***(R144) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair short circuit to ground in harness between ECM and fuel tank sensor control valve connector.
4	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and fuel tank sensor control valve connector. ***Connector & terminal*** ***(B134) No. 1 — (R144) No. 2:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel tank sensor control valve connector • Poor contact in coupling connector
5	**CHECK FUEL TANK SENSOR CONTROL VALVE.** Measure the resistance between fuel tank sensor control valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Go to step **6.**	Replace the fuel tank sensor control valve. <Ref. to EC(H4SO)-18, Drain Valve.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO FUEL TANK SENSOR CONTROL VALVE.** 1) Turn ignition switch to ON. 2) Measure the voltage between fuel tank sensor control valve and chassis ground. ***Connector & terminal*** ***(R144) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel tank sensor control valve • Poor contact in coupling connector • Poor contact in main relay connector
7	**CHECK FOR POOR CONTACT.** Check for poor contact in fuel tank sensor control valve connector.	Is there poor contact in fuel tank sensor control valve connector?	Repair poor contact in fuel tank sensor control valve connector.	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

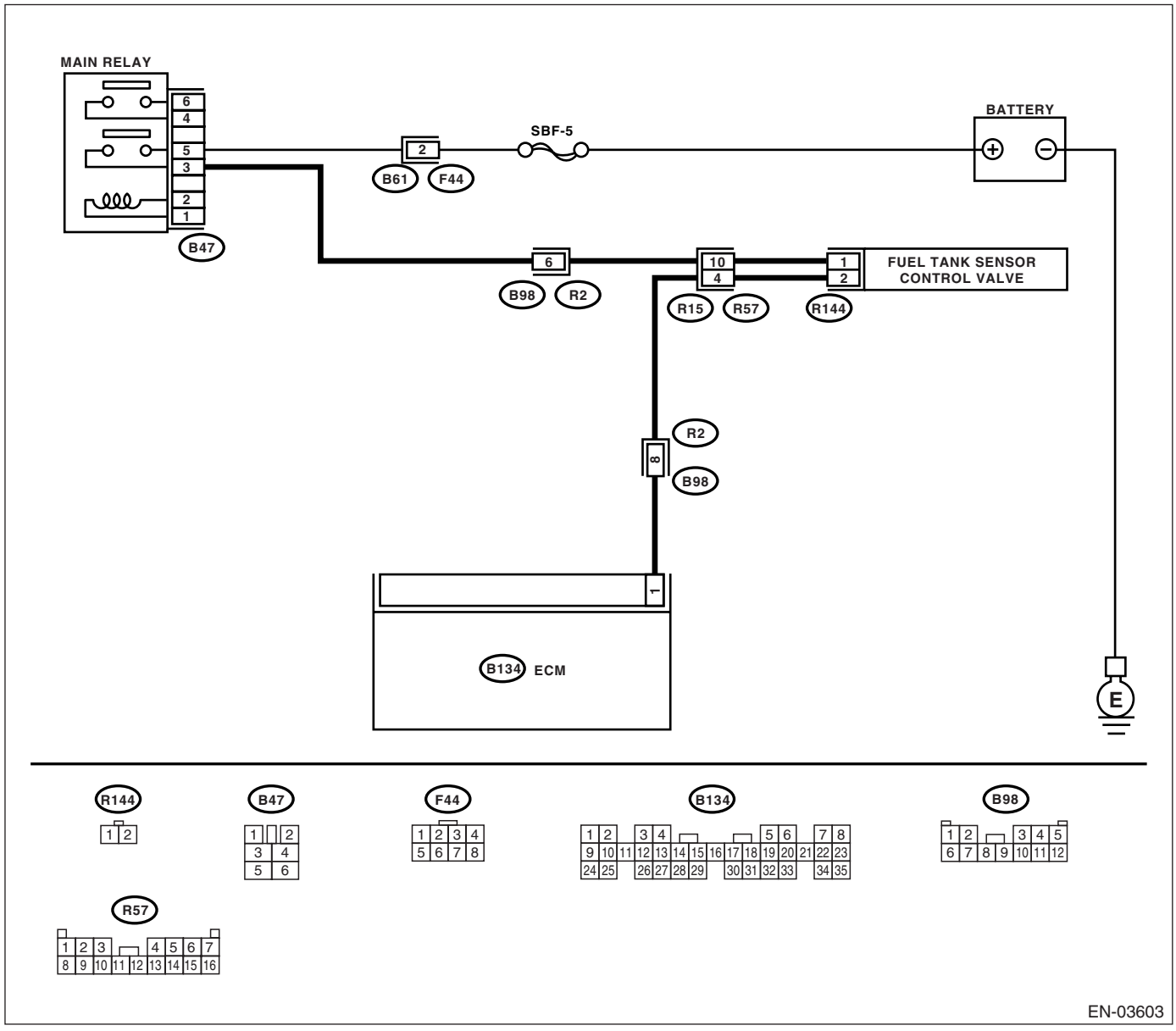
DA:DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-205, DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Go to step **2.**
2	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>
3	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from fuel tank sensor control valve. 3) Turn ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and fuel tank sensor control valve connector. After repair, replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Go to step **4.**
4	**CHECK FUEL TANK SENSOR CONTROL VALVE.** 1) Turn ignition switch to OFF. 2) Measure the resistance between fuel tank sensor control valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the fuel tank sensor control valve <Ref. to EC(H4SO)-18, Drain Valve.> and the ECM <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>.	Go to step **5.**
5	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

DB:DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE PROBLEM

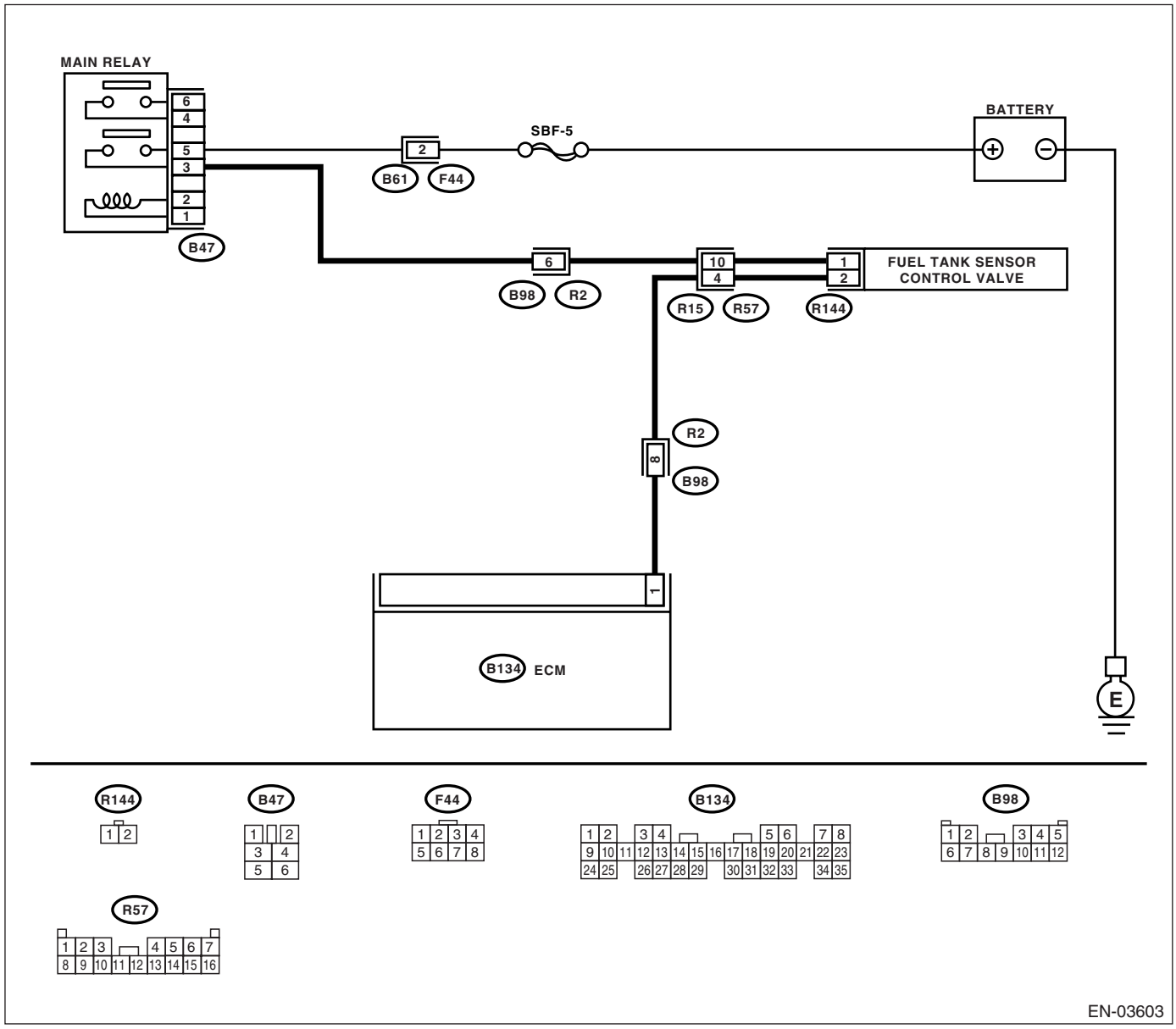
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-207, DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using the “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK EVAPORATIVE EMISSION LINE.** NOTE: Check the following items. • Disconnection, leakage and clogging of hoses between fuel tank pressure sensor and fuel tank. • Disconnection, leakage and clogging of hoses and pipes between fuel filler pipe and fuel tank.	Is there any trouble in evaporation line?	Repair the hoses and pipes.	Replace the fuel tank pressure sensor.

DC:DTC P1510 ISC SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1516. <Ref. to EN(H4SO)(diag)-280, DTC P1516 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DD:DTC P1511 ISC SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1517. <Ref. to EN(H4SO)(diag)-282, DTC P1517 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DE:DTC P1512 ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1516. <Ref. to EN(H4SO)(diag)-280, DTC P1516 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DF:DTC P1513 ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1517. <Ref. to EN(H4SO)(diag)-282, DTC P1517 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DG:DTC P1514 ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1516. <Ref. to EN(H4SO)(diag)-280, DTC P1516 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DH:DTC P1515 ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1517. <Ref. to EN(H4SO)(diag)-282, DTC P1517 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DI: DTC P1516 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-222, DTC P1516 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

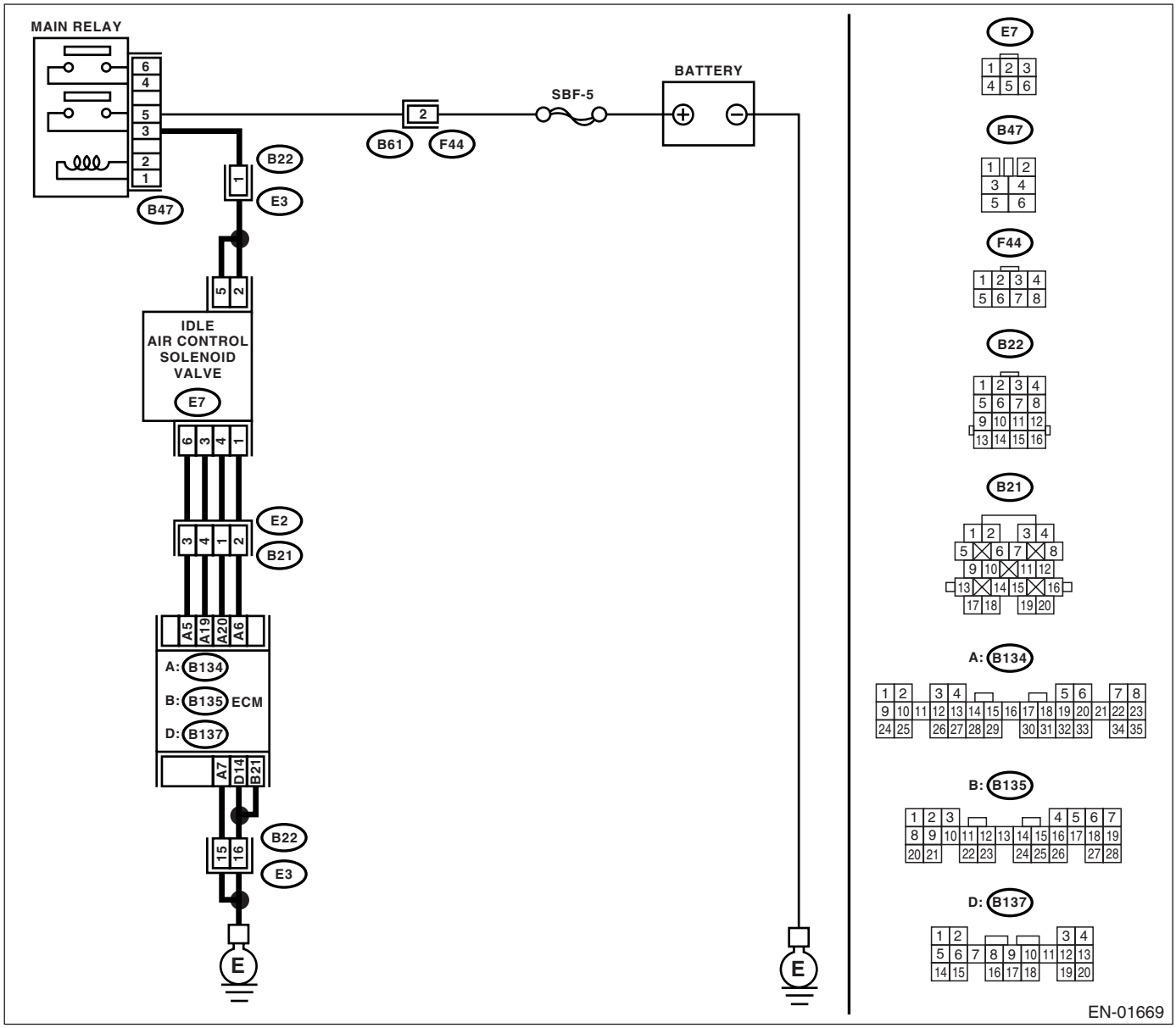
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Engine breathing

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from idle air control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between idle air control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E7) No. 2 (+) — Engine ground (−):*** ***(E7) No. 5 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between idle air control solenoid valve and main relay connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ECM and idle air control solenoid valve connector. ***Connector & terminal*** ***DTC P1510; (B134) No. 20 — (E7) No. 4:*** ***DTC P1512; (B134) No. 6 — (E7) No. 1:*** ***DTC P1514; (B134) No. 5 — (E7) No. 6:*** ***DTC P1516; (B134) No. 19 — (E7) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and idle air control solenoid valve connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***DTC P1510; (B134) No. 20 — Chassis ground:*** ***DTC P1512; (B134) No. 6 — Chassis ground:*** ***DTC P1514; (B134) No. 5 — Chassis ground:*** ***DTC P1516; (B134) No. 19 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between ECM and idle air control solenoid valve connector.
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector and idle air control solenoid valve connector.	Is there poor contact in ECM connector or idle air control solenoid valve connector?	Repair poor contact in ECM connector or idle air control solenoid valve connector.	Replace the idle air control solenoid valve. <Ref. to FU(H4SO)-32, Idle Air Control Solenoid Valve.>

DJ:DTC P1517 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-224, DTC P1517 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

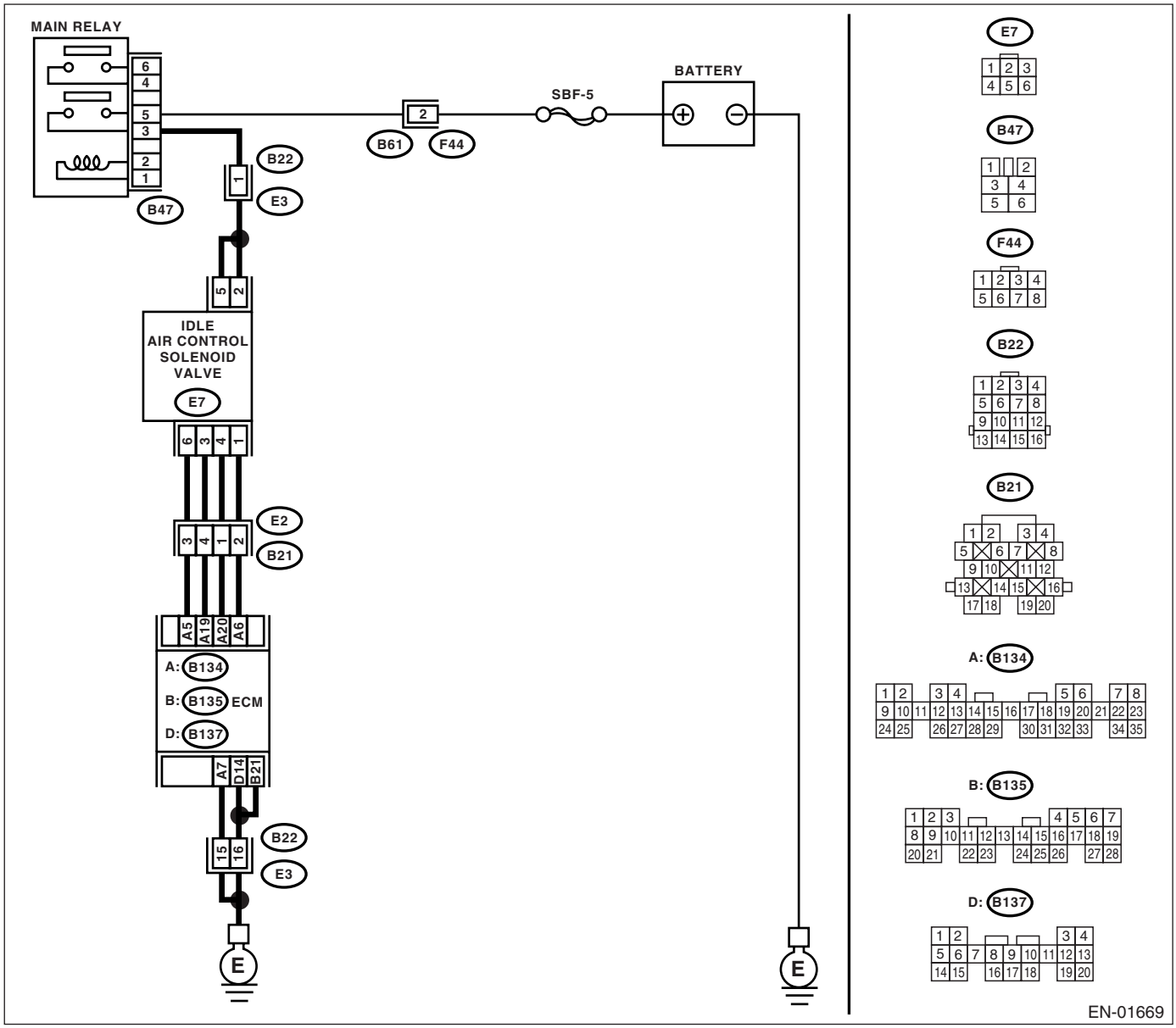
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Engine breathing

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check the DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 7 — Chassis ground:*** ***(B137) No. 14 — Chassis ground:*** ***(B135) No. 21 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM connector and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from idle air control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***DTC P1511; (B134) No. 20 (+) — Chassis ground (−):*** ***DTC P1513; (B134) No. 6 (+) — Chassis ground (−):*** ***DTC P1515; (B134) No. 5 (+) — Chassis ground (−):*** ***DTC P1517; (B134) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

DK:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-226, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

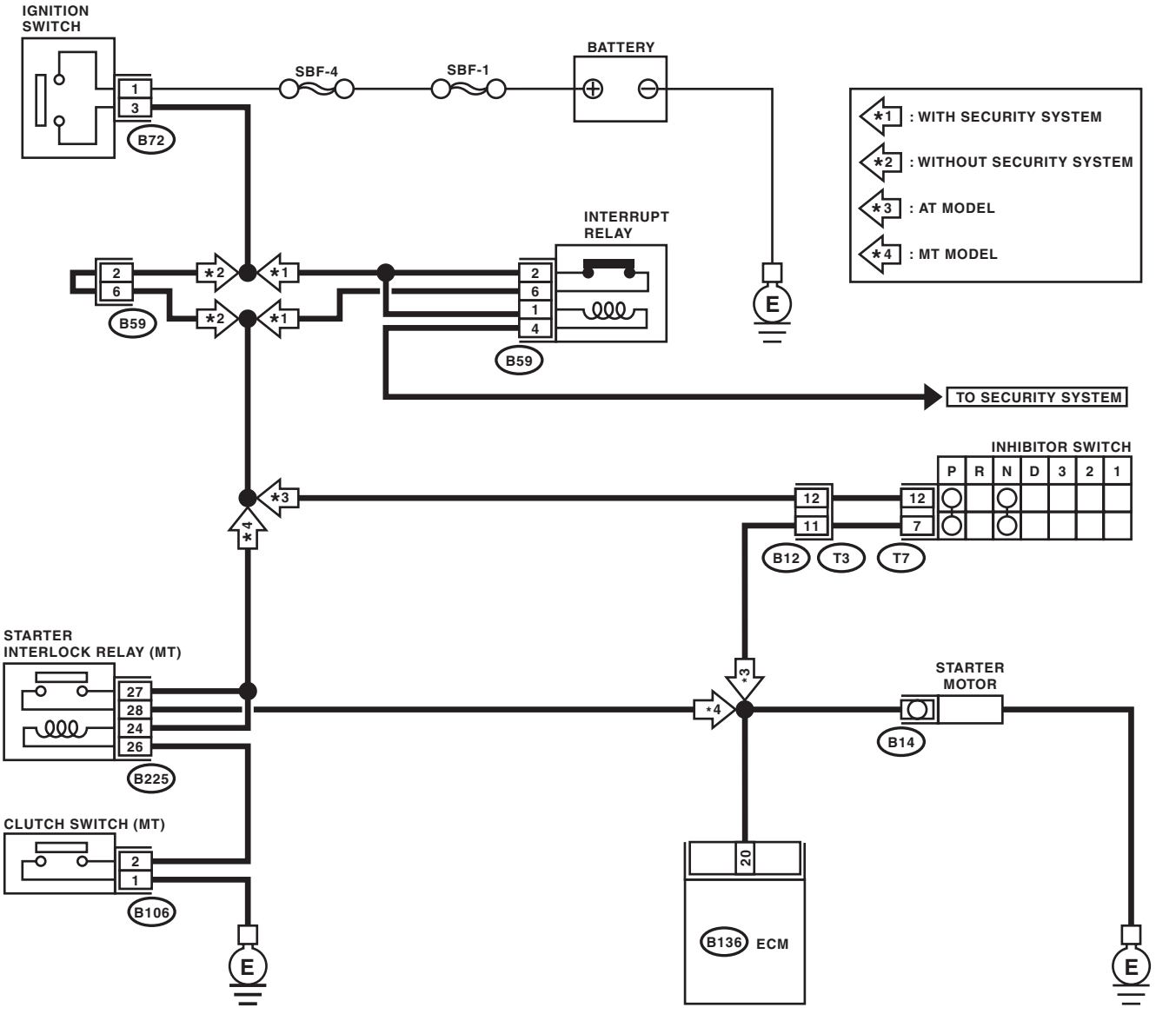
TROUBLE SYMPTOM:

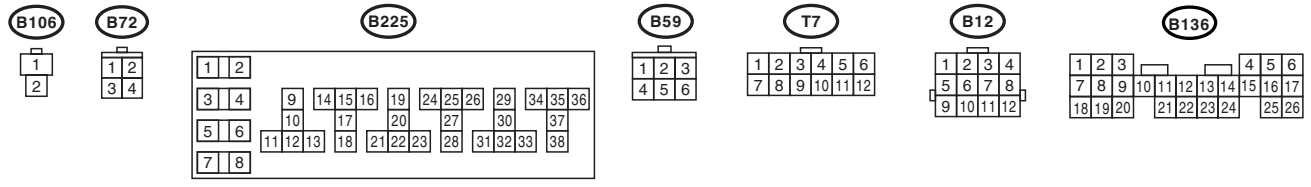
Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:





EN-01645

	Step	Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** Place the inhibitor switch in the “P” or “N” range. (AT model) Depress the clutch pedal. (MT model)	Does the starter motor operate when ignition switch is turned to “ST”?	Repair harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between ECM and starter motor connector. • Poor contact in ECM connector.	Check starter motor circuit. <Ref. to EN(H4SO)(diag)-57, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

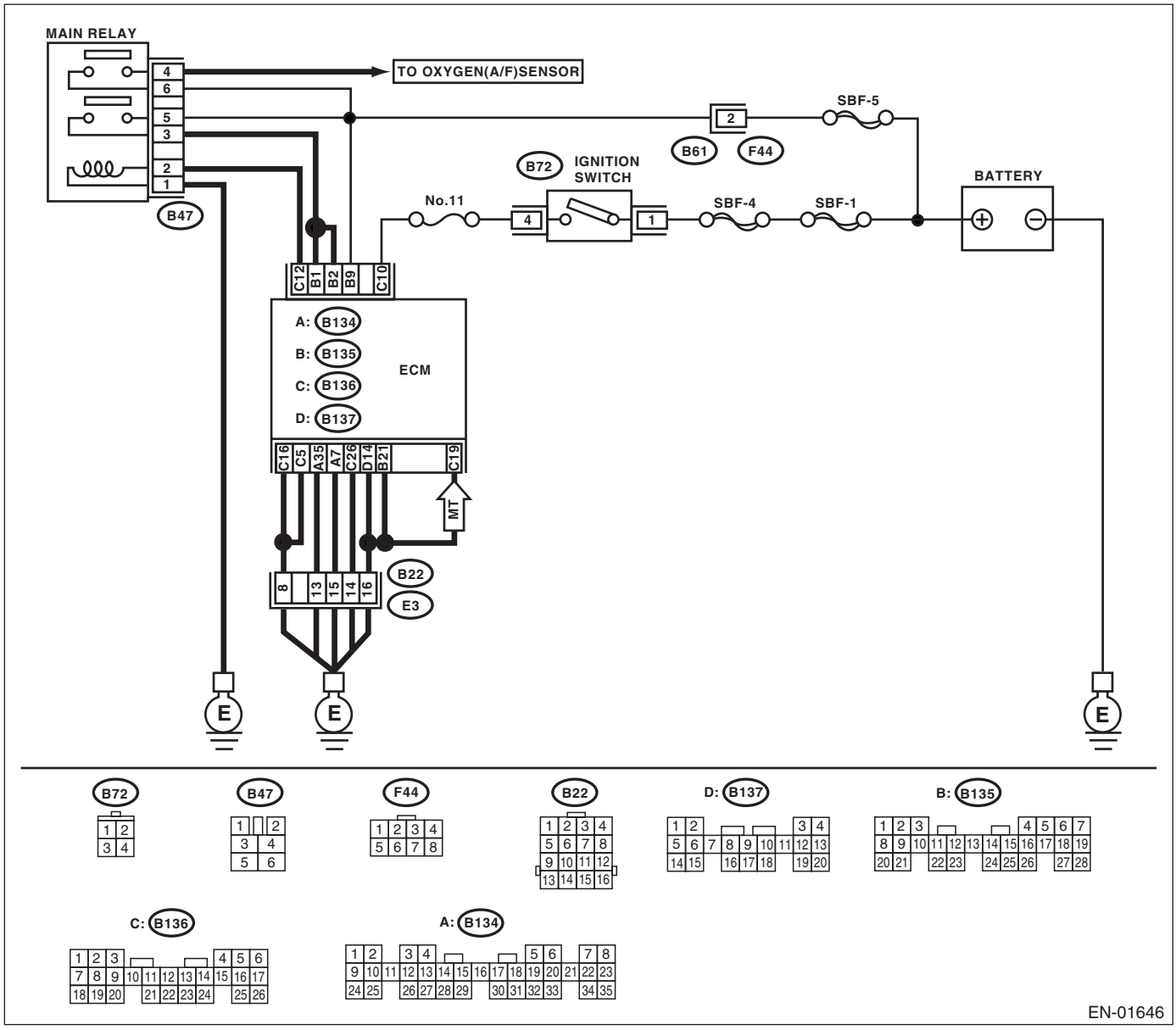
DL:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-227, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 9 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM connector and battery terminal.	Go to step **3.**
3	**CHECK FUSE SBF-5.**	Is the fuse blown out?	Replace the fuse.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and battery • Poor contact in ECM connector • Poor contact in battery terminal

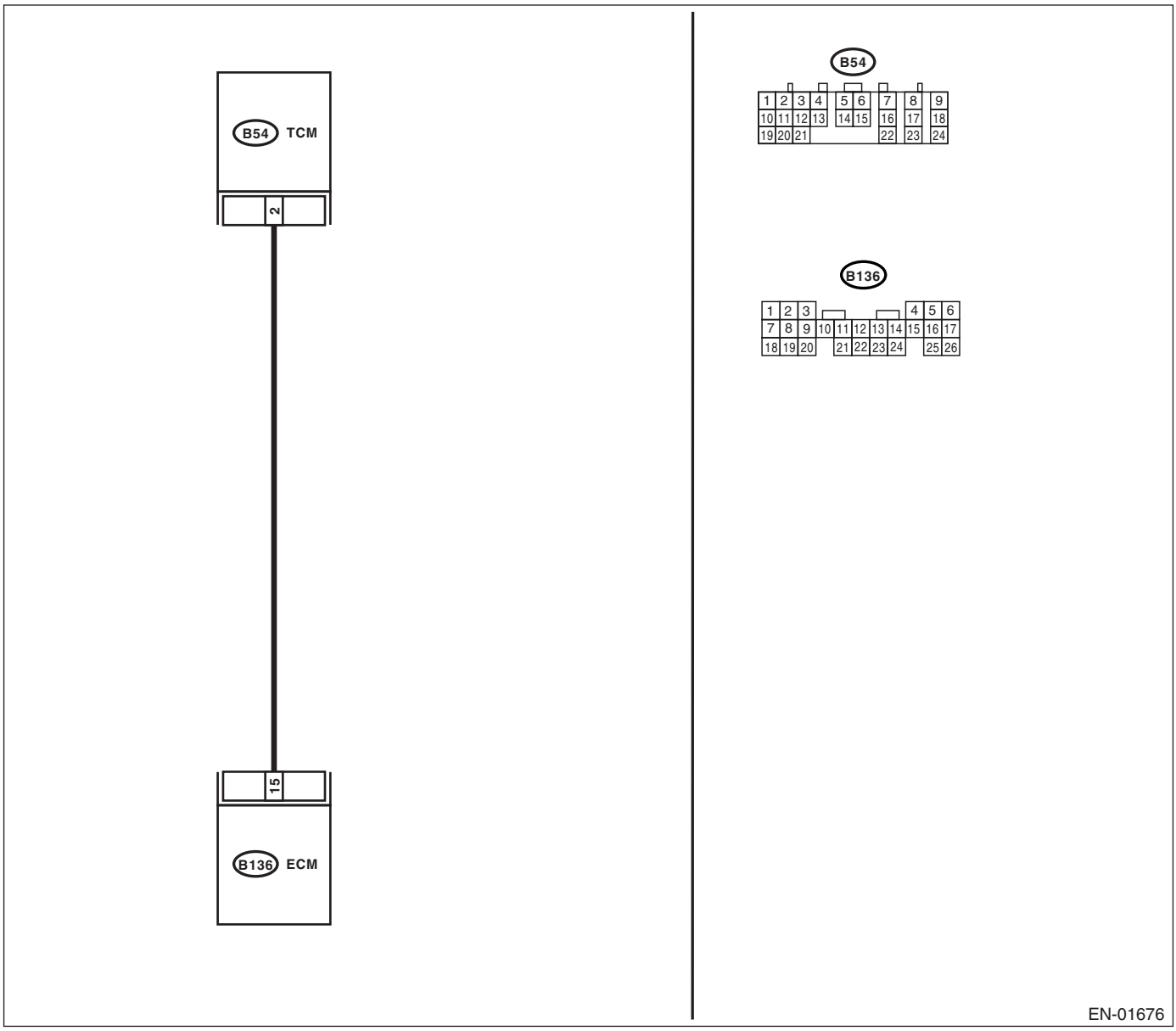
DM:DTC P1698 ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-228, DTC P1698 ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start the engine, and warm-up the engine. 2) Turn the ignition switch to OFF. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (−):***	Is the voltage more than 3 V?	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and TCM. 3) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 15 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in harness between ECM and TCM connector.
3	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***(B136) No. 15 — (B54) No. 2:***	Is the resistance less than 1 Ω?	Repair poor contact in ECM or TCM connector.	Repair open circuit in harness between ECM and TCM connector.

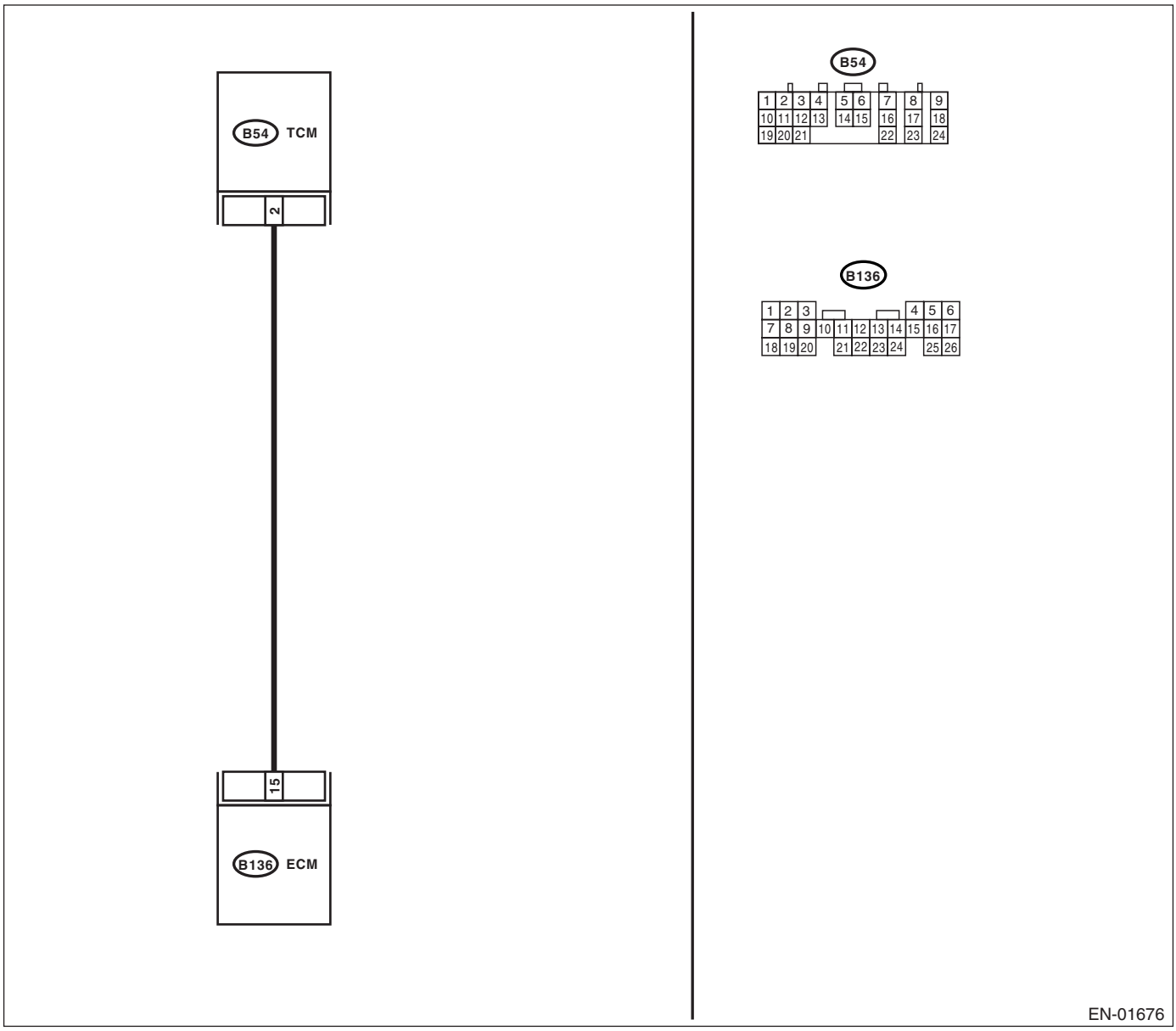
DN:DTC P1699 ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-229, DTC P1699 ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start the engine, and warm-up the engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connector from TCM. 4) Turn the ignition switch to ON. 5) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (−):***	Is the voltage less than 3 V?	Go to step **2.**	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (−):***	Is the voltage more than 10 V by shaking the harness and connector of ECM?	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

DO:DTC P1700 THROTTLE POSITION SENSOR CIRCUIT MALFUNCTION FOR AT

GENERAL DESCRIPTION <Ref. to GD(H4SO)-230, DTC P1700 THROTTLE POSITION SENSOR CIRCUIT MALFUNCTION FOR AT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
Refer to AT-section for diagnostic procedure. <Ref. to 4AT(diag)-46, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DP:DTC P1711 ENGINE TORQUE CONTROL SIGNAL 1 CIRCUIT MALFUNCTION

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-232, DTC P1711 ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

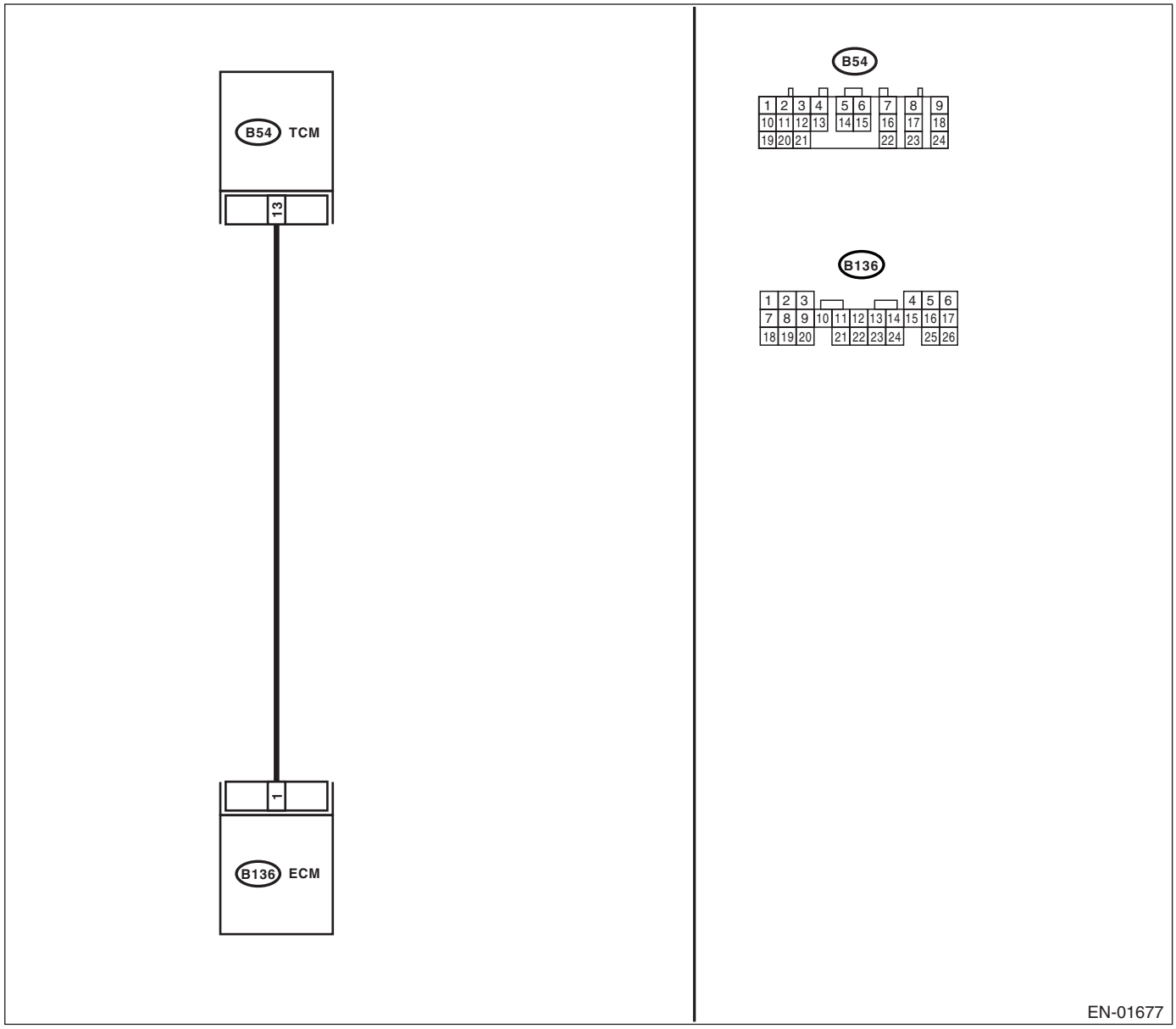
TROUBLE SYMPTOM:

Excessive shift shock

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and TCM. 3) Measure the resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***(B136) No. 1 — (B54) No. 13:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair open circuit in harness between ECM and TCM connector.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair ground short circuit in harness between ECM and TCM connector.
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

DQ:DTC P1712 ENGINE TORQUE CONTROL SIGNAL 2 CIRCUIT MALFUNCTION

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-233, DTC P1712 ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

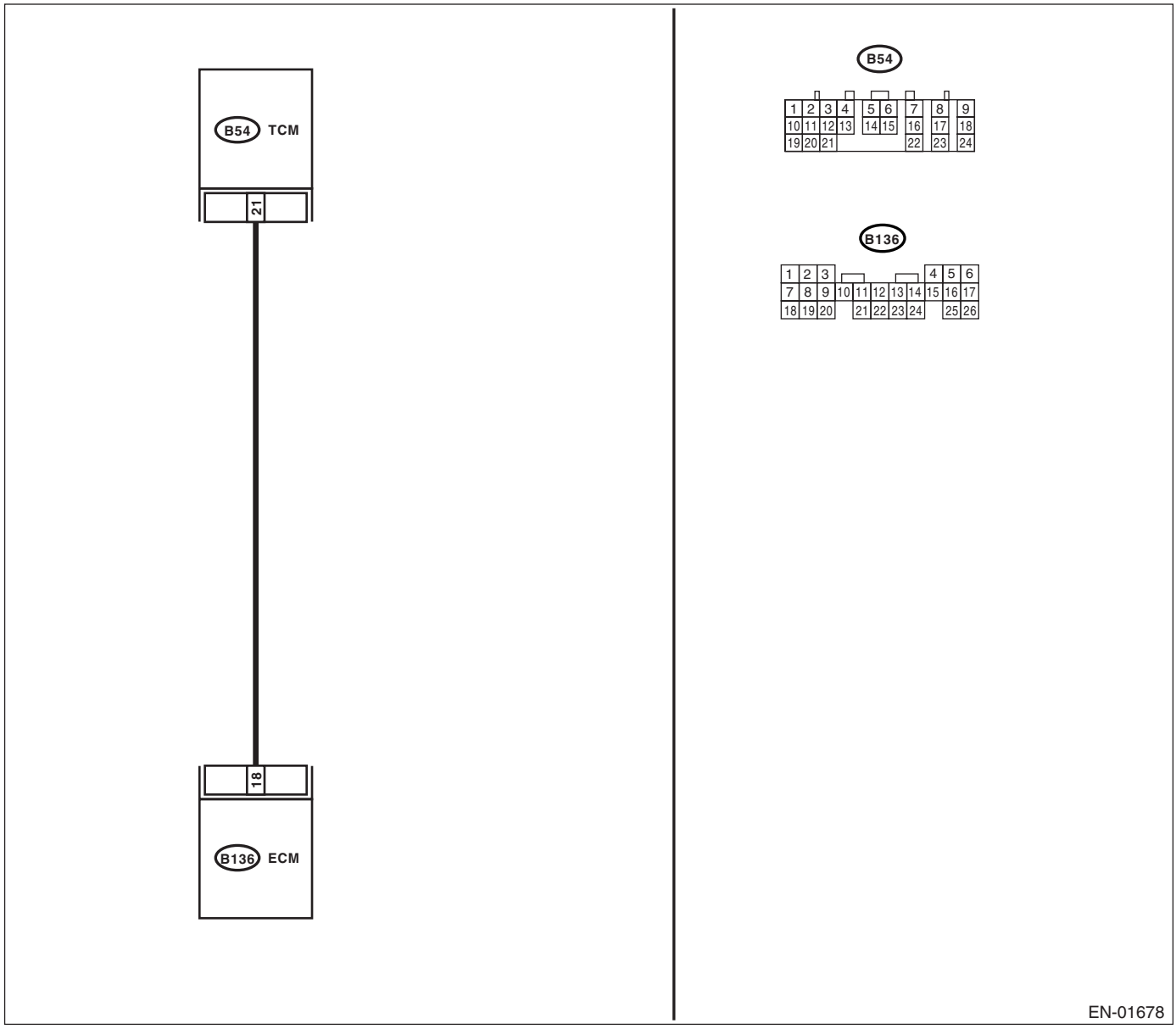
TROUBLE SYMPTOM:

Excessive shift shock

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 18 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 18 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and TCM. 3) Measure the resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***(B136) No. 18 — (B54) No. 21:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair open circuit in harness between ECM and TCM connector.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 18 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair ground short circuit in harness between ECM and TCM connector.
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

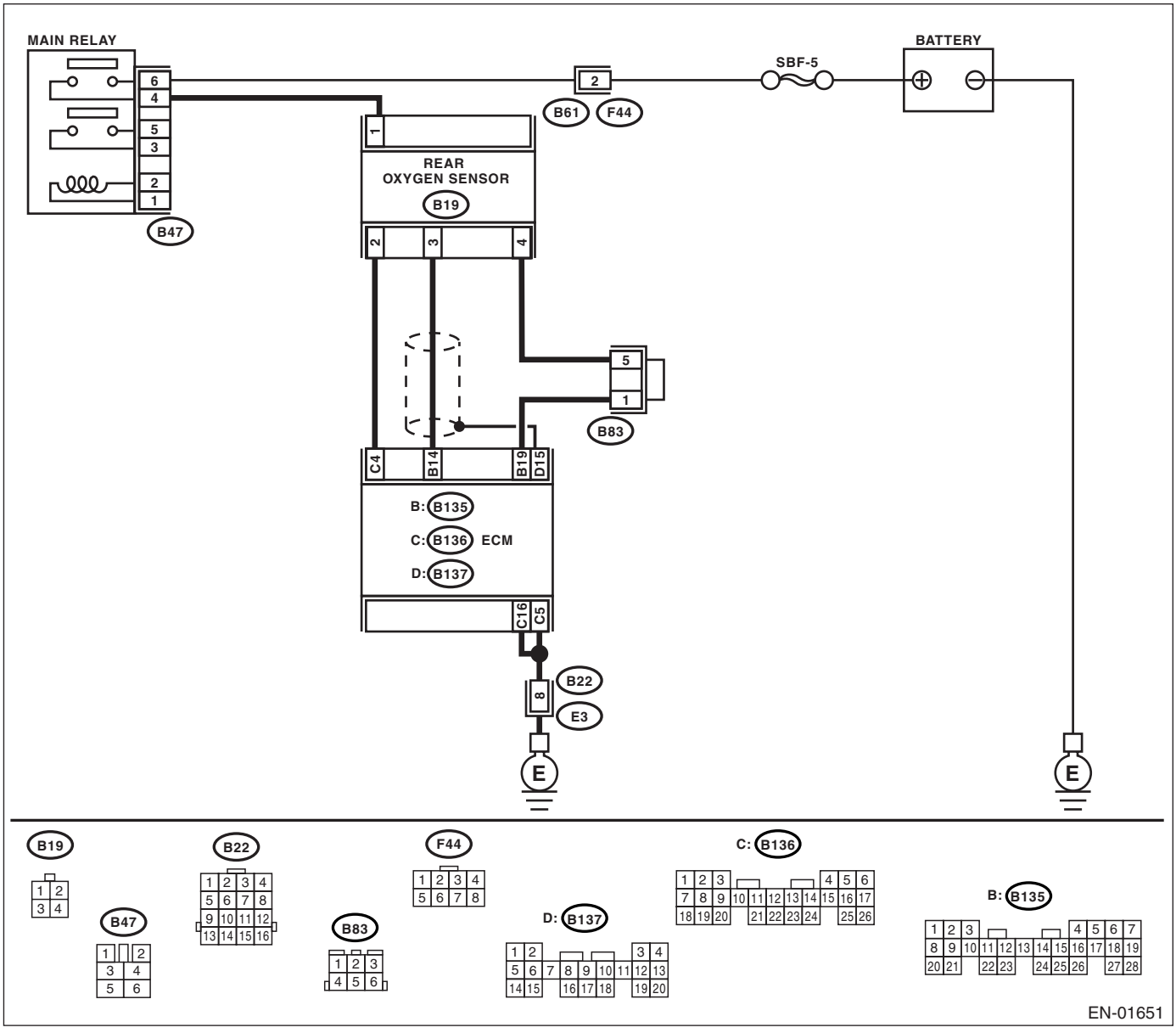
DR:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-234, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0137.	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 5,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage 490 mV?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 14 — (B19) No. 3:*** ***(B135) No. 19 — (B19) No. 4:***	Is the resistance more than 3 Ω?	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(B19) No. 3 (+) — Engine ground (−):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4SO)-42, Rear Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

	Step	Check	Yes	No
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace faulty parts.	Go to step **6.**
6	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step **7.**
7	**CHECK PURGE CONTROL SOLENOID VALVE OR PRESSURE CONTROL SOLENOID VALVE.**	Is the purge control solenoid valve or pressure control solenoid valve stuck?	Replace the purge control solenoid valve or pressure control solenoid valve.	Go to step **8.**
8	**CHECK FUEL PRESSURE.** **Warning:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel on the floor.** 1) Release fuel pressure. (1)Disconnect the connector from fuel pump relay. (2)Start the engine and run it until it stalls. (3)After the engine stalls, crank it for five more seconds. (4)Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install the fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the fuel pressure 284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)?	Go to step **9.**	Repair the following items. Fuel pressure too high • Clogged fuel return line or bent hose Fuel pressure too low • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
9	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: • If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If out of specification as measured at this step, check or replace pressure regulator and pressure regulator vacuum hose.	Is the fuel pressure 206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)?	Go to step **10.**	Repair the following items. Fuel pressure too high • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
10	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the engine coolant temperature 70 — 100°C (158 — 212°F)?	Go to step **11.**	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-24, Engine Coolant Temperature Sensor.>
11	**CHECK PRESSURE SENSOR SIGNAL.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the select lever in "N" or "P" range. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read the data of pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Idling: Is the measured value 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg), Ignition ON: Is the measured value 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg)?	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Replace the Pressure sensor. <Ref. to FU(H4SO)-30, Manifold Absolute Pressure Sensor.>

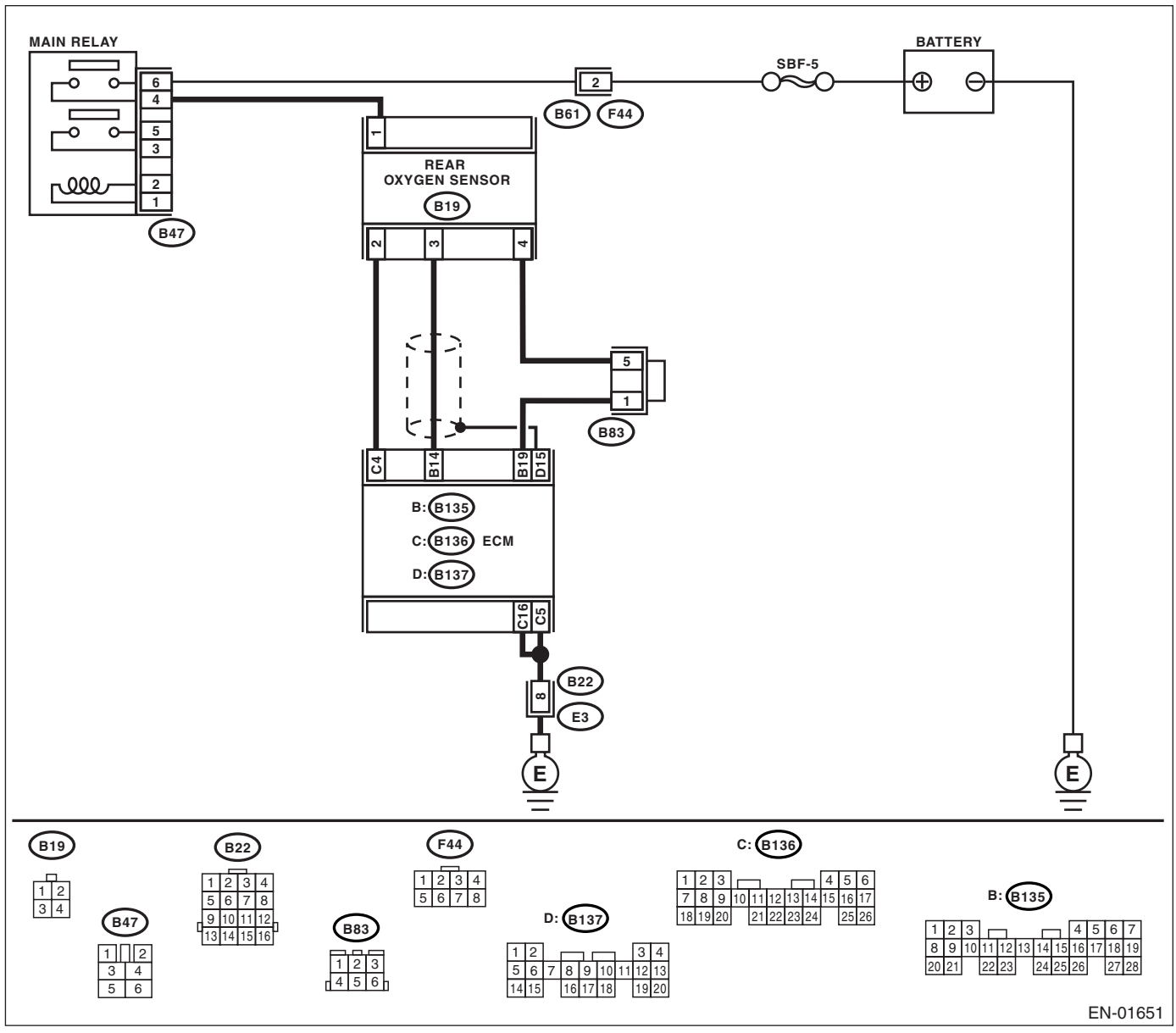
DS:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-236, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-37, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0138.	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and immediately decrease the engine speed from 5,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage 250 mV?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 14 — (B19) No. 3:*** ***(B135) No. 19 — (B19) No. 4:***	Is the resistance more than 3 Ω?	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(B19) No. 3 (+) — Engine ground (−):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4SO)-42, Rear Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

	Step	Check	Yes	No
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace faulty parts.	Go to step **6.**
6	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step **7.**
7	**CHECK PURGE CONTROL SOLENOID VALVE OR PRESSURE CONTROL SOLENOID VALVE.**	Is the purge control solenoid valve or pressure control solenoid valve stuck?	Replace the purge control solenoid valve or pressure control solenoid valve.	Go to step **8.**
8	**CHECK FUEL PRESSURE.** **Warning:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel on the floor.** 1) Release fuel pressure. (1)Disconnect the connector from fuel pump relay. (2)Start the engine and run it until it stalls. (3)After the engine stalls, crank it for five more seconds. (4)Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install the fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the fuel pressure 284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)?	Go to step **9.**	Repair the following items. Fuel pressure too high • Clogged fuel return line or bent hose Fuel pressure too low • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
9	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: • If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If out of specification as measured at this step, check or replace pressure regulator and pressure regulator vacuum hose.	Is the fuel pressure 206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)?	Go to step **10.**	Repair the following items. Fuel pressure too high • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
10	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the engine coolant temperature 70 — 100°C (158 — 212°F)?	Go to step **11.**	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-24, Engine Coolant Temperature Sensor.>
11	**CHECK PRESSURE SENSOR SIGNAL.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the select lever in "N" or "P" range. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read the data of pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Idling: Is the measured value 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg), Ignition ON: Is the measured value 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg)?	Contact SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Replace the Pressure sensor. <Ref. to FU(H4SO)-30, Manifold Absolute Pressure Sensor.>

20.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(H4SO)-83, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Idle air control solenoid valve 2) Manifold absolute pressure sensor 3) Intake air temperature sensor 4) Ignition parts (*1) 5) Engine coolant temperature sensor (*2) 6) Crankshaft position sensor (*3) 7) Camshaft position sensor (*3) 8) Fuel injection parts (*4)
2. Rough idling	1) Idle air control solenoid valve 2) Manifold absolute pressure sensor 3) Intake air temperature sensor 4) Engine coolant temperature sensor (*2) 5) Ignition parts (*1) 6) Air intake system (*5) 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Crankshaft position sensor (*3) 10) Camshaft position sensor (*3) 11) Oxygen sensor 12) Fuel pump and fuel pump relay
3. Engine does not return to idle.	1) Idle air control solenoid valve 2) Engine coolant temperature sensor 3) Accelerator cable (*6) 4) Throttle position sensor 5) Manifold absolute pressure sensor 6) Intake air temperature sensor
4. Poor acceleration	1) Manifold absolute pressure sensor 2) Intake air temperature sensor 3) Throttle position sensor 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) A/C switch and A/C cut relay 10) Engine torque control signal circuit 11) Ignition parts (*1)
5. Engine stalls or engine sags or hesitates at acceleration.	1) Manifold absolute pressure sensor 2) Intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Purge control solenoid valve 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Fuel pump and fuel pump relay

Symptom	Problem parts
6. Surge	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Manifold absolute pressure sensor 4) Engine coolant temperature sensor (*2) 5) Crankshaft position sensor (*3) 6) Camshaft position sensor (*3) 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Fuel pump and fuel pump relay
7. Spark knock	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Manifold absolute pressure sensor 4) Engine coolant temperature sensor 5) Knock sensor 6) Fuel injection parts (*4) 7) Fuel pump and fuel pump relay
8. After burning in exhaust system	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Manifold absolute pressure sensor 4) Engine coolant temperature sensor (*2) 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay

*1: Check ignition coil & ignitor ASSY and spark plug.
*2: Indicate the symptom occurring only in cold temperatures.
*3: Ensure the secure installation.
*4: Check fuel injector, fuel pressure regulator and fuel filter.
*5: Inspect air leak in air intake system.
*6: Adjust accelerator cable.

2. AUTOMATIC TRANSMISSION

NOTE:
Check general diagnostics table with non-conformity symptom for automatic transmission. <Ref. to 4AT(diag)-2, Basic Diagnostic Procedure.>

GENERAL DESCRIPTION

GD(H4SO)

Page

1. List of Diagnostic Trouble Code (DTC) 2
2. Diagnostic Trouble Code (DTC) Detecting Criteria 8

1. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Index
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-8, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-10, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-12, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to GD(H4SO)-14, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to GD(H4SO)-16, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0065	Air Assisted Injector Control Range/ Performance	<Ref. to GD(H4SO)-18, DTC P0065 AIR ASSISTED INJECTOR CONTROL RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0066	Air Assisted Injector Control Circuit or Circuit Low	<Ref. to GD(H4SO)-21, DTC P0066 AIR ASSISTED INJECTOR CONTROL CIRCUIT OR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0067	Air Assisted Injector Control Circuit High	<Ref. to GD(H4SO)-23, DTC P0067 AIR ASSISTED INJECTOR CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0068	Manifold Pressure Sensor Range/ Performance	<Ref. to GD(H4SO)-25, DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to GD(H4SO)-27, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to GD(H4SO)-29, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0111	Intake Air Temperature Circuit Range/Performance	<Ref. to GD(H4SO)-31, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to GD(H4SO)-33, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0113	Intake Air Temperature Circuit High Input	<Ref. to GD(H4SO)-35, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to GD(H4SO)-37, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to GD(H4SO)-39, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0121	Throttle/Pedal Position Sensor/ Switch “A” Circuit Range/Performance	<Ref. to GD(H4SO)-41, DTC P0121 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low Input	<Ref. to GD(H4SO)-43, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0123	Throttle/Pedal Position Sensor/ Switch “A” Circuit High Input	<Ref. to GD(H4SO)-45, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0125	Insufficient Coolant Temperature For Closed Loop Fuel Control	<Ref. to GD(H4SO)-47, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to GD(H4SO)-48, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0129	Barometric Pressure Too Low	<Ref. to GD(H4SO)-50, DTC P0129 BAROMETRIC PRESSURE TOO LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0130	O_2 Sensor Circuit (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-51, DTC P0130 O_2 SENSOR CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0131	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-53, DTC P0131 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0132	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-55, DTC P0132 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-57, DTC P0133 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-61, DTC P0134 O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4SO)-63, DTC P0137 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4SO)-65, DTC P0138 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to GD(H4SO)-67, DTC P0139 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System Too Lean (Bank 1)	<Ref. to GD(H4SO)-71, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System Too Rich (Bank 1)	<Ref. to GD(H4SO)-73, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	<Ref. to GD(H4SO)-75, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0182	Fuel Temperature Sensor “A” Circuit Low Input	<Ref. to GD(H4SO)-77, DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0183	Fuel Temperature Sensor “A” Circuit High Input	<Ref. to GD(H4SO)-79, DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 Misfire Detected	<Ref. to GD(H4SO)-81, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0302	Cylinder 2 Misfire Detected	<Ref. to GD(H4SO)-86, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 Misfire Detected	<Ref. to GD(H4SO)-86, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 Misfire Detected	<Ref. to GD(H4SO)-86, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to GD(H4SO)-87, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to GD(H4SO)-89, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to GD(H4SO)-91, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to GD(H4SO)-93, DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to GD(H4SO)-96, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0341	Camshaft Position Sensor “A” Circuit Range/Performance (Bank 1 or Single Sensor)	<Ref. to GD(H4SO)-98, DTC P0341 CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to GD(H4SO)-100, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0442	Evaporative Emission Control System Leak Detected (Small Leak)	<Ref. to GD(H4SO)-105, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to GD(H4SO)-130, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to GD(H4SO)-132, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	<Ref. to GD(H4SO)-134, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to GD(H4SO)-137, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to GD(H4SO)-139, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	<Ref. to GD(H4SO)-140, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	<Ref. to GD(H4SO)-140, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to GD(H4SO)-141, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to GD(H4SO)-143, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0461	Fuel Level Sensor Circuit Range/Performance	<Ref. to GD(H4SO)-145, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0462	Fuel Level Sensor Circuit Low Input	<Ref. to GD(H4SO)-147, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0463	Fuel Level Sensor Circuit High Input	<Ref. to GD(H4SO)-149, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(H4SO)-151, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0483	Cooling Fan Rationality Check	<Ref. to GD(H4SO)-154, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to GD(H4SO)-156, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0503	Vehicle Speed Sensor Intermittent/Erratic/High	<Ref. to GD(H4SO)-157, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0506	Idle Control System RPM Lower Than Expected	<Ref. to GD(H4SO)-158, DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0507	Idle Control System RPM Higher Than Expected	<Ref. to GD(H4SO)-160, DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(H4SO)-162, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to GD(H4SO)-163, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0565	Cruise Control On Signal	<Ref. to GD(H4SO)-164, DTC P0565 CRUISE CONTROL ON SIGNAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(H4SO)-165, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to GD(H4SO)-166, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0692	Cooling Fan 1 Control Circuit High	<Ref. to GD(H4SO)-167, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0703	Torque Converter/Brake Switch “B” Circuit	<Ref. to GD(H4SO)-168, DTC P0703 TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0705	Transmission Range Sensor Circuit (PRNDL Input)	<Ref. to GD(H4SO)-169, DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0710	Transmission Fluid Temperature Sensor Circuit	<Ref. to GD(H4SO)-170, DTC P0710 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0716	Input/Turbine Speed Sensor Circuit Range/Performance	<Ref. to GD(H4SO)-171, DTC P0716 INPUT/TURBINE SPEED SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0720	Output Speed Sensor Circuit	<Ref. to GD(H4SO)-172, DTC P0720 OUTPUT SPEED SENSOR CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0726	Engine Speed Input Circuit Range/ Performance	<Ref. to GD(H4SO)-173, DTC P0726 ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0731	Gear 1 Incorrect Ratio	<Ref. to GD(H4SO)-174, DTC P0731 GEAR 1 INCORRECT RATIO, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0732	Gear 2 Incorrect Ratio	<Ref. to GD(H4SO)-175, DTC P0732 GEAR 2 INCORRECT RATIO, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0733	Gear 3 Incorrect Ratio	<Ref. to GD(H4SO)-176, DTC P0733 GEAR 3 INCORRECT RATIO, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0734	Gear 4 Incorrect Ratio	<Ref. to GD(H4SO)-177, DTC P0734 GEAR 4 INCORRECT RATIO, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0741	Torque Converter Clutch Circuit Performance or Stuck Off	<Ref. to GD(H4SO)-178, DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0743	Torque Converter Clutch Circuit Electrical	<Ref. to GD(H4SO)-179, DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0748	Pressure Control Solenoid “A” Electrical	<Ref. to GD(H4SO)-180, DTC P0748 PRESSURE CONTROL SOLENOID “A” ELECTRICAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0753	Shift Solenoid “A” Electrical	<Ref. to GD(H4SO)-181, DTC P0753 SHIFT SOLENOID “A” ELECTRICAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0758	Shift Solenoid “B” Electrical	<Ref. to GD(H4SO)-182, DTC P0758 SHIFT SOLENOID “B” ELECTRICAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0771	Shift Solenoid “E” Performance or Stuck Off	<Ref. to GD(H4SO)-183, DTC P0771 SHIFT SOLENOID “E” PERFORMANCE OR STUCK OFF, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0778	Pressure Control Solenoid “B” Electrical	<Ref. to GD(H4SO)-184, DTC P0778 PRESSURE CONTROL SOLENOID “B” ELECTRICAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0785	Shift/Timing Solenoid	<Ref. to GD(H4SO)-185, DTC P0785 SHIFT/TIMING SOLENOID, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Neutral Switch Input Circuit Low	<Ref. to GD(H4SO)-186, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Neutral Switch Input Circuit High	<Ref. to GD(H4SO)-188, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0864	TCM Communication Circuit Range/Performance	<Ref. to GD(H4SO)-190, DTC P0864 TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0865	TCM Communication Circuit Low	<Ref. to GD(H4SO)-191, DTC P0865 TCM COMMUNICATION CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0866	TCM Communication Circuit High	<Ref. to GD(H4SO)-192, DTC P0866 TCM COMMUNICATION CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1110	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)	<Ref. to GD(H4SO)-193, DTC P1110 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1111	Atmospheric Pressure Sensor Circuit Malfunction (High Input)	<Ref. to GD(H4SO)-194, DTC P1111 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1134	A/F Sensor Micro-Computer Problem	<Ref. to GD(H4SO)-195, DTC P1134 A/F SENSOR MICRO-COMPUTER PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4SO)-197, DTC P1137 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to GD(H4SO)-199, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to GD(H4SO)-201, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to GD(H4SO)-202, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1446	Fuel Tank Sensor Control Valve Circuit Low	<Ref. to GD(H4SO)-203, DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1447	Fuel Tank Sensor Control Valve Circuit High	<Ref. to GD(H4SO)-205, DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1448	Fuel Tank Sensor Control Valve Range/Performance	<Ref. to GD(H4SO)-207, DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1510	ISC Solenoid Valve Signal #1 Circuit Malfunction (Low Input)	<Ref. to GD(H4SO)-210, DTC P1510 ISC SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1511	ISC Solenoid Valve Signal #1 Circuit Malfunction (High Input)	<Ref. to GD(H4SO)-212, DTC P1511 ISC SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1512	ISC Solenoid Valve Signal #2 Circuit Malfunction (Low Input)	<Ref. to GD(H4SO)-214, DTC P1512 ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1513	ISC Solenoid Valve Signal #2 Circuit Malfunction (High Input)	<Ref. to GD(H4SO)-216, DTC P1513 ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1514	ISC Solenoid Valve Signal #3 Circuit Malfunction (Low Input)	<Ref. to GD(H4SO)-218, DTC P1514 ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P1515	ISC Solenoid Valve Signal #3 Circuit Malfunction (High Input)	<Ref. to GD(H4SO)-220, DTC P1515 ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1516	ISC Solenoid Valve Signal #4 Circuit Malfunction (Low Input)	<Ref. to GD(H4SO)-222, DTC P1516 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1517	ISC Solenoid Valve Signal #4 Circuit Malfunction (High Input)	<Ref. to GD(H4SO)-224, DTC P1517 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1518	Starter Switch Circuit Low Input	<Ref. to GD(H4SO)-226, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to GD(H4SO)-227, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1698	Engine Torque Control Cut Signal Circuit Malfunction (Low Input)	<Ref. to GD(H4SO)-228, DTC P1698 ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1699	Engine Torque Control Cut Signal Circuit Malfunction (High Input)	<Ref. to GD(H4SO)-229, DTC P1699 ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1700	Throttle Position Sensor Circuit Malfunction For AT	<Ref. to GD(H4SO)-230, DTC P1700 THROTTLE POSITION SENSOR CIRCUIT MALFUNCTION FOR AT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1711	Engine Torque Control Signal #1 Circuit Malfunction	<Ref. to GD(H4SO)-232, DTC P1711 ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1712	Engine Torque Control Signal #2 Circuit Malfunction	<Ref. to GD(H4SO)-233, DTC P1712 ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to GD(H4SO)-234, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to GD(H4SO)-236, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

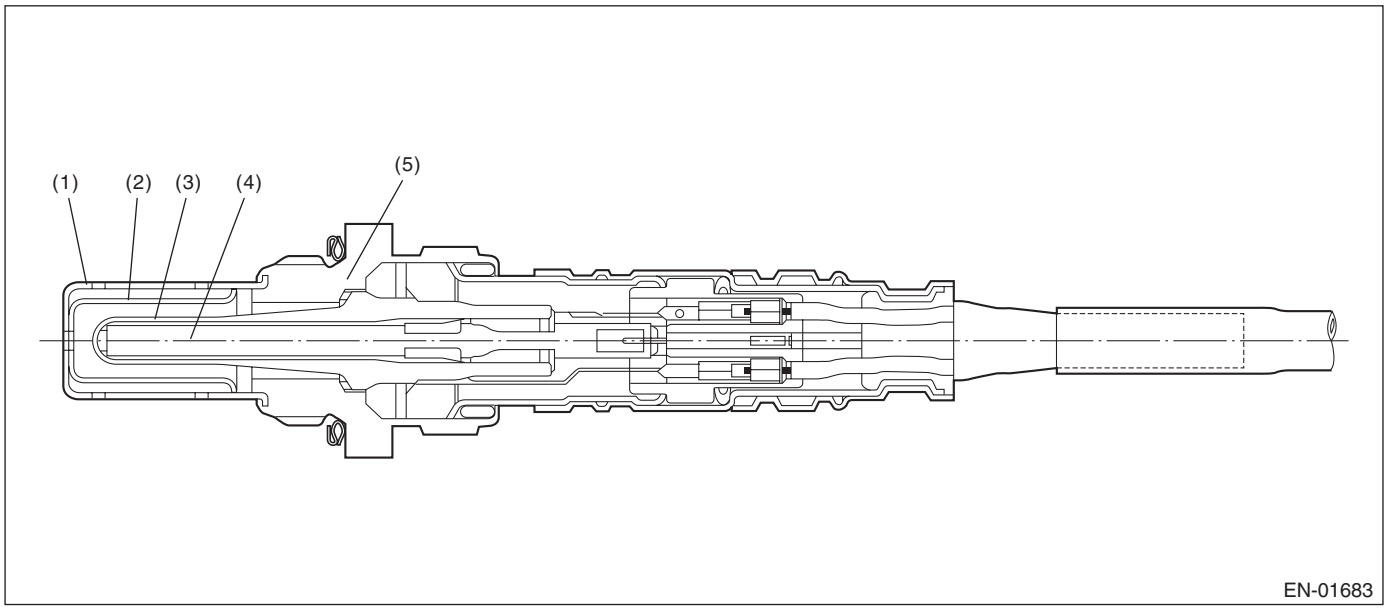
2. Diagnostic Trouble Code (DTC) Detecting Criteria

A: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of front oxygen (A/F) sensor heater.
Diagnosis is performed using A/F microcomputer, and communication is established between A/F microcomputer and main microcomputer. Judge NG when the data of heater malfunction NG is transmitted.
Judge NG when the front oxygen (A/F) sensor element impedance is out of the standard value.

2. COMPONENT DESCRIPTION



(1) Element cover (outer)
(2) Element cover (inner)
(3) Sensor element
(4) Ceramic heater
(5) Sensor housing

3. ENABLE CONDITIONS

Secondary Parameters	Enable Conditions
Front oxygen (A/F) sensor heater diagnosis	Incomplete
Battery voltage	> 10.9 V
After heater control starting	More than 30 seconds
After fuel shut-off	More than 20 seconds

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 30 seconds after the heater continuity starting, and complete the diagnosis if making a NG judgment.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when one of the malfunction criteria below is completed.
Judgment Value

Malfunction Criteria	Threshold Value
Continuous completion period of malfunction criteria below	120 seconds or more
Impedance of front oxygen (A/F) sensor	< 10 Ω or > 40 Ω
Element resistance when determined voltage is applied	≥ 250 Ω

Time Needed for Diagnosis: 120 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when all of the malfunction criteria below is completed.
Judgment Value

Malfunction Criteria	Threshold Value
Continuous completion period of malfunction criteria below	30 seconds or more
Impedance of front oxygen (A/F) sensor	10 Ω — 40 Ω
Continuous completion period of malfunction criteria below	15 seconds or more
Element resistance when determined voltage is applied	< 250 Ω

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

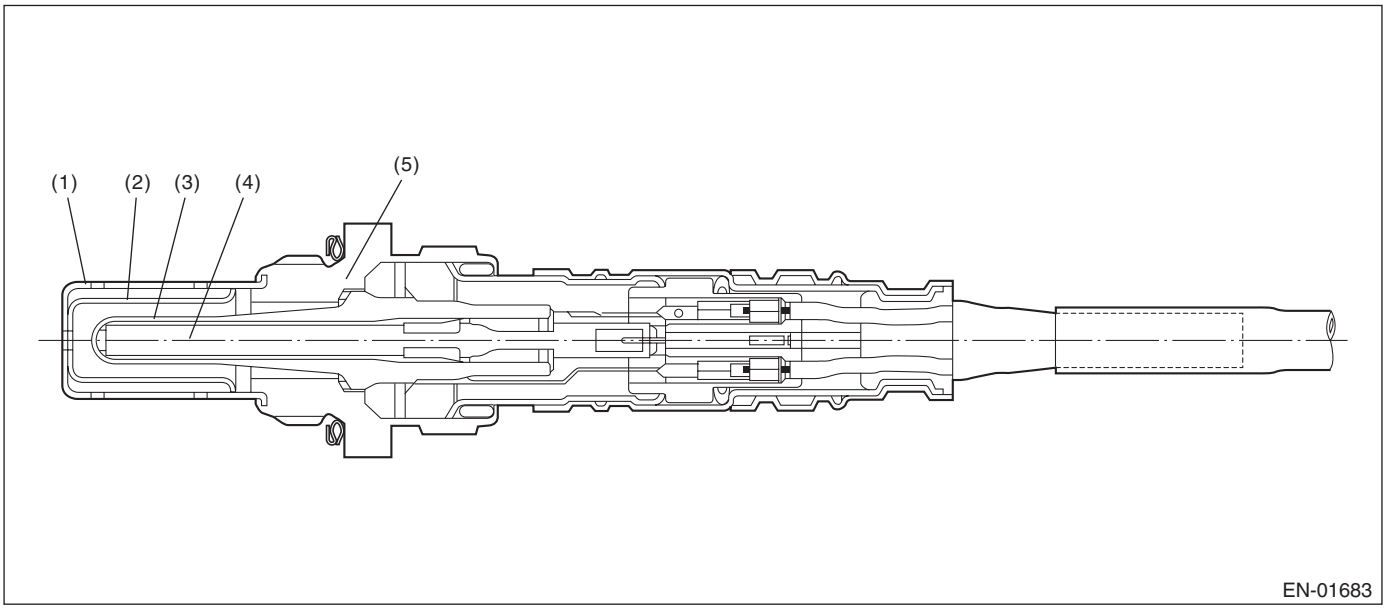
Memorize the freeze frame data. (For test mode $02)

B: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of front oxygen (A/F) sensor heater.
Diagnosis is performed using A/F microcomputer, and communication is established between A/F microcomputer and main microcomputer. Judge NG when the data of open circuit and shortage NG is transmitted.

2. COMPONENT DESCRIPTION



(1) Element cover (outer)
(2) Element cover (inner)
(3) Sensor element
(4) Ceramic heater
(5) Sensor housing

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Front oxygen (A/F) sensor heater diagnosis	Incomplete
Battery voltage	10.9 V or more

4. GENERAL DRIVING CYCLE

Terminate the diagnosis if the open or short circuit becomes NG once by performing diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing all the malfunction criteria below becomes more then 4.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Heater circuit	ON
Heater both edge voltage	≤ 5 V
Heater current	≤ 1.5 A

Time Needed for Diagnosis: 4.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

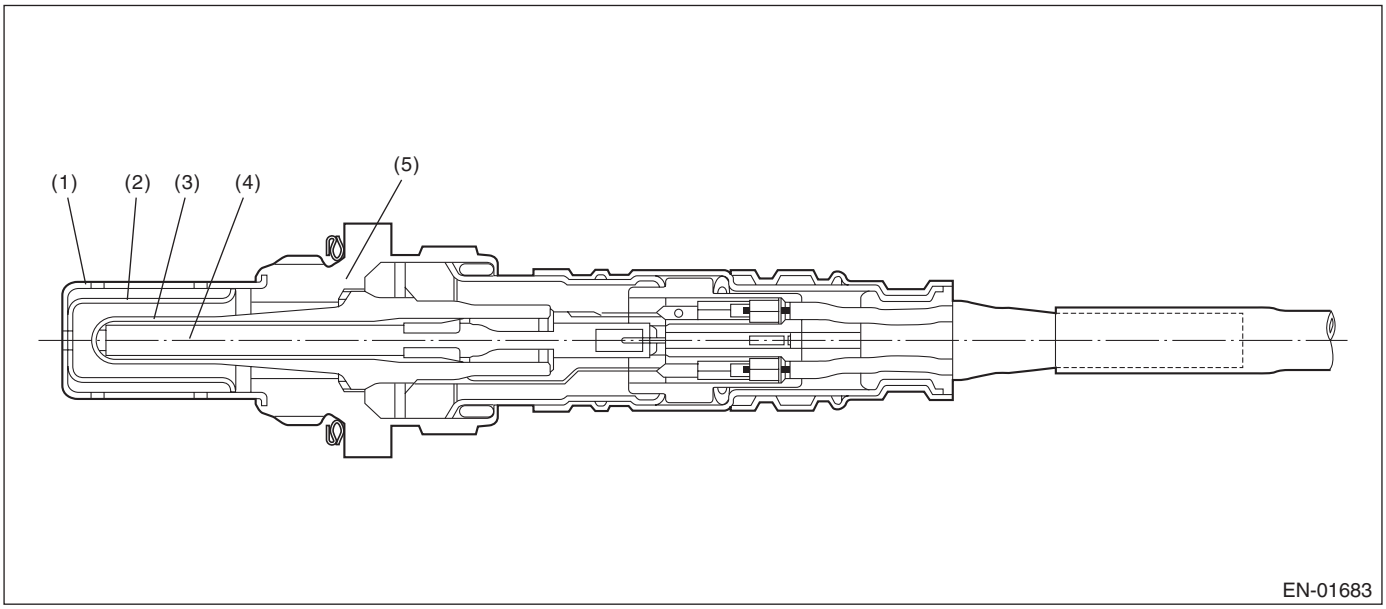
Memorize the freeze frame data. (For test mode $02)

C: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of front oxygen (A/F) sensor heater.
Diagnosis is performed using A/F microcomputer, and communication is established between A/F microcomputer and main microcomputer. Judge NG when the data of open circuit and shortage NG is transmitted.

2. COMPONENT DESCRIPTION



(1) Element cover (outer)
(2) Element cover (inner)
(3) Sensor element
(4) Ceramic heater
(5) Sensor housing

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Front oxygen (A/F) sensor heater diagnosis	Incomplete
Battery voltage	10.9 V or more

4. GENERAL DRIVING CYCLE

Terminate the diagnosis if the open or short circuit becomes NG once by performing diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when all the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Heater circuit	OFF
Heater both edge voltage	≥ 5 V
Heater current	≥ 1.5 A
Heater current ≥ 23 A event at heater continuity	Continues more than 385 milliseconds

Time Needed for Diagnosis: 4.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

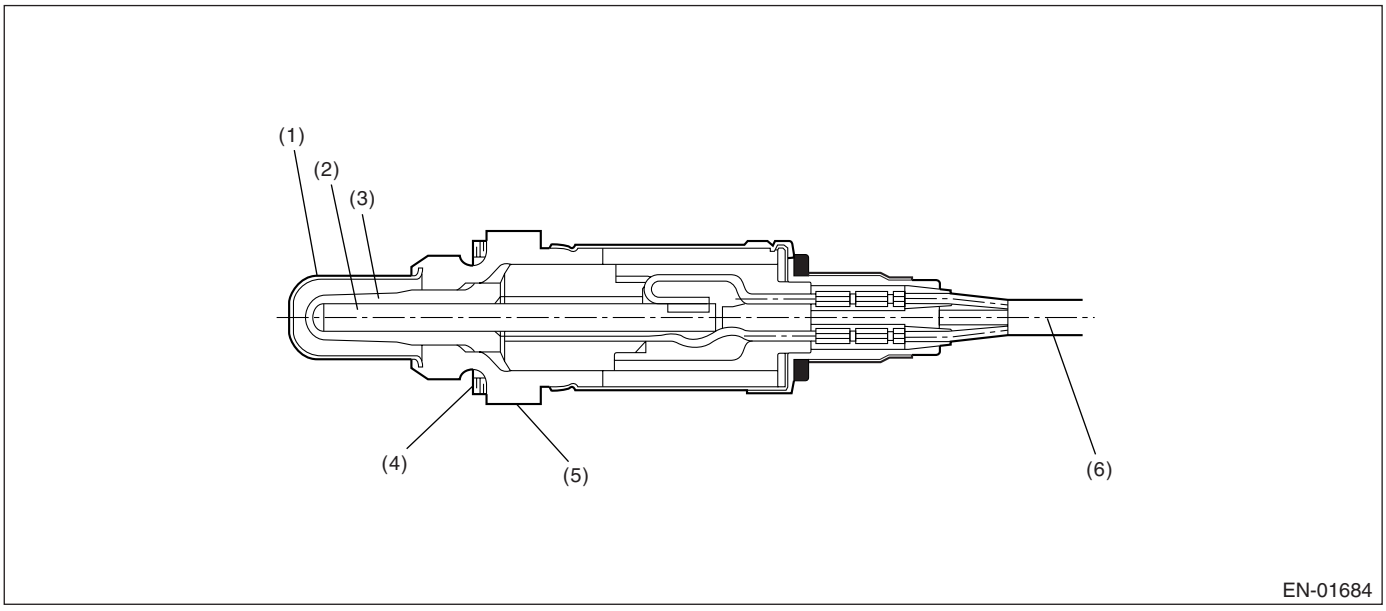
Memorize the freeze frame data. (For test mode $02)

D: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of rear oxygen sensor heater.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Protection tube
(2) Ceramic heater
(3) Zirconium tube
(4) Gasket
(5) Sensor housing
(6) Harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Engine speed	≥ 500 rpm
Rear oxygen sensor heater diagnosis	Incomplete
After engine starting	10 seconds or more
Battery voltage	≥ 8 V

4. GENERAL DRIVING CYCLE

In 10 seconds after starting the engine, perform the diagnosis just once.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes 10 seconds or more. Judge OK when the continuous time until completing none of the malfunction criteria below becomes 10 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Calculated electric power	< 6 watts

Time needed for diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

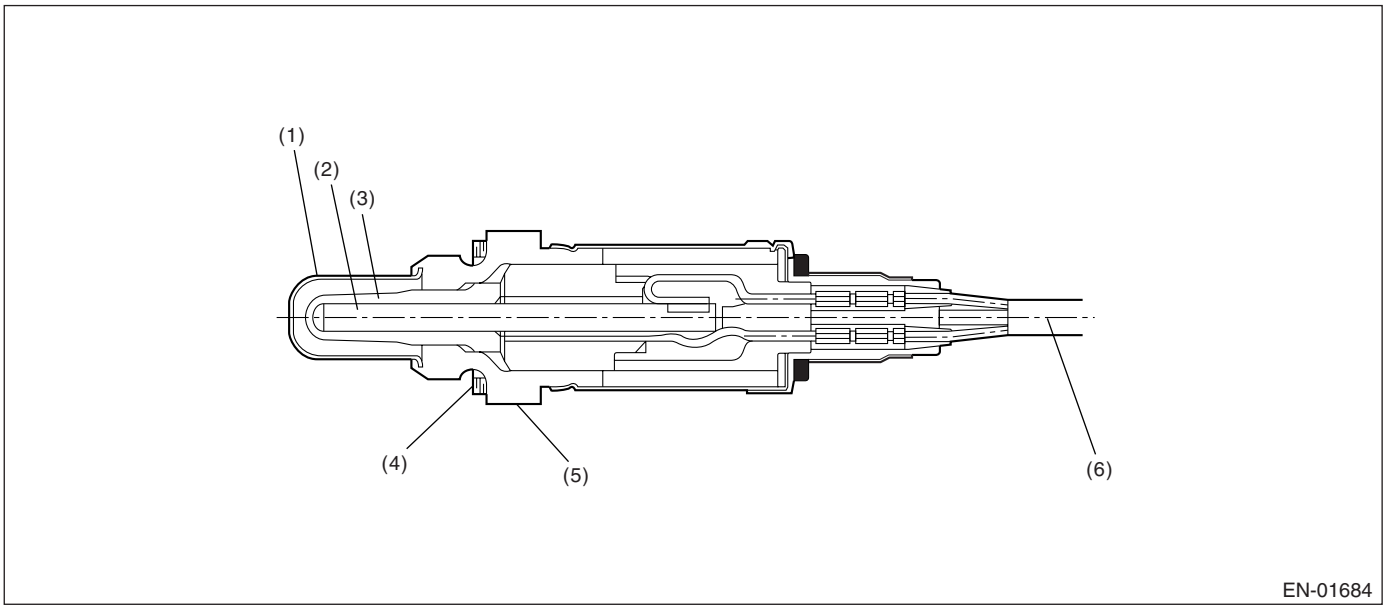
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

E: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of rear oxygen sensor heater.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Protection tube
(2) Ceramic heater
(3) Zirconium tube
(4) Gasket
(5) Sensor housing
(6) Harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Engine speed	≥ 500 rpm
Rear oxygen sensor heater diagnosis	Incomplete
After engine starting	10 seconds or more
Battery voltage	≥ 8 V

4. GENERAL DRIVING CYCLE

In 10 seconds after starting the engine, perform the diagnosis just once.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes 10 seconds or more. Judge OK when the continuous time until completing none of the malfunction criteria below becomes 10 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Calculated electric power	≥ 50 watts

Time needed for diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

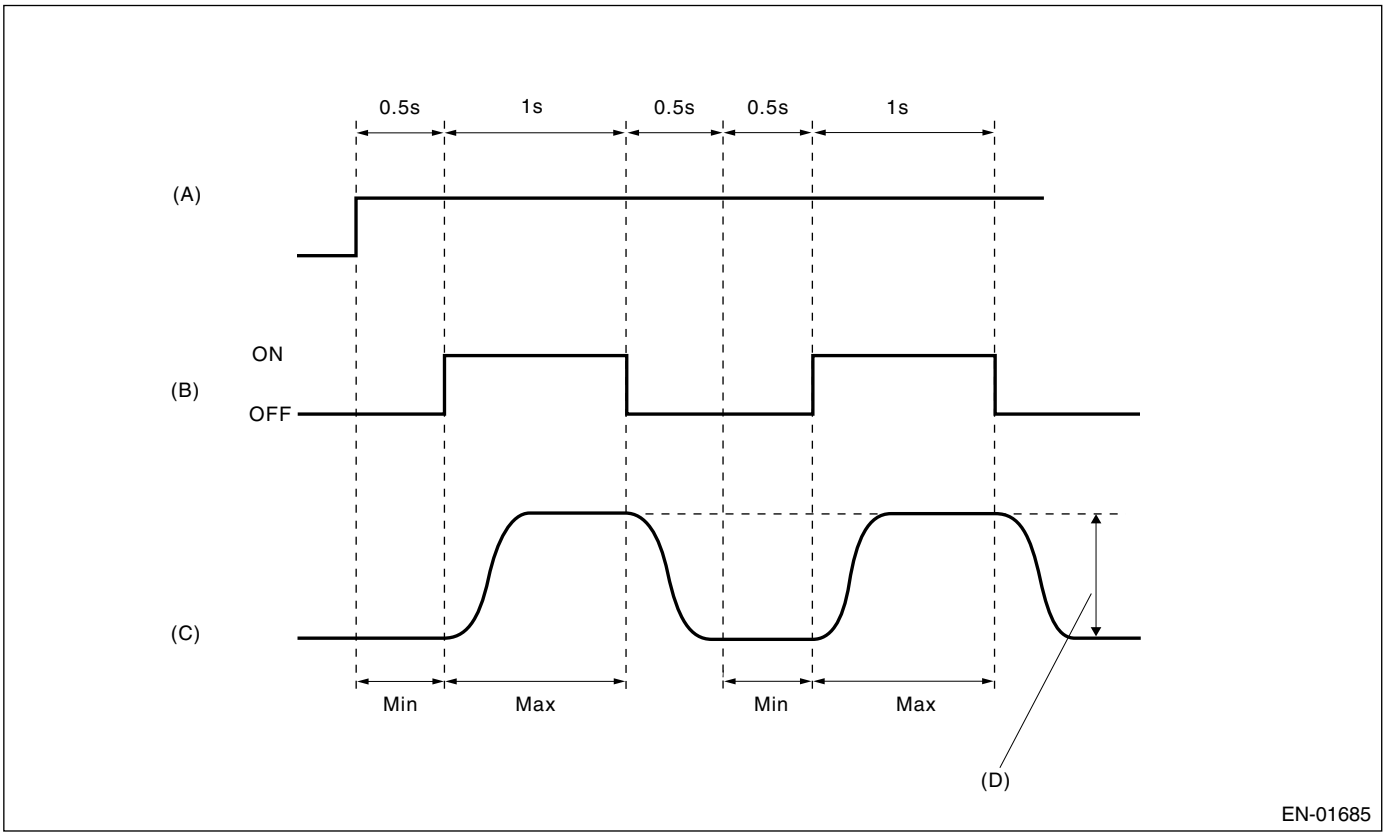
9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

F: DTC P0065 AIR ASSISTED INJECTOR CONTROL RANGE/PERFORMANCE

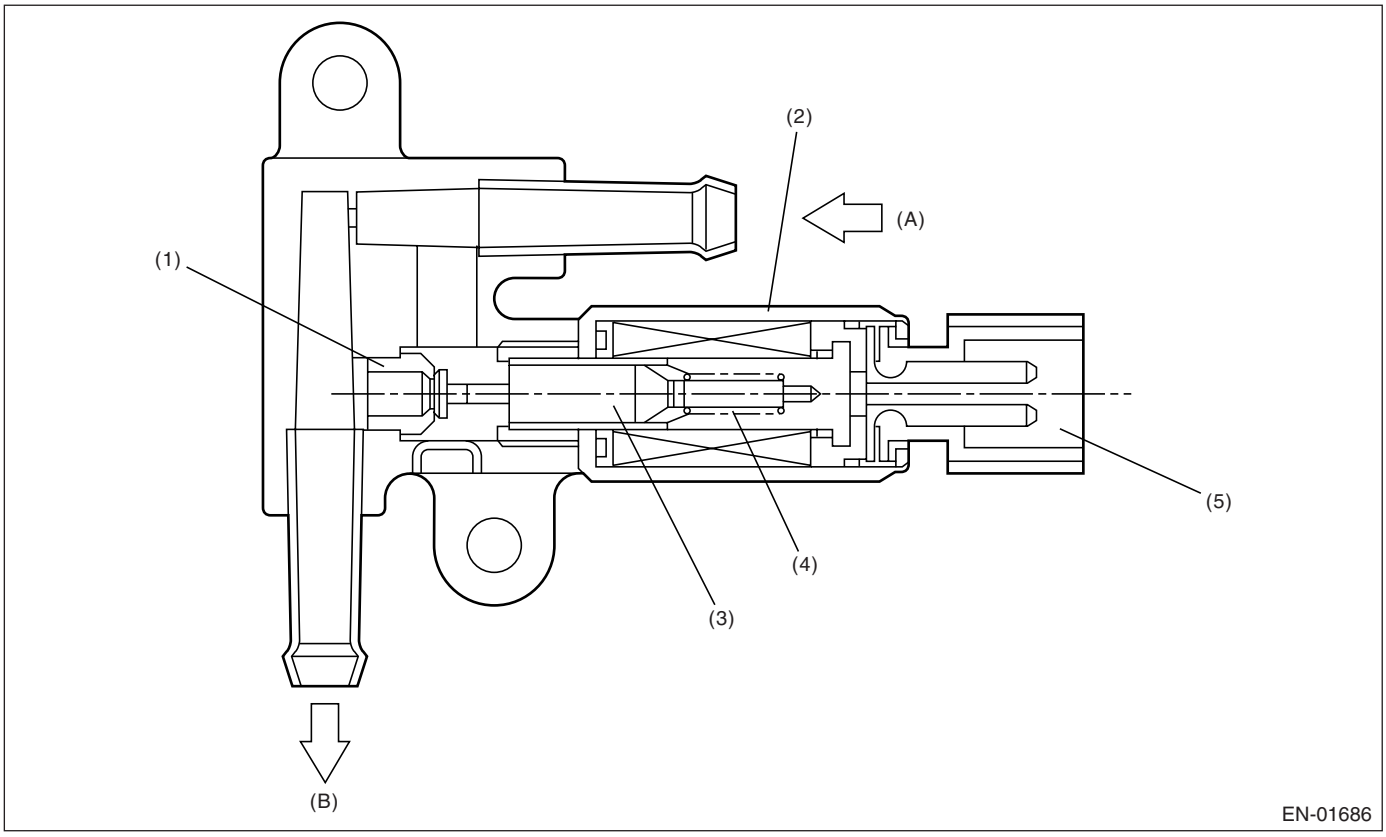
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of AAI solenoid valve.
Intake manifold pressure (negative pressure) is constant because the throttle valve is fully closed during fuel cut at deceleration. At this time, opening AAI solenoid valve makes the intake manifold pressure larger. For AAI solenoid valve function diagnosis, judge OK or NG by the amount of change of intake manifold pressure when opening and closing the AAI solenoid valve.
Max. value with the valve open-Min. value with the valve closed < Threshold value → NG
Max. value with the valve open-Min. value with the valve closed ≥ Threshold value → OK



(A) Conditions executed for diagnosis
(B) AAI solenoid valve
(C) Intake manifold pressure (At normal condition)
(D) Diagnostic value

2. COMPONENT DESCRIPTION



(1) Valve seat
(2) Solenoid
(3) Plunger and valve
(4) Spring
(5) Connector
(A) From idle air control solenoid valve
(B) To injector

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°F)
Engine speed	1,300 ←→ 2,300 rpm
Vehicle speed	≥ 60 km/h (37 MPH)
Atmospheric pressure	≥ 86 kPa (642 mmHg, 25 inHg)
Atmospheric-MAP	≥ 53 kPa (400 mmHg, 16 inHg)
Fuel cut event by coasting	In operation
AAI solenoid valve position	OFF (closed)
Estimated ambient air temperature value	> 5°C (41°F)

4. GENERAL DRIVING CYCLE

Conduct a serial diagnosis during fuel cut at deceleration from approx. 100 km/h (62 MPH).
Be careful for vehicle speed and engine speed. (Diagnosis may not finish if the vehicle speed and engine speed conditions become out of specification.)

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 2 times in a row. Judge OK and clear the NG if not completed once

Judgment Value

Malfunction Criteria	Threshold Value
Paai1 – Paai2 Paai1; max. MAP value during AAI solenoid valve ON signal Paai2; min. MAP value during 0.5 seconds just before changing the valve from OFF to ON	< See Map 1

Map 1

Atmospheric pressure kPa (mmHg, inHg)	85.5 (641, 25.2)	86.3 (647, 25.5)	87.5 (656, 25.8)	91.7 (688, 27.1)	92.7 (695, 27.4)	93.9 (704, 27.7)	99.1 (743, 29.3)	100.3 (752, 29.6)	101.3 (760, 29.9)
Judgment value kPa (mmHg, inHg)	0 (0, 0)	0.40 (3, 0.12)	0.40 (3, 0.12)	0.53 (4, 0.16)	0.53 (4, 0.16)	0.80 (6, 0.24)	0.80 (6, 0.24)	0.80 (6, 0.24)	0.80 (6, 0.24)

Time needed for diagnosis: 3.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

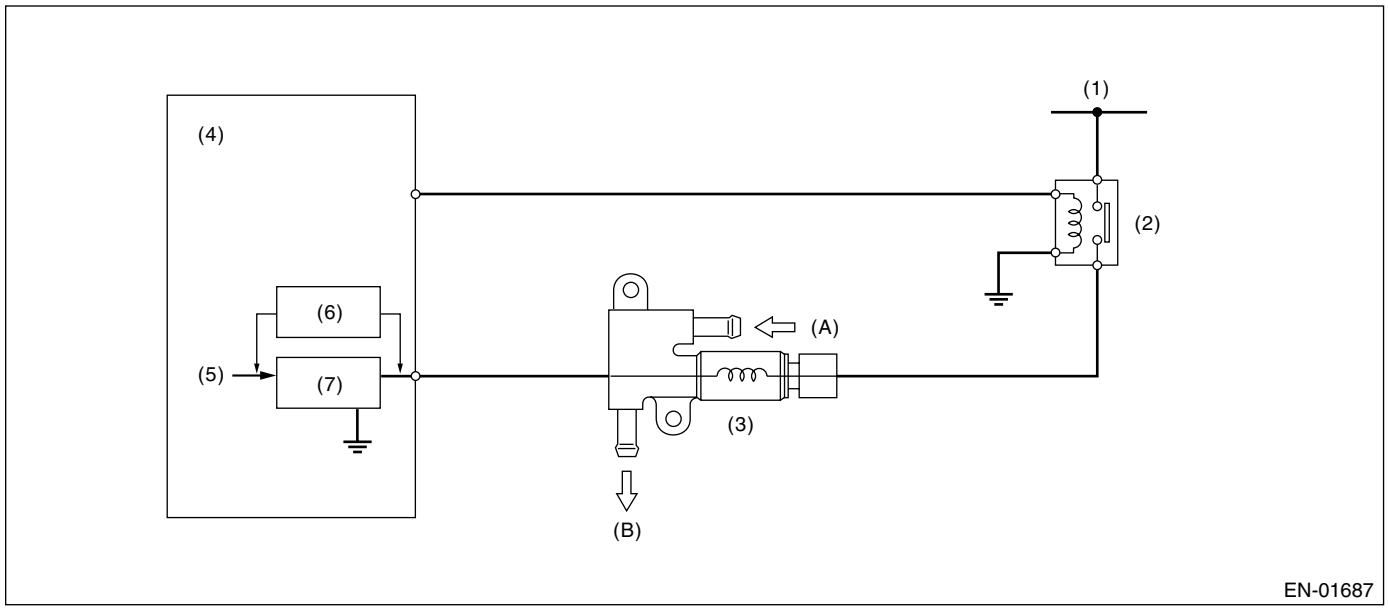
Memorize the freeze frame data. (For test mode $02)

G: DTC P0066 AIR ASSISTED INJECTOR CONTROL CIRCUIT OR CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of AAI solenoid valve. Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Battery
(2) Main relay
(3) AAI solenoid valve
(4) Engine control module (ECM)
(5) CPU
(6) Detecting circuit
(7) Switching circuit
(A) From idle air control solenoid valve
(B) To injector

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 10.9 V
After engine starting	2 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level while ECM sent OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level while ECM sent OFF signal	High level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

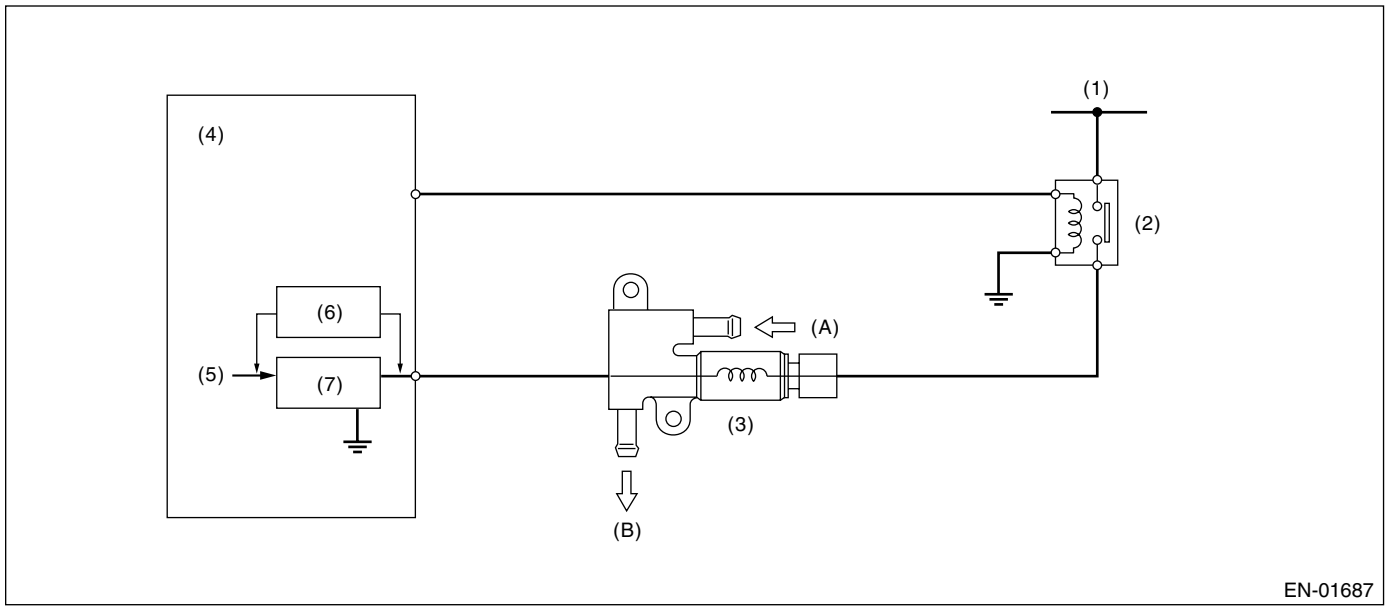
Memorize the freeze frame data. (For test mode $02)

H: DTC P0067 AIR ASSISTED INJECTOR CONTROL CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of AAI solenoid valve. Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Battery
(2) Main relay
(3) AAI solenoid valve
(4) Engine control module (ECM)
(5) CPU
(6) Detecting circuit
(7) Switching circuit

(A) From idle air control solenoid valve
(B) To injector

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 10.9 V
After engine starting	2 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than the time needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level while ECM sent OFF signal	High level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level while ECM sent OFF signal	Low level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

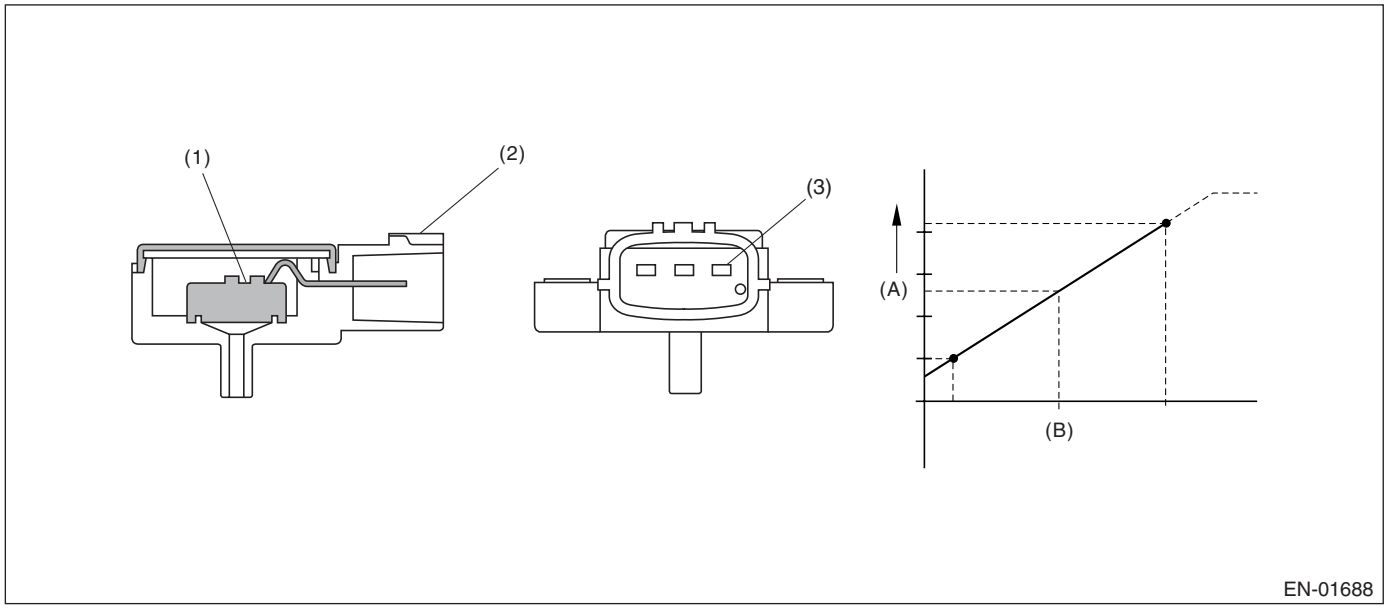
Memorize the freeze frame data. (For test mode $02)

I: DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake manifold pressure sensor output property.
Judge NG when the intake manifold pressure is small (voltage is low) regardless of the driving situation that the intake manifold pressure may be thought larger than engine speed and throttle opening. (Low side)
On the other hand, judge NG when the intake manifold pressure is large (voltage is high) regardless of the driving situation that the intake manifold pressure may be thought smaller than engine speed and throttle opening. (High side)

2. COMPONENT DESCRIPTION



(1) Pressure detecting part
(2) Connector
(3) Terminal
(A) Output voltage
(B) Input voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria of Low side or High side below becomes more than the time (3 seconds) needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
(Low side)	
Engine speed	> 2,500 rpm
Throttle position	> 15°
Output voltage	≤ 0.985 V
(High side)	
Engine speed	600 ←→ 900 rpm
Throttle position	≤ 2°
Output voltage	> 2.81 V

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria of Low side or High side are completed.

Judgment Value

Malfunction Criteria	Threshold Value
(Low side)	
Engine speed	> 2,500 rpm
Throttle position	> 15°
Output voltage	> 0.985 V
(High side)	
Engine speed	600 ←→ 900 rpm
Throttle position	≤ 2°
Output voltage	≤ 2.81 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

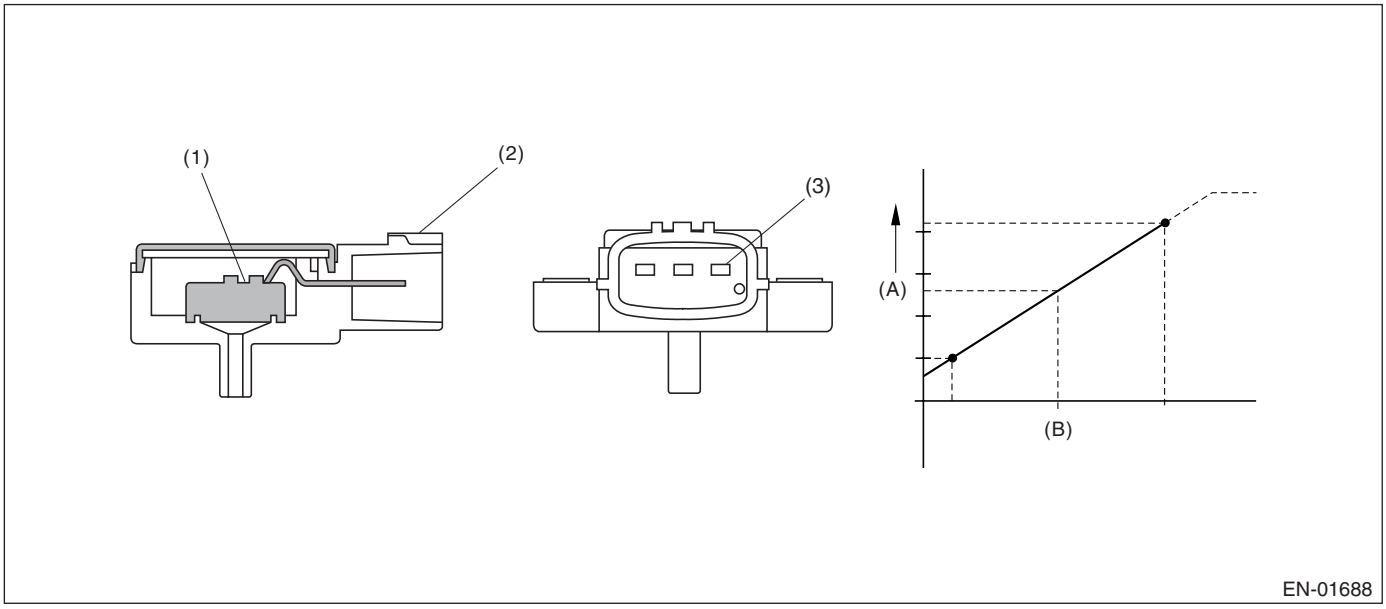
Memorize the freeze frame data. (For test mode $02)

J: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Pressure detecting part
(2) Connector
(3) Terminal
(A) Output voltage
(B) Input voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 10 V
Self-diagnosis timer after starting the engine	≥ 0.5 seconds

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis. Judge fail safe NG when the continuous time until completing the malfunction criteria below becomes more than time (0.1 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.14 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHTCLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Calculate the manifold absolute pressure using the map figured by engine speed and throttle opening grid.

9. ECM OPERATION AT DTC SETTING

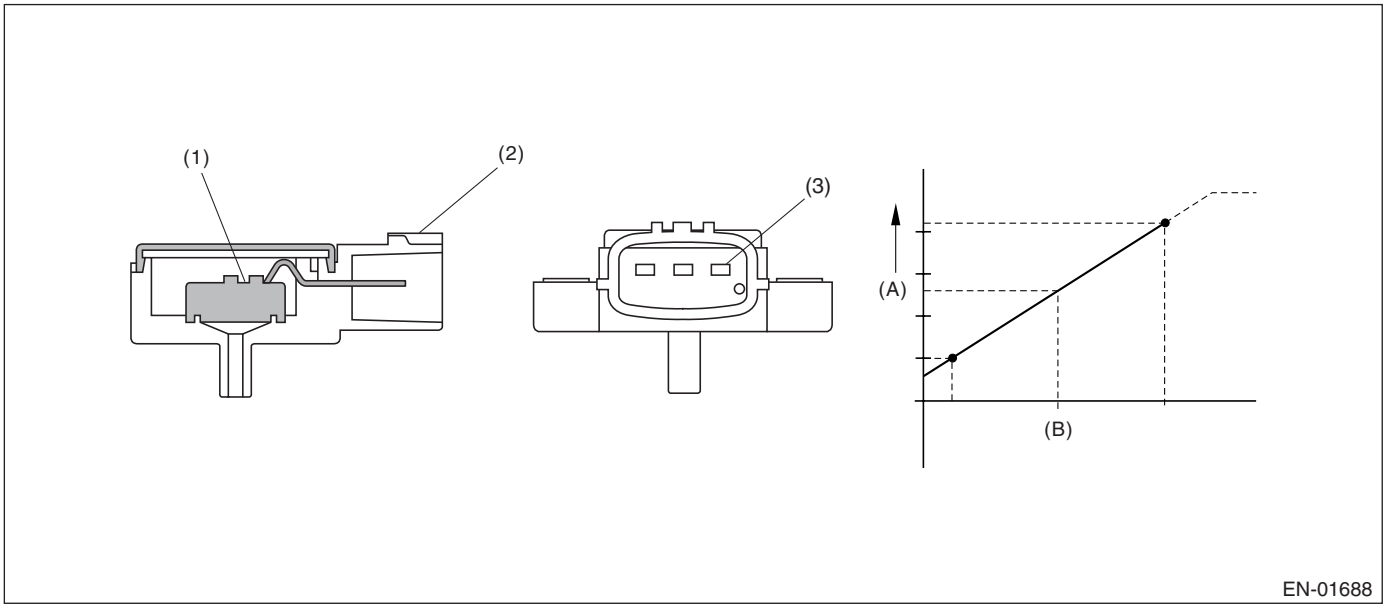
Memorize the freeze frame data. (For test mode $02)

K: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Pressure detecting part
(2) Connector
(3) Terminal
(A) Output voltage
(B) Input voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 10 V
Self-diagnosis timer after starting the engine	≥ 0.5 seconds

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis. Judge fail safe NG when the continuous time until completing the malfunction criteria below becomes more than time (0.1 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.88 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Calculate the intake manifold pressure using the map figured by engine speed and throttle opening grid.

9. ECM OPERATION AT DTC SETTING

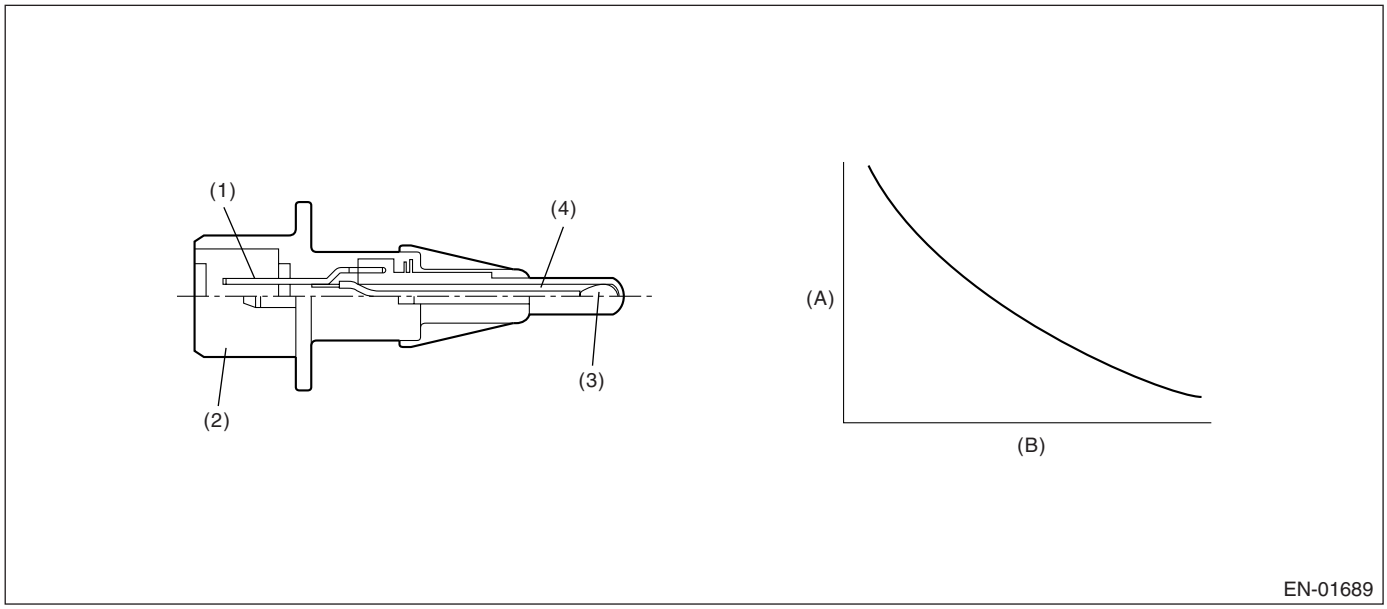
Memorize the freeze frame data. (For test mode $02)

L: DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property.
Judge NG when the intake air temperature is high regardless of the driving condition that the intake air temperature may be low.

2. COMPONENT DESCRIPTION



(1) Terminal
(2) Connector
(3) Thermistor
(4) Housing
(A) Resistance value (Ω)
(B) Intake air temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing all the malfunction criteria below becomes more than the time (3 seconds) needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 40°C (104°F)
Fuel temperature	< 40°C (104°F)
Fuel level	≥ 9 ℓ (2.4 US gal, 2.0 Imp gal)
Intake air temperature	≥ 80°C (176°F)

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Intake air temperature	< 80°C (176°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Make the intake air temperature 40°C (104°F).

9. ECM OPERATION AT DTC SETTING

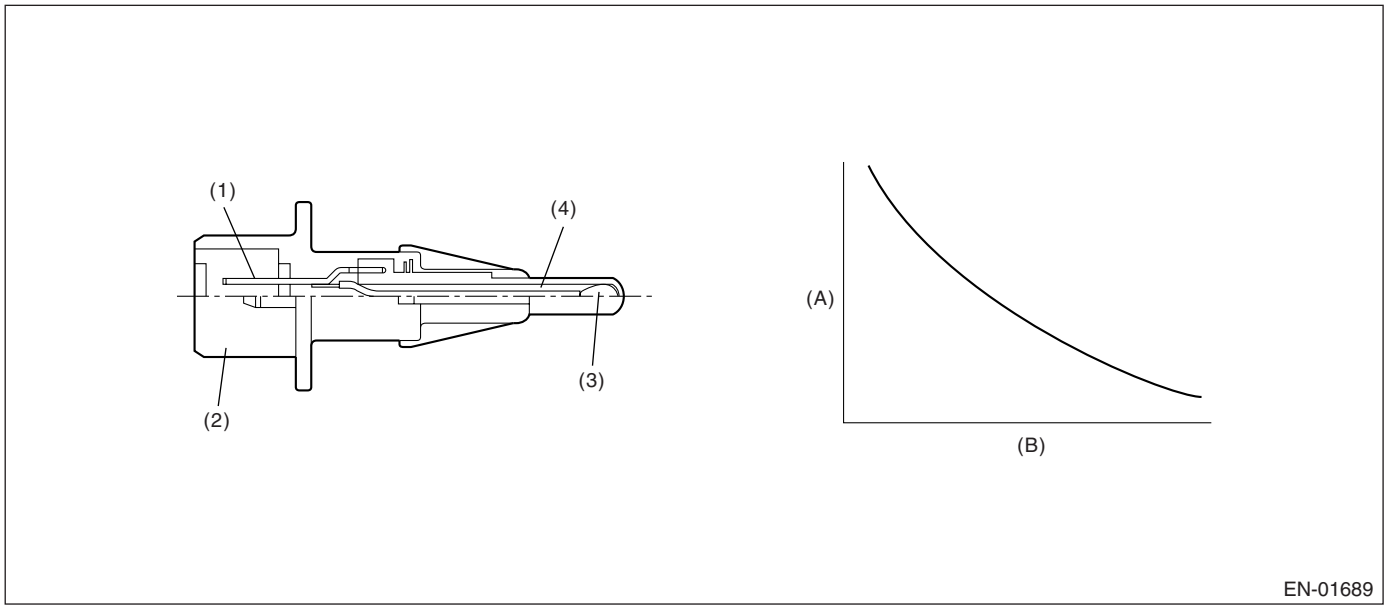
Memorize the freeze frame data. (For test mode $02)

M: DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Terminal
(2) Connector
(3) Thermistor
(4) Housing

(A) Resistance value (Ω)
(B) Intake air temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
Timer after starting the engine	≥ 1 second

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis. Judge fail safe NG when the continuous time until completing the malfunction criteria below becomes more than the time (0.1 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.1 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Make the intake air temperature 40°C (104°F).

9. ECM OPERATION AT DTC SETTING

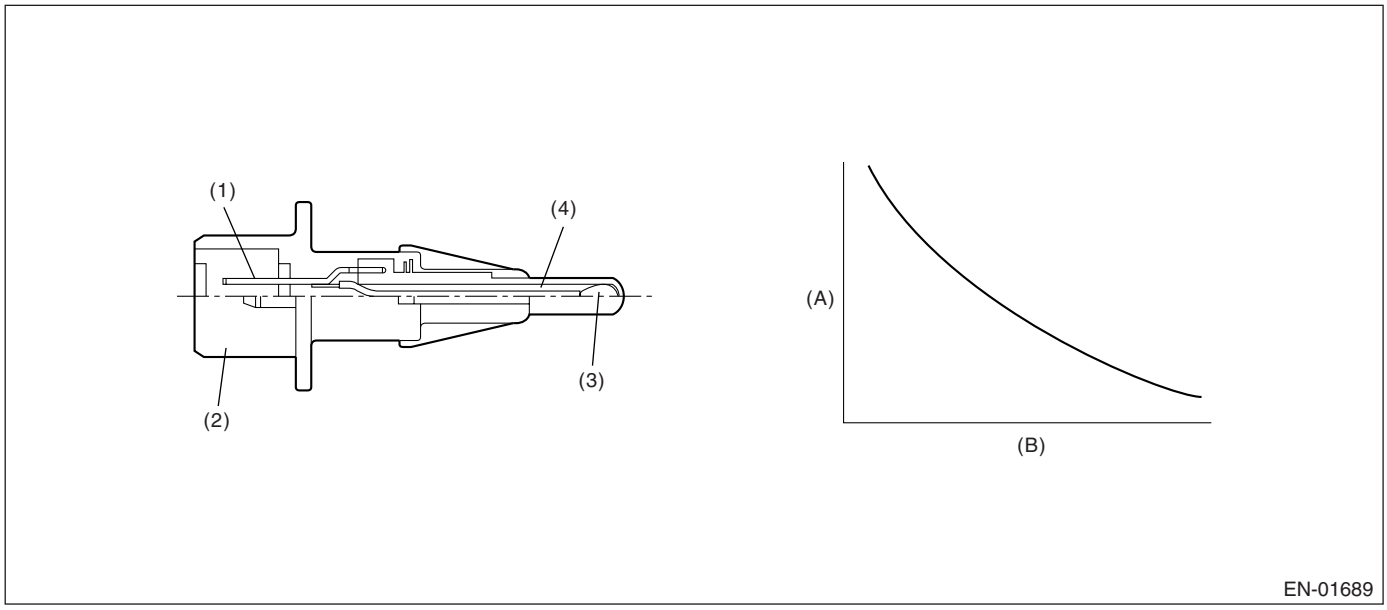
Memorize the freeze frame data. (For test mode $02)

N: DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Terminal
(2) Connector
(3) Thermistor
(4) Housing

(A) Resistance value (Ω)
(B) Intake air temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
Timer after starting the engine	≥ 1 second

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis. Judge fail safe NG when the continuous time until completing the malfunction criteria below becomes more than the time (0.1 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	> 4.85 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Make the intake air temperature 40°C (104°F).

9. ECM OPERATION AT DTC SETTING

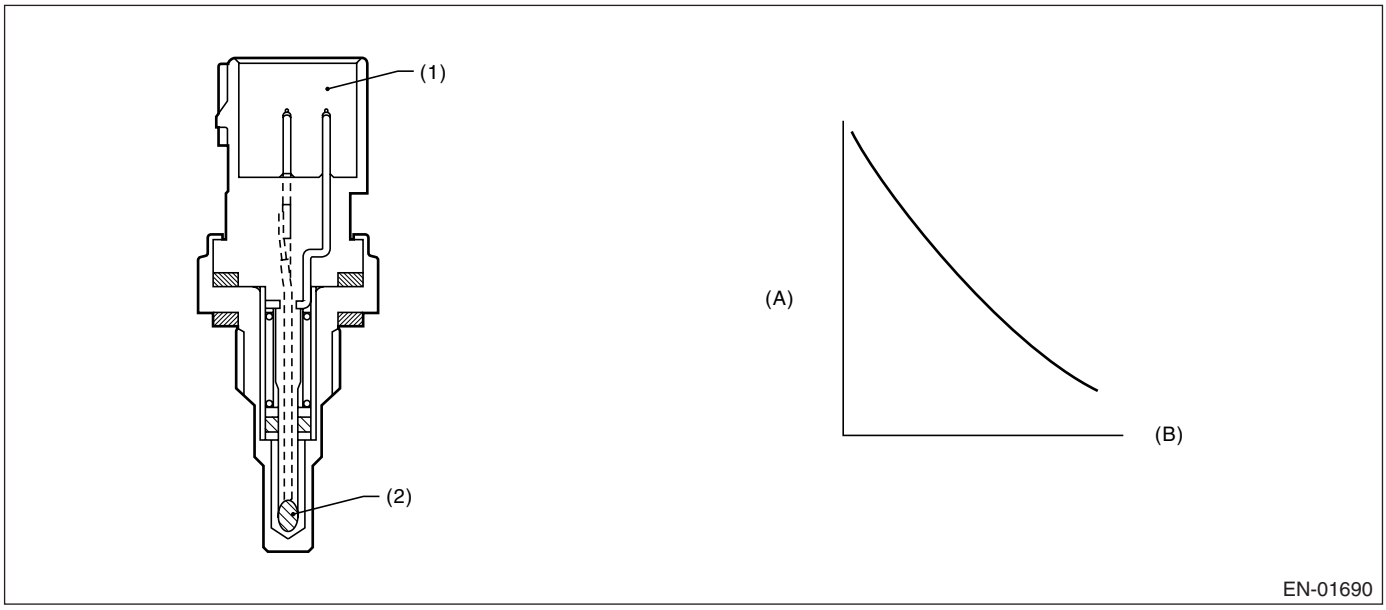
Memorize the freeze frame data. (For test mode $02)

O: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
Timer after starting the engine	≥ 1 second

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis.
Judge fail safe NG when the continuous time until completing the malfunction criteria below becomes more than the time (0.2 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.1 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Keep the engine coolant temperature at 70°C (158°F).

9. ECM OPERATION AT DTC

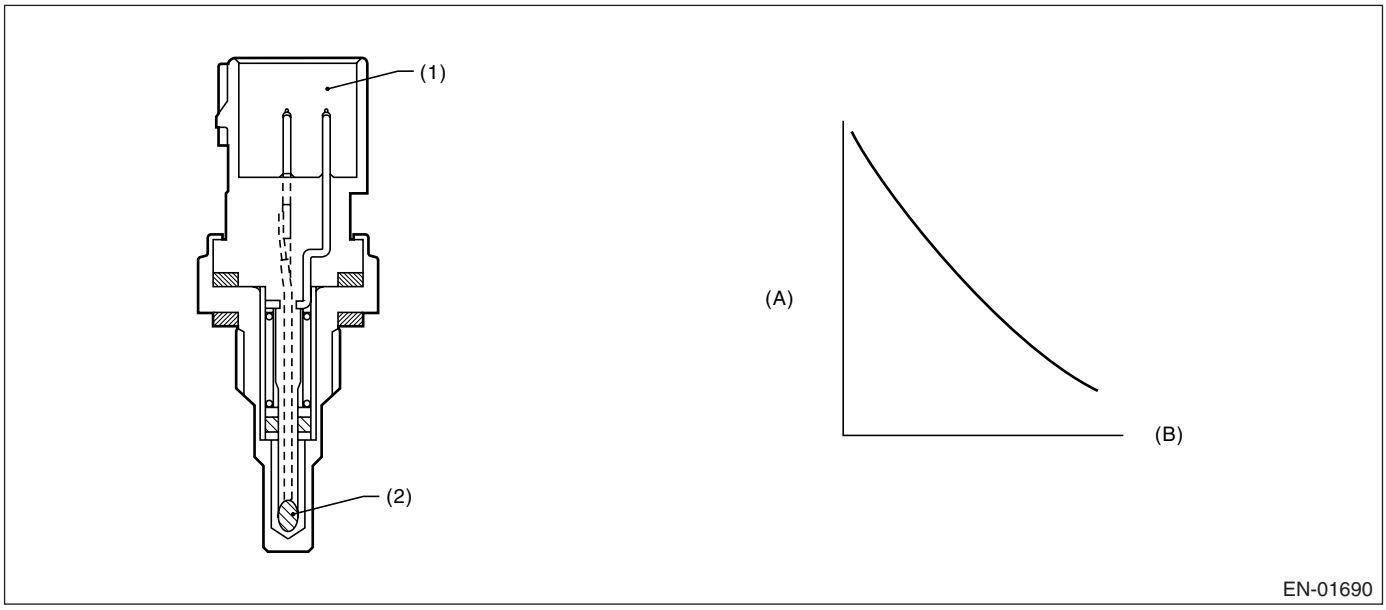
Memorize the freeze frame data. (For test mode $02)

P: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
Timer after starting the engine	≥ 1 second

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis.
Judge fail safe NG when the continuous time until completing the malfunction criteria below becomes more than the time (0.2 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.85 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Keep the engine coolant temperature at 70°C (158°F).

9. ECM OPERATION AT DTC

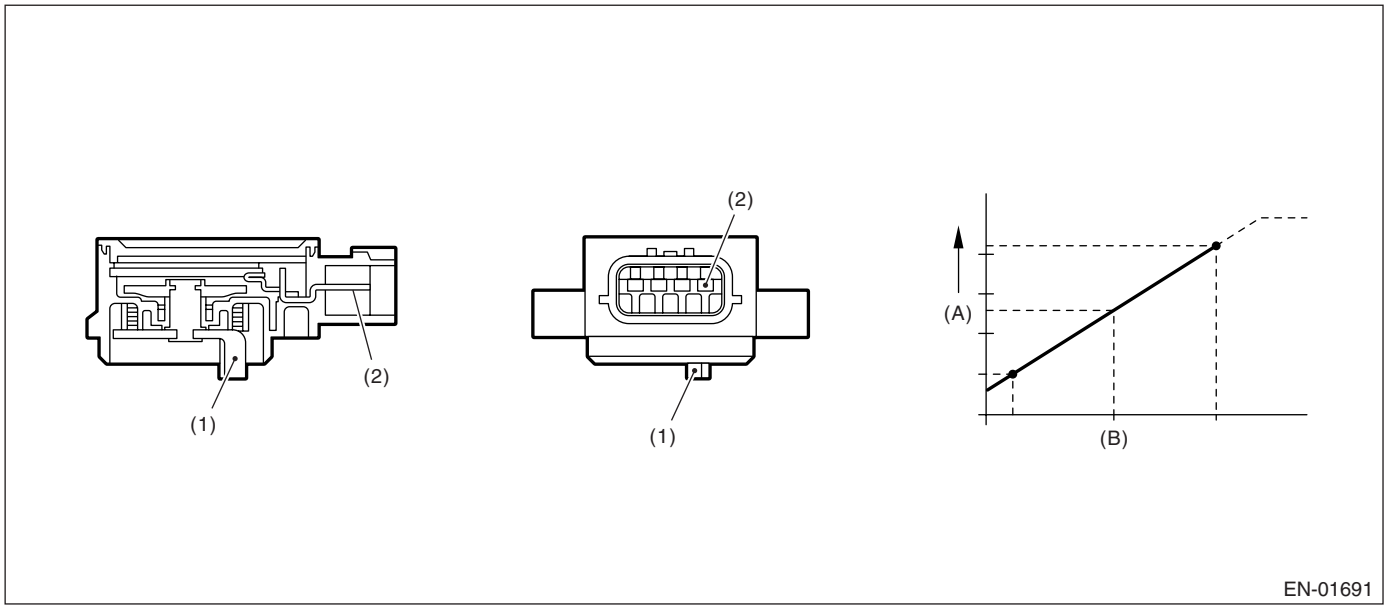
Memorize the freeze frame data. (For test mode $02)

Q: DTC P0121 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of throttle position sensor output property.
Judge NG when the throttle position value is low in spite of the driving condition that accelerator pedal seems to be depressed, or when the throttle position value is high in spite of the driving condition that accelerator pedal seems to be released from engine appearance.

2. COMPONENT DESCRIPTION



(1) Lever
(2) Terminal
(A) Output voltage
(B) Throttle angle

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Coolant temperature	≥ 75°C (167°F)

4. GENERAL DRIVE CYCLE

Perform the diagnosis continuously after starting engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria of Low side or High side below becomes more than time needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
(Low side)	
Output voltage	≤ 0.75 V
Engine speed	≥ 1,000 rpm
Amount of intake air	≥ 90 kg/h
Intake manifold pressure	≥ 80 kPa (600 mmHg, 24 inHg)
(High side)	
Output voltage	≥ 1.6 V
Engine speed	600 — 1,900 rpm
Amount of intake air	≤ 33.8 kg/h
Intake manifold pressure	≤ 47 kPa (352 mmHg, 14 inHg)

Time Needed for Diagnosis:

Low side	3 seconds
High side	10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
(Low side)	
Output voltage	> 0.75 V
Engine speed	≥ 1,000 rpm
Amount of intake air	≥ 90 kg/h
Intake manifold pressure	≥ 80 kPa (600 mmHg, 24 inHg)
(High side)	
Output voltage	≤ 1.6 V
Engine speed	600 — 1,900 rpm
Amount of intake air	≤ 33.8 kg/h
Intake manifold pressure	≤ 47 kPa (352 mmHg, 14 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Fix the throttle position to 6.4°.

9. ECM OPERATION AT DTC

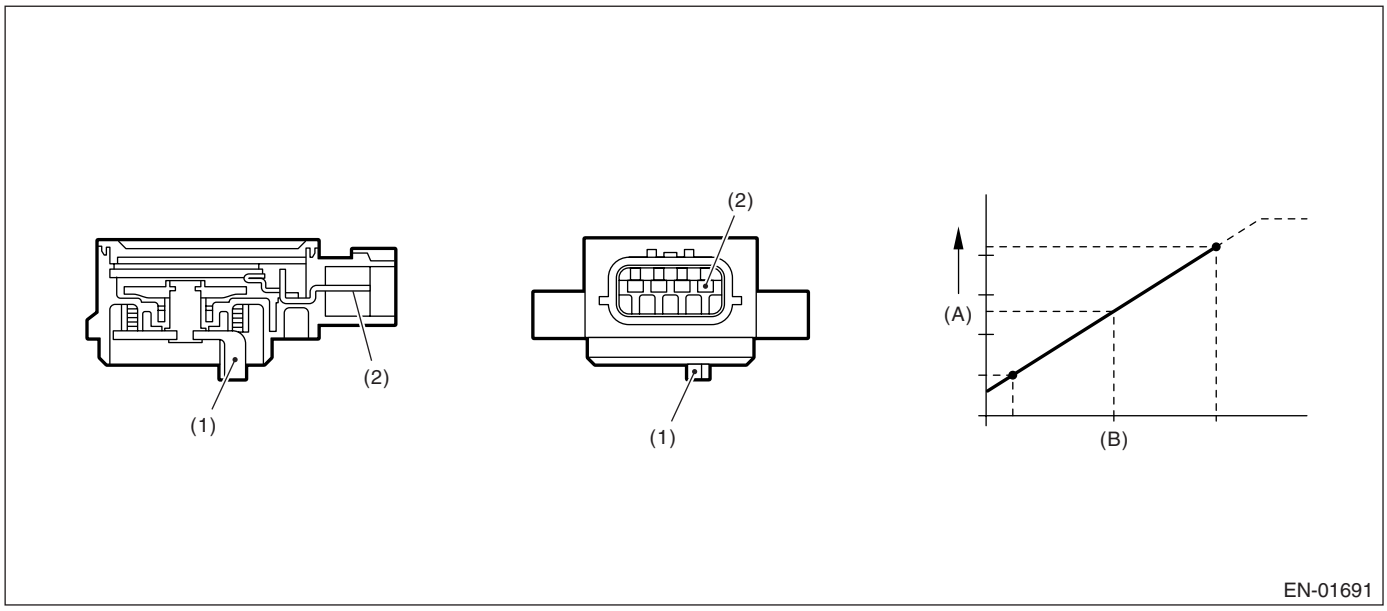
Memorize the freeze frame data. (For test mode $02)

R: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Lever
(2) Terminal
(A) Output voltage
(B) Throttle angle

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVE CYCLE

Perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis.
Judge fail safe NG when the continuous time until completing the malfunction criteria below becomes more than the time (0.1 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.1 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Fix the throttle position to 6.4°.

9. ECM OPERATION AT DTC

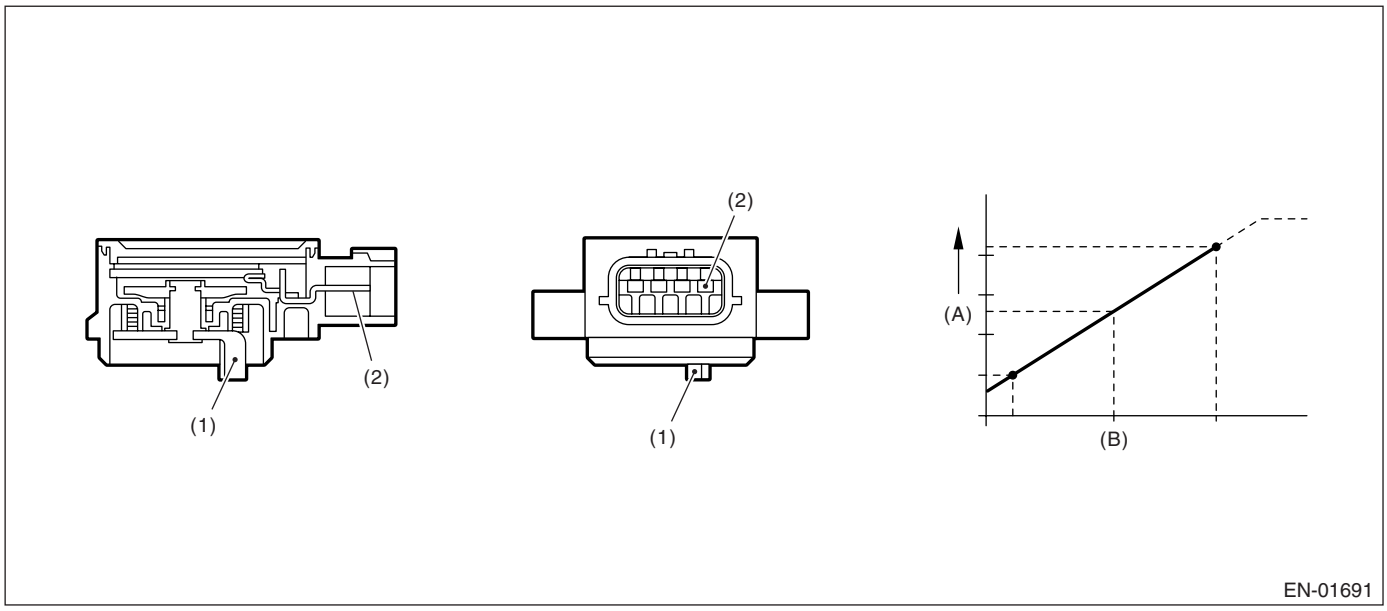
Memorize the freeze frame data. (For test mode $02)

S: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Lever
(2) Terminal
(A) Output voltage
(B) Throttle angle

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVE CYCLE

Perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis.
Judge fail safe NG when the continuous time until completing the malfunction criteria below becomes more than the time (0.1 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.9 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Fix the throttle position to 6.4°.

9. ECM OPERATION AT DTC

Memorize the freeze frame data. (For test mode $02)

T: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature sensor output property. Judge NG when the engine coolant temperature does not increase after engine starting in spite of the driving condition that it seems to increase.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Closed loop coolant temperature property diagnosis	Incomplete

3. GENERAL DRIVE CYCLE

Always perform the diagnosis until the engine coolant temperature becomes 20°C (68°F) after starting engine with cooled condition or until NG is judged once.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the engine coolant temperature is more than 20°C (68°F) or more.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 20°C (68°F)
Timer after starting the engine	≥ Judgment time

Judgment time: Find from minimum engine coolant temperature.

Minimum engine coolant temperature °C (°F)	−30 (−22)	0 (32)	30 (86)	60 (140)	64.25 (147.65)
Judgment time (second)	630.05	429.5	228.95	28.4	0

Time Needed for Diagnosis: Change at minimum engine coolant temperature.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Keep engine coolant temperature at 70°C (158°F).

8. ECM OPERATION AT DTC

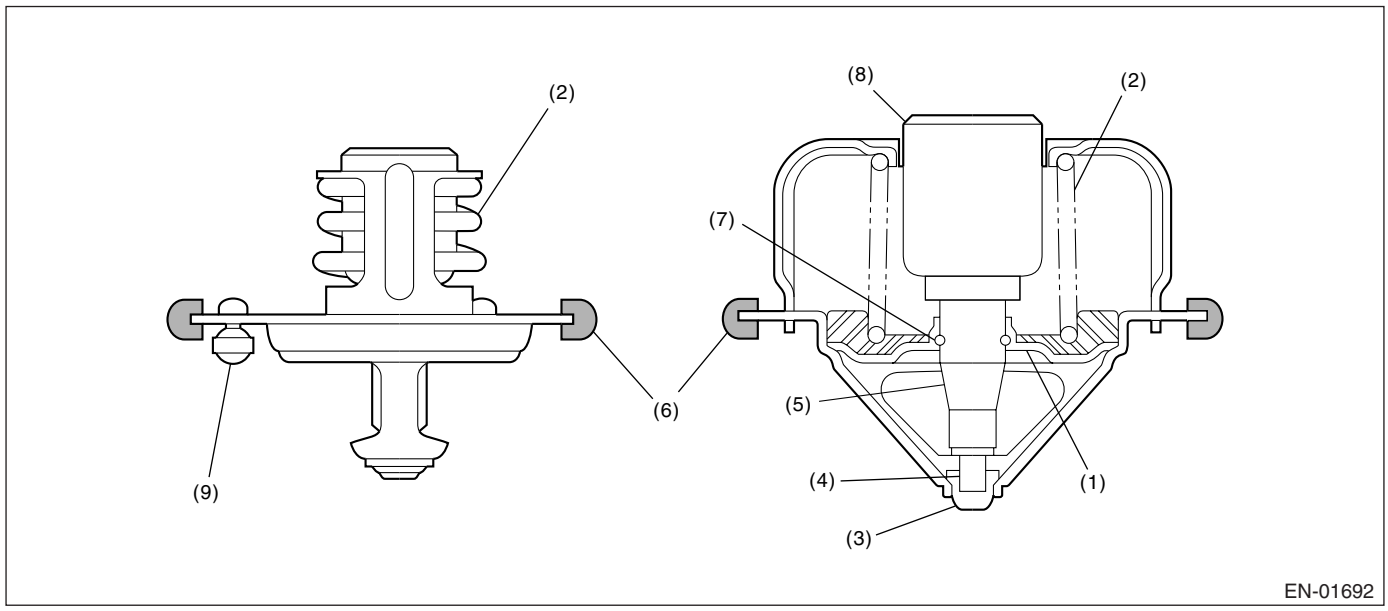
Memorize the freeze frame data. (For test mode $02)

U: DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of thermostat.
Thermostat open fixing may result in overcooling. Therefore, engine coolant temperature becomes low and the control is unable under theoretical air fuel ratio, so the exhaust deteriorate. Furthermore, it is impossible to perform the other diagnosis if the engine coolant temperature does not rise. For these reasons, thermostat open fixing diagnosis should be conducted.
Judge NG when the estimated engine coolant temperature is higher than engine coolant temperature and the difference between them is large. Judge OK when the engine coolant temperature becomes 75°C (167°F) before judging NG.

2. COMPONENT DESCRIPTION



(1) Valve
(2) Spring
(3) Stopper
(4) Piston
(5) Guide
(6) Rubber packing
(7) Stop ring
(8) Wax element
(9) Jiggle valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ambient air temperature	≥ −7°C (19°F)
Engine coolant temperature at engine starting	< 55°C (131°F)

4. GENERAL DRIVING CYCLE

After starting the engine at cool condition, always perform the diagnosis until the engine coolant temperature becomes more than 75°C (167°F).

5. DIAGNOSTIC METHOD

Judge NG when the estimated engine coolant temperature comes to 75°C (167°F) before the engine coolant temperature becomes 75°C (167°F) and the difference between them becomes more than 30°C (86°F). Judge OK when the engine coolant temperature comes to 75°C (167°F) before judging NG.

• Abnormality Judgment

Judge NG when the cumulative time becomes more than 30 seconds after completing all the malfunction criteria below.

Judgment Value

Malfunction Criteria	Threshold Value
(Estimated-measured) coolant temperature	> 30°C (86°F)
Engine coolant temperature	< 75°C (167°F)
Estimated coolant temperature	≥ 75°C (167°F)
Vehicle speed	≥ 40 km/h (25 MPH)
Injector pulse	≥ 1.92 milliseconds

Time Needed for Diagnosis: 30 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
(Estimated-measured) coolant temperature	≤ 30°C (86°F)
Engine coolant temperature	≥ 75°C (167°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

V: DTC P0129 BAROMETRIC PRESSURE TOO LOW

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of atmospheric pressure sensor output property.
Intake manifold pressure and atmospheric pressure are the same from turning the IG key to ON to turning the start SW to ON. Therefore, compare the pressure from intake manifold pressure and atmospheric pressure sensors, and then judge NG when their difference is large.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Neutral switch	ON
Engine speed	< 500 rpm
Vehicle speed	< 2 km/h (1 MPH)
Start SW	OFF
(Max-min) manifold absolute pressure output	< 1.2 kPa (9 mmHg, 0.4 inHg)
Atmospheric Pressure Sensor Circuit Range/Performance diagnosis	Not yet.

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once from the IG key turned to ON to the start SW turned to ON.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (0.1 seconds) needed for diagnosis. Judge OK when the malfunction criteria below are not completed.
Judgment Value

Malfunction Criteria	Threshold Value
| Atmospheric-manifold absolute pressure |	≥ 27 kPa (200 mmHg, 8 inHg)

Time Needed for Diagnosis: 0.1 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Make the atmospheric pressure 101 kPa (760 mmHg, 29.8 inHg).

9. ECM OPERATION AT DTC SETTING

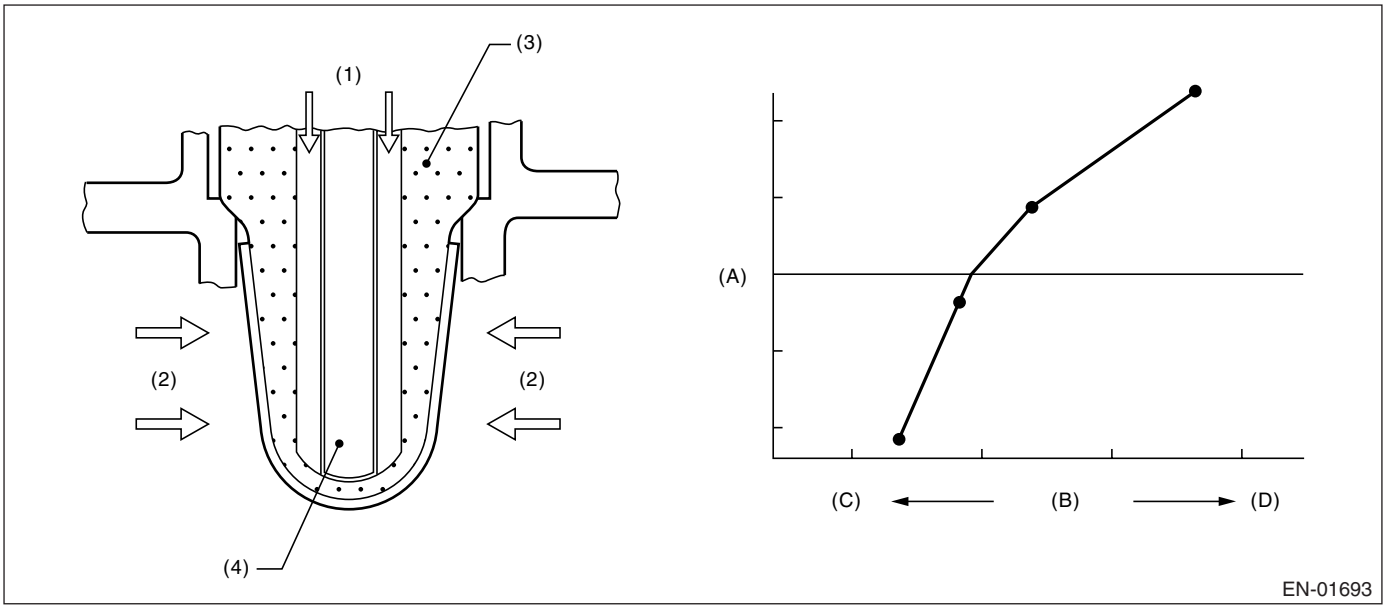
Memorize the freeze frame data. (For test mode $02)

W: DTC P0130 O_2 SENSOR CIRCUIT (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of front oxygen (A/F) sensor output property.
Judge NG when the front oxygen (A/F) sensor output continues to be lean.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Closed loop control	In operation
Fuel shut-off event	Not in operation
Misfire rate during 200 engine revs.	≤ 1.0%
After engine starting	230 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Fuel level	≥ 9 ℓ (2.4 US gal, 2.0 Imp gal)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 200 seconds after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than the time (10 seconds) needed for diagnosis

Judgment Value

Malfunction Criteria	Threshold Value
A/F sensor output (VAF)	> 2.3 V (lean)
Lambda fudge factor (LAMBDA)	= Rich clamp at MAX limiter (1.375)

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.
• Normality Judgment

Judge OK when the cumulative time until completing all the malfunction criteria below becomes more than the time (10 seconds) needed for diagnosis
Judgment Value

Malfunction Criteria	Threshold Value
A/F sensor output (VAF)	≤ 2.3 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

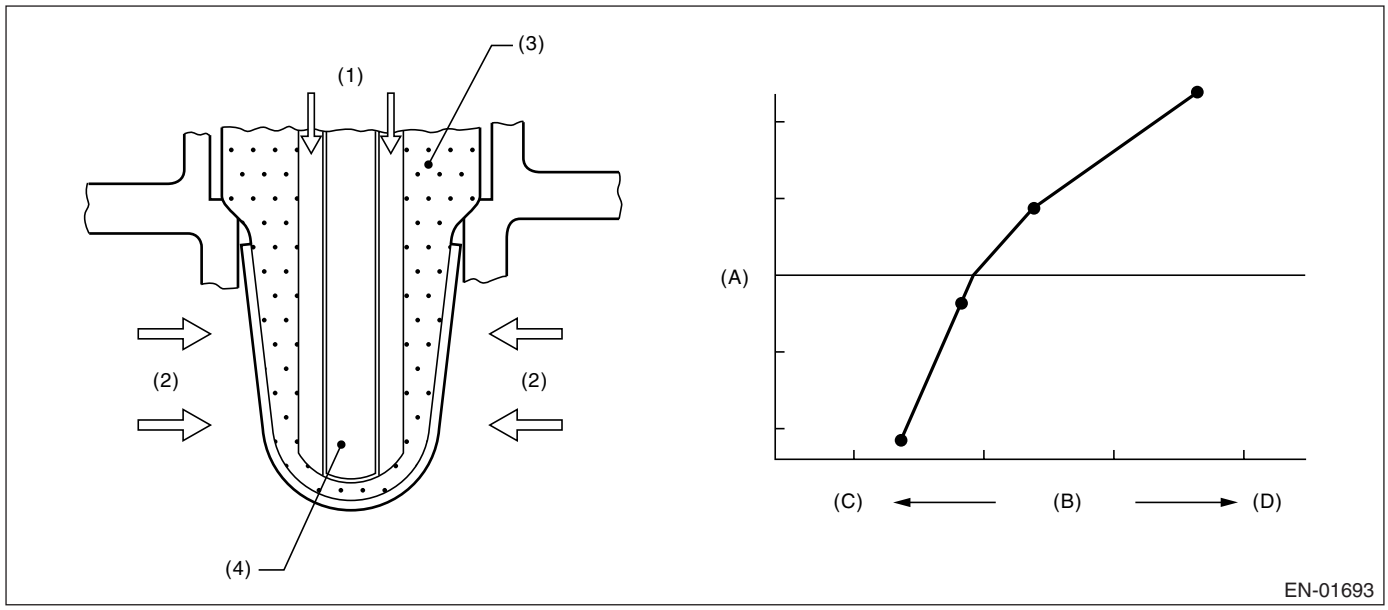
Memorize the freeze frame data. (For test mode $02)

X: DTC P0131 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the low voltage short circuit of front oxygen (A/F) sensor.
Diagnosis is performed using A/F microcomputer, and communication is established between A/F microcomputer and main microcomputer. Judge NG when the data of low voltage short circuit NG is transmitted.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Front oxygen (A/F) sensor diagnosis	Incomplete

4. GENERAL DRIVING CYCLE

Terminate the diagnosis if the open circuit, low voltage short circuit or high voltage short circuit becomes NG once by performing diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below is completed.
Judgment Value

Malfunction Criteria	Threshold Value
AFV voltage ≤ 0.3 V	Continue for 4.02 seconds or more
OR; AFC voltage ≤ 0.4 V	Continue for 4.02 seconds or more.

Time Needed for Diagnosis: 4.02 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

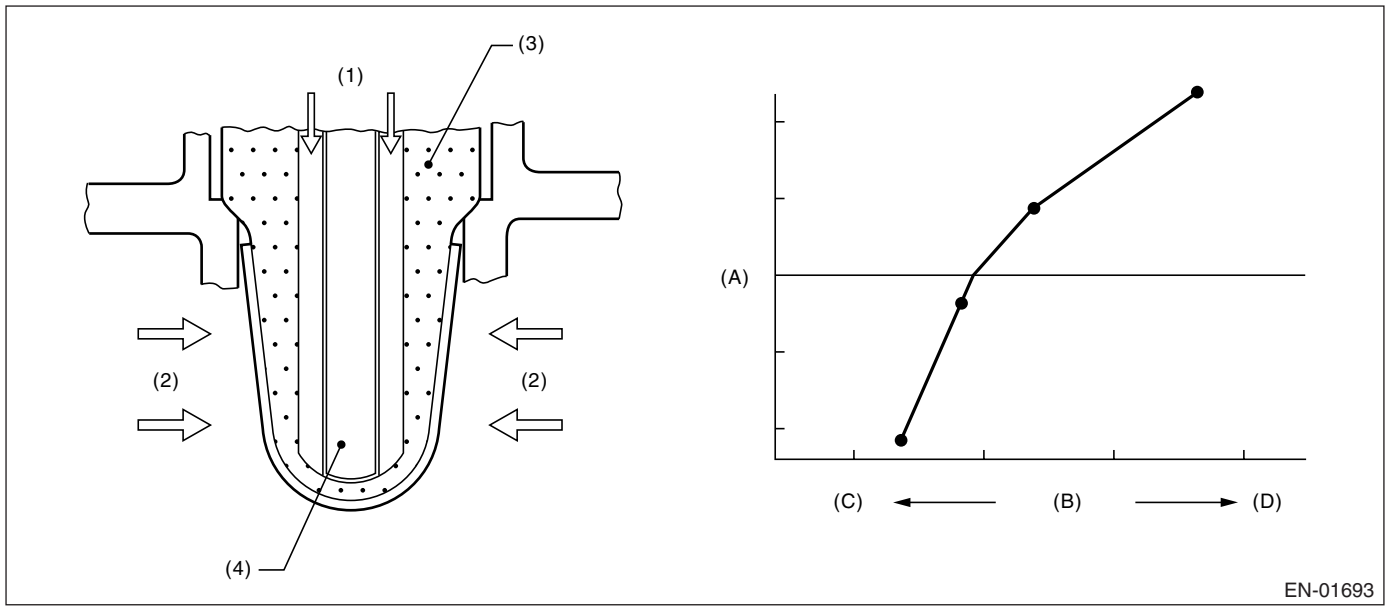
Memorize the freeze frame data. (For test mode $02)

Y: DTC P0132 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the high voltage short circuit of front oxygen (A/F) sensor.
Diagnosis is performed using A/F microcomputer, and communication is established between A/F microcomputer and main microcomputer. Judge NG when the data of high voltage short circuit NG is transmitted.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Front oxygen (A/F) sensor diagnosis	Incomplete

4. GENERAL DRIVING CYCLE

Terminate the diagnosis if the open circuit, low voltage short circuit or high voltage short circuit becomes NG once by performing diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below is completed.
Judgment Value

Malfunction Criteria	Threshold Value
AFV voltage ≥ 4.4 V or AFC voltage ≥ 4.4 V,	Continue for 4.02 seconds or more
OR; heater current ≥ 23 A during heater continuity,	Continue for 385 minutes or more
AND; AFV / AFC	VB short

Time Needed for Diagnosis: 4.02 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

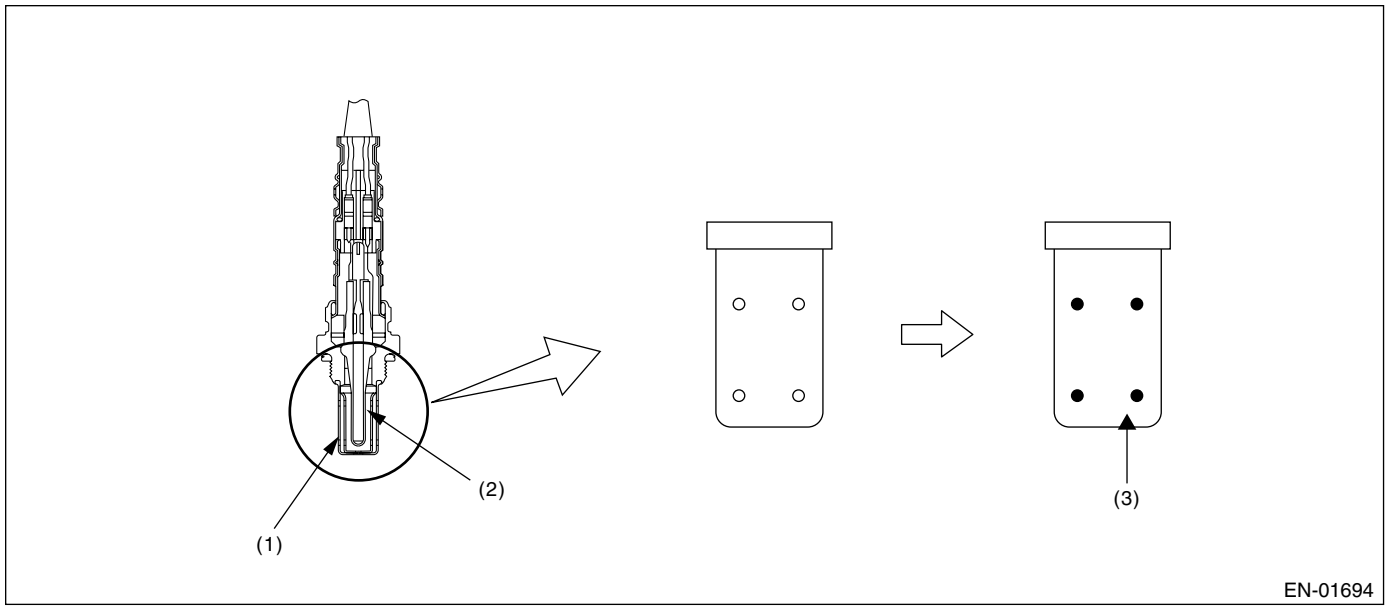
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

Z: DTC P0133 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

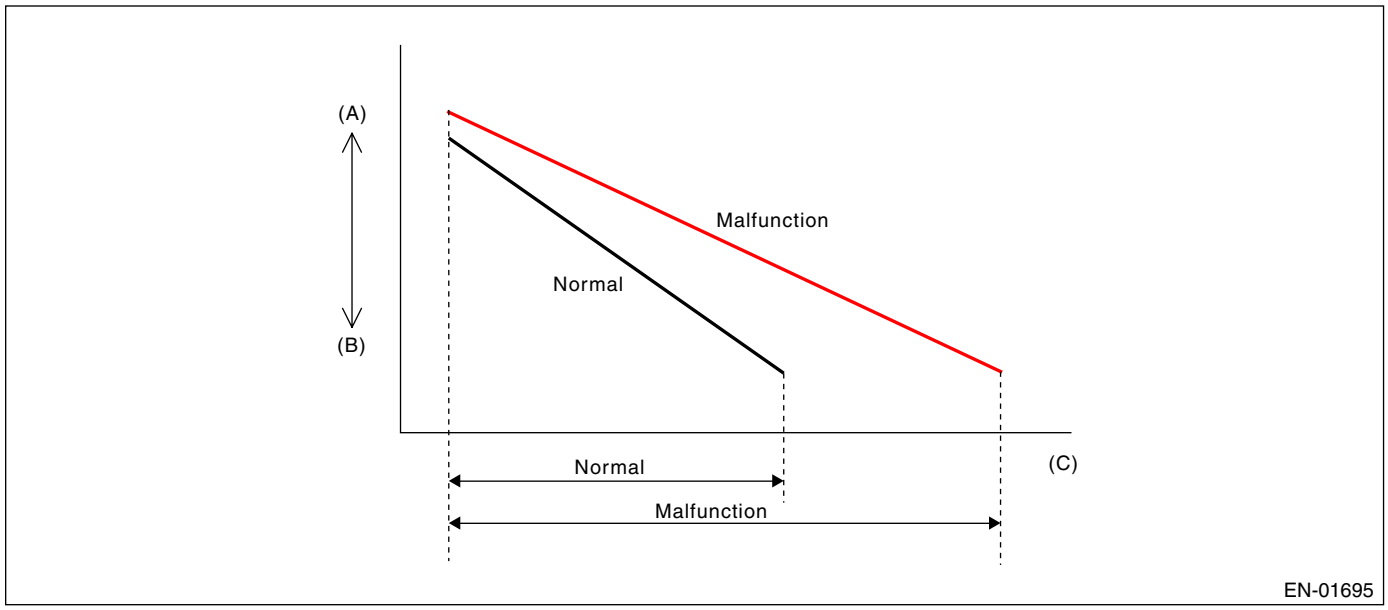
1. OUTLINE OF DIAGNOSIS

Detect the slow response of front oxygen (A/F) sensor.
Front oxygen (A/F) sensor cover has some ventilation holes for exhaust gas. Clogged ventilation holes are diagnosed.
When the holes are clogged, the A/F output variation becomes slow comparing with the actual A/F variation because oxygen which reaches the zirconia layer is insufficient. Therefore, if the cover has clogged holes, the rich to lean judgment in ECM is delayed when the change from rich to lean is caused.



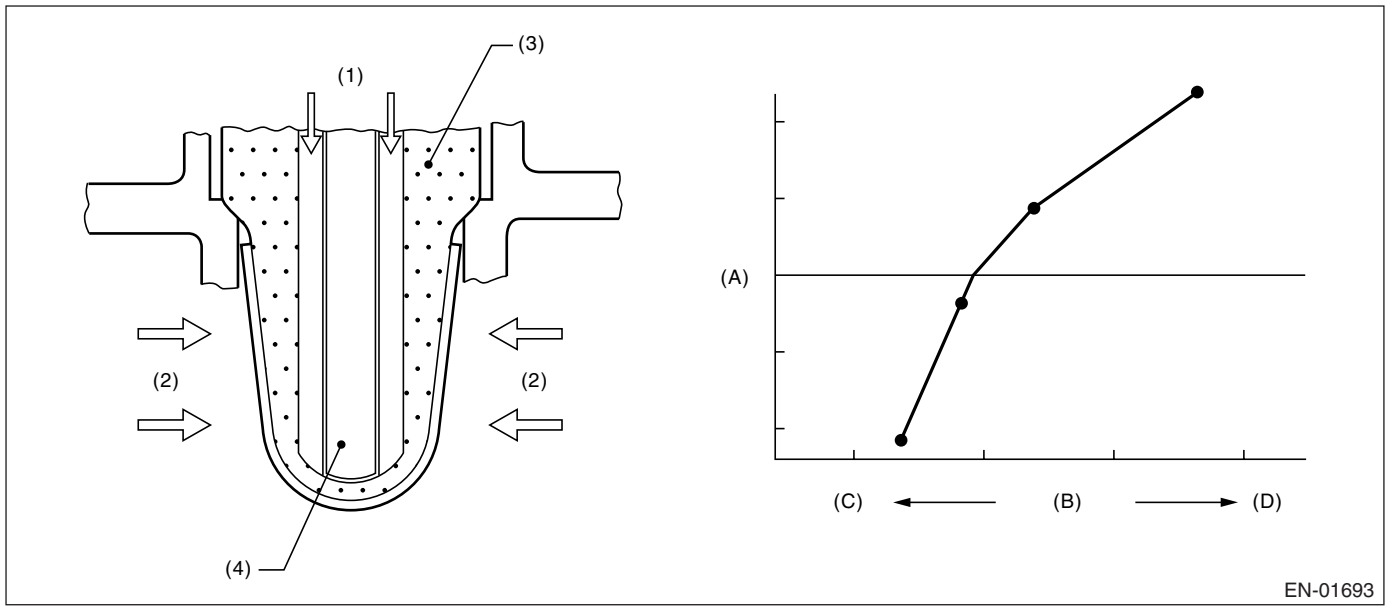
(1) Cover
(2) Zirconia
(3) Clogging

When abnormal, the variation period from rich to lean is longer than when normal, as shown in the figure below.
When the condition is completed, the variation time from rich to lean and vice versa is calculated by varying the desired A/F value. Judge NG when the period is long.



(A) Rich
(B) Lean
(C) Time

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater

(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
Closed loop control	In operation
Average lambda	0.703 ←→ 1.375
After starting the engine	225 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Injector pulse	1.792 ←→ 4.032 milliseconds
Engine speed	1,800 ←→ 3,000 rpm
Vehicle speed	≥ 76 km/h (47 MPH)
Atmospheric air pressure	≥ 76 kPa (568 mmHg, 22 inHg)
Throttle position change for 90 milliseconds	< 1.60°
Impedance of lambda sensor	10 ←→ 40 Ω
Misfire rate at engine 200 rev.	≤ 1.0%
A/F sensor response diagnosis	Incomplete
Idle SW	OFF

4. GENERAL DRIVING CYCLE

Perform diagnosis constantly at 80 km/h (50 MPH) just once in 225 seconds after starting the engine.

5. DIAGNOSTIC METHOD

When enable conditions are completed, measure the A/F sensor output A/F value variation period by changing air fuel ratio desired value to lean and rich. Judge NG when this period is long. Judge OK when this period is short.
Judge NG when the malfunction criteria below is completed. Judge OK when the malfunction criteria below is not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Average time of 5 changes from rich to lean, and from lean to rich Response time when noise is detected is not used as data.	> See Map 5

Map 5

Engine Speed (Ne) (rpm)	1.75 ≤ TP < 2.25 (milliseconds)	2.25 ≤ TP < 2.75 (milliseconds)	2.75 ≤ TP < 3.19 (milliseconds)	3.19 ≤ TP (milliseconds)
1,800 ≤ Ne < 2,100	1,898	1,731	1,658	1,591
2,100 ≤ Ne < 2,500	1,720	1,570	1,540	1,530
2,500 ≤ Ne < 3,000	1,674	1,535	1,499	1,478
3,000 ≤ Ne	1,674	1,535	1,499	1,478

Time Needed for Diagnosis: 2 to 12 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

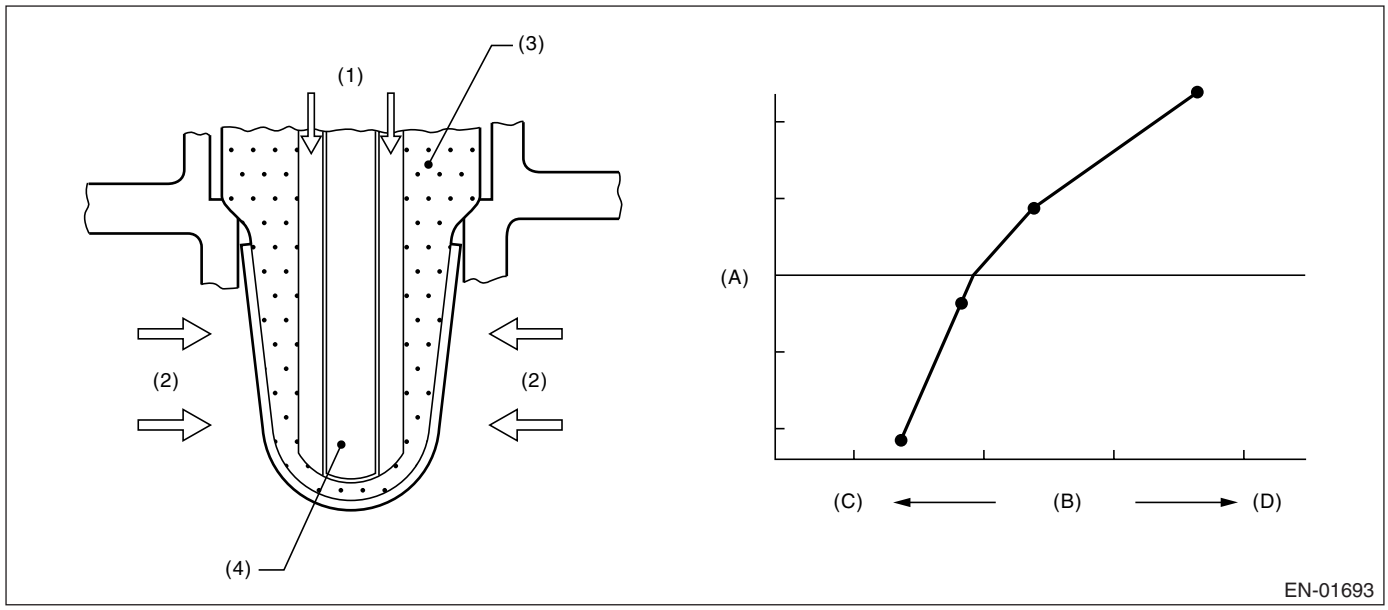
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AA:DTC P0134 O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open circuit of front oxygen (A/F) sensor.
Diagnosis is performed using A/F microcomputer, and communication is established between A/F microcomputer and main microcomputer. Judge NG when the data of open circuit NG is transmitted.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Front oxygen (A/F) sensor diagnosis	Incomplete

4. GENERAL DRIVING CYCLE

Terminate the diagnosis if the open circuit, low voltage short circuit or high voltage short circuit becomes NG once by performing diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when all the malfunction criteria below is completed.
Judgment Value

Malfunction Criteria	Threshold Value
Heater control	In operation
Target heater power = 25 W	Continues more than 5 seconds
Element resistance ≥ 250 Ω	Continues more than 5 seconds

Time Needed for diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

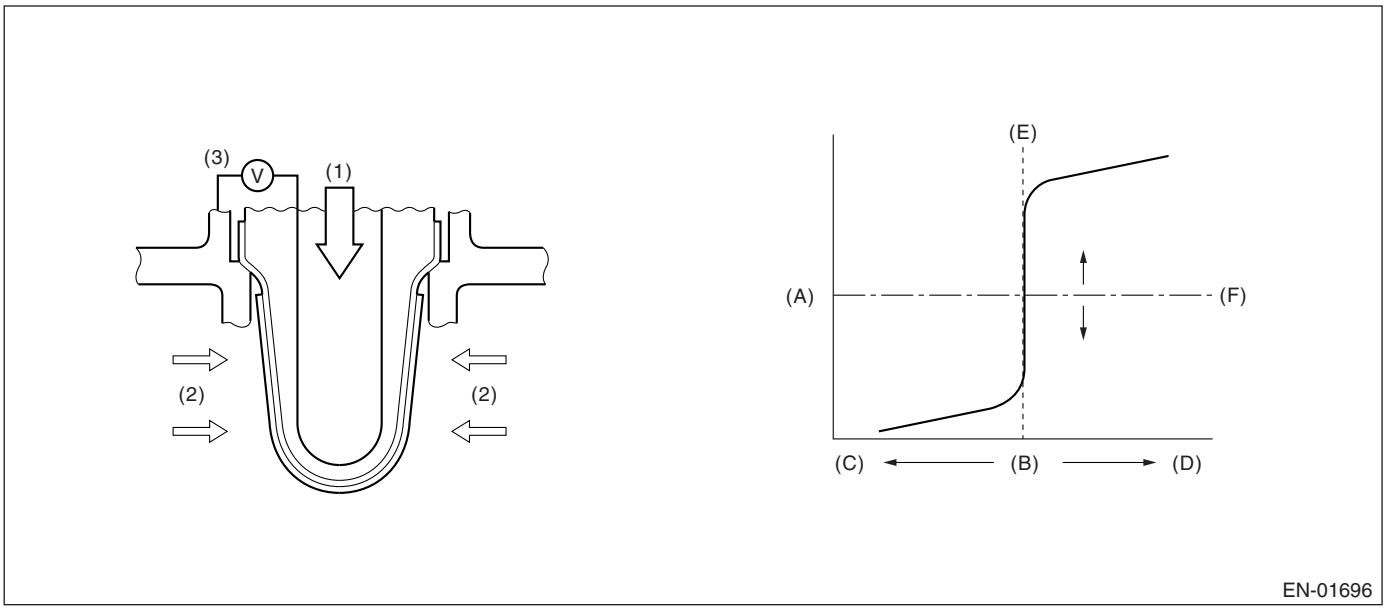
Memorize the freeze frame data. (For test mode $02)

AB:DTC P0137 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of rear oxygen sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Closed loop control	In operation
Rear oxygen sensor Low diagnosis	Unexperienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once during the closed loop.

5. DIAGNOSTIC METHOD

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than time needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Maximum output voltage	< 490 mV
Coolant temperature	≥ 75°C (167°F)
Injector pulse	≥ 2.24 milliseconds
Engine speed	≥ 1,500 rpm
2 seconds or more fuel shut-off in decel.	Experienced
Vehicle speed	≥ 32 km/h (20 MPH)
Engine misfire	None
Air fuel ratio feed back	Not in clamp

Time Needed for Diagnosis: 200 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
maximum output voltage	≥ 490 mV

6. DTC CLEAR CONDITION

- When the OK driving cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

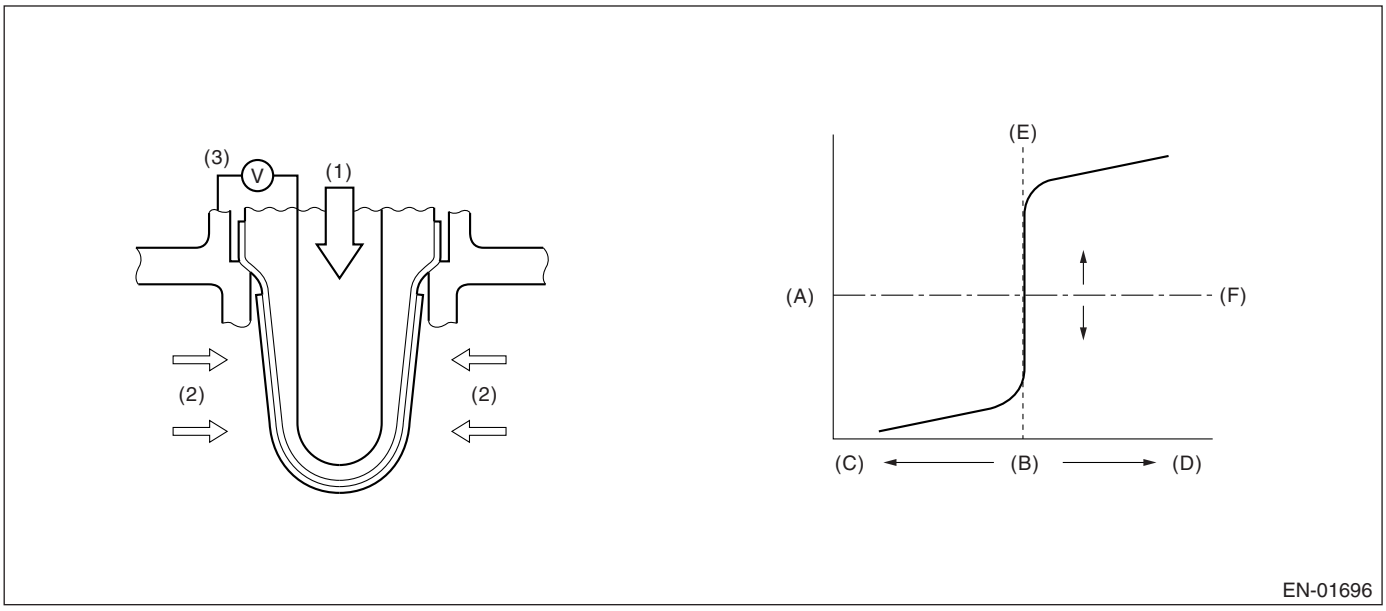
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AC:DTC P0138 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of rear oxygen sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force

(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Closed loop control	In operation
Rear oxygen sensor High diagnosis	Unexperienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once during the closed loop.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing all the malfunction criteria below becomes more than time needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Minimum output voltage	> 250 mV
Coolant temperature	≥ 75°C (167°F)
Injector pulse	≥ 2.24 milliseconds
Engine speed	≥ 1,500 rpm
2 seconds or more fuel shut-off in decel.	Experienced
Vehicle speed	≥ 32 km/h (20 MPH)
Engine misfire	No
Air fuel ratio feed back	Not in clamp

Time Needed for Diagnosis: 200 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Minimum output voltage	≤ 250 mV

6. DTC CLEAR CONDITION

- When the OK driving cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

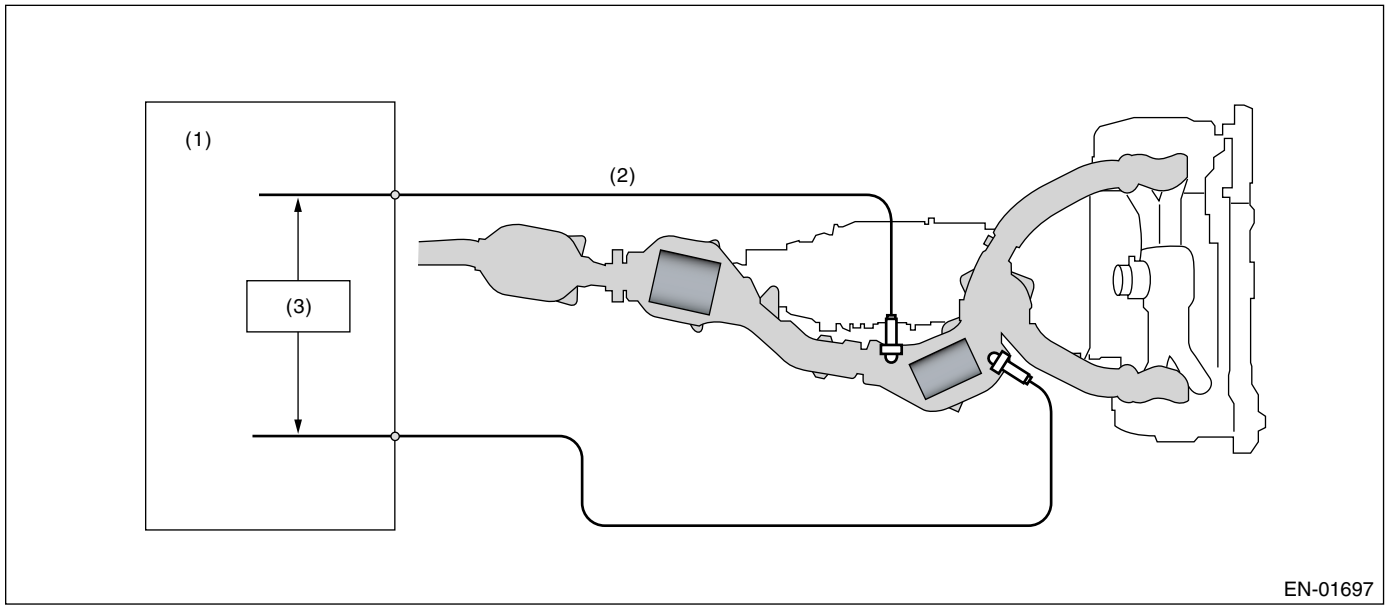
9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AD:DTC P0139 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

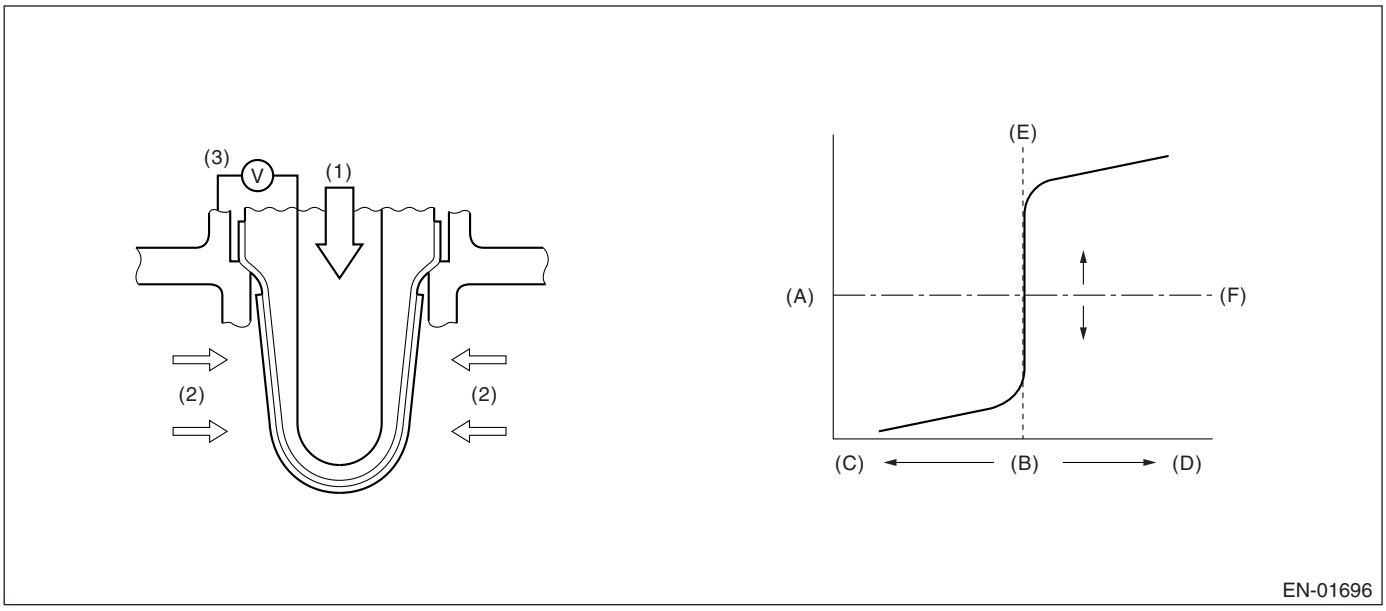
1. OUTLINE OF DIAGNOSIS

Detect the slow response of rear oxygen sensor.
Calculate the response time of the output change of the rear oxygen sensor when the A/F ratio changes from rich to lean. And carry out the diagnosis comparing the calculated response time with the threshold value.



(1) Engine control module (ECM)
(2) Rear oxygen sensor
(3) Diagnosis circuit

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force

(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Closed loop control with rear oxygen sensor	In operation
Closed loop control	In operation
Oxygen sensor response diagnosis	Incomplete

4. GENERAL DRIVING CYCLE

Diagnosis is performed only once during the closed loop. However, from the rapid acceleration, the deceleration fuel is cut to calculate the diagnostic value. (Pay attention to oxygen sensor voltage when deciding the deceleration timing.)

5. DIAGNOSTIC METHOD

When the rear oxygen sensor output voltage changes from 0.5 V (rich) to 0.15 V (lean), carry out calculation regarding the response time of the output change from 0.45 V to 0.2 V as diagnostic value. When the rear oxygen sensor output voltage does not change from 0.5 V to 0.15 V, do not carry out calculation even if the output changes from 0.45 V to 0.2 V.

• Abnormality Judgment

Judge NG when the rear oxygen sensor output change response time (diagnostic value) exceeds the threshold value.
Response time > 2 seconds (threshold value) → Abnormal
Judge NG when all of the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from rich (450 mV oxygen output) to lean (200 mV) if voltage reduces from 500 mV to 150 mV	≥ 0.43 seconds
2 seconds or more fuel shut-off in decel.	Experienced
After fuel shut-off	2 seconds or more

Time Needed for Diagnosis: 4 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

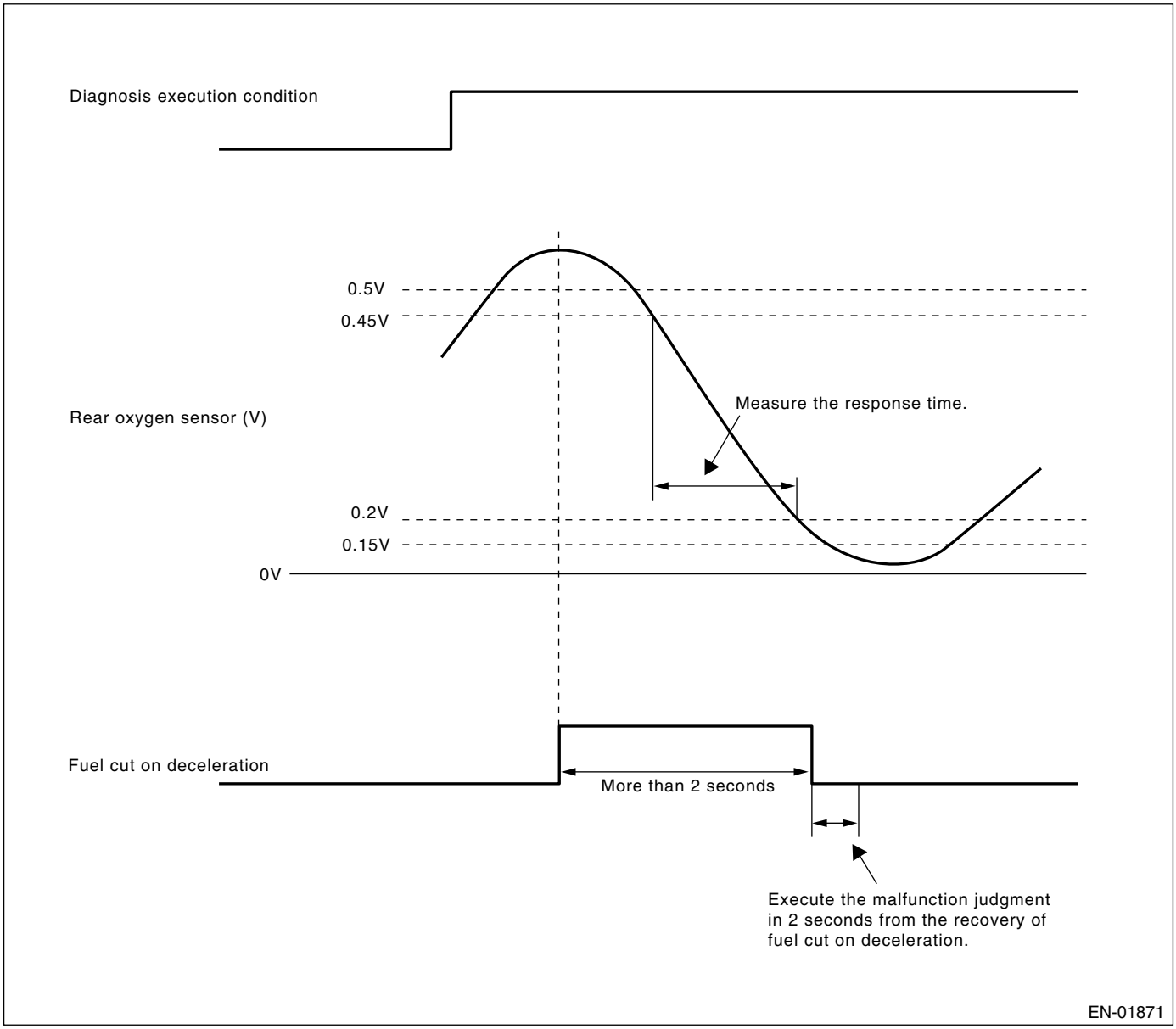
• Normality Judgment

Judge OK when the rear oxygen sensor output change response time (diagnostic value) is below the threshold value.
Response time ≤ 2 seconds (threshold value) → Normal
Judge NG when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change	≤ 0.43 seconds

NOTE:
Response time is calculated during the deceleration fuel cut in case of abnormal judgment. However, in order to make a normal judgment quickly, diagnosis is performed without deceleration fuel cut.



6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

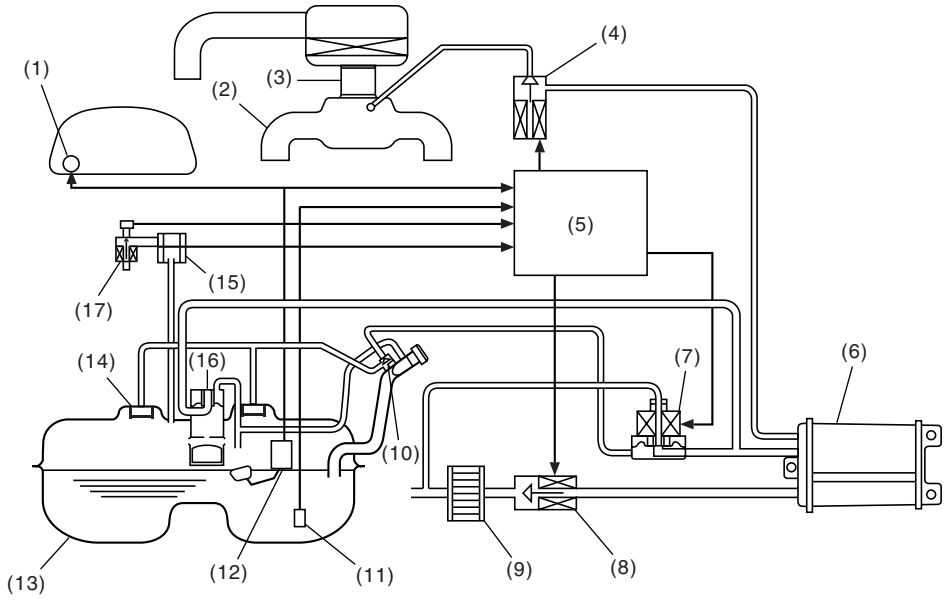
9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AE:DTC P0171 SYSTEM TOO LEAN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system by the amount of main feedback control.



EN-01699

(1) Fuel meter
(2) Intake manifold
(3) Throttle body
(4) Purge control solenoid valve
(5) Engine control module (ECM)
(6) Canister
(7) Pressure control solenoid valve
(8) Drain valve
(9) Drain filter
(10) Shut-off valve
(11) Fuel temperature sensor
(12) Fuel level sensor
(13) Fuel tank
(14) Fuel cut valve
(15) Fuel tank pressure sensor
(16) Vent valve
(17) Tank pressure switching solenoid valve

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Fuel learning system	In operation
Engine coolant temperature	75 ←→ 110°C (167 ←→ 230°F)
Intake manifold pressure change during 50 msecs	≤ 14.6 kPa (110 mmHg, 4.3 inHg)
Learning value of EVAP conc. during purge	≤ 1.0
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	10 seconds or more
Intake air temperature	< 70°C (158°F)
Fuel level	≥ 9 ℓ (2.4 US gal, 2.0 Imp gal)

3. GENERAL DRIVING CYCLE

Perform the serial diagnoses with a constant vehicle speed more than 60 km/h (37 MPH).

4. DIAGNOSTIC METHOD

Judge that the malfunction occurred in fuel system when the malfunction criteria are completed for 30 seconds or more by comparing the diagnostic value (fsobd) with threshold value.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = aflmd + lambda + kblrc	≥ fsobdL1
aflmd = measured lambda lambda = short term fuel trim kblrc = long term fuel trim	See Map 2 fsobdL1 = lean side threshold value of fsobd

Map 2: Threshold value for fuel system malfunction criteria

Amount of air (g/s)	0	3.2	6.4	9.6	12.8	16	19.2
fsobdL1 (%)	40	40	33.2	26.5	26.5	26.5	26.5

Time Needed for Diagnosis: 10 seconds × 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Judge OK when the malfunction criteria below are completed for 10 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = aflmd + lambda + kblrc	< 19%

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When diagnosed OK with the similar driving for 3 driving cycles in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

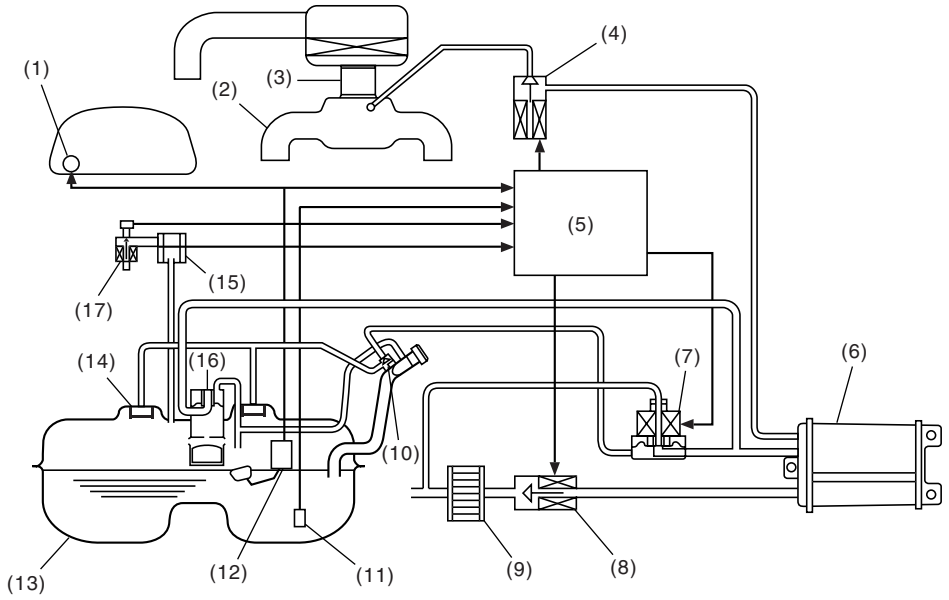
8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AF:DTC P0172 SYSTEM TOO RICH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system by the amount of main feedback control.



(1) Fuel meter
(2) Intake manifold
(3) Throttle body
(4) Purge control solenoid valve
(5) Engine control module (ECM)
(6) Canister
(7) Pressure control solenoid valve
(8) Drain valve
(9) Drain filter
(10) Shut-off valve
(11) Fuel temperature sensor
(12) Fuel level sensor
(13) Fuel tank
(14) Fuel cut valve
(15) Fuel tank pressure sensor
(16) Vent valve
(17) Tank pressure switching solenoid valve

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Fuel learning system	In operation
Engine coolant temperature	75 ←→ 110°C (167 ←→ 230°F)
Intake manifold pressure change during 50 msecs	≤ 14.6 kPa (110 mmHg, 4.3 inHg)
Learning value of EVAP conc. during purge	≤ 1.0
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	10 seconds or more
Intake air temperature	< 70°C (158°F)
Fuel level	≥ 9 ℓ (2.4 US gal, 2.0 Imp gal)

3. GENERAL DRIVING CYCLE

Perform the serial diagnoses with a constant vehicle speed more than 60km/h (37 MPH).

4. DIAGNOSTIC METHOD

Judge that the malfunction occurred in fuel system when the malfunction criteria are completed for 30 seconds or more by comparing the diagnostic value (fsobd) with threshold value.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = aflmd + lambda + kblrc	≤ fsobdR1
aflmd = measured lambda lambda = short term fuel trim kblrc = long term fuel trim	See Map 2 fsobdR1 = rich side threshold value of fsobd

Map 2: Threshold value for fuel system malfunction criteria

Amount of air (g/s)	0	3.2	6.4	9.6	12.8	16	19.2
fsobdR1 (%)	−40	−40	−33.2	−26.5	−26.5	−26.5	−26.5

Time Needed for Diagnosis: 10 seconds × 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Judge OK when the malfunction criteria below are completed for 10 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = aflmd + lambda + kblrc	≥ −20%

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When diagnosed OK with the similar driving for 3 driving cycles in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

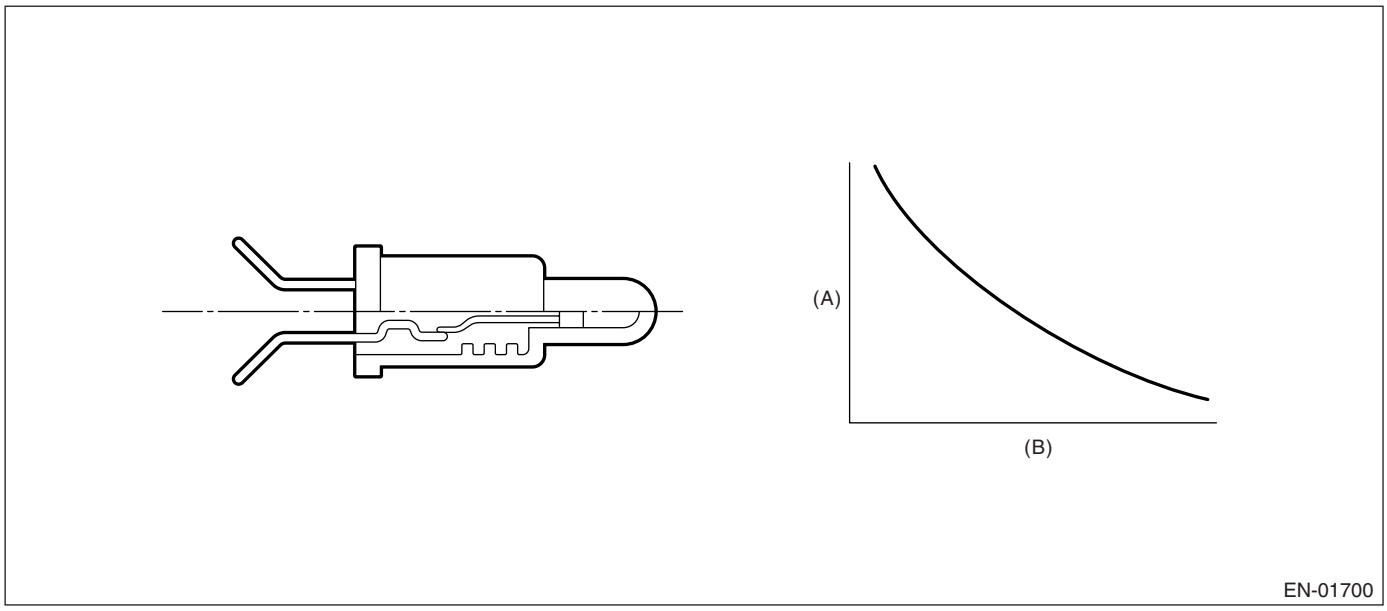
Memorize the freeze frame data. (For test mode $02)

AG:DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel temperature sensor output property.
Diagnosis is performed in two methods; namely, drift diagnosis and stuck diagnosis.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω)
(B) Fuel temperature °C (°F)

• Drift Diagnosis

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and NG judgment is done.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Fuel level	≥ 9 ℓ (2.4 US gal, 2.0 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature difference from engine start	> 10°C (50°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the engine coolant temperature increases more than 10 degrees (50 degrees of Fahrenheit) from the temperature of engine starting in 20 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (120 seconds) needed for diagnosis. Also, judge OK when the malfunction criteria below is not completed. And then, clear the NG.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel temperature-engine coolant temperature	≥10°C (50°F)

Time Needed for Diagnosis: 120 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
Stuck Diagnosis
If the fuel temperature which must increase along with engine idling does not increase, the engine is considered to be stuck and NG judgment is done.

6. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	20 seconds or more

7. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 20 seconds and more after starting the engine.

8. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when all of the malfunction criteria below is completed.

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 550 kg (1,213 lb)
Fuel temperature difference between max and min	< 3°C (37°F)

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Malfunction Criteria	Threshold Value
Fuel temperature difference between max. and min.	≥ 3°C (37°F)

Time Needed for Diagnosis: 0 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

9. DTC CLEAR CONDITION

- When the OK idling was completed 40 times in a row
- When “Clear Memory” was performed

10.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

11.FAIL SAFE

Fix the fuel temperature at 40°C (104°F).

12.ECM OPERATION AT DTC SETTING

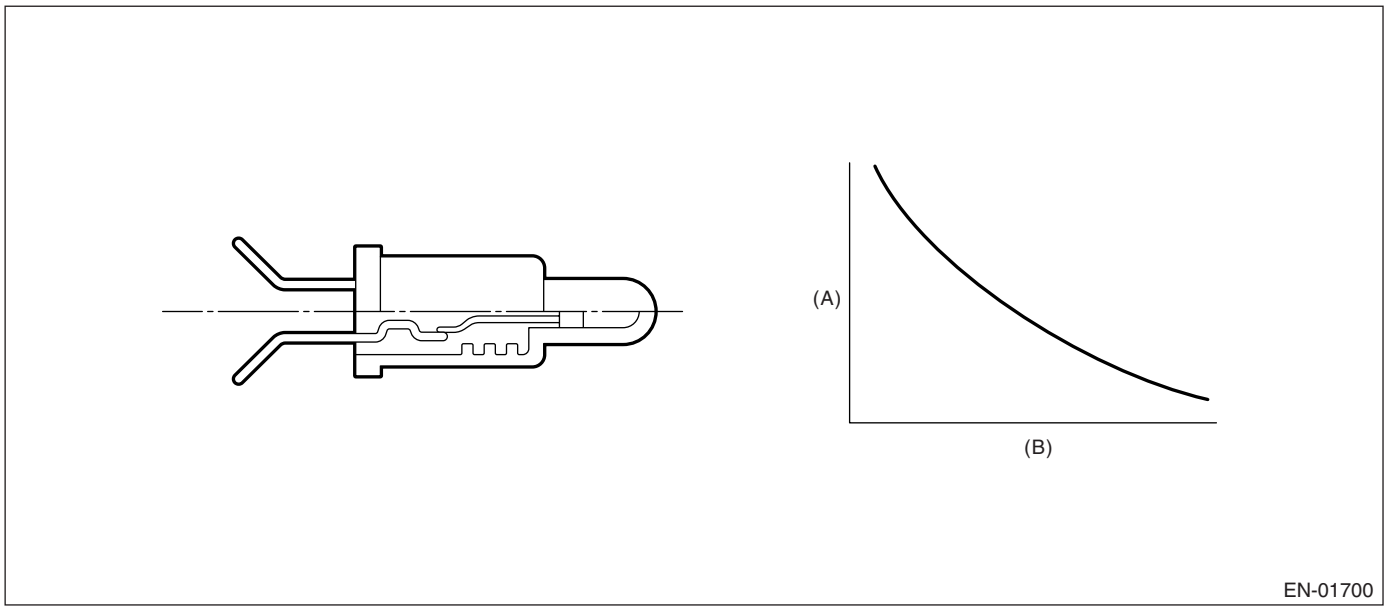
Memorize the freeze frame data. (For test mode $02)

AH:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω)
(B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
Timer after starting the engine	≥ 1 second

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.1 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Fix the fuel temperature for control at 40°C (104°F).

9. ECM OPERATION AT DTC SETTING

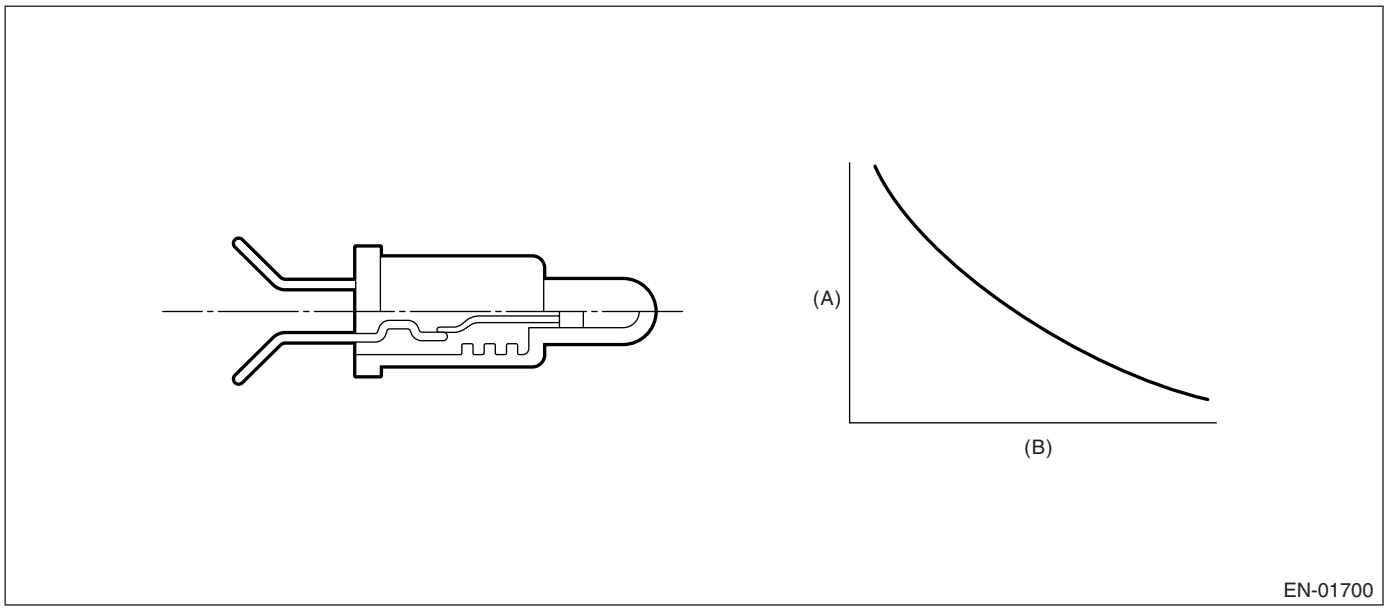
Memorize the freeze frame data. (For test mode $02)

AI: DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω)
(B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
Timer after starting the engine	≥ 1 second

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than time (2.5 seconds) needed for diagnosis. Judge OK when the malfunction criteria below are not completed.
Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.85 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Fix the fuel temperature for control at 40°C (104°F).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AJ:DTC P0301 CYLINDER 1 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

Detect the presence of misfire occurrence.
Monitoring Misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has three patterns below.

- Intermittent misfire (Different cylinders misfire intermittently.): FTP 1.5 times misfire
- Every time misfire (The same cylinder misfires every time.): Catalyst damage misfire, FTP 1.5 times misfire
- Opposed misfire (Dual ignition equipped model as #1, #2 simultaneously ignite. NA model only.): Catalyst damage misfire, FTP 1.5 times misfire

The following detecting methods are adopted for these detection.
(1) Intermittent misfire: FTP 1.5 times misfire
  - 180° Interval Difference Method (3,550 rpm or less)
  - 720° Interval Difference Method (2,950 rpm or less)

(2) Every time misfire: Catalyst damage misfire, FTP 1.5 times misfire
  - 180° Interval Difference Method (3,550 rpm or less)
  - Pattern Recognition Method (2,950 rpm or more)

(3) Opposed misfire: Catalyst damage misfire, FTP 1.5 times misfire
  - 180° Interval Difference Method (3,550 rpm or less)
  - Pattern Recognition Method (2,950 rpm or more)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Injector pulse	≥ 1.00 milliseconds
Engine speed	450 — 6,200 rpm
Fuel shut-off function	Not operating
Fuel parameter determination	Not as extremely low volatility
Engine speed change	≥ Misfire level × −4.00
After fuel shut-off finished	15 revs. or more
(Weighted avg. value / given amount) of intake air −1.0	−0.5 ←→ 1.9
Fuel level	≥ 9 ℓ (2.4 US gal, 2.0 Imp gal)
Crankshaft position has been learned intake manifold pressure	> Value from Map 4
The change in torque during shifting (Misfire detection by oxygen sensor)	Not in operation
Throttle position change during 30 milli-seconds	−20° ←→ 20°
Engine speed	> 4,600 rpm

Map 4

rpm	0	400	800	1,200	1,600	2,000	2,400	2,800
MT (V. Speed < 64 km/h (40 MPH))	164	164	164	144	140	144	140	148
(V. Speed ≥ 64 km/h (40 MPH))	164	164	164	192	188	192	184	236
AT	172	172	172	152	152	160	152	164

rpm	3,200	3,600	4,000	4,400	4,800	5,200	5,600	6,000
MT (V. Speed < 64 km/h (40 MPH))	172	188	212	236	260	288	312	336
(V. Speed ≥ 64 km/h (40 MPH))	244	236	236	236	260	288	312	336
AT	188	216	240	264	284	308	332	356

3. GENERAL DRIVING CYCLE

If the condition matched, detecting misfire is possible in the engine speed of idling to high revolution; however, idling is better from the viewpoint of engine load and damage.

4. DIAGNOSTIC METHOD

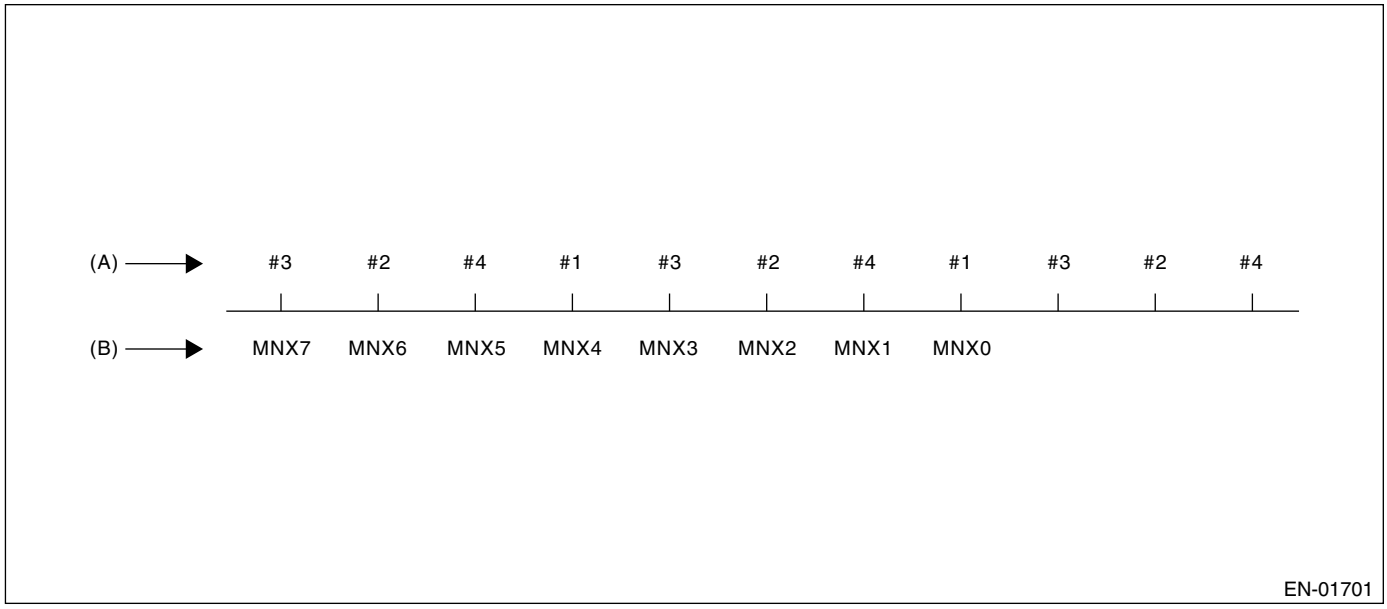
When the misfire occurred, the engine speed is decreased and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed, and judge whether the misfire occurs or not comparing the calculated result with judgment value.

Calculate the diagnostic value (from crankshaft position speed)	→	Misfire detection every single ignition (Compare diagnostic value with judgment value) • 180° Interval Difference Method • 720° Interval Difference Method • Pattern Recognition Method	→	NG judgment (Judge misfire occurrence required by the law) (Compare number of misfire with judgment) • FTP1.5 times misfire NG judgment • Catalyst damage misfire NG judgment

For misfire detection, there are three methods such as 180° Interval Difference Method, 720° Interval Difference Method and Pattern Recognition Method.

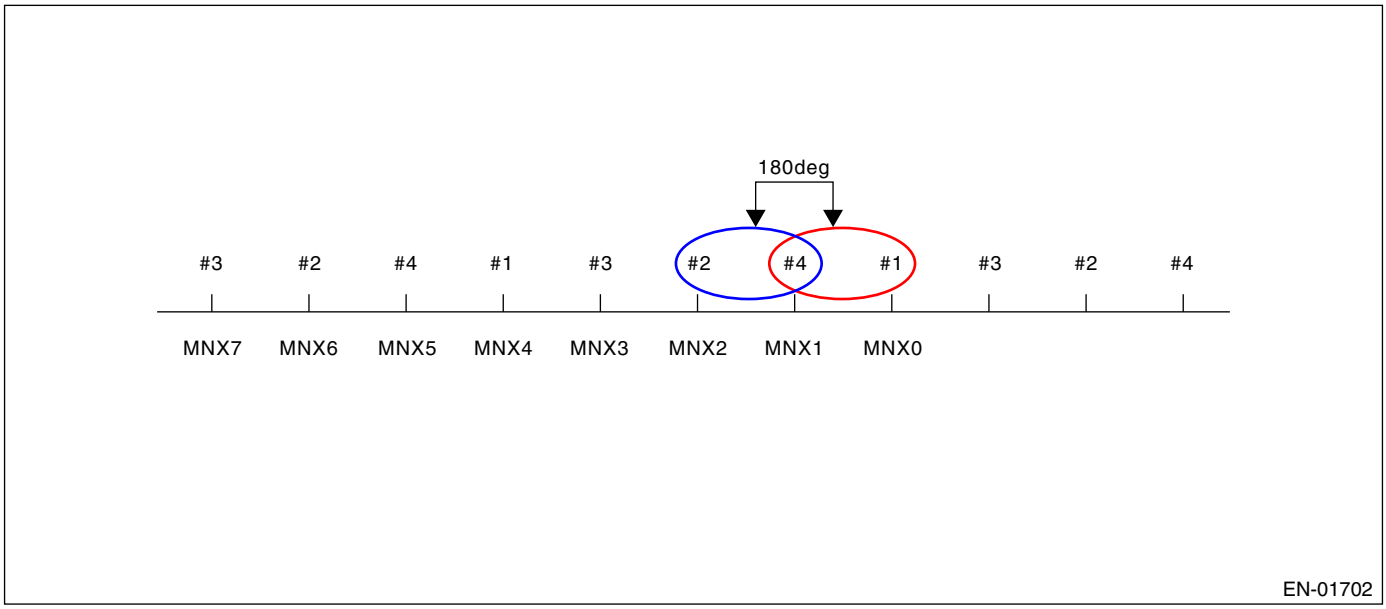
• 180° Interval Difference Method, 720° Interval Difference Method

Transform the time needed for crankshaft movement from BTDC65° to BTDC10° into revolution. As the following, regard the revolution as MNX0. And then regard the former revolution as MNX1, the second former revolution as MNX2, and the third as MNX3, etc.
Use the detecting method below for misfire patterns, and judge misfire occurrence when the result calculated from the formula is out of threshold value.



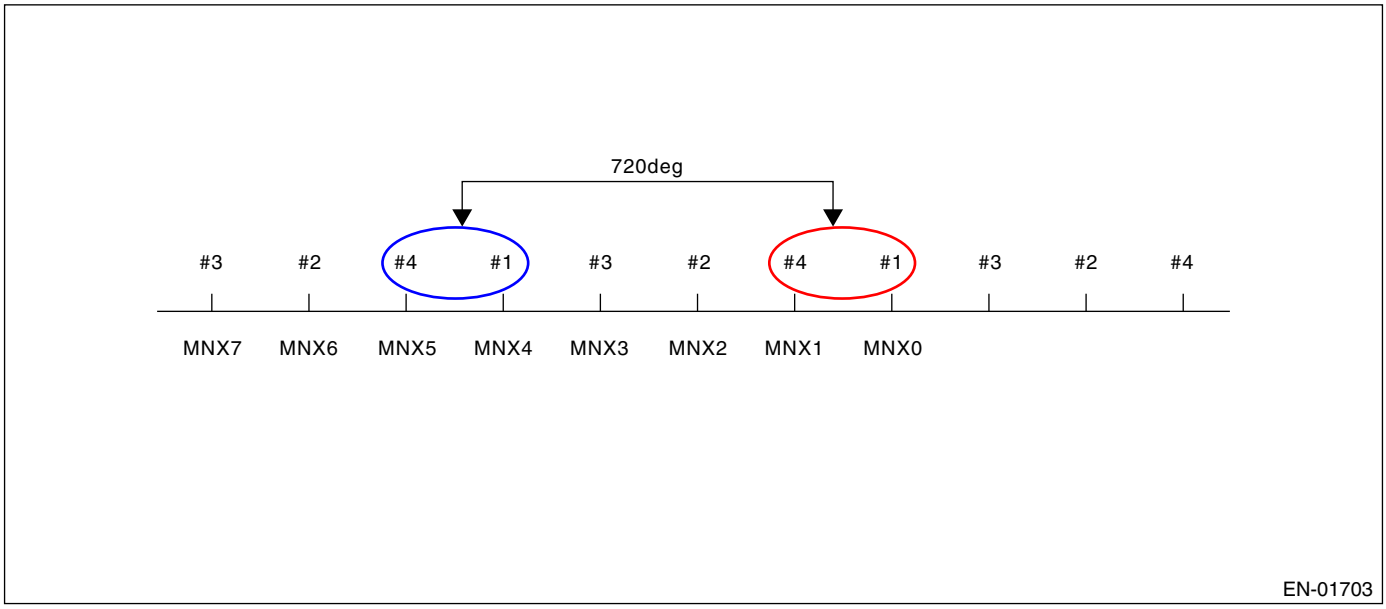
(A) Ignition order
(B) Engine speed (rpm)

180° Interval Difference Method (DDNCON0)



(1) DDNCON1 = (MNX 1 – MNX 2) – (MNX 2 – MNX 3) ≤ Threshold value
(2) DDNCON0 = (MNX 0 – MNX 1) – (MNX 1 – MNX 2) ≥ Threshold value
Judge misfire when the (1) and (2) above are completed.

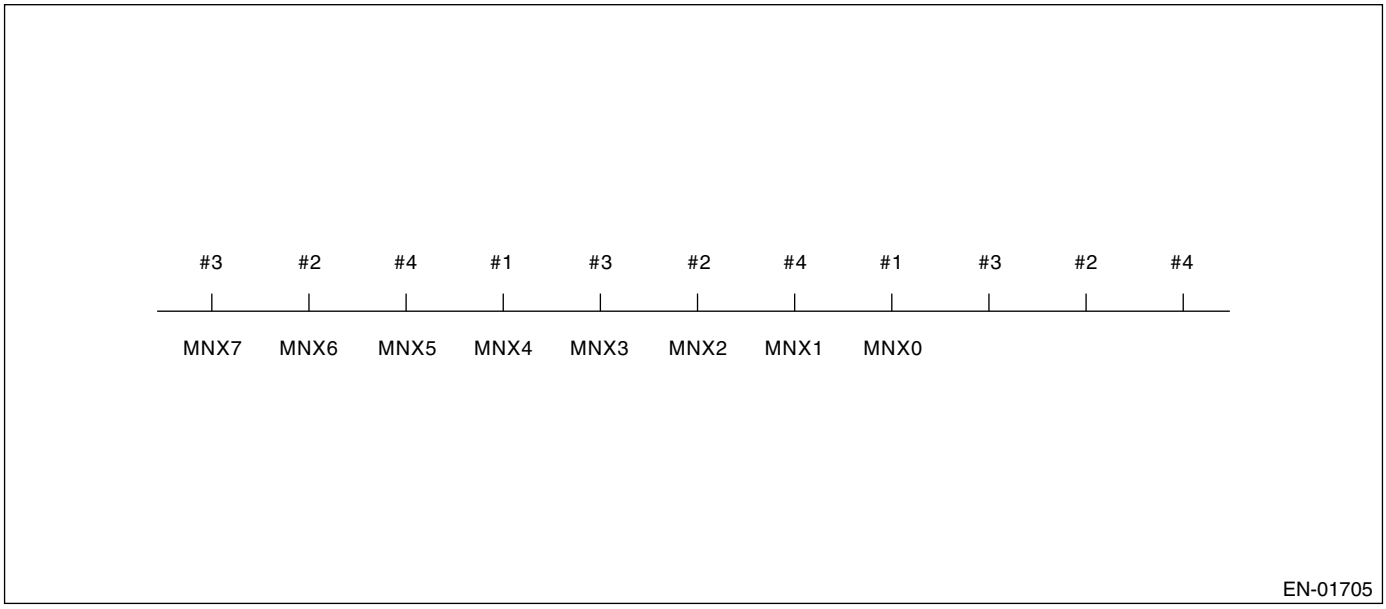
720° Interval Difference Method (DDNCYL0)



(1) DDNCYL4 = (MNX 4 – MNX 5) – (MNX 8 – MNX 9) ≤ Threshold value
(2) DDNCYL0 = (MNX 0 – MNX 1) – (MNX 4 – MNX 5) ≥ Threshold value
Judge misfire when the (1) and (2) above are completed.

• Pattern Recognition Method

Pattern Recognition Method has two patterns such as every time misfire on one cylinder and continuous misfire on two cylinders.



Every time misfire on one cylinder

Calculate the simple average (calculate MNX 0 − MNX 1) per one hundred ignitions for one cylinder (per four hundred ignitions for four cylinder).

Regard the value calculated for #1 cylinder as AVE1, #2 cylinder as AVE2, and as AVE3, AVE4 like the same way. Judge misfire occurrence when the value calculated from the following formula is larger than threshold value.

(Max. value of AVE1 to AVE4) − AVEn (n=1,2,3,4) ≥ threshold value → Judge that misfire occurs.

Continuous misfire on two cylinders

(1) Two continuous ignitions with "MNX 0 − MNX 1 ≥ threshold value" occurs.

(2) Two continuous ignitions with "MNX 0 − MNX 1 ≤ − (threshold value)" occurs.

Judge misfire occurrence on continuous two cylinders when the judgment criteria (1) and (2) above repeated for four hundred ignition.

• FTP 1.5 times Misfire (Misfire occurrence level which influences exhaust gas)

Judgment Value

Judge malfunction when the misfire rate in 1,000 revs. is large.

Malfunction Criteria	Threshold Value
FTP emission	> 1.0% in 1,000 revs.

Time Needed for Diagnosis: 1,000 engine revs.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

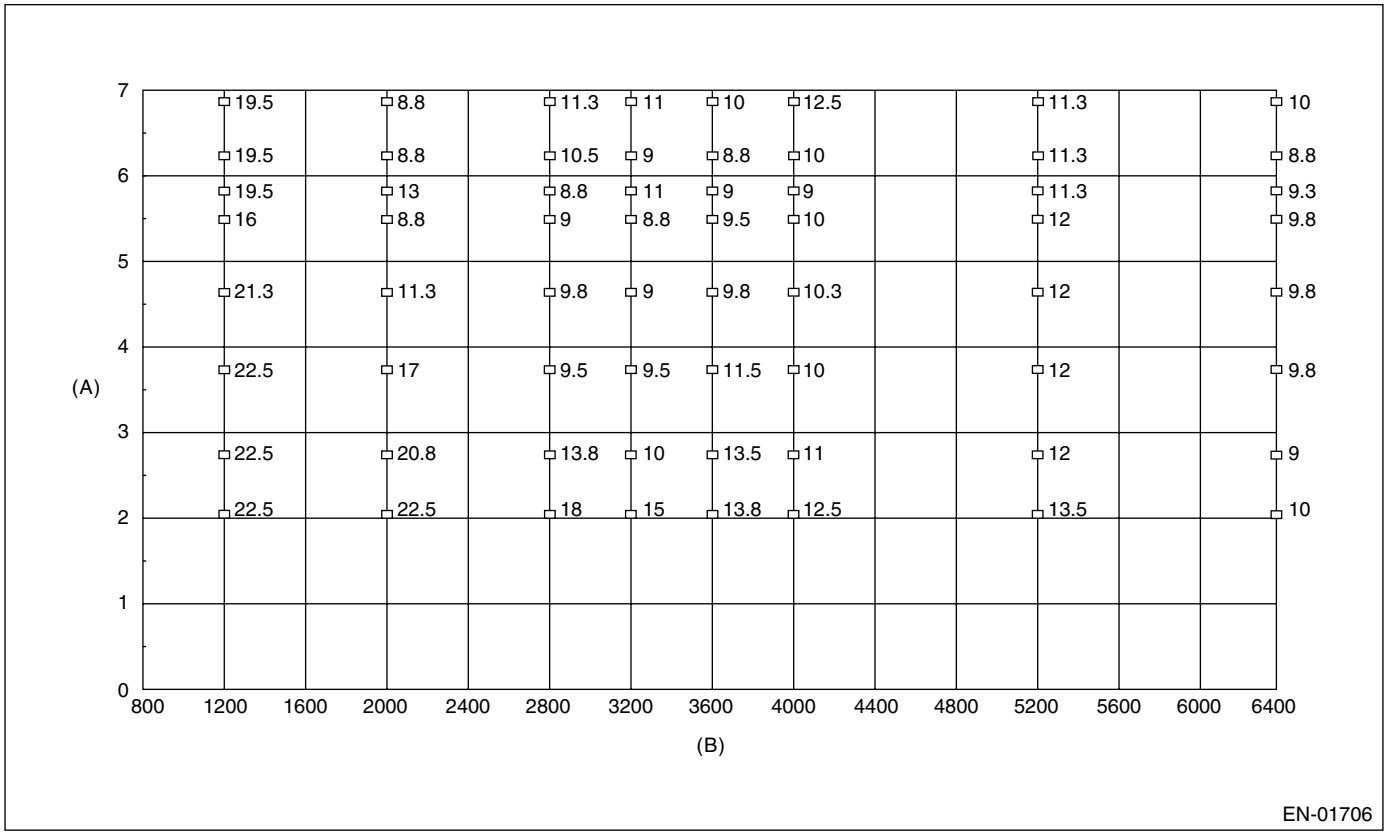
• Catalyst Damage Misfire (Misfire occurrence level which results in catalyst damage)

Judgment Value

Judge malfunction when the misfire rate in 200 revs (400 ignitions) is large.

Malfunction Criteria	Threshold Value
Catalyst damage	See Map 1

Map 1 Fault criteria limit for misfire which would result in catalyst damage



(A) Basic injection pulse (millisecond)
(B) Engine speed (rpm)

*These figures represent the misfire rate (%) in 400 ignitions.
22.5 (%) means “400 (ignitions) × 22.5 (%) = 90 (ignitions)” or more, and judge misfire.

Time Needed for Diagnosis: 200 engine revs.
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When diagnosed OK with the similar driving for 3 driving cycles in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AK:DTC P0302 CYLINDER 2 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

For detecting criteria, refer to DTC P0301 CYLINDER 1 MISFIRE DETECTED. <Ref. to GD(H4SO)-81, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AL:DTC P0303 CYLINDER 3 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

For detecting criteria, refer to DTC P0301 CYLINDER 1 MISFIRE DETECTED. <Ref. to GD(H4SO)-81, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AM:DTC P0304 CYLINDER 4 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

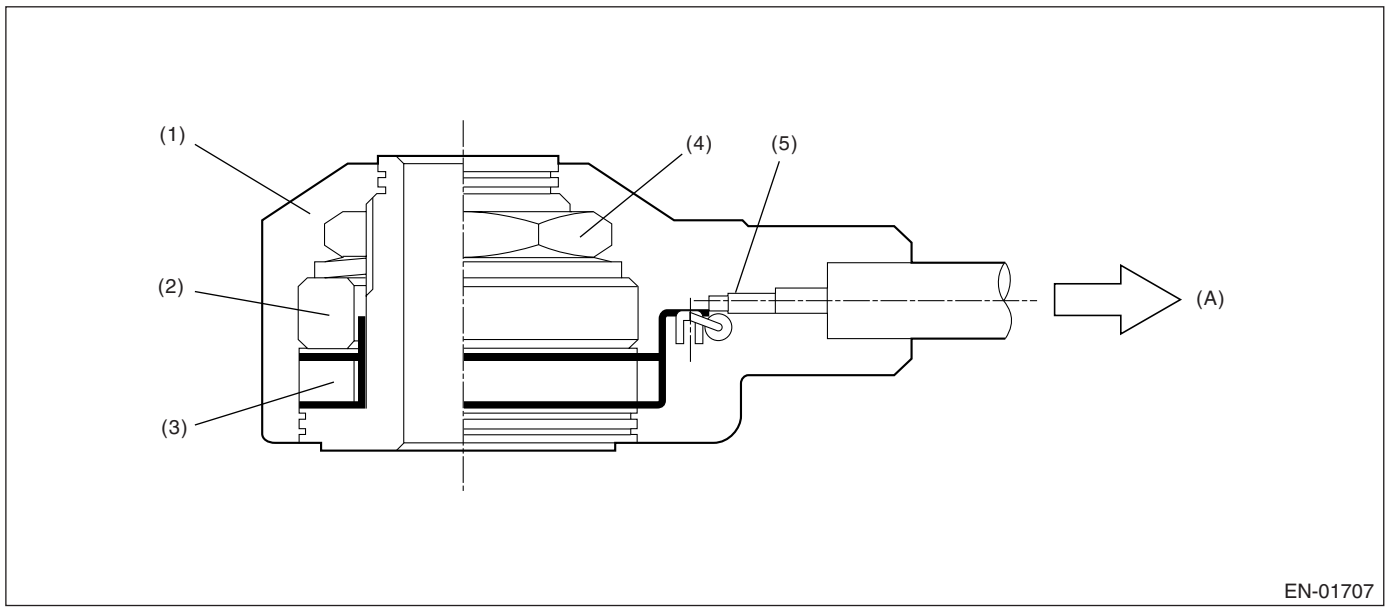
For detecting criteria, refer to DTC P0301 CYLINDER 1 MISFIRE DETECTED. <Ref. to GD(H4SO)-81, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AN:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of knock sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance
(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
Timer after starting the engine	≥ 1 second

4. GENERAL DRIVE CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis. Judge OK when the malfunction criteria below are not completed.
Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.6 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

(1) Stop whole compensation, partial compensation, knock cancel compensation in ignition timing calculation at normal.
(2) Knock cancel compensation of low engine coolant temperature is fixed value (7°CA).
(3) Stop partial compensation calculation of ignition leaning.

9. ECM OPERATION AT DTC

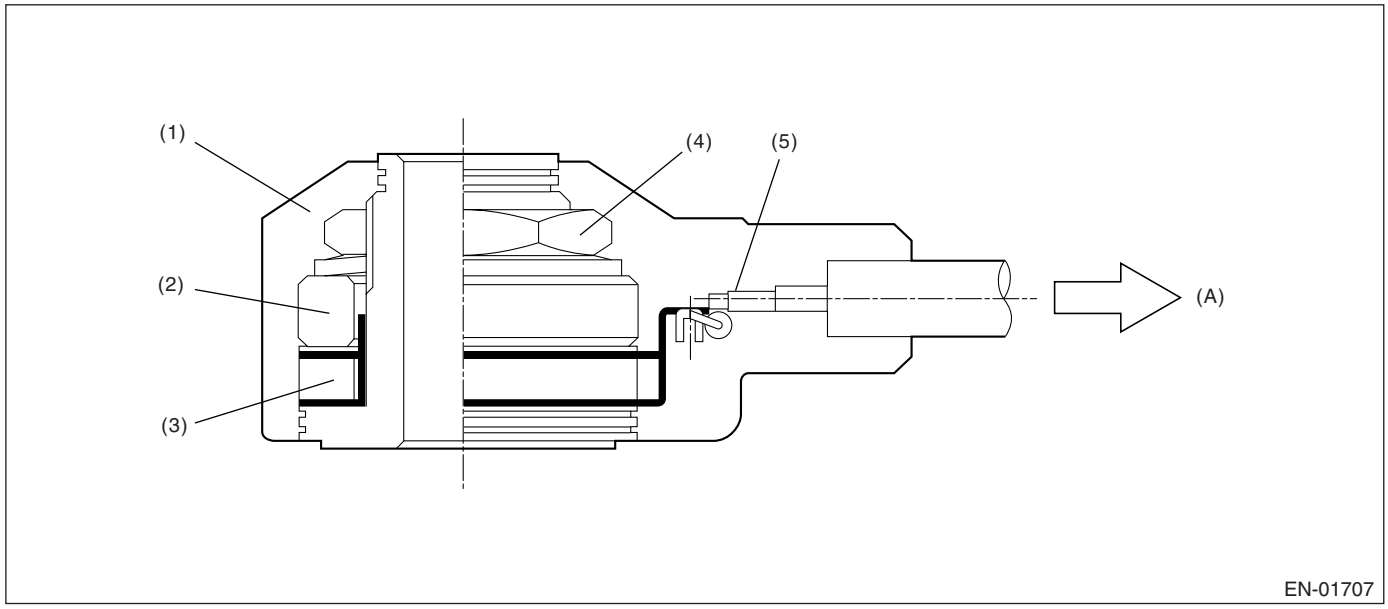
Memorize the freeze frame data. (For test mode $02)

AO:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of knock sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance
(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
Timer after starting the engine	≥ 1 second

4. GENERAL DRIVE CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis. Judge OK when the malfunction criteria below are not completed.
Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	> 3.5 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

(1) Stop whole compensation, partial compensation, knock cancel compensation in ignition timing calculation at normal.
(2) Knock cancel compensation of low engine coolant temperature is fixed value (7°CA).
(3) Stop partial compensation calculation of ignition leaning.

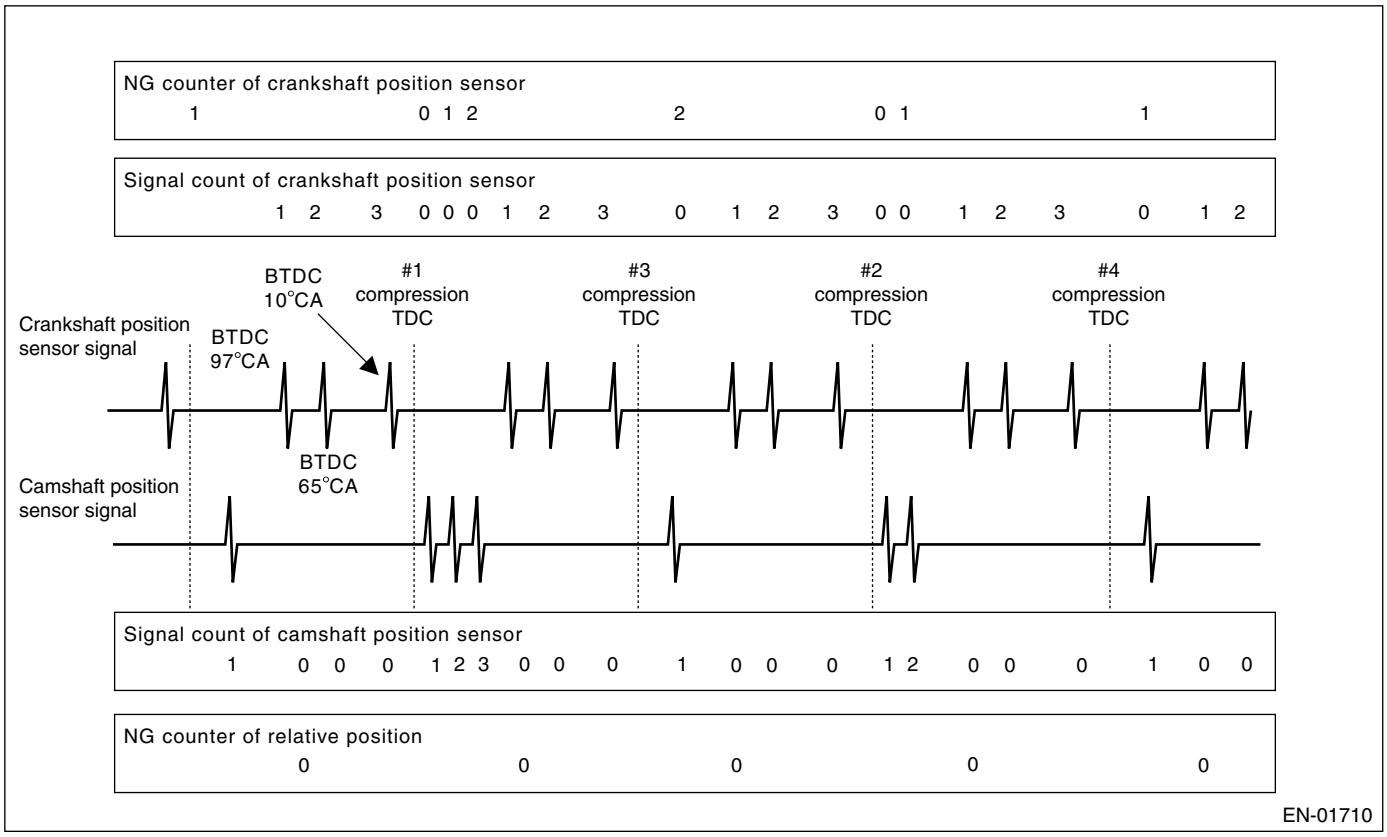
9. ECM OPERATION AT DTC

Memorize the freeze frame data. (For test mode $02)

AP:DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of crankshaft position sensor.
Normally, the crankshaft position sensor signal and camshaft position sensor signal are input as shown below. But judge NG when continuing not to input the crankshaft position sensor signal.

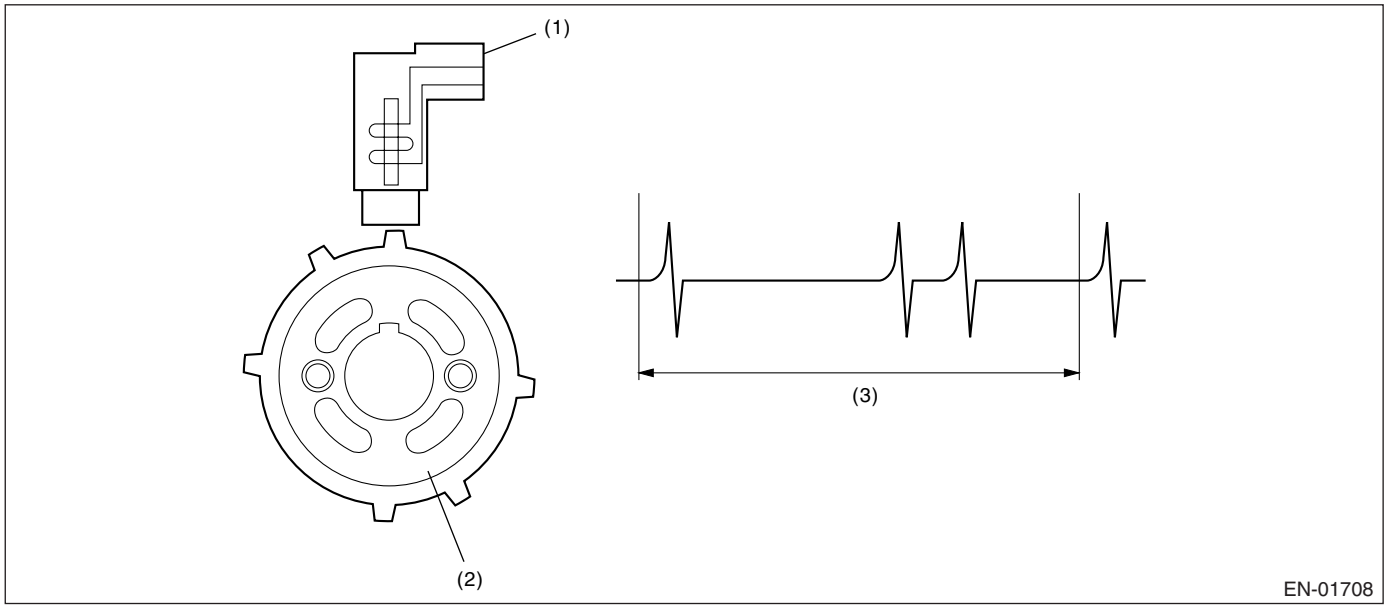


• Cylinder judgment method

When inputting BTDC97°CA crankshaft position sensor signal, judge what cylinder piston is brought to the top dead center of compression by camshaft position sensor signal number.

Camshaft position sensor signal number	Next top dead center of compression
3	#3
1	#2
2	#4
1	#1

2. COMPONENT DESCRIPTION



(1) Crankshaft position sensor
(2) Crankshaft sprocket
(3) Crankshaft half-turn

3. ENABLE CONDITION

Perform the diagnosis without condition.

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Camshaft position sensor signal	≥ 24

When the crankshaft position sensor signal is input, clear the above camshaft position sensor signal.
Time Needed for Diagnosis: 7 revs.
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

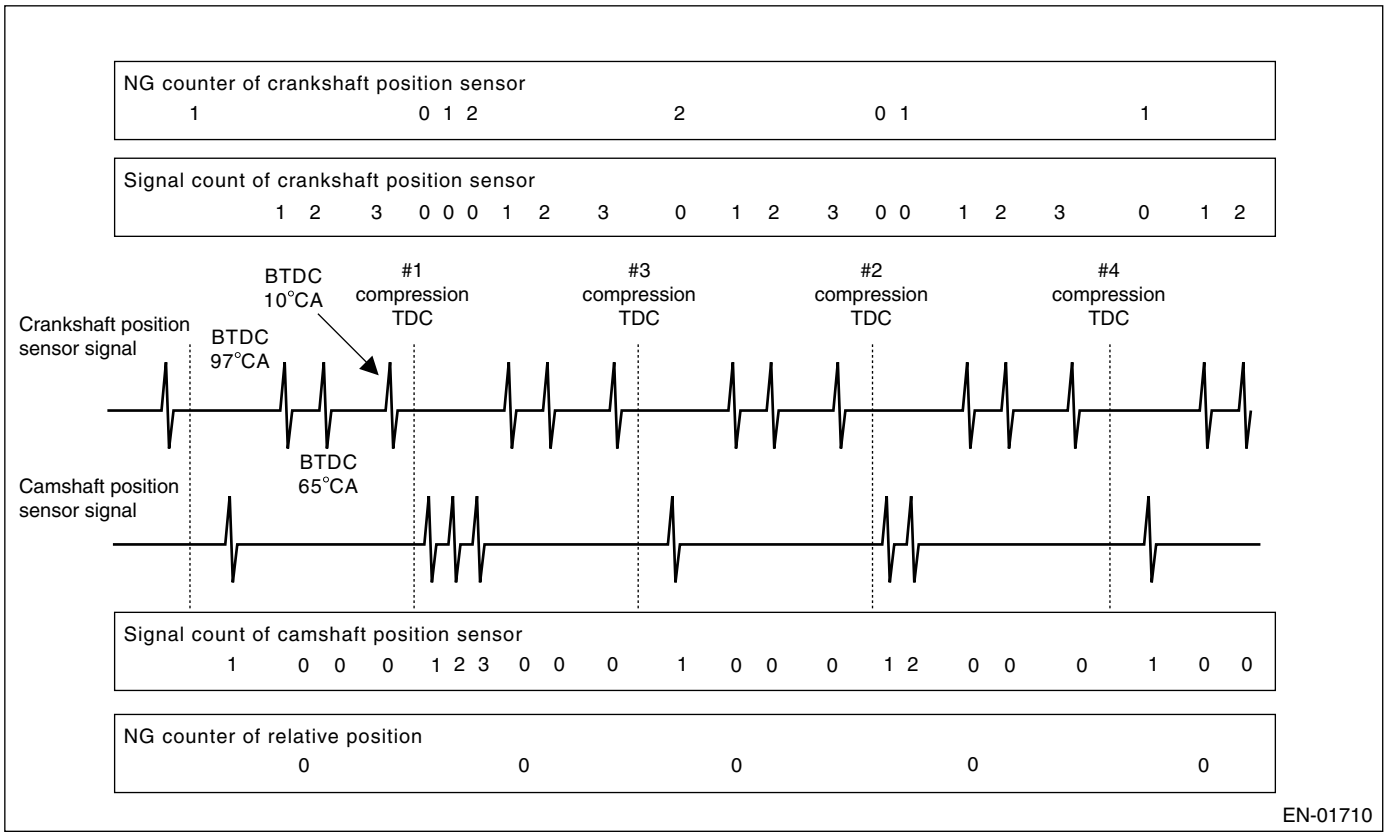
9. ECM OPERATION AT DTC

Memorize the freeze frame data. (For test mode $02)

AQ:DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of crankshaft position sensor output property.
Compare the normal crankshaft position sensor signal with normal camshaft position sensor signal. When each input number does not correspond, judge NG.

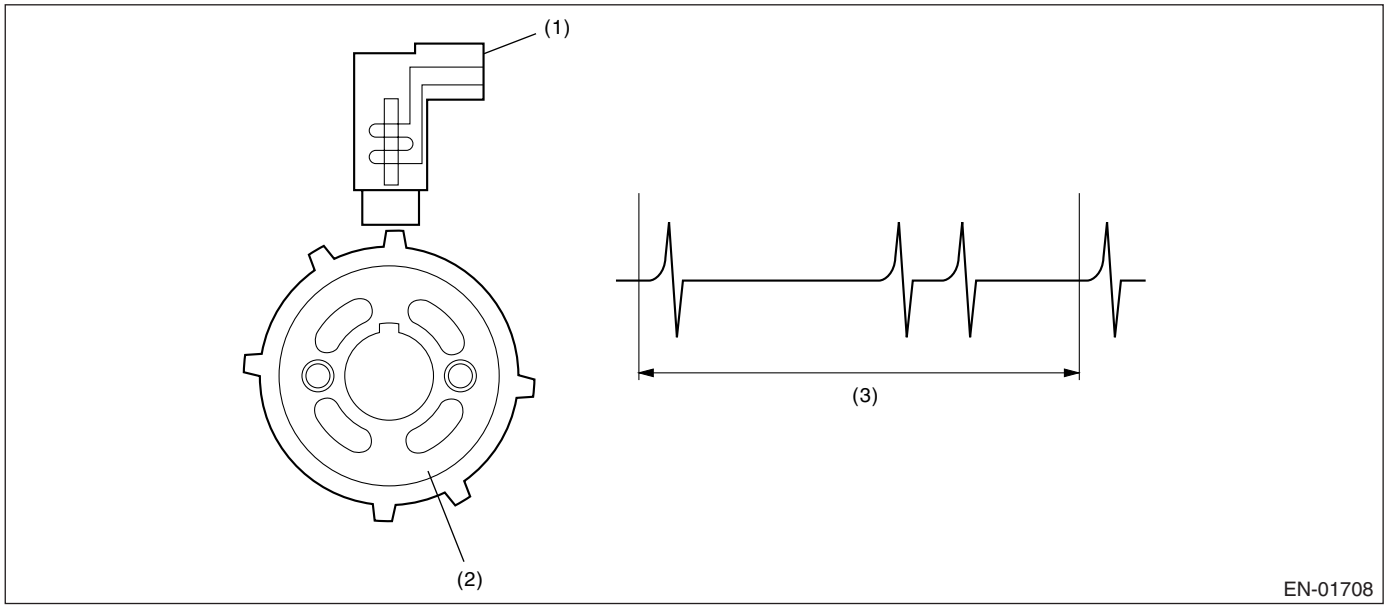


• Cylinder judgment method

When BTDC97°CA crankshaft position sensor signal is input, judge what cylinder piston is brought to the top dead center of compression by camshaft position sensor signal number.

Camshaft position sensor signal number	Next top dead center of compression
3	#3
1	#2
2	#4
1	#1

2. COMPONENT DESCRIPTION



(1) Crankshaft position sensor
(2) Crankshaft sprocket
(3) Crankshaft half-turn

3. ENABLE CONDITION

Perform the diagnosis without condition.

4. GENERAL DRIVE CYCLE

Perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

When the camshaft position sensor signal is input, compare the total crankshaft position sensor signal number from occasion of previous camshaft position sensor signal input to now with crankshaft position sensor signal number at normal. Increase NG judgment counter when each number does not correspond at once. Judge NG when each number does not correspond sequentially (NG counter ≥ 32). Judge OK and clear NG when the crankshaft position sensor signal number corresponds (NG counter = 0).

Judgment Value

Malfunction Criteria	Threshold Value
Fault counter of relative position	≥ 32

Time Needed for Diagnosis: 10 revs.
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

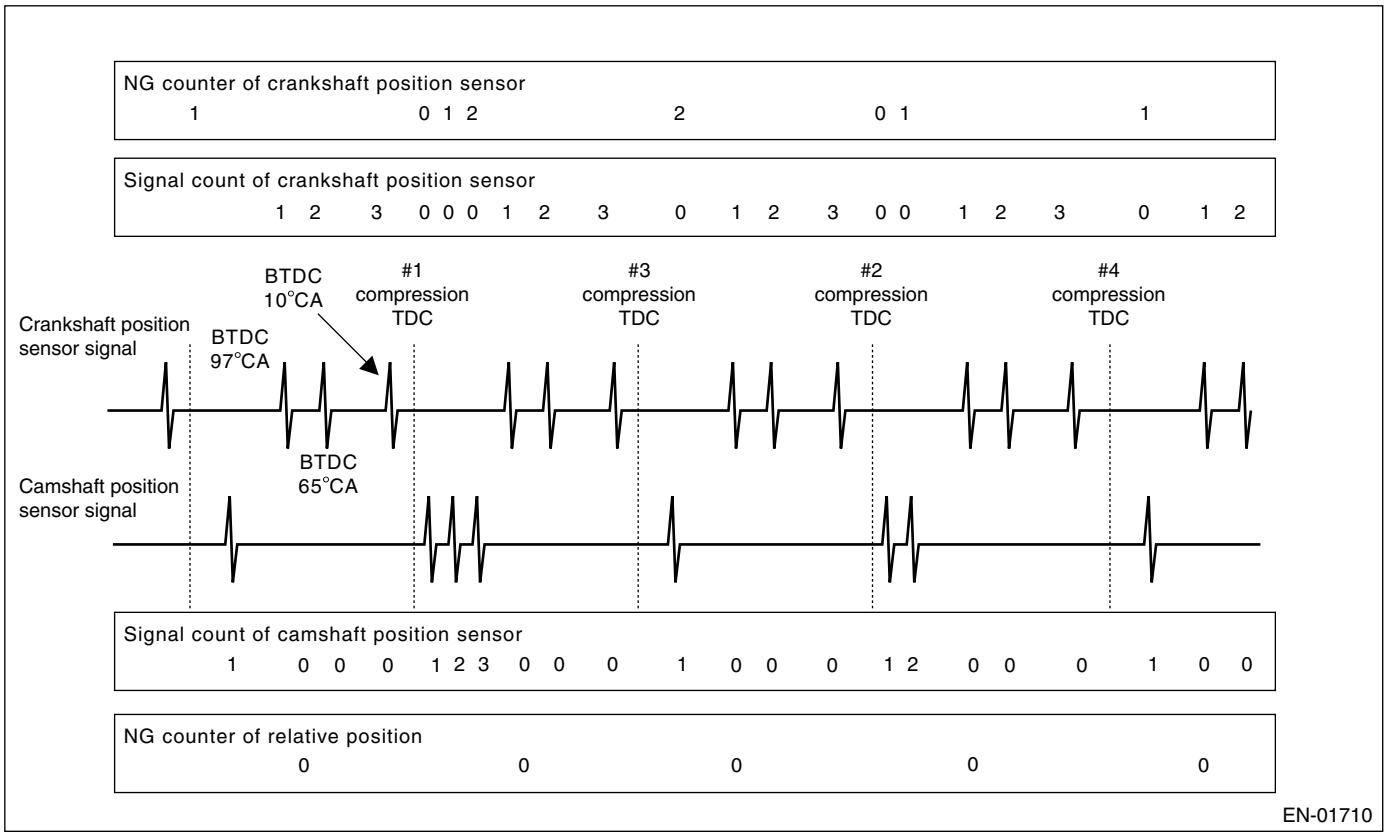
9. ECM OPERATION AT DTC

Memorize the freeze frame data. (For test mode $02)

AR:DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of crankshaft position sensor output property.
Judge NG when continuing not to input the camshaft position sensor signal.

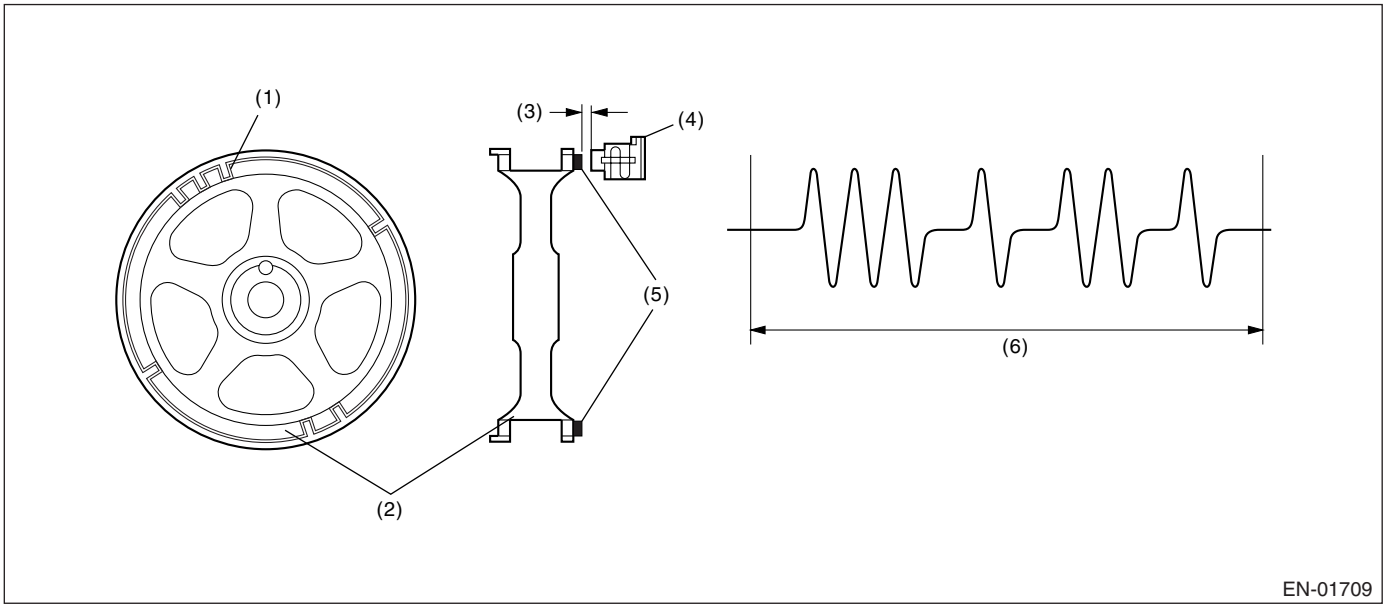


• Cylinder judgment method

When BTDC97°CA crankshaft position sensor signal is input, judge what cylinder piston is brought to the top dead center of compression by camshaft position sensor signal number.

Camshaft position sensor signal number	Next top dead center of compression
3	#3
1	#2
2	#4
1	#1

2. COMPONENT DESCRIPTION



(1) Boss
(2) Camshaft sprocket
(3) Air gap
(4) Camshaft position sensor
(5) Boss
(6) Camshaft one turn (Crankshaft two turns)

3. ENABLE CONDITION

Perform the diagnosis without condition.

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

When many crankshaft position sensor signals were input without camshaft position sensor signal input, judge OK and clear NG.

Judgment Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	≥ 36

Time Needed for Diagnosis: 6 revs.
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

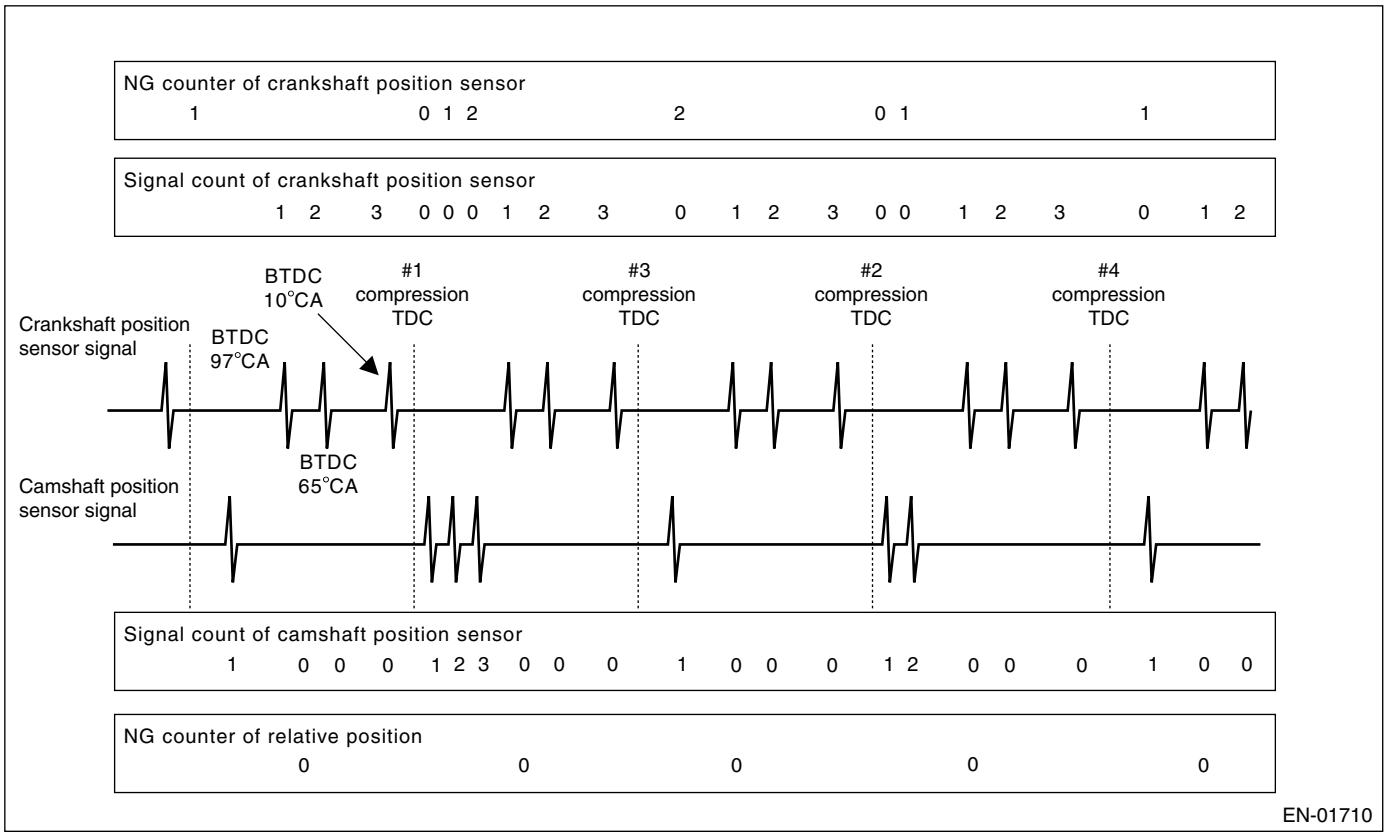
9. ECM OPERATION AT DTC

Memorize the freeze frame data. (For test mode $02)

AS:DTC P0341 CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of crankshaft position sensor output property.
Compare the normal crankshaft position sensor signal with normal camshaft position sensor signal. When each input number does not correspond, judge NG.

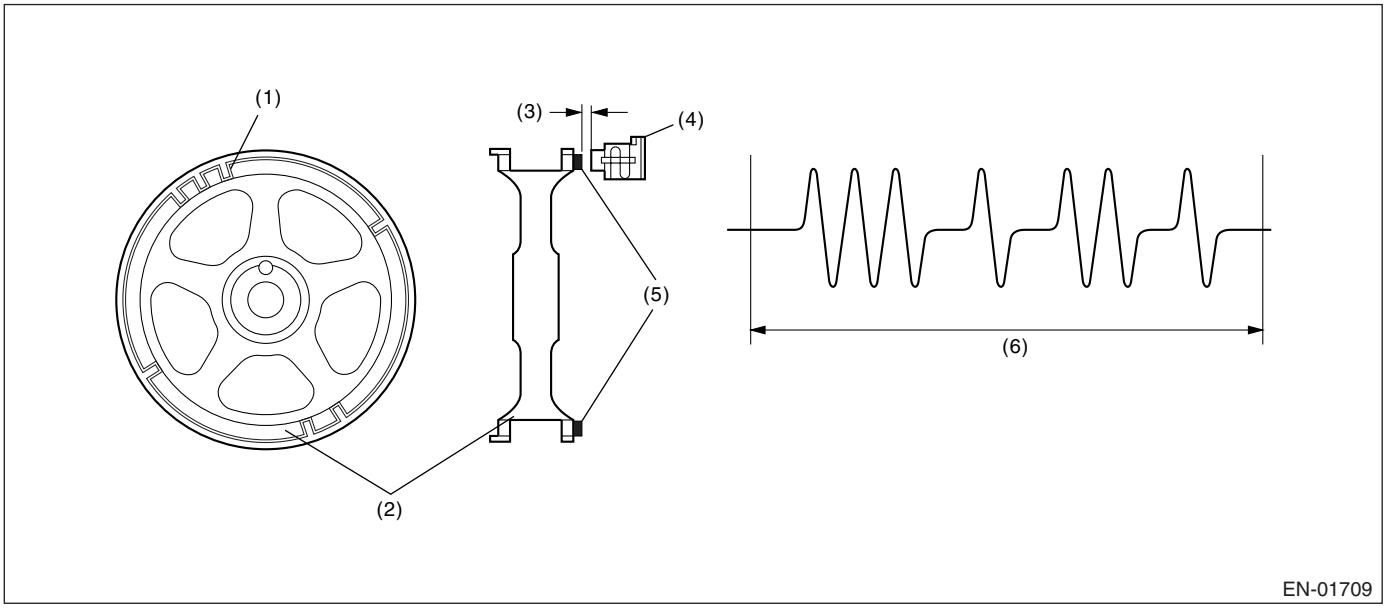


• Cylinder judgment method

When BTDC97°CA crankshaft position sensor signal is input, judge what cylinder piston is brought to the top dead center of compression by camshaft position sensor signal number.

Camshaft position sensor signal number	Next top dead center of compression
3	#3
1	#2
2	#4
1	#1

2. COMPONENT DESCRIPTION



(1) Boss
(2) Camshaft sprocket
(3) Air gap
(4) Camshaft position sensor
(5) Boss
(6) Camshaft one turn (Crankshaft two turns)

3. ENABLE CONDITION

Perform the diagnosis without condition.

4. GENERAL DRIVE CYCLE

Perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

When BTDC97°CA crankshaft position sensor signal is input, compare the camshaft position sensor signal number in past 4 times with camshaft position sensor signal number at normal. Increase NG judgment counter when each number does not correspond at once, judge OK and clear NG when the camshaft position sensor signal is normal.

Judgment Value

Malfunction Criteria	Threshold Value
Fault counter of relative position	≥ 32

Time Needed for Diagnosis: 6 revs.
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

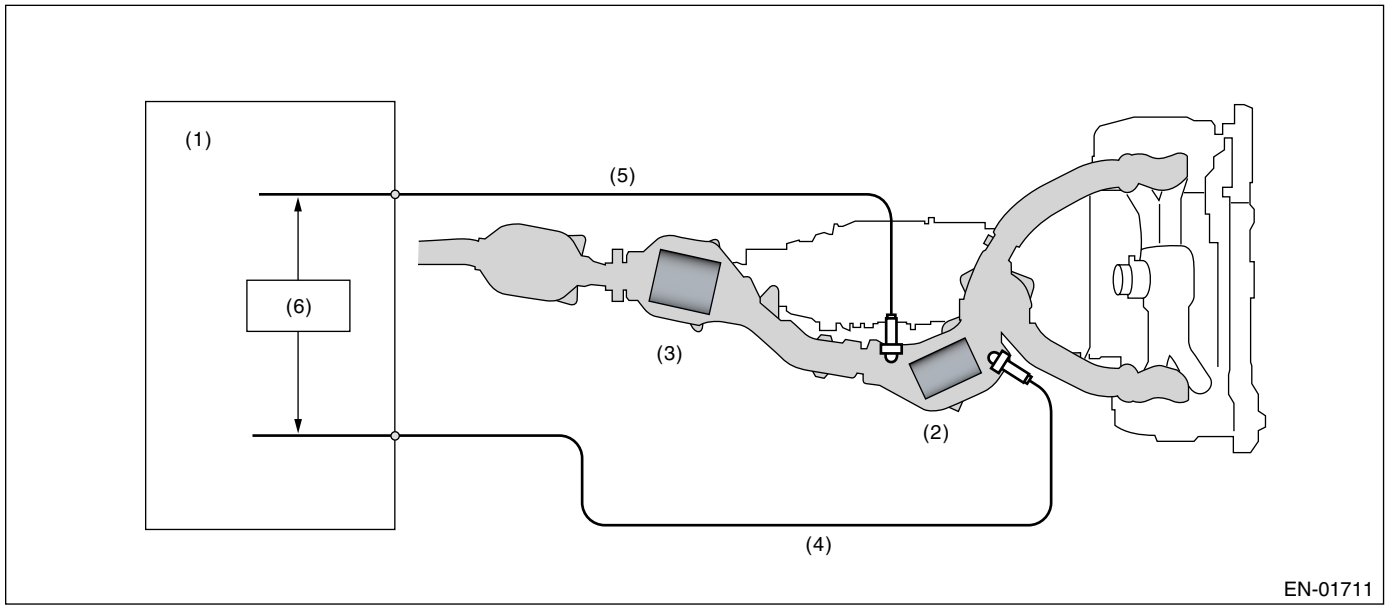
9. ECM OPERATION AT DTC

Memorize the freeze frame data. (For test mode $02)

AT:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

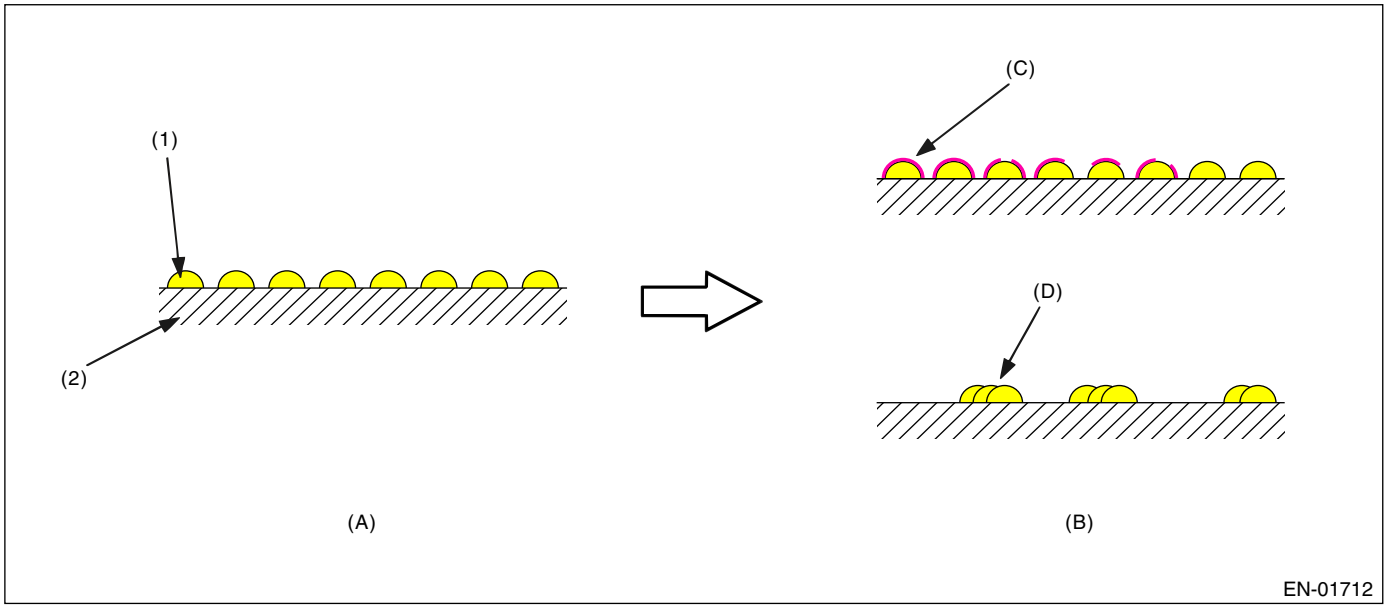
1. OUTLINE OF DIAGNOSIS

Check the catalyst efficiency deterioration.
Generally, the catalytic converter exhaust gas conversion efficiency and oxygen absorbing/removing function are inter-related. The front A/F sensor and rear oxygen sensor are therefore utilized to monitor the oxygen absorbing/removing function, and the results are used to monitor the conversion efficiency.



(1) Engine control module (ECM)
(2) Front catalyst converter
(3) Rear catalyst converter
(4) Front oxygen (A/F) sensor
(5) Rear oxygen sensor
(6) Diagnosis circuit

Oil adherence to the catalytic metal (an alloy of platinum and rhodium, or an alloy of platinum, rhodium and palladium) in catalyst converter or metal melting by extraordinary high temperature result in the decrease of metal surface area contacting exhaust gas. Eventually, catalytic conversion efficiency blunted and oxygen density of catalyst downstream may change.

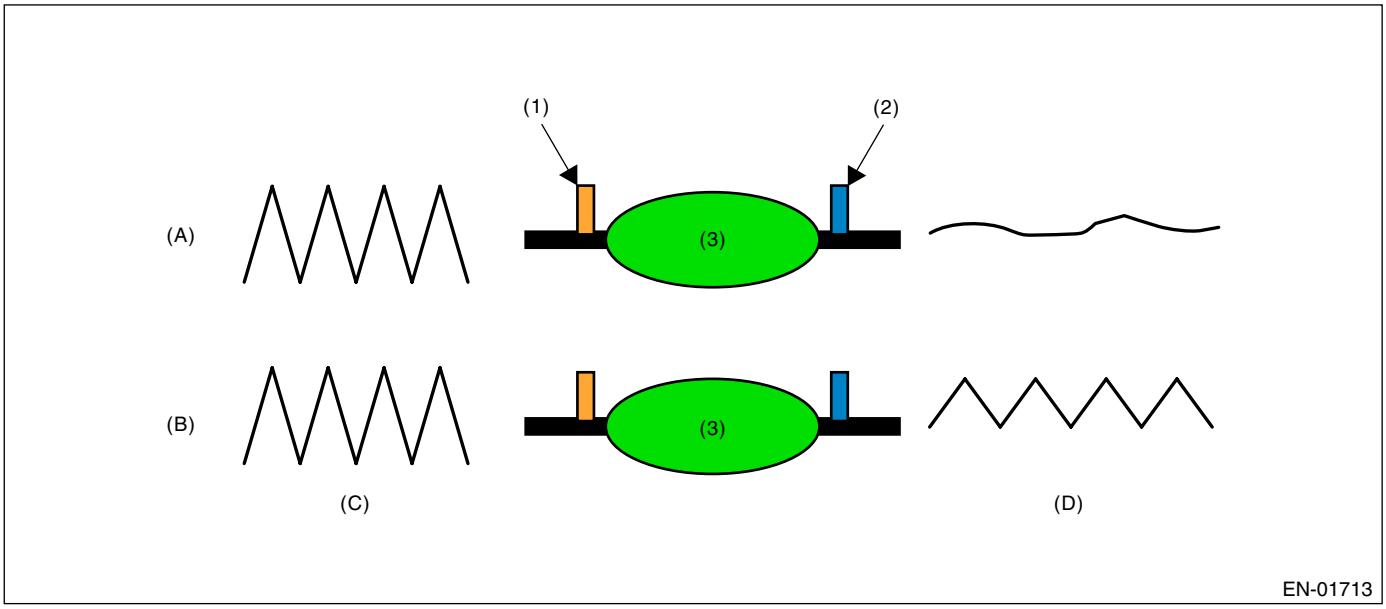


(1) Metal (catalytic function)
(2) Monolith

(A) Normal
(B) Deterioration
(C) Oil adherence
(D) Metal melting by high temperature

Output of rear oxygen sensor changes gradually with a new catalyst, but the blunted catalyst efficiency mentioned above makes sensor output larger and inverse time shorter.

Therefore, catalyst diagnosis is conducted by monitoring the rear oxygen sensor output and comparing its output with the front A/F sensor output.



(1) Front oxygen (A/F) sensor
(2) Rear catalyst converter
(3) Catalytic converter

(A) Normal
(B) Deterioration
(C) Output waveform from the front oxygen (A/F) sensor
(D) Output waveform from the rear oxygen sensor

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Idle switch off after coolant temp 71°C (160°F)	180 seconds
Closed loop control continuous 5 seconds	Not in standstill
Vehicle speed	24 — 140 km/h (15 — 87 MPH)
Injector pulse (AT)	0.832 — 4.096 milliseconds
(MT)	0.384 — 3.840 milliseconds
Closed loop control with rear oxygen sensor	Operating
Engine misfire during 400 ignitions	≤ 5 times
Lambda	0.625 — 1.375
Engine speed (AT)	600 — 3,000 rpm
(MT)	1,000 — 3,300 rpm
Neutral position	OFF
Engine coolant temperature	≥ 75°C (167°F)
Throttle position (AT)	< 14.72°
(MT)	< 17.60°
Average AIA during diagnosis	≥ 35.2 kg/h
Integrated fluctuating AIA during diagnosis	> 160 kg/h
After fuel shut-off finished	1 seconds or more
Accumulated amount of intake air (AIA) (entry condition)	0.84 kg (1.85 lb)/60 seconds
Vehicle speed (continuous 80 seconds) (entry condition)	≥ 20 km/h (12 MPH)
Injector pulse (continuous 40 seconds) (entry condition)	1.34 — 4.22 milliseconds
Vehicle speed (continuous 70 seconds) (entry condition)	≥ 74 km/h (46 MPH)
Catalyst deterioration diagnosis	Incomplete

3. GENERAL DRIVING CYCLE

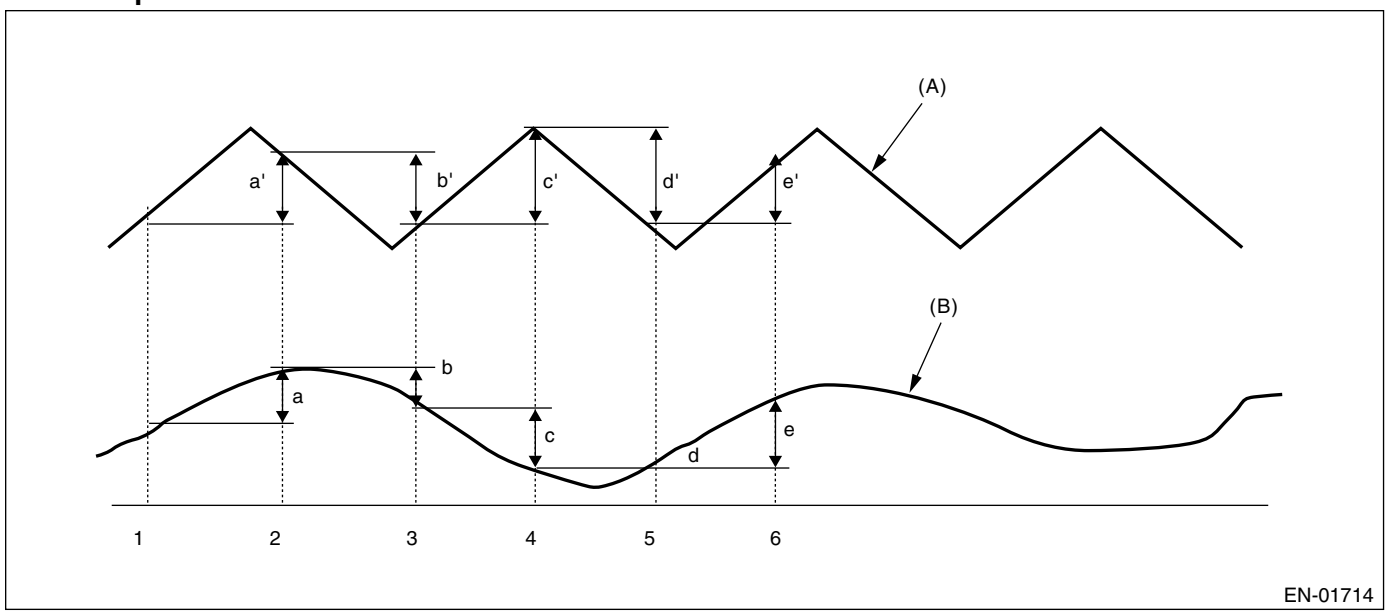
Perform the diagnosis once with a constant vehicle speed 80 — 100 km/h (49.7 — 62.1 MPH).

4. DIAGNOSTIC METHOD

• Output fluctuation accumulate method

The accumulated value of front A/F sensor output changes and the accumulated value of rear oxygen sensor output changes are determined, and the diagnostic value is calculated using the following formula.
Diagnostic value = Accumulated value of rear oxygen sensor output changes / Accumulated value of front A/F sensor output changes

For example



(A) Front oxygen (A/F) sensor output waveform
(B) Rear oxygen sensor output waveform

Judge NG when the malfunction criteria below are completed, and judge OK when they are not completed.
Judgment Value

Malfunction Criteria	Threshold Value
Accumulated variation of output Voltage of rear oxygen sensor per 50 milliseconds divided by accumulated Variation of output voltage of front lambda sensor per 50 milliseconds	≥ 1.5

Time Needed for Diagnosis: 45 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

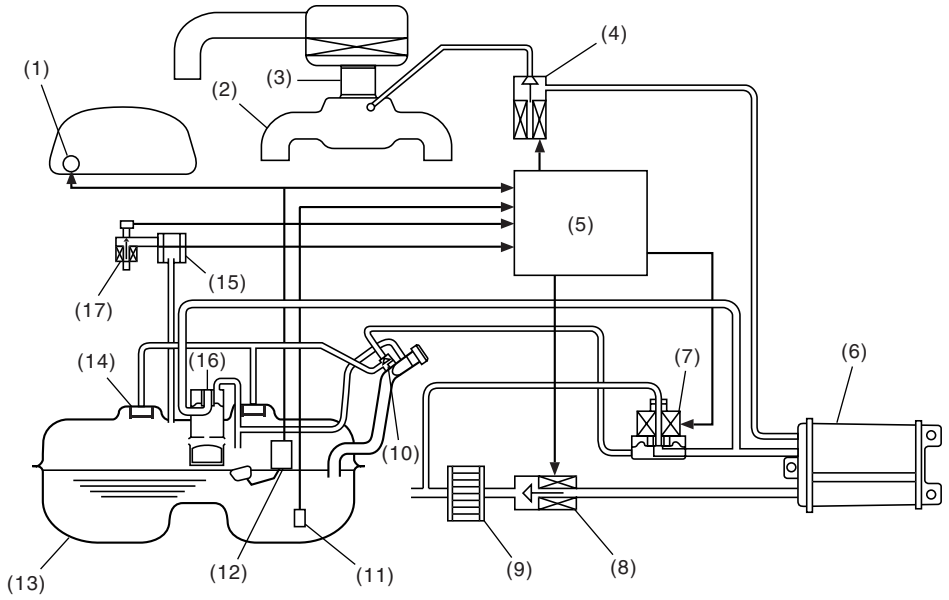
8. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnosis value and trouble standard value. (For test mode $06)

AU:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

1. OUTLINE OF DIAGNOSIS

Check if there is a leakage in fuel system or not, and perform the function diagnosis of valve.

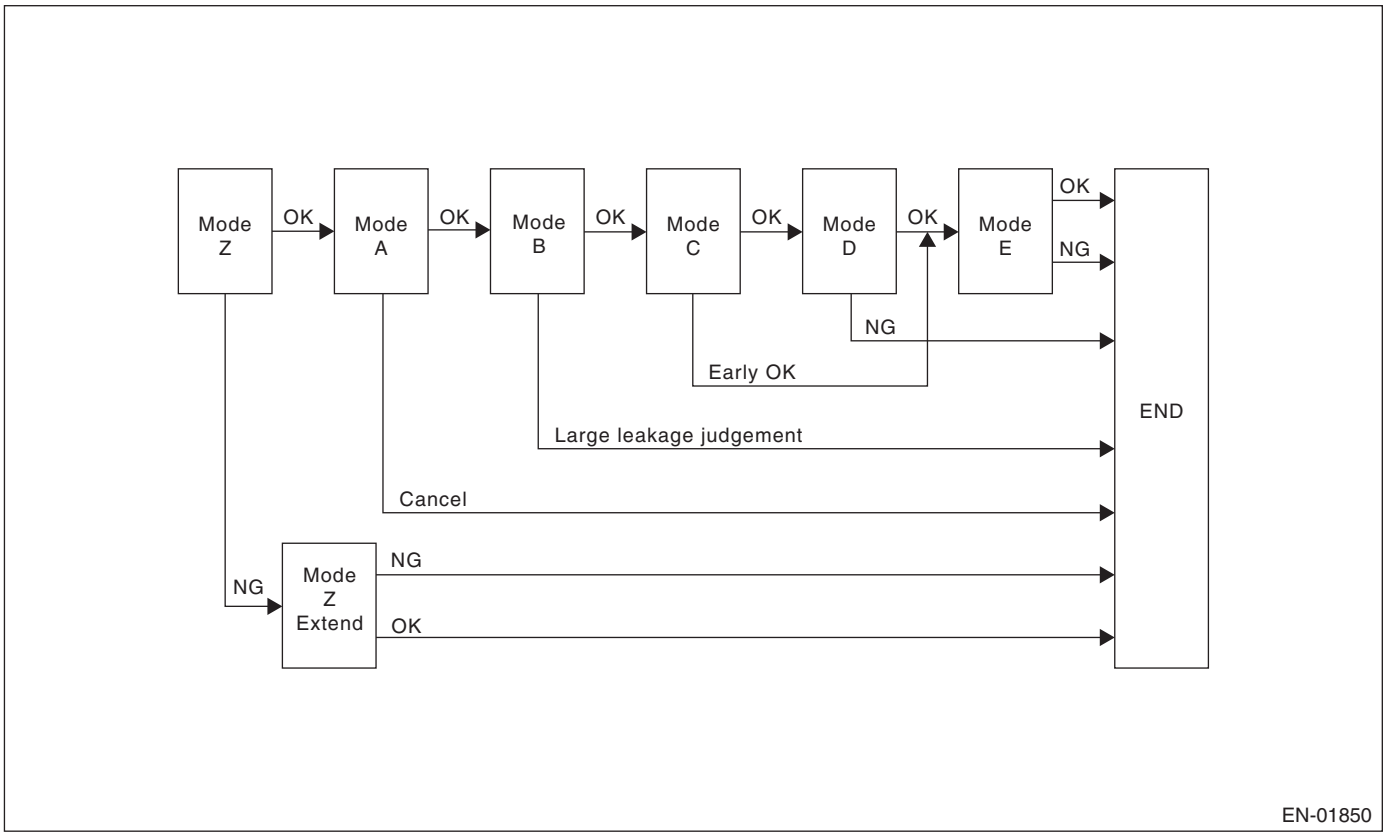


EN-01699

(1) Fuel gauge
(2) Intake manifold
(3) Throttle body
(4) Purge control solenoid valve
(5) Engine control module (ECM)
(6) Canister
(7) Pressure control solenoid valve
(8) CCV
(9) Drain filter
(10) Shut-off valve
(11) Fuel temperature sensor
(12) Fuel level sensor
(13) Fuel tank
(14) Fuel cut valve
(15) Fuel tank pressure sensor
(16) Vent valve
(17) Tank pressure switching solenoid valve

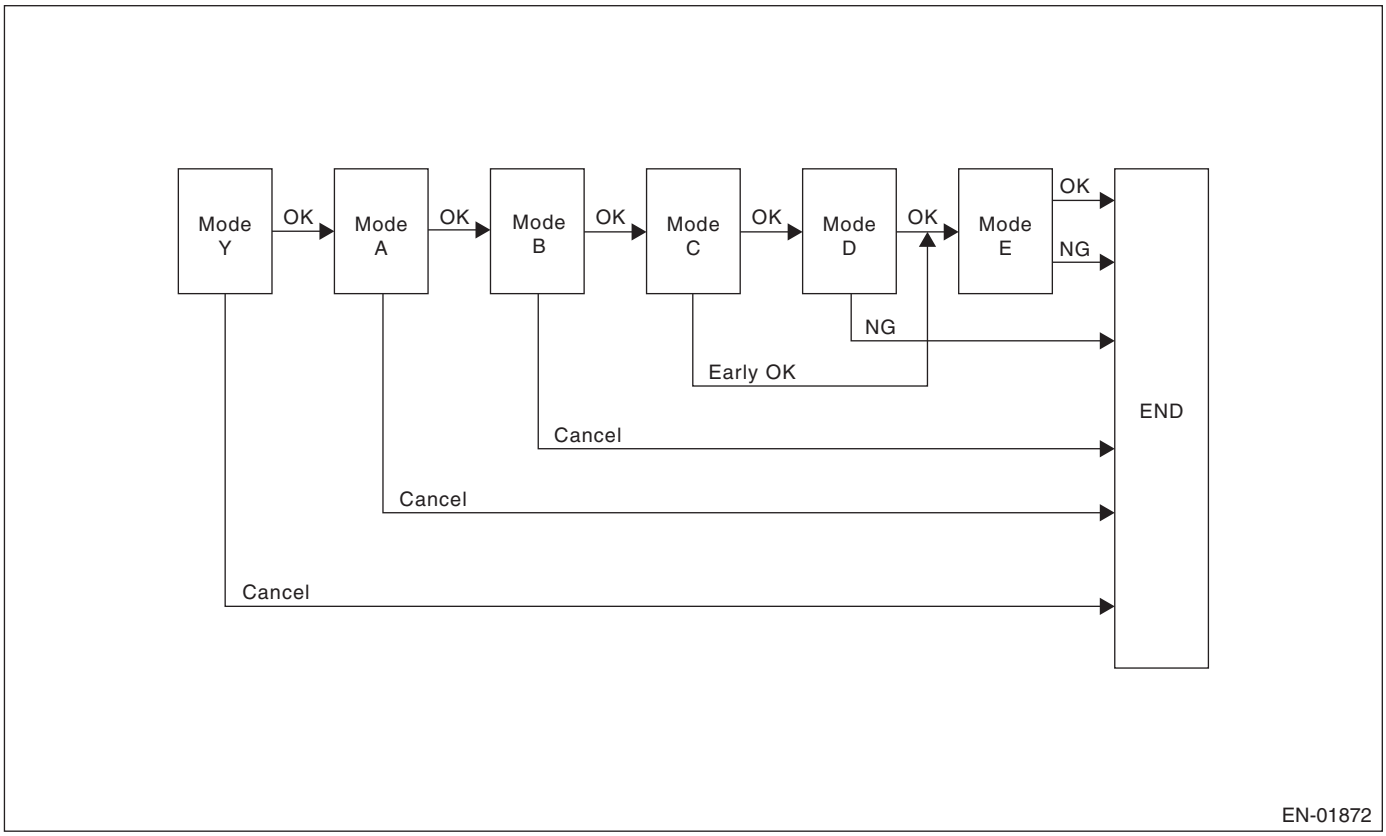
In this system diagnosis, checking for leakage and valve function is conducted by changing the fuel tank pressure and monitoring the pressure change using the fuel tank pressure sensor. 0.04 inch diagnosis is performed in the order of mode Z, mode A, mode B, mode C, mode D and mode E, and 0.02 inch diagnosis is performed in the order of mode Y, mode A, mode B, mode C, mode D and mode E.

• 0.04-inch Diagnosis



Mode	Mode Description	Diagnosis Period
Mode Z (CPC abnormal open diagnosis, CCV abnormal close diagnosis)	Carry out CPC open trouble and CCV close trouble diagnosis according to tank pressure change amount after diagnosis started.	3 — 16 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	7 — 15.5 seconds
Mode B (Sealed negative pressure, large leakage judgment)	Introduce the intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value. If the tank pressure cannot be reduced, it is diagnosed as large leak.	5 — 35 seconds
Mode C (Pressure increase check, advanced OK judgment)	Wait until the tank pressure becomes desired pressure. If the tank pressure does not become the value, make advanced OK judgment.	4 — 16 seconds
Mode D (Negative pressure variation measurement, evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode A. Perform the evaporation leakage diagnosis using the diagnostic value.	7 — 15.5 seconds
Mode E (CCV property abnormal diagnosis)	Perform the CCV property abnormal diagnosis according to the tank pressure change amount after the leakage diagnosis completed.	4 seconds

• 0.02-inch Diagnosis



Mode	Mode Description	Diagnosis Period
Mode Y (Tank pressure stabilization)	Return the tank pressure to atmosphere.	0.1 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	18 — 29 seconds
Mode B (Negative pressure sealed)	Introduce the intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value.	10 — 62 seconds
Mode C (Pressure increase check, advanced OK judgment)	Wait until the tank pressure becomes desire pressure. If the tank pressure does not become the value, make advanced OK judgment.	5 — 20 seconds
Mode D (Negative pressure variation measurement, evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode A. Perform the evaporation leakage diagnosis using the diagnostic value.	14 — 25 seconds
Mode E (CCV property abnormal diagnosis)	Perform the CCV property abnormal diagnosis according to the tank pressure change amount after the evaporation leakage diagnosis completed.	4 seconds

• Mode Table for Evaporative Emission Control System Diagnosis

0.04-inch Diagnosis

Mode	Behavior of tank internal pressure under normal conditions	Diagnostic item	DTC
Mode Z	Nearly same as atmospheric pressure (equivalent pressure of 0 kPa (0 mmHg, 0 inHg))	CCV is judged to be stuck closed.	P1443
		CPC is judged to be stuck open.	P0457
Mode A	Pressure is in proportion to amount of evaporation gas occurrence.	—	—
Mode B	Negative pressure is formed due to intake manifold negative pressure	Large leakage judgment	P0457
Mode C	Target pressure is reached.	—	—
Mode D	Pressure change is small.	Evaporation system is judged to have large leak [1.0 mm (0.04 in)].	P0442
Mode E	Return to atmosphere	CCV property judgment	P1443

0.02-inch Diagnosis

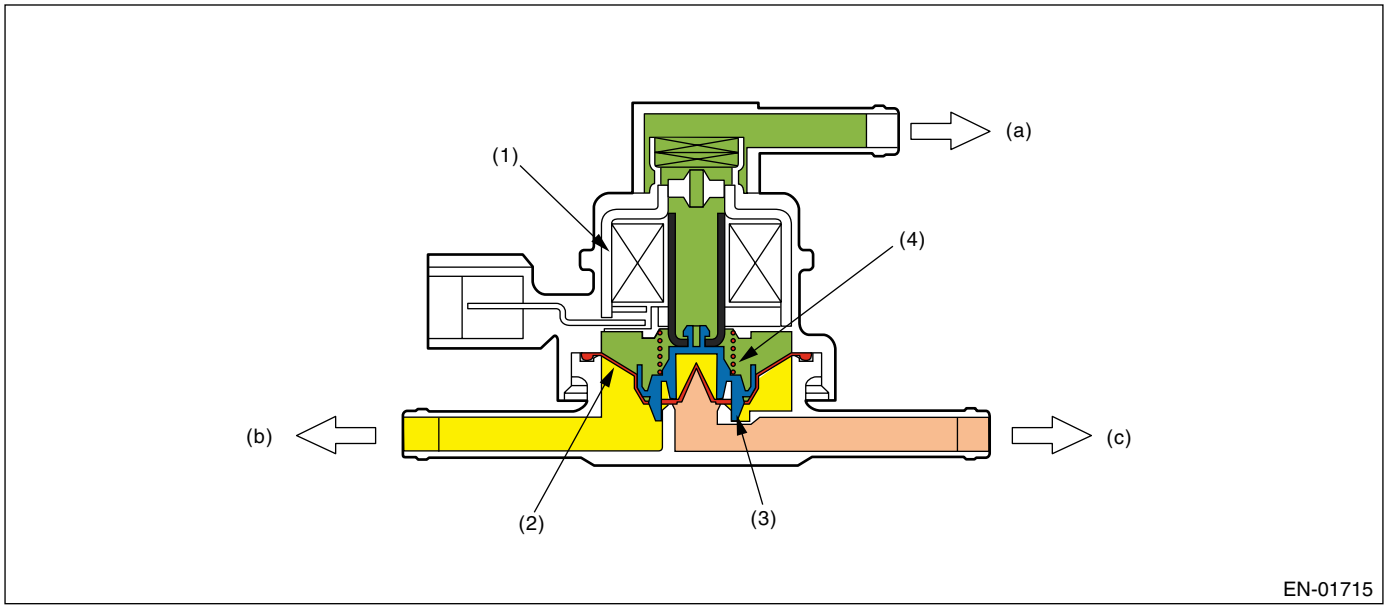
Mode	Behavior of tank internal pressure under normal conditions	Diagnostic item	DTC
Mode Y	Return to atmosphere	—	—
Mode A	Pressure is in proportion to amount of evaporation gas occurrence.	—	—
Mode B	Negative pressure is formed due to intake manifold negative pressure	—	—
Mode C	Target pressure is reached.	—	—
Mode D	Pressure change is small.	P2 measurement of small leak in system. Evaporation system is judged to have small leak [0.5 mm (0.02 in.)].	P0456
Mode E	Return to atmosphere	CCV property judgment	P1443

2. COMPONENT DESCRIPTION

• Pressure Control Solenoid Valve

PCV controls the fuel tank pressure to be equal to the atmospheric air pressure.
Normally, the solenoid is set to OFF. And the valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.

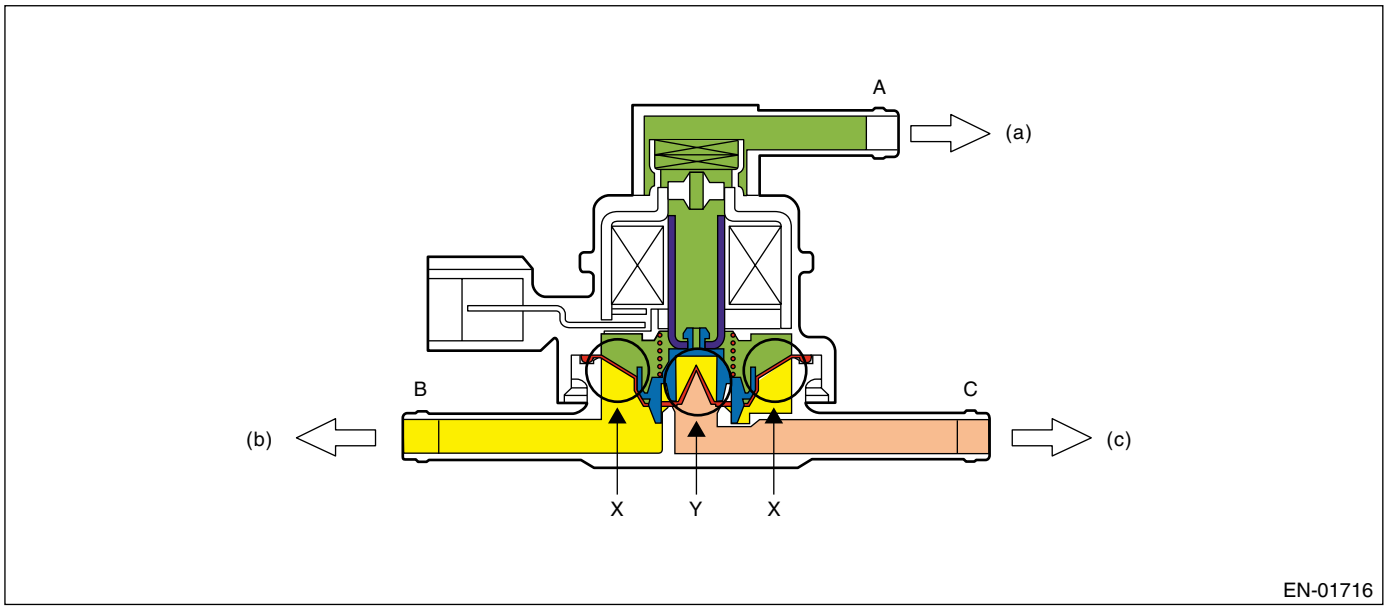
The solenoid which is set to ON forces to open the valve.



(1) Solenoid
(2) Diaphragm
(3) Valve
(4) Spring
(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

• Valve Operation and Air Flow

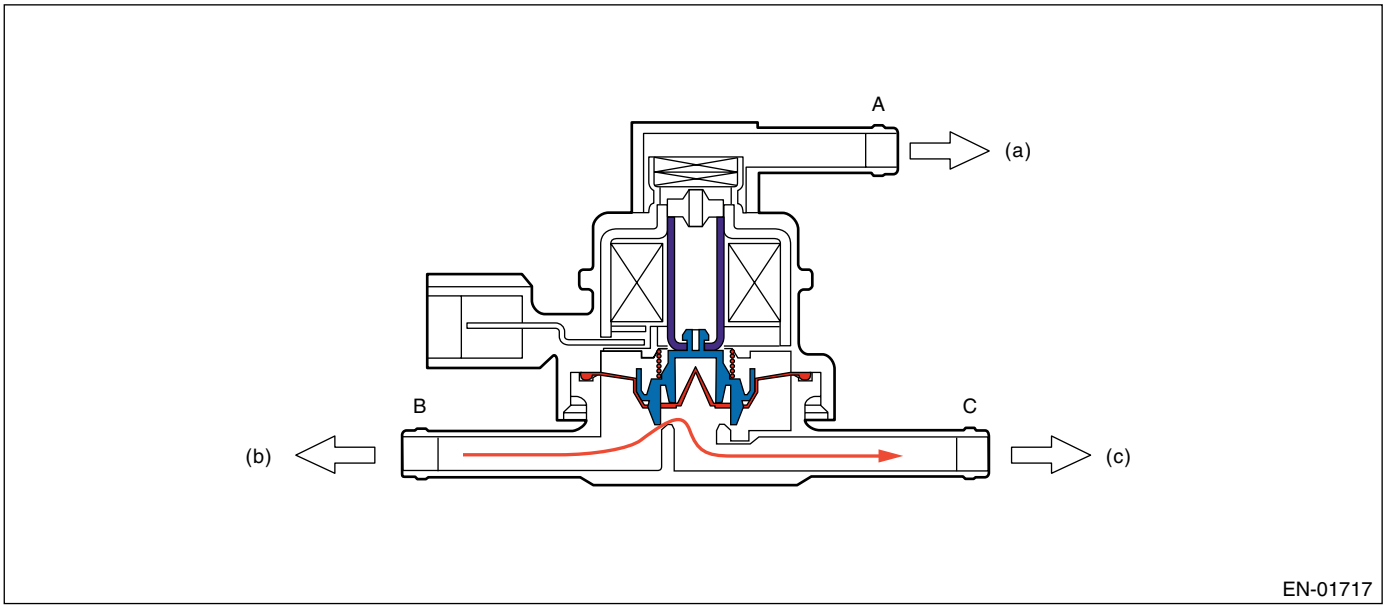
In the figure below, divided by the diaphragm, the part above X is charged with atmospheric air pressure, and the part below X is charged with tank pressure. Also, the part above Y is charged with tank pressure, and the part below Y is charged with canister pressure.
If the atmospheric air pressure port is A, tank pressure port is B, and canister pressure port is C, the air flows according to pressure difference from each port as shown in the table below.



(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

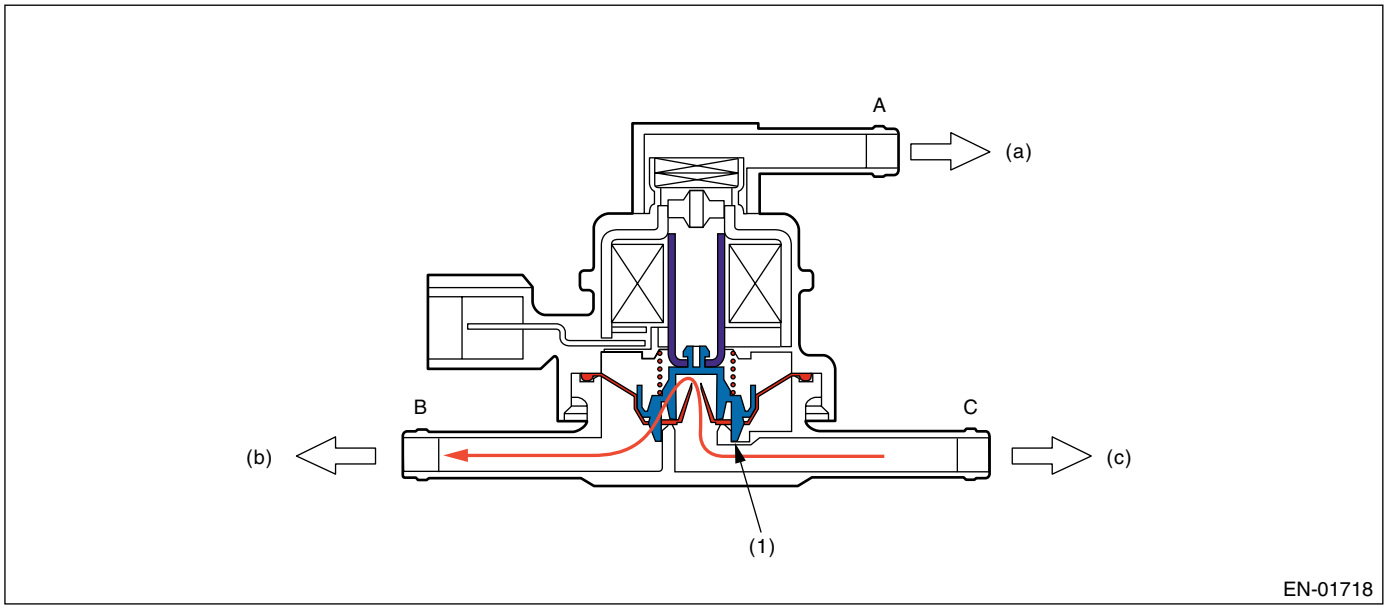
Condition of pressure	Flow
A < B (solenoid OFF)	B → C
B < C (solenoid OFF)	C → B
Solenoid ON	B ←→ C

• When A < B (Solenoid OFF)



(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

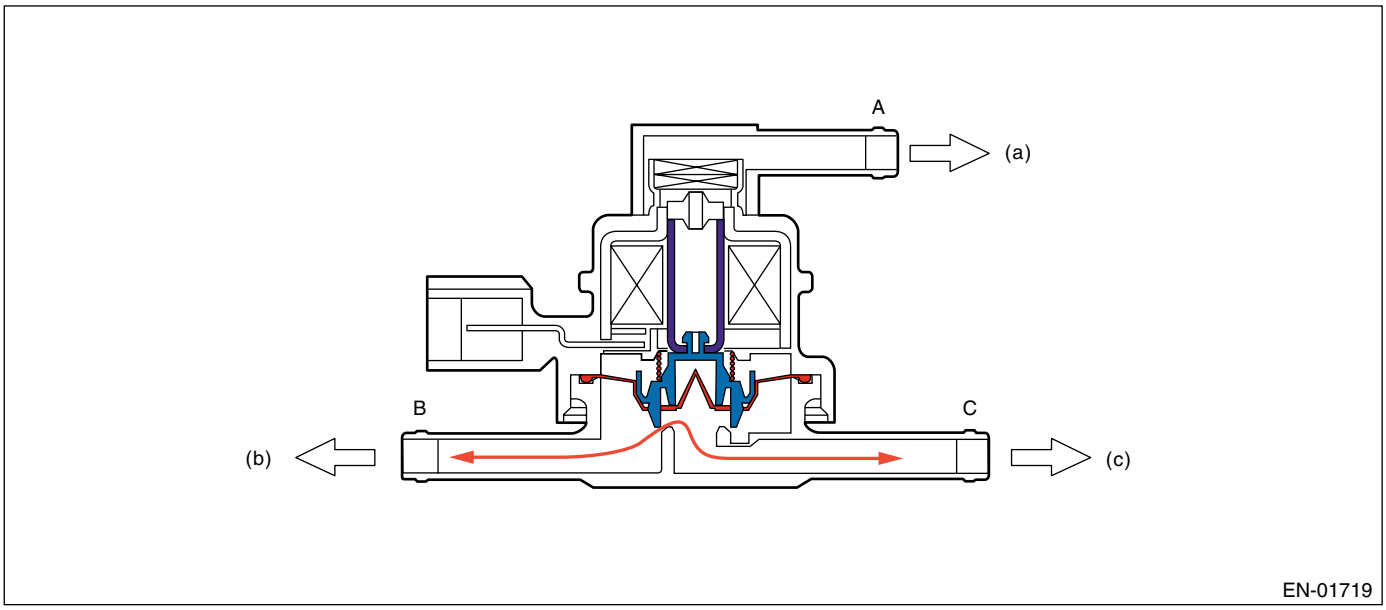
• When B < C (Solenoid OFF)



(1) Valve

(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

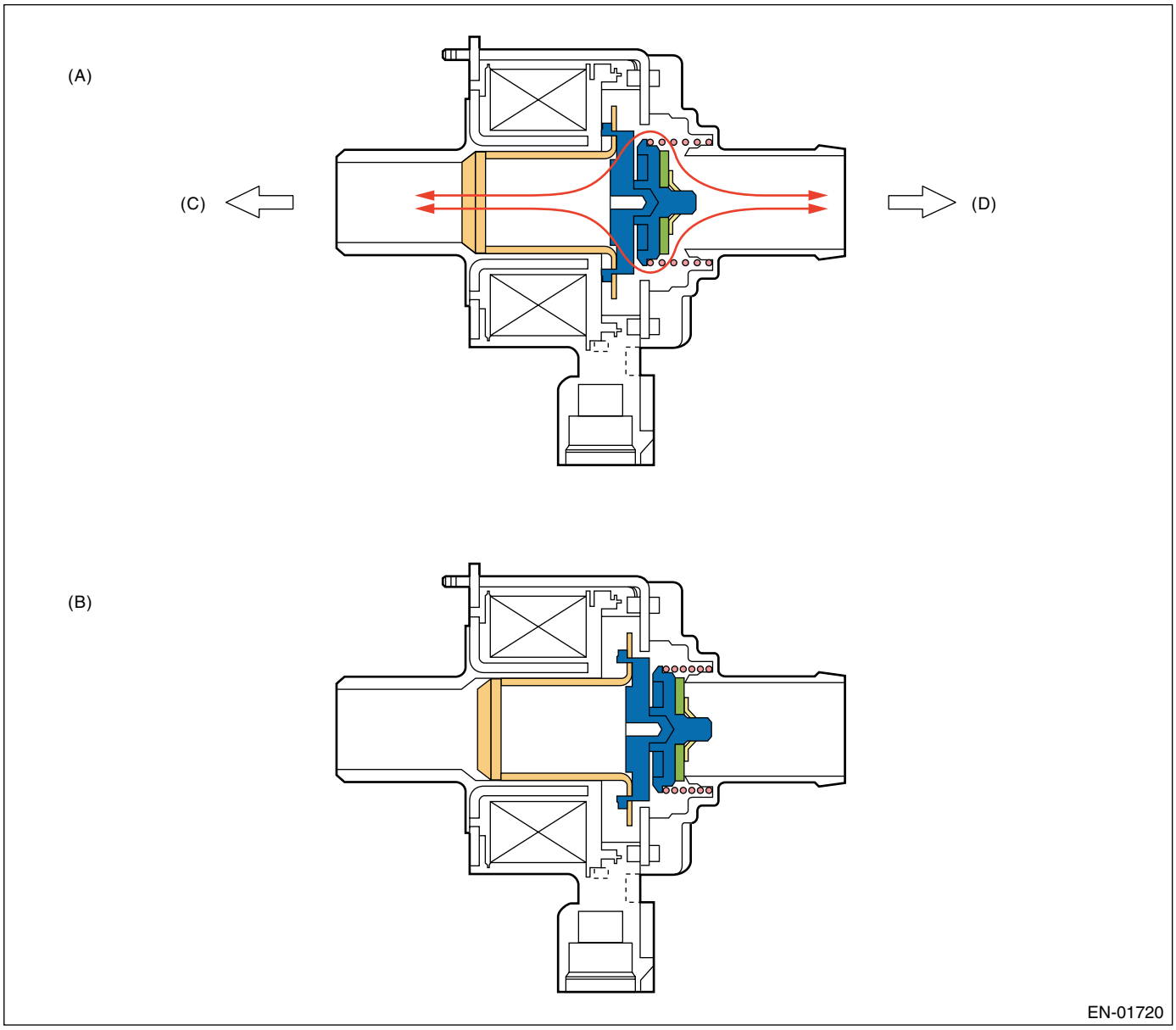
• When Solenoid is ON



(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

• CCV

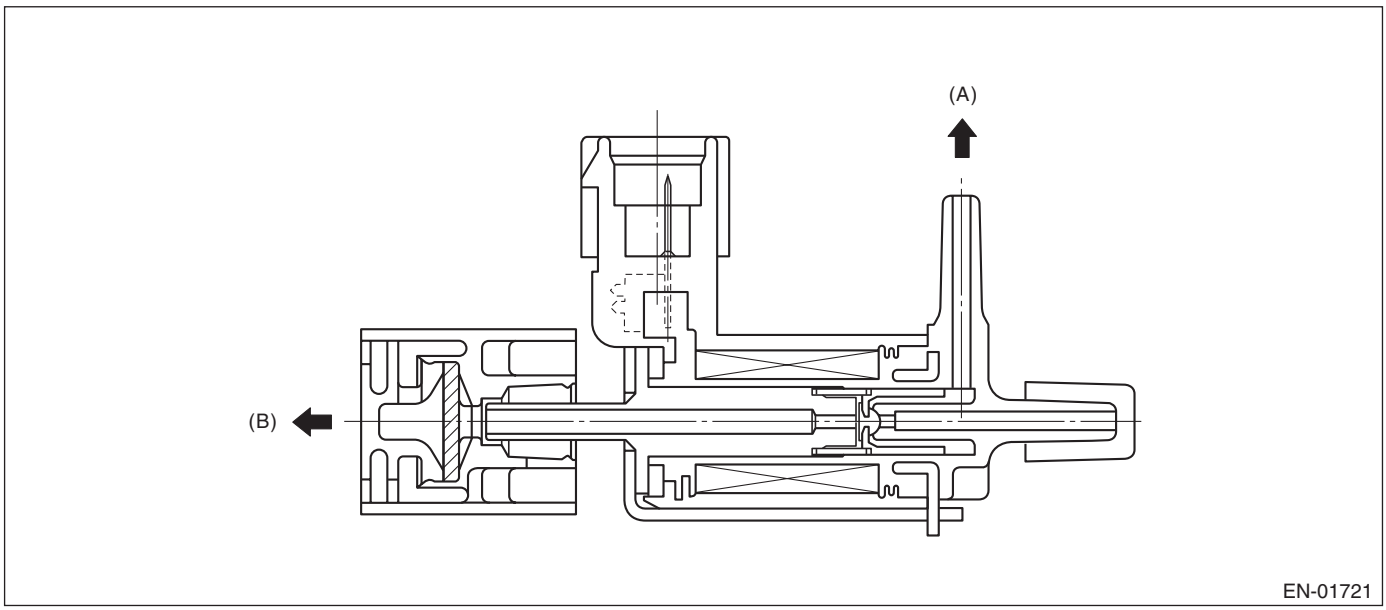
CCV controls the ambient air to be introduced to the canister.



(A) Open (Solenoid OFF)
(B) Close (Solenoid ON)
(C) Filter
(D) Canister

• Tank Pressure Switching Solenoid

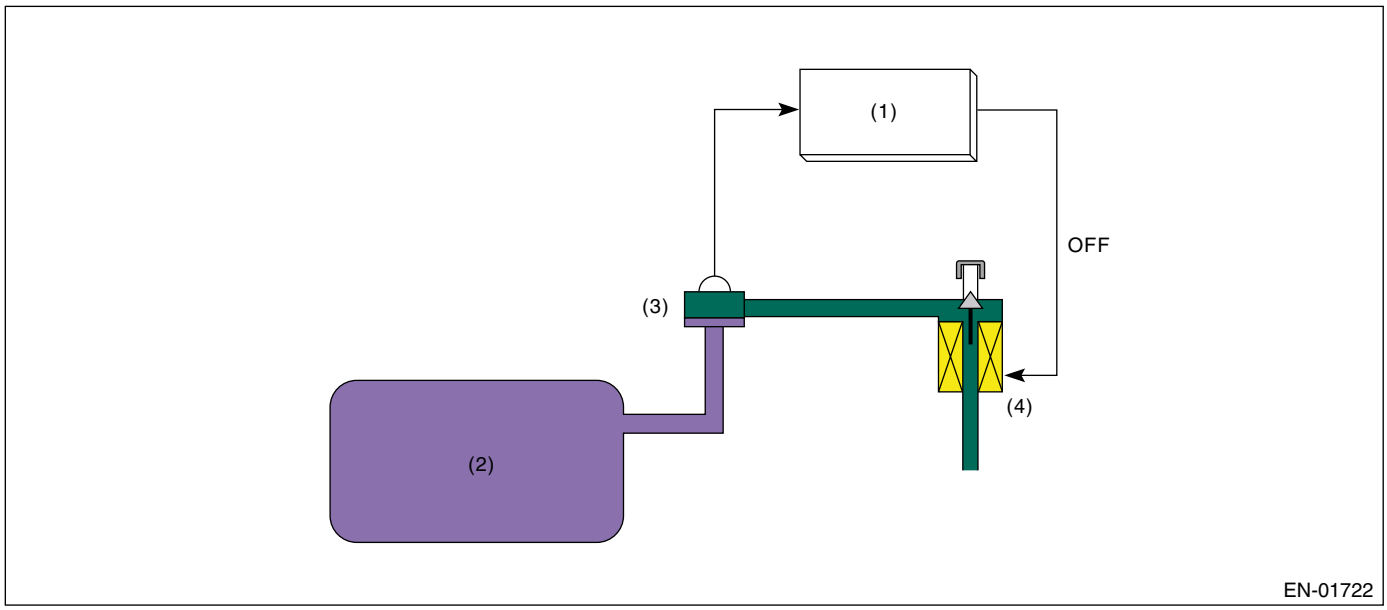
One of the atmospheric pressure switching solenoid valves is connected to fuel tank pressure sensor and the other is released to atmosphere. The passage to fuel tank pressure sensor is usually released to atmosphere because the solenoid is set to OFF, but the solenoid which is set to ON close the passage open to atmosphere.



(A) Fuel tank pressure sensor
(B) Atmosphere

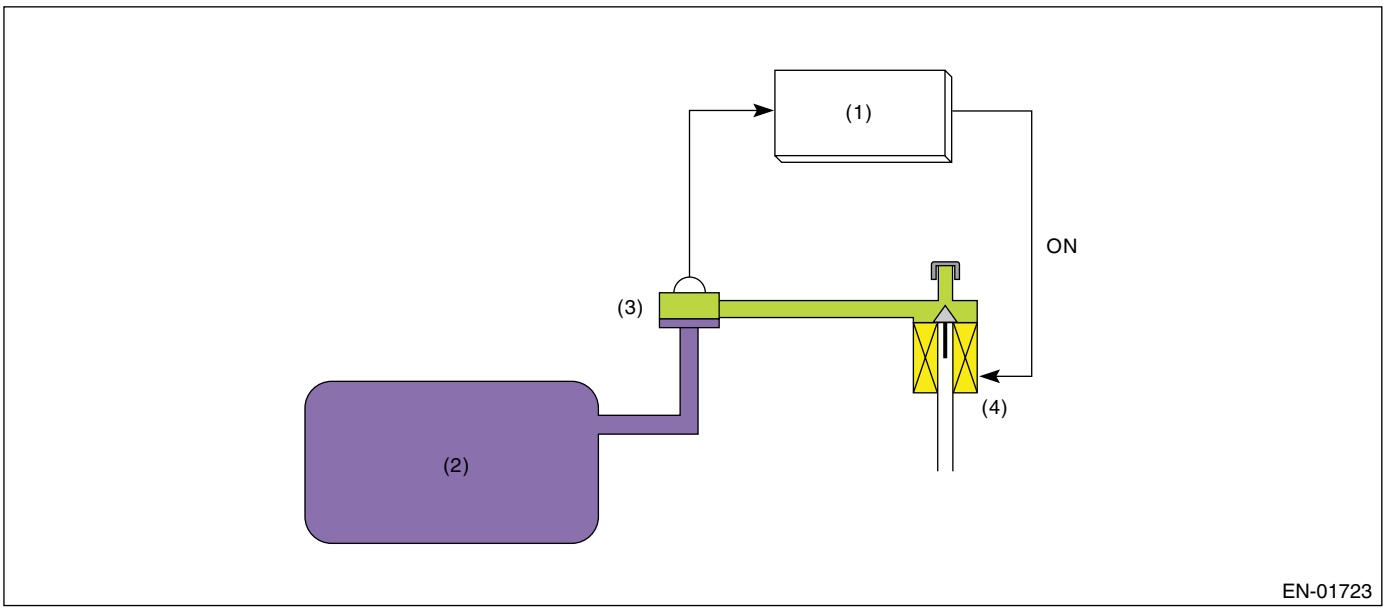
• Purpose of this solenoid

Fuel tank pressure sensor detects the difference between the atmospheric air pressure and the tank pressure and the ECM monitors the pressure difference.
Even if the tank pressure is constant, the atmospheric air pressure varies depending on the driving height, and the pressure signal transmitted to ECM will change.



(1) Engine control module (ECM)
(2) Fuel tank
(3) Fuel tank pressure sensor
(4) Atmospheric pressure switching solenoid

Especially, in the small leakage [0.5 mm (0.02 in)], minute change in the tank pressure has to be detected. This diagnosis period is long (approx. 29 seconds). And if the driving height changes during the diagnosis, the atmospheric air pressure changes. In this case, it becomes difficult to precisely detect the tank pressure variation, causing erroneous diagnosis. Therefore, using the atmospheric pressure switching solenoid, atmospheric air is sealed between the fuel tank pressure sensor and atmospheric pressure switching solenoid, maintaining the air pressure constant and enabling the detection of minute variation of tank pressure.



(1) Engine control module (ECM)
(2) Fuel tank
(3) Fuel tank pressure sensor
(4) Atmospheric pressure switching solenoid

NOTE:
ECM also has the atmospheric air pressure sensor, and always monitors atmospheric air. However, as the monitoring range is large, that is, 53 to 107 kPa (400 to 800 mmHg, 16 to 32 inHg) it is not suitable for detection of minute pressure variation.
In the case of small leakage diagnosis, the tank pressure variation is very small, that is, 0.13 to 0.27 kPa (1 to 2 mmHg, 0.04 to 0.08 inHg) and the fuel tank pressure sensor is equipped.

3. ENABLE CONDITION

0.04-inch Diagnosis

Secondary Parameters	Enable Conditions
Evap. diagnosis	Not completed
Since last incomplete diagnosis event of 0.04 inches leak	≥ 180 seconds (vehicle speed ≥ 72 km/h (45 MPH))
	≥ 920 seconds (vehicle speed < 72 km/h (45 MPH))
Throttle angle	96 — 14.1°
Canister purge cumulative time	≥ 120 seconds
Engine speed	≥ 1,500 rpm
Fuel tank pressure at Evap. monitoring starting	≥ −1,000 Pa (7.5 mmHg, 0.295 inHg)
Intake manifold relative pressure	≥ 26.65 kPa (200 mmHg, 7.9 inHg)
Vehicle speed	≥ 48 km/h (30 MPH)
Fuel level	9 — 51 ℓ (2.4 — 13.5 US gal, 2.0 — 11.2 Imp gal)
After engine started	More than 454 seconds
Barometric pressure	≥ 75 kPa (563 mmHg, 22.1 inHg)
Fuel temperature	−10 — 45°C (14 — 113°F)
Change of fuel level	< 5 ℓ (1.3 US gal, 1.1 Imp gal)/ 200 milliseconds
0.02-inch diagnosis cancel timer	≥ 120 seconds (vehicle speed ≥ 72 km/h (45 MPH))
	≥ 920 seconds (vehicle speed < 72 km/h (45 MPH))

Cancel Conditions

Secondary Parameters	Enable Conditions
Change of fuel level	≥ 5 ℓ (1.3 US gal, 1.1 Imp gal)/200 milliseconds
When the continuous time until the conditions below are completed becomes more than 4 seconds during Mode B	
Throttle angle	≤ 0.640°
Engine speed	≤ 1,300 rpm
Intake manifold relative pressure	≤ −16 kPa (−120 mmHg, 4.7 inHg)
Vehicle speed	≤ 48 km/h (30 MPH)
CPC duty	≤ 15%
Compensation factor of air fuel ratio	≤ −30%
When one of the conditions below is completed during Mode A	
Tank pressure	≥ 1.8 kPa (13.5 mmHg, 0.5 inHg)
Tank pressure variation amount	≥ 0.1 kPa (0.75 mmHg, 0.03 inHg)
P1	< −0.1 kPa (−0.75 mmHg, −0.03 inHg)
When the conditions below are completed during Mode D	
Tank pressure variation amount	≥ 0.1 kPa (0.75 mmHg, 0.03 inHg)

0.02-inch Diagnosis

Secondary Parameters	Enable Conditions
Continuous time until the conditions (1) (2) (3) below are all completed.	≥ 5 seconds
Enable condition (1) (All conditions below are completed.)	
Fuel tank pressure at vacuum starting	−37.5 — 937 Pa (−0.28 — 7.03 mmHg, −0.0110 — 0.277 inHg)
Evap. 0.02-inch Diagnosis	Not completed
Since last incomplete diagnosis event of 0.02 inches leak	> 180 seconds
Total time of operating canister purge	More than 120 seconds
After engine started	More than 325 seconds
Fuel tank pressure below −3,050 Pa (−22.87 mmHg, −0.9007 inHg) during same driving cycle	< 2 seconds
Fuel temperature	−10 — 35°C (14 — 95°F)
After engine start with coolant temperature of 40°C (104°F) or below	< 2,400 seconds
0.04-inch diagnosis cancel timer	≥ 120 seconds
Number of times changing fuel level at 8 2 or more after starting engine	> 3 seconds
Enable condition (2) (All conditions below are completed.)	
Fuel level	9 — 51 ℓ (2.4 — 13.5 US gal, 2.0 — 11.2 Imp gal)
Atmospheric pressure	≥ 75.7 kPa (568 mmHg, 22.3 inHg)
Change of fuel level	< 4 — 4.5 ℓ (1.1 — 1.2 US gal, 0.9 — 1.0 Imp gal)
Ambient temperature	≥ −10°C (14°F)
(Ambient-fuel) temperature	≥ 1°C (34°F)
Change of engine speed after starting the diagnosis	< 300 rpm
Change of manifold absolute pressure after starting the diagnosis	< 20 kPa (150 mmHg, 5.9 inHg)
Enable condition (3) (All conditions below are completed.)	
Engine speed	≥ 1,500 rpm
Intake manifold relative pressure	≥ 8 kPa (60 mmHg, 2.4 inHg)
Vehicle speed	≥ 68 km/h (42 MPH)
Closed air fuel ratio control	In operating
CPC duty	≥ 15%
Lambda factor	≥ 0.75

Cancel Conditions

Secondary Parameters	Enable Conditions
Enable condition (2) completion during Mode Y	Not completed
Continuous time for enable condition (3) completion during Mode B	≥ 10 seconds
When one of the conditions below is completed during Mode A	
Fuel tank pressure	≥ 1.1 kPa (8.25 mmHg, 0.32 inHg)
P1	≥ 125 Pa (0.94 mmHg, 0.04 inHg)
P1	< −87.5 Pa (−0.66 mmHg, −0.03 inHg)
Tank pressure variation amount	≥ 0.1 kPa (0.75 mmHg, 0.03 inHg)
When the condition below is completed during Mode D	
Tank pressure variation amount	≥ 0.1 kPa (0.75 mmHg, 0.03 inHg)

4. GENERAL DRIVING CYCLE

• 0.04-inch Diagnosis

• Perform the diagnosis only once in more than 920 seconds after the engine start at the constant driving speed of 48 km/h (30 MPH) or more.
• Pay attention to the fuel temperature and fuel level.

• 0.02-inch Diagnosis

• Perform diagnosis in more than 325 seconds after engine start at the constant speed of 68 km/h (42 MPH) or more, and then terminate the diagnosis when judged OK or NG.
• If not judged OK or NG, repeat the diagnosis until judged OK or NG.
• Pay attention to the fuel temperature and fuel level.

5. DIAGNOSTIC METHOD

• MODE Y (Tank pressure stabilization)

Return the tank pressure to atmosphere, and perform the diagnosis under the conditions.
Tank pressure > 0.9 kPa (67.5 mmHg, 2.7 inHg) after 0.1 seconds:
Cancel the leak check. (Change to Mode A, Tank pressure ≤ 0.9 kPa (67.5 mmHg, 2.7 inHg).)

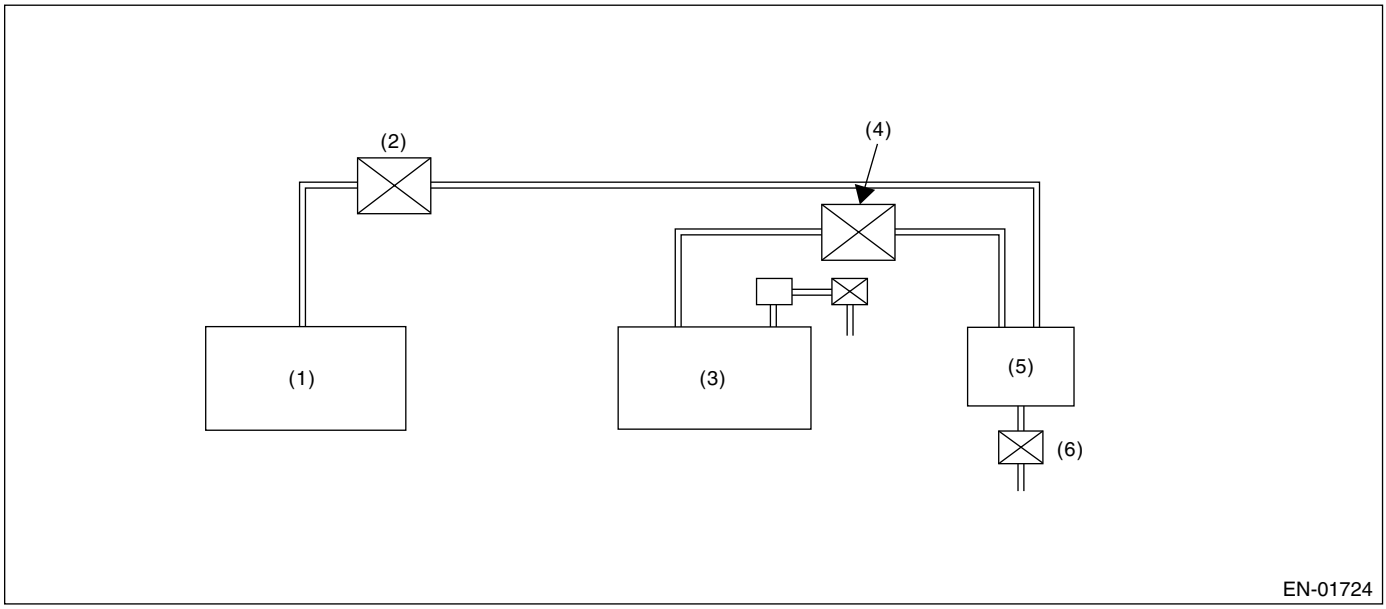
• MODE Z (Purge control solenoid valve open malfunction diagnosis, CPC close malfunction diagnosis)

DTC P0457
DTC P1443

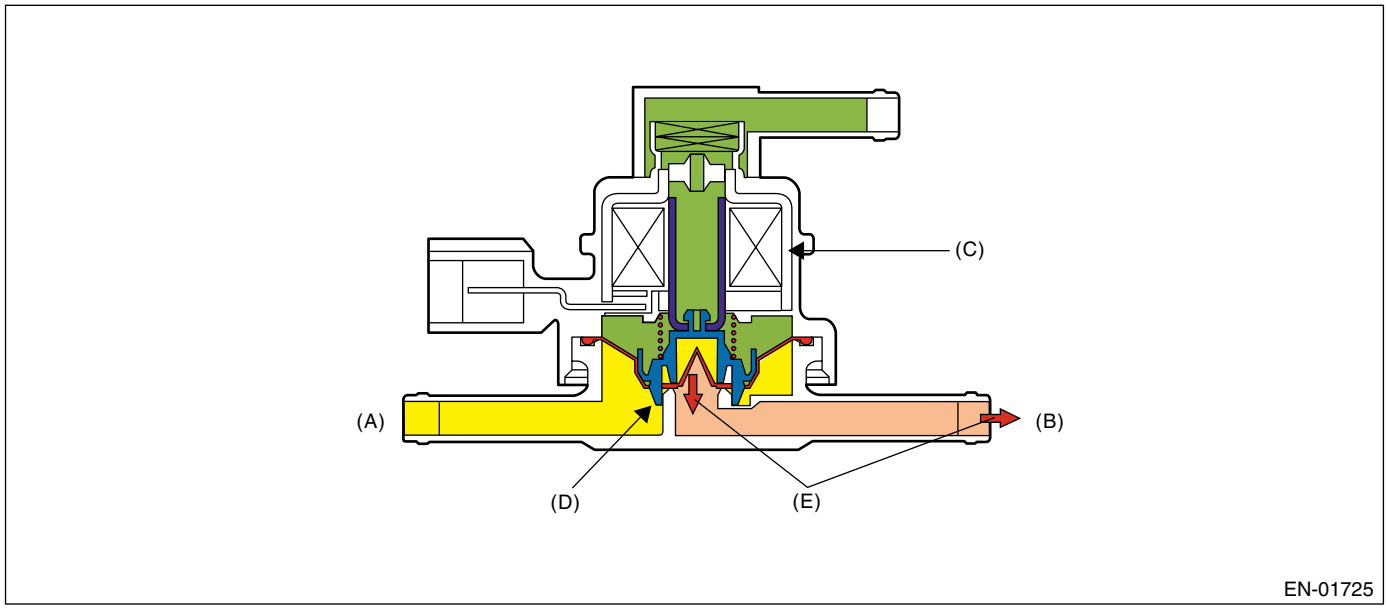
• Purpose of Mode Z

When performing the leakage diagnosis of EVAP system, CCV and CPC have to operate normally. Therefore, mode Z is used to diagnose the CCV close fixation and CPC open fixation.
If the CCV closed fixation trouble or CPC open fixation trouble is detected, the EVAP system leakage diagnosis is cancelled.

If the CCV closed fixation trouble occurred, negative pressure is generated from the engine to pressure control solenoid valve when pressure control solenoid valve is closed and CPC is opened. In this status, the pressure control solenoid valve solenoid, which is set to ON, does not open the valve for its structure when the negative pressure is larger than electromagnetic force.



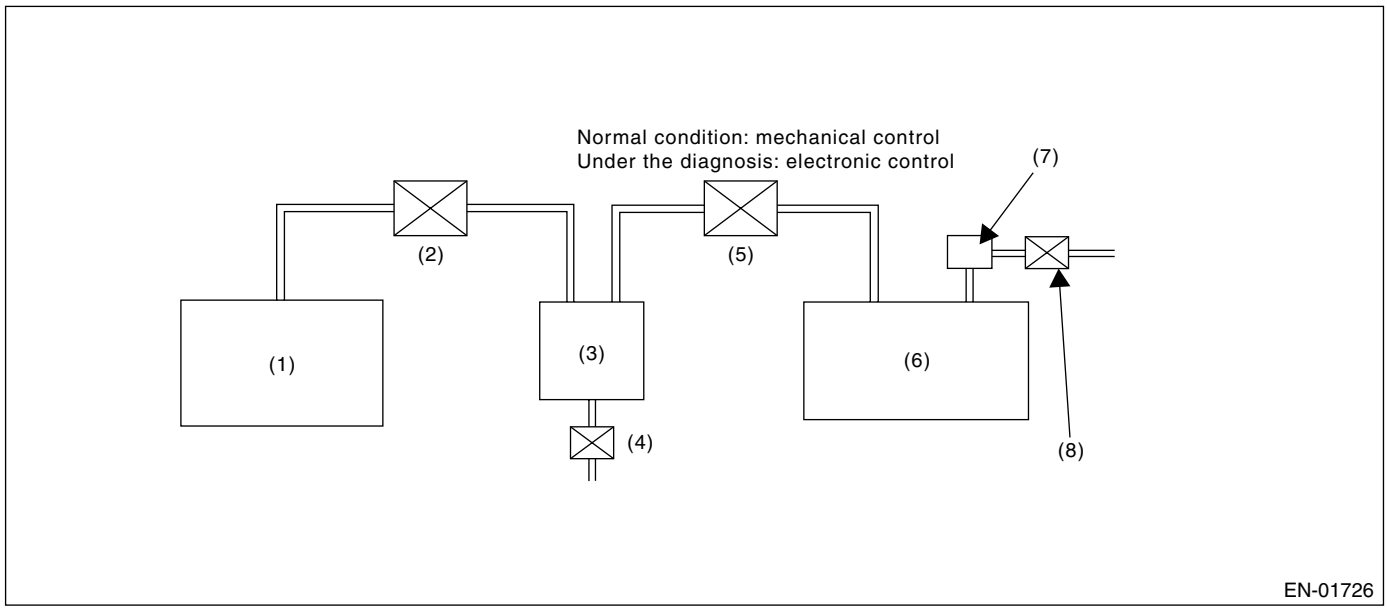
(1) Engine
(2) Purge control solenoid valve open
(3) Fuel tank
(4) Pressure control solenoid valve close
(5) Canister
(6) CCV stuck close



(A) To fuel tank
(B) To canister (Negative pressure)
(C) Solenoid ON
(D) Valve cannot be open.
(E) Negative pressure

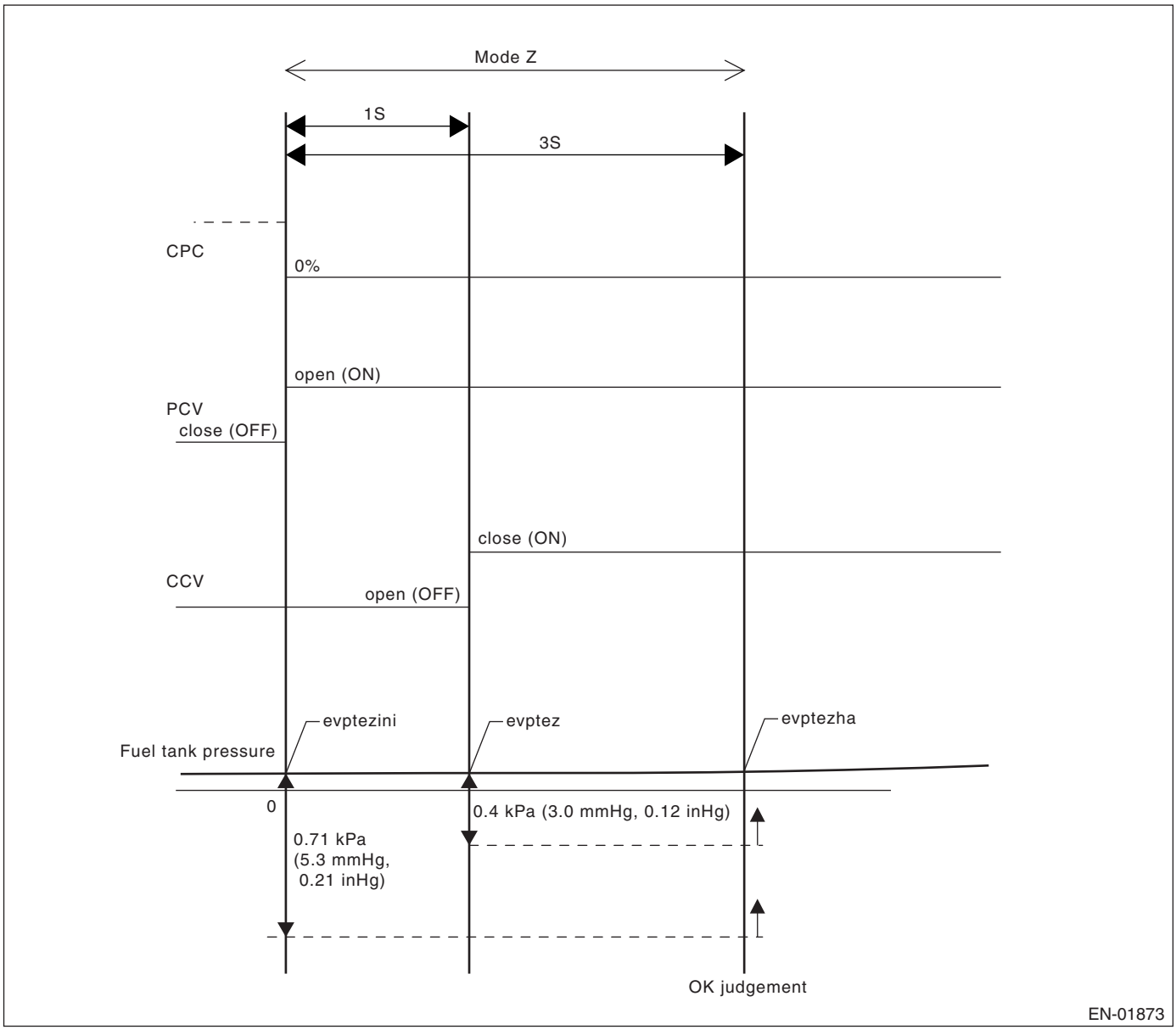
• Diagnostic method

CCV closed fixation diagnosis and CPC open fixation diagnosis are performed in mode Z as shown in the figure below.



(1) Engine
(2) Purge control solenoid valve
(3) Canister
(4) Drain valve
(5) Pressure control solenoid valve
(6) Fuel tank
(7) Fuel tank pressure sensor
(8) Tank pressure switching solenoid valve

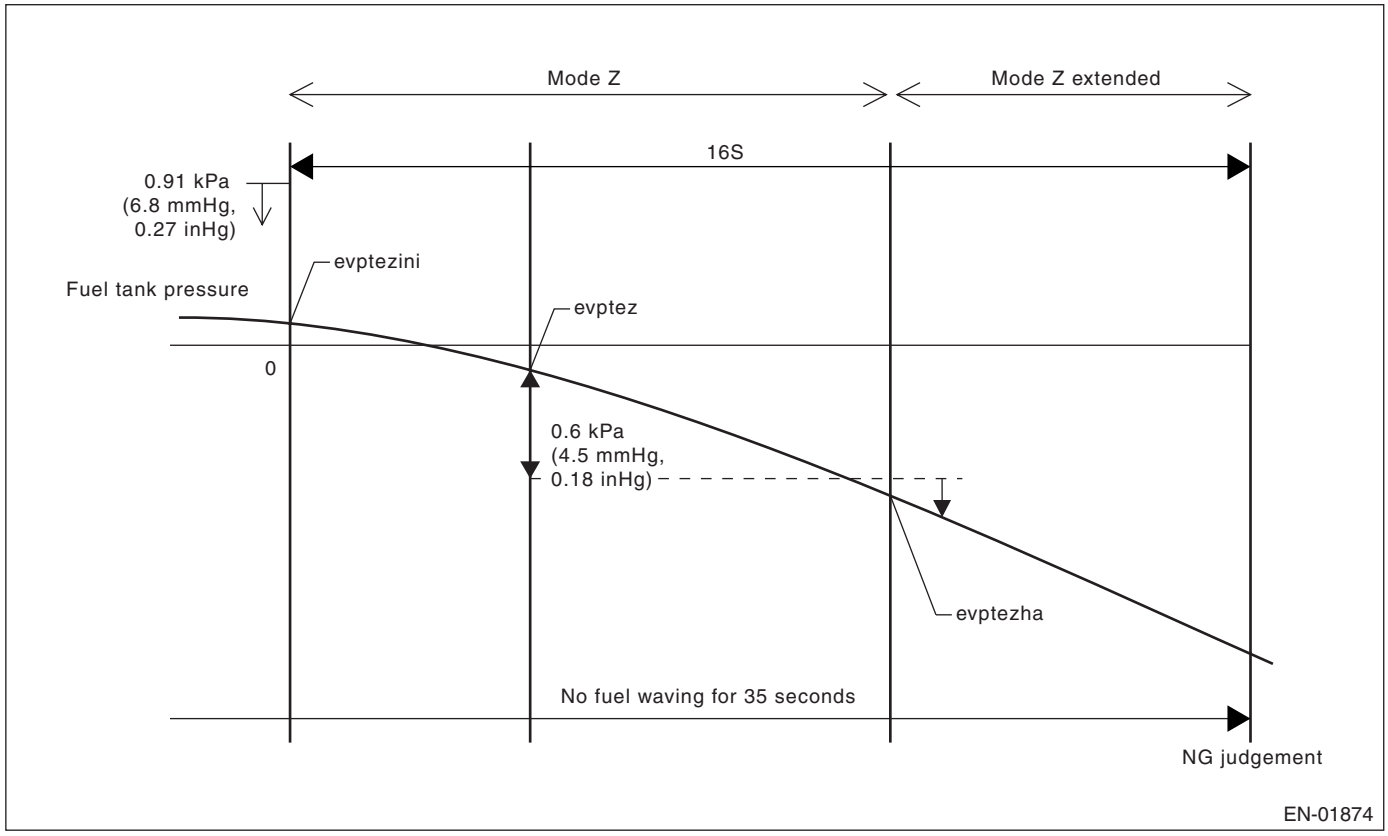
• Normal Operation



- evptez − evptezha ≤ 0.4 kPa (3.0 mmHg, 0.12 inHg)
- evptezini − evptezha ≤ 0.71 kPa (5.3 mmHg, 0.21 inHg)

Judge normal when these calculations are completed.

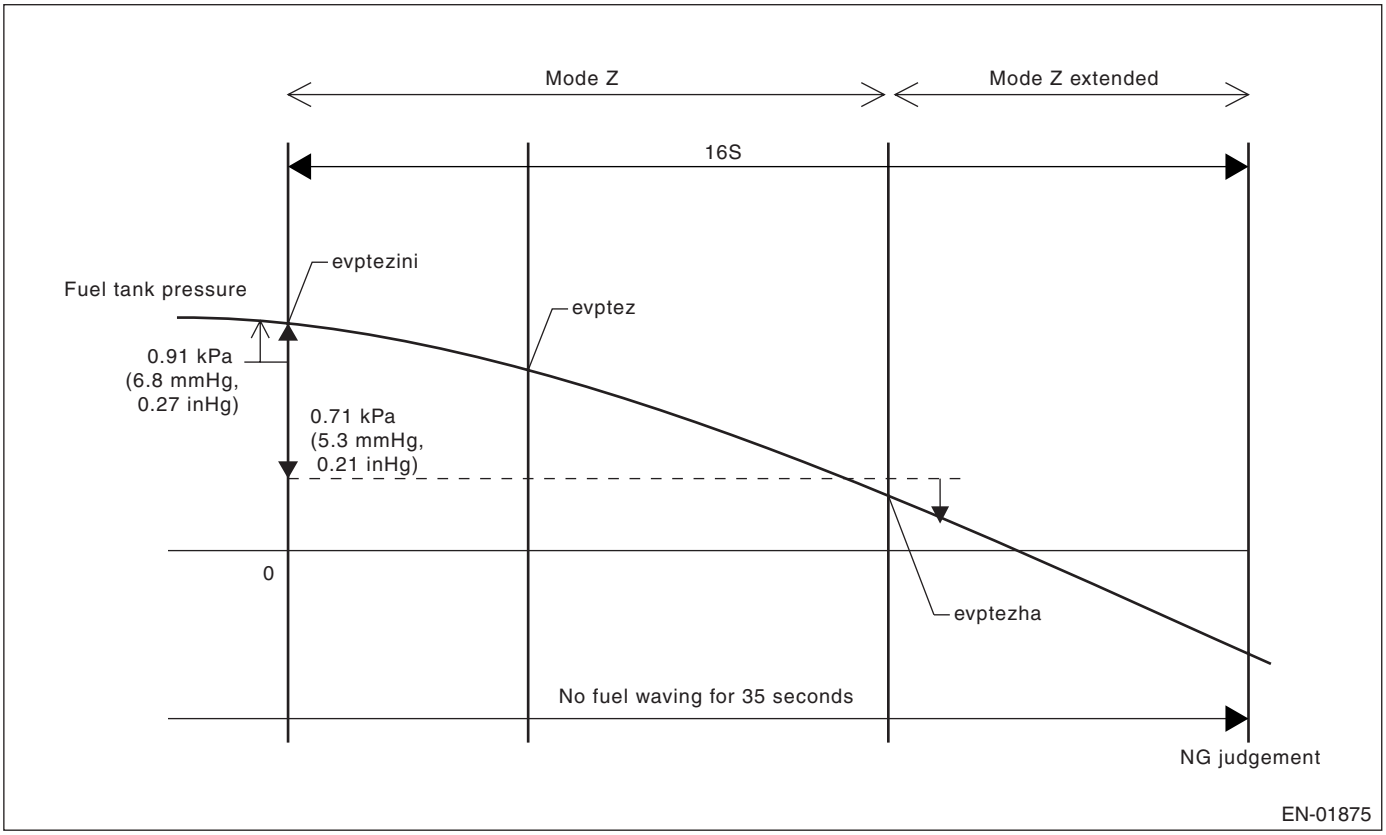
• Purge control solenoid valve Open Fixation



- evptez − evptezha > 0.6 kPa (4.5 mmHg, 0.18 inHg)
- evptezini ≤ 0.91 kPa (6.8 mmHg, 0.27 inHg)
- No fuel rolling of above 3 ℓ (0.79 US gal, 0.67 Imp gal) for more than 35 seconds.

Judge normal when these calculations are completed.

• Drain valve close fixation



- evptezini − evptezha > 0.71 kPa (5.3 mmHg, 0.21 inHg)
- evptezini > 0.91 kPa (6.8 mmHg, 0.27 inHg)
- No fuel rolling of above 3 ℓ (0.79 US gal, 0.67 Imp gal) for more than 35 seconds

Judge normal when these calculations are completed.

• Diagnosing Function of CCV [P1443]

CCV functional diagnosis is performed by monitoring the tank pressure variation in Mode Z.

Normality Judgment

Judge OK and change to Mode A when the criteria below are completed in 3 seconds after Mode Z started.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure in 1 second after Mode Z started) − (Tank pressure when Mode Z finished)	≤ 0.4 kPa (3.0 mmHg, 0.12 inHg)	P1443
(Tank pressure when Mode Z started) − (Tank pressure when Mode Z finished)	≤ 0.6 kPa (4.5 mmHg, 0.18 inHg)	P0457
Tank pressure when Mode Z started	≤ 1.6 kPa (12 mmHg, 0.47 inHg)	

Abnormality Judgment

If OK judgment cannot be made, extend Mode Z 16 seconds more, and judge NG when all the criteria below are completed in 16 seconds.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Tank pressure when Mode Z started	> −0.7 kPa (−5.3 mmHg, −0.21 inHg)	P1443
(Tank pressure when Mode Z started) − (Tank pressure when Mode Z finished)	> 0.6 kPa (4.5 mmHg, 0.18 inHg)	
No fuel locking time	≥ 40 seconds	

Time Needed for Diagnosis: 16 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
Finish the evaporative emission control system diagnosis when making NG judgment for drain valve close fixation.
Cancel the evaporative emission control system diagnosis when the OK/NG judgment for drain valve close fixation and purge control solenoid valve open fixation cannot be made in Mode Z.

• Diagnosing function of CPC [P0457]

CPC functional diagnosis is performed by monitoring the tank pressure in Mode Z.
Normality Judgment
Make OK judgment in 3 seconds after Mode Z started, and change to Mode A if OK.
Both diagnostic method and judgment value are the same as PCV normality judgment.
Abnormality Judgment
If OK judgment cannot be made, extend Mode Z 16 seconds more, and judge NG when all the criteria below are completed in 16 seconds.
Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure in 1 second after Mode Z started) − (Tank pressure when Mode Z finished)	> 0.6 kPa (4.5 mmHg, 0.18 inHg)	P0457
Tank pressure when Mode Z started	≤ −0.7 kPa (−5.3 mmHg, −0.21 inHg)	
No fuel locking time	≥ 40 seconds	
Air fuel ratio rich cumulative time during Mode Z	0.5 seconds	

Time Needed for Diagnosis: 16 seconds
Malfunction Indicator Light Illumination: Immediately
Finish the evaporative emission control system diagnosis when making NG judgment for purge control solenoid valve open fixation.
Cancel the evaporative emission control system diagnosis when the OK/NG judgment for drain valve close fixation and purge control solenoid valve open fixation cannot be made in Mode Z.

• Leak Diagnosis

DTC P0442
DTC P0456
DTC P0457

• Diagnostic method

• The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.
• The diagnosis is divided into the following five phases.

Mode A;
Calculate tank pressure variation amount (P1). After calculating P1, change to Mode B.
Mode B;
Introduce the negative pressure in the intake manifold to the tank.
Approx. 0 → −1.4 kPa (0 → −10.5 mmHg, 0 → −0.41 inHg) (0.04-in diagnosis)
Approx. 0 → −3.05 kPa (0 → −22.9 mmHg, 0 → −0.9 inHg) (0.02-in diagnosis)
When the pressure above (desired negative pressure) is reached, Mode C is entered.
In this case, if the tank pressure does not become the desired negative pressure, judge that there is a large leakage in the system.
Judge NG when the malfunction criteria below is completed.
Finish the Evap. diagnosis when judging large leak (18 seconds or 35 seconds) in 0.04-inch diagnosis. Cancel the diagnosis (62 seconds) in 0.02-inch diagnosis.

Abnormality Judgment
Judge NG (large leak) when the criteria below are completed in the specified time.
Specified Time
High vehicle speed mode (Vehicle speed ≥ 72 km/h (45 MPH)); 35 seconds
Low vehicle speed mode (Vehicle speed < 72 km/h (45 MPH)); 18 seconds
Judgment Value

Malfunction Criteria	Threshold Value	DTC
(0.04-inch diagnosis) Time for Mode B (Tank pressure when Mode Z started) − (Min. value of tank pressure during Mode B)	 ≥ 18 seconds or 35 seconds < 900 Pa (6.75 mmHg, 0.25 inHg)	P0457

Cancel the diagnosis when the NG judgment does not completed in the specified time.
Mode C;
Stop the introduction of negative pressure. (Wait until returning to target pressure.)
When returning to target pressure, move to Mode D.
Judge immediate OK and change to Mode E when it does not return in spite of spending the specified time.

	Target pressure	Time for immediate OK judgment
0.04-inch diagnosis	−1.3 kPa (−9.75 mmHg, −0.38 inHg)	16 seconds
0.02-inch diagnosis	−3 kPa (−22.5 mmHg, −0.89 inHg)	20 seconds

Mode D;
Monitor the tank pressure variation in Mode D. In this case, the tank pressure increases, that is, the pressure becomes as high as the atmospheric air pressure, because evaporator is generated. However, if any leakage exists, the pressure increases additionally in proportion to this leakage. The pressure variation of this tank is P2.
After calculating P2, perform small leak diagnosis and change to Mode E if normal. Complete Evap. diagnosis if abnormal.
• After Mode D

Assigning P1 and P2, which are tank variations measured in Mode A and Mode B, to the formula below, judge the small leakage of the system. If the measured judgment value exceeds the threshold value, it is judged to be malfunction.
• 0.04-inch Diagnosis

Abnormality Judgment
Judge NG when the criteria below are completed and judge OK when not completed.
Judgment Value

Malfunction Criteria	Threshold Value	DTC
$P2 - 1.5 \times P1$ P2 = Tank pressure varying at a specified time in mode D. P1 = Tank pressure varying at a specified time in mode A.	> 0.55 kPa (4.13 mmHg, 0.16 inHg)	P0442

***1.5:** Compensation value of the amount of evaporator occurrence. (Because evaporator increases more when becoming negative pressure.)

• 0.02-inch Diagnosis

Abnormality Judgment

Judge NG when the criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 − 1.9375 × P1 P2 = Tank pressure varying at a specified time in mode D. P1 = Tank pressure varying at a specified time in mode A.	≥ 800 Pa (6.0 mmHg, 0.24 inHg)	P0456

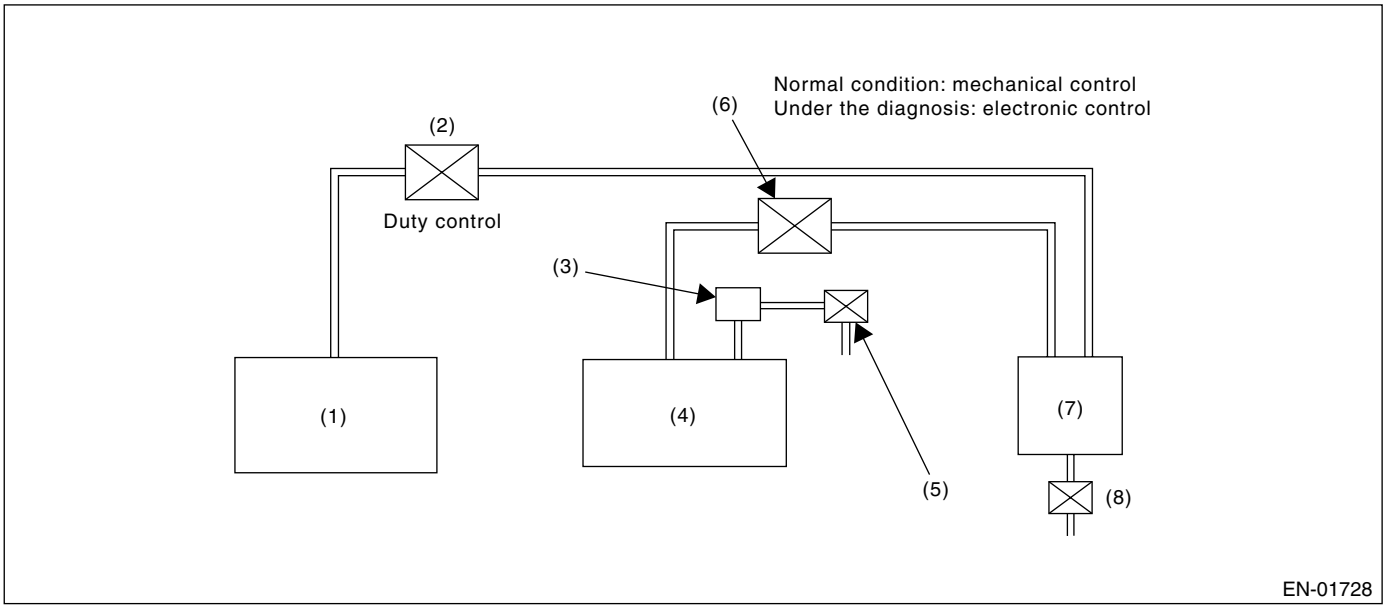
Normality Judgment

Judge OK when the criteria below are completed.

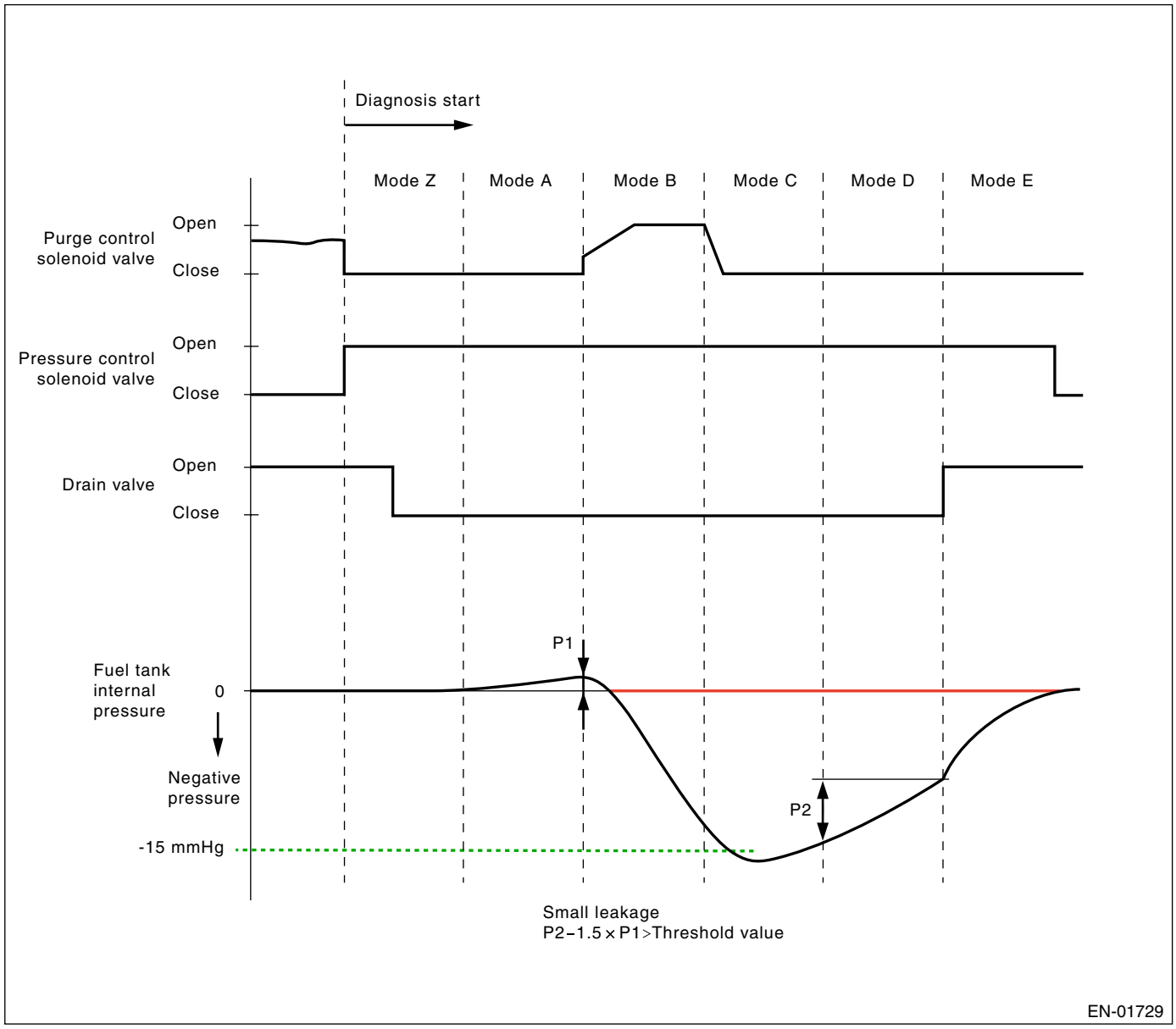
Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 − 1.9375 × P1	< 600 Pa (4.5 mmHg, 0.18 inHg)	P0456

If not judged OK or NG, repeat the diagnosis.



(1) Engine
(2) Purge control solenoid valve
(3) Fuel tank pressure sensor
(4) Fuel tank
(5) Atmospheric pressure switching solenoid
(6) Pressure control solenoid valve
(7) Canister
(8) Drain valve



• CCV Property Diagnosis [P1443]

Mode E;

The tank pressure must become again as high as the atmospheric air pressure after the evaporation diagnosis (normal judgment on Mode C or after Mode D). If the tank pressure does not become as high as the atmospheric air pressure, judge that CCV is blocked.
Judge NG when the criteria below are completed.

Malfunction Criteria	Threshold Value	DTC
Fuel tank pressure difference from the end of EVAP sys. diagnosis to 4 seconds later	< 362.5 Pa (2.7 mmHg, 0.11 inHg)	P1443

Time Needed for Diagnosis:

0.04-inch:	30 — 70 seconds
0.02-inch:	45 — 90 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric purge solenoid function malfunction; Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

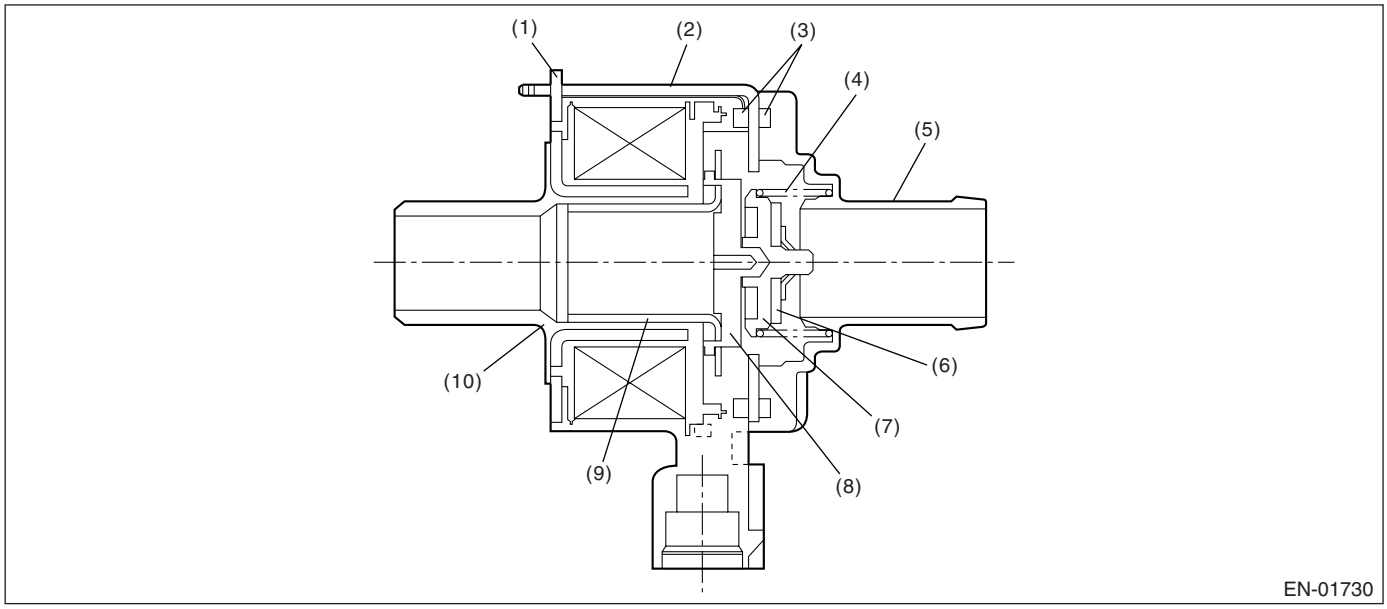
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AV:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.
Judge NG when the ECM output level is not equal to the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Magnetic plate
(2) Yoke
(3) Packing
(4) Spring
(5) Valve seat
(6) Valve
(7) Plate
(8) Retainer
(9) Movable core
(10) Bobbin

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
After starting the engine	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after string the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below become more than time (2.5 seconds) needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs OFF signal.	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs OFF signal.	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Open PCV solenoid.

9. ECM OPERATION AT DTC SETTING

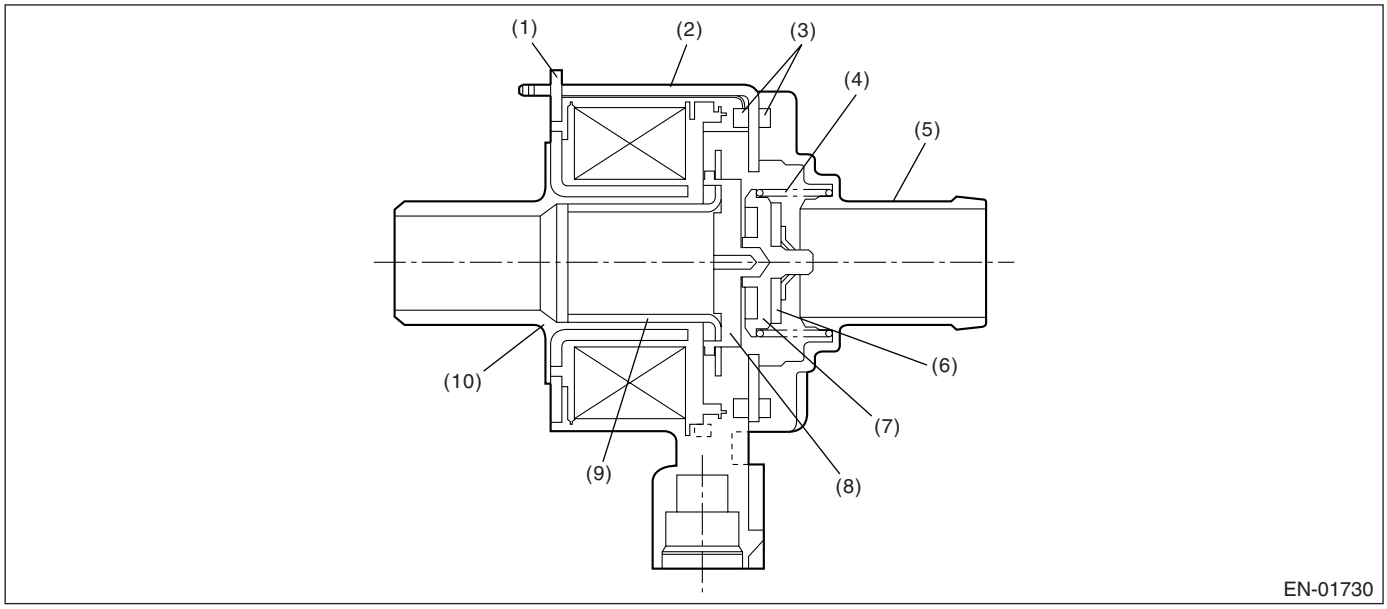
Memorize the freeze frame data. (For test mode $02)

AW:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

1. OUTLINE OF DIAGNOSIS

Detect the short circuit of drain valve.
Judge NG when the ECU output level is not equal to the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Magnetic plate
(2) Yoke
(3) Packing
(4) Spring
(5) Valve seat
(6) Valve
(7) Plate
(8) Retainer
(9) Movable core
(10) Bobbin

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
After starting the engine	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below become more than time (2.5 seconds) needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs ON signal.	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs ON signal.	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Open PCV solenoid.

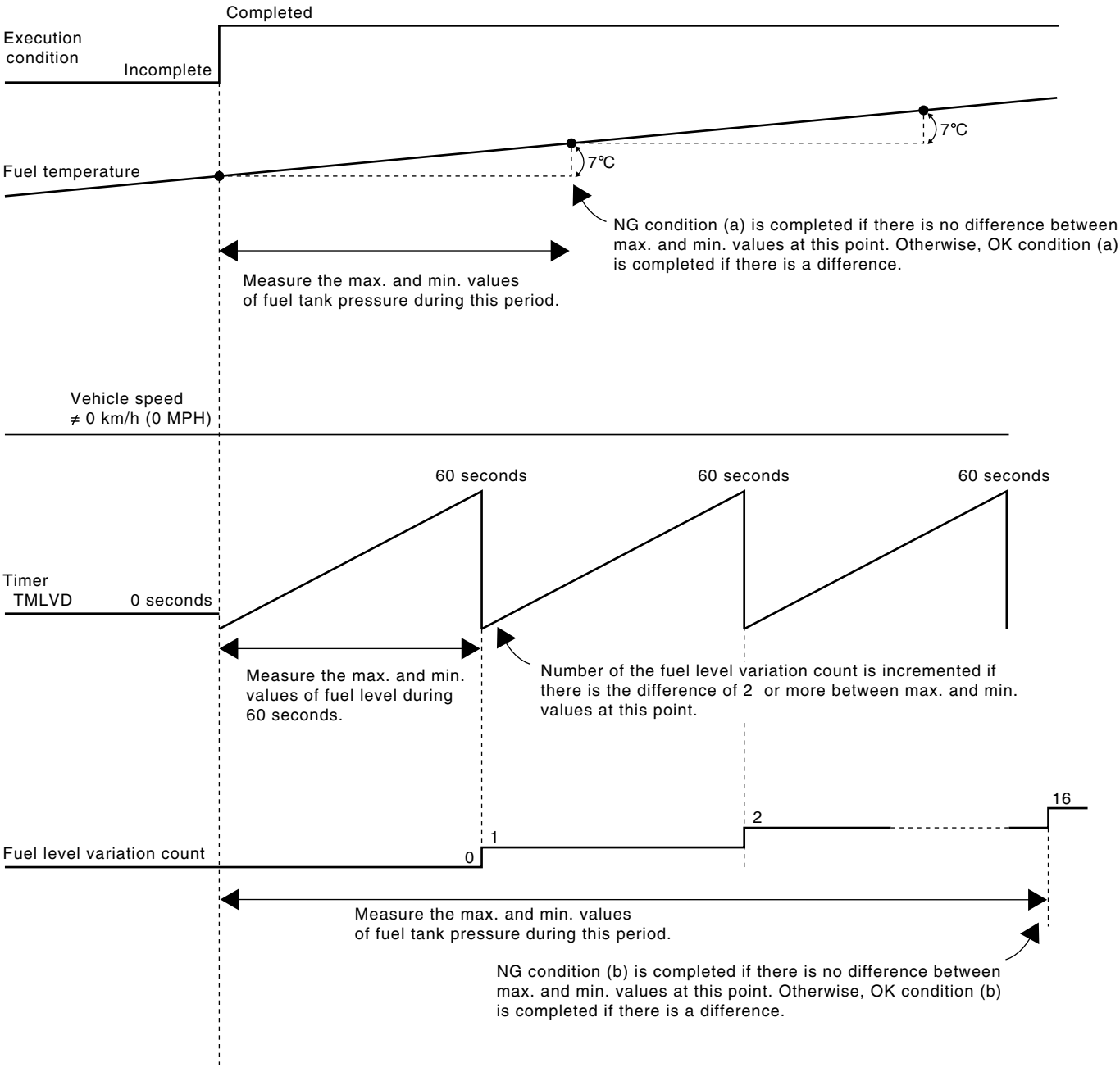
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AX:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tank pressure sensor output property.
Judge NG when there is little variation in the fuel tank pressure even if the vehicle is in driving status where there must be variation in the fuel tank pressure considering the fuel temperature and fuel level.



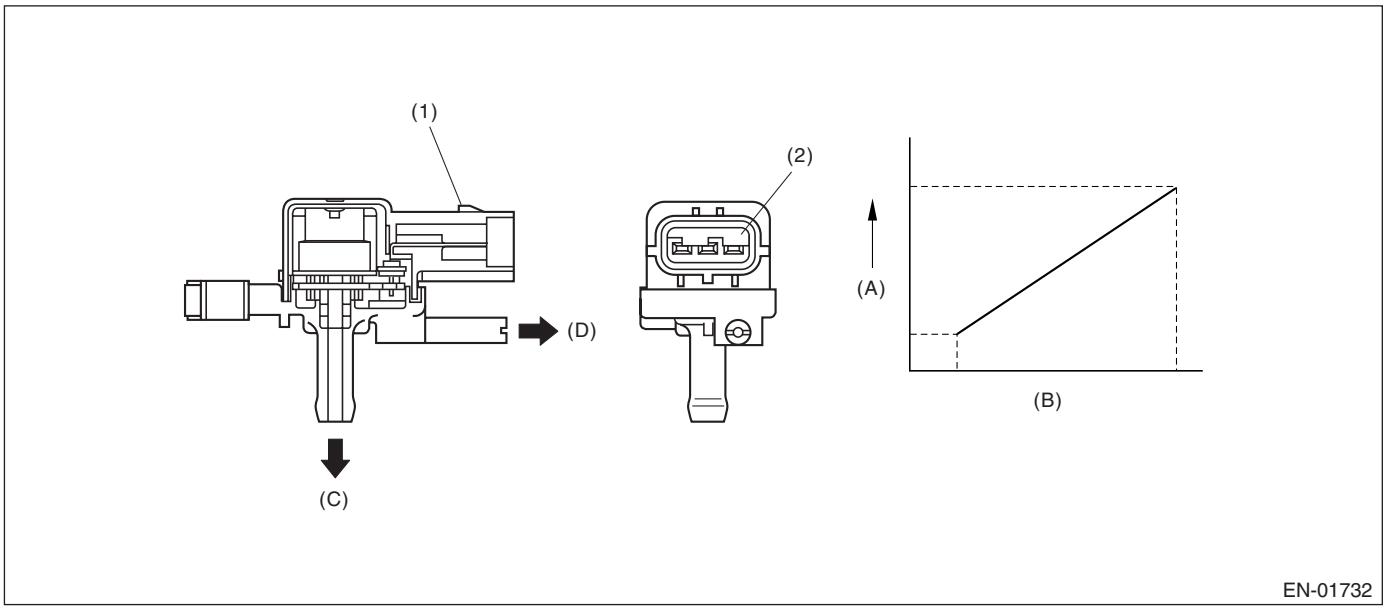
EN-01731

- If NG condition (a) & (b) are experienced, NG results.

(If there is OK, NG experience becomes unexperienced.)

• If OK conditions (a) & (b) are experienced, OK results.
(If there is NG, OK experience becomes unexperienced.)

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To tank pressure switching solenoid valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Timer after starting the engine	≥ 30 seconds
Fuel level	≥ 9 ℓ (2.4 US gal, 2.0 Imp gal)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 30 seconds after starting the engine.

5. DIAGNOSTIC METHOD

(1) There is no tank pressure variation when there is fuel temperature variation of 7°C (45°F).
(2) There is no tank pressure variation even when there is fuel level variation of 2 ℓ (0.5 US gal, 0.4 Imp gal) or more every 60 seconds.
Judge NG when both of the conditions above are experienced.

• Abnormality Judgment

Judge NG when both of the conditions below are experienced.

Judgment Value

Malfunction Criteria	Threshold Value
Max. – min. tank pressure (During fuel temperature variation of 7°C (45°F))	≤ 100 Pa (0.75 mmHg, 0.03 inHg)
Change of fuel temperature	≥ 7°C (45°F)

Malfunction Criteria	Threshold Value
Max. − min. tank pressure (During time lapse below)	≤ 100 Pa (0.75 mmHg, 0.03 inHg)
Total time lapse where there is fuel level variation of 2 ℓ (0.5 US gal, 0.4 Imp gal) or more per minute.	≥ 16 minutes

Time Needed for Diagnosis: 16 minutes
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when both of the conditions below are experienced, and clear NG.

Judgment Value

Malfunction Criteria	Threshold Value
Max. − min. tank pressure (During fuel temperature variation of 7°C (45°F))	> 100 Pa (0.75 mmHg, 0.03 inHg)
Change of fuel temperature	≥ 7°C (45°F)

Malfunction Criteria	Threshold Value
Max. − min. tank pressure (During time lapse below)	> 100 Pa (0.75 mmHg, 0.03 inHg)
Total time lapse where there is fuel level variation of 2 ℓ (0.5 US gal, 0.4 Imp gal) or more per minute.	≥ 16 minutes

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Fix the fuel tank pressure at 0 kPa (0 mmHg, 0 inHg).

9. ECM OPERATION AT DTC SETTING

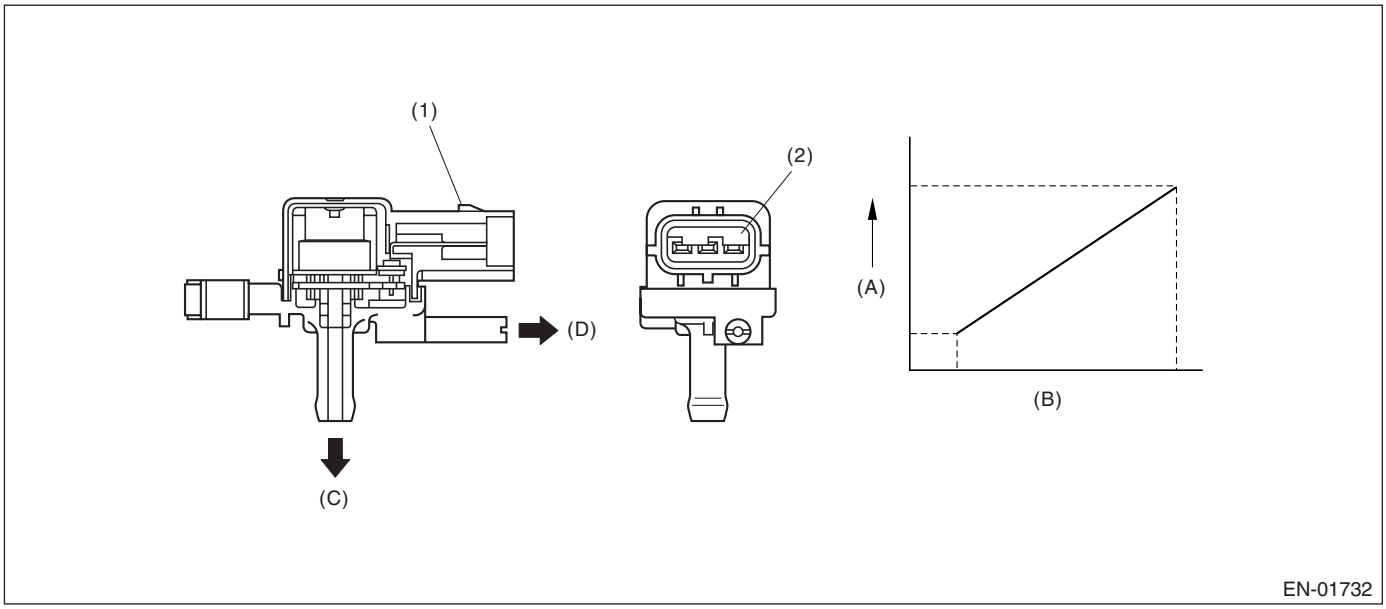
Memorize the freeze frame data. (For test mode $02)

AY:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To tank pressure switching solenoid valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 10 V
After engine starting	2 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing all of the malfunction criteria below becomes more than time needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.2 V

Time Needed for Diagnosis: 20 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed
Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.2 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Fix the fuel tank pressure at 0 kPa (0 mmHg, 0 inHg).

9. ECM OPERATION AT DTC SETTING

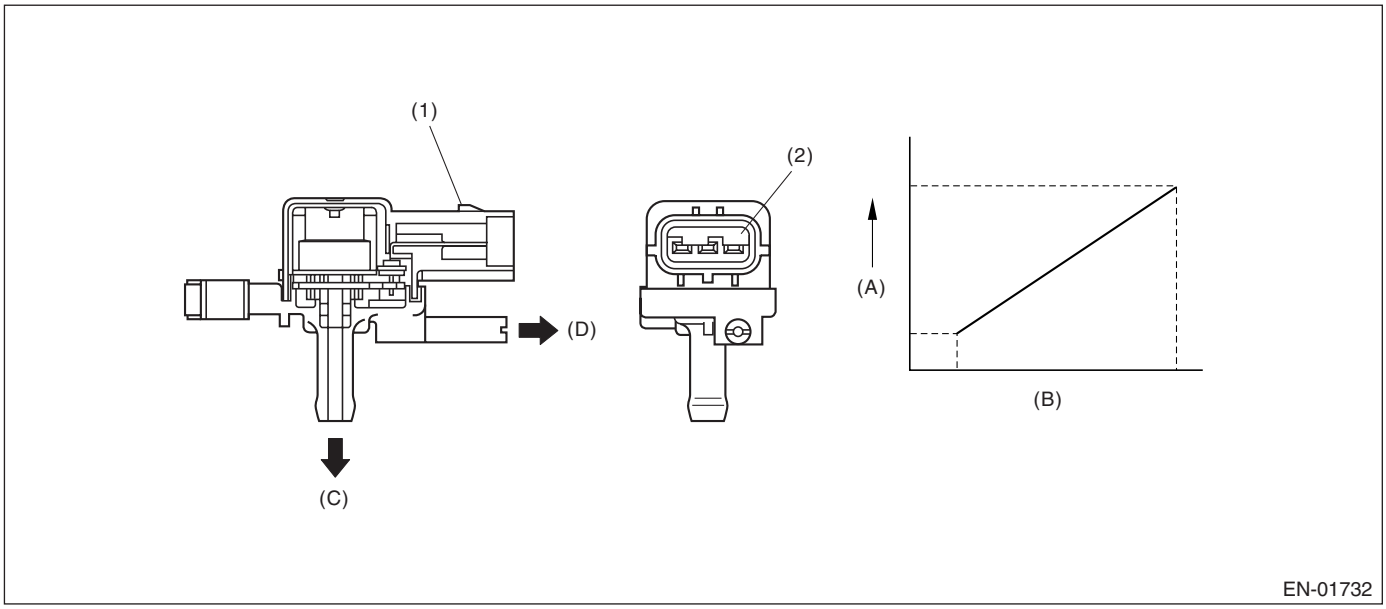
Memorize the freeze frame data. (For test mode $02)

AZ:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To tank pressure switching solenoid valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 10 V
After engine starting	2 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing all of the malfunction criteria below becomes more than the time (20 seconds) needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.8 V
Fuel temperature	< 35°C (95°F)
Barometric pressure	≥ 76 kPa (568 mmHg, 22.4 inHg)

Time Needed for Diagnosis: 20 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.
• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.8 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Fix the fuel tank pressure at 0 kPa (0 mmHg, 0 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BA:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4SO)-105, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BB:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)

1. OUTLINE OF DIAGNOSIS

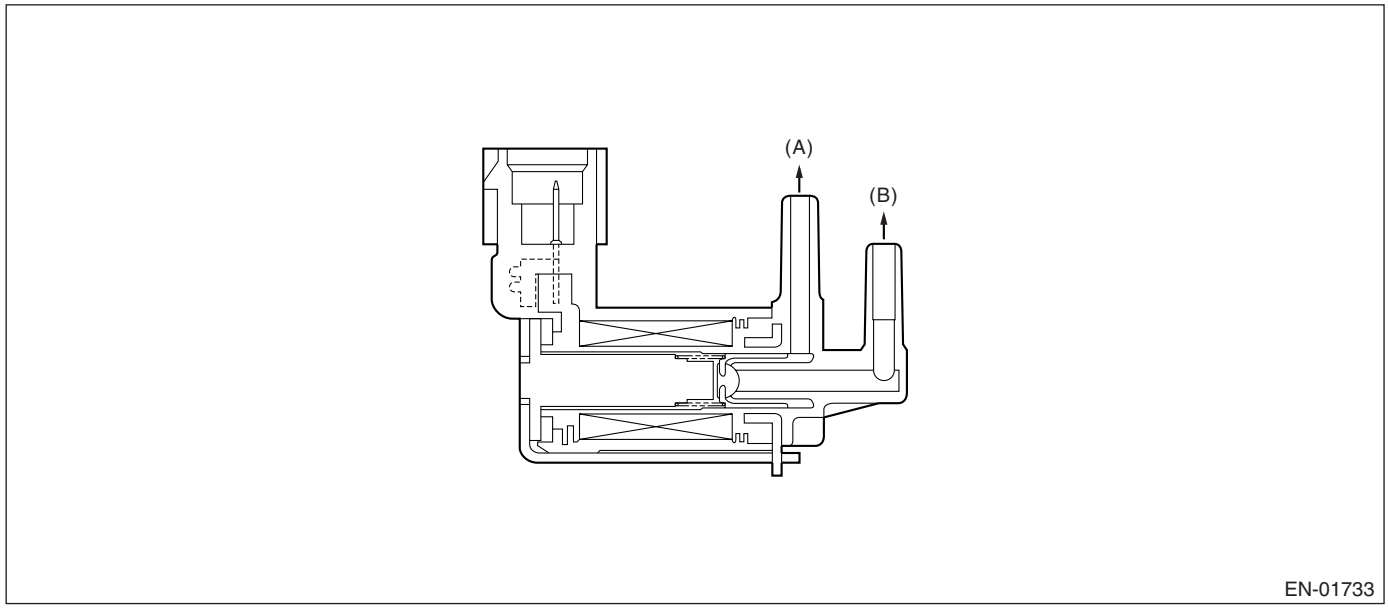
For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4SO)-105, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BC:DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of purge control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) To canister
(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing all the malfunction criteria below becomes more than the time (2 seconds) needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio of “ON”	< 25%
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.0 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the cumulative time until completing all the malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio of “ON”	< 25%
Terminal output voltage when ECM outputs OFF signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC

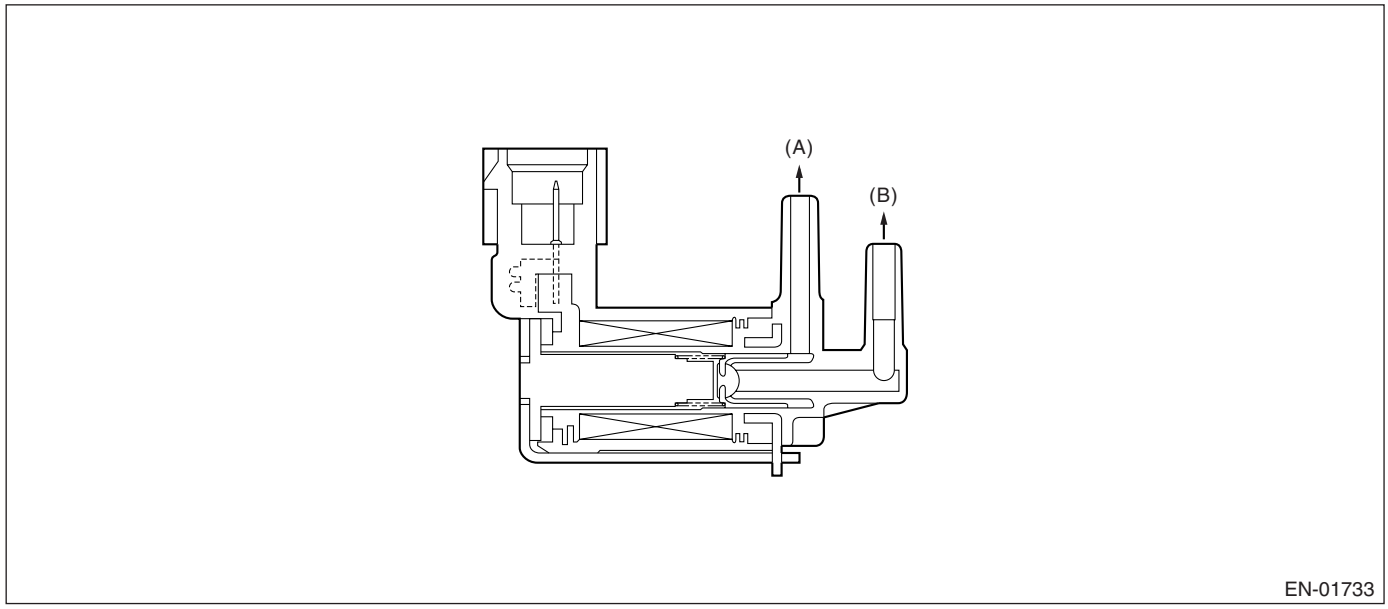
Memorize the freeze frame data. (For test mode $02)

BD:DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of purge control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) To canister
(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than the time (2 seconds) needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio of “ON”	> 75%
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.0 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio of “ON”	> 75%
Terminal output voltage when ECM outputs OFF signal	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC

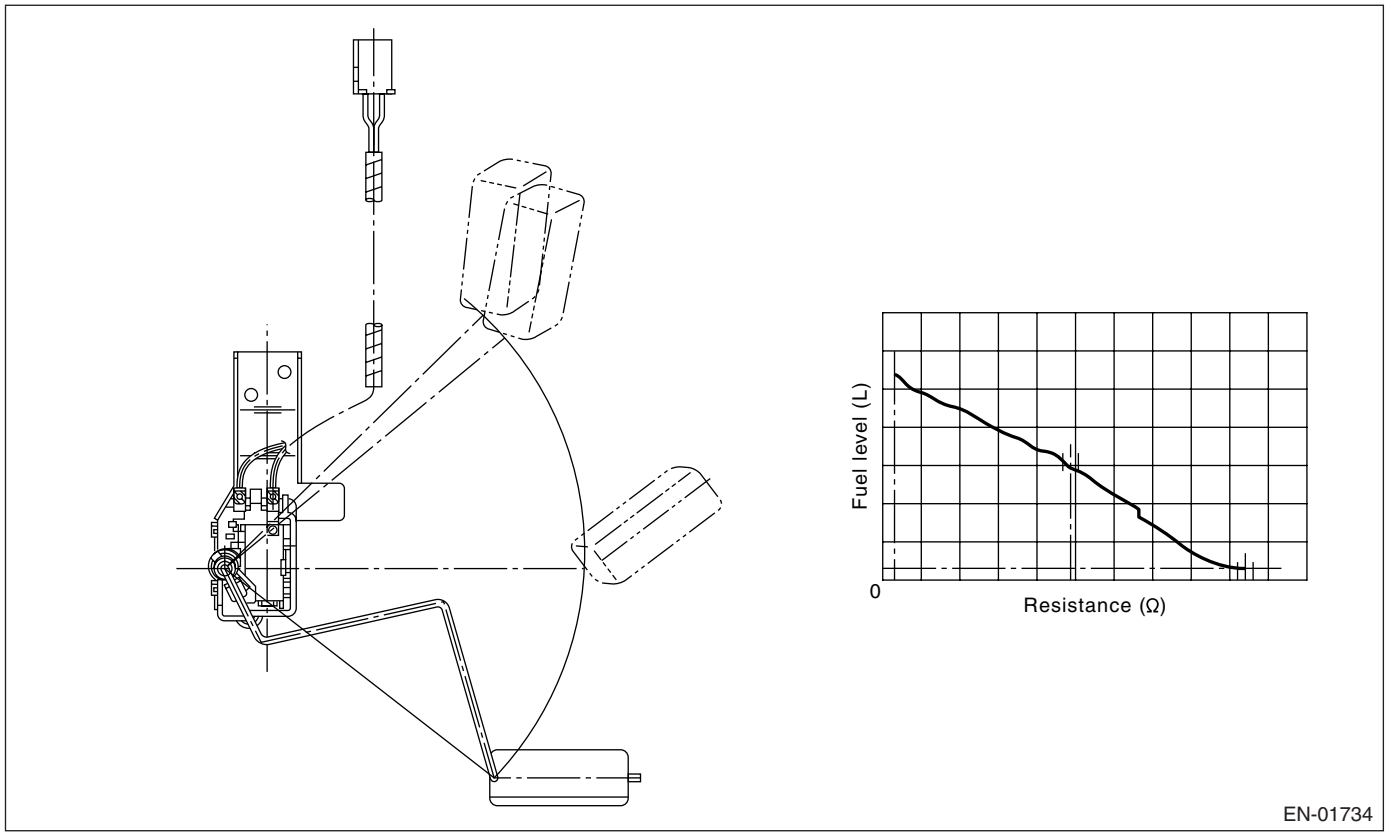
Memorize the freeze frame data. (For test mode $02)

BE:DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel level sensor output property.
Judge NG by the difference between max. and min. value of fuel level during every 160 km (100 miles) driving distance converted from vehicle speed.

2. COMPONENT DESCRIPTION



3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Timer after engine starting	≥ 250 seconds

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 250 seconds after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when all the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Max. − min. fuel level	< 10 ℓ (2.6 US gal, 2.2 Imp gal)
Trip distance from last fill up	≥ 160 km (100 miles)

Time Needed for Diagnosis: Not determined.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Max. – min. fuel level	≥ 10 ℓ (2.6 US gal, 2.2 Imp gal)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

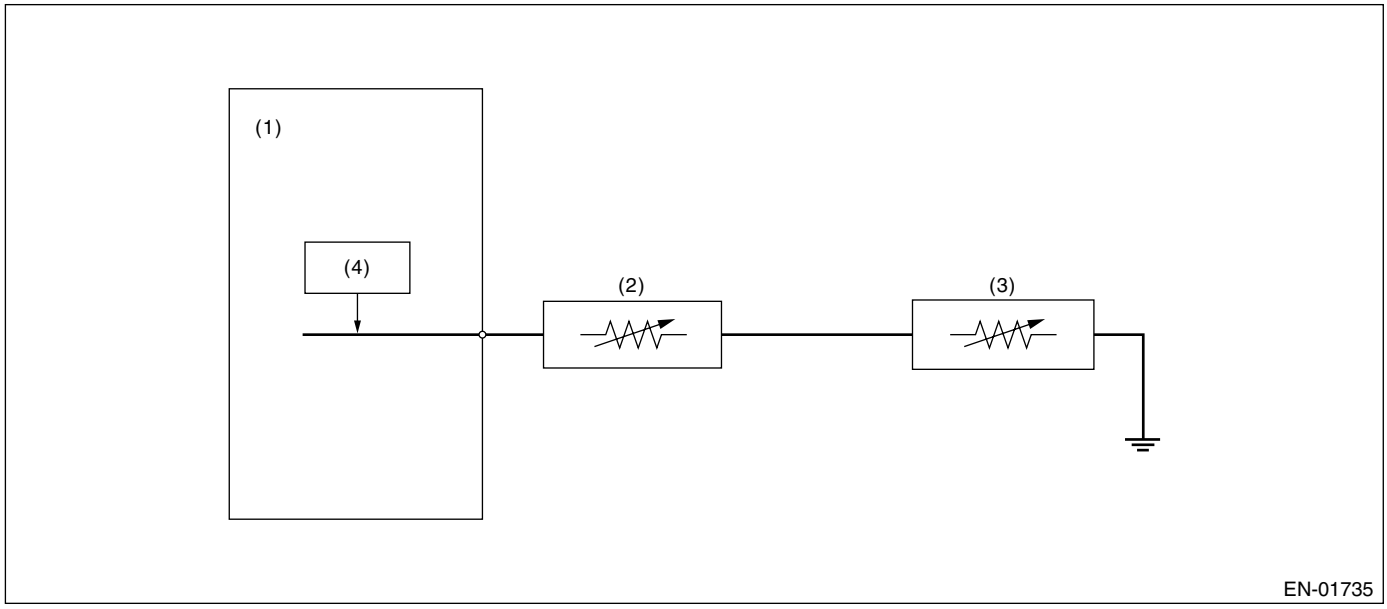
Memorize the freeze frame data. (For test mode $02)

BF:DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	8 — 16 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time (0.5 seconds) needed for diagnosis, and then judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.02 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

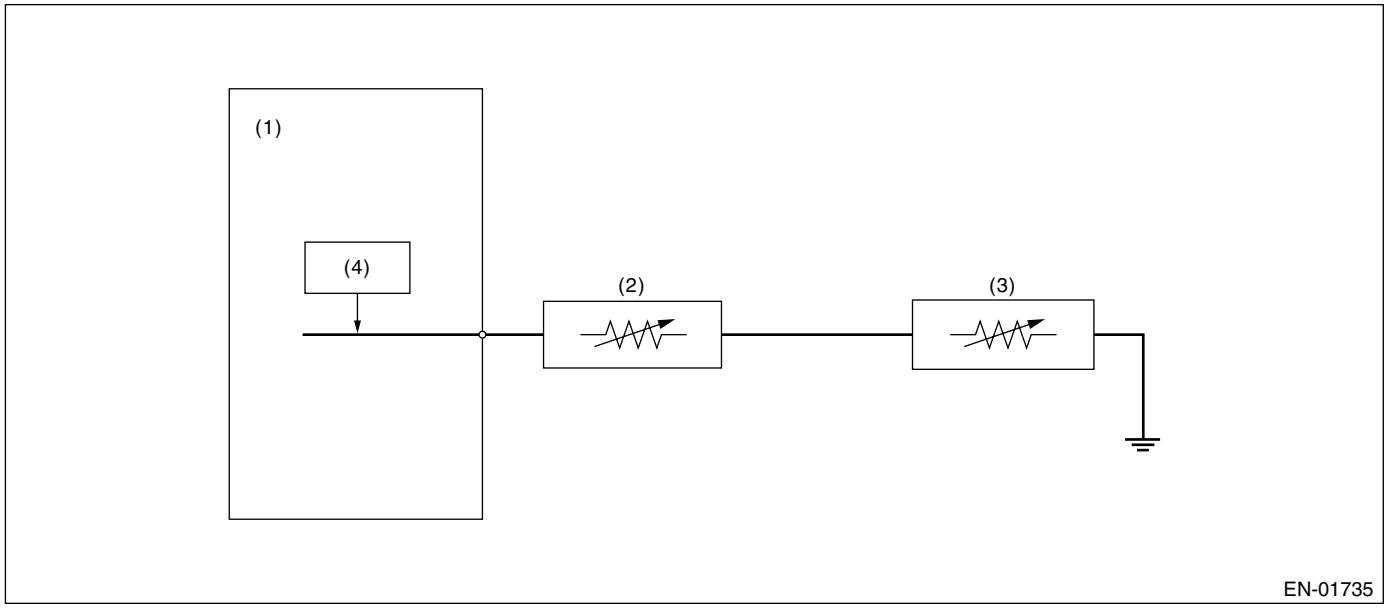
Memorize the freeze frame data. (For test mode $02)

BG:DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameter	Enable Conditions
Battery voltage	8 — 16 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than the time (0.5 seconds) needed for diagnosis, and then judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.90 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BH:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of unstable output from fuel level sensor because of noise.
Judge NG by comparing the max value and cumulative value of the amount of output voltage variation from fuel level sensor with threshold value.

2. ENABLE CONDITION

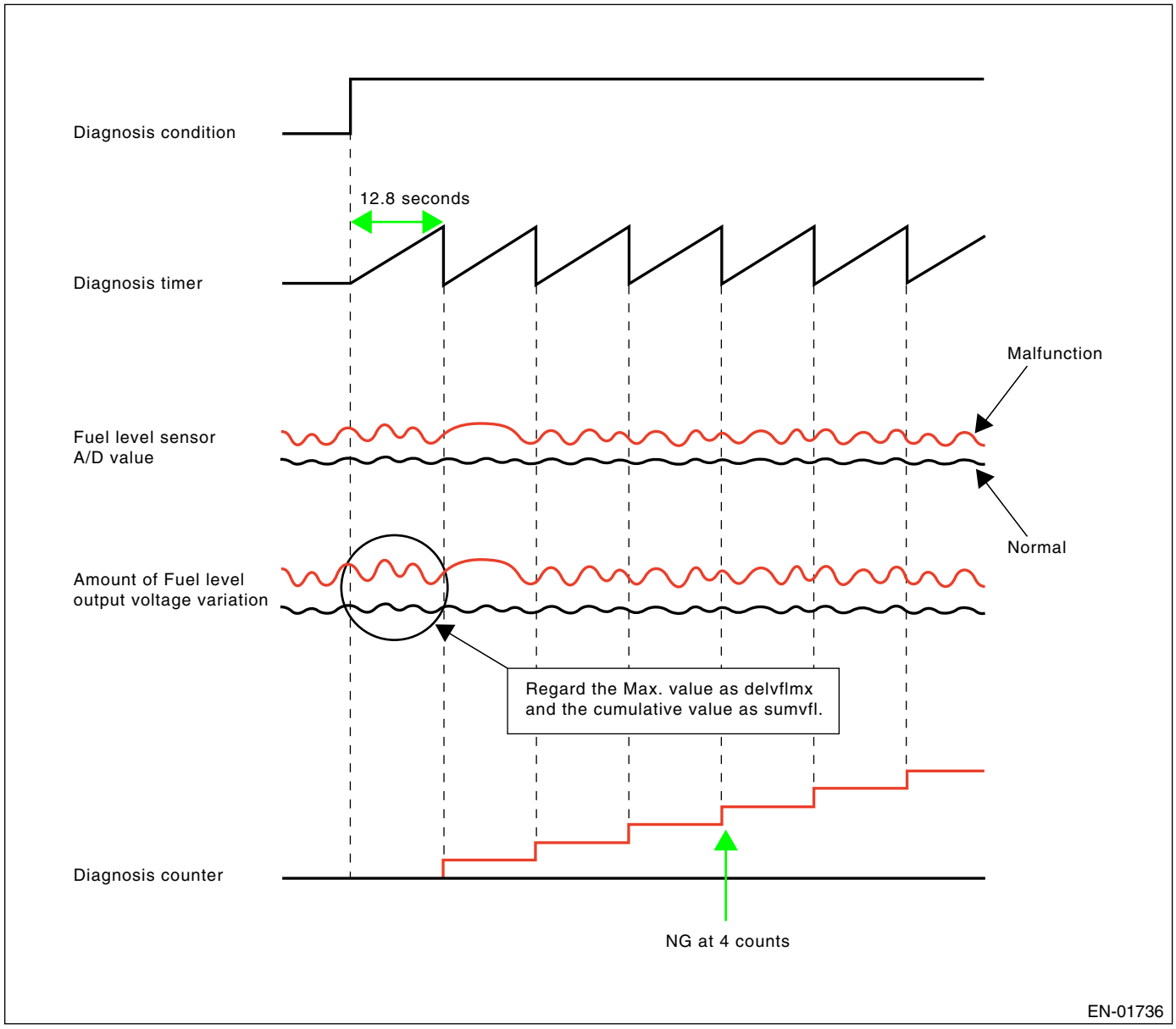
Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	> 10.9 V
After engine starting	1 second or more
Idle switch	ON
Fuel level	9 — 51 ℓ (2.4 — 13.5 US gal, 2.0 — 11.2 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	10 seconds or more

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling.

4. DIAGNOSTIC METHOD

Calculate the max. value of the amount of output voltage variation from fuel level sensor and cumulative value during 12.8 seconds. Comparing the max value and cumulative value with the threshold value, and judge OK when the both do not go over the threshold value. Otherwise, when one of them goes over the threshold, count the counter up. Judge the ECM is troubled when the counter increased 4 times in a row.



• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Integrated times of the condition reaching follows, • DVFLMAX ≥ 0.88 V • SUMVFL ≥ 14.08 V – DVFLMAX is max. value of sensor output during 12.8 seconds. – SUMVFL is cumulative value of sensor output deviation during 12.8 seconds.	≥ 4 times

Time Needed for Diagnosis: 12.8 seconds × 4 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
DVFLMAX	< 0.88 V
SUMVFL	< 14.08 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BI: DTC P0483 COOLING FAN RATIONALITY CHECK

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of radiator fun.
Judge NG when the engine coolant temperature decreases slowly even if the radiator fan started rotating.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 100°C (212°F)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the engine coolant temperature is very high (more than 100°C (212°F)).

4. DIAGNOSTIC METHOD

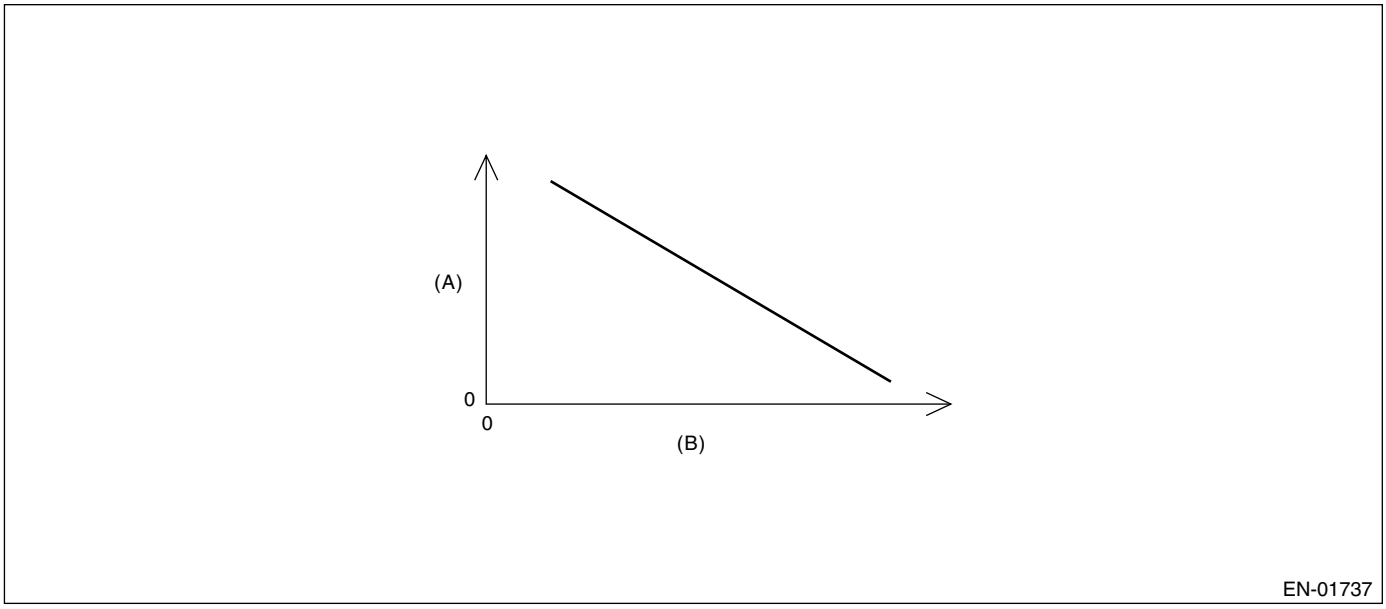
Check the engine coolant temperature (A/D value) when the radiator fan is ON since the radiator fan output turns from OFF to ON with all of the malfunction conditions below completed.

Secondary Parameters	Enable Conditions
Engine speed	600 — 900 rpm
Idle switch	ON
Vehicle speed	0 km/h (0 MPH)
Battery voltage	≥ 10.9 V

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than the time (150 seconds) needed for diagnosis. Also Judge OK when the malfunction criteria below is not completed. And then clear NG.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature sensor A/D value – engine coolant temperature sensor A/D min. value	< 15 mV (Approx. 1°C (34°F))



(A) Engine coolant temperature °C (°F)
(B) A/D value (V)

Time Needed for Diagnosis: 150 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR METHOD

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BJ:DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

- Detect the open or short circuit of vehicle speed.
- Judge NG when the vehicle speed is low while the vehicle speed is assumed to be high.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVE CYCLE

Perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judge NG when the time of completing the malfunction criteria below becomes more than time needed for diagnosis. Judge OK when the vehicle speed is more than 4 km/h (2.5 MPH) and less than 224 km/h (140 MPH).

Judgment Value

Malfunction Criteria	Threshold Value
Low side diagnosis (1)	
Cumulative time when the malfunction criteria below are completed	≥ 20 seconds
Idle switch	OFF
Injector pulse	≥ 2.5 milliseconds
Engine speed	≥ 2,800 rpm
Neutral switch	OFF
Vehicle speed	< 4 km/h (2.5 MPH)
Low side diagnosis (2)	
Cumulative time when the malfunction criteria below are completed	≥ 60 seconds
Idle switch	OFF
Injector pulse	≥ 2.0 milliseconds
Engine speed	≥ 2,100 rpm
Neutral switch	OFF
Vehicle speed	< 4 km/h (2.5 MPH)

Time Needed for Diagnosis:

Low side (1)	20 seconds
Low side (2)	60 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row.
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC

Memorize the freeze frame data. (For test mode $02)

BK:DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH

1. OUTLINE OF DIAGNOSIS

- Detect the open or short circuit of vehicle speed.
- Judge NG when the vehicle speed is high while the vehicle speed is assumed to be low.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVE CYCLE

Perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judge NG when the time of completing the malfunction criteria below becomes more than time needed for diagnosis. Judge OK when the vehicle speed is more than 4 km/h (2.5 MPH) and less than 224 km/h (140 MPH).

Judgment Value

Malfunction Criteria	Threshold Value
High side diagnosis	
Cumulative time when the malfunction criteria below are completed	≥ 5 seconds
Idle switch	OFF
Injector pulse	≤ 2.0 milliseconds
Engine speed	≤ 2,100 rpm
Neutral switch	OFF
Vehicle speed	≥ 244 km/h (152 MPH)

Time Needed for Diagnosis:

High	5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC

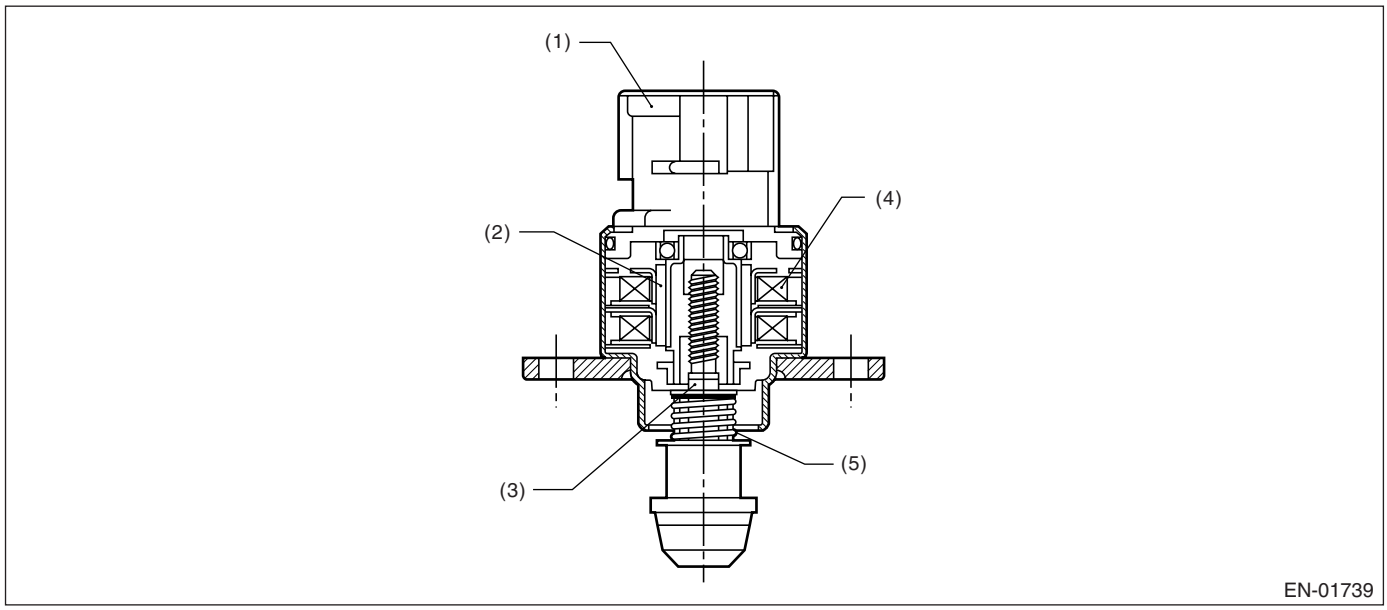
Memorize the freeze frame data. (For test mode $02)

BL:DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that the engine speed does not approach to the target engine speed at idling.
Judge NG when the engine speed is lower than target engine speed and does not increase to target engine speed even though idle air control solenoid valve is opened.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Permanent magnet
(3) Shaft
(4) Coil
(5) Spring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Closed control in ISC	In operation
Dashpot function	0
Vehicle speed	= 0 km/h (0 MPH)
Coolant temperature	≥ 75°C (167°F)
Battery voltage	> 10.9 V
AT or neutral gear for MT model	

4. GENERAL DRIVE CYCLE

Perform the diagnosis continuously at idling after warming up engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing all the malfunction criteria below becomes more than the time (10 seconds) needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	≤ 100 rpm
ISC output ISCON	ISC output MAX value

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
• Normality Judgment

Judge OK when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis (2 seconds).
Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	> 100 rpm

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC

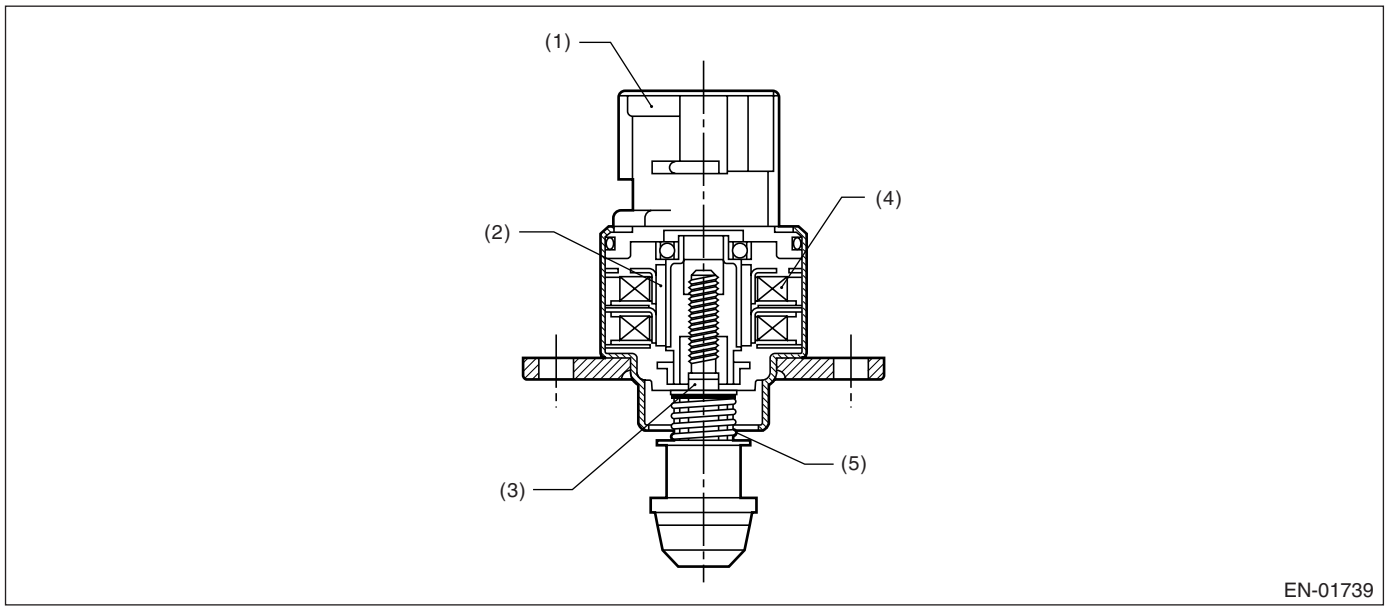
Memorize the freeze frame data. (For test mode $02)

BM:DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that the engine speed does not approach to the target engine speed at idling.
Judge NG when the engine speed is higher than target engine speed and does not decrease to target engine speed even though idle air control solenoid valve is closed.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Permanent magnet
(3) Shaft
(4) Coil
(5) Spring

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Closed control in ISC	In operation
Dashpot function	0
Vehicle speed	= 0 km/h (0 MPH)
Coolant temperature	≥ 75°C (167°F)
Battery voltage	> 10.9 V
AT or neutral gear for MT model	

4. GENERAL DRIVE CYCLE

Perform the diagnosis continuously at idling after warming up engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing all the malfunction criteria below becomes more than the time (10 seconds) needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	≥ 200 rpm
ISC output ISCON	ISC output MAX value

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
• Normality Judgment

Judge OK when the continuous time until completing all the malfunction criteria below becomes more than the time (2 seconds) needed for diagnosis.
Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	< 200 rpm

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC

Memorize the freeze frame data. (For test mode $02)

BN:DTC P0512 STARTER REQUEST CIRCUIT

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of starter switch.
- Judge ON NG when the starter signal remains ON even though vehicle speed and engine speed increased.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine	Run

3. GENERAL DRIVING CYCLE

Always perform diagnosis continuously after starting engine.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis (10 seconds). Judge OK and clear the NG when the starter switch is turned to OFF.

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	≥ 1,500 rpm
Vehicle speed	≥ 30 km/h (19 MPH)
Starter “OFF” signal	Not detected

Time Needed for Diagnosis:

OFF side	Condition (engine speed 0 → 700 rpm) time needed for completion
ON side	10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC

Memorize the freeze frame data. (For test mode $02)

BO:DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE)

1. OUTLINE OF DIAGNOSIS

- Detect the malfunction of engine speed increase at idling.
- Judge NG when the engine speed is higher than and too far from the target engine speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Dashpot function at closed idle control	0

3. GENERAL DRIVE CYCLE

Always perform the diagnosis continuously at idle speed.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than the time needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	≥ 800 rpm
ISC closed loop compensation value	= MIN value
Engine speed	≥ Target idle speed

• Normality Judgment

Judge OK when one of the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
ISC closed loop compensation value	≠ MIN value
Cumulative time (actual – target engine speed) < 100 rpm	≥ 2 seconds
Cumulative time (engine speed < target idle speed)	≥ 2 seconds

Time Needed for Diagnosis: 2 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Cut the fuel of all cylinders, #1 cylinder or #1, #2 cylinder according to throttle position, engine speed, vehicle speed.

8. ECM OPERATION AT DTC

Memorize the freeze frame data. (For test mode $02)

BP:DTC P0565 CRUISE CONTROL ON SIGNAL

1. OUTLINE OF DIAGNOSIS

Judge NG when the vehicle speed is less than 20 km/h (12 MPH) and cruise control set signal remains ON for limited time.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed	≤ 20 km/h (12 MPH)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis with less than 20 km/h (12 MPH) vehicle speed.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Canceling signal	No signal

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BQ:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

1. OUTLINE OF DIAGNOSIS

- Detect the malfunction of micro-computer (RAM).
- Zero clear the all normal RAM on initial routine, and judge NG when the sum of cleared RAM is not “0”.

2. ENABLE CONDITION

Perform the diagnosis without condition by initial routine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis only once immediately after the IG key is turned to ON.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed, and judge OK at the IG key turned to ON.
Judgment Value

Malfunction Criteria	Threshold Value
Sum on RAM data after data cleared operation	Not to zero

Time Needed for Diagnosis: Not determined
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BR:DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of radiator fan circuit.
- Judge NG when the ECM output level and the actual terminal level are different.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
After engine starting	1 second or more

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis, and also judge OK when the malfunction criteria below is not completed. And then clear NG.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM transmits OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BS:DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of radiator fan circuit.
- Judge NG when the ECM output level and the actual terminal level are different.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
After engine starting	1 second or more

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis, and also judge OK when the malfunction criteria below is not completed. And then clear NG.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM transmits ON signal	High level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BT:DTC P0703 TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT

1. OUTLINE OF DIAGNOSIS

Judge NG when the AT break SW circuit is battery short, ground short or open.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed change	30 to 0 km/h (19 to 0 MPH) 0 to 30 km/h (0 to 19 MPH)

3. GENERAL DRIVING CYCLE

Reform the diagnosis continuously after engine start.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
ON signal	No signal
OFF signal	No signal

Time Needed for Diagnosis: 10 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BU:DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT)

1. OUTLINE OF DIAGNOSIS

Judge NG when the “D” range switch becomes ground short or open circuit.

2. COMPONENT DESCRIPTION

Inhibitor switch ensures the safety at engine start. This switch is installed to the right side of transmission case, and operated by selector lever. When the selector lever is in the “P” or “N” range, the engine will start because the electric circuit in inhibitor switch is closed and the starter circuit is connected. When the selector lever is in the “R”, “D”, “3”, “2” or “1” range, the electric circuit in inhibitor switch is open; therefore, the engine cannot be cranked. In the “R” range, the back-up light will illuminate because the back-up light circuit in the switch is connected. In addition to the functions above, the inhibitor switch has the circuit which detects the selected range position at the present and transmits the range signal to the TCM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Shift	“N” to “3”
Vehicle speed	≥ 60 km/h (37 MPH)
Engine speed	> 500 rpm
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine start.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
“D” signal continuously	Not detected
Simultaneous signal	≥ 2

Time Needed for Diagnosis:
- 63.75 seconds
- 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BV:DTC P0710 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT

1. OUTLINE OF DIAGNOSIS

- Judge NG when the ATF temperature sensor is open, battery short or ground short.
- Judge NG when the ATF sensor is detective.

2. COMPONENT DESCRIPTION

ATF temperature sensor is installed to the hydraulic control valve body of transmission as a unit with transmission harness. This sensor detects ATF temperature and outputs it as electric resistance signal.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.1 V
Output at ≥ 80km/h (50 MPH) after 5 minutes from reaching more than 4.8 V	≥ 4.7 V

Time Needed for Diagnosis: 63.75 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control ATF temperature at a constant temperature 80°C (176°F).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BW:DTC P0716 INPUT/TURBINE SPEED SENSOR CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge NG when the turbine speed signal is not transmitted for some reasons.

2. COMPONENT DESCRIPTION

Torque converter turbine speed sensor (output shaft speed sensor) is installed to the outside of transmission case. This sensor detects the turbine speed of torque converter by the peripheral speed of high clutch drum connected to input shaft. And then it transmits the sine wave signal (32 pulses per rev.) to TCM. TCM calculates the ratio of the input shaft speed to vehicle speed, and then makes a judgment whether to shift or not.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 1,500 rpm
Vehicle speed	≥ 40 km/h (25 MPH)
Range switch	“D”, “3”, “2” or “1”

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine start.

5. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below were continued for 2 seconds.
(1) Except “P”, “N”, “R” ranges and inhibitor switch is normal.
(2) Engine speed is more than 3,000 rpm.
(3) Vehicle speed is 30 km/h (19 MPH) and vehicle speed sensor is normal.
(4) Turbine speed is more than 600 rpm.

Judgment Value

Malfunction Criteria	Threshold Value
Output from turbine shaft speed	< 600 rpm

Time Needed for Diagnosis: 2 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BX:DTC P0720 OUTPUT SPEED SENSOR CIRCUIT

1. OUTLINE OF DIAGNOSIS

Judge NG when an abnormal large signal is input to the front vehicle speed sensor, or no signal is input to the rear vehicle speed sensor.

2. COMPONENT DESCRIPTION

This vehicle speed sensor (output shaft speed sensor) is installed to the outside of transmission case. This sensor detects the front wheel speed, and transmits the sine wave signal (16 pulses per rev.) to TCM. TCM converts the signal to pulse signal, and transmits to both of the ECM and the combination meter.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed	≥ 20 km/h (12 MPH)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously with more than 20 km/h (12 MPH) vehicle speed.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed sensor Front Rear	 ≥ 255 km/h (158 MPH) = 0 km/h (0 MPH)
Front vehicle speed sensor (When driving at 20 km/h (12 MPH))	= 0 km/h (0 MPH)

Time Needed for Diagnosis: 63.75 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Use the normal vehicle speed sensor signal when either of them is normal.
- Use the vehicle speed calculated from the current gear position and turbine speed when both front and rear wheels are troubled.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BY:DTC P0726 ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge NG when the engine speed is not input in the status of running the engine.

2. COMPONENT DESCRIPTION

Engine speed sensor is installed to the outside of engine body and crank part. This sensor detects the crank speed, and transmits the sine wave signal (2 pulses per rev.) to TCM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Output from mass air flow sensor	1.12 — 1.52 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine start.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	≤ 400 rpm

Time Needed for Diagnosis: 63.75 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BZ:DTC P0731 GEAR 1 INCORRECT RATIO

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	≥ 15°
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	"D", "3", "2" or "1"
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously with less than 10 km/h (6 MPH) vehicle speed.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.
(1) Vehicle speed is more than 10 km/h (6 MPH).
(2) Throttle sensor is more than a certain angle.
(3) Shifted to "D", "3", "2" or "1" range, and range signal is normal.
(4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR / (1st gear ratio) Where, GR = (vehicle speed sensor 1 output) / (turbine shaft speed sensor output)	> 110% or < 90%

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CA:DTC P0732 GEAR 2 INCORRECT RATIO

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	≥ 15°
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	“D”, “3”, “2” or “1”
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously with less than 10 km/h (6 MPH) vehicle speed.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.
(1) Vehicle speed is more than 10 km/h (6 MPH).
(2) Throttle sensor is more than a certain angle.
(3) Shifted to “D”, “3”, “2” or “1” range, and range signal is normal.
(4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR / (2nd gear ratio) Where, GR = (vehicle speed sensor 1 output) / (turbine shaft speed sensor output)	> 110% or < 90%

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CB:DTC P0733 GEAR 3 INCORRECT RATIO

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	≥ 15°
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	"D", "3", "2" or "1"
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously with less than 10 km/h (6 MPH) vehicle speed.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.
(1) Vehicle speed is more than 10 km/h (6 MPH).
(2) Throttle sensor is more than a certain angle.
(3) Shifted to "D", "3", "2" or "1" range, and range signal is normal.
(4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR / (3rd gear ratio) Where, GR = (vehicle speed sensor 1 output) / (turbine shaft speed sensor output)	> 110% or < 90%

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CC:DTC P0734 GEAR 4 INCORRECT RATIO

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	≥ 15°
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	“D”, “3”, “2” or “1”
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously with less than 10 km/h (6 MPH) vehicle speed.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.
(1) Vehicle speed is more than 10 km/h (6 MPH).
(2) Throttle sensor is more than a certain angle.
(3) Shifted to “D”, “3”, “2” or “1” range, and range signal is normal.
(4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR / (4th gear ratio) Where, GR = (vehicle speed sensor 1 output) / (turbine shaft speed sensor output)	> 110% or < 90%

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CD:DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF

1. OUTLINE OF DIAGNOSIS

Judge NG when the engine speed is different from the turbine speed for some reasons at AT lock-up.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
In 4th gear position, duty ratio for duty solenoid valve	≥ 90%

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed ≥ (output shaft speed × 4th gear ratio × 9/8)	

Time Needed for Diagnosis: 10.2 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Not allowed to lock up.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CE:DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL

1. OUTLINE OF DIAGNOSIS

Judge NG when the lock-up duty solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Lock-up duty solenoid is installed to the transmission hydraulic control valve body. The duty ratio is controlled by the signal from TCM. This allows the lock-up clutch to be connected or released smoothly by controlling the lock-up control valve.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 0.14 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CF:DTC P0748 PRESSURE CONTROL SOLENOID “A” ELECTRICAL

1. OUTLINE OF DIAGNOSIS

Judge NG when the line pressure duty solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Line pressure duty solenoid is installed to the transmission hydraulic control valve body. The duty ratio is controlled by the signal from TCM. This allows controlling the pressure modifier valve and accumulator control valve A, and allows the line pressure to be adjusted to the pressure appropriate for driving condition.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low
Vc at “OFF” signal from ECM	High

Time Needed for Diagnosis: 0.14 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CG:DTC P0753 SHIFT SOLENOID “A” ELECTRICAL

1. OUTLINE OF DIAGNOSIS

Judge NG when the shift solenoid 1 becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Shift solenoid 1 Shift solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. Gear positions will change depending on the solenoid condition which is ON or OFF.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Collector voltage of transistor (Vc) for solenoid valve is inconsistent with signal from ECM	

Time Needed for Diagnosis: 30 milliseconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CH:DTC P0758 SHIFT SOLENOID “B” ELECTRICAL

1. OUTLINE OF DIAGNOSIS

Judge NG when the shift solenoid 2 becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Shift solenoid 2 Shift solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. Gear positions will change depending on the solenoid condition which is ON or OFF.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc for solenoid valve is inconsistent with signal from ECM	

Time Needed for Diagnosis: 30 milliseconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CI: DTC P0771 SHIFT SOLENOID “E” PERFORMANCE OR STUCK OFF

1. OUTLINE OF DIAGNOSIS

Judge NG when the low clutch timing solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Low clutch timing solenoid Low clutch timing solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. This allows controlling the low clutch timing valve B and reverse inhibitor valve.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 30 milliseconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CJ:DTC P0778 PRESSURE CONTROL SOLENOID “B” ELECTRICAL

1. OUTLINE OF DIAGNOSIS

Judge NG when the 2-4 brake duty solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

2-4 brake duty solenoid is installed to the transmission hydraulic control valve body. The duty ratio is controlled by the signal from TCM. This solenoid decreases the change gear shock by adjusting the 2-4 brake pressure during 2-4 brake operation.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 0.14 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CK:DTC P0785 SHIFT/TIMING SOLENOID

1. OUTLINE OF DIAGNOSIS

Judge NG when the 2-4 brake timing solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

2-4 brake timing solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. This allows controlling the 2-4 brake timing valve B and decreases the change gear shock.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 30 milliseconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CL:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of neutral switch.
- AT: Judge NG when ECM neutral terminal input is different from reception data from TCM.
- MT: Judge NG when the neutral switch does not respond even though shift lever is changed (neutral switch is turned on or off by vehicle and engine speed).

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	1 second or more
Starter switch	OFF
Battery voltage	≥ 8 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

AT: Judge NG when the continuous number of times until completing the malfunction criteria below becomes more than number of times needed for diagnosis (10 times).

Judgment Value

Malfunction Criteria	Threshold Value
Switch signal	ON (Low)
“P” range / “N” range on AT	OFF
Any other switches on AT	ON

• Normality Judgment

AT: Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Switch signal	OFF (High)
“P” range / “N” range on AT	OFF
Any other switches on AT	ON

MT: Judge NG when the number of times until completing the malfunction criteria below continue 3 times in a row, judge OK when turning to OFF or ON.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch on MT Driving condition change a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm b) Vehicle speed 64 — 106 km/h (40 — 66 MPH) & engine speed 1,600 — 2,550 rpm	While changing a) to b) SW OFF (Low)

Time Needed for Diagnosis:

- Normal reception from AT is 5 times
- 3 monitoring on MT

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC

Memorize the freeze frame data. (For test mode $02)

CM:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of neutral switch.
- AT: Judge NG when ECM neutral terminal input is different from reception data from TCM.
- MT: Judge NG when the neutral switch does not respond even though shift lever is changed (neutral switch is turned on or off by vehicle and engine speed).

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	1 second or more
Starter switch	Turn off
Battery voltage	≥ 8 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgement

AT: Judge NG when the continuous number of times until completing the malfunction criteria below becomes more than number of times needed for diagnosis (10 times).

Judgment Value

Malfunction Criteria	Threshold Value
Switch signal	OFF (High)
“P” range / “N” range on AT	ON
Any other switches on AT	OFF

• Normality Judgment

AT: Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Switch signal	ON (Low)
“P” range / “N” range on AT	ON
Any other switches on AT	OFF

MT: Judge NG when the number of times until completing the malfunction criteria below continue 3 times in a row, judge OK when turning to OFF or ON.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch on MT Driving condition change a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm b) Vehicle speed 64 — 106 km/h (40 — 66 MPH) & engine speed 1,600 — 2,550 rpm	While changing a) to b) SW OFF (High)

Time Needed for Diagnosis:

- Normal reception from AT is 10 times
- 3 monitoring on MT

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC

Memorize the freeze frame data. (For test mode $02)

CN:DTC P0864 TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

- Detect the communication malfunction of AT diagnosis.
- Judge NG when the communication format does not correspond.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8.0 V
Engine speed	≥ 500 rpm

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time communication format does not correspond continued for time needed for diagnosis. Judge OK and clear the NG when the communication format corresponds.

Judgment Value

Malfunction Criteria	Threshold Value
Incorrect pattern in wiring harness for communication	≥ 60 seconds

Time Needed for Diagnosis: 60 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC

Memorize the freeze frame data. (For test mode $02)

CO:DTC P0865 TCM COMMUNICATION CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of AT diagnosis line.
- Judge NG when the signal remains Low.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8.0 V
Engine speed	≥ 500 rpm

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed. Judge OK and clear the NG when the signal is turned over.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous signal line is Low	≥ 3 seconds

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC

Memorize the freeze frame data. (For test mode $02)

CP:DTC P0866 TCM COMMUNICATION CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of AT diagnosis line.
- Judge NG when the signal remains High.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8.0 V
Engine speed	≥ 500 rpm

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed. Judge OK and clear the NG when the signal is turned over.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous signal line is High	≥ 3 seconds

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC

Memorize the freeze frame data. (For test mode $02)

CQ:DTC P1110 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of atmospheric pressure sensor.
- Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 10 V
Timer after starting the engine	≥ 2 seconds

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis. Judge fail safe NG when the continuous time until completing the malfunction criteria below becomes more than the time (0.1 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.755 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Make the atmospheric pressure 101 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CR:DTC P1111 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of atmospheric pressure sensor.
- Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 10 V
Timer after starting the engine	≥ 2 seconds

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis. Judge fail safe NG when the cumulative time until completing the malfunction criteria below becomes more than the time (0.1 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 5.06 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Make the atmospheric pressure 101 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

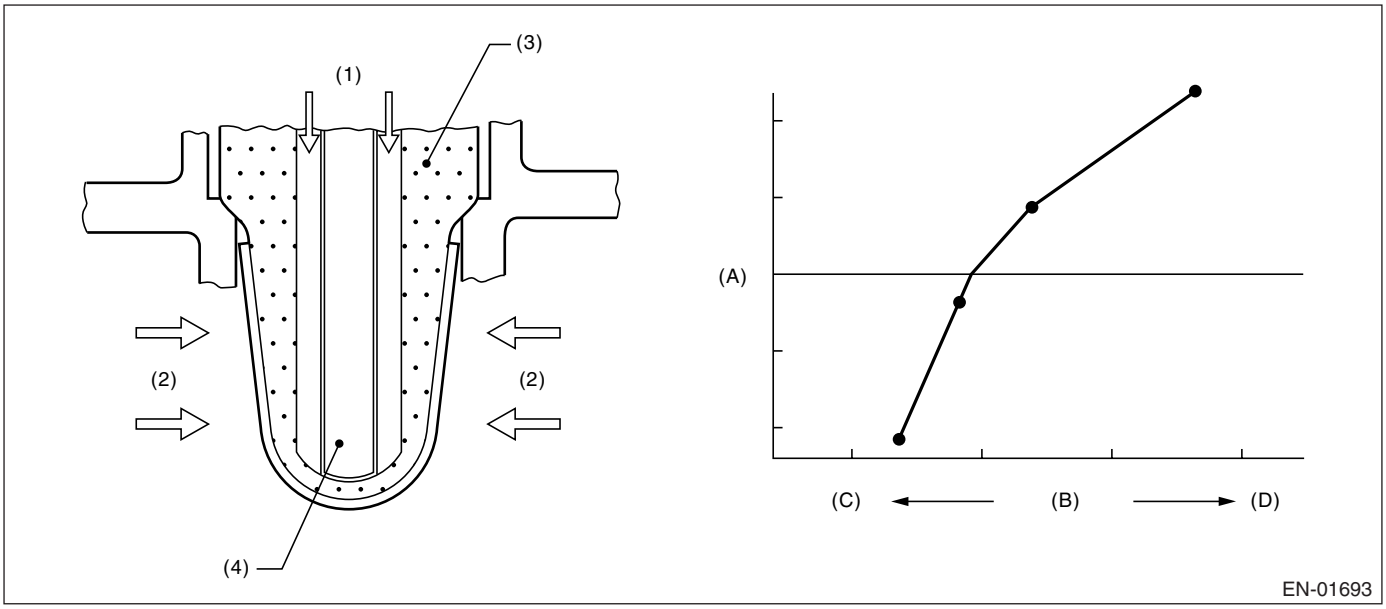
Memorize the freeze frame data. (For test mode $02)

CS:DTC P1134 A/F SENSOR MICRO-COMPUTER PROBLEM

1. OUTLINE OF DIAGNOSIS

- Detect the malfunction of IC communication.
- Judge NG when the communication to front oxygen (A/F) sensor control IC is unable.

2. COMPONENT DESCRIPTION



(1) Atmospheric air
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Air fuel ratio feed back control	During OPEN LOOP
OR; air fuel ratio feed back control	During CLOSED LOOP AND; not during clamp except A/F sensor voltage clamp OR; A/F fudge factor is 0.7 — 1.375.
Misfire rate during 200 engine revs.	≤ 1.0%
Battery voltage	≥ 10.9 V
After engine starting	≥ 140 seconds

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 140 seconds after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Communication error to main CPU	≥ 250 times

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Error	None

Time Needed for Diagnosis: 12.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

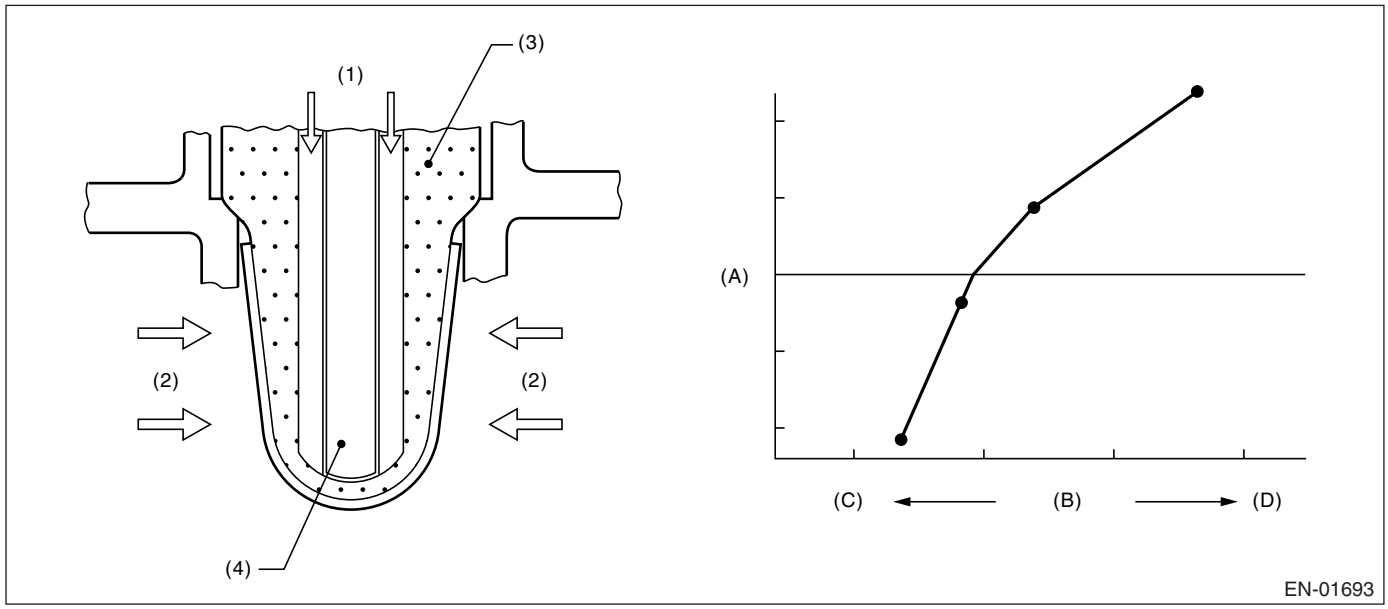
CT:DTC P1137 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

Middle Electric Potential

1. OUTLINE OF DIAGNOSIS

- Detect the output property malfunction of from oxygen (A/F) sensor.
- Judge NG when output voltage does not move to lean side or rich side.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic rotor
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameter	Enable Conditions
Middle electric potential malfunction	Incomplete
A/F sensor response diagnosis	Under diagnosis

4. GENERAL DRIVING CYCLE

Perform the diagnosis just once in 225 seconds or more after starting the engine constantly at 80 km/h (50 MPH) of vehicle speed (Same as A/F sensor response diagnosis).

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when one of the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of output voltage > 2.065 V (λ = 0.98)	3.4 seconds or more
Continuous time of output voltage < 2.180 V (λ = 1.0)	3.4 seconds or more

Time needed for diagnosis: 3.4 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.
Time Needed for Diagnosis: 0.2 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK when all the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Cumulative time of output voltage ≤ 2.065 V	0.2 seconds or more
Cumulative time of output voltage ≥ 2.180 V	0.2 seconds or more

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

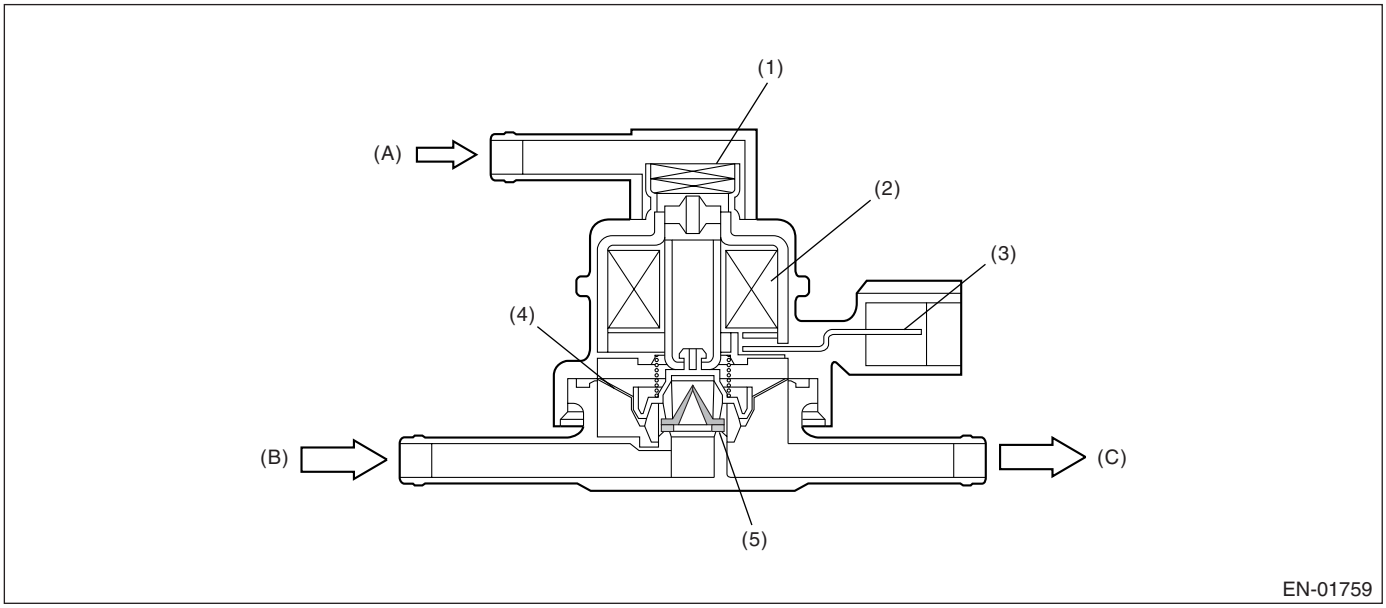
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

CU:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of pressure control solenoid valve.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve

(A) Atmospheric pressure
(B) Shut-off valve
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
After engine starting	1 second or more
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs OFF signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC

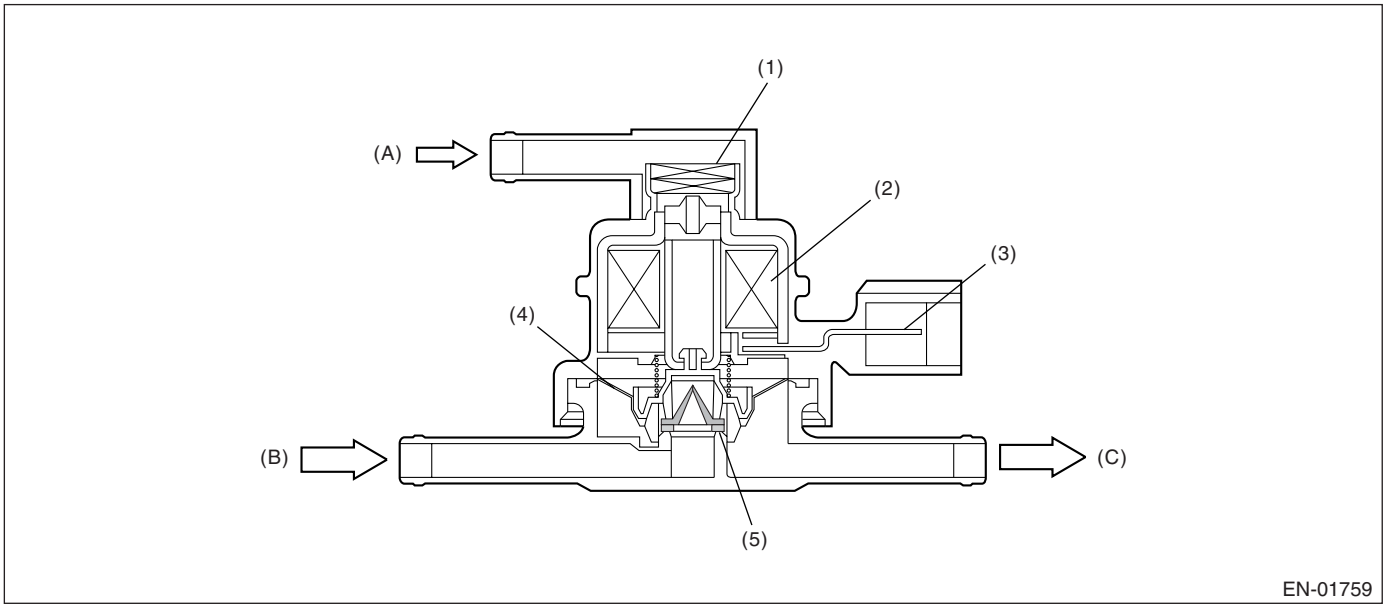
Memorize the freeze frame data. (For test mode $02)

CV:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of pressure control solenoid valve.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve
(A) Atmospheric pressure
(B) Shut-off valve
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs ON signal	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC

Memorize the freeze frame data. (For test mode $02)

CW:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

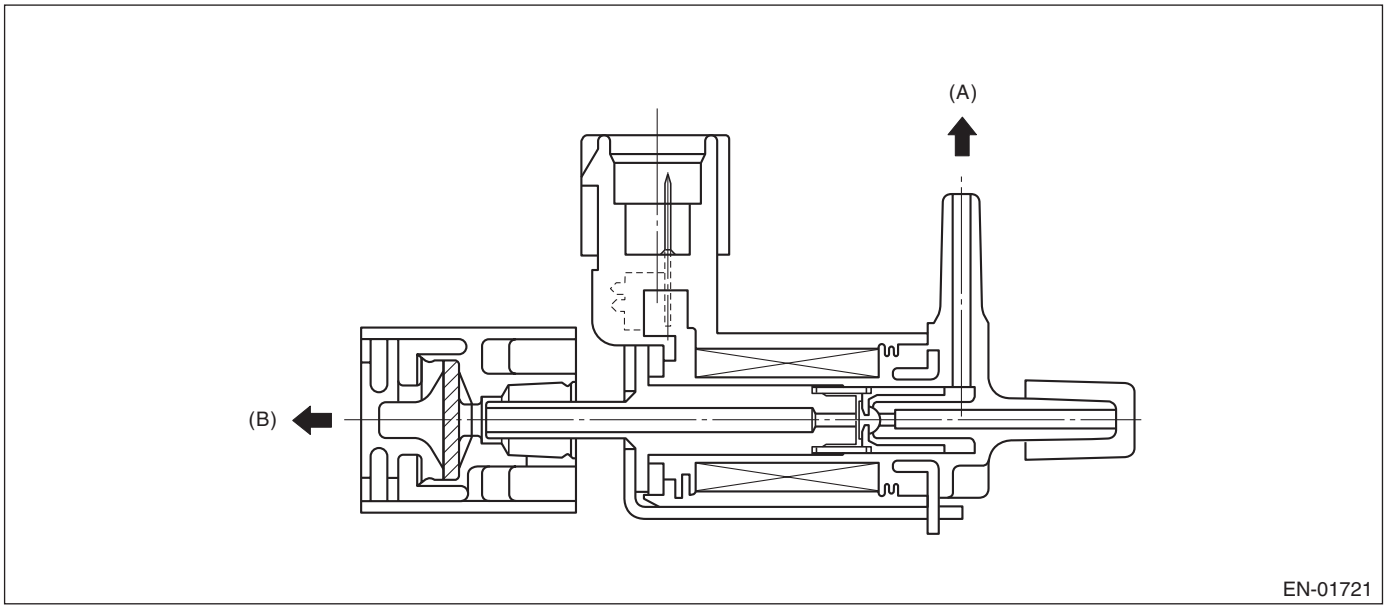
For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4SO)-105, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CX:DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of fuel tank sensor control valve.
- Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) Fuel tank pressure sensor
(B) External air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM sent OFF signals	Low level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

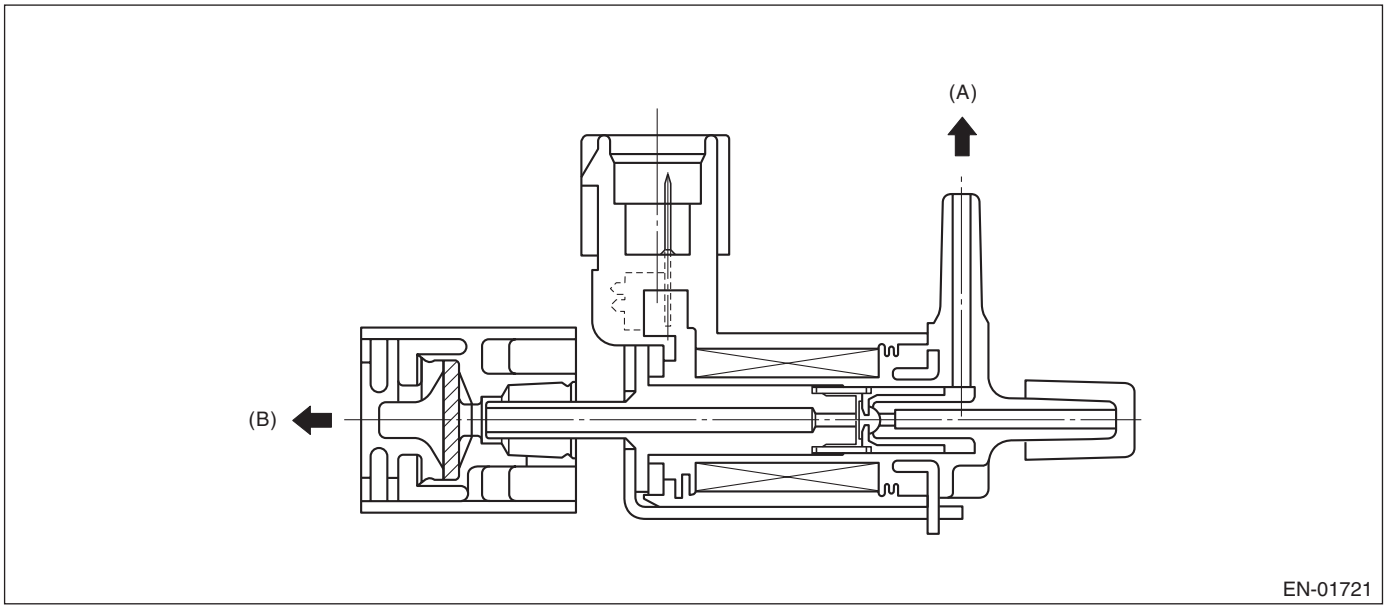
Memorize the freeze frame data. (For test mode $02)

CY:DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of fuel tank sensor control valve.
- Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) Fuel tank pressure sensor
(B) External air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time (2.5 seconds) needed for diagnosis. Judge OK and clear the NG when the malfunction criteria are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM sent ON signals	High level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

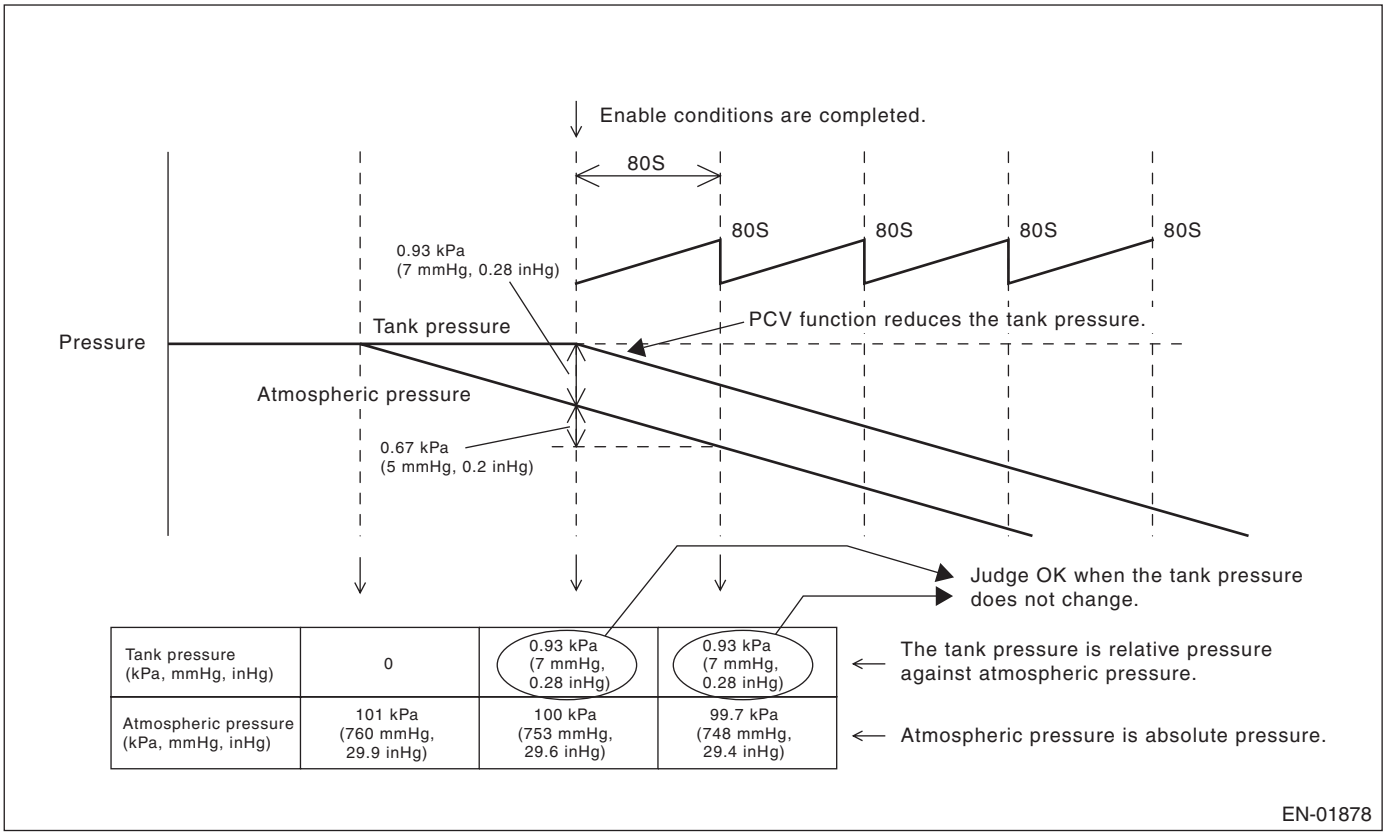
CZ:DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure switching solenoid function abnormality.
The tank pressure sensor is a relative pressure sensor, which normally compares the pressure with the atmospheric pressure. The tank pressure switching solenoid is a solenoid, which shifts the compare space from opening to closed during the EVAP diagnosis. Detect the malfunction that the compare space remains closed. (Not judge NG after enable condition completed but assume NG before enable condition completed.)

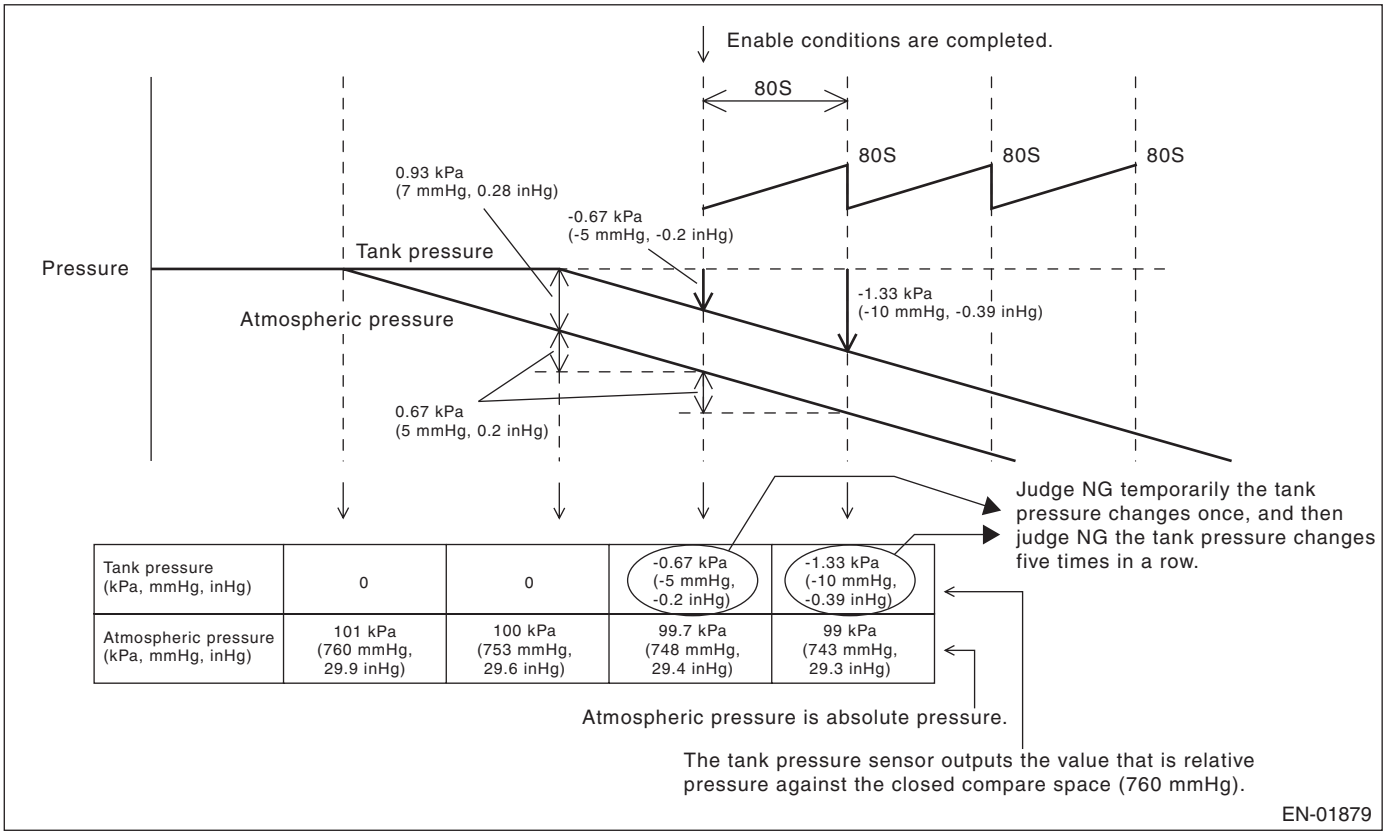
• Normality Judgment

Judge OK when the fuel tank pressure does not change (or changes by less than 0.67 kPa (5 mmHg, 0.2 inHg)) at atmospheric pressure changing by 0.67 kPa (5 mmHg, 0.2 inHg) or more per 80 seconds.



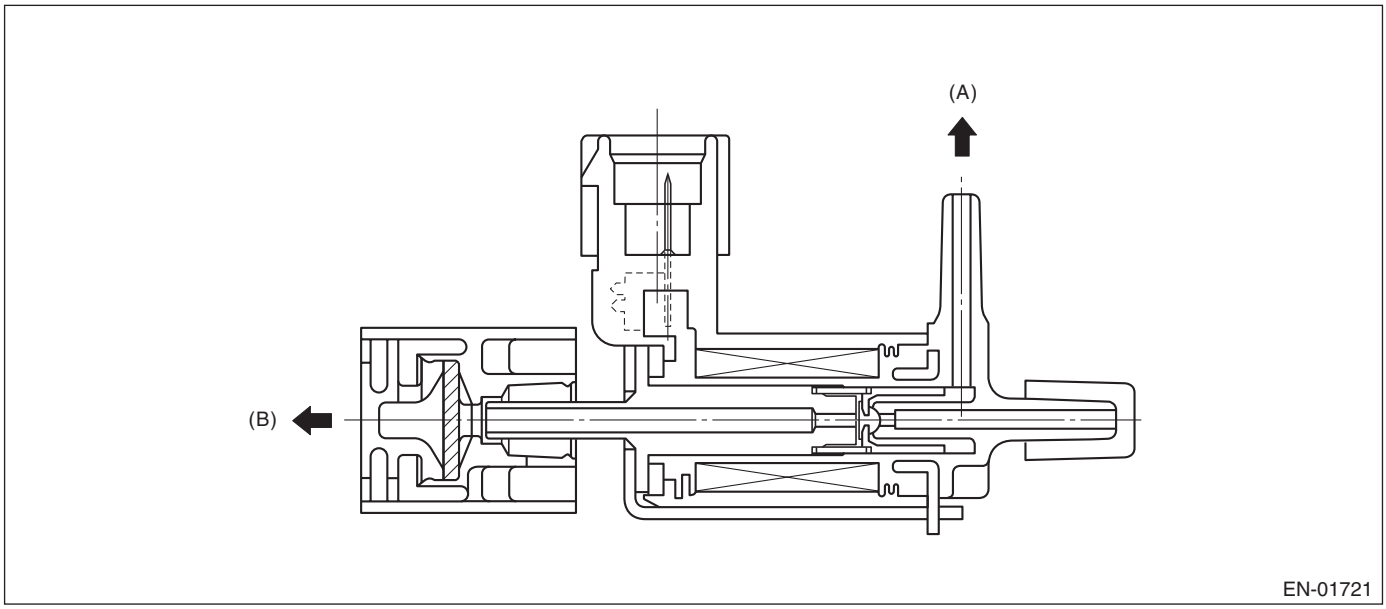
• Abnormality Judgment

Judge NG temporarily when the fuel tank pressure changes by 0.67 kPa (5 mmHg, 0.2 inHg) or more at atmospheric pressure changing by 0.67 kPa (5 mmHg, 0.2 inHg) or more per 80 seconds, and then judge NG when the previous condition is completed 5 times in a row.



Tank pressure (kPa, mmHg, inHg)	0	0	-0.67 kPa (-5 mmHg, -0.2 inHg)	-1.33 kPa (-10 mmHg, -0.39 inHg)
Atmospheric pressure (kPa, mmHg, inHg)	101 kPa (760 mmHg, 29.9 inHg)	100 kPa (753 mmHg, 29.6 inHg)	99.7 kPa (748 mmHg, 29.4 inHg)	99 kPa (743 mmHg, 29.3 inHg)

2. COMPONENT DESCRIPTION



(A) Fuel tank pressure sensor
(B) External air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	≥ 80 seconds
Fuel level	9 to 51 ℓ (2.4 — 13.5 US gal, 2.0 — 11.2 Imp gal)
Fuel tank pressure	< 0 or > 1,200 Pa (< 0 or > 9.0 mmHg, < 0 or > 0.4 inHg)
Evaporative emission control system diagnosis	Not in diagnosis

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 80 seconds after starting the engine. (Do not diagnose during evaporative emission control system diagnosis.)

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Count the counter up when the malfunction criteria below are completed by checking the change such as tank pressure, atmospheric pressure and fuel level during every 80 seconds. Judge NG when the count comes to the specified number (3 times).

Judgment Value

Malfunction Criteria	Threshold Value
Change of tank pressure during 80 seconds	≥ 600 Pa (4.5 mmHg, 0.2 inHg)
Change of atmospheric pressure during 80 seconds	≥ 600 Pa (4.5 mmHg, 0.2 inHg)
Change of fuel level during 80 seconds	< 8 ℓ (2.1 US gal, 1.8 Imp gal)

Time Needed for Diagnosis: 80 seconds × 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Change of tank pressure during 80 seconds	≥ 600 Pa (4.5 mmHg, 0.2 inHg)
Change of atmospheric pressure during 80 seconds	< 600 Pa (4.5 mmHg, 0.2 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

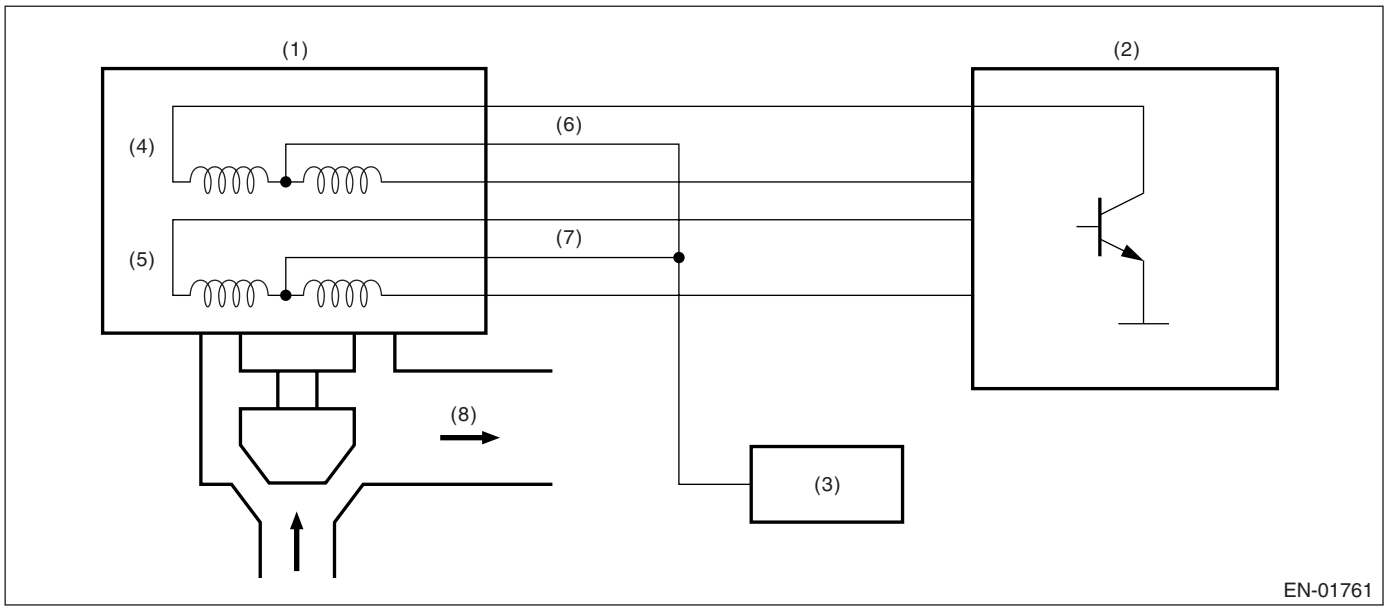
Memorize the freeze frame data. (For test mode $02)

DA:DTC P1510 ISC SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of idle air control solenoid valve.
- Judge NG when the output terminal is Low level even though ECM outputs OFF signal.

2. COMPONENT DESCRIPTION



(1) Idle air control solenoid valve
(2) Engine control module (ECM)
(3) Ignition relay
(4) A phase
(5) B phase
(6) A phase power
(7) B phase power
(8) Intake air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis when starter switch is OFF.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	High level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Cut the fuel of all cylinders, #1 cylinder or #1, #2 cylinder according to throttle position, engine speed, vehicle speed.
- ISC closed loop compensation value becomes zero. [ISCCL = 0 (l/min)]

9. ECM OPERATION AT DTC

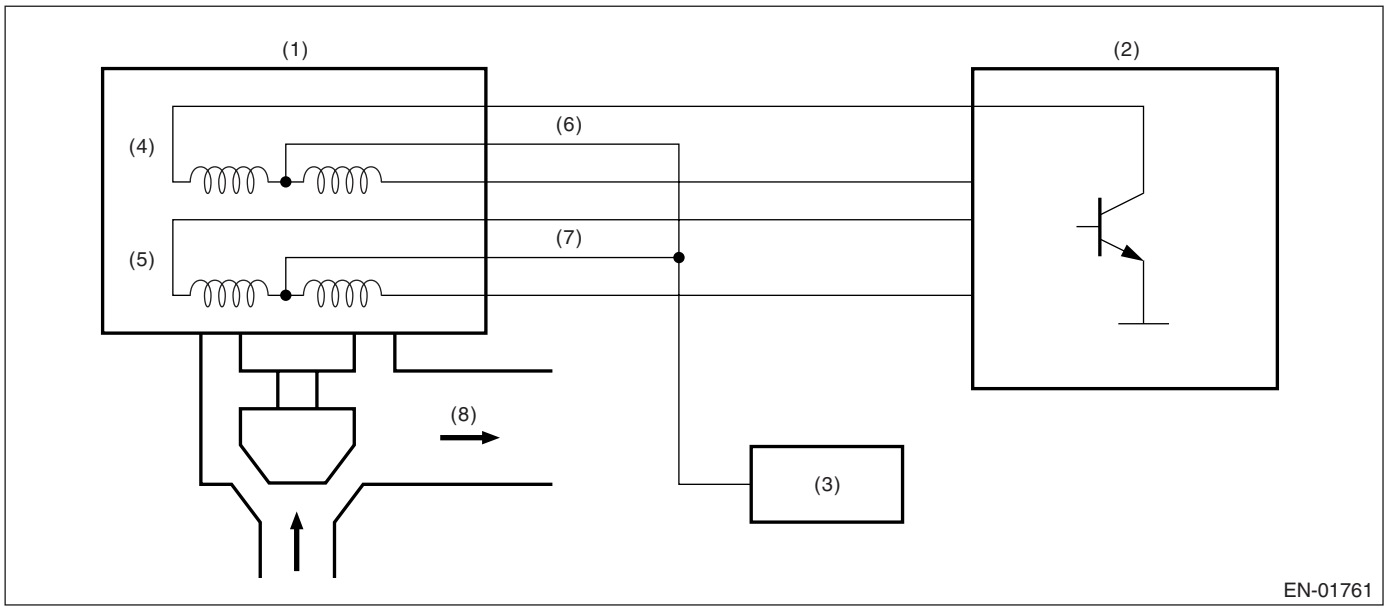
Memorize the freeze frame data. (For test mode $02)

DB:DTC P1511 ISC SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of idle air control solenoid valve.
- Judge NG when the output terminal is High level even though ECM outputs ON signal.

2. COMPONENT DESCRIPTION



(1) Idle air control solenoid valve
(2) Engine control module (ECM)
(3) Ignition relay
(4) A phase
(5) B phase
(6) A phase power
(7) B phase power
(8) Intake air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Starter switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when starter switch is OFF.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

Time needed for diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	Low level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Cut the fuel of all cylinders, #1 cylinder or #1, #2 cylinder according to throttle position, engine speed, vehicle speed.
- ISC closed loop compensation value becomes zero. [ISCCL = 0 (l/min)]

9. ECM OPERATION AT DTC

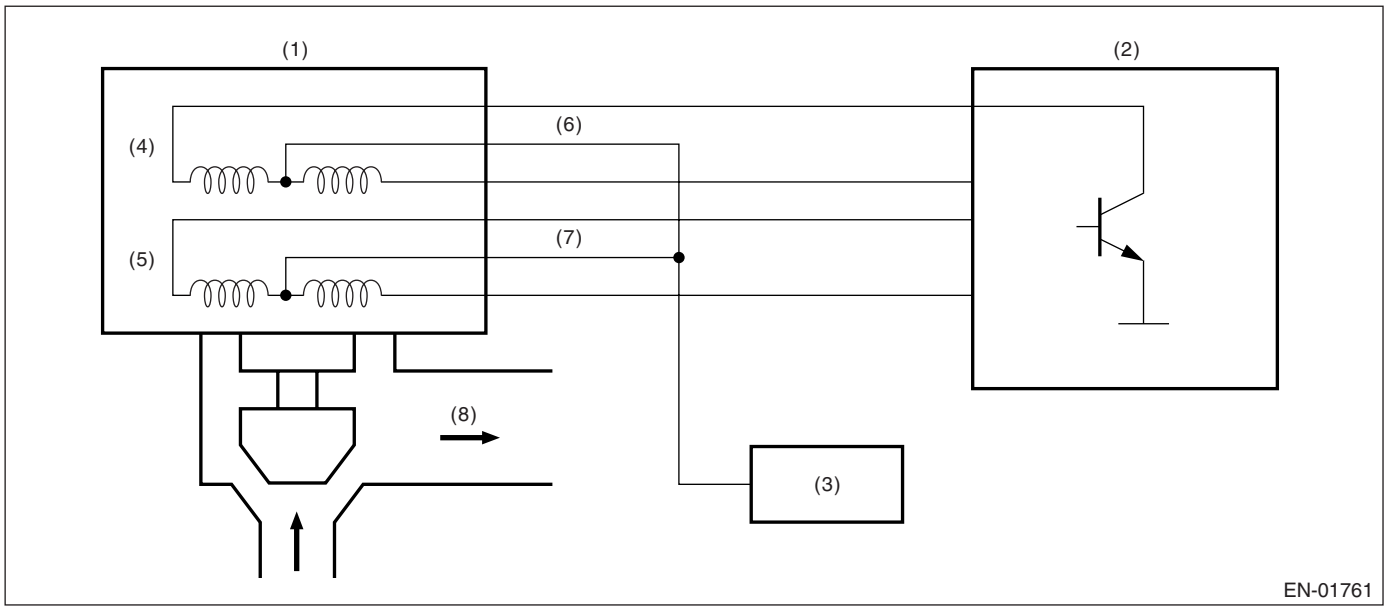
Memorize the freeze frame data. (For test mode $02)

DC:DTC P1512 ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of idle air control solenoid valve.
- Judge NG when the output terminal is Low level even though ECM outputs OFF signal.

2. COMPONENT DESCRIPTION



(1) Idle air control solenoid valve
(2) Engine control module (ECM)
(3) Ignition relay
(4) A phase
(5) B phase
(6) A phase power
(7) B phase power
(8) Intake air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Starter switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when starter switch is OFF.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	High level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Cut the fuel of all cylinders, #1 cylinder or #1, #2 cylinder according to throttle position, engine speed, vehicle speed.
- ISC closed loop compensation value becomes zero. [ISCCL = 0 (l/min)]

9. ECM OPERATION AT DTC

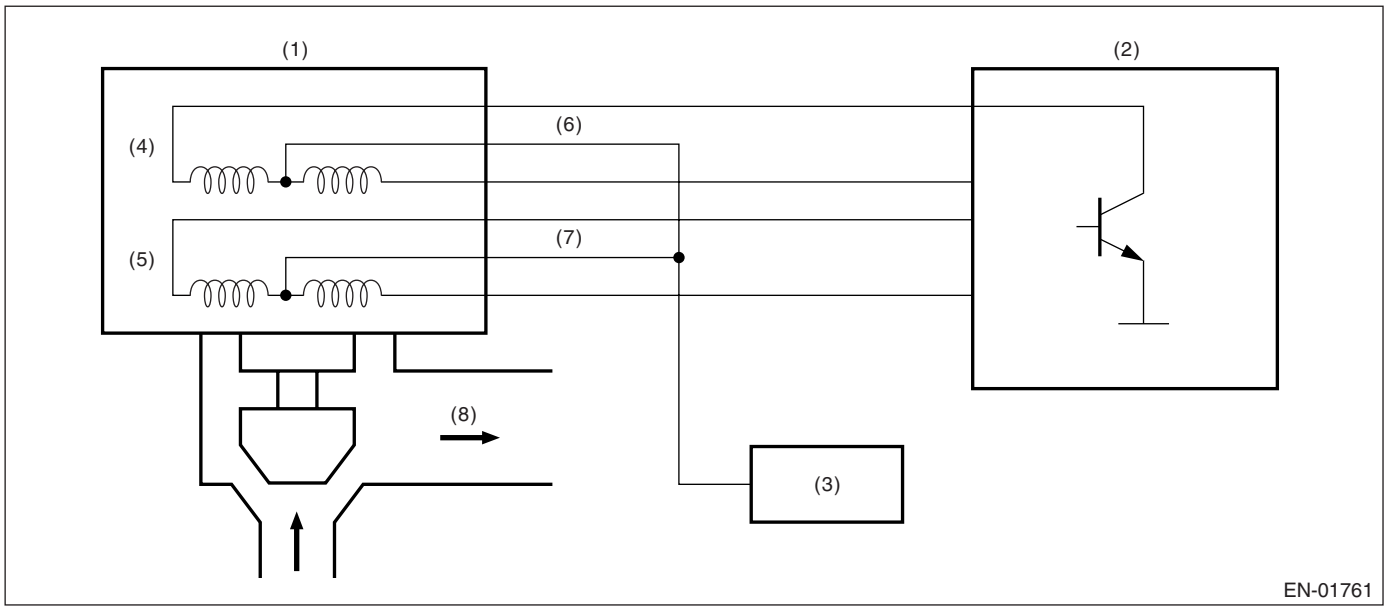
Memorize the freeze frame data. (For test mode $02)

DD:DTC P1513 ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of idle air control solenoid valve.
- Judge NG when the output terminal is High level even though ECM outputs ON signal.

2. COMPONENT DESCRIPTION



(1) Idle air control solenoid valve
(2) Engine control module (ECM)
(3) Ignition relay
(4) A phase
(5) B phase
(6) A phase power
(7) B phase power
(8) Intake air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Starter switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when starter switch is OFF.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	Low level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Cut the fuel of all cylinders, #1 cylinder or #1, #2 cylinder according to throttle position, engine speed, vehicle speed.
- ISC closed loop compensation value becomes zero. [ISCCL = 0 (l/min)]

9. ECM OPERATION AT DTC

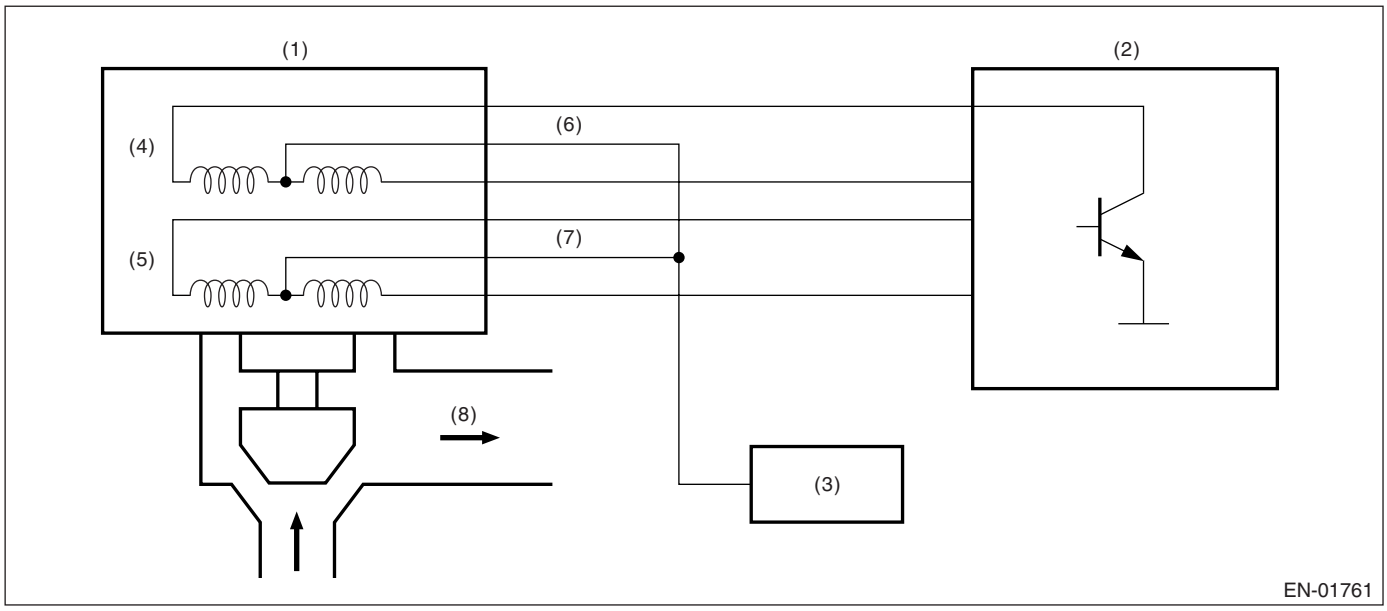
Memorize the freeze frame data. (For test mode $02)

DE:DTC P1514 ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of idle air control solenoid valve.
- Judge NG when the output terminal is Low level even though ECM outputs OFF signal.

2. COMPONENT DESCRIPTION



(1) Idle air control solenoid valve
(2) Engine control module (ECM)
(3) Ignition relay
(4) A phase
(5) B phase
(6) A phase power
(7) B phase power
(8) Intake air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Starter switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when starter switch is OFF.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	High level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Cut the fuel of all cylinders, #1 cylinder or #1, #2 cylinder according to throttle position, engine speed, vehicle speed.
- ISC closed loop compensation value becomes zero. [ISCCL = 0 (l/min)]

9. ECM OPERATION AT DTC

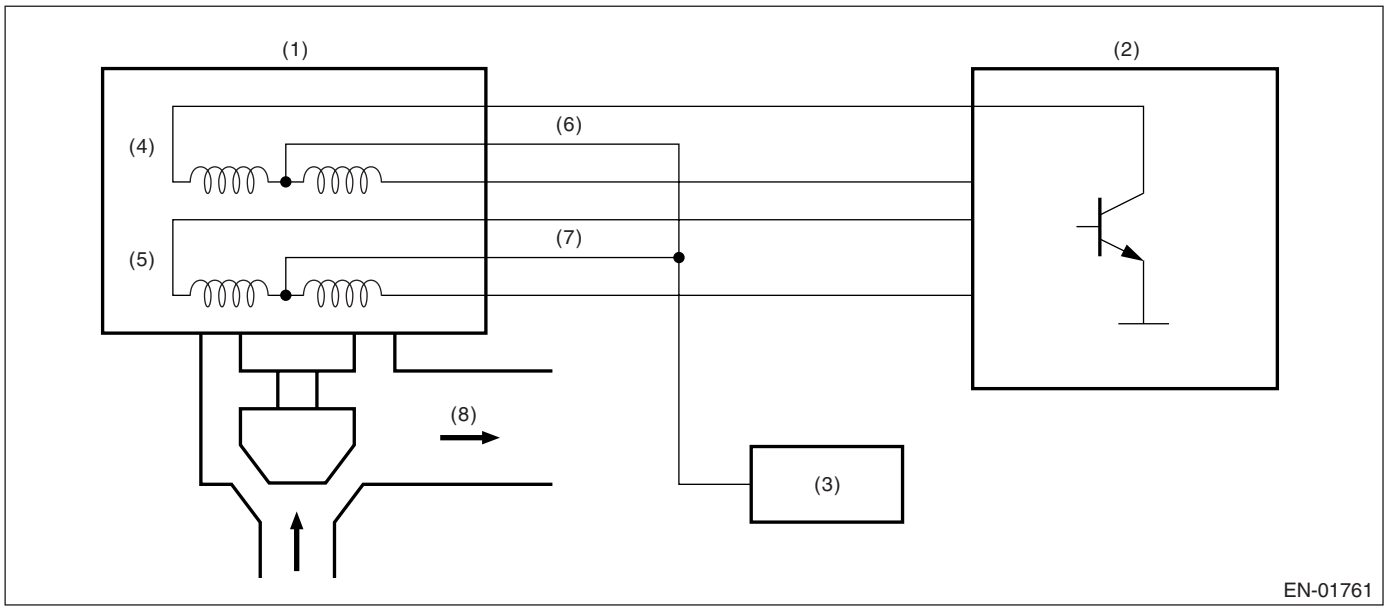
Memorize the freeze frame data. (For test mode $02)

DF:DTC P1515 ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of idle air control solenoid valve.
- Judge NG when the output terminal is High level even though ECM outputs ON signal.

2. COMPONENT DESCRIPTION



(1) Idle air control solenoid valve
(2) Engine control module (ECM)
(3) Ignition relay
(4) A phase
(5) B phase
(6) A phase power
(7) B phase power
(8) Intake air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Starter switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when starter switch is OFF.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	Low level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Cut the fuel of all cylinders, #1 cylinder or #1, #2 cylinder according to throttle position, engine speed, vehicle speed.
- ISC closed loop compensation value becomes zero. [ISCCL = 0 (l/min)]

9. ECM OPERATION AT DTC

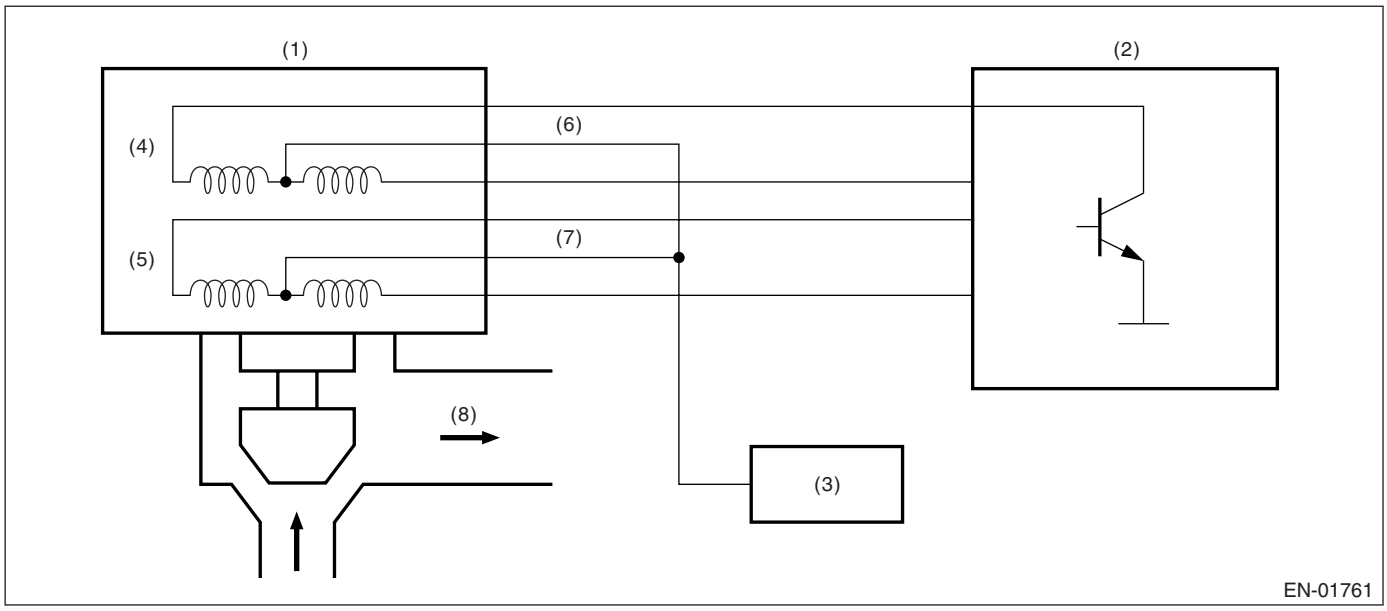
Memorize the freeze frame data. (For test mode $02)

DG:DTC P1516 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of idle air control solenoid valve.
- Judge NG when the output terminal is Low level even though ECM outputs OFF signal.

2. COMPONENT DESCRIPTION



(1) Idle air control solenoid valve
(2) Engine control module (ECM)
(3) Ignition relay
(4) A phase
(5) B phase
(6) A phase power
(7) B phase power
(8) Intake air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Starter switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when starter switch is OFF.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	High level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Cut the fuel of all cylinders, #1 cylinder or #1, #2 cylinder according to throttle position, engine speed, vehicle speed.
- ISC closed loop compensation value becomes zero. [ISCCL = 0 (l/min)]

9. ECM OPERATION AT DTC

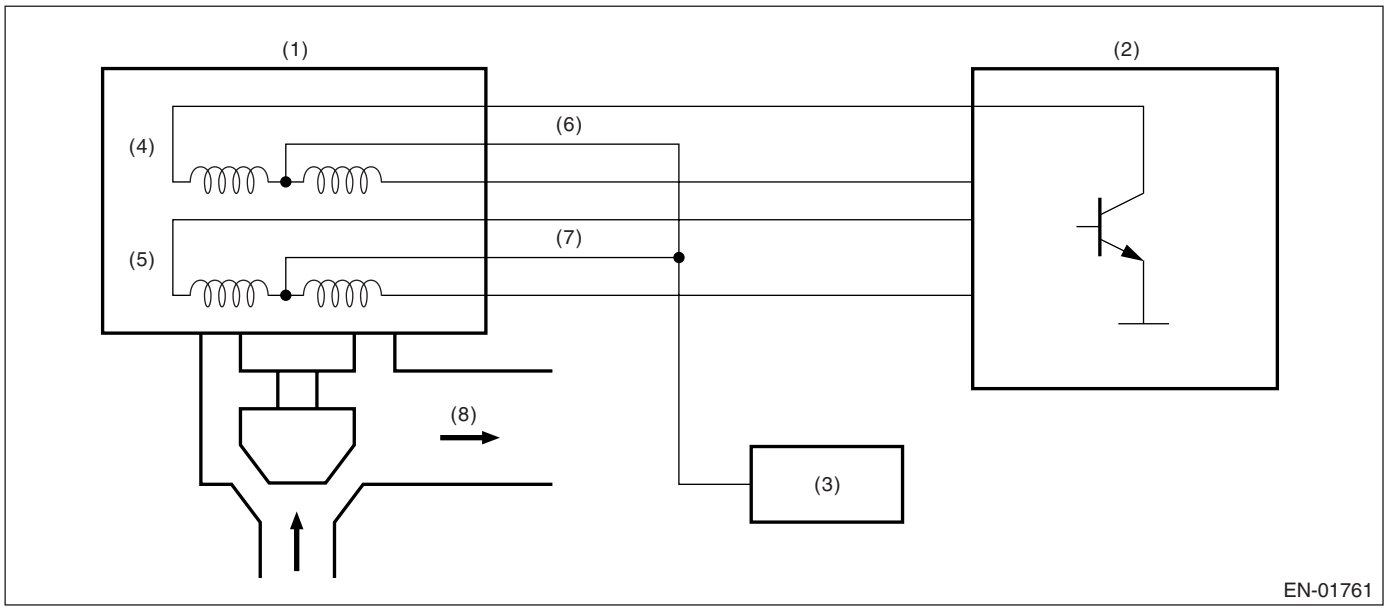
Memorize the freeze frame data. (For test mode $02)

DH:DTC P1517 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of idle air control solenoid valve.
- Judge NG when the output terminal is High level even though ECM outputs ON signal.

2. COMPONENT DESCRIPTION



(1) Idle air control solenoid valve
(2) Engine control module (ECM)
(3) Ignition relay
(4) A phase
(5) B phase
(6) A phase power
(7) B phase power
(8) Intake air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Starter switch	OFF
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when starter switch is OFF.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	Low level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Cut the fuel of all cylinders, #1 cylinder or #1, #2 cylinder according to throttle position, engine speed, vehicle speed.
- ISC closed loop compensation value becomes zero. [ISCCL = 0 (l/min)]

9. ECM OPERATION AT DTC

Memorize the freeze frame data. (For test mode $02)

DI: DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of starter switch.
- Judge OFF NG when the starter signal remains OFF even though engine started.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine	Run

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed. Judge OK and clear the NG when the starter switch is turned to ON.

Judgment value

Malfunction Criteria	Threshold Value
Engine speed	0 — 700 rpm
Vehicle speed	= 0 km/h (0 MPH)
Starter “ON” signal	Not detected

Time Needed for Diagnosis

OFF side	Condition (engine speed 0 → 700 rpm) time needed for completion

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC

Memorize the freeze frame data. (For test mode $02)

DJ:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of back-up power supply circuit.
- Judge NG when the back-up power supply does not come to ECM regardless of the battery voltage coming.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Self-diagnosis timer after starting the engine	≥ 5 seconds
Battery voltage MVB	≥ 9.2 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously in 5 seconds after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG and clear the NG when the cumulative time until completing the malfunction criteria below becomes more than the time (5 seconds) needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Battery back-up power supply	Low

Time Needed for Diagnosis: 5 seconds
Malfunction indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DK:DTC P1698 ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of AT cooperative signal line.
- Judge NG when ECM output level is different from actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8.0 V
After engine starting	1 second or more

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than the time (0.5 seconds) needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs OFF signal	High

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC

Memorize the freeze frame data. (For test mode $02)

DL:DTC P1699 ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of AT cooperative signal line.
- Judge NG when ECM output level is different from actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	≥ 8.0 V
After engine starting	1 second or more

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time until completing the malfunction criteria below becomes more than the time (0.5 seconds) needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs ON signal	Low

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC

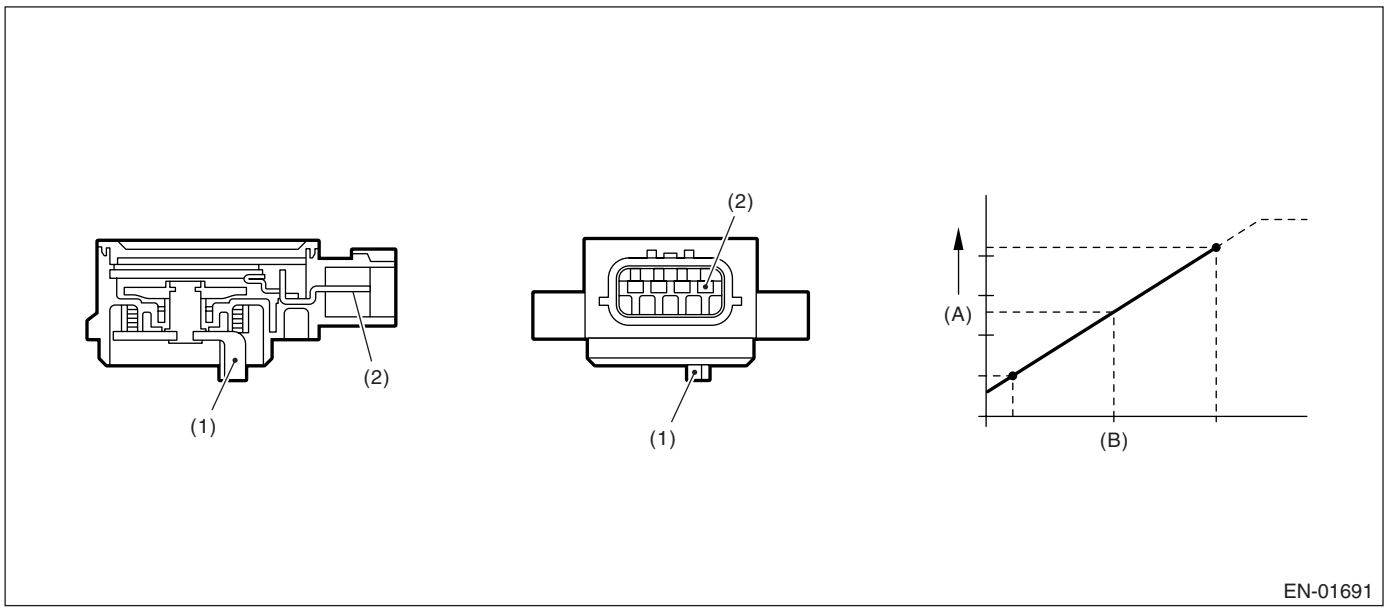
Memorize the freeze frame data. (For test mode $02)

DM:DTC P1700 THROTTLE POSITION SENSOR CIRCUIT MALFUNCTION FOR AT

1. OUTLINE OF DIAGNOSIS

Judge NG when the voltage from throttle sensor is out of specified value.

2. COMPONENT DESCRIPTION



(1) Lever
(2) Terminal
(A) Output voltage
(B) Throttle valve angle

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.1 or ≥ 4.6 V

Time Needed for Diagnosis: 63.75 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Make the throttle angle to 3/8 open, and the line pressure and 2-4B pressure to maximum.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DN:DTC P1711 ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION

1. OUTLINE OF DIAGNOSIS

Judge NG when detecting the difference 250 times in a row by comparing the CPU output with signal line output every 10 milliseconds.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Collector voltage of transistor (Vc) at “ON” signal from TCM	High level
Collector voltage of transistor (Vc) at “OFF” signal from ECM	Low level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DO:DTC P1712 ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION

1. OUTLINE OF DIAGNOSIS

Judge NG when detecting the difference 250 times in a row by comparing the CPU output with signal line output every 10 milliseconds.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	High
Vc at “OFF” signal from ECM	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

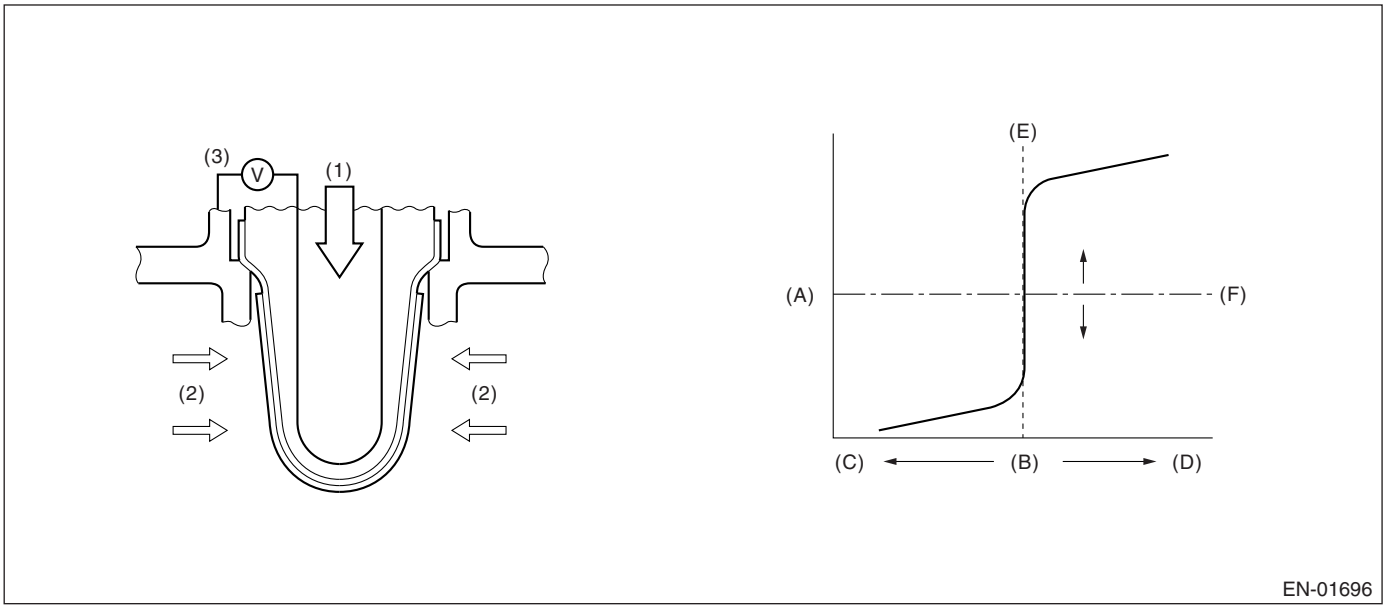
Memorize the freeze frame data. (For test mode $02)

DP:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.
Judge NG when the rear oxygen sensor output does not approach to the slice level (target voltage) with the control amount sticks to rich or lean side while operating the sub feedback control.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Fuel system monitoring with primary oxygen sensor	In operation
Target lambda with primary oxygen sensor	1.0
Closed loop control with secondary oxygen sensor	In operation
Amount of intake air	≥ 20 kg/h
Feed back control with secondary oxygen sensor	Reached to the limit value

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 80 km/h (50 MPH).

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Calculate the continuous time from the sticking of sub feedback control amount to rich or lean side and cumulative deviation (sumdelo 2) of rear oxygen sensor voltage and slice level (target voltage).
Judge NG when the malfunction criteria below are completed after 300 seconds have passed continuously.
Judgment Value

Malfunction Criteria	Threshold Value
sumdelo2 = sumdelo2 + (rvo2 − rsl) where: rvo2 = sensing voltage of secondary oxygen sensor rsl = target voltage of secondary oxygen sensor	> −16,740 V

Time Needed for Diagnosis: 300 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the rear oxygen output is reversed, and during 4 seconds after that, the sub feedback control amount does not stick to rich or lean sides.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

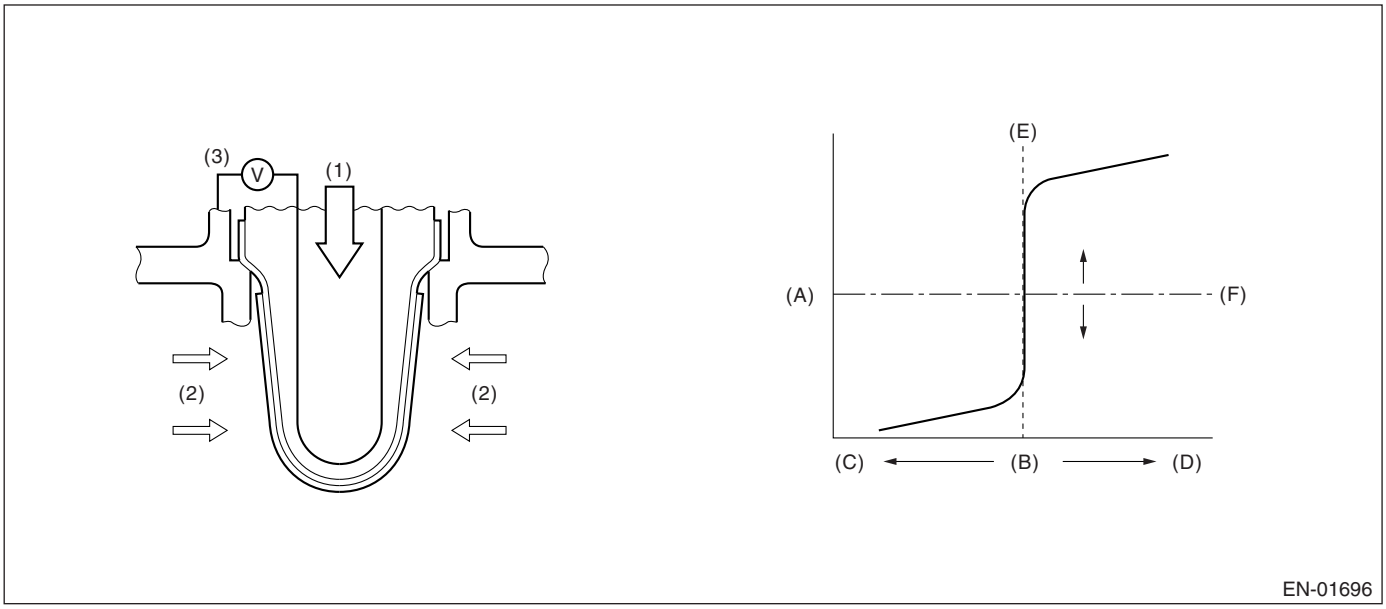
Memorize the freeze frame data. (For test mode $02)

DQ:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.
Judge NG when the rear oxygen sensor output does not approach to the slice level (target voltage) with the control amount sticks to rich or lean side while operating the sub feedback control.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Fuel system monitoring with primary oxygen sensor	In operation
Target lambda with primary oxygen sensor	1.0
Closed loop control with secondary oxygen sensor	In operation
Amount of intake air	≥ 20 kg/h
Feed back control with secondary oxygen sensor	Reached to the limit value

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 80 km/h (50 MPH).

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Calculate the continuous time from the sticking of sub feedback control amount to rich or lean side and cumulative deviation (sumdelo 2) of rear oxygen sensor voltage and slice level (target voltage).
Judge NG when the malfunction criteria below are completed after 300 seconds have passed continuously.
Judgment Value

Malfunction Criteria	Threshold Value
sumdelo2 = sumdelo2 + (rvo2 − rsl) where: rvo2 = sensing voltage of secondary oxygen sensor rsl = target voltage of secondary oxygen sensor	> 6,750 V

Time Needed for Diagnosis: 300 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the rear oxygen output is reversed, and during 4 seconds after that, the sub feedback control amount does not stick to rich or lean sides.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

ENGINE SECTION 2

FUEL INJECTION (FUEL SYSTEMS)	FU(H4DOTC)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(H4DOTC)
INTAKE (INDUCTION)	IN(H4DOTC)
MECHANICAL	ME(H4DOTC)
EXHAUST	EX(H4DOTC)
COOLING	CO(H4DOTC)
LUBRICATION	LU(H4DOTC)
SPEED CONTROL SYSTEMS	SP(H4DOTC)
IGNITION	IG(H4DOTC)
STARTING/CHARGING SYSTEMS	SC(H4DOTC)
ENGINE (DIAGNOSTICS)	EN(H4DOTC)(diag)
GENERAL DESCRIPTION	GD(H4DOTC)

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

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

FUJI HEAVY INDUSTRIES LTD.

G1870BE3

FUEL INJECTION (FUEL SYSTEMS)

FU(H4DOTC)

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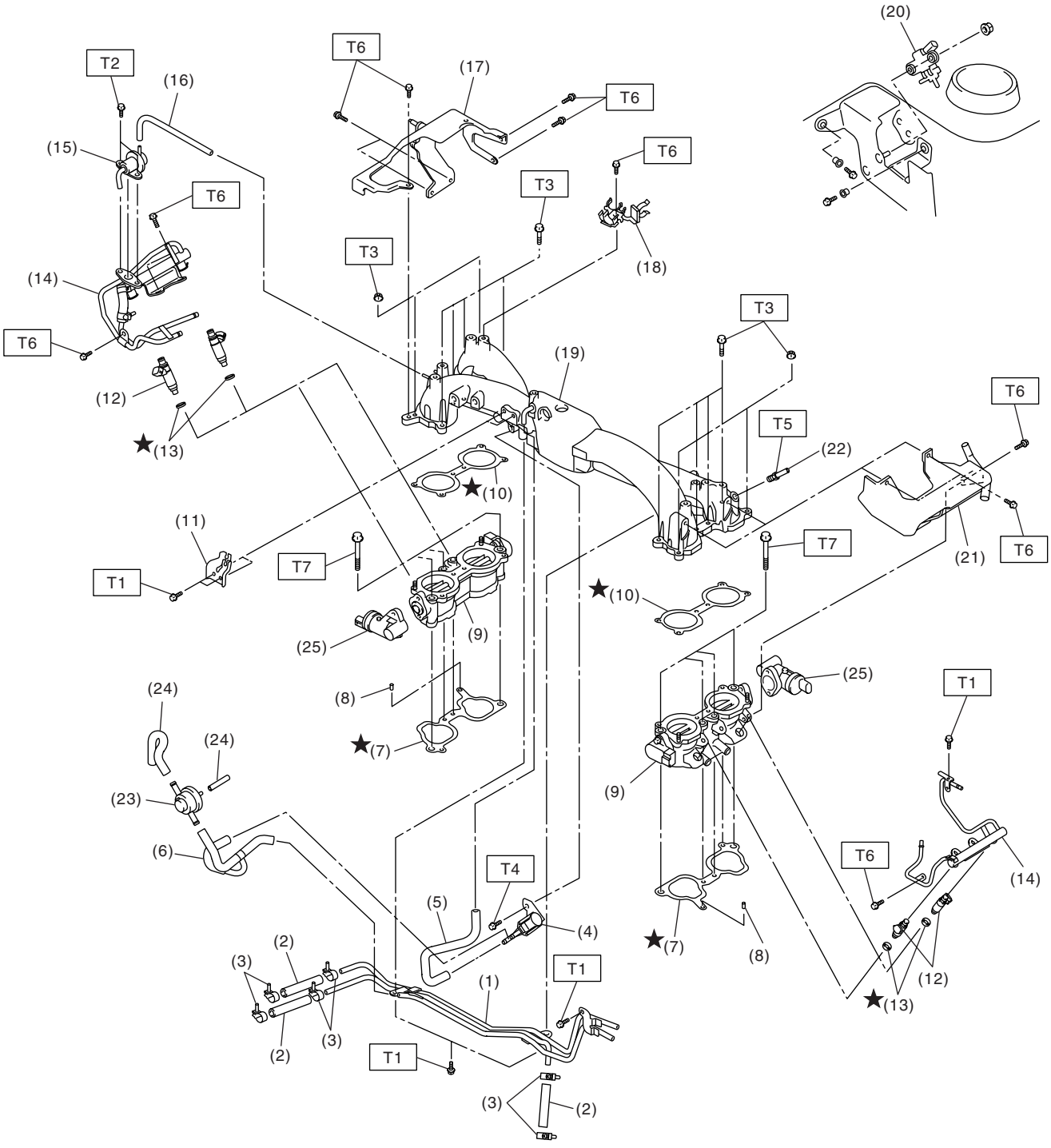
1. General Description

A: SPECIFICATIONS

Fuel tank	Capacity	60 ℓ (15.9 US gal, 13.2 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	450 — 677 kPa (4.59 — 6.9 kg/cm^2, 65.27 — 98.2 psi)
	Discharge flow	More than 130 ℓ (34.3 US gal, 28.6 Imp gal)/h [12 V at 300 kPa (3.06 kg/cm^2, 43.5 psi)]
Fuel filter		Cartridge type

B: COMPONENT

1. INTAKE MANIFOLD

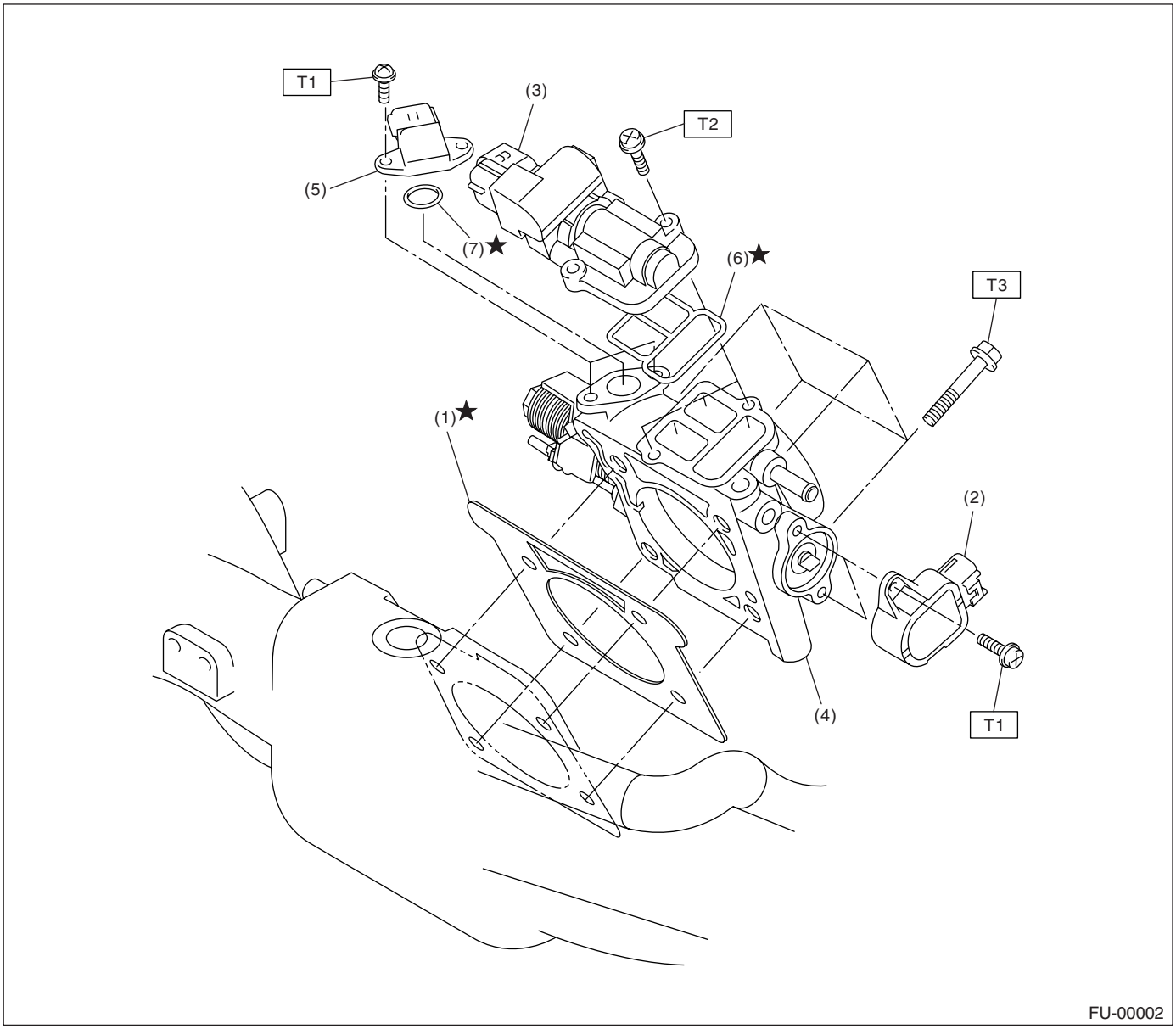


FU-00966

(1) Fuel pipe ASSY
(2) Fuel hose
(3) Clip
(4) Purge control solenoid valve
(5) Vacuum hose
(6) Vacuum control hose
(7) Intake manifold gasket
(8) Guide pin
(9) Tumble generator valve ASSY
(10) Tumble generator valve gasket
(11) Accelerator cable bracket
(12) Fuel injector
(13) Insulator
(14) Fuel injector pipe
(15) Pressure regulator
(16) Pressure regulator hose
(17) Fuel pipe protector RH
(18) Blow-by hose stay
(19) Intake manifold
(20) Wastegate control solenoid valve ASSY
(21) Fuel pipe protector LH
(22) Nipple
(23) Purge valve
(24) Purge hose
(25) Tumble generator valve actuator

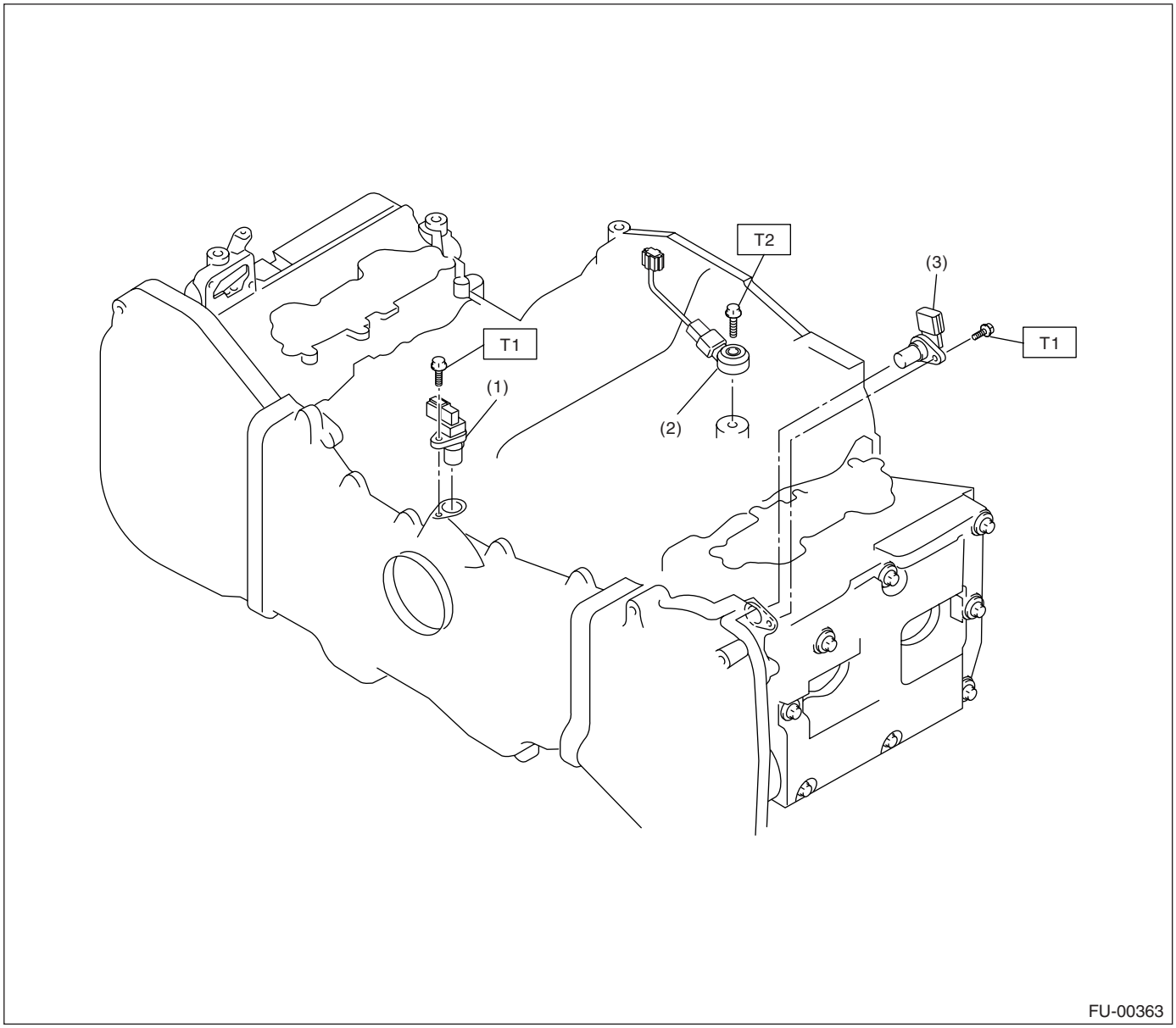
Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.9 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 8.25 (0.84, 6.1)
T4: 16 (1.6, 11.8)
T5: 17 (1.73, 12.5)
T6: 19 (1.94, 13.7)
T7: 25 (2.5, 18.1)

2. AIR INTAKE SYSTEM



(1)	Gasket	(5)	Manifold absolute pressure sensor	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Throttle position sensor	(6)	Gasket	***T1: 1.6 (0.16, 1.2)***
(3)	Idle air control solenoid valve	(7)	O-ring	***T2: 2.8 (0.29, 2.1)***
(4)	Throttle body			***T3: 22 (2.2, 15.9)***

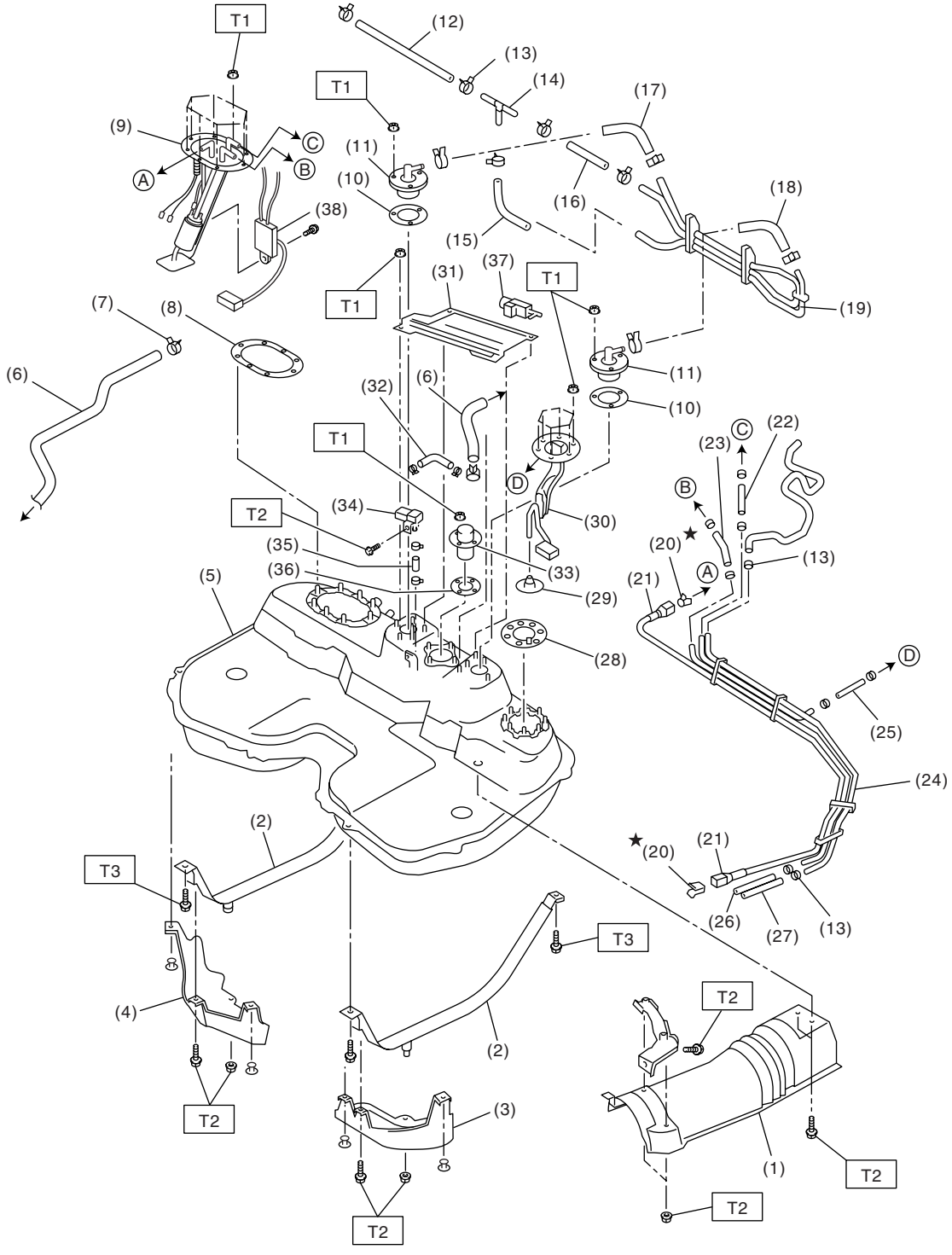
3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



(1) Crankshaft position sensor
(2) Knock sensor
(3) Camshaft position sensor

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 24 (2.4, 17.4)

4. FUEL TANK

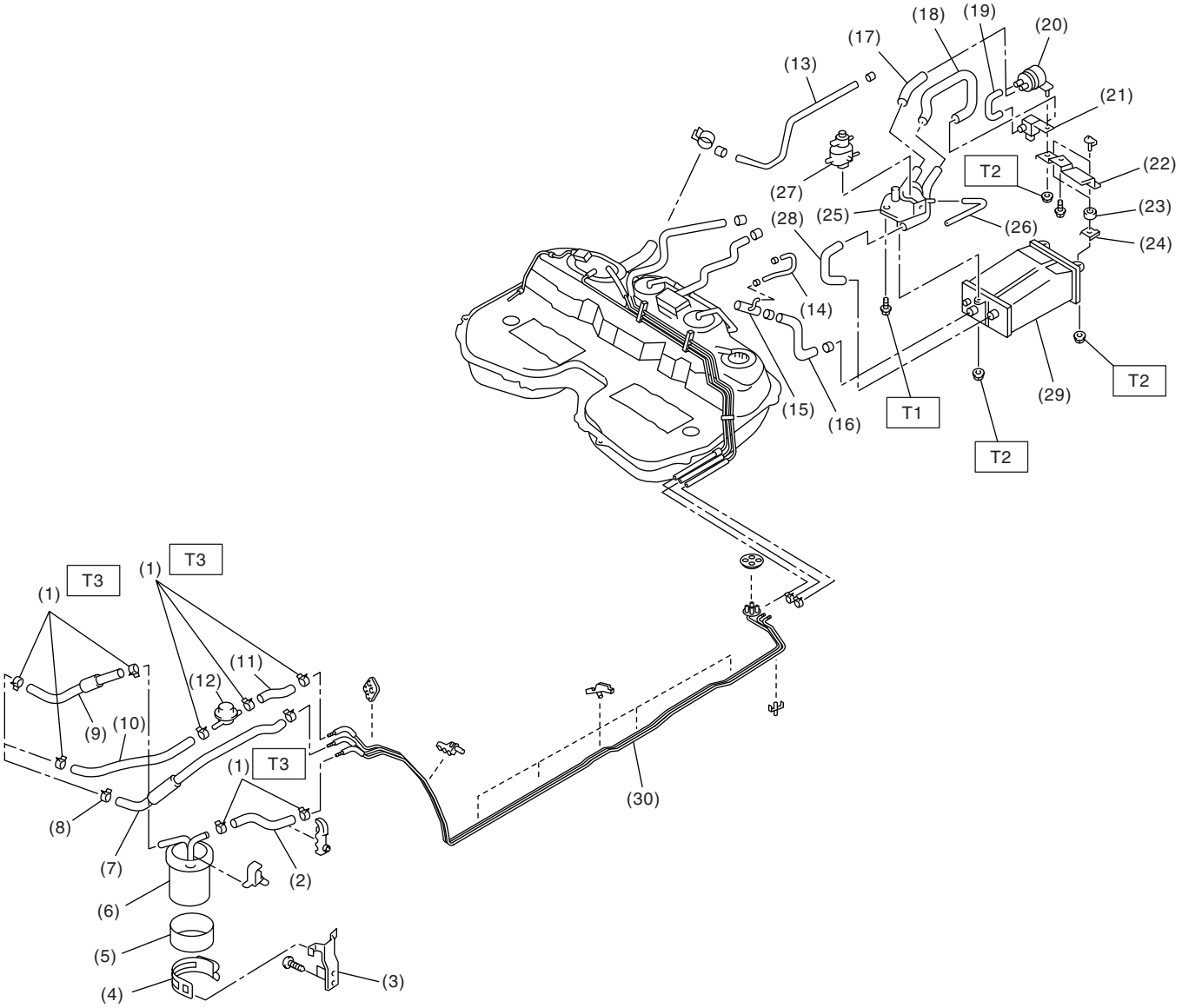


FU-01030

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

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

5. FUEL LINE

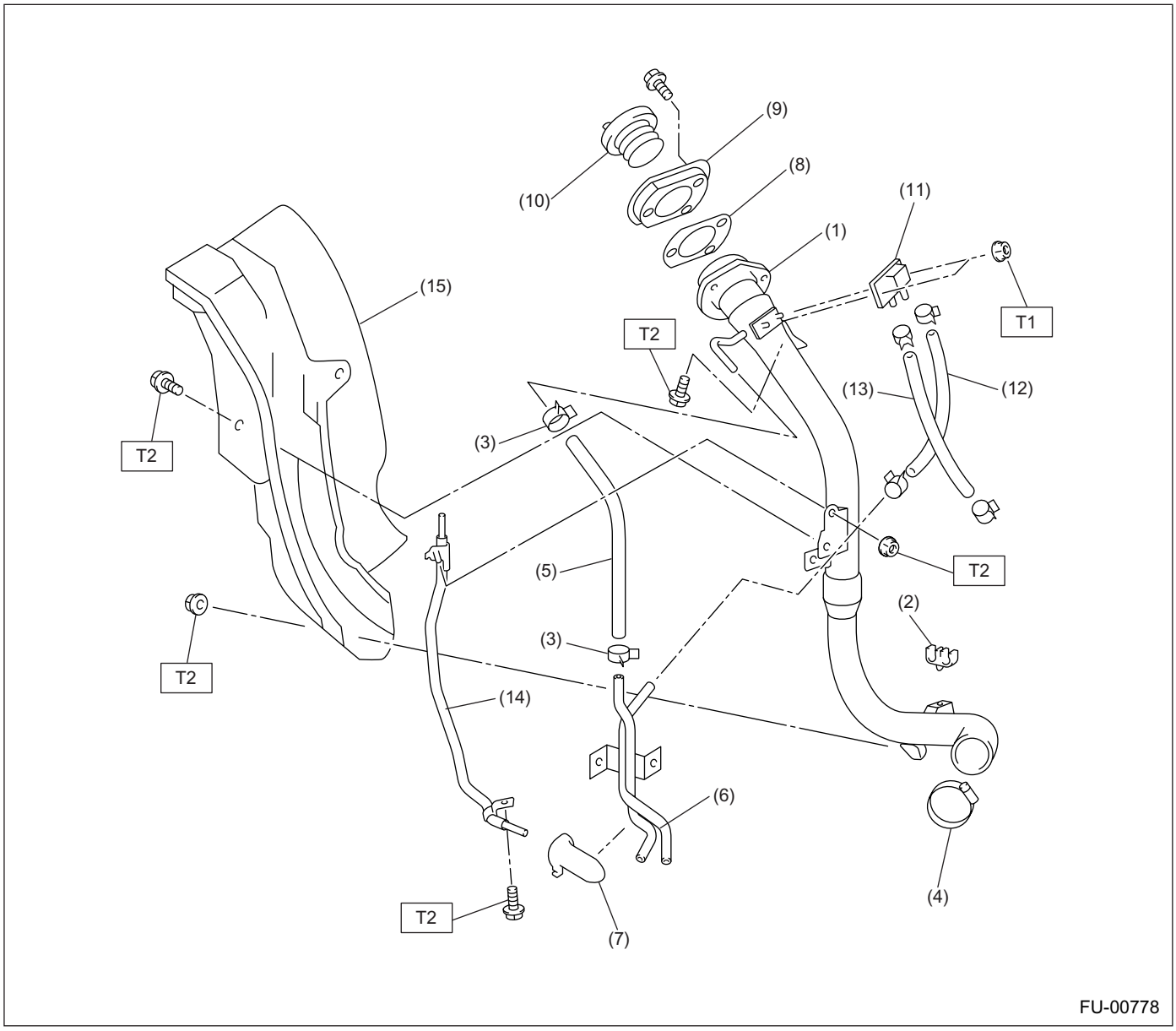


FU-01026

(1) Clamp
(2) Fuel delivery hose A
(3) Fuel filter bracket
(4) Fuel filter holder
(5) Fuel filter cup
(6) Fuel filter
(7) Evaporation hose
(8) Clip
(9) Fuel delivery hose B
(10) Fuel return hose A
(11) Fuel return hose B
(12) Fuel damper
(13) Evaporation hose J
(14) Evaporation hose K
(15) Joint pipe
(16) Canister hose A
(17) Air filter hose A
(18) Drain valve hose
(19) Air filter hose B
(20) Drain filter
(21) Drain valve
(22) Canister upper bracket
(23) Cushion rubber
(24) Canister lower bracket
(25) Canister holder
(26) Evaporation hose L
(27) Pressure control solenoid valve
(28) Canister hose B
(29) Canister
(30) Fuel pipe ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)
T2: 23 (2.3, 16.6)
T3: 1.25 (0.13, 0.94)

6. FUEL FILLER PIPE



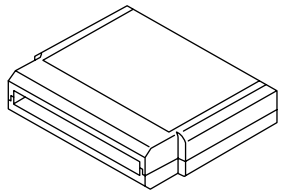
(1) Fuel filler pipe ASSY
(2) Evaporation hose holder
(3) Clip
(4) Clamp
(5) Evaporation hose A
(6) Evaporation pipe
(7) Evaporation pipe holder
(8) Filler pipe packing
(9) Filler ring
(10) Filler cap
(11) Shut valve
(12) Evaporation hose B
(13) Evaporation hose C
(14) Joint pipe
(15) Fuel filler pipe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

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 7.5 (0.76, 5.5)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect negative terminal from battery.
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

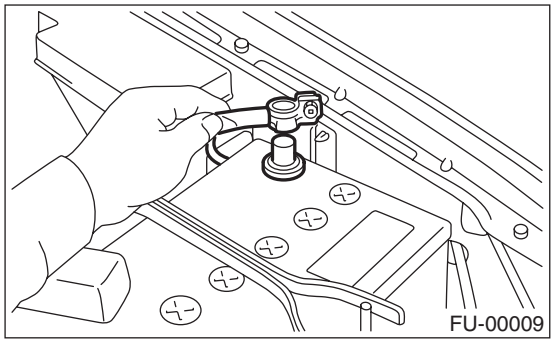
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems.

2. Throttle Body

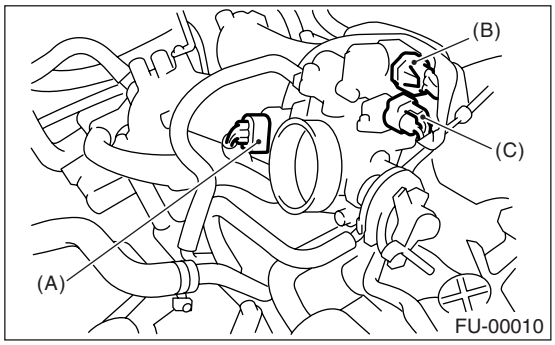
A: REMOVAL

1) Disconnect the ground cable from battery.

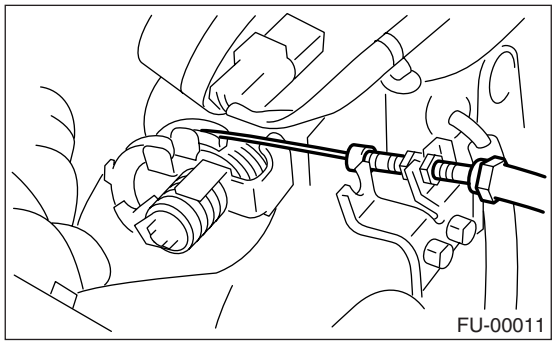


2) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>

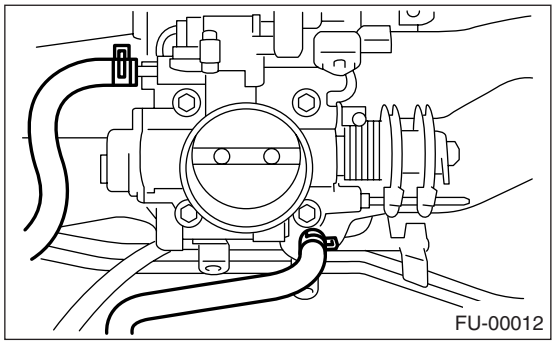
3) Disconnect the connector from the throttle position sensor (A) and idle air control solenoid valve (B) and manifold absolute pressure sensor (C).



4) Disconnect the accelerator cable.



5) Disconnect the engine coolant hoses from the throttle body.



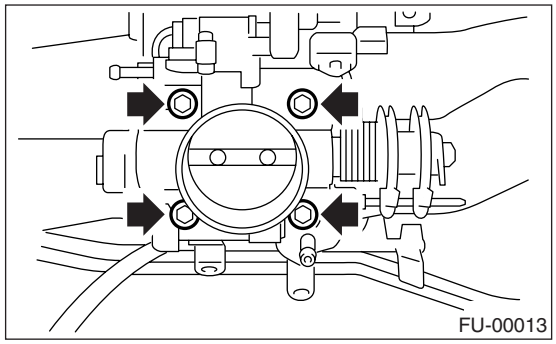
6) Remove the bolts which secure the throttle body to intake manifold.

B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
Always use a new gasket.

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

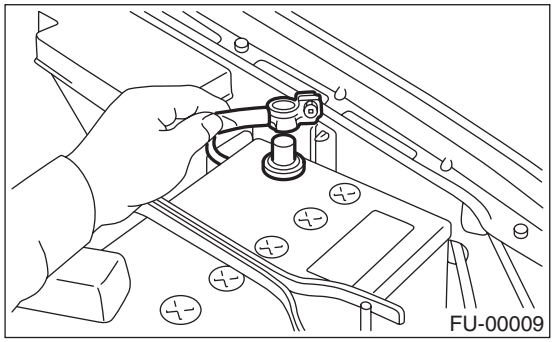


2) Adjust the play of accelerator cable. <Ref. to SP(H4SO)-6, INSTALLATION, Accelerator Control Cable.>

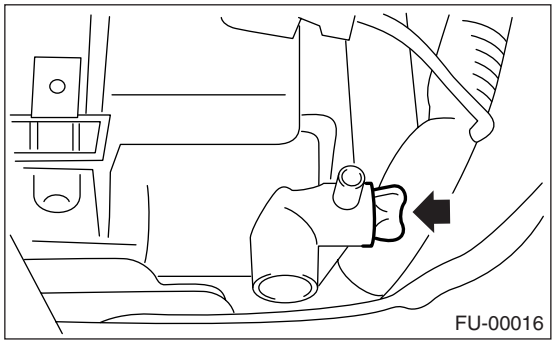
3. Intake Manifold

A: REMOVAL

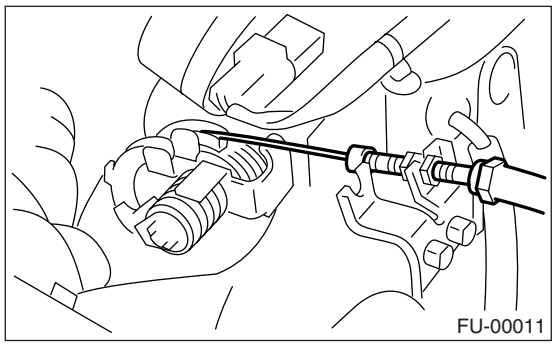
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-52, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.



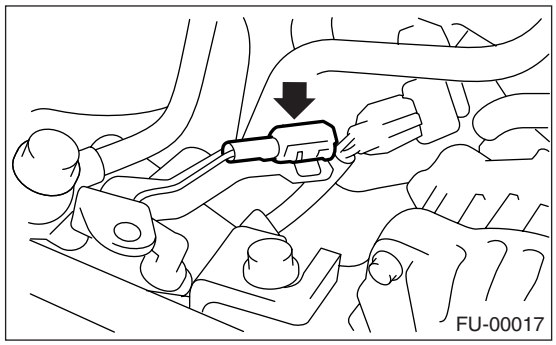
4) Lift up the vehicle.
5) Remove the under cover.
6) Drain the engine coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt).



7) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner.>
8) Remove the air cleaner element.
9) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
10) Disconnect the accelerator cable.

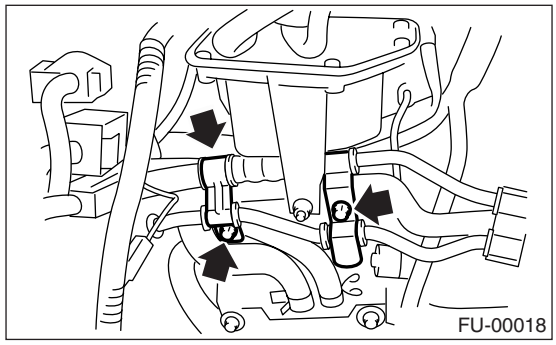


11) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-32, REMOVAL, Coolant Filler Tank.>
12) Remove the power steering pump.
(1) Remove the front side V-belt. <Ref. to ME(H4DOTC)-42, REMOVAL, V-belt.>
(2) Disconnect the power steering switch connector.

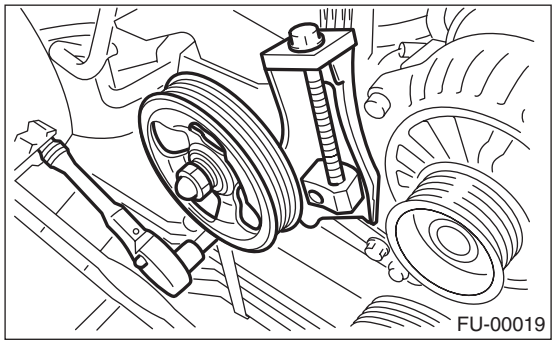


(3) Remove the bolts which secure the power steering pipe brackets to the intake manifold.

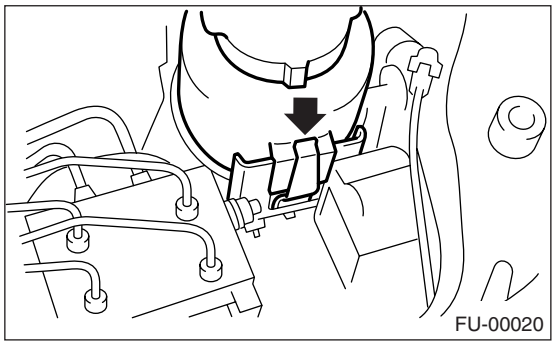
NOTE:
Do not disconnect the power steering hose.



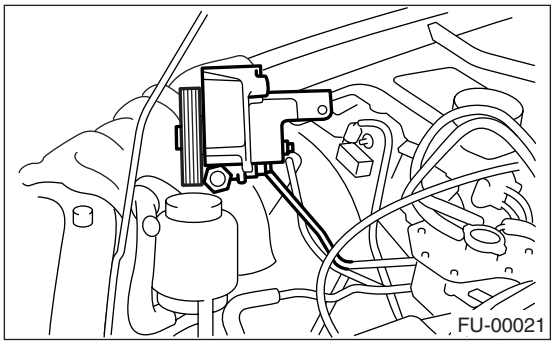
(4) Remove the bolts which secure the power steering pump bracket.



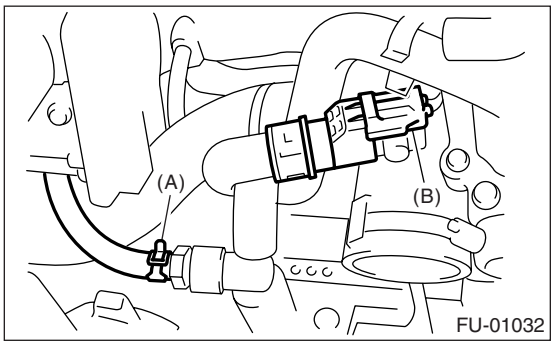
(5) Remove the power steering tank from the bracket by pulling it upward.



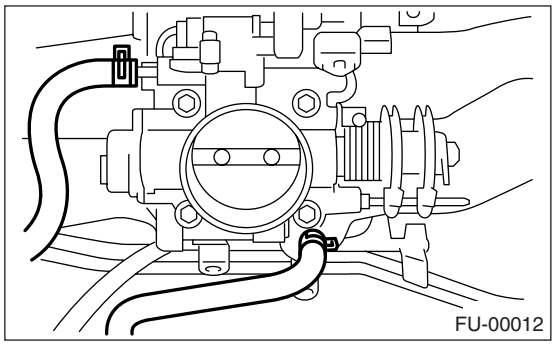
(6) Place the power steering pump on the right side wheel apron.



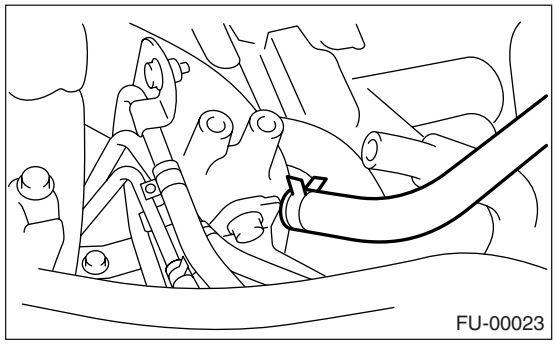
13) Disconnect the emission hose (A) and connector (B) from the PCV hose assembly.



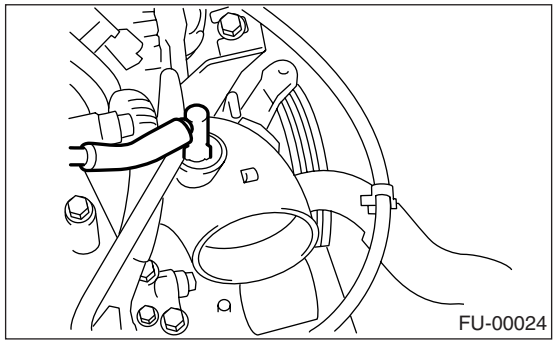
14) Disconnect the engine coolant hoses from the throttle body.



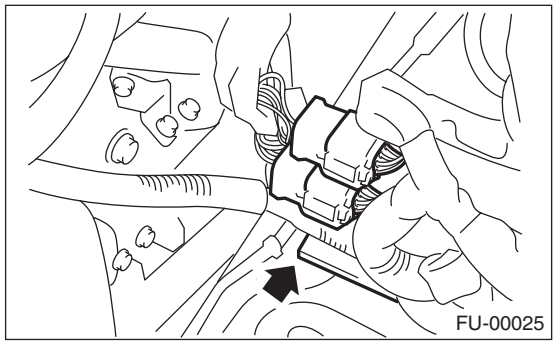
15) Disconnect the brake booster hose.

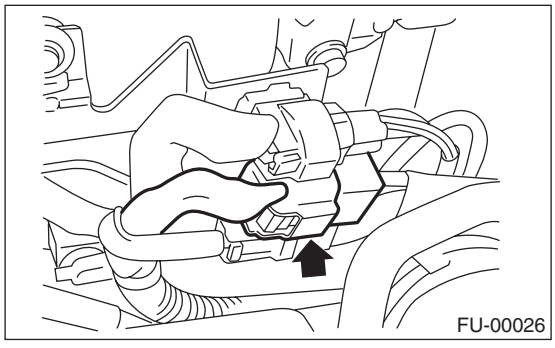


16) Disconnect the pressure hose from the intake duct.

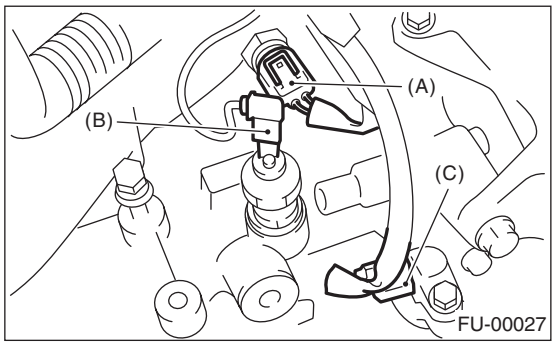


17) Disconnect the engine harness connectors from the bulkhead harness connectors.

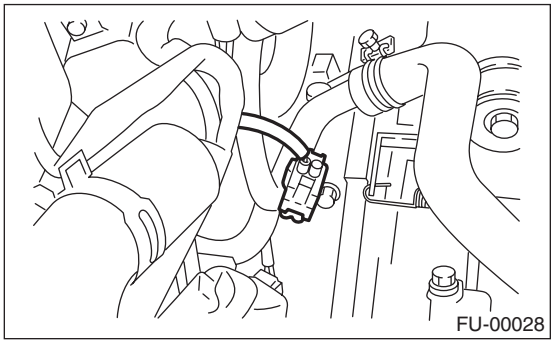




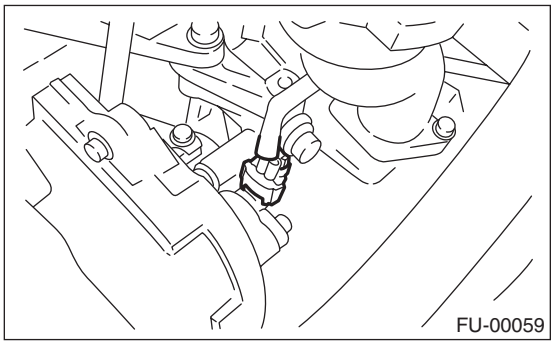
18) Disconnect the connectors from the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



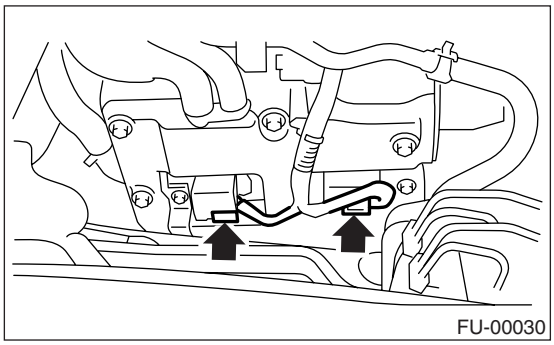
19) Disconnect the knock sensor connector.



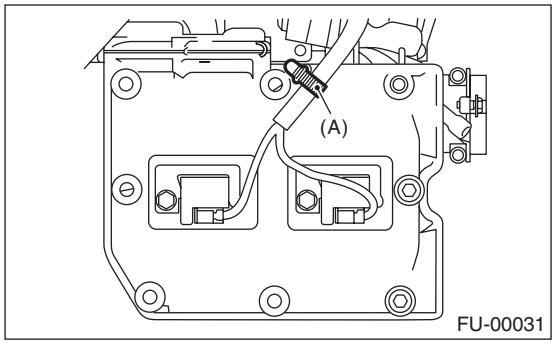
20) Disconnect the connector from the camshaft position sensor.



21) Disconnect the connector from the ignition coil.

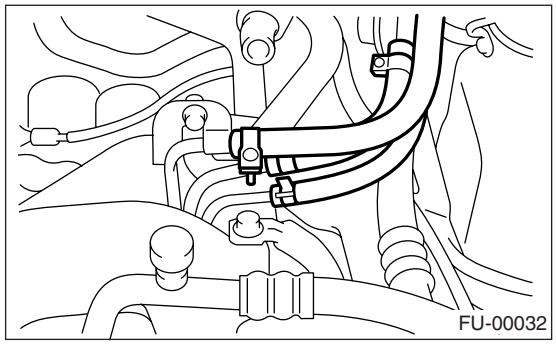


22) Disconnect the engine harness fixed by clip (A) from the bracket.

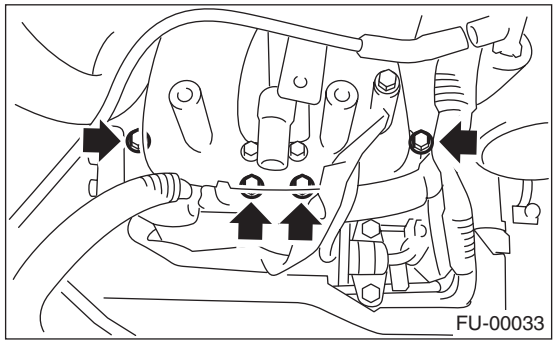


23) Disconnect the fuel delivery hose, return hose and evaporation hose.

CAUTION:
- **Do not spill fuel.**
- **Catch fuel from hoses in a container or cloth.**



24) Remove the bolts which secure the intake manifold to the cylinder heads.



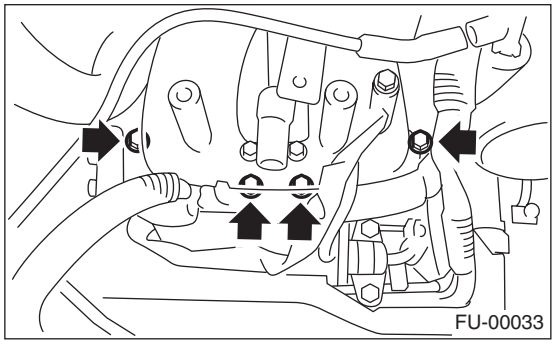
25) Remove the intake manifold.

B: INSTALLATION

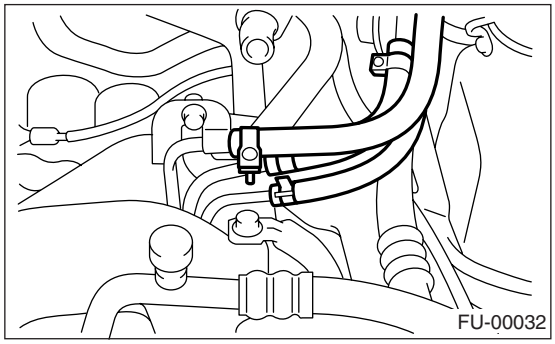
1) Install the intake manifold onto cylinder heads.

NOTE:
Always use new gaskets.

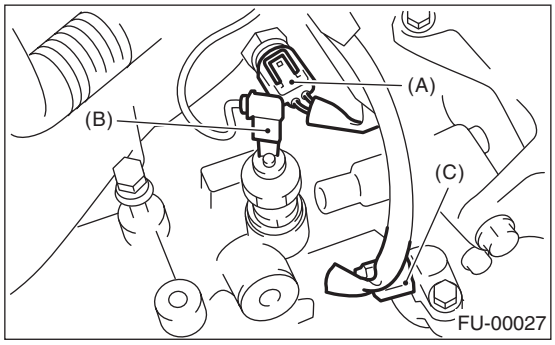
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



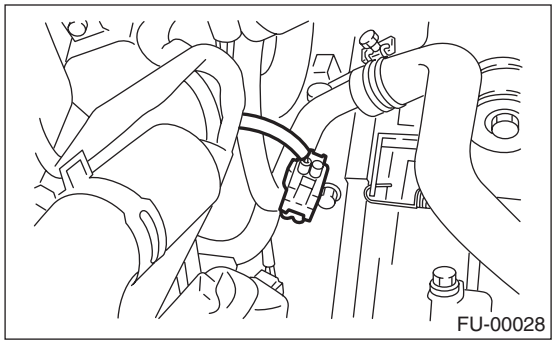
2) Connect the fuel delivery hose, return hose and evaporation hose.



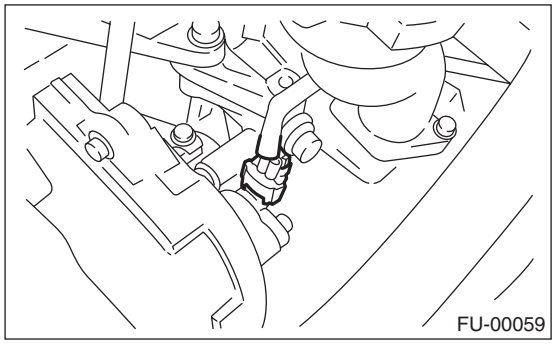
3) Connect the connector to the oil pressure switch (B), crankshaft position sensor (C) and engine coolant temperature sensor (A).



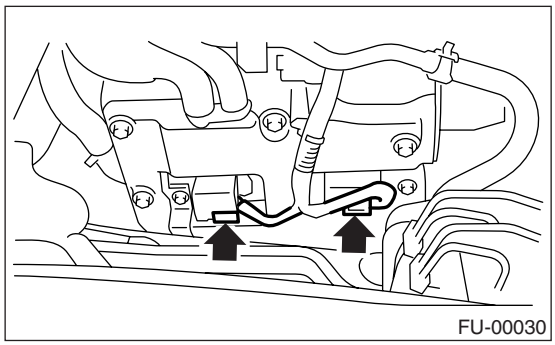
4) Connect the connector to the knock sensor.



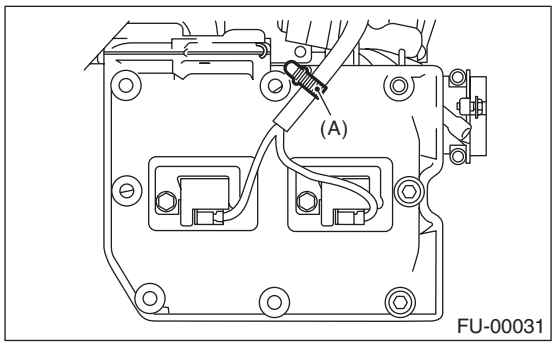
5) Connect the connector to the camshaft position sensor.



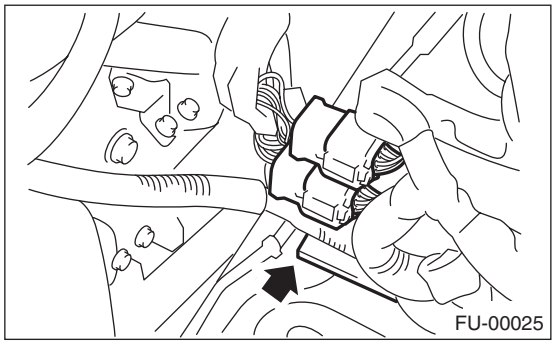
6) Connect the connector to the ignition coil.

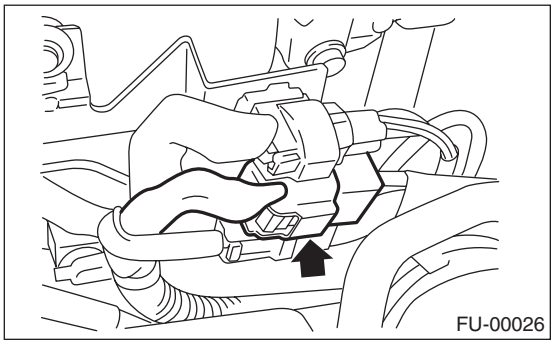


7) Connect the engine harness with clip (A) to the bracket.

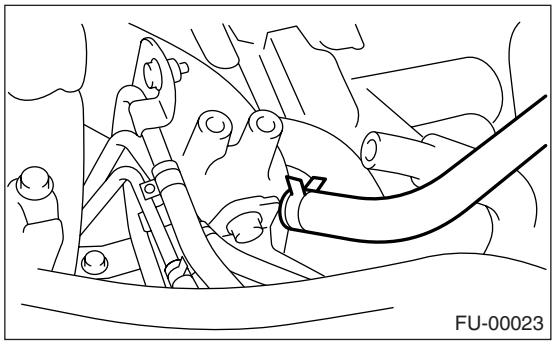


8) Connect the engine harness connector to the bulkhead harness connectors.

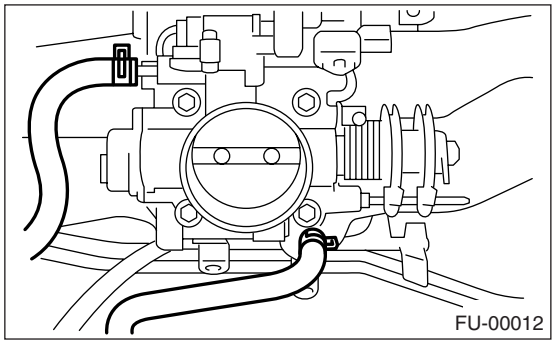




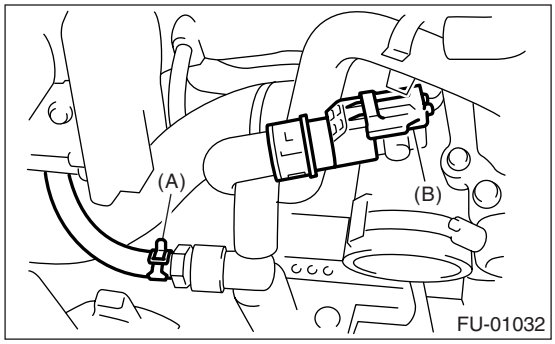
9) Connect the brake booster vacuum hose.



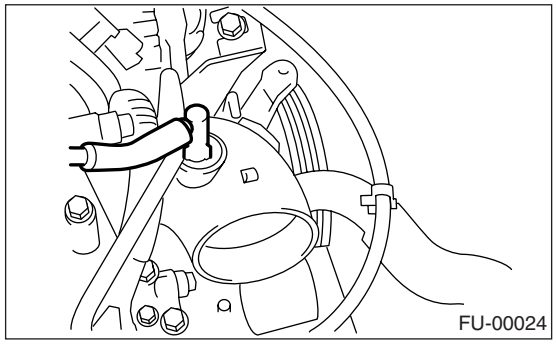
10) Connect the engine coolant hoses to the throttle body.



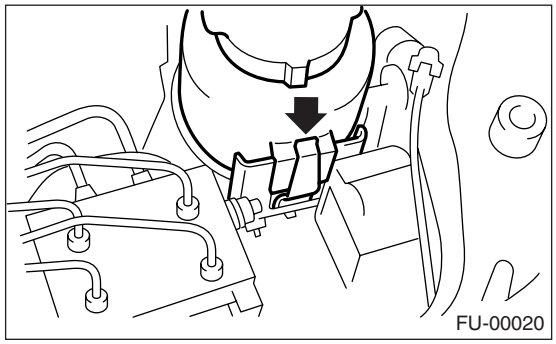
11) Connect the emission hose (A) and connector (B) to the PCV hose assembly.



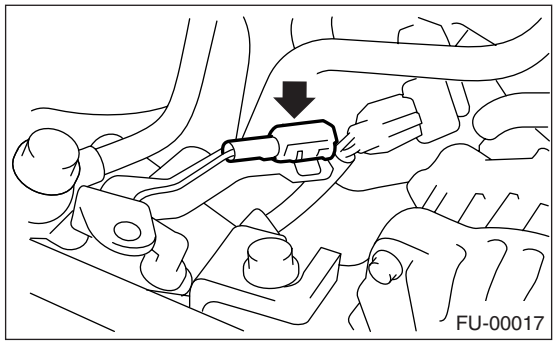
12) Connect the pressure hose to the intake duct.



13) Install the power steering pump.
(1) Install the power steering tank on the bracket.

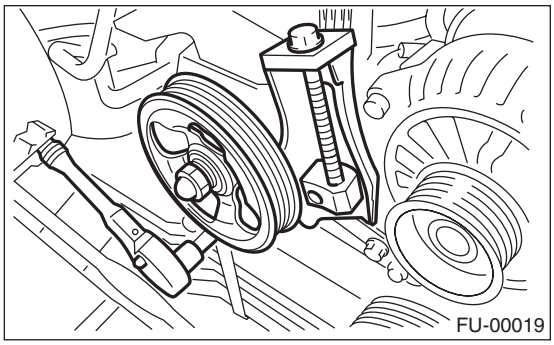


(2) Connect the connector to the power steering pump switch.

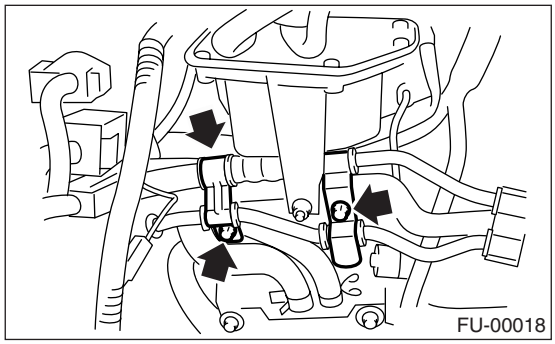


(3) Install the power steering pump, and tighten the bolts.

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



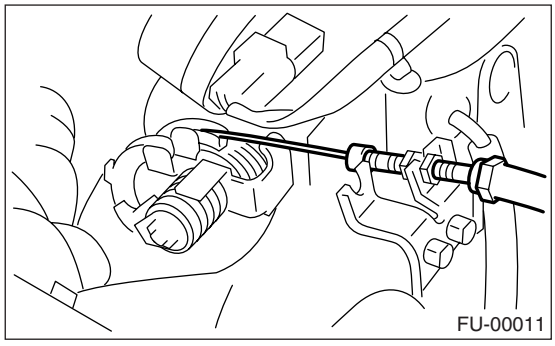
(4) Install the power steering pipe brackets on the intake manifold RH.



(5) Install the front side V-belt. <Ref. to ME(H4DOTC)-42, REMOVAL, V-belt.>

14) Install the coolant filler tank. <Ref. to CO(H4DOTC)-32, INSTALLATION, Coolant Filler Tank.>

15) Connect the accelerator cable.

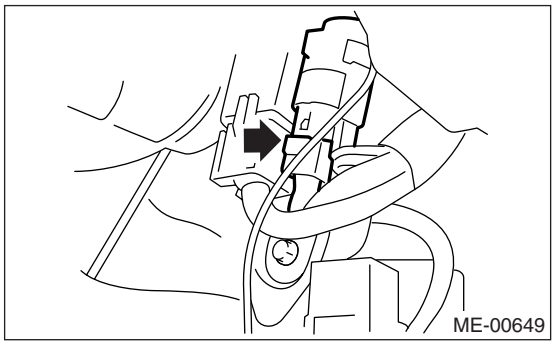


16) Install the intercooler. <Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>

17) Install the air cleaner element.

18) Install the air cleaner upper cover and air intake duct as a unit. <Ref. to IN(H4DOTC)-7, INSTALLATION, Air Cleaner.>

19) Connect the connector to the fuel pump relay.



20) Connect the battery ground cable to battery.

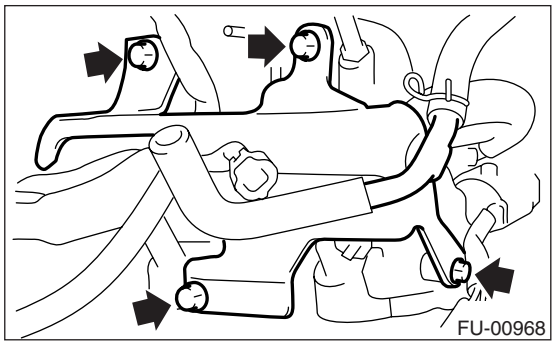
21) Lift up the vehicle.

22) Install the under cover.

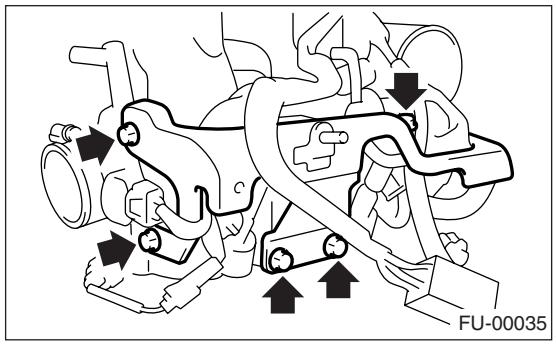
23) Fill the engine coolant. <Ref. to CO(H4SO)-12, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: DISASSEMBLY

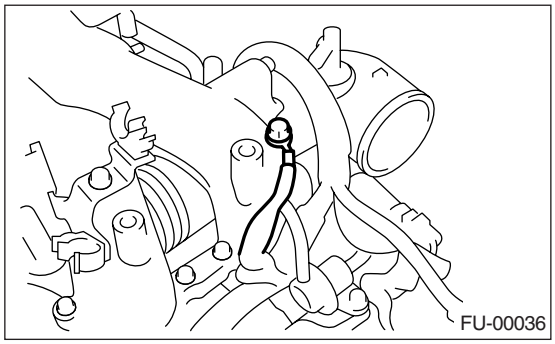
1) Remove the fuel pipe protector LH.

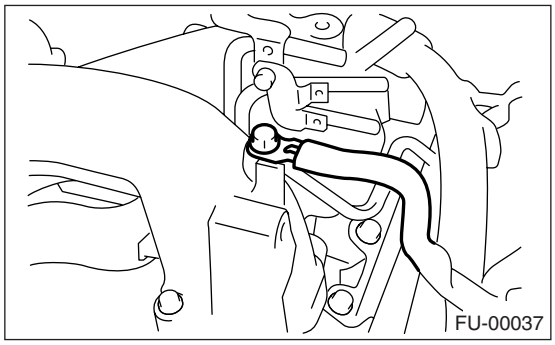


2) Remove the fuel pipe protector RH.

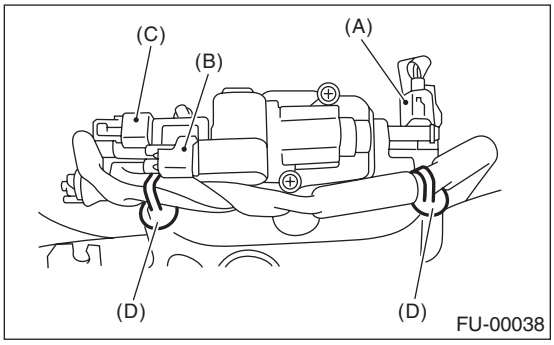


3) Remove the engine ground terminal from the intake manifold.

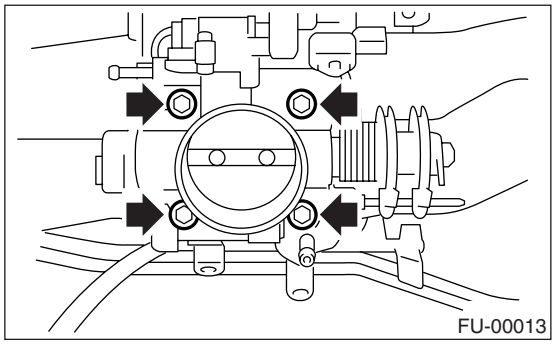




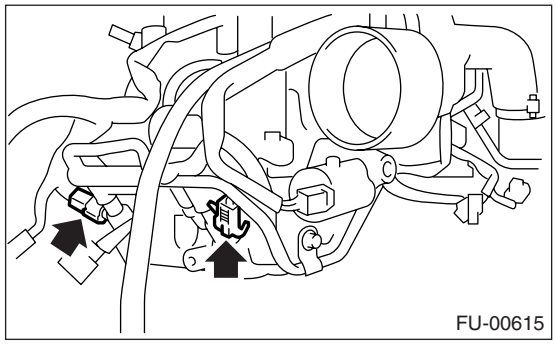
4) Disconnect the connector from the throttle position sensor (A), idle air control solenoid valve (B) and manifold absolute pressure sensor (C).
5) Disconnect the engine harness fixed by clip (D) from the intake manifold.



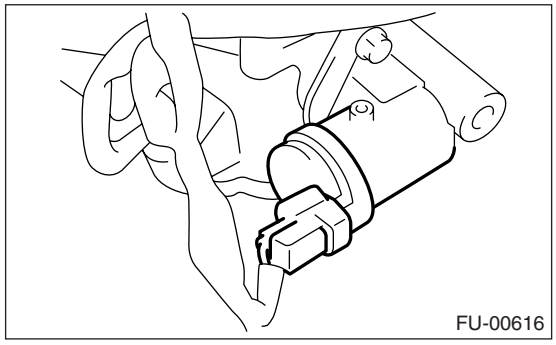
6) Remove the throttle body from the intake manifold.



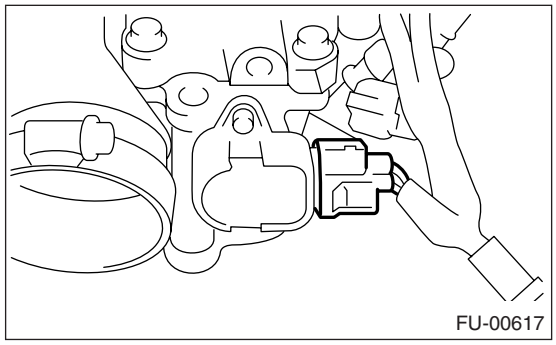
7) Disconnect the connector from the fuel injector.



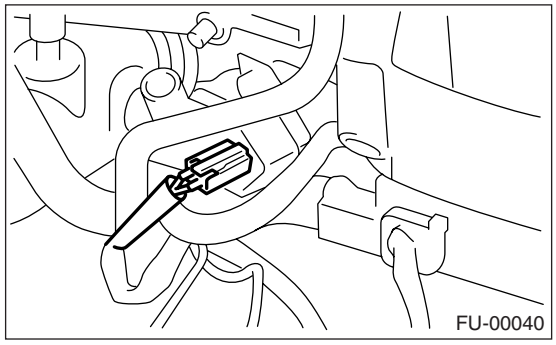
8) Disconnect the connector from the tumble generator valve actuator.



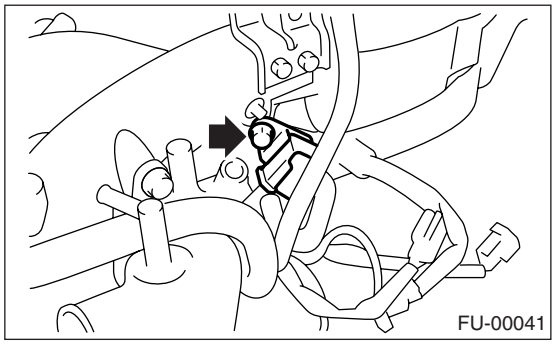
9) Disconnect the connector from the tumble generator valve sensor.



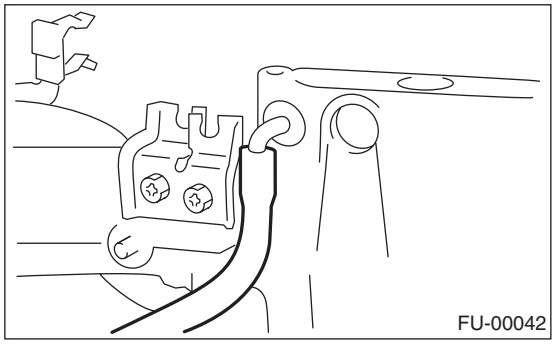
10) Disconnect the connector from the purge control solenoid valve.



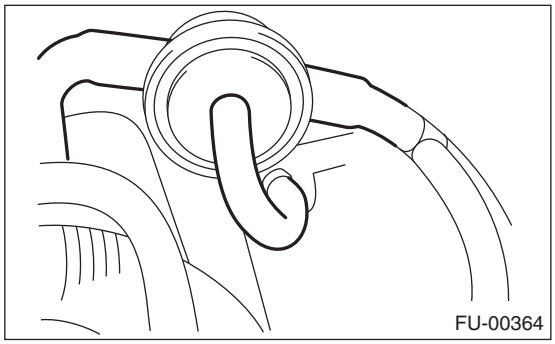
11) Remove the purge control solenoid valve.



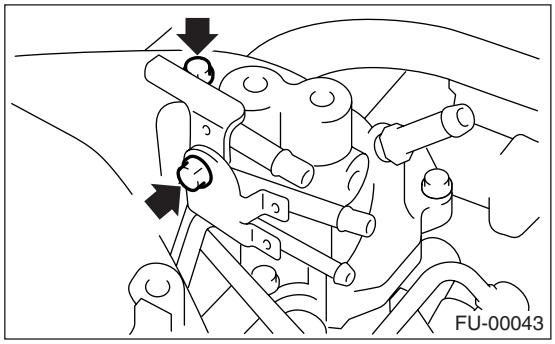
12) Disconnect the evaporation hose from the intake manifold.



13) Disconnect the evaporation hoses from the purge valve.

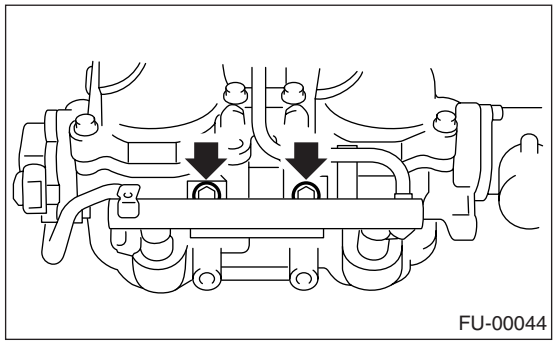


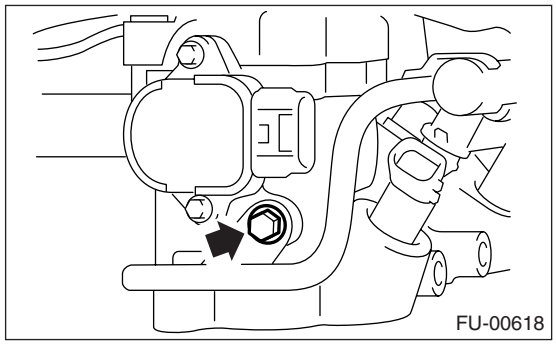
14) Remove the two bolts which hold the fuel pipes on the left side of intake manifold.



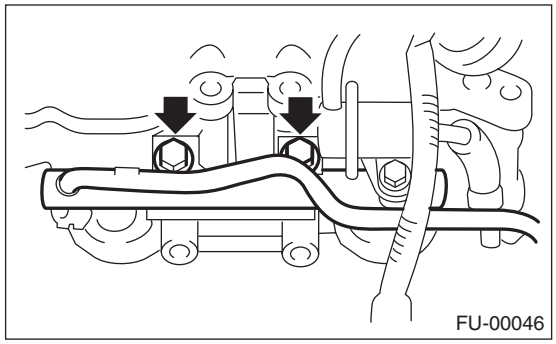
15) Remove the bolt which hold the fuel injector pipe onto intake manifold.

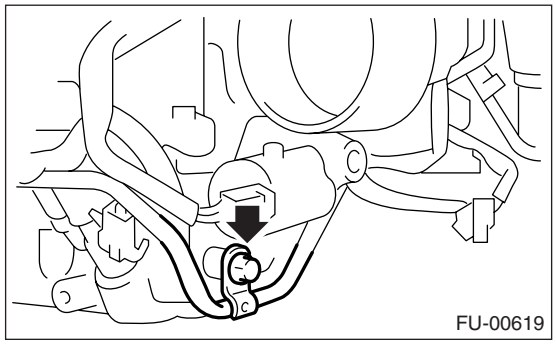
- LH SIDE



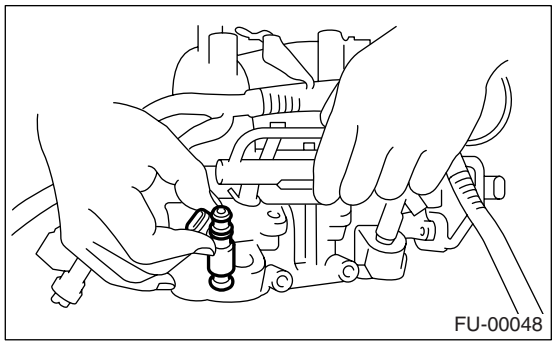


- RH SIDE

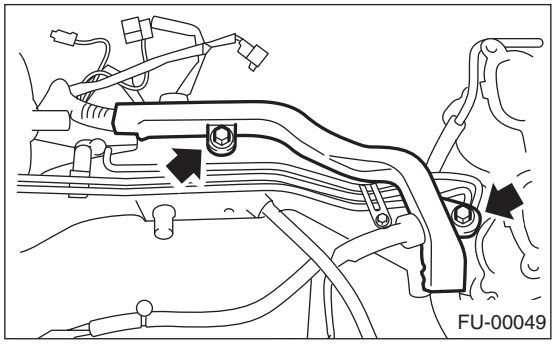




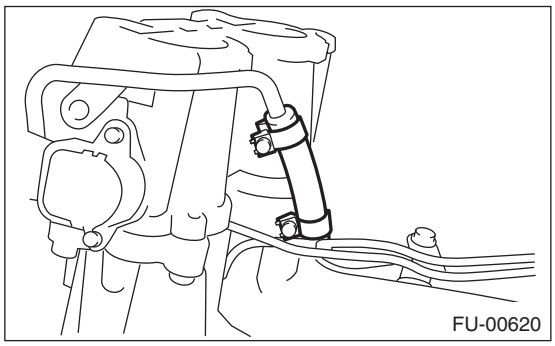
16) Remove the fuel injector.



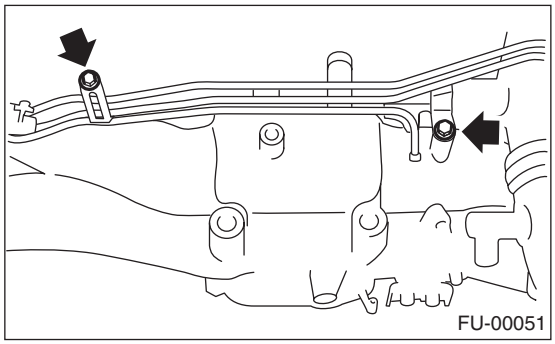
17) Remove the harness bracket which holds the engine harness onto intake manifold.



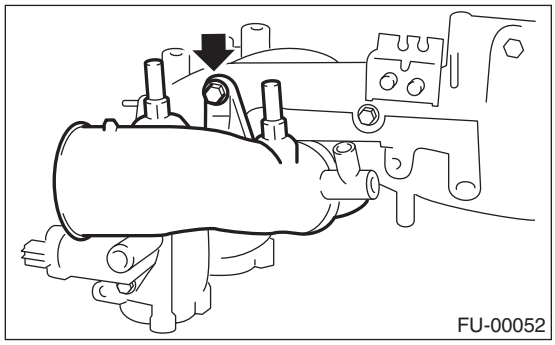
18) Remove the engine harness from the intake manifold.
19) Loosen the clamp which holds the front left side fuel hose to injector pipe and remove the pipe from clamp.



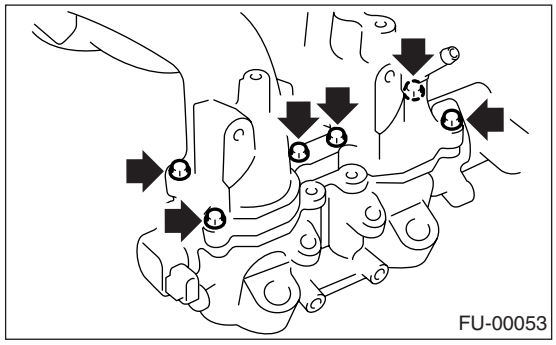
20) Remove the fuel injector pipe LH.
21) Remove the bolts which install the fuel pipe on intake manifold.



22) Remove the fuel pipe assembly and pressure regulator, from the intake manifold.
23) Remove the intake duct from the intake manifold.



24) Remove the tumble generator valve assembly from the intake manifold.

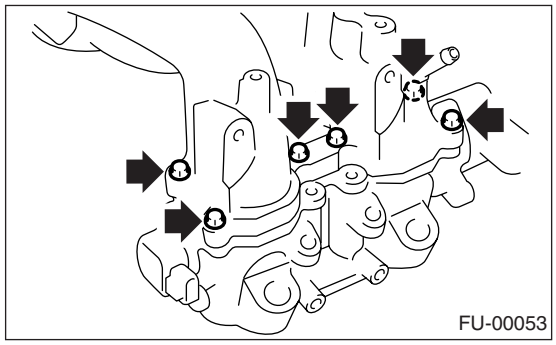


D: ASSEMBLY

NOTE:
Replace the gasket with a new one.

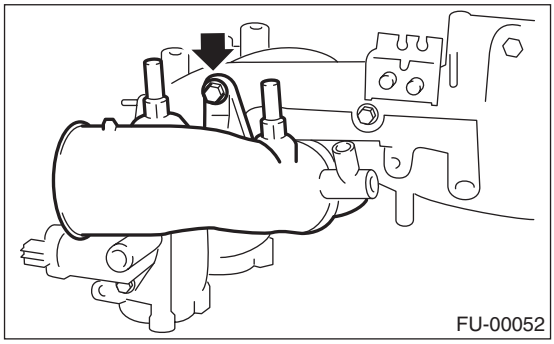
1) Install the tumble generator valve assembly to the intake manifold.

Tightening torque:
8.25 N·m (0.84 kgf-m, 6.1 ft-lb)



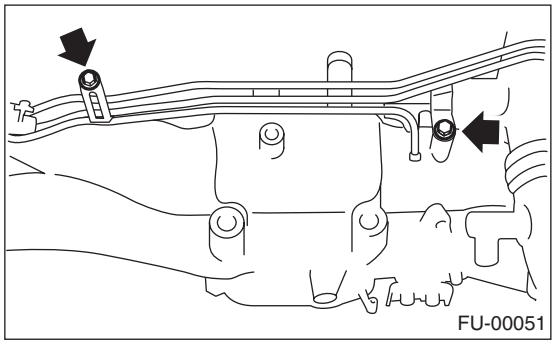
2) Install the air intake duct to the intake manifold.

Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)

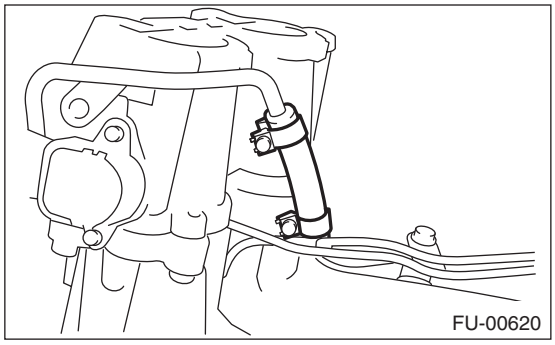


3) Install the fuel pipe assembly and pressure regulator to the intake manifold.

Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)

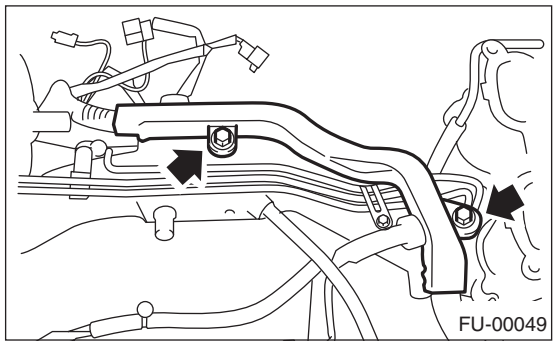


4) Install the fuel injector pipe LH.
5) Connect the left side fuel hose to injector pipe, and tighten the clamp screw.

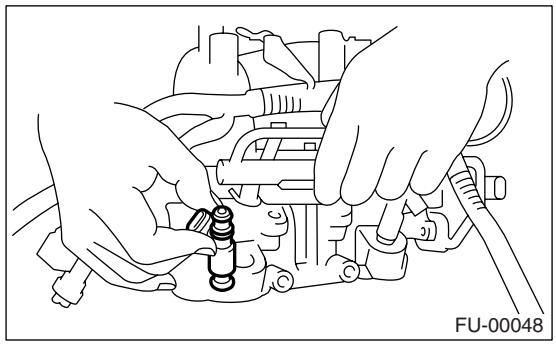


6) Install the engine harness to the intake manifold.
7) Install the harness bracket which holds the engine harness onto intake manifold.

Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



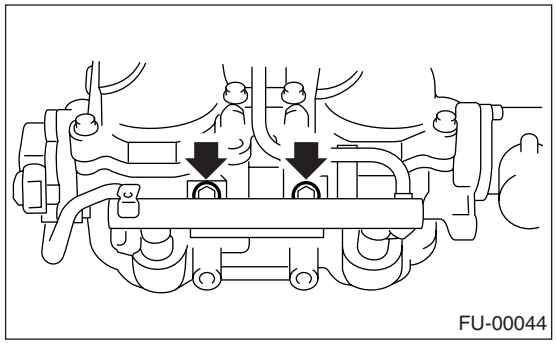
8) Install the fuel injector.

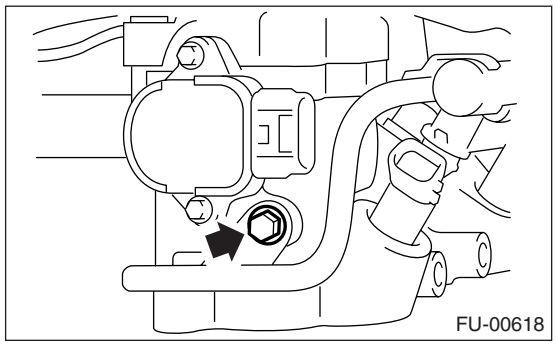


9) Tighten the bolts which install the fuel injector pipe onto intake manifold.

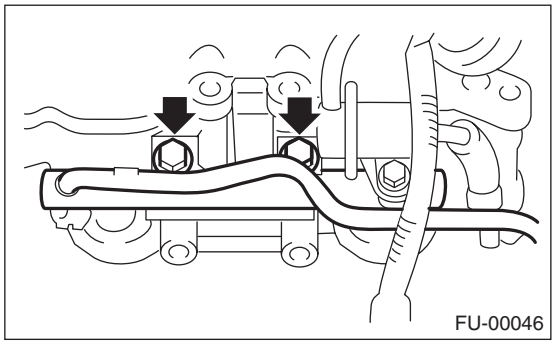
Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)

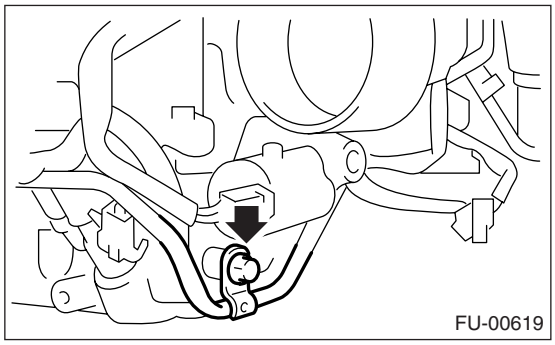
- LH SIDE





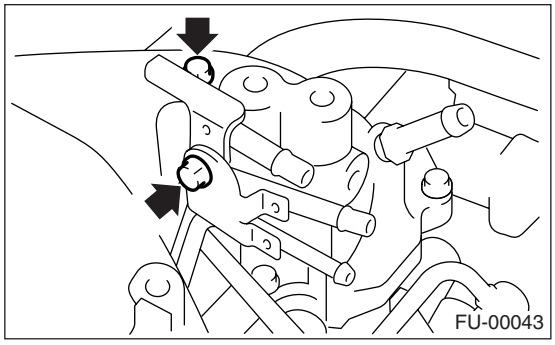
- RH SIDE





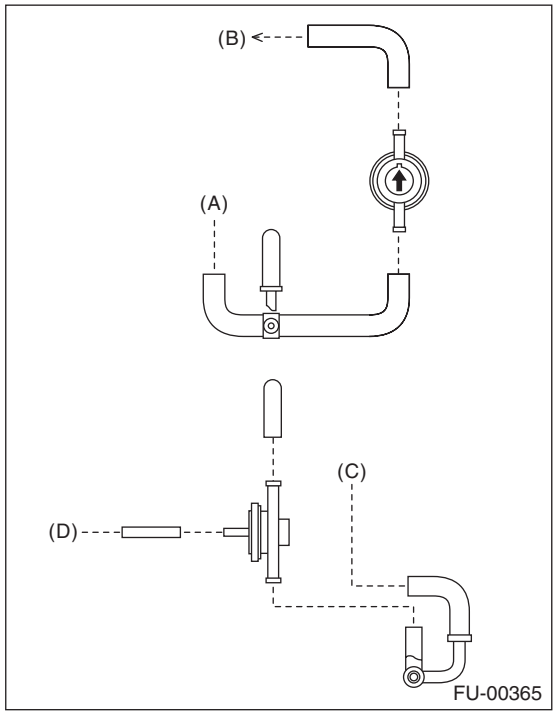
10) Tighten the two bolts which install the fuel pipes on the left side of intake manifold.

Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)



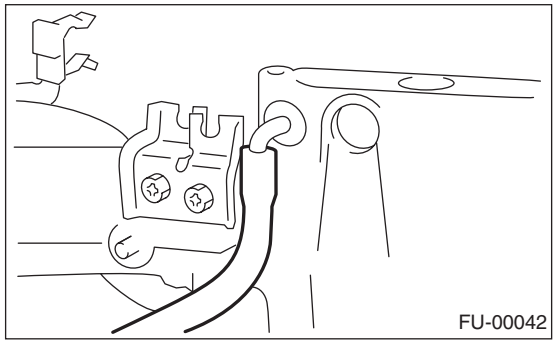
11) Connect the evaporation hoses to the purge valve.

NOTE:
Connect the evaporation hoses as shown in the figure.



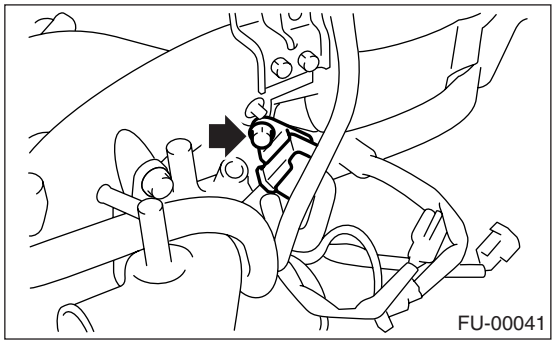
(A) To fuel pipe ASSY
(B) To intake duct
(C) To purge control solenoid valve
(D) To intake manifold

12) Connect the evaporation hose to the intake manifold.



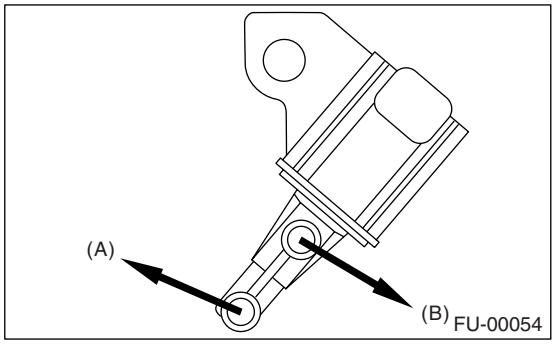
13) Install the purge control solenoid valve.

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



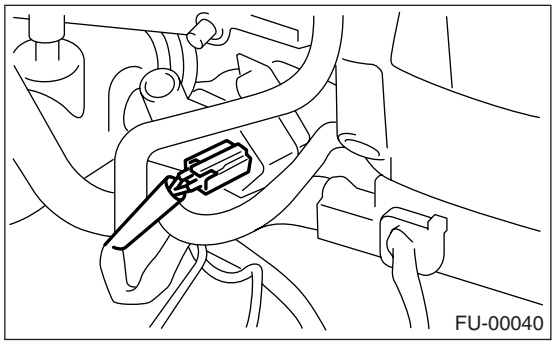
14) Connect the hoses to the purge control solenoid valve.

NOTE:
Connect the evaporation hoses as shown in the figure.

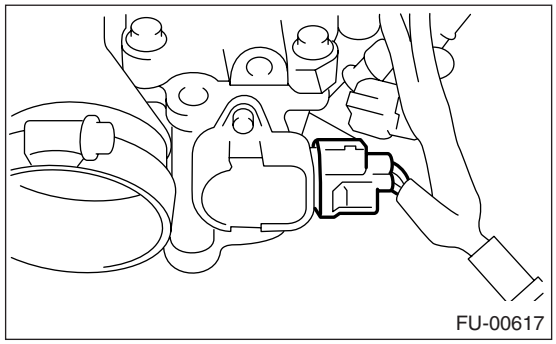


(A) To intake manifold
(B) To purge valve

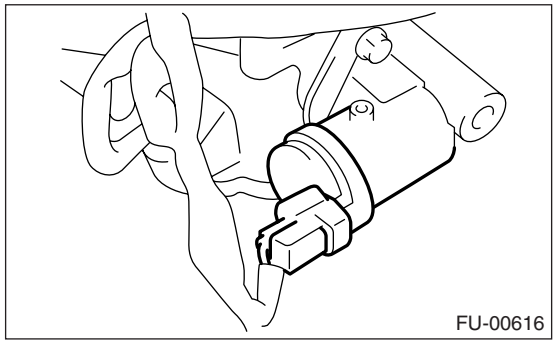
15) Connect the connector to the purge control solenoid valve.



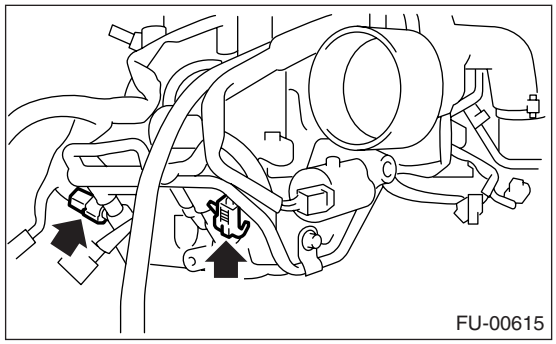
16) Connect the connector to the tumble generator valve sensor.



17) Connect the connector to the tumble generator valve actuator.



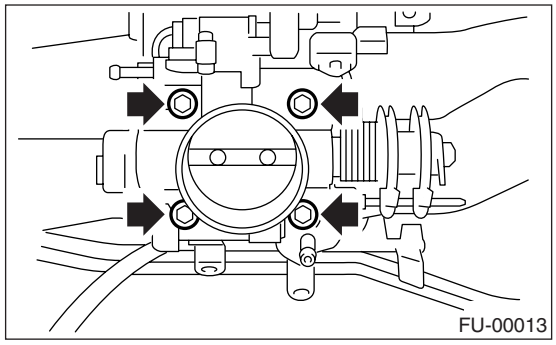
18) Connect the connector to the fuel injector.



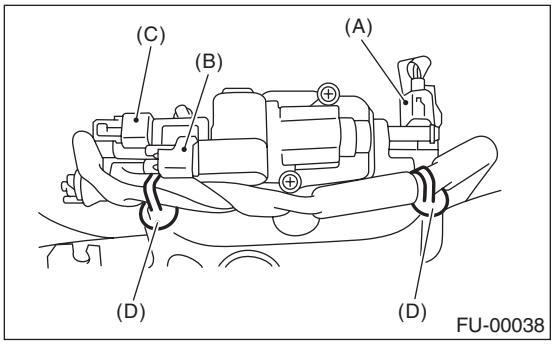
19) Install the throttle body to the intake manifold.

NOTE:
Replace the gasket with a new one.

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

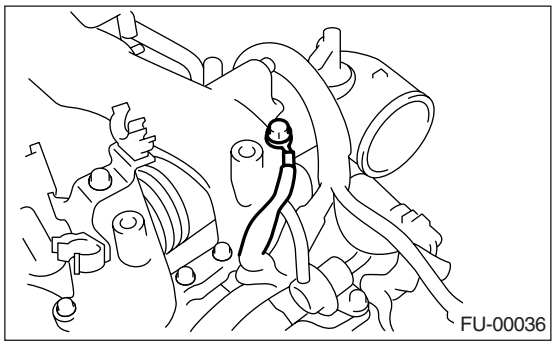


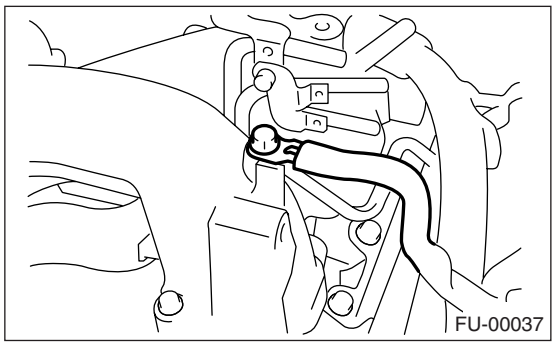
20) Connect the connector to the throttle position sensor (A), idle air control solenoid valve (B) and manifold absolute pressure sensor (C).
21) Connect the engine harness to the intake manifold using clips (D).



22) Install the engine ground terminal to the intake manifold.

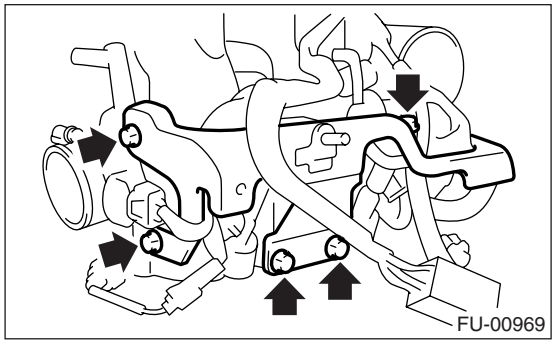
Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)





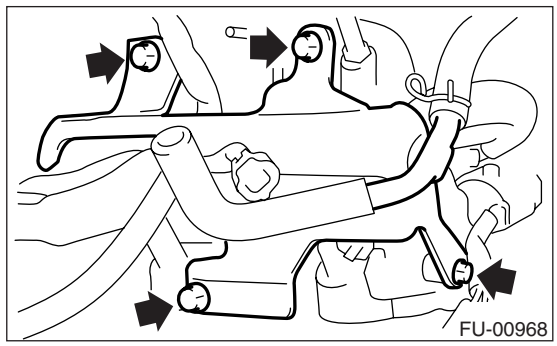
23) Install the fuel pipe protector RH.

Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



24) Install the fuel pipe protector LH.

Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



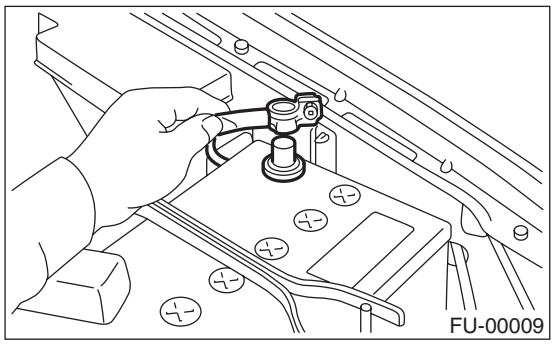
E: INSPECTION

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

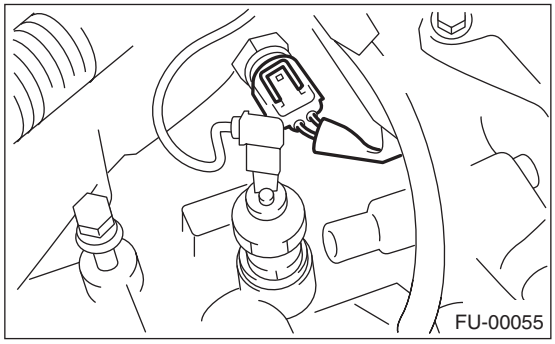
4. Engine Coolant Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the generator. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>
3) Drain the engine coolant. <Ref. to CO(H4DOTC)-17, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
4) Disconnect the connector from the engine coolant temperature sensor.



5) Remove the engine coolant temperature sensor.

B: INSTALLATION

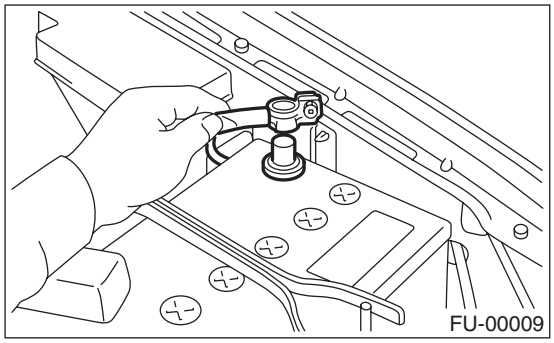
Install in the reverse order of removal.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

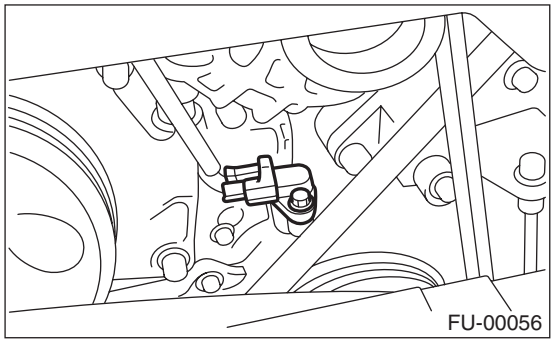
5. Crankshaft Position Sensor

A: REMOVAL

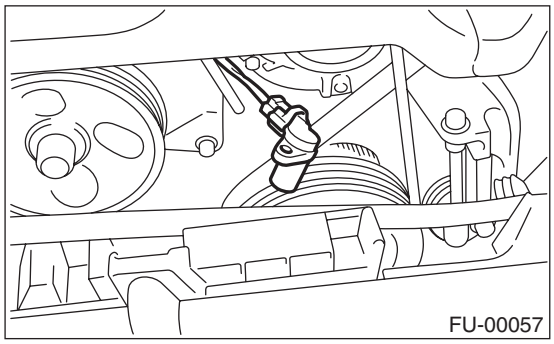
1) Disconnect the ground cable from battery.



2) Remove the bolt which installs the crankshaft position sensor to cylinder block.



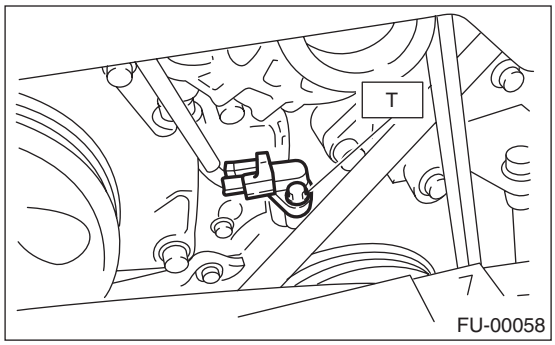
3) Remove the crankshaft position sensor, and disconnect the connector from it.



B: INSTALLATION

Install in the reverse order of removal.

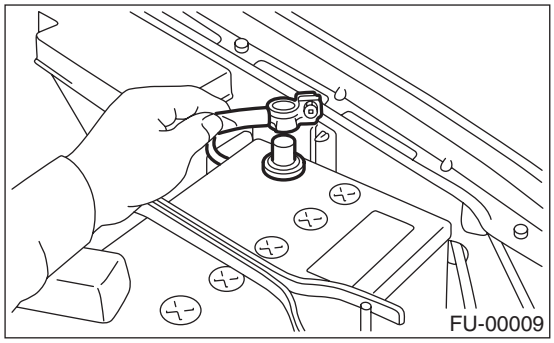
Tightening torque:
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



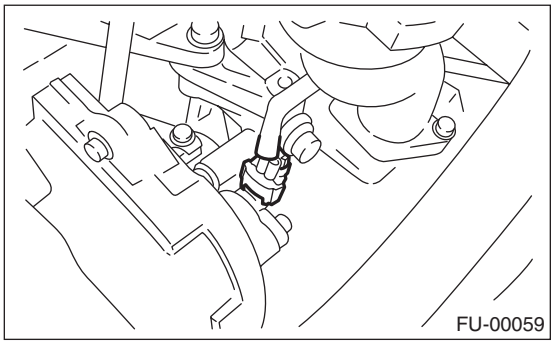
6. Camshaft Position Sensor

A: REMOVAL

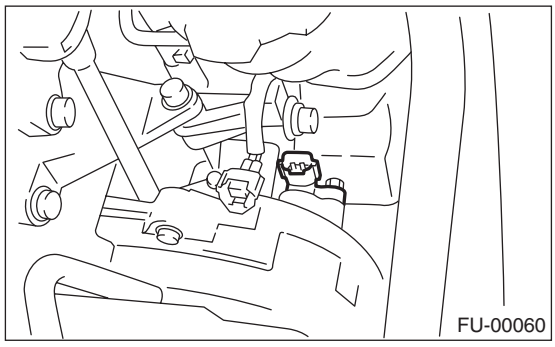
1) Disconnect the ground cable from battery.



2) Disconnect the connector from the camshaft position sensor.



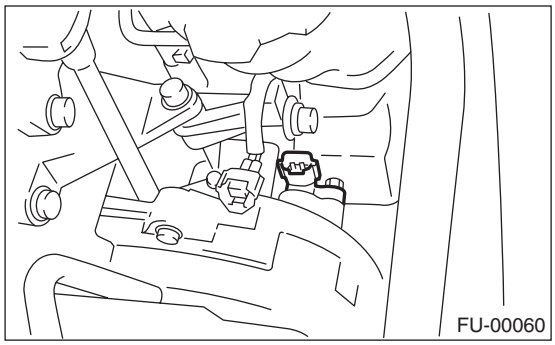
3) Remove the camshaft position sensor from the camshaft support LH.



B: INSTALLATION

Install in the reverse order of removal.

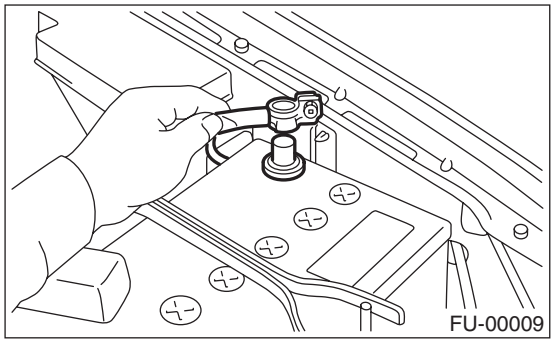
Tightening torque:
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



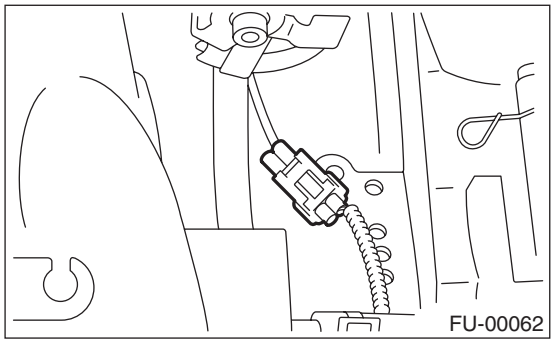
7. Knock Sensor

A: REMOVAL

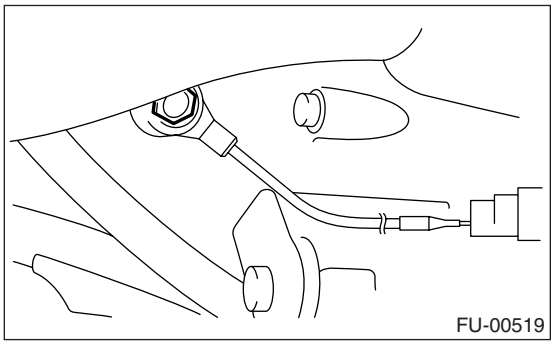
1) Disconnect the ground cable from battery.



2) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
3) Disconnect the knock sensor connector.



4) Remove the knock sensor from the cylinder block.

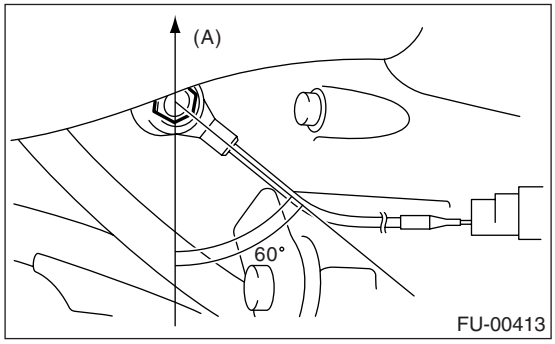


B: INSTALLATION

1) Install the knock sensor to the cylinder block.

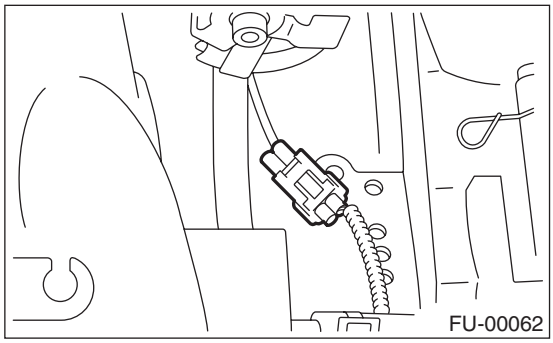
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

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

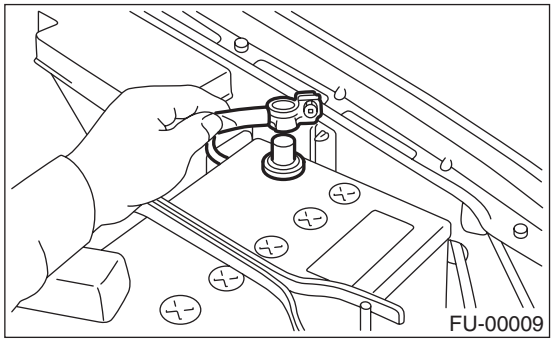


(A) Front side

2) Connect the knock sensor connector.



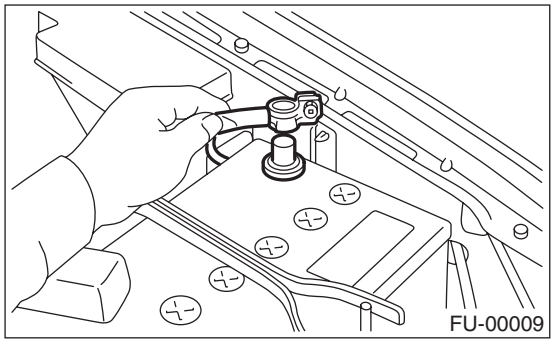
3) Install the intercooler. <Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>
4) Connect the battery ground cable to battery.



8. Throttle Position Sensor

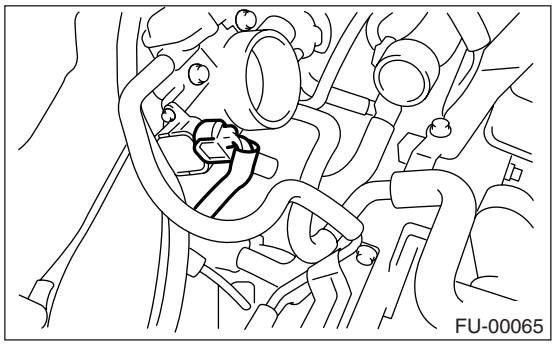
A: REMOVAL

1) Disconnect the ground cable from battery.

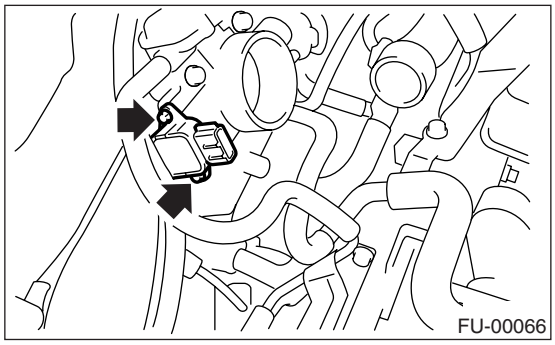


2) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>

3) Disconnect the connector from the throttle position sensor.



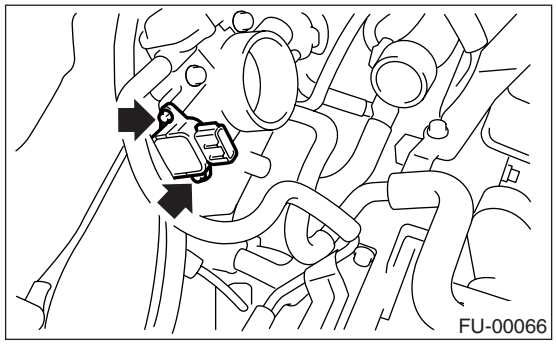
4) Remove the throttle position sensor holding screws, and remove the throttle position sensor.



B: INSTALLATION

Install in the reverse order of removal.

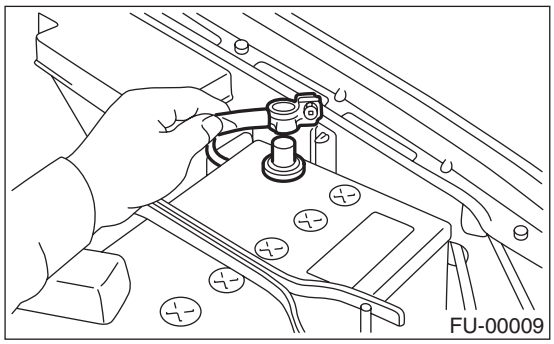
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



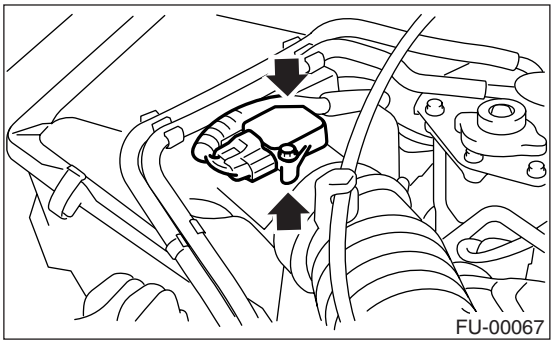
9. Mass Air Flow and Intake Air Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector from mass air flow and intake air temperature sensor.
3) Remove the mass air flow and intake air temperature sensor.



B: INSTALLATION

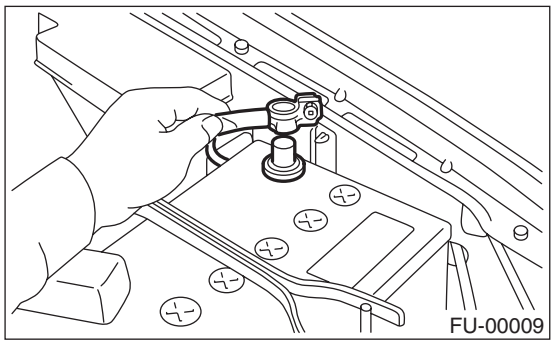
Install in the reverse order of removal.

Tightening torque:
1.7 N·m (0.17 kgf-m, 1.3 ft-lb)

10.Manifold Absolute Pressure Sensor

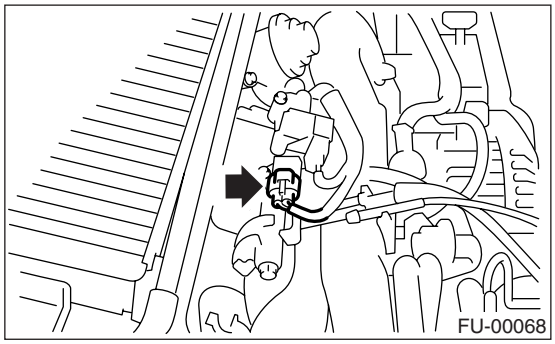
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the idle air control solenoid valve. <Ref. to FU(H4DOTC)-34, REMOVAL, Idle Air Control Solenoid Valve.>

3) Disconnect the connectors from manifold absolute pressure sensor.



4) Remove the manifold absolute pressure sensor from the throttle body.

B: INSTALLATION

Install in the reverse order of removal.

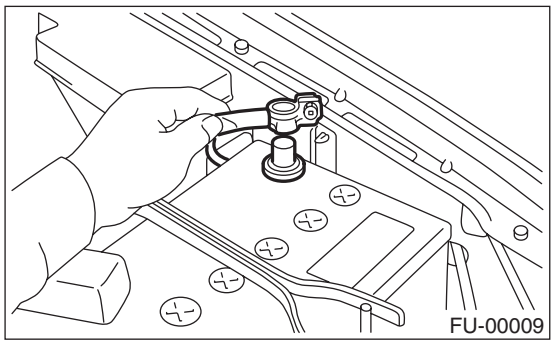
NOTE:
Replace the O-rings for the manifold absolute pressure sensor with new ones.

Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

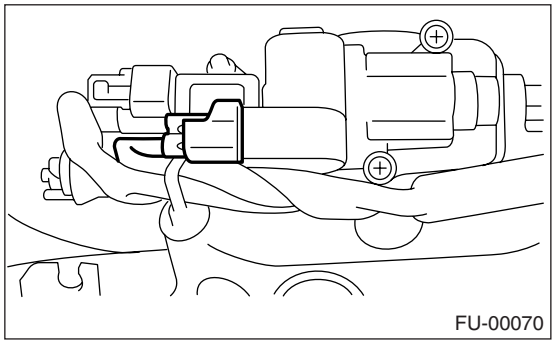
11.Idle Air Control Solenoid Valve

A: REMOVAL

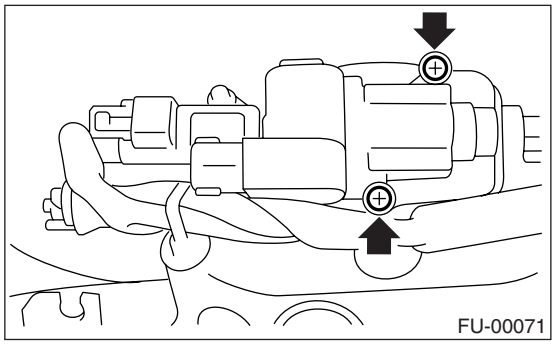
1) Disconnect the ground cable from battery.



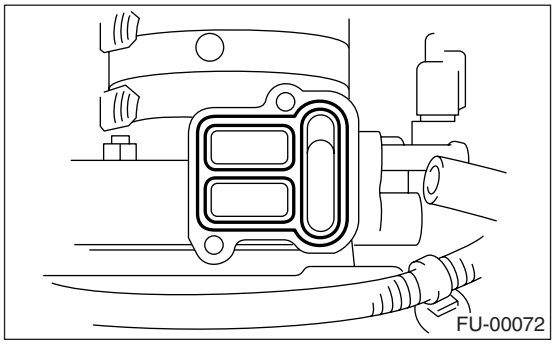
2) Disconnect the connector from the idle air control solenoid valve.



3) Remove the idle air control solenoid valve from the throttle body.



4) Remove the gasket from the throttle body.

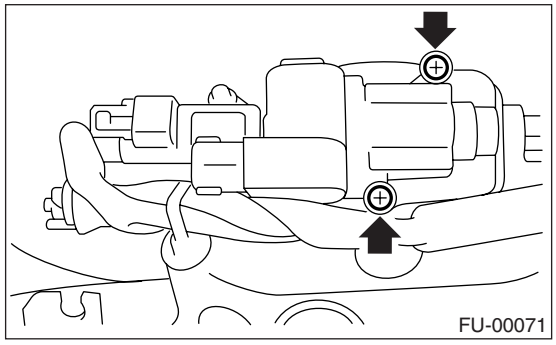


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace the gasket with a new one.

Tightening torque:
2.8 N·m (0.29 kgf-m, 2.1 ft-lb)

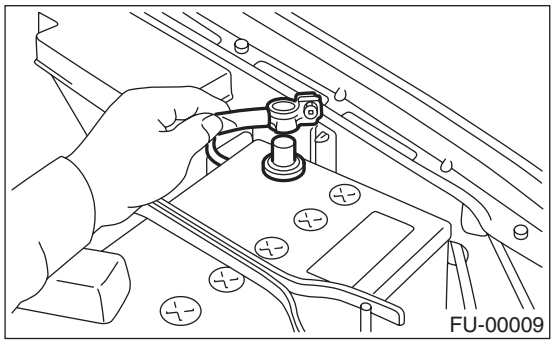


12.Fuel Injector

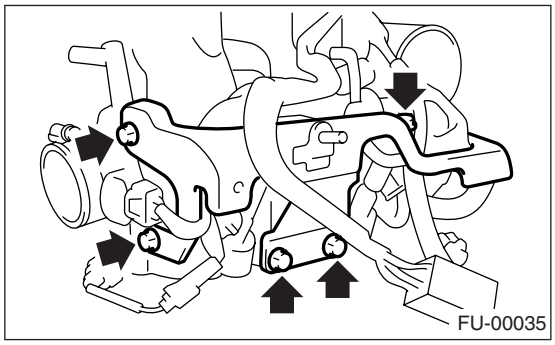
A: REMOVAL

1. RH SIDE

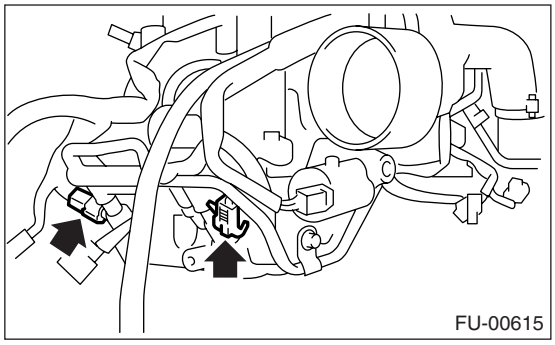
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-52, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler flap lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.



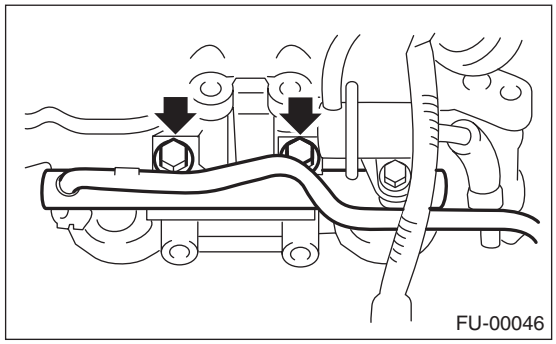
4) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
5) Remove the fuel pipe protector RH.

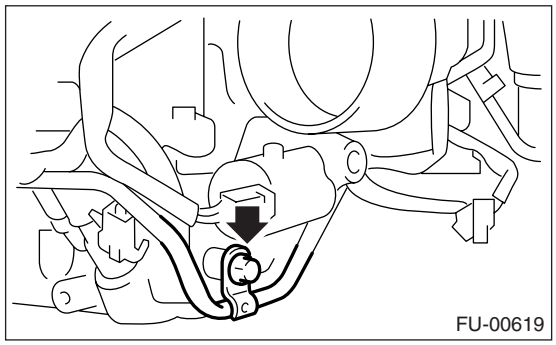


6) Disconnect the connector from the fuel injector.

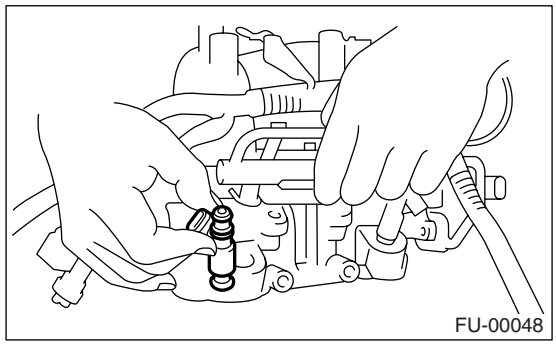


7) Remove the bolts which hold the injector pipe to intake manifold.



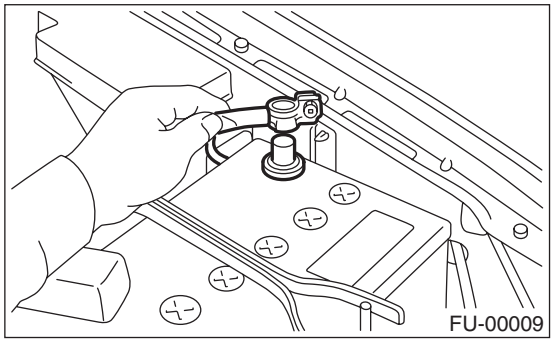


8) Remove the fuel injector while lifting up the fuel injector pipe.

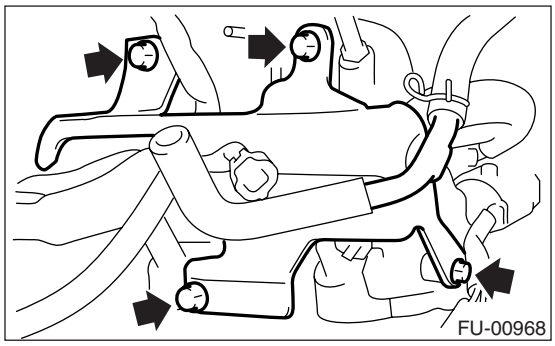


2. LH SIDE

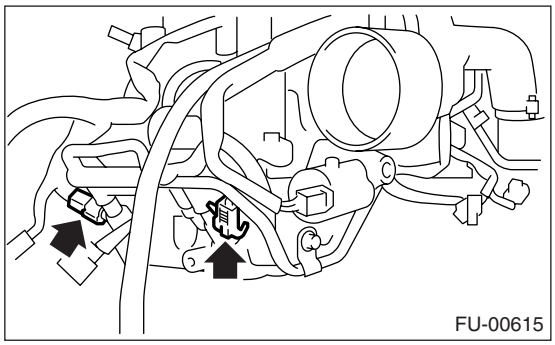
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-52, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler flap lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.



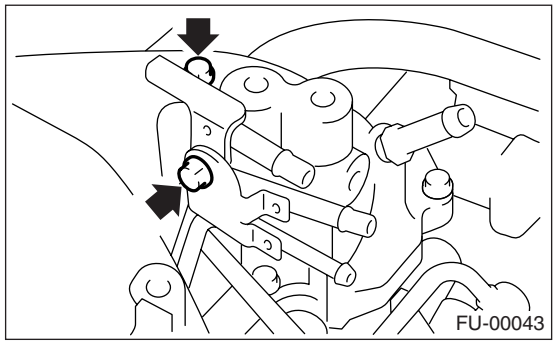
4) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
5) Remove the fuel pipe protector LH.

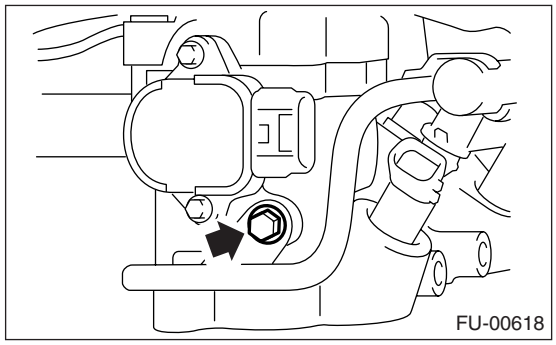


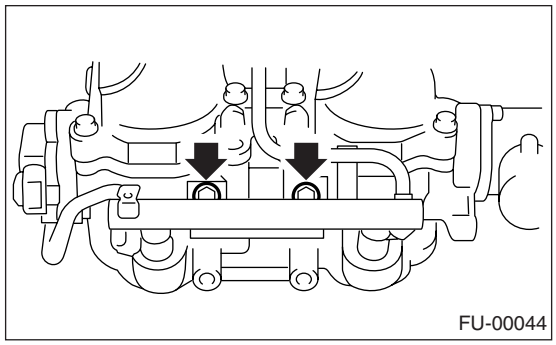
6) Disconnect the connector from the fuel injector.



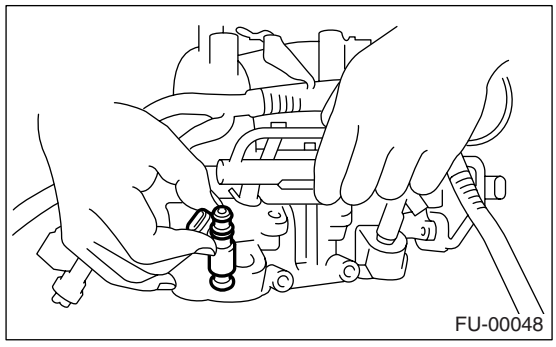
7) Remove the bolts which hold the injector pipe to intake manifold.







8) Remove the fuel injector while lifting up the fuel injector pipe.

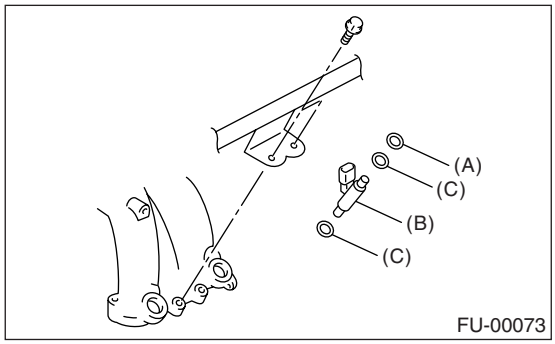


B: INSTALLATION

1. RH SIDE

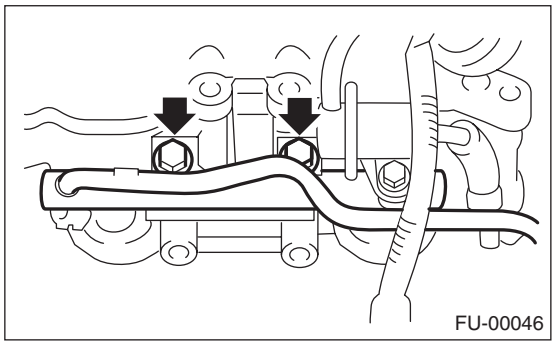
Install in the reverse order of removal.

NOTE:
Replace the O-ring and insulators with new ones.

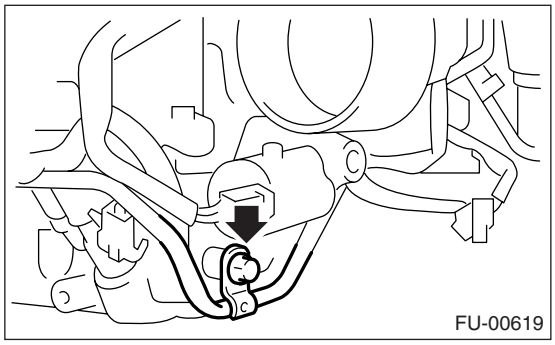


(A) O-ring
(B) Fuel injector
(C) Insulator

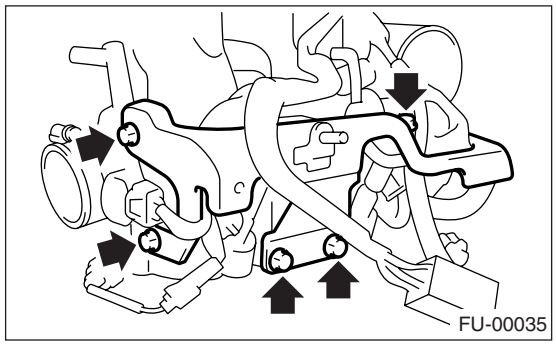
Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



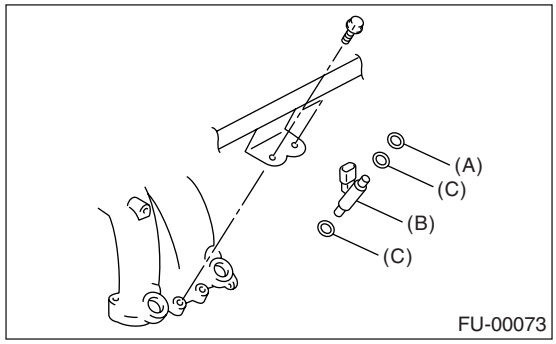
Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



2. LH SIDE

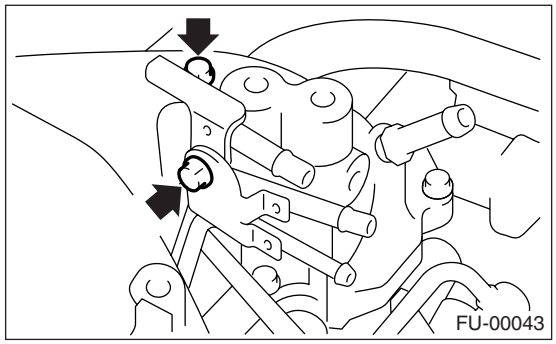
Install in the reverse order of removal.

NOTE:
Replace the O-ring and insulators with new ones.

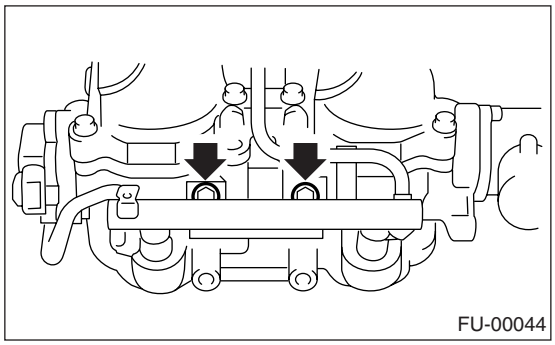


(A) O-ring
(B) Fuel injector
(C) Insulator

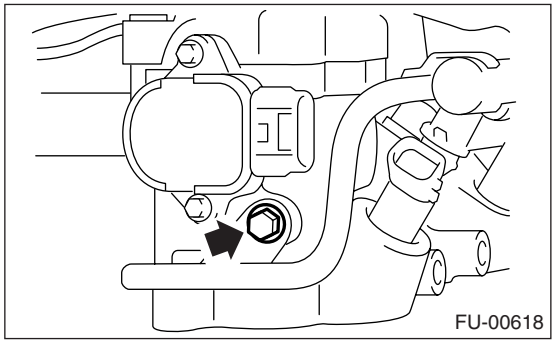
Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)



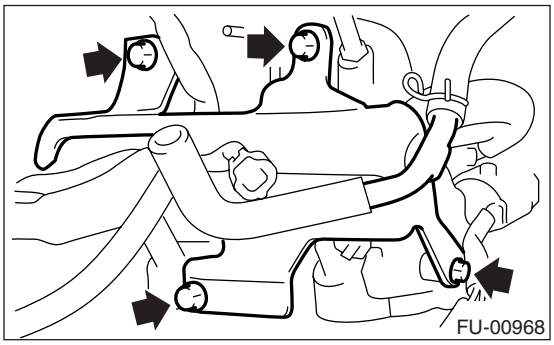
Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



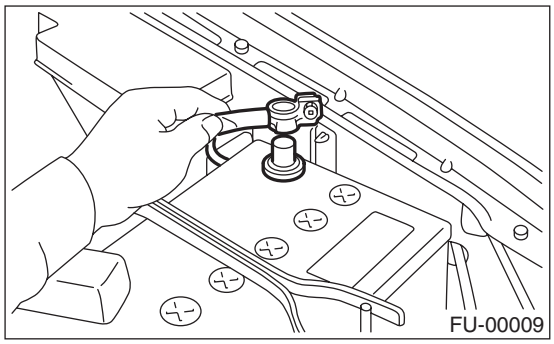
Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



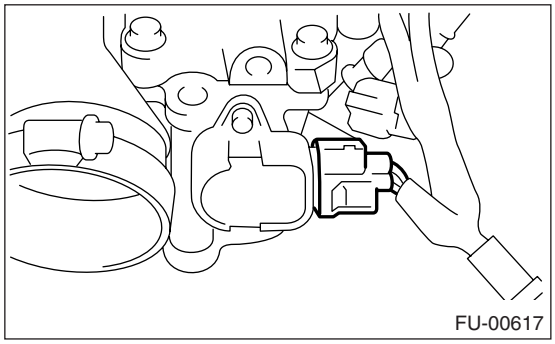
13. Tumble Generator Valve Assembly

A: REMOVAL

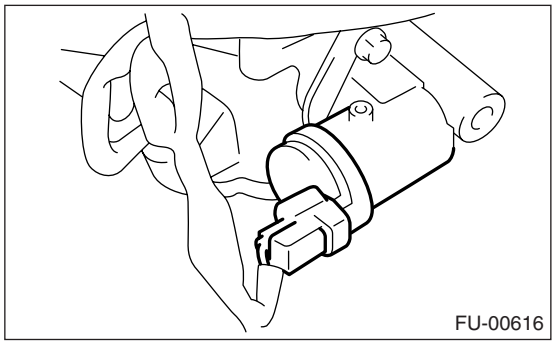
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-52, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.



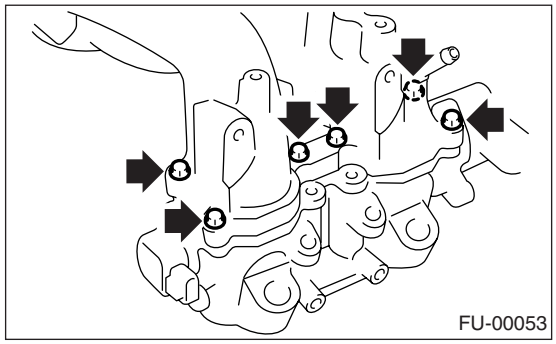
4) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
5) Disconnect the connector from the tumble generator valve sensor.



6) Disconnect the connector from the tumble generator valve actuator.



7) Remove the fuel injector. <Ref. to FU(H4DOTC)-35, REMOVAL, Fuel Injector.>
8) Remove the tumble generator valve body from the intake manifold.

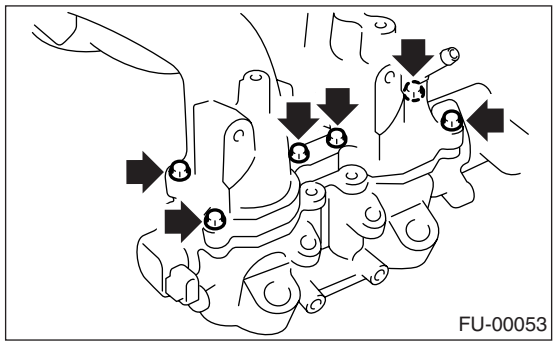


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use new gaskets.

Tightening torque:
8.25 N·m (0.84 kgf-m, 6.1 ft-lb)



14. Tumble Generator Valve Position Sensor

A: SPECIFICATION

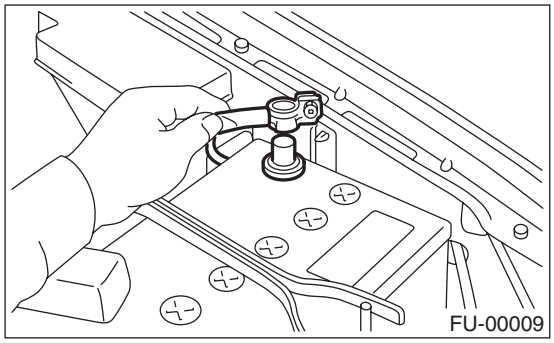
Do not remove the tumble generator valve position sensor from tumble generator valve assembly, since it cannot be adjusted during installation.
Refer to “Tumble Generator Valve Assembly” for removal and installation procedures. <Ref. to FU(H4DOTC)-39, REMOVAL, Tumble Generator Valve Assembly.> <Ref. to FU(H4DOTC)-39, INSTALLATION, Tumble Generator Valve Assembly.>

15. Tumble Generator Valve Actuator

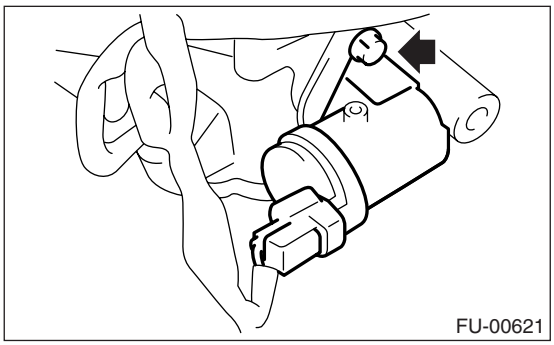
A: REMOVAL

1. RH SIDE

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-52, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.

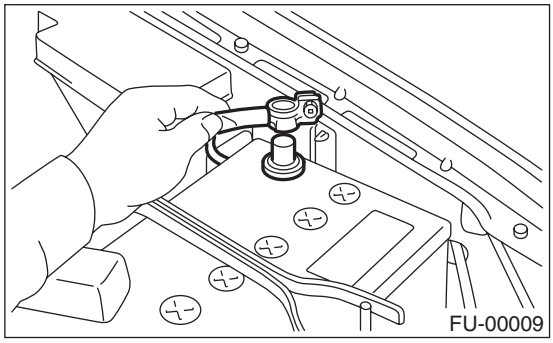


4) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
5) Disconnect the connector from tumble generator valve actuator RH.
6) Remove the tumble generator valve RH.

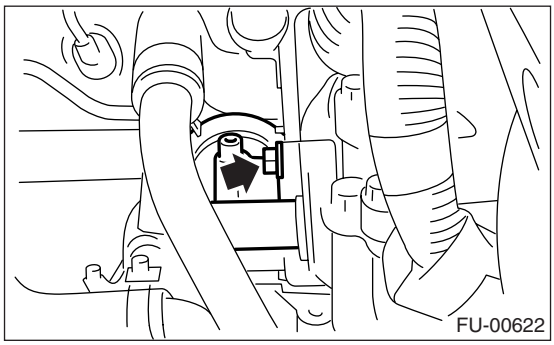


2. LH SIDE

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-52, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.



4) Disconnect the connector from tumble generator valve LH.
5) Remove the tumble generator valve actuator LH.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

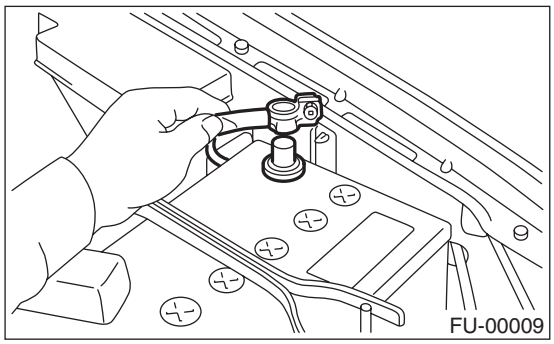
2. LH SIDE

Install in the reverse order of removal.

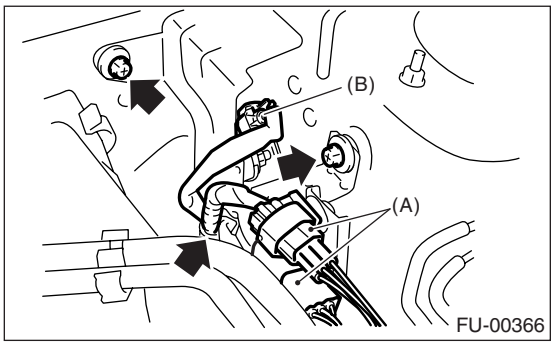
16. Wastegate Control Solenoid Valve

A: REMOVAL

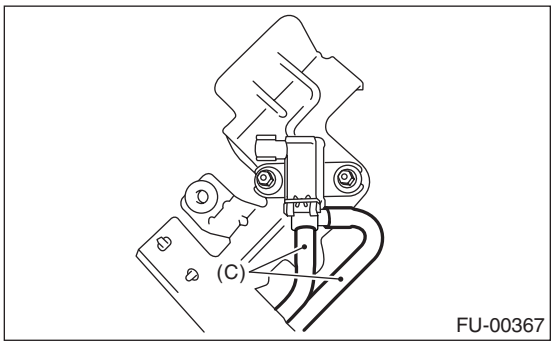
1) Disconnect the ground cable from battery.



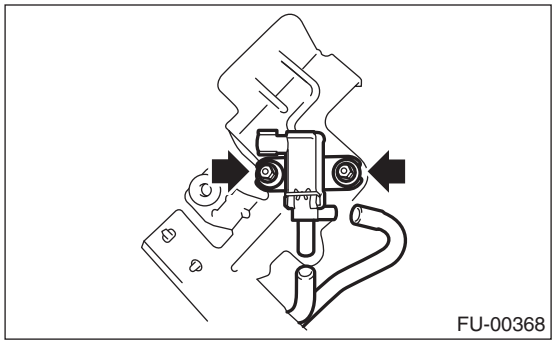
2) Disconnect the engine harness connector (A) from bracket.
3) Disconnect the connector (B) from wastegate control solenoid valve.
4) Remove the bracket from body.



5) Disconnect the pressure hoses (C) from wastegate control solenoid valve.



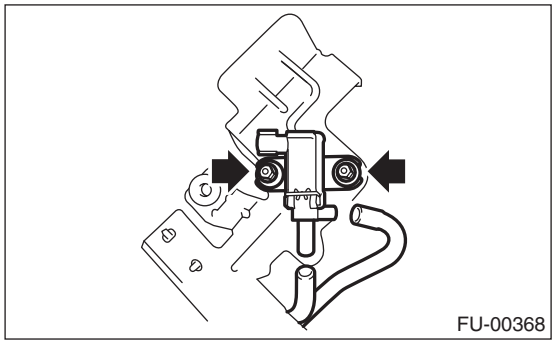
6) Remove the wastegate control solenoid valve from bracket.



B: INSTALLATION

Install in the reverse order of removal.

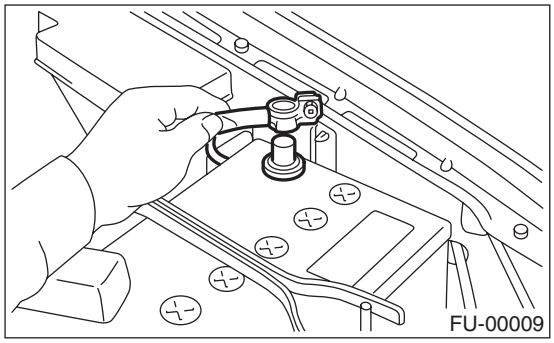
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



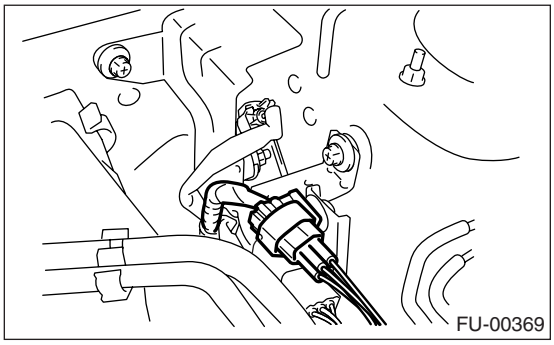
17.Front Oxygen (A/F) Sensor

A: REMOVAL

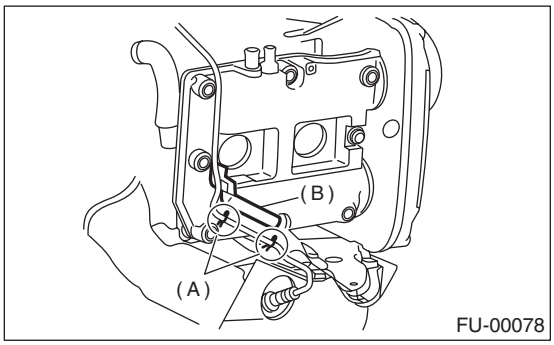
1) Disconnect the ground cable from battery.



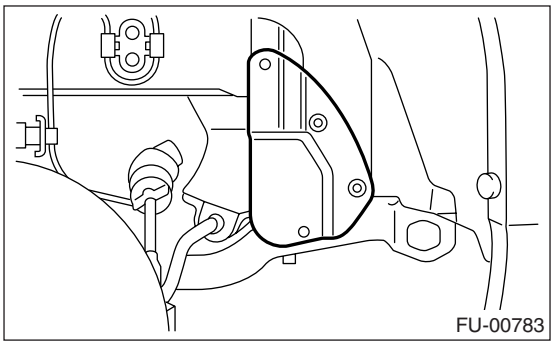
2) Disconnect the connector from the front oxygen (A/F) sensor.



3) Disconnect the engine harness fixed by clip (A) from the bracket (B).



4) Remove the front right side wheel.
5) Lift-up the vehicle.
6) Remove the service hole cover.

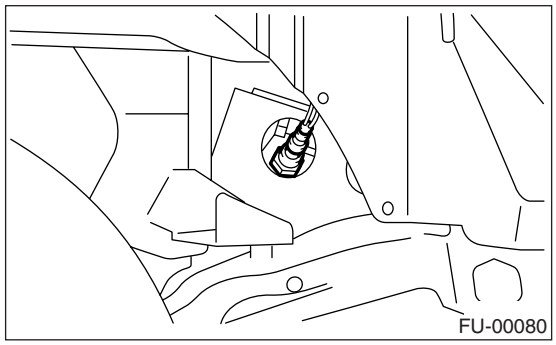


7) Apply SUBARU CRC or its equivalent to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

8) Remove the front oxygen (A/F) sensor.

CAUTION:
When removing the oxygen (A/F) sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.



B: INSTALLATION

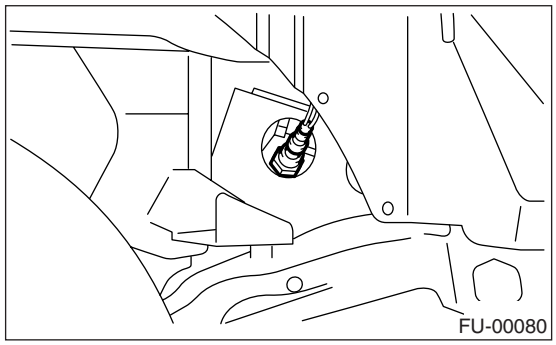
1) Before installing front oxygen (A/F) sensor, apply anti-seize compound only to the threaded portion of front oxygen (A/F) sensor to make the next removal easier.

Anti-seize compound:
SS-30 by JET LUBE

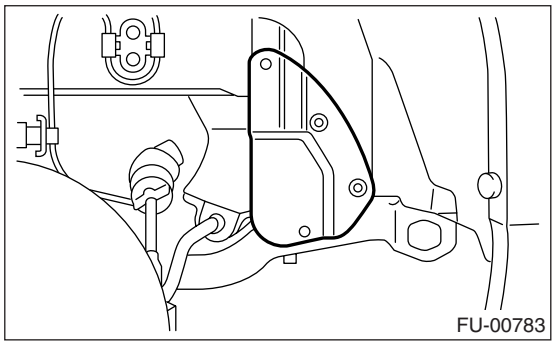
CAUTION:
Never apply anti-seize compound to protector of front oxygen (A/F) sensor.

2) Install the front oxygen (A/F) sensor.

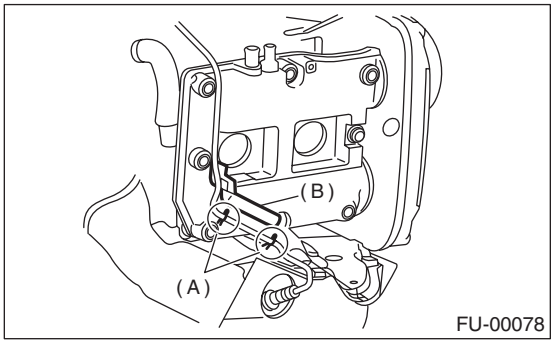
Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)



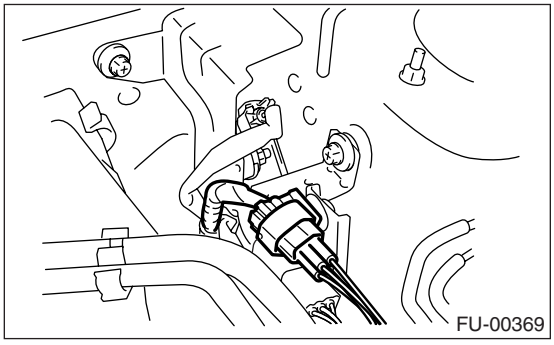
3) Install the service hole cover.



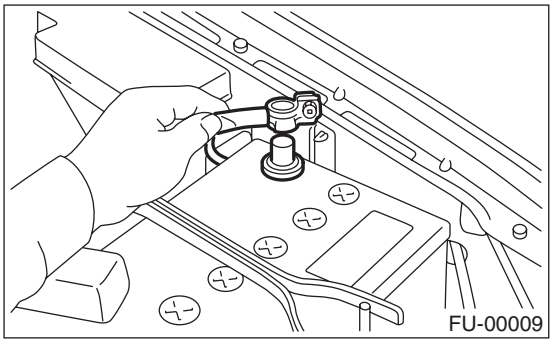
4) Lower the vehicle.
5) Install the front right side wheel.
6) Connect the engine harness to the bracket (B) using clips (A).



7) Connect the connector of front oxygen (A/F) sensor.



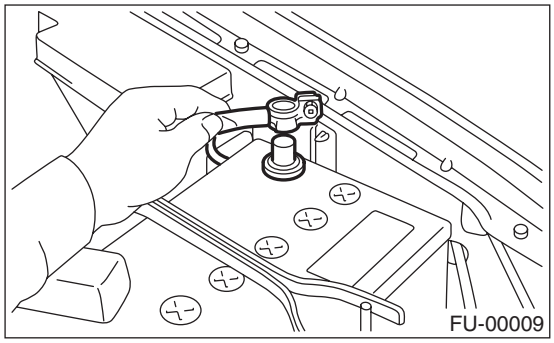
8) Connect the battery ground cable to battery.



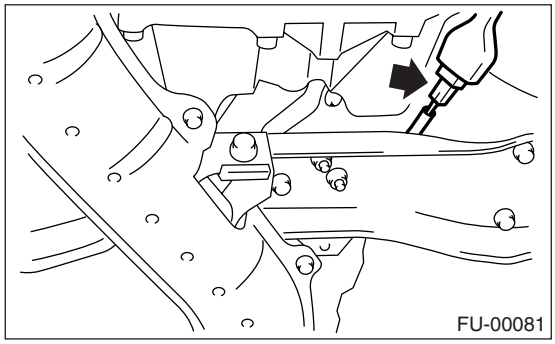
18.Rear Oxygen Sensor

A: REMOVAL

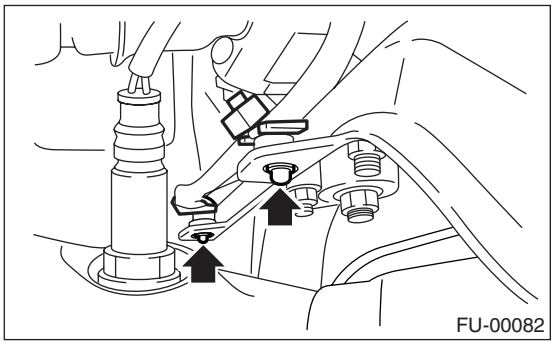
1) Disconnect the ground cable from battery.



2) Lift-up the vehicle.
3) Disconnect the connector from the rear oxygen sensor.



4) Remove the clip by pulling out from the upper side of crossmember.

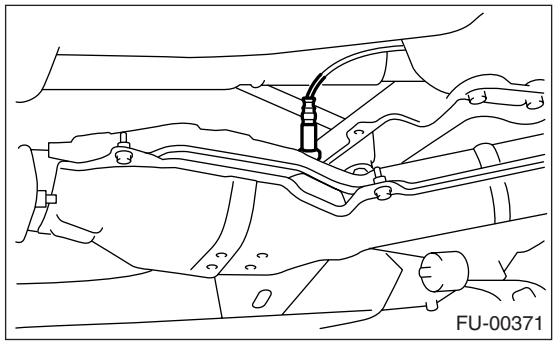


5) Apply SUBARU CRC or its equivalent to the threaded portion of rear oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

6) Remove the rear oxygen sensor.

CAUTION:
When removing the oxygen sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.



B: INSTALLATION

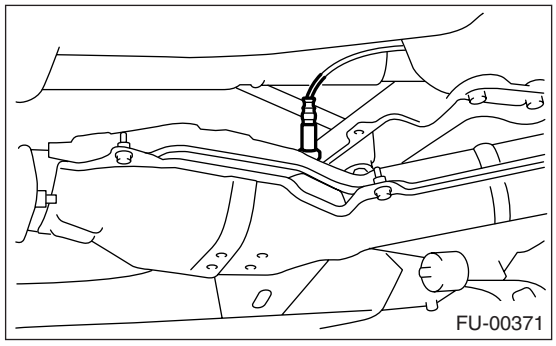
1) Before installing rear oxygen sensor, apply anti-seize compound only to the threaded portion of rear oxygen sensor to make the next removal easier.

CAUTION:
Never apply anti-seize compound to protector of rear oxygen sensor.

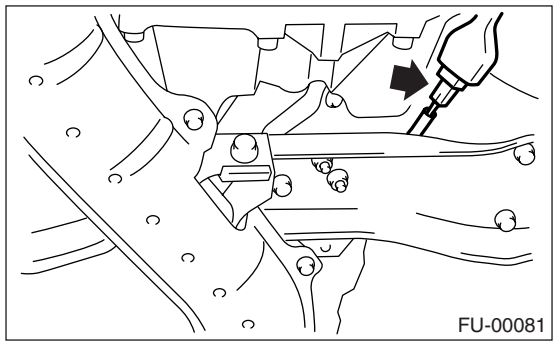
Anti-seize compound:
SS-30 by JET LUBE

2) Install the rear oxygen sensor.

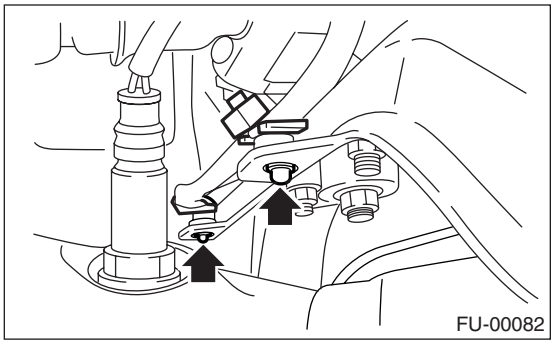
Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



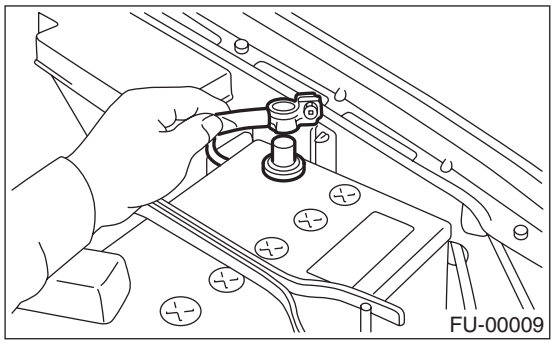
3) Connect the connector to the rear oxygen sensor.



4) Connect the clip to the crossmember.



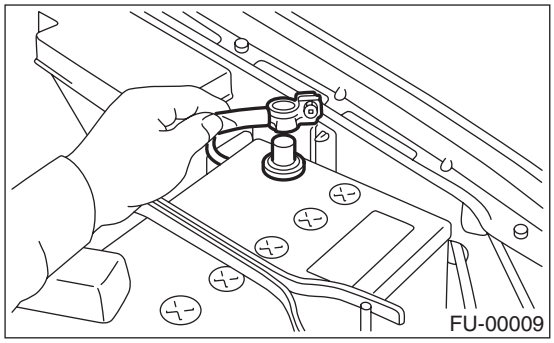
5) Lower the vehicle.
6) Connect the battery ground cable to battery.



19.Exhaust Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



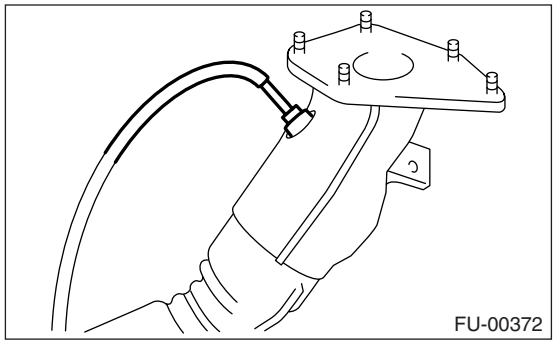
2) Remove the joint pipe. <Ref. to EX(H4DOTC)-12, REMOVAL, Joint Pipe.>

3) Apply SUBARU CRC or its equivalent to the threaded portion of exhaust temperature sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

4) Remove the exhaust temperature sensor.

CAUTION:
When removing the oxygen sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.



B: INSTALLATION

1) Before installing exhaust temperature sensor, apply anti-seize compound only to the threaded portion of rear oxygen sensor to make the next removal easier.

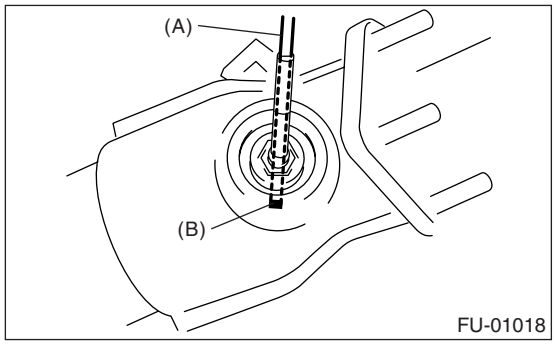
CAUTION:
Never apply anti-seize compound to protector of exhaust temperature sensor.

Anti-seize compound:
SS-30 by JET LUBE

2) Install the exhaust temperature sensor.

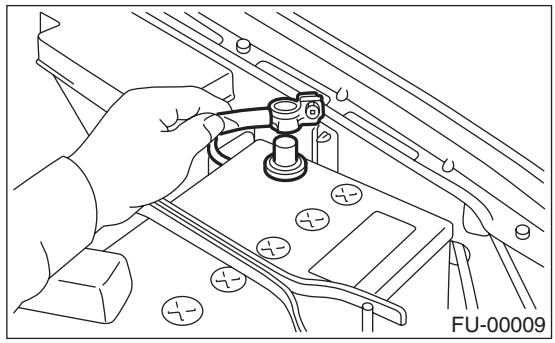
NOTE:
Align the harness (A) of exhaust temperature sensor to the marking (B) of joint pipe, and tighten the screws.

Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



3) Install the joint pipe. <Ref. to EX(H4DOTC)-12, INSTALLATION, Joint Pipe.>

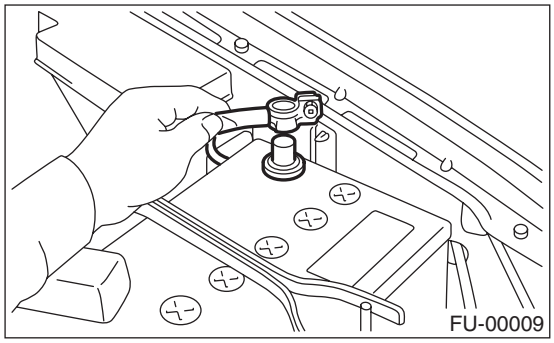
4) Connect the battery ground cable to battery.



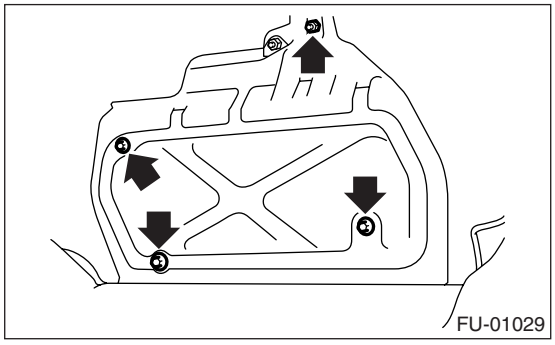
20.Engine Control Module (ECM)

A: REMOVAL

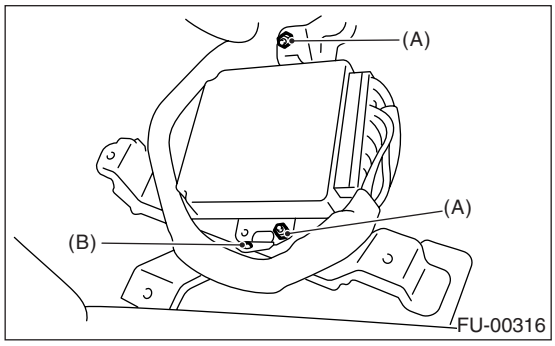
1) Disconnect the ground cable from battery.



2) Remove the lower inner trim of the passenger side. <Ref. to EI-49, REMOVAL, Lower Inner Trim.>
3) Detach the floor mat of the front passenger seat.
4) Remove the protect cover.



5) Remove the nuts (A) which hold ECM to the bracket.
6) Remove the clip (B) from the bracket.



7) Disconnect the ECM connectors and take out the ECM.

B: INSTALLATION

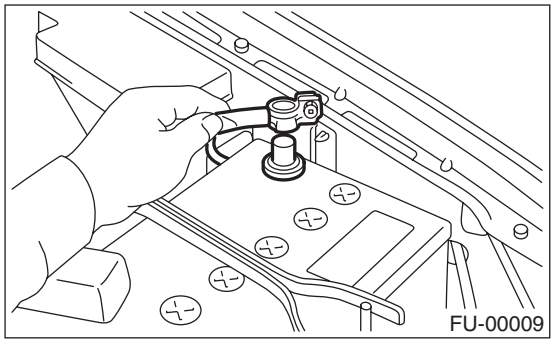
Install in the reverse order of removal.

NOTE:
When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage to the fuel injection system.

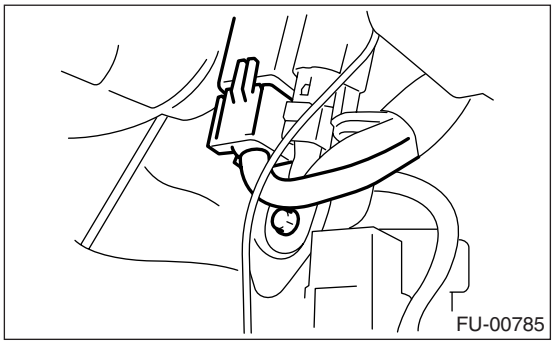
21.Main Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the passenger's side front side sill cover.
3) Remove the bolt which holds the main relay bracket on the body.
4) Disconnect the connectors from the main relay.



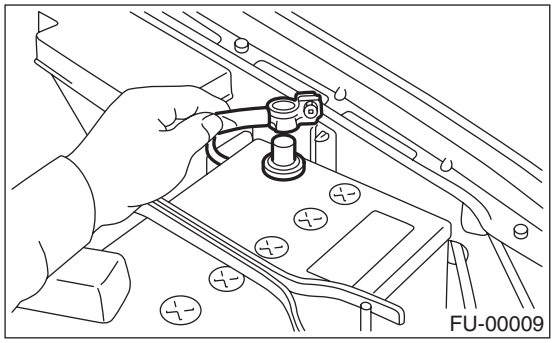
B: INSTALLATION

Install in the reverse order of removal.

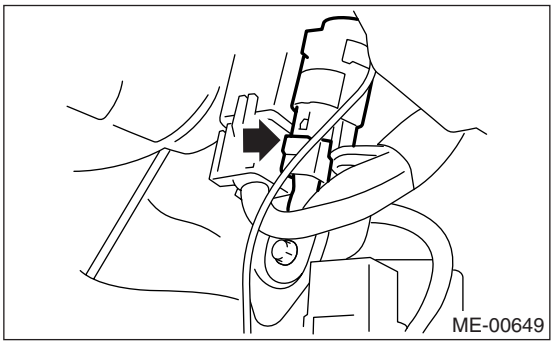
22.Fuel Pump Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the passenger's side front side sill cover.
3) Remove the bolt which holds fuel pump relay bracket on the body.
4) Disconnect the connector from the fuel pump relay.



5) Remove the fuel pump relay from the mounting bracket.

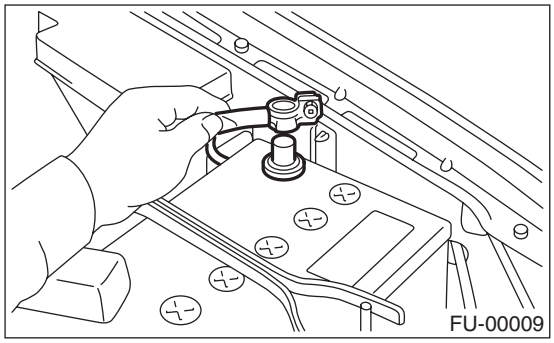
B: INSTALLATION

Install in the reverse order of removal.

23.Fuel Pump Control Unit

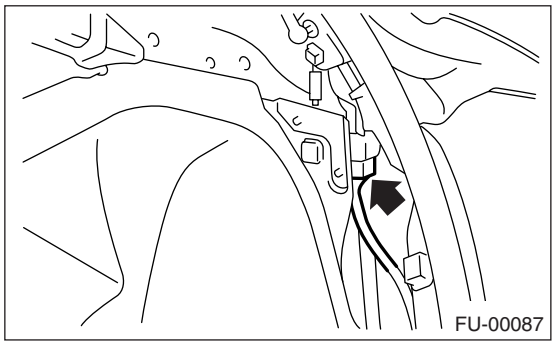
A: REMOVAL

1) Disconnect the ground cable from battery.

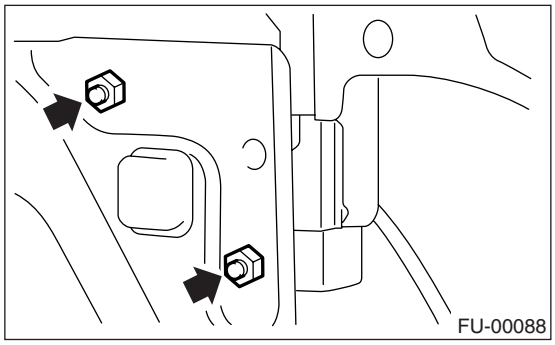


2) Remove the rear quarter trim. <Ref. to EI-50, REMOVAL, Rear Quarter Trim.>

3) Disconnect the connector from the fuel pump control unit.



4) Remove the fuel pump control unit.



B: INSTALLATION

Install in the reverse order of removal.

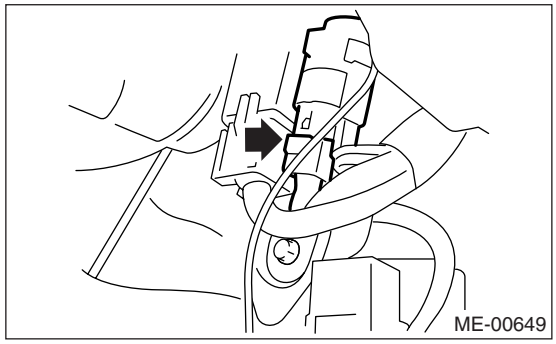
24.Fuel

A: PROCEDURE

1. RELEASING OF FUEL PRESSURE

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill the fuel.**

1) Disconnect the connector from the fuel pump relay.

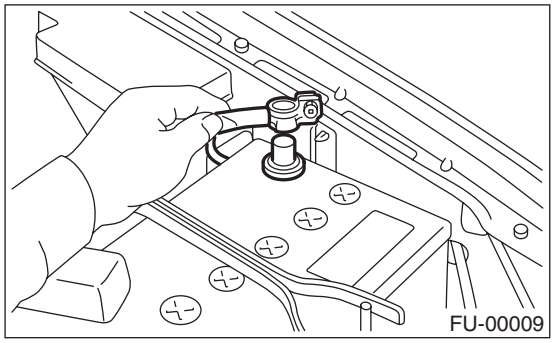


2) Start and run the engine until it stalls.
3) After the engine stalls, crank it for five more seconds.
4) Turn the ignition switch to OFF.

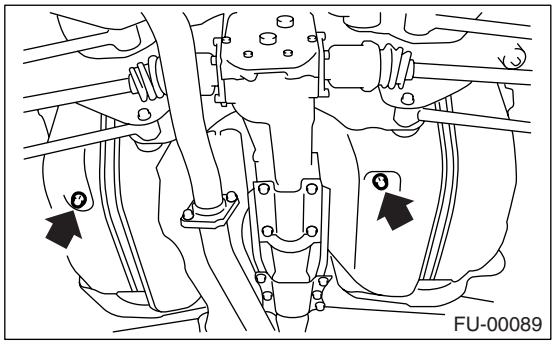
2. DRAINING FUEL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill the fuel.**

1) Set the vehicle on the lift.
2) Disconnect the ground cable from battery.

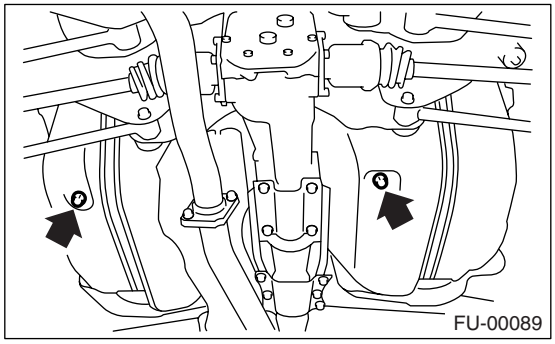


3) Open the fuel filler flap lid and remove the fuel filler cap.
4) Lift-up the vehicle.
5) Drain the fuel from the fuel tank.
Set a container under the vehicle and remove drain plug from the fuel tank.



6) Tighten the fuel drain plug.

Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)

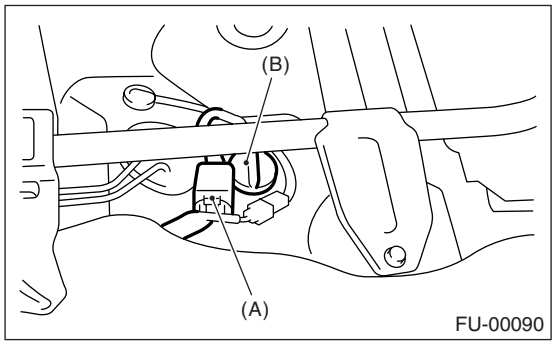


25.Fuel Tank

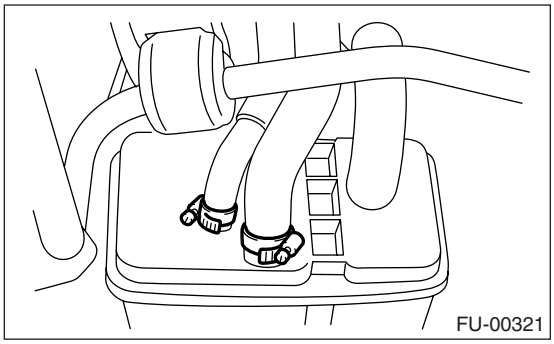
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill the fuel.**

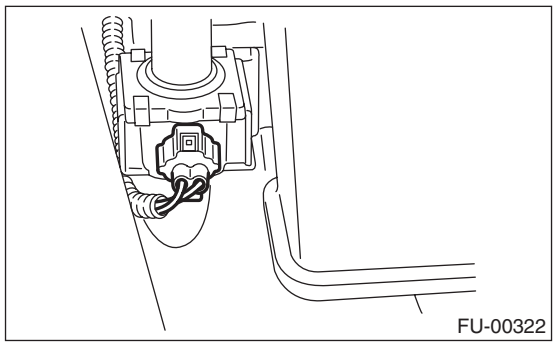
1) Set the vehicle on the lift.
2) Release the fuel pressure. <Ref. to FU(H4DOTC)-52, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Drain the fuel from the fuel tank. <Ref. to FU(H4DOTC)-52, DRAINING FUEL, PROCEDURE, Fuel.>
4) Remove the rear seat.
5) Disconnect the connector (A) of fuel tank cord to the rear harness.
6) Push the grommet (B) which holds the fuel tank cord on floor panel into under the body.



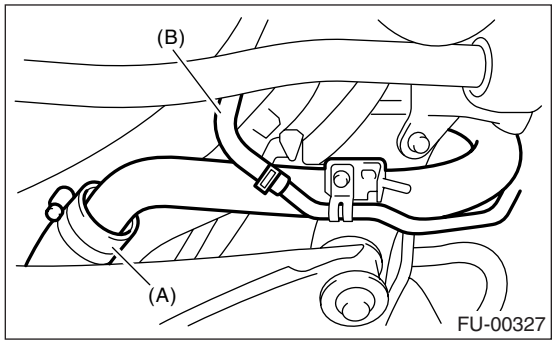
7) Remove the rear crossmember. <Ref. to RS-18, REMOVAL, Rear Crossmember.>
8) Move the clamp, and disconnect the evaporation hose from canister.



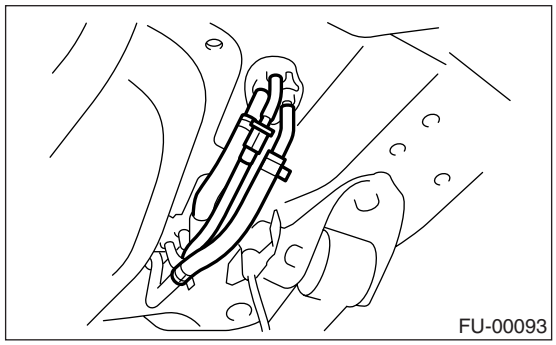
9) Disconnect the connector from the pressure control solenoid valve.
10) Disconnect the connector from the drain valve.



11) Loosen the clamp and disconnect the fuel filler hose (A) from fuel filler pipe.
12) Move the clip, and disconnect the evaporation hose (B).

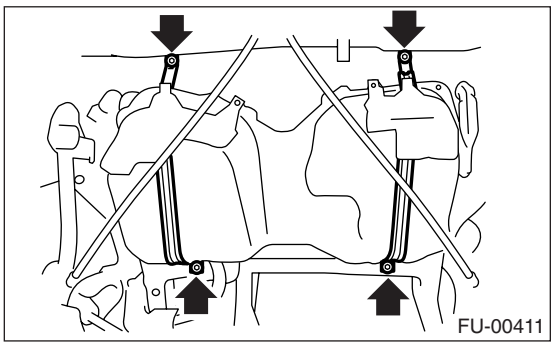


13) Move the clips, and disconnect the quick connector. <Ref. to FU(H4DOTC)-69, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
14) Disconnect the fuel hoses.



15) Support the fuel tank with transmission jack, remove the bolts from bands and dismount the fuel tank from vehicle.

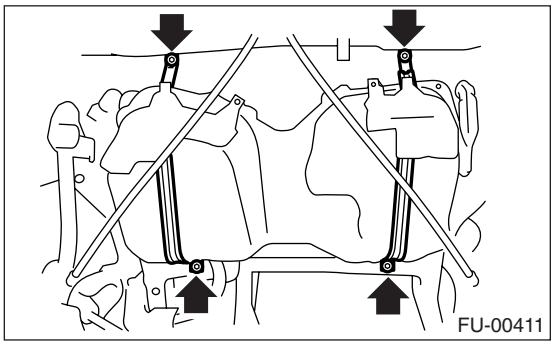
WARNING:
A helper is required to perform this work.



B: INSTALLATION

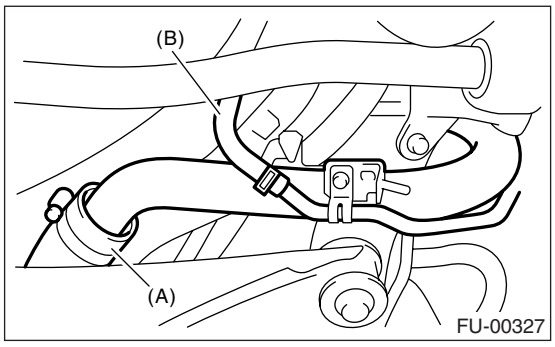
1) Support the fuel tank with transmission jack and push the fuel tank harness into the access hole with grommet.
2) Set the fuel tank and temporarily tighten the bolts of fuel tank bands.

WARNING:
A helper is required to perform this work.

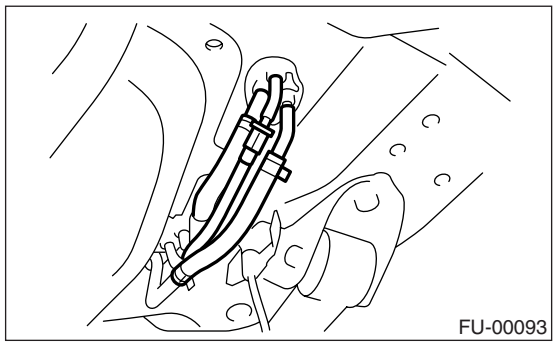


3) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.

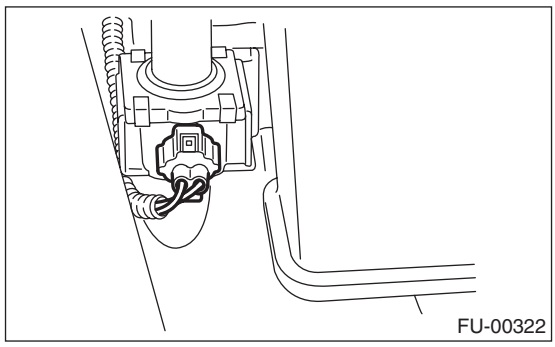
CAUTION:
Do not allow clips to touch air vent hose (B) and rear suspension crossmember.



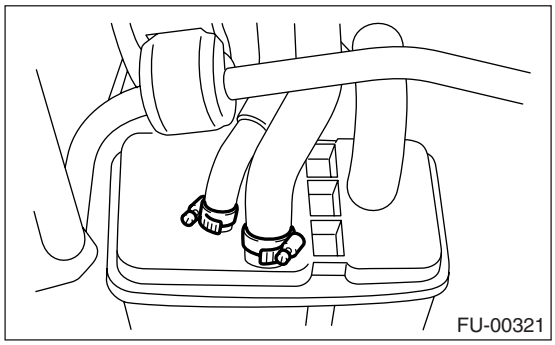
4) Connect the fuel hoses, and hold them with clips and quick connector. <Ref. to FU(H4DOTC)-70, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>



5) Connect the connector to the drain valve.

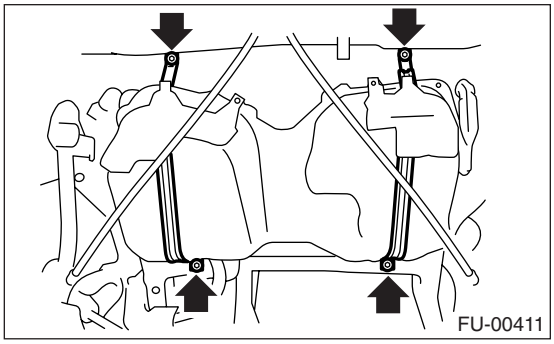


6) Connect the connector to the pressure control solenoid valve.
7) Connect the evaporation hose to the canister, and hold them with clamp.

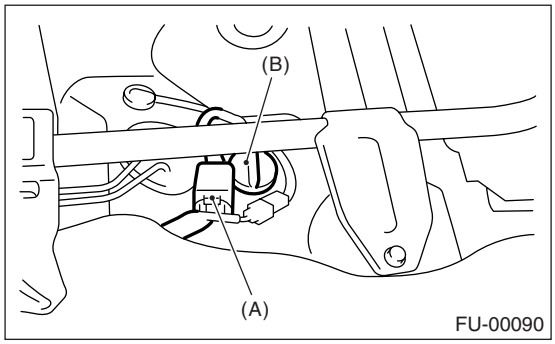


8) Tighten the band mounting bolts.

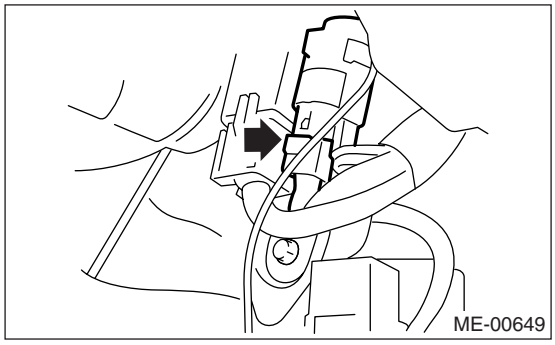
Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



9) Install the rear crossmember. <Ref. to RS-18, INSTALLATION, Rear Crossmember.>
10) Connect the connector (A) to the fuel tank cord and plug the service hole with grommet (B).



11) Set the rear seat and floor mat.
12) Connect the connector to the fuel pump relay.



C: INSPECTION

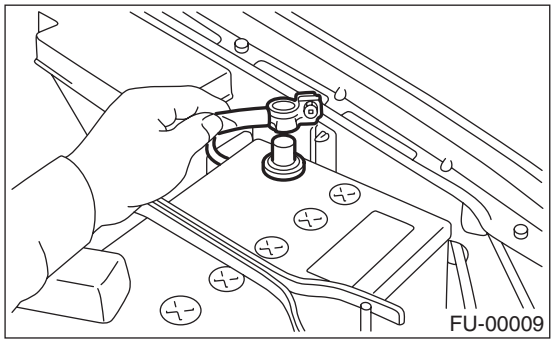
1) Make sure there are no cracks, holes, or other damage on the fuel tank.
2) Make sure that the fuel hoses and fuel pipes are not cracked and the connections are tightened firmly.

26.Fuel Filler Pipe

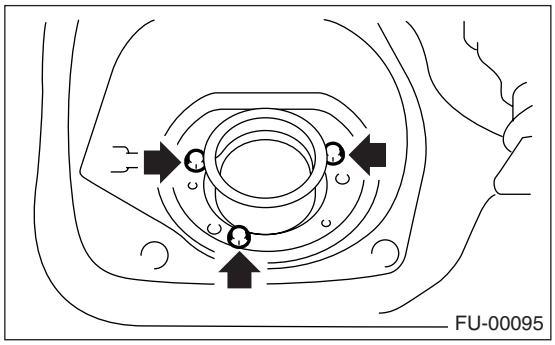
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill the fuel.**

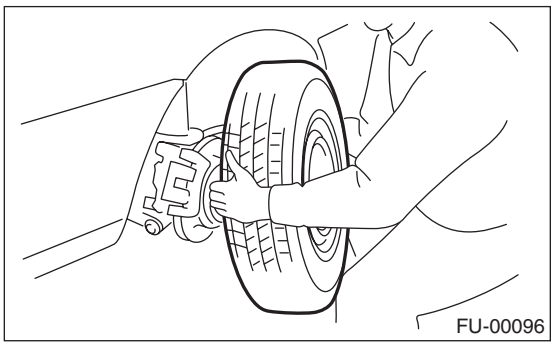
1) Set the vehicle on the lift.
2) Release the fuel pressure. <Ref. to FU(H4DOTC)-52, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Open the fuel filler flap lid and remove the filler cap.
4) Disconnect the ground cable from battery.


FU-00009

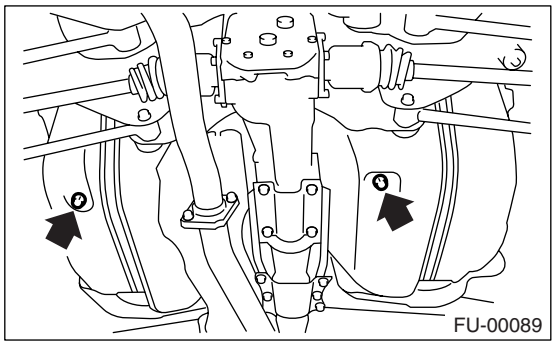
5) Remove the screws holding packing.


FU-00095

6) Loosen the rear right side wheel nuts.
7) Lift-up the vehicle.
8) Remove the rear right side wheel.

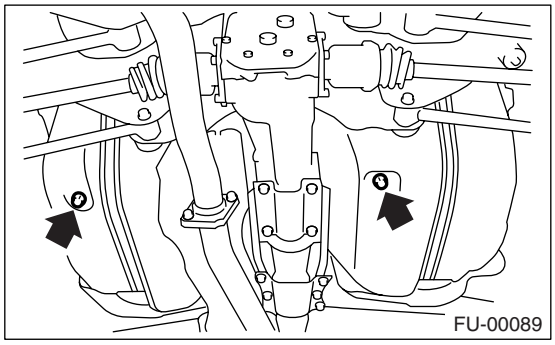

FU-00096

9) Drain the fuel from fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.

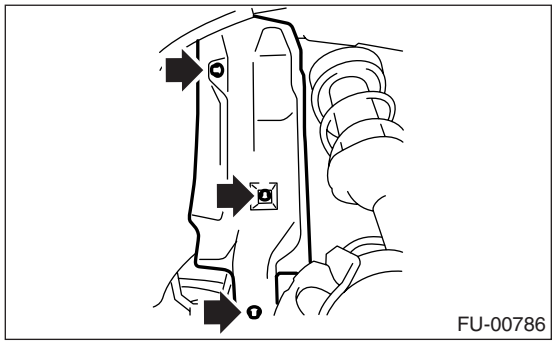

FU-00089

10) Tighten the fuel drain plug and then install the front right side tank cover.

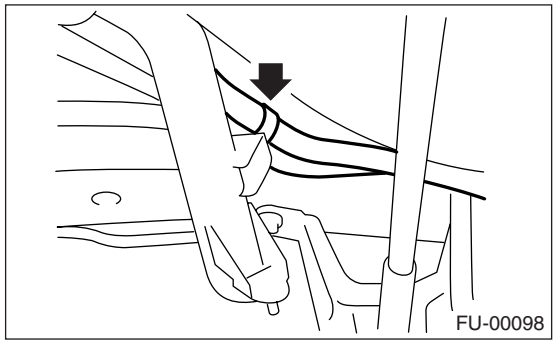
Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)


FU-00089

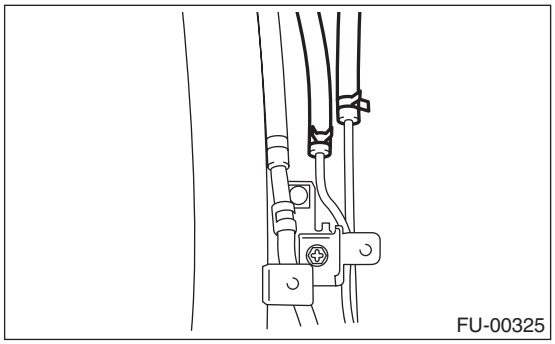
11) Remove the fuel filler pipe protector.


FU-00786

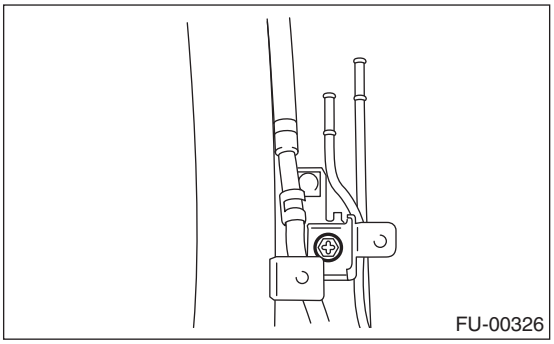
12) Separate the evaporation hoses from the clip of fuel filler pipe.


FU-00098

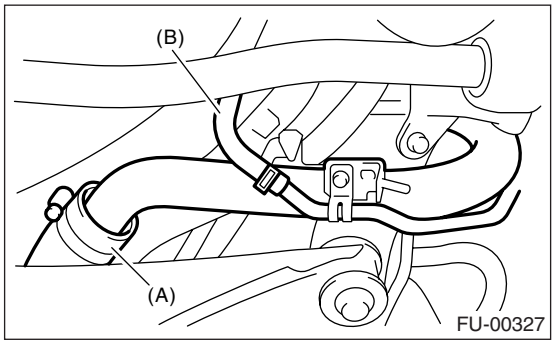
13) Disconnect the evaporation hoses from the pipes.



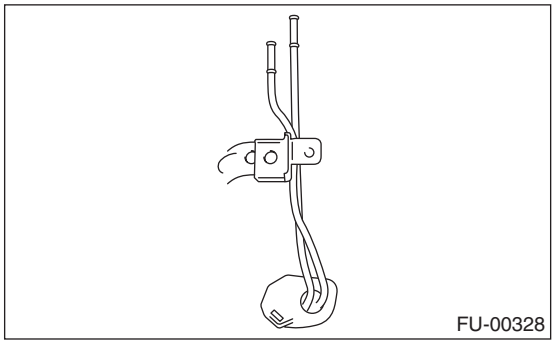
14) Remove the bolts which hold fuel filler pipe bracket on the body.



15) Loosen the clamp, and disconnect the fuel filler hose (A) from fuel filler pipe.
16) Move the clip, and disconnect the evaporation hose (B).

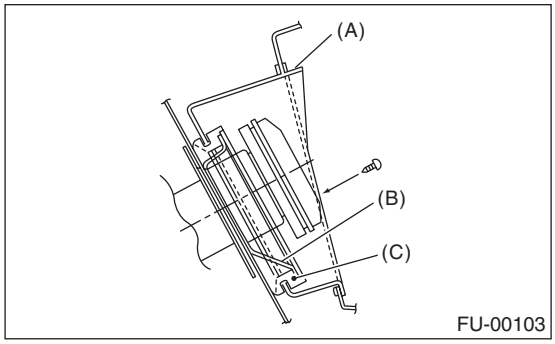


17) Remove the fuel filler pipe to under side of the vehicle.
18) Remove the air vent pipe together with clip from the body.



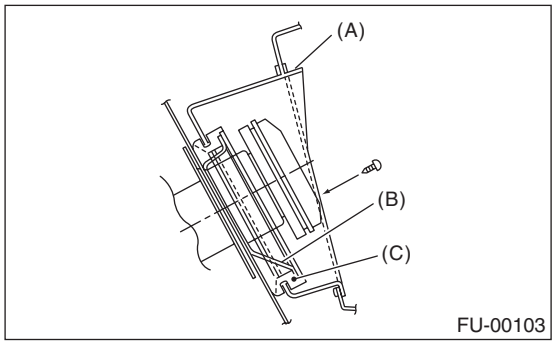
B: INSTALLATION

1) Hold the fuel filler flap open.
2) Set the fuel saucer (A) with rubber packing (C) and insert the fuel filler pipe into the hole from the inner side of apron.

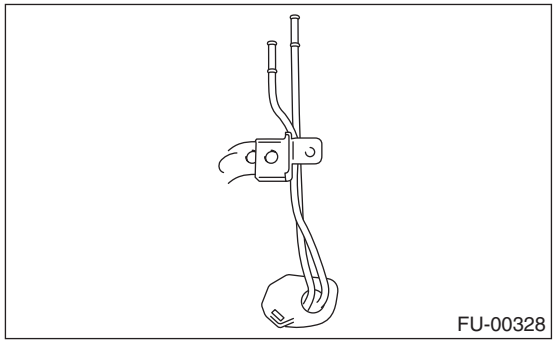


3) Align the holes in fuel filler pipe neck and set the cup (B), and tighten the screws.

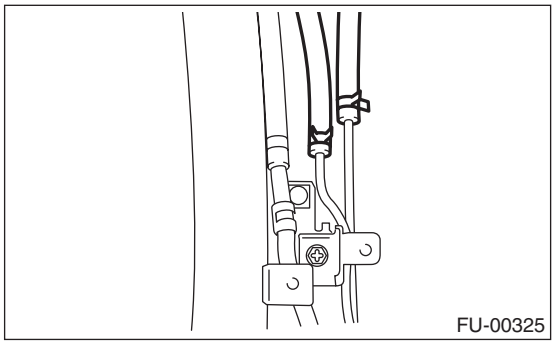
NOTE:
If edges of rubber packing are folded toward the inside, straighten it with a screwdriver.



4) Install the evaporation pipes.

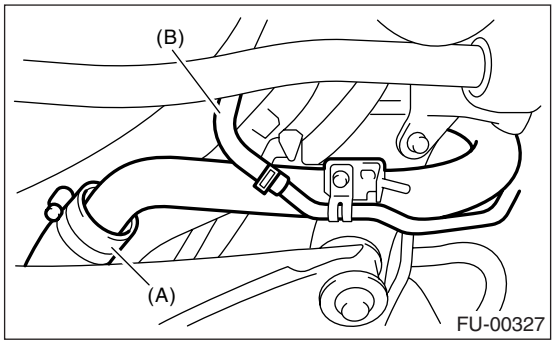


5) Connect the evaporation hose to pipes.



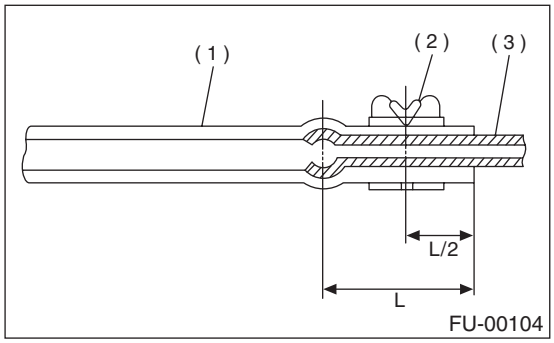
6) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.

CAUTION:
Do not allow clips to touch air vent hose (B) and rear suspension crossmember.



7) Insert the air vent hose approx. 25 to 30 mm (0.98 to 1.18 in) into the lower end of air vent pipe, and hold the clip.

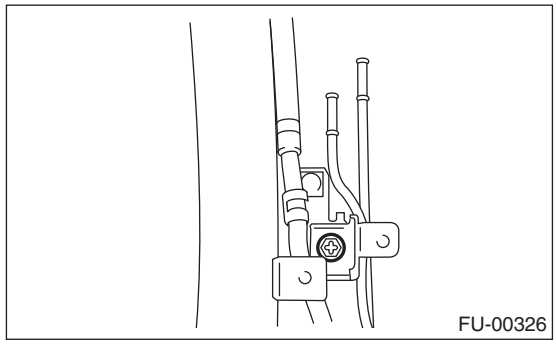
L = 27.5±2.5 mm (1.083±0.098 in)



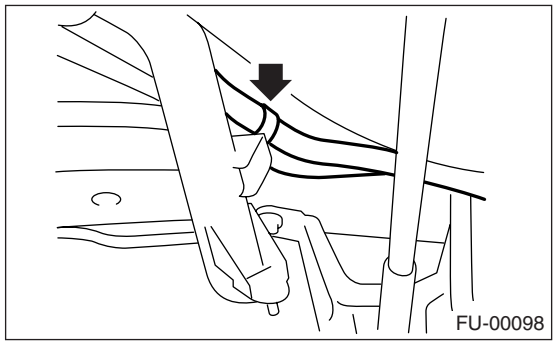
(1) Hose
(2) Clip
(3) Pipe

8) Tighten the bolt which holds fuel filler pipe bracket on the body.

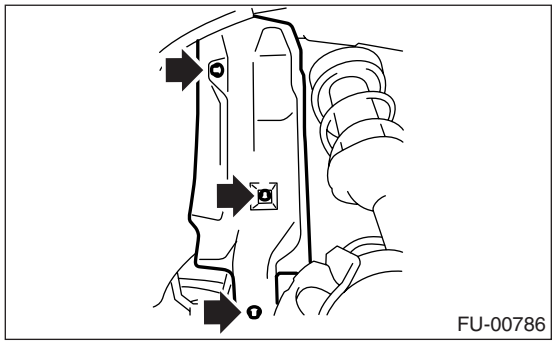
Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



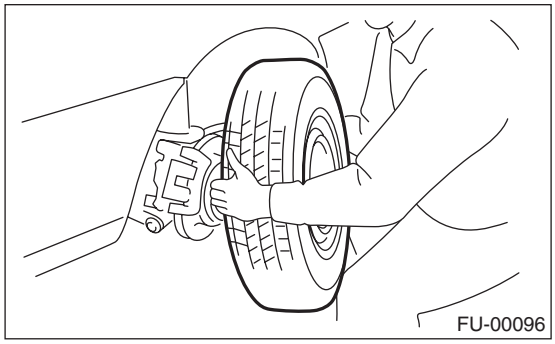
9) Tighten the bolts which hold evaporation hoses onto the clip of fuel filler pipe.



10) Install the fuel filler pipe protector.

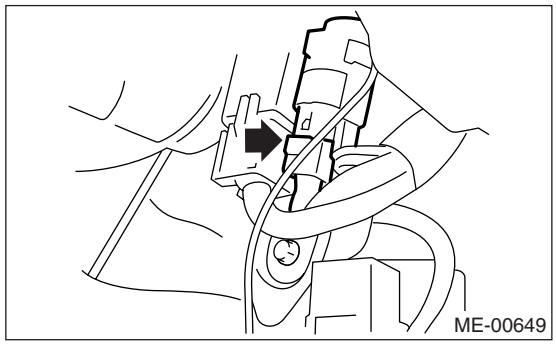


11) Install the rear right wheel.

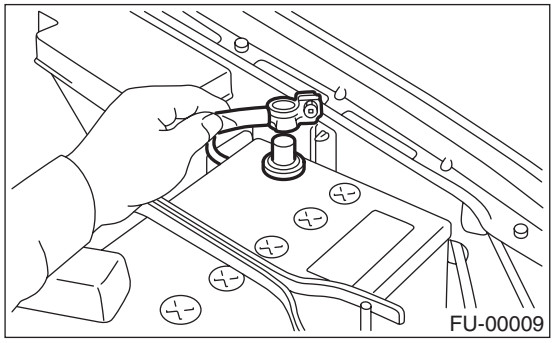


12) Lower the vehicle.
13) Tighten the wheel nuts.

14) Connect the connector to the fuel pump relay.

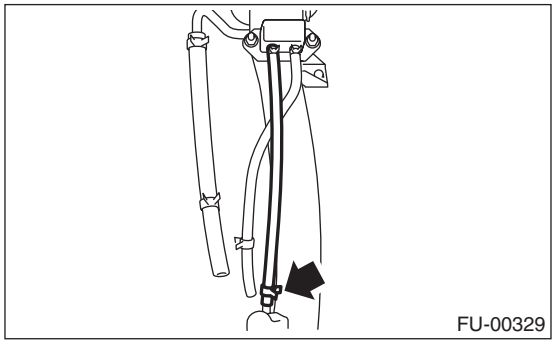


15) Connect the battery ground cable to battery.

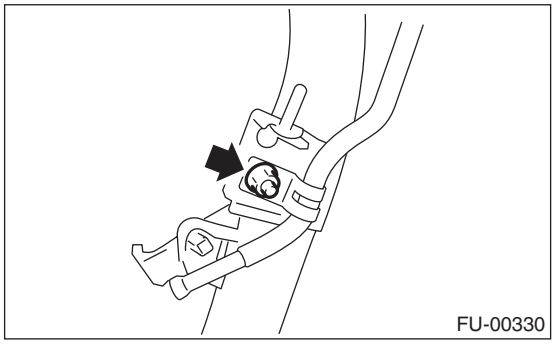


C: DISASSEMBLY

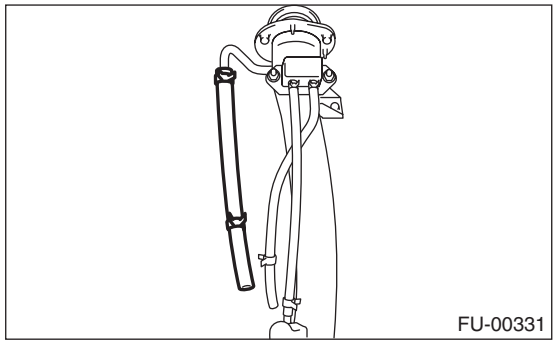
1) Move the clip, and disconnect the evaporation hose from joint pipe.



2) Remove the bolt which installs the joint pipe on fuel filler pipe.



3) Disconnect the evaporation hose from the fuel filler pipe.

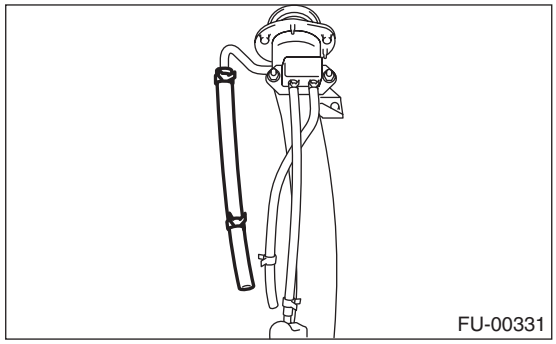


4) Remove the shut valve from the fuel filler pipe. <Ref. to EC(H4DOTC)-18, REMOVAL, Shut Valve.>

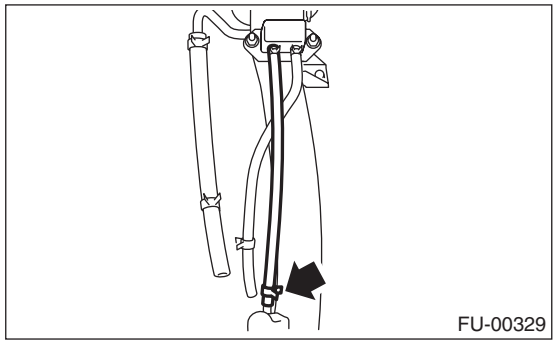
D: ASSEMBLY

1) Install the shut valve on the fuel filler pipe. <Ref. to EC(H4DOTC)-18, INSTALLATION, Shut Valve.>

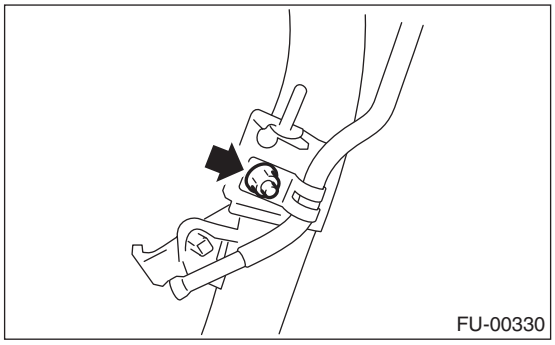
2) Connect the evaporation hose to the fuel filler pipe.



3) Connect the evaporation hose to the evaporation pipe.



4) Install the evaporation pipe to the fuel filler pipe.



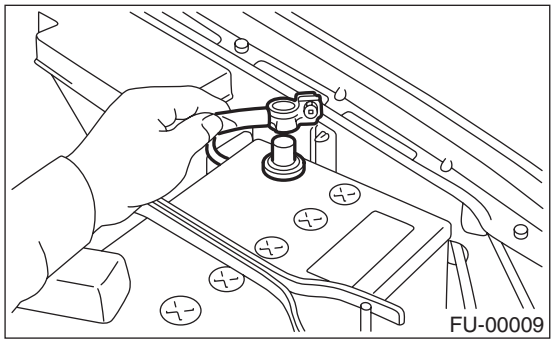
27.Fuel Pump

A: REMOVAL

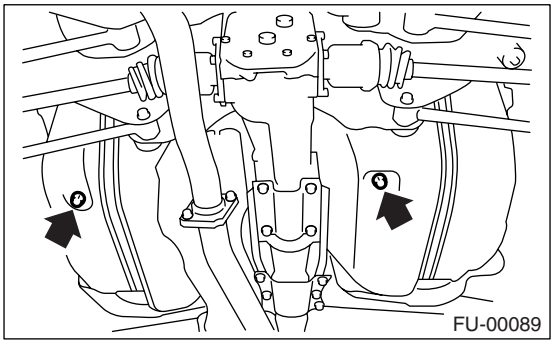
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill the fuel.**

NOTE:
Fuel pump assembly consists of fuel pump and fuel level sensor.

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-52, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler flap lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.

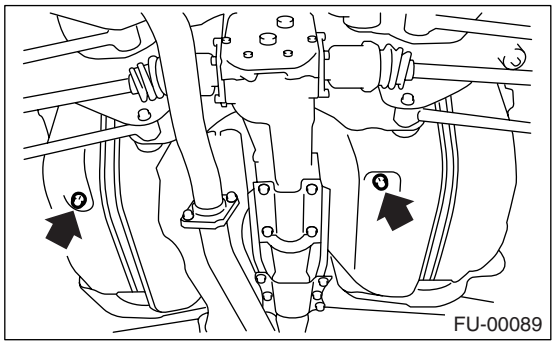

FU-00009

4) Lift-up the vehicle.
5) Drain the fuel from fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.

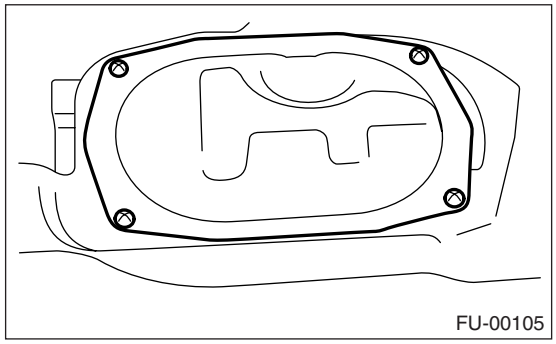

FU-00089

6) Tighten the fuel drain plug.

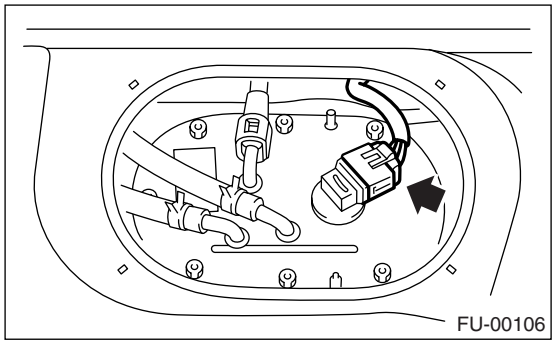
Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)


FU-00089

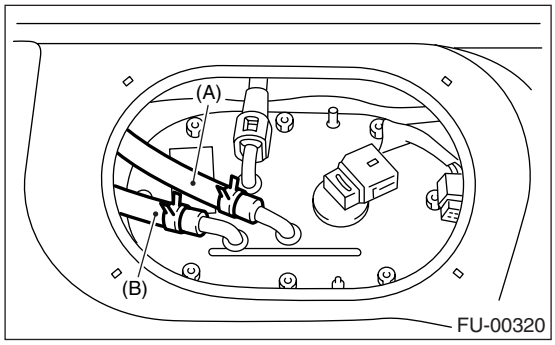
7) Raise the rear seat and turn the floor mat up.
8) Remove the access hole lid.


FU-00105

9) Disconnect the connector from the fuel pump.

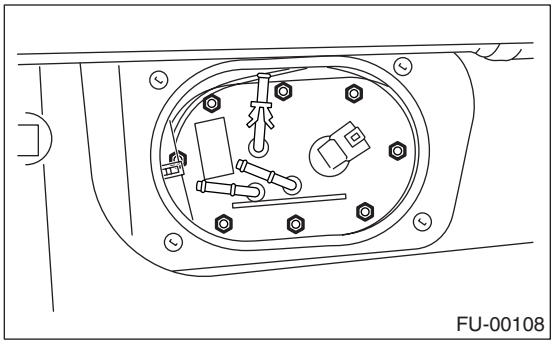

FU-00106

10) Disconnect the quick connector and then disconnect the fuel delivery hose (A). <Ref. to FU(H4DOTC)-69, Fuel Delivery, Return and Evaporation Lines.>
11) Move the clips, and then disconnect the fuel return hose (A) and jet pump hose (B).



FU-00320

12) Remove the nuts which install the fuel pump assembly onto fuel tank.



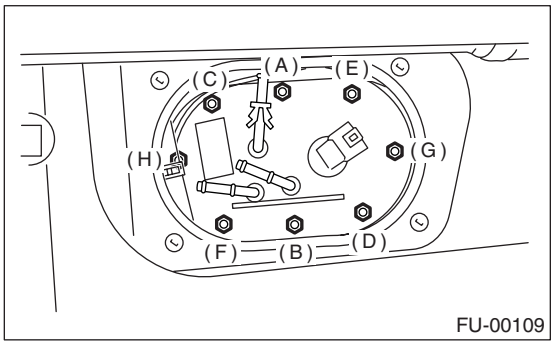
13) Take off the fuel pump assembly from the fuel tank.

B: INSTALLATION

Carefully following the steps below, install in the reverse order of removal.

NOTE:
Always use new gaskets.
(1) Ensure the sealing portion is free from fuel or foreign particles before installation.
(2) Tighten the nuts to the specified torque in alphabetical sequence as shown in the figure.

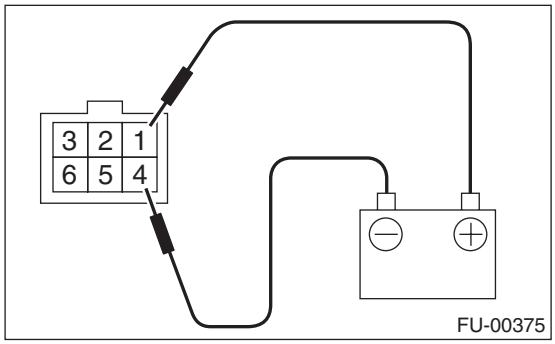
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

Connect the lead harness to the connector terminal of fuel pump and apply battery power supply to check whether the pump operate.

WARNING:
• Wipe off the fuel completely.
• Keep battery as far apart from fuel pump as possible.
• Be sure to turn the battery supply ON and OFF on the battery side.
• Do not run fuel pump for a long time under non-load condition.



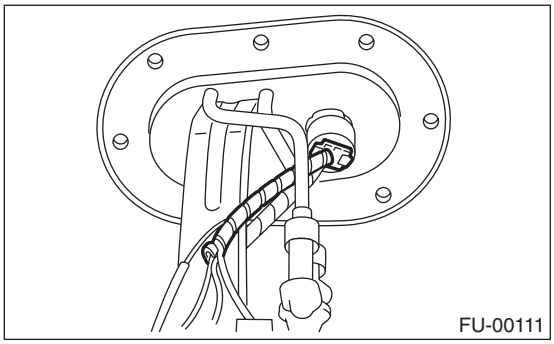
28.Fuel Level Sensor

A: REMOVAL

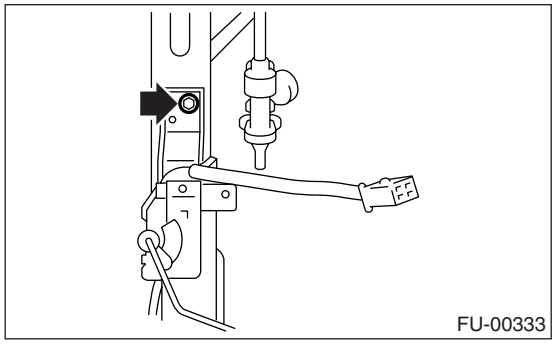
WARNING:
- **Place “NO FIRE” signs near the working area.**
- **Be careful not to spill the fuel.**

NOTE:
Fuel level sensor is built in fuel pump assembly.

1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-61, REMOVAL, Fuel Pump.>
2) Disconnect the connector from the fuel pump bracket.



3) Remove the bolt which installs the fuel level sensor on mounting bracket.



B: INSTALLATION

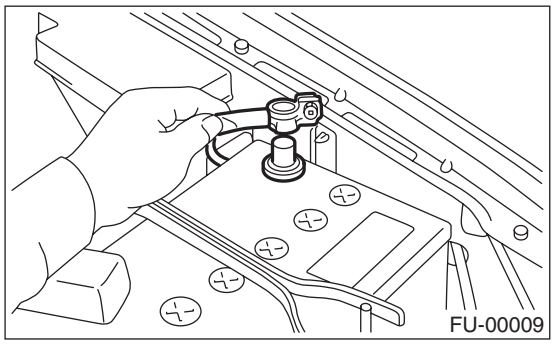
Install in the reverse order of removal.

29.Fuel Sub Level Sensor

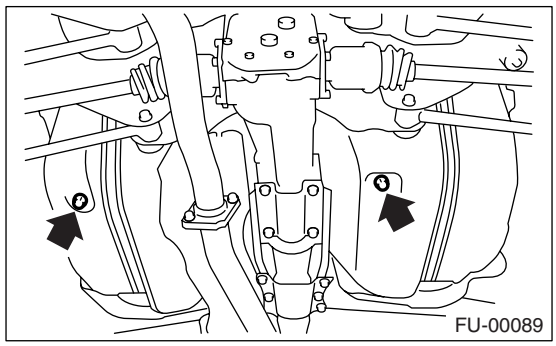
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill the fuel.**

1) Disconnect the ground cable from battery.

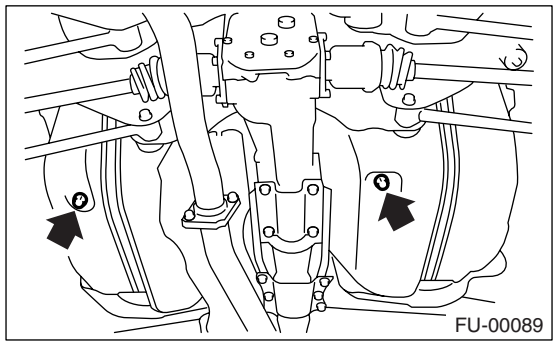


2) Lift-up the vehicle.
3) Drain the fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.

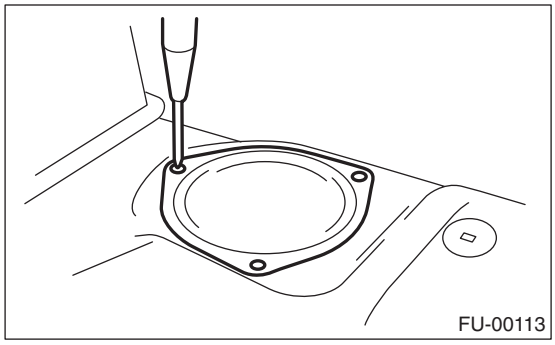


4) Tighten the fuel drain plug.

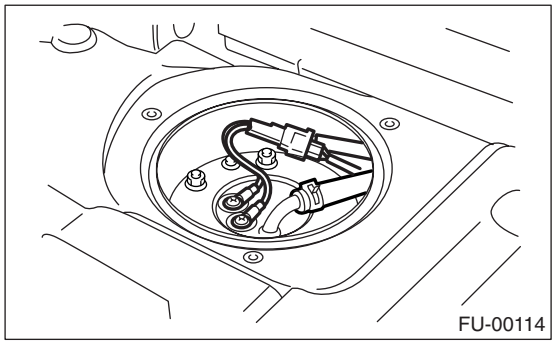
Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)



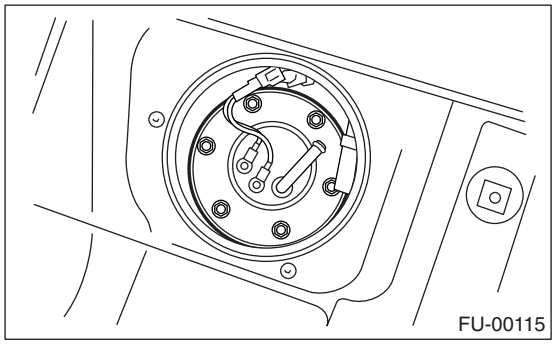
5) Remove the rear seat.
6) Remove the service hole cover.



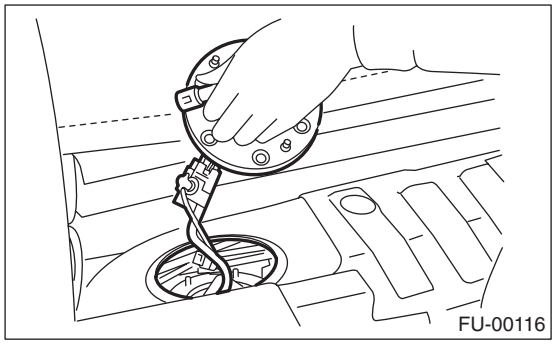
7) Disconnect the connector from the fuel sub level sensor.
8) Disconnect the fuel jet pump hose.



9) Remove the bolts which install the fuel sub level sensor on fuel tank.



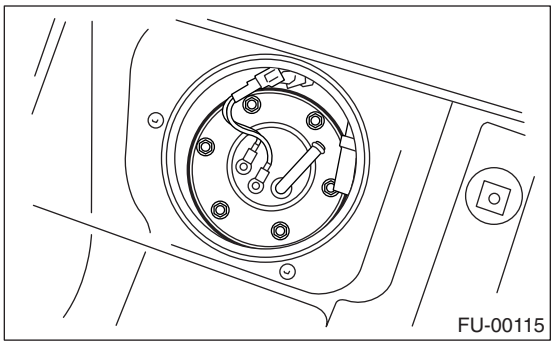
10) Remove the fuel sub level sensor.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

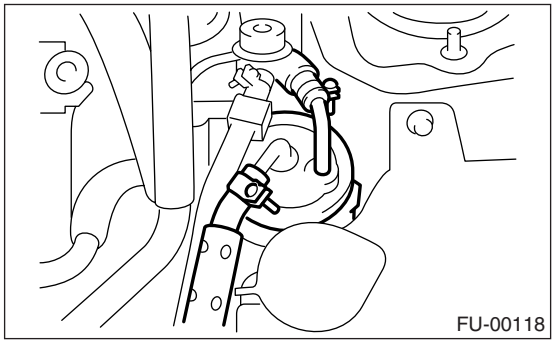


30.Fuel Filter

A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill the fuel.**

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-52, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Disconnect the fuel delivery hoses from the fuel filter.



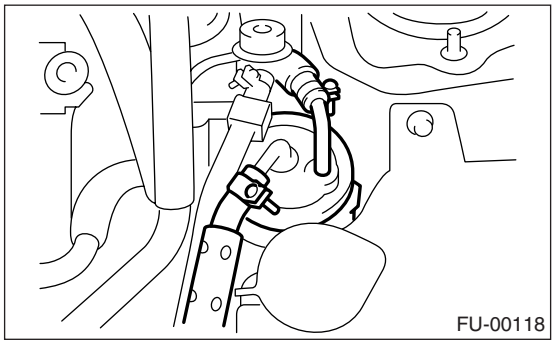
3) Remove the filter from the holder.

B: INSTALLATION

CAUTION:
- **If fuel hoses are damaged at the connecting portion, replace them with new ones.**
- **If clamps are badly damaged, replace them with new ones.**

1) Install in the reverse order of removal.
2) Tighten the hose clamp screws.

Tightening torque:
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)



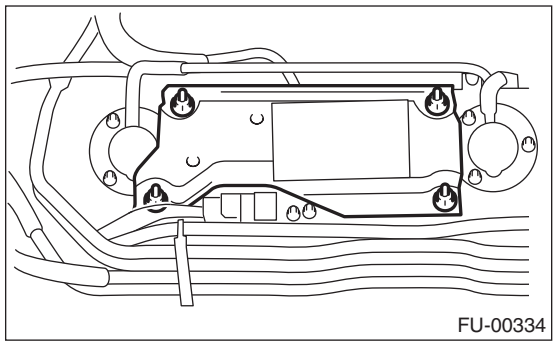
C: INSPECTION

1) Check the inside of fuel filter for dirt and water sediment.
2) If it is clogged, or if replacement interval has been reached, replace it.
3) If water is found in it, shake and expel the water from the inlet port.

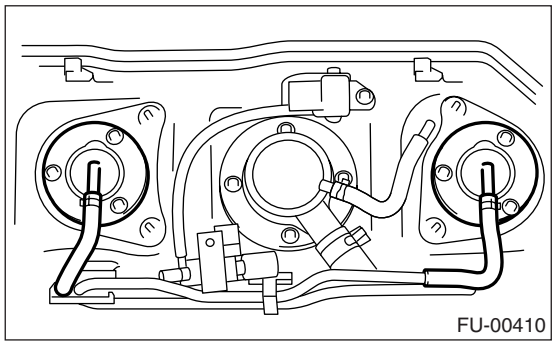
31.Fuel Cut Valve

A: REMOVAL

1) Remove the fuel tank. <Ref. to FU(H4DOTC)-53, REMOVAL, Fuel Tank.>
2) Remove the protect cover.


FU-00334

3) Move the clip and disconnect the evaporation hose from fuel cut valve.

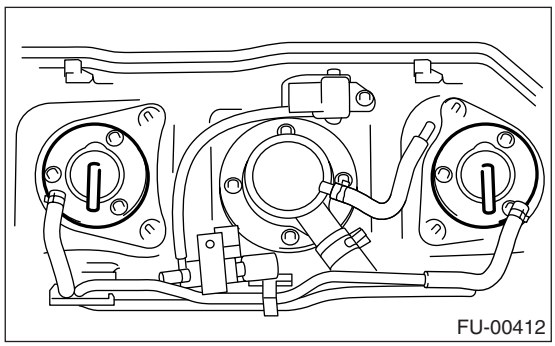

FU-00410

4) Remove the bolts which install the fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

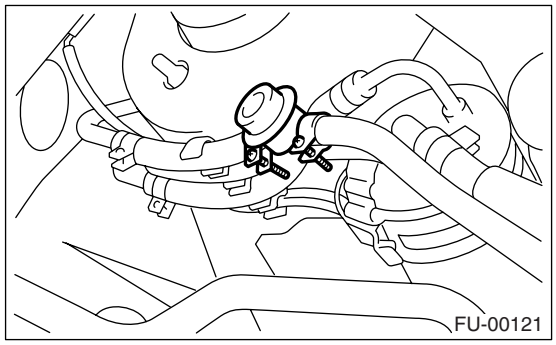
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)


FU-00412

32.Fuel Damper Valve

A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-52, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Remove the fuel damper valve from the fuel return line.



B: INSTALLATION

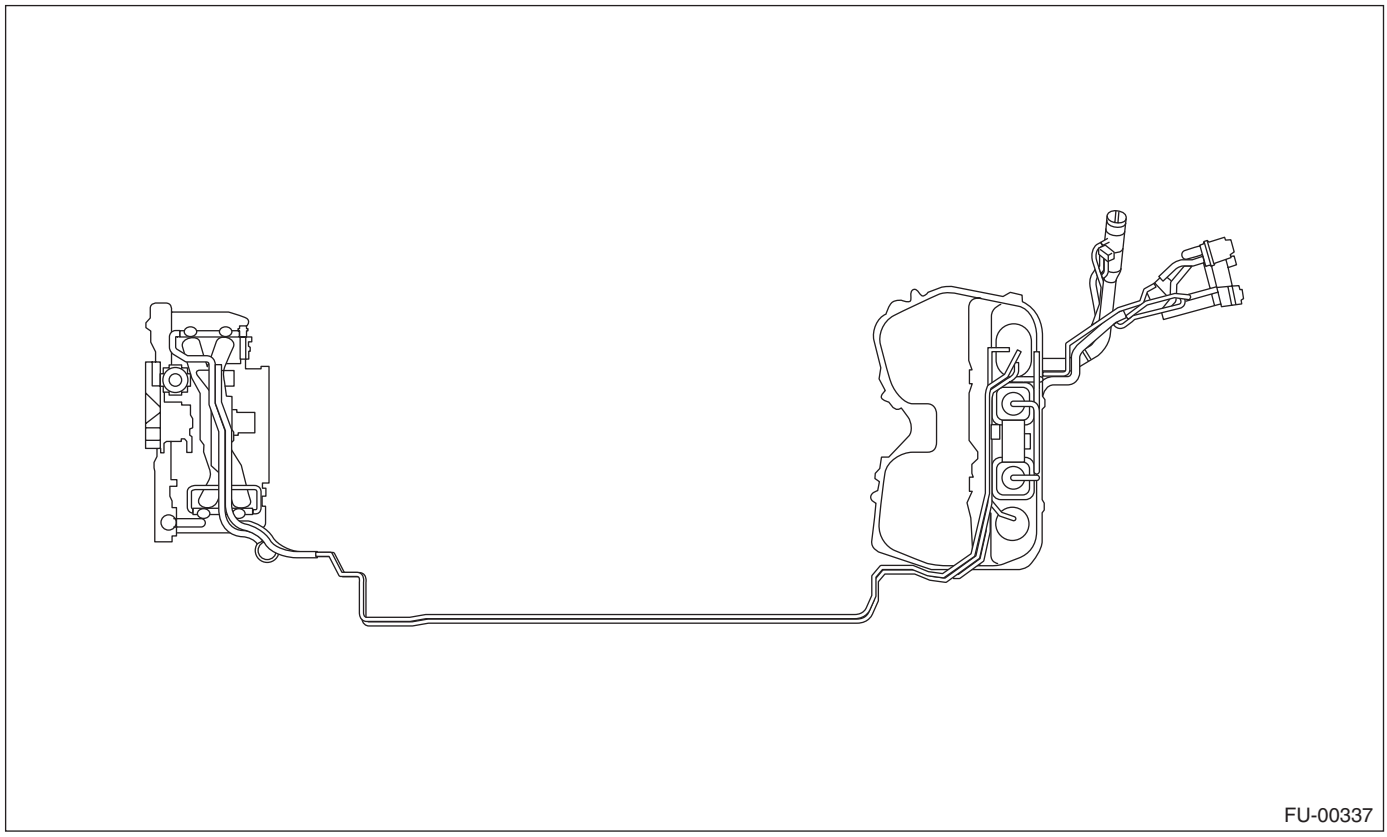
Install in the reverse order of removal.

Tightening torque:
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)

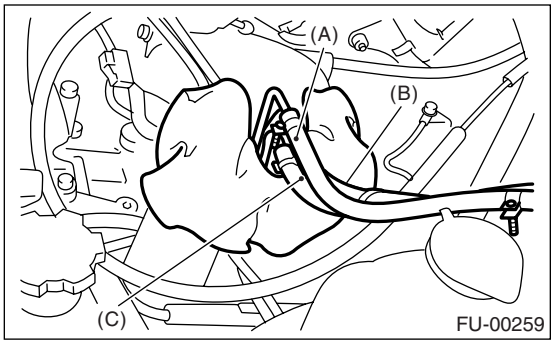
33.Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(H4DOTC)-52, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Open the fuel filler flap lid and remove the fuel filler cap.
4) Remove the floor mat. <Ref. to EI-57, REMOVAL, Floor Mat.>
5) Remove the fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.

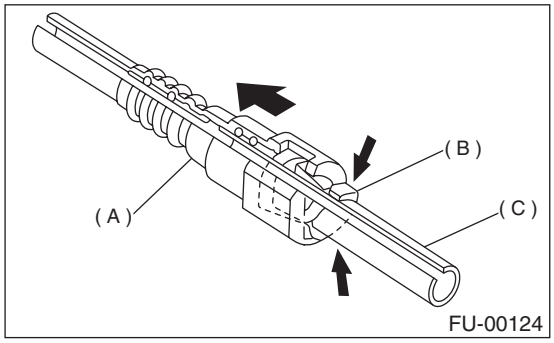


6) In engine compartment, detach the fuel delivery hose (A), return hose (B) and evaporation hose (C).



7) Lift-up the vehicle.
8) Separate the quick connector on the fuel delivery line.
(1) Clean the pipe and connector, if they are covered with dust.
(2) Hold the connector (A) and push retainer (B) down.
(3) Pull out the connector (A) from retainer (B).

CAUTION:
Replace the retainer with a new one.

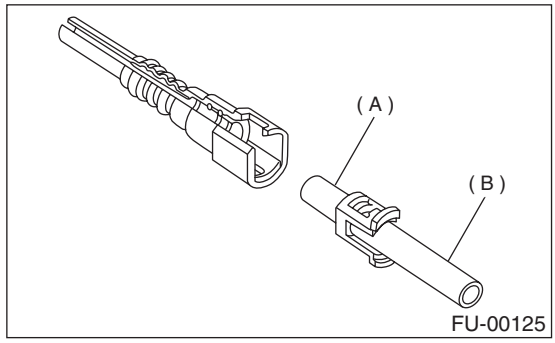


(A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

1) Connect the quick connector on the fuel delivery line.

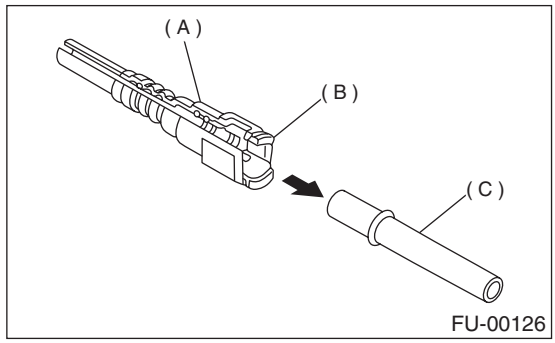
NOTE:
- Always use a new retainer.
- Make sure that the connected portion is not damaged or has dust. If necessary, clean seal surface of pipe.



(A) Seal surface
(B) Pipe

(1) Set a new retainer (B) to connector (A).
(2) Push the pipe into the connector completely.

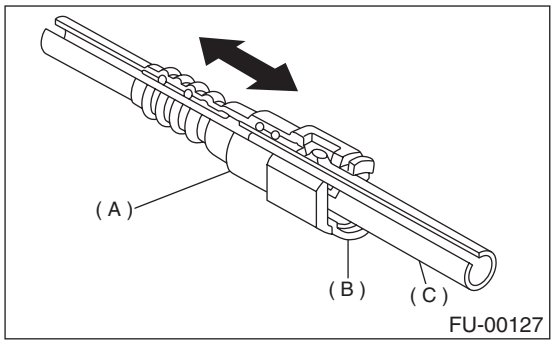
NOTE:
At this time, two clicking sounds are heard.



(A) Connector
(B) Retainer
(C) Pipe

CAUTION:
• Pull the connector to ensure it is connected securely.
• Ensure the two retainer pawls are engaged in their mating positions in the connector.

• Be sure to inspect hoses and their connections for any leakage of fuel.

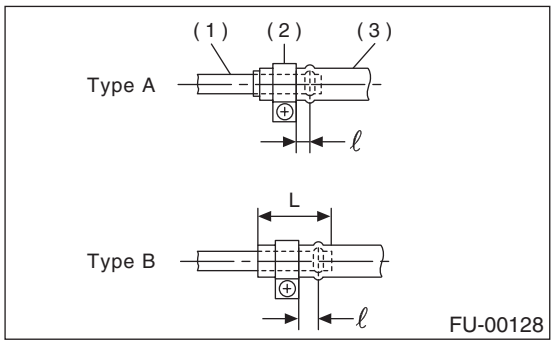


(A) Connector
(B) Retainer
(C) Pipe

2) Connect the fuel delivery hose and return hose to the pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).
Type A: When the fitting length is specified.
Type B: When the fitting length is not specified.

ℓ : 2.5±1.5 mm (0.098±0.059 in)

L: 22.5±2.5 mm (0.886±0.098 in)

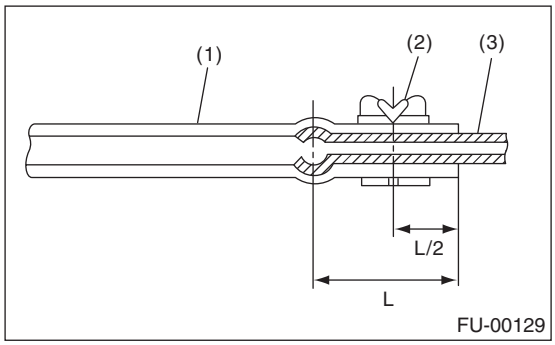


(1) Fitting
(2) Clamp
(3) Hose

3) Connect the evaporation hose to the pipe with an overlap of 15 to 20 mm (0.59 to 0.79 in).

L = 17.5±2.5 mm (0.689±0.098 in)

CAUTION:
Be sure to inspect hoses and their connections for any leakage of fuel.



(1) Hose
(2) Clip
(3) Pipe

C: INSPECTION

1) Make sure there are no cracks on the fuel pipes and fuel hoses.
2) Make sure the fuel pipe and fuel hose connections are tightened firmly.

34.Fuel System Trouble in General

A: INSPECTION

Trouble and possible cause		Corrective action
1. Insufficient fuel supply to the injector		
1)	Fuel pump will not operate.	
	❍ Defective terminal contact.	Inspect connections, especially ground, and tighten securely.
	❍ Trouble in electromagnetic or electronic circuit parts.	Replace fuel pump.
2)	Lowering of fuel pump function.	Replace fuel pump.
3)	Clogged dust or water in the fuel filter.	Replace fuel filter, clean or replace fuel tank.
4)	Clogged or bent fuel pipe or hose.	Clean, correct or replace fuel pipe or hose.
5)	Air is mixed in the fuel system.	Inspect or retighten each connection part.
6)	Clogged or bent breather tube or pipe.	Clean, correct or replace air breather tube or pipe.
7)	Damaged diaphragm of pressure regulator.	Replace.
2. Leakage or blow out fuel		
1)	Loosened joints of the fuel pipe.	Retightening.
2)	Cracked fuel pipe, hose and fuel tank.	Replace.
3)	Defective welding part on the fuel tank.	Replace.
4)	Defective drain packing of the fuel tank.	Replace.
5)	Clogged or bent air breather tube or air vent tube.	Clean, correct or replace air breather tube or air vent tube.
3. Gasoline smell inside of compartment		
1)	Loose joints at air breather tube, air vent tube and fuel filler pipe.	Retightening.
2)	Defective packing air tightness on the fuel saucer.	Correct or replace packing.
3)	Cracked fuel separator.	Replace separator.
4)	Inoperative fuel pump modulator or circuit.	Replace.
4. Defective fuel meter indicator		
1)	Defective operation of fuel level sensor.	Replace.
2)	Defective operation of fuel meter.	Replace.
5. Noise		
1)	Large operation noise or vibration of fuel pump.	Replace.

NOTE:

• When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank.

To prevent water condensation.

(1) Top off the fuel tank or drain the fuel completely.

(2) Drain the water condensation from the fuel filter.

• Refilling the fuel tank.

Refill the fuel tank while there is still some fuel left in the tank.

• Protecting the fuel system against freezing and water condensation.

(3) Cold areas

In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use an anti-freeze solution in the cooling system. Refueling will also complement the effect of anti-freeze solution each time the fuel level drops to about one-half. After the winter season, drain the water which may have accumulated in the fuel filter and fuel tank in the manner same as that described under Affected areas below.

(4) Affected areas

When the water condensation is notched in the fuel filter, drain the water from both the fuel filter and fuel tank or use a water removing agent (or anti-freeze solution) in the fuel tank.

• Observe the instructions, notes, etc., indicated on the label affixed to the anti-freeze solution (water removing agent) container before use.

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES)
EC(H4DOTC)

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8.	Fuel Temperature Sensor	9
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17.	PCV Hose Assembly	21

1. General Description

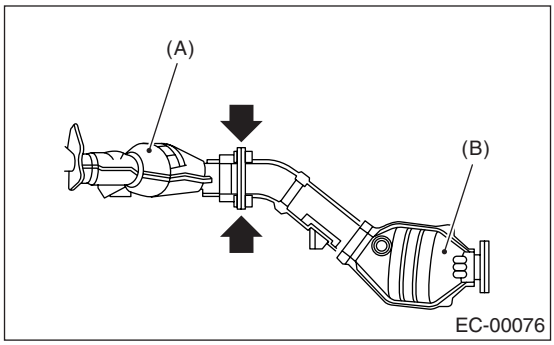
A: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the negative terminal from battery.

2. Front Catalytic Converter

A: REMOVAL

1) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
2) Separate the front catalytic converter (A) from rear catalytic converter (B).



B: INSTALLATION

NOTE:
- Replace the gaskets with new ones.
- Install in the reverse order of removal.

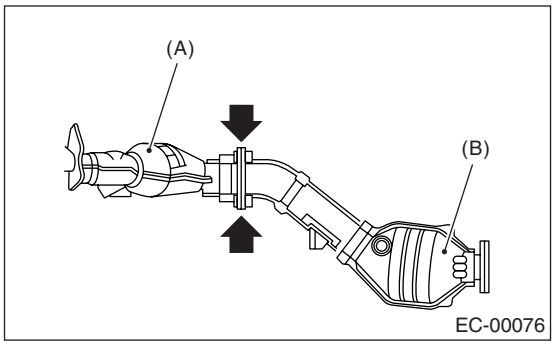
C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

3. Rear Catalytic Converter

A: REMOVAL

1) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
2) Separate the rear catalytic converter (B) from front catalytic converter (A).



B: INSTALLATION

NOTE:
- Replace the gaskets with new ones.
- Install in the reverse order of removal.

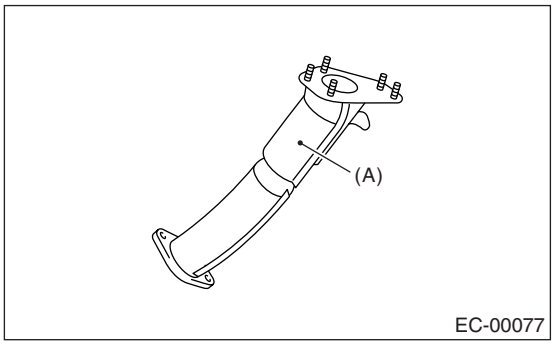
C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

4. Precatalytic Converter

A: REMOVAL

Precatalytic converter (A) is built in the joint pipe. Refer to the removal of joint pipe for removal procedure. <Ref. to EX(H4DOTC)-12, REMOVAL, Joint Pipe.>



B: INSTALLATION

Install in the reverse order of removal.

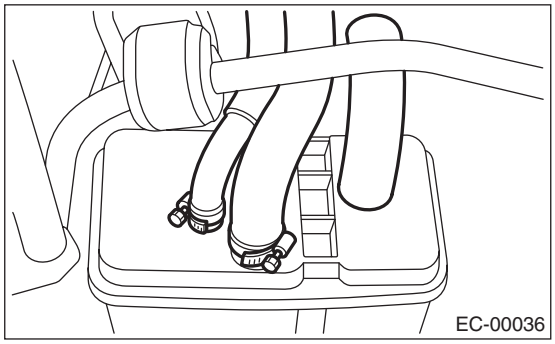
C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

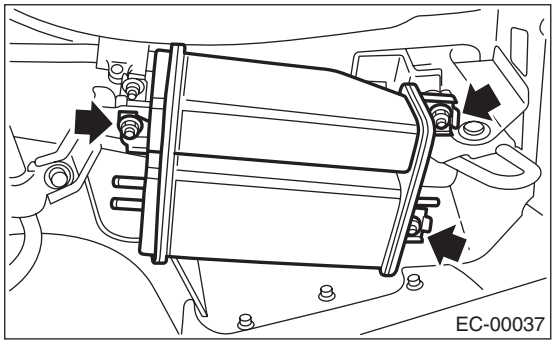
5. Canister

A: REMOVAL

1) Lift-up the vehicle.
2) Loosen the two clamps which hold two canister hoses, and disconnect the evaporation three hoses from canister.



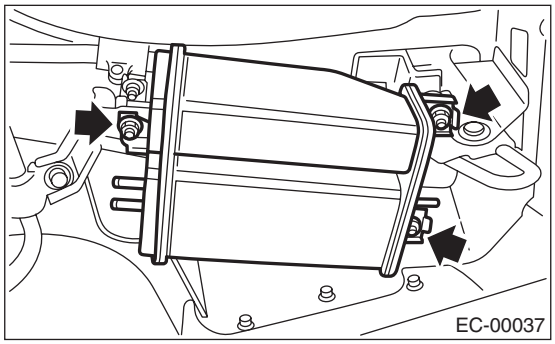
3) Remove the canister from body.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
23 N·m (2.3 kgf-m, 17 ft-lb)



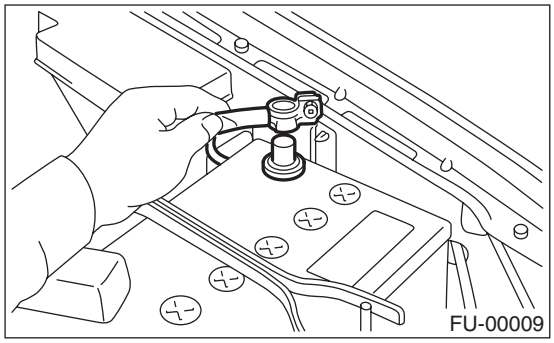
C: INSPECTION

Make sure the canister and canister hoses are not cracked or loose.

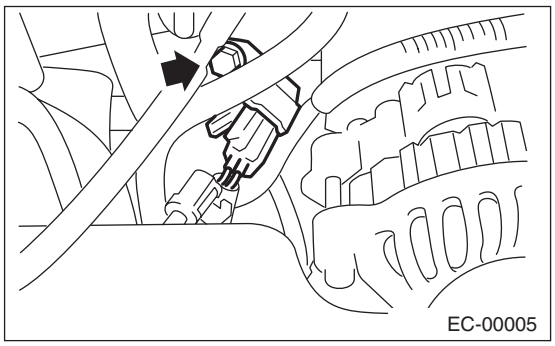
6. Purge Control Solenoid Valve

A: REMOVAL

1) Disconnect the ground terminal from battery.



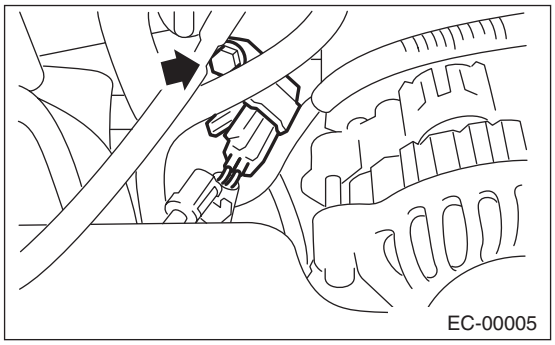
2) Disconnect the connector and hoses from purge control solenoid valve.
3) Remove the bolt which installs the purge control solenoid valve onto intake manifold.



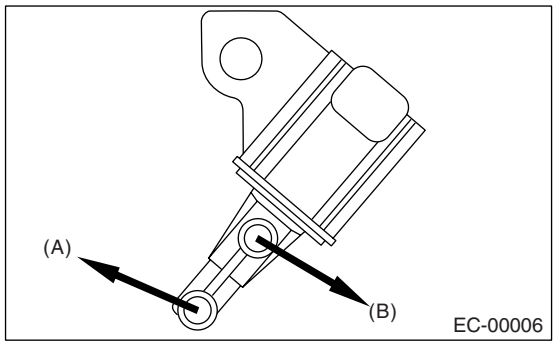
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



NOTE:
Connect the evaporation hoses as shown in the figure.



(A) To intake manifold
(B) To purge value

C: INSPECTION

Make sure the hoses are not cracked or loose.

7. Main Fuel Level Sensor

A: REMOVAL

For work procedures, refer to FU(H4DOTC) section. <Ref. to FU(H4DOTC)-63, REMOVAL, Fuel Level Sensor.>

B: INSTALLATION

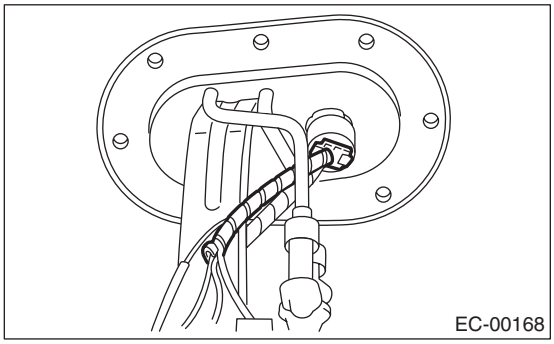
For work procedures, refer to FU(H4DOTC) section. <Ref. to FU(H4DOTC)-63, INSTALLATION, Fuel Level Sensor.>

8. Fuel Temperature Sensor

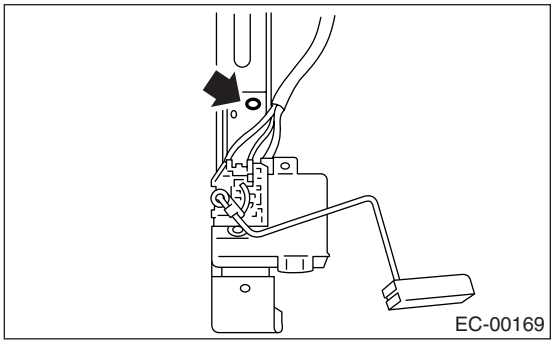
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-61, REMOVAL, Fuel Pump.>
2) Disconnect the connector from fuel pump bracket.



3) Remove the main fuel level sensor from fuel pump assembly. <Ref. to FU(H4DOTC)-63, REMOVAL, Fuel Level Sensor.>



NOTE:
Fuel temperature sensor is a unit with the fuel pump. If replacing it, replace as a fuel pump.

B: INSTALLATION

Install in the reverse order of removal.

9. Fuel Sub Level Sensor

A: REMOVAL

For work procedures, refer to FU(H4DOTC) section. <Ref. to FU(H4DOTC)-64, REMOVAL, Fuel Sub Level Sensor.>

B: INSTALLATION

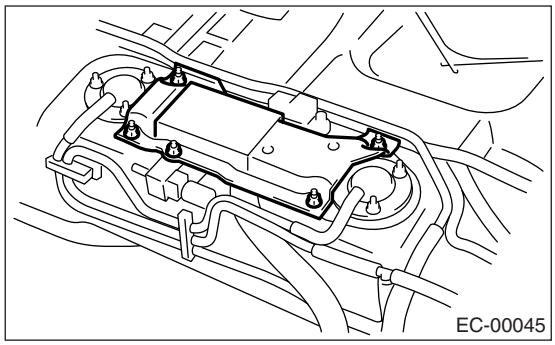
For work procedures, refer to FU(H4DOTC) section. <Ref. to FU(H4DOTC)-65, INSTALLATION, Fuel Sub Level Sensor.>

10.Fuel Tank Pressure Sensor

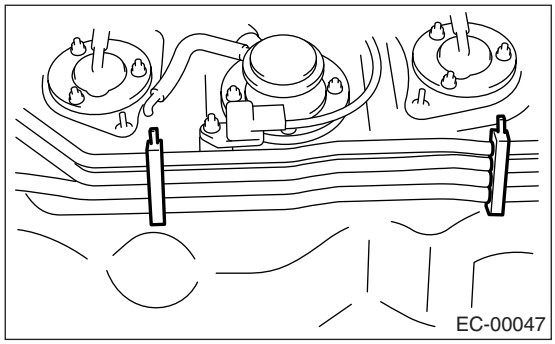
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

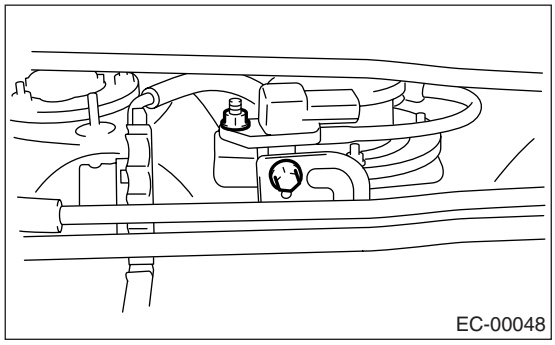
1) Remove the fuel tank. <Ref. to FU(H4DOTC)-53, REMOVAL, Fuel Tank.>
2) Remove the protector cover.



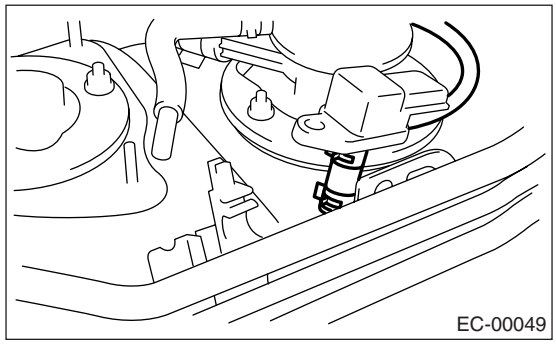
3) Disconnect the connector from fuel pressure sensor.
4) Release the clips which hold fuel pipes onto fuel tank.



5) Remove the bolt and nut which hold the fuel tank pressure sensor onto the bracket.



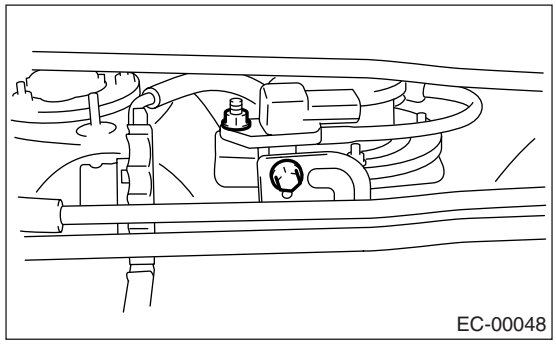
6) Disconnect the pressure hose from fuel tank pressure sensor.



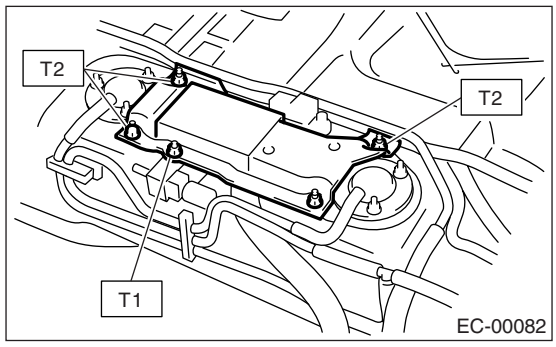
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



Tightening torque:
T1: 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)
T2: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

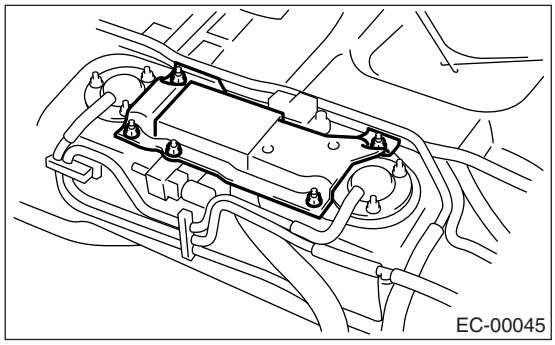
Make sure the hoses are not cracked or loose.

11.Fuel Tank Sensor Control Valve

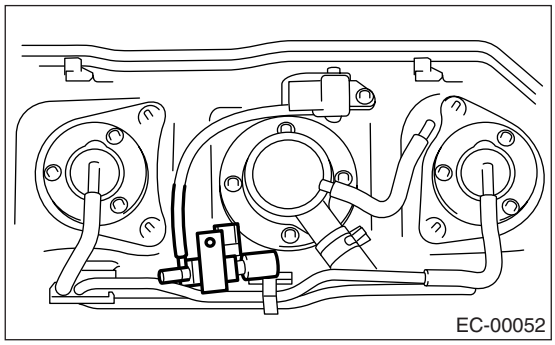
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

1) Remove the fuel tank. <Ref. to FU(H4DOTC)-53, REMOVAL, Fuel Tank.>
2) Remove the protector cover.



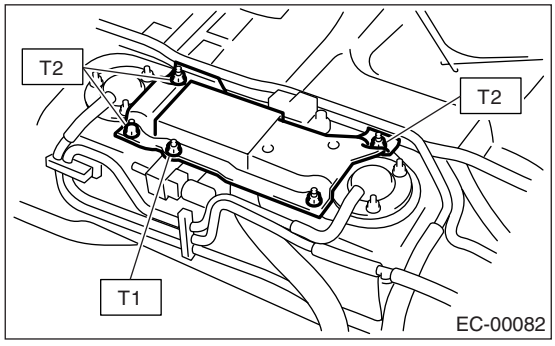
3) Disconnect the connector from fuel tank sensor control valve.
4) Disconnect hose and remove fuel tank sensor control valve.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
T1: 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)
T2: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



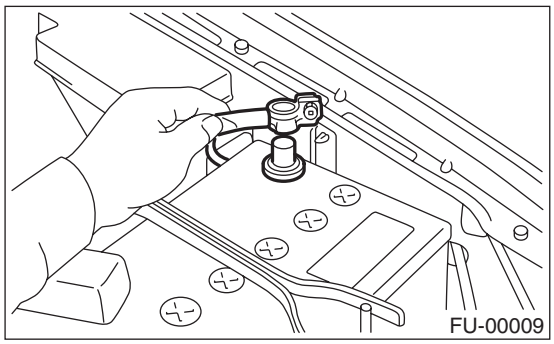
C: INSPECTION

Make sure the hoses are not cracked or loose.

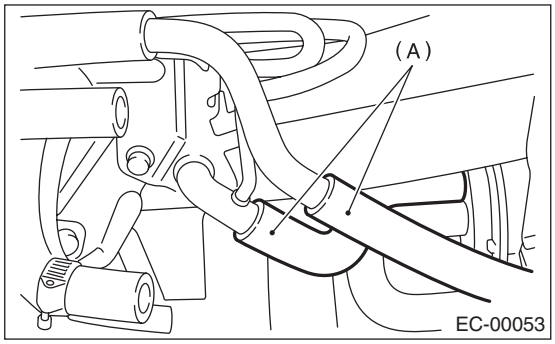
12.Pressure Control Solenoid Valve

A: REMOVAL

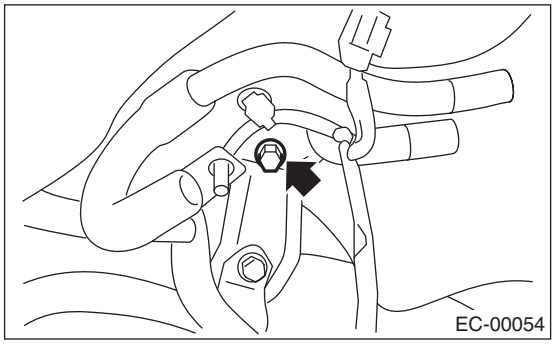
1) Disconnect the ground terminal from battery.



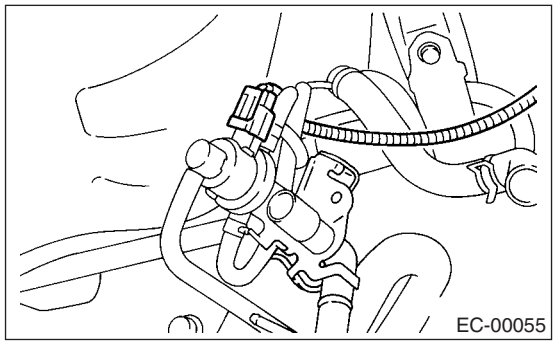
2) Remove the canister. <Ref. to EC(H4DOTC)-6, REMOVAL, Canister.>
3) Disconnect the evaporation hoses (A) from joint pipes.



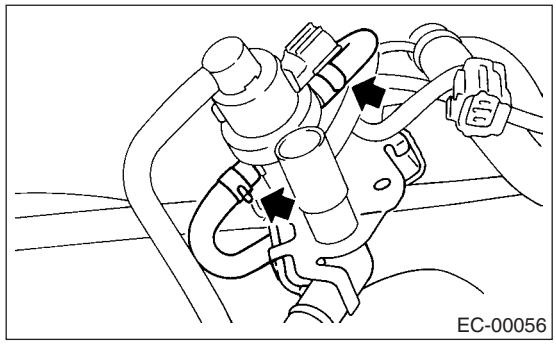
4) Remove the bolt which installs pressure control solenoid valve holding bracket on body.



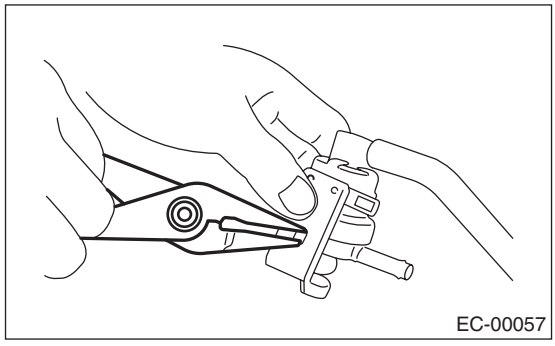
5) Disconnect the connector from pressure control solenoid valve.



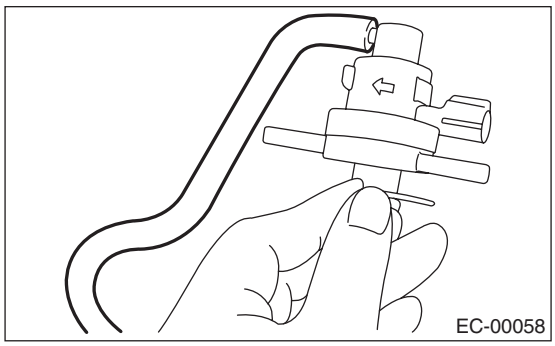
6) Disconnect the two evaporation hoses from pressure control solenoid valve.
7) Remove the pressure control solenoid valve with bracket.



8) Remove the pressure control solenoid valve from bracket.



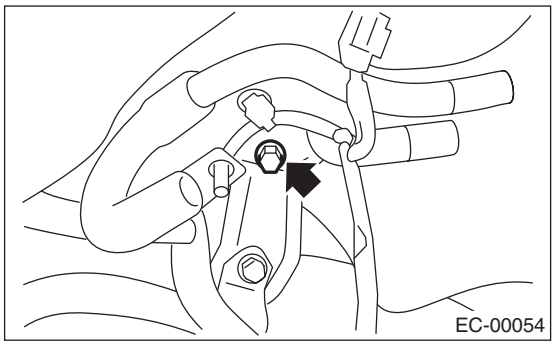
9) Disconnect the vacuum hose from pressure control solenoid valve.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
17.6 N·m (1.8 kgf-m, 13.0 ft-lb)



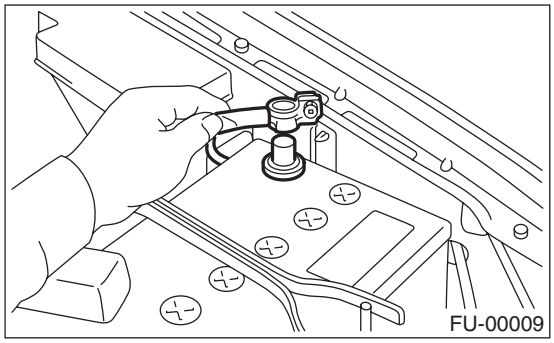
C: INSPECTION

Make sure the hoses are not cracked or loose.

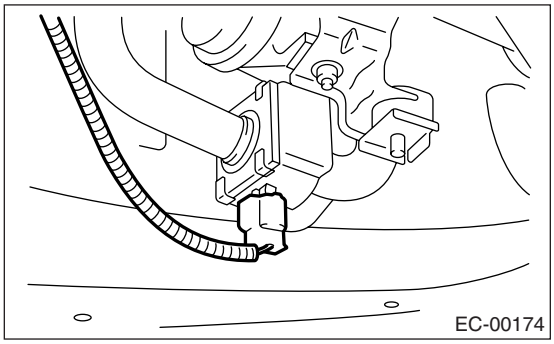
13.Drain Filter

A: REMOVAL

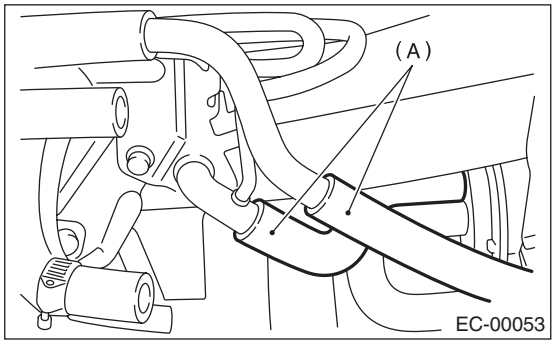
1) Disconnect the ground terminal from battery.



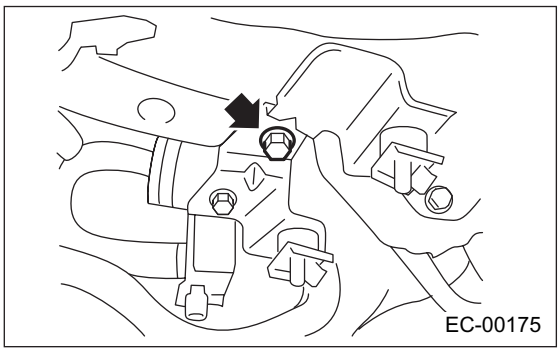
2) Lift-up the vehicle.
3) Remove the canister. <Ref. to EC(H4DOTC)-6, REMOVAL, Canister.>
4) Disconnect the connector from drain valve.



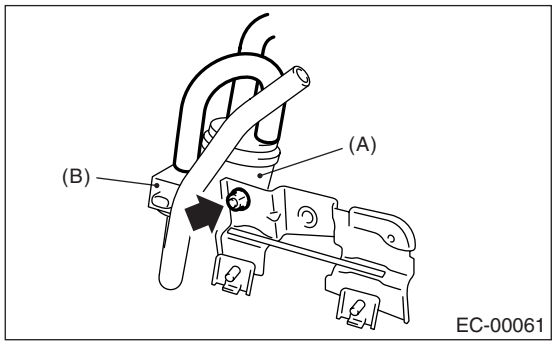
5) Disconnector the evaporation hoses (A) from joint pipes.



6) Remove the bolt which installs the drain filter and drain valve brackets on body, and remove them as a unit.



7) Disconnect the evaporation hoses, and remove the drain filter from the bracket.

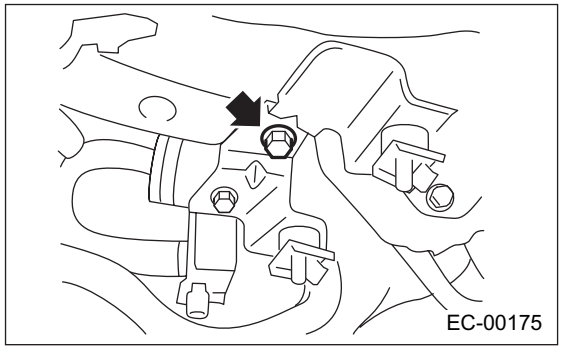


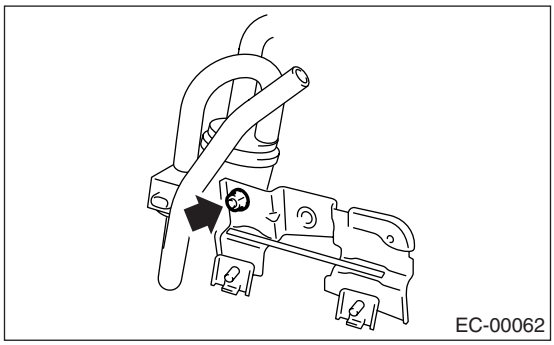
(A) Drain filter
(B) Drain valve

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
23 N·m (2.3 kgf-m, 17 ft-lb)





C: INSPECTION

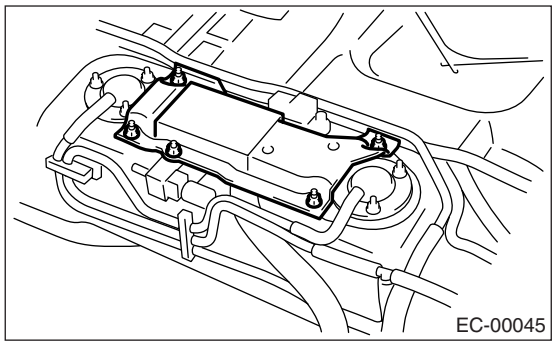
1) Make sure all hoses are installed correctly.
2) Make sure the hoses are not cracked or loose.

14.Vent Valve

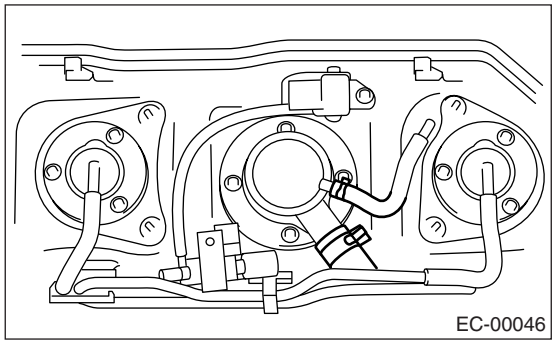
A: REMOVAL

WARNING:
- **Place “NO FIRE” signs near the working area.**
- **Be careful not to spill fuel.**

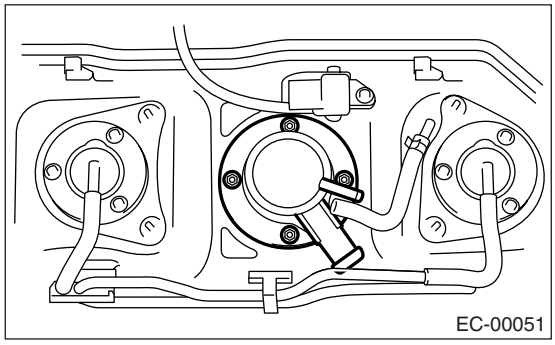
1) Remove the fuel tank. <Ref. to FU(H4DOTC)-53, REMOVAL, Fuel Tank.>
2) Remove the protector cover.



3) Remove the clips, and disconnect the hoses from vent valve.



4) Remove the nuts and then remove the vent valve.

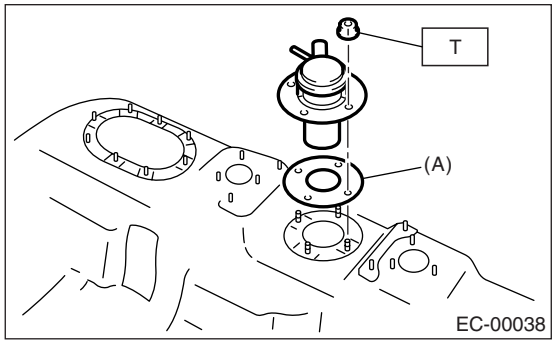


B: INSTALLATION

Install in the reverse order of removal.

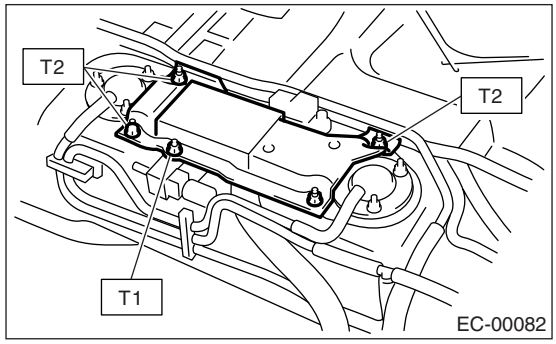
NOTE:
Replace the rubber seat with a new one.

Tightening torque:
T: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



(A) Rubber seat

Tightening torque:
T1: 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)
T2: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

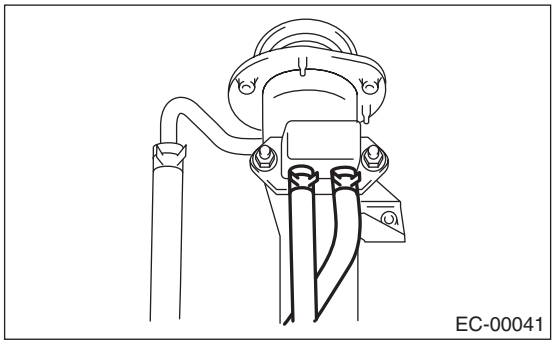
Make sure the hoses are not cracked or loose.

15.Shut Valve

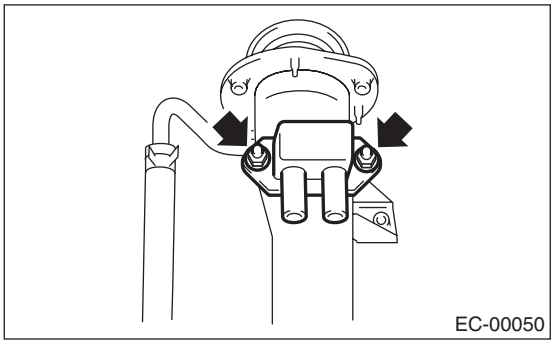
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

1) Remove the fuel filler pipe. <Ref. to FU(H4DOTC)-56, REMOVAL, Fuel Filler Pipe.>
2) Disconnect the evaporation hoses from shut valve.



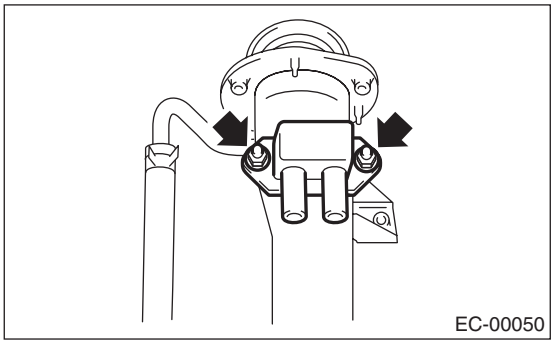
3) Remove the shut valve from fuel filler pipe.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.5 N·m (0.46 kgf-m, 3.3 ft-lb)



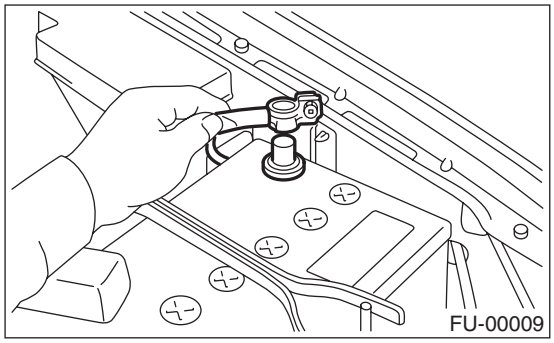
C: INSPECTION

Make sure the hoses are not cracked or loose.

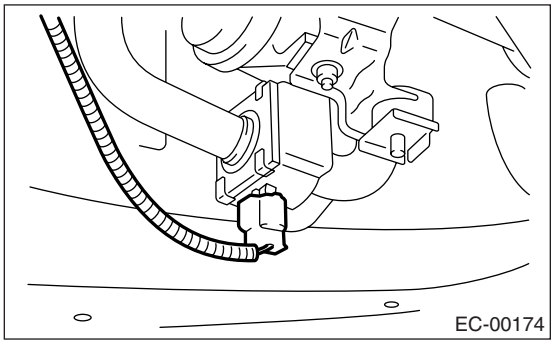
16.Drain Valve

A: REMOVAL

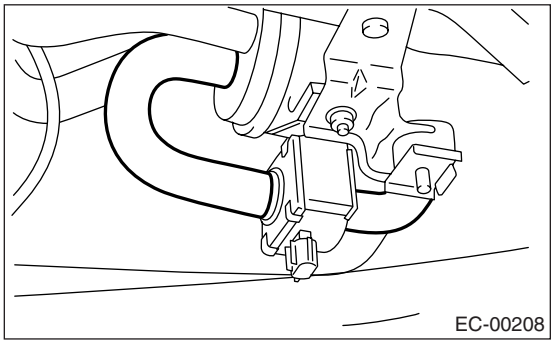
1) Disconnect the ground terminal from battery.



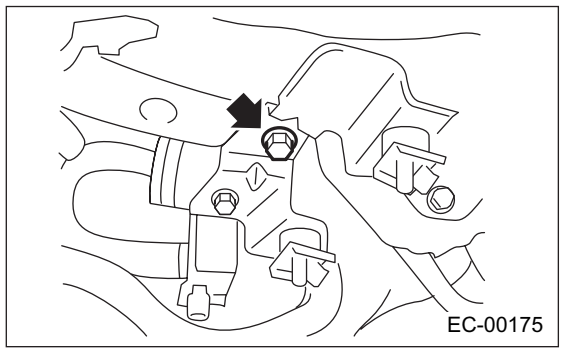
2) Lift-up the vehicle.
3) Remove the canister. <Ref. to EC(H4DOTC)-6, REMOVAL, Canister.>
4) Disconnect the connector from drain valve.



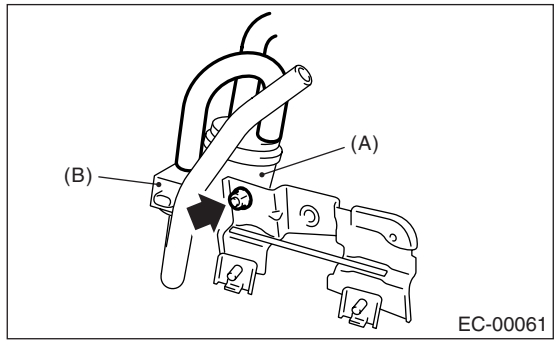
5) Disconnect the evaporation hoses from drain valve.



6) Remove the bolt which installs the drain filter and drain valve brackets on body, and remove them as a unit.



7) Remove the drain valve from bracket.

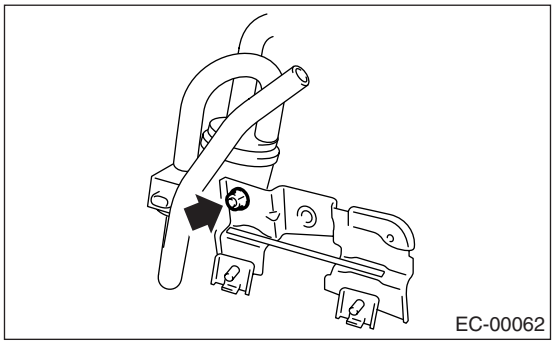


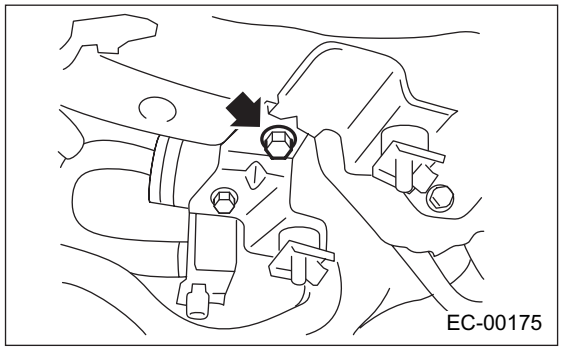
(A) Drain filter
(B) Drain valve

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
23 N·m (2.3 kgf-m, 17 ft-lb)





C: INSPECTION

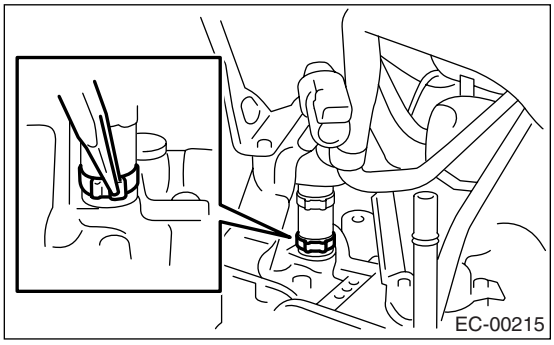
1) Make sure all hoses are installed correctly.
2) Make sure the hoses are not cracked or loose.

17.PCV Hose Assembly

A: REMOVAL

CAUTION:
Removal is not allowed except for the damage of PCV hose, diagnosis connector and PCV valve.

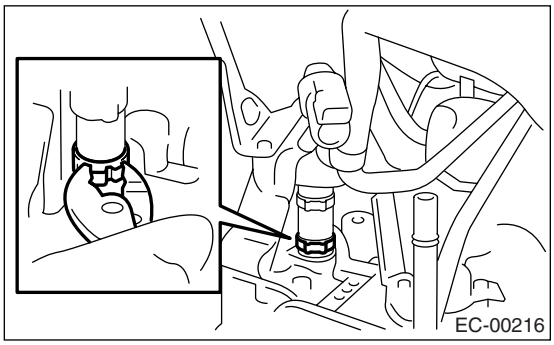
1) Remove the intake manifold.
<Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
2) Remove the clamp using pliers, etc. and then remove the PCV hose assembly.



B: INSTALLATION

NOTE:
Replace the clamp with a new one.

1) Install the PCV hose assembly and lock it with a clamp clipped by pliers.



2) Install the intake manifold.
<Ref. to FU(H4DOTC)-17, INSTALLATION, Intake Manifold.>

INTAKE (INDUCTION)

IN(H4DOTC)

		Page
1.	General Description	2
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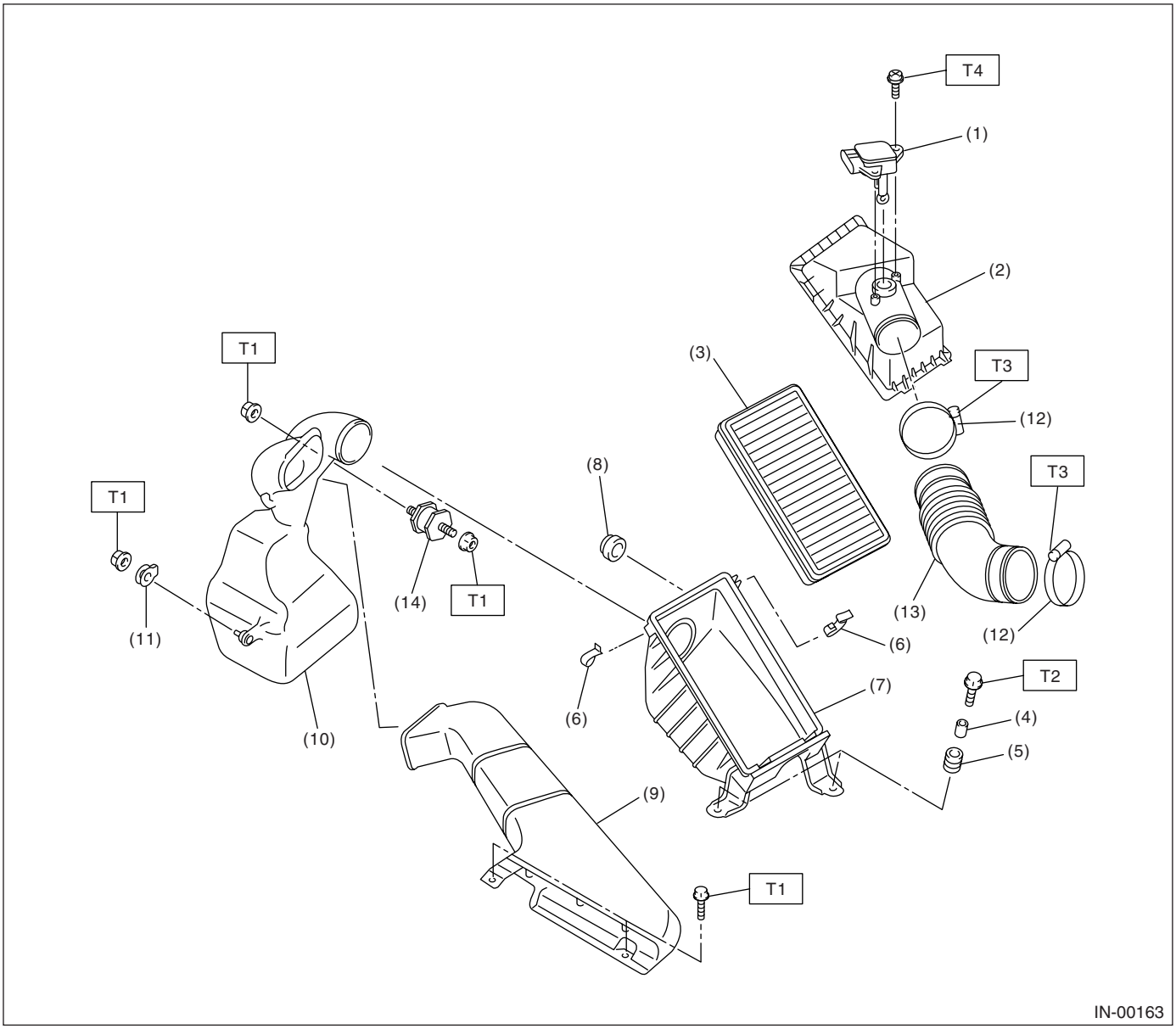
4.	Intake Duct	9
5.	Intercooler	10
6.	Turbocharger	12
7.	Air By-pass Valve	14
8.	Resonator Chamber	15

1. General Description

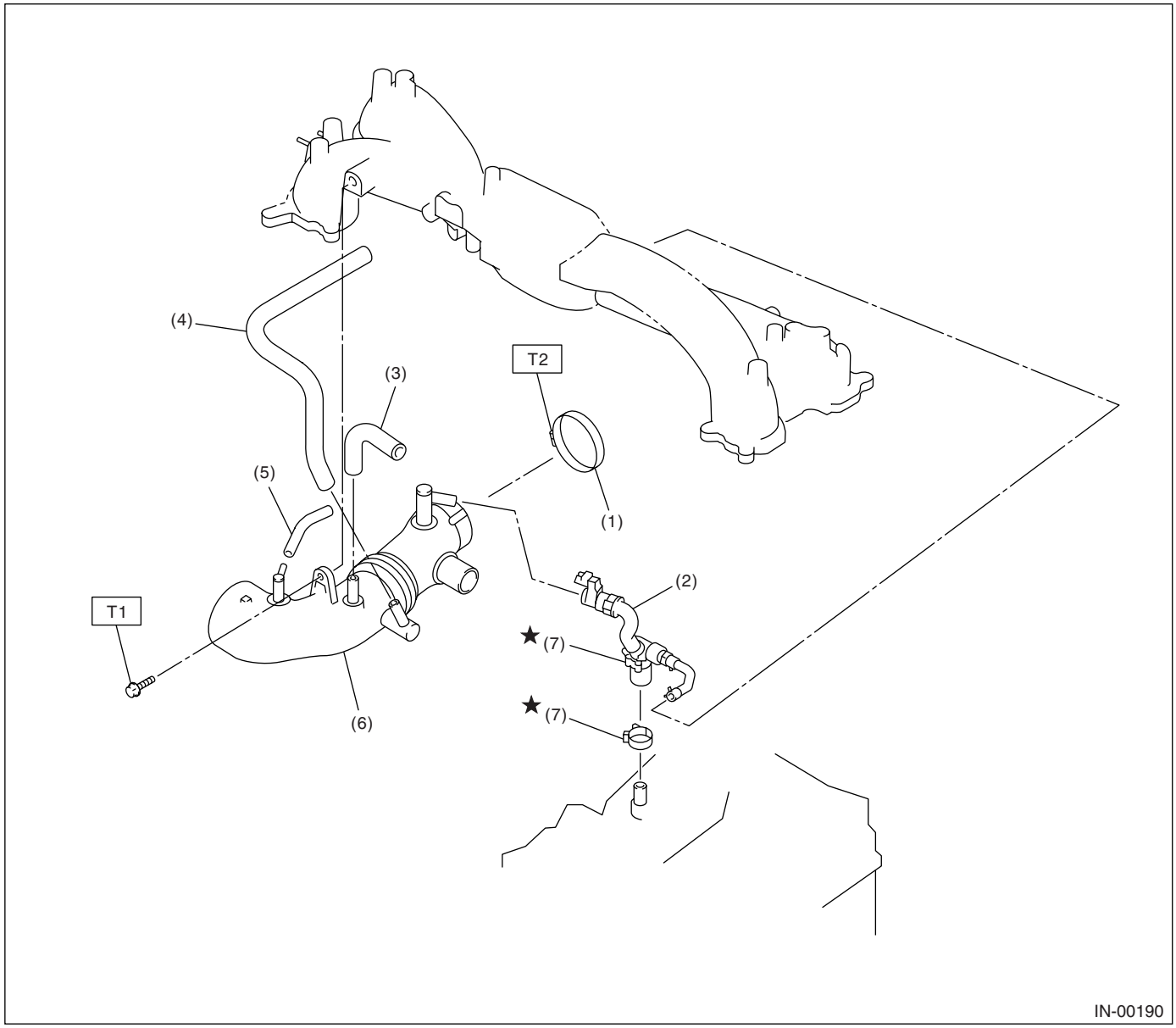
A: COMPONENT

1. AIR CLEANER



(1)	Mass air flow and intake air temperature sensor	(7)	Air cleaner lower case	(14)	Cushion
(2)	Air cleaner upper cover	(8)	Cushion rubber		
(3)	Air cleaner element	(9)	Air intake duct	***Tightening torque: N·m (kgf-m, ft-lb)***	
(4)	Spacer	(10)	Resonator chamber ASSY	***T1: 7.5 (0.76, 5.5)***	
(5)	Bushing	(11)	Cushion rubber	***T2: 33 (3.4, 24.6)***	
(6)	Clip	(12)	Clamp	***T3: 2.5 (0.25, 1.8)***	
		(13)	Air intake boot	***T4: 1.7 (0.17, 1.2)***	

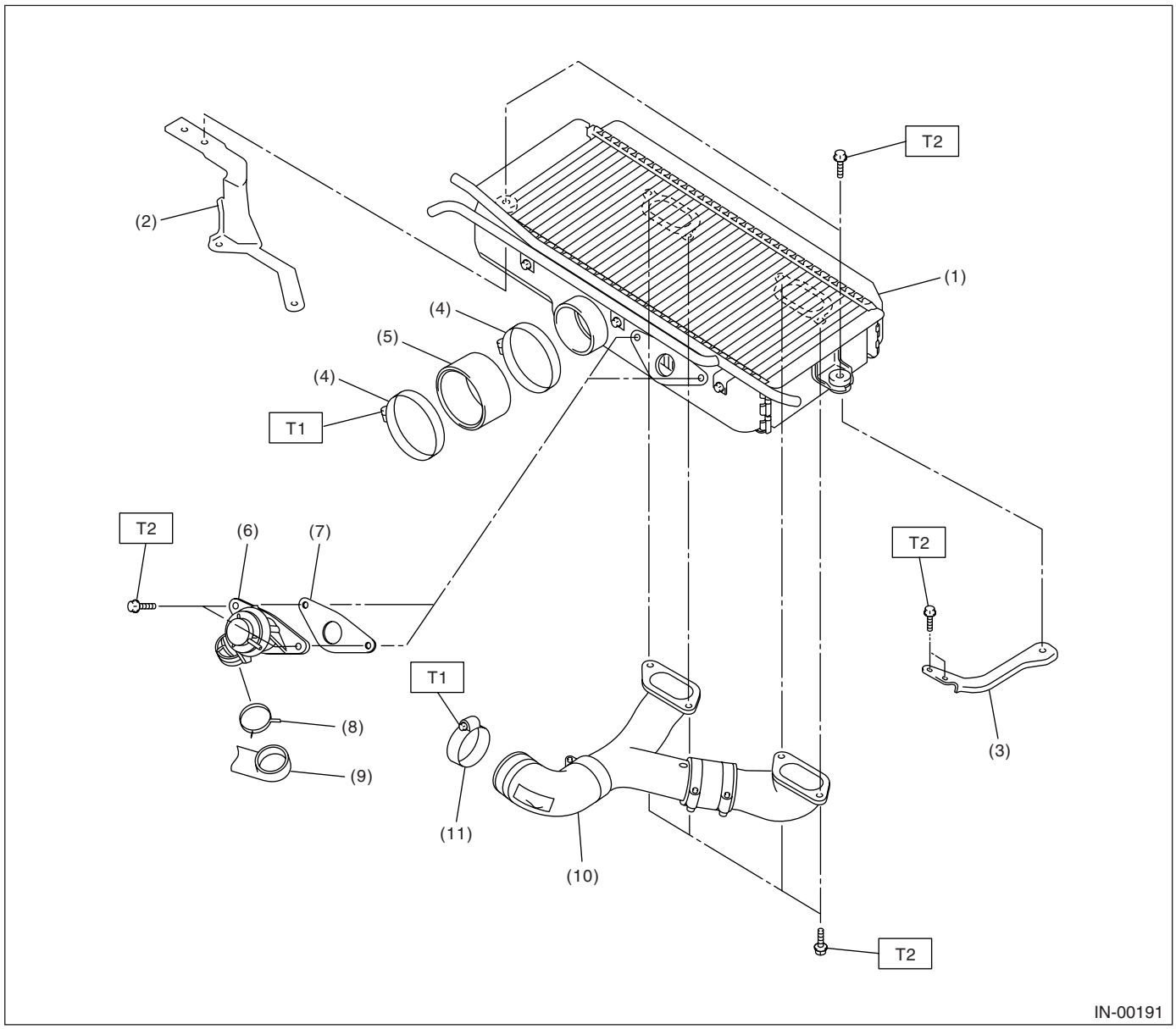
2. INTAKE DUCT



(1) Clamp
(2) PCV hose ASSY
(3) Air by-pass hose A
(4) Air by-pass hose B
(5) Air by-pass hose C
(6) Intake duct
(7) Clamp

Tightening torque: N·m (kgf-m, ft-lb)
T1: 19 (1.9, 13.7)
T2: 3 (0.3, 2.2)

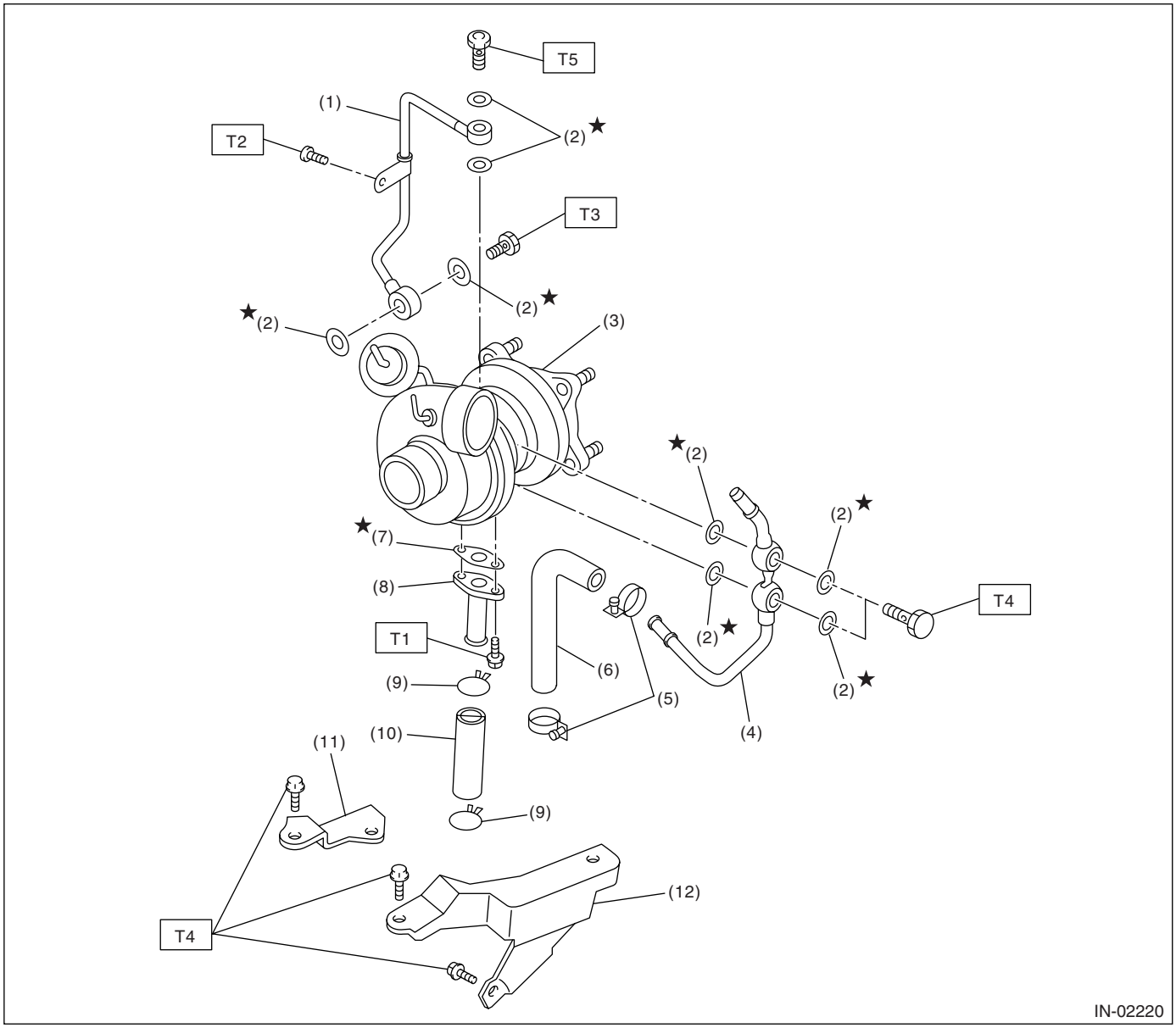
3. INTERCOOLER



(1) Intercooler
(2) Intercooler bracket RH
(3) Intercooler bracket LH
(4) Clamp
(5) Air intake duct
(6) Air by-pass valve
(7) Gasket
(8) Clamp
(9) Air by-pass hose A
(10) Intercooler duct
(11) Clamp

Tightening torque: N·m (kgf-m, ft-lb)
T1: 3 (0.3, 2.2)
T2: 16 (1.6, 11.6)

4. TURBOCHARGER



(1) Oil inlet pipe
(2) Metal gasket
(3) Turbocharger
(4) Water pipe
(5) Clamp
(6) Engine coolant hose
(7) Gasket
(8) Oil outlet pipe
(9) Clip
(10) Oil outlet hose
(11) Turbocharger bracket RH
(12) Turbocharger bracket LH

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 4.9 (0.50, 3.6)
T3: 29 (3.0, 21.7)
T5: 33 (3.4, 24.6)
T6: 16 (1.6, 11.6)

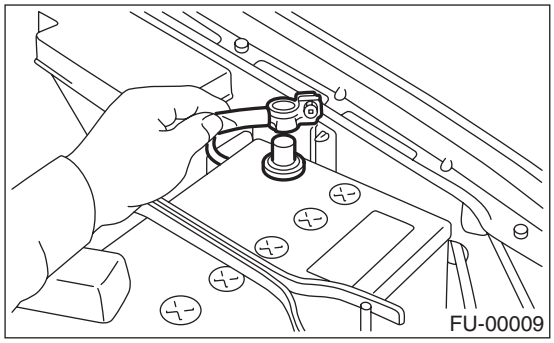
B: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensor or units, be sure to disconnect the ground cable from battery.

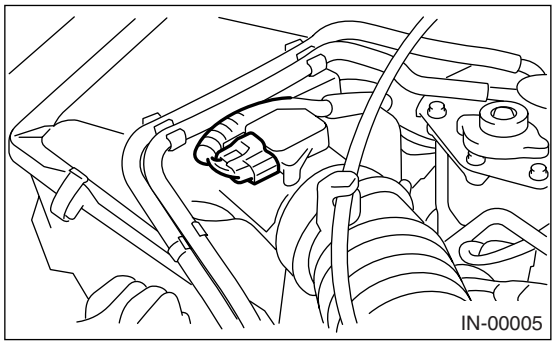
2. Air Cleaner

A: REMOVAL

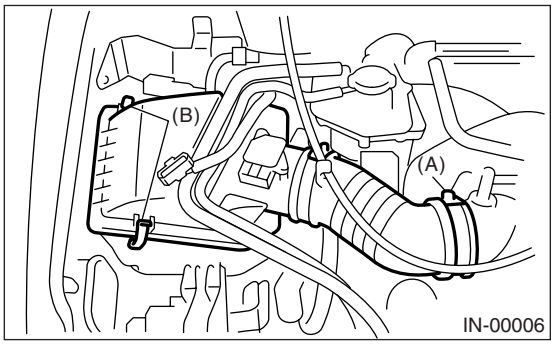
1) Disconnect the ground cable from battery.



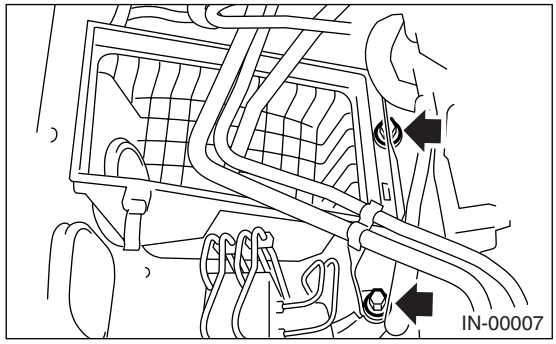
2) Disconnect the connector from mass air flow sensor.



3) Loosen the clamp (A) which connects the air intake boot and intake duct.
4) Remove the clip (B) from air cleaner upper cover.



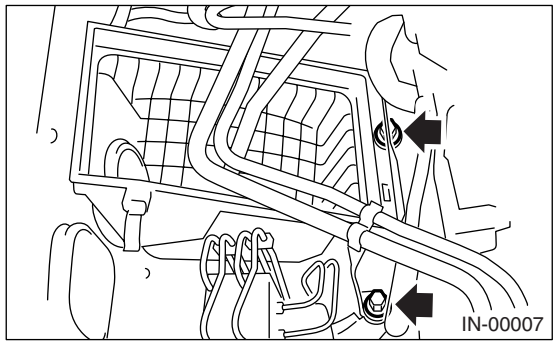
5) Remove the air cleaner upper cover.
6) Remove the air cleaner element.
7) Remove the air cleaner lower case.



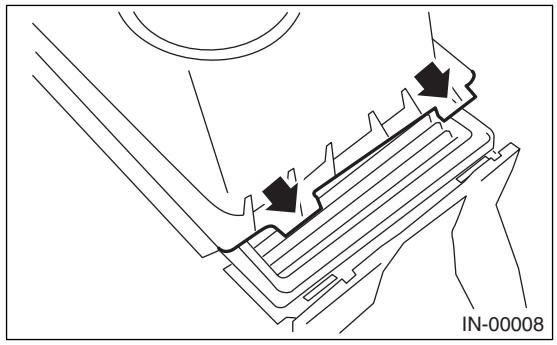
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)



NOTE:
Before installing the air cleaner upper cover, align the holes with protruding portions of air cleaner lower case, then secure the upper cover to the lower case.



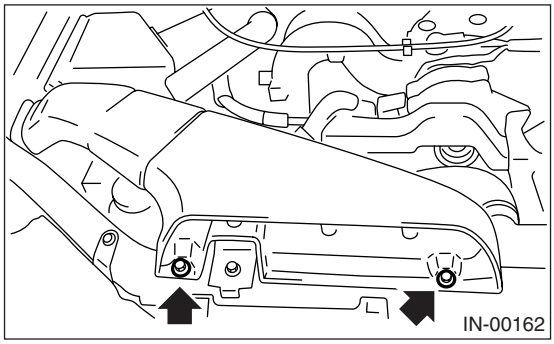
C: INSPECTION

Replace it if excessively damaged or dirty.

3. Air Intake Duct

A: REMOVAL

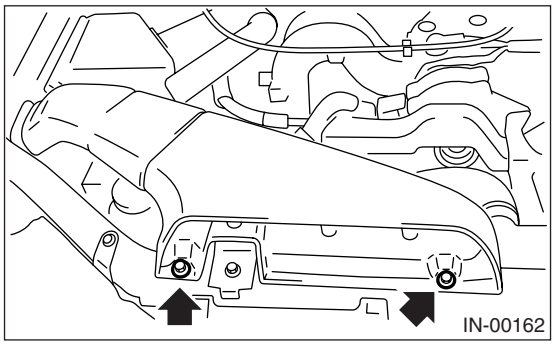
Remove the bolts which install the air intake duct on front side of body.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 55 ft-lb)



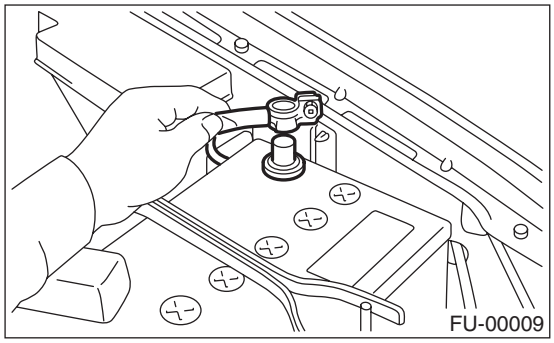
C: INSPECTION

1) Inspect for cracks and loose connections.
2) Inspect that no foreign objects are mixed in air intake duct.

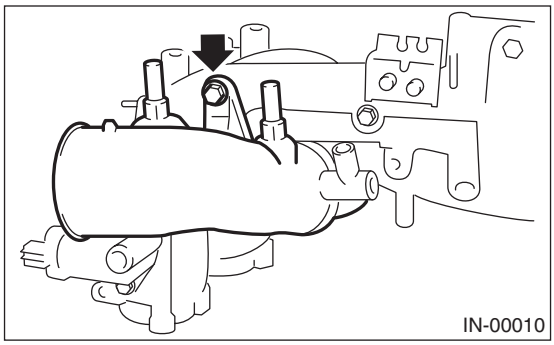
4. Intake Duct

A: REMOVAL

1) Disconnect the ground cable from battery.



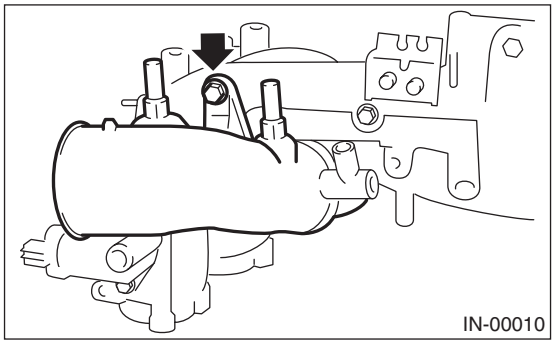
2) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
3) Remove the sensor, engine harness and fuel pipe attached to intake manifold. <Ref. to FU(H4DOTC)-19, DISASSEMBLY, Intake Manifold.>
4) Remove the intake duct from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

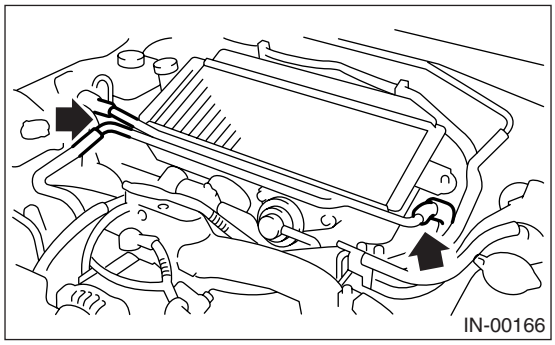
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



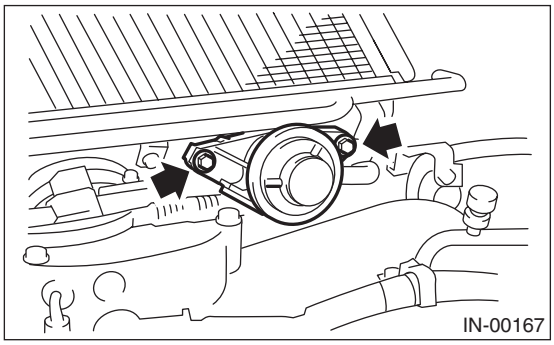
5. Intercooler

A: REMOVAL

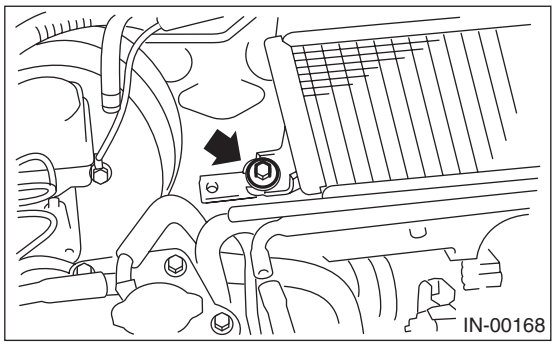
1) Disconnect the air by-pass hoses from intercooler.

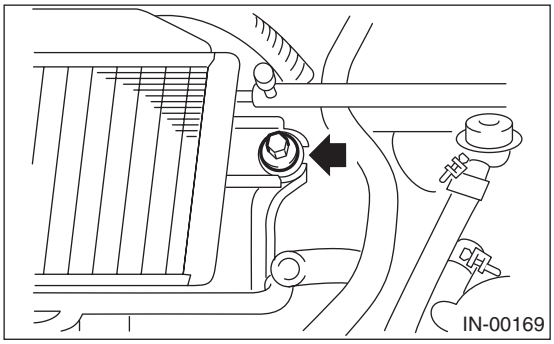


2) Separate the air by-pass valve from intercooler.



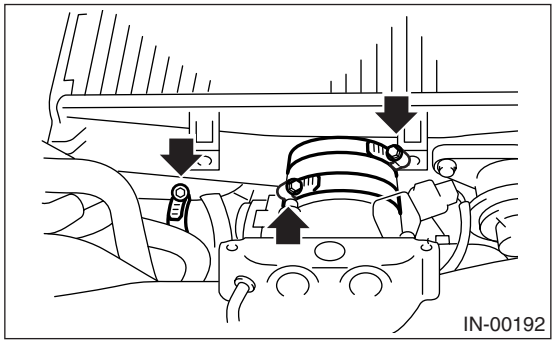
3) Remove the bolts which secure the intercooler to bracket.





4) Separate the intercooler air duct from turbocharger.

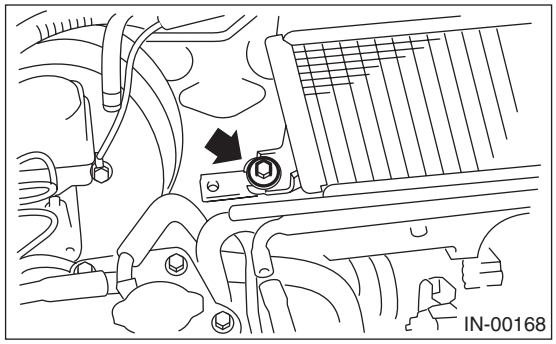
5) Separate the intercooler from throttle body.

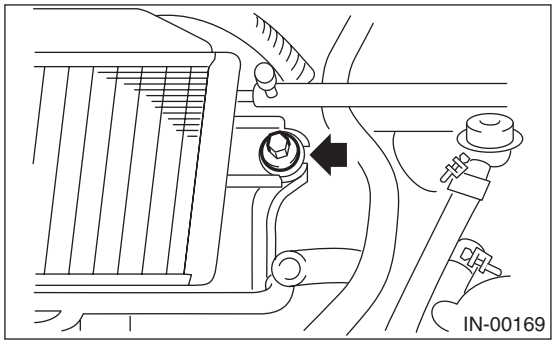


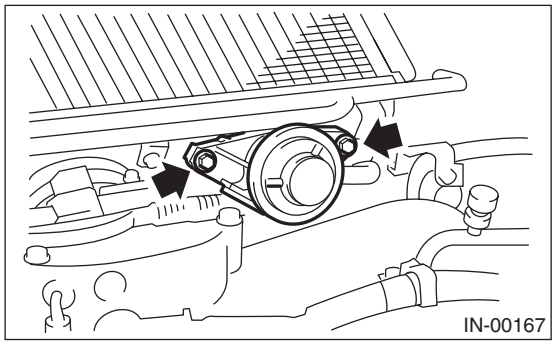
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)

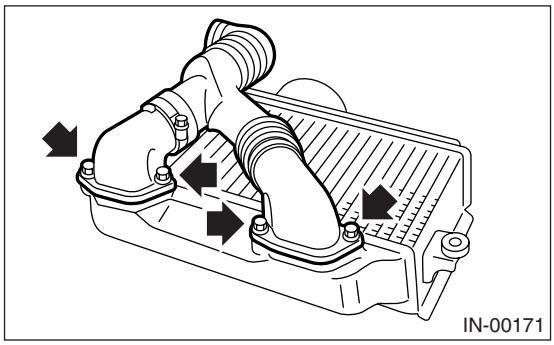






C: DISASSEMBLY

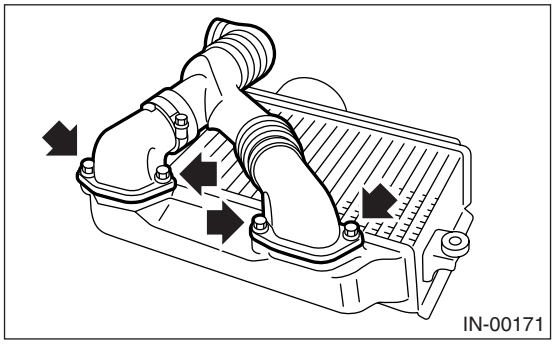
Remove the intercooler ducts from intercooler.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

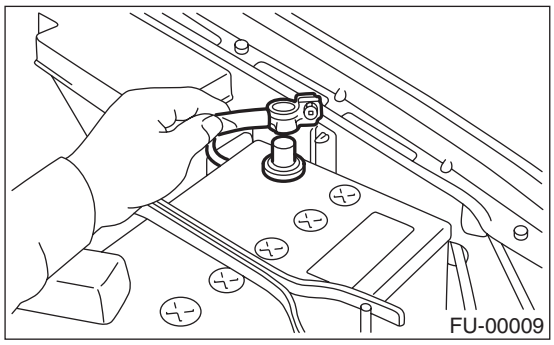
Tightening torque:
16 N·m (1.6 kgf-m, 11.7 ft-lb)



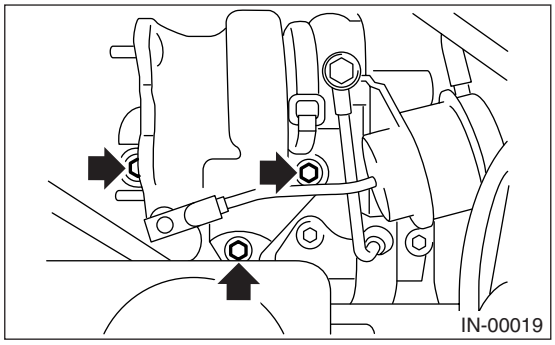
6. Turbocharger

A: REMOVAL

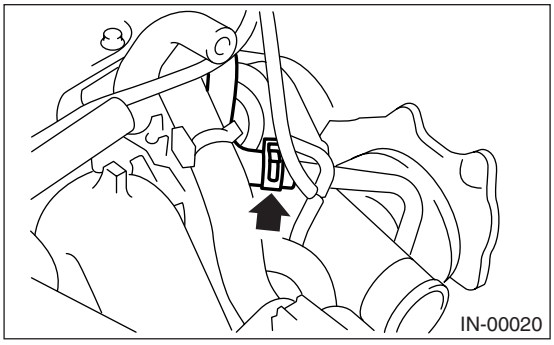
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



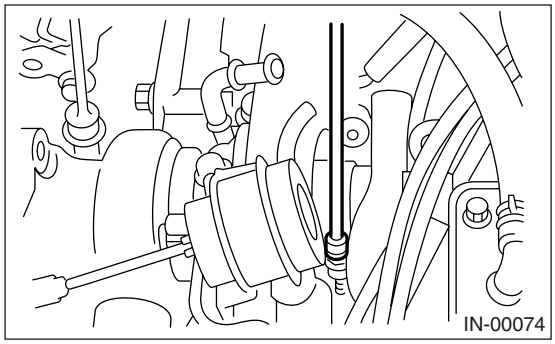
3) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
4) Lower the vehicle.
5) Separate the turbocharger joint pipe from turbocharger.



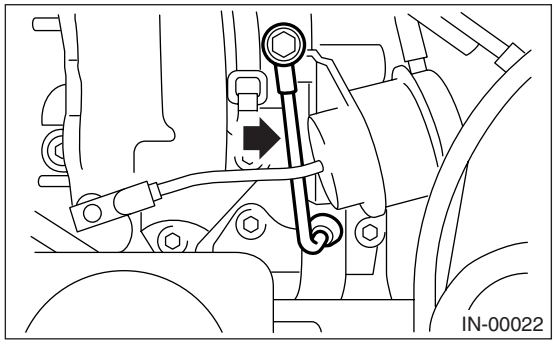
6) Disconnect the engine coolant hose which is connected to coolant filler tank.



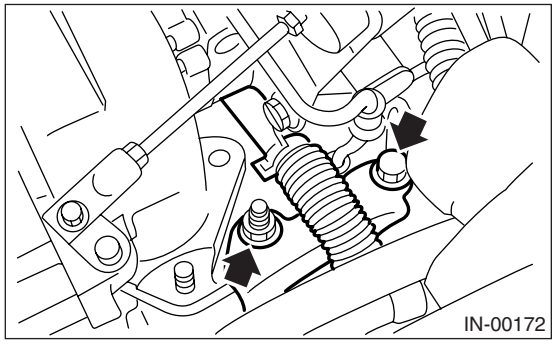
7) Loosen the clamp which secures the turbocharger to intake duct.



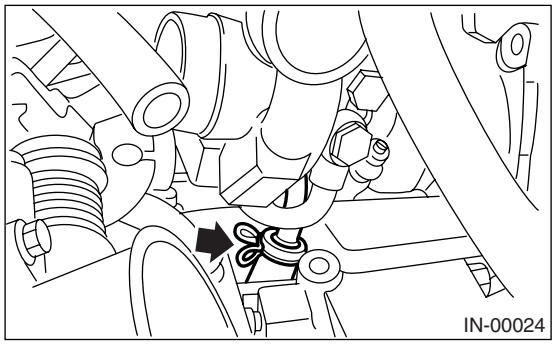
8) Remove the bolt which secures the bracket of oil pipe to turbocharger.
9) Remove the oil pipe from turbocharger.



10) Disconnect the engine coolant hose.
11) Remove the turbocharger bracket.



12) Disconnect the oil outlet hose from pipe.

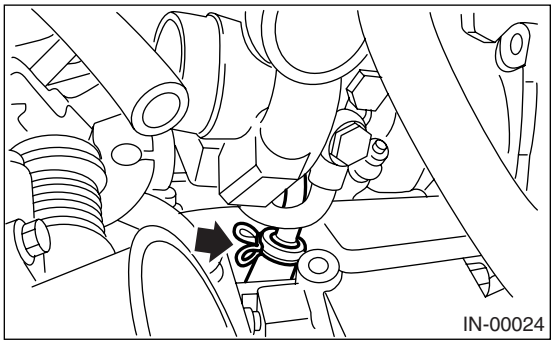


13) Take out the turbocharger from engine compartment.

B: INSTALLATION

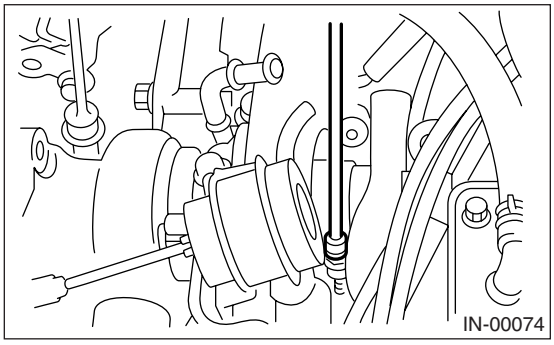
CAUTION:
When replacing the turbocharger, check the filter part of union screw for clogging. <Ref. to LU(H4DOTC)-20, INSPECTING UNION SCREW WITH FILTER, INSPECTION, Oil Pipe.>

1) Connect the oil outlet hose to outlet pipe.



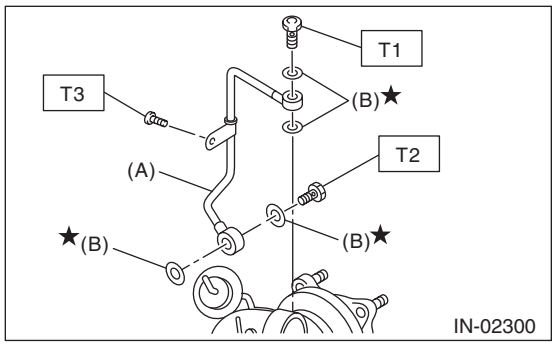
2) Install the turbocharger to intake duct.

Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)



3) Install the oil pipe to turbocharger.

Tightening torque:
T1: 16 N·m (1.6 kgf-m, 11.6 ft-lb)
T2: 29 N·m (3.0 kgf-m, 21.7 ft-lb)
T3: 4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

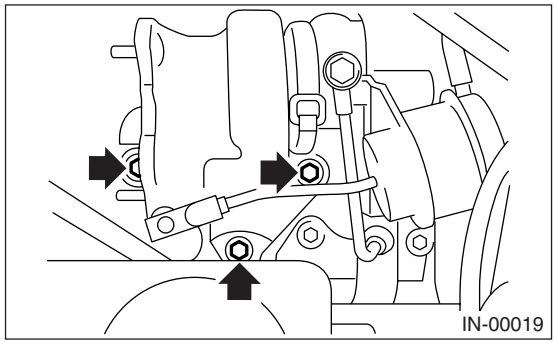


(A) Oil inlet pipe
(B) Metal gasket

4) Install the joint pipe to turbocharger.

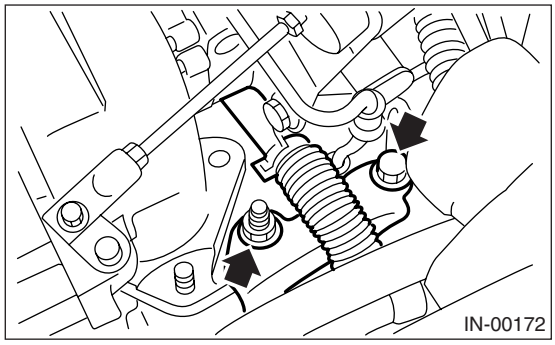
NOTE:
Replace the gasket with a new one.

Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

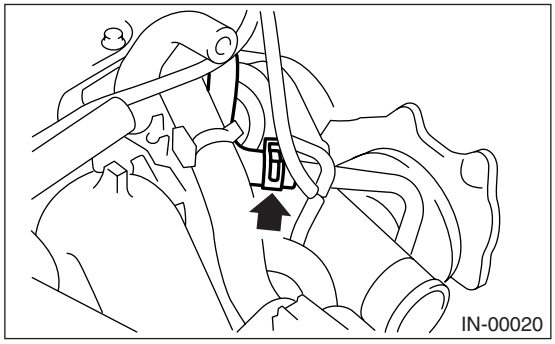


5) Connect the engine coolant hose.
6) Install the turbocharger bracket.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)



7) Connect the engine coolant hose which is connected to coolant filler tank.

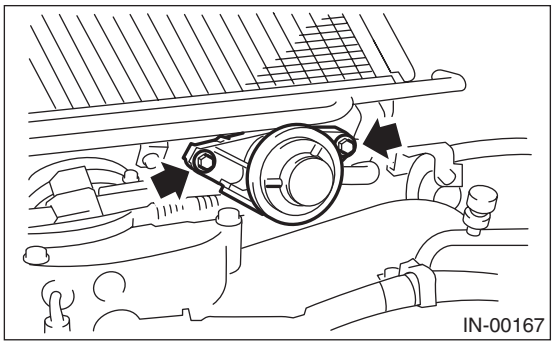


8) Lift-up the vehicle.
9) Install the center exhaust pipe. <Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>

7. Air By-pass Valve

A: REMOVAL

1) Remove the air by-pass valve from intercooler.

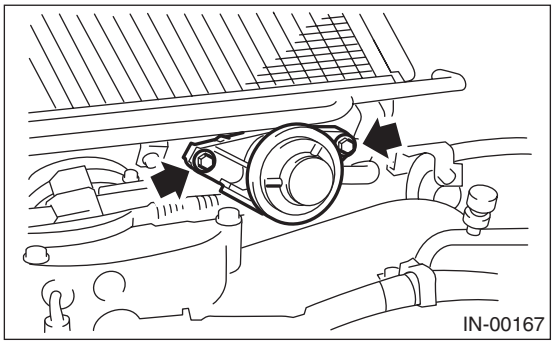


2) Disconnect the air by-pass hoses from air by-pass valve.

B: INSTALLATION

Install in the reverse order of removal.

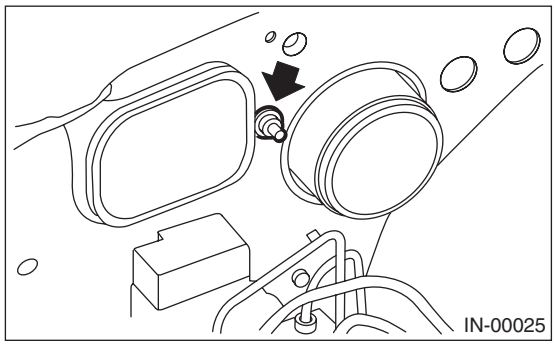
Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



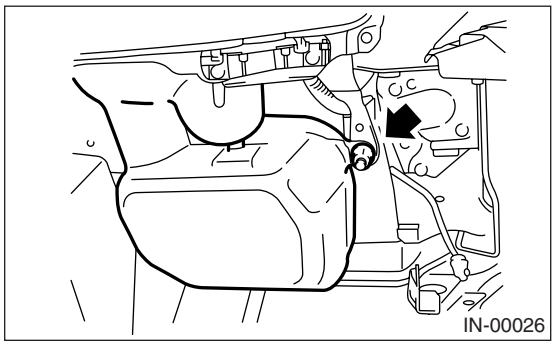
8. Resonator Chamber

A: REMOVAL

1) Set the vehicle on a lift.
2) Remove the air intake duct. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Intake Duct.>
3) Remove the air cleaner lower case. <Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner.>
4) Remove the resonator chamber mounting bolt on right side of engine compartment.



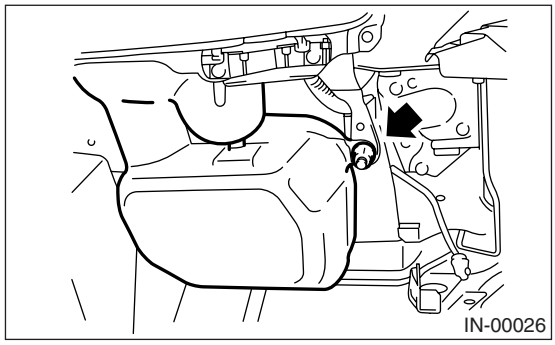
5) Remove the front right tire, and lift up the vehicle.
6) Remove the front mudguard RH.
7) Remove the resonator chamber from the inside front fender.

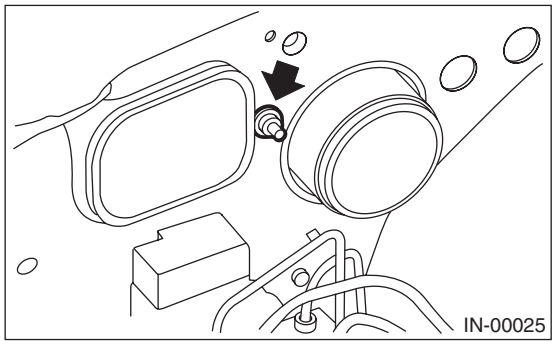


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)





C: INSPECTION

Inspect for cracks and loose connections. Check that no foreign objects are mixed in resonator chamber.

MECHANICAL

ME(H4DOTC)

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1. General Description

A: SPECIFICATIONS

Engine	Type			Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine
	Valve arrangement			Belt driven, double overhead camshaft, 4-valve/cylinder
	Bore × Stroke mm (in)			92 × 75 (3.62 × 2.95)
	Piston displacement cm^3 (cu in)			1,994 (121.67)
	Compression ratio			8.0
	Compression pressure (at 200 — 300 rpm) kPa (kgf/cm^2, psi)			981 — 1,177 (10 — 12, 142 — 171)
	Number of piston rings			Pressure ring: 2, Oil ring: 1
	Intake valve timing	Opening		BTDC 10°
		Closing		ABDC 50°
	Exhaust valve timing	Opening		BBDC 53°
		Closing		ATDC 7°
	Valve clearance	Intake	STD	0.20±0.02 mm (0.0079±0.0008 in)
		Exhaust	STD	0.35±0.02 mm (0.0136±0.0008 in)
	Idling speed [At neutral position on MT or “P” or “N” range on AT] rpm		MT	750±100 (No load) 800±150 (A/C switch ON)
			AT	750±100 (No load) 825±150 (A/C switch ON)
	Firing order			1 → 3 → 2 → 4
	Ignition timing BTDC/rpm			12°±3°/700

NOTE:
STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter OS: Oversize US: Undersize

Belt tension adjuster	Protrusion of adjuster rod			5.2 — 6.2 mm (0.205 — 0.244 in)
Belt tensioner	Spacer O.D.			17.955 — 17.975 mm (0.7069 — 0.7077 in)
	Tensioner bush I.D.			18.0 — 18.08 mm (0.7087 — 0.7118 in)
	Clearance between spacer and bush		STD	0.025 — 0.125 mm (0.0010 — 0.0049 in)
			Limit	0.175 mm (0.0069 in)
	Side clearance of spacer		STD	0.2 — 0.55 mm (0.0079 — 0.0217 in)
			Limit	0.81 mm (0.0319 in)
Camshaft	Bend limit			0.020 mm (0.00079 in)
	Thrust clearance		STD	0.040 — 0.080 mm (0.0016 — 0.0031 in)
			Limit	0.10 mm (0.0039 in)
	Cam lobe height	Intake	STD	46.25 — 46.35 mm (1.821 — 1.825 in)
			Limit	46.15 mm (1.817 in)
		Exhaust	STD	46.15 — 46.25 mm (1.817 — 1.821 in)
			Limit	46.05 mm (1.813 in)
	Journal O.D.	STD	Front	37.946 — 37.963 mm (1.4939 — 1.4946 in)
			Center rear	29.946 — 29.963 mm (1.1790 — 1.1796 in)
	Oil clearance		STD	0.037 — 0.072 mm (0.0015 — 0.0028 in)
			Limit	0.10 mm (0.0039 in)
Cylinder head	Surface warpage limit			0.05 mm (0.0020 in)
	Surface grinding limit			0.3 mm (0.012 in)
	Standard height			127.5 mm (5.02 in)

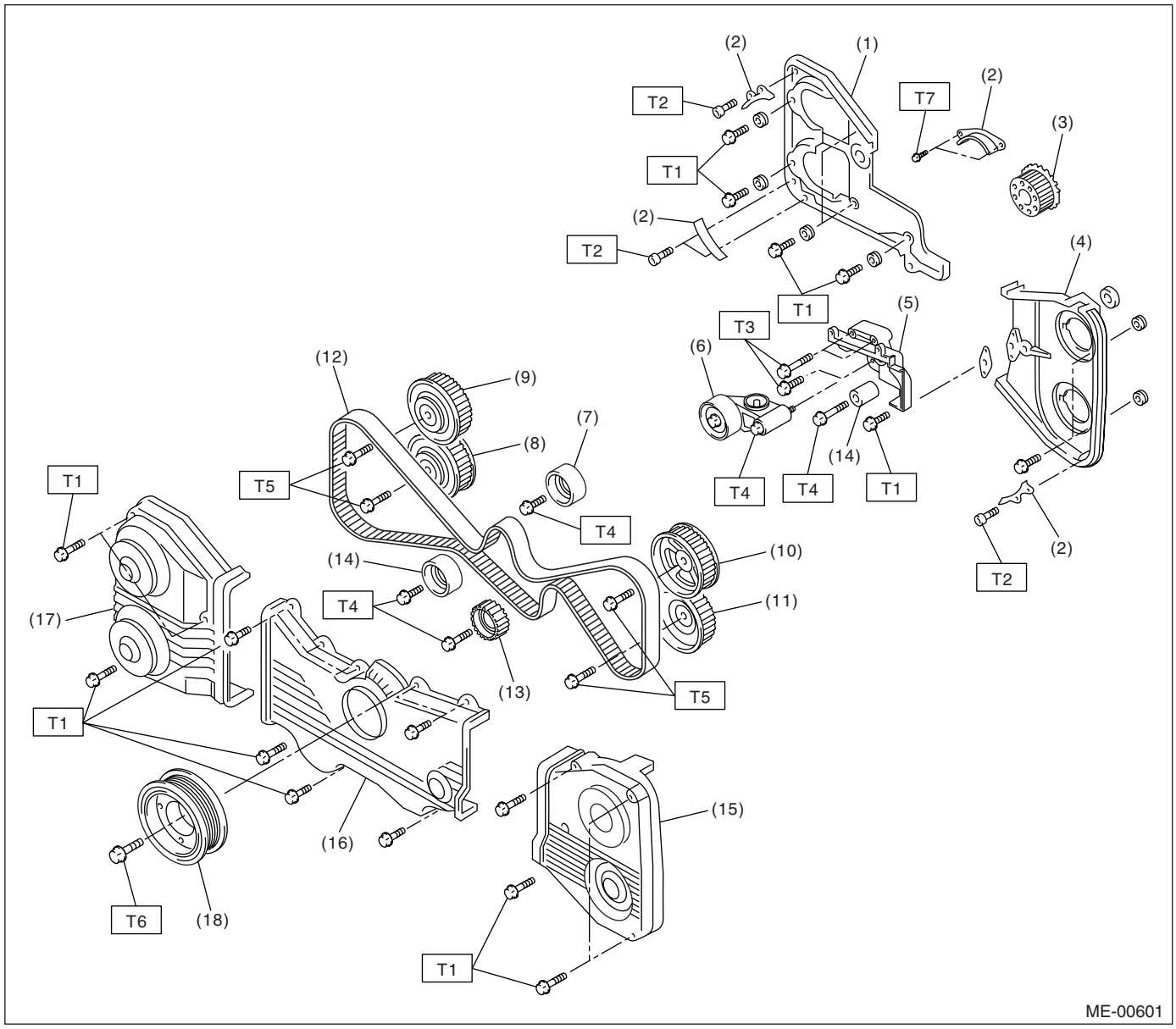
Valve seat	Refacing angle			90°
	Contacting width	Intake	STD	1.0 mm (0.039 in)
			Limit	1.7 mm (0.067 in)
		Exhaust	STD	1.5 mm (0.059 in)
			Limit	2.2 mm (0.087 in)
Valve guide	Inner diameter			6.000 — 6.012 mm (0.2362 — 0.2367 in)
	Protrusion above head			15.8 — 16.2 mm (0.622 — 0.638 in)
Valve	Head edge thickness	Intake	STD	1.2 mm (0.047 in)
			Limit	0.8 mm (0.031 in)
		Exhaust	STD	1.5 mm (0.059 in)
			Limit	0.8 mm (0.031 in)
	Stem diameter		Intake	5.955 — 5.970 mm (0.2344 — 0.2350 in)
			Exhaust	5.945 — 5.960 mm(0.2341 — 0.2346 in)
	Stem oil clearance	STD	Intake	0.030 — 0.057 mm (0.0012 — 0.0022 in)
			Exhaust	0.040 — 0.067 mm (0.0016 — 0.0026 in)
		Limit	—	0.15 mm (0.0059 in)
	Overall length		Intake	104.4 mm (4.110 in)
			Exhaust	104.7 mm (4.122 in)
Valve spring	Free length			47.32 mm (1.8630 in)
	Squareness			2.5°, 2.1 mm (0.083 in)
	Tension/spring height		Set	205 — 235 N (20.9 — 24.0 kgf, 46.1 — 52.8 lb)/ 36.0 mm (1.417 in)
			Lift	426 — 490 N (43.4 — 50.0 kgf, 95.8 — 110 lb)/ 26.5 mm (1.043 in)
Cylinder block	Surface warpage limit (mating with cylinder head)			0.05 mm (0.0020 in)
	Surface grinding limit			0.1 mm (0.004 in)
	Cylinder bore	STD	A	92.005 — 92.015 mm (3.6222 — 3.6226 in)
			B	91.995 — 92.005 mm (3.6218 — 3.6222 in)
	Taper		STD	0.015 mm (0.0006 in)
			Limit	0.050 mm (0.0020 in)
	Out-of-roundness		STD	0.010 mm (0.0004 in)
			Limit	0.050 mm (0.0020 in)
	Piston clearance		STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.050 mm (0.0020 in)
	Enlarging (boring) limit			0.5 mm (0.020 in)
Piston	Outer diameter	STD	A	91.985 — 91.995 mm (3.6214 — 3.6218 in)
			B	91.975 — 91.985 mm (3.6211 — 3.6214 in)
		0.25 mm (0.0098 in) OS		92.225 — 92.235 mm (3.6309 — 3.6313 in)
		0.50 mm (0.0197 in) OS		92.475 — 92.485 mm (3.6407 — 3.6411 in)
Piston pin	Standard clearance between piston pin and hole in piston		STD	0.004 — 0.008 mm (0.0002 — 0.0003 in)
			Limit	0.020 mm (0.0008 in)
	Degree of fit			Piston pin must be fitted into position with thumb at 20°C (68°F).

Piston ring	Piston ring gap	Top ring	STD	0.20 — 0.25 mm (0.0079 — 0.0098 in)
			Limit	1.0 mm (0.039 in)
		Second ring	STD	0.40 — 0.50 mm (0.016 — 0.020 in)
			Limit	1.0 mm (0.039 in)
		Oil ring	STD	0.20 — 0.50 mm (0.0079 — 0.020 in)
			Limit	1.5 mm (0.059 in)
	Clearance between piston ring and piston ring groove	Top ring	STD	0.04 — 0.08 mm (0.0016 — 0.0031 in)
			Limit	0.15 mm (0.0059 in)
		Second ring	STD	0.030 — 0.070 mm (0.0012 — 0.0028 in)
			Limit	0.15 mm (0.0059 in)
Connecting rod	Bend twist per 100 mm (3.94 in) in length		Limit	0.10 mm (0.0039 in)
	Side clearance		STD	0.070 — 0.330 mm (0.0028 — 0.0130 in)
			Limit	0.4 mm (0.016 in)
Connecting rod bearing	Oil clearance		STD	0.020 — 0.046 mm (0.0008 — 0.0018 in)
			Limit	0.05 mm (0.0020 in)
	Thickness at center portion		STD	1.486 — 1.498 mm (0.0585 — 0.0590 in)
			0.03 mm (0.0012 in) US	1.504 — 1.512 mm (0.0592 — 0.0595 in)
			0.05 mm (0.0020 in) US	1.514 — 1.522 mm (0.0596 — 0.0599 in)
			0.25 mm (0.0098 in) US	1.614 — 1.622 mm (0.0635 — 0.0639 in)
Connecting rod bushing	Clearance between piston pin and bushing		STD	0 — 0.022 mm (0 — 0.0009 in)
			Limit	0.030 mm (0.0012 in)
Crankshaft	Bend limit			0.035 mm (0.0014 in)
	Crank pin and crank journal	Out-of-roundness		0.005 mm (0.0002 in) or less
		Grinding limit		0.25 mm (0.0098 in)
	Crank pin outer diameter		STD	51.984 — 52.000 mm (2.0466 — 2.0472)
			0.03 mm (0.0012 in) US	51.954 — 51.970 mm (2.0454 — 2.0461)
			0.05 mm (0.0020 in) US	51.934 — 51.950 mm (2.0447 — 2.0453)
			0.25 mm (0.0098 in) US	51.734 — 51.750 mm (2.0368 — 2.0374)
	Crank journal outer diameter	#1, #3, #5	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)

Crankshaft	Crank journal outer diameter	#2, #4	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
	Thrust clearance		STD	0.030 — 0.115 mm (0.0012 — 0.0045 in)
			Limit	0.25 mm (0.0098 in)
	Oil clearance	#1	STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#2	STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.045 mm (0.0018 in)
		#3	STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#4	STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.045 mm (0.0018 in)
		#5	STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
Crankshaft bearing	Crankshaft bearing thickness	#1, #3	STD	1.998 — 2.011 mm (0.0787 — 0.0792 in)
			0.03 mm (0.0012 in) US	2.017 — 2.020 mm (0.0794 — 0.0795 in)
			0.05 mm (0.0020 in) US	2.027 — 2.030 mm (0.0798 — 0.0799 in)
			0.25 mm (0.0098 in) US	2.127 — 2.130 mm (0.0837 — 0.0839 in)
		#2, #4, #5	STD	2.000 — 2.013 mm (0.0787 — 0.0793 in)
			0.03 mm (0.0012 in) US	2.019 — 2.022 mm (0.0795 — 0.0796 in)
			0.05 mm (0.0020 in) US	2.029 — 2.032 mm (0.0799 — 0.0800 in)
			0.25 mm (0.0098 in) US	2.129 — 2.132 mm (0.0838 — 0.0839 in)

B: COMPONENT

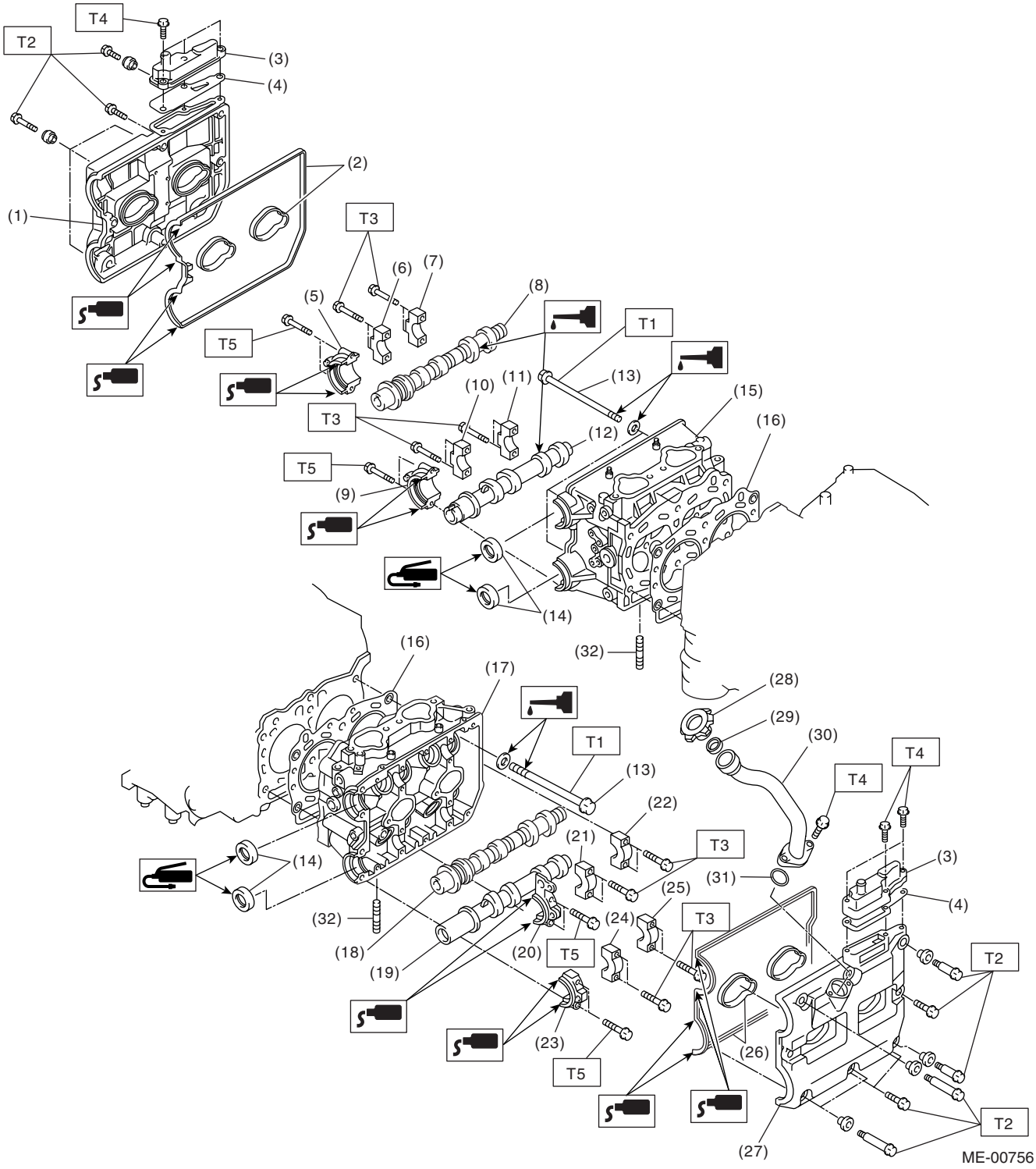
1. TIMING BELT



(1) Timing belt cover No. 2 (RH)
(2) Timing belt guide (MT model)
(3) Crankshaft sprocket
(4) Timing belt cover No. 2 (LH)
(5) Tensioner bracket
(6) Automatic belt tension adjuster ASSY
(7) Belt idler
(8) Exhaust camshaft sprocket (RH)
(9) Intake camshaft sprocket (RH)
(10) Intake camshaft sprocket (LH)
(11) Exhaust camshaft sprocket (LH)
(12) Timing belt
(13) Belt idler No. 2
(14) Belt idler
(15) Timing belt cover (LH)
(16) Front belt cover
(17) Timing belt cover (RH)
(18) Crankshaft pulley

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 25 (2.5, 18.1)
T4: 39 (4.0, 28.9)
T5: 98 (10, 72.4)
T6: <Ref. to ME(H4DOTC)-44, INSTALLATION, Crankshaft Pulley.>
T7: 10 (1.0, 7.2)

2. CYLINDER HEAD AND CAMSHAFT

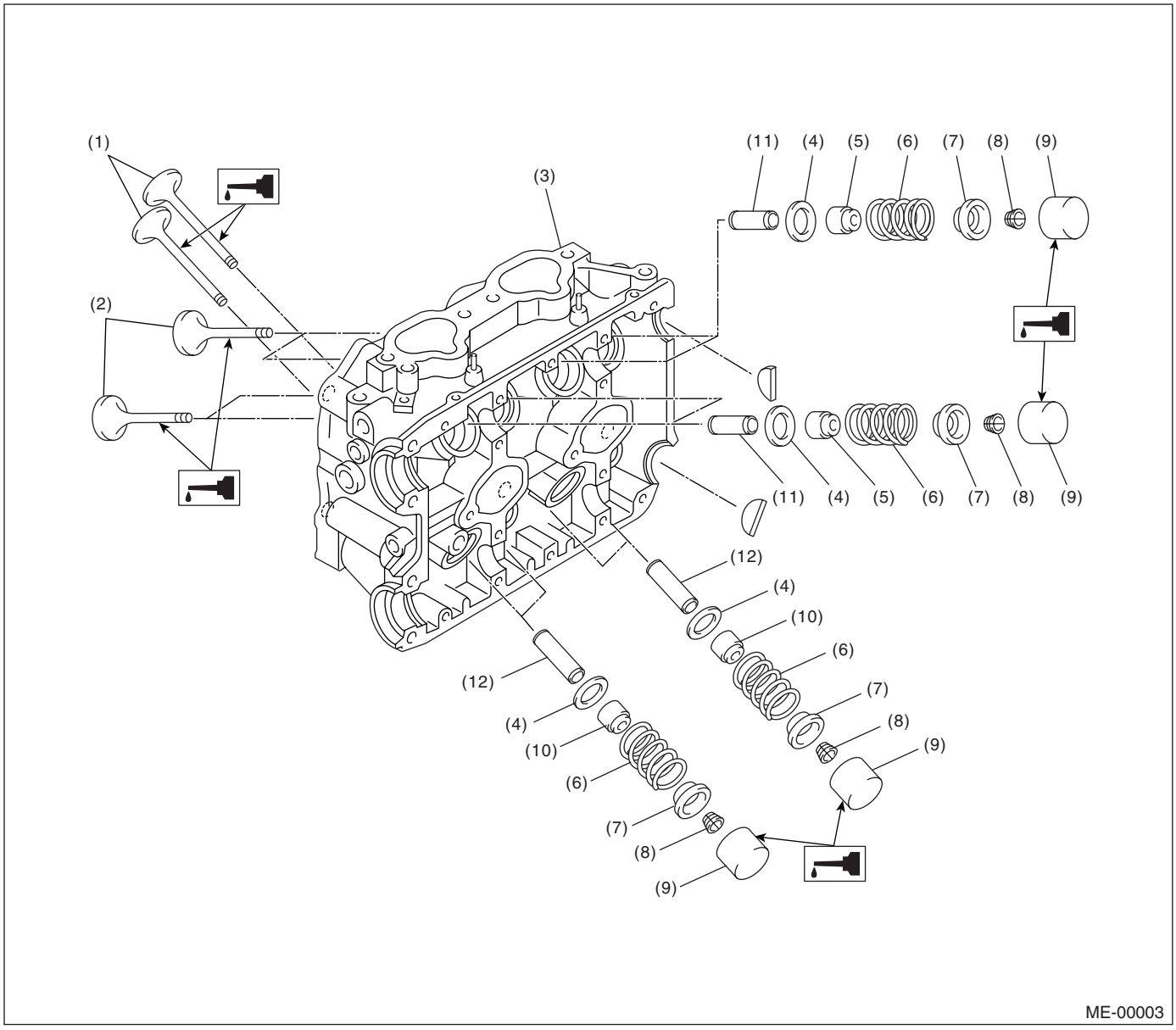


(1) Rocker cover (RH)
(2) Rocker cover gasket (RH)
(3) Oil separator cover
(4) Gasket
(5) Intake camshaft cap (Front RH)
(6) Intake camshaft cap (Center RH)
(7) Intake camshaft cap (Rear RH)
(8) Intake camshaft cap (RH)
(9) Exhaust camshaft cap (Front RH)
(10) Exhaust camshaft cap (Center RH)
(11) Exhaust camshaft cap (Rear RH)
(12) Exhaust camshaft (RH)
(13) Cylinder head bolt
(14) Oil seal
(15) Cylinder head (RH)
(16) Cylinder head gasket
(17) Cylinder head (LH)
(18) Intake camshaft (LH)
(19) Exhaust camshaft (LH)
(20) Intake camshaft cap (Front LH)
(21) Intake camshaft cap (Center LH)
(22) Intake camshaft cap (Rear LH)
(23) Exhaust camshaft cap (Front LH)
(24) Exhaust camshaft cap (Center LH)
(25) Exhaust camshaft cap (Rear LH)
(26) Rocker cover gasket (LH)
(27) Rocker cover (LH)
(28) Oil filler cap
(29) Gasket
(30) Oil filler duct
(31) O-ring
(32) Stud bolt

Tightening torque: N·m (kgf-m, ft-lb)

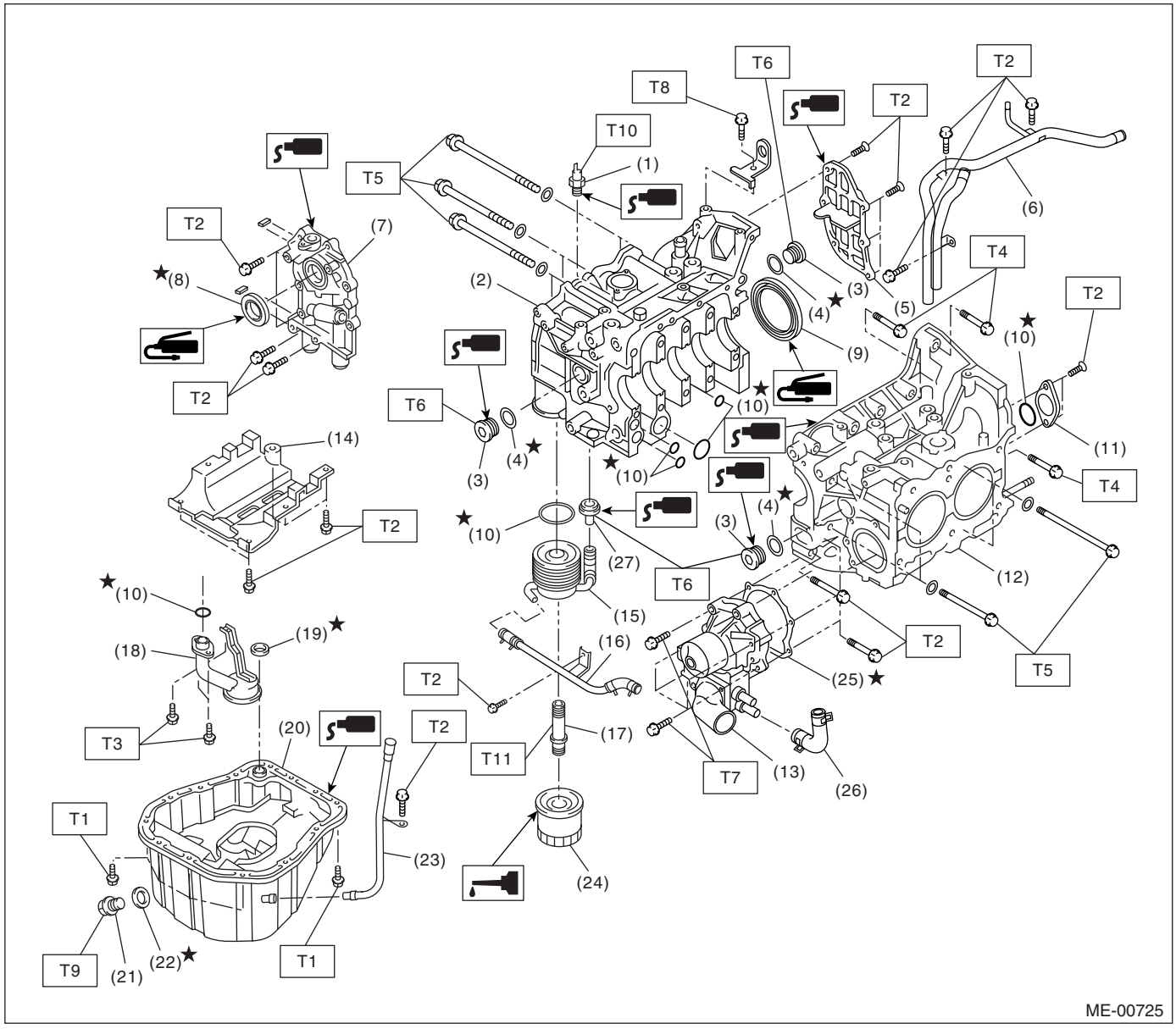
T1:	***<Ref. to ME(H4DOTC)-61, INSTALLATION, Cylinder Head Assembly.>***
T2:	***5 (0.5, 3.6)***
T3:	***20 (2.0, 14.5)***
T4:	***6.4 (0.65, 4.7)***
T5:	***10 (1.0, 7.2)***

3. CYLINDER HEAD AND VALVE ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Cylinder head
(4) Valve spring seat
(5) Intake valve oil seal
(6) Valve spring
(7) Retainer
(8) Retainer key
(9) Valve lifter
(10) Exhaust valve oil seal
(11) Intake valve guide
(12) Exhaust valve guide

4. CYLINDER BLOCK

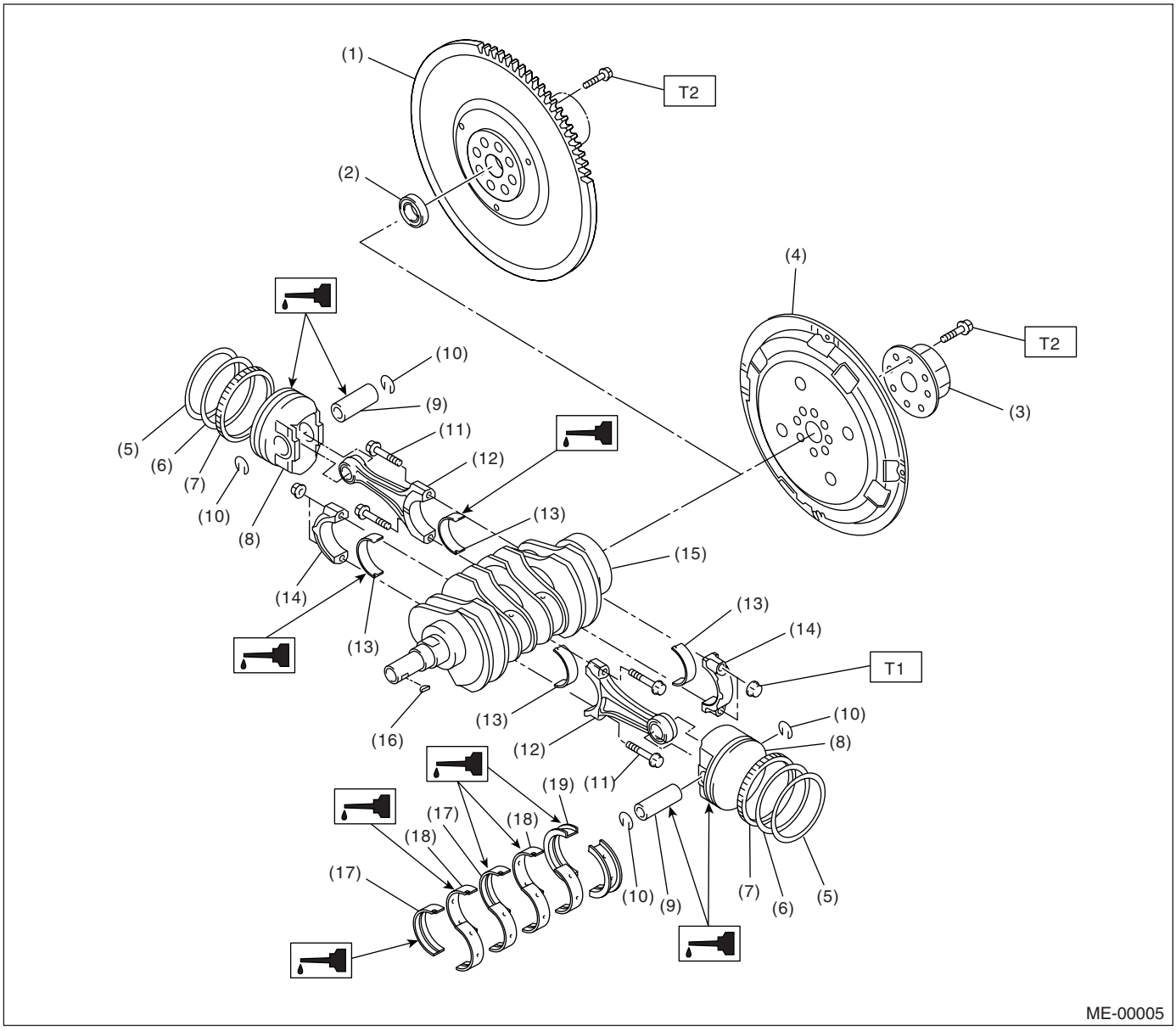


(1) Oil pressure switch
(2) Cylinder block (RH)
(3) Service hole plug
(4) Gasket
(5) Oil separator cover
(6) Water by-pass pipe
(7) Oil pump
(8) Front oil seal
(9) Rear oil seal
(10) O-ring
(11) Service hole cover
(12) Cylinder block (LH)
(13) Water pump
(14) Baffle plate
(15) Oil cooler
(16) Water by-pass pipe
(17) Connector
(18) Oil strainer
(19) Gasket
(20) Oil pan
(21) Drain plug
(22) Metal gasket
(23) Oil level gauge guide
(24) Oil filter
(25) Gasket
(26) Water pump hose
(27) Plug

Tightening torque: N·m (kgf-m, ft-lb)

T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7.2)
T4: 25 (2.5, 18.1)
T5: <Ref. to ME(H4DOTC)-72, INSTALLATION, Cylinder Block.>
T6: 69 (7.0, 50.9)
T7: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)
T8: 16 (1.6, 11.6)
T9: 44 (4.5, 33)
T10: 25 (2.5, 18.1)
T11: 54 (5.5, 40)

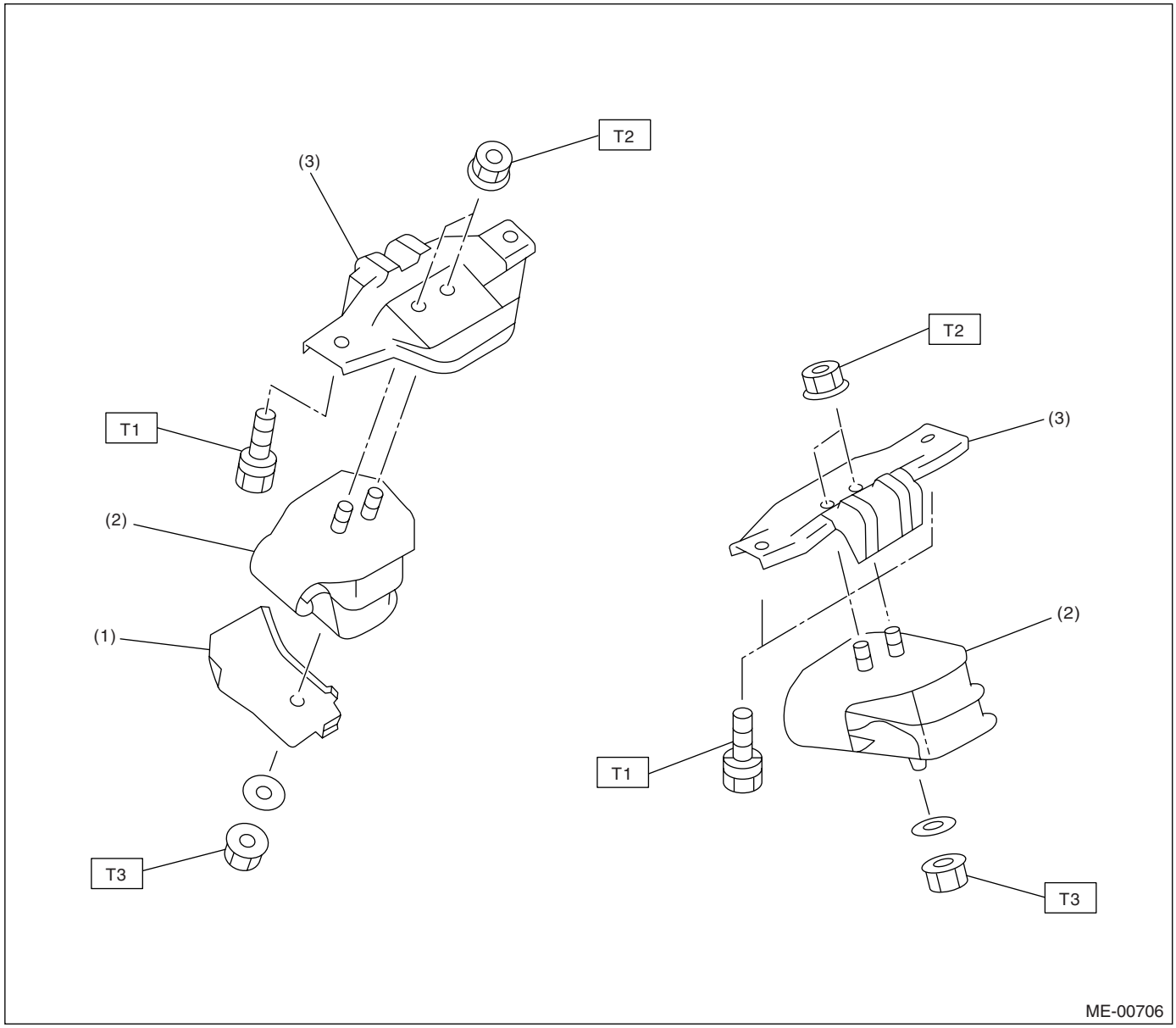
5. CRANKSHAFT AND PISTON



(1) Flywheel (MT model)
(2) Ball bearing (MT model)
(3) Reinforcement (AT model)
(4) Drive plate (AT model)
(5) Top ring
(6) Second ring
(7) Oil ring
(8) Piston
(9) Piston pin
(10) Circlip
(11) Connecting rod bolt
(12) Connecting rod
(13) Connecting rod bearing
(14) Connecting rod cap
(15) Crankshaft
(16) Woodruff key
(17) Crankshaft bearing #1, #3
(18) Crankshaft bearing #2, #4
(19) Crankshaft bearing #5

Tightening torque: N·m (kgf-m, ft-lb)
T1: 45 (4.6, 33.3)
T2: 72 (7.3, 52.8)

6. ENGINE MOUNTING



(1) Heat shield cover
(2) Front cushion rubber
(3) Front engine mounting bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 25.8)
T2: 42 (4.3, 30.9)
T3: 85 (8.7, 62.7)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
• All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
• Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
• Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
• All removed parts, if to be reused, should be reinstalled in the original positions and directions.
• Bolts, nuts and washers should be replaced with new ones as required.
• Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
• Remove or install the engine in an area where chain hoists, lifting devices, etc. are available for ready use.
• Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
• Prior to starting work, prepare the following:
Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
• Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

D: PREPARATION TOOL

1. SPECIAL TOOLS

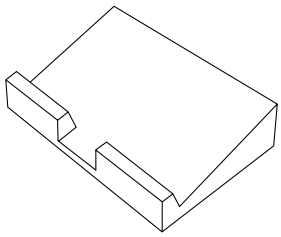
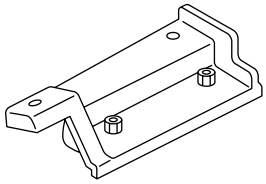
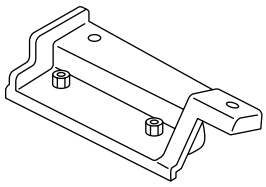
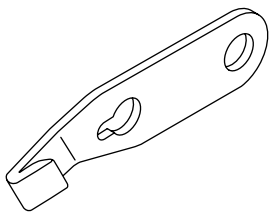
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498267600	498267600	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve springs.
 ST-498457000	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817100).
 ST-498457100	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817100).
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crankshaft pulley bolt, etc.

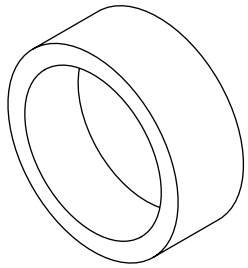
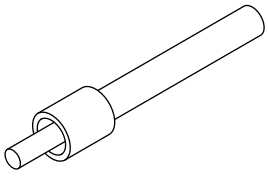
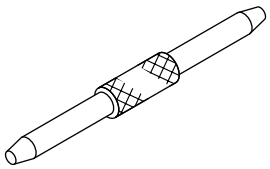
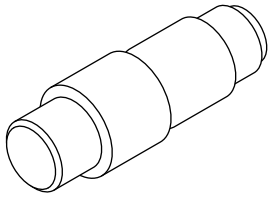
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398744300	398744300	PISTON GUIDE	Used for installing piston in cylinder for 2.0 L engine.
 ST-498857100	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 ST-499017100	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 ST-499037100	499037100	CONNECTING ROD BUSHING REMOVER & INSTALLER	Used for removing and installing connecting rod bushing.

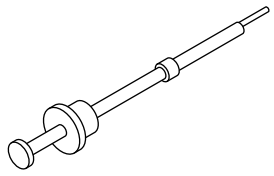
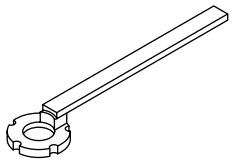
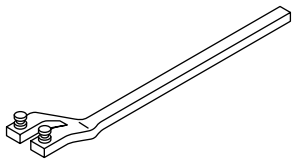
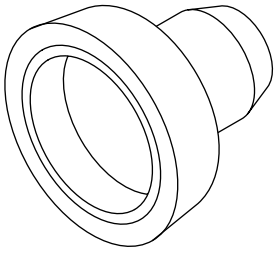
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499097600	499097600	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 ST-499207400	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing exhaust camshaft sprocket and intake camshaft sprocket (RH).
 ST18231AA010	18231AA010	CAMSHAFT SPROCKET WRENCH	Used for removing and installing intake camshaft sprocket (LH).
 ST-499587200	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).

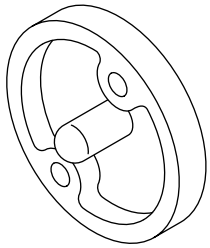
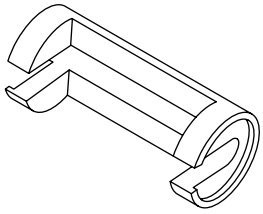
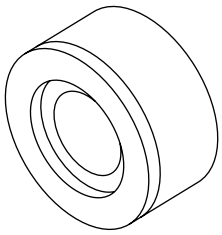
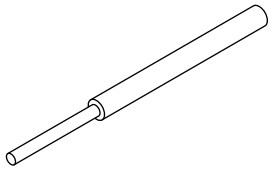
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499597100	499597100	CRANKSHAFT OIL SEAL GUIDE	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 ST18251AA020	18251AA020	VALVE GUIDE ADJUSTER	Used for installing intake and exhaust valve guides.
 ST-499767200	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.

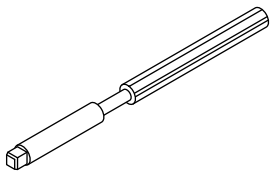
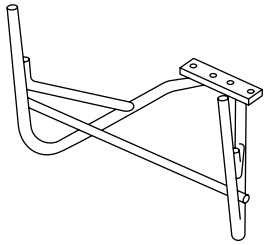
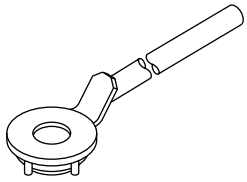
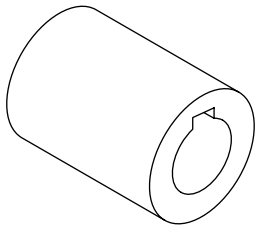
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499767400	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST-499817000	499817100	ENGINE STAND	• Stand used for engine disassembly and assembly. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).
 ST-499977400	499977400	CRANKSHAFT PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.

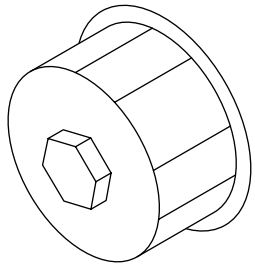
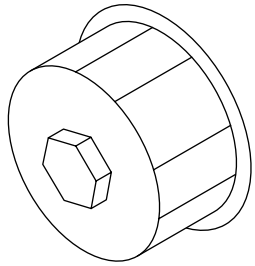
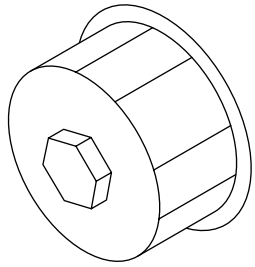
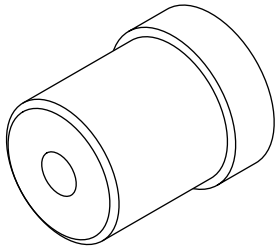
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498547000	498547000	OIL FILTER WRENCH	Used for removing and installing the oil filter. (Outer diameter: 80 mm (3.15 in))
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in))
 ST18332AA010	18332AA010	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in))
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.

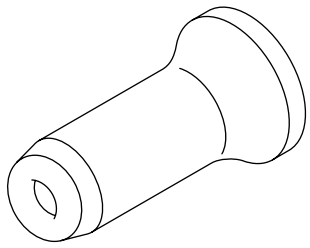
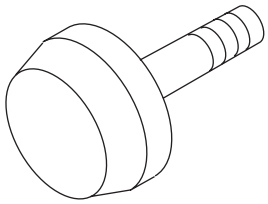
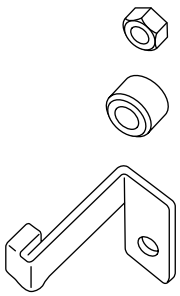
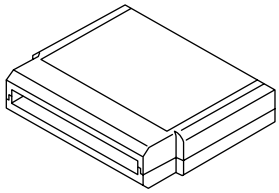
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499587600	499587600	OIL SEAL INSTALLER	Used for installing camshaft oil seal for DOHC engine.
 ST-499597200	499597200	OIL SEAL GUIDE	• Used for installing camshaft oil seal for DOHC engine. • Used with OIL SEAL GUIDE (499587600).
 ST-498277200	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Compression Gauge	Used for measuring compression.

E: PROCEDURE

It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- V-belt
- Timing Belt
- Camshaft
- Cylinder Head

2. Compression

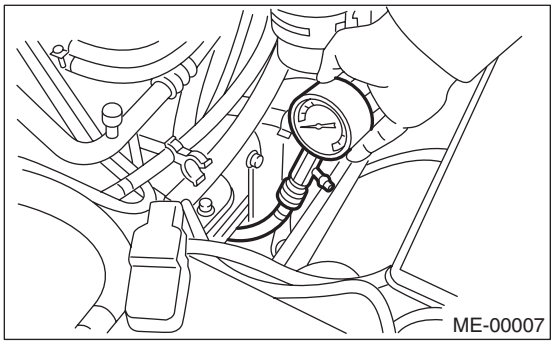
A: INSPECTION

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

1) After warming-up the engine, turn the ignition switch to OFF.
2) Make sure that the battery is fully charged.
3) Release the fuel pressure. <Ref. to FU(H4DOTC)-52, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
4) Remove all the spark plugs. <Ref. to IG(H4DOTC)-4, REMOVAL, Spark Plug.>
5) Fully open the throttle valve.
6) Check the starter motor for satisfactory performance and operation.
7) Hold the compression gauge tight against spark plug hole.

NOTE:
When using a screw-in type compression gauge, the screw (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.

8) Crank the engine by means of starter motor, and then read the maximum value on the gauge when the pointer is steady.



9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):
Standard
981 — 1,177 kPa (10 — 12 kgf/cm^2, 142 — 171 psi)
Limit
882 kPa (9.0 kgf/cm^2, 128 psi)
Difference between cylinders
Less than 49 kPa (0.5 kgf/cm^2, 7 psi)

3. Idle Speed

A: INSPECTION

1) Before checking the idle speed, check the following:
   (1) Ensure the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and that the hoses are connected properly.
   (2) Ensure the malfunction indicator light does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and then turn the ignition switch to OFF.
4) Insert the cartridge to SUBARU SELECT MONITOR.
5) Connect the SUBARU SELECT MONITOR to data link connector.
6) Turn the ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
7) Select the {2. Each System Check} in Main Menu.
8) Select the {Engine Control System} in Selection Menu.
9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.
10) Select the {1.12 Data Display} in Data Display Menu.
11) Start the engine, and then read the engine idle speed.
12) Check the idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF)

Idle speed [No load and gears in neutral]:
750±100 rpm

13) Check the idle speed when loaded. (Turn the air conditioning switch to “ON” and operate the compressor for at least 1 minute before measurement.)

Idle speed [A/C “ON”, no load and gears in neutral]:
Except for STi model
800±150 rpm (MT model)
825±150 rpm (AT model)

NOTE:
As idle speed is controlled by the automatic adjustment type, it can not be adjusted manually. If the idle speed is out of specifications, refer to General On-board Diagnosis Table under “Engine Control System”. <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>

4. Ignition Timing

A: INSPECTION

1) Before checking the ignition timing speed, check the following:
   (1) Ensure the air cleaner element is free from clogging, spark plugs are in good condition, and that hoses are connected properly.
   (2) Ensure the malfunction indicator light does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and then turn the ignition switch to OFF.
4) Insert the cartridge to SUBARU SELECT MONITOR.
5) Connect the SUBARU SELECT MONITOR to data link connector.
6) Turn the ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
7) Select the {2. Each System Check} in Main Menu.
8) Select the {Engine Control System} in Selection Menu.
9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.
10) Select the {1.12 Data Display} in Data Display Menu.
11) Start the engine and check the ignition timing at idle speed.

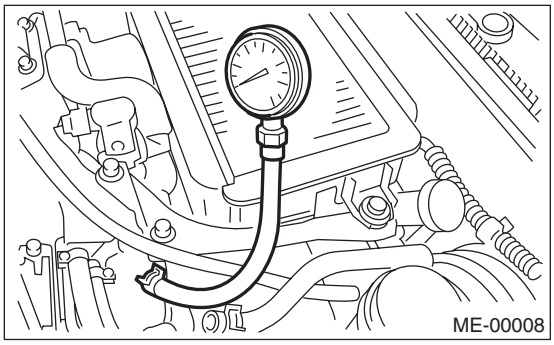
Ignition timing [BTDC/rpm]:
12°±3°/700

If the timing is not correct, check the ignition control system. Refer to Engine Control System. <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>

5. Intake Manifold Vacuum

A: INSPECTION

1) Warm-up the engine.
2) Disconnect the brake vacuum hose, and then install the vacuum gauge to hose fitting on manifold.
3) Keep the engine at the idle speed, and then read the vacuum gauge indication.
By observing the gauge needle movement, the internal condition of engine can be diagnosed as described below.



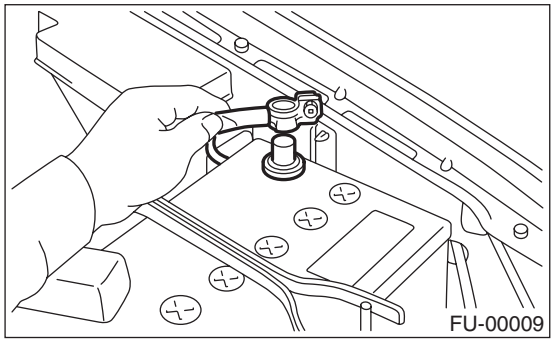
Vacuum pressure (at idling, A/C "OFF"):
Less than −60.0 kPa (−450 mmHg, −17.72 in-Hg)

Diagnosis of engine condition by measurement of manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket or disconnection or damaged vacuum hose
2. When engine speed is reduced slowly from higher speed, needle stops temporarily when it is lowering or becomes steady above normal position.	Back pressure too high, or exhaust system clogged
3. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
4. Needle drops suddenly and intermittently from normal position.	Sticky valves
5. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve springs
6. Needle vibrates above and below normal position in narrow range.	Defective ignition system or throttle chamber idle adjustment

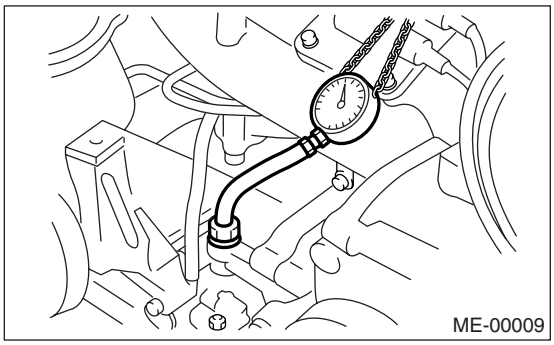
6. Engine Oil Pressure

A: INSPECTION

1) Remove the oil pressure switch from engine cylinder block. <Ref. to LU(H4DOTC)-18, REMOVAL, Oil Pressure Switch.>
2) Connect the oil pressure gauge hose to cylinder block.
3) Connect the battery ground cable to battery.



4) Start the engine, and then measure the oil pressure.



Oil pressure:
98 kPa (1.0 kg/cm^2, 14 psi) or more at 800 rpm
294 kPa (3.0 kg/cm^2, 43 psi) or more at 5,000 rpm

- If the oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU(H4DOTC)-23, INSPECTION, Engine Lubrication System Trouble in General.>
- If the oil pressure warning light is turned ON and oil pressure is in specification, replace the oil pressure switch. <Ref. to LU(H4DOTC)-23, INSPECTION, Engine Lubrication System Trouble in General.>

NOTE:
The specified data is based on an engine oil temperature of 80°C (176°F).

5) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU(H4DOTC)-18, INSTALLATION, Oil Pressure Switch.>

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

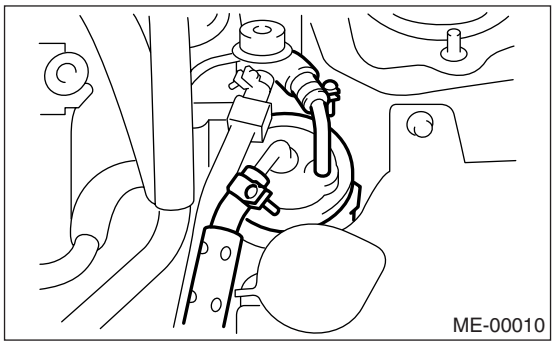
7. Fuel Pressure

A: INSPECTION

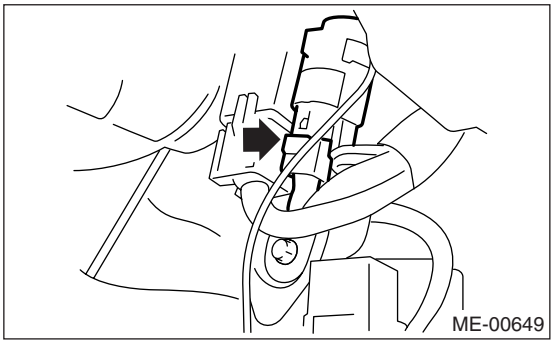
CAUTION:
Before removing the fuel pressure gauge, release the fuel pressure.

NOTE:
If out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-52, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel flap lid, and then remove the fuel filler cap.
3) Disconnect the fuel delivery hoses from fuel filter, and then connect the fuel pressure gauge.

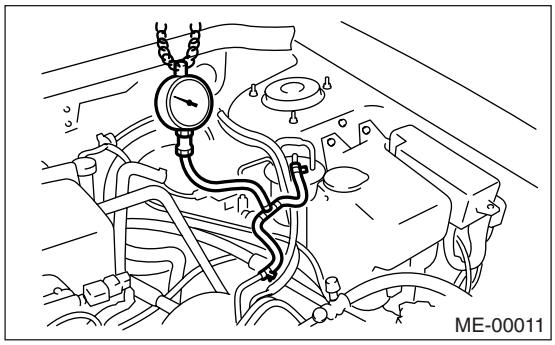


4) Connect the connector of fuel pump relay.



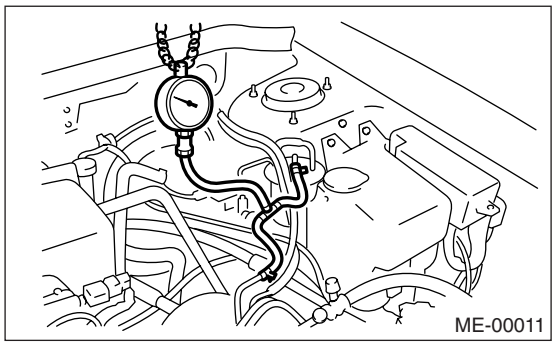
5) Start the engine.
6) Measure the fuel pressure while disconnecting the pressure regulator vacuum hose from intake manifold.

Fuel pressure:
Standard; 284 — 314 kPa (2.9 — 3.2 kgf/cm^2, 41 — 46 psi)



7) After connecting the pressure regulator vacuum hose, measure the fuel pressure.

Fuel pressure:
Standard; 230 — 260 kPa (2.35 — 2.65 kgf/cm^2, 33 — 38 psi)



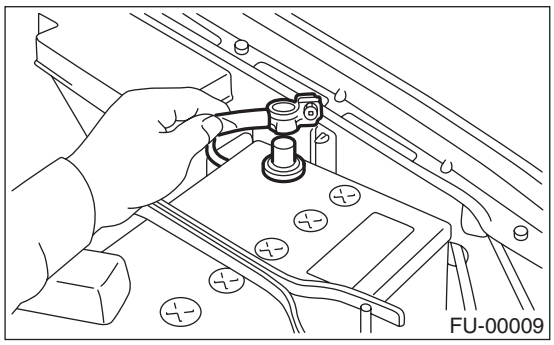
NOTE:
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm^2, 1 to 3 psi) higher than standard values during high-altitude operations.

8. Valve Clearance

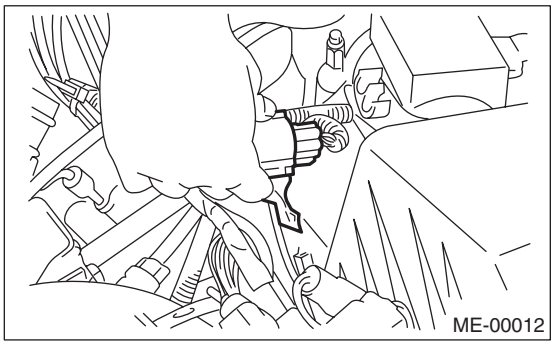
A: INSPECTION

Inspection and adjustment of the valve clearance should be performed while engine is cold.

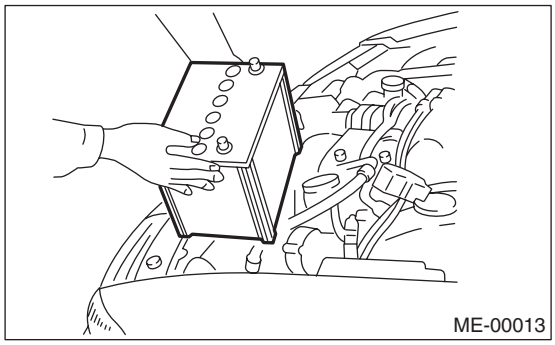
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



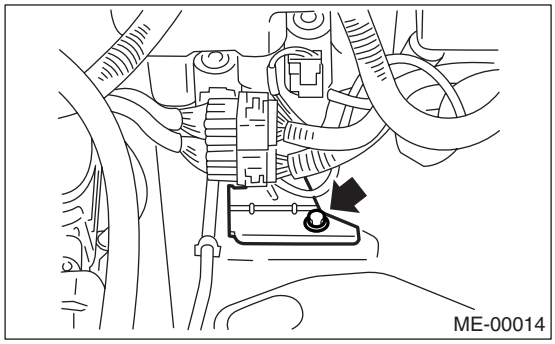
3) Remove the air intake duct. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Intake Duct.>
4) Remove the bolts which secure the timing belt cover (RH).
5) Lift-up the vehicle.
6) Remove the under cover.
7) Loosen the remaining bolts which secure the timing belt cover (RH), and then remove the timing belt cover.
8) Lower the vehicle.
9) When inspecting the #1 and #3 cylinders:
   (1) Pull out the engine harness connector with bracket from air cleaner upper cover.



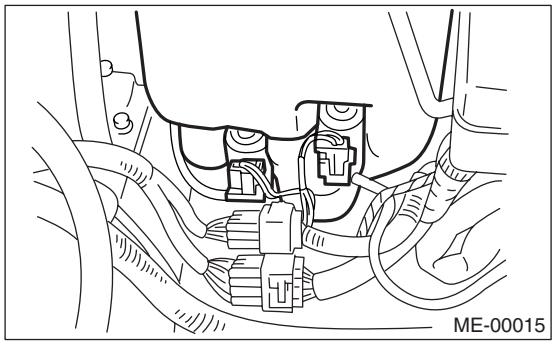
   (2) Remove the air cleaner case. <Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner.>
   (3) Disconnect the ignition coil connector.
   (4) Remove the ignition coil.
   (5) Place a suitable container under the vehicle.
   (6) Disconnect the PCV hose from rocker cover (RH).
   (7) Remove the bolts, and then remove the rocker cover (RH).
10) When inspecting the #2 and #4 cylinders:
   (1) Disconnect the battery cable, and then remove the battery and battery carrier.



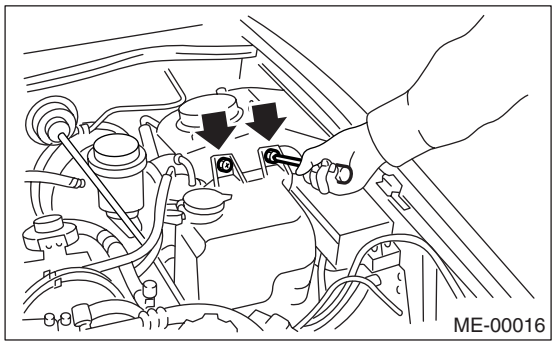
   (2) Remove the bolt which secures the engine harness bracket onto body.



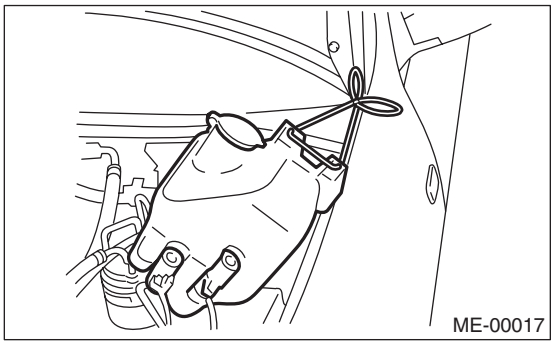
   (3) Disconnect the washer motor connectors.



   (4) Remove the washer tank mounting bolts.



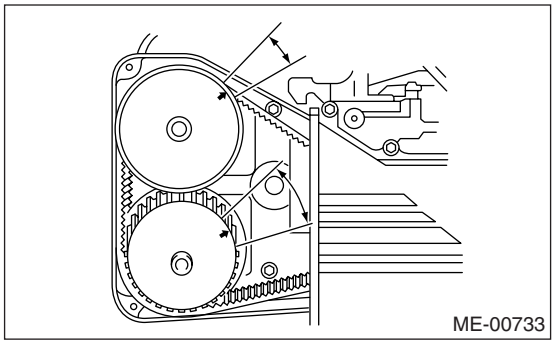
(5) Move the washer tank upward.



(6) Disconnect the ignition coil connector.
(7) Remove the ignition coil.
(8) Place a suitable container under the vehicle.
(9) Disconnect the PCV hose from rocker cover (LH).
(10) Remove the bolts, and then remove the rocker cover (LH).

11) Turn the crankshaft pulley clockwise until arrow mark on the camshaft sprocket is set to position shown in the figure.

NOTE:
Turn the crankshaft using socket wrench.

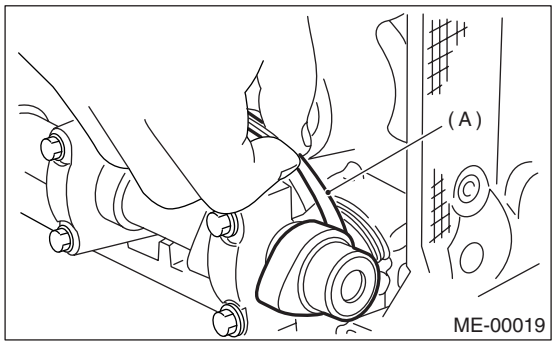


12) Measure the #1 cylinder intake valve and #3 cylinder exhaust valve clearance by using thickness gauge (A).

NOTE:
• Insert the thickness gauge in as horizontal a direction as possible with respect to the shim.
• Measure the exhaust valve clearances while lifting-up the vehicle.

Valve clearance:
STD
Intake: 0.20±0.02 mm (0.0079±0.0008 in)
Exhaust: 0.35±0.02 mm (0.0136±0.0008 in)

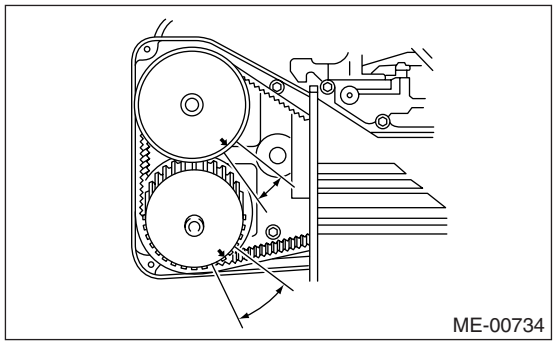
NOTE:
If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.



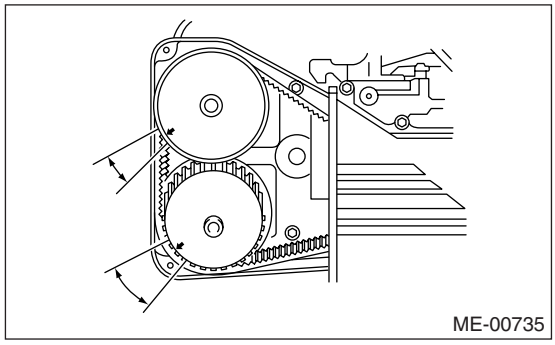
13) If necessary, adjust the valve clearance. <Ref. to ME(H4DOTC)-30, ADJUSTMENT, Valve Clearance.>

14) Further turn the crankshaft pulley clockwise. Using the same procedures described previously, and then measure the valve clearances again.

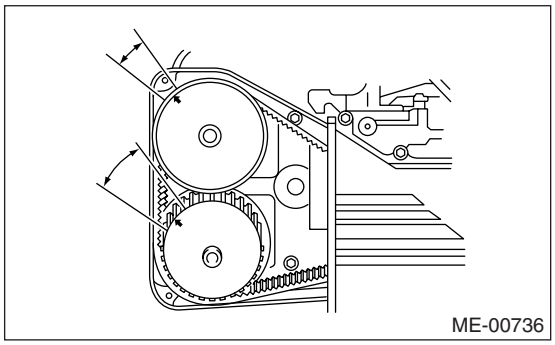
(1) Set the arrow mark on camshaft sprocket to position shown in the figure, and then measure the #2 cylinder exhaust valve and #3 cylinder intake valve clearances.



(2) Set the arrow mark on camshaft sprocket to position shown in the figure, and then measure the #2 cylinder intake valve and #4 cylinder exhaust valve clearances.

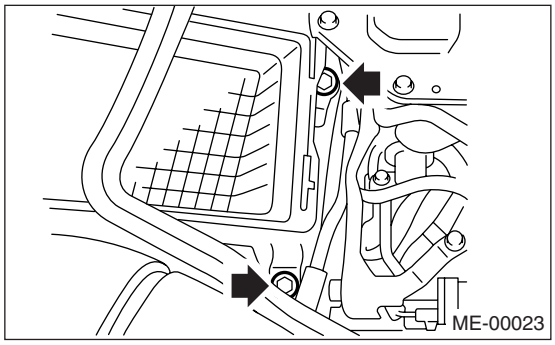


(3) Set the arrow mark on camshaft sprocket to position shown in the figure, and then measure the #1 cylinder exhaust valve and #4 cylinder intake valve clearances.


ME-00736

15) After inspection, install the related parts in the reverse order of removal.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)

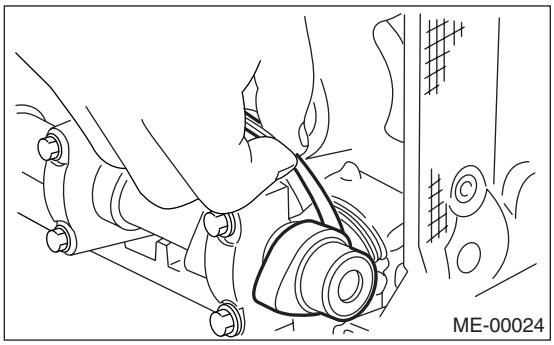

ME-00023

B: ADJUSTMENT

CAUTION:
Adjustment of the valve clearance should be performed while engine is cold.

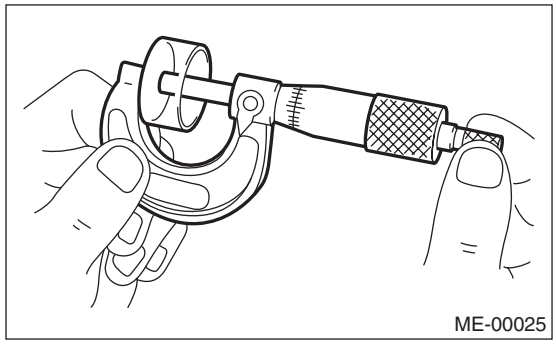
1) Measure all valve clearances. <Ref. to ME(H4DOTC)-28, INSPECTION, Valve Clearance.>

NOTE:
Record each valve clearance after it has been measured.


ME-00024

2) Remove the camshaft. <Ref. to ME(H4DOTC)-56, REMOVAL, Camshaft.>
3) Remove the valve lifter.

4) Measure the thickness of valve lifter with a micrometer.


ME-00025

5) Select a shim of suitable thickness using measured valve clearance and valve lifter thickness, by referring to the following table.

Unit: mm
Intake valve: S =V – 0.20 Exhaust valve: S =V – 0.25
S: Valve lifter thickness to be used V: Measured valve clearance

Part No.	Thickness mm (in)
13228 AB101	4.68 (0.1843)
13228 AB111	4.69 (0.1846)
13228 AB121	4.70 (0.1850)
13228 AB131	4.71 (0.1854)
13228 AB141	4.72 (0.1858)
13228 AB151	4.73 (0.1862)
13228 AB161	4.74 (0.1866)
13228 AB171	4.75 (0.1870)
13228 AB181	4.76 (0.1874)
13228 AB191	4.77 (0.1878)
13228 AB201	4.78 (0.1882)
13228 AB211	4.79 (0.1886)
13228 AB221	4.80 (0.1890)
13228 AB231	4.81 (0.1894)
13228 AB241	4.82 (0.1898)
13228 AB251	4.83 (0.1902)
13228 AB261	4.84 (0.1906)
13228 AB271	4.85 (0.1909)
13228 AB281	4.86 (0.1913)
13228 AB291	4.87 (0.1917)
13228 AB301	4.88 (0.1921)
13228 AB311	4.89 (0.1925)
13228 AB321	4.90 (0.1929)
13228 AB331	4.91 (0.1933)
13228 AB341	4.92 (0.1937)
13228 AB351	4.93 (0.1941)
13228 AB361	4.94 (0.1945)
13228 AB371	4.95 (0.1949)
13228 AB381	4.96 (0.1953)
13228 AB391	4.97 (0.1957)
13228 AB401	4.98 (0.1961)

Part No.	Thickness mm (in)
13228 AB411	4.99 (0.1965)
13228 AB421	5.00 (0.1969)
13228 AB431	5.01 (0.1972)
13228 AB441	5.02 (0.1976)
13228 AB451	5.03 (0.1980)
13228 AB461	5.04 (0.1984)
13228 AB471	5.05 (0.1988)
13228 AB481	5.06 (0.1992)
13228 AB491	5.07 (0.1996)
13228 AB501	5.08 (0.2000)
13228 AB511	5.09 (0.2004)
13228 AB521	5.10 (0.2008)
13228 AB531	5.11 (0.2012)
13228 AB541	5.12 (0.2016)
13228 AB551	5.13 (0.2020)
13228 AB561	5.14 (0.2024)
13228 AB571	5.15 (0.2028)
13228 AB581	5.16 (0.2031)
13228 AB591	5.17 (0.2035)
13228 AB601	5.18 (0.2039)
13228 AB611	5.19 (0.2043)
13228 AB621	5.20 (0.2047)
13228 AB631	5.21 (0.2051)
13228 AB641	5.22 (0.2055)
13228 AB651	5.23 (0.2059)
13228 AB661	5.24 (0.2063)
13228 AB671	5.25 (0.2067)
13228 AB681	5.26 (0.2071)
13228 AB691	5.27 (0.2075)
13228 AB701	4.38 (0.1724)
13228 AB711	4.40 (0.1732)
13228 AB721	4.42 (0.1740)
13228 AB731	4.44 (0.1748)
13228 AB741	4.46 (0.1756)
13228 AB751	4.48 (0.1764)
13228 AB761	4.50 (0.1771)
13228 AB771	4.52 (0.1780)
13228 AB781	4.54 (0.1787)
13228 AB791	4.56 (0.1795)
13228 AB801	4.58 (0.1803)
13228 AB811	4.60 (0.1811)
13228 AB821	4.62 (0.1819)
13228 AB831	4.64 (0.1827)
13228 AB841	4.66 (0.1835)
13228 AB851	5.29 (0.2083)
13228 AB861	5.31 (0.2091)
13228 AB871	5.33 (0.2098)
13228 AB881	5.35 (0.2106)
13228 AB891	5.37 (0.2114)
13228 AB901	5.39 (0.2122)
13228 AB911	5.41 (0.2123)

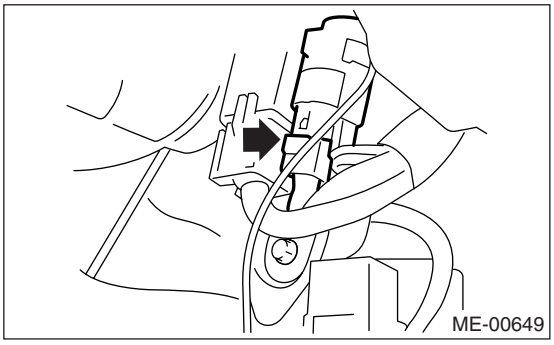
Part No.	Thickness mm (in)
13228 AB921	5.43 (0.2138)
13228 AB931	5.45 (0.2146)
13228 AB941	5.47 (0.2154)
13228 AB951	5.49 (0.2161)
13228 AB961	5.51 (0.2169)
13228 AB971	5.53 (0.2177)
13228 AB981	5.55 (0.2185)
13228 AB991	5.57 (0.2193)
13228 AC001	5.59 (0.2201)
13228 AC011	5.61 (0.2209)
13228 AC021	5.63 (0.2217)
13228 AC031	5.65 (0.2224)

6) Inspect all valves for clearance again at this stage. If the valve clearance is not correct, repeat the procedure over again from the first step.
7) After inspection, install the related parts in the reverse order of removal.

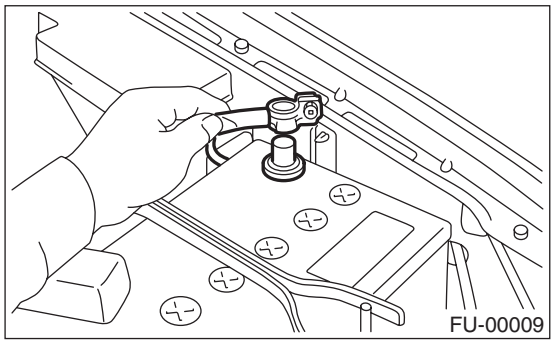
9. Engine Assembly

A: REMOVAL

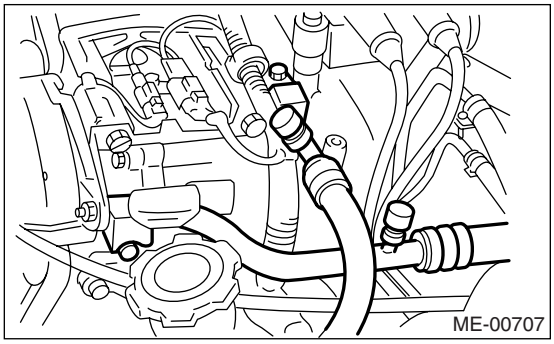
1) Set the vehicle on a lift.
2) Open the front hood fully, and then support with the hood stay.
3) Collect the refrigerant from A/C system.
4) Release the fuel pressure.
   (1) Disconnect the fuel pump relay connector.



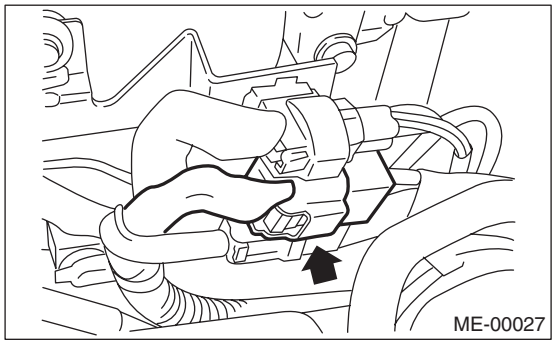
   (2) Start the engine, and run until stalls.
   (3) After the engine stalls, crank it for 5 seconds more.
   (4) Turn the ignition switch to OFF.
5) Remove the filler cap.
6) Disconnect the ground cable from battery.



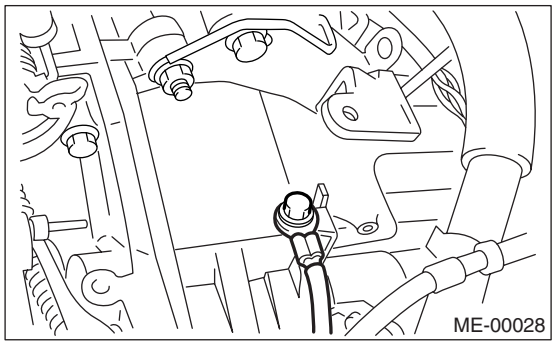
7) Remove the radiator from vehicle. <Ref. to CO(H4DOTC)-22, REMOVAL, Radiator.>
8) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-32, REMOVAL, Coolant Filler Tank.>
9) Disconnect the A/C pressure hoses from A/C compressor.



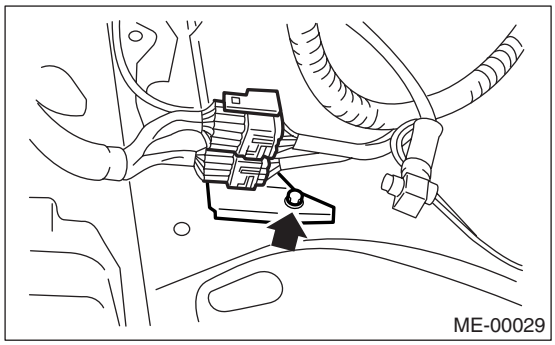
10) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
11) Disconnect the following connectors and cable.
   (1) Engine harness connector



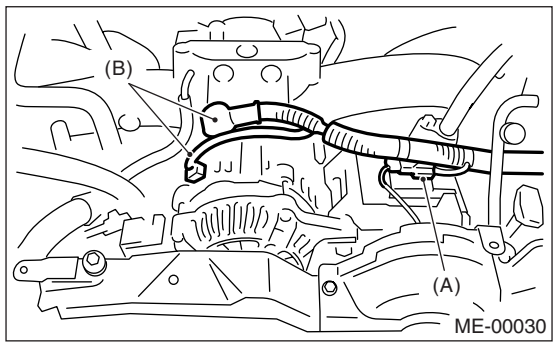
   (2) Engine ground terminal



   (3) Engine harness connector

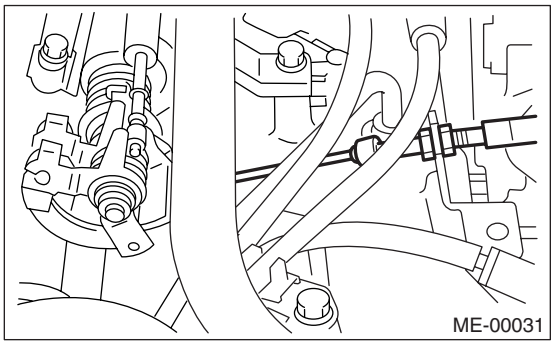


   (4) Generator connector, terminal and A/C compressor connectors

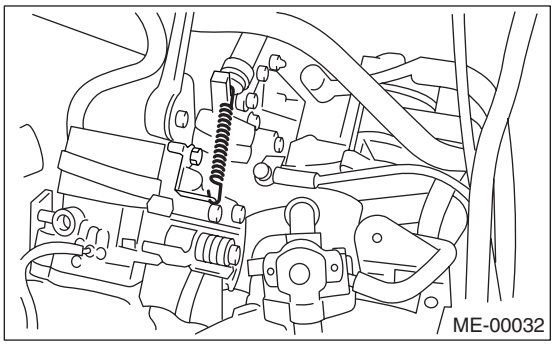


   (A) A/C compressor connector
   (B) Generator connector and terminal

(5) Accelerator cable (MT model)

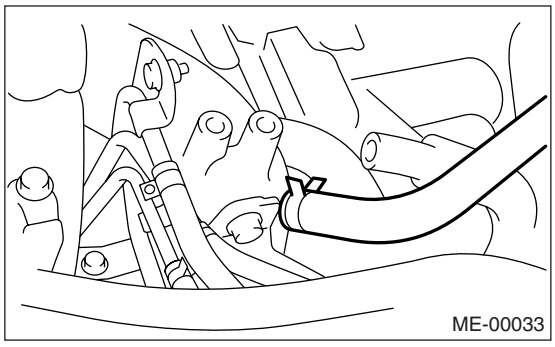


(6) Clutch release spring (MT model)

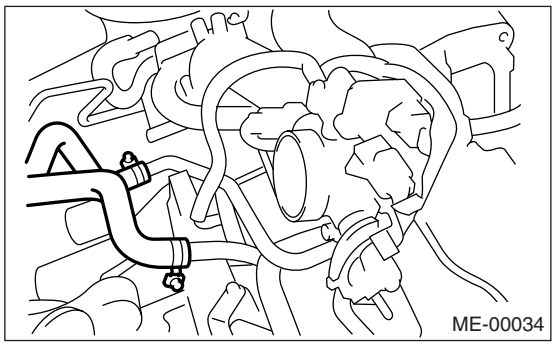


12) Disconnect the following hoses.

(1) Brake booster vacuum hose



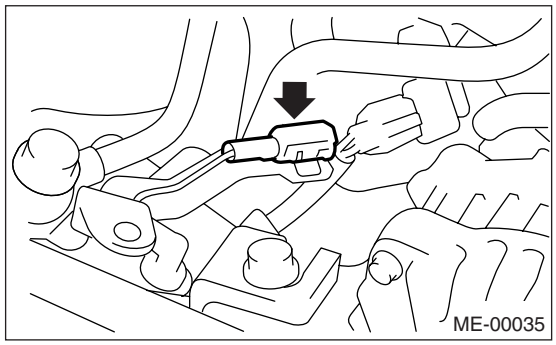
(2) Heater inlet and outlet hose



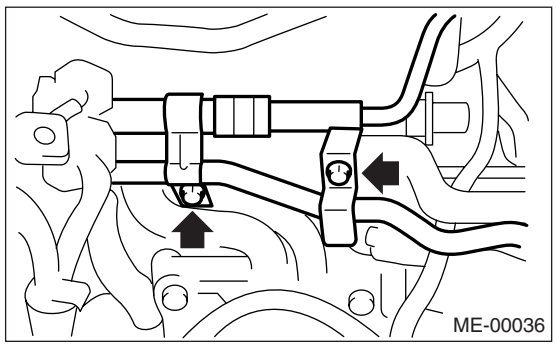
13) Remove the power steering pump from bracket.

(1) Loosen the lock bolt and slider bolt, and then remove the front side V-belt. <Ref. to ME(H4DOTC)-42, FRONT SIDE BELT, REMOVAL, V-belt.>

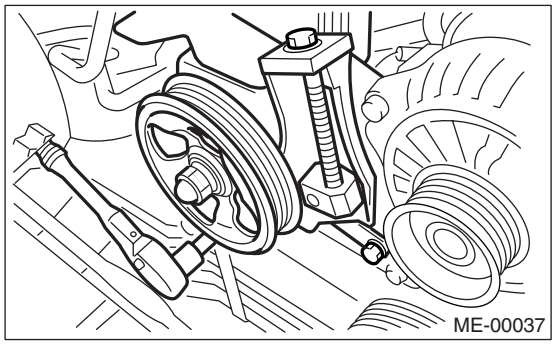
(2) Disconnect the power steering switch connector.



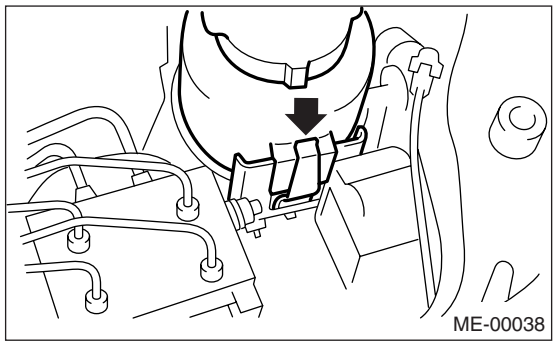
(3) Remove the pipe with bracket from intake manifold.



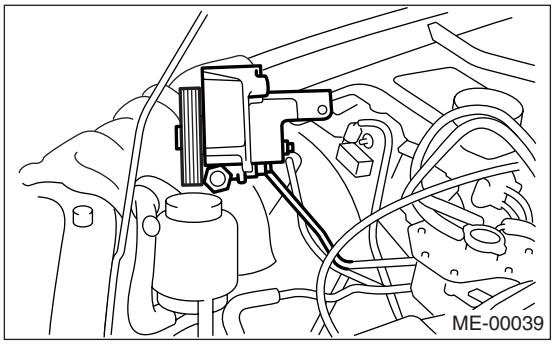
(4) Remove the power steering pump from engine.



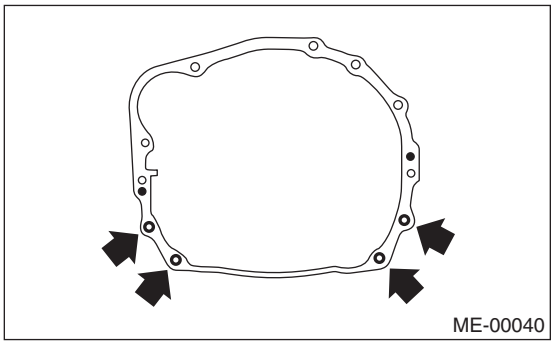
(5) Remove the power steering tank from bracket by pulling it upward.



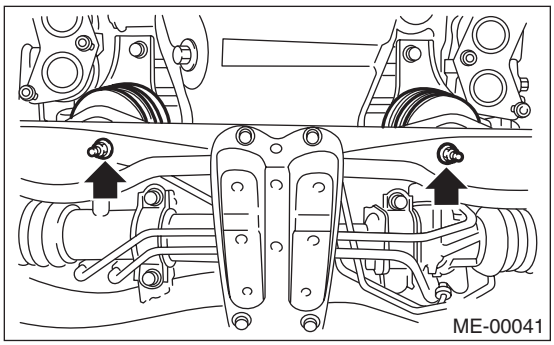
(6) Place the power steering pump on right side wheel apron.



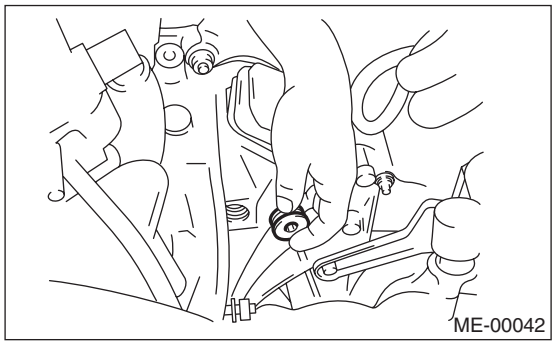
14) Lift-up the vehicle.
15) Remove the ATF cooler pipe from frame. (AT model)
16) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
17) Remove the nuts which hold the lower side of transmission to engine.



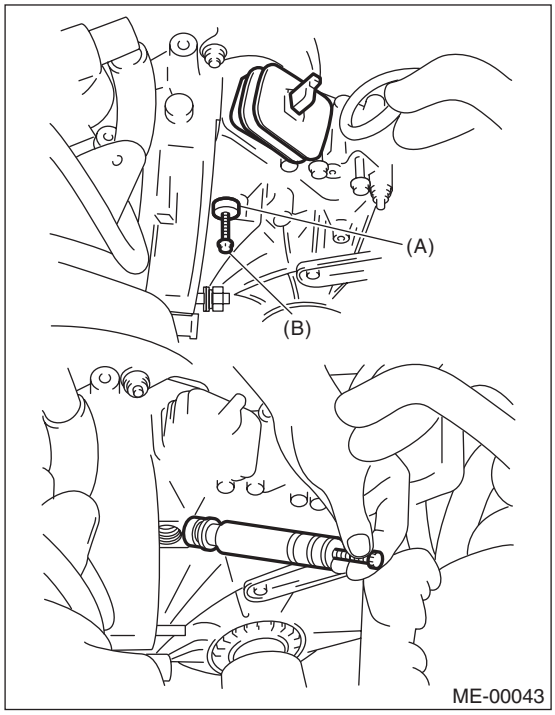
18) Remove the nuts which install the front cushion rubber onto front crossmember.



19) Lower the vehicle.
20) Separate the clutch release fork from release bearing. (MT model)
(1) Remove the clutch operating cylinder from transmission.
(2) Remove the plug using a 10 mm hexagon wrench.



(3) Screw the 6 mm dia. bolt into release fork shaft, and remove it.



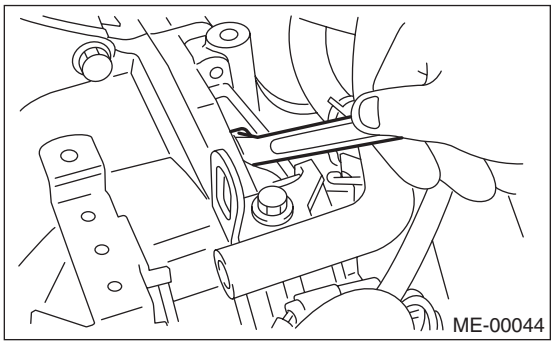
(A) Shaft
(B) Bolt

(4) Raise the release fork, and then unfasten the release bearing tabs to free release fork.

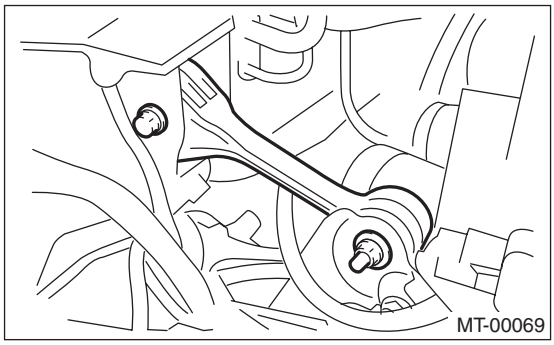
NOTE:
Step (4) is required to prevent interference with engine when removing the engine from transmission.

21) Separate the torque converter clutch from drive plate. (AT model)
(1) Lower the vehicle.
(2) Remove the service hole plug.
(3) Remove the bolts which hold the torque converter clutch to drive plate.

(4) Remove the other bolts while rotating the engine using socket wrench.

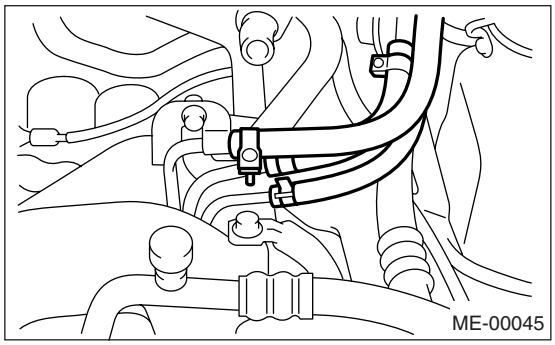


22) Remove the pitching stopper.

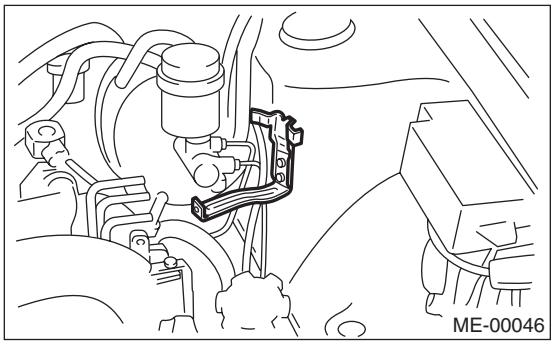


23) Disconnect the fuel delivery hose, return hose and evaporation hose.

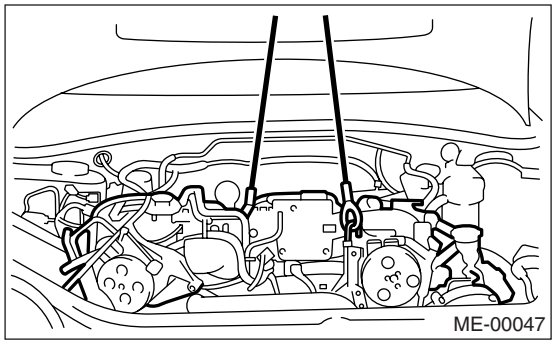
NOTE:
- Catch fuel from the hose into container.
- Disconnect the hose with its end wrapped with cloth to prevent fuel from splashing.



24) Remove the fuel filter and bracket.

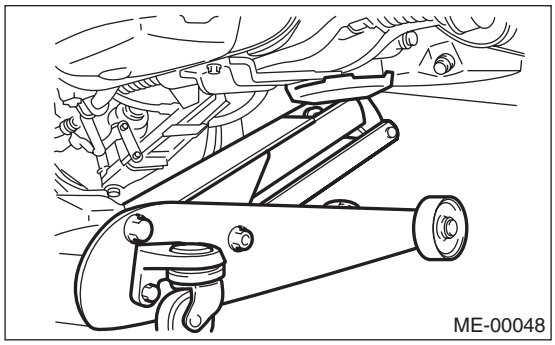


25) Support the engine with a lifting device and wire ropes.



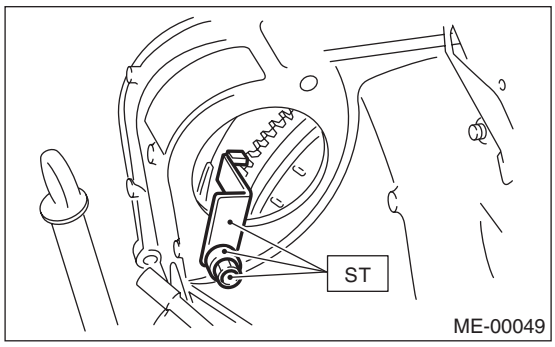
26) Support the transmission with a garage jack.

NOTE:
Before moving the engine away from transmission, check to be sure no work has been overlooked. Doing this is very important in order to facilitate re-installation and because transmission lowers under its own weight.

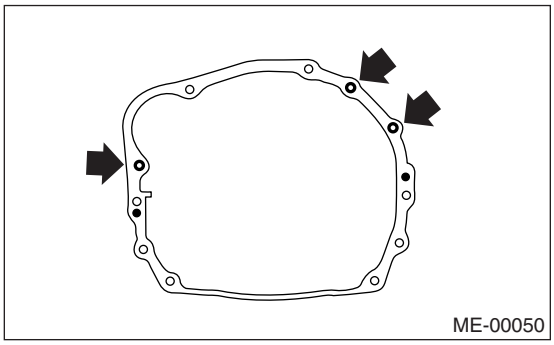


27) Separation of the engine and transmission.
(1) Remove the starter. <Ref. to SC(H4SO)-7, REMOVAL, Starter.>
(2) Install the ST to torque converter clutch case. (AT model)

ST 498277200 STOPPER SET



(3) Remove the bolts which hold the right upper side of transmission to engine.



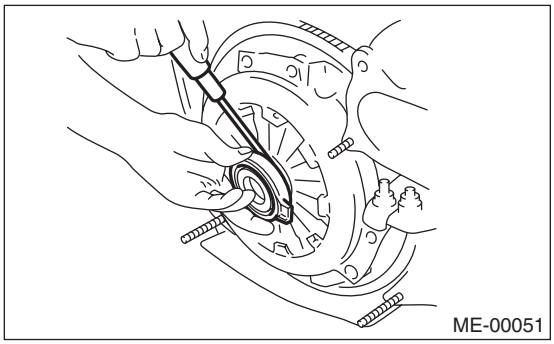
28) Remove the engine from vehicle.
(1) Slightly raise the engine.
(2) Raise the transmission with garage jack.
(3) Move the engine horizontally until the main-shaft is withdrawn from clutch cover.
(4) Slowly move the engine away from engine compartment.

NOTE:
Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

29) Remove the front cushion rubbers.

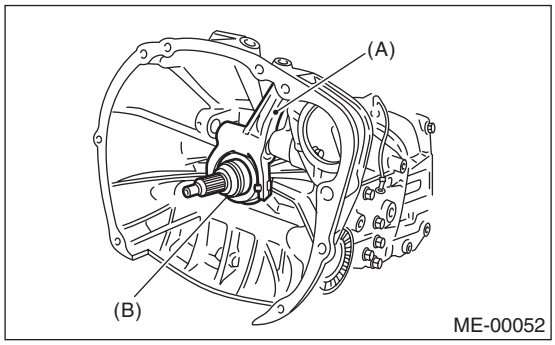
B: INSTALLATION

1) Install the clutch release fork and bearing onto transmission. (MT model)
(1) Remove the release bearing from clutch cover with flat type screw driver.



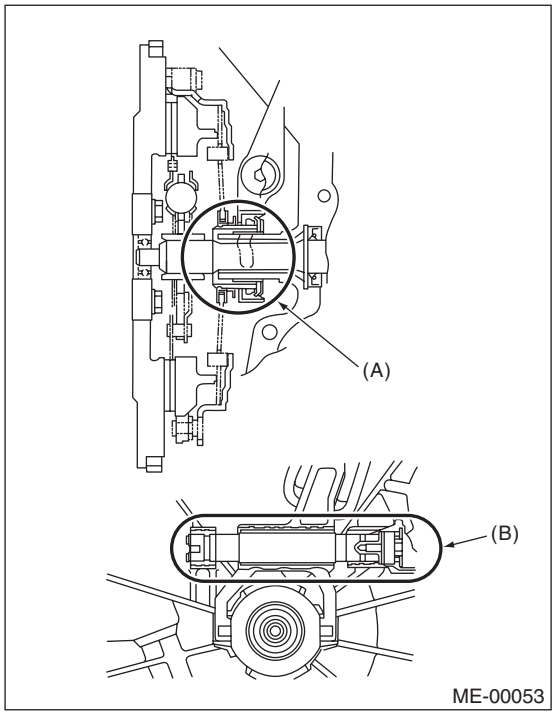
(2) Install the release bearing on transmission.

(3) Install the release fork into release bearing tab.



(A) Release fork
(B) Release bearing

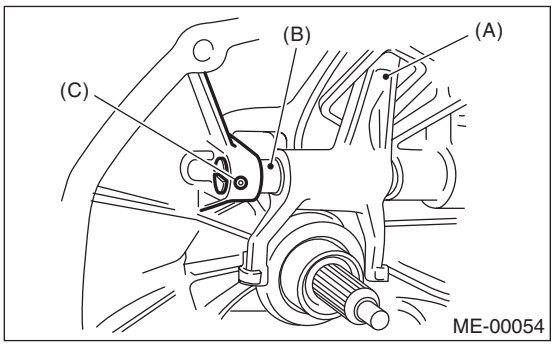
(4) Apply grease to the specified points.
- Spline FX2200
- Shaft SUNLIGHT 2



(A) Spline (FX2200)
(B) Shaft (SUNLIGHT 2)

(5) Insert the release fork shaft into release fork.

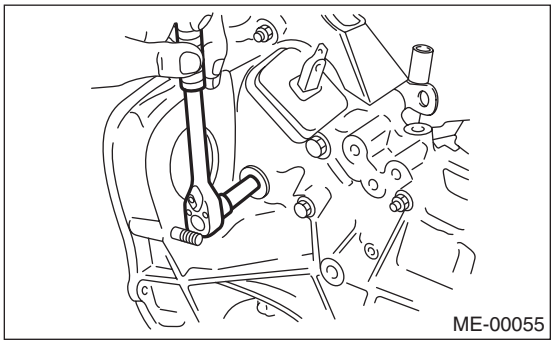
CAUTION:
Make sure the cutout portion of release fork shaft contacts spring pin.



(A) Release fork
(B) Release shaft
(C) Spring pin

(6) Tighten the plug.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)



2) Install the front cushion rubbers to engine.

Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

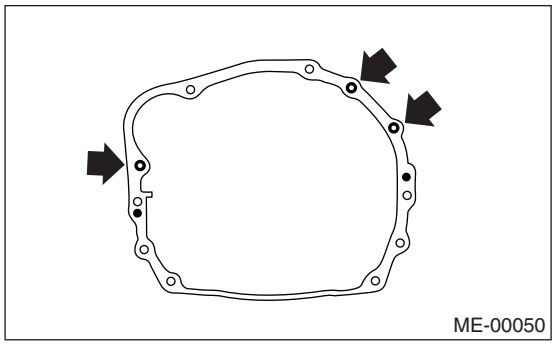
3) Install the engine onto transmission.
(1) Position the engine in engine compartment, and then align it with the transmission.

NOTE:
Be careful not to damage the adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

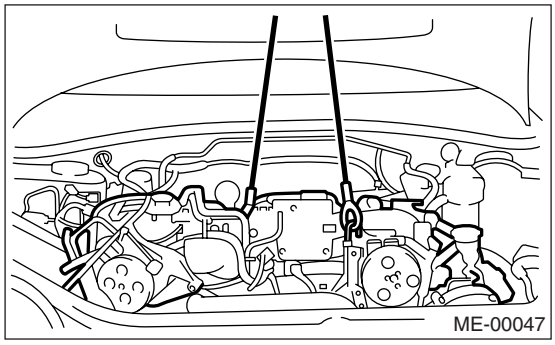
(2) Apply a small amount of grease to the splines of mainshaft. (MT model)

4) Tighten the bolts which hold the right upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

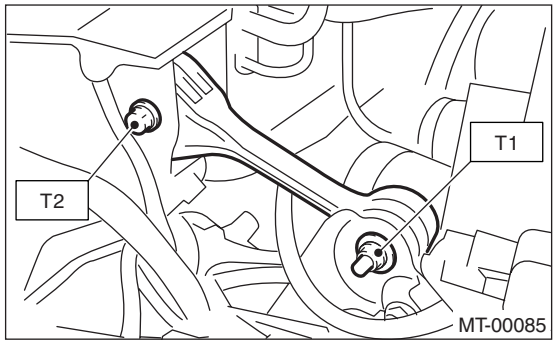


5) Remove the lifting device and wire ropes.
6) Remove the garage jack.



7) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



8) Remove the ST from torque converter clutch case. (AT model)

NOTE:
Be careful not to drop the ST into torque converter clutch case when removing ST.
ST 498277200 STOPPER SET

9) Install the starter. <Ref. to SC(H4SO)-7, INSTALLATION, Starter.>

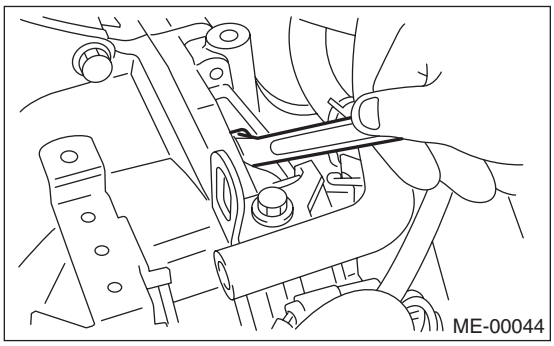
10) Install the torque converter clutch onto drive plate. (AT model)
(1) Tighten the bolts which hold the torque converter clutch to drive plate.

(2) Tighten other bolts while rotating the engine by using ST.

CAUTION:
Be careful not to drop bolts into the torque converter clutch housing.

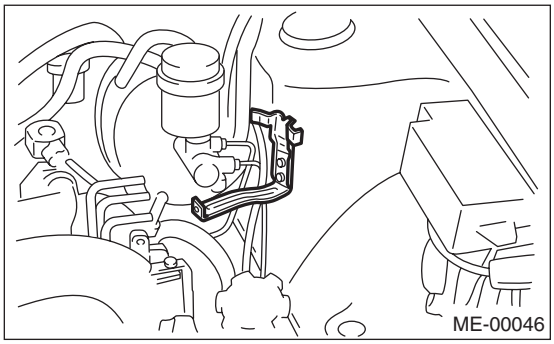
ST 499977400 CRANKSHAFT PULLEY WRENCH

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

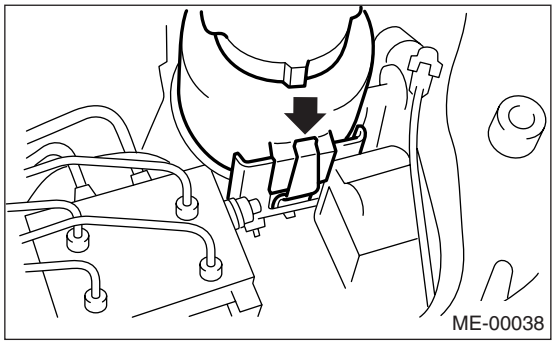


(3) Clog the service hole with plug.

11) Install the fuel filter and bracket.

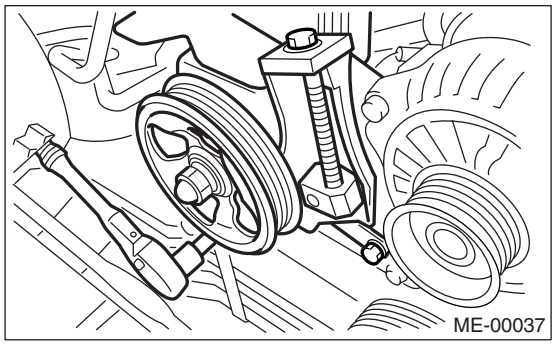


12) Install the power steering pump on bracket.
(1) Install the power steering tank on bracket.

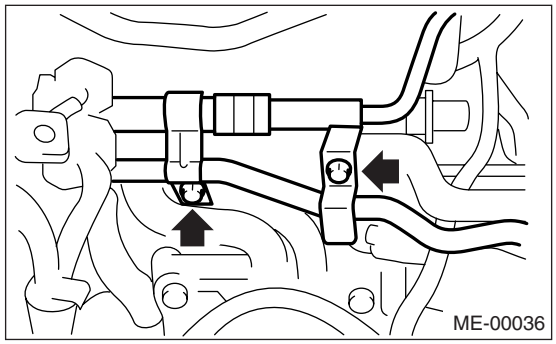


(2) Install the power steering pump.

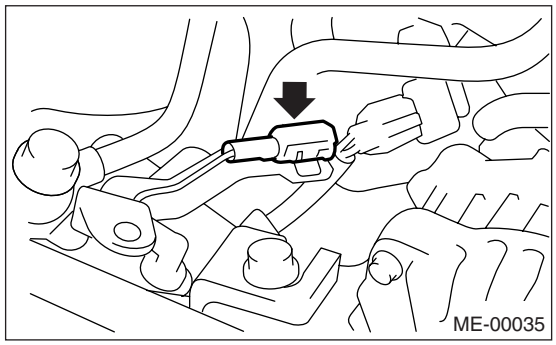
Tightening torque:
20.1 N·m (2.05 kgf-m, 14.8 ft-lb)



(3) Install the power steering pipe bracket on intake manifold RH.



(4) Connect the power steering switch connector.

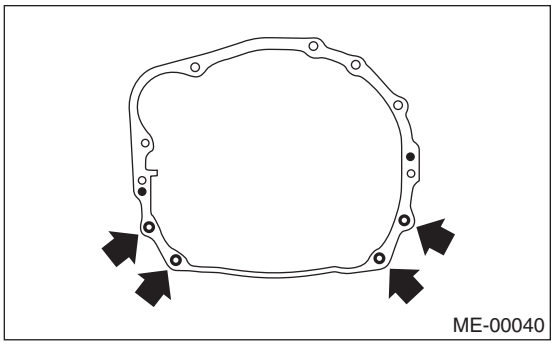


(5) Install the front side V-belt, and adjust it. <Ref. to ME(H4DOTC)-42, FRONT SIDE BELT, INSTALLATION, V-belt.>

13) Lift-up the vehicle.

14) Tighten the nuts which hold the lower side of transmission to engine.

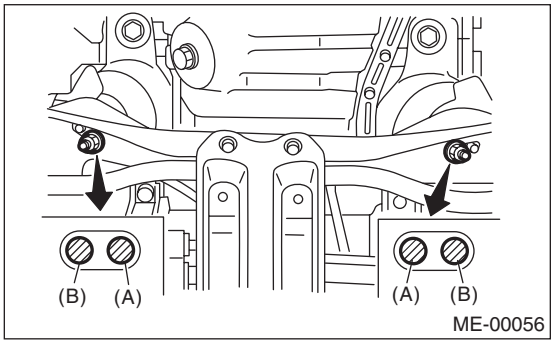
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



15) Tighten the nuts which install the front cushion rubber onto crossmember.

Tightening torque:
85 N·m (8.7 kgf-m, 62.7 ft-lb)

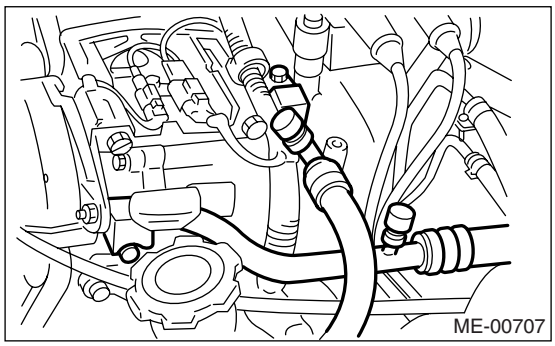
NOTE:
Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



16) Install the ATF cooler pipe to frame. (AT model)
17) Install the center exhaust pipe.
<Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>
18) Lower the vehicle.
19) Connect the following hoses:
(1) Fuel delivery hose, return hose and evaporation hose
(2) Heater inlet and outlet hoses
(3) Brake booster vacuum hose
20) Connect the following connectors and terminals:
(1) Engine ground terminal
(2) Engine harness connectors
(3) Generator connector and terminal
(4) A/C compressor connectors
21) Connect the following cables:
(1) Accelerator cable
(2) Clutch release spring
22) After connecting each cable, adjust them.
23) Install the air intake system.
(1) Install the intercooler. <Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>
(2) Install the air cleaner element and air cleaner upper cover.
(3) Install the engine harness connector bracket.
(4) Install the filler hose to air cleaner case.
24) Install the A/C pressure hoses.

NOTE:
Use new O-rings.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



25) Install the radiator. <Ref. to CO(H4DOTC)-23, INSTALLATION, Radiator.>
26) Install the coolant filler tank. <Ref. to CO(H4DOTC)-32, INSTALLATION, Coolant Filler Tank.>
27) Install the window washer tank.
28) Install the battery in the vehicle, and then connect the cables.
29) Fill engine coolant.
<Ref. to CO(H4DOTC)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
30) Charge the A/C system with refrigerant.
<Ref. to AC-21, PROCEDURE, Refrigerant Charging Procedure.>
31) Remove the front hood stay, and close the front hood.
32) Take off the vehicle from lift arms.

10.Engine Mounting

A: REMOVAL

1) Remove the engine assembly. <Ref. to ME(H4DOTC)-32, REMOVAL, Engine Assembly.>
2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Engine mounting;
35 N·m (3.6 kgf-m, 25.8 ft-lb)

C: INSPECTION

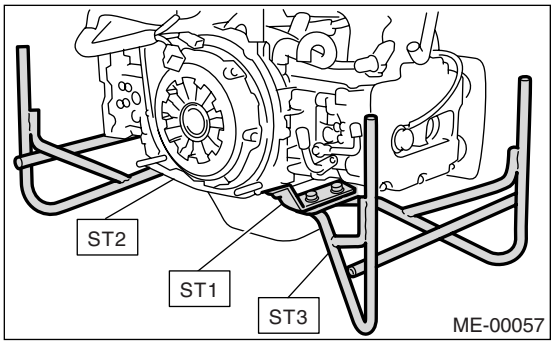
Make sure there are no cracks or other damage.

11.Preparation for Overhaul

A: PROCEDURE

1) After removing the engine from body, secure it in the ST shown below.

ST1	498457000	ENGINE STAND ADAPTER RH
ST2	498457100	ENGINE STAND ADAPTER LH
ST3	499817100	ENGINE STAND



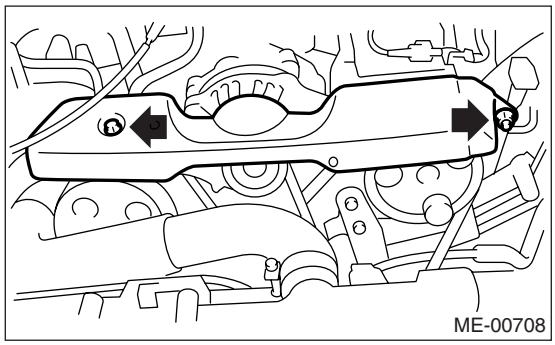
2) In this section the procedures described under each index are all connected and stated in order. It will be the complete procedure for overhauling of the engine itself when you go through all steps in the process.
Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

12.V-belt

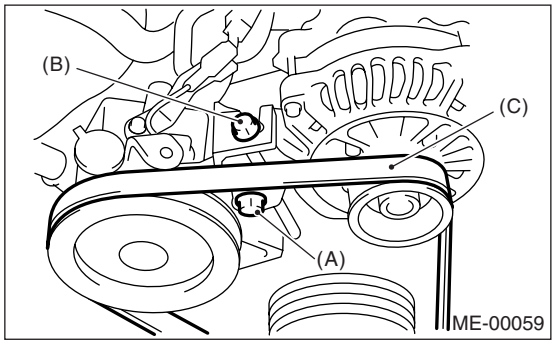
A: REMOVAL

1. FRONT SIDE BELT

1) Remove the V-belt cover.

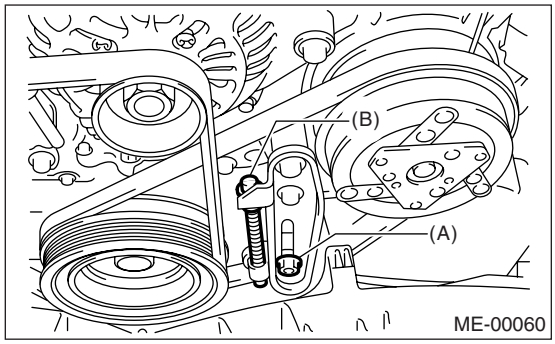


2) Loosen the lock bolt (A).
3) Loosen the slider bolt (B).
4) Remove the front side belt (C).

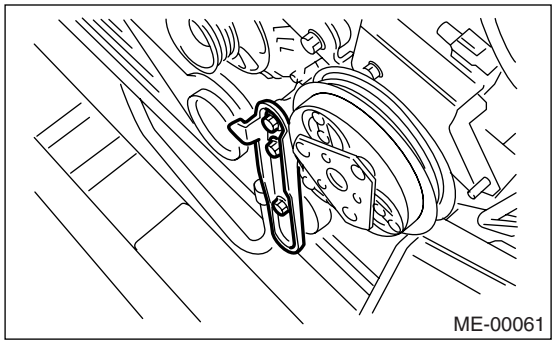


2. REAR SIDE BELT

1) Loosen the lock nut (A).
2) Loosen the slider bolt (B).



3) Remove the A/C belt.
4) Remove the A/C belt tensioner.



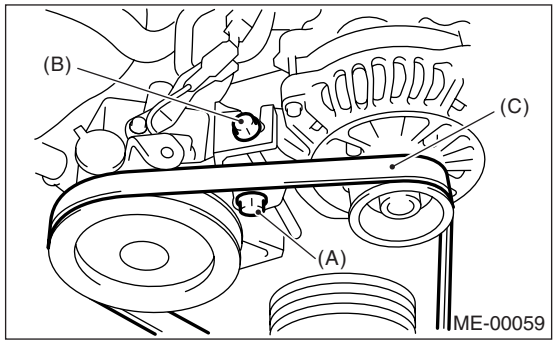
B: INSTALLATION

1. FRONT SIDE BELT

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

1) Install the belt (C), and tighten the slider bolt so as to obtain the specified belt tension. <Ref. to ME(H4DOTC)-43, INSPECTION, V-belt.>
2) Tighten the lock bolt (A).
3) Tighten the slider bolt (B).

Tightening torque:
Lock bolt through bolt:
25 N·m (2.5 kgf-m, 18.1 ft-lb)
Slider bolt:
8 N·m (0.8 kgf-m, 5.5 ft-lb)

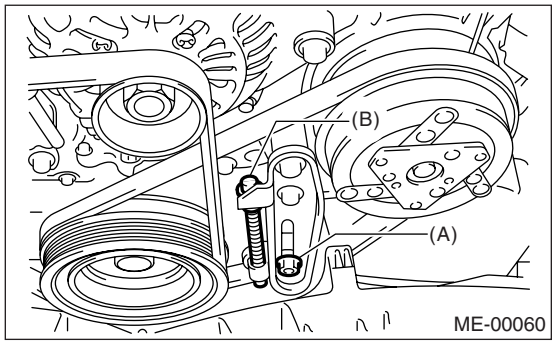


4) Idle the engine for approx. 5 min. to normalize the V-belt. (With using tension gauge)
5) Stop the engine, and then check the belt tension and adjust it. (With using tension gauge)
6) Idle the engine for approx. 1 min. to normalize the V-belt. (With using tension gauge)
7) Stop the engine, and then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

2. REAR SIDE BELT

1) Install the belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(H4DOTC)-43, INSPECTION, V-belt.>
2) Tighten the lock nut (A).

Tightening torque:
Lock nut (A);
22.6 N·m (2.3 kgf-m, 16.6 ft-lb)



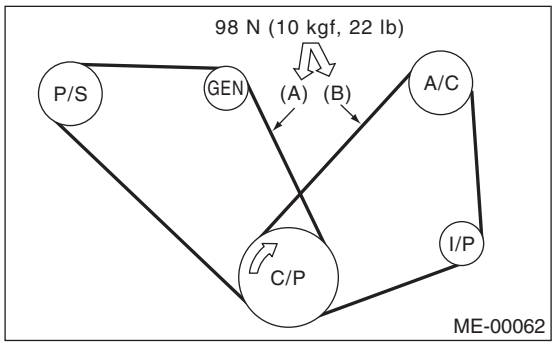
3) Idle the engine for approx. 5 min. to normalize the V-belt. (With using tension gauge)
4) Stop the engine, and then check the belt tension and adjust it. (With using tension gauge)
5) Idle the engine for approx. 1 min. to normalize the V-belt. (With using tension gauge)
6) Stop the engine, and then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

C: INSPECTION

1. WITHOUT USING BELT TENSION GAUGE

1) Replace the belts, if cracks, fraying or wear is found.
2) Check the drive belt tension and adjust it if necessary by changing generator installing position and/or idler pulley installing position.

Belt tension
(A)
replaced: 7 — 9 mm (0.276 — 0.354 in)
reused: 9 — 11 mm (0.354 — 0.433 in)
(B)*
replaced: 7.5 — 8.5 mm (0.295 — 0.335 in)
reused: 9.0 — 10.0 mm (0.354 — 0.394 in)
****: with air conditioner***

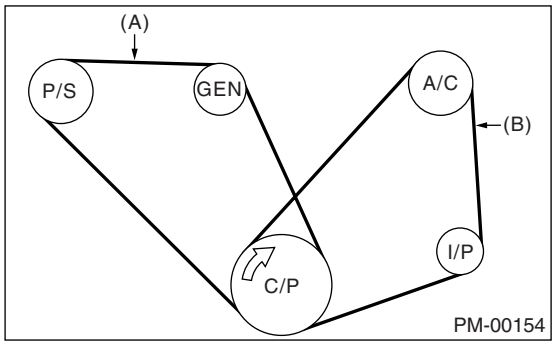


C/P Crankshaft pulley
GEN Generator
P/S Power steering oil pump pulley
A/C Air conditioning compressor pulley
I/P Idler pulley

2. WITH USING BELT TENSION GAUGE

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

Belt tension
(A) 490 — 640 N (50 — 65 kgf, 110 — 144 lb)
(B) 350 — 450 N (36 — 46 kgf, 79 — 101 lb)



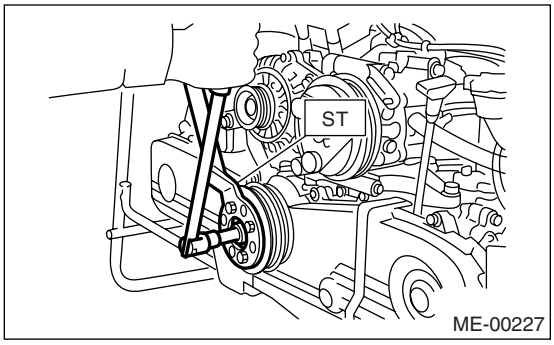
(A) Front side belt
(B) Rear side belt
C/P Crankshaft pulley
GEN Generator
P/S Power steering oil pump pulley
A/C A/C compressor pulley
I/P Idler pulley

13.Crankshaft Pulley

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4DOTC)-42, REMOVAL, V-belt.>
2) Remove the crankshaft pulley bolt. To lock the crankshaft, use ST.

ST 499977400 CRANKSHAFT PULLEY WRENCH



3) Remove the crankshaft pulley.

B: INSTALLATION

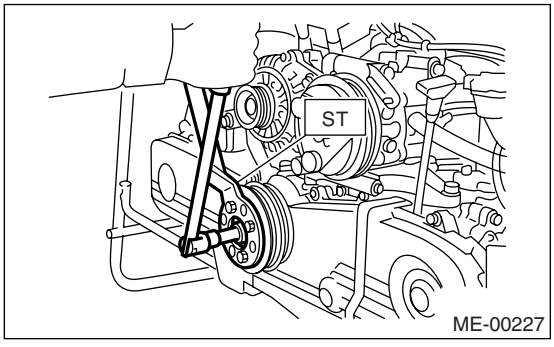
1) Install the crankshaft pulley.
2) Install the pulley bolt.

To lock the crankshaft, use ST.

ST 499977400 CRANKSHAFT PULLEY WRENCH

(1) Clean the crankshaft pulley thread using an air gun.
(2) Apply engine oil to the crankshaft pulley bolt seat and thread.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crankshaft pulley bolts.

Tightening torque:
127 N·m (13 kgf-m, 94.0 ft-lb)



3) Confirm that the tightening angle of crankshaft pulley bolt is 45 degrees or more. If the tightening angle of crankshaft pulley bolt is less than 45 degrees, conduct the following procedures.

CAUTION:
If the tightening angle of crankshaft pulley bolt is less than 45 degrees, the bolt should be damaged. In this case, the bolt must be replaced.

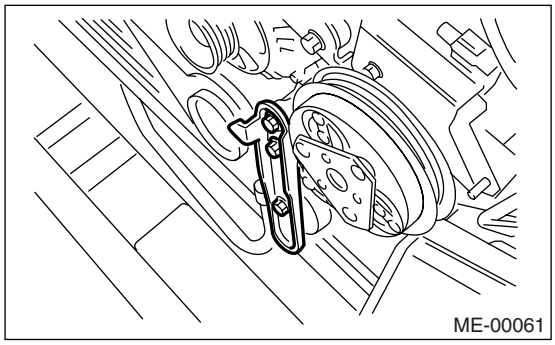
(1) Replace the crankshaft pulley bolts and clean them.

Crankshaft pulley bolt:
12369AA011

(2) Clean the crankshaft thread using an air gun.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crankshaft pulley bolts keeping them in an angle between 45 degrees and 60 degrees.

NOTE:
Conduct the tightening procedures by confirming the turning angle of crankshaft pulley bolt referring to the gauge indicated on timing belt cover.

4) Install the A/C belt tensioner.



5) Install the V-belt. <Ref. to ME(H4DOTC)-42, INSTALLATION, V-belt.>

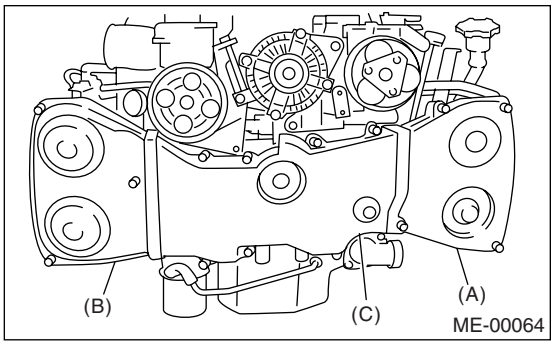
C: INSPECTION

1) Make sure the V-belt is not worn or otherwise damaged.
2) Check the tension of the belt. <Ref. to ME(H4DOTC)-43, INSPECTION, V-belt.>

14.Timing Belt Cover

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4DOTC)-42, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-44, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover (LH) (A).
4) Remove the timing belt cover (RH) (B).
5) Remove the front timing belt cover (C).



B: INSTALLATION

1) Install the front timing belt cover (C).

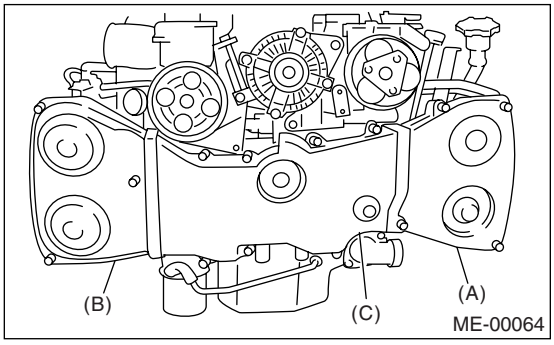
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

2) Install the timing belt cover (RH) (B).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

3) Install the timing belt cover (LH) (A).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



4) Install the crankshaft pulley. <Ref. to ME(H4DOTC)-44, INSTALLATION, Crankshaft Pulley.>
5) Install the V-belt. <Ref. to ME(H4DOTC)-42, INSTALLATION, V-belt.>

C: INSPECTION

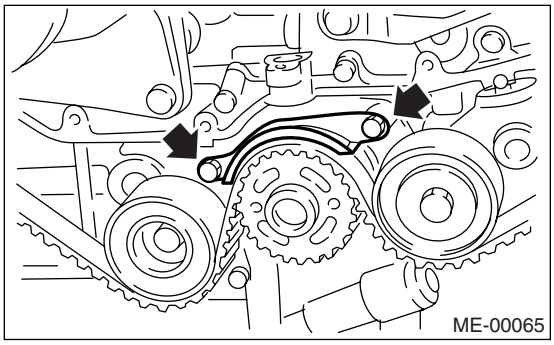
Make sure the cover is not damaged.

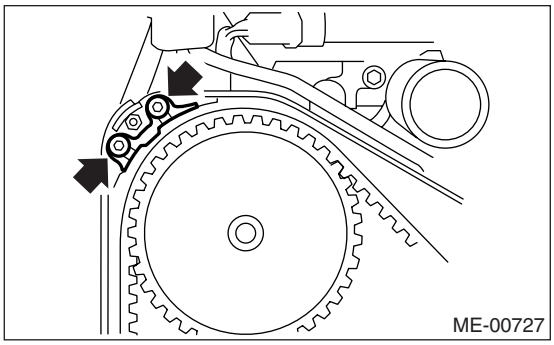
15.Timing Belt Assembly

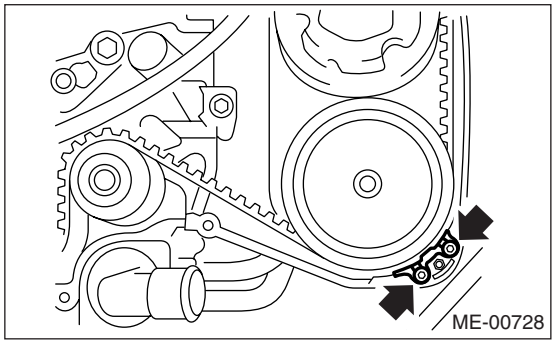
A: REMOVAL

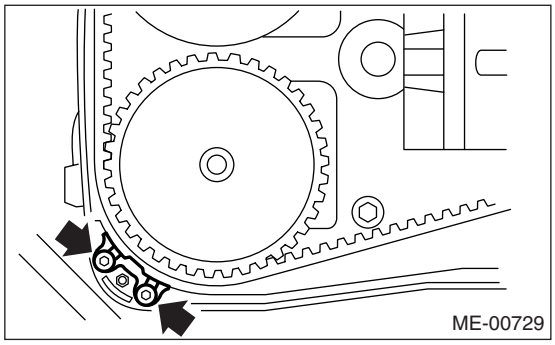
1. TIMING BELT

1) Remove the V-belt. <Ref. to ME(H4DOTC)-42, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-44, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt guides. (MT model)



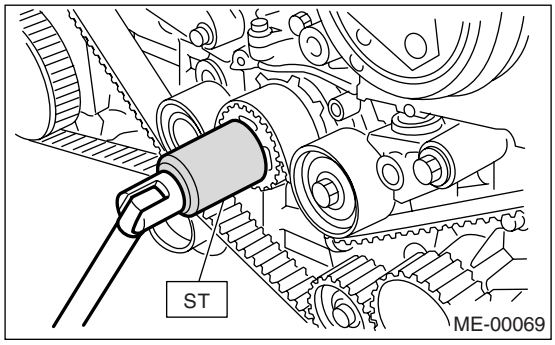




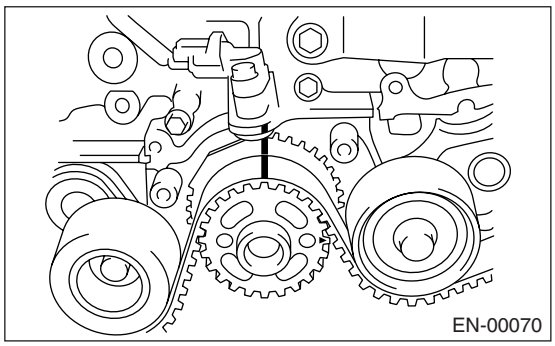


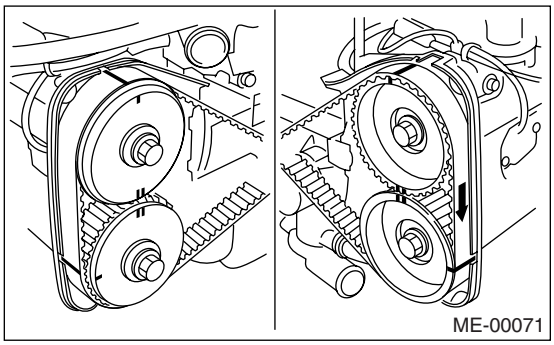
5) If the alignment mark and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing the timing belt as follows:
   (1) Turn the crankshaft using ST, and align the alignment marks on crankshaft sprocket, intake camshaft sprocket (LH), exhaust camshaft sprocket (LH), intake camshaft sprocket (RH) and exhaust camshaft sprocket (RH) with notches of timing belt cover and cylinder block.

ST 499987500 CRANKSHAFT SOCKET

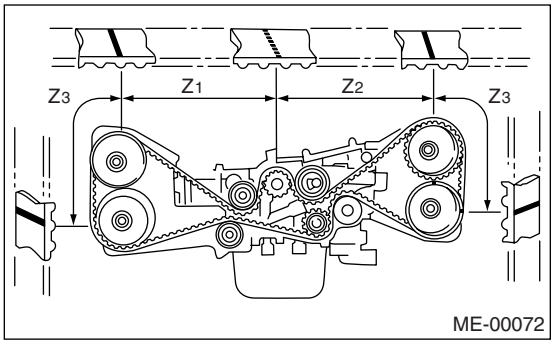


(2) Using white paint, put alignment and/or arrow marks on the timing belts in relation to the sprockets.


EN-00070

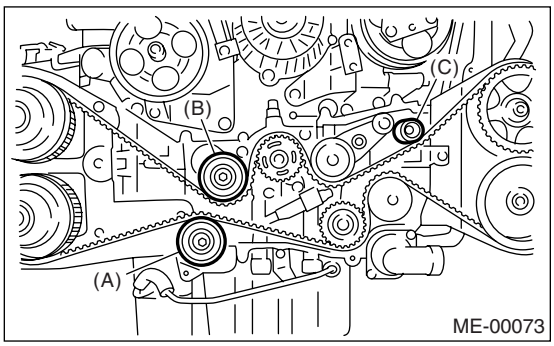

ME-00071

Z_1: 54.5 tooth length
Z_2: 51 tooth length
Z_3: 28 tooth length



ME-00072

6) Remove the belt idler (A).



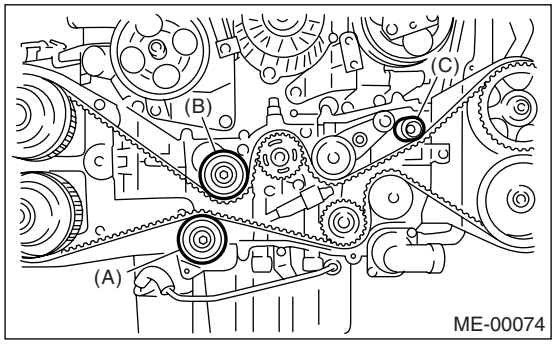
ME-00073

7) Remove the timing belt.

CAUTION:
After the timing belt has been removed, never rotate the intake and exhaust, camshaft sprocket. If the camshaft sprocket is rotated, the intake and exhaust valve heads strike together and valve stems are bent.

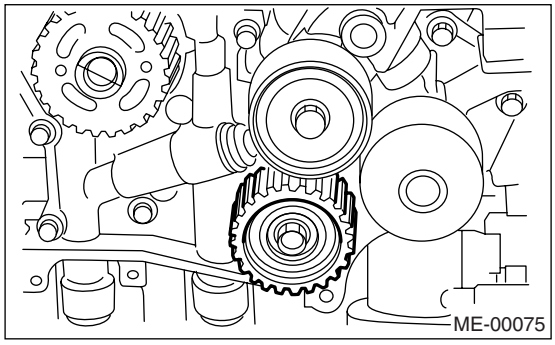
2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

1) Remove the belt idler (B) and (C).

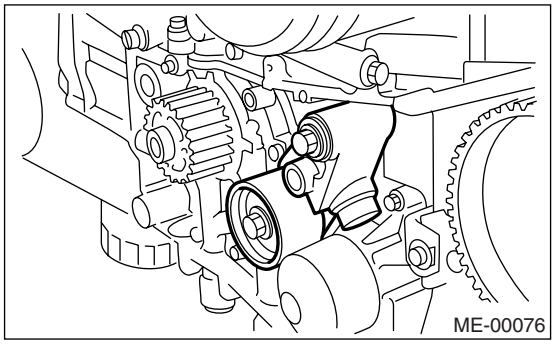


ME-00074

2) Remove the belt idler No. 2.


ME-00075

3) Remove the automatic belt tension adjuster assembly.


ME-00076

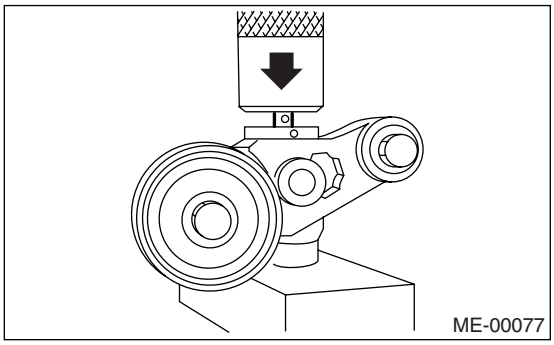
B: INSTALLATION

1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

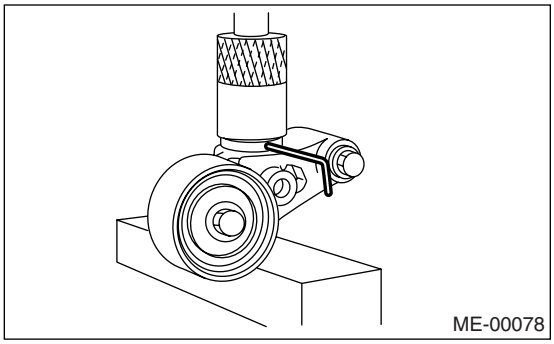
1) Preparation for installation of automatic belt tension adjuster assembly:

NOTE:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push the adjuster rod vertically.
• Press-in the push adjuster rod gradually taking more than 3 minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
• Press the adjuster rod as far as the end surface of cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
• Do not release the press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to the vertical pressing tool.
(2) Slowly move the adjuster rod down with a pressure of 165 N (16.8 kgf, 37.1 lb) or more until the adjuster rod is aligned with the stopper pin hole in the cylinder.

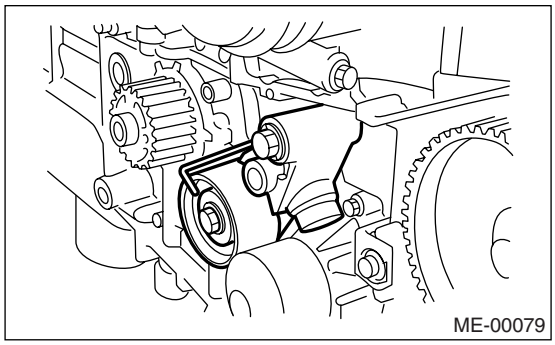

ME-00077

(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (0.08 in) (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.


ME-00078

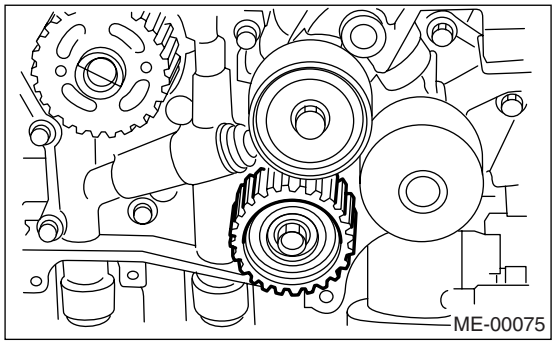
2) Install the automatic belt tension adjuster assembly.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)


ME-00079

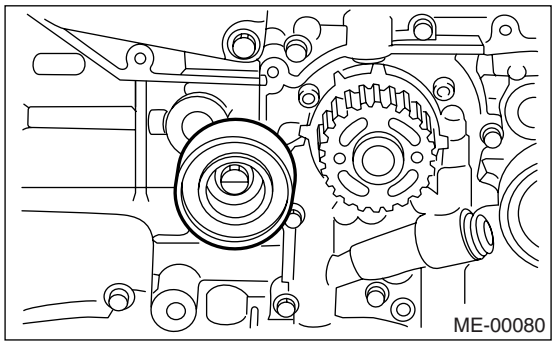
3) Install the belt idler No. 2.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)


ME-00075

4) Install the belt idler.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

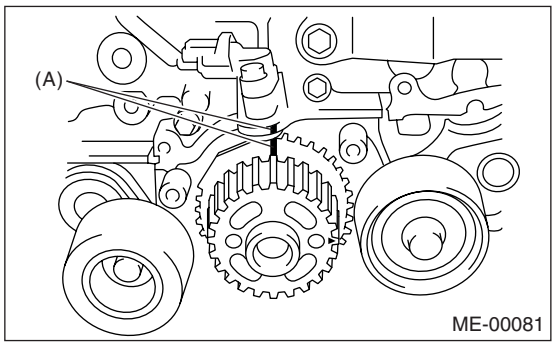

ME-00080

2. TIMING BELT

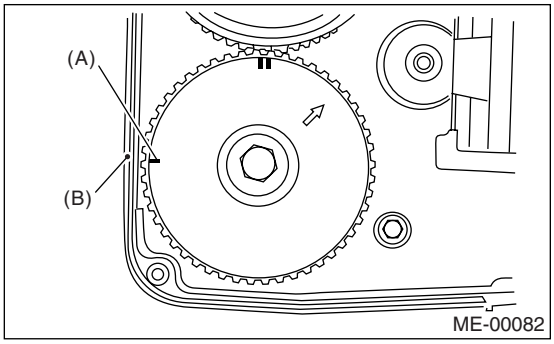
1) Preparation for installation of automatic belt tension adjuster assembly. <Ref. to ME(H4DOTC)-48, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>

2) Crankshaft and camshaft sprocket alignment.

(1) Align mark (A) on the crankshaft sprocket with mark on the oil pump cover at cylinder block.

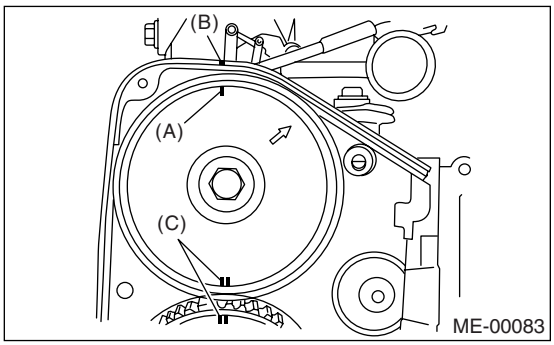


(2) Align single line mark (A) on the exhaust camshaft sprocket (RH) with notch (B) on timing belt cover.

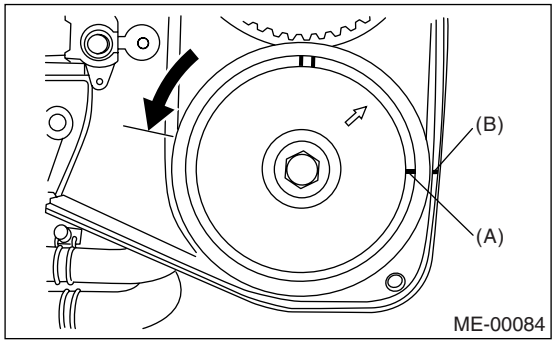


(3) Align single line mark (A) on the intake camshaft sprocket (RH) with notch (B) on timing belt cover.

(Make sure double lines (C) on intake camshaft and exhaust camshaft sprockets are aligned.)

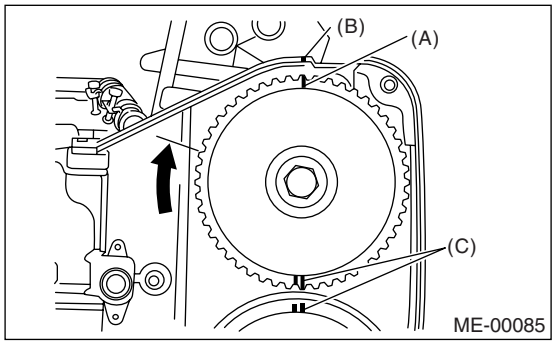


(4) Align single line mark (A) on exhaust camshaft sprocket (LH) with notch (B) on timing belt cover by turning the sprocket counterclockwise (as viewed from front of engine).



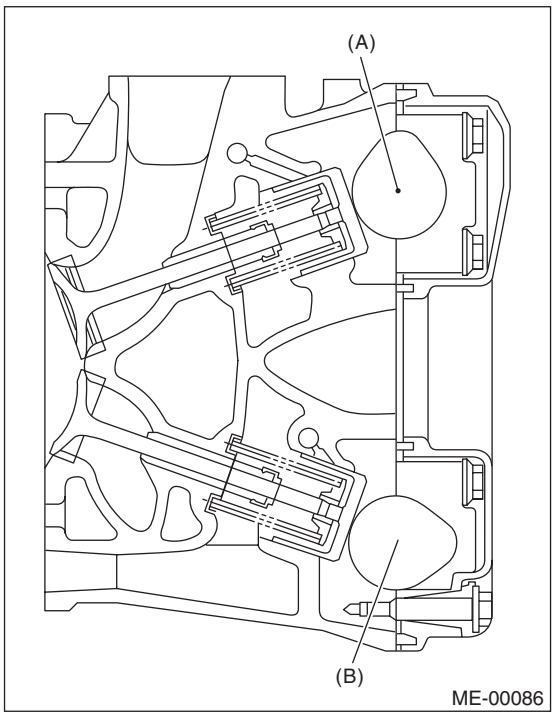
(5) Align the single line mark (A) on intake camshaft sprocket (LH) with notch (B) on timing belt cover by turning the sprocket clockwise (as viewed from front of engine).

Ensure the double lines (C) on intake and exhaust camshaft sprockets are aligned.



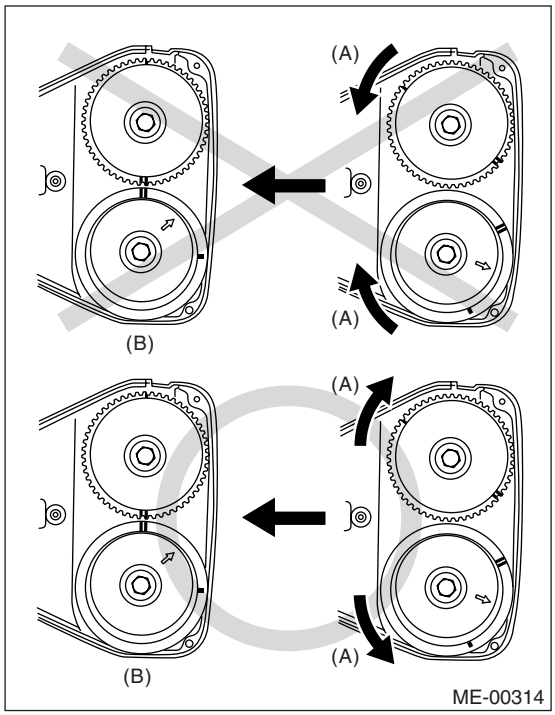
(6) Ensure the camshaft and crankshaft sprockets are positioned properly.

CAUTION:
• Intake and exhaust camshafts for this DOHC engine can be independently rotated with the timing belts removed. As can be seen from the figure, if the intake and exhaust valves are lifted simultaneously, their heads will interfere with each other, resulting in bent valves.



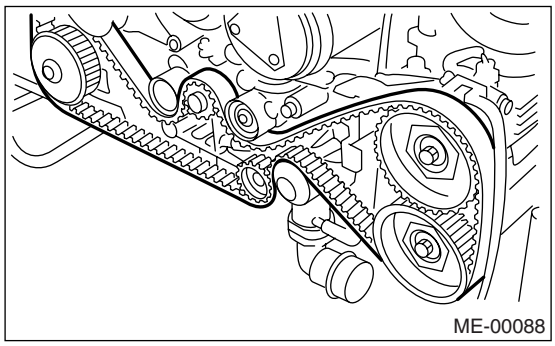
(A) Intake camshaft
(B) Exhaust camshaft

• When the timing belts are not installed, four camshafts are held at the "zero-lift" position, where all cams on camshafts do not push the intake and exhaust valves down. (Under this condition, all valves remain unlifted.)
• When the camshafts are rotated to install the timing belts, #2 intake and #4 exhaust cam of camshafts (LH) are held to push their corresponding valves down. (Under this condition, these valves are held lifted.) Camshafts (RH) are held so that their cams do not push valves down.
• Camshafts (LH) must be rotated from the "zero-lift" position to the position where the timing belt is to be installed at as small an angle as possible, in order to prevent mutual interference of intake and exhaust valve heads.
• Do not allow the camshafts to rotate in the direction shown in the figure as this causes both intake and exhaust valves to lift simultaneously, resulting in interference with their heads.



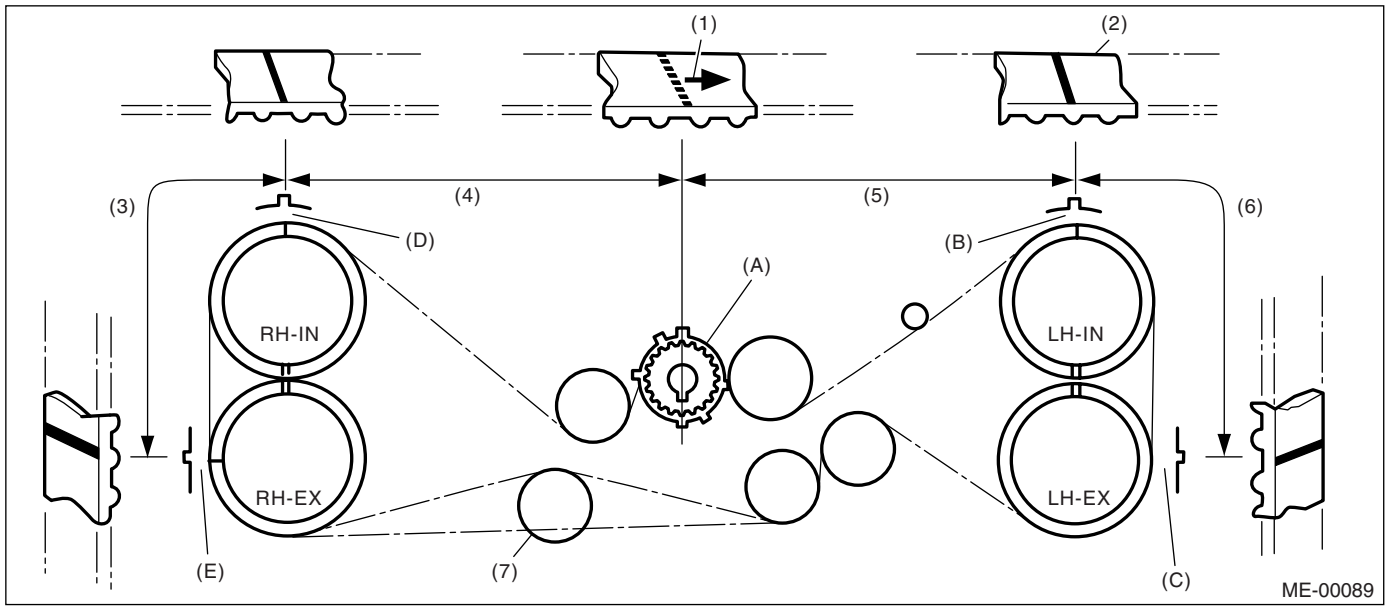
(A) Rotating direction
(B) Timing belt installation position

3) Installation of timing belt:



Align the alignment mark on timing belt with marks on sprockets in alphabetical order shown in the figure. While aligning marks, position the timing belt properly.

CAUTION:
• Disengagement of more than three timing belt teeth may result in interference between the valve and piston.
• Ensure the belt's rotating direction is correct.

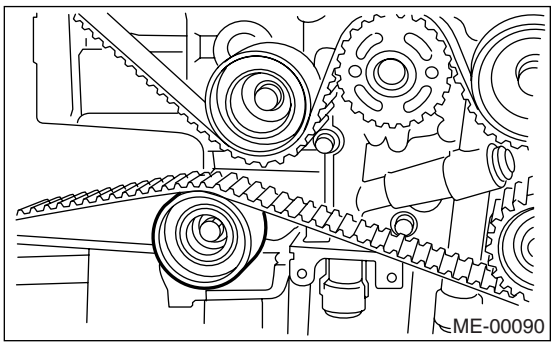


(1) Arrow mark
(2) Timing belt
(3) 28 tooth length
(4) 54.5 tooth length
(5) 51 tooth length
(6) 28 tooth length
(7) Install it in the end

4) Install the belt idlers.

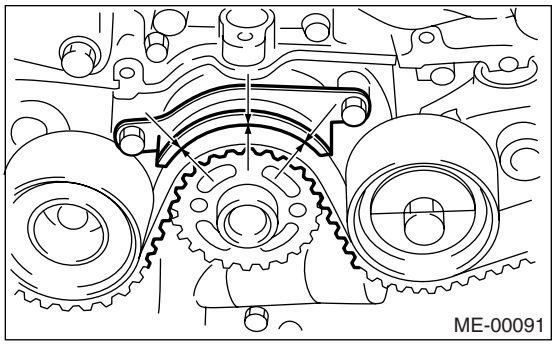
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

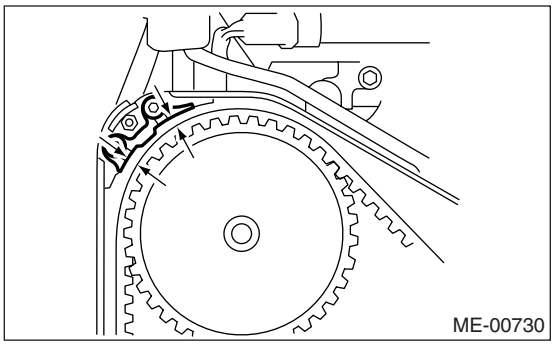
NOTE:
Make sure that the marks on the timing belt and sprockets are aligned.

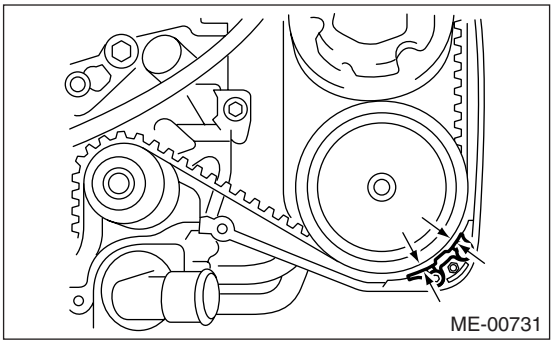


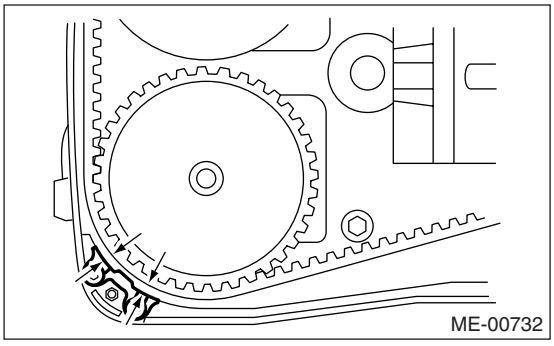
5) After ensuring that the marks on the timing belt and sprockets are aligned, remove the stopper pin from tensioner adjuster.
6) Install the timing belt guide. (MT model)
(1) Temporarily tighten the bolts.
(2) Check and adjust the clearance between timing belt and timing belt guide.

Clearance:
1.0±0.5 mm (0.039±0.020 in)



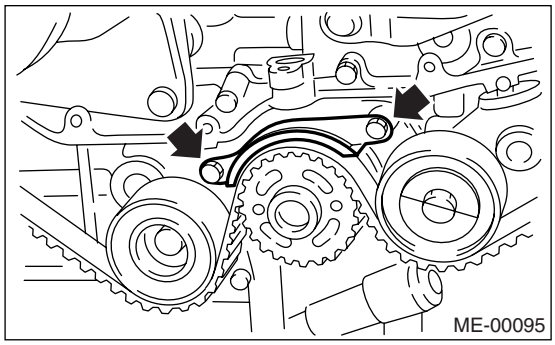




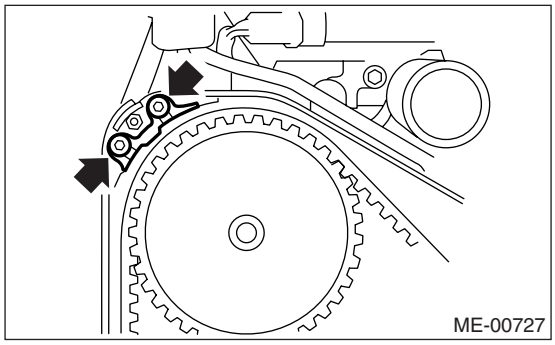


(3) Tighten the bolts.

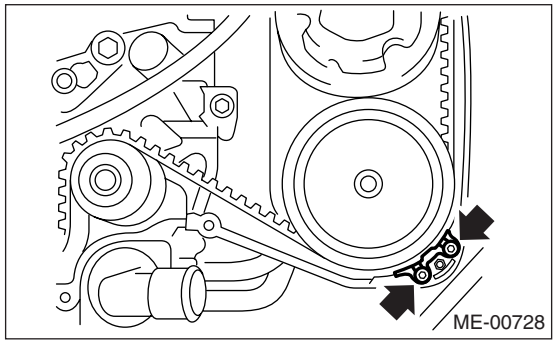
Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



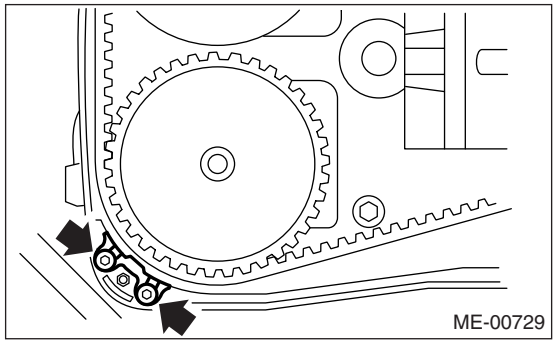
Tightening torque:
6.4 N·m (0.7 kgf-m, 5.1 ft-lb)



Tightening torque:
6.4 N·m (0.7 kgf-m, 5.1 ft-lb)



Tightening torque:
6.4 N·m (0.7 kgf-m, 5.1 ft-lb)



7) Install the timing belt cover. <Ref. to ME(H4DOTC)-45, INSTALLATION, Timing Belt Cover.>

8) Install the crankshaft pulley. <Ref. to ME(H4DOTC)-44, INSTALLATION, Crankshaft Pulley.>
9) Install the V-belt. <Ref. to ME(H4DOTC)-42, INSTALLATION, V-belt.>

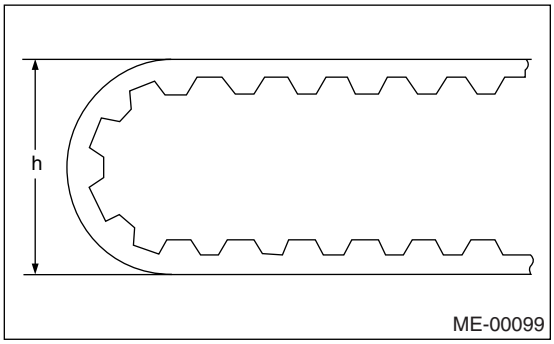
C: INSPECTION

1. TIMING BELT

1) Check the timing belt teeth for breaks, cracks, and wear. If any fault is found, replace the belt.
2) Check the condition of back side of belt; if any crack is found, replace the belt.

NOTE:
• Be careful not to let oil, grease or coolant contact the belt. Remove quickly and thoroughly if this happens.
• Do not bend the belt sharply.

Bending radius: h
60 mm (2.36 in) or more



2. AUTOMATIC BELT TENSION ADJUSTER

1) Visually check the oil seals for leaks, and rod ends for abnormal wear or scratches. If necessary, replace the automatic belt tension adjuster assembly.

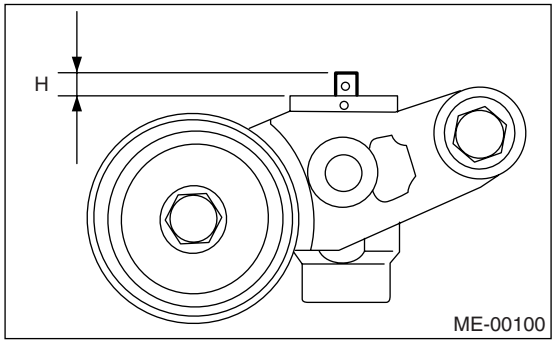
NOTE:
Slight traces of oil at rod's oil seal does not indicate a problem.

2) Check that the adjuster rod does not move when a pressure of 165 N (16.8 kgf, 37.1 lb) is applied to it. This is to check adjuster rod stiffness.
3) If the adjuster rod is not stiff and moves freely when applying 165 N (16.8 kgf, 37.1 lb), check it using the following procedures:
(1) Slowly press the adjuster rod down to the end surface of the cylinder. Repeat this motion 2 or 3 times.
(2) With the adjuster rod moved all the way up, apply a pressure of 165 N (16.8 kgf, 37.1 lb) to it. Check the adjuster rod stiffness.
(3) If the adjuster rod is not stiff and moves down, replace the automatic belt tension adjuster assembly with a new one.

NOTE:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push the adjuster rod vertically.
• Press-in the push adjuster rod gradually taking more than 3 minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
• Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.

4) Measure the extension of rod beyond the body. If it is not within specifications, replace with a new one.

Rod extension: H
5.7±0.5 mm (0.224±0.020 in)



3. BELT TENSION PULLEY

1) Check the mating surfaces of timing belt and contact point of adjuster rod for abnormal wear or scratches. Replace the belt tension pulley if faulty.
2) Check the belt tension pulley for smooth rotation. Replace if noise or excessive play is noted.
3) Check the belt tension pulley for grease leakage.

4. BELT IDLER

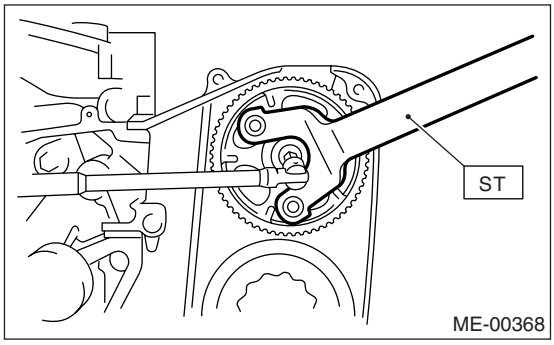
1) Check the belt idler for smooth rotation. Replace if noise or excessive play is noted.
2) Check the outer contacting surfaces of idler pulley for abnormal wear and scratches.
3) Check the belt idler for grease leakage.

16.Camshaft Sprocket

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4DOTC)-42, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-44, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-46, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft position sensor. <Ref. to FU(H4DOTC)-29, REMOVAL, Camshaft Position Sensor.>
6) Remove the camshaft sprockets. To lock the camshaft, use ST.

ST	18231AA010	CAMSHAFT SPROCKET WRENCH (INTAKE LH)
ST	499207400	CAMSHAFT SPROCKET WRENCH (Except INTAKE LH)



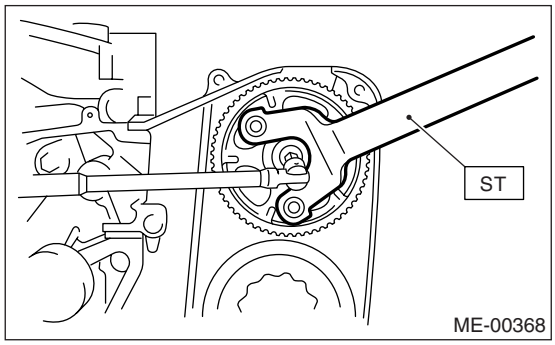
B: INSTALLATION

1) Install the camshaft sprocket. To lock the camshaft, use ST.

ST	18231AA010	CAMSHAFT SPROCKET WRENCH (INTAKE LH)
ST	499207400	CAMSHAFT SPROCKET WRENCH (Except INTAKE LH)

Tightening torque:
98 N·m (10 kgf-m, 72.4 ft-lb)

NOTE:
Do not confuse the camshaft sprockets (RH) and (LH) intake side during installation. The camshaft sprocket (LH) is identified by a projection used to monitor camshaft position sensor.



2) Install the camshaft position sensor. <Ref. to FU(H4DOTC)-29, INSTALLATION, Camshaft Position Sensor.>
3) Install the timing belt assembly. <Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt Assembly.>
4) Install the timing belt cover. <Ref. to ME(H4DOTC)-45, INSTALLATION, Timing Belt Cover.>
5) Install the crankshaft pulley. <Ref. to ME(H4DOTC)-44, INSTALLATION, Crankshaft Pulley.>
6) Install the V-belt. <Ref. to ME(H4DOTC)-42, INSTALLATION, V-belt.>

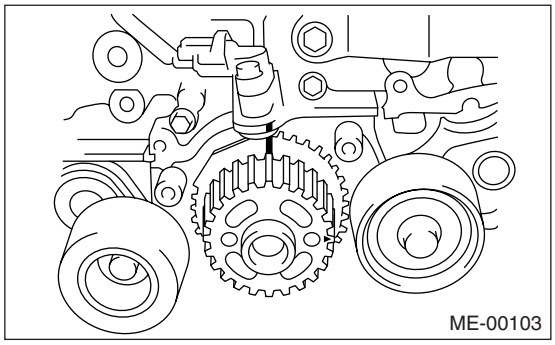
C: INSPECTION

1) Check the sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.
3) Check the crankshaft sprocket notch used for sensor for damage and contamination of foreign matter.

17.Crankshaft Sprocket

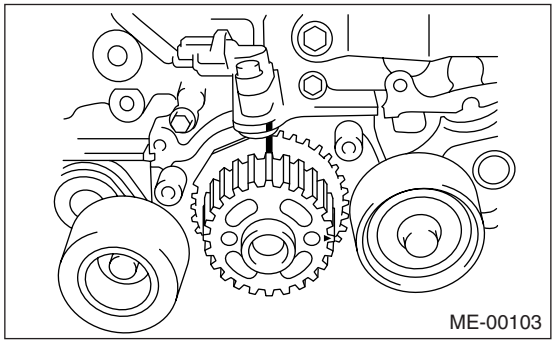
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4DOTC)-42, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-44, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-46, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(H4DOTC)-54, REMOVAL, Camshaft Sprocket.>
6) Remove the crankshaft sprocket.



B: INSTALLATION

1) Install the crankshaft sprocket.



2) Install the camshaft sprocket. <Ref. to ME(H4DOTC)-54, INSTALLATION, Camshaft Sprocket.>
3) Install the timing belt assembly. <Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt Assembly.>
4) Install the timing belt cover. <Ref. to ME(H4DOTC)-45, INSTALLATION, Timing Belt Cover.>
5) Install the crankshaft pulley. <Ref. to ME(H4DOTC)-44, INSTALLATION, Crankshaft Pulley.>
6) Install the V-belt. <Ref. to ME(H4DOTC)-42, INSTALLATION, V-belt.>

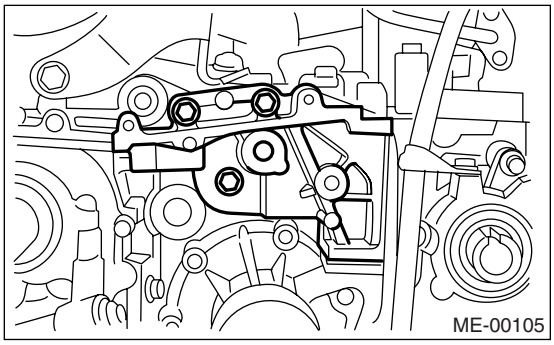
C: INSPECTION

1) Check the sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.
3) Check the crankshaft sprocket notch used for sensor for damage and contamination of foreign matter.

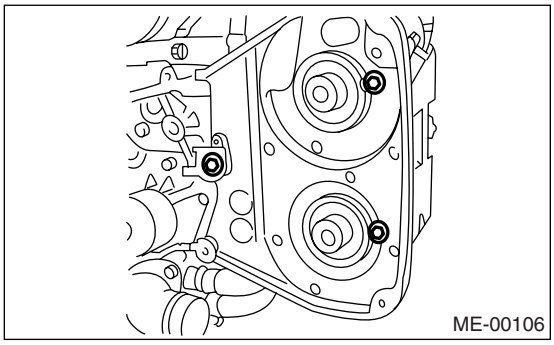
18.Camshaft

A: REMOVAL

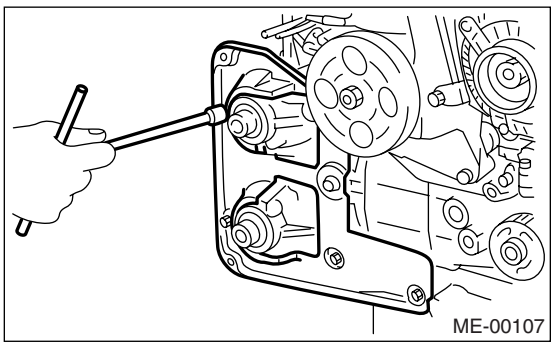
1) Remove the V-belt. <Ref. to ME(H4DOTC)-42, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-44, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-46, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(H4DOTC)-54, REMOVAL, Camshaft Sprocket.>
6) Remove the crankshaft sprocket. <Ref. to ME(H4DOTC)-55, REMOVAL, Crankshaft Sprocket.>
7) Remove the tensioner bracket.


ME-00105

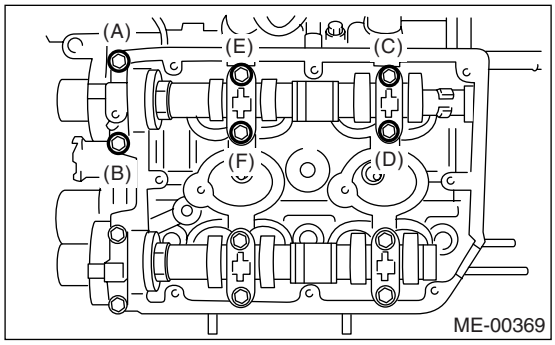
8) Remove the timing belt cover No. 2 (LH).


ME-00106

9) Remove the timing belt cover No. 2 (RH).

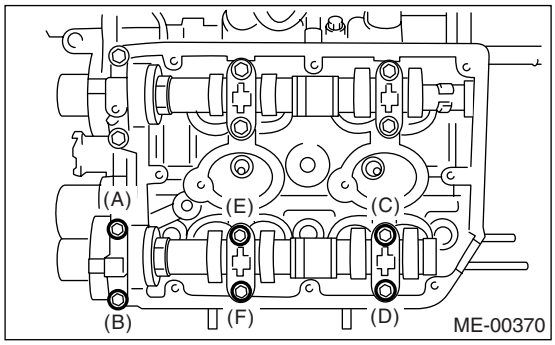

ME-00107

10) Disconnect the ignition coil connector.
11) Remove the ignition coil.
12) Remove the rocker cover and gasket.
13) Loosen the intake camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



ME-00369

14) Remove the camshaft cap and intake camshaft.
15) Loosen the exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



ME-00370

16) Remove the camshaft caps and exhaust camshaft.

NOTE:
Arrange the camshaft caps in order so that they can be installed in their original positions.

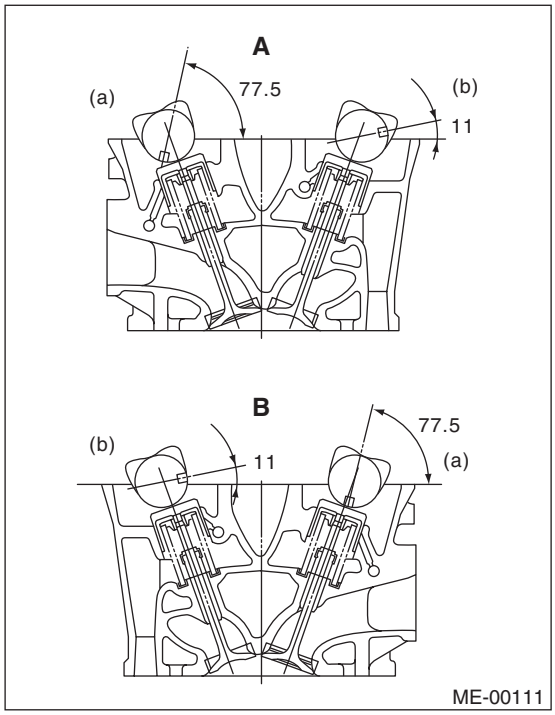
17) Similarly, remove the camshafts (RH) and related parts.

B: INSTALLATION

1) Camshaft installation: Apply engine oil to the cylinder head at camshaft bearing location before installing the camshaft. Install the camshaft so that each valves is close to or in contact with “base circle” of cam lobe.

NOTE:
• When the camshafts are positioned as shown in the figure, camshafts need to be rotated at a minimum to align with the timing belt during installation.

• Camshaft (RH) need not be rotated when set at the position shown in the figure. Intake camshaft (LH): Rotate 80° clockwise. Exhaust camshaft (LH): Rotate 45° counterclockwise.

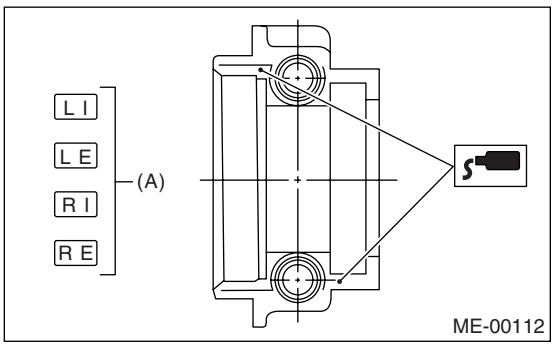


A Cylinder head (LH)
B Cylinder head (RH)
(a) Intake camshaft
(b) Exhaust camshaft

2) Camshaft cap installation:
(1) Apply fluid packing sparingly to the cap mating surface.

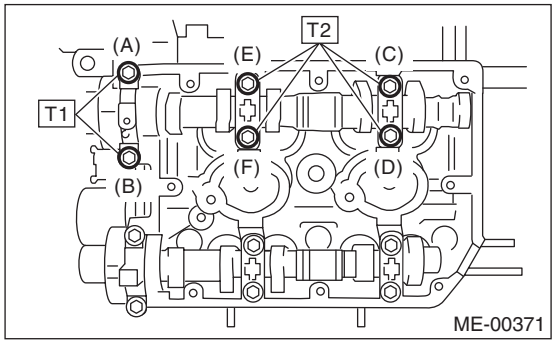
NOTE:
Do not apply fluid packing excessively. Failure to do so may cause excess packing to come out and flow toward oil seal, resulting in oil leaks.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



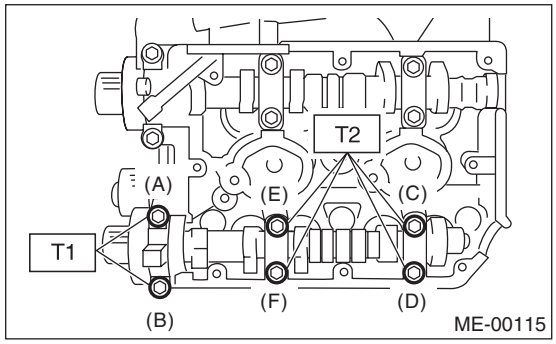
(2) Apply engine oil to cap bearing surface and install the cap on camshaft as shown by identification mark (A).
(3) Gradually tighten the camshaft cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.

Tightening torque:
T1: 10 N·m (1.0 kgf-m, 7.2 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



(4) Similarly, tighten the cap on exhaust side. After tightening the cap, ensure the camshaft rotates only slightly while holding it at “base” circle.

Tightening torque:
T1: 10 N·m (1.0 kgf-m, 7.2 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)

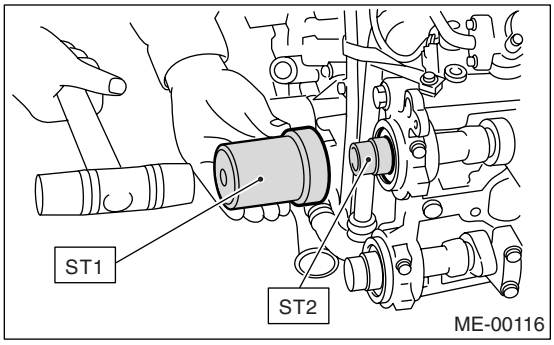


3) Camshaft oil seal installation: Apply grease to the new oil seal lips and press onto the front end of camshaft by using ST1 and ST2.

NOTE:
Use a new oil seal.

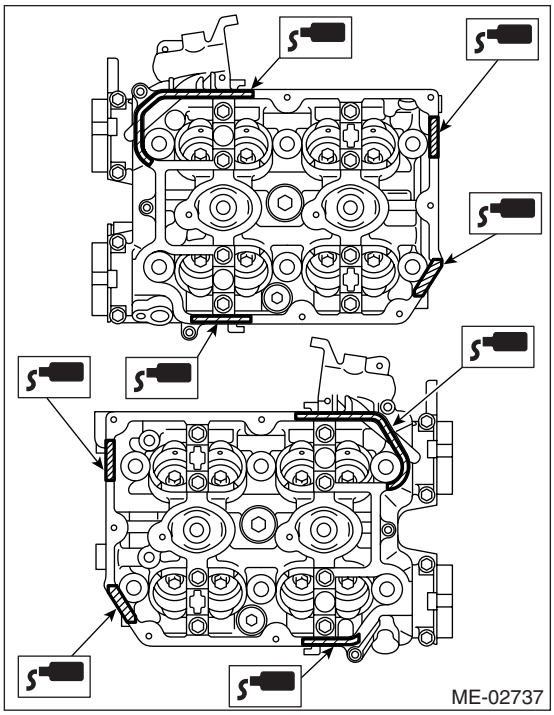
ST1 499587600 OIL SEAL INSTALLER

ST2 499597200 OIL SEAL GUIDE



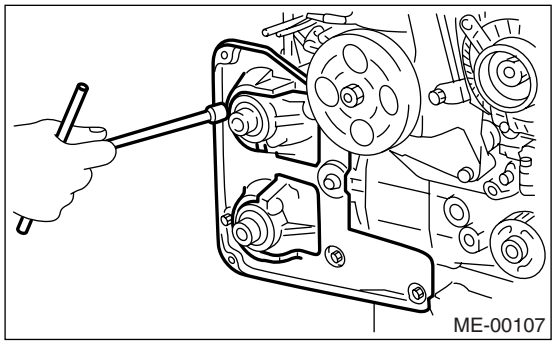
4) Rocker cover installation:
(1) Install the gasket on rocker cover. Install the peripheral gasket and ignition coil gasket.
(2) Apply fluid packing to the indicated portion on cylinder head.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



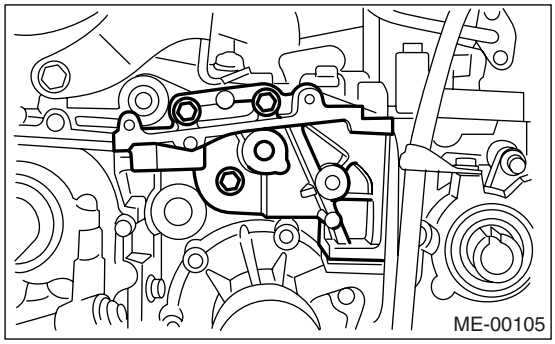
(3) Install the rocker cover on cylinder head. Ensure the gasket is properly positioned during installation.
5) Install the ignition coil.
6) Connect the ignition coil connector.
7) Similarly, install the parts on right-hand side.
8) Install the timing belt cover No. 2 (RH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



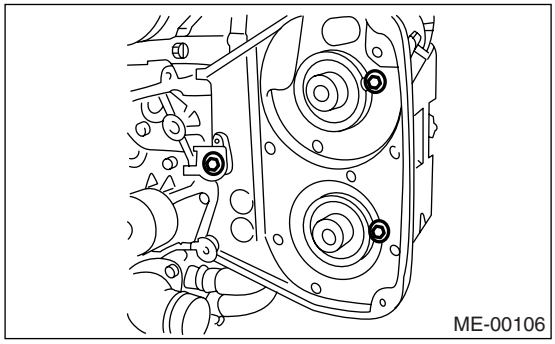
9) Install the tensioner bracket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



10) Install the timing belt cover No. 2 (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



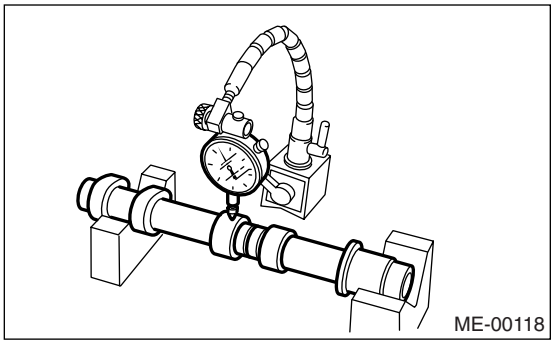
11) Install the crankshaft sprocket. <Ref. to ME(H4DOTC)-55, INSTALLATION, Crankshaft Sprocket.>
12) Install the camshaft sprockets. <Ref. to ME(H4DOTC)-54, INSTALLATION, Camshaft Sprocket.>
13) Install the timing belt assembly. <Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt Assembly.>
14) Install the timing belt cover. <Ref. to ME(H4DOTC)-45, INSTALLATION, Timing Belt Cover.>

15) Install the crankshaft pulley. <Ref. to ME(H4DOTC)-44, INSTALLATION, Crankshaft Pulley.>
16) Install the V-belt. <Ref. to ME(H4DOTC)-42, INSTALLATION, V-belt.>

C: INSPECTION

1) Measure the bend, and repair or replace if necessary.

Limit:
0.020 mm (0.00079 in)

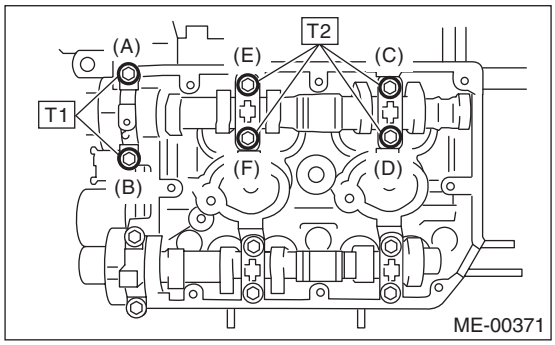


2) Check the journal for damage and wear. Replace if faulty.
3) Measure the outside diameter of camshaft journal. If the journal diameter is not as specified, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard	37.946 — 37.963 mm (1.4939 — 1.4946 in)	29.946 — 29.963 mm (1.1790 — 1.1796 in)

4) Measurement of the camshaft journal oil clearance:
(1) Clean the bearing caps and camshaft journals.
(2) Place the camshafts on cylinder head. (Without installing the valve rocker.)
(3) Place a plastigauge across each of the camshaft journals.
(4) Gradually tighten the cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.
Do not turn the camshaft.

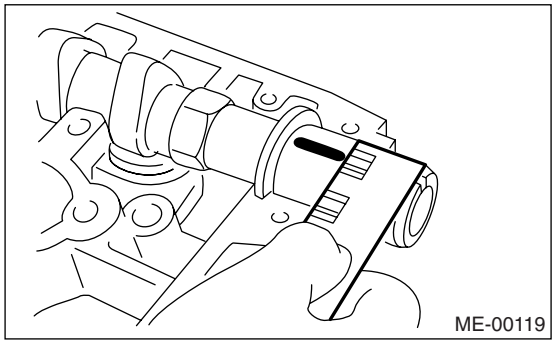
Tightening torque:
T1: 10 N·m (1.0 kgf-m, 7.2 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



(5) Remove the bearing caps.
(6) Measure the widest point of plastigauge on each journal. If the oil clearance exceeds the limit, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

Standard:
0.037 — 0.072 mm (0.0015 — 0.0028 in)

Limit:
0.10 mm (0.0039 in)



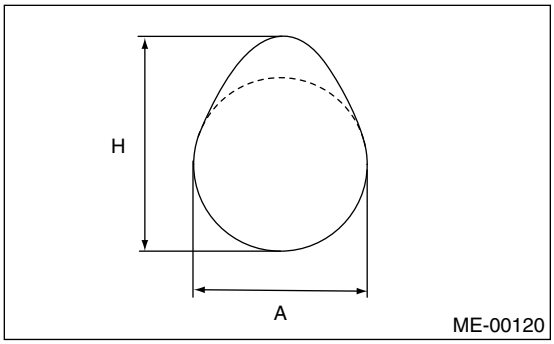
(7) Completely remove the plastigauge.
5) Check the cam face condition; remove the minor faults by grinding with oil stone. Measure the cam height H, replace if the limit has been exceeded.

Cam height: H

Standard:
Intake:
46.25 — 46.35 mm (1.821 — 1.825 in)
Exhaust:
46.15 — 46.25 mm (1.817 — 1.821 in)

Limit:
Intake:
46.15 mm (1.817 in)
Exhaust:
46.05 mm (1.813 in)

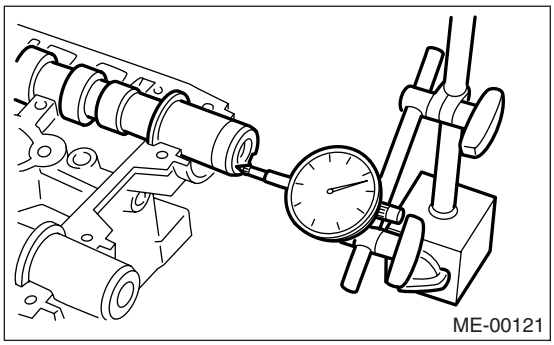
Cam base circle diameter A:
37.0 mm (1.457 in)



6) Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace the caps and cylinder head as a set. If necessary, replace the camshaft.

Standard:
0.040 — 0.080 mm (0.0016 — 0.0031 in)

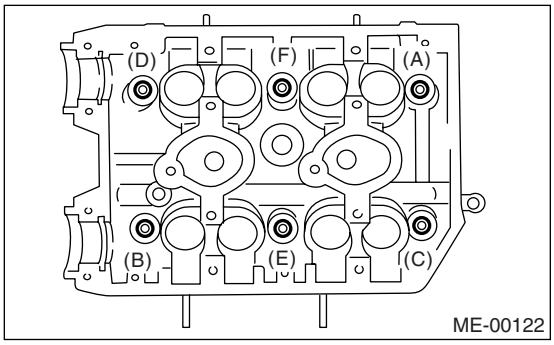
Limit:
0.1 mm (0.004 in)



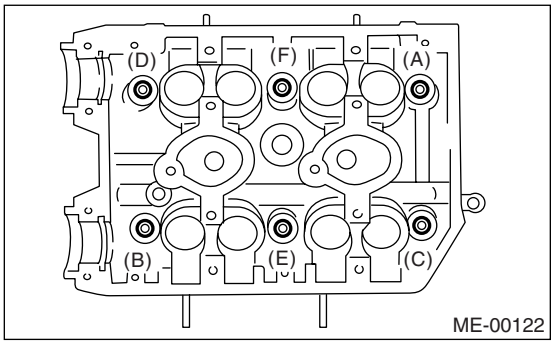
19.Cylinder Head Assembly

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4DOTC)-42, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-44, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-46, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(H4DOTC)-54, REMOVAL, Camshaft Sprocket.>
6) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
7) Remove the bolt which installs the A/C compressor bracket on cylinder head.
8) Remove the camshaft. <Ref. to ME(H4DOTC)-56, REMOVAL, Camshaft.>
9) Remove the cylinder head bolts in alphabetical sequence shown in the figure.
Leave bolts (A) and (D) engaged by three or four threads to prevent the cylinder head from falling.



10) While tapping the cylinder head with a plastic hammer, separate it from cylinder block. Remove the bolts (A) and (D) to remove cylinder head.



11) Remove the cylinder head gasket.

NOTE:
Do not scratch the mating surface of cylinder head and cylinder block.

12) Similarly, remove the cylinder head (RH).

B: INSTALLATION

1) Install the cylinder head and gaskets on cylinder block.

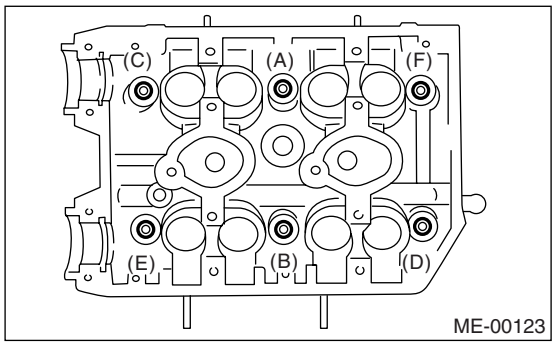
NOTE:
- Use new cylinder head gaskets.
- Be careful not to scratch the mating surface of cylinder head and cylinder block.

2) Tighten the cylinder head bolts.
   (1) Apply a coat of engine oil to the washers and bolt threads.
   (2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence.
   (3) Tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence again.
   (4) Back off all bolts by 180° first; back them off by 180° again in reverse order of installation.
   (5) Tighten all bolts to 39 N·m (4.0 kgf-m, 29 ft-lb) in alphabetical sequence.
   (6) Tighten all bolts 80 to 90° in alphabetical sequence.
   (7) Tighten all bolts by 40 to 45° in alphabetical sequence again.

NOTE:
Do not tighten the bolts by more than 45°.

   (8) Further tighten all bolts (A) and (B) by 40 to 45°.

NOTE:
Ensure that the total “re-tightening angle” in the previous two steps do not exceed 90°.



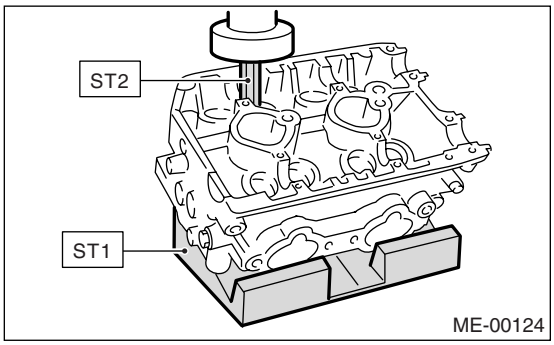
3) Install the camshaft. <Ref. to ME(H4DOTC)-56, INSTALLATION, Camshaft.>
4) Install the A/C compressor bracket on cylinder head.
5) Install the intake manifold. <Ref. to FU(H4DOTC)-17, INSTALLATION, Intake Manifold.>
6) Install the camshaft sprocket. <Ref. to ME(H4DOTC)-54, INSTALLATION, Camshaft Sprocket.>
7) Install the timing belt assembly. <Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt Assembly.>

8) Install the timing belt cover. <Ref. to ME(H4DOTC)-45, INSTALLATION, Timing Belt Cover.>
9) Install the crankshaft pulley. <Ref. to ME(H4DOTC)-44, INSTALLATION, Crankshaft Pulley.>
10) Install the V-belt. <Ref. to ME(H4DOTC)-42, INSTALLATION, V-belt.>

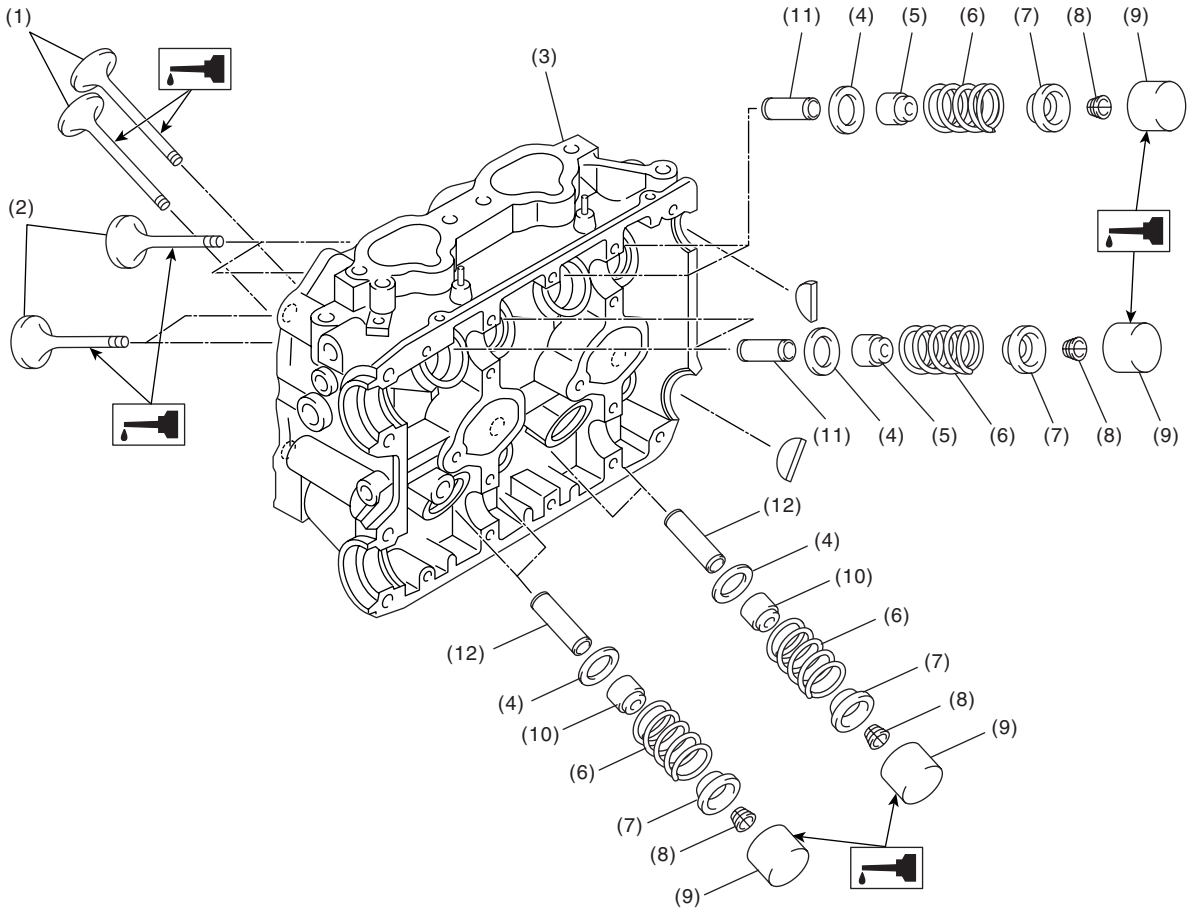
C: DISASSEMBLY

1) Remove the valve lifters.
2) Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.
ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

NOTE:
• Keep the removed parts in order for re-installing in their original positions.
• Mark each valve to prevent confusion.
• Use extreme care not to damage the lips of the intake valve oil seals and exhaust valve oil seals.



D: ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Cylinder head
(4) Valve spring seat
(5) Intake valve oil seal
(6) Valve spring
(7) Retainer
(8) Retainer key
(9) Valve lifter
(10) Exhaust valve oil seal
(11) Intake valve guide
(12) Exhaust valve guide

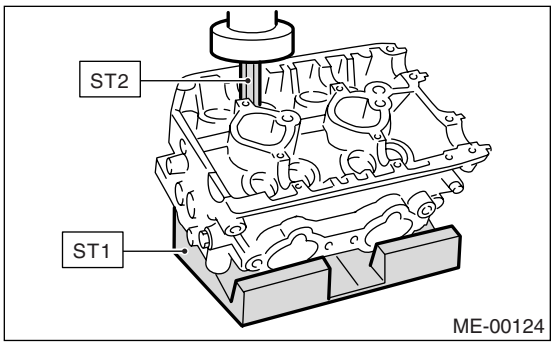
1) Installation of valve spring and valve:
(1) Coat the stem of each valve with engine oil and insert the valve into valve guide.

NOTE:
When inserting the valve into valve guide, use special care not to damage the oil seal lip.

(2) Set the cylinder head on ST1.
(3) Install the valve spring and retainer using ST2.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

NOTE:
Be sure to install the valve springs with their close-coiled end facing the seat on cylinder head.



(4) Compress the valve spring, and then fit the valve spring retainer key.
(5) After installing, tap the valve spring retainers lightly with wooden hammer for better seating.

2) Apply oil to the surface of the valve lifter.
3) Install the valve lifter.

E: INSPECTION

1. CYLINDER HEAD

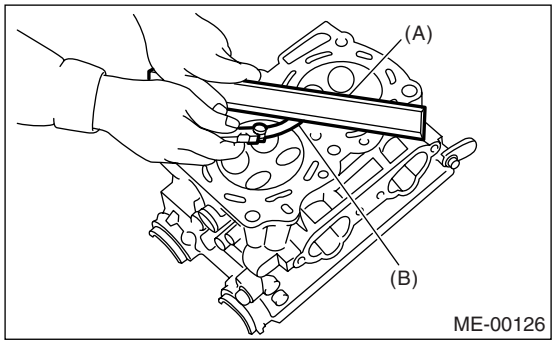
1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect the important areas by means of red check.
2) Measure the warping of the cylinder head surface that mates with crankcase by using a straight edge (A) and thickness gauge (B).
If the warping exceeds 0.05 mm (0.0020 in), re-grind the surface with a surface grinder.

Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.3 mm (0.012 in)

Standard height of cylinder head:
127.5 mm (5.02 in)

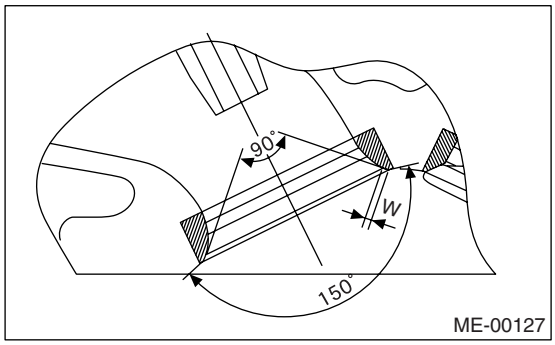
NOTE:
Uneven torque for the cylinder head nuts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.



2. VALVE SEAT

Inspect the intake and exhaust valve seats, and then correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

Valve seat width: W
Intake
Standard 1.0 mm (0.039 in)
Limit 1.7 mm (0.067 in)
Exhaust
Standard 1.5 mm (0.059 in)
Limit 2.2 mm (0.087 in)



3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

Clearance between the valve guide and valve stem:

Standard
Intake
0.030 — 0.057 mm (0.0012 — 0.0022 in)
Exhaust
0.040 — 0.067 mm (0.0016 — 0.0026 in)

Limit
0.15 mm (0.0059 in)

2) If the clearance between valve guide and stem exceeds the limit, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

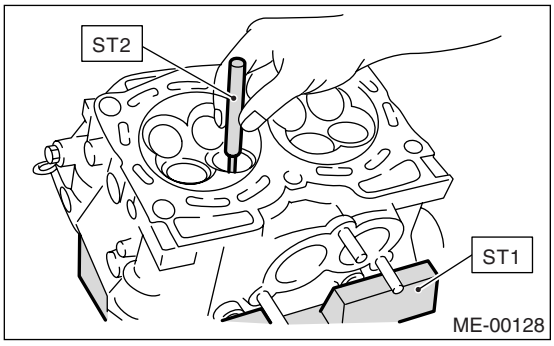
Valve guide inner diameter:
6.000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameters:
Intake
5.955 — 5.970 mm (0.2344 — 0.2350 in)
Exhaust
5.945 — 5.960 mm (0.2341 — 0.2346 in)

(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.

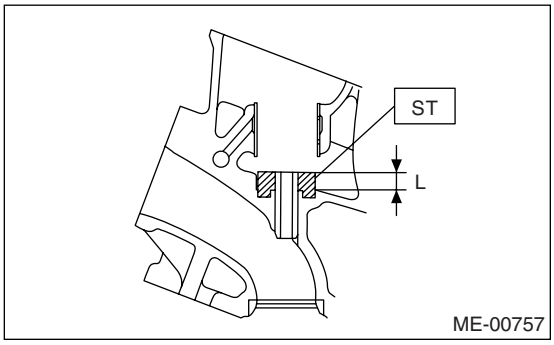
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



(3) Turn the cylinder head upside down and place ST as shown in the figure.

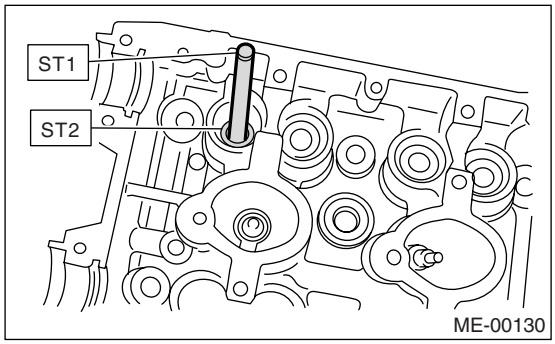
ST 18251AA020 VALVE GUIDE ADJUSTER



(4) Before installing a new valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.

(5) Put a new valve guide, coated with sufficient oil, in cylinder, and insert ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER
ST2 18251AA020 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion: L
15.8 — 16.2 mm (0.622 — 0.638 in)

(7) Ream the inside of valve guide with ST. Gently rotate the reamer clockwise while pressing it lightly into the valve guide, and return it also rotating clockwise. After reaming, clean the valve guide to remove chips.

ST 499767400 VALVE GUIDE REAMER

NOTE:
• Apply engine oil to the reamer when reaming.
• If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
• If the inner surface of the valve guide becomes lustrous and the reamer does not chip, use a new reamer or remedy the reamer.

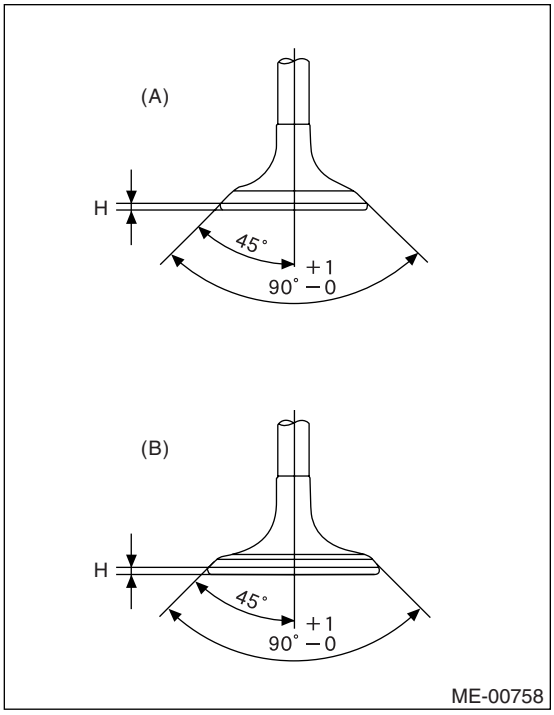
(8) Recheck the contact condition between valve and valve seat after replacing the valve guide.

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if “H” is less than the specified limit.

H:
Intake (A)
Standard 1.2 mm (0.047 in)
Limit 0.8 mm (0.031 in)
Exhaust (B)
Standard 1.5 mm (0.059 in)
Limit 0.8 mm (0.031 in)

Valve overall length:
Intake (A)
104.4 mm (4.110 in)
Exhaust (B)
104.7 mm (4.122 in)

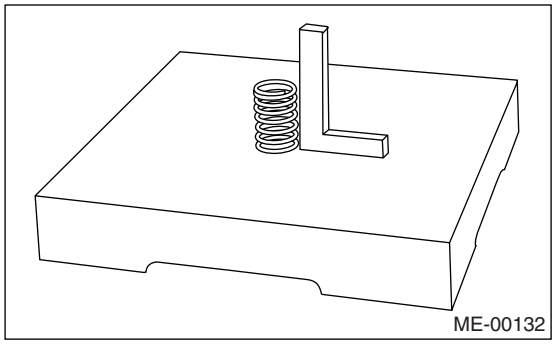


2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Install a new intake valve oil seal after lapping.

5. VALVE SPRINGS

1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not within specifications presented in the table.
2) To measure the squareness of valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

		Valve spring
Free length		47.32 mm (1.863 in)
Tension/spring height	Set	205 — 235 N (20.9 — 24.0 kgf, 41.6 — 52.8 lb) /36.0 mm (1.417 in)
	Lift	426 — 490 N (43.4 — 50.0 kgf, 95.8 — 110 lb) /26.5 mm (1.04 in)
Squareness		2.5°, 2.1 mm (0.083 in)



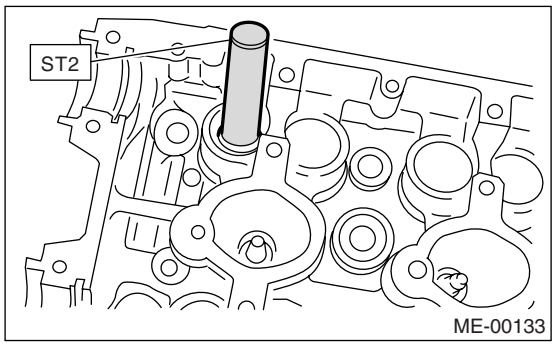
6. INTAKE AND EXHAUST VALVE OIL SEAL

Replace the oil seal with a new one, if the lip is damaged or spring out of place, or when the surfaces of intake valve and valve seat are reconditioned or intake valve guide is replaced.
1) Place the cylinder head on ST1.
2) Press in the oil seal to the specified dimension indicated in the figure by using ST2.
ST1 498267600 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE

NOTE:
- Apply engine oil to oil seal before press-fit.
- Differentiate between the intake valve oil seal and exhaust valve oil seal by noting their difference in color.

Color of rubber part:
Intake [Black] Exhaust [Brown]

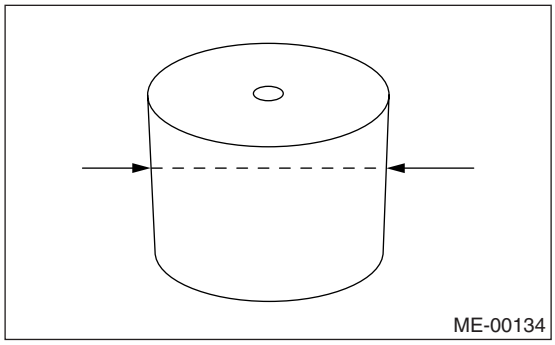
Color of spring part:
Intake [Silver] Exhaust [Silver]



7. VALVE LIFTER

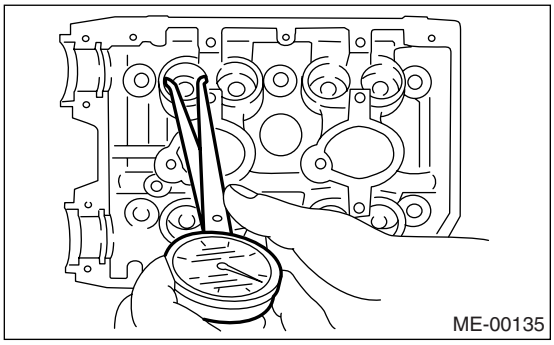
1) Visually check the valve lifter.
2) Measure the outer diameter of valve lifter.

Outer diameter:
34.959 — 34.975 mm (1.3763 — 1.3770 in)



3) Measure the inner diameter of valve lifter mating part on cylinder head.

Inner diameter:
34.994 — 35.016 mm (1.3777 — 1.3786 in)



NOTE:
If difference between outer diameter of valve lifter and inner diameter of valve lifter mating part is over the limit, replace the cylinder head.

Standard:
0.019 — 0.057 mm (0.0007 — 0.0022 in)

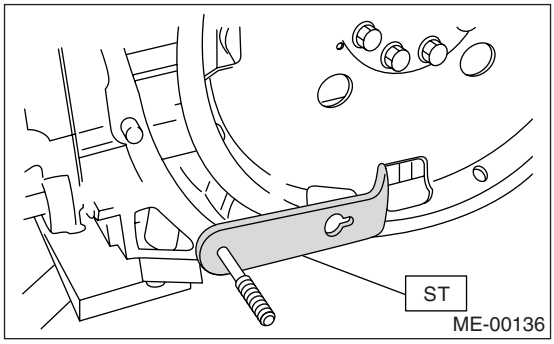
Limit:
0.100 mm (0.0039 in)

20.Cylinder Block

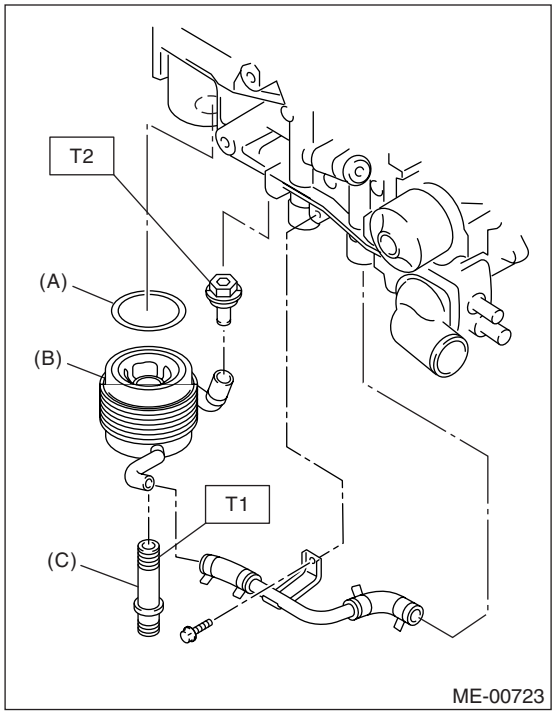
A: REMOVAL

NOTE:
Before conducting this procedure, drain the engine oil completely if applicable.

1) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
2) Remove the V-belt. <Ref. to ME(H4DOTC)-42, REMOVAL, V-belt.>
3) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-44, REMOVAL, Crankshaft Pulley.>
4) Remove the timing belt cover. <Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt Cover.>
5) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-46, REMOVAL, Timing Belt Assembly.>
6) Remove the camshaft sprocket. <Ref. to ME(H4DOTC)-54, REMOVAL, Camshaft Sprocket.>
7) Remove the crankshaft sprocket. <Ref. to ME(H4DOTC)-55, REMOVAL, Crankshaft Sprocket.>
8) Remove the generator and A/C compressor with their brackets.
9) Remove the cylinder head assembly. <Ref. to ME(H4DOTC)-61, REMOVAL, Cylinder Head Assembly.>
10) Remove the clutch disc and cover. (MT model) <Ref. to CL-11, REMOVAL, Clutch Disc and Cover.>
11) Remove the flywheel. (MT model) <Ref. to CL-13, REMOVAL, Flywheel.>
12) Remove the drive plate. (AT model)
Using the ST, lock crankshaft.
ST 498497100 CRANKSHAFT STOPPER



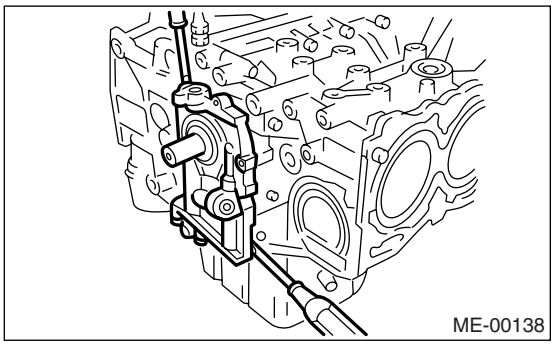
13) Remove the oil separator cover.
14) Remove the water by-pass pipe for heater.
15) Remove the oil filter.
ST 498547000 OIL FILTER WRENCH (Outer diameter: 80 mm (3.15 in))
ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))
ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))
16) Remove the oil cooler.

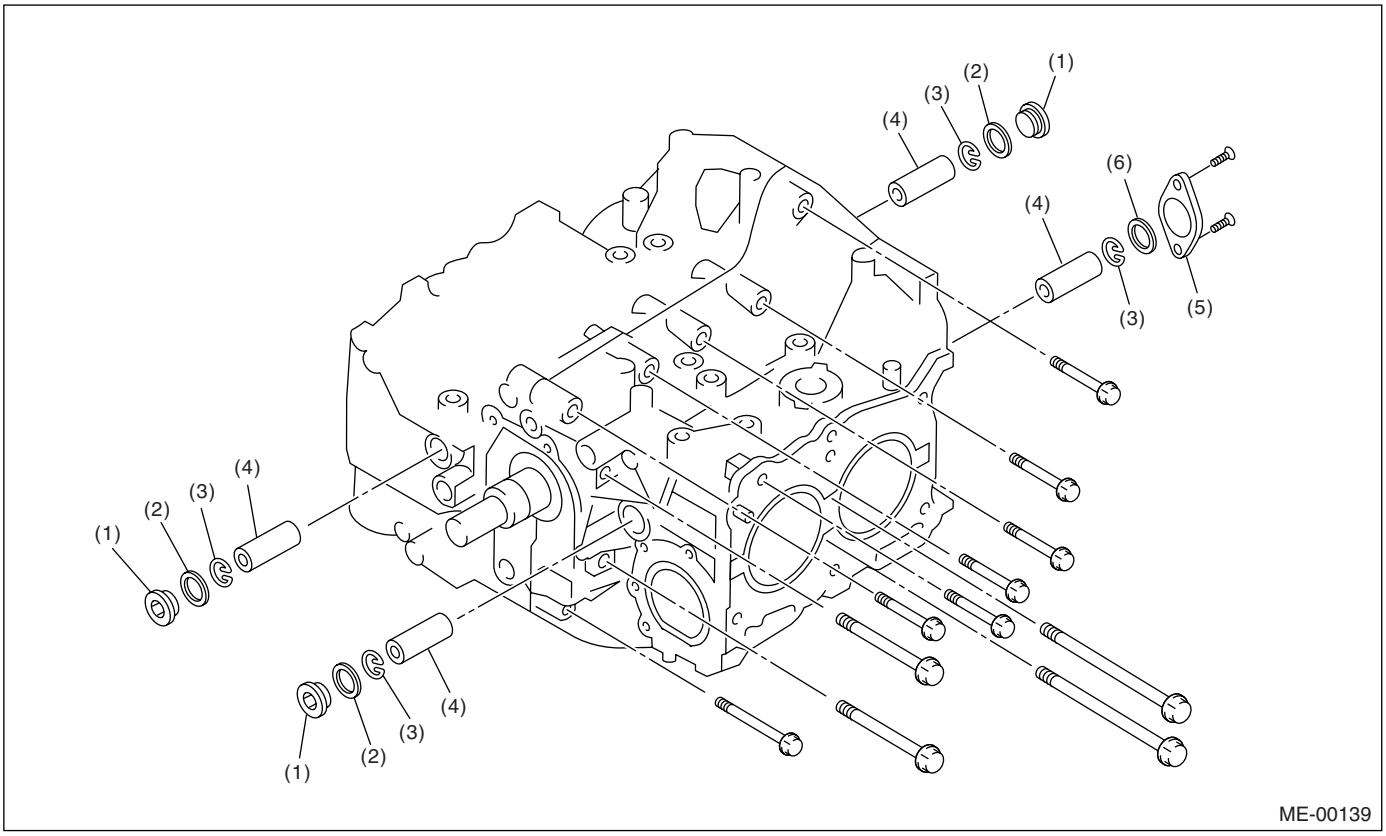


(A) Gasket
(B) Oil cooler
(C) Oil cooler connector

17) Removal of oil pan:
(1) Turn the cylinder block with #2 and #4 piston sides facing upward.
(2) Remove the bolts which secure oil pan to cylinder block.
(3) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance, and then remove the oil pan.
Do not use a screwdriver or similar tool in place of oil pan cutter.
18) Remove the oil strainer stay.
19) Remove the oil strainer.
20) Remove the baffle plate.
21) Remove the water pipes.
22) Remove the water pump.
23) Remove the oil pump from cylinder block.
Use a flat-bladed screwdriver as shown in the figure when removing the oil pump.

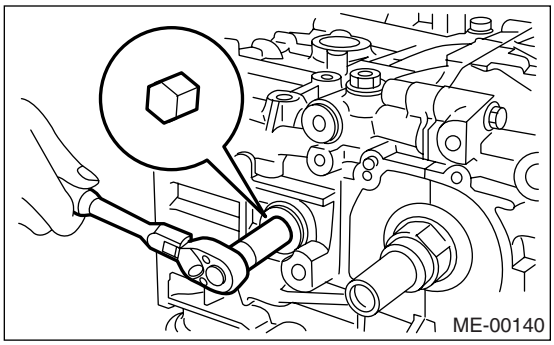
NOTE:
Be careful not to scratch the mating surface of cylinder block and oil pump.



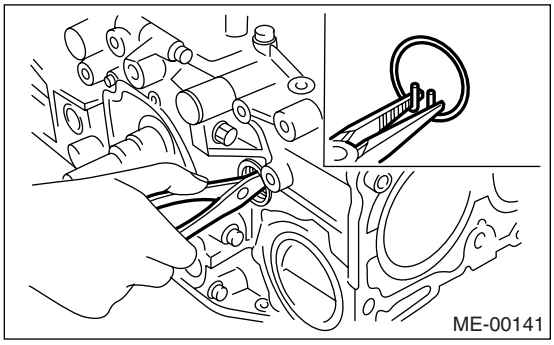


(1) Service hole plug
(2) Gasket
(3) Circlip
(4) Piston pin
(5) Service hole cover
(6) O-ring

24) Remove the service hole cover and service hole plugs using hexagon wrench [14 mm (0.55 in)].

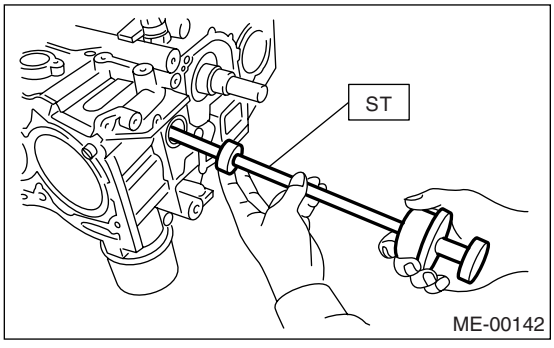


25) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, and then remove the piston circlip through service hole of #1 and #2 cylinders.



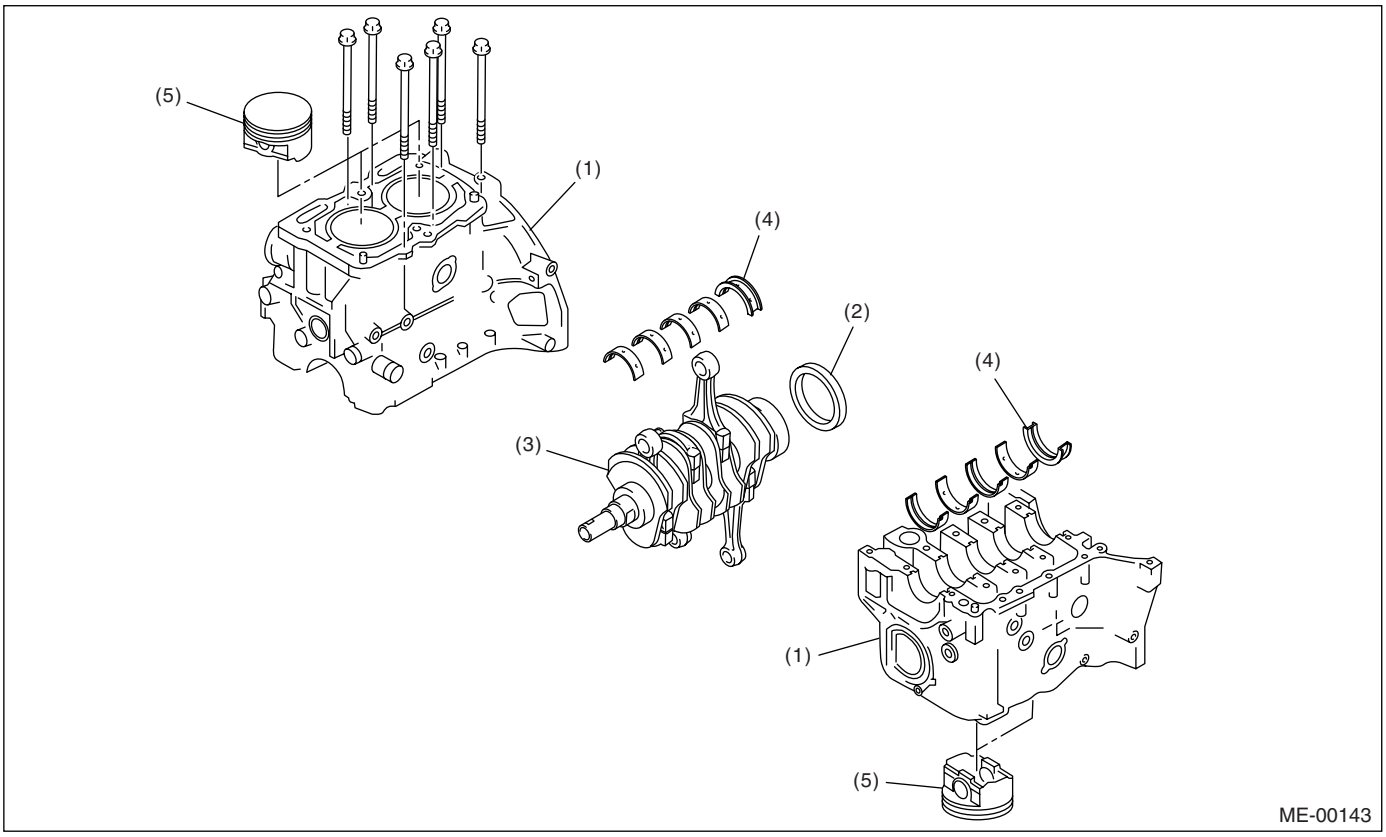
26) Draw out the piston pin from #1 and #2 pistons using ST.
ST 499097600 PISTON PIN REMOVER

NOTE:
Be careful not to confuse the original combination of piston, piston pin and cylinder.



27) Similarly remove the piston pins from #3 and #4 pistons.
28) Remove the bolts which connect the cylinder block on the side of #2 and #4 cylinders.
29) Back off the bolts which connect the cylinder block on the side of #1 and #3 cylinders two or three turns.
30) Set up the cylinder block so that #1 and #3 cylinders are on the upper side, then remove the cylinder block connecting bolts.
31) Separate the cylinder blocks (LH) and (RH).

NOTE:
When separating the cylinder block, do not allow the connecting rod to fall and damage the cylinder block.



(1) Cylinder block
(2) Rear oil seal
(3) Crankshaft
(4) Crankshaft bearing
(5) Piston

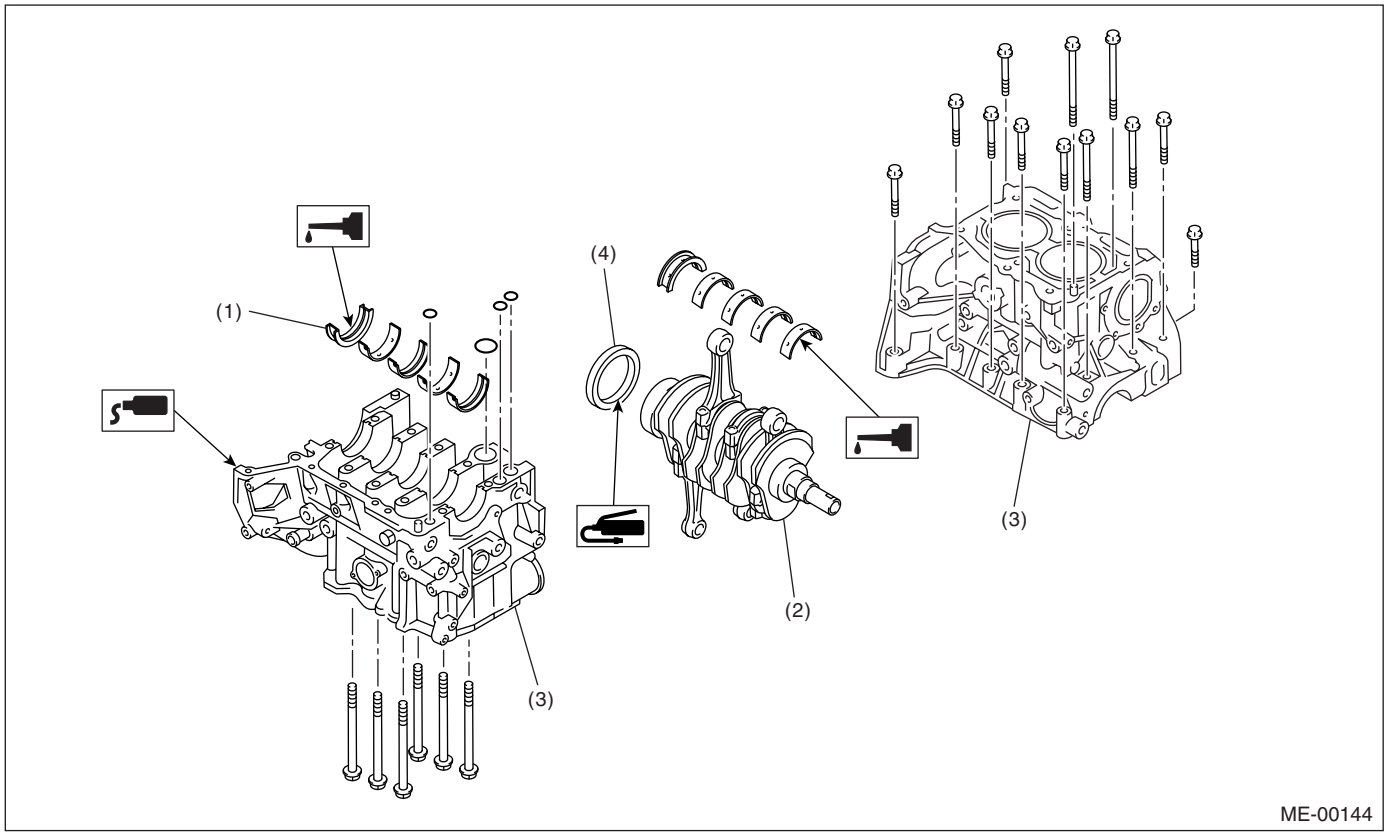
32) Remove the rear oil seal.
33) Remove the crankshaft together with connecting rod.
34) Remove the crankshaft bearings from cylinder block using a hammer handle.

NOTE:
Do not confuse the combination of crankshaft bearings. Press the bearing at the end opposite to locking lip.

35) Draw out each piston from cylinder block using a hammer handle.

NOTE:
Do not confuse the combination of piston and cylinder.

B: INSTALLATION

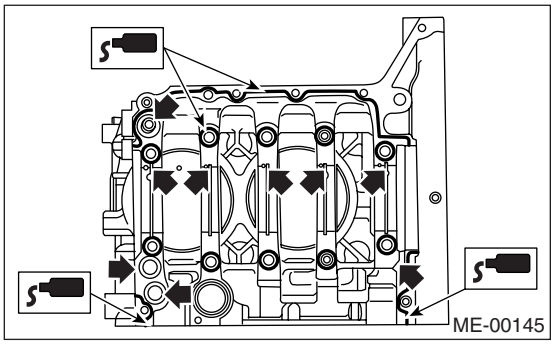


(1) Crankshaft bearing
(2) Crankshaft
(3) Cylinder block
(4) Rear oil seal

1) Remove oil in the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.
2) Position the crankshaft on #2 and #4 cylinder block.
3) Apply fluid packing to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

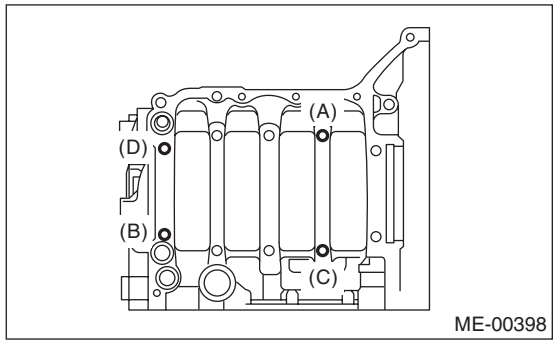
Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent

NOTE:
Do not allow fluid packing to jut into O-ring grooves, oil passages, bearing grooves, etc.



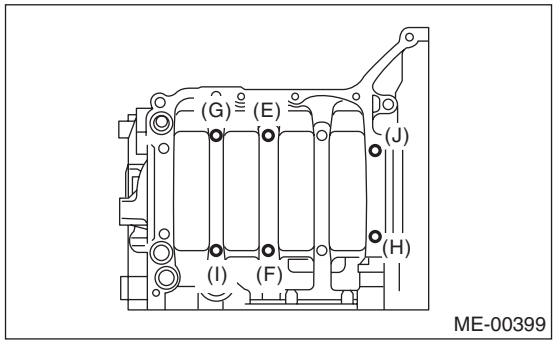
4) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (LH side)

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

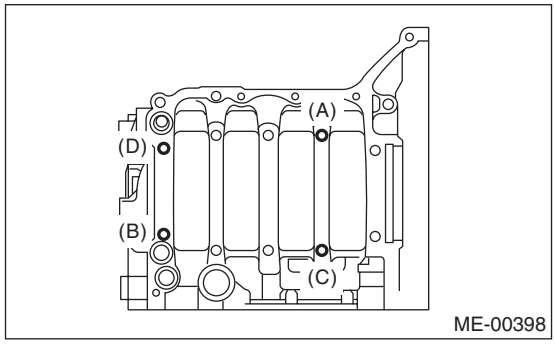


5) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (RH side)

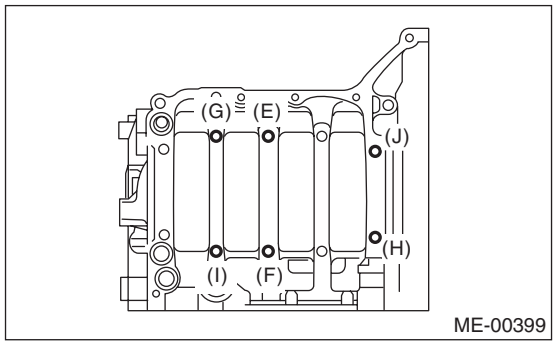
Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)



6) Further tighten the LH side bolts (A — D) to 90° in alphabetical sequence.

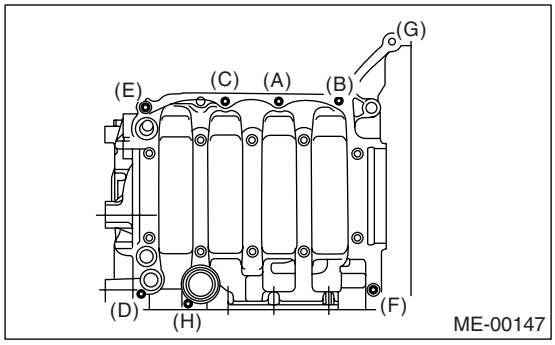


7) Further tighten the RH side bolts (E — J) to 90° in alphabetical sequence.



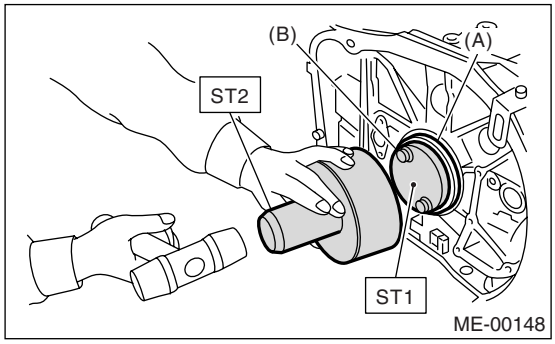
8) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

Tightening torque:
(A) — (G): 25 N·m (2.5 kgf-m, 18.1 ft-lb)
(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



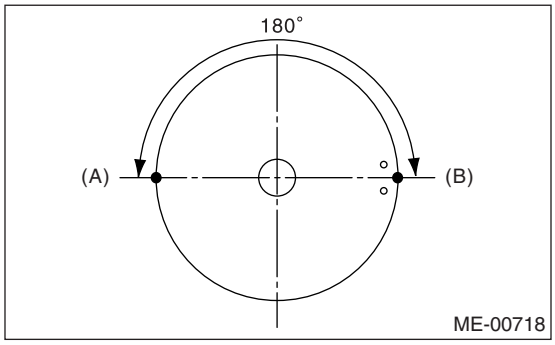
9) Install the rear oil seal using ST1 and ST2.

ST1	499597100	CRANKSHAFT OIL SEAL GUIDE
ST2	499587200	CRANKSHAFT OIL SEAL INSTALLER

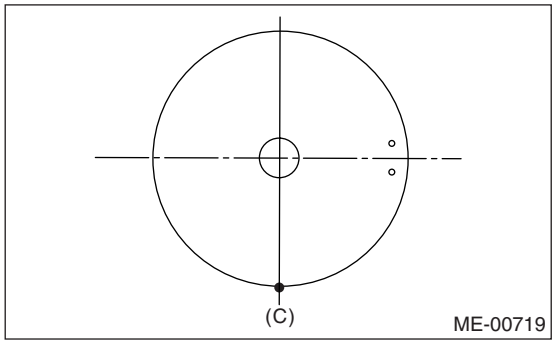


(A) Rear oil seal
(B) Flywheel attaching bolt

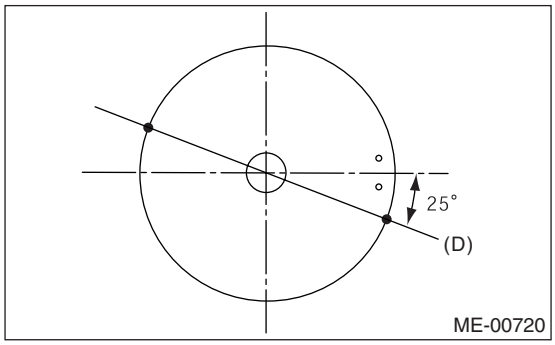
10) Position the top ring gap at (A) or (B) in the figure.
11) Position the second ring gap at 180° on the reverse side for the top ring gap.



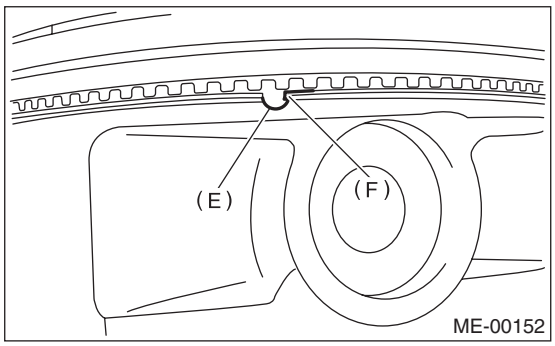
12) Position the expander gap at (C) in the figure.



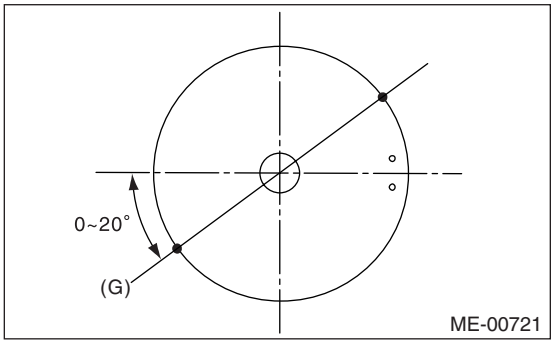
13) Position the lower rail gap at (D) in the figure.



14) Align lower rail spin stopper (F) with piston side surface hole (E).



15) Position the upper rail gap at (G) in the figure.

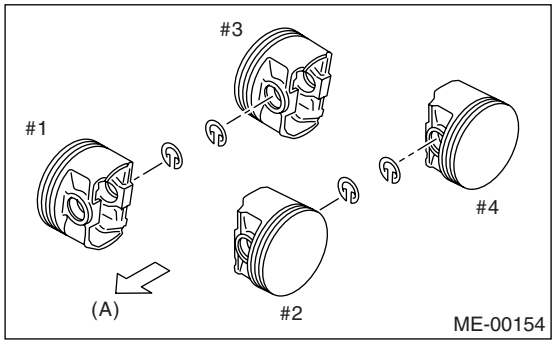


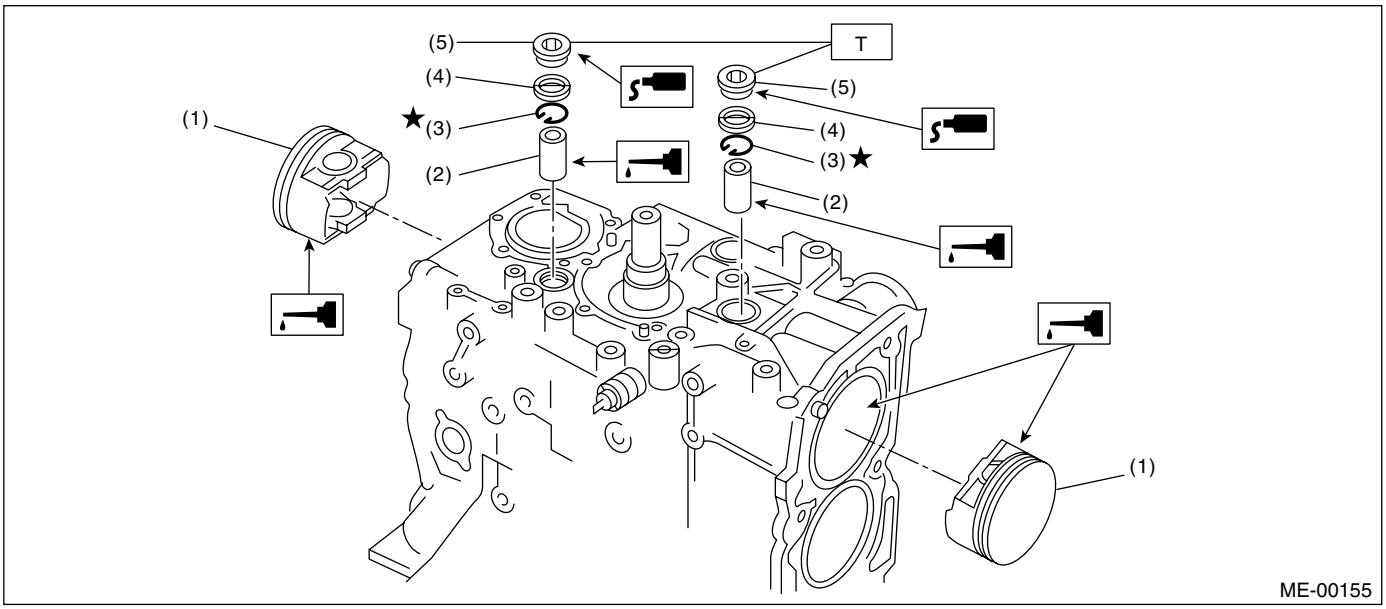
NOTE:
- Ensure ring gaps do not face the same direction.
- Ensure ring gaps are not within the piston skirt area.

16) Install the circlip.

Install the circlips in piston holes located opposite of service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

NOTE:
Use new circlips.





(1) Piston
(2) Piston pin
(3) Circlip
(4) Gasket
(5) Service hole plug

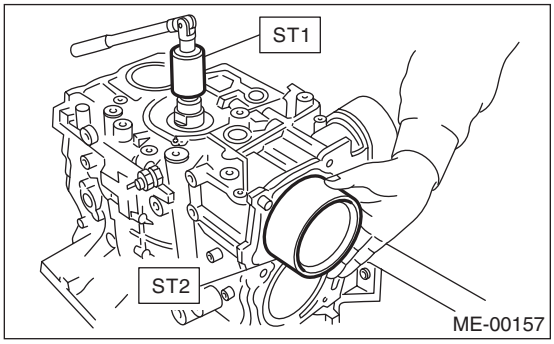
Tightening torque: N·m (kgf-m, ft-lb)
T: 70 (7.1, 51.4)

17) Installing the piston:
(1) Turn the cylinder block so that #1 and #2 cylinders face upward.
(2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

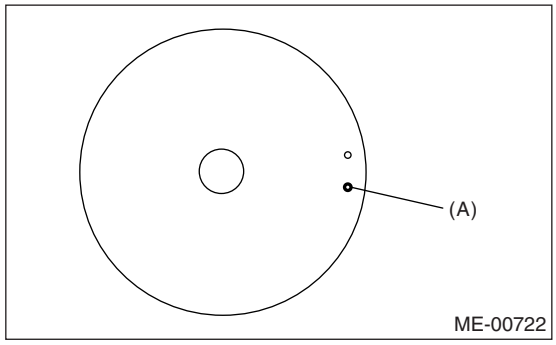
ST1 499987500 CRANKSHAFT SOCKET

(3) Apply a coat of engine oil to the pistons and cylinders and insert pistons in their cylinders using ST2.

ST2 398744300 PISTON GUIDE



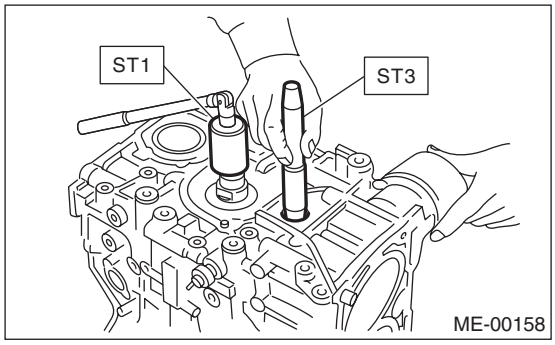
NOTE:
Piston front mark faces towards the front of the engine.



(A) Front mark

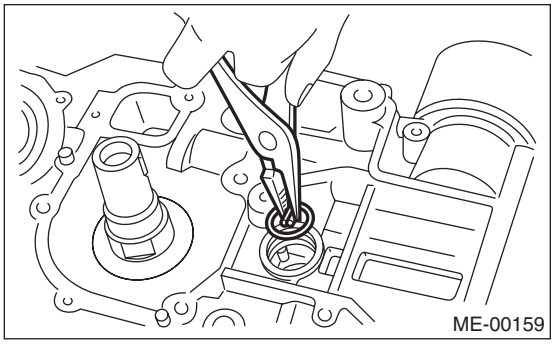
18) Installing piston pin:
(1) Apply a coat of engine oil to ST3, and then insert the ST3 into service hole to align piston pin hole with connecting rod small end.

ST3 499017100 PISTON PIN GUIDE



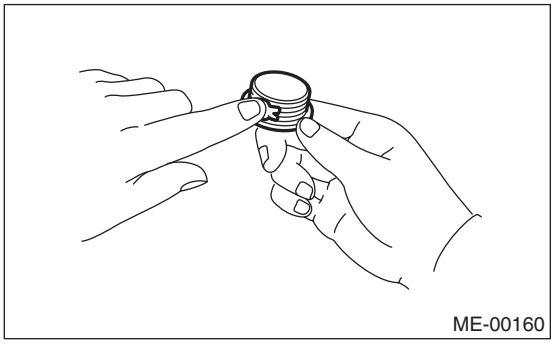
(2) Apply a coat of engine oil to the piston pin and insert piston pin into piston and connecting rod through service hole.
(3) Install the circlip.

NOTE:
Use new circlips.


ME-00159

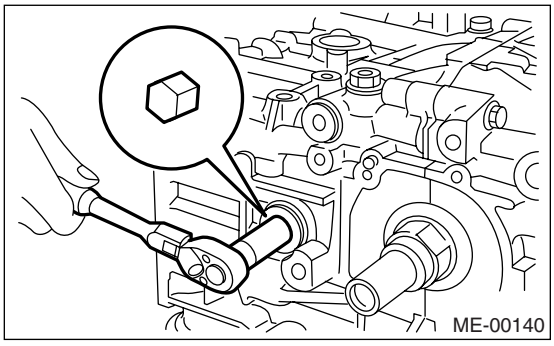
(4) Apply fluid packing around the service hole plug.

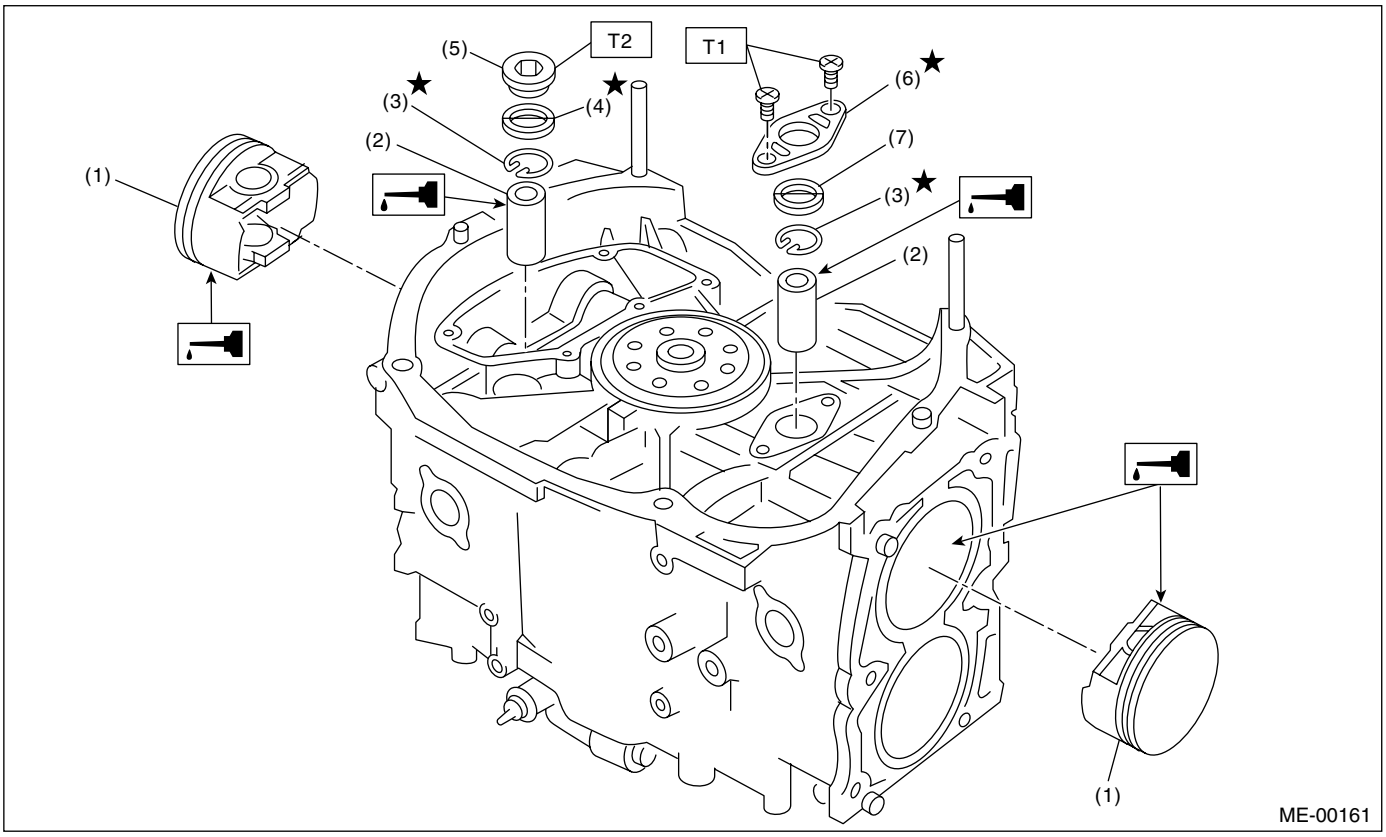
Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent


ME-00160

(5) Install the service hole plug and gasket.

NOTE:
Use a new gasket.


ME-00140



(1) Piston
(2) Piston pin
(3) Circlip
(4) Gasket
(5) Service hole plug
(6) Service hole cover
(7) O-ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 70 (7.1, 51.4)

(6) Turn the cylinder block so that #3 and #4 cylinders face upward. Using the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.

19) Install the water pipe.
20) Install the baffle plate.

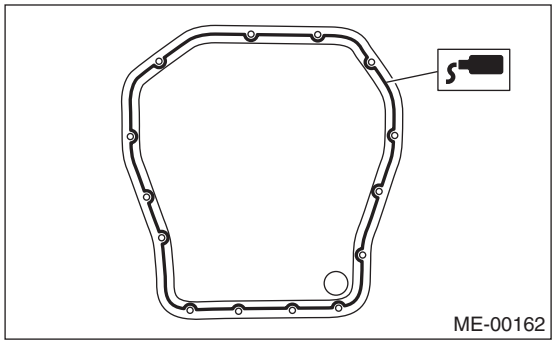
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

21) Install the oil strainer and O-ring

Tightening torque:
10 N·m (1.0 kgf-m, 7 ft-lb)

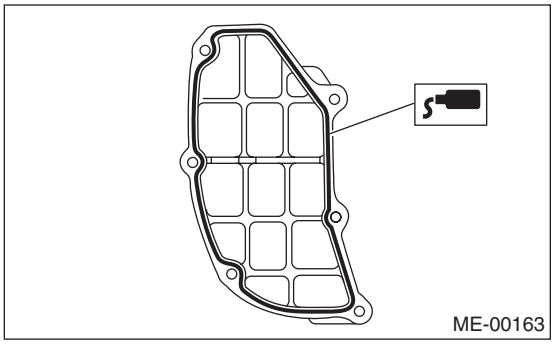
22) Install the oil strainer stay.
23) Apply fluid packing to the matching surfaces, and then install the oil pan.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



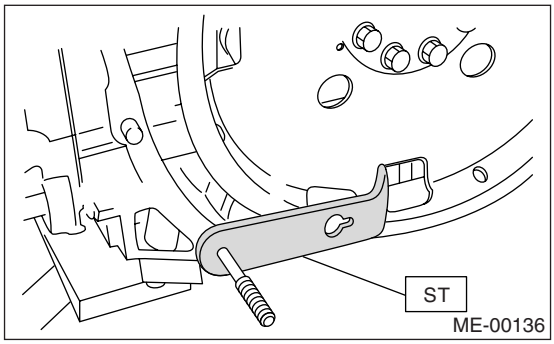
24) Apply fluid packing to the matching surfaces, and then install the oil separator cover.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent

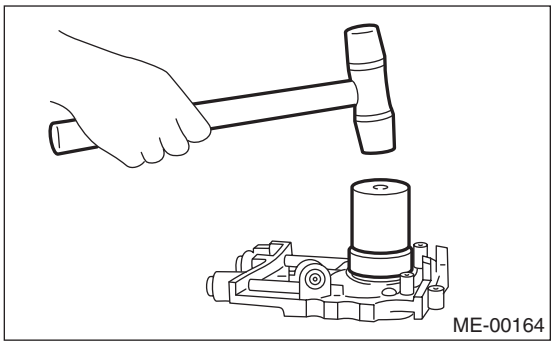


25) Install the drive plate. (AT model)
To lock the crankshaft, use ST.
ST 498497100 CRANKSHAFT STOPPER

Tightening torque:
72 N·m (7.3 kgf-m, 52.8 ft-lb)

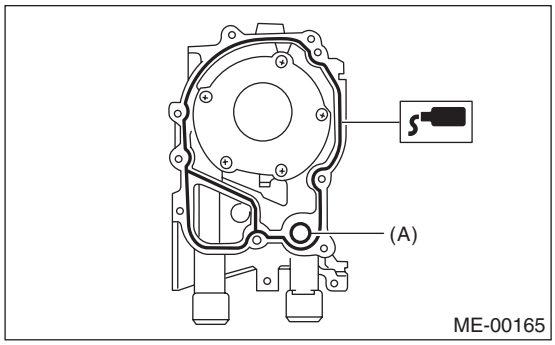


26) Install the flywheel. (MT model) <Ref. to CL-13, INSTALLATION, Flywheel.>
27) Install the clutch disc and cover. (MT model) <Ref. to CL-11, INSTALLATION, Clutch Disc and Cover.>
28) Installation of oil pump:
(1) Discard the front oil seal after removal. Replace with a new one using the ST.
ST 499587100 OIL SEAL INSTALLER



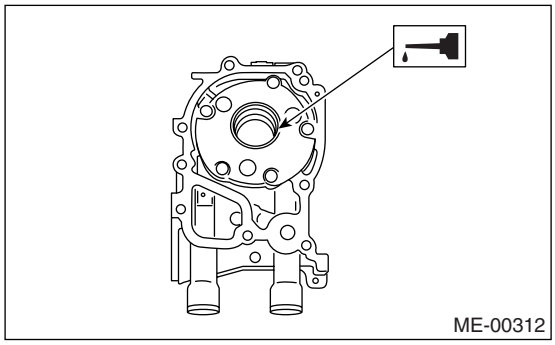
(2) Apply fluid packing to the matching surface of oil pump.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



(A) O-ring

(3) Apply a coat of engine oil to the inside of the oil seal.



(4) Install the oil pump on cylinder block. Be careful not to damage the oil seal during installation.

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

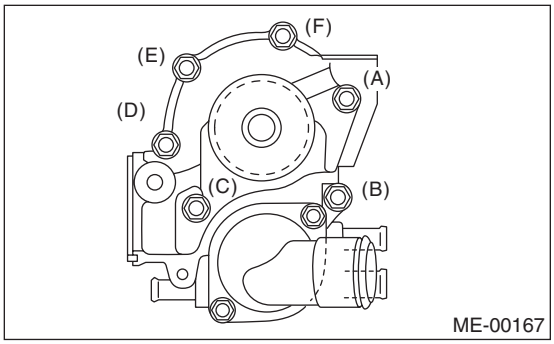
NOTE:
• Do not forget to install the O-ring and seal when installing the oil pump.
• Align the flat surface of oil pump's inner rotor with crankshaft before installation.

29) Install the water pump and gasket.

Tightening torque:
First; 12 N·m (1.2 kgf-m, 8.7 ft-lb)
Second; 12 N·m (1.2 kgf-m, 8.7 ft-lb)

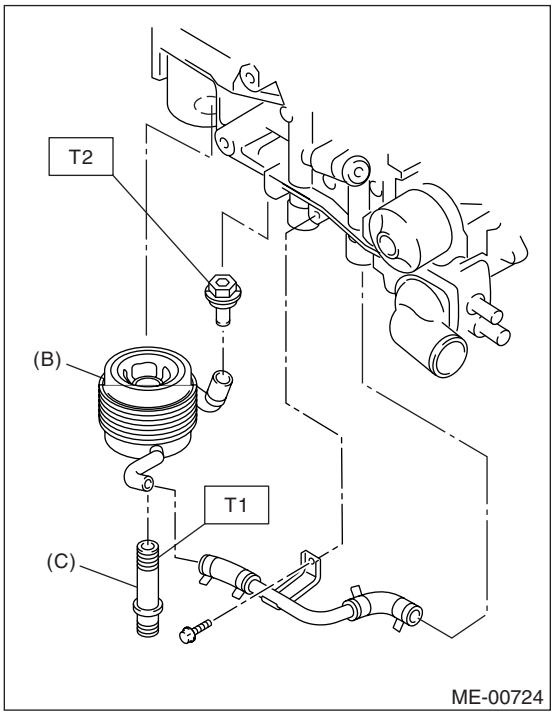
NOTE:
• Be sure to use a new gasket.

• When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in the figure.



30) Install the water by-pass pipe for heater.
31) Install the oil cooler.

Tightening torque:
T1: 54 N·m (5.5 kgf-m, 40 ft-lb)
T2: 69 N·m (7.0 kgf-m, 50.6 ft-lb)



(A) O-ring
(B) Oil cooler
(C) Oil cooler connector

32) Install the oil filter using ST.

ST	498547000	OIL FILTER WRENCH (Outer diameter: 80 mm (3.15 in))
ST	18332AA000	OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))
ST	18332AA010	OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))

Install the oil filter by turning it by hand, being careful not to damage the seal rubber.

• Tighten the oil filter 80 mm (3.15 in) or 65 mm (2.56 in) in diameter by approx. 2/3 - 3/4 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler.
• Tighten the oil filter 68 mm (2.68 in) in diameter by approx. 1 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler.

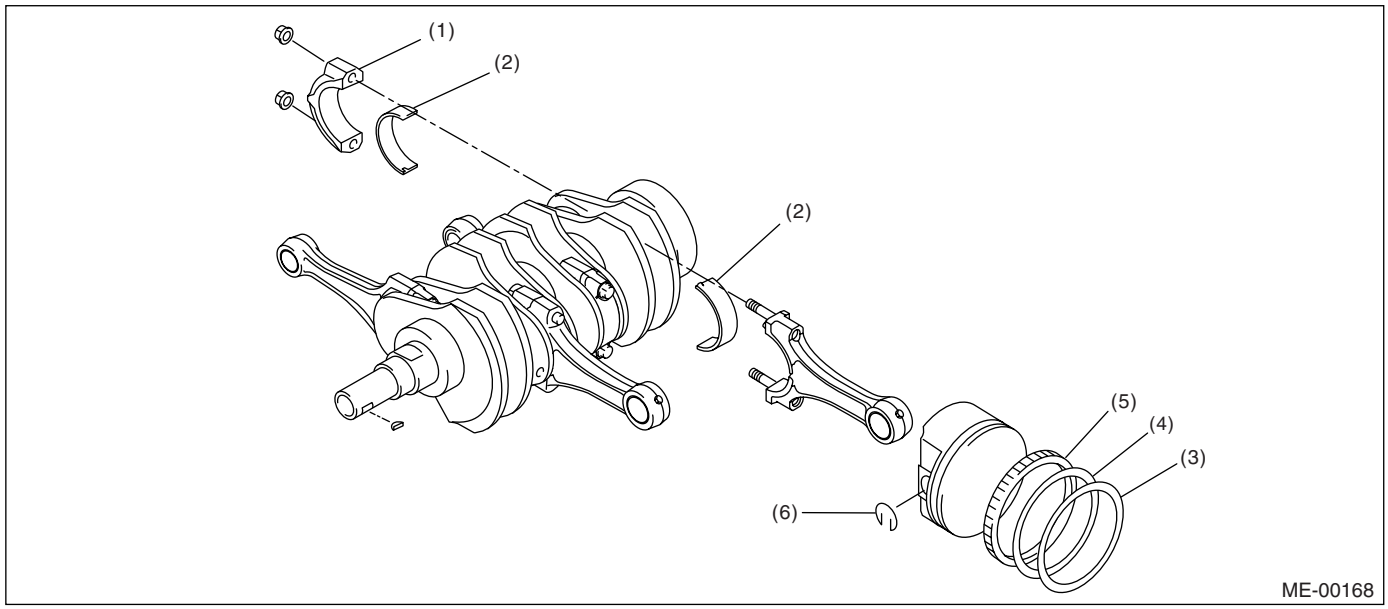
CAUTION:
Do not tighten excessively, or oil may leak.

33) Install the water by-pass pipe between oil cooler and water pump.
34) Install the water pipe.

NOTE:
Always use a new O-ring.

35) Install the cylinder head assembly. <Ref. to ME(H4DOTC)-61, INSTALLATION, Cylinder Head Assembly.>
36) Install the oil level gauge guide and tighten the attaching bolt (LH side).
37) Install the rocker cover.
38) Install the crankshaft sprocket. <Ref. to ME(H4DOTC)-55, INSTALLATION, Crankshaft Sprocket.>
39) Install the camshaft sprocket. <Ref. to ME(H4DOTC)-54, INSTALLATION, Camshaft Sprocket.>
40) Install the timing belt assembly. <Ref. to ME(H4DOTC)-48, INSTALLATION, Timing Belt Assembly.>
41) Install the timing belt cover. <Ref. to ME(H4DOTC)-45, INSTALLATION, Timing Belt Cover.>
42) Install the crankshaft pulley. <Ref. to ME(H4DOTC)-44, INSTALLATION, Crankshaft Pulley.>
43) Install the generator and A/C compressor brackets on cylinder head.
44) Install the V-belt. <Ref. to ME(H4DOTC)-42, INSTALLATION, V-belt.>
45) Install the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>

C: DISASSEMBLY



(1) Connecting rod cap
(2) Connecting rod bearing
(3) Top ring
(4) Second ring
(5) Oil ring
(6) Circlip

1) Remove the connecting rod cap.
2) Remove the connecting rod bearing.

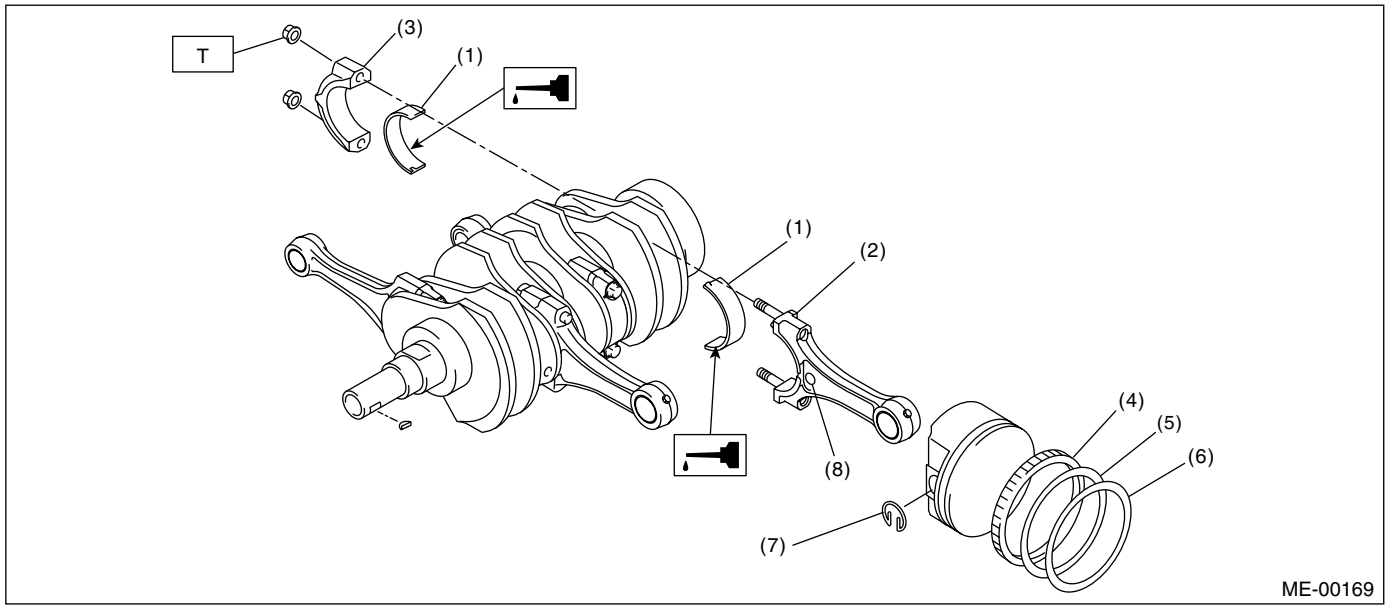
NOTE:
Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

3) Remove the piston rings using the piston ring expander.
4) Remove the oil ring by hand.

NOTE:
Arrange the removed piston rings in proper order to prevent confusion.

5) Remove the circlip.

D: ASSEMBLY



(1) Connecting rod bearing
(2) Connecting rod
(3) Connecting rod cap
(4) Oil ring
(5) Second ring
(6) Top ring
(7) Circlip
(8) Side mark

Tightening torque: N·m (kgf-m, ft-lb)
T: 45 (4.6, 33)

1) Apply oil to the surfaces of the connecting rod bearings. Install the connecting rod bearings on connecting rods and connecting rod caps.
2) Install the connecting rod on crankshaft.

NOTE:
Position each connecting rod with the side marked facing forward.

3) Install the connecting rod cap with connecting rod nut.
Ensure the arrow on connecting rod cap faces the front during installation.

NOTE:
• Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
• When tightening the connecting rod nuts, apply oil on the threads.

4) Install the oil ring spacer, upper rail and lower rail in this order by hand. Then install the second ring and top ring with a piston ring expander.

E: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks and damage. Especially, inspect the important parts by means of red lead check.
2) Check the oil passages for clogging.
3) Inspect the crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.1 mm (0.004 in)

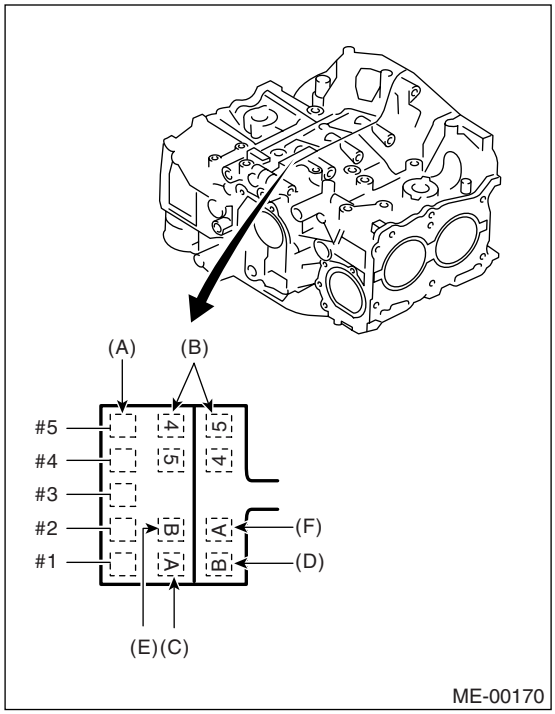
Standard height of cylinder block:
201.0 mm (7.91 in)

2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on cylinder block's front upper surface.

NOTE:
• Measurement should be performed at a temperature of 20°C (68°F).
• Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as a guide line in selecting a standard piston.

Standard diameter:
A: 92.005 — 92.015 mm (3.6222 — 3.6226 in)
B: 91.995 — 92.005 mm (3.6218 — 3.6222 in)



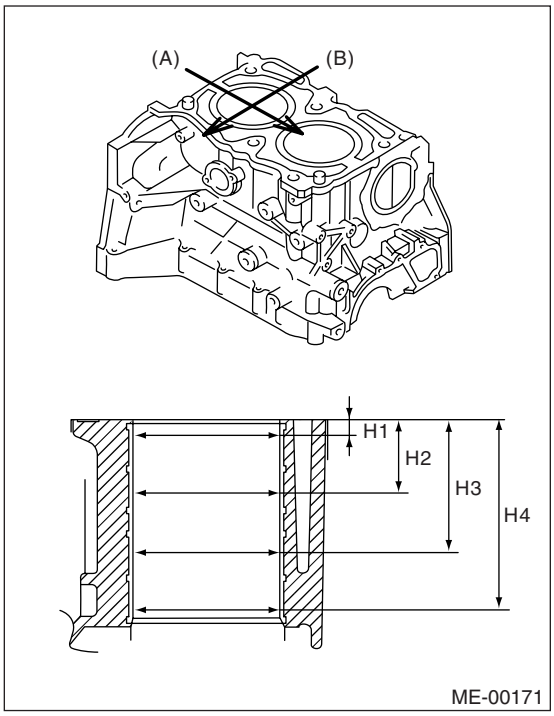
(A) Main journal size mark
(B) Cylinder block (RH)-(LH) combination mark
(C) #1 cylinder bore size mark
(D) #2 cylinder bore size mark
(E) #3 cylinder bore size mark
(F) #4 cylinder bore size mark

2) How to measure the inner diameter of each cylinder:
Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the figure, using a cylinder bore gauge.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Taper:
Standard
0.015 mm (0.0006 in)
Limit
0.050 mm (0.0020 in)

Out-of-roundness:
Standard
0.010 mm (0.0004 in)
Limit
0.050 mm (0.0020 in)



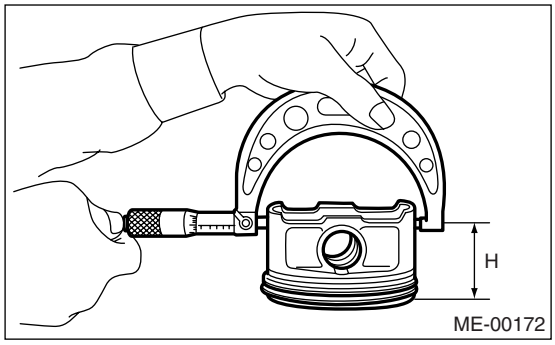
(A) Piston pin direction
(B) Thrust direction
H1: 10 mm (0.39 in)
H2: 45 mm (1.77 in)
H3: 80 mm (3.15 in)
H4: 115 mm (4.53 in)

3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.
4) How to measure the outer diameter of each piston:
Measure the outer diameter of each piston at the height shown in the figure. (Thrust direction)

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Piston grade point H:
40.0 mm (1.57 in)

Piston outer diameter:
Standard
A: 91.985 — 91.995 mm
(3.6214 — 3.6218 in)
B: 91.975 — 91.985 mm
(3.6211 — 3.6214 in)
0.25 mm (0.0098 in) oversize
92.225 — 92.235 mm
(3.6309 — 3.6313 in)
0.50 mm (0.0197 in) oversize
92.475 — 92.485 mm
(3.6407 — 3.6411 in)



5) Calculate the clearance between cylinder and piston.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Cylinder to piston clearance at 20°C (68°F):
Standard
0.010 — 0.030 mm (0.0004 — 0.0012 in)
Limit
0.050 mm (0.0020 in)

6) Boring and honing:
(1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the specified limit or if there is any damage on the cylinder wall, reboring it to use an oversize piston.

CAUTION:
When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons. Do not perform boring on one cylinder only, nor use an oversize piston for one cylinder only.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the crankcase.

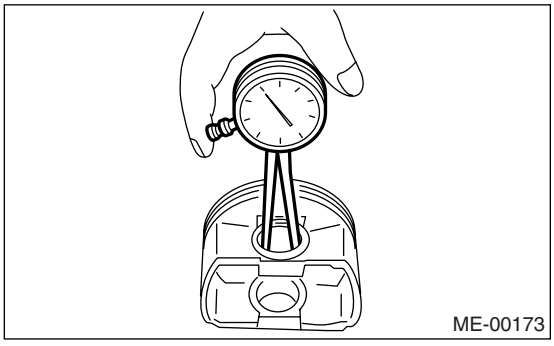
NOTE:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

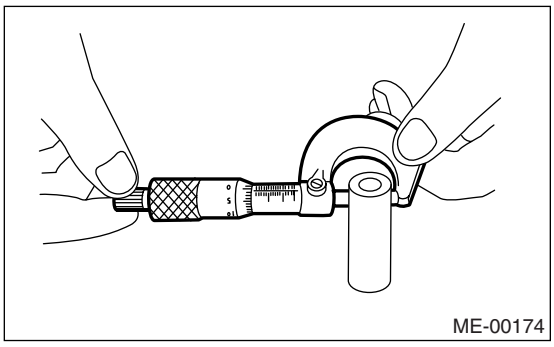
Limit of cylinder enlarging (boring):
0.5 mm (0.020 in)

3. PISTON AND PISTON PIN

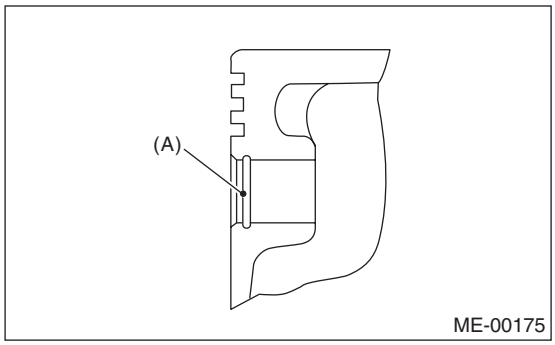
1) Check the pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.
2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(H4DOTC)-81, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not within specification, replace the piston or bore the cylinder to use an oversize piston.
3) Make sure that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if defective.

Standard clearance between piston pin and hole in piston:
Standard
0.004 — 0.008 mm (0.0002 — 0.0003 in)
Limit
0.020 mm (0.0008 in)


ME-00173


ME-00174

4) Check the circlip installation groove on piston for burr (A). If necessary, remove the burr from groove so that the piston pin can lightly move.



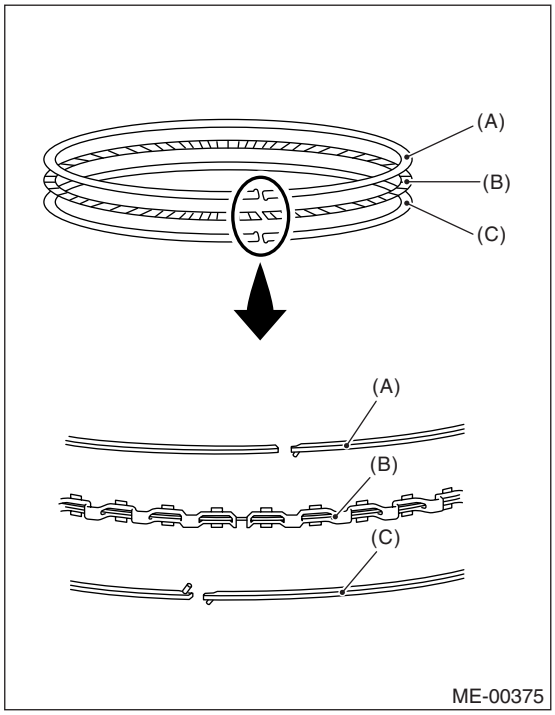
ME-00175

5) Check the piston pin circlip for distortion, cracks and wear.

4. PISTON RING

1) If the piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new one of the same size as the piston.

NOTE:
• Marks are shown on the end of top and second rings. When installing the rings to piston, face this mark upward.
• Oil ring consists of upper rail, expander and lower rail. When installing on piston, be careful of each rail's direction.

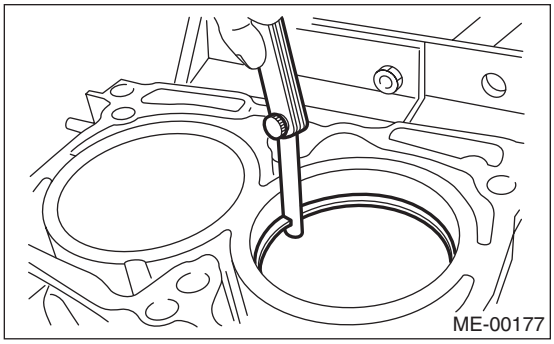


ME-00375

(A) Upper rail
(B) Expander
(C) Lower rail

2) Squarely place the piston ring and oil ring in cylinder, and then measure the piston ring gap with a thickness gauge.

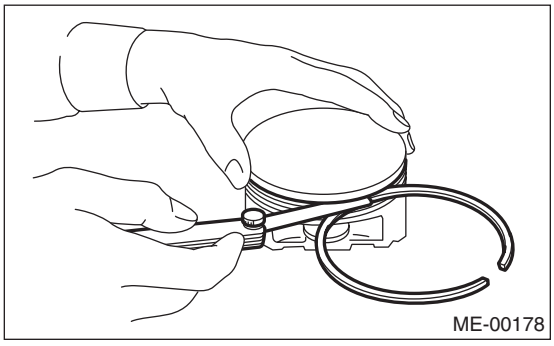
			Unit: mm (in)
		Standard	Limit
Piston ring gap	Top ring	0.20 — 0.25 (0.0079 — 0.0098)	1.0 (0.039)
	Second ring	0.40 — 0.50 (0.0157 — 0.0197)	1.0 (0.039)
	Oil ring rail	0.20 — 0.50 (0.0079 — 0.0197)	1.5 (0.059)


ME-00177

3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

NOTE:
Before measuring the clearance, clean the piston ring groove and piston ring.

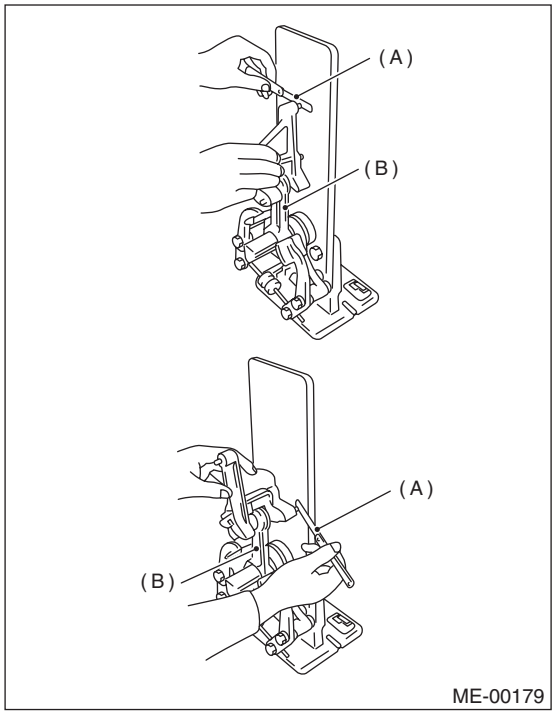
			Unit: mm (in)
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)


ME-00178

5. CONNECTING ROD

1) Replace the connecting rod, if the large or small end thrust surface is damaged.
2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)

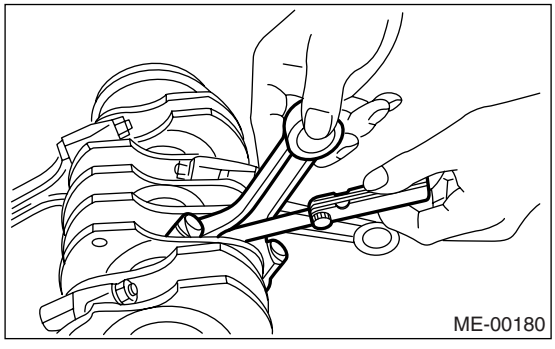


ME-00179

(A) Thickness gauge
(B) Connecting rod

3) Install the connecting rod fitted with bearing to crankshaft, and then measure the side clearance (thrust clearance). Replace the connecting rod if the side clearance exceeds the specified limit.

Connecting rod side clearance:
Standard
0.070 — 0.330 mm (0.0028 — 0.0130 in)
Limit
0.40 mm (0.016 in)


ME-00180

4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.
5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

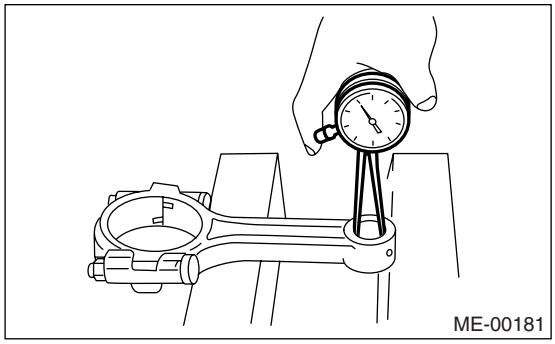
Connecting rod oil clearance:
Standard
0.020 — 0.046 mm (0.0008 — 0.0018 in)
Limit
0.050 mm (0.0020 in)

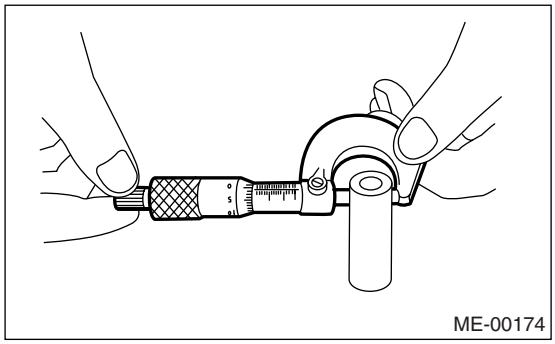
Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.486 — 1.498 (0.0585 — 0.0590)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.504 — 1.512 (0.0592 — 0.0595)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.514 — 1.522 (0.0596 — 0.0599)	51.934 — 51.950 (2.0447 — 2.0453)
0.25 (0.0098) undersize	1.614 — 1.622 (0.0635 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

6) Inspect the bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at connecting rod small end.

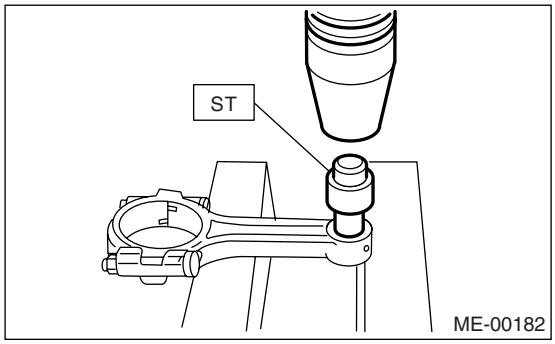
Clearance between piston pin and bushing:
Standard
0 — 0.022 mm (0 — 0.0009 in)
Limit
0.030 mm (0.0012 in)


ME-00181


ME-00174

7) Replacement procedure is as follows:
(1) Remove the bushing from connecting rod with ST and press.
(2) Press the bushing with ST after applying oil on the periphery of bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



ME-00182

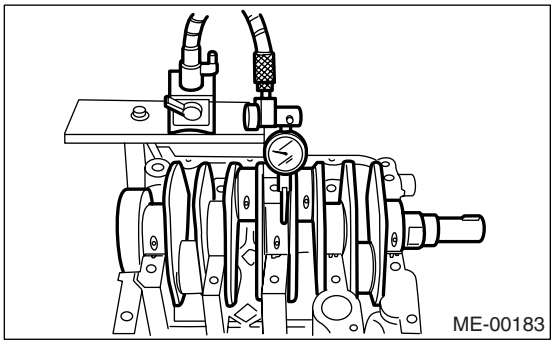
(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
(4) After the completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean the crankshaft completely and check for cracks by means of red lead check etc., and replace if defective.
2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

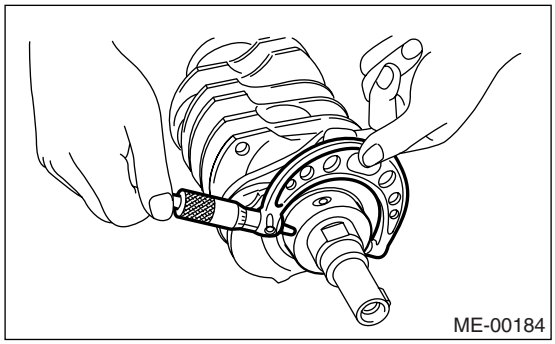
NOTE:
If a suitable V-block is not available, install the #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings and measure the crankshaft bend using a dial gauge.

Crankshaft bend limit:
0.035 mm (0.0014 in)



3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace the bearing with a suitable (undersize) one, and then replace or recondition the crankshaft as necessary. When grinding the crank journal or crank pin, finish them to specified dimensions according to the undersize bearing to be used.

Crank pin and crank journal:
Out-of-roundness
0.005 mm (0.0002 in) or less
Taper limit
0.07 mm (0.0028 in)
Grinding limit
0.250 mm (0.0098 in)



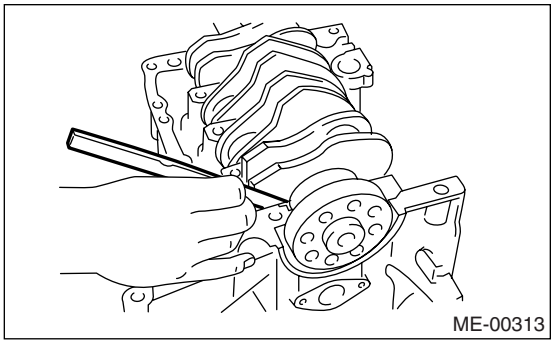
Unit: mm (in)

		Crank journal diameter		Crank pin diameter
		#1, #3, #5	#2, #4	
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.486 — 1.498 (0.0585 — 0.0590)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.504 — 1.512 (0.0592 — 0.0595)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	51.934 — 51.950 (2.0447 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.514 — 1.522 (0.0596 — 0.0599)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.614 — 1.622 (0.0635 — 0.0639)

O.D.: Outer Diameter

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace the bearing.

Crankshaft thrust clearance:
Standard
0.030 — 0.115 mm (0.0012 — 0.0045 in)
Limit
0.25 mm (0.0098 in)



5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.
6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace the defective bearing with an undersize one, and replace or recondition the crankshaft as necessary.

Unit: mm (in)

Crankshaft oil clearance		
#1	STD	0.010 — 0.030 (0.0004 — 0.0012)
	Limit	0.040 (0.0016)
#2	STD	0.010 — 0.030 (0.0004 — 0.0012)
	Limit	0.045 (0.0018)
#3	STD	0.010 — 0.030 (0.0004 — 0.0012)
	Limit	0.040 (0.0016)
#4	STD	0.010 — 0.030 (0.0004 — 0.0012)
	Limit	0.045 (0.0018)
#5	STD	0.010 — 0.030 (0.0004 — 0.0012)
	Limit	0.040 (0.0016)

21.Intake and Exhaust Valve

A: REMOVAL AND INSTALLATION

For operations related to intake and exhaust valve, refer to “19. Cylinder Head.” <Ref. to ME(H4DOTC)-61, REMOVAL, Cylinder Head Assembly.> and <Ref. to ME(H4DOTC)-61, INSTALLATION, Cylinder Head Assembly.>

22.Piston

A: REMOVAL AND INSTALLATION

For operations related to piston, refer to “20. Cylinder Block.” <Ref. to ME(H4DOTC)-68, REMOVAL, Cylinder Block.> and <Ref. to ME(H4DOTC)-72, INSTALLATION, Cylinder Block.>

23.Connecting Rod

A: REMOVAL AND INSTALLATION

For operations related to connecting rod, refer to “20. Cylinder Block.” <Ref. to ME(H4DOTC)-68, REMOVAL, Cylinder Block.> and <Ref. to ME(H4DOTC)-72, INSTALLATION, Cylinder Block.>

24.Crankshaft

A: REMOVAL AND INSTALLATION

For operations related to crankshaft, refer to “20. Cylinder Block.” <Ref. to ME(H4DOTC)-68, REMOVAL, Cylinder Block.> and <Ref. to ME(H4DOTC)-72, INSTALLATION, Cylinder Block.>

25.Engine Trouble in General

A: INSPECTION

NOTE:
“RANK” shown in the chart refers to the possibility of reason for the trouble in order (“Very often” to “Rarely”)
A — Very often
B — Sometimes
C — Rarely

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
1. Engine will not start.			
1) Starter does not turn.	Starter	Defective battery-to-starter harness	B
		Defective starter switch	C
		Defective inhibitor switch or neutral switch	C
		Defective starter	B
	Battery	Poor terminal connection	A
		Run-down battery	A
		Defective charging system	B
	Friction	Seizure of crankshaft and connecting rod bearing	C
		Seized camshaft	C
		Seized or stuck piston and cylinder	C
2) Initial combustion does not occur.	Starter	Defective starter	C
	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Fuel line	Defective fuel pump and relay	A
		Lack of or insufficient fuel	B
	Belt	Defective	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B
3) Initial combustion occurs.	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Defective intake manifold gasket	B
		Defective throttle body gasket	B
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Defective	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
4) Engine stalls after initial combustion.	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	B
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	C
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Dirty air cleaner element	C
	Fuel line	Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Defective	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B
2. Rough idle and engine stall	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	C
		Loosened oil filler cap	B
		Dirty air cleaner element	C
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Defective timing	C
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	B
		Loosened cylinder head bolts or defective gasket	B
		Improper valve seating	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Lubrication system	Incorrect oil pressure	B
		Defective rocker cover gasket	C
	Cooling system	Overheating	C
	Others	Malfunction of evaporative emission control system	A
		Stuck or damaged throttle valve	B
		Accelerator cable out of adjustment	C

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
3. Low output, hesitation and poor acceleration	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	B
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	A
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	B
		Loosened cylinder head bolts or defective gasket	B
		Improper valve seating	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Lubrication system	Incorrect oil pressure	B
	Cooling system	Overheating	C
		Over cooling	C
	Others	Malfunction of evaporative emission control system	A
4. Surging	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	B
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	C
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Cooling system	Overheating	B
	Others	Malfunction of evaporative emission control system	C

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
5. Engine does not return to idle.	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked vacuum hose	A
	Others	Stuck or damaged throttle valve	A
		Accelerator cable out of adjustment	B
6. Dieseling (Run-on)	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Cooling system	Overheating	B
	Others	Malfunction of evaporative emission control system	B
7. Afterburning in exhaust system	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	C
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	B
		Defective PCV valve	B
		Loosened oil filler cap	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over cooling	C
	Others	Malfunction of evaporative emission control system	C
8. Knocking	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened oil filler cap	B
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	C
		Incorrect valve timing	B
	Cooling system	Overheating	A
9. Excessive engine oil consumption	Intake system	Loosened or cracked PCV hose	A
		Defective PCV valve	B
		Loosened oil filler cap	C
	Compression	Defective valve stem	A
		Worn or stuck piston rings, cylinder and piston	A
	Lubrication system	Loosened oil pump attaching bolts and defective gasket	B
		Defective oil filter o-ring	B
		Defective crankshaft oil seal	B
		Defective rocker cover gasket	B
		Loosened oil drain plug or defective gasket	B
		Loosened oil pan fitting bolts or defective oil pan	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
10. Excessive fuel consumption	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Dirty air cleaner element	A
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	B
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over cooling	C
	Others	Accelerator cable out of adjustment	B

26.Engine Noise

A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	• Valve mechanism is defective. • Incorrect valve clearance • Worn valve rocker • Worn camshaft • Broken valve spring
Heavy and dull clank	Oil pressure is low.	• Worn crankshaft main bearing • Worn connecting rod bearing (big end)
	Oil pressure is normal.	• Loose flywheel mounting bolts • Damaged engine mounting
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload.	• Ignition timing advanced • Accumulation of carbon inside combustion chamber • Wrong spark plug • Improper gasoline
Clank when engine speed is medium (1,000 to 2,000 rpm).	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn crankshaft main bearing • Worn bearing at crankshaft end of connecting rod
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn cylinder liner and piston ring • Broken or stuck piston ring • Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	• Unusually worn valve lifter • Worn cam gear • Worn camshaft journal bore in crankcase
Squeaky sound	—	• Insufficient generator lubrication
Rubbing sound	—	• Defective generator brush and rotor contact
Gear scream when starting engine	—	• Defective ignition starter switch • Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	• Loose drive belt • Defective water pump shaft
Hissing sound	—	• Loss of compression • Air leakage in air intake system, hoses, connections or manifolds
Timing belt noise	—	• Loose timing belt • Belt contacting case/adjacent part
Valve tappet noise	—	• Incorrect valve clearance

NOTE*:
When disconnecting the fuel injector connector, Malfunction Indicator Light illuminates and DTC is stored in ECM memory. Therefore, carry out the CLEAR MEMORY MODE <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.> after connecting the fuel injector connector.

EXHAUST

EX(H4DOTC)

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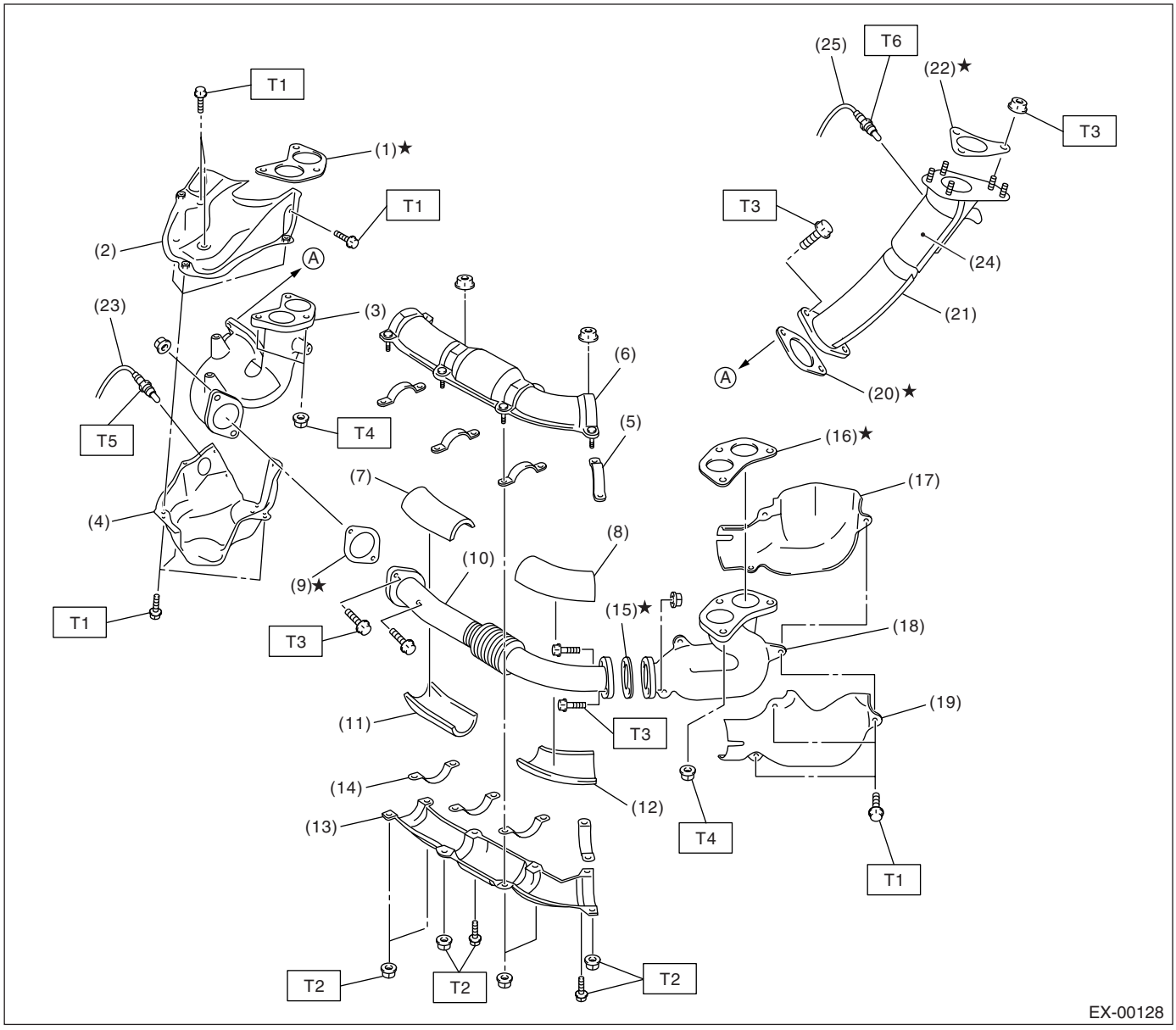
3. Center Exhaust Pipe 8
4. Joint Pipe 12
5. Rear Exhaust Pipe 13
6. Muffler 14

1. General Description

A: COMPONENT

1. FRONT EXHAUST PIPE

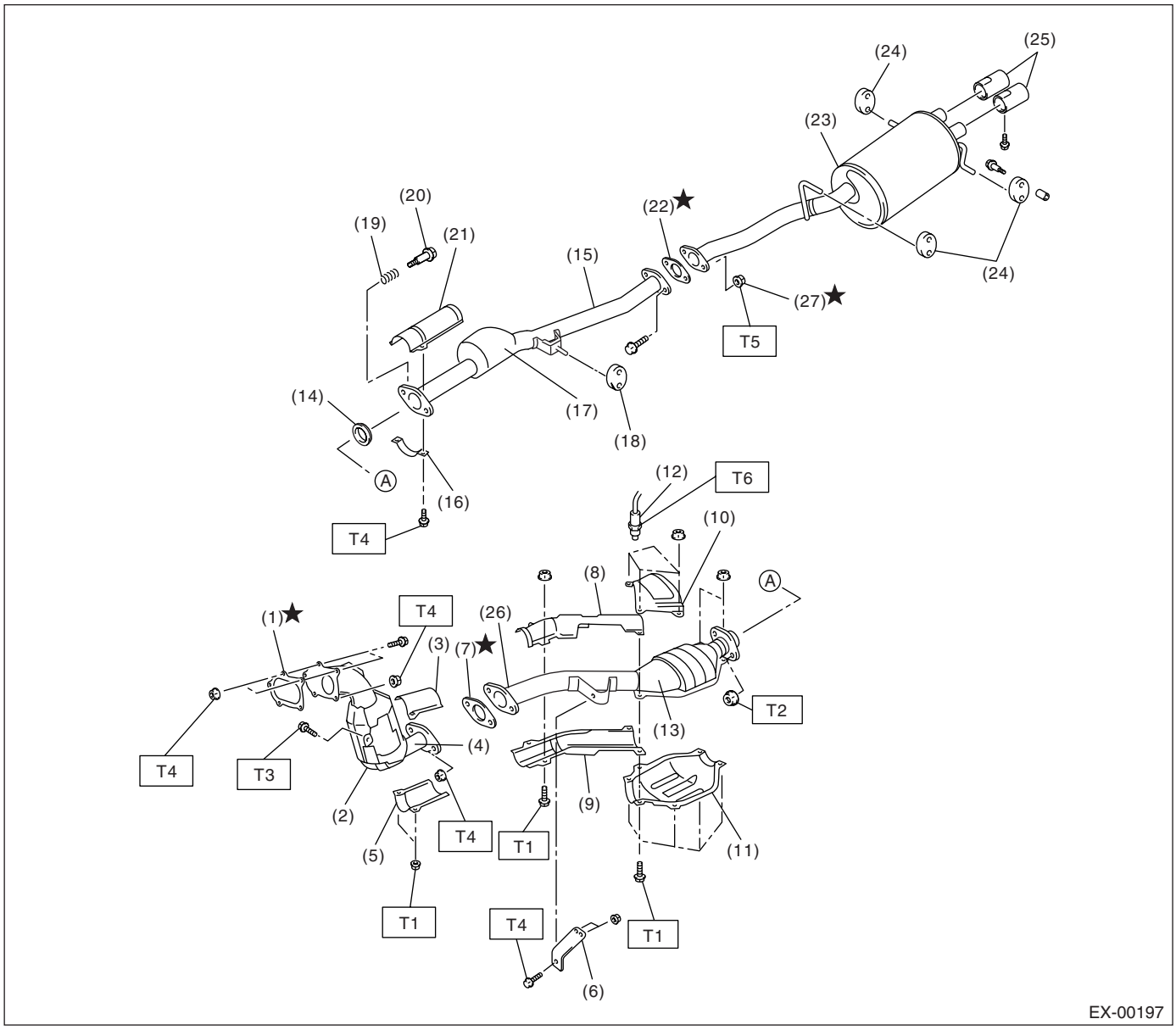


(1) Gasket
(2) Exhaust manifold upper cover (RH)
(3) Exhaust manifold (RH)
(4) Exhaust manifold lower cover (RH)
(5) Front exhaust pipe upper clamp
(6) Front exhaust pipe upper cover
(7) Front exhaust pipe upper insulator (RH)
(8) Front exhaust pipe upper insulator (LH)
(9) Gasket
(10) Front exhaust pipe
(11) Front exhaust pipe lower insulator (RH)
(12) Front exhaust pipe lower insulator (LH)
(13) Front exhaust pipe lower cover
(14) Front exhaust pipe lower clamp
(15) Gasket
(16) Gasket
(17) Exhaust manifold upper cover (LH)
(18) Exhaust manifold (LH)
(19) Exhaust manifold lower cover (LH)
(20) Gasket
(21) Turbocharger joint pipe
(22) Gasket
(23) Front oxygen (A/F) sensor
(24) Precatalytic converter (except STi model)
(25) Exhaust temperature sensor (except STi model)

Tightening torque: N·m (kgf-m, ft-lb)

T1: 19 (1.9, 13.7)
T2: 25 (2.5, 18.1)
T3: 35 (3.6, 26.0)
T4: 40 (4, 28.9)
T5: <Ref. to FU(H4DOTC)-43, INSTALLATION, Front Oxygen (A/F) Sensor.>
T6: <Ref. to FU(H4DOTC)-47, INSTALLATION, Exhaust Temperature Sensor.>

2. CENTER AND REAR EXHAUST PIPE, AND MUFFLER



(1) Gasket
(2) Front catalytic converter
(3) Center pipe upper cover (Front)
(4) Center exhaust pipe (Front)
(5) Center pipe lower cover (Front)
(6) Bracket
(7) Gasket
(8) Center pipe upper cover (Rear)
(9) Center pipe lower cover (Rear)
(10) Rear catalytic converter upper cover
(11) Rear catalytic converter lower cover
(12) Rear oxygen sensor
(13) Rear catalytic converter
(14) Gasket
(15) Rear exhaust pipe
(16) Clamp
(17) Chamber
(18) Cushion rubber
(19) Spring
(20) Bolt
(21) Rear exhaust pipe upper cover (Front)
(22) Gasket
(23) Muffler
(24) Cushion rubber
(25) Muffler cutter
(26) Center exhaust pipe (Rear)
(27) Self-locking nut

Tightening torque: N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.6)
T2: 18 (1.8, 13.0)
T3: 30 (3.1, 22.4)
T4: 35 (3.6, 26.0)
T5: 48 (4.9, 35.4)
T6: <Ref. to FU(H4DOTC)-45, INSTALLATION, Rear Oxygen Sensor.>

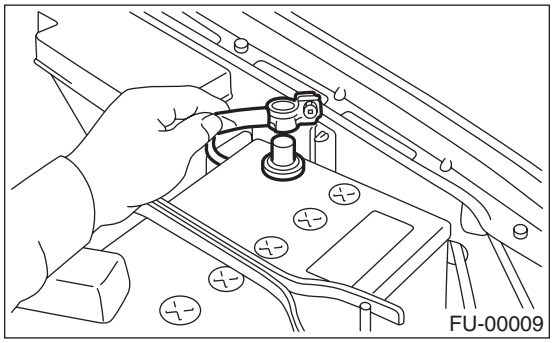
B: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

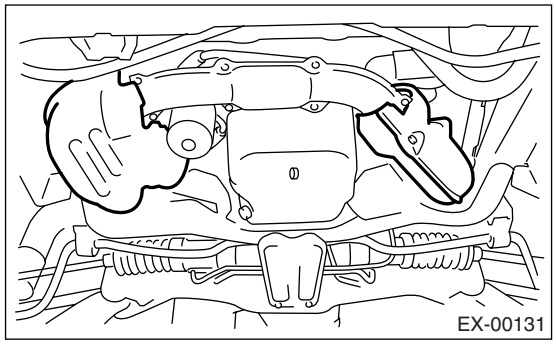
2. Front Exhaust Pipe

A: REMOVAL

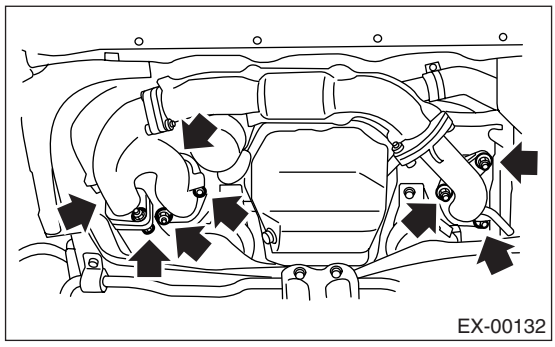
1) Disconnect the ground cable from battery.



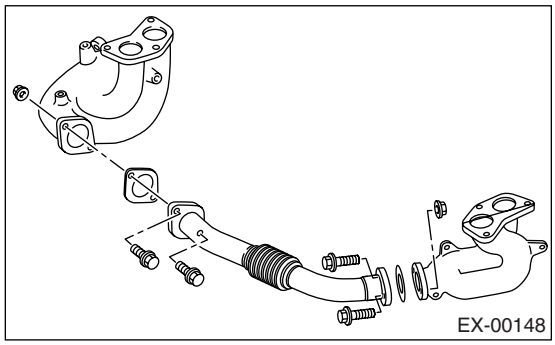
2) Remove the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-43, REMOVAL, Front Oxygen (A/F) Sensor.>
3) Remove the under cover.
4) Remove the lower exhaust manifold cover (RH).
5) Remove the lower and upper exhaust manifold covers (LH).



6) Remove the bolts and nuts which hold the front exhaust pipe assembly to turbocharger joint pipe.
7) While holding the front exhaust pipe assembly with one hand, remove the nuts which hold the front exhaust pipe assembly to cylinder head exhaust port.



8) Remove the front exhaust pipe assembly.
9) Remove the covers from exhaust manifold and front exhaust pipe.
10) Separate the front exhaust pipe from exhaust manifolds.

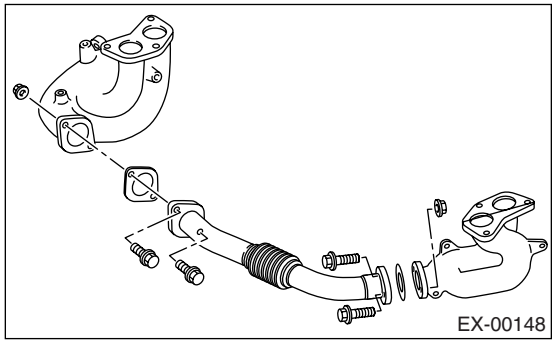


B: INSTALLATION

NOTE:
Replace the gaskets with new ones.

1) Assemble the front exhaust pipe and exhaust manifolds.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)



2) Install the front exhaust pipe covers.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

3) Install the upper exhaust manifold cover (RH).

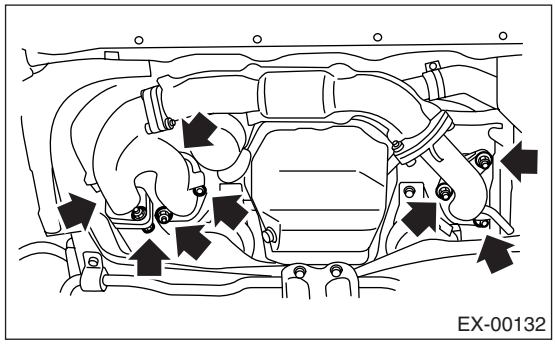
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

4) Install the front exhaust pipe assembly.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

5) Connect the exhaust manifold (RH) to turbocharger joint pipe.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

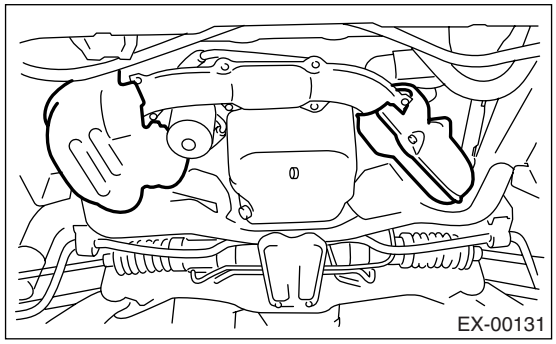


6) Install the upper and lower exhaust manifold covers (LH).

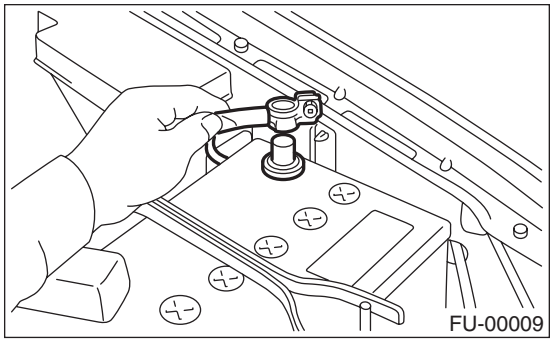
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

7) Install the lower exhaust manifold cover (RH).

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



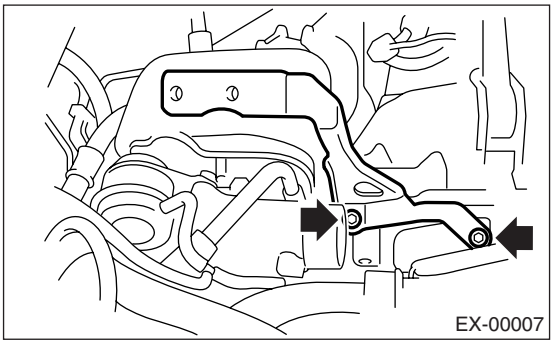
8) Install the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-43, INSTALLATION, Front Oxygen (A/F) Sensor.>
9) Install the under cover.
10) Connect the battery ground cable to battery.



3. Center Exhaust Pipe

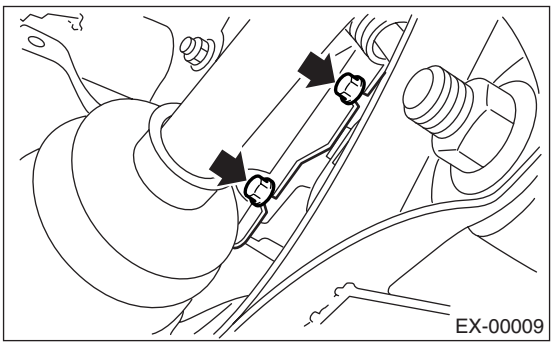
A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
4) Remove the intercooler bracket.

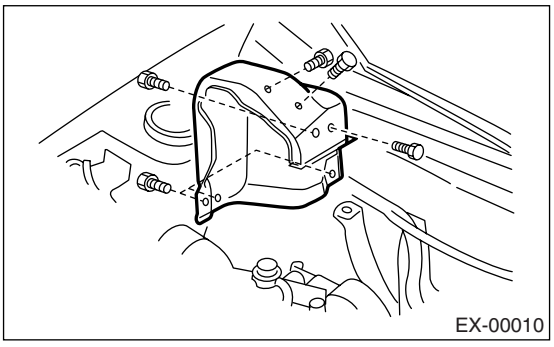


5) Lift-up the vehicle.
6) Remove the under cover.
7) Remove the bolts which install the lower side of turbocharger upper cover.

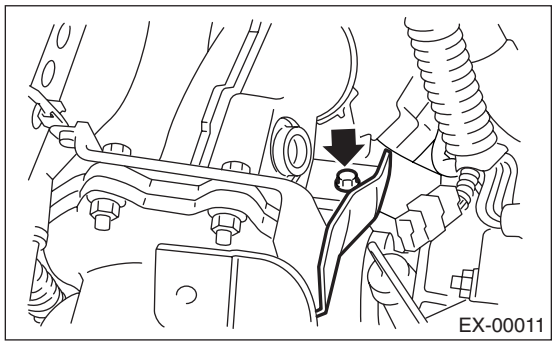
CAUTION:
Be careful, the turbocharger and exhaust pipe are hot.



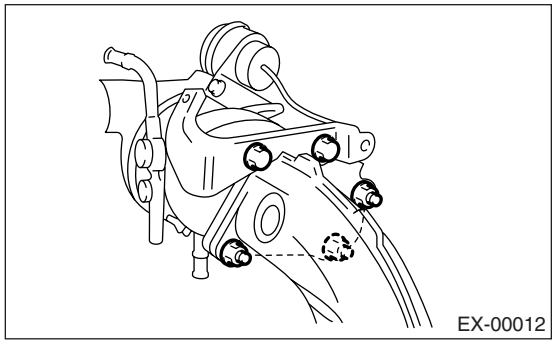
8) Lower the vehicle.
9) Remove the turbocharger upper cover.



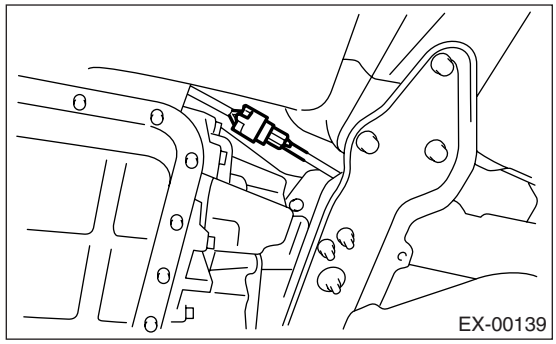
10) Remove the bolts which install the lower upper side of turbocharger upper cover, and remove it.



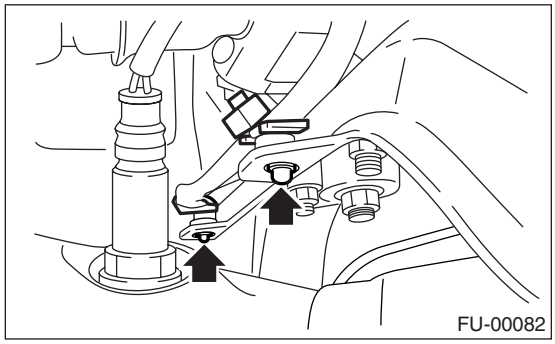
11) Separate the center exhaust pipe from turbocharger.



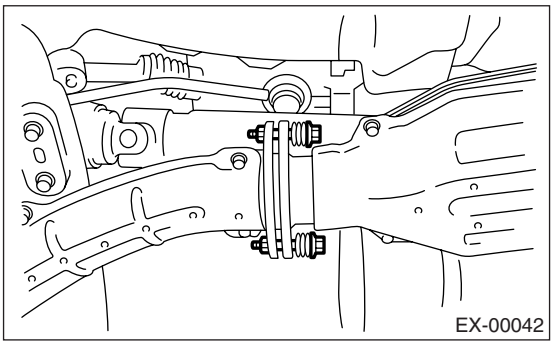
12) Lift-up the vehicle.
13) Disconnect the connector from rear oxygen sensor.



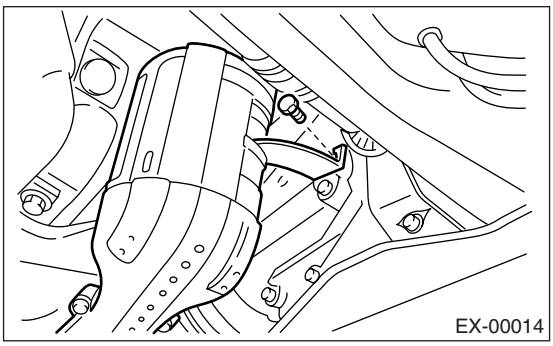
14) Vertically draw out the clip from crossmember.



15) Separate the center exhaust pipe from rear exhaust pipe.

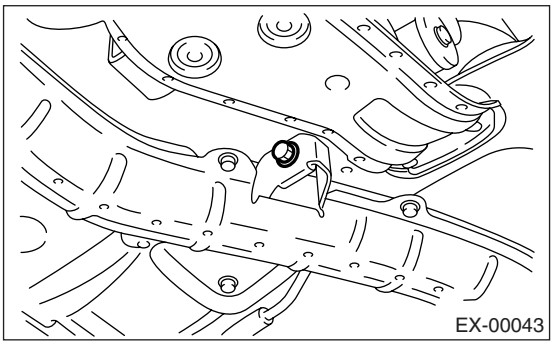


16) Remove the bolt which holds the center exhaust pipe bracket to transmission.

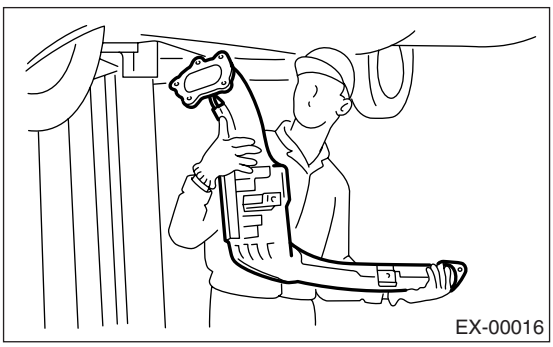


17) Remove the intercooler bracket.
18) Remove the bolt which holds the center exhaust pipe to hanger bracket.

CAUTION:
Be careful not to pull down the center exhaust pipe.



19) Remove the center exhaust pipe.

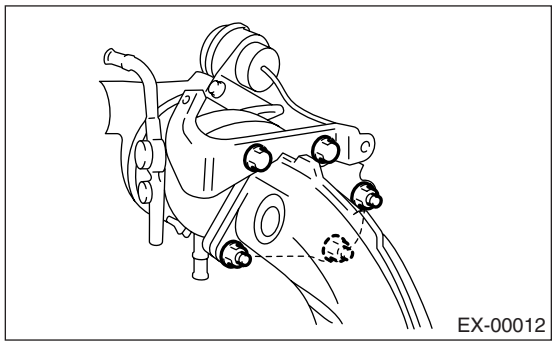


B: INSTALLATION

NOTE:
Replace the gaskets with new ones.

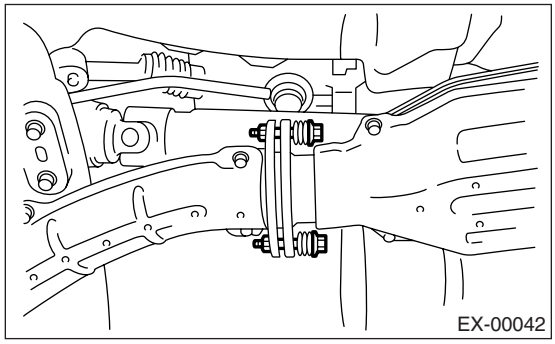
1) Install the center exhaust pipe and temporarily tighten the bolt which holds the center exhaust pipe to hanger bracket.
2) Temporarily tighten the bolt which holds the center pipe to transmission.
3) Connect the center exhaust pipe to turbocharger.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

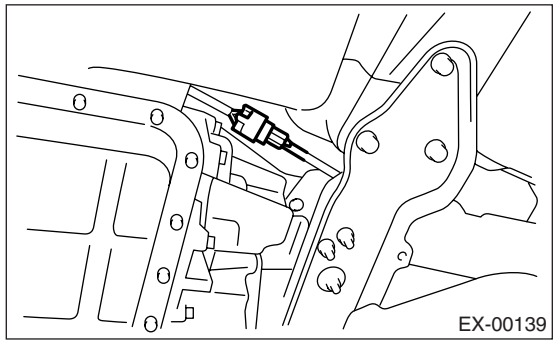


4) Install the center exhaust pipe to rear exhaust pipe.

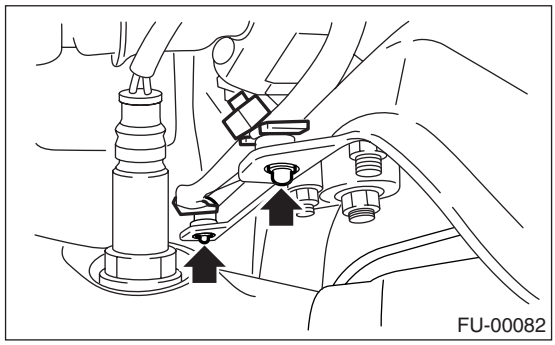
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



5) Connect the connector to rear oxygen sensor.

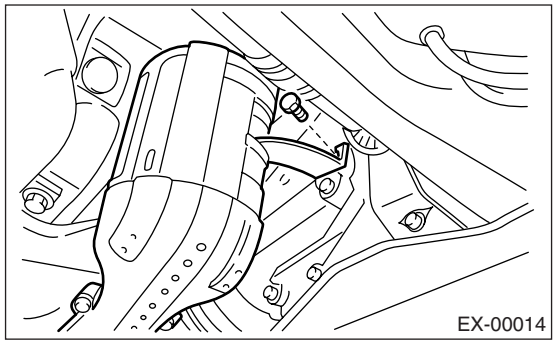


6) Secure the clip on crossmember.



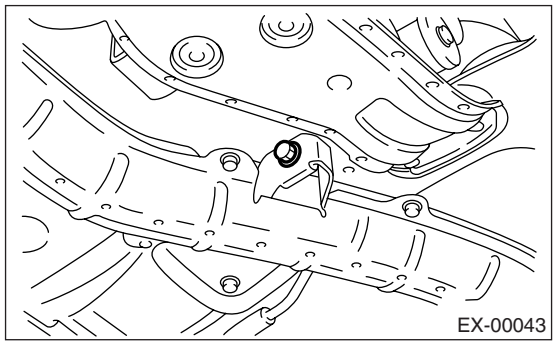
7) Tighten the bolt which holds the center exhaust pipe bracket to transmission.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)



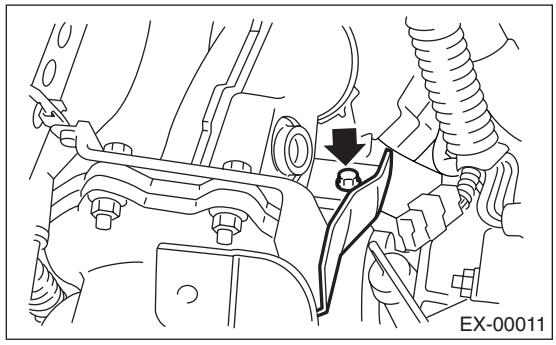
8) Tighten the bolt which holds the center exhaust pipe to hanger bracket.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)



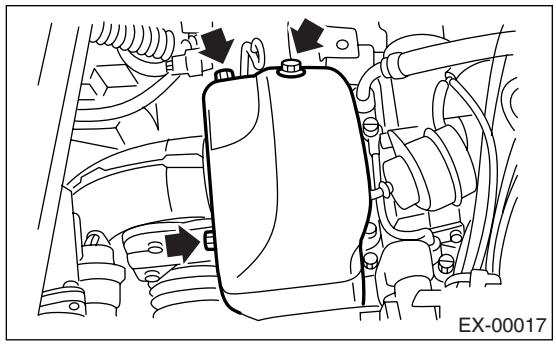
9) Lower the vehicle.
10) Place the turbocharger lower cover, and tighten the bolts which install the upper side of lower cover.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



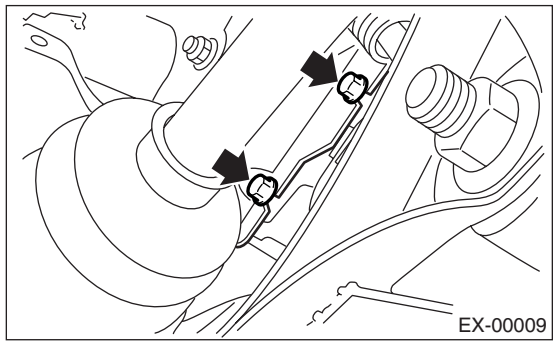
11) Place the turbocharger upper cover, and tighten the bolts which install the upper side of upper cover.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



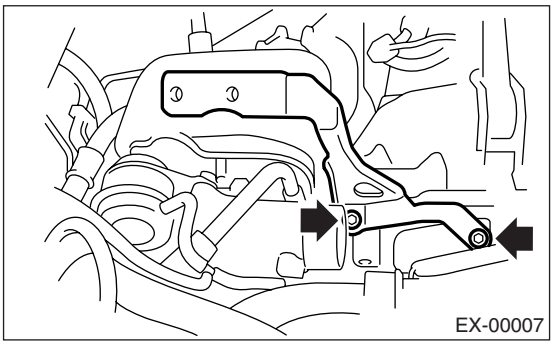
12) Lift-up the vehicle.
13) Tighten the bolts which install the under side of turbocharger upper cover.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



14) Install the under cover.
15) Lower the vehicle.

16) Install the intercooler bracket.

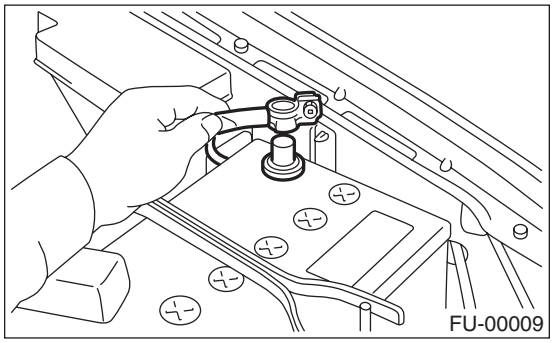


17) Install the intercooler. <Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>

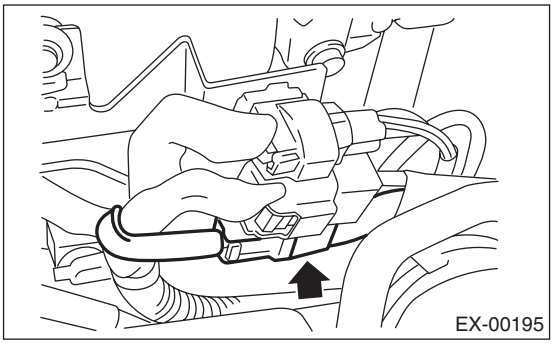
4. Joint Pipe

A: REMOVAL

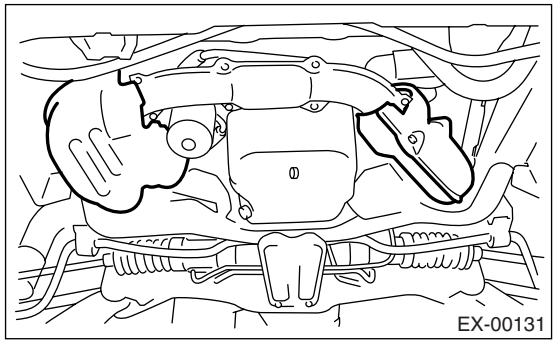
1) Disconnect the ground cable from battery.



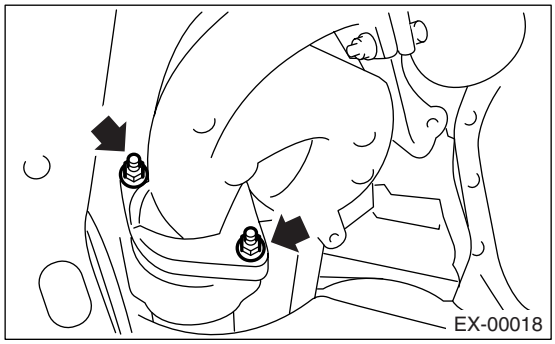
2) Disconnect the exhaust temperature sensor connector. (Except STi model)



3) Remove the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-43, REMOVAL, Front Oxygen (A/F) Sensor.>
4) Remove the under cover.
5) Remove the lower exhaust manifold cover (RH).



6) Remove the nuts which hold the front exhaust manifold to joint pipe.

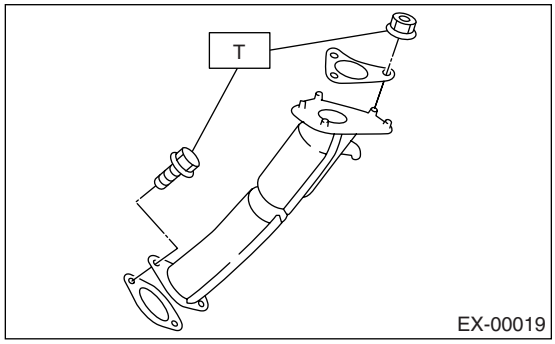


7) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
8) Remove the turbocharger. <Ref. to IN(H4DOTC)-12, REMOVAL, Turbocharger.>
9) Take off the joint pipe in the upward direction.

B: INSTALLATION

Install in the reverse order of removal.

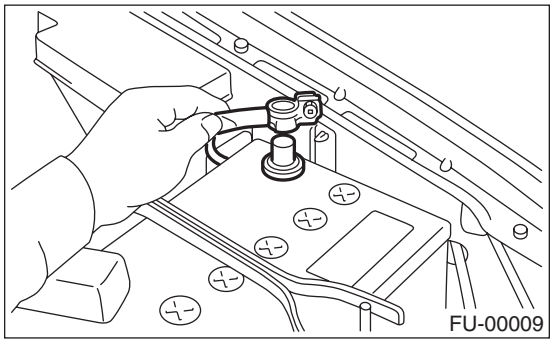
Tightening torque:
T: 35 N·m (3.6 kgf-m, 26.0 ft-lb)



5. Rear Exhaust Pipe

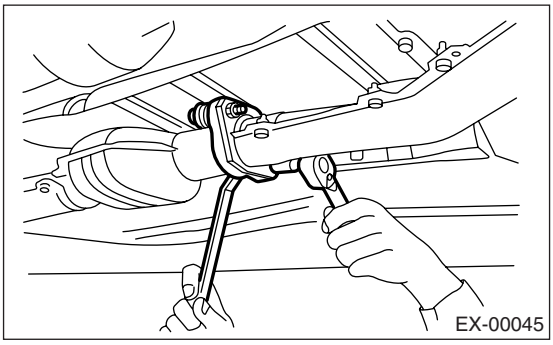
A: REMOVAL

1) Disconnect the ground cable from battery.



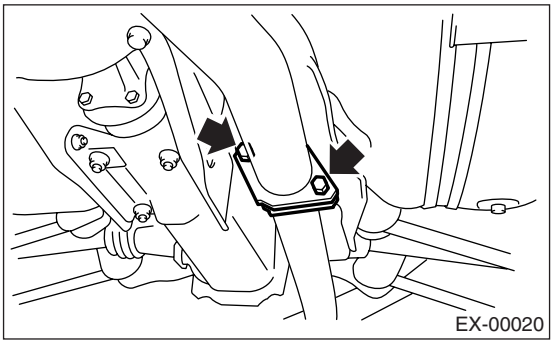
2) Lift-up the vehicle.
3) Separate the rear exhaust pipe from center exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.



4) Separate the rear exhaust pipe from muffler.

CAUTION:
Be careful not to pull down the rear exhaust pipe.



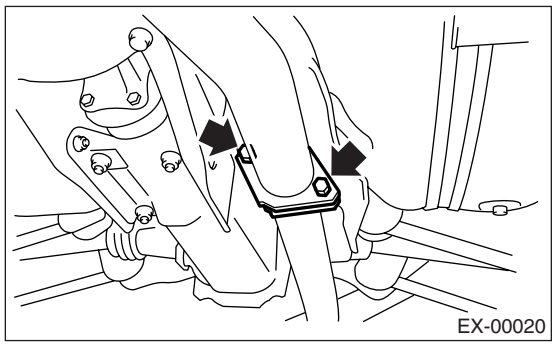
5) Remove the rear exhaust pipe.

B: INSTALLATION

NOTE:
Replace the gaskets with new ones.

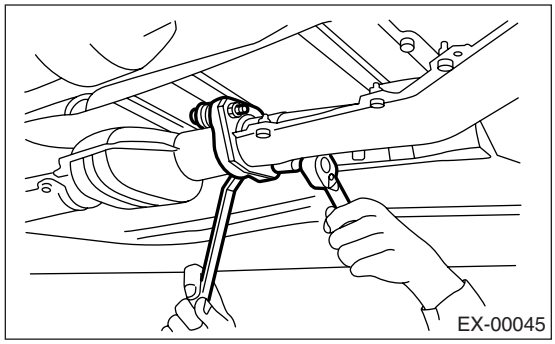
1) Install the rear exhaust pipe to muffler.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)

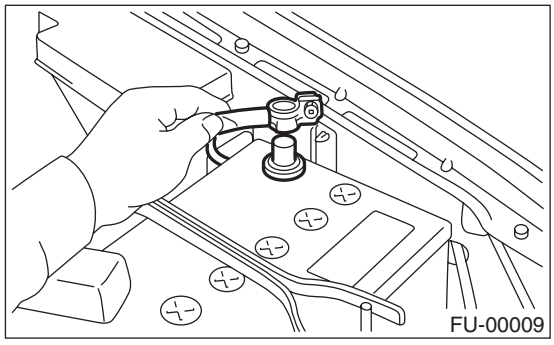


2) Install the rear exhaust pipe to center exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



3) Lower the vehicle.
4) Connect the battery ground cable to battery.



C: INSPECTION

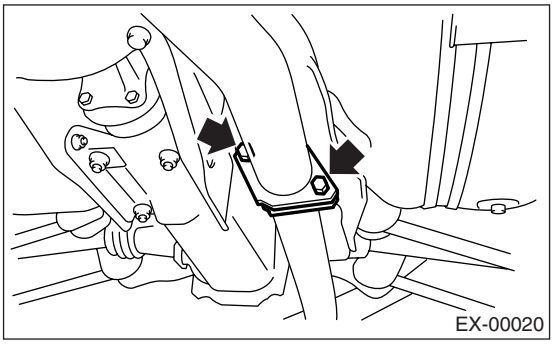
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

6. Muffler

A: REMOVAL

1) Separate the muffler from rear exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.

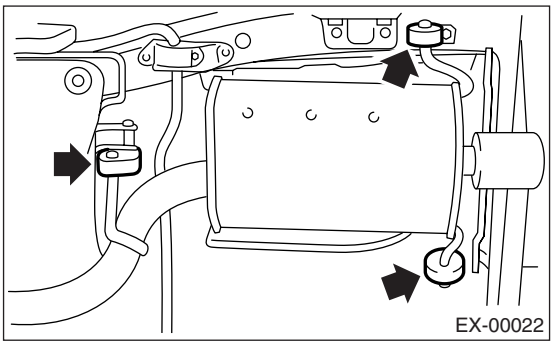


2) Remove the rubber cushions, and detach the muffler.

CAUTION:
Be careful not to drop the muffler during removal.

NOTE:
To facilitate removal, apply a coat of SUBARU CRC to the mating area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)

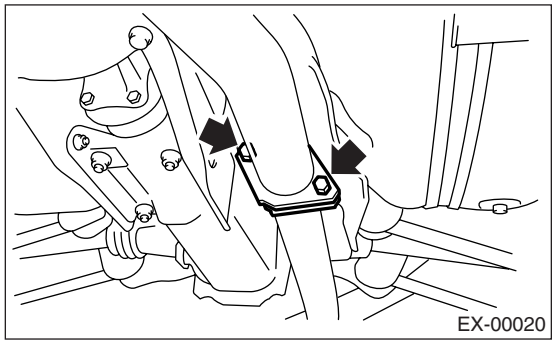


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace the gasket and self-locking nut with a new one.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

COOLING

CO(H4DOTC)

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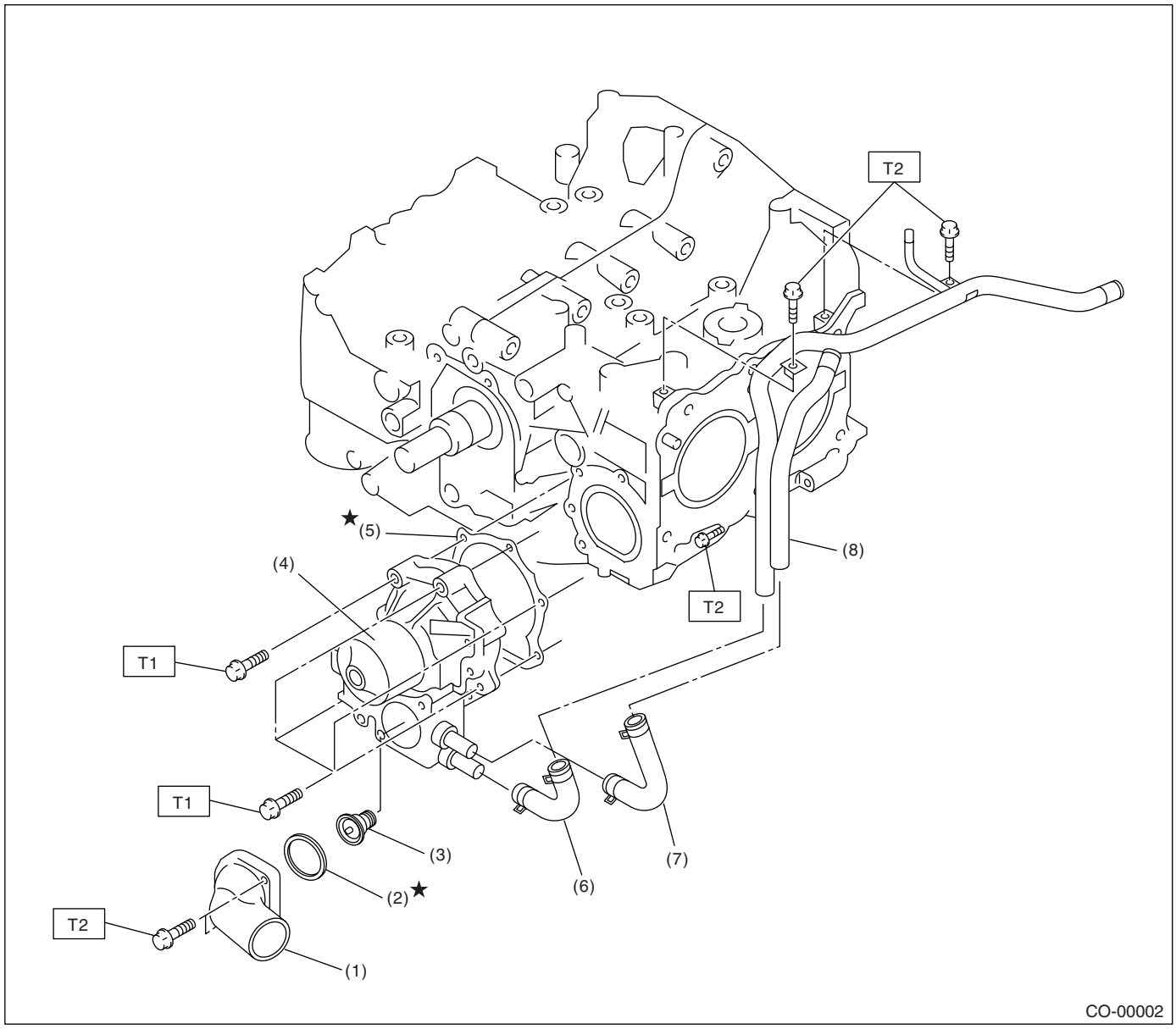
1. General Description

A: SPECIFICATIONS

Model			DOHC TURBO
Cooling system			Electric fan + Forced engine coolant circulation system
Total engine coolant capacity ℓ (US qt, Imp qt)			AT: Approx. 7.6 (8.03, 6.69) MT: Approx. 7.7 (8.14, 6.78)
Water pump	Type		Centrifugal impeller type
	Discharge performance I	Discharge	20 ℓ (5.3 US gal, 4.4 Imp gal)/min.
		Pump speed — Discharge pressure	760 rpm — 2.9 kPa (0.3 mAq)
		Engine coolant temperature	85°C (185°F)
	Discharge performance II	Discharge	100 ℓ (26.4 US gal, 22.0 Imp gal)/min.
		Pump speed — Discharge pressure	3,000 rpm — 49.0 kPa (5.0 mAq)
		Engine coolant temperature	85°C (185°F)
	Discharge performance III	Discharge	200 ℓ (52.8 US gal, 44.0 Imp gal)/min.
		Pump speed — Discharge pressure	6,000 rpm — 225.4 kPa (23.0 mAq)
		Engine coolant temperature	85°C (185°F)
	Impeller diameter		76 mm (2.99 in)
	Number of impeller vanes		8
	Pump pulley diameter		60 mm (2.36 in)
	Clearance between impeller and case	Standard	0.5 — 0.7 mm (0.020 — 0.028 in)
		Limit	1.0 mm (0.039 in)
	"Thrust" runout of impeller end		0.5 mm (0.020 in)
Thermostat	Type		Wax pellet type
	Starts to open		76 — 80°C (169 — 176°F)
	Fully opened		91°C (196°F)
	Valve lift		9.0 mm (0.354 in) or more/91°C (196°F)
	Valve bore		35 mm (1.38 in)
Radiator fan	Motor	Main fan	120 W
		Sub fan	120 W
	Fan diameter × Blade		320 mm (12.60 in) × 5 (main fan) 320 mm (12.60 in) × 7 (sub fan)
Radiator	Type		Down flow, pressure type
	Core dimensions	Width × Height × Thickness	AT: 691.5 × 340 × 16 mm (27.22 × 13.39 × 0.63 in) MT: 691.5 × 340 × 27 mm (27.22 × 13.39 × 1.06 in)
	Pressure range in which cap valve is open	Coolant filler tank side	Above: 108±15 kPa (1.1±0.15 kg/cm^2, 16±2 psi) Below: −1.0 to −4.9 kPa (−0.01 to −0.05 kg/cm^2, −0.1 to −0.7 psi)
		Radiator side	Above only: 137±14.7 kPa (1.40±0.15 kg/cm^2, 20±2.1 psi)
	Fins		Corrugated fin type
Reservoir tank	Capacity		0.5 ℓ (0.5 US qt, 0.4 Imp qt)

B: COMPONENT

1. WATER PUMP



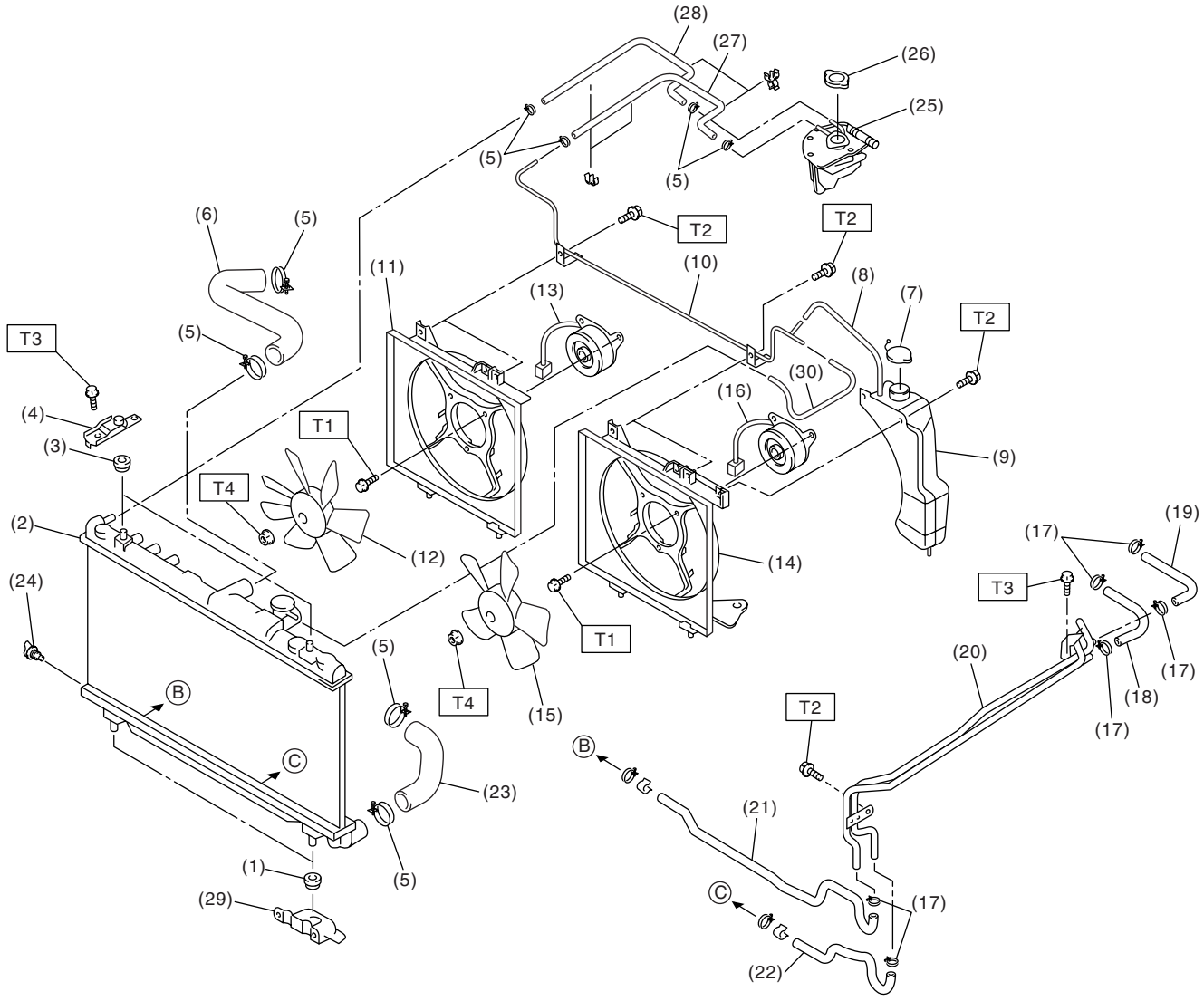
(1)	Thermostat cover	(5)	Gasket
(2)	Gasket	(6)	Heater by-pass hose
(3)	Thermostat	(7)	Coolant filler tank by-pass hose
(4)	Water pump ASSY	(8)	Water by-pass pipe

Tightening torque: N·m (kgf-m, ft-lb)

T1: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)

T2: 6.5 (0.66, 4.8)

2. RADIATOR AND RADIATOR FAN



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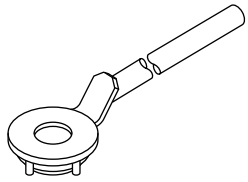
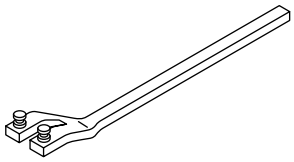
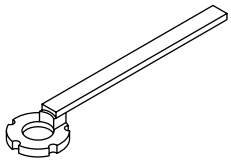
(1) Radiator lower cushion
(2) Radiator
(3) Radiator upper cushion
(4) Radiator upper bracket
(5) Clamp
(6) Radiator inlet hose
(7) Engine coolant reservoir tank cap
(8) Overflow hose A
(9) Engine coolant reservoir tank
(10) Overflow pipe
(11) Radiator sub fan shroud
(12) Radiator sub fan
(13) Radiator sub fan motor
(14) Radiator main fan shroud
(15) Radiator main fan
(16) Radiator main fan motor
(17) ATF hose clamp (AT model)
(18) ATF inlet hose A (AT model)
(19) ATF outlet hose A (AT model)
(20) ATF pipe (AT model)
(21) ATF inlet hose B (AT model)
(22) ATF outlet hose B (AT model)
(23) Radiator outlet hose
(24) Radiator drain plug
(25) Engine coolant filler tank
(26) Radiator cap (engine coolant filler tank cap)
(27) Engine overflow hose
(28) Engine air breather hose
(29) Radiator lower bracket
(30) Overflow hose B

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 7.5 (0.76, 5.5)
T3: 18 (1.8, 13.0)
T4: 3.4 (0.35, 2.5)

C: CAUTION

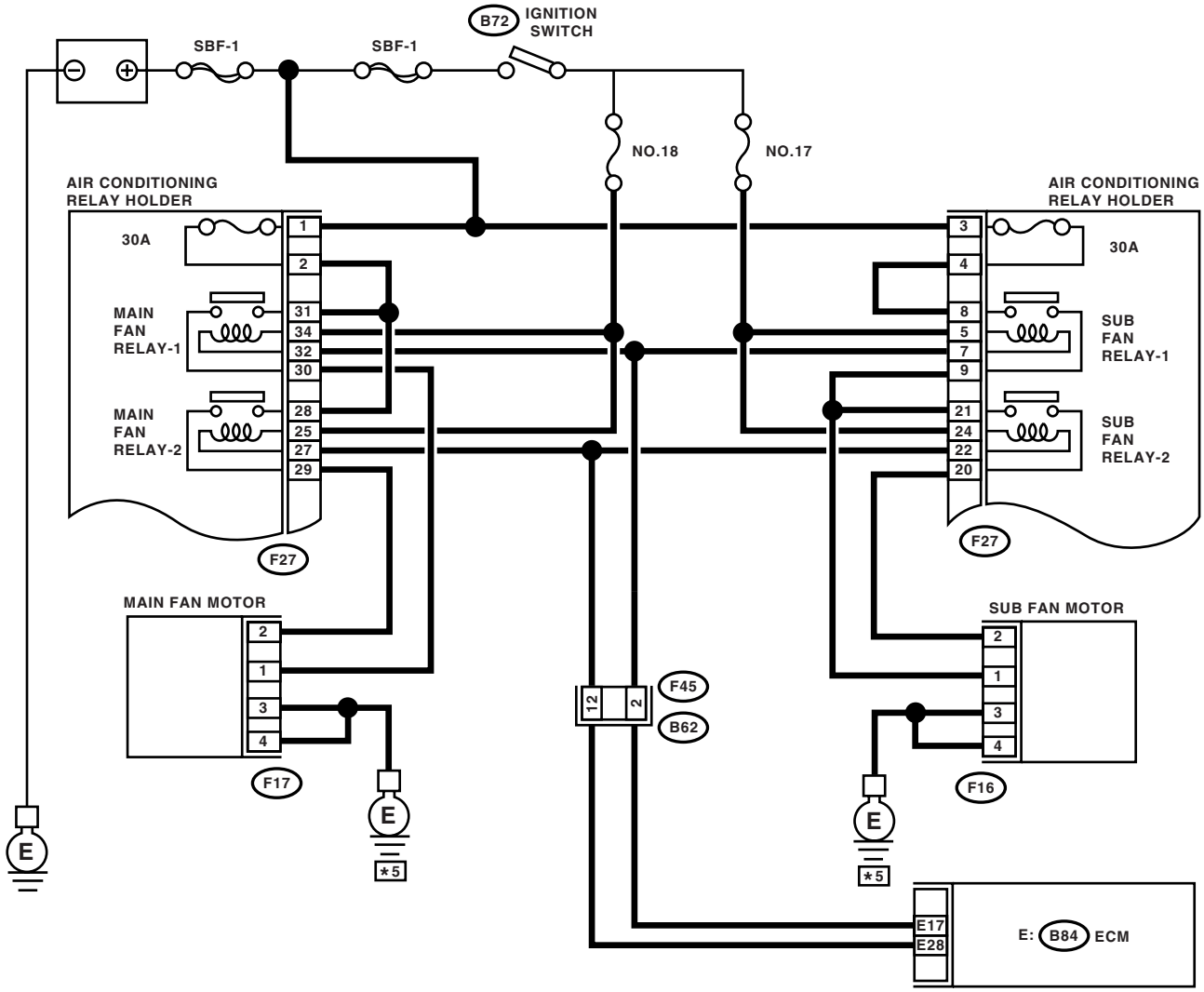
• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

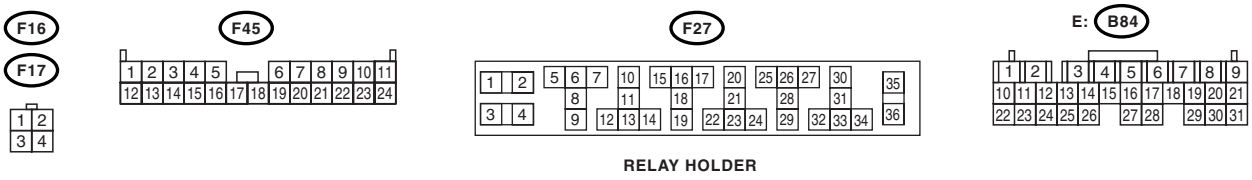
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977400	49 9977400	CRANKSHAFT PULLEY WRENCH	Used for stopping crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 ST18231AA010	18231AA010	CAMSHAFT SPROCKET WRENCH	Used for removing and installing intake camshaft sprocket.
 ST-499207400	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing exhaust camshaft sprocket.

2. Radiator Main Fan System

A: WIRING DIAGRAM





CO-00241

B: INSPECTION

DETECTING CONDITION:

- Engine coolant temperature is above 96°C (205°F).
- A/C compressor is rotated.
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

- Radiator main fan does not rotate under the above conditions.
- Radiator main fan does not rotate at high speed when the following conditions are both met:
  (1) Engine coolant temperature is above 90°C (194°F).
  (2) A/C is ON.

	Step	Check	Yes	No
1	**CHECK OPERATION OF RADIATOR.** 1) Run the engine at idle. (Vehicle stationary) 2) Turn the A/C switch to OFF. 3) Warm the engine coolant temperature over 96°C (205°F).	Does the main radiator fan rotate?	Go to step **2.**	Go to step **3.**
2	**CHECK OPERATION OF RADIATOR.** Turn the A/C switch to ON at condition of step 1.	Does the main radiator fan rotate faster when A/C compressor is operated?	Radiator main fan system is okay.	Go to step **17.**
3	**CHECK POWER SUPPLY TO MAIN FAN MOTOR.** **CAUTION:** **Be careful not to overheat the engine during repair.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from main fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 96°C (205°F). 4) Stop the engine and turn ignition switch to ON. 5) Measure the voltage between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **7.**
4	**CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 3 — Chassis ground:*** ***(F17) No. 4 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the open circuit in harness between main fan motor connector and chassis ground.
5	**CHECK POOR CONTACT.** Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair the poor contact in main fan motor connector.	Go to step **6.**
6	**CHECK MAIN FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 1, and ground (–) terminal to terminal No. 3 or No. 4 of main fan motor connector.	Does the main fan rotate?	Repair the poor contact in main fan motor connector.	Replace the main fan motor with a new one.

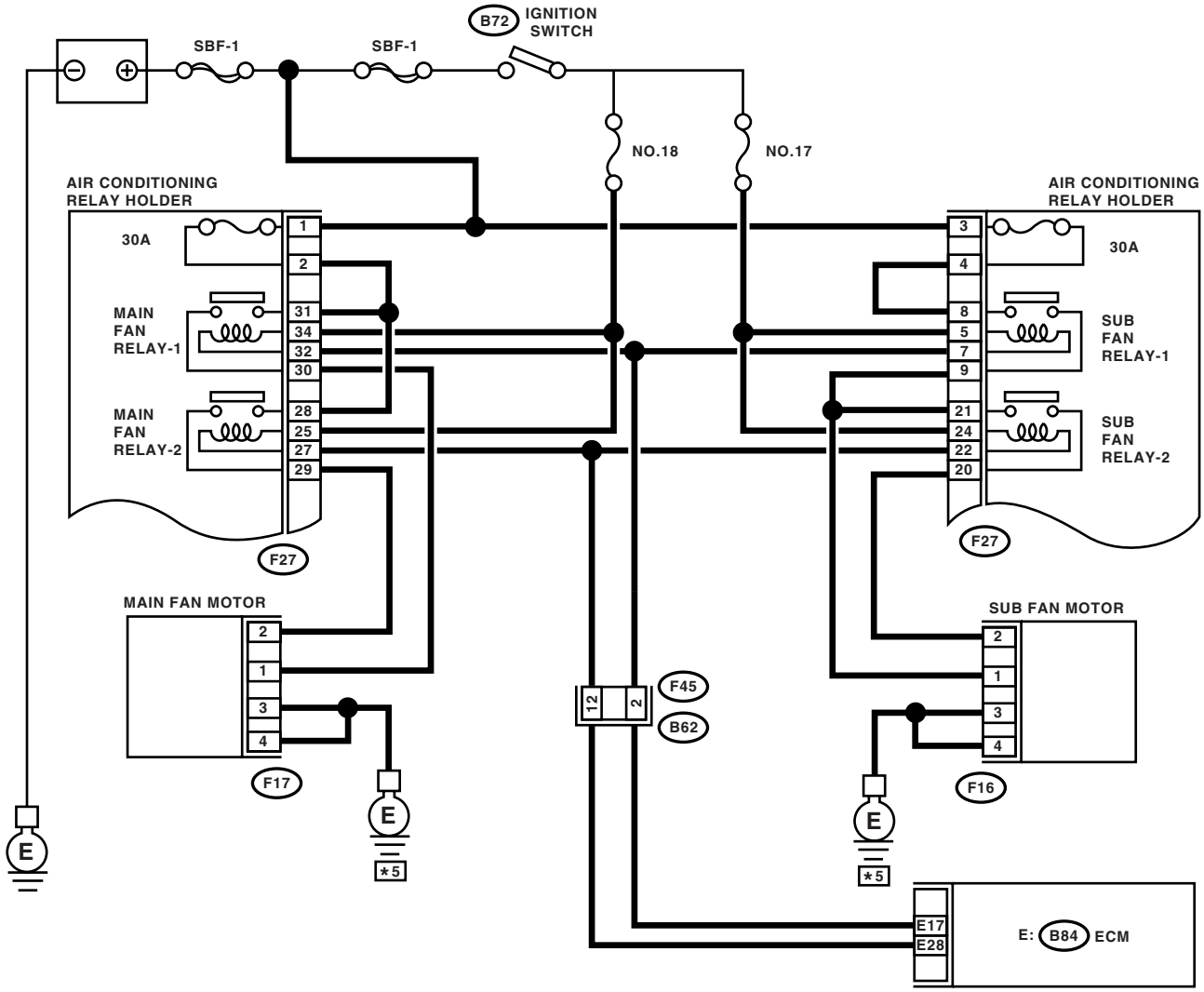
Step		Check	Yes	No
7	**CHECK POWER SUPPLY TO MAIN FAN RELAY1.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay1 from A/C relay holder. 3) Measure the voltage between main fan relay1 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 31 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **8.**	Go to step **9.**
8	**CHECK POWER SUPPLY TO MAIN FAN RELAY1.** 1) Turn the ignition switch to ON. 2) Measure the voltage between main fan relay1 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 34 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **12.**	Go to step **11.**
9	**CHECK 30 A FUSE.** 1) Remove the 30 A fuse from A/C relay holder. 2) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step **10.**
10	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL.** Measure the voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the open circuit in harness between 30 A fuse and main fan relay terminal.	Repair the open circuit in harness between main fuse box connector and 30 A fuse terminal.
11	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 18 from joint box. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the open circuit in harness between main fan relay and ignition switch.
12	**CHECK MAIN FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay1. 3) Measure the resistance of main fan relay1. ***Terminals*** ***No. 30 — No. 31:***	Is the resistance more than 1 MΩ?	Go to step **13.**	Replace the main fan relay.
13	**CHECK MAIN FAN RELAY.** 1) Connect the battery to terminals No. 27 and No. 28 of main fan relay1. 2) Measure the resistance of main fan relay1. ***Terminals*** ***No. 30 — No. 31:***	Is the resistance less than 1 Ω?	Go to step **14.**	Replace the main fan relay.
14	**CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR.** Measure the resistance of harness between main fan motor connector and main fan relay terminal. ***Connector & terminal*** ***(F17) No. 1 — (F27) No. 30:***	Is the resistance less than 1 Ω?	Go to step **15.**	Repair the open circuit in harness between main fan motor connector and main fan relay terminal.

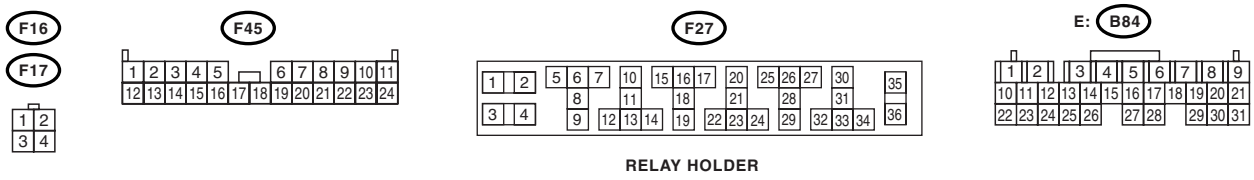
	Step	Check	Yes	No
15	**CHECK HARNESS BETWEEN MAIN FAN RELAY AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between main fan relay connector and ECM connector. ***Connector & terminal*** ***(F27) No. 32 — (B84) No. 17:***	Is the resistance less than 1 Ω?	Go to step **16.**	Repair the open circuit in harness between main fan relay and ECM.
16	**CHECK POOR CONTACT.** Check poor contact in connector between main fan and ECM.	Is there poor contact in connector between main fan motor and ECM?	Repair the poor contact connector.	Record the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-38, Read Diagnostic Trouble Code (DTC).>
17	**CHECK POWER SUPPLY TO MAIN FAN MOTOR.** **CAUTION:** **Be careful not to overheat the engine during repair.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from main fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 96°C (205°F). 4) Turn the A/C switch ON. 5) Measure the voltage while A/C compressor is rotating. 6) Measure the voltage between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **18.**	Go to step **20.**
18	**CHECK POOR CONTACT.** Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair the poor contact in main fan motor connector.	Go to step **19.**
19	**CHECK MAIN FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 2, and ground (−) terminal to terminal No. 1 of main fan motor connector.	Does the main fan rotate?	Repair the poor contact in main fan motor connector.	Replace the main fan motor with a new one.
20	**CHECK POWER SUPPLY TO MAIN FAN RELAY2.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay2 from A/C relay holder. 3) Measure the voltage between main fan relay2 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 28 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **21.**	Go to step **22.**
21	**CHECK POWER SUPPLY TO MAIN FAN RELAY2.** 1) Turn the ignition switch to ON. 2) Measure the voltage between main fan relay2 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 25 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **25.**	Go to step **24.**

Step		Check	Yes	No
22	**CHECK 30 A FUSE.** 1) Remove the 30 A fuse from A/C relay holder. 2) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step **23.**
23	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL.** Measure the voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the open circuit in harness between 30 A fuse and main fan relay terminal.	Repair the open circuit in harness between main fuse box connector and 30 A fuse terminal.
24	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 18 from joint box. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the open circuit in harness between main fan relay and ignition switch.
25	**CHECK MAIN FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay2. 3) Measure the resistance of main fan relay2. ***Terminals*** ***No. 28 — No. 29:***	Is the resistance more than 1 MΩ?	Go to step **26.**	Replace the main fan relay.
26	**CHECK MAIN FAN RELAY.** 1) Connect the battery to terminals No. 21 and No. 22 of main fan relay1. 2) Measure the resistance of main fan relay2. ***Terminals*** ***No. 28 — No. 29:***	Is the resistance less than 1 Ω?	Go to step **27.**	Replace the main fan relay.
27	**CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR.** Measure the resistance of harness between main fan motor connector and main fan relay terminal. ***Connector & terminal*** ***(F17) No. 2 — (F27) No. 29:***	Is the resistance less than 1 Ω?	Go to step **28.**	Repair the open circuit in harness between main fan motor connector and main fan relay terminal.
28	**CHECK HARNESS BETWEEN MAIN FAN RELAY AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between main fan relay connector and ECM connector. ***Connector & terminal*** ***(F27) No. 27 — (B84) No. 28:***	Is the resistance less than 1 Ω?	Go to step **29.**	Repair the open circuit in harness between main fan relay and ECM.
29	**CHECK POOR CONTACT.** Check poor contact in connector between main fan and ECM.	Is there poor contact in connector between main fan motor and ECM?	Repair the poor contact connector.	Record the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-38, Read Diagnostic Trouble Code (DTC).>

3. Radiator Sub Fan System

A: WIRING DIAGRAM





CO-00241

B: INSPECTION

DETECTING CONDITION:

- Engine coolant temperature is above 96°C (205°F).
- A/C compressor is rotated.
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

- Radiator sub fan does not rotate under the above conditions.
- Radiator sub fan does not rotate at high speed when the following conditions are both met:
  (1) Engine coolant temperature is above 90°C (194°F).
  (2) A/C is ON.

	Step	Check	Yes	No
1	**CHECK OPERATION OF RADIATOR.** 1) Run the engine at idle. (Vehicle stationary) 2) Turn the A/C switch to OFF. 3) Warm the engine coolant temperature over 96°C (205°F).	Does the radiator sub fan rotate?	Go to step **2.**	Go to step **3.**
2	**CHECK OPERATION OF RADIATOR.** Turn the A/C switch to ON at condition of step 1.	Does the radiator sub fan rotate faster when A/C compressor is operated?	Radiator main fan system is okay.	Go to step **17.**
3	**CHECK POWER SUPPLY TO SUB FAN MOTOR.** **CAUTION:** **Be careful not to overheat the engine during repair.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from sub fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 96°C (205°F). 4) Stop the engine and turn ignition switch to ON. 5) Measure the voltage between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **7.**
4	**CHECK GROUND CIRCUIT OF SUB FAN MOTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 3 — Chassis ground:*** ***(F16) No. 4 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the open circuit in harness between sub fan motor connector and chassis ground.
5	**CHECK POOR CONTACT.** Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair the poor contact in sub fan motor connector.	Go to step **6.**
6	**CHECK MAIN FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 1, and ground (−) terminal to terminal No. 3 or No. 4 of sub fan motor connector.	Does the main fan rotate?	Repair the poor contact in sub fan motor connector.	Replace the sub fan motor with a new one.

Step		Check	Yes	No
7	**CHECK POWER SUPPLY TO SUB FAN RELAY1.** 1) Turn the ignition switch to OFF. 2) Remove the sub fan relay1 from A/C relay holder. 3) Measure the voltage between sub fan relay1 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 7 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **8.**	Go to step **9.**
8	**CHECK POWER SUPPLY TO SUB FAN RELAY1.** 1) Turn the ignition switch to ON. 2) Measure the voltage between sub fan relay1 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 5 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **12.**	Go to step **11.**
9	**CHECK 30 A FUSE.** 1) Remove the 30 A fuse from A/C relay holder. 2) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step **10.**
10	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL.** Measure the voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the open circuit in harness between 30 A fuse and sub fan relay terminal.	Repair the open circuit in harness between sub fuse box connector and 30 A fuse terminal.
11	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 17 from joint box. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the open circuit in harness between sub fan relay and ignition switch.
12	**CHECK SUB FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay1. 3) Measure the resistance of sub fan relay1. ***Terminals*** ***No. 7 — No. 8:***	Is the resistance more than 1 MΩ?	Go to step **13.**	Replace the sub fan relay.
13	**CHECK SUB FAN RELAY.** 1) Connect the battery to terminals No. 6 and No. 5 of sub fan relay1. 2) Measure the resistance of sub fan relay. ***Terminals*** ***No. 7 — No. 8:***	Is the resistance less than 1 Ω?	Go to step **14.**	Replace the sub fan relay.
14	**CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.** Measure the resistance of harness between sub fan motor connector and sub fan relay terminal. ***Connector & terminal*** ***(F16) No. 1 — (F27) No. 9:***	Is the resistance less than 1 Ω?	Go to step **15.**	Repair the open circuit in harness between sub fan motor connector and sub fan relay terminal.

	Step	Check	Yes	No
15	**CHECK HARNESS BETWEEN SUB FAN RELAY AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between sub fan relay connector and ECM connector. ***Connector & terminal*** ***(F27) No. 7 — (B84) No. 17:***	Is the resistance less than 1 Ω?	Go to step **16.**	Repair the open circuit in harness between sub fan relay and ECM.
16	**CHECK POOR CONTACT.** Check poor contact in connector between sub fan and ECM.	Is there poor contact in connector between sub fan motor and ECM?	Repair the poor contact connector.	Record the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-38, Read Diagnostic Trouble Code (DTC).>
17	**CHECK POWER SUPPLY TO SUB FAN MOTOR.** **CAUTION:** **Be careful not to overheat the engine during repair.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from sub fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 96°C (205°F). 4) Turn the A/C switch ON. 5) Measure the voltage while A/C compressor is rotating. 6) Measure the voltage between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **18.**	Go to step **20.**
18	**CHECK POOR CONTACT.** Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair the poor contact in sub fan motor connector.	Go to step **19.**
19	**CHECK SUB FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 2, and ground (−) terminal to terminal No. 3 or No. 4 of sub fan motor connector.	Does the main fan rotate?	Repair the poor contact in sub fan motor connector.	Replace the sub fan motor with a new one.
20	**CHECK POWER SUPPLY TO SUB FAN RELAY2.** 1) Turn the ignition switch to OFF. 2) Remove the sub fan relay2 from A/C relay holder. 3) Measure the voltage between sub fan relay2 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 21 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **21.**	Go to step **22.**
21	**CHECK POWER SUPPLY TO SUB FAN RELAY2.** 1) Turn the ignition switch to ON. 2) Measure the voltage between sub fan relay2 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 24 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **23.**	Go to step **24.**

	Step	Check	Yes	No
22	**CHECK 30 A FUSE.** 1) Remove the 30 A fuse from A/C relay holder. 2) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step **23.**
23	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL.** Measure the voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the open circuit in harness between 30 A fuse and sub fan relay terminal.	Repair the open circuit in harness between sub fuse box connector and 30 A fuse terminal.
24	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 17 from joint box. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the open circuit in harness between sub fan relay and ignition switch.
25	**CHECK SUB FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the sub fan relay2. 3) Measure the resistance of main fan relay2. ***Terminals*** ***No. 20 — No. 21:***	Is the resistance more than 1 MΩ?	Go to step **26.**	Replace the sub fan relay.
26	**CHECK MAIN FAN RELAY.** 1) Connect the battery to terminals No. 19 and No. 20 of sub fan relay2. 2) Measure the resistance of main fan relay2. ***Terminals*** ***No. 20 — No. 21:***	Is the resistance less than 1 Ω?	Go to step **27.**	Replace the sub fan relay.
27	**CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.** Measure the resistance of harness between sub fan motor connector and sub fan relay2 terminal. ***Connector & terminal*** ***(F16) No. 2 — (F27) No. 20:***	Is the resistance less than 1 Ω?	Go to step **28.**	Repair the open circuit in harness between sub fan motor connector and sub fan relay terminal.
28	**CHECK HARNESS BETWEEN SUB FAN RELAY AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between sub fan relay connector and ECM connector. ***Connector & terminal*** ***(F27) No. 22 — (B84) No. 28:***	Is the resistance less than 1 Ω?	Go to step **29.**	Repair the open circuit in harness between sub fan relay and ECM.
29	**CHECK POOR CONTACT.** Check poor contact in connector between sub fan and ECM.	Is there poor contact in connector between sub fan motor and ECM?	Repair the poor contact connector.	Record the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-38, Read Diagnostic Trouble Code (DTC).>

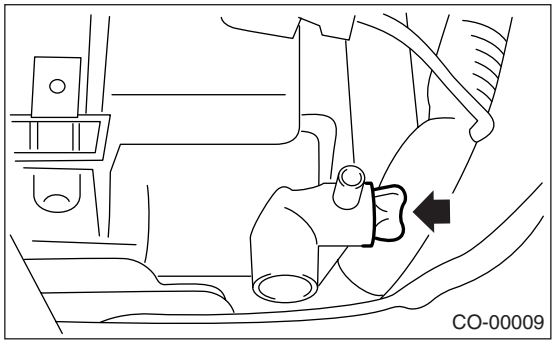
4. Engine Coolant

A: REPLACEMENT

1. DRAINING OF ENGINE COOLANT

1) Lift-up the vehicle.
2) Remove the under cover.
3) Remove the drain cock to drain engine coolant into container.

NOTE:
Remove the coolant filler tank cap so that engine coolant will drain faster.



4) Install the drain cock.

2. FILLING OF ENGINE COOLANT

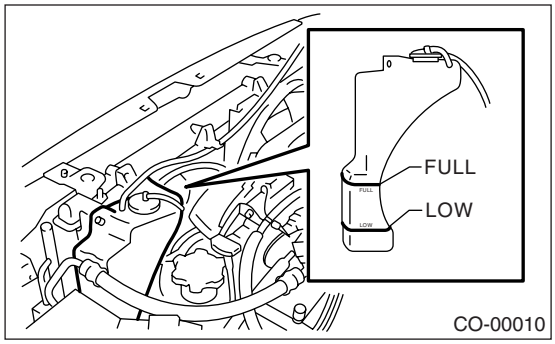
1) Fill engine coolant into the coolant filler tank up to filler neck position.

Coolant capacity (fill up to "FULL" level):
AT model
Approx. 7.6 ℓ (8.03 US qt, 6.69 Imp qt)
MT model
Approx. 7.7 ℓ (8.14 US qt, 6.78 Imp qt)

CAUTION:
Do not mix up the coolant filler tank side cap with radiator side cap.

NOTE:
• Do not remove the radiator side cap when filling engine coolant.
• The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crank-case. Always use SUBARU Genuine Coolant, since other coolant may cause corrosion.

2) Fill engine coolant into the reservoir tank up to Full level.



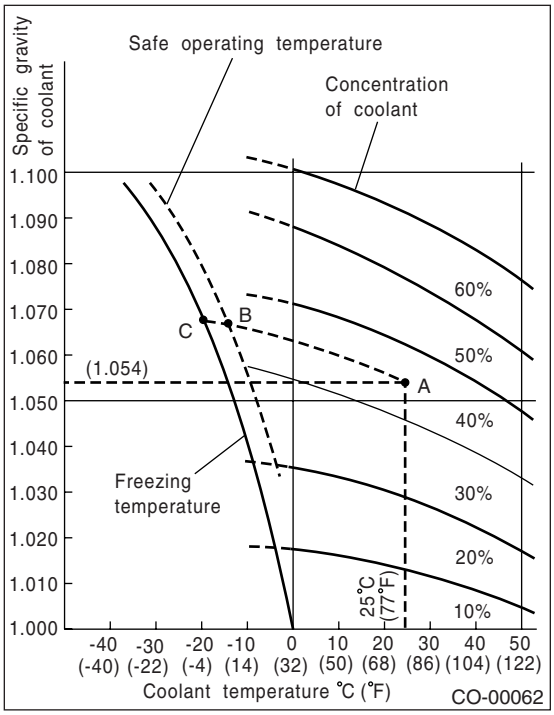
3) Warm-up the engine completely for more than 5 minutes at 2,000 to 3,000 rpm.
4) If the engine coolant level drops in coolant filler tank, add engine coolant to filler neck position.
5) If the engine coolant level drops from Full level of reservoir tank, add engine coolant to Full level.
6) Attach the coolant filler tank cap and reservoir tank cap properly.

B: INSPECTION

1. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

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

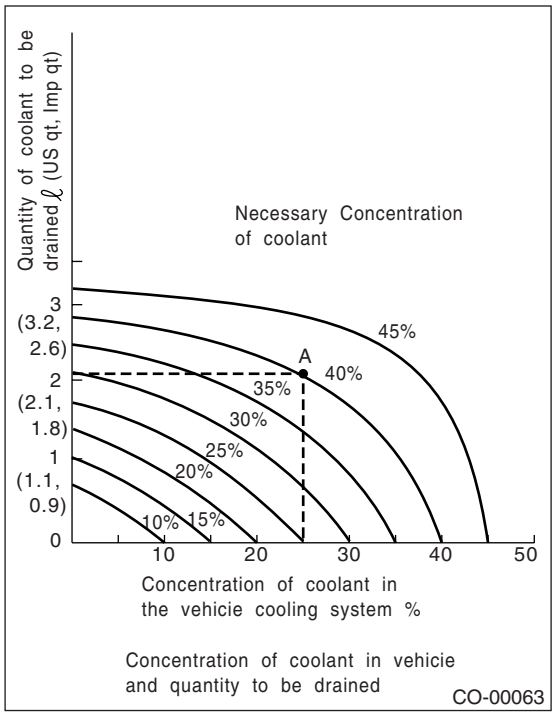
[Example]
If the coolant temperature is 25°C (77°F) and its specific gravity is 1.054, the concentration is 45% (point A), the safe operating temperature is −14°C (7°F) (point B), and the freezing temperature is −20°C (−4°F) (point C).



2. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50%).
The amount of coolant that should be replaced can be determined using the diagram.
[Example]
Assume that the coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of coolant concentration intersects with the 40% curve of the necessary coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 ℓ (2.2 US qt, 1.8 Imp qt). Drain 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.

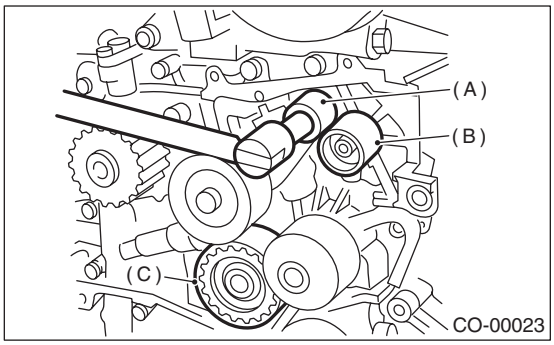
If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.



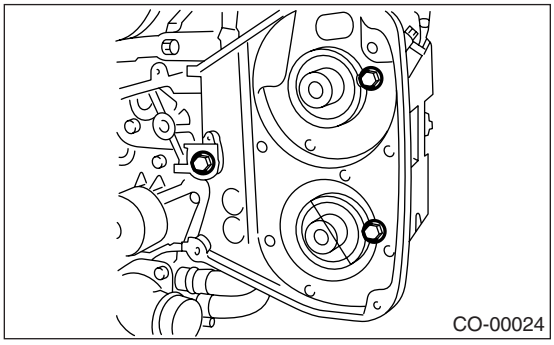
5. Water Pump

A: REMOVAL

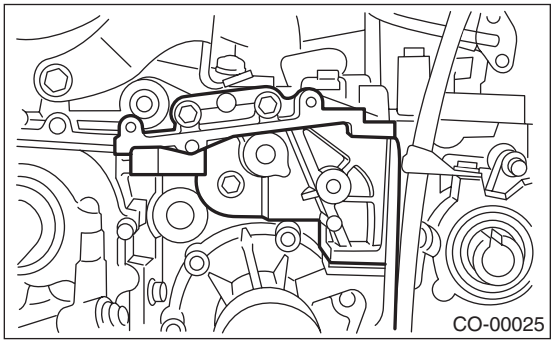
1) Remove the radiator. <Ref. to CO(H4DOTC)-22, REMOVAL, Radiator.>
2) Remove the V-belts. <Ref. to ME(H4DOTC)-42, REMOVAL, V-belt.>
3) Remove the timing belt. <Ref. to ME(H4DOTC)-46, REMOVAL, Timing Belt Assembly.>
4) Remove the automatic belt tension adjuster (A).
5) Remove the belt idler (B).
6) Remove the belt idler No. 2 (C).



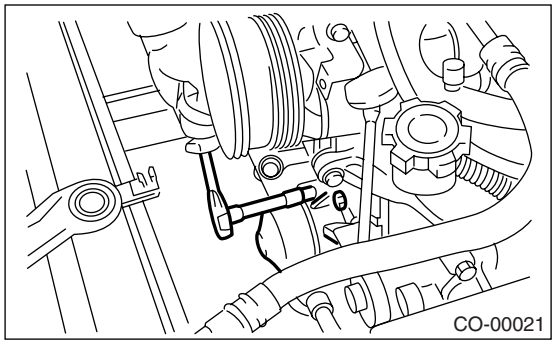
7) Remove the camshaft position sensor. <Ref. to FU(H4DOTC)-29, REMOVAL, Camshaft Position Sensor.>
8) Remove the camshaft sprockets (LH) by using ST. <Ref. to ME(H4DOTC)-54, REMOVAL, Camshaft Sprocket.>
9) Remove the belt cover No. 2 (LH).



10) Remove the tensioner bracket.



11) Disconnect the hose from water pump.
12) Remove the water pump.

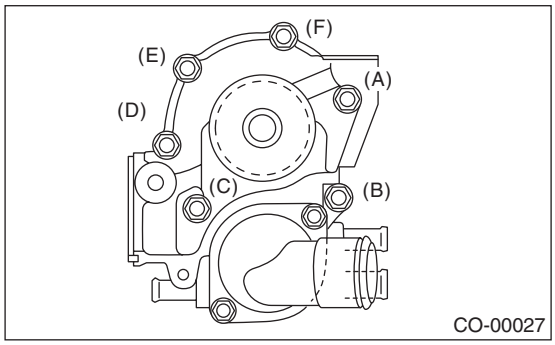


B: INSTALLATION

1) Install the water pump onto cylinder block (LH).

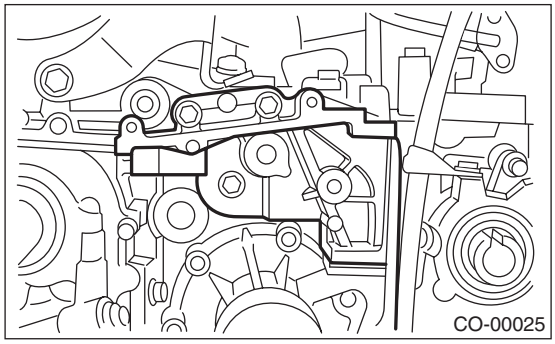
NOTE:
- Replace the gasket with a new one.
- When installing the water pump, tighten bolts in two stages in alphabetical sequence as shown in the figure.

Tightening torque:
First:
12 N·m (1.2 kgf-m, 8.7 ft-lb)
Second:
12 N·m (1.2 kgf-m, 8.7 ft-lb)



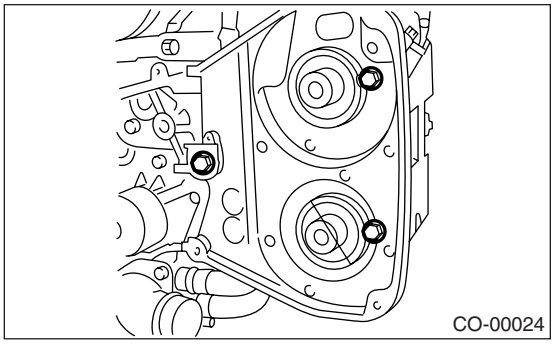
2) Connect the hose to water pump.
3) Install the tensioner bracket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



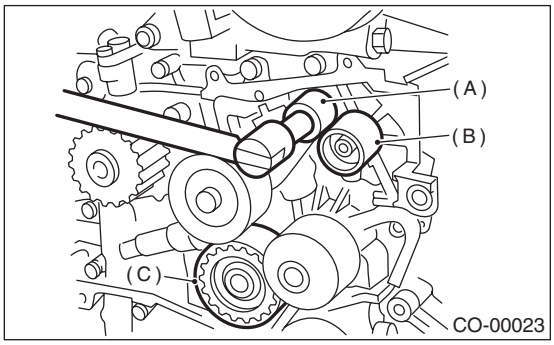
4) Install the belt cover No. 2 (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



5) Install the camshaft sprockets (LH) by using ST. <Ref. to ME(H4DOTC)-54, INSTALLATION, Camshaft Sprocket.>
6) Install the camshaft position sensor. <Ref. to FU(H4DOTC)-29, INSTALLATION, Camshaft Position Sensor.>
7) Install the belt idler No. 2 (C).
8) Install the belt idler (B).
9) Install the automatic belt tension adjuster (A) which has tension rod held by pin. <Ref. to ME(H4DOTC)-48, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

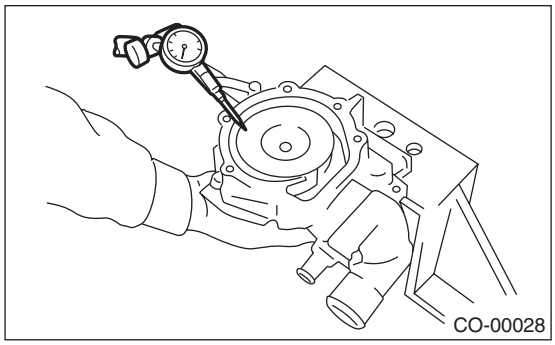


10) Install the timing belt. <Ref. to ME(H4DOTC)-49, TIMING BELT, INSTALLATION, Timing Belt Assembly.>
11) Install the V-belts. <Ref. to ME(H4DOTC)-42, INSTALLATION, V-belt.>
12) Install the radiator. <Ref. to CO(H4DOTC)-23, INSTALLATION, Radiator.>

C: INSPECTION

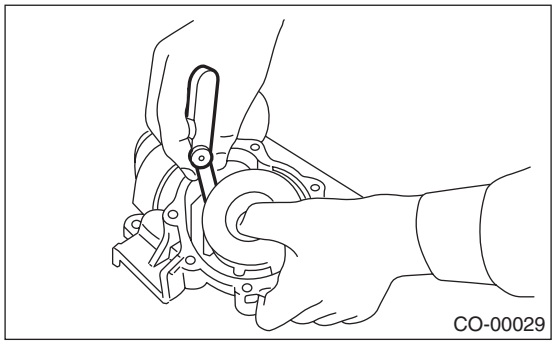
1) Check the water pump bearing for smooth rotation.
2) Check the water pump pulley for abnormalities.
3) Using a dial gauge, measure the impeller runout in thrust direction while rotating the pulley.

"Thrust" runout limit:
0.5 mm (0.020 in)



4) Check the clearance between impeller and pump case.

Clearance between impeller and pump case:
Standard
0.5 — 0.7 mm (0.020 — 0.028 in)
Limit
1.0 mm (0.039 in)

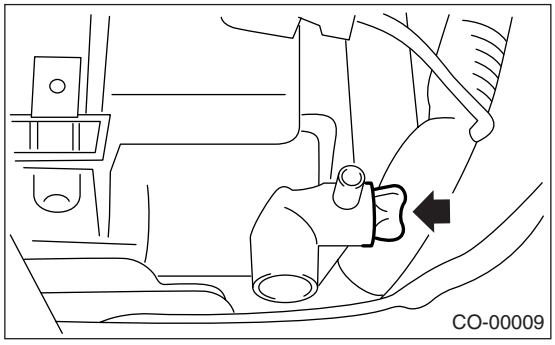


5) After water pump installation, check the pulley shaft for engine coolant leaks. If leaks are noted, replace the water pump assembly.

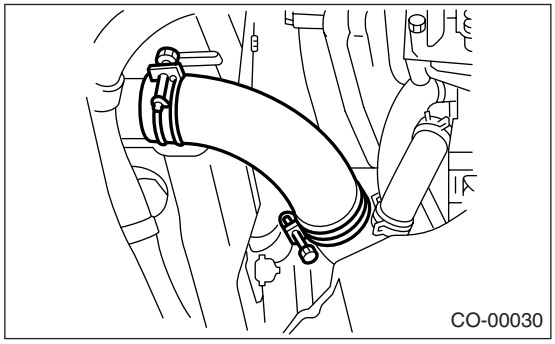
6. Thermostat

A: REMOVAL

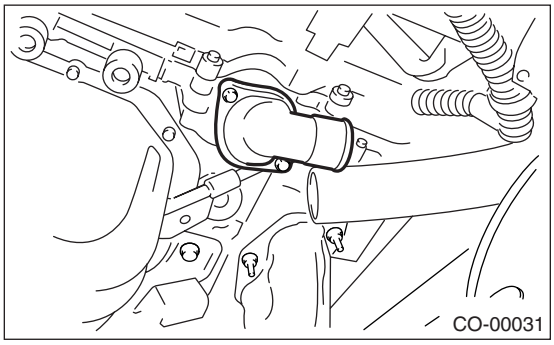
1) Set the vehicle on a lift.
2) Lift-up the vehicle.
3) Remove the under cover.
4) Drain the engine coolant completely. <Ref. to CO(H4DOTC)-17, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>



5) Disconnect the radiator outlet hose.



6) Remove the thermostat cover and gasket, and then pull out the thermostat.

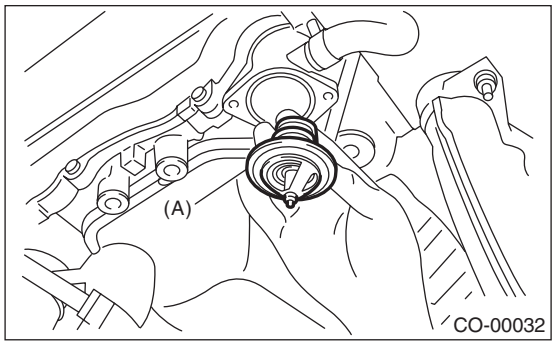


B: INSTALLATION

1) Install the thermostat in water pump, and then install the thermostat cover together with a gasket.

NOTE:
• When reinstalling the thermostat, use a new gasket.
• The thermostat must be installed with the jiggle pin (A) facing to front side.

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



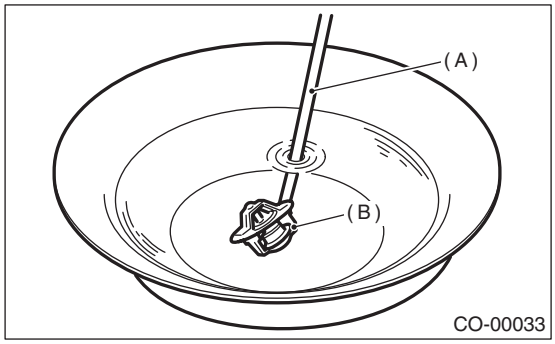
2) Fill engine coolant. <Ref. to CO(H4DOTC)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.
Immerse the thermostat and thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measurement should be to the specification.

Starts to open:
76 — 80 °C (169 — 176 °F)

Fully opens:
91 °C (196 °F)



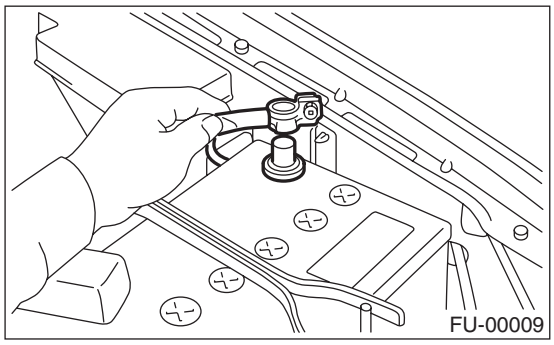
(A) Thermometer
(B) Thermostat

7. Radiator

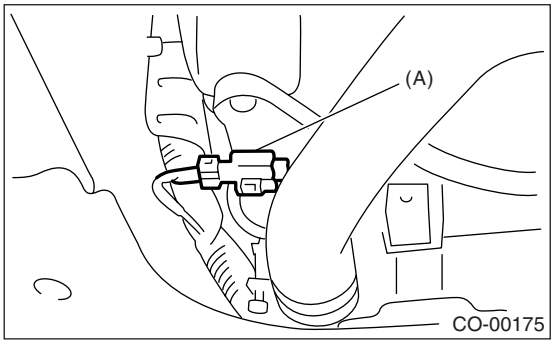
A: REMOVAL

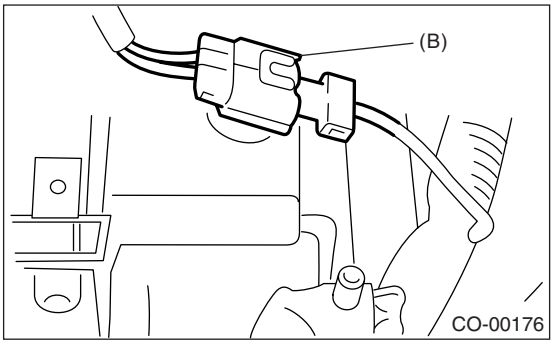
WARNING:
The radiator is pressurized. Wait until the engine cools down before working on the radiator.

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.

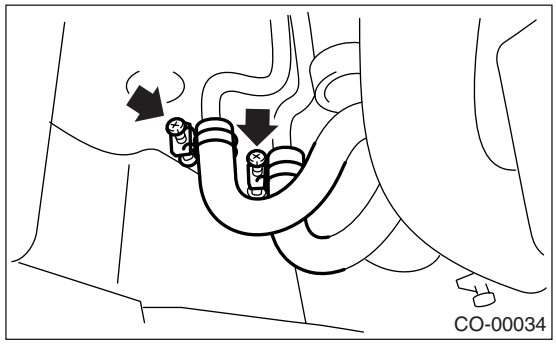


3) Lift-up the vehicle.
4) Remove the under cover.
5) Drain the engine coolant completely. <Ref. to CO(H4DOTC)-17, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
6) Disconnect the connectors of radiator main fan motor (A) and sub fan motor (B).

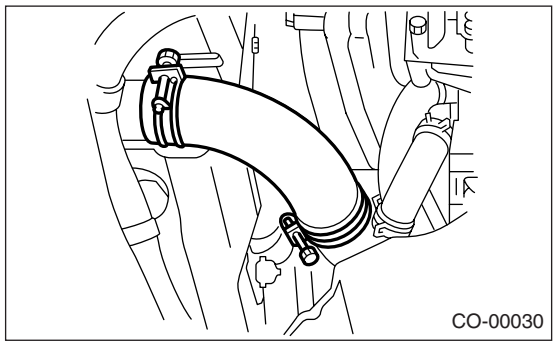




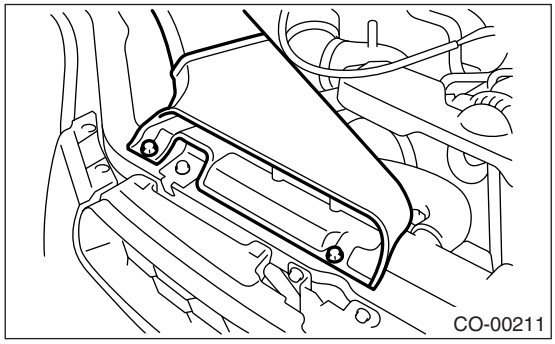
7) Disconnect the ATF cooler hose from ATF pipe. (AT model) Plug the openings in the hose and radiator with caps in order to prevent ATF from leaking.



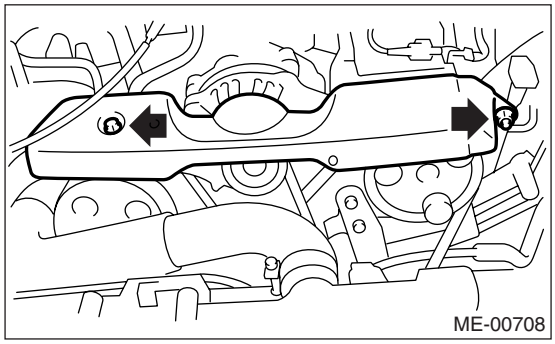
8) Disconnect the radiator outlet hose from thermostat cover.



9) Lower the vehicle.
10) Remove the air intake duct.

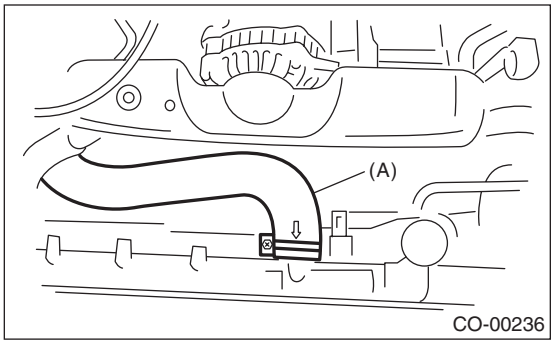


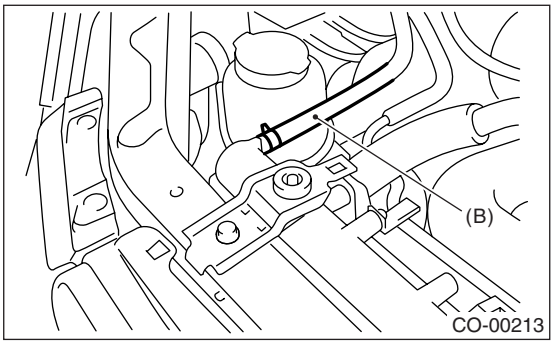
11) Remove the V-belt covers.



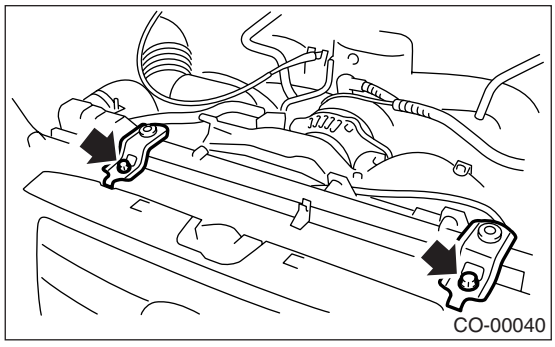
12) Disconnect the overflow hose.
13) Remove the reservoir tank. <Ref. to CO(H4DOTC)-31, REMOVAL, Reservoir Tank.>

14) Disconnect the radiator inlet hose (A) and water tank hose (B) from radiator.





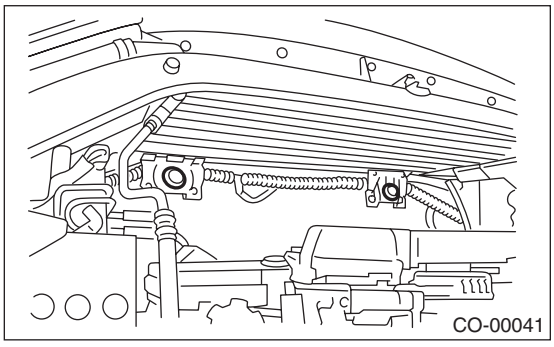
15) Remove the radiator upper brackets.



16) While lifting the radiator up, slide it to the left.
17) Lift-up the radiator, and then remove it from vehicle.

B: INSTALLATION

1) Attach the radiator mounting cushions to the holes on vehicle.

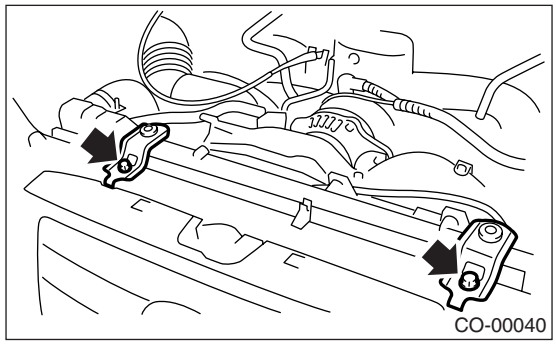


2) Install the radiator to vehicle.

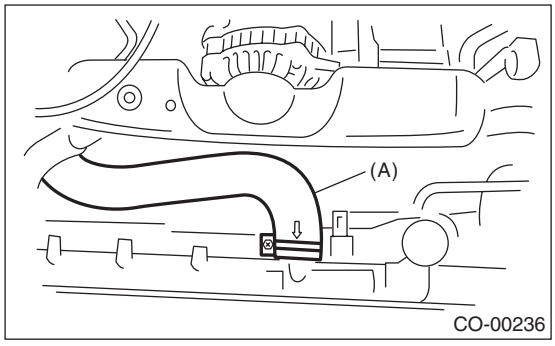
NOTE:
Fit the pins on lower side of radiator into the cushions on body side.

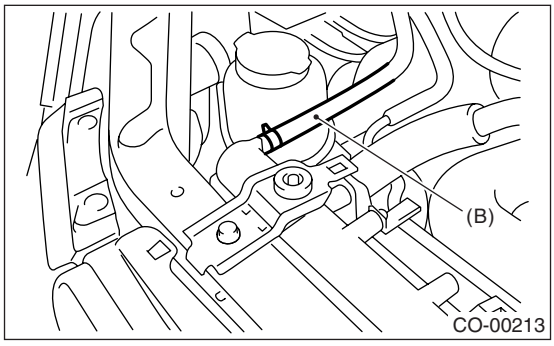
3) Install the radiator brackets, and then tighten the bolts.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



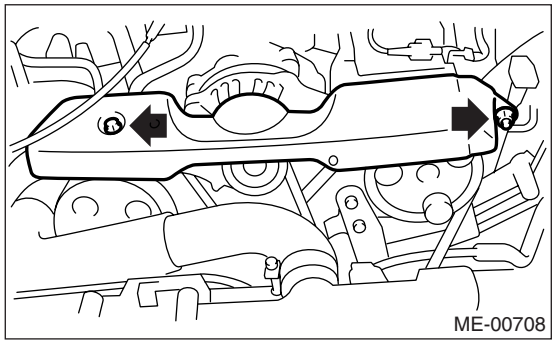
4) Connect the radiator inlet hose (A) and water tank hose (B).



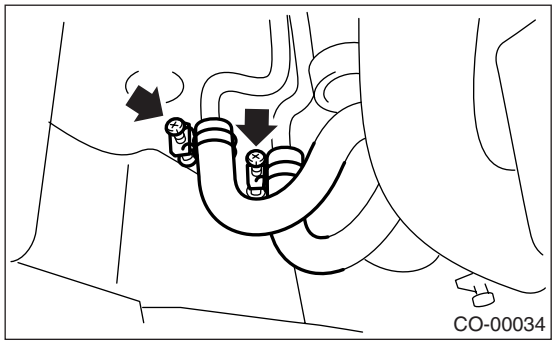


5) Install the reservoir tank. <Ref. to CO(H4DOTC)-31, INSTALLATION, Reservoir Tank.>
6) Connect the overflow hose.

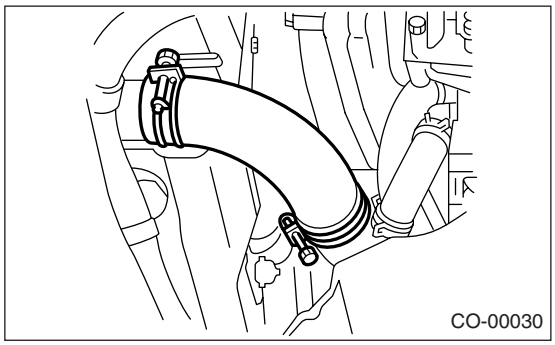
7) Install the V-belt cover.



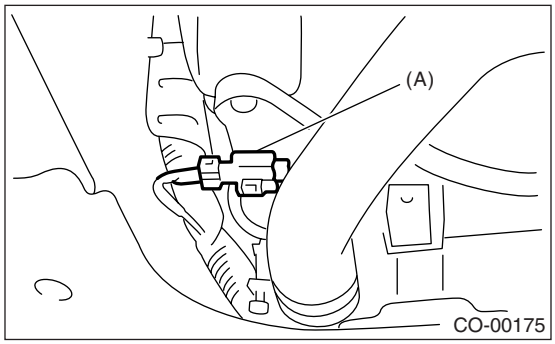
8) Install the air intake duct.
<Ref. to IN(H4DOTC)-8, INSTALLATION, Air Intake Duct.>
9) Lift-up the vehicle.
10) Connect the ATF cooler hoses. (AT model).

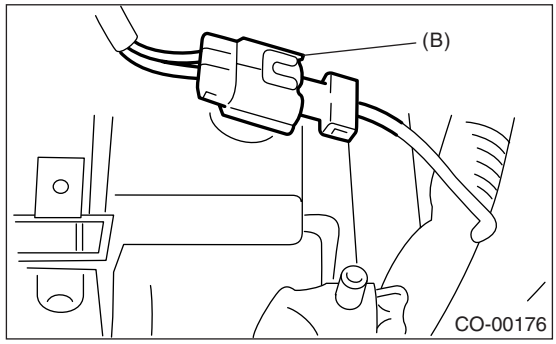


11) Connect the radiator outlet hose.

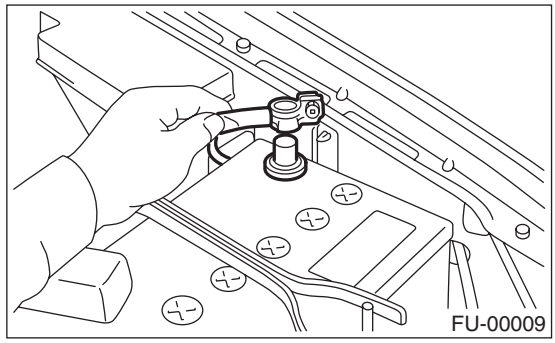


12) Connect the connectors to radiator main fan motor (A) and sub fan motor (B).





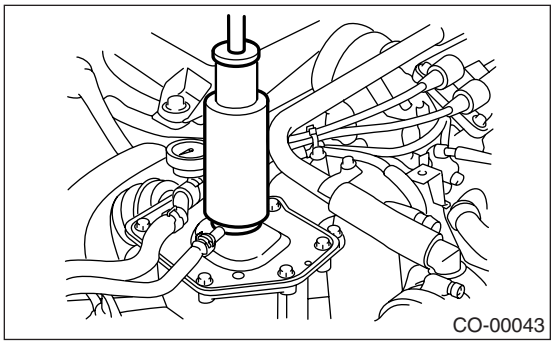
13) Install the under cover.
14) Lower the vehicle.
15) Connect the battery ground cable to battery.



16) Fill engine coolant. <Ref. to CO(H4DOTC)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
17) Check the ATF level. <Ref. to 4AT-30, INSPECTION, Automatic Transmission Fluid.>

C: INSPECTION

1) Remove the coolant filler tank cap, top off coolant filler tank, and then attach the tester to coolant filler tank in place of cap.



2) Apply a pressure of 122 kPa (1.2 kg/cm^2, 18 psi) to the radiator to check if:

(1) Engine coolant leaks at/around radiator.

(2) Engine coolant leaks at/around hoses or connections.

CAUTION:

• Inspection must be carried out at the side of coolant filler tank, not at the side of radiator.

• Engine should be turned off.

• Wipe engine coolant from check points in advance.

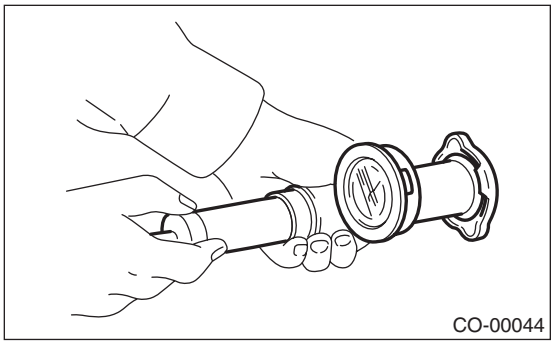
• Be careful to prevent engine coolant from spurting out when removing the tester.

• Be careful also not to deform the filler neck of coolant filler tank when installing or removing tester.

8. Radiator Cap

A: INSPECTION

1) Attach the radiator cap to tester.



2) Increase the pressure until tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for 5 to 6 seconds.

Coolant filler tank side

Standard pressure:

93 — 123 kPa (0.95 — 1.25 kg/cm^2, 14 — 18 psi)

Service limit pressure:

83 kPa (0.85 kg/cm^2, 12 psi)

Radiator side

Standard pressure:

122 — 152 kPa (1.24 — 1.55 kg/cm^2, 18 — 22 psi)

Service limit pressure:

112 kPa (1.14 kg/cm^2, 16 psi)

CAUTION:

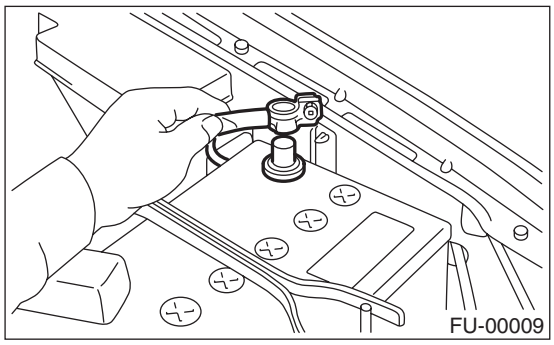
• Be sure to remove foreign matter and rust from the cap in advance otherwise, results of pressure test will be incorrect.

• Do not mix up the coolant filler tank side cap with radiator side cap.

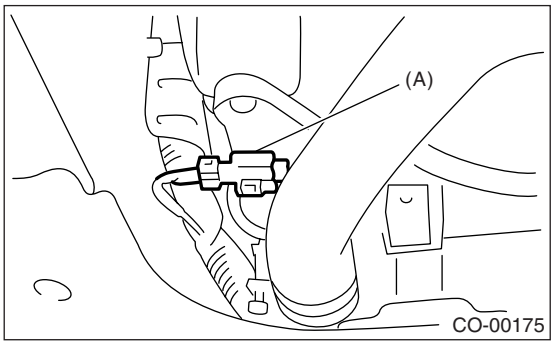
9. Radiator Main Fan and Fan Motor

A: REMOVAL

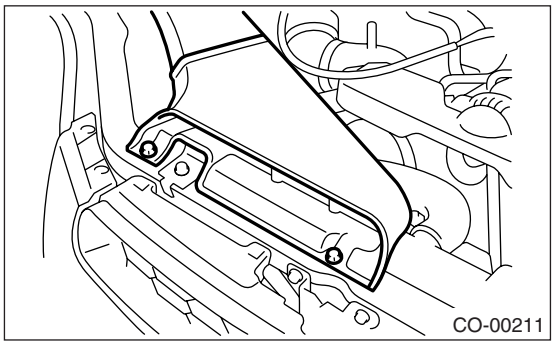
1) Disconnect the ground cable from battery.



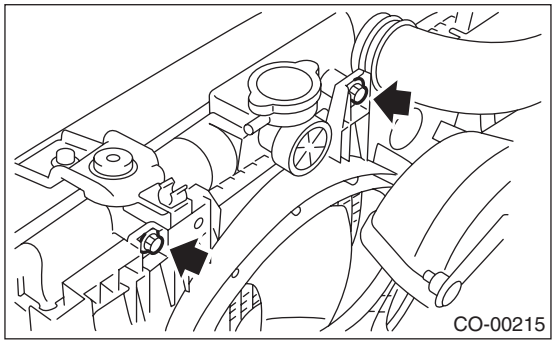
2) Lift-up the vehicle.
3) Remove the under cover.
4) Disconnect the connector of main fan motor (A).



5) Lower the vehicle.
6) Remove the air intake duct.



7) Disconnect the overflow hose.
8) Remove the overflow pipe.
9) Remove the reservoir tank. <Ref. to CO(H4DOTC)-31, REMOVAL, Reservoir Tank.>
10) Remove the radiator main fan motor assembly.

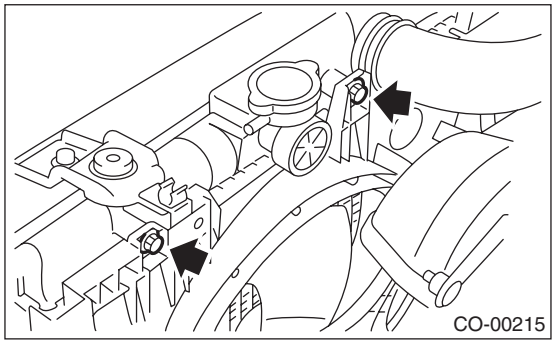


B: INSTALLATION

Install in the reverse order of removal.

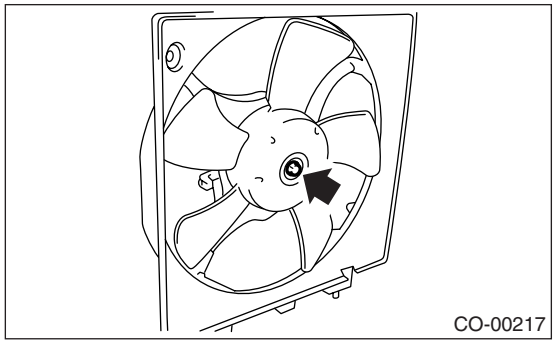
NOTE:
When the main fan motor assembly cannot be installed as is, loosen the sub fan motor assembly securing bolts to install it.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

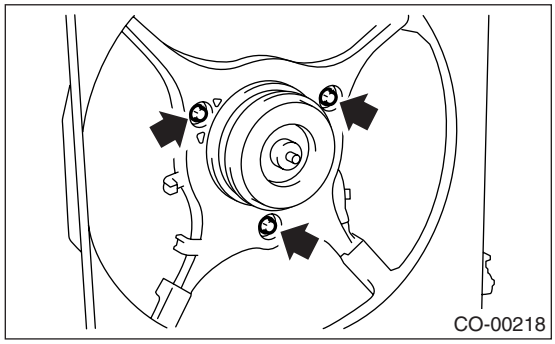


C: DISASSEMBLY

1) Remove the nut which holds the fan itself onto fan motor and shroud assembly.



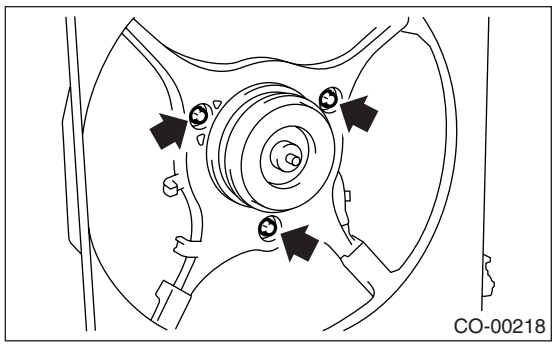
2) Remove the bolts which install the fan motor onto shroud.



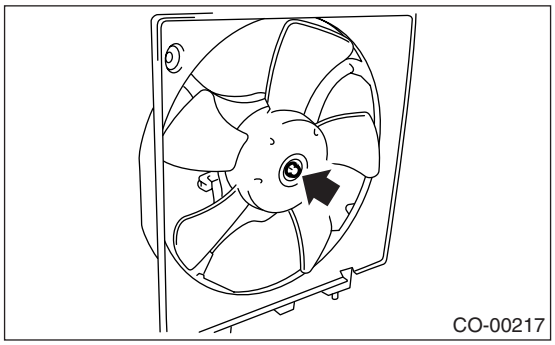
D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



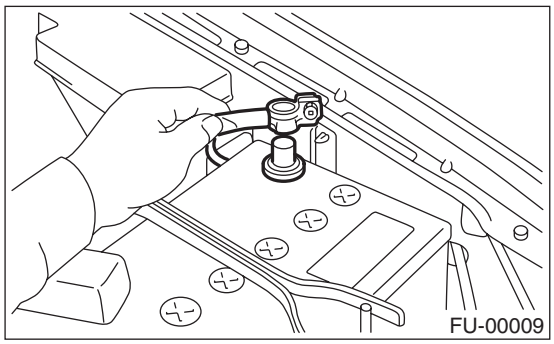
Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



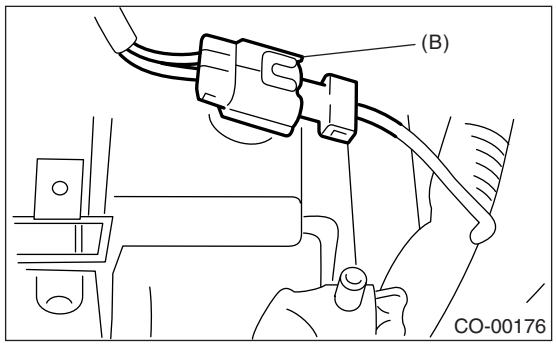
10. Radiator Sub Fan and Fan Motor

A: REMOVAL

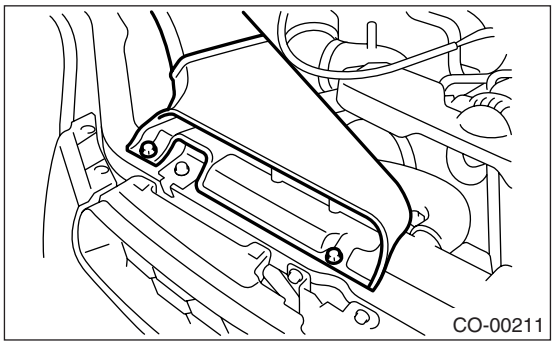
1) Disconnect the ground cable from battery.



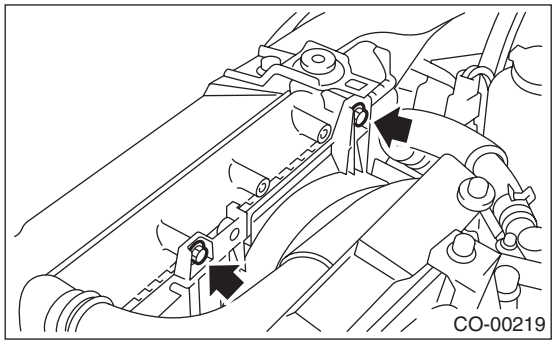
2) Lift-up the vehicle.
3) Remove the under cover.
4) Disconnect the connector of sub fan motor (B).



5) Lower the vehicle.
6) Remove the air intake duct.



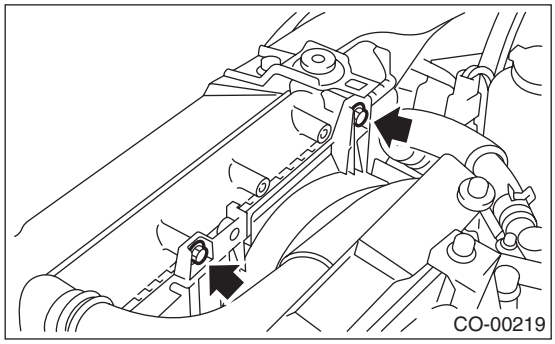
7) Remove the bolts which hold the sub fan shroud to radiator.
8) Remove the overflow pipe.
9) Remove the radiator sub fan shroud through the under side of vehicle.



B: INSTALLATION

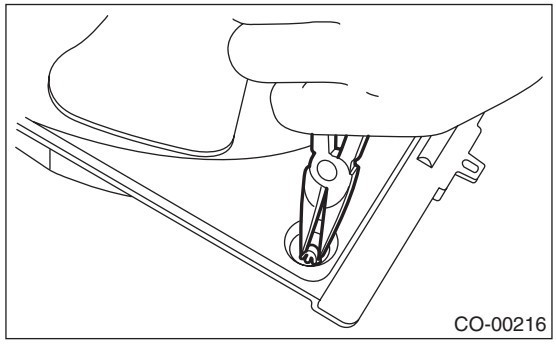
Install in the reverse order of removal.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

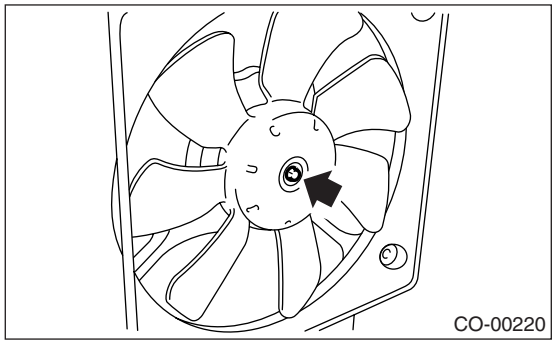


C: DISASSEMBLY

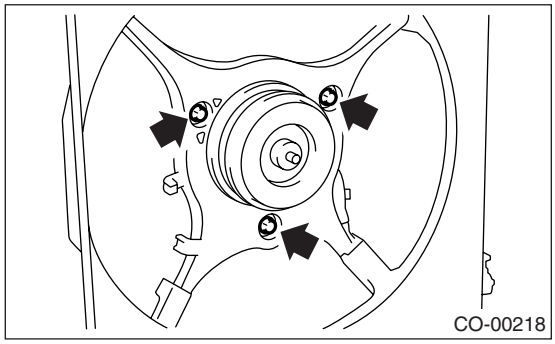
1) Remove the clip which holds the motor harness onto shroud.



2) Remove the nut which holds the fan itself onto fan motor and shroud assembly.



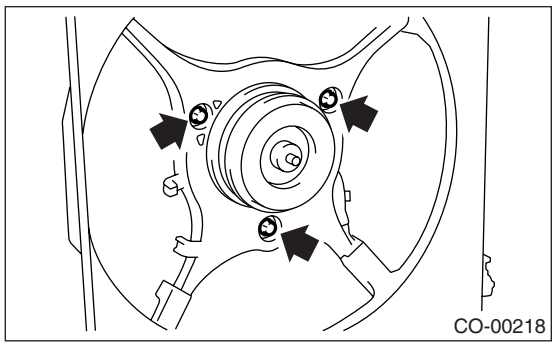
3) Remove the bolts which install the fan motor onto shroud.



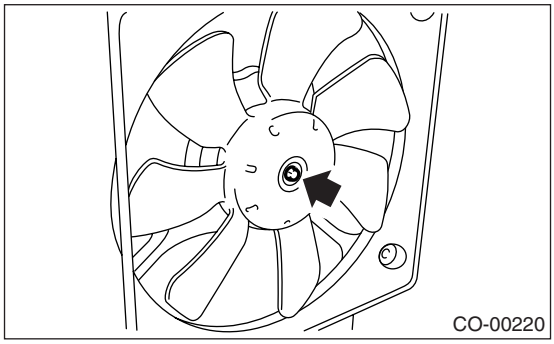
D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



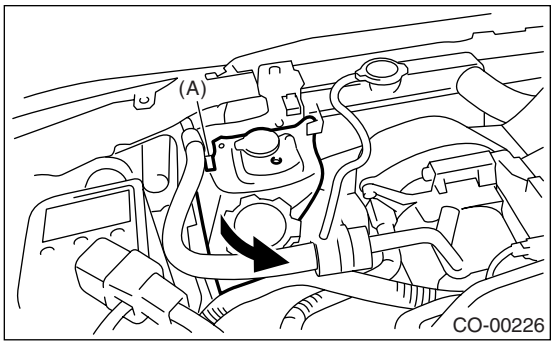
Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



11.Reservoir Tank

A: REMOVAL

1) Disconnect the overflow hose from the radiator filler neck position.
2) Pull out the reservoir tank to direction of arrow while pushing the pawl (A).



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Refer to COMPONENT for tightening torque. <Ref. to CO(H4DOTC)-3, COMPONENT, General Description.>

C: INSPECTION

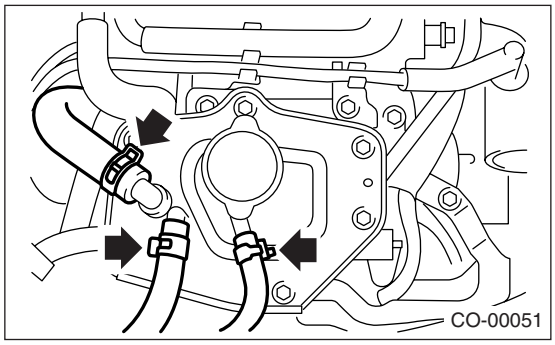
Make sure the engine coolant level is between full and low.

12.Coolant Filler Tank

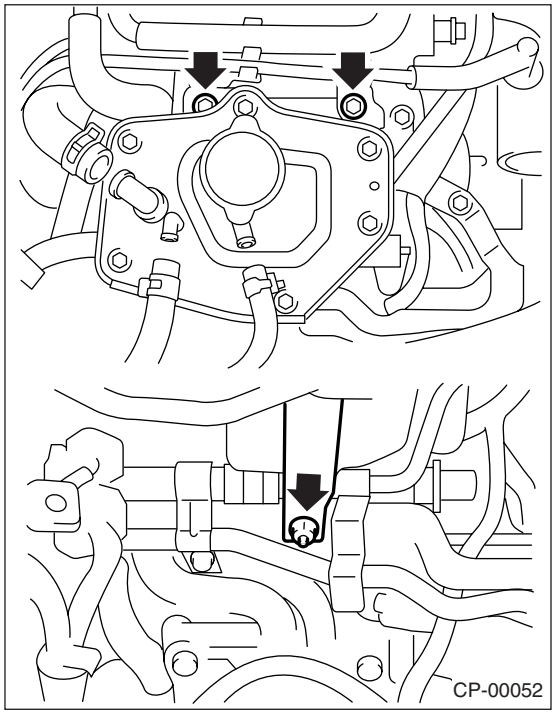
A: REMOVAL

WARNING:
The radiator is pressurized. Wait until the engine cools down before working on the radiator.

1) Drain the coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt). <Ref. to CO(H4DOTC)-17, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
2) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner.>
3) Remove the air cleaner element.
4) Disconnect the engine coolant hoses from coolant filler tank.



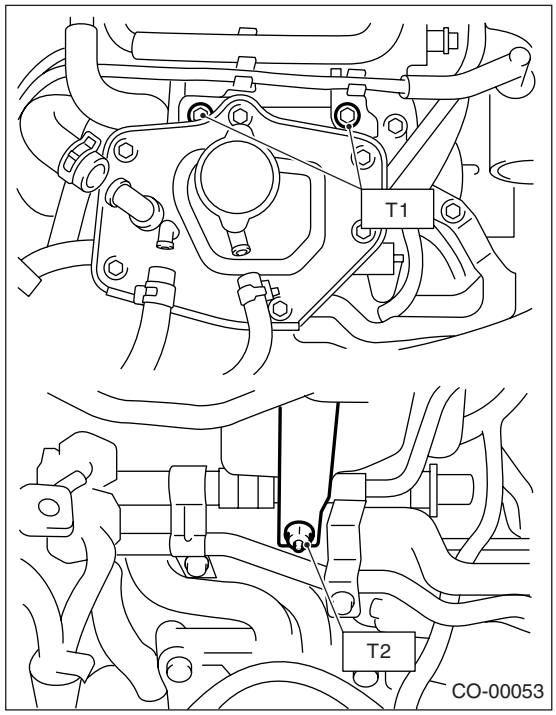
5) Remove the bolts and nut which install the coolant filler tank.
6) Disconnect the engine coolant hose which connects the under side of coolant filler tank.
7) Remove the coolant filler tank.



B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:
T1: 16 N·m (1.6 kgf-m, 11.8 ft-lb)
T2: 13 N·m (1.3 kgf-m, 9.6 ft-lb)



2) Fill engine coolant. <Ref. to CO(H4DOTC)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

13.Engine Cooling System Trouble in General

A: INSPECTION

Trouble	Possible cause	Corrective action
Over-heating	a. Insufficient engine coolant	Replenish the engine coolant, inspect for leakage, and repair.
	b. Loose timing belt	Repair or replace the timing belt tensioner.
	c. Oil on drive belt	Replace.
	d. Malfunction of thermostat	Replace.
	e. Malfunction of water pump	Replace.
	f. Clogged engine coolant passage	Clean.
	g. Improper ignition timing	Inspect and repair the ignition control system. <Ref. to EN(H4DOTC)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>
	h. Clogged or leaking radiator	Clean or repair, or replace.
	i. Improper engine oil in engine coolant	Replace the engine coolant.
	j. Air/fuel mixture ratio too lean	Inspect and repair the fuel injection system. <Ref. to EN(H4DOTC)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>
	k. Excessive back pressure in exhaust system	Clean or replace.
	l. Insufficient clearance between piston and cylinder	Adjust or replace.
	m. Slipping clutch	Repair or replace.
	n. Dragging brake	Adjust.
	o. Defective thermostat	Replace.
	p. Malfunction of radiator fan	Inspect the radiator fan relay, engine coolant temperature sensor or radiator motor and replace there.
Over-cooling	a. Atmospheric temperature extremely low	Partly cover the radiator front area.
	b. Defective thermostat	Replace.
Engine coolant leaks	a. Loosened or damaged connecting units on hoses	Repair or replace.
	b. Leakage from water pump	Replace.
	c. Leakage from water pipe	Repair or replace.
	d. Leakage around cylinder head gasket	Retighten the cylinder head bolts or replace gasket.
	e. Damaged or cracked cylinder head and crankcase	Repair or replace.
	f. Damaged or cracked thermostat case	Repair or replace.
	g. Leakage from radiator	Repair or replace.
Noise	a. Defective drive belt	Replace.
	b. Defective radiator fan	Replace.
	c. Defective water pump bearing	Replace the water pump.
	d. Defective water pump mechanical seal	Replace the water pump.

LUBRICATION

LU(H4DOTC)

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5.	Oil Pan and Strainer	14
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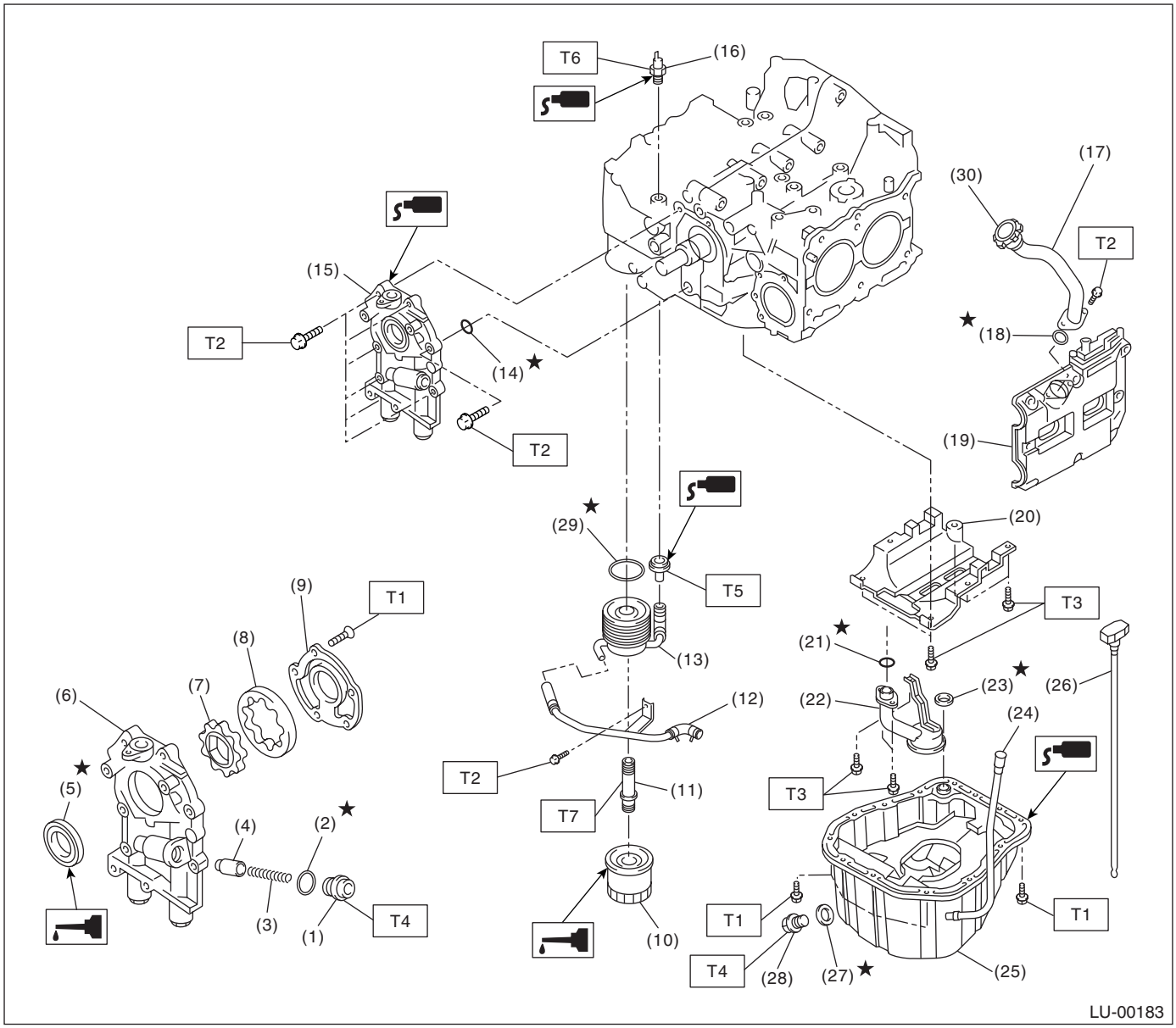
7.	Oil Pipe	19
8.	Engine Oil Cooler	21
9.	Engine Oil Filter	22
10.	Engine Lubrication System Trouble in General	23

1. General Description

A: SPECIFICATIONS

Lubrication method				Forced lubrication
Oil pump	Pump type			Trochoid type
	Number of teeth	Inner rotor		9
		Outer rotor		10
	Outer rotor diameter × thickness			78 × 10 mm (3.07 × 0.39 in)
	Tip clearance between inner and outer rotor		STANDARD	0.04 — 0.14 mm (0.0016 — 0.0055 in)
			LIMIT	0.18 mm (0.0071 in)
	Side clearance between inner rotor and pump case		STANDARD	0.02 — 0.07 mm (0.0008 — 0.0028 in)
			LIMIT	0.12 mm (0.0047 in)
	Case clearance between outer rotor and pump case		STANDARD	0.10 — 0.175 mm (0.0039 — 0.0069 in)
			LIMIT	0.20 mm (0.0079 in)
	Capacity at 80°C (176°F)	600 rpm	Discharge pressure	98 kPa (1.0 kg/cm^2, 14 psi)
			Discharge quantity	4.6 ℓ (4.9 US qt, 4.0 Imp qt)/min.
		5,000 rpm	Discharge pressure	294 kPa (3.0 kg/cm^2, 43 psi)
			Discharge quantity	47.0 ℓ (49.7 US qt, 41.4 Imp qt)/min.
	Relief valve operation pressure			588 kPa (6.0 kg/cm^2, 85 psi)
Oil filter	Type			Full-flow filter type
	Filtration area	Diameter 80 mm (3.15 in)		760 cm^2 (118 sq in)
		Diameter 68 mm (2.68 in)		800 cm^2 (124 sq in)
		Diameter 65 mm (2.56 in)		470 cm^2 (73 sq in)
	By-pass valve opening pressure			157 kPa (1.60 kg/cm^2, 22.8 psi)
	Outer diameter × width	Diameter 80 mm (3.15 in)		80 × 70 mm (3.15 × 2.76 in)
		Diameter 68 mm (2.68 in)		68 × 65 mm (2.68 × 2.56 in)
		Diameter 65 mm (2.56 in)		65 × 74.4 mm (2.56 × 2.93 in)
	Oil filter to engine thread size			M 20 × 1.5
Oil pressure switch	Type			Immersed contact point type
	Working voltage — wattage			12 V — 3.4 W or less
	Warning light activation pressure			14.7 kPa (0.15 kg/cm^2, 2.1 psi)
	Proof pressure			More than 981 kPa (10 kg/cm^2, 142 psi)
Oil capacity (at replacement)				4.5 ℓ (4.8 US qt, 4.0 Imp qt)

B: COMPONENT



(1) Plug
(2) Gasket
(3) Relief valve spring
(4) Relief valve
(5) Oil seal
(6) Oil pump case
(7) Inner rotor
(8) Outer rotor
(9) Oil pump cover
(10) Oil filter
(11) Oil cooler connector (Model with oil cooler)
(12) Water by-pass pipe (Model with oil cooler)
(13) Oil cooler (Model with oil cooler)
(14) O-ring
(15) Oil pump ASSY
(16) Oil pressure switch
(17) Oil filler duct
(18) O-ring
(19) Rocker cover
(20) Baffle plate
(21) O-ring
(22) Oil strainer
(23) Gasket
(24) Oil level gauge guide
(25) Oil pan
(26) Oil level gauge
(27) Metal gasket
(28) Drain plug
(29) O-ring
(30) Oil filler cap

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7.0)
T4: 44 (4.5, 32.5)
T5: 69 (7.0, 50.9)
T6: 25 (2.5, 18.1)
T7: 54 (5.5, 40)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

D: PREPARATION TOOL

1. SPECIAL TOOLS

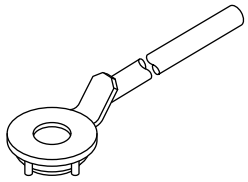
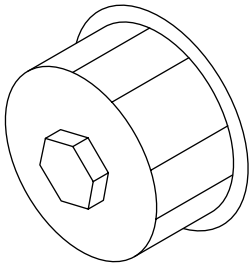
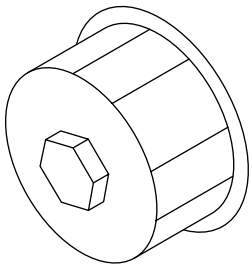
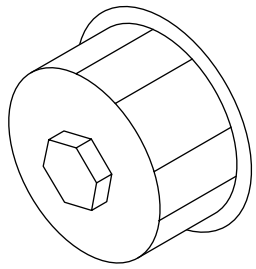
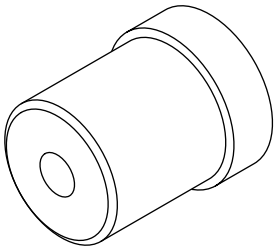
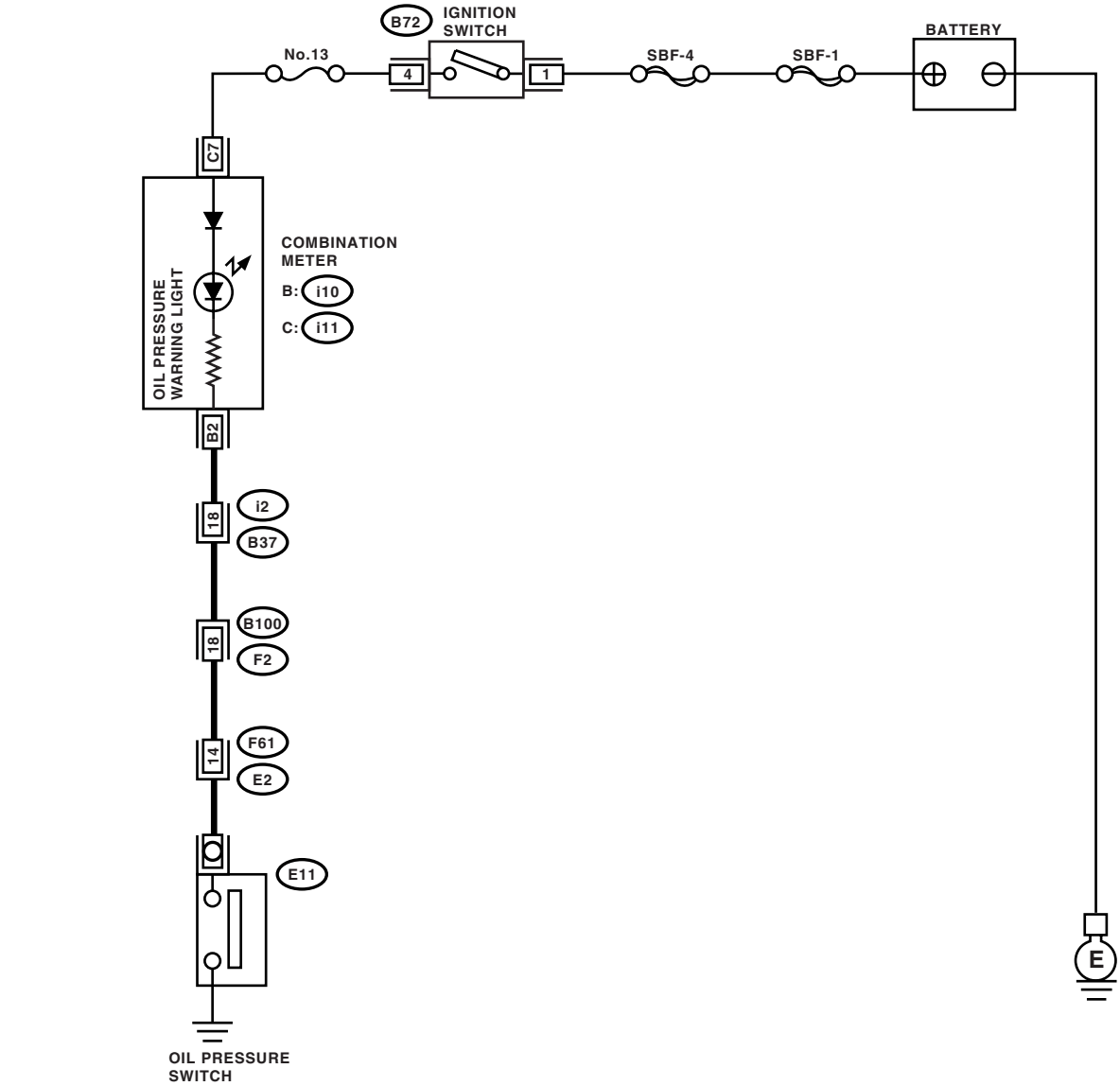
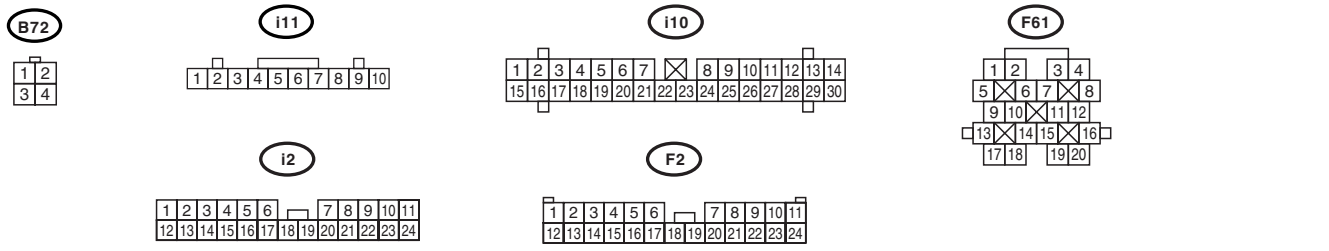
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977400	499977400	CRANKSHAFT PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt.
 ST-498547000	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 80 mm (3.15 in))
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in))

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18332AA010	18332AA010	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in))
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil seal to oil pump.

2. Oil Pressure System

A: WIRING DIAGRAM





LU-00211

B: INSPECTION

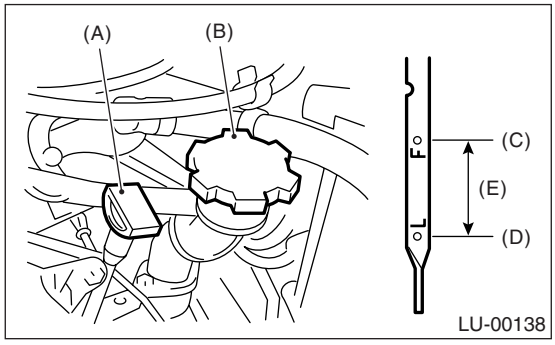
	Step	Check	Yes	No
1	**CHECK COMBINATION METER.** 1) Turn the ignition switch to ON. (engine OFF) 2) Check other warning lights.	Does the warning lights go on?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-3, INSPECTION, Combination Meter System.>
2	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND OIL PRESSURE SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from oil pressure switch. 3) Turn the ignition switch ON. 4) Measure the voltage of harness between the combination meter connector and chassis ground. ***Connector & terminal*** ***(E11) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Replace the oil pressure switch.	Go to step **3.**
3	**CHECK COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Measure the resistance of combination meter. ***Terminals*** ***No. C7 — No. B2:***	Is the resistance less than 10 Ω?	Replace the harness connector between combination meter and oil pressure switch.	Repair or replace the combination meter.

3. Engine Oil

A: INSPECTION

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe it clean.
3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in proper orientation.
4) Remove it again and note the reading. If the engine oil level is below the “L” line, add oil to bring the level up to “F” line.
5) After turning off the engine, wait a few minutes for oil to drain back into the oil pan before checking the level.
6) Just after driving or while the engine is warm, engine oil level may show in the range between the “F” line and notch mark. This is caused by thermal expansion of engine oil.

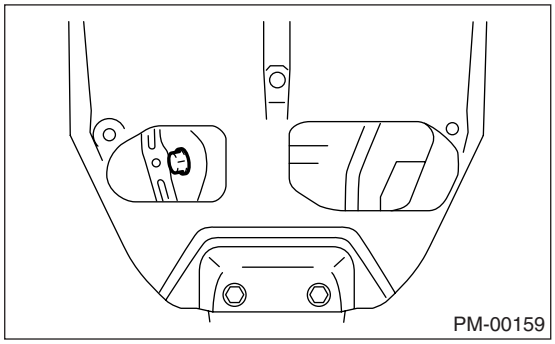
NOTE:
To prevent overfilling the engine oil, do not add oil above “F” line when the engine is cold.



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

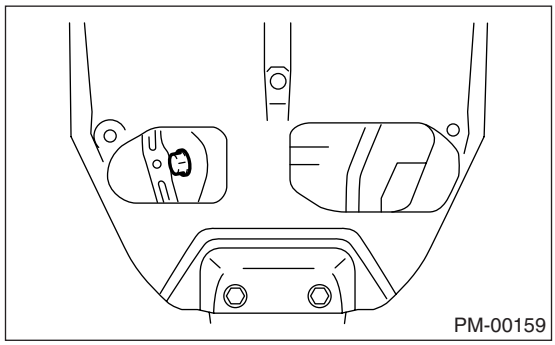
B: REPLACEMENT

1) Open the engine oil filler cap for quick draining of engine oil.
2) Drain the engine oil by loosening the engine oil drain plug.



3) Replace the drain plug gasket.
4) Tighten the engine oil drain plug after draining engine oil.

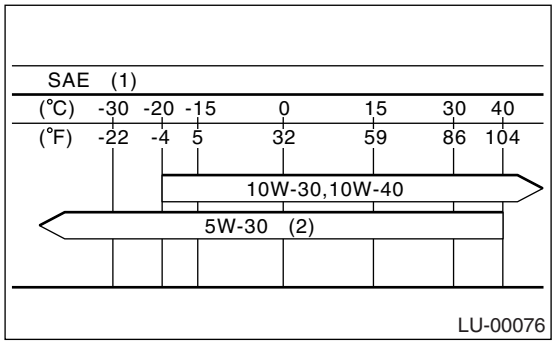
Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)



5) Install the service hole cover.
6) Fill engine oil through the filler pipe up to upper level on level gauge. Make sure that the vehicle is placed level when checking oil level. Use the engine oil of proper quality and viscosity, selected in accordance with the table in figure.

Recommended oil
ILSAC GF-3, which can be identified with the new API certification mark (Star burst mark) API classification SL with the words “ENERGY CONSERVING” (if you cannot obtain the oil with SL grade, you may use SJ grade “ENERGY CONSERVING” oil)

Engine oil capacity:
Upper level
4.5 ℓ (4.8 US qt, 4.0 Imp qt)
Lower level
3.5 ℓ (3.7 US qt, 3.1 Imp qt)



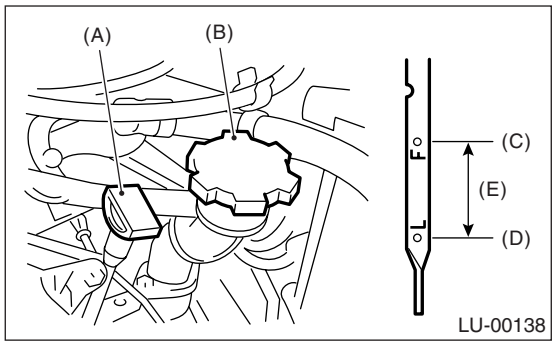
(1) SAE Viscosity No. and Applicable Temperature
(2) PREFERRED

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

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

NOTE:
If the vehicle is used in areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API classification: SL or SJ or SH
SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50.

7) Close the engine oil filler cap.
8) Start the engine and warm it up for a time.
9) After the engine stops, recheck the oil level. If necessary, add engine oil up to the upper level on level gauge.

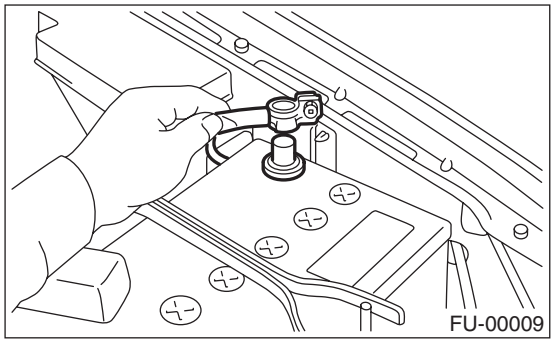


(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

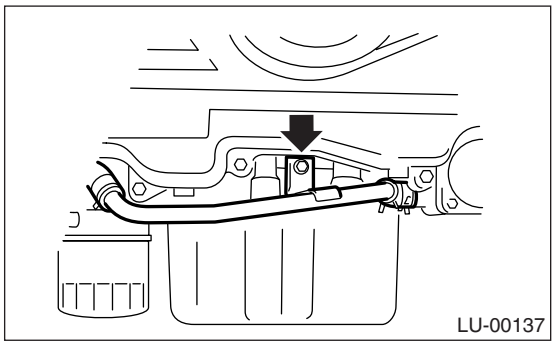
4. Oil Pump

A: REMOVAL

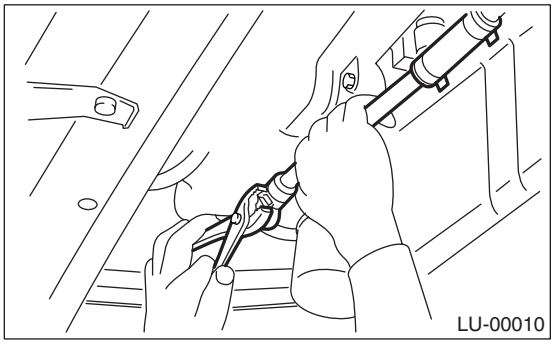
1) Disconnect the ground cable from battery.



2) Lift-up the vehicle.
3) Remove the under cover.
4) Remove the bolts which install the water pipe of oil cooler to oil pump.

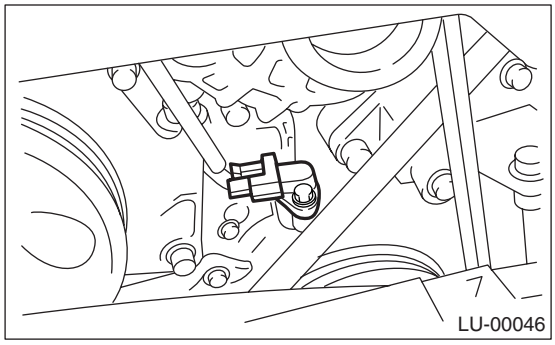


5) Remove the water pipe and hoses between oil cooler and water pump.

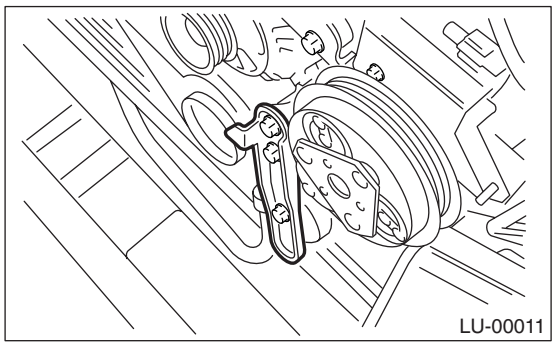


6) Remove the radiator. <Ref. to CO(H4SO)-18, REMOVAL, Radiator.>

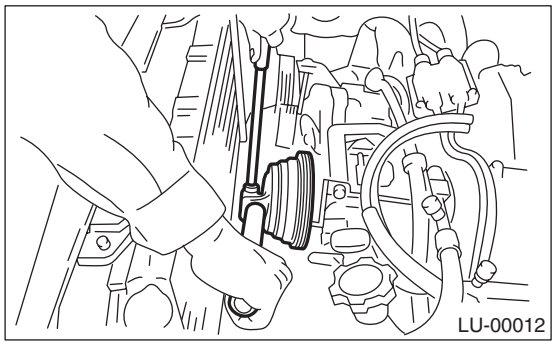
7) Remove the crankshaft position sensor.



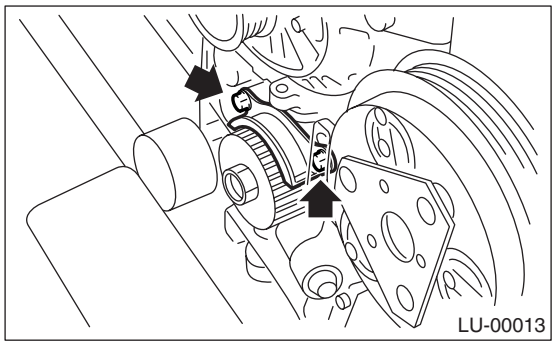
8) Remove the V-belts.
<Ref. to ME(H4DOTC)-42, REMOVAL, V-belt.>
9) Remove the rear side V-belt tensioner.



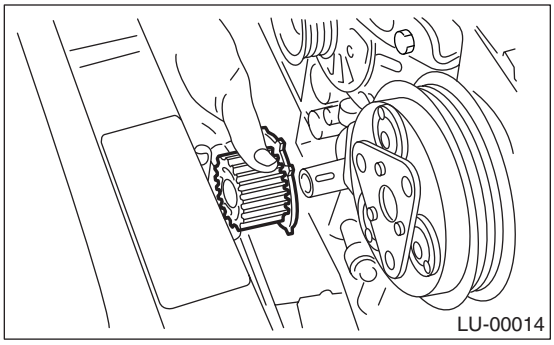
10) Remove the crankshaft pulley by using ST.
<Ref. to ME(H4DOTC)-44, REMOVAL, Crankshaft Pulley.>



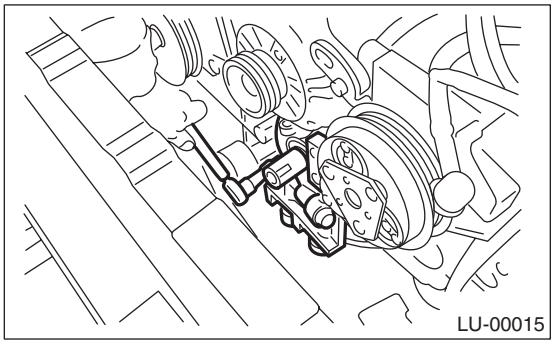
11) Remove the water pump. <Ref. to CO(H4SO)-14, REMOVAL, Water Pump.>
12) Remove the timing belt guide. (MT model)



13) Remove the crankshaft sprocket.

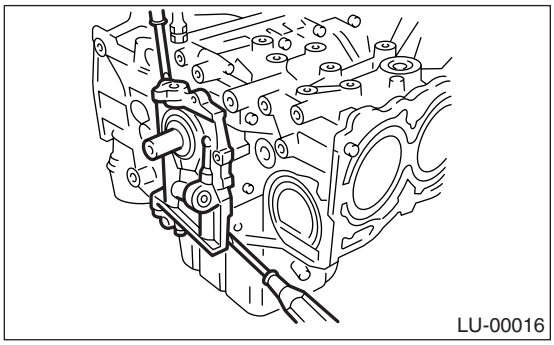


14) Remove the bolts which install the oil pump onto cylinder block.



15) Remove the oil pump using the flat tip screwdriver.

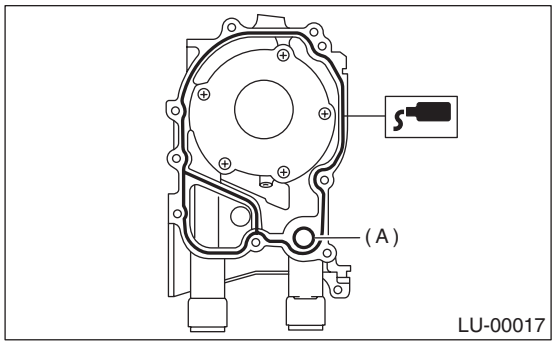
CAUTION:
Be careful not to scratch the mating surfaces of cylinder block and oil pump.



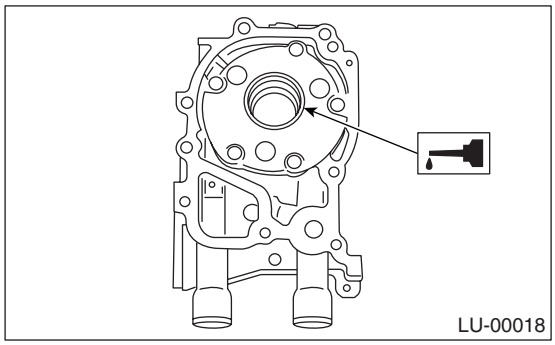
B: INSTALLATION

Install in the reverse order of removal.
Do the following:
1) Apply fluid packing to the matching surfaces of oil pump.

Fluid packing:
THREE BOND 1215 (Part No. 004403007) or equivalent



2) Replace the O-ring (A) with a new one.
3) Apply a coat of engine oil to the inside of oil seal.

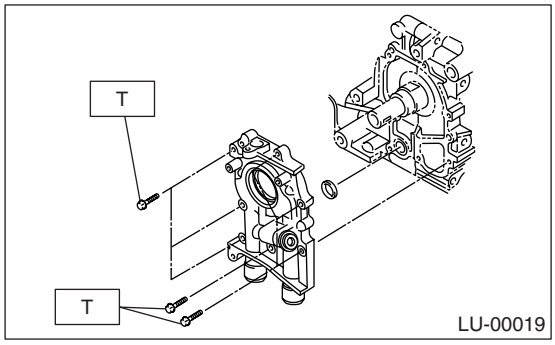


4) Be careful not to scratch the oil seal when installing the oil pump on cylinder block.
5) Position the oil pump, aligning the notched area with crankshaft, and push the oil pump straight.

CAUTION:
Make sure the oil seal lip is not folded.

6) Install the oil pump.

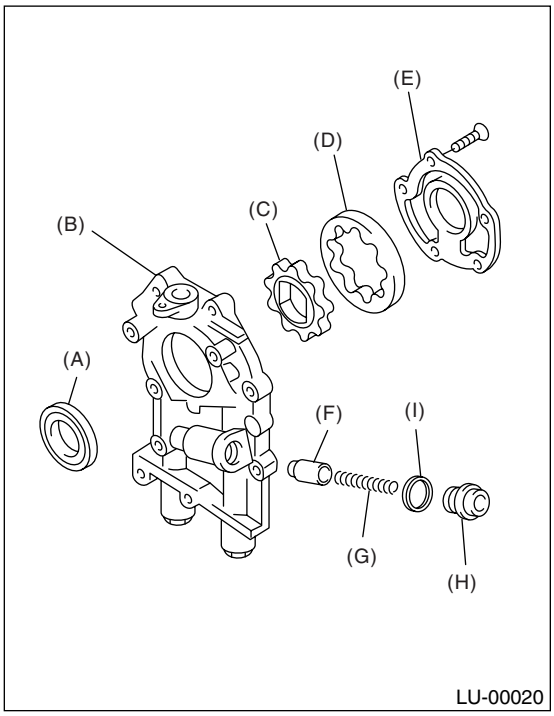
Tightening torque:
6.4 N·m (0.65 kgf -m, 4.7 ft-lb)



C: DISASSEMBLY

Remove the screws which secure the oil pump cover and disassemble oil pump. Inscribe alignment marks on the inner and outer rotors so that they can be replaced in their original positions during reassembly.

CAUTION:
Before disassembling the oil pump, remove the relief valve.

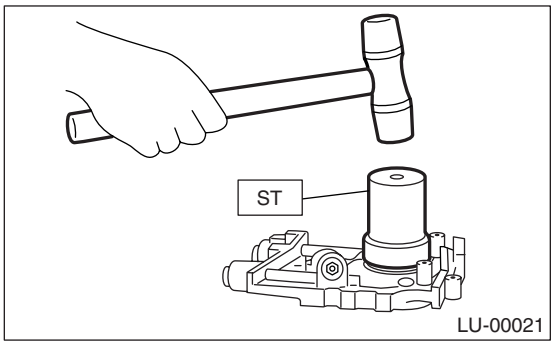


(A) Oil seal
(B) Pump case
(C) Inner rotor
(D) Outer rotor
(E) Pump cover
(F) Relief valve
(G) Relief valve spring
(H) Plug
(I) Gasket

D: ASSEMBLY

1) Install the front oil seal by using ST.
ST 499587100 OIL SEAL INSTALLER

NOTE:
Use a new oil seal.



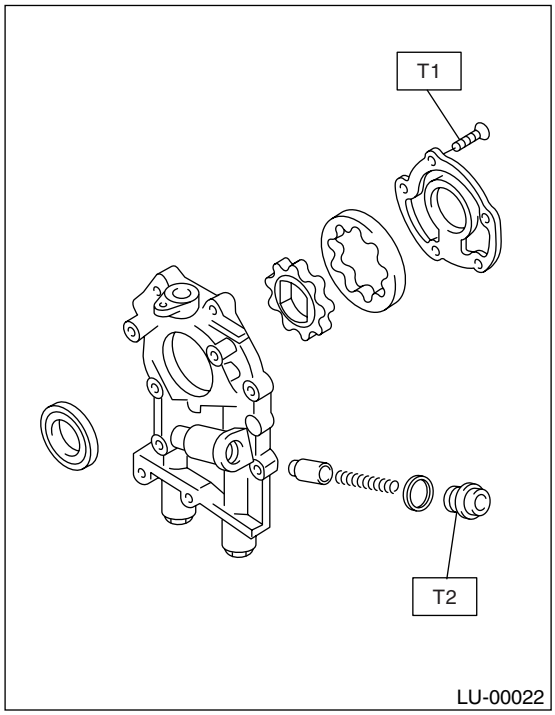
2) Apply a coat of engine oil to the inner and outer rotors.

3) Install the inner and outer rotors in their original positions.
4) Install the oil relief valve, relief valve spring and plug.

NOTE:
Use a new gasket.

5) Install the oil pump cover.

Tightening torque:
T1: 5 N·m (0.5 kgf-m, 3.6 ft-lb)
T2: 44 N·m (4.5 kgf-m, 32.5 ft-lb)

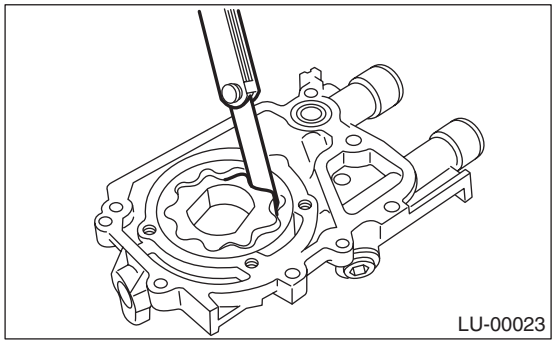


E: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. If clearance exceeds the limit, replace the rotors as a matched set.

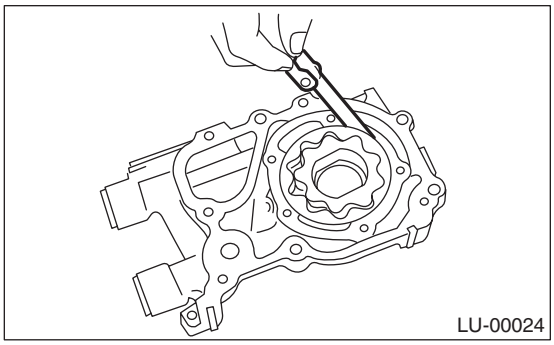
Tip clearance:
Standard
0.04 — 0.14 mm (0.0016 — 0.0055 in)
Limit
0.18 mm (0.0071 in)



2. CASE CLEARANCE

Measure the clearance between outer rotor and oil pump rotor housing. If clearance exceeds the limit, replace the rotor.

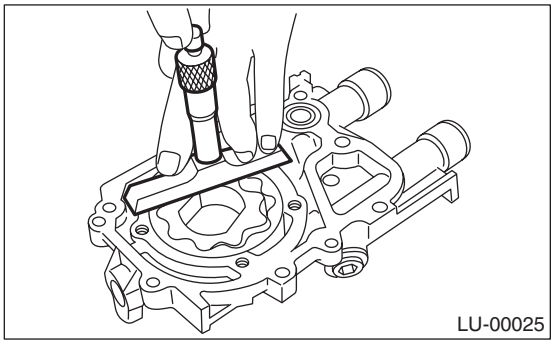
Case clearance:
Standard
0.10 — 0.175 mm (0.0039 — 0.0069 in)
Limit
0.20 mm (0.0079 in)



3. SIDE CLEARANCE

Measure the clearance between the oil pump inner rotor and pump cover. If clearance exceeds the limit, replace the rotor or pump body.

Side clearance:
Standard
0.02 — 0.07 mm (0.0008 — 0.0028 in)
Limit
0.12 mm (0.0047 in)



4. OIL RELIEF VALVE

Check the valve for fitting condition and damage, and the relief valve spring for damage and deterioration. Replace the parts if defective.

Relief valve spring:
Free length
73.7 mm (2.902 in)
Installed length
54.7 mm (2.154 in)
Load when installed
93.1 N (9.49 kgf, 20.88 lb)

5. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, worn rotor chamber, cracks, and other faults.

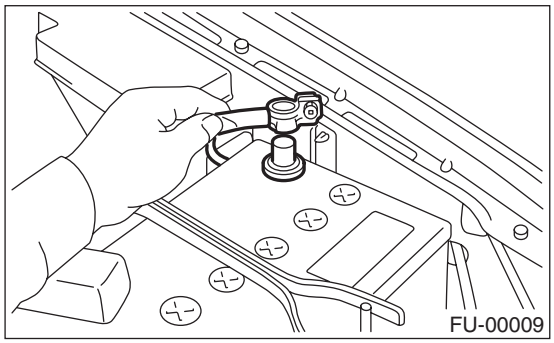
6. OIL SEAL

Check the oil seal lips for deformation, hardening, wear, etc. and replace if defective.

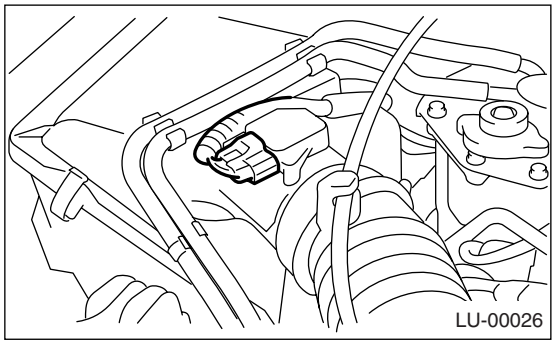
5. Oil Pan and Strainer

A: REMOVAL

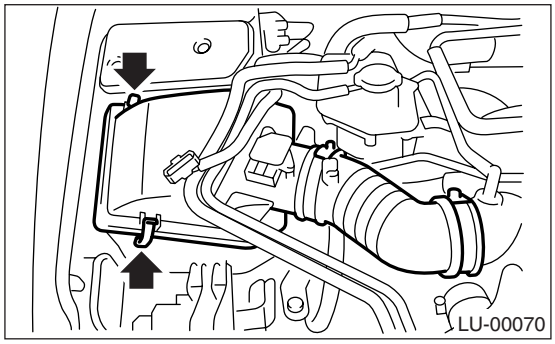
1) Set the vehicle on a lift.
2) Remove the front wheels.
3) Disconnect the ground cable from battery.



4) Disconnect the connector from mass air flow sensor.

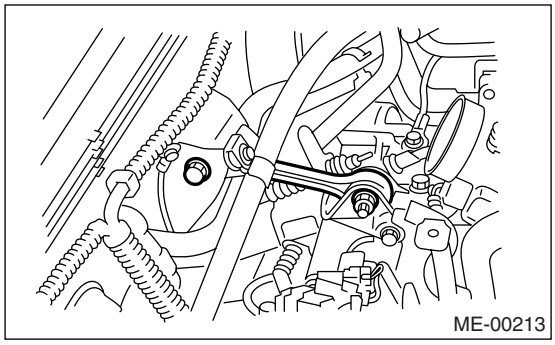


5) Remove the air intake boot and air cleaner upper cover.

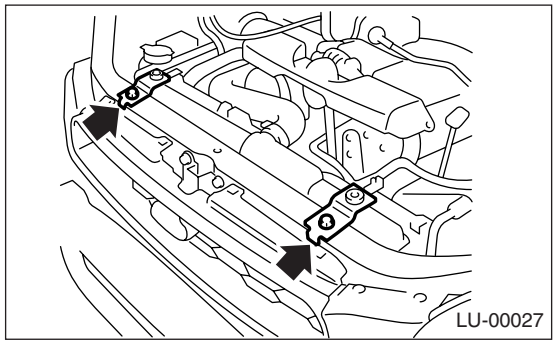


6) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>

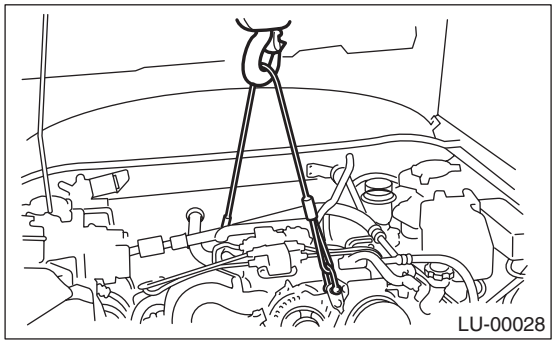
7) Remove the pitching stopper.



8) Remove the radiator upper brackets.



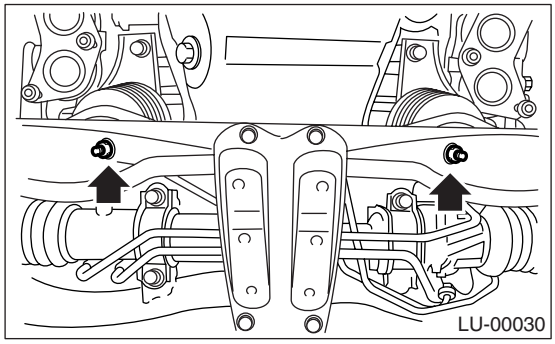
9) Support the engine with a lifting device and wire ropes.



10) Lift-up the vehicle.

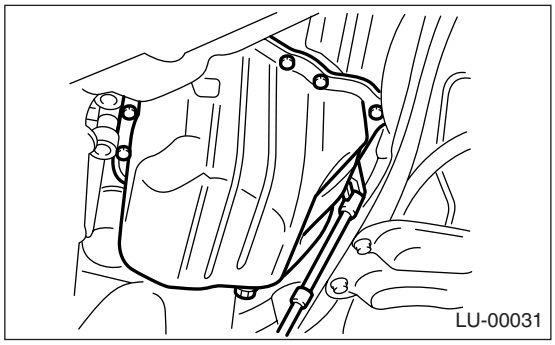
CAUTION:
When lifting up the vehicle, rise up the wire rope together.

11) Remove the under cover.
12) Drain the engine oil.
13) Remove the nuts which install the front cushion rubber onto front crossmember.

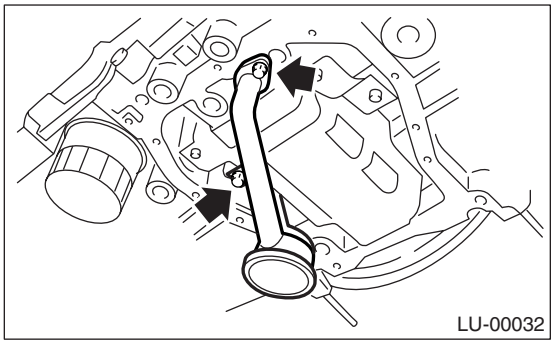


14) Remove the bolts which install the oil pan on cylinder block while raising up engine.
15) Insert the oil pan cutter blade between cylinder block-to-oil pan clearance.

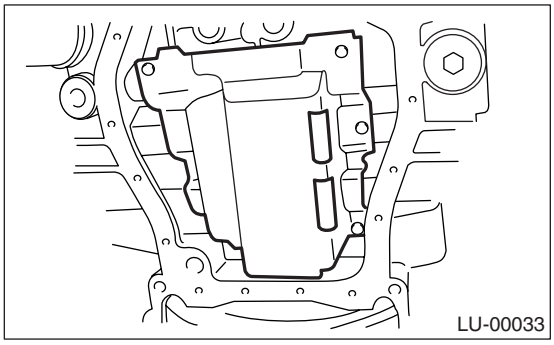
CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter.



16) Remove the oil strainer.



17) Remove the baffle plate.

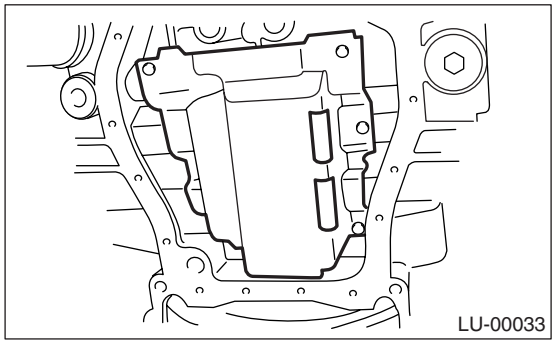


B: INSTALLATION

CAUTION:
Before installing the oil pan, clean sealant from oil pan and engine block.

1) Install the baffle plate.

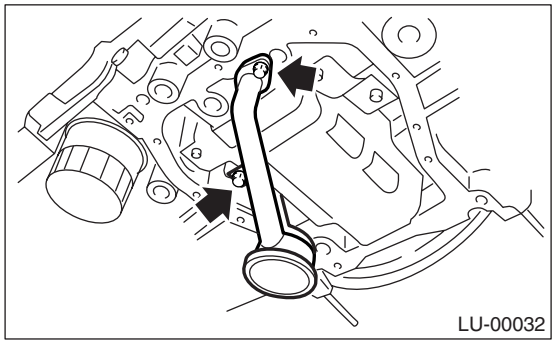
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



2) Install the oil strainer onto baffle plate.

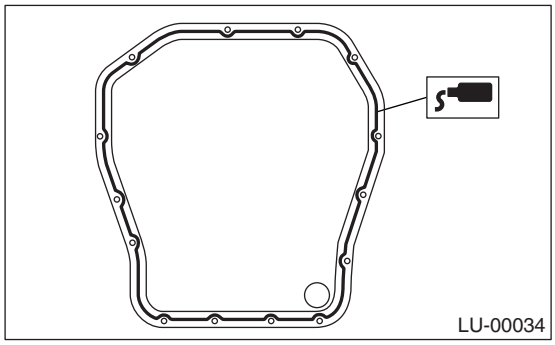
NOTE:
Replace the O-ring with a new one.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



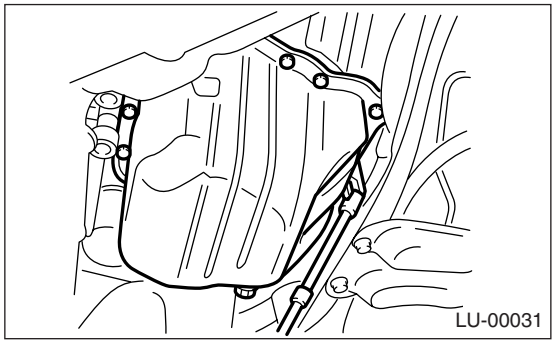
3) Apply fluid packing to the mating surfaces, and then install the oil pan.

Fluid packing:
THREE BOND 1215 (Part No. 004403007) or equivalent



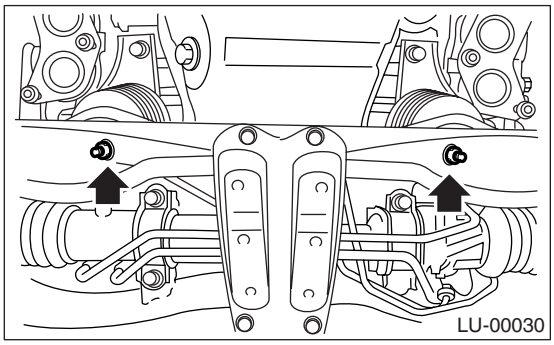
4) Tighten the bolts which install the oil pan onto engine block.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



5) Lower the engine onto front crossmember.
6) Tighten the nuts which install the front cushion rubber onto front crossmember.

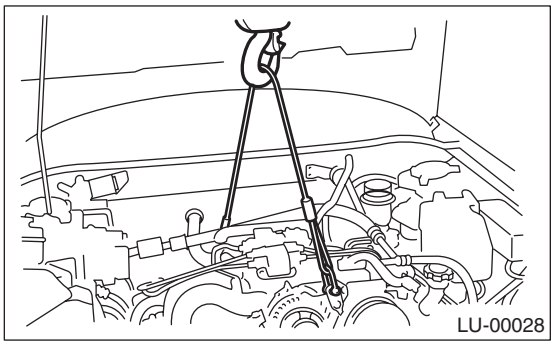
Tightening torque:
83 N·m (8.5 kgf-m, 61 ft-lb)



7) Install the under cover.
8) Lower the vehicle.

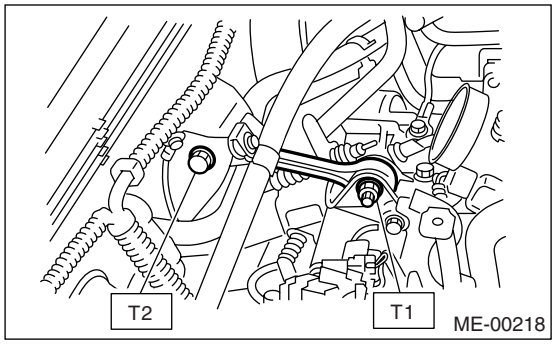
CAUTION:
When lowering the vehicle, lower the lifting device and wire rope together.

9) Remove the lifting device and steel cables.

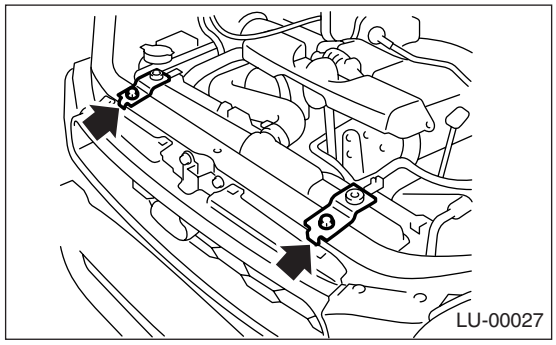


10) Install the pitching stopper.

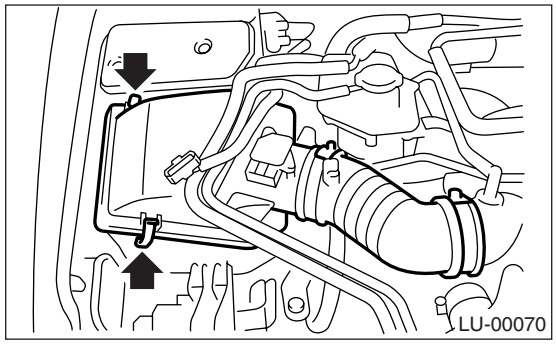
Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)



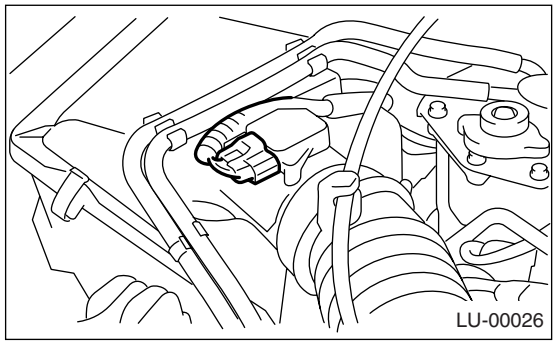
11) Install the radiator upper brackets.



12) Install the intercooler. <Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>
13) Install the air intake boot and air cleaner upper cover.

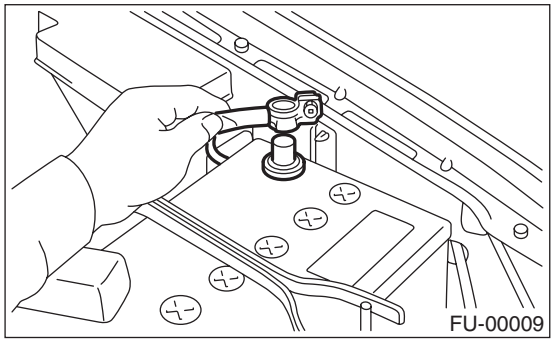


14) Connect the connector to mass air flow sensor.



15) Install the front wheels.

16) Connect the battery ground cable to battery.



17) Fill engine oil. <Ref. to LU(H4DOTC)-8, INSPECTION, Engine Oil.>

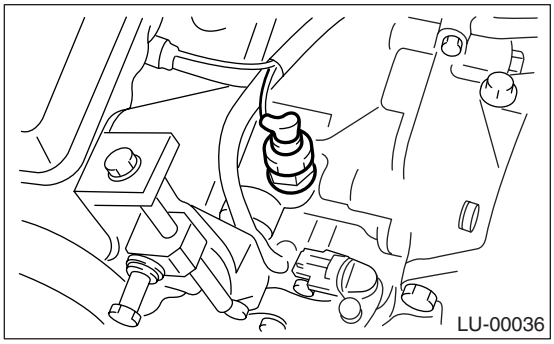
C: INSPECTION

By visual check, make sure the oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.

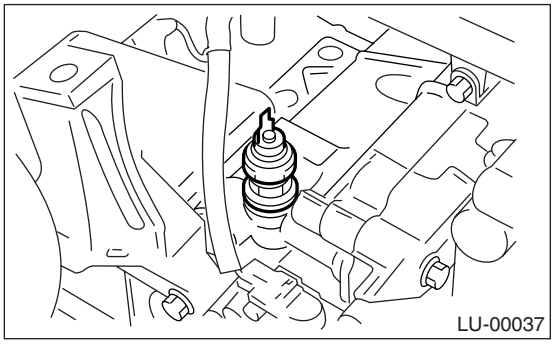
6. Oil Pressure Switch

A: REMOVAL

1) Remove the generator from bracket. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>
2) Disconnect the terminal from oil pressure switch.



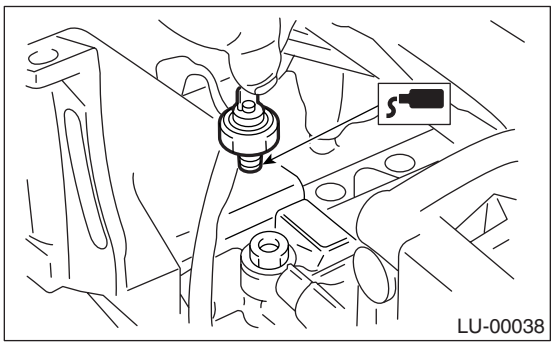
3) Remove the oil pressure switch.



B: INSTALLATION

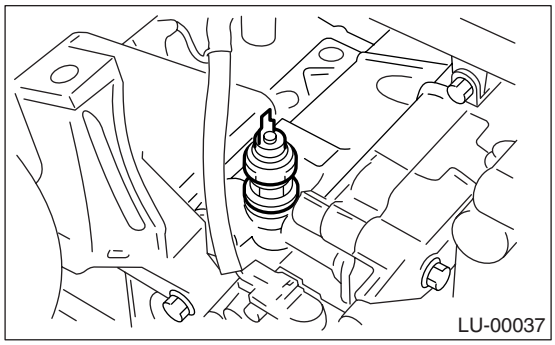
1) Apply fluid packing to the oil pressure switch threads.

Fluid packing:
THREE BOND 1324 (Part No. 004403007) or equivalent

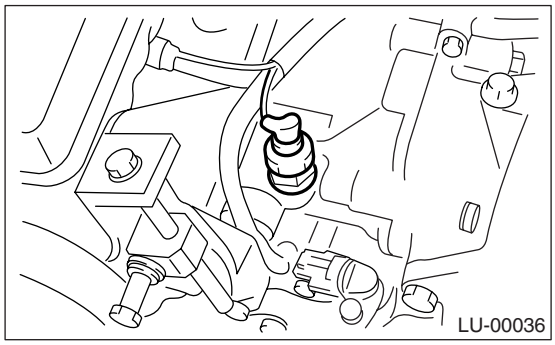


2) Install the oil pressure switch onto engine block.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



3) Connect the terminal of oil pressure switch.



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

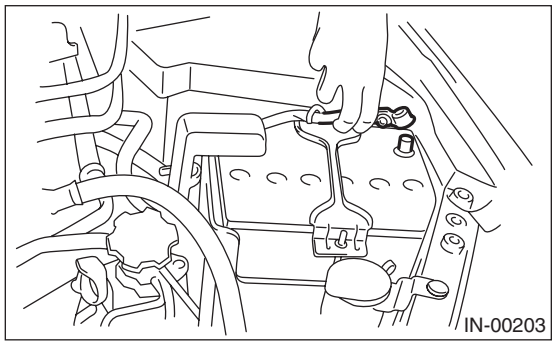
C: INSPECTION

Make sure oil does not leak or seep from where the oil pressure switch is installed.

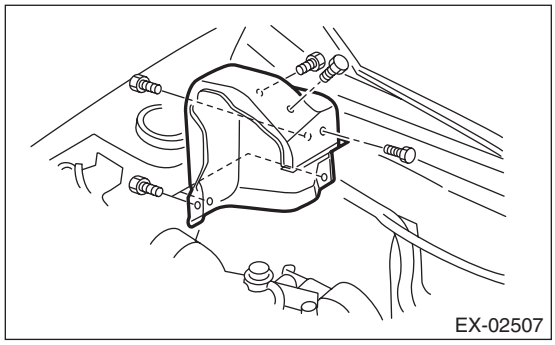
7. Oil Pipe

A: REMOVAL

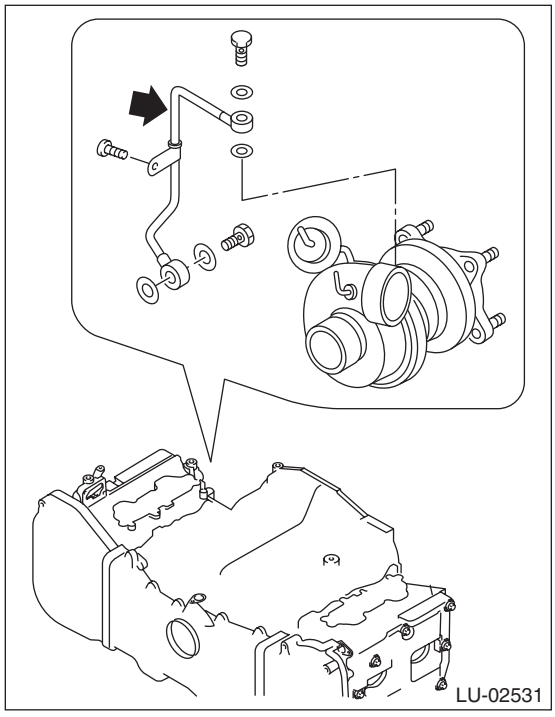
1) Disconnect the ground cable from battery.



2) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
3) Remove the intercooler bracket RH.
4) Remove the turbocharger upper cover.



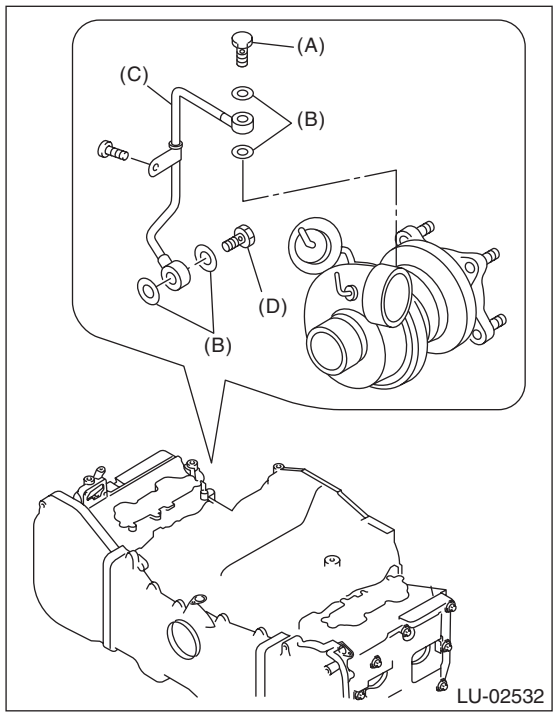
5) Remove the oil inlet pipe from the turbocharger.



B: INSTALLATION

1) Inspect the union screw with filter. <Ref. to LU(H4DOTC)-20, INSPECTING UNION SCREW WITH FILTER, INSPECTION, Oil Pipe.>
2) Temporarily install the oil pipe.

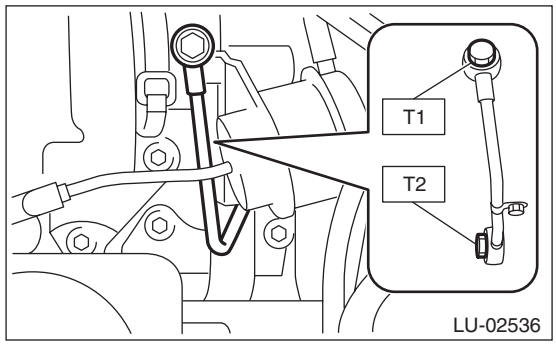
NOTE:
- Make sure not to mix up the union screws with filter and without filter as their installation positions are different.
- Use a new gasket.



(A) Union screw without filter (without protrusion)
(B) Gasket
(C) Oil inlet pipe
(D) Union screw with filter (with protrusion)

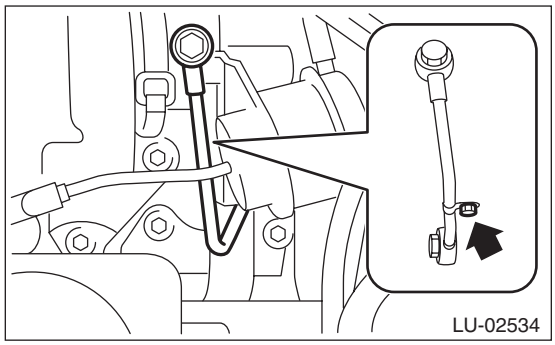
3) Tighten the union screws of oil inlet pipe.

Tightening torque:
T1: 16 N·m (1.6 kgf-m, 11.6 ft-lb)
T2: 29 N·m (3.0 kgf-m, 21.7 ft-lb)



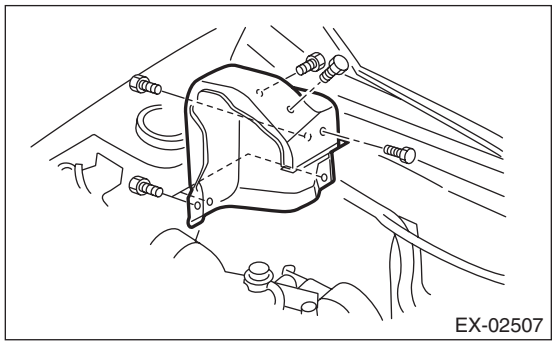
4) Tighten the bolts which hold the oil inlet pipe stay to the turbocharger.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

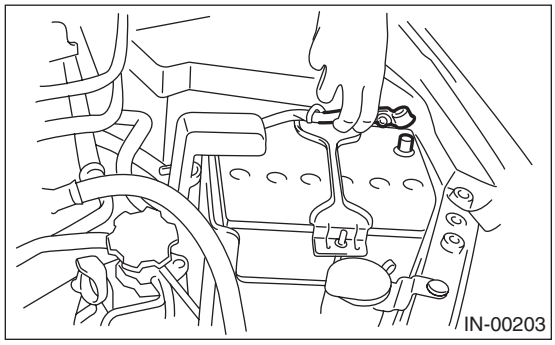


5) Install the turbocharger upper cover.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



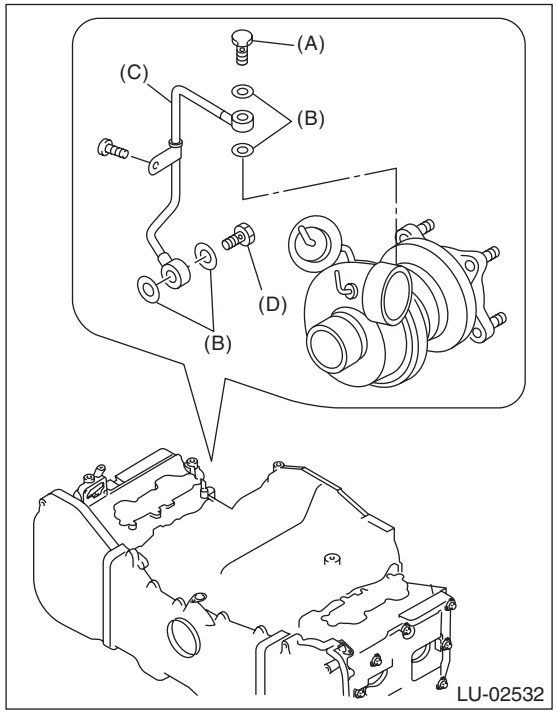
6) Instal the intercooler bracket RH.
7) Install the intercooler. <Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>
8) Connect the ground cable to battery.



C: INSPECTION

1. INSPECTING UNION SCREW WITH FILTER

Check the filter part of union screw for clogging or damage, and if defective, replace the union screw with filter with a new part.



(A) Union screw without filter (without protrusion)
(B) Gasket
(C) Oil inlet pipe
(D) Union screw with filter (with protrusion)

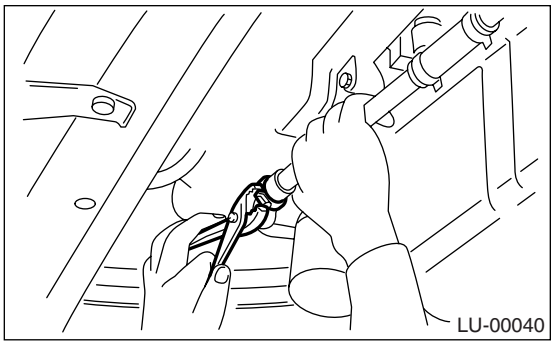
2. OTHER INSPECTIONS

1) Check that the oil pipe and union screw have no deformation, cracks and other damages.
2) Check that there are no oil leaks or oil oozing from the oil pipe attachment section.

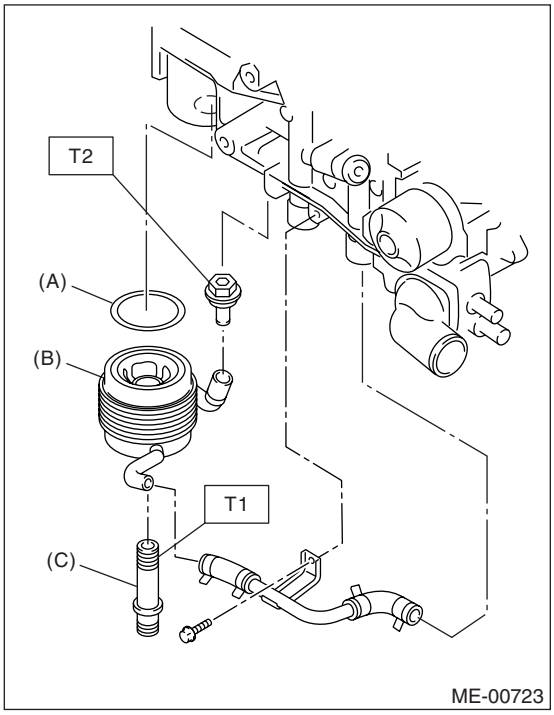
8. Engine Oil Cooler

A: REMOVAL

1) Lift-up the vehicle.
2) Remove the under cover.
3) Drain the engine oil.
4) Drain the engine coolant.
5) Remove the water by-pass pipe between oil cooler and water pump.



6) Remove the engine oil filter. <Ref. to LU(H4DOTC)-22, REMOVAL, Engine Oil Filter.>
7) Remove the connector, and then remove the oil cooler.



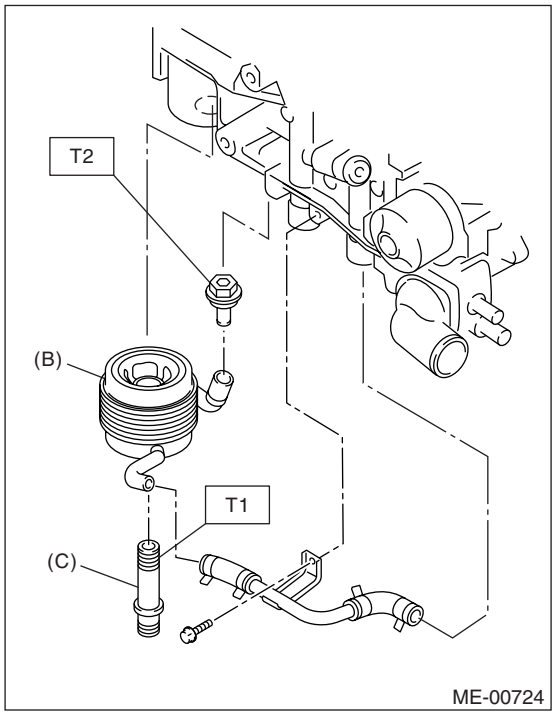
(A) O-ring
(B) Oil cooler
(C) Oil cooler connector

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
T1: 54 N·m (5.5 kgf-m, 40 ft-lb)
T2: 69 N·m (7.0 kgf-m, 50.6 ft-lb)

NOTE:
Always use a new O-ring.



C: INSPECTION

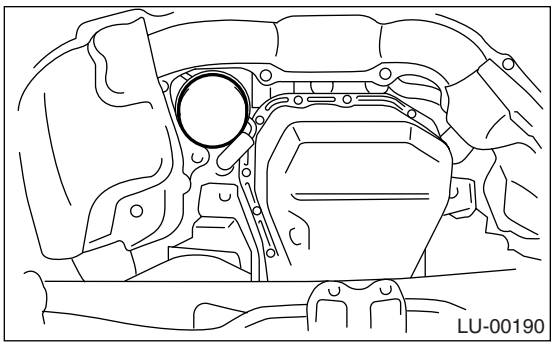
1) Check the coolant passages are not clogged using air blow method.
2) Check the mating surfaces of cylinder block, O-ring groove and oil filter for damage.

9. Engine Oil Filter

A: REMOVAL

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

ST	498547000	OIL FILTER WRENCH (Outer diameter: 80 mm (3.15 in))
ST	18332AA000	OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))
ST	18332AA010	OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))



B: INSTALLATION

1) Get a new oil filter and apply a thin coat of engine oil to seal rubber.
2) Install the oil filter by turning it by hand, being careful not to damage seal rubber.

• Tighten the oil filter 80 mm (3.15 in) or 65 mm (2.56 in) in diameter by approx. 2/3 — 3/4 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler.
• Tighten the oil filter 68 mm (2.68 in) in diameter by approx. 1 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler.

CAUTION:
Do not tighten excessively, or oil may leak.

C: INSPECTION

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

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

2) Check the engine oil level. <Ref. to LU(H4DOTC)-8, INSPECTION, Engine Oil.>

10.Engine Lubrication System Trouble in General

A: INSPECTION

Before performing diagnostics, make sure that the engine oil level is correct and no oil leakage exists.

Trouble	Possible cause		Corrective action
1. Warning light remains on.	1) Oil pressure switch failure	Cracked diaphragm or oil leakage within switch	Replace.
		Broken spring or seized contacts	Replace.
	2) Low oil pressure	Clogged oil filter	Replace.
		Malfunction of oil by-pass valve of oil filter	Clean or replace.
		Malfunction of oil relief valve of oil pump	Clean or replace.
		Clogged oil passage	Clean.
		Excessive tip clearance and side clearance of oil pump rotor and gear	Replace.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Insufficient engine oil	Replenish.
		Broken pipe of oil strainer	Replace.
		Stuck oil pump rotor	Replace.
2. Warning light does not go on.	1) Poor contact of switch contact points		Replace.
	2) Disconnection of wiring		Repair.
3. Warning light flickers momentarily.	1) Poor contact at terminals		Repair.
	2) Defective wiring harness		Repair.
	3) Low oil pressure		Check for the same possible causes as listed in 1. — 2).

SPEED CONTROL SYSTEMS

SP(H4DOTC)

Page

1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for Turbo model is included in SP (H4SO) section. <Ref. to SP(H4SO)-2, General Description.>

IGNITION

IG(H4DOTC)

Page

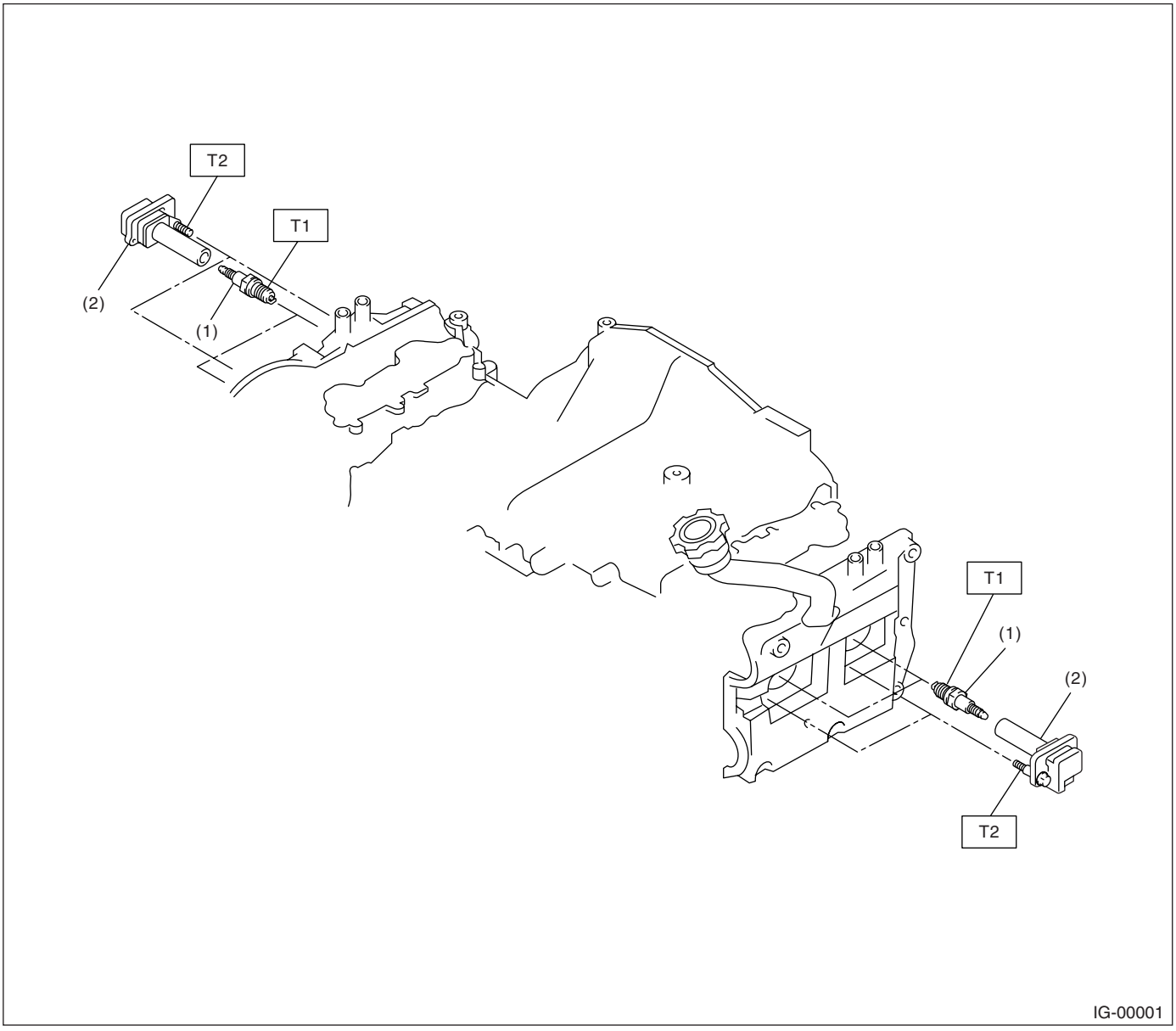
1. General Description 2
2. Spark Plug.....4
3. Ignition Coil & Ignitor ASSY 7

1. General Description

A: SPECIFICATIONS

Item		Designation
Ignition coil & ignitor assembly	Model	FK0186
	Ignition type	Direct ignition
	Manufacturer	DIAMOND
Spark plug	Type and manufacturer	NGK: PFR6G
	Thread diameter, pitch, length mm	14, 1.25, 19
	Spark plug gap mm (in)	0.7 — 0.8 (0.028 — 0.031)
	Electrode	Platinum

B: COMPONENT



(1) Spark plug
(2) Ignition coil & ignitor ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 21 (2.1, 15.2)
T2: 16 (1.6, 11.7)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Spark Plug

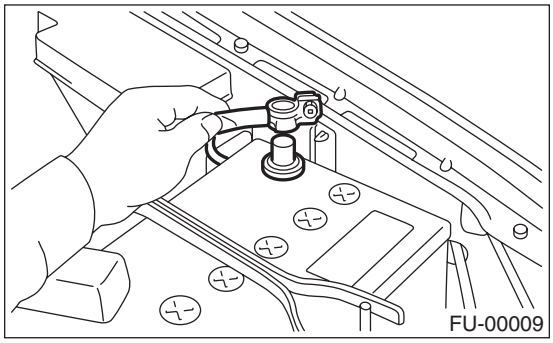
A: REMOVAL

CAUTION:
All spark plugs installed on an engine, must be of the same heat range.

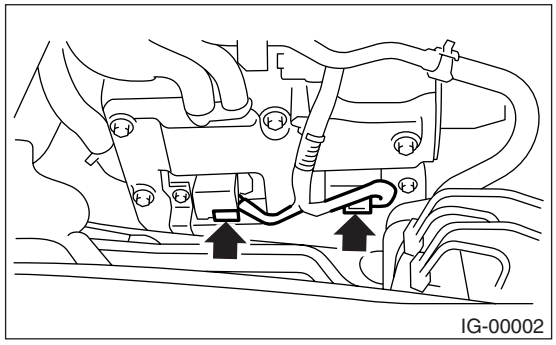
Spark plug:
NGK: PFR6G

1. RH SIDE

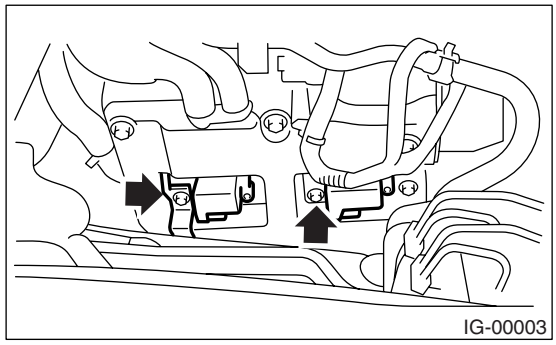
1) Disconnect the ground cable from battery.



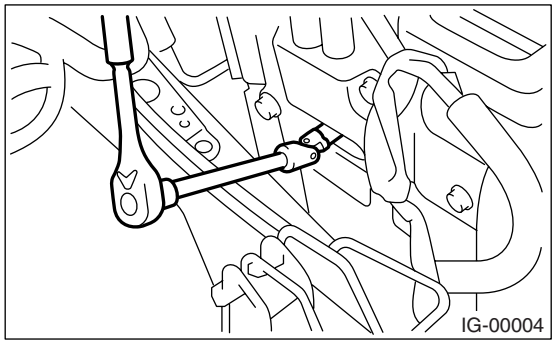
2) Remove the air cleaner lower case. <Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner.>
3) Disconnect the connector from ignition coil.



4) Remove the ignition coil.

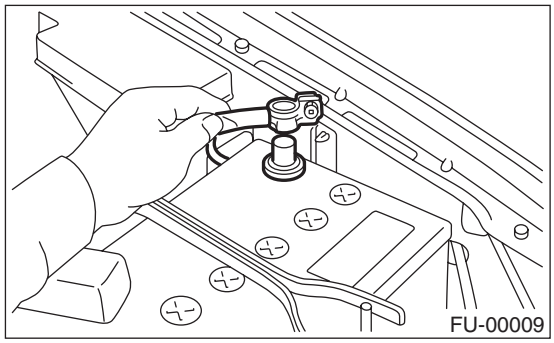


5) Remove the spark plugs with the spark plug sockets.

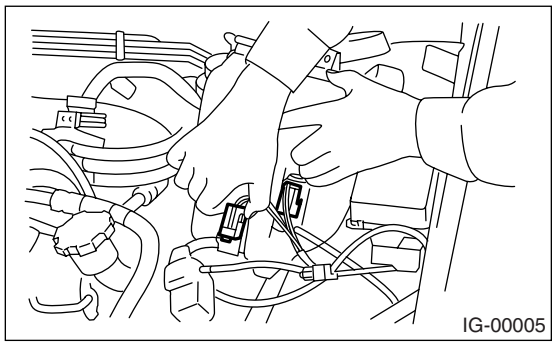


2. LH SIDE

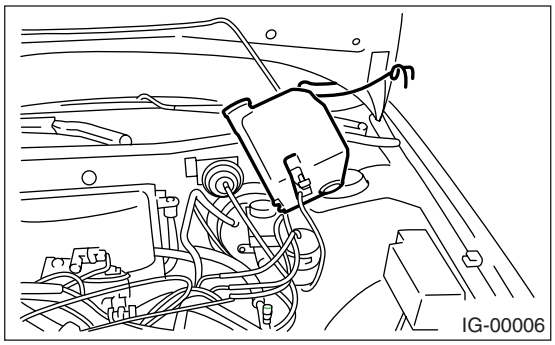
1) Disconnect the battery cables, and then remove the battery and battery carrier.



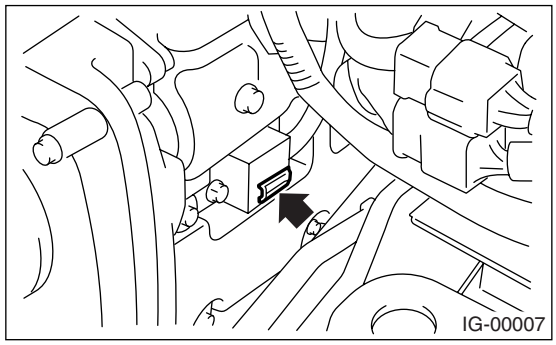
2) Disconnect the washer motor connector.



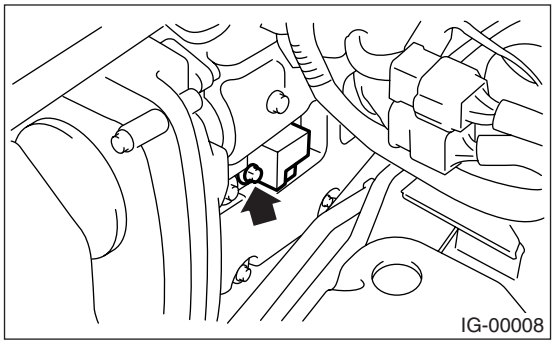
3) Disconnect the rear window glass washer hose from washer motor, then plug connection with a suitable cap.
4) Remove the two bolts which hold washer tank, then take the tank away from working area.



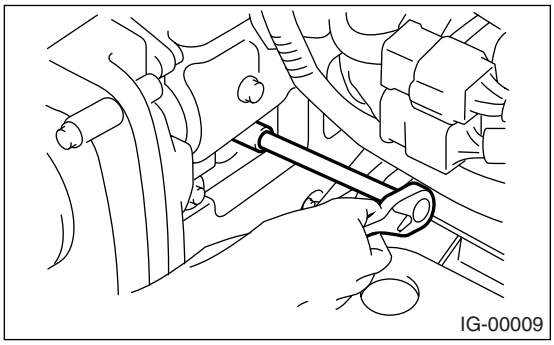
5) Disconnect the connector from ignition coil.



6) Remove the ignition coil.



7) Remove the spark plugs with the spark plug sockets.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 11.7 ft-lb)

NOTE:
The above torque should be only applied to new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

2. LH SIDE

Install in the reverse order of removal.

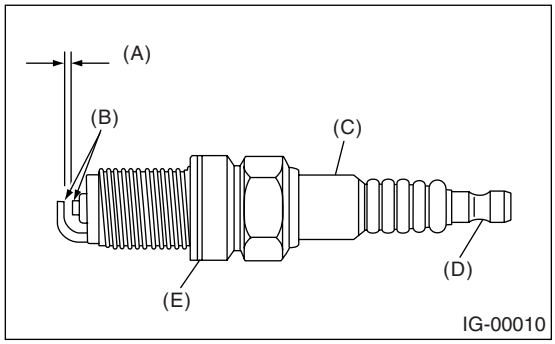
Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 11.7 ft-lb)

NOTE:
The above torque should be only applied to new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

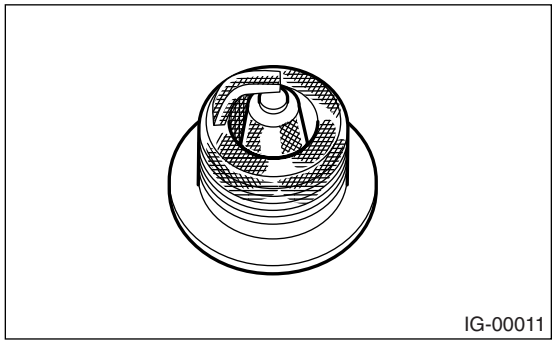
C: INSPECTION

Check the electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.

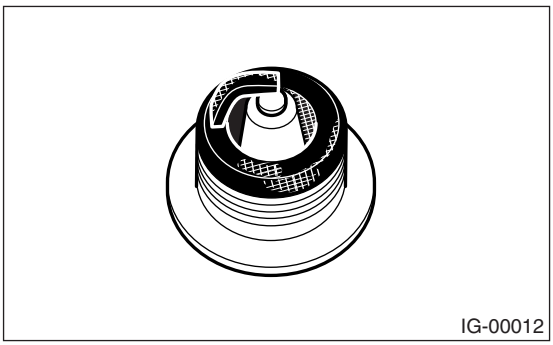


(A) Spark plug gap
(B) Carbon accumulation or wear
(C) Cracks
(D) Damage
(E) Damaged gasket

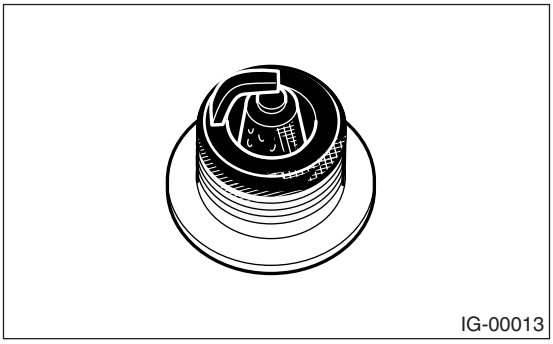
1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicates correct spark plug heat range.



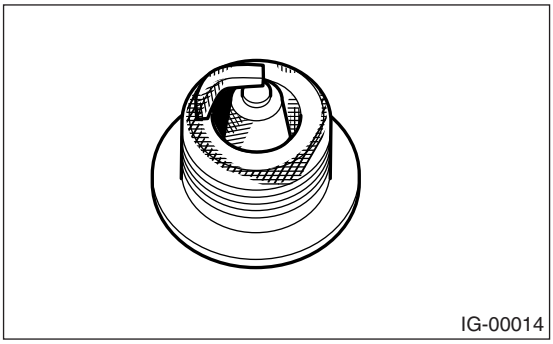
2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.
It is advisable to replace with plugs having hotter heat range.


IG-00012

3) Oil fouled:
Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems. If the same condition remains after repair, use a hotter plug.


IG-00013

4) Overheating:
White or light gray insulator with black or brown spots and bluish burnt electrodes indicates engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc. It is advisable to replace with plugs having colder heat range.

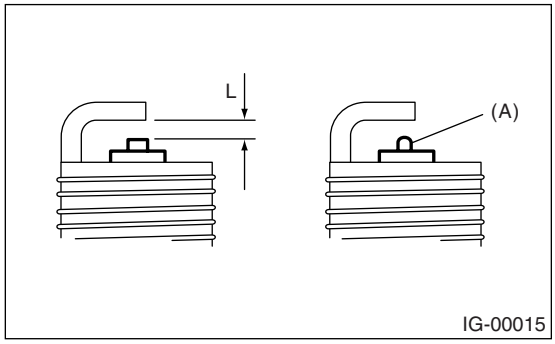

IG-00014

D: ADJUSTMENT

Clean the spark plugs with a wire brush. Clean and remove the carbon or oxide deposits, but do not wear away porcelain.
If deposits are too stubborn, replace the plugs.
After cleaning the spark plugs, correct the spark plug gap using a gap gauge.

NOTE:
Do not use spark plug cleaners, because the spark plugs are applied with platinum tips.

Spark plug gap: L
0.7 — 0.8 mm (0.028 — 0.031 in)



IG-00015

NOTE:
Replace with a new spark plug if this area (A) is worn to “ball” shape.

3. Ignition Coil & Ignitor ASSY

A: REMOVAL

Direct ignition type has been adopted. Refer to the “Spark Plug Removal” for removal procedure. <Ref. to IG(H4DOTC)-4, REMOVAL, Spark Plug.>

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
16 N·m (1.6 kgf-m, 11.7 ft-lb)

C: INSPECTION

For inspection, refer to the following. <Ref. to EN(H4DOTC)(diag)-65, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

Ignition Coil & Ignitor ASSY

STARTING/CHARGING SYSTEMS

SC(H4DOTC)

Page

1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for Turbo model is included in SC (H4SO) section. <Ref. to SC(H4SO)-2, General Description.>

ENGINE (DIAGNOSTICS)

EN(H4DOTC)(diag)

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1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

	Step	Check	Yes	No
1	**CHECK ENGINE START FAILURE.** 1) Ask the customer when and how trouble occurred using the interview check list. <Ref. to EN(H4DOTC)(diag)-4, CHECK, Check List for Interview.> 2) Start the engine.	Does the engine start?	Go to step **2.**	Inspection using “Diagnostics for Engine Start Failure”. <Ref. to EN(H4DOTC)(diag)-58, Diagnostics for Engine Starting Failure.>
2	**CHECK ILLUMINATION OF MALFUNCTION INDICATOR LIGHT.**	Does the malfunction indicator light illuminate?	Go to step **3.**	Inspection using “General Diagnostics Table”. <Ref. to EN(H4DOTC)(diag)-340, General Diagnostic Table.>
3	**CHECK INDICATION OF DTC ON DISPLAY.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector. 3) Turn the ignition switch to ON and the Subaru Select Monitor or OBD-II general scan tool switch to ON. 4) Read the DTC on Subaru Select Monitor or OBD-II general scan tool.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Record the DTC code. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).> Go to step **4.**	Repair the related parts. NOTE: If a DTC is not shown on display although malfunction indicator light illuminates, perform diagnostics of malfunction indicator light circuit or combination meter. <Ref. to EN(H4DOTC)(diag)-49, Malfunction Indicator Light.>
4	**PERFORM THE DIAGNOSIS.** 1) Perform the clear memory mode. <Ref. to EN(H4DOTC)(diag)-46, Clear Memory Mode.> 2) Perform the inspection mode. <Ref. to EN(H4DOTC)(diag)-39, Inspection Mode.>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Inspect using “Diagnostics Procedure with Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-78, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

2. AUTOMATIC TRANSMISSION

When DTC about automatic transmission is shown on display, carry out the following basic check. After that, carry out the replacement or repair work.
1) ATF level check <Ref. to 4AT-30, Automatic Transmission Fluid.>
2) Differential gear oil level check <Ref. to 4AT-31, Differential Gear Oil.>
3) ATF leak check <Ref. to 4AT-30, Automatic Transmission Fluid.>
4) Differential gear oil leak check <Ref. to 4AT-31, Differential Gear Oil.>
5) Stall test <Ref. to 4AT-33, Stall Test.>
6) Line pressure test <Ref. to 4AT-35, Line Pressure Test.>
7) Transfer clutch pressure test <Ref. to 4AT-36, Transfer Clutch Pressure Test.>
8) Time lag test <Ref. to 4AT-34, Time Lag Test.>
9) Road test <Ref. to 4AT-32, Road Test.>
10) Shift characteristics <Ref. to 4AT-36, Transfer Clutch Pressure Test.>

2. Check List for Interview

A: CHECK

1. CHECK LIST No. 1

Check the following items when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name		Engine No.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
VIN			miles
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others:		
Outdoor temperature	°C (°F)		
	❑ Hot ❑ Warm ❑ Cool ❑ Cold		
Place	❑ Highway ❑ Suburbs ❑ Inner city ❑ Uphill ❑ Downhill ❑ Rough road ❑ Others:		
Engine temperature	❑ Cold ❑ Warming-up ❑ After warming-up ❑ Any temperature ❑ Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	❑ Not affected ❑ At starting ❑ While idling ❑ At racing ❑ While accelerating ❑ While cruising ❑ While decelerating ❑ While turning (RH/LH)		
Headlight	❑ ON / ❑ OFF	Rear defogger	❑ ON / ❑ OFF
Blower	❑ ON / ❑ OFF	Radio	❑ ON / ❑ OFF
A/C compressor	❑ ON / ❑ OFF	CD/Cassette	❑ ON / ❑ OFF
Cooling fan	❑ ON / ❑ OFF	Car phone	❑ ON / ❑ OFF
Front wiper	❑ ON / ❑ OFF	CB	❑ ON / ❑ OFF
Rear wiper	❑ ON / ❑ OFF		

2. CHECK LIST No. 2

Check the following items about the vehicle's state when malfunction indicator light turns on.

NOTE:
Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. ❑ Yes / ❑ No
❑ Low fuel warning light ❑ Charge indicator light ❑ AT diagnostics indicator light ❑ ABS warning light ❑ Engine oil pressure warning light
b) Fuel level
• Lack of gasoline: ❑ Yes / ❑ No • Indicator position of fuel gauge:
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ❑ Yes / ❑ No
• What:
d) Intentional connecting or disconnecting of hoses: ❑ Yes / ❑ No
• What:
e) Installing of parts other than genuine parts: ❑ Yes / ❑ No
• What: • Where:
f) Occurrence of noise: ❑ Yes / ❑ No
• From where: • What kind:
g) Occurrence of smell: ❑ Yes / ❑ No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: ❑ Yes / ❑ No
i) Troubles occurred
❑ Engine does not start. ❑ Engine stalls during idling. ❑ Engine stalls while driving. ❑ Engine speed decreases. ❑ Engine speed does not decrease. ❑ Rough idling ❑ Poor acceleration ❑ Back fire ❑ After fire ❑ No shift ❑ Excessive shift shock

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the ECM, main relay and fuel pump relay.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use the electrical test equipment on these circuit.
• Be careful not to damage the airbag system wiring harness when servicing the ECM, TCM, main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.
• The ECM will be destroyed instantly.
• The fuel injector and other part will be damaged in just a few minutes more.

3) Do not disconnect the battery cables while the engine is running.
A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as ECM, etc.

4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn the ignition switch to OFF.

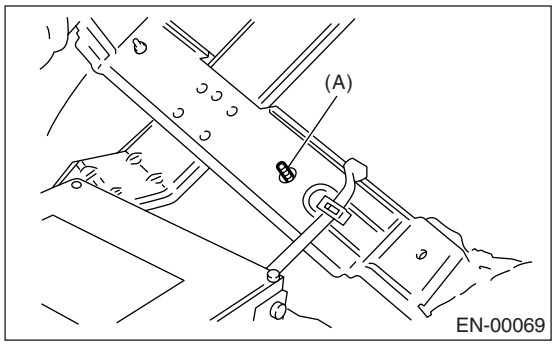
5) Poor contact has been identified as a primary cause of this problem. To measure the voltage and/or resistance of individual sensors or all electrical control modules at the harness side connector, use a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

6) Before removing the ECM from located position, disconnect two cables on battery.
Otherwise, the ECM may be damaged.

CAUTION:
When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on the fuel injection system.

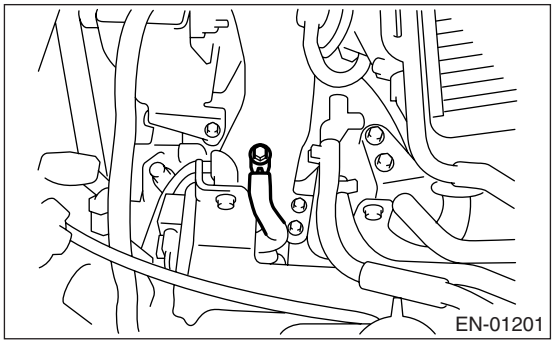
7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use the ECM mounting stud bolt at the body head grounding points when measuring voltage and resistance inside the passenger compartment.

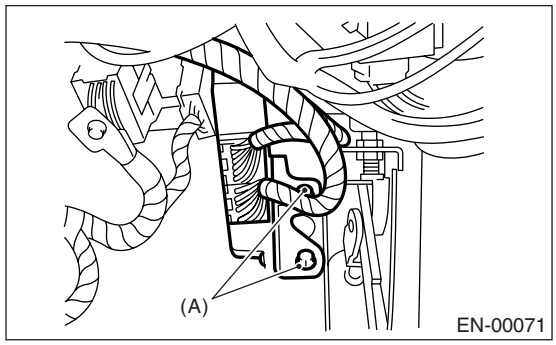


(A) Stud bolt

9) Use the engine grounding terminal or engine proper as the grounding point to the body, when measuring voltage and resistance in the engine compartment.



10) Use the TCM mounting stud bolts at the grounding point, when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

11) Every MFI-related part is a precision part. Do not drop them.

12) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:
• The antenna must be kept as far apart as possible from the control unit.
(The ECM is located under the steering column, inside of the instrument panel lower trim panel.)
• The antenna feeder must be placed as far as possible from ECM and MFI harness.
• Carefully adjust the antenna for correct matching.
• When mounting a large power type radio, pay special attention to the three items above mentioned.
• Incorrect installation of the radio may affect the operation of ECM.

13) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than 5 seconds to release pressure in the fuel system. If the engine starts during this operation, run it until it stops.
14) Problems in the electronic-controlled automatic transmission may be caused by failure of the engine, the electronic control system, the transmission proper, or by a combination of these. These three causes must be distinguished clearly when performing diagnostics.
15) Diagnostics should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.
16) On model with ABS, when performing driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between front and rear wheels. After diagnosis of engine control system, perform the ABS memory clearance procedure of self-diagnosis system.

B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems:

1. BATTERY

1) Measure the battery voltage and specific gravity of electrolyte.

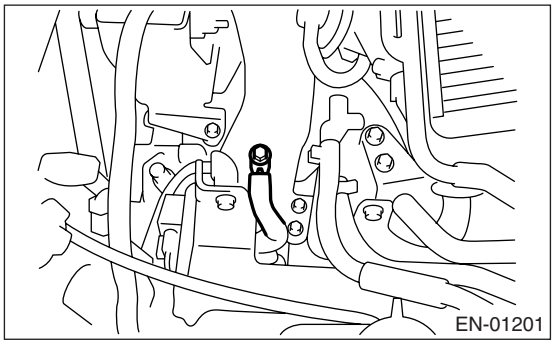
Standard voltage: 12 V

Specific gravity: Above 1.260

2) Check the condition of main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUNDING

Make sure the engine grounding terminal is properly connected to engine.



C: NOTE

1. DESCRIPTION

• The on-board diagnostics (OBD) system detects and indicates a fault in various inputs and outputs of complex electronic control. Malfunction indicator light in combination meter indicates occurrence of a fault or trouble.
• Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
• The OBD system incorporated with the vehicles within this engine family complies with Section 1968.1, California Code of Regulations (OBD-II regulation). The OBD system monitors the components and the system malfunction listed in Engine Section which affects on emissions.
• When the system decides that a malfunction occurs, malfunction indicator light illuminates. At the same time of malfunction indicator light illumination or blinking, a DTC and a freeze frame engine conditions are stored into on-board computer.
• The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction first.
• If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
• When the malfunction does not occur again for three consecutive driving cycles, malfunction indicator light is turned off, but DTC remains at on-board computer.
• The OBD-II system is capable of communication with a general scan tool (OBD-II general scan tool) formed by ISO 9141 CARB.

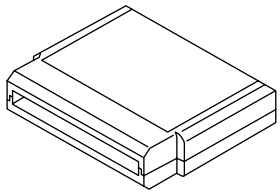
• The OBD-II diagnostics procedure is different from usual diagnostics procedure. When troubleshooting model with OBD-II, connect the Subaru Select Monitor or the OBD-II general scan tool to the vehicle.

2. ENGINE AND EMISSION CONTROL SYSTEM

• The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.
With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.

• Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.
The MFI system also has the following features:
- Reduced emission of harmful exhaust gases.
- Reduced in fuel consumption.
- Increased engine output.
- Superior acceleration and deceleration.
- Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

D: PREPARATION TOOL

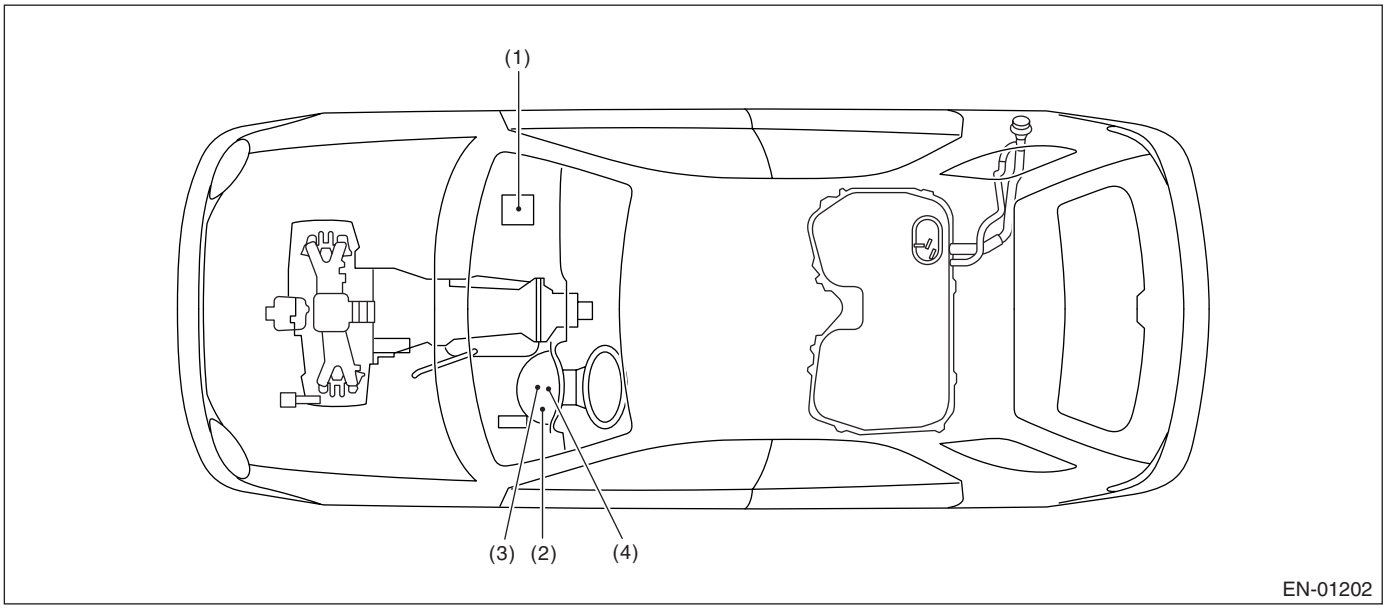
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

4. Electrical Components Location

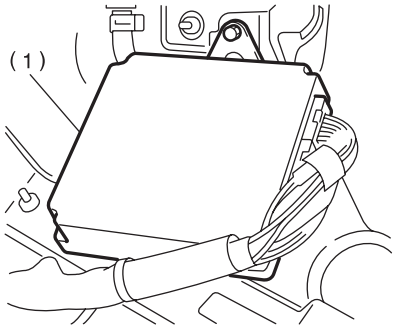
A: LOCATION

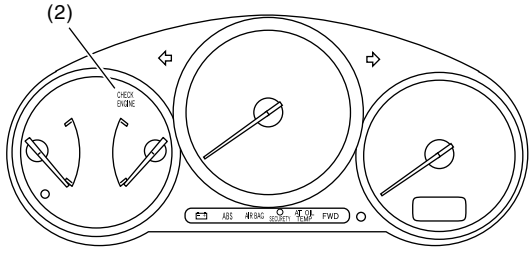
1. ENGINE

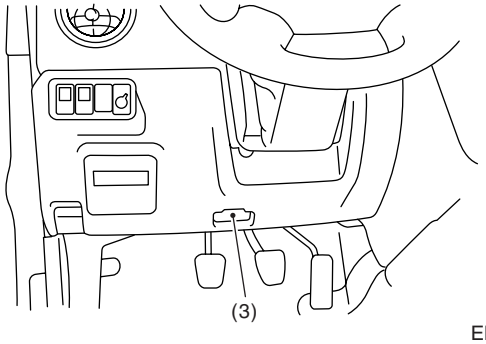
• Module

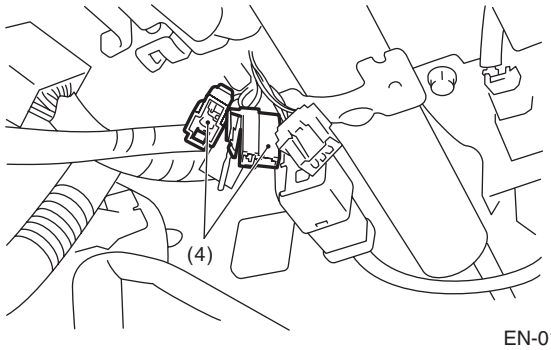


(1) Engine control module (ECM)
(2) Malfunction indicator light
(3) Data link connector
(4) Test mode connector

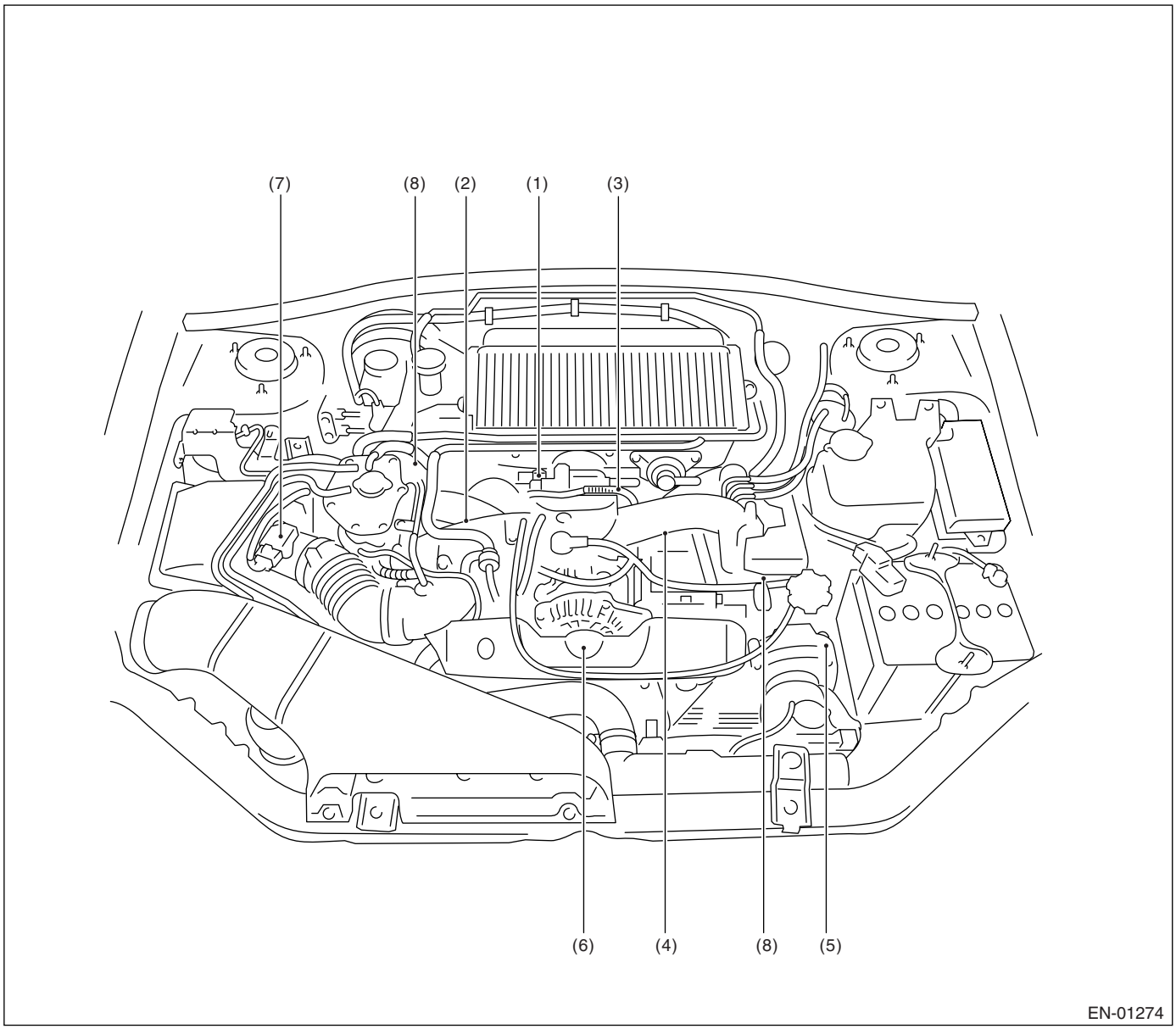




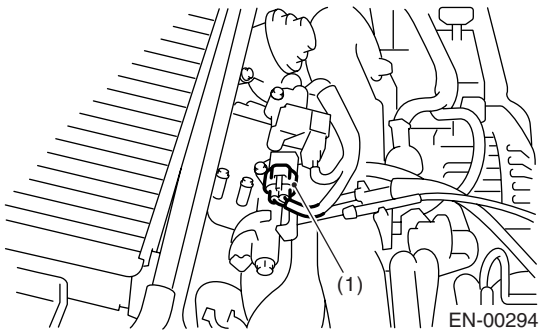




• Sensor



(1) Manifold absolute pressure sensor
(2) Engine coolant temperature sensor
(3) Throttle position sensor
(4) Knock sensor
(5) Camshaft position sensor
(6) Crankshaft position sensor
(7) Mass air flow and intake air temperature sensor
(8) Tumble generator valve position sensor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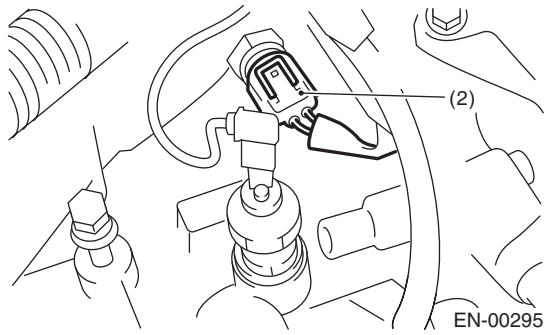
EN-00294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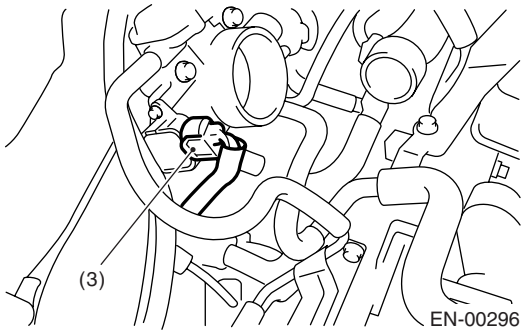
EN-00295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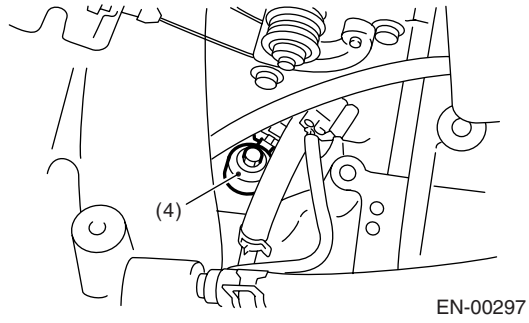
EN-00296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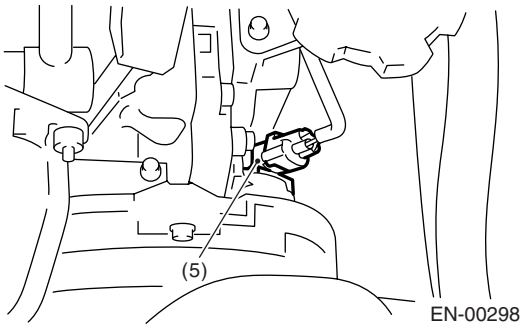
EN-00297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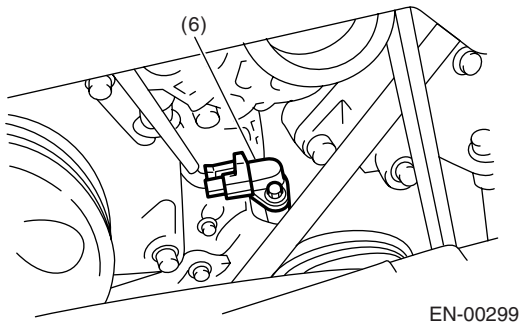
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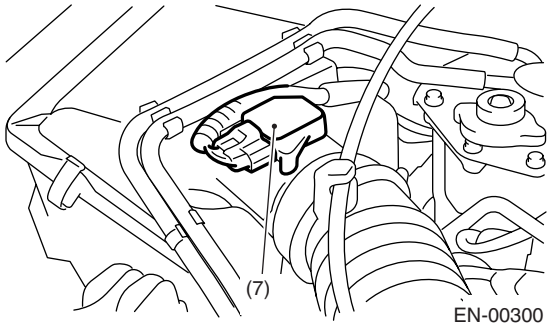
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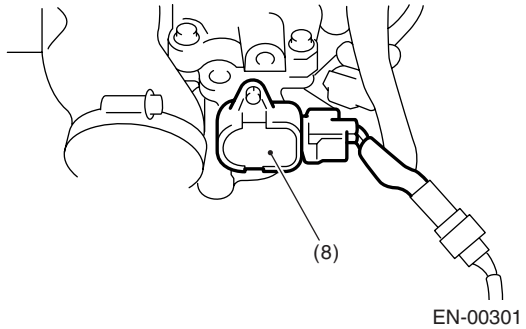
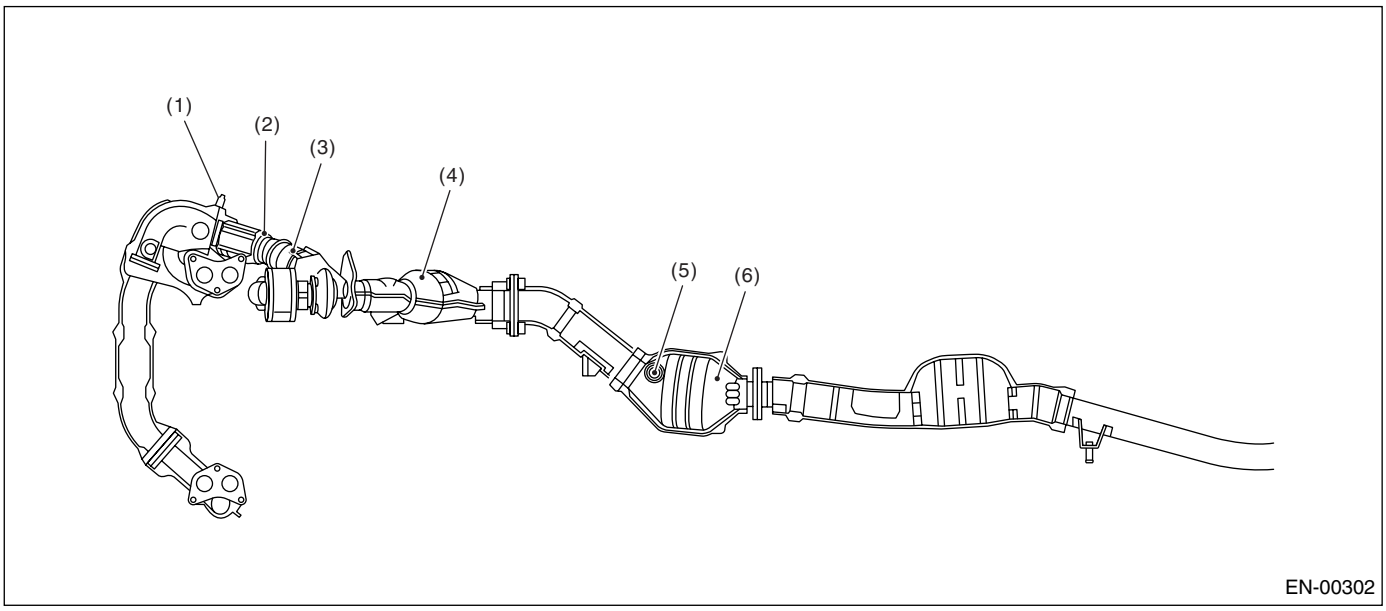
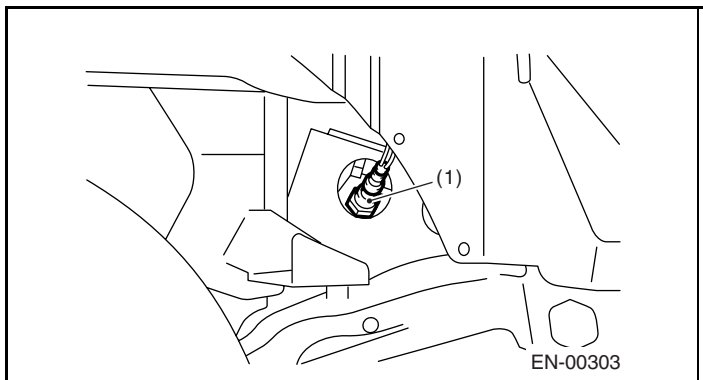
EN-00300

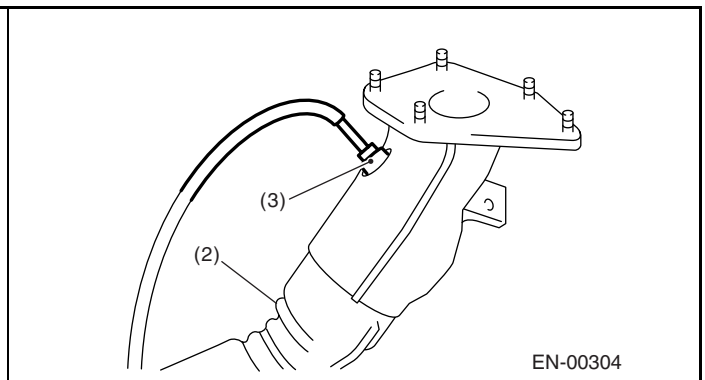

(8)
EN-00301

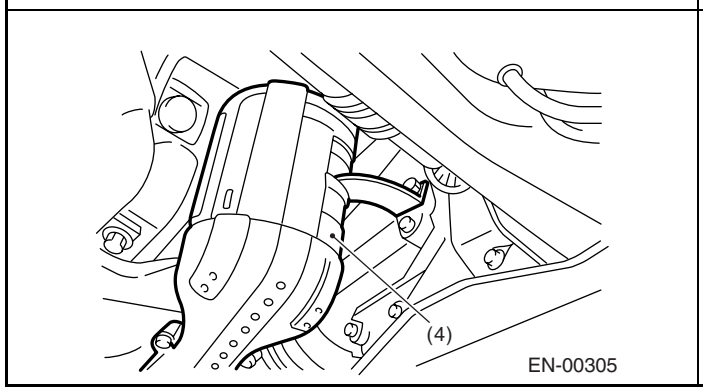
Electrical Components Location

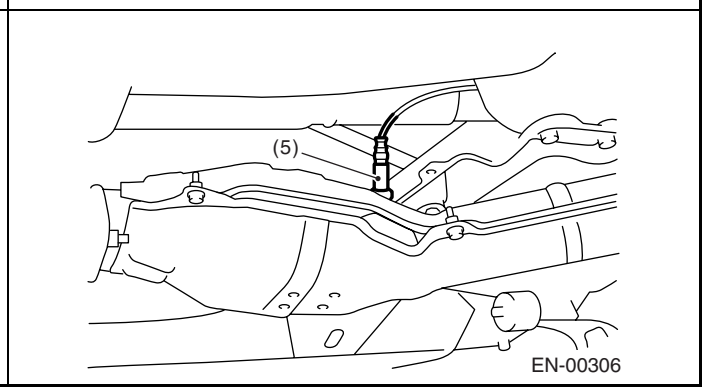


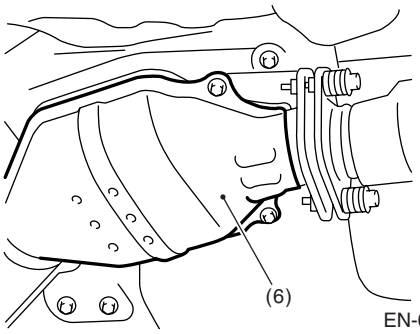
(1) Front oxygen (A/F) sensor
(2) Precatalytic converter
(3) Exhaust temperature sensor
(4) Front catalytic converter
(5) Rear oxygen sensor
(6) Rear catalytic converter



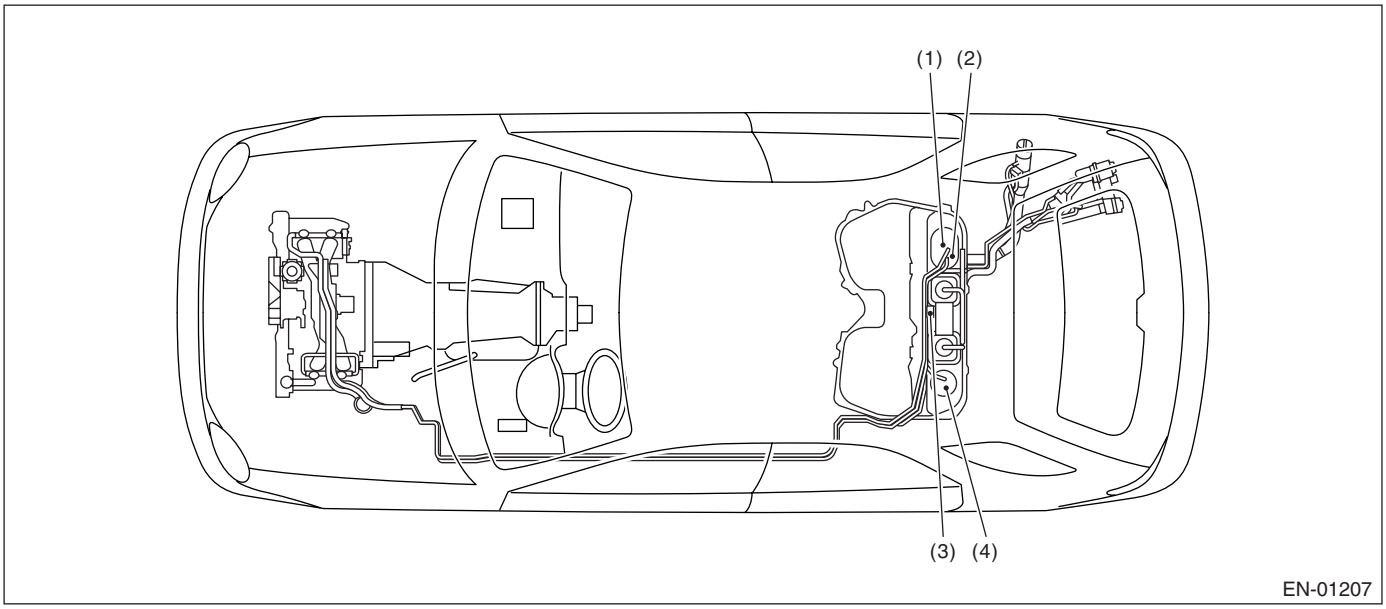






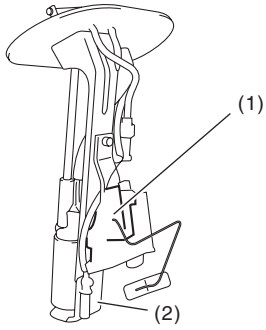


EN-00307

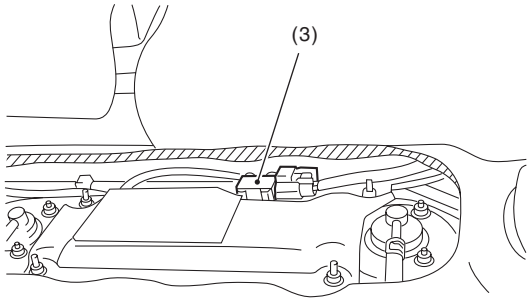


EN-01207

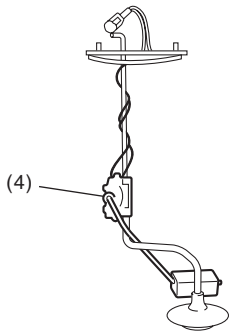
(1) Fuel level sensor
(2) Fuel temperature sensor
(3) Fuel tank pressure sensor
(4) Fuel sub level sensor



EN-01208

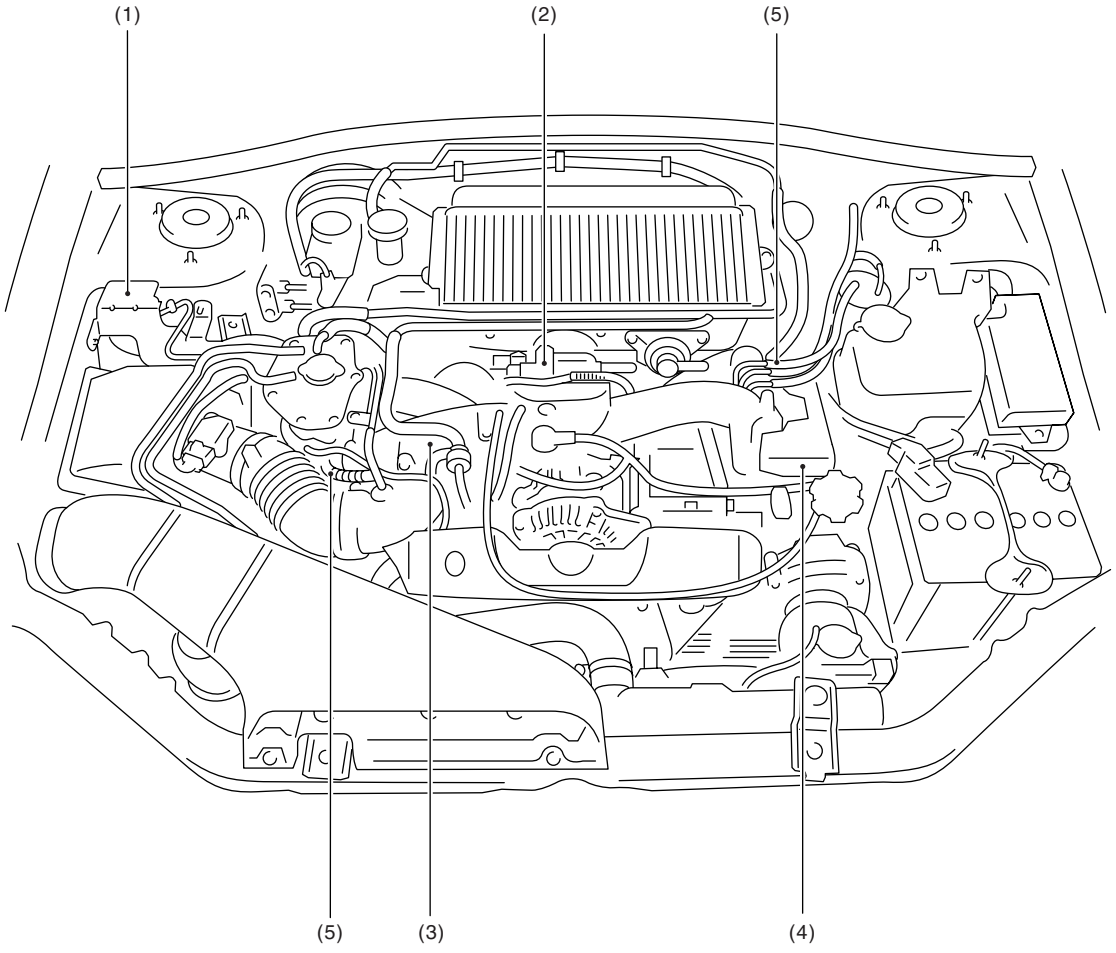


EN-01209



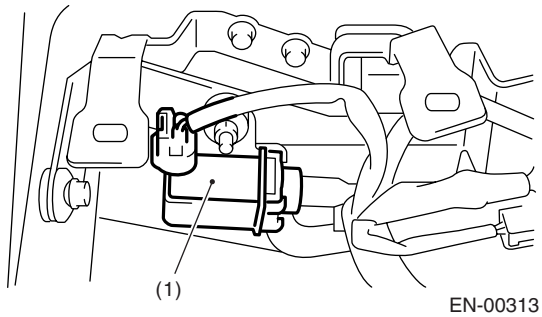
EN-01210

• Solenoid Valve, Actuator, Emission Control System Parts and Ignition System Parts

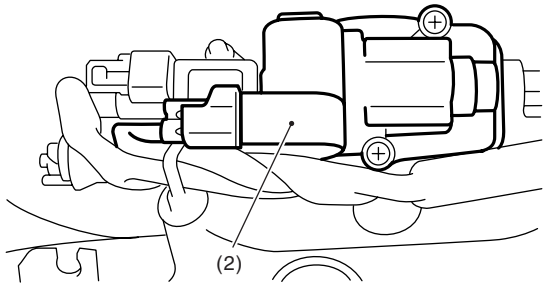


EN-01278

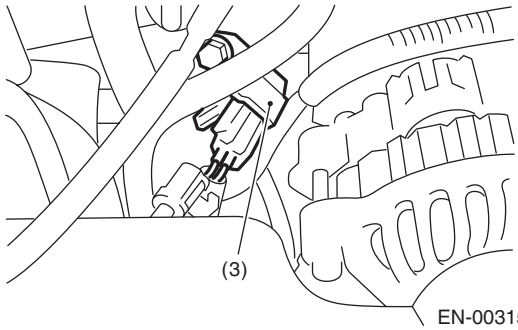
(1) Wastegate control solenoid valve
(2) Idle air control solenoid valve
(3) Purge control solenoid valve
(4) Ignition coil
(5) Tumble generator valve actuator



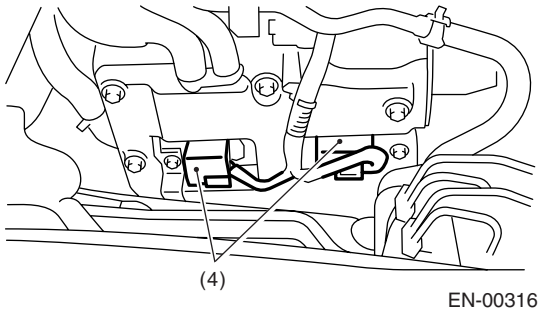
EN-00313



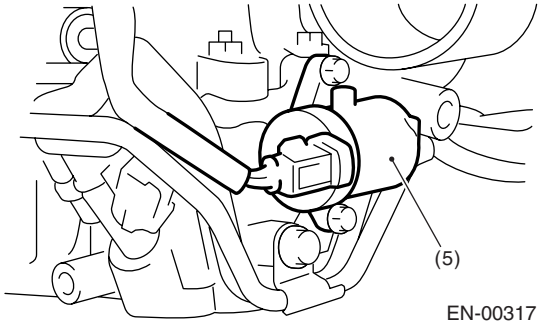
EN-00314



EN-00315

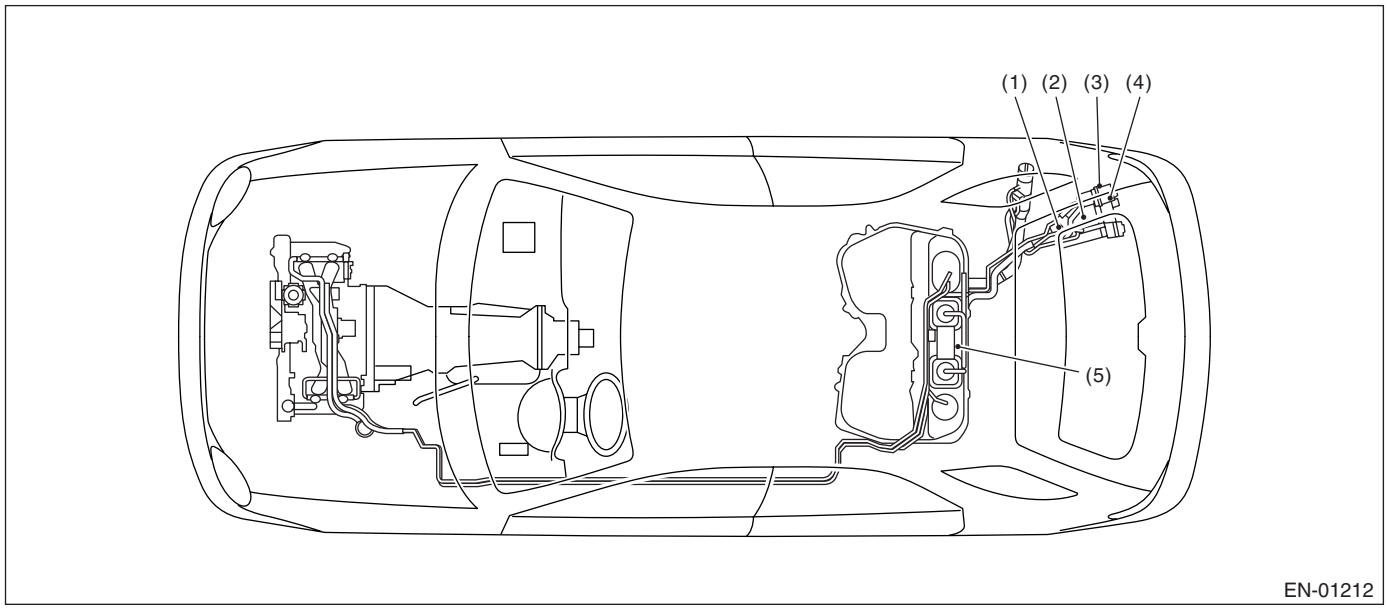


EN-00316

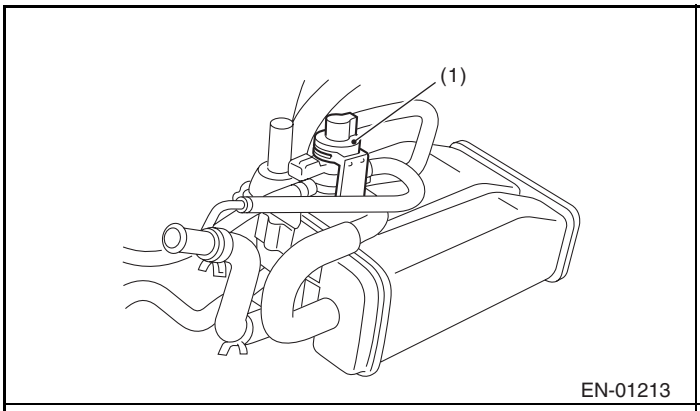


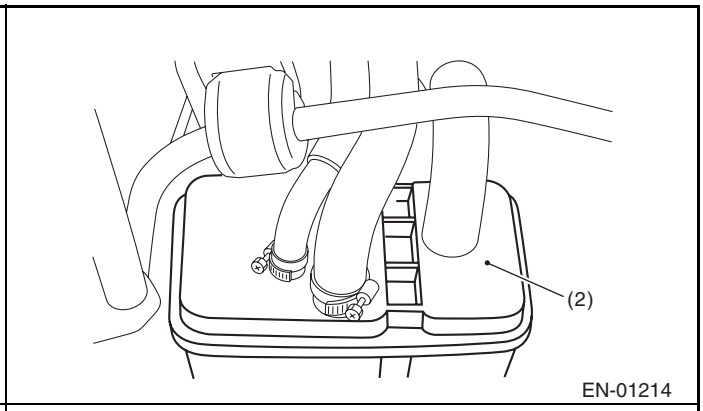
EN-00317

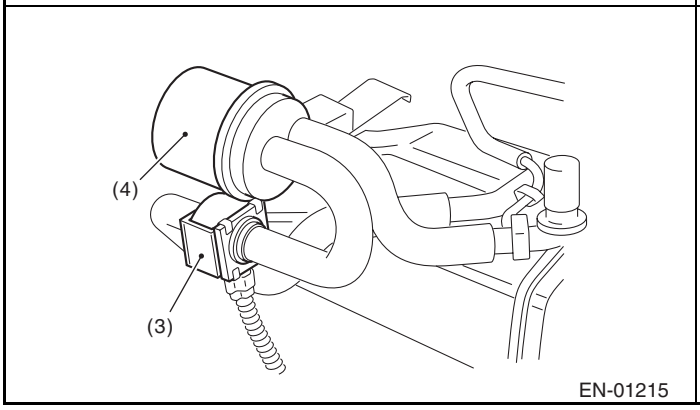
Electrical Components Location

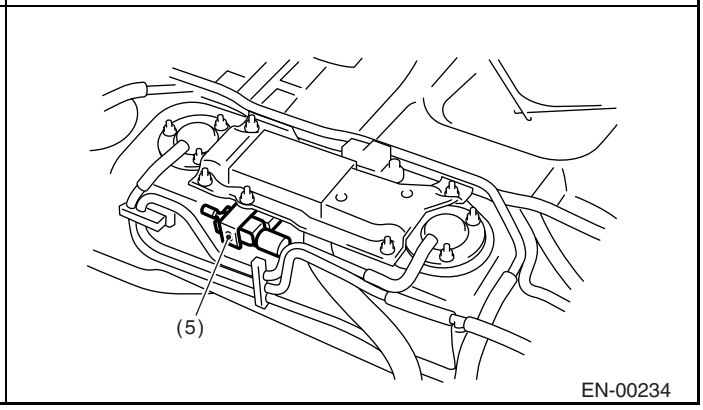


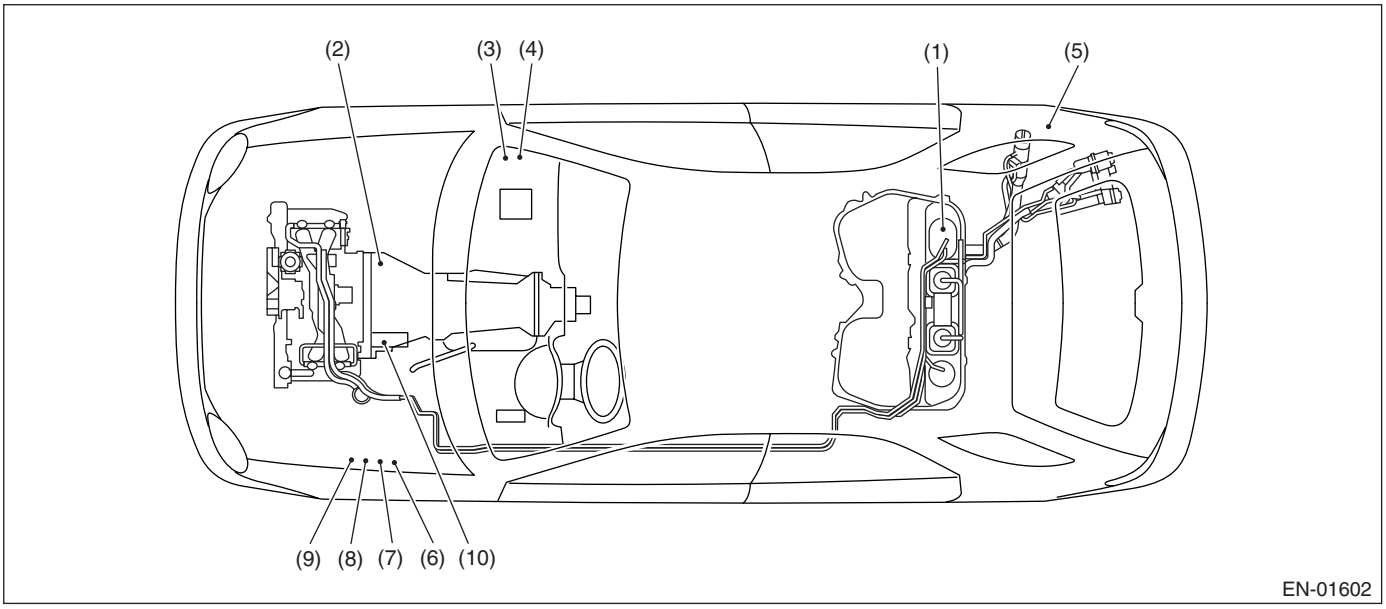
(1) Pressure control solenoid valve
(2) Canister
(3) Drain valve
(4) Drain filter
(5) Fuel tank sensor control valve



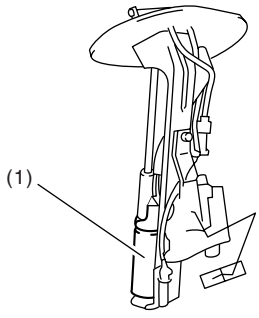


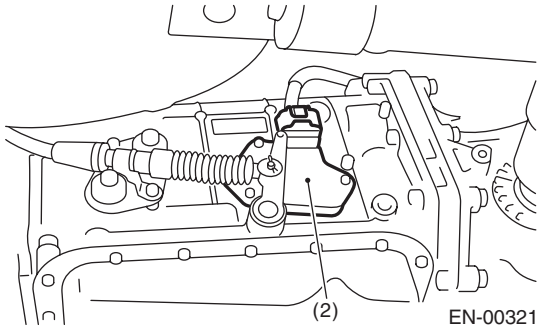


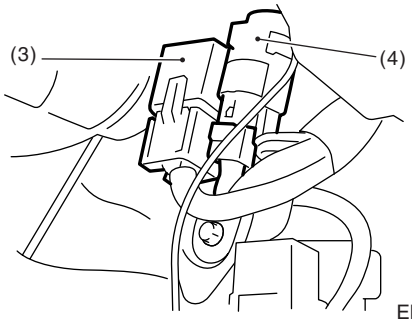


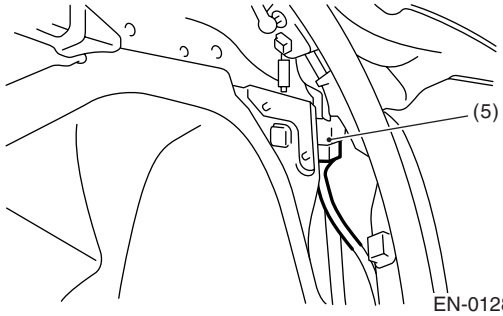


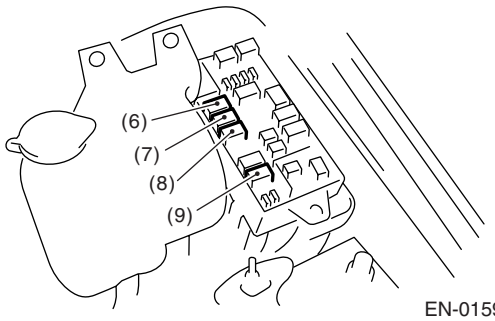
(1) Fuel pump
(2) Inhibitor switch
(3) Main relay
(4) Fuel pump relay
(5) Fuel pump control unit
(6) Radiator main fan relay 1
(7) Radiator main fan relay 2
(8) Radiator sub fan relay 1
(9) Radiator sub fan relay 2
(10) Starter



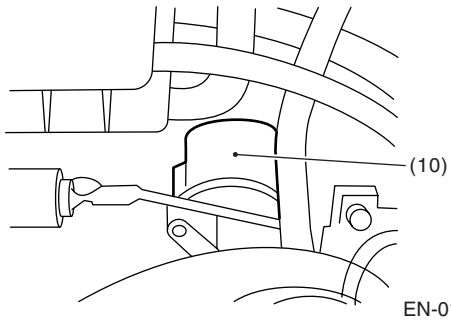








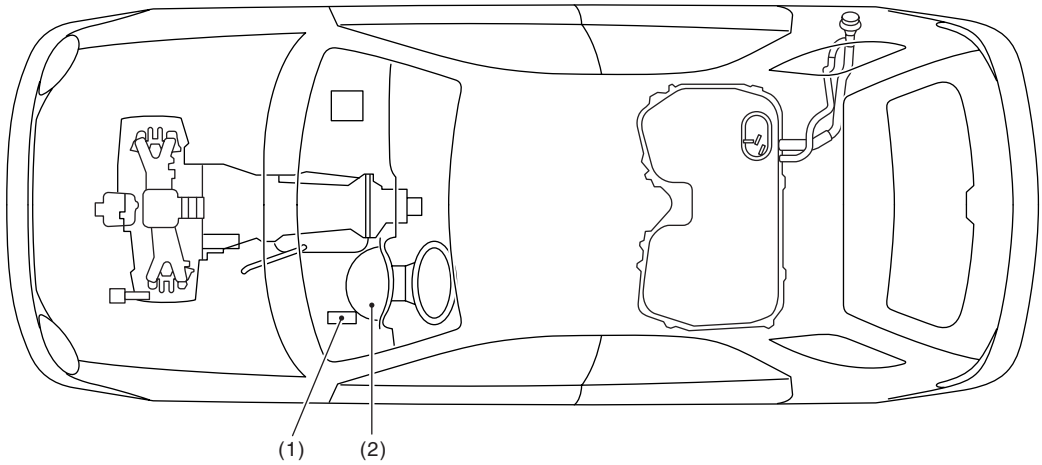
EN-01596



EN-01328

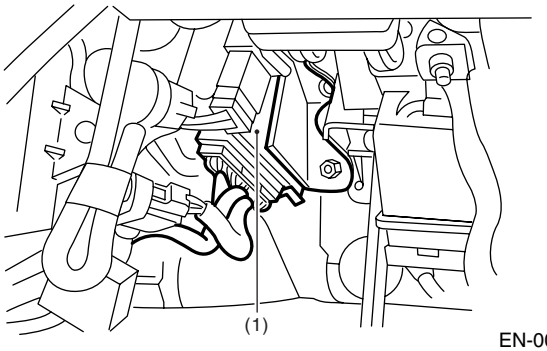
2. TRANSMISSION

• Module

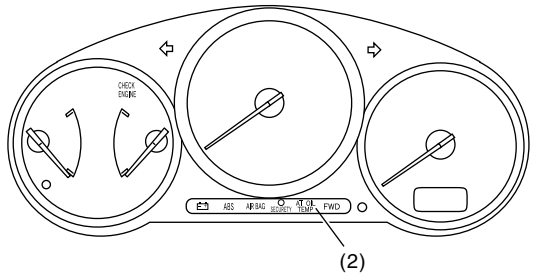


EN-01222

(1) Transmission control module (TCM) (for AT model)
(2) AT diagnostic indicator light (for AT model)

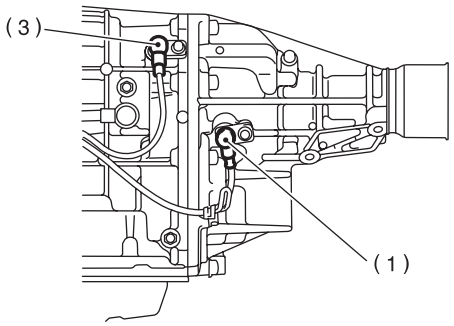


EN-00327

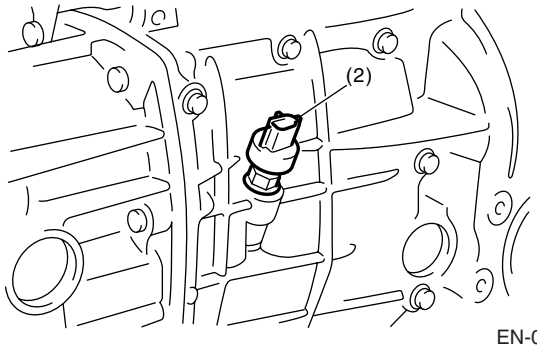


EN-01603

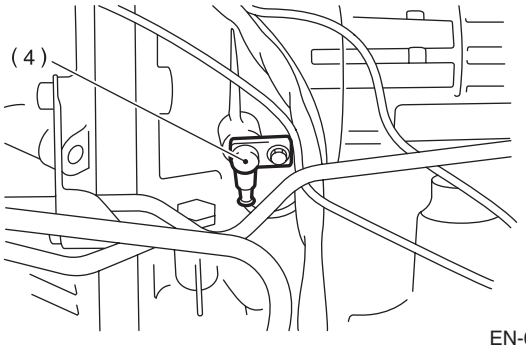
• Sensor



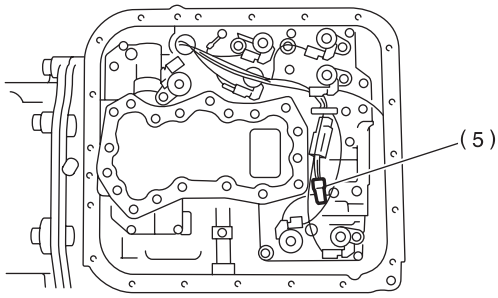
EN-00184



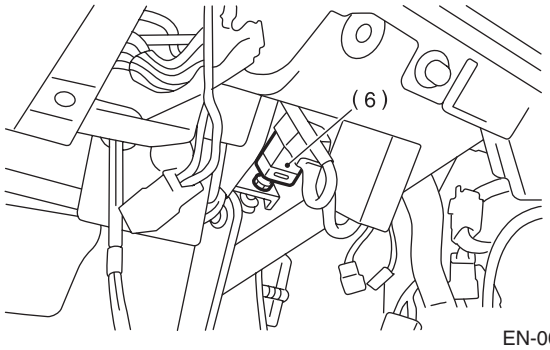
EN-00107



EN-00186



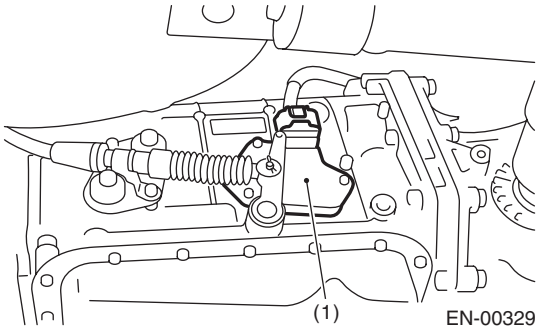
EN-00187

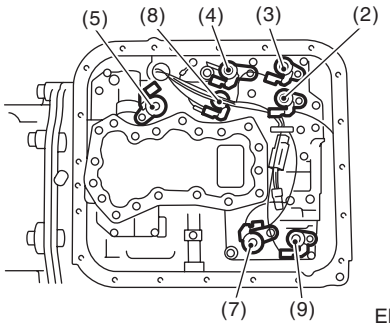


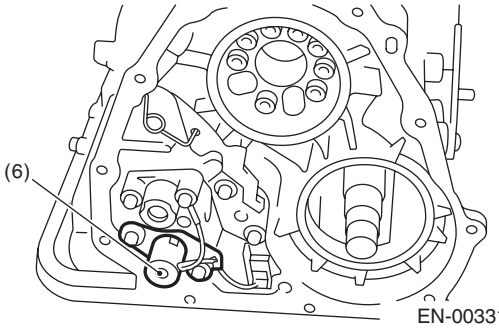
EN-00188

(1) Rear vehicle speed sensor (for AT model)
(2) Front vehicle speed sensor (for MT model)
(3) Front vehicle speed sensor (for AT model)
(4) Torque converter turbine speed sensor (for AT model)
(5) ATF temperature sensor (for AT model)
(6) Brake light switch

• Solenoid Valve and Switch (AT model)



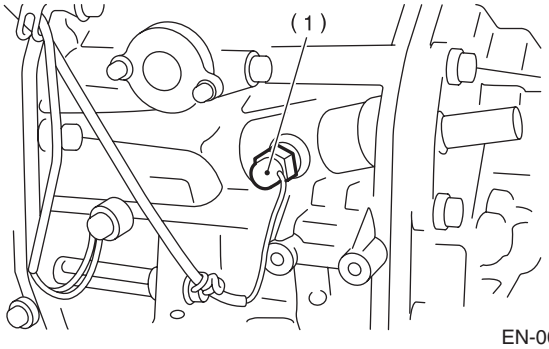




SUBARU.

(1) Inhibitor switch
(2) Shift solenoid valve 1
(3) Shift solenoid valve 2
(4) Line pressure duty solenoid
(5) Lock-up duty solenoid
(6) Transfer duty solenoid
(7) 2-4 brake duty solenoid
(8) Low clutch timing solenoid valve
(9) 2-4 brake timing solenoid valve

• Solenoid Valve and Switch (MT model)

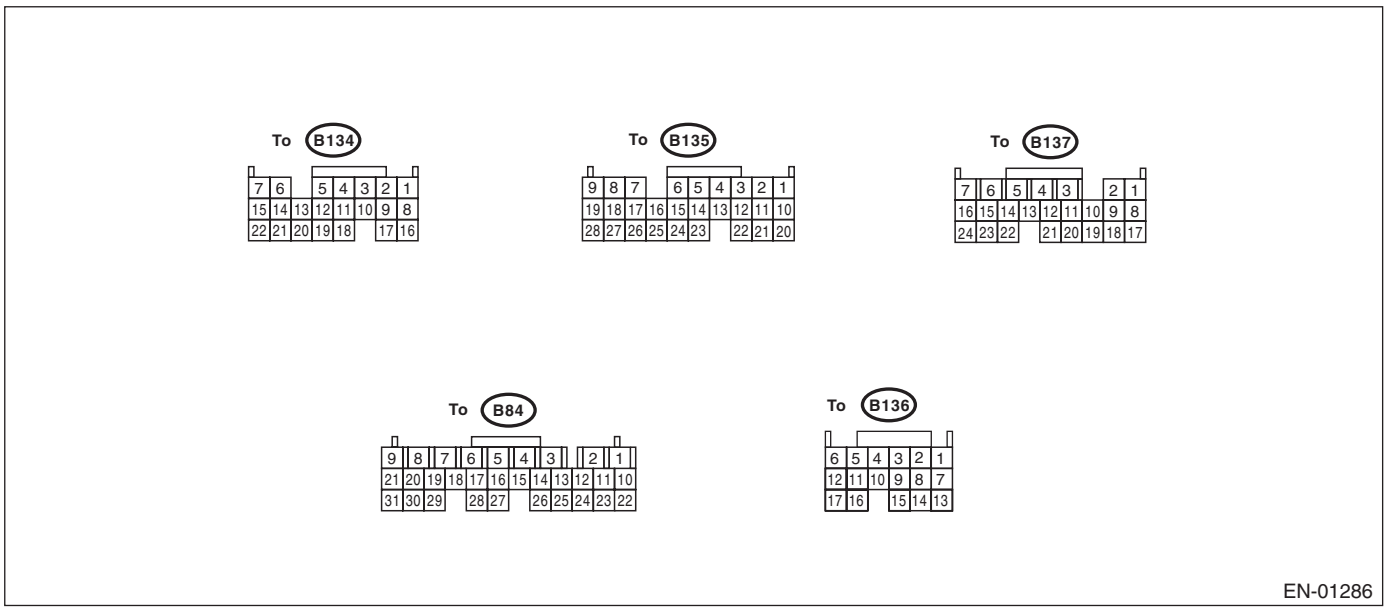


SUBARU.

(1) Neutral position switch

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Crankshaft position sensor	Signal (+)	B135	2	0	–7 — +7	Sensor output waveform
	Signal (–)	B135	11	0	0	—
	Shield	B135	21	0	0	—
Camshaft position sensor	Signal (+)	B135	1	0	–7 — +7	Sensor output waveform
	Signal (–)	B135	10	0	0	—
	Shield	B135	21	0	0	—
Throttle position sensor	Signal	B135	7	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	B135	9	5	5	—
	GND (sensor)	B135	19	0	0	—
Rear oxygen sensor	Signal	B135	17	0	0 — 0.9	—
	Shield	B135	26	0	0	—
	GND (sensor)	B135	19	0	0	—
Front oxygen (A/F) sensor heater	Signal 1	B84	5	0 — 1.0	0 — 1.0	—
	Signal 2	B84	4	0 — 1.0	0 — 1.0	—
Rear oxygen sensor heater signal		B137	13	0 — 1.0	0 — 1.0	—
Engine coolant temperature sensor	Signal	B135	18	1.0 — 1.4	1.0 — 1.4	After warm-up the engine.
	GND (sensor)	B135	19	0	0	After warm-up the engine.
Vehicle speed signal		B134	1	0 or 5	0 or 5	“5” and “0” are repeatedly displayed when vehicle is driven.

Engine Control Module (ECM) I/O Signal

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Mass air flow sensor	Signal	B136	13	—	0.3 — 4.5	—
	Shield	B136	8	0	0	—
	GND	B136	7	0	0	—
Intake air temperature sensor signal		B135	27	—	—	—
Exhaust gas temperature sensor	Signal	B135	16	—	—	—
	GND (sensor)	B135	19	0	0	—
Tumble generator valve position sensor RH	Signal	B135	23	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	B135	9	5	5	—
	GND (sensor)	B135	19	0	0	—
Tumble generator valve position sensor LH	Signal	B135	13	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	B135	9	5	5	—
	GND (sensor)	B135	19	0	0	—
Tumble generator valve RH (open)		B136	4	0 or 10 — 13	0 or 13 — 14	—
Tumble generator valve RH (close)		B136	5	0 or 10 — 13	0 or 13 — 14	—
Tumble generator valve LH (open)		B136	10	0 or 10 — 13	0 or 13 — 14	—
Tumble generator valve LH (close)		B136	11	0 or 10 — 13	0 or 13 — 14	—
Wastegate control solenoid valve		B84	24	10 — 13	13 — 14	—
Starter switch		B134	16	0	0	Cranking: 8 — 14
A/C switch		B134	2	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		B134	5	10 — 13	13 — 14	—
Neutral position switch (MT model)		B134	8	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Neutral position switch (AT model)		B134	8	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Test mode connector		B134	14	5	5	When connected: 0
Knock sensor	Signal	B135	4	2.8	2.8	—
	Shield	B135	22	0	0	—
Back-up power supply		B84	10	10 — 13	13 — 14	Ignition switch “OFF”: 10 — 13
Control unit power supply		B84	2	10 — 13	13 — 14	—
		B84	3	10 — 13	13 — 14	—
Sensor power supply		B135	9	5	5	—
Line end check 1		B134	10	0	0	—
Ignition control	#1	B137	24	0	13 — 14	Waveform
	#2	B137	23	0	13 — 14	Waveform
	#3	B137	22	0	13 — 14	Waveform
	#4	B137	21	0	13 — 14	Waveform

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Fuel injector	#1	B84	1	10 — 13	1 — 14	Waveform
	#2	B137	6	10 — 13	1 — 14	Waveform
	#3	B137	5	10 — 13	1 — 14	Waveform
	#4	B137	4	10 — 13	1 — 14	Waveform
Idle air control solenoid valve	Signal	B137	10	0 or 13 — 14	0 or 13 — 14	Waveform
Fuel pump control unit	Signal 1	B134	13	—	—	—
	Signal 2	B137	15	—	—	—
A/C relay control		B84	27	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	—
Radiator fan relay 1 control		B84	17	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	—
Radiator fan relay 2 control		B84	28	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	Model with A/C only
Malfunction indicator lamp		B84	15	—	—	Light “ON”: 1 or less Light “OFF”: 10 — 14
Engine speed output		B137	9	—	0 — 13, or more	Waveform
Purge control solenoid valve		B84	16	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
Manifold absolute pressure sensor	Signal	B135	8	1.7 — 2.4	1.1 — 1.6	—
	Power supply	B135	9	5	5	
	GND (sensor)	B135	19	0	0	
Fuel tank pressure sensor	Signal	B135	15	2.3 — 2.7	2.3 — 2.7	The valve operates when fuel filler cap is removed and reinstalled.
	GND (sensor)	B135	19	0	0	—
Pressure control solenoid valve		B84	22	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
Drain valve		B84	11	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
Fuel tank sensor control valve		B84	23	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
Fuel level sensor		B135	25	0.12 — 4.75	0.12 — 4.75	—
Fuel temperature sensor signal		B135	6	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C (75°F)
Blow-by leak diagnosis signal		B137	2	5	5	
Small light switch		B134	17	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Blower fan switch		B134	9	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Rear defogger switch		B134	3	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Power steering oil pressure switch		B135	24	10 — 13	ON: 0 OFF: 13 — 14	—
Front oxygen (A/F) sensor signal (+)		B84	29	2.8 — 3.2	2.8 — 3.2	—

Engine Control Module (ECM) I/O Signal

Content	Connector No.	Terminal No.	Signal (V)		Note
			Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Front oxygen (A/F) sensor signal (–)	B84	19	2.4 — 2.7	2.4 — 2.7	—
Front oxygen (A/F) sensor shield	B84	18	0	0	—
SSM/GST communication line	B134	21	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	—
Torque control 1 signal	B134	19	More than 4	More than 4	—
Torque control 2 signal	B134	18	More than 4	More than 4	—
Torque control cut signal	B137	14	8	8	—
AT diagnosis input signal	B135	20	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	Waveform
AT load signal	B135	28	4.3 — 4.4	0.9 — 1.4	—
GND (sensors)	B135	19	0	0	—
GND (injectors)	B137	8	0	0	—
GND (ignition system)	B137	18	0	0	—
GND (power supply)	B137	17	0	0	—
	B134	22	0	0	—
GND (control systems)	B134	7	0	0	—
	B134	15	0	0	—
GND (front oxygen (A/F) sensor heater 1)	B84	9	0	0	—
GND (front oxygen (A/F) sensor heater 2)	B84	8	0	0	—

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Content	Specified data
Engine load	1.6 — 2.9 (%): Idling
	6.4 — 12.8 (%): 2,500 rpm racing

Measuring condition:
- After warm-up the engine.
- Gear position is in neutral position.
- A/C is turned to OFF.
- All accessory switches are turned to OFF.

7. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION

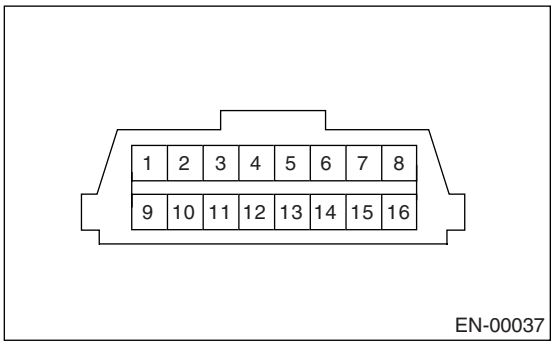
<Ref. to 4AT(diag)-11, Transmission Control Module (TCM) I/O Signal.>

8. Data Link Connector

A: NOTE

This connector is used both for the OBD-II general scan tools and Subaru Select Monitor.

CAUTION:
Do not connect any scan tools other than the OBD-II general scan tools and Subaru Select Monitor, because the circuit for Subaru Select Monitor may be damaged.



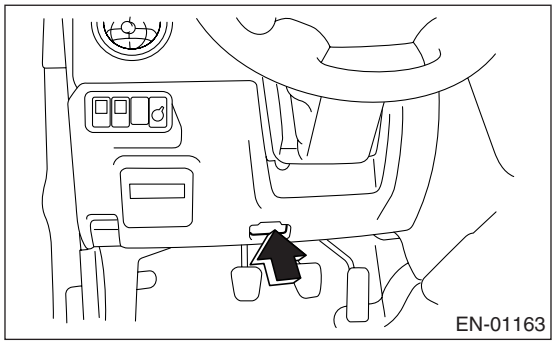
Terminal No.	Contents	Terminal No.	Contents
1	Power supply	9	Blank
2	Blank	10	Subaru Select Monitor/OBD-II general scan tool signal
3	Blank	11	Blank
4	Blank	12	Ground
5	Blank	13	Ground
6	Line end check signal 1	14	Blank
7	Blank	15	Blank
8	Line end check signal 2	16	Blank

9. OBD-II General Scan Tool

A: OPERATION

1. HOW TO USE OBD-II GENERAL SCAN TOOL

1) Prepare a general scan tool (OBD-II general scan tool) required by SAE J1978.
2) Open the cover and connect the OBD-II general scan tool to data link connector located in the lower portion of instrument panel (on the driver's side).



3) Using the OBD-II general scan tool, call up DTC and freeze frame data.

OBD-II general scan tool functions consist of:
(1) MODE $01: Current powertrain diagnostic data
(2) MODE $02: Powertrain freeze frame data
(3) MODE $03: Emission-related powertrain DTC
(4) MODE $04: Clear/Reset emission-related diagnostic information
(5) MODE $06: Request on-board monitoring test results for non-continuously monitored systems
(6) MODE $07: Request on-board monitoring test results for continuously monitored systems
(7) MODE $09: Request vehicle information

Read out the data according to repair procedures. (For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual.)

NOTE:
For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>

2. MODE $01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refers to data denoting the current operating condition of analog input/output, digital input/output and/or the powertrain system.
A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
01	Number of emission-related powertrain DTC and malfunction indicator light status and diagnosis support information	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate from mass air flow sensor	g/sec
11	Throttle valve absolute opening angle	%
13	Check whether oxygen sensor is installed.	—
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor	V and %
1C	Supporting OBD system	—
24	A/F value and A/F sensor output voltage	— and V

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access generic OBD-II PIDs (MODE $01).

3. MODE $02 (POWERTRAIN FREEZE FRAME DATA)

Refers to data denoting the operating condition when trouble is sensed by the on-board diagnosis system. A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
02	DTC that caused CARB required freeze frame data storage	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate from mass air flow sensor	g/sec
11	Throttle valve opening angle	%

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access freeze frame data (MODE $02).

4. MODE $03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODE (DTC))

Refer to Read Diagnostic Trouble Code (DTC) for information about data denoting emission-related powertrain DTC. <Ref. to EN(H4DOTC)(diag)-38, Read Diagnostic Trouble Code (DTC).>

5. MODE $04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refers to the mode used to clear or reset emission-related diagnostic information (OBD-II trouble diagnostic information).

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE $04).

6. MODE $06

Refer to test value of troubleshooting and data of test limit on support data bit sequence table. List of support data is shown in the following table.

TID	CID	Test value & Test limit	Unit
$01	$01	Catalyst system efficiency below threshold	-----
$03	$01	Evaporative emission control system large leak	mmHg
	$02	Evaporative emission control system small leak	mmHg
	$03	Evaporative emission control system very small leak	mmHg
$05	$01	O_2 sensor circuit slow response (Bank 1 Sensor 1)	-----
$06	$81	O_2 sensor circuit (Bank 1 Sensor 2)	V
	$02		
$07	$01	O_2 sensor circuit slow response (Bank 1 Sensor 2)	Sec.
$0C	$01	Coolant thermostat (Coolant temperature below thermostat regulating temperature)	°C
$0F	$01	Drain valve range/performance	mmHg
	$82		

7. MODE $07

Refer to data of DTC (pending code) for troubleshooting result about emission in first time.

8. MODE $09

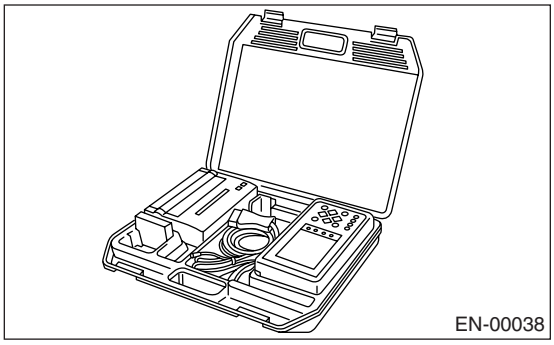
Refer to data of vehicle specification (VIN, calibration ID, etc.).

10.Subaru Select Monitor

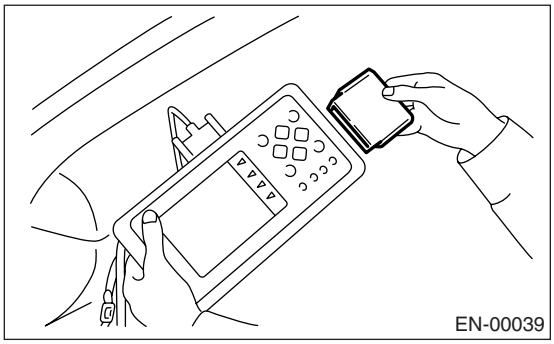
A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-8, PREPARATION TOOL, General Description.>

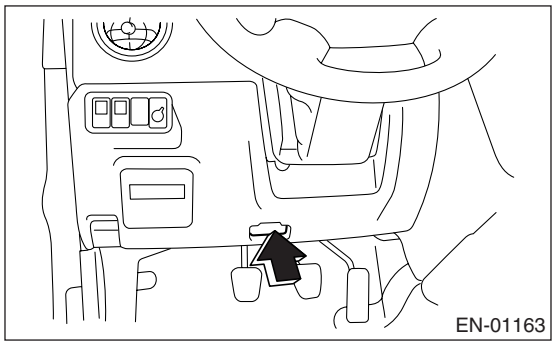


2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-8, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

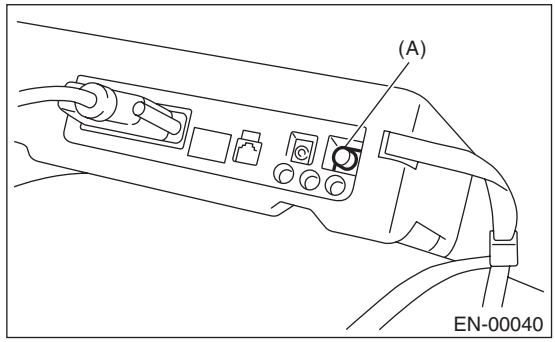
(1) Data link connector is located in the lower portion of instrument panel (on the driver's side).



(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

6) Using the Subaru Select Monitor, call up the DTC and various data, and then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (NORMAL MODE)

Refer to Read Diagnostic Trouble Code (DTC) for information about how to indicate DTC. <Ref. to EN(H4DOTC)(diag)-38, Read Diagnostic Trouble Code (DTC).>

3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (OBD MODE)

Refer to Read Diagnostic Trouble Code (DTC) for information about how to indicate DTC. <Ref. to EN(H4DOTC)(diag)-38, Read Diagnostic Trouble Code (DTC).>

4. READ CURRENT DATA FOR ENGINE. (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Vehicle speed signal	Vehicle Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Engine coolant temperature signal	Coolant Temp.	°C or °F
Ignition timing signal	Ignition Timing	deg
Throttle position signal	Throttle Opening Angle	%
Throttle position signal	Throttle Sensor Voltage	V
Injection pulse width	Fuel Injection #1 Pulse	ms
Idle air control signal	ISC Valve Duty Ratio	%
Fuel pump duty control signal	Fuel Pump Duty	%
A/F sensor current	A/F Sensor #1 Current	mA
A/F sensor resistance	A/F Sensor #1 Resistance	Ω
Front oxygen (A/F) sensor output signal	A/F Sensor #1	—
Rear oxygen sensor output signal	Rear O_2 Sensor	V
Short term fuel trim	A/F Correction #1	%
Knock sensor signal	Knocking Correction	deg
Atmospheric absolute pressure signal	Atmosphere Pressure	mmHg or kPa or inHg or psi
Intake manifold relative pressure signal	Mani. Relative Pressure	mmHg or kPa or inHg or psi
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
A/F correction (short term fuel trim) by rear oxygen sensor	A/F Correction #3	%
Long term whole fuel trim	A/F Learning #1	%
Front oxygen (A/F) sensor heater current	A/F Heater Current 1	A
Rear oxygen sensor heater voltage	Rear O_2 Heater Voltage	V
Canister purge control solenoid valve duty ratio	CPC Valve Duty Ratio	%
Primary supercharged pressure control signal	Primary Control	%
Tumble generator valve position sensor signal (right side)	TGV Position Sensor R	V
Tumble generator valve position sensor signal (left side)	TGV Position Sensor L	V
Tumble generator valve drive signal	TGV Drive	OPEN or CLOSE
Fuel level signal	Fuel Level	V
Intake air temperature signal	Intake Air Temp.	°C or °F
Mass air flow sensor signal	Mass Air Flow	g/s
Mass air flow sensor signal	Air Flow Sensor Voltage	V
Fuel tank pressure signal	Fuel Tank Pressure	mmHg or kPa or inHg or psi
Fuel temperature signal	Fuel Temp.	°C or °F
Exhaust gas temperature signal	Exhaust Gas Temperature	°C or °F
AT/MT identification signal	AT Vehicle ID Signal	AT or MT
Fuel pressure control signal	Solenoid Valve	ON or OFF

Contents	Display	Unit of measure
Drain valve signal	Vent. Solenoid Valve	ON or OFF
Tank sensor control solenoid valve signal	Tank Sensor Cntl Valve	ON or OFF
Ignition switch signal	Ignition Switch	ON or OFF
Test mode signal	Test Mode Signal	ON or OFF
Neutral position switch signal	Neutral Position Switch	ON or OFF
Air conditioning switch signal	A/C Switch	ON or OFF
Air conditioning signal	A/C Compressor Signal	ON or OFF
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF
Blow-by leak diagnosis SW	Blow-by Leak Connector	ON or OFF
Knocking signal	Knocking Signal	ON or OFF
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF
Power steering switch signal	P/S Switch	ON or OFF
Engine torque control signal #1	Torque Control Signal #1	ON or OFF
Engine torque control signal #2	Torque Control Signal #2	ON or OFF
Engine torque control permission signal	Torque Permission Signal	ON or OFF
Rear oxygen sensor rich signal	Rear O_2 Rich Signal	ON or OFF
Starter switch signal	Starter Switch	ON or OFF
Idle switch signal	Idle Switch	ON or OFF
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF
Rear defogger switch signal	Rear Defogger SW	ON or OFF
Blower fan switch signal	Blower Fan SW	ON or OFF
Small light switch signal	Light Switch	ON or OFF
Tumble generator valve output signal	TGV Output	ON or OFF

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

5. READ CURRENT DATA FOR ENGINE. (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Current Data Display & Save} and press the [YES] key.
6) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
7) Using the scroll key, move the display screen up or down until desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Number of DTC	Number of DTC	—
Malfunction indicator light status	MI (MIL)	ON or OFF
Monitoring test of misfire	Misfire monitoring	Complete or incomplete
Monitoring test of fuel system	Fuel system monitoring	Complete or incomplete
Monitoring test of comprehensive component	Component monitoring	Complete or incomplete
Test of catalyst	Catalyst Diagnosis	Complete or incomplete
Test of heated catalyst	Heated catalyst	No support
Test of evaporative emission purge control system	Evaporative purge system	Complete or incomplete
Test of secondary air system	Secondary air system	No support
Test of air conditioning system refrigerant	A/C system refrigerant	No support
Test of oxygen sensor	Oxygen sensor	Complete or incomplete
Test of oxygen sensor heater	O_2 Heater Diagnosis	Complete or incomplete
Test of EGR system	EGR system	No support
Air fuel ratio control system for bank 1	Fuel System for Bank 1	—
Engine load data	Calculated load value	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Intake air amount	Mass Air Flow	g/s
Throttle position signal	Throttle Opening Angle	%
Oxygen sensor #11	Oxygen Sensor #11	—
Oxygen sensor #12	Oxygen Sensor #12	—
Rear oxygen sensor output signal	Oxygen Sensor #12	V
Air fuel ratio correction by rear oxygen sensor	Short term fuel trim #12	%
On-board diagnostic system	OBD System	CARB-OBD2
A/F sensor output signal	A/F sensor #11	V
A/F lambda signal	A/F sensor #11	—

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

6. READ FREEZE FRAME DATA FOR ENGINE. (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Freeze Frame Data} and press the [YES] key.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
DTC for freeze frame data	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank1	Closed loop or Open loop
Engine load data	Calculated load value	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

7. LED OPERATION MODE FOR ENGINE

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data & LED Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Message	LED "ON" requirements
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is turned to ON.
Test mode signal	Test Mode Signal	ON or OFF	When test mode connector is connected.
Neutral position switch signal	Neutral Position Switch	ON or OFF	When neutral position signal is entered.
Air conditioning switch signal	A/C Switch	ON or OFF	When air conditioning switch is turned ON.
Air conditioning relay signal	A/C Compressor Signal	ON or OFF	When air conditioning relay is in function.
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF	When radiator main fan relay is in function.
Knocking signal	Knocking Signal	ON or OFF	When knocking signal is entered.
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF	When radiator sub fan relay is in function.
Engine torque control signal #1	Torque Control Signal #1	ON or OFF	When engine torque control signal 1 is entered.
Engine torque control signal #2	Torque Control Signal #2	ON or OFF	When engine torque control signal 2 is entered.
Engine torque control permission signal	Torque Control Permission	ON or OFF	When engine torque control permission signal is entered.
Rear oxygen sensor rich signal	Rear O_2 Rich Signal	ON or OFF	When rear oxygen sensor mixture ratio is rich.
Starter switch signal	Starter Switch Signal	ON or OFF	When starter switch signal is entered.
Idle switch signal	Idle Switch Signal	ON or OFF	When idle switch signal is entered.
Crankshaft position sensor signal	Crankshaft Position Signal	ON or OFF	When crankshaft position sensor signal is entered.
Camshaft position sensor signal	Camshaft Position Signal	ON or OFF	When camshaft position sensor signal is entered.
Power steering switch signal	P/S Switch	ON or OFF	When power steering switch is entered.
Rear defogger switch signal	Rear Defogger Switch	ON or OFF	When rear defogger switch is turned ON.
Blower fan switch signal	Blower Fan Switch	ON or OFF	When blower fan switch is turned ON.
Small light switch signal	Light Switch	ON or OFF	When small light switch is turned ON.
Tumble generator valve actuator signal	TGV Output	ON or OFF	When TGV actuator signal is entered.
Tumble generator valve drive signal	TGV Drive	Close or Open	When TGV moves and valve opens.
Fuel pressure control solenoid	PCV Solenoid Valve	ON or OFF	When fuel pressure control solenoid valve is in function.
Drain valve signal	Vent. Solenoid Valve	ON or OFF	When drain valve is in function.
AT/MT identification signal	AT Vehicle ID Signal	ON or OFF	When AT vehicle is checked.
Fuel tank sensor control solenoid valve signal	Fuel Tank Sensor Ctrl Valve	ON or OFF	When tank sensor control solenoid valve is in function.
Blow-by leak diagnosis SW	Blow-by Leak Connector	ON or OFF	When connected.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

8. READ CURRENT DATA FOR AT

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
3) Press the [YES] key after the information of transmission type is displayed.
4) On the «Transmission Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Rear Wheel Speed	km/h or MPH
Front vehicle speed sensor signal	Front Wheel Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Automatic transmission fluid temperature signal	ATF Temp.	°C or °F
Mass air flow sensor signal	Air Flow Sensor Voltage	V
Throttle position signal	Throttle Sensor Voltage	V
Gear position	Gear Position	—
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch control duty ratio	Lock Up Duty Ratio	%
Transfer clutch control duty ratio	Transfer Duty Ratio	%
Power supply for throttle position sensor	Throttle Sensor Power	V
Torque converter turbine speed signal	Turbine Revolution Speed	rpm
2-4 brake timing pressure control duty ratio	Brake Clutch Duty Ratio	%
Stop lamp switch signal	Stop Light Switch	ON or OFF
Anti lock brake system signal	ABS Signal	ON or OFF
Cruise control system signal	Cruise Control Signal	ON or OFF
Neutral/Parking range signal	N/P Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
Shift control solenoid A	Shift Solenoid #1	ON or OFF
Shift control solenoid B	Shift Solenoid #2	ON or OFF
Torque control output signal #1	Torque Control Signal #1	ON or OFF
Torque control output signal #2	Torque Control Signal #2	ON or OFF
Torque control cut signal	Torque Control Cut Sig.	ON or OFF
2-4 brake timing control solenoid valve	2-4 Brake Timing Sol.	ON or OFF
Low clutch timing control solenoid valve	Low Clutch Timing Sol.	ON or OFF
Automatic transmission diagnosis indicator lamp	Diagnosis Lamp	ON or OFF

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

11.Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {DTC Display} and press the [YES] key.
5) On the «DTC Display» display screen, select the {Current DTC} or {History DTC} and press the [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {DTC Display} and press the [YES] key.
6) Make sure that a DTC is shown on the display screen.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>

3. OBD-II GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain DTC.
For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access emission-related powertrain DTC (MODE $03).

12.Inspection Mode

A: PROCEDURE

Carry out trouble diagnosis shown in the following DTC table.
When performing trouble diagnosis which is not shown in the DTC table, refer to the next item Drive cycle.
<Ref. to EN(H4DOTC)(diag)-44, Drive Cycle.>

DTC	Item	Condition
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	—
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	—
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	—
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	—
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	—
P0102	Mass or Volume Air Flow Circuit Low Input	—
P0103	Mass or Volume Air Flow Circuit High Input	—
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	—
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	—
P0112	Intake Air Temperature Circuit Low Input	—
P0113	Intake Air Temperature Circuit High Input	—
P0117	Engine Coolant Temperature Circuit Low Input	—
P0118	Engine Coolant Temperature Circuit High Input	—
P0122	Throttle/Pedal Position Sensor/Switch “A” Circuit Low Input	—
P0123	Throttle/Pedal Position Sensor/Switch “A” Circuit High Input	—
P0129	Atmospheric Pressure Sensor Circuit Range/Performance	—
P0130	O_2 Sensor Circuit (Bank 1 Sensor 1)	—
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	—
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	—
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	—
P0182	Fuel Temperature Sensor “A” Circuit Low Input	—
P0183	Fuel Temperature Sensor “A” Circuit High Input	—
P0230	Fuel Pump Primary Circuit	—
P0245	Turbo/Super Charger Wastegate Solenoid “A” Low	—
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	—
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	—
P0335	Crankshaft Position Sensor “A” Circuit	—
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	—
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	—
P0341	Camshaft Position Sensor “A” Circuit Range/Performance (Bank 1 or Single Sensor)	—
P0447	Evaporative Emission Control System Vent Control Circuit Open	—
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	—
P0452	Evaporative Emission Control System Pressure Sensor Low Input	—
P0453	Evaporative Emission Control System Pressure Sensor High Input	—
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	—
P0462	Fuel Level Sensor Circuit Low Input	—
P0463	Fuel Level Sensor Circuit High Input	—
P0502	Vehicle Speed Sensor Circuit Low Input	—
P0503	Vehicle Speed Sensor Intermittent/Erratic/High	—
P0508	Idle Control System Circuit Low	—
P0509	Idle Control System Circuit High	—
P0512	Starter Request Circuit	—
P0519	Idle Control System Malfunction (Fail-Safe)	—

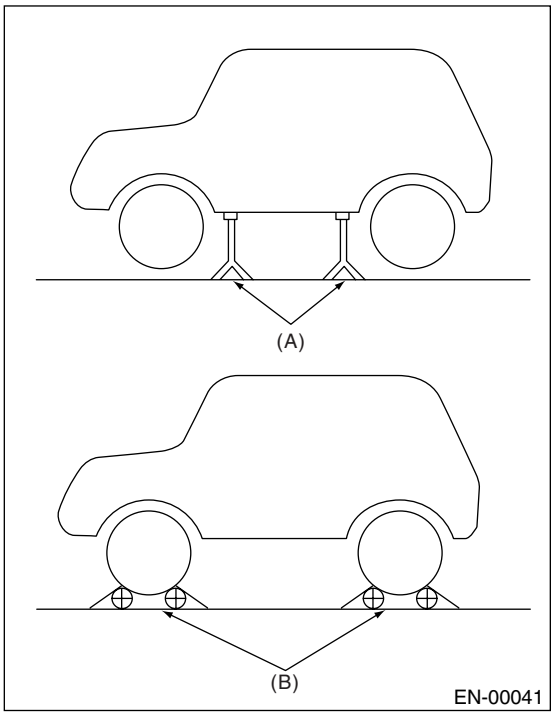
DTC	Item	Condition
P0545	Exhaust Gas Temperature Sensor Circuit Low - Bank 1	—
P0565	Cruise Control On Signal	—
P0604	Internal Control Module Random Access Memory (RAM) Error	—
P0691	Cooling Fan 1 Control Circuit Low	—
P0703	Torque Converter/Brake Switch “B” Circuit	—
P0705	Transmission Range Sensor Circuit (PRNDL Input)	—
P0710	Transmission Fluid Temperature Sensor Circuit	—
P0716	Torque Converter Turbine Speed Sensor	—
P0720	Output Speed Sensor Circuit	—
P0726	Engine Speed Input Circuit Range/Performance	—
P0731	Gear 1 Incorrect Ratio	—
P0732	Gear 2 Incorrect Ratio	—
P0733	Gear 3 Incorrect Ratio	—
P0734	Gear 4 Incorrect Ratio	—
P0741	Torque Converter Clutch Circuit Performance or Stuck Off	—
P0743	Torque Converter Clutch Circuit Electrical	—
P0748	Pressure Control Solenoid “A” Electrical	—
P0753	Shift Solenoid “A” Electrical	—
P0758	Shift Solenoid “B” Electrical	—
P0771	Low Clutch Timing Solenoid	—
P0778	Pressure Control Solenoid “B” Electrical	—
P0785	Shift/Timing Solenoid	—
P0851	Neutral Switch Input Circuit Low	—
P0852	Neutral Switch Input Circuit High	—
P0864	TCM Communication Circuit Range/Performance	—
P0865	TCM Communication Circuit Low	—
P0866	TCM Communication Circuit High	—
P1086	Tumble Generated Valve Position Sensor 2 Circuit Low	—
P1087	Tumble Generated Valve Position Sensor 2 Circuit High	—
P1088	Tumble Generated Valve Position Sensor 1 Circuit Low	—
P1089	Tumble Generated Valve Position Sensor 1 Circuit High	—
P1091	Tumble Generated Valve System 1 (Valve Close)	—
P1093	Tumble Generated Valve System 2 (Valve Close)	—
P1094	Tumble Generated Valve Signal 1 Circuit Malfunction (Open)	—
P1095	Tumble Generated Valve Signal 1 Circuit Malfunction (Short)	—
P1096	Tumble Generated Valve Signal 2 Circuit Malfunction (Open)	—
P1097	Tumble Generated Valve Signal 2 Circuit Malfunction (Short)	—
P1110	Atmospheric Pressure sensor circuit malfunction (Low input)	—
P1111	Atmospheric Pressure sensor circuit malfunction (High input)	—
P1134	A/F Sensor Micro-Computer Problem	—
P1152	O_2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	—
P1153	O_2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	—
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	—
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	—
P1446	Fuel Tank Sensor Control Valve Circuit Low	—
P1447	Fuel Tank Sensor Control Valve Circuit High	—
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	—
P1518	Starter Switch Circuit Low Input	—
P1544	Exhaust Gas Temperature Too High	—
P1560	Back-up Voltage Circuit Malfunction	—
P1700	Throttle Position Sensor	—

DTC	Item	Condition
P1711	Engine Torque Control Signal 1 Circuit Malfunction	—
P1712	Engine Torque Control Signal 2 Circuit Malfunction	—

1. PREPARATION FOR THE INSPECTION MODE

1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)] and the battery voltage is 12 V or more.
2) Raise the vehicle using a garage jack and place on safety stands or drive the vehicle onto free rollers.

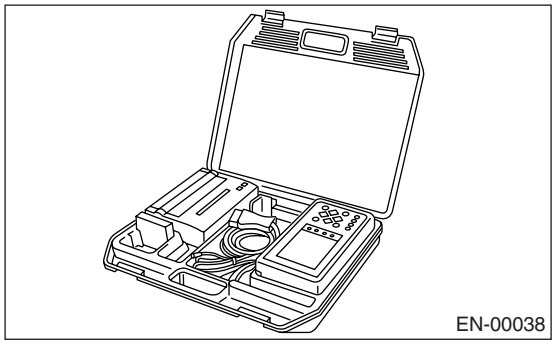
WARNING:
• Before raising the vehicle, ensure the parking brake is applied.
• Do not use a pantograph jack in place of a safety stand.
• Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
• Do not abruptly depress/release the clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
• In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.
• Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



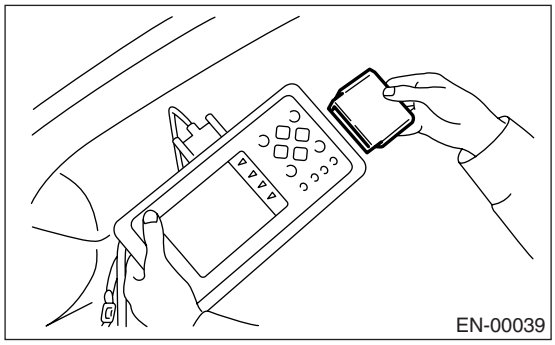
(A) Safety stand
(B) Free rollers

2. SUBARU SELECT MONITOR

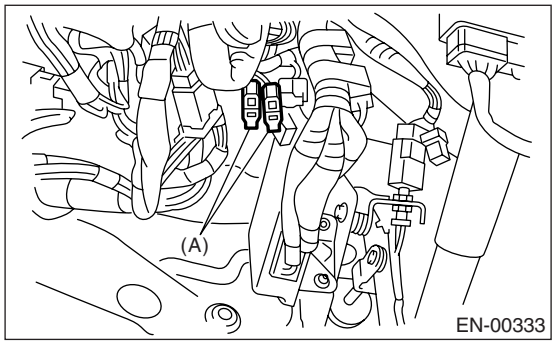
1) Warm up the engine.
2) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-8, PREPARATION TOOL, General Description.>



3) Connect the diagnosis cable to Subaru Select Monitor.
4) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-8, PREPARATION TOOL, General Description.>

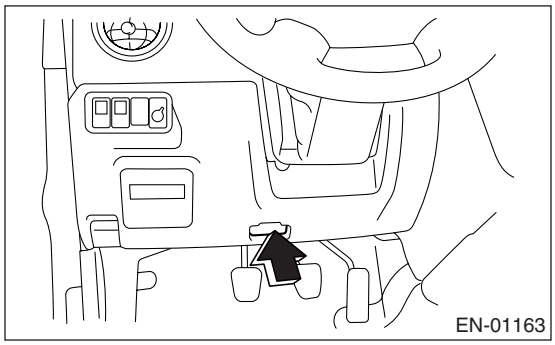


5) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



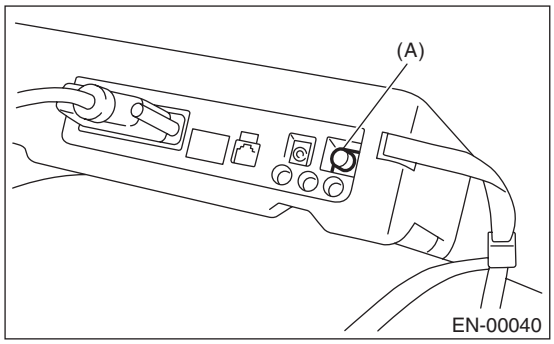
(A) Test mode connector

6) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.

7) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

8) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
9) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
10) Press the [YES] key after the information of engine type is displayed.
11) On the «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press the [YES] key.
12) When the "Perform Inspection (Dealer Check) Mode?" is shown on the display screen, press the [YES] key.
13) Perform subsequent procedures as instructed on the display screen.

- If trouble still remains in the memory, the corresponding DTC appears on the display screen.

NOTE:

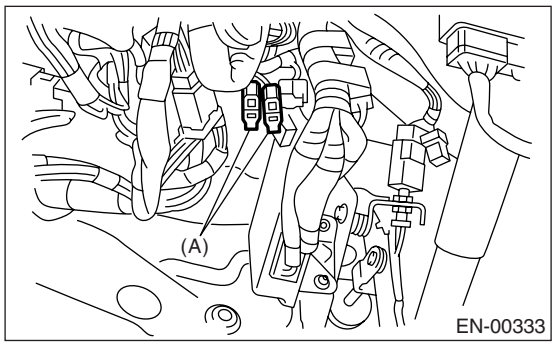
- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning the DTC, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>

- Release the parking brake.
- The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

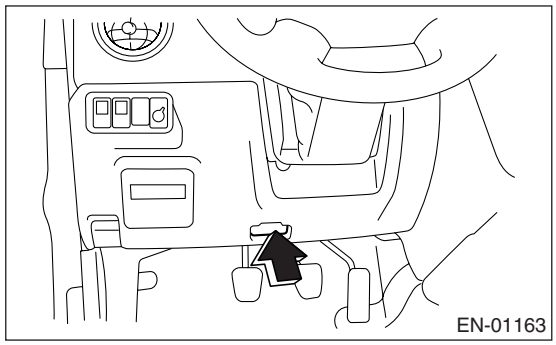
3. OBD-II GENERAL SCAN TOOL

1) Warm up the engine.
2) Connect the test mode connector (A) at the lower side of instrument panel (on the driver's side).



3) Connect the OBD-II general scan tool to its data link connector in the lower portion of instrument panel (on the driver's side).

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.



4) Start the engine.

NOTE:

- Ensure the select lever is placed in "P" range before starting. (AT model)
- Depress the clutch pedal when starting engine. (MT model)

5) Using the select lever or shift lever, turn the "P" position switch and "N" position switch to ON.
6) Depress the brake pedal to turn brake switch ON. (AT model)
7) Keep the engine speed in 2,500 — 3,000 rpm range for 40 seconds.

8) Place the select lever or shift lever in “D” range (AT model) or “1st” gear (MT model) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:
• On AWD model, release the parking brake.
• The speed difference between front and rear wheels may light ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

9) Using the OBD-II general scan tool, check for DTC and record the result(s).

NOTE:
• For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.
• For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>

13.Drive Cycle

A: PROCEDURE

There are three drive patterns for the trouble diagnosis. Driving in the specified pattern allows to diagnose malfunctioning items listed below. After the malfunctioning items listed below are repaired, always check whether they correctly resume their functions by driving in the required drive pattern.

1. PREPARATION FOR THE DRIVE CYCLE

1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12 V or more.
2) Separate the test mode connector.

NOTE:
• Except for the engine coolant temperature specified items at starting, the diagnosis is carried out after engine warm up.
• Carry out the diagnosis which is marked* on DTC twice, then, after finishing first diagnosis, stop the engine and do second time at the same condition.

2. AFTER RUNNING 20 MINUTES AT 80 KM/H (50 MPH), IDLE ENGINE FOR 1 MINUTE.

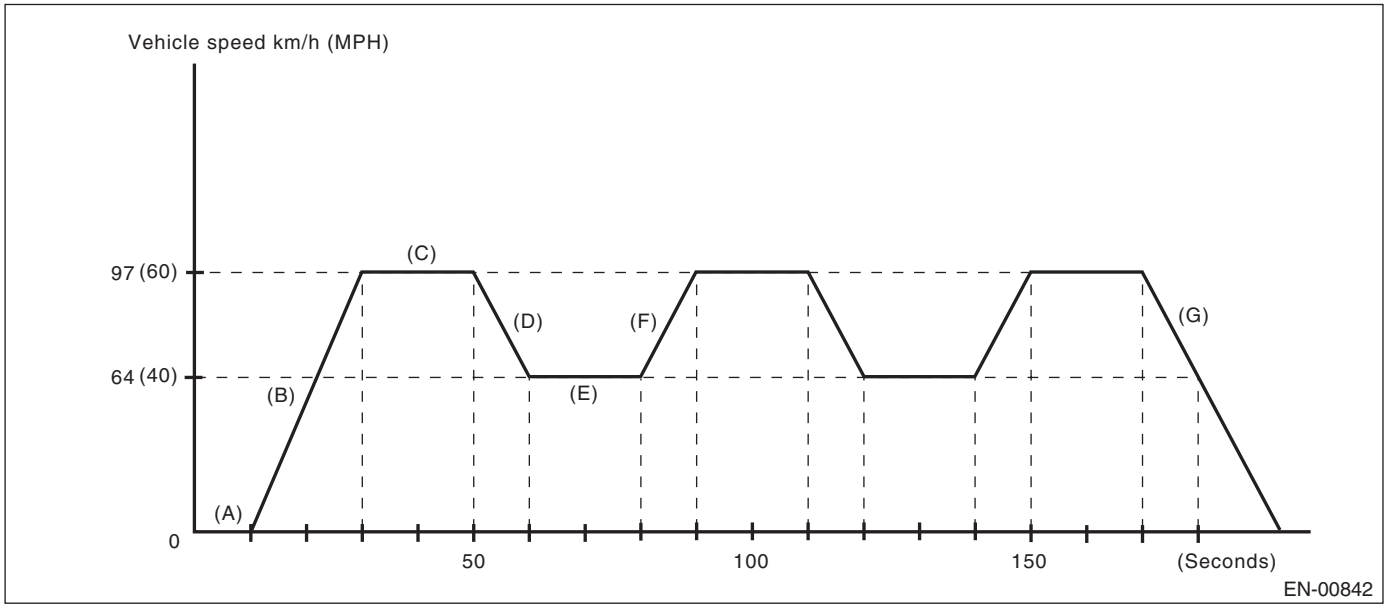
DTC	Item	Condition
*P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	Engine coolant temperature is less than 20°C (68°F) at engine start.
*P0128	Coolant Thermostat	Engine coolant temperature is less than 55°C (131°F) at engine start.
*P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	—
*P0181	Fuel Temperature Sensor A Performance Problem	—
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
*P0442	Evaporative Emission Control System Leak Detected (small leak)	—
*P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	—
*P0456	Evaporative Emission Control System Leak Detected (very small leak)	—
*P0457	Evaporative Emission Control System Leak Detected (fuel cap loose/off)	—
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	—
P0461	Fuel Level Sensor Circuit Range/Performance	—
P0692	Cooling Fan 1 Control Circuit High	—
P1312	Exhaust Gas Temperature Sensor Malfunction	Engine coolant temperature is less than 40°C (104°F) at engine start.
P1443	Vent Control Solenoid Valve Function Problem	—
*P1448	Fuel Tank Sensor Control Valve Range/Performance	—
*P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	—
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	—

3. IDLE FOR 10 MINUTES

NOTE:
Before the diagnosis, drive the vehicle at 10 km/h (6 MPH) or more.

DTC	Item	Condition
*P0111	Intake Air Temperature Sensor Range/Performance Problem	Engine coolant temperature is less than 30°C (86°F) at engine start.
P0171	System too Lean (Bank 1)	—
P0172	System too Rich (Bank 1)	—
*P0464	Fuel Level Sensor Circuit Intermittent	—
*P0483	Cooling Fan Rationality Check	—
*P0506	Idle Control System RPM Lower Than Expected	—
*P0507	Idle Control System RPM Higher Than Expected	—
P0546	Exhaust Gas Temperature Sensor Circuit High-Bank 1	—

4. DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN



(A) Idle engine for 10 seconds or more.
(B) Accelerate to 97 km/h (60 MPH) within 20 seconds.
(C) Drive vehicle at 97 km/h (60 MPH) for 20 seconds.
(D) Decelerate with fully closed throttle to 64 km/h (40 MPH).
(E) Drive vehicle at 64 km/h (40 MPH) for 20 seconds.
(F) Accelerate to 97 km/h (60 MPH) within 10 seconds.
(G) Stop vehicle with throttle fully closed.

DTC	Item	Condition
P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	—
*P0101	Mass or Volume Air Flow Circuit Range/Performance	—
*P0121	Throttle/Pedal Position Sensor/Switch “A” Circuit Range/Performance	—
*P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	—
P0244	Turbo/Supercharger Wastegate Solenoid “A” Range/Performance	—
P0246	Turbo/Supercharger Wastegate Solenoid “A” High	—
*P0301	Cylinder 1 Misfire Detected	In some cases, diagnosis may complete at once.
*P0302	Cylinder 2 Misfire Detected	In some cases, diagnosis may complete at once.
*P0303	Cylinder 3 Misfire Detected	In some cases, diagnosis may complete at once.
*P0304	Cylinder 4 Misfire Detected	In some cases, diagnosis may complete at once.
P1090	Tumble Generated Valve System 1 (Valve Open)	—
P1092	Tumble Generated Valve System 2 (Valve Open)	—
P1301	Misfire Detected (High Temperature Exhaust Gas)	—

14.Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
5) When the 'Done' and 'Turn Ignition Switch OFF' are shown on the display screen, turn the ignition switch to OFF, and then turn the Subaru Select Monitor to OFF.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {4. Diagnosis Code(s) Cleared} and press the [YES] key.
6) When the 'Clear Diagnostic Code?' is shown on the display screen, press the [YES] key.
7) Turn the ignition switch to OFF, and then turn the Subaru Select Monitor to OFF.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

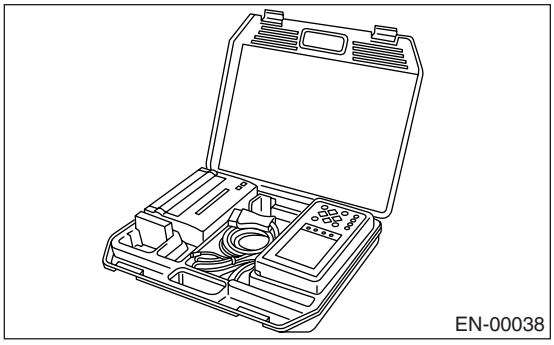
3. OBD-II GENERAL SCAN TOOL

For clear memory procedures using the OBD-II general scan tool, refer to the OBD-II General Scan Tool Instruction Manual.

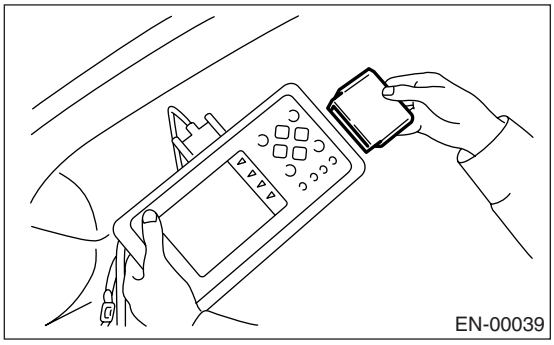
15. Compulsory Valve Operation Check Mode

A: OPERATION

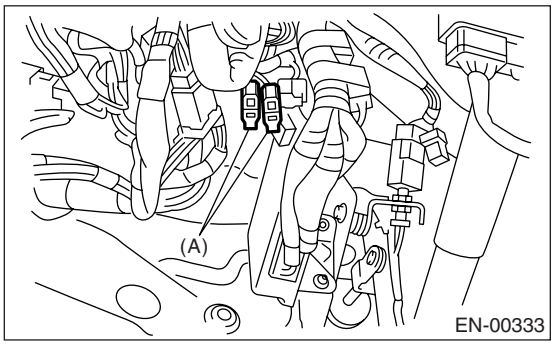
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-8, PREPARATION TOOL, General Description.>



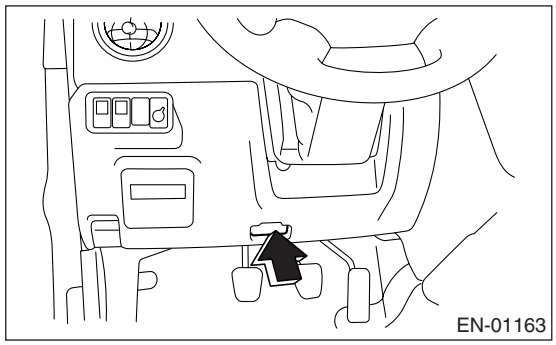
2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-8, PREPARATION TOOL, General Description.>



4) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).

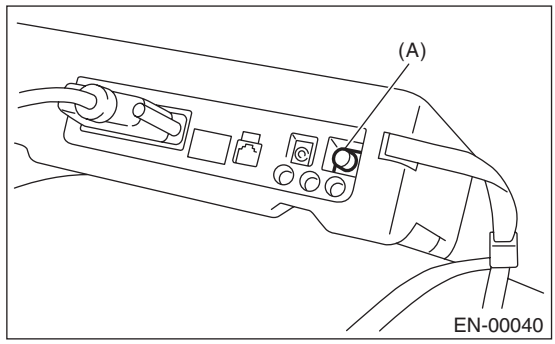


5) Connect the Subaru Select Monitor to data link connector located in the lower portion of instrument panel (on the driver's side).



CAUTION:
Do not connect scan tools except for the Subaru Select Monitor and OBD-II general scan tool.

6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

7) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
8) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
9) Press the [YES] key after the information of engine type is displayed.
10) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press the [YES] key.
11) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press the [YES] key.
12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press the [YES] key.
13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

• A list of support data is shown in the following table.

Contents	Display
Compulsory fuel pump relay operation check	Fuel Pump Relay
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Solenoid Valve
Compulsory pressure control solenoid valve operation check	PCV Solenoid Valve
Compulsory drain valve operation check	Vent. Control Solenoid Valve
Compulsory fuel tank sensor control valve operation check	Fuel Tank Sensor Control Valve

NOTE:
• The following parts will be displayed but not functional because they are not installed on the vehicle.

Display
EGR Solenoid Valve
ASV Solenoid Valve
FICD Solenoid
Pressure Switching Sol. 1
Pressure Switching Sol. 2
AAI Solenoid Valve
Turbocharger Wastegate Solenoid

• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

16.Malfunction Indicator Light

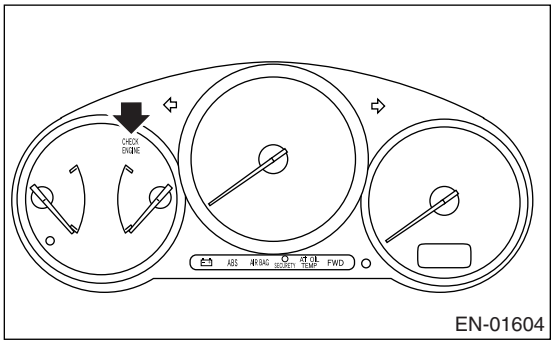
A: PROCEDURE

1. Activation of check malfunction indicator light. <Ref. to EN(H4DOTC)(diag)-50, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Check that the malfunction indicator light does not come on. <Ref. to EN(H4DOTC)(diag)-51, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON., Malfunction Indicator Light.>
↓
3. Check that the malfunction indicator light does not go off. <Ref. to EN(H4DOTC)(diag)-53, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF., Malfunction Indicator Light.>
↓
4. Check that the malfunction indicator light does not blink at a cycle of 3 Hz. <Ref. to EN(H4DOTC)(diag)-54, MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 HZ., Malfunction Indicator Light.>
↓
5. Check that the malfunction indicator light remains blinking at a cycle of 3 Hz. <Ref. to EN(H4DOTC)(diag)-56, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 HZ., Malfunction Indicator Light.>

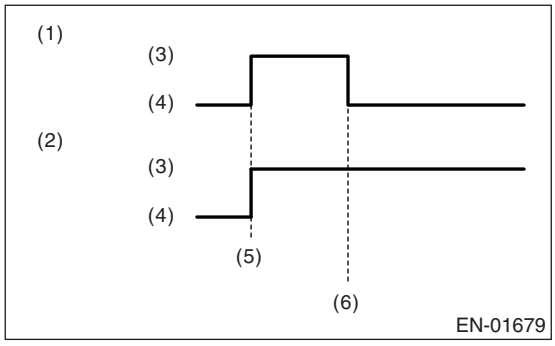
B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

1) When the ignition switch is turned to ON (engine off), the malfunction indicator light in the combination meter illuminates.

NOTE:
If the malfunction indicator light does not illuminate, perform diagnostics of the malfunction indicator light circuit or the combination meter circuit. <Ref. to EN(H4DOTC)(diag)-51, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON., Malfunction Indicator Light.>

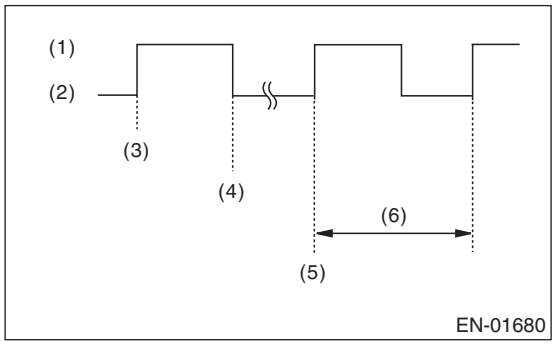


2) After starting the engine, the malfunction indicator light goes out. If it does not, either the engine or the emission control system is malfunctioning.



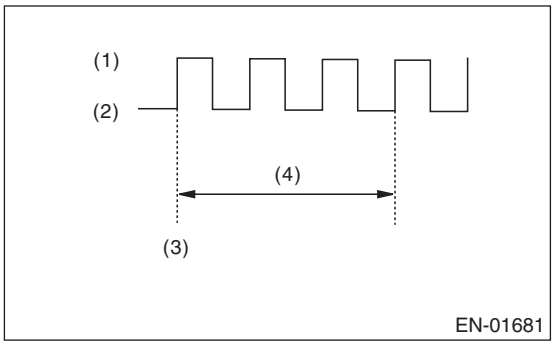
(1) No trouble
(2) Trouble occurs
(3) ON
(4) OFF
(5) Ignition switch ON
(6) Engine start

3) If the diagnosis system senses a misfire which could damage the catalyzer, the malfunction indicator light will blink at a cycle of 1 Hz.



(1) ON
(2) OFF
(3) Ignition switch ON
(4) Engine start
(5) Misfire start
(6) 1 second

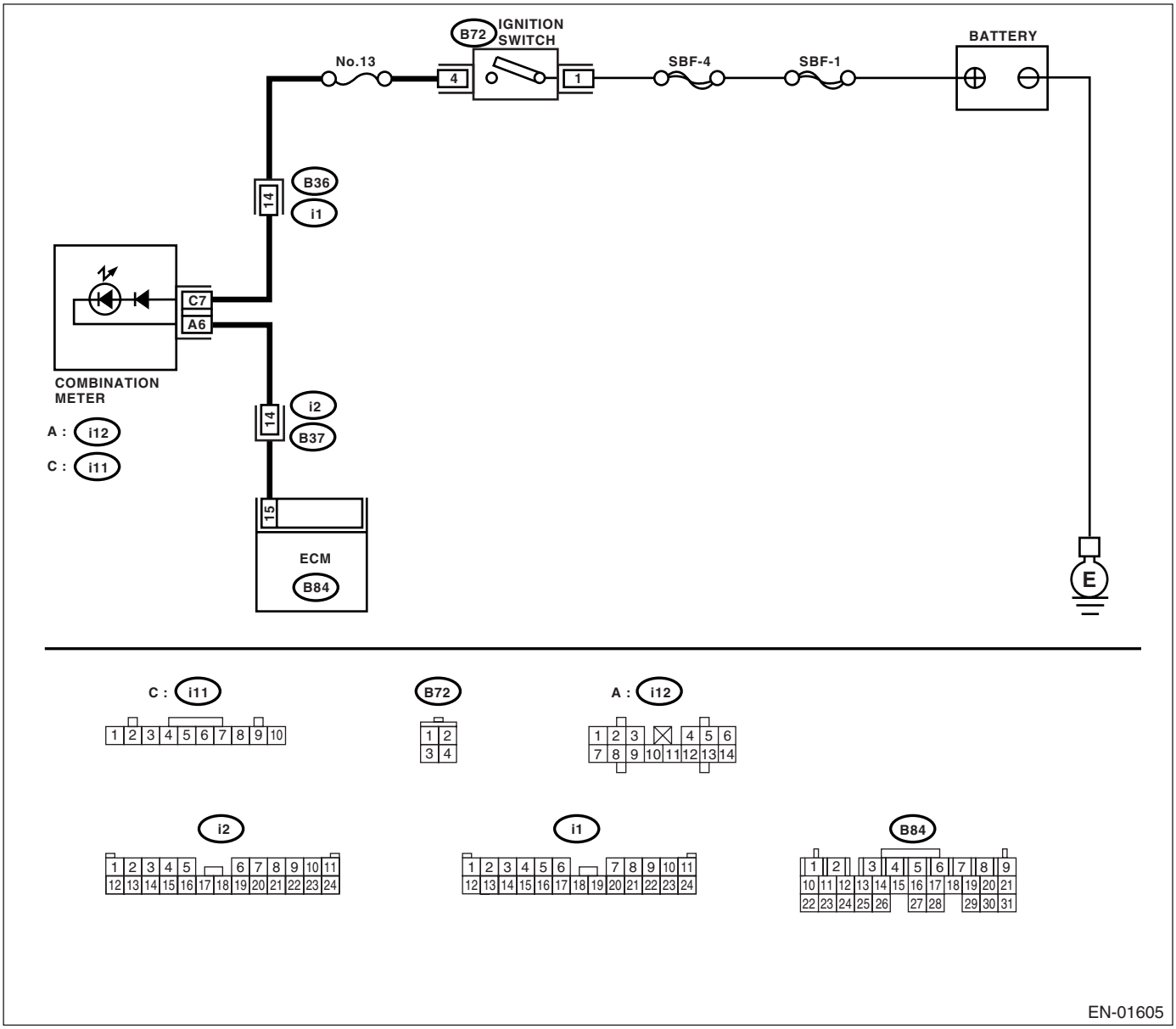
4) When the ignition switch is turned to ON (engine off) or to START with the test mode connector connected, the malfunction indicator light blinks at a cycle of 3 Hz.



(1) ON
(2) OFF
(3) Ignition switch ON
(4) 1 second

C: MALFUNCTION INDICATOR LIGHT DOES NOT COME ON.

DIAGNOSIS:
The malfunction indicator light circuit is shorted.
TROUBLE SYMPTOM:
When the ignition switch is turned to ON (engine OFF), malfunction indicator light does not come on.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 15 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **4.**	Go to step **2.**
2	**CHECK POOR CONTACT.**	Does the malfunction indicator light come on when shaking or pulling ECM connector and harness?	Repair the poor contact in ECM connector.	Go to step **3.**

	Step	Check	Yes	No
3	**CHECK ECM CONNECTOR.**	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Repair the connection of ECM connector.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-10, Combination Meter Assembly.> 3) Disconnect the connector from ECM and combination meter. 4) Measure the resistance of harness between ECM and combination meter connector. ***Connector & terminal*** ***(B84) No. 15 — (i11) No. 6:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector
5	**CHECK POOR CONTACT.** Check poor contact in combination meter connector.	Is there poor contact in combination meter connector?	Repair the poor contact in combination meter connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i12) No. 7 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Replace the combination meter circuit board. <Ref. to IDI-10, Combination Meter Assembly.>	Check the following and repair if necessary. NOTE: • Blown out fuse (No. 13) • Open or short circuit in harness between fuse (No. 13) and battery terminal • Poor contact in ignition switch connector

D: MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF.

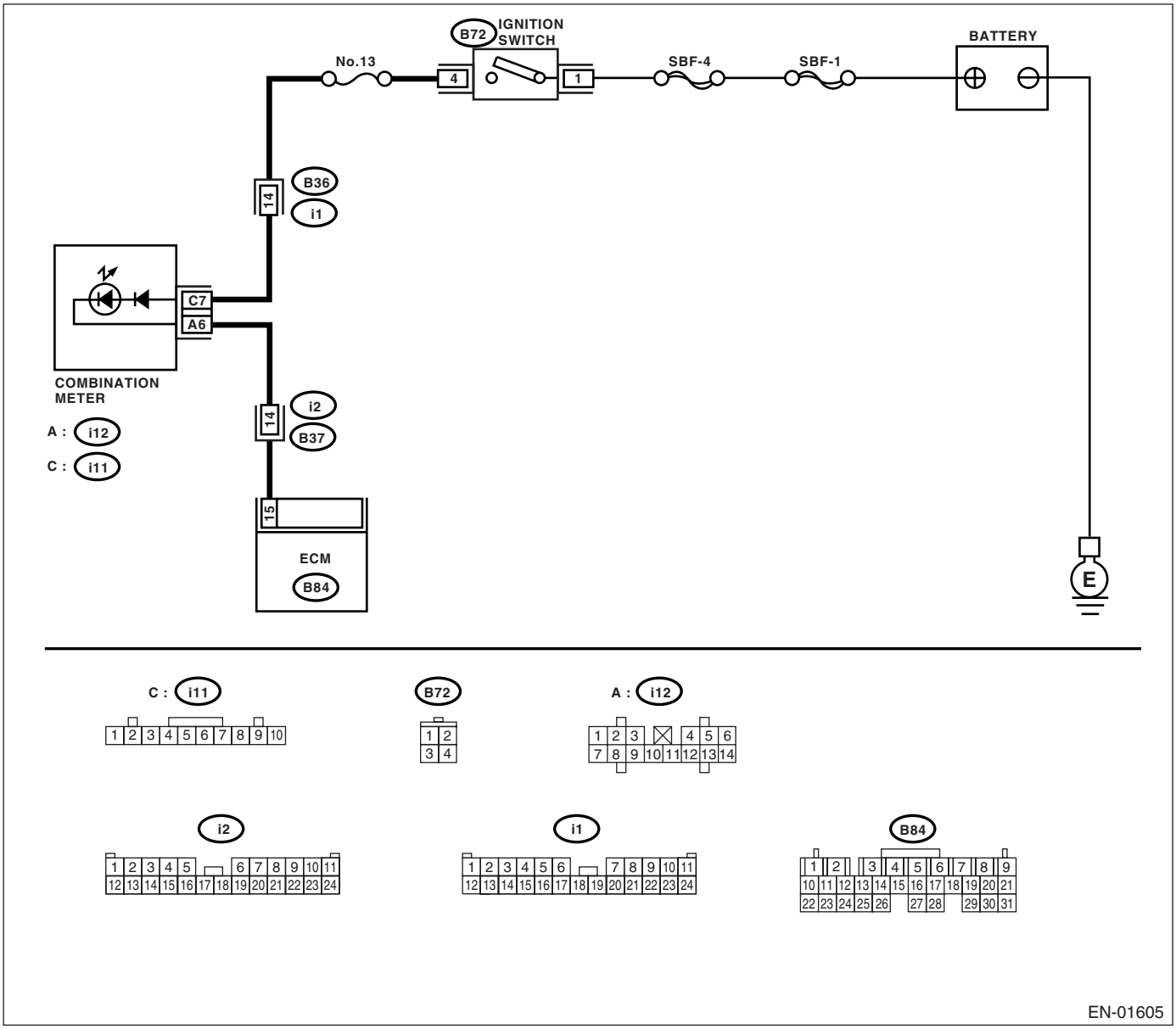
DIAGNOSIS:

The malfunction indicator light circuit is shorted.

TROUBLE SYMPTOM:

Although malfunction indicator light comes on when engine runs, but DTC is not shown on Subaru Select Monitor or OBD-II general scan tool display.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light come on?	Repair the short circuit in harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>

E: MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 Hz.

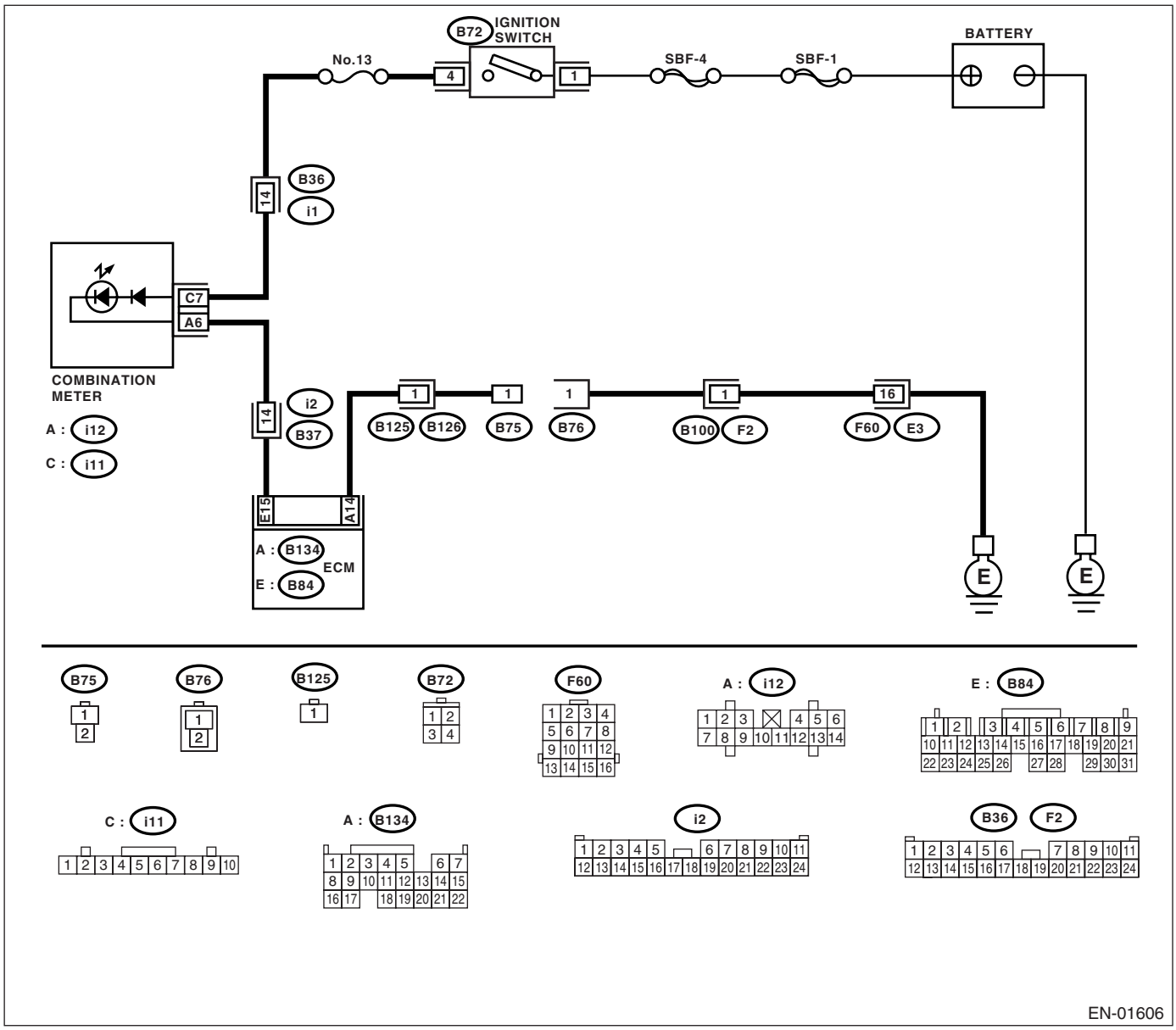
DIAGNOSIS:

- The malfunction indicator light circuit is open or shorted.
- Test mode connector circuit is open.

TROUBLE SYMPTOM:

During inspection mode, malfunction indicator light does not blink at a cycle of 3 Hz.

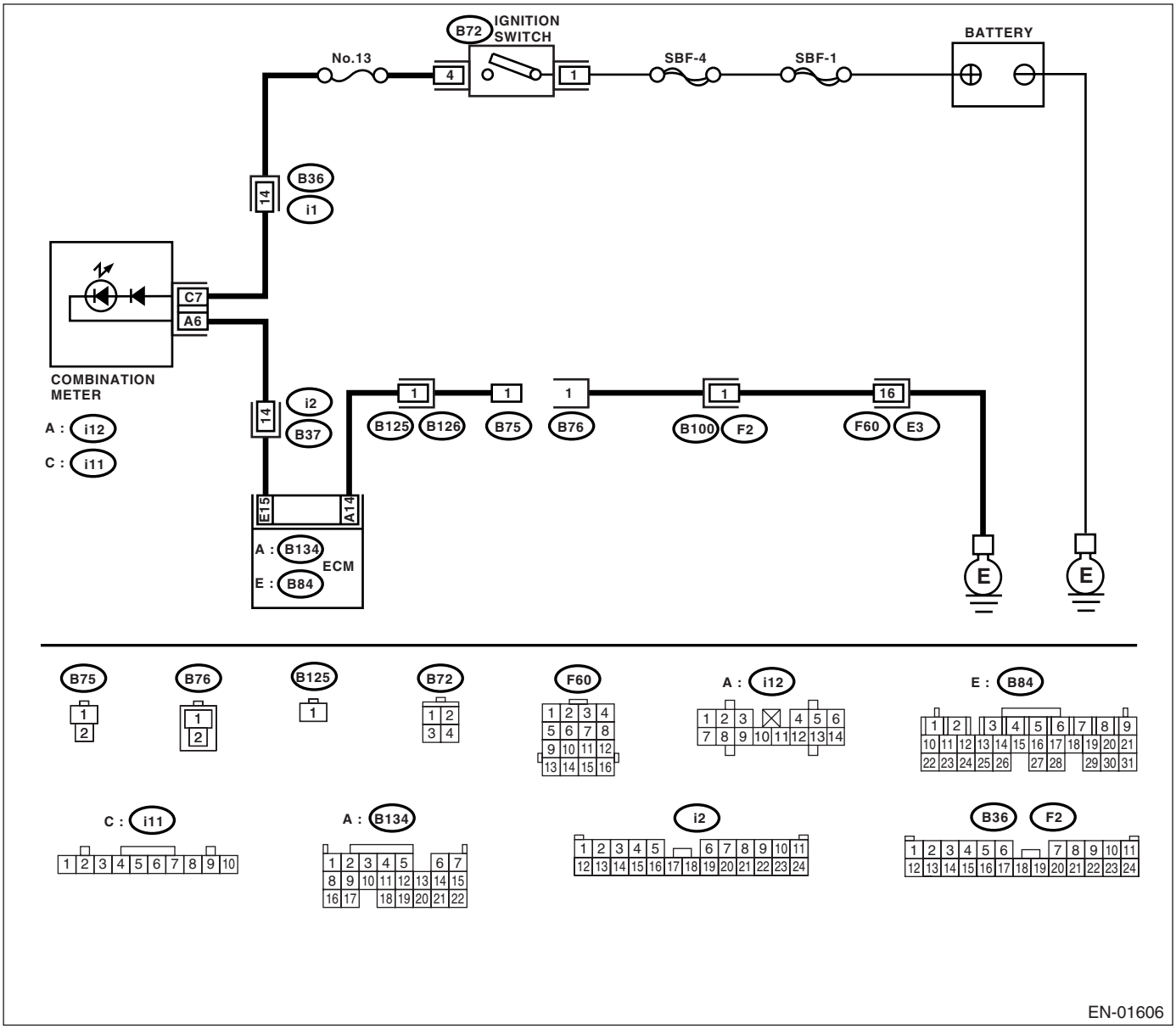
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Disconnect the test mode connector. 3) Turn the ignition switch to ON. (engine OFF)	Does the malfunction indicator light come on?	Go to step **2.**	Repair the malfunction indicator light circuit. <Ref. to EN(H4DOTC)(diag)-51, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON., Malfunction Indicator Light.>
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light come on?	Repair the ground short circuit in harness between combination meter and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between test mode connector and chassis ground. ***Connector & terminal*** ***(B76) No. 1 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between test mode connector and chassis ground
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.** 1) Connect the test mode connector. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between ECM and test mode connector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>

F: MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 Hz.

DIAGNOSIS:
Test mode connector circuit is shorted.
TROUBLE SYMPTOM:
Malfunction indicator light blinks at a cycle of 3 Hz when ignition switch is turned to ON.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK TEST MODE CONNECTOR.** 1) Disconnect the test mode connector. 2) Turn the ignition switch to ON.	Does the malfunction indicator light blink?	Go to step **2.**	System is in good order. NOTE: Malfunction indicator light blinks at a cycle of 3 Hz when test mode connector is connected.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 14 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the short circuit in harness between ECM and test mode connector.	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>

17.Diagnostics for Engine Starting Failure

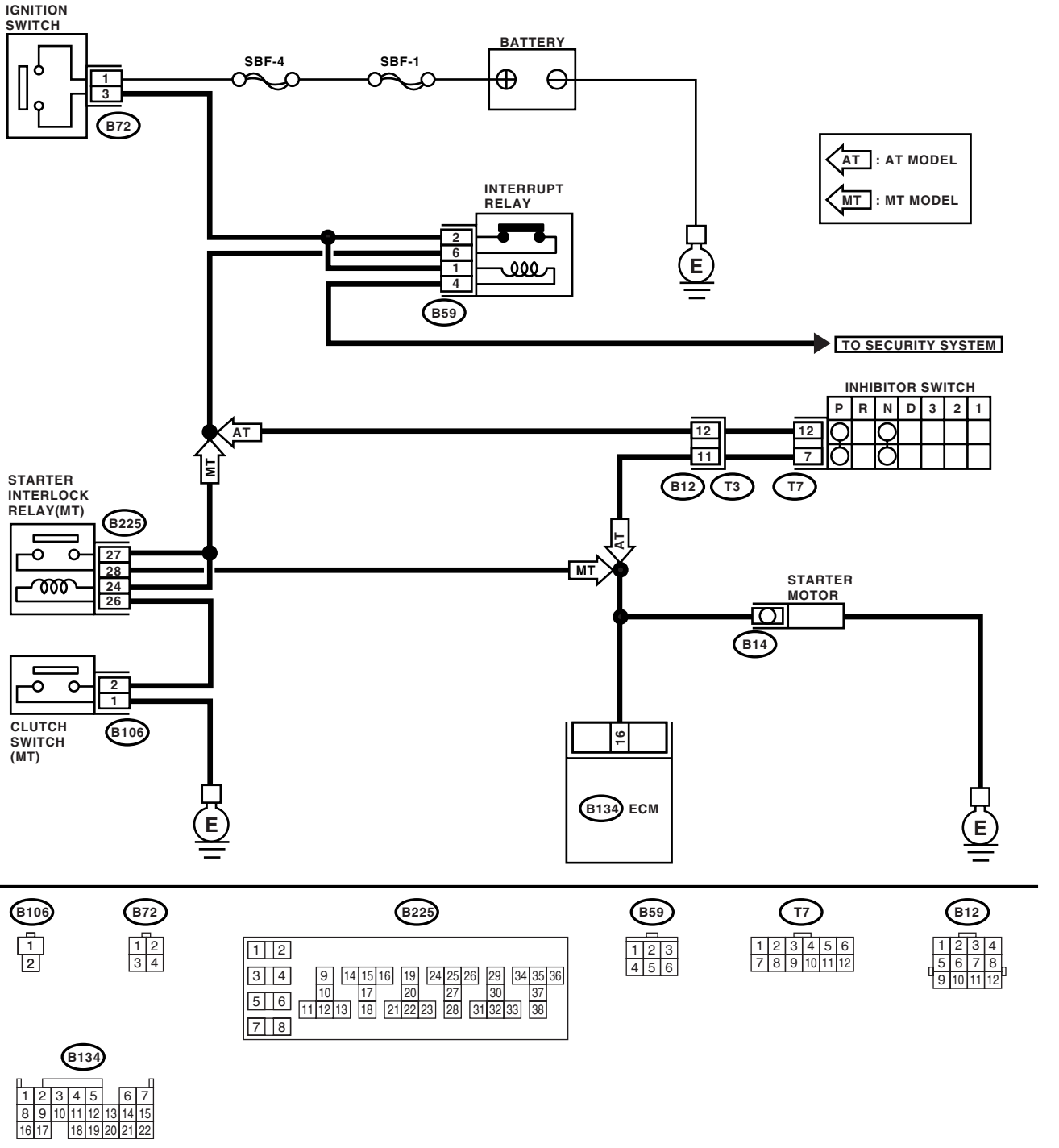
A: PROCEDURE

1. Inspection of starter motor circuit. <Ref. to EN(H4DOTC)(diag)-59, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN(H4DOTC)(diag)-62, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ignition control system. <Ref. to EN(H4DOTC)(diag)-65, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of fuel pump circuit. <Ref. to EN(H4DOTC)(diag)-68, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel injector circuit. <Ref. to EN(H4DOTC)(diag)-69, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

B: STARTER MOTOR CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



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Diagnostics for Engine Starting Failure

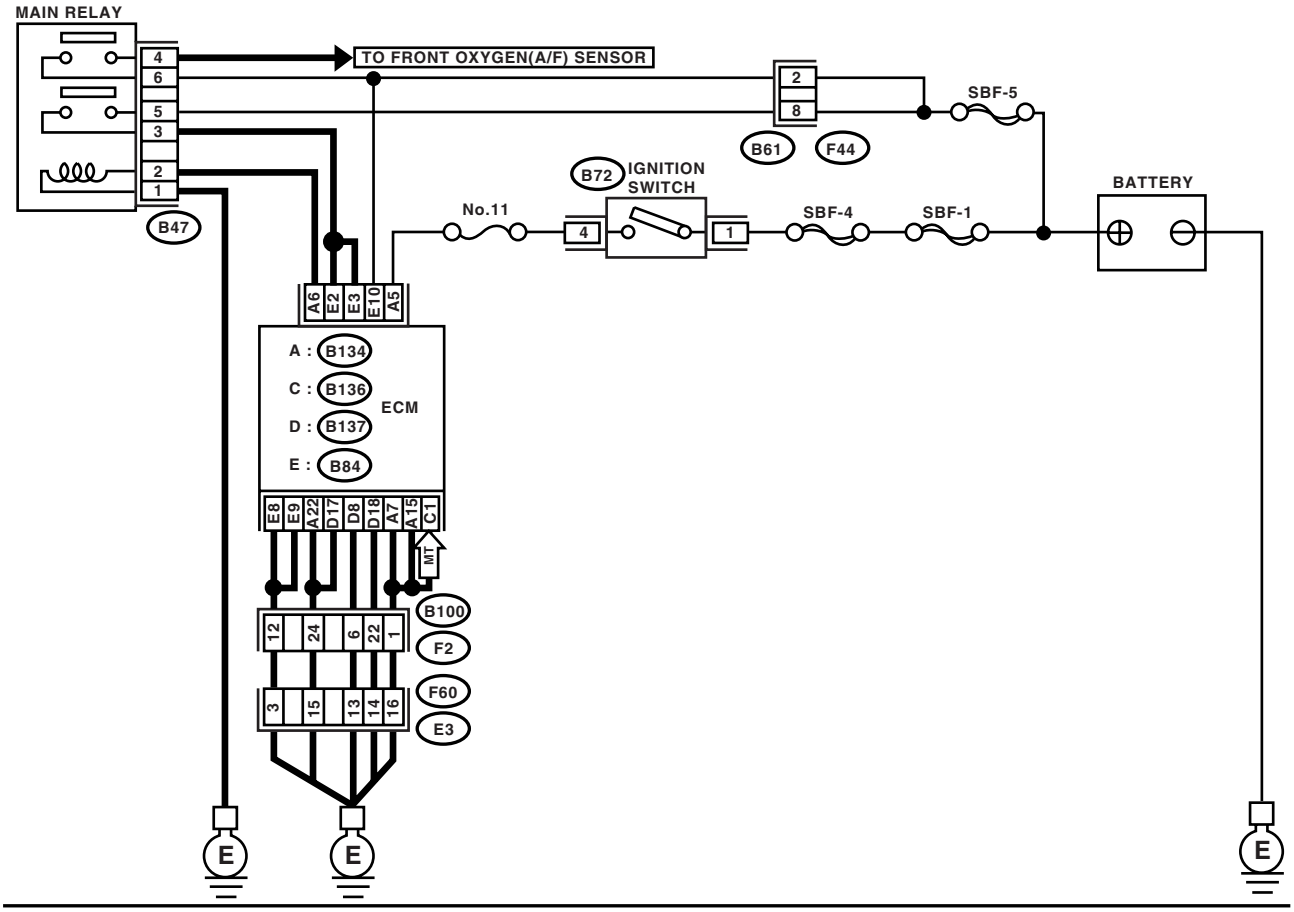
	Step	Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.**	Does the starter motor operate?	Go to step **2.**	Go to step **3.**
2	**CHECK DTC.**	Is the DTC displayed? <Ref. to EN(H4DOTC)(diag)-38, OPERATION, Read Diagnostic Trouble Code (DTC).>	Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Repair the poor contact in ECM connector.
3	**CHECK INPUT SIGNAL FOR STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Turn the ignition switch to START. 4) Measure the power supply voltage between starter motor connector terminal and engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (−):*** NOTE: • On AT model, move the select lever to “P” or “N” range. • On MT model, depress the clutch pedal.	Is the voltage more than 10 V?	Go to step **4.**	Go to step **5.**
4	**CHECK GROUND CIRCUIT OF STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the terminal from starter motor. 3) Measure the resistance of ground cable between ground cable terminal and engine ground.	Is the resistance less than 5 Ω?	Check the starter motor. <Ref. to SC(H4SO)-7, Starter.>	Repair the open circuit of ground cable.
5	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1) Disconnect the connector from ignition switch. 2) Measure the power supply voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Check the following, repair if necessary. • Fuse is blown out. • Open circuit in harness between ignition switch and battery.
6	**CHECK IGNITION SWITCH.** 1) Disconnect the connector from ignition switch. 2) Measure the resistance between ignition switch terminals while turning ignition switch to START. ***Terminals*** ***No. 1 — No. 3:***	Is the resistance less than 5 Ω?	Go to step **7.**	Replace the ignition switch.
7	**CHECK TRANSMISSION TYPE.**	Is the transmission AT?	Go to step **8.**	Go to step **10.**

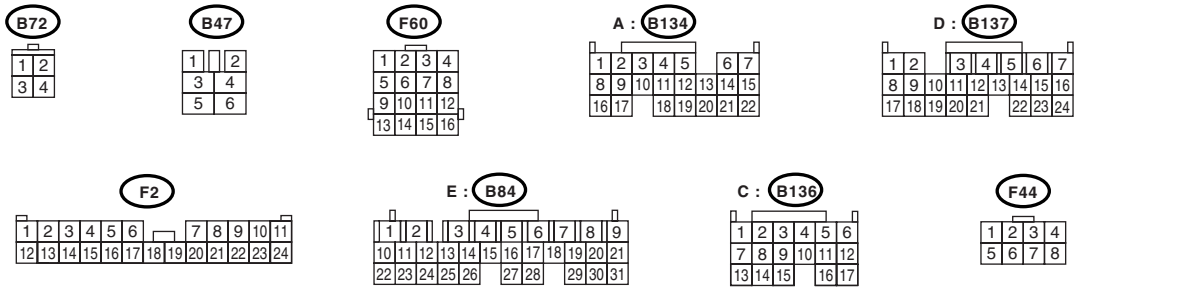
	Step	Check	Yes	No
8	**CHECK INPUT VOLTAGE OF INHIBITOR SWITCH.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from inhibitor switch. 3) Connect the connector to ignition switch. 4) Measure the input voltage between inhibitor switch connector terminal and engine ground while turning ignition switch to START. ***Connector & terminal*** ***(B12) No. 12 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **9.**	Repair open or short circuit to ground in harness between inhibitor switch and ignition switch. NOTE: Check security system (if equipped). <Ref. to SL-20, Security System.>
9	**CHECK INHIBITOR SWITCH.** 1) Move the selector lever to "P" or "N" range. 2) Measure the resistance between inhibitor switch terminals. ***Connector & terminal*** ***(T3) No. 11 — No. 12:***	Is the resistance less than 1 Ω?	Repair open or short circuit to ground in harness between inhibitor switch and starter motor.	Replace the inhibitor switch. <Ref. to 4AT-46, Inhibitor Switch.>
10	**CHECK INPUT VOLTAGE OF STARTER INTERLOCK RELAY.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from starter interlock relay. 3) Connect the connector to ignition switch. 4) Measure the input voltage between starter interlock relay connector and chassis ground while turning ignition switch to START. ***Connector & terminal*** ***(B104) No. 27 (+) — Chassis ground (−):*** ***(B104) No. 24 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **11.**	Repair open or short circuit to ground in harness between starter interlock relay and ignition switch. NOTE: Check security system (if equipped). <Ref. to SL-20, Security System.>
11	**CHECK STARTER INTERLOCK RELAY.** 1) Connect the battery to starter interlock relay terminals No. 26 and No. 24. 2) Measure the resistance between starter interlock relay terminals. ***Terminals*** ***No. 27 — No. 28:***	Is the resistance less than 1 Ω?	Go to step **12.**	Replace the starter interlock relay.
12	**CHECK GROUND CIRCUIT OF CLUTCH SWITCH.** 1) Disconnect the connector from clutch switch. 2) Measure the resistance between clutch switch connector and chassis ground. ***Connector & terminal*** ***(B106) No. 1 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **13.**	Repair open circuit of ground cable.
13	**CHECK CLUTCH SWITCH.** Measure the resistance between clutch switch terminals while depressing the clutch pedal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Go to step **12.**	Replace the clutch switch. <Ref. to CL-28, Clutch Switch.>
14	**CHECK CLUTCH SWITCH CIRCUIT.** 1) Connect the connector to clutch switch. 2) Measure the resistance between starter interlock relay connector and chassis ground while depressing the clutch pedal. ***Connector & terminal*** ***(B104) No. 26 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair short circuit to ground in harness between starter interlock relay and starter motor.	Repair open circuit in harness between starter interlock relay and clutch switch.

C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-01608

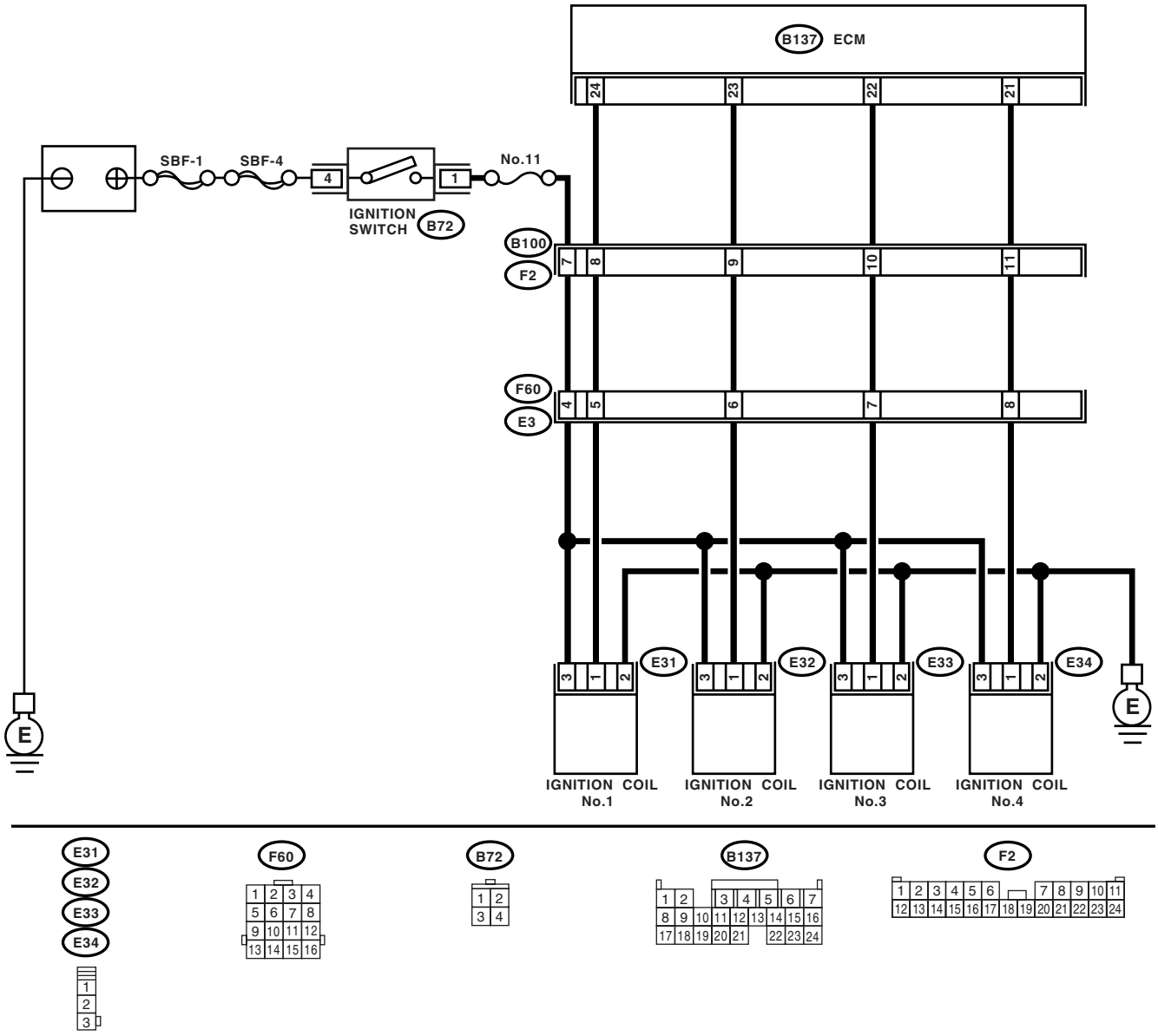
	Step	Check	Yes	No
1	**CHECK MAIN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 1 and No. 2. 4) Measure the resistance between main relay terminals. ***Terminals*** ***No. 3 — No. 5:*** ***No. 4 — No. 6:***	Is the resistance less than 10 Ω?	Go to step **2.**	Replace the main relay.
2	**CHECK GROUND CIRCUIT OF ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 7 — Chassis ground:*** ***(B134) No. 15 — Chassis ground:*** ***(B134) No. 22 — Chassis ground:*** ***(B136) No. 1 — Chassis ground:*** ***(B137) No. 8 — Chassis ground:*** ***(B137) No. 17 — Chassis ground:*** ***(B137) No. 18 — Chassis ground:*** ***(B84) No. 8 — Chassis ground:*** ***(B84) No. 9 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the open circuit in harness between ECM connector and engine grounding terminal.
3	**CHECK INPUT VOLTAGE OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 10 (+) — Chassis ground (−):*** ***(B134) No. 5 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair the open or ground short circuit of power supply circuit.
4	**CHECK HARNESS BETWEEN ECM AND MAIN RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit in harness between ECM connector and main relay connector, and then replace ECM.
5	**CHECK OUTPUT VOLTAGE FROM ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>
6	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Check the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **7.**	Repair the open circuit in harness between ECM connector and main relay connector.
7	**CHECK GROUND CIRCUIT OF MAIN RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 1 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **8.**	Repair the open circuit between main relay and chassis ground.

	Step	Check	Yes	No
8	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 5 (+) — Chassis ground (−):*** ***(B47) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **9.**	Repair the open or ground short circuit in harness of power supply circuit.
9	**CHECK INPUT VOLTAGE OF ECM.** 1) Connect the main relay connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 2 (+) — Chassis ground (−):*** ***(B84) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Check the ignition control system. <Ref. to EN(H4DOTC)(diag)-65, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair the open or ground short circuit in harness between ECM connector and main relay connector.

D: IGNITION CONTROL SYSTEM

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01294

Diagnostics for Engine Starting Failure

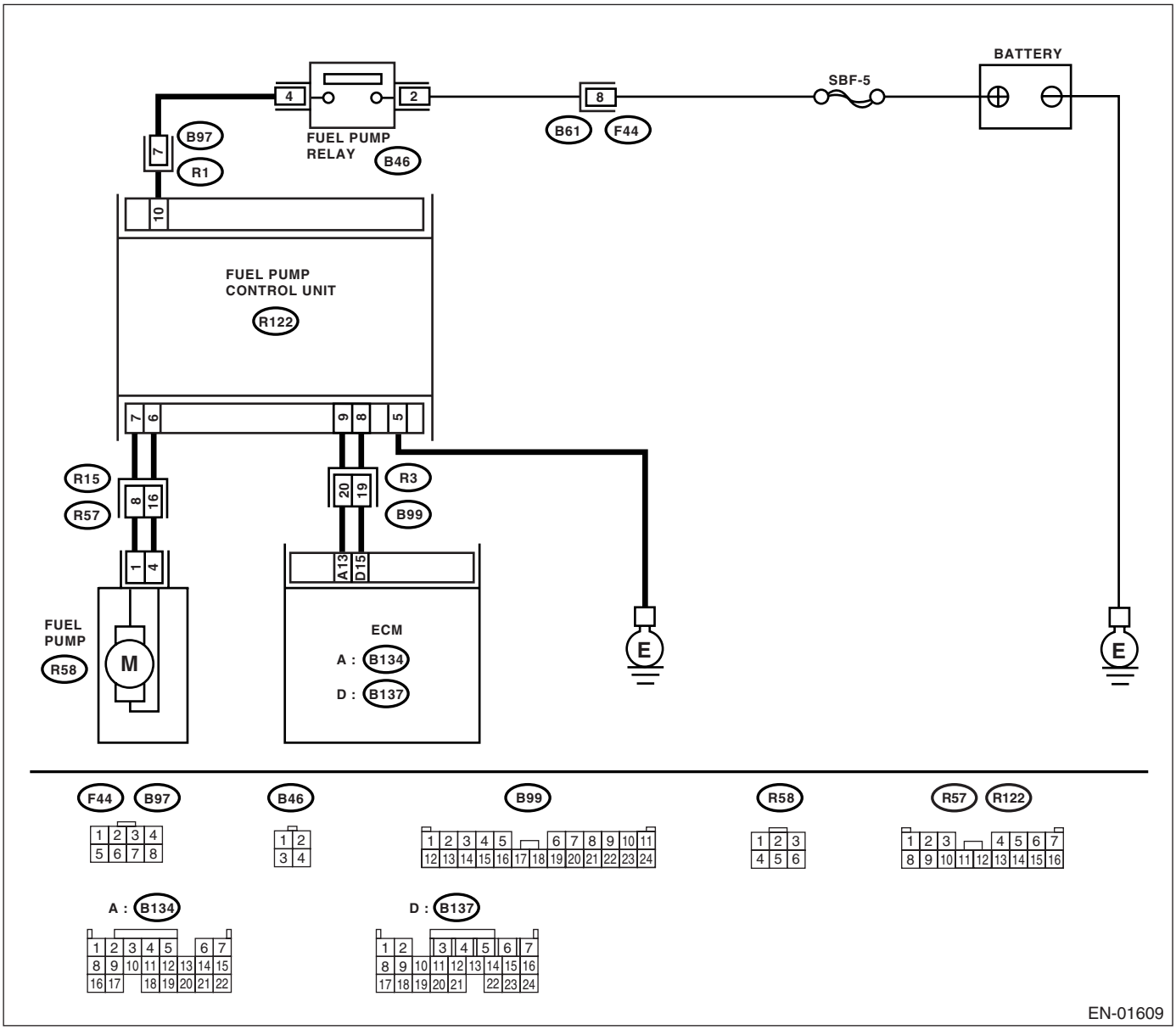
	Step	Check	Yes	No
1	**CHECK SPARK PLUG CONDITION.** 1) Remove the spark plug. <Ref. to IG(H4DOTC)-5, INSTALLATION, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(H4DOTC)-5, INSPECTION, Spark Plug.>	Is the spark plug's status OK?	Go to step **2.**	Replace the spark plug.
2	**CHECK IGNITION SYSTEM FOR SPARKS.** 1) Connect the spark plug to ignition coil. 2) Release the fuel pressure. <Ref. to FU(H4DOTC)-52, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.> 3) Contact the spark plug's thread portion on engine. 4) While opening the throttle valve fully, crank engine to check that spark occurs at each cylinder.	Does spark occur at each cylinder?	Check the fuel pump system. <Ref. to EN(H4DOTC)(diag)-68, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **3.**
3	**CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSEMBLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition coil & ignitor assembly. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between ignition coil & ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E31) No. 3 (+) — Engine ground (–):*** ***(E32) No. 3 (+) — Engine ground (–):*** ***(E33) No. 3 (+) — Engine ground (–):*** ***(E34) No. 3 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil & ignitor assembly, and ignition switch connector • Poor contact in coupling connectors
4	**CHECK HARNESS OF IGNITION COIL & IGNITOR ASSEMBLY GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ignition coil & ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E31) No. 2 — Engine ground:*** ***(E32) No. 2 — Engine ground:*** ***(E33) No. 2 — Engine ground:*** ***(E34) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil & ignitor assembly connector and engine grounding terminal
5	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from ignition coil & ignitor assembly. 4) Measure the resistance of harness between ECM and ignition coil & ignitor assembly connector. ***Connector & terminal*** ***(B137) No. 21 — (E34) No. 1:*** ***(B137) No. 22 — (E33) No. 1:*** ***(B137) No. 23 — (E32) No. 1:*** ***(B137) No. 24 — (E31) No. 1:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and ignition coil & ignitor assembly connector • Poor contact in coupling connector

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** Measure the resistance of harness between ECM and engine ground. ***Connector & terminal:*** ***(B137) No. 21 — Engine ground:*** ***(B137) No. 22 — Engine ground:*** ***(B137) No. 23 — Engine ground:*** ***(B137) No. 24 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.
7	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ignition coil and ignitor assembly.

E: FUEL PUMP CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

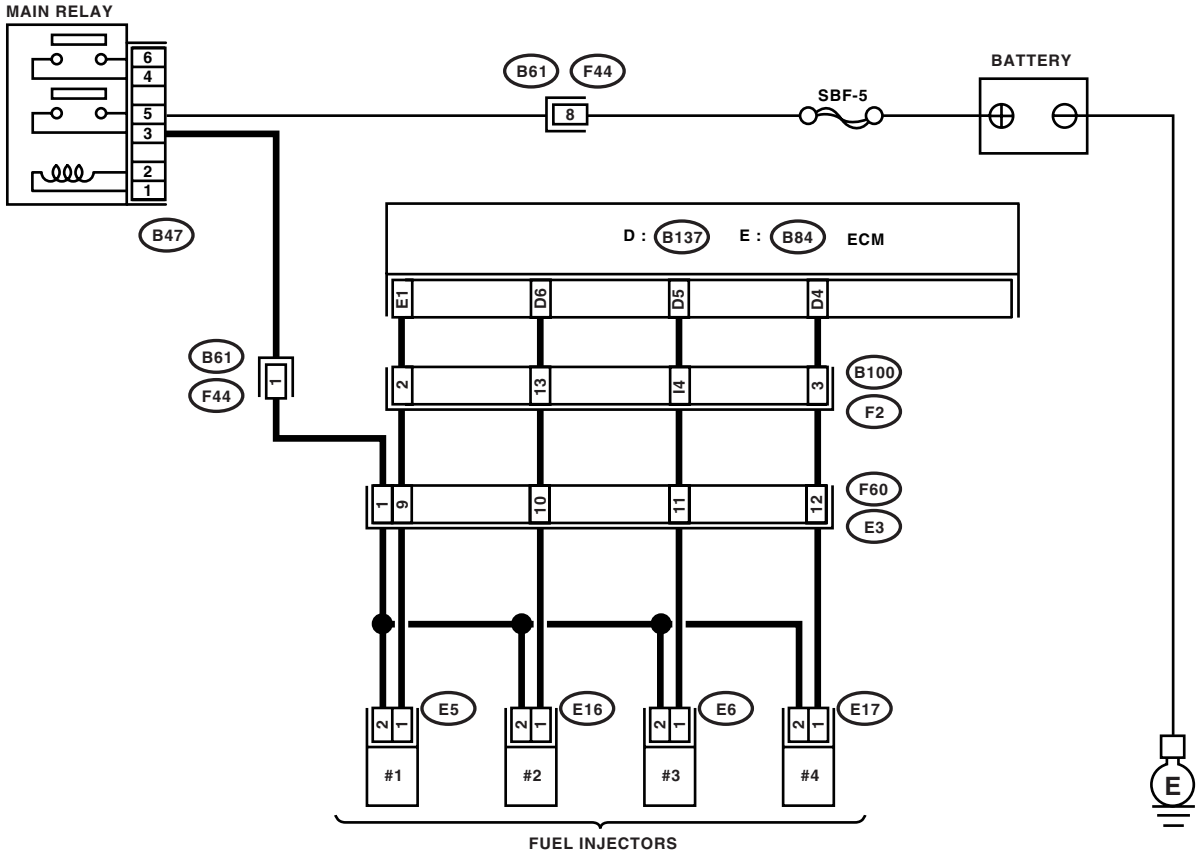


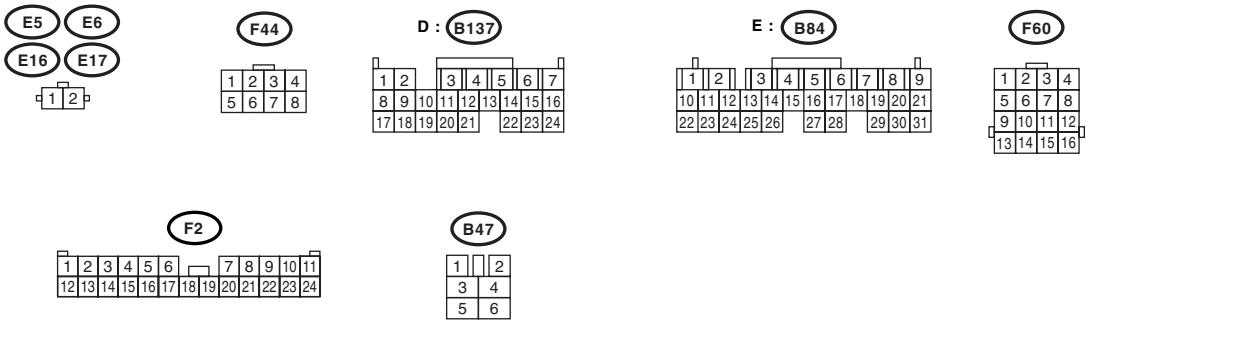
Step		Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that the fuel pump is in operation for 2 seconds when turning ignition switch to ON. NOTE: Fuel pump operation check can also be executed using the Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Does the fuel pump produce "operating" sound?	Check the fuel injector circuit. <Ref. to EN(H4DOTC)(diag)-69, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Display the DTC. <Ref. to EN(H4DOTC)(diag)-38, OPERATION, Read Diagnostic Trouble Code (DTC).>

F: FUEL INJECTOR CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-01297

Diagnostics for Engine Starting Failure

	Step	Check	Yes	No
1	**CHECK OPERATION OF EACH FUEL INJECTOR.** While cranking the engine, check that each fuel injector emits “operating” sound. Use a sound scope or attach a screwdriver to injector for this check.	Does the fuel injector emit “operating” sound?	Check the fuel pressure. <Ref. to ME(H4DOTC)-27, INSPECTION, Fuel Pressure.>	Go to step **2.**
2	**CHECK POWER SUPPLY TO EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between the fuel injector terminal and engine ground. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector • Poor contact in fuel injector connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B84) No. 1 — (E5) No. 1:*** ***(B137) No. 6 — (E16) No. 1:*** ***(B137) No. 5 — (E6) No. 1:*** ***(B137) No. 4 — (E6) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B84) No. 1 — Chassis ground:*** ***(B137) No. 6 — Chassis ground:*** ***(B137) No. 5 — Chassis ground:*** ***(B137) No. 4 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair the ground short circuit in harness between ECM and fuel injector connector.	Go to step **5.**
5	**CHECK EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between each fuel injector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **6.**	Replace the faulty fuel injector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Inspection using “General Diagnostic Table”. <Ref. to EN(H4DOTC)(diag)-340, INSPECTION, General Diagnostic Table.>

18.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Index
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-78, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-80, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-83, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-85, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-88, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-90, DTC P0068 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-92, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-94, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to EN(H4DOTC)(diag)-97, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-99, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to EN(H4DOTC)(diag)-101, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0111	Intake Air Temperature Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-103, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-105, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake Air Temperature Circuit High Input	<Ref. to EN(H4DOTC)(diag)-107, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-110, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to EN(H4DOTC)(diag)-112, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0121	Throttle/Pedal Position Sensor/ Switch “A” Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-115, DTC P0121 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-117, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Item	Index
P0123	Throttle/Pedal Position Sensor/ Switch “A” Circuit High Input	<Ref. to EN(H4DOTC)(diag)-120, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to EN(H4DOTC)(diag)-122, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to EN(H4DOTC)(diag)-124, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0129	Atmospheric Pressure Sensor Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-125, DTC P0129 ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0130	O_2 Sensor Circuit (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-126, DTC P0130 O_2 SENSOR CIRCUIT (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-128, DTC P0133 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-129, DTC P0134 O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-130, DTC P0137 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-133, DTC P0138 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-136, DTC P0139 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System too Lean (Bank 1)	<Ref. to EN(H4DOTC)(diag)-137, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System too Rich (Bank 1)	<Ref. to EN(H4DOTC)(diag)-138, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-141, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0182	Fuel Temperature Sensor “A” Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-143, DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0183	Fuel Temperature Sensor “A” Circuit High Input	<Ref. to EN(H4DOTC)(diag)-145, DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0230	Fuel Pump Primary Circuit	<Ref. to EN(H4DOTC)(diag)-148, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0244	Turbo/Super Charger Wastegate Solenoid “A” Range/Performance	<Ref. to EN(H4DOTC)(diag)-151, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0245	Turbo/Super Charger Wastegate Solenoid “A” Low	<Ref. to EN(H4DOTC)(diag)-153, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0246	Turbo/Super Charger Wastegate Solenoid “A” High	<Ref. to EN(H4DOTC)(diag)-155, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 misfire detected	<Ref. to EN(H4DOTC)(diag)-157, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P0302	Cylinder 2 misfire detected	<Ref. to EN(H4DOTC)(diag)-157, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 misfire detected	<Ref. to EN(H4DOTC)(diag)-157, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 misfire detected	<Ref. to EN(H4DOTC)(diag)-157, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)(diag)-162, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)(diag)-164, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to EN(H4DOTC)(diag)-166, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-168, DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)(diag)-170, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0341	Camshaft Position Sensor “A” Circuit Range/Performance (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)(diag)-172, DTC P0341 CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(H4DOTC)(diag)-175, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0442	Evaporative Emission Control System Leak Detected (small leak)	<Ref. to EN(H4DOTC)(diag)-177, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to EN(H4DOTC)(diag)-181, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to EN(H4DOTC)(diag)-184, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	<Ref. to EN(H4DOTC)(diag)-186, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to EN(H4DOTC)(diag)-188, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to EN(H4DOTC)(diag)-191, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0456	Evaporative Emission Control System Leak Detected (very small leak)	<Ref. to EN(H4DOTC)(diag)-194, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0457	Evaporative Emission Control System Leak Detected (fuel cap loose/off)	<Ref. to EN(H4DOTC)(diag)-198, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to EN(H4DOTC)(diag)-202, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to EN(H4DOTC)(diag)-204, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Item	Index
P0461	Fuel Level Sensor Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-206, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel Level Sensor Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-208, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0463	Fuel Level Sensor Circuit High Input	<Ref. to EN(H4DOTC)(diag)-212, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to EN(H4DOTC)(diag)-215, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling Fan Rationality Check	<Ref. to EN(H4DOTC)(diag)-218, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-221, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0503	Vehicle Speed Sensor Intermittent/ Erratic/High	<Ref. to EN(H4DOTC)(diag)-223, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle Control System RPM Lower Than Expected	<Ref. to EN(H4DOTC)(diag)-225, DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0507	Idle Control System RPM Higher Than Expected	<Ref. to EN(H4DOTC)(diag)-227, DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0508	Idle Control System Circuit Low	<Ref. to EN(H4DOTC)(diag)-229, DTC P0508 IDLE CONTROL SYSTEM CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0509	Idle Control System Circuit High	<Ref. to EN(H4DOTC)(diag)-231, DTC P0509 IDLE CONTROL SYSTEM CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter Request Circuit	<Ref. to EN(H4DOTC)(diag)-232, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to EN(H4DOTC)(diag)-235, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0545	Exhaust Gas Temperature Sensor Circuit Low-Bank 1	<Ref. to EN(H4DOTC)(diag)-237, DTC P0545 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW-BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0546	Exhaust Gas Temperature Sensor Circuit High-Bank 1	<Ref. to EN(H4DOTC)(diag)-239, DTC P0546 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH-BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0565	Cruise Control On Signal	<Ref. to EN(H4DOTC)(diag)-242, DTC P0565 CRUISE CONTROL ON SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(H4DOTC)(diag)-244, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to EN(H4DOTC)(diag)-246, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0692	Cooling Fan 1 Control Circuit High	<Ref. to EN(H4DOTC)(diag)-249, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0703	Torque Converter/Brake Switch “B” Circuit	<Ref. to EN(H4DOTC)(diag)-252, DTC P0703 TORQUE CONVERTER/ BRAKE SWITCH “B” CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P0705	Transmission Range Sensor Circuit (PRNDL Input)	<Ref. to EN(H4DOTC)(diag)-254, DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0710	Transmission Fluid Temperature Sensor Circuit	<Ref. to EN(H4DOTC)(diag)-254, DTC P0710 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0716	Torque Converter Turbine Speed Sensor	<Ref. to EN(H4DOTC)(diag)-254, DTC P0716 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0720	Output Speed Sensor Circuit	<Ref. to EN(H4DOTC)(diag)-254, DTC P0720 OUTPUT SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0726	Engine Speed Input Circuit Range/ Performance	<Ref. to EN(H4DOTC)(diag)-254, DTC P0726 ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0731	Gear 1 Incorrect Ratio	<Ref. to EN(H4DOTC)(diag)-254, DTC P0731 GEAR 1 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0732	Gear 2 Incorrect Ratio	<Ref. to EN(H4DOTC)(diag)-254, DTC P0732 GEAR 2 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0733	Gear 3 Incorrect Ratio	<Ref. to EN(H4DOTC)(diag)-254, DTC P0733 GEAR 3 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0734	Gear 4 Incorrect Ratio	<Ref. to EN(H4DOTC)(diag)-255, DTC P0734 GEAR 4 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0741	Torque Converter Clutch Circuit Performance or Stuck Off	<Ref. to EN(H4DOTC)(diag)-256, DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0743	Torque Converter Clutch Circuit Electrical	<Ref. to EN(H4DOTC)(diag)-258, DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0748	Pressure Control Solenoid “A” Electrical	<Ref. to EN(H4DOTC)(diag)-258, DTC P0748 PRESSURE CONTROL SOLENOID “A” ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0753	Shift Solenoid “A” Electrical	<Ref. to EN(H4DOTC)(diag)-258, DTC P0753 SHIFT SOLENOID “A” ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0758	Shift Solenoid “B” Electrical	<Ref. to EN(H4DOTC)(diag)-258, DTC P0758 SHIFT SOLENOID “B” ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0771	Low Clutch Timing Solenoid	<Ref. to EN(H4DOTC)(diag)-258, DTC P0771 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0778	Pressure Control Solenoid “B” Electrical	<Ref. to EN(H4DOTC)(diag)-258, DTC P0778 PRESSURECONTROL SOLENOID “B” ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0785	Shift/Timing Solenoid	<Ref. to EN(H4DOTC)(diag)-258, DTC P0785 SHIFT/TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Neutral Switch Input Circuit Low	<Ref. to EN(H4DOTC)(diag)-259, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(H4DOTC)(diag)-261, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Neutral Switch Input Circuit High	<Ref. to EN(H4DOTC)(diag)-263, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(H4DOTC)(diag)-266, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0864	TCM Communication Circuit Range/ Performance	<Ref. to EN(H4DOTC)(diag)-268, DTC P0864 TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0865	TCM Communication Circuit Low	<Ref. to EN(H4DOTC)(diag)-270, DTC P0865 TCM COMMUNICATION CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P0866	TCM Communication Circuit High	<Ref. to EN(H4DOTC)(diag)-272, DTC P0866 TCM COMMUNICATION CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1086	Tumble Generated Valve Position Sensor 2 Circuit Low	<Ref. to EN(H4DOTC)(diag)-274, DTC P1086 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1087	Tumble Generated Valve Position Sensor 2 Circuit High	<Ref. to EN(H4DOTC)(diag)-277, DTC P1087 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1088	Tumble Generated Valve Position Sensor 1 Circuit Low	<Ref. to EN(H4DOTC)(diag)-279, DTC P1088 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1089	Tumble Generated Valve Position Sensor 1 Circuit High	<Ref. to EN(H4DOTC)(diag)-282, DTC P1089 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1090	Tumble Generated Valve System 1 (Valve Open)	<Ref. to EN(H4DOTC)(diag)-284, DTC P1090 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1091	Tumble Generated Valve System 1 (Valve Close)	<Ref. to EN(H4DOTC)(diag)-285, DTC P1091 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1092	Tumble Generated Valve System 2 (Valve Open)	<Ref. to EN(H4DOTC)(diag)-286, DTC P1092 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1093	Tumble Generated Valve System 2 (Valve Close)	<Ref. to EN(H4DOTC)(diag)-287, DTC P1093 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1094	Tumble Generated Valve Signal 1 Circuit Malfunction (Open)	<Ref. to EN(H4DOTC)(diag)-288, DTC P1094 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1095	Tumble Generated Valve Signal 1 Circuit Malfunction (Short)	<Ref. to EN(H4DOTC)(diag)-290, DTC P1095 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1096	Tumble Generated Valve Signal 2 Circuit Malfunction (Open)	<Ref. to EN(H4DOTC)(diag)-292, DTC P1096 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1097	Tumble Generated Valve Signal 2 Circuit Malfunction (Short)	<Ref. to EN(H4DOTC)(diag)-294, DTC P1097 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1110	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)	<Ref. to EN(H4DOTC)(diag)-295, DTC P1110 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1111	Atmospheric Pressure Sensor Circuit Malfunction (High Input)	<Ref. to EN(H4DOTC)(diag)-296, DTC P1111 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1134	A/F Sensor Micro-Computer Problem	<Ref. to EN(H4DOTC)(diag)-297, DTC P1134 A/F SENSOR MICRO-COMPUTER PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1152	O_2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to EN(H4DOTC)(diag)-298, DTC P1152 O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1153	O_2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to EN(H4DOTC)(diag)-300, DTC P1153 O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1301	Misfire Detected (High Temperature Exhaust Gas)	<Ref. to EN(H4DOTC)(diag)-302, DTC P1301 MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P1312	Exhaust Gas Temperature Sensor Malfunction	<Ref. to EN(H4DOTC)(diag)-304, DTC P1312 EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to EN(H4DOTC)(diag)-306, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to EN(H4DOTC)(diag)-309, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to EN(H4DOTC)(diag)-311, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1446	Fuel Tank Sensor Control Valve Circuit Low	<Ref. to EN(H4DOTC)(diag)-313, DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1447	Fuel Tank Sensor Control Valve Circuit High	<Ref. to EN(H4DOTC)(diag)-316, DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1448	Fuel Tank Sensor Control Valve Range/Performance	<Ref. to EN(H4DOTC)(diag)-318, DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	<Ref. to EN(H4DOTC)(diag)-320, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter Switch Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-321, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1544	Exhaust Gas Temperature Too High	<Ref. to EN(H4DOTC)(diag)-324, DTC P1544 EXHAUST GAS TEMPERATURE TOO HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to EN(H4DOTC)(diag)-325, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1700	Throttle Position Sensor	<Ref. to EN(H4DOTC)(diag)-327, DTC P1700 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1711	Engine Torque Control Signal 1 Circuit Malfunction	<Ref. to EN(H4DOTC)(diag)-328, DTC P1711 ENGINE TORQUE CONTROL SIGNAL 1 CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1712	Engine Torque Control Signal 2 Circuit Malfunction	<Ref. to EN(H4DOTC)(diag)-330, DTC P1712 ENGINE TORQUE CONTROL SIGNAL 2 CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to EN(H4DOTC)(diag)-332, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to EN(H4DOTC)(diag)-336, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

19.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

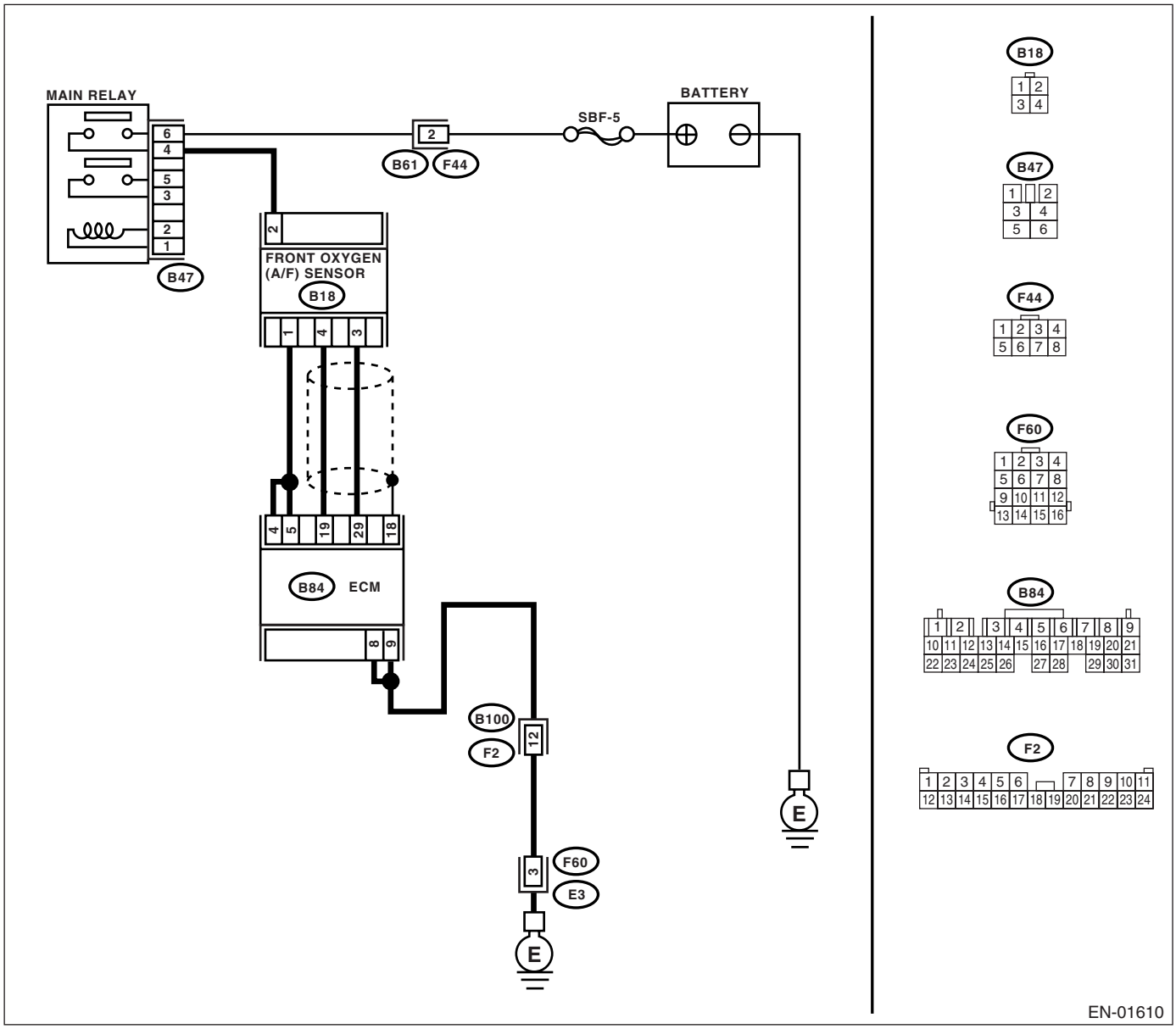
A: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-9, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start the engine and warm-up engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 4) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B84) No. 5 — (B18) No. 1:*** ***(B84) No. 4 — (B18) No. 1:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B84) No. 19 — (B18) No. 4:*** ***(B84) No. 29 — (B18) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between main relay and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B47) No. 4 — (B18) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance less than 5 Ω?	Go to step **5.**	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-43, Front Oxygen (A/F) Sensor.>
5	**CHECK POOR CONTACT.** Check the poor contact in ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair the poor contact in ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-43, Front Oxygen (A/F) Sensor.>

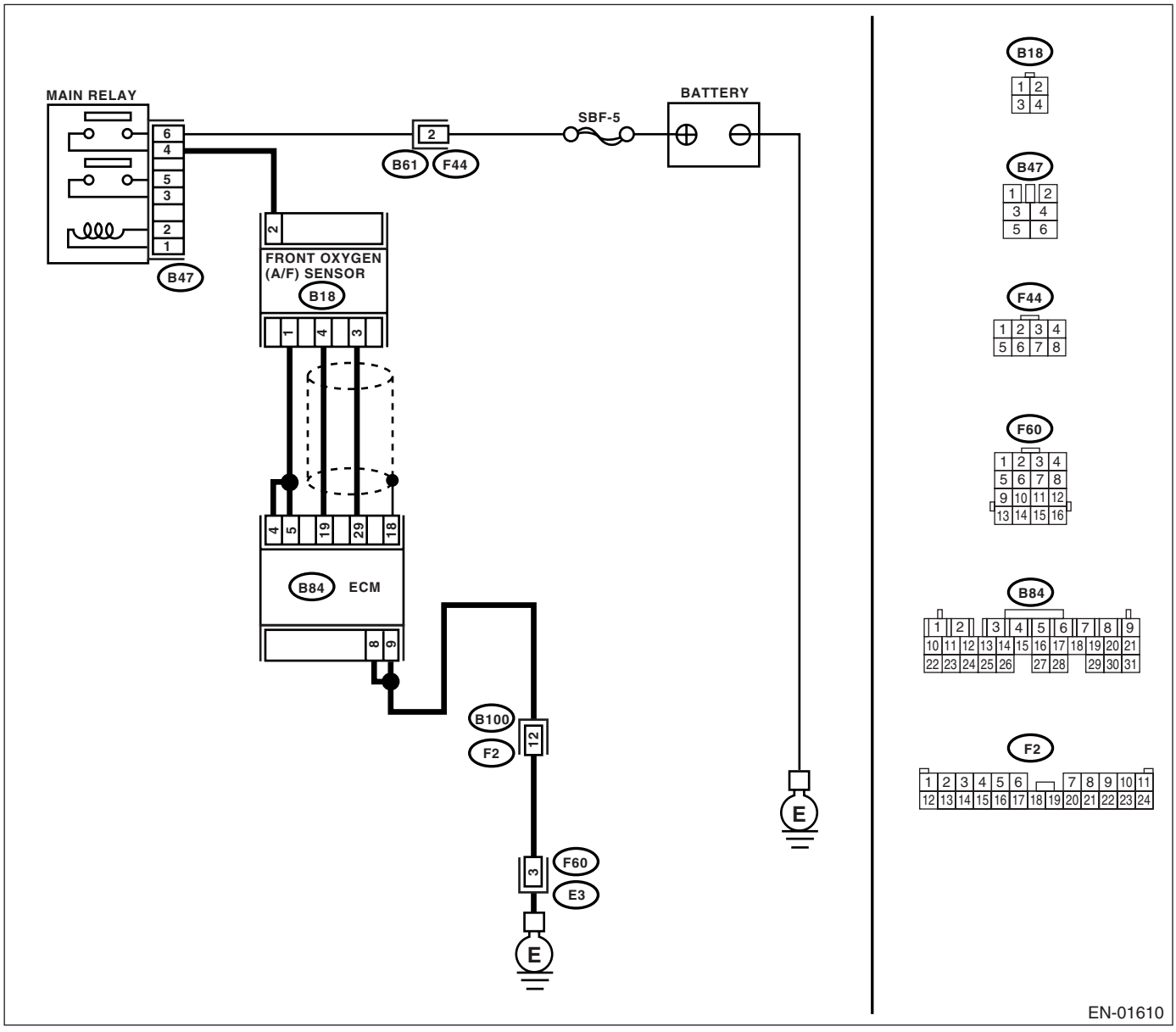
B: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-11, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & terminal*** ***(B18) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Repair the power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in main relay connector • Malfunction in main relay
2	**CHECK GROUND CIRCUIT OF ECM.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 8 — Chassis ground:*** ***(B84) No. 9 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground cable • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the current more than 0.2 A?	Repair the poor contact in connector. NOTE: In this case, repair the following: • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 4 (+) — Chassis ground (–):*** ***(B84) No. 5 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 4 (+) — Chassis ground (–):*** ***(B84) No. 5 (+) — Chassis ground (–):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance less than 10 Ω?	Repair the harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-43, Front Oxygen (A/F) Sensor.>

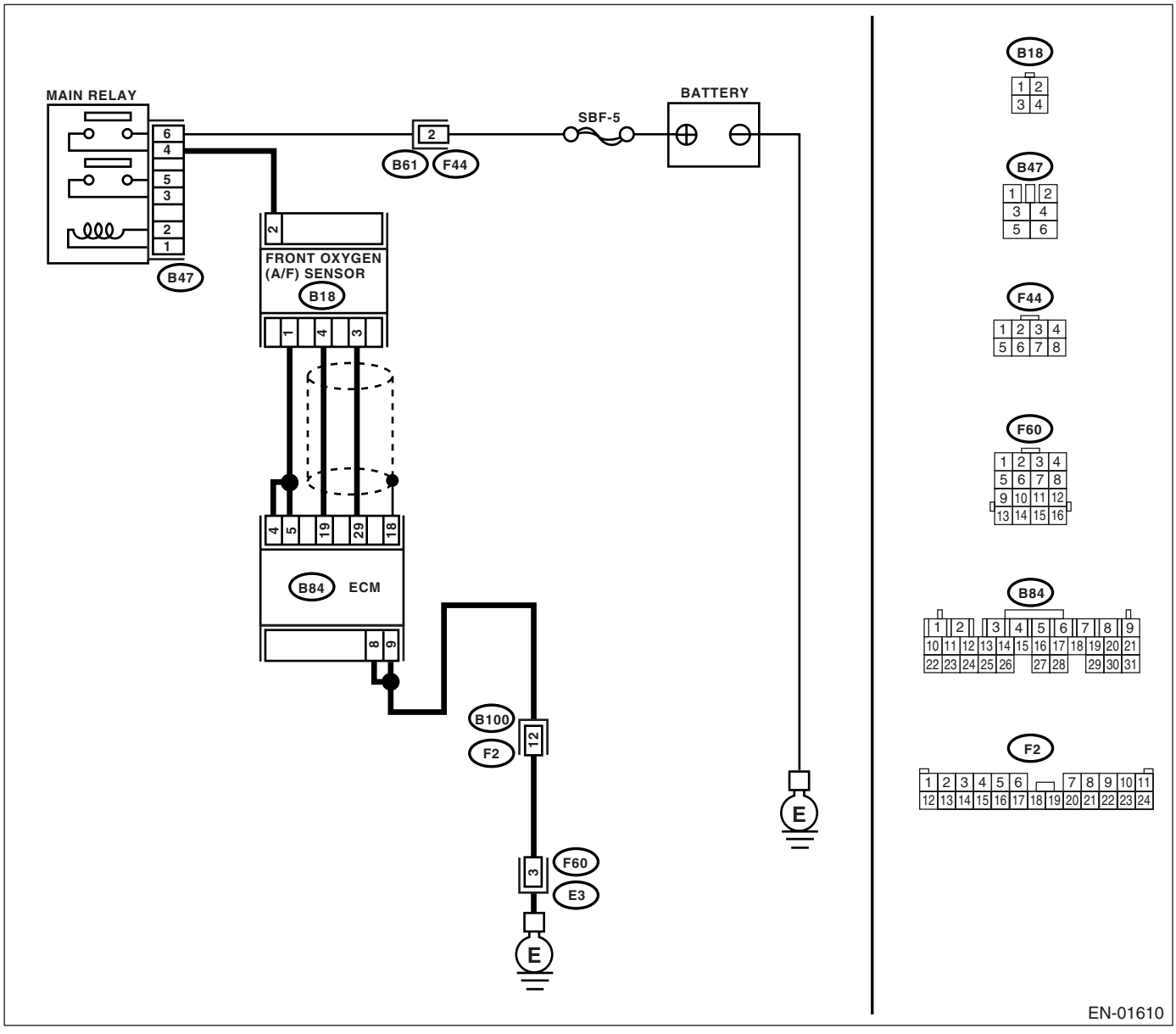
C: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-13, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 4 (+) — Chassis ground (–):*** ***(B84) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **3.**	Go to step **2.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.** 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the current more than 2.3 A?	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	END
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 4 (+) — Chassis ground (–):*** ***(B84) No. 5 (+) — Chassis ground (–):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

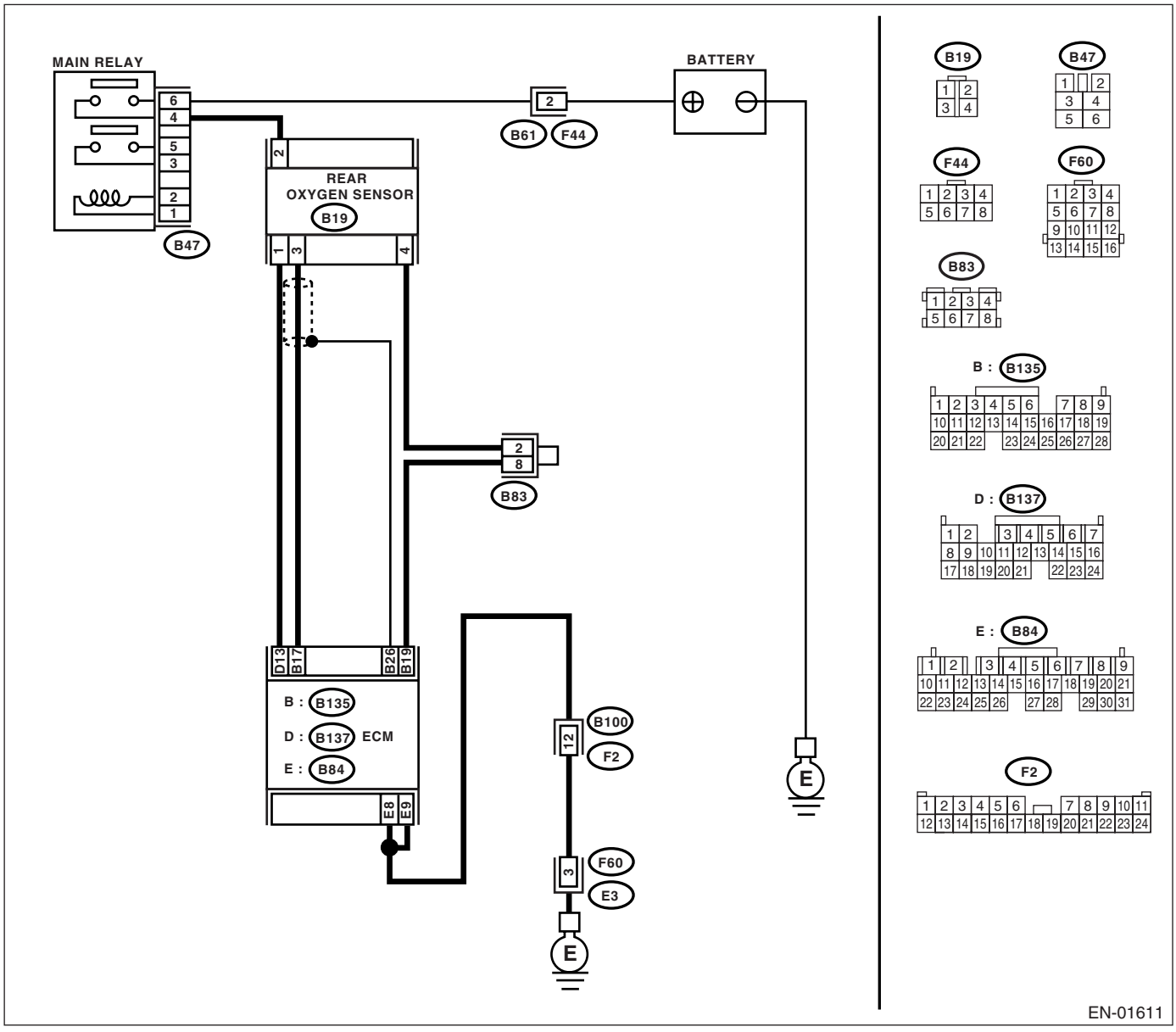
D: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-15, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 8 — Chassis ground:*** ***(B84) No. 9 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground cable • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the current more than 0.2 A?	Repair the connector. NOTE: In this case, repair the following: • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 13 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **6.**	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 13 (+) — Chassis ground (–):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 13 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and engine ground or chassis ground. ***Connector & terminal*** ***(B19) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **7.**	Repair the power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in main relay connector • Malfunction in main relay
7	**CHECK REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between rear oxygen sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 30 Ω?	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-45, Rear Oxygen Sensor.>

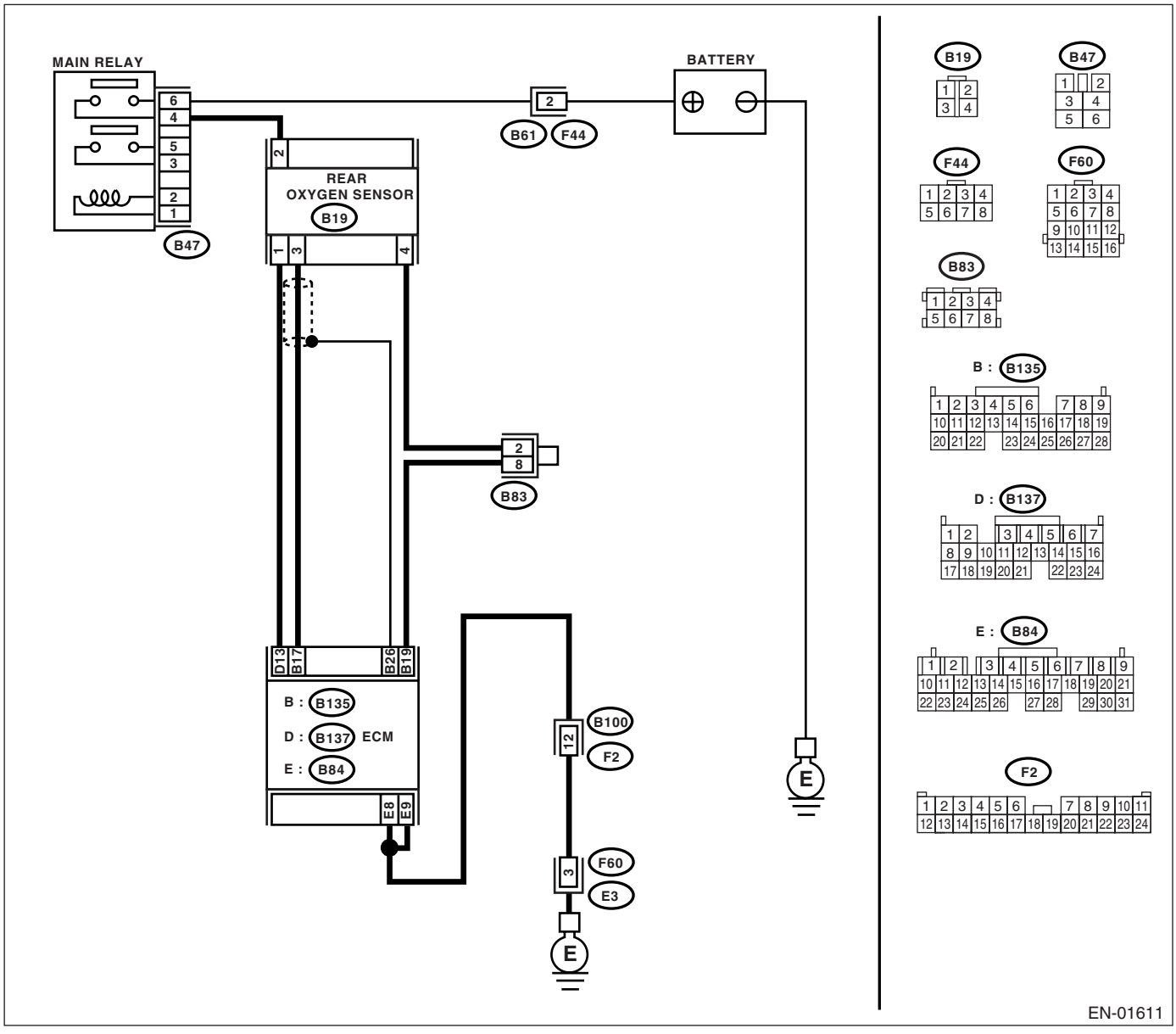
E: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-17, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 13 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK CURRENT DATA.** 1) Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. 2) Turn the ignition switch to ON. 3) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the current more than 7 A?	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	END
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	END

F: DTC P0068 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-19, DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

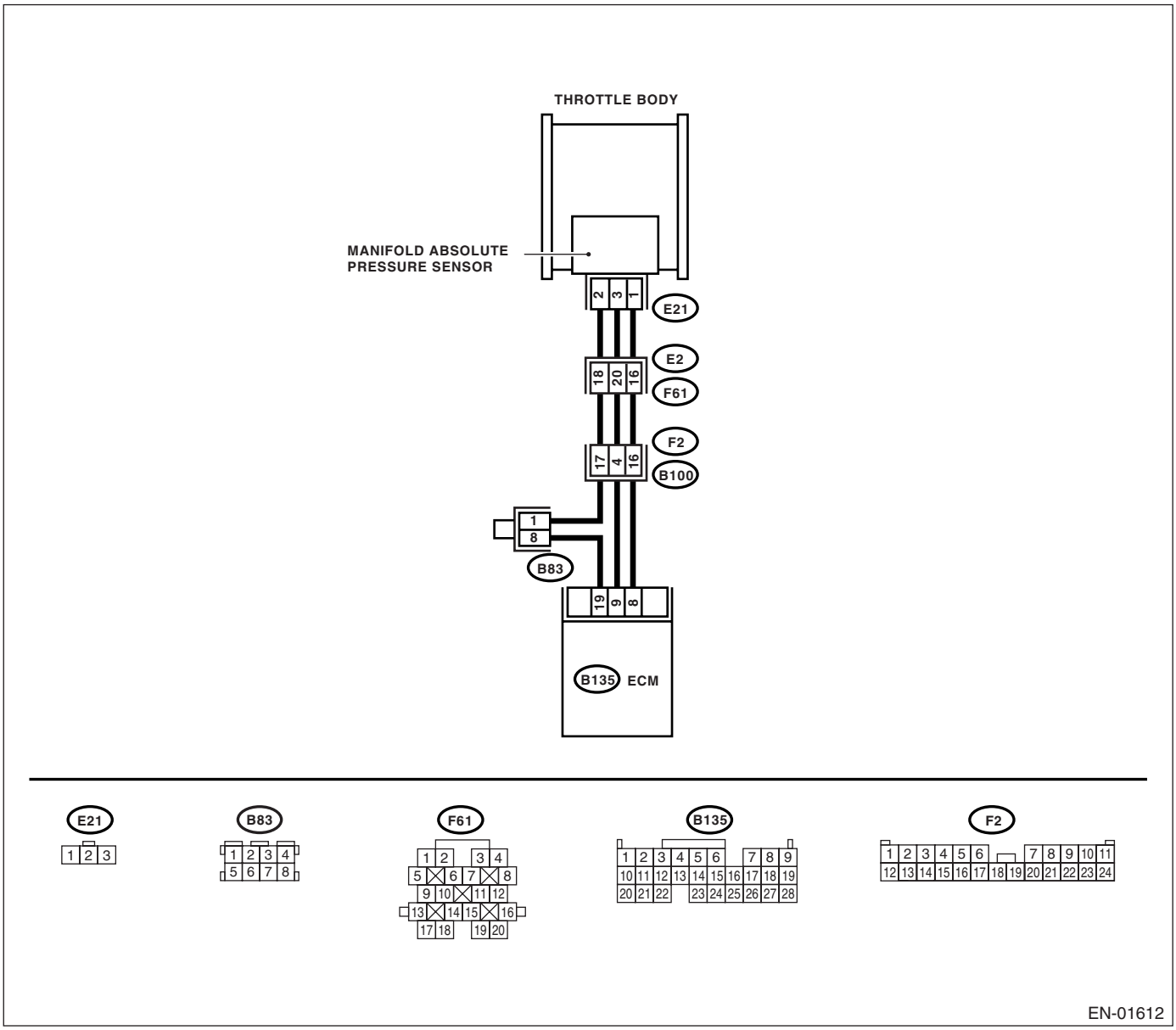
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK IDLE SWITCH SIGNAL.** 1) Turn the ignition switch to ON. 2) Operate the LED operation mode for engine using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.>	Does the LED of {Idle Switch Signal} come on?	Go to step **2.**	Check the throttle position sensor circuit. <Ref. to EN(H4DOTC)(diag)-115, DTC P0121 THROTTLE/ PEDAL POSITION SENSOR/ SWITCH "A" CIRCUIT RANGE/ PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.
2	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC. "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.	Go to step **3.**
3	**CHECK CONDITION OF MANIFOLD ABSOLUTE PRESSURE SENSOR.**	Is the manifold absolute pressure sensor installation bolt tightened securely?	Go to step **4.**	Tighten the manifold absolute pressure sensor installation bolt securely.
4	**CHECK CONDITION OF THROTTLE BODY.**	Is the throttle body installation bolt tightened securely?	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-33, Manifold Absolute Pressure Sensor.>	Tighten the throttle body installation bolt securely.

G: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-21, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

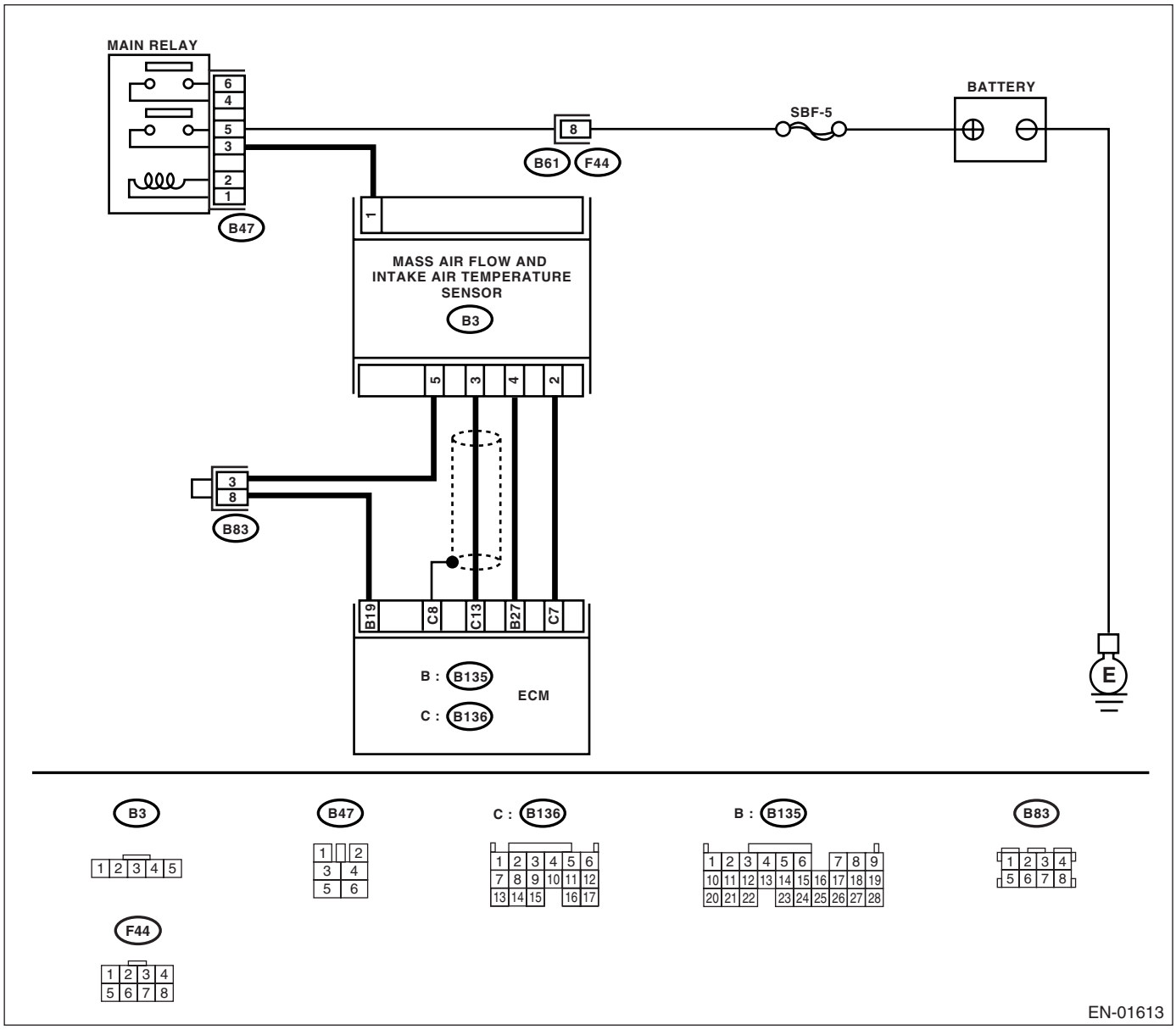
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0101.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-32, Mass Air Flow and Intake Air Temperature Sensor.>

H: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-23, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

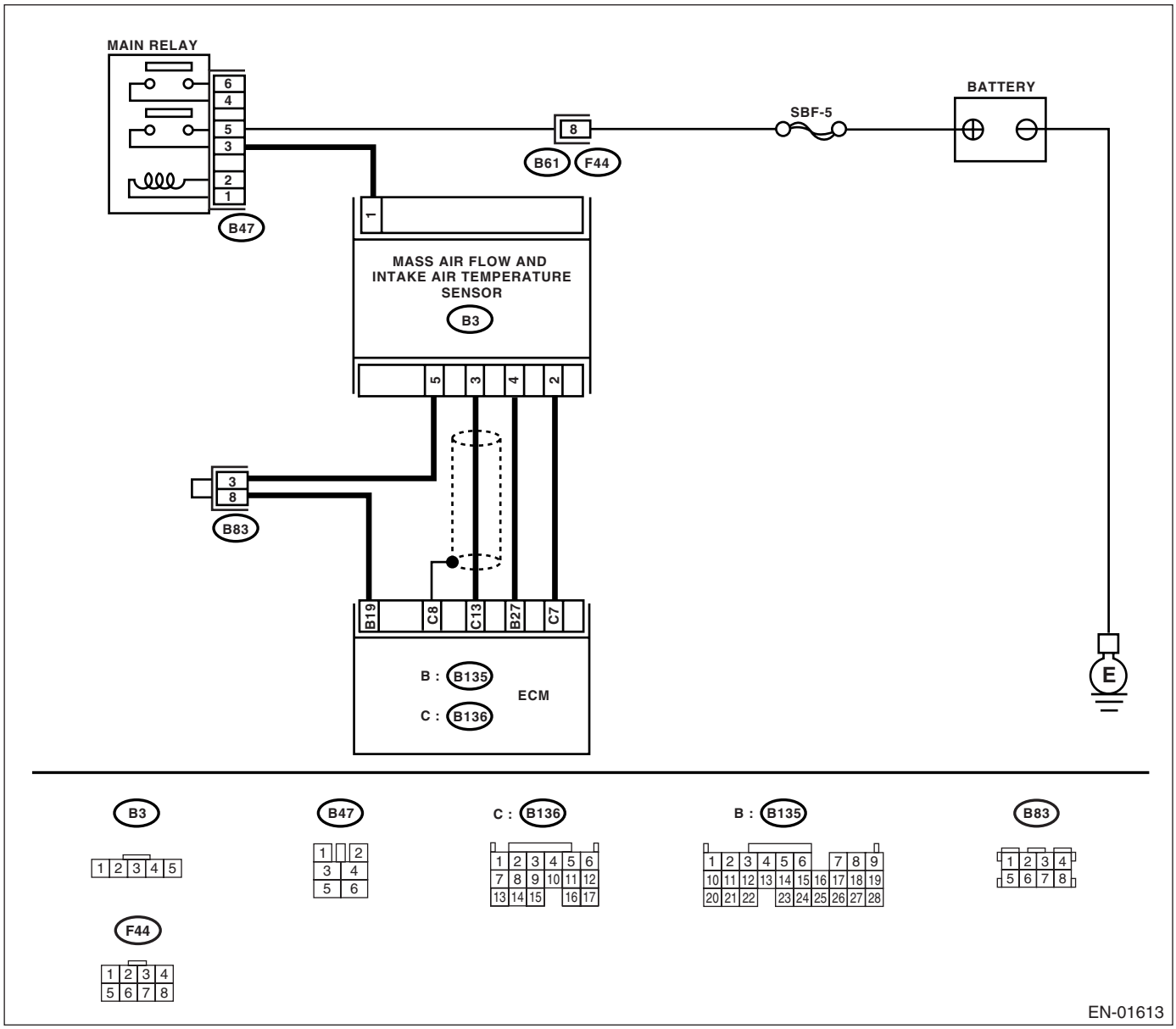
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector. 3) Turn the ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON. 4) Start the engine. 5) Read the mass air flow sensor voltage using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage 0.2 — 4.7 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in the mass air flow sensor. NOTE: In this case, repair the following: • Open or ground short circuit in harness between mass air flow sensor and ECM connector • Poor contact in mass air flow sensor or ECM connector	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground while engine is idling. ***Connector & terminal*** ***(B136) No. 13 (+) — Chassis ground (−):***	Is the voltage less than 0.2 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).** Measure the voltage between ECM connector and chassis ground while engine is idling.	Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow sensor connector and chassis ground. ***Connector & terminal*** ***(B3) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 5 V?	Go to step **5.**	Repair the open circuit between mass air flow sensor and main relay.

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and mass air flow sensor connector. ***Connector & terminal*** ***(B136) No. 13 — (B3) No. 3:*** ***(B136) No. 7 — (B3) No. 2:*** ***(B135) No. 19 — (B3) No. 5:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit between ECM and mass air flow sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 13 — Chassis ground:*** ***(B136) No. 7 — Chassis ground:*** ***(B135) No. 19 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit between ECM and mass air flow sensor connector.
7	**CHECK POOR CONTACT** Check poor contact in mass air flow sensor connector.	Is there poor contact in mass air flow sensor connector?	Repair the poor contact in mass air flow sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-32, Mass Air Flow and Intake Air Temperature Sensor.>

I: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-25, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

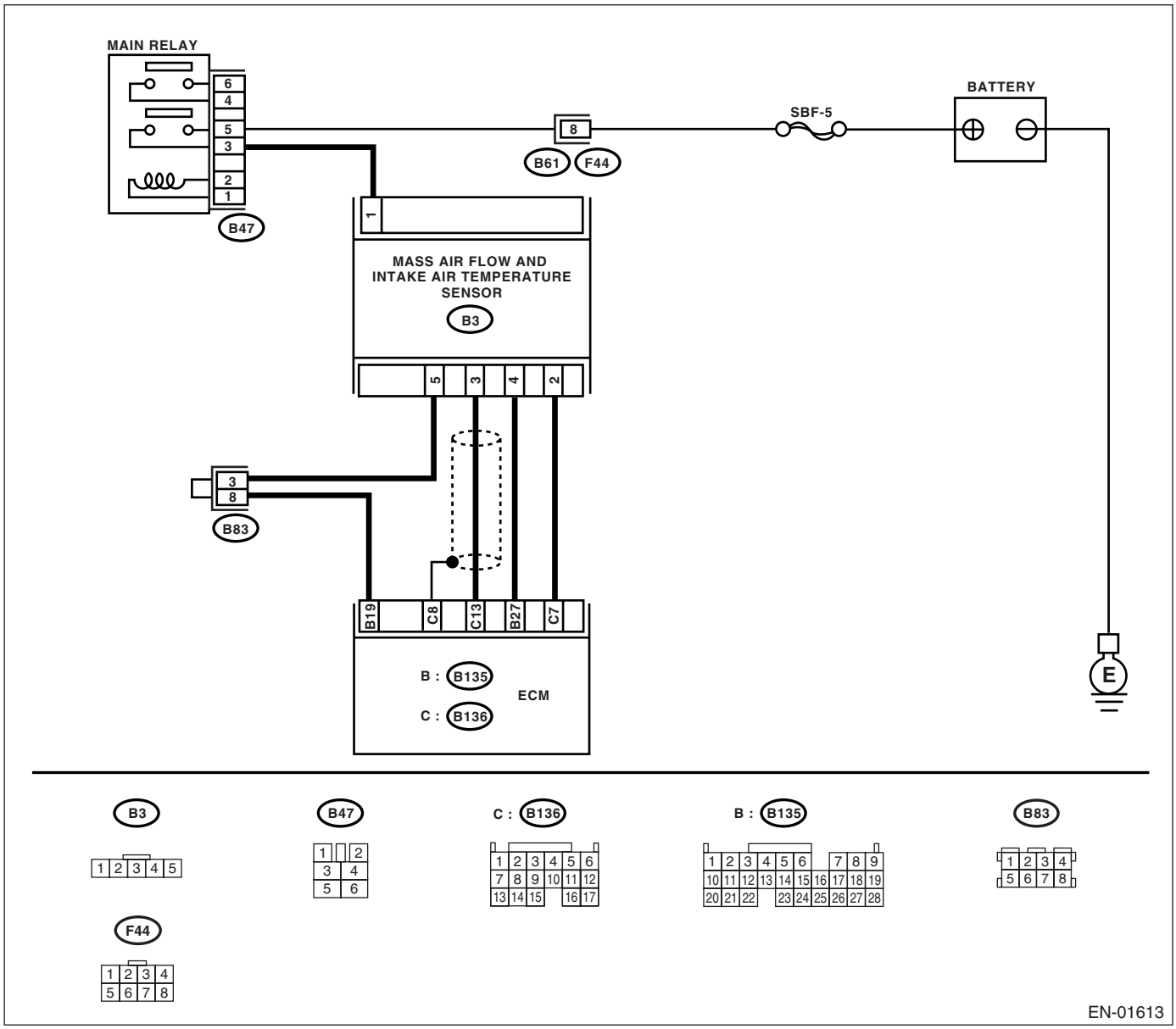
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector. 3) Turn the ignition switch to ON and Subaru Select Monitor or OBD-II general scan tool switch to ON. 4) Start the engine. 5) Read the mass air flow sensor voltage using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage 0.2 — 4.7 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow sensor connector and chassis ground. ***Connector & terminal*** ***(B3) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 5 V?	Repair the battery short of harness between mass air flow sensor connector and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connector and mass air flow sensor connector. ***Connector & terminal*** ***(B3) No. 2 — (B136) No. 7:***	Is the resistance less than 1 Ω?	Replace the mass air flow sensor. <Ref. to FU(H4DOTC)-32, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the open harness between mass air flow sensor connector and ECM connector.

J: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

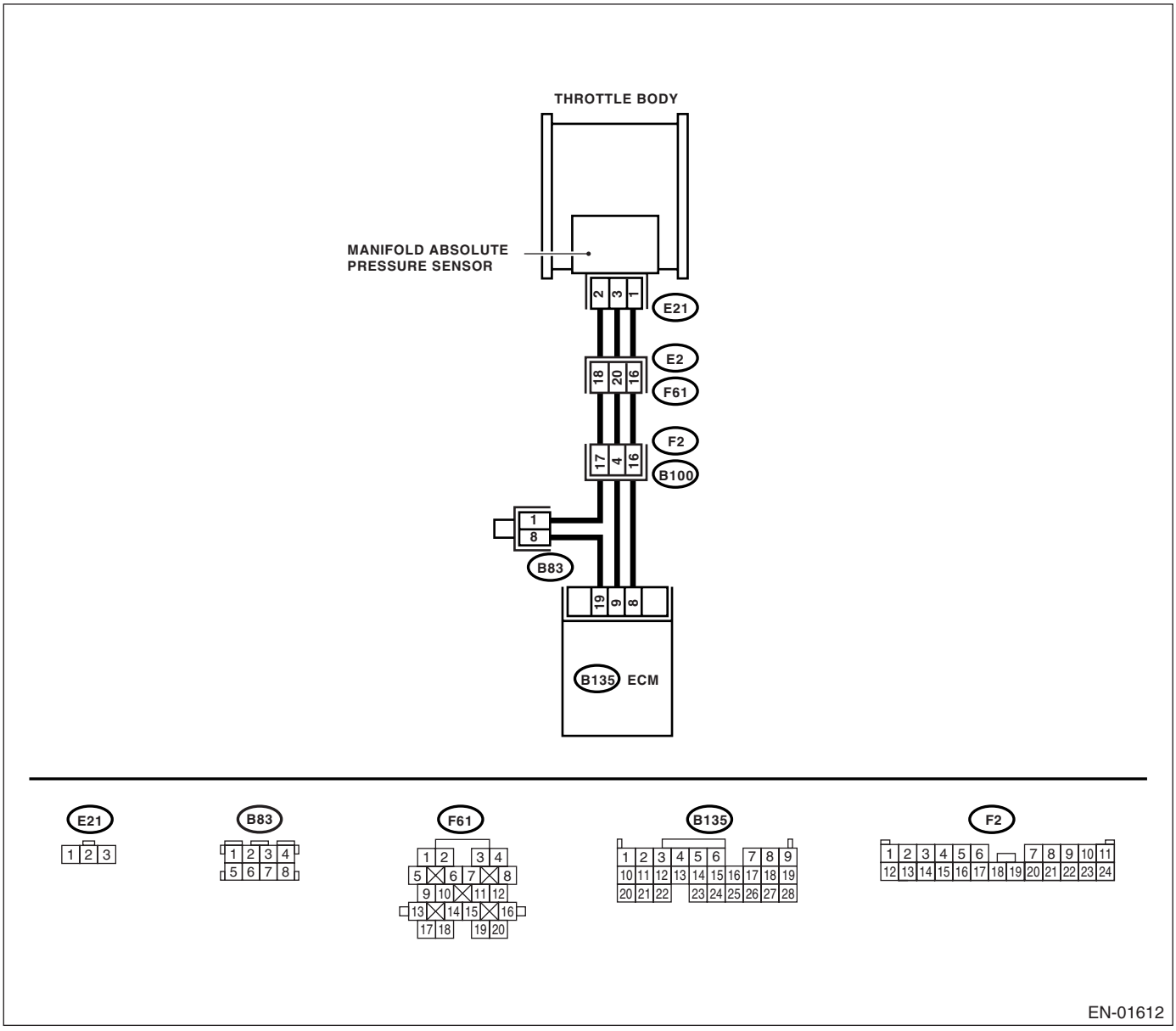
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-27, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **3.**	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (−):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 8 (+) — Chassis ground (−):***	Is the voltage less than 0.7 V?	Go to step **4.**	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **5.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
5	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B135) No. 19 — (E21) No. 2:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit in harness between ECM and manifold absolute pressure sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact in manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair the poor contact in manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-33, Manifold Absolute Pressure Sensor.>

K: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

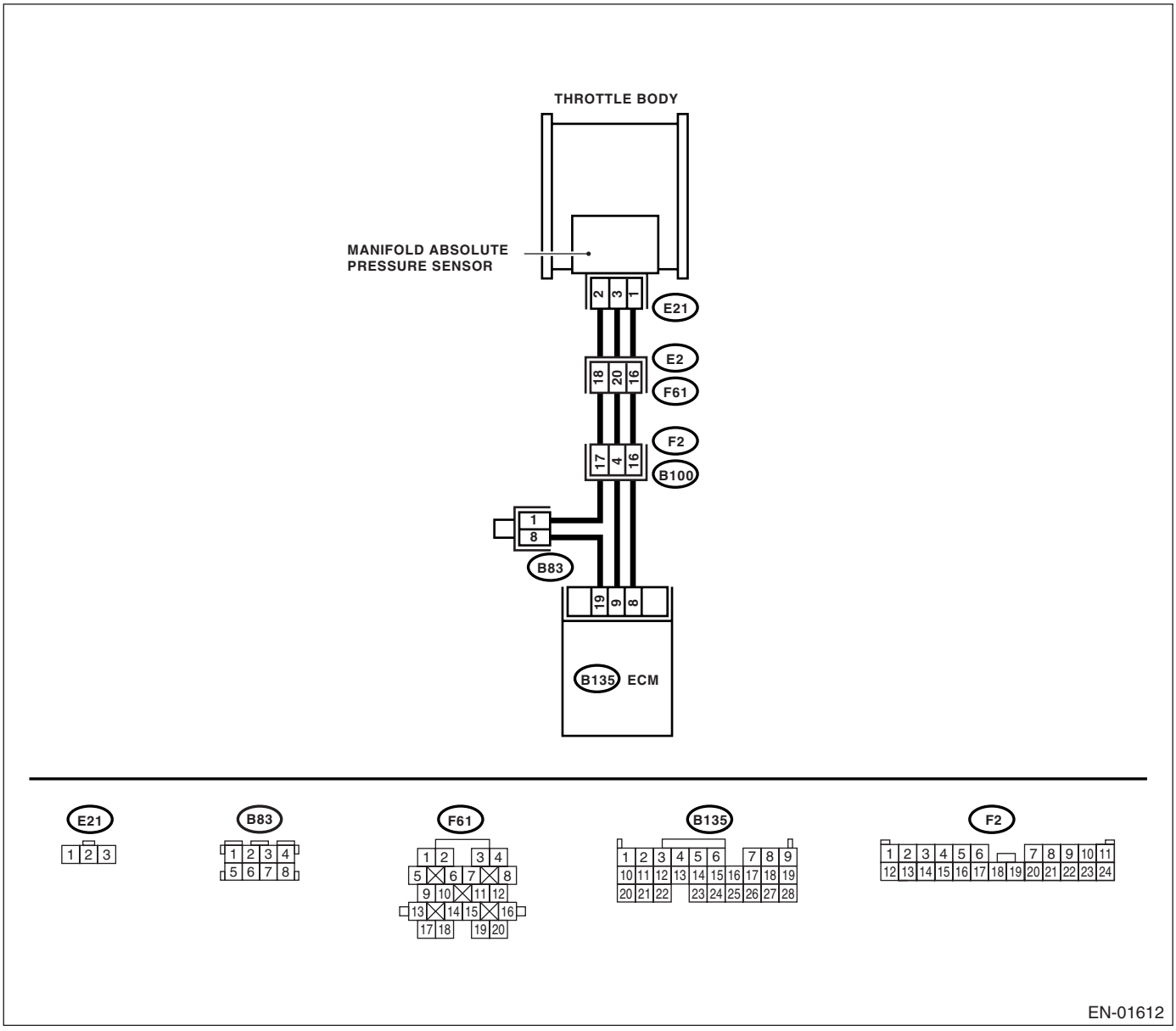
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-29, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **3.**	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (−):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 8 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **4.**	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **5.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
5	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B135) No. 8 — (E21) No. 1:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B135) No. 19 — (E21) No. 2:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact in manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair the poor contact in manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-33, Manifold Absolute Pressure Sensor.>

L: DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-31, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

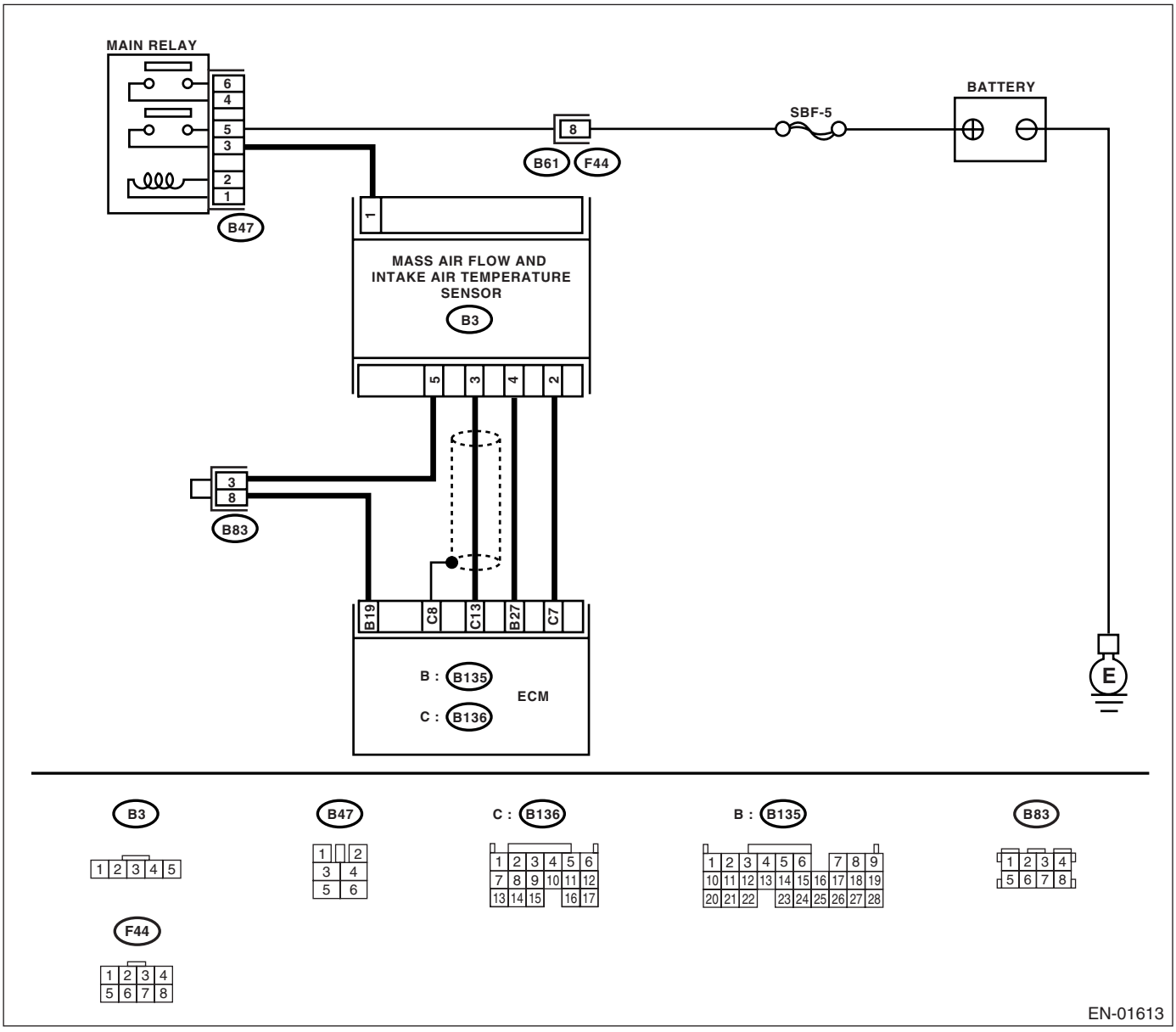
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0111.	Go to step **2.**
2	**CHECK ENGINE COOLANT TEMPERATURE.** 1) Start the engine and warm it up completely. 2) Measure the engine coolant temperature using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the engine coolant temperature 75°C (167°F) — 95°C (203°F)?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-32, Mass Air Flow and Intake Air Temperature Sensor.>	Inspect the DTC P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>

M: DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-33, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

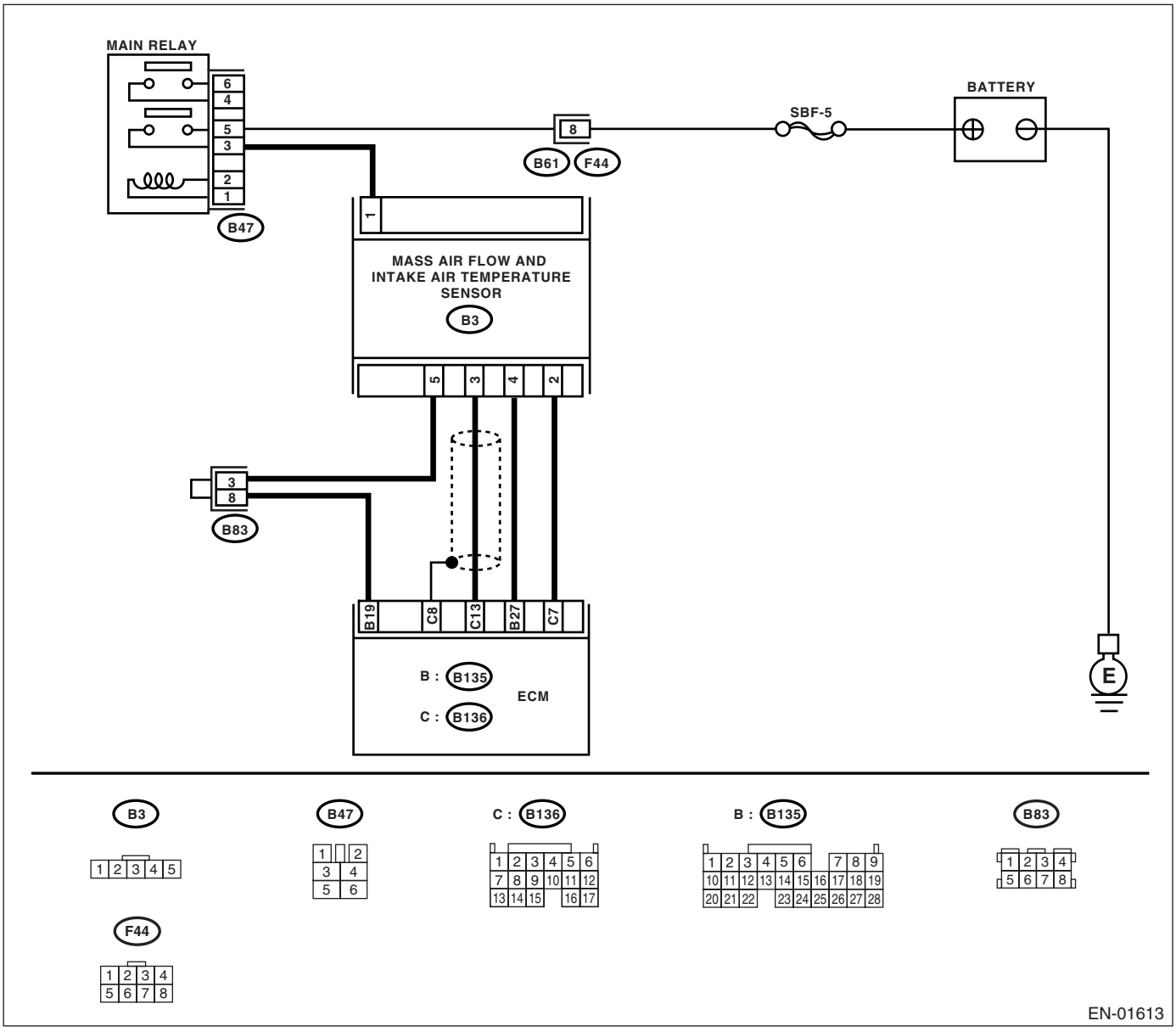
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature more than 55°C (131°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow and intake air temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature less than −36°C (−33°F)?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-32, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the ground short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.

N: DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-35, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

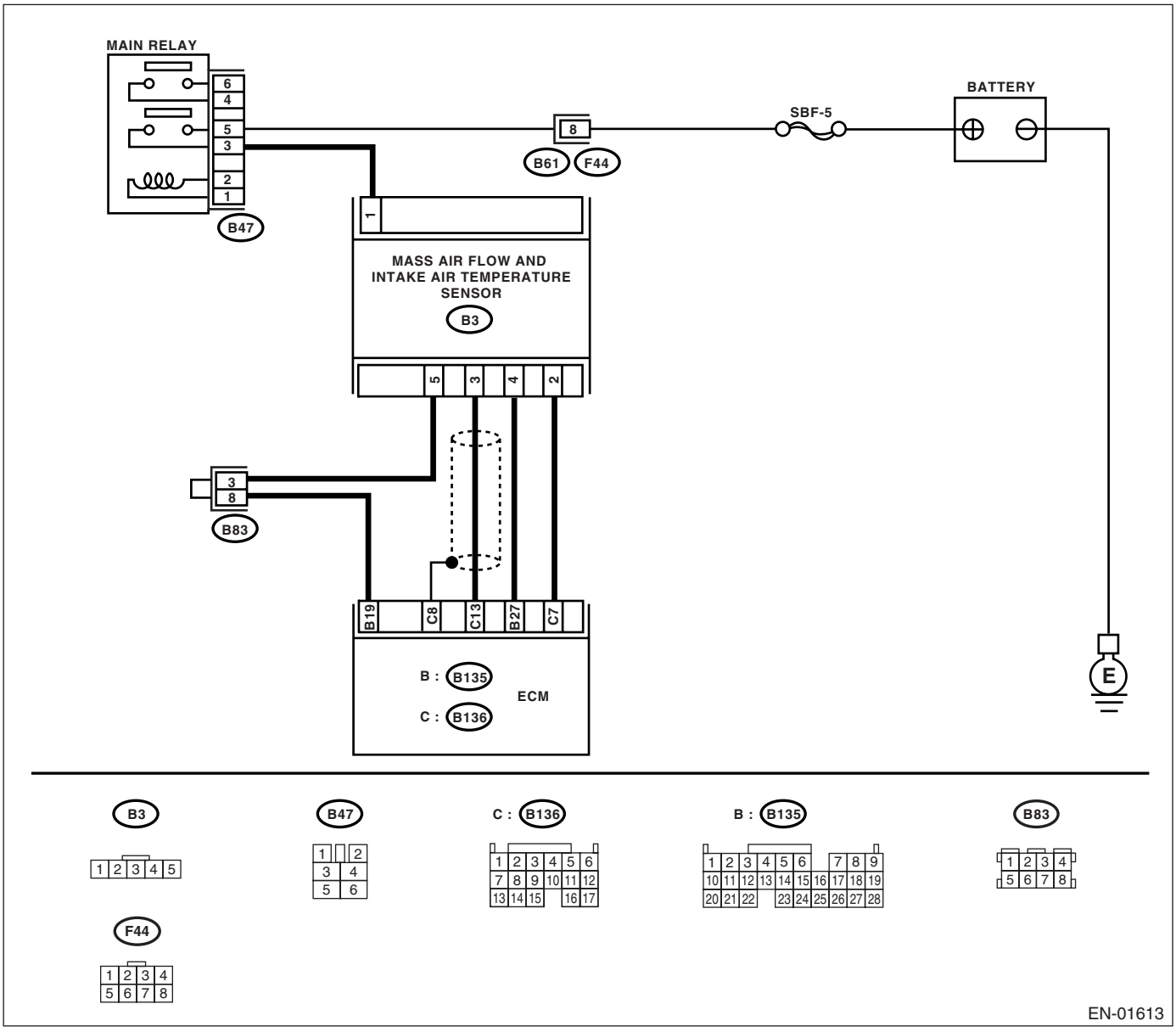
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature less than –36°C (–33°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow and intake air temperature sensor. 3) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between mass air flow and intake air temperature sensor and manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):***	Is the voltage more than 4 V?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between mass air flow and intake air temperature sensor and engine ground. ***Connector & terminal*** ***(B3) No. 5 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-32, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

O: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-37, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

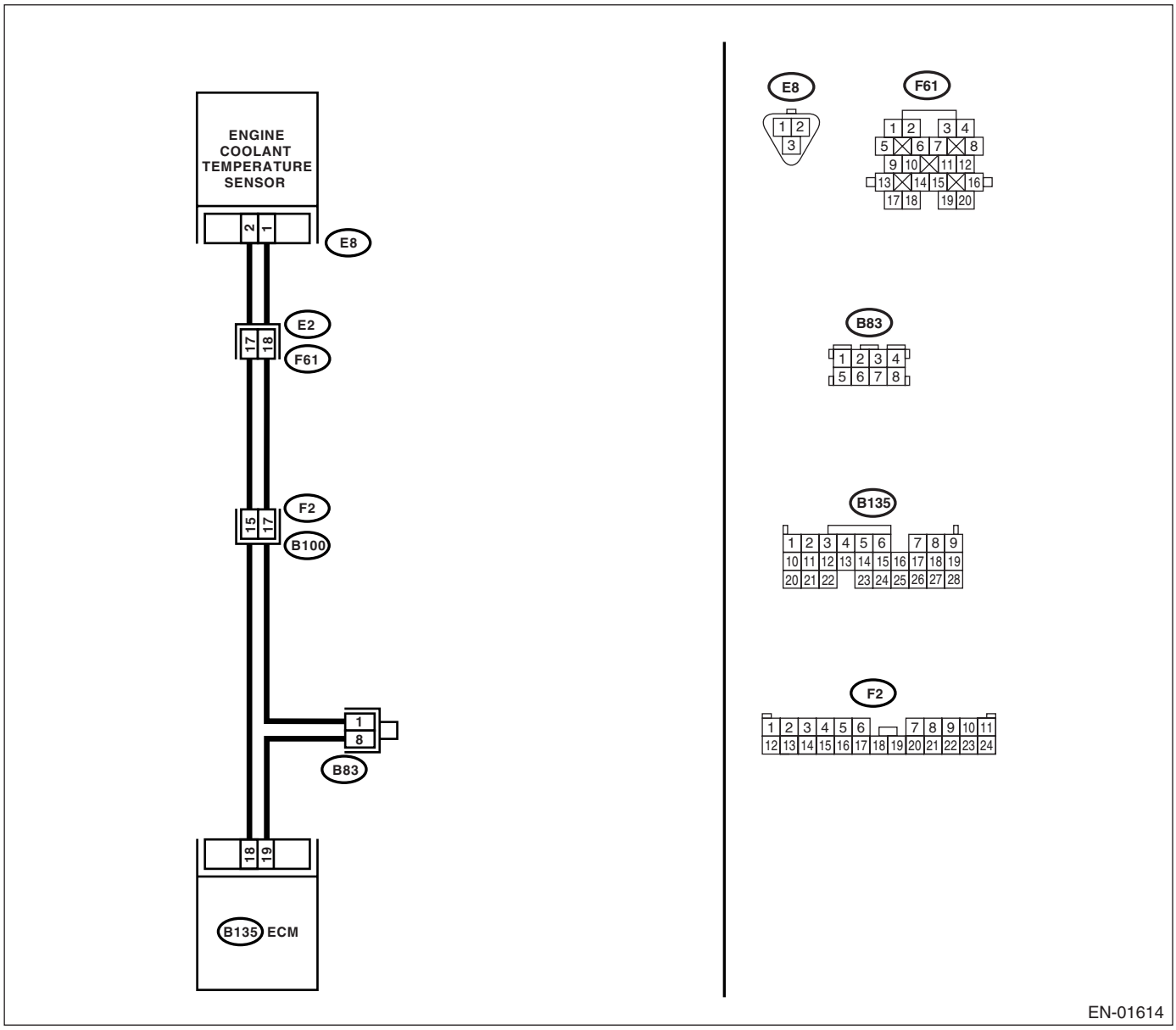
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature more than 120°C (248°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from engine coolant temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature less than −40°C (−40°F)?	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>	Repair the ground short circuit in harness between engine coolant temperature sensor and ECM connector.

P: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-39, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

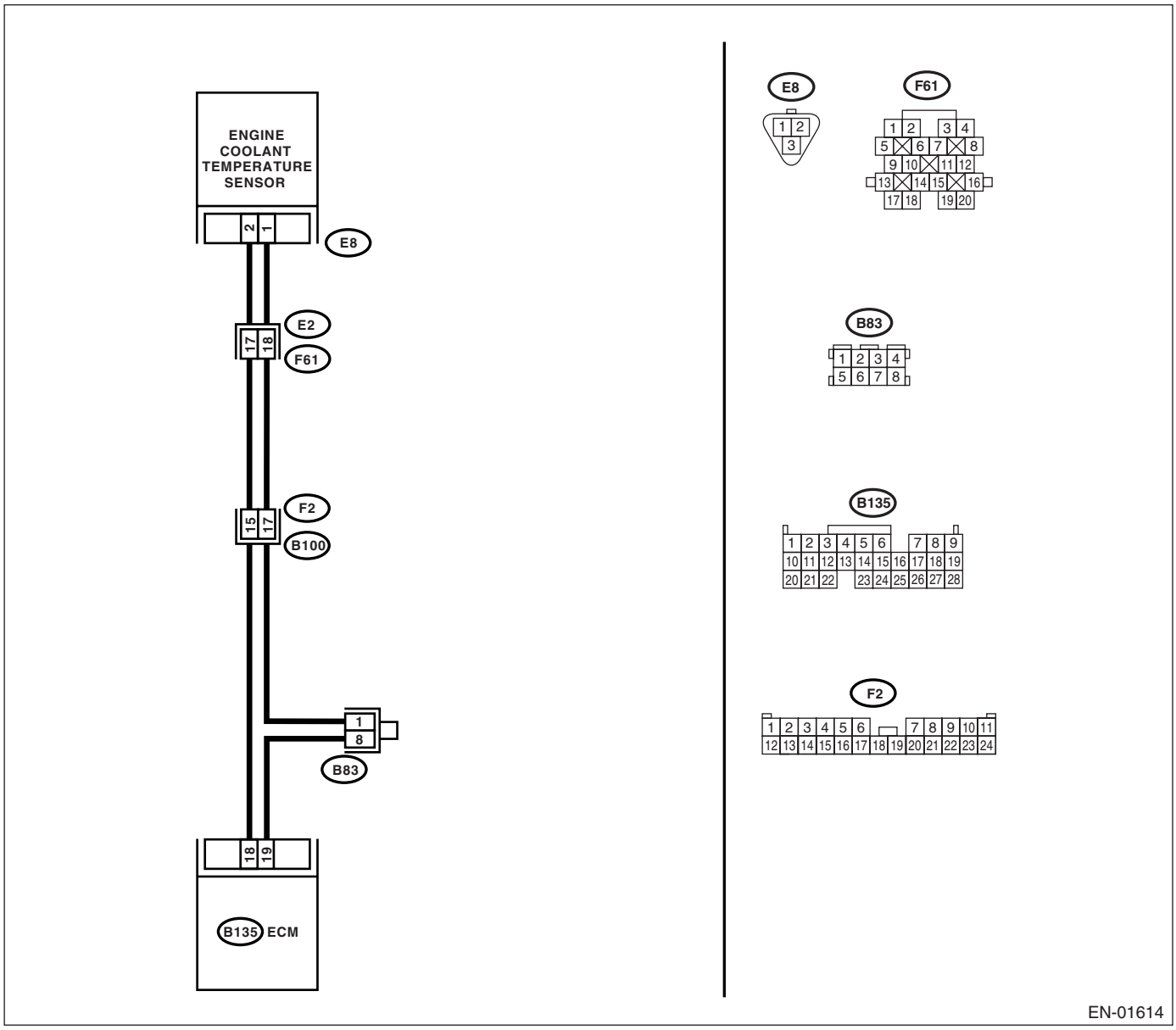
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature less than −40°C (−40°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from engine coolant temperature sensor. 3) Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (−):***	Is the voltage more than 4 V?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

Q: DTC P0121 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-41, DTC P0121 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

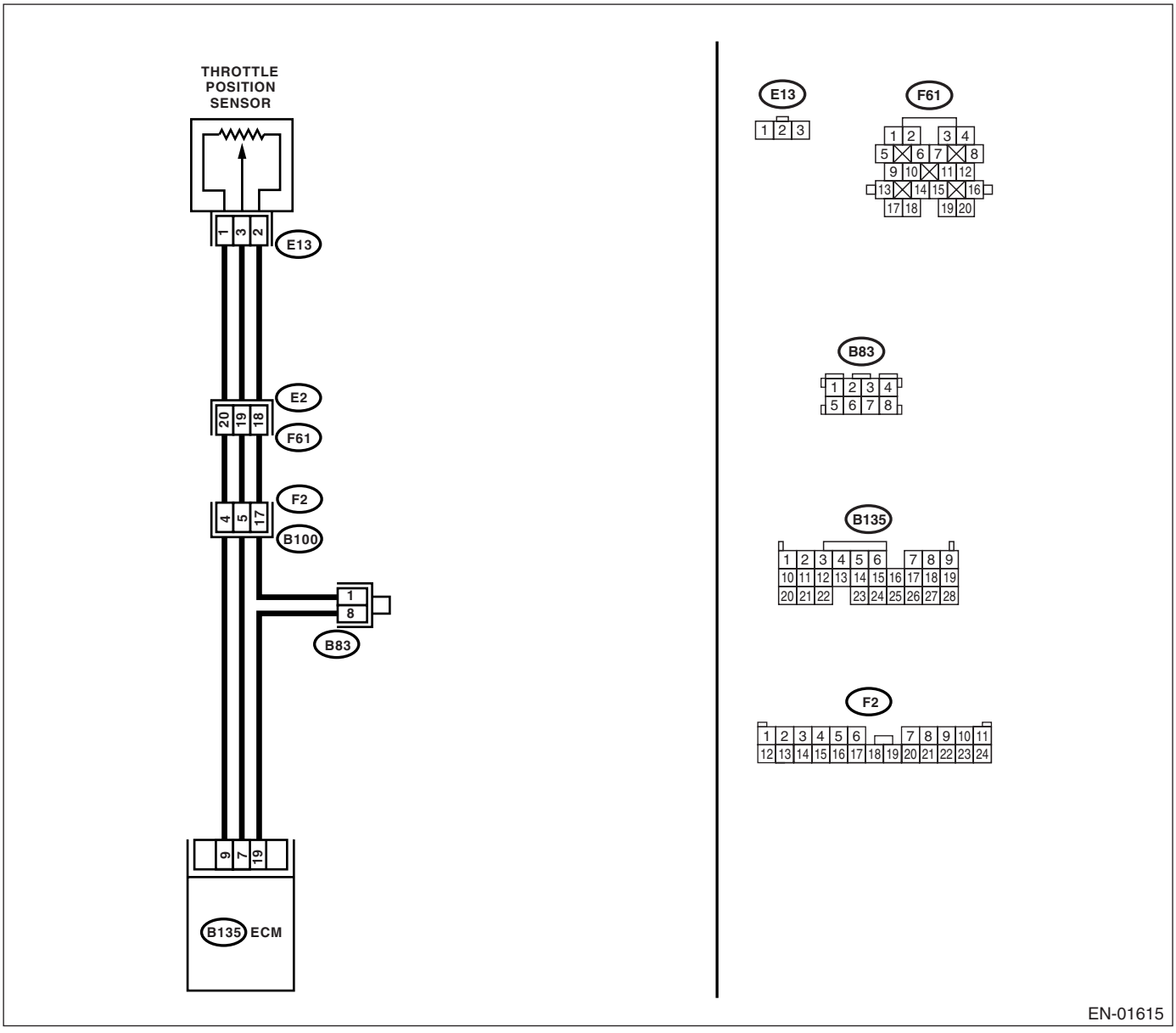
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance
- Fuel is cut.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0121.	Replace the throttle position sensor. <Ref. to FU(H4DOTC)-31, Throttle Position Sensor.>

R: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

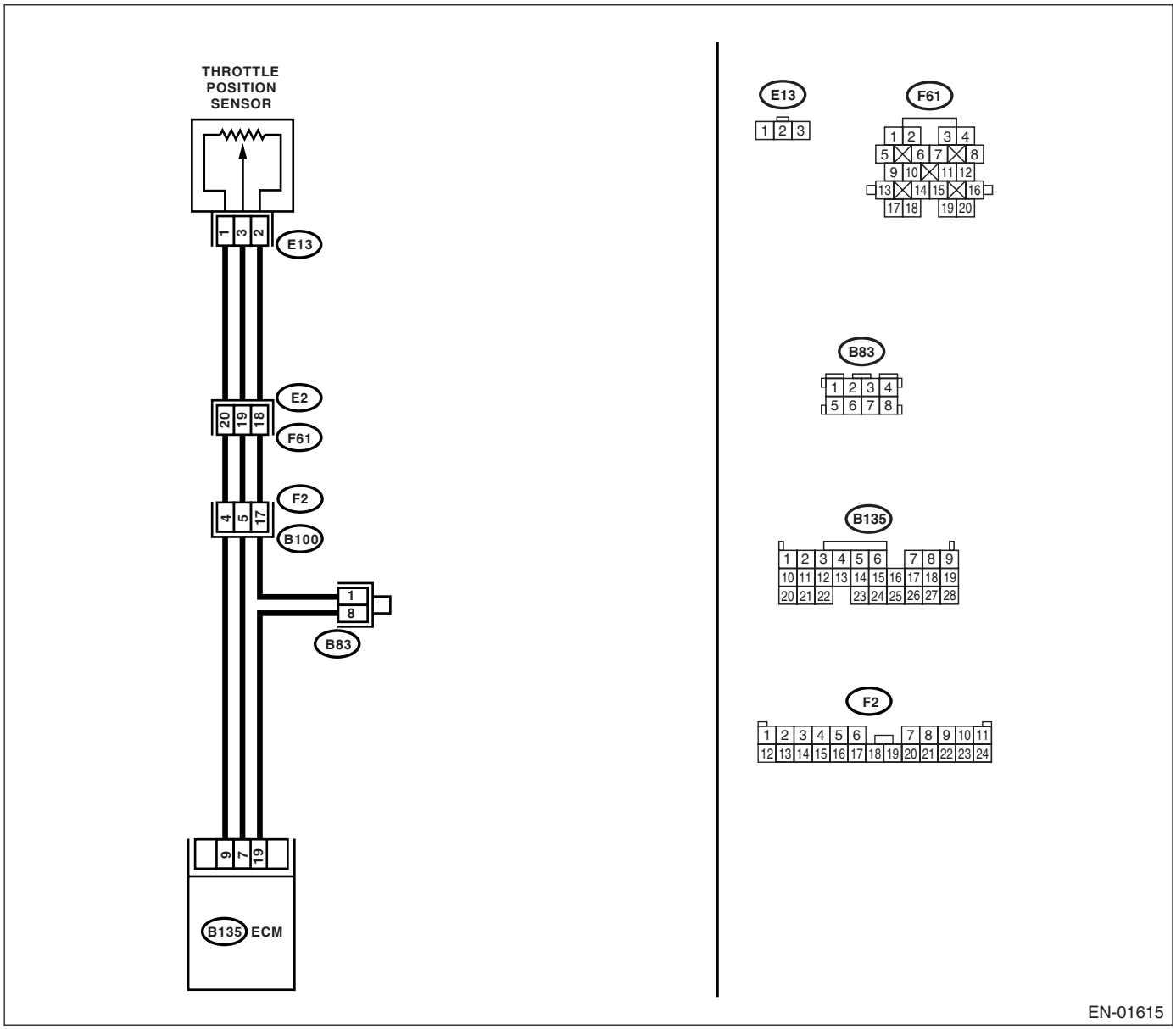
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-44, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage less than 0.15 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground while throttle valve is fully closed. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 0.15 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)** Measure the voltage between ECM connector and chassis ground.	Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change?	Repair the poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from throttle position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 1 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and throttle position sensor connector. ***Connector & terminal*** ***(B135) No. 7 — (E13) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in ECM connector • Poor contact in throttle position sensor connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** Measure the resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the ground short circuit in harness between throttle position sensor and ECM connector.
9	**CHECK POOR CONTACT.** Check poor contact in throttle position sensor connector.	Is there poor contact in throttle position sensor connector?	Repair the poor contact in throttle position sensor connector.	Replace the throttle position sensor. <Ref. to FU(H4DOTC)-31, Throttle Position Sensor.>

S: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-46, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

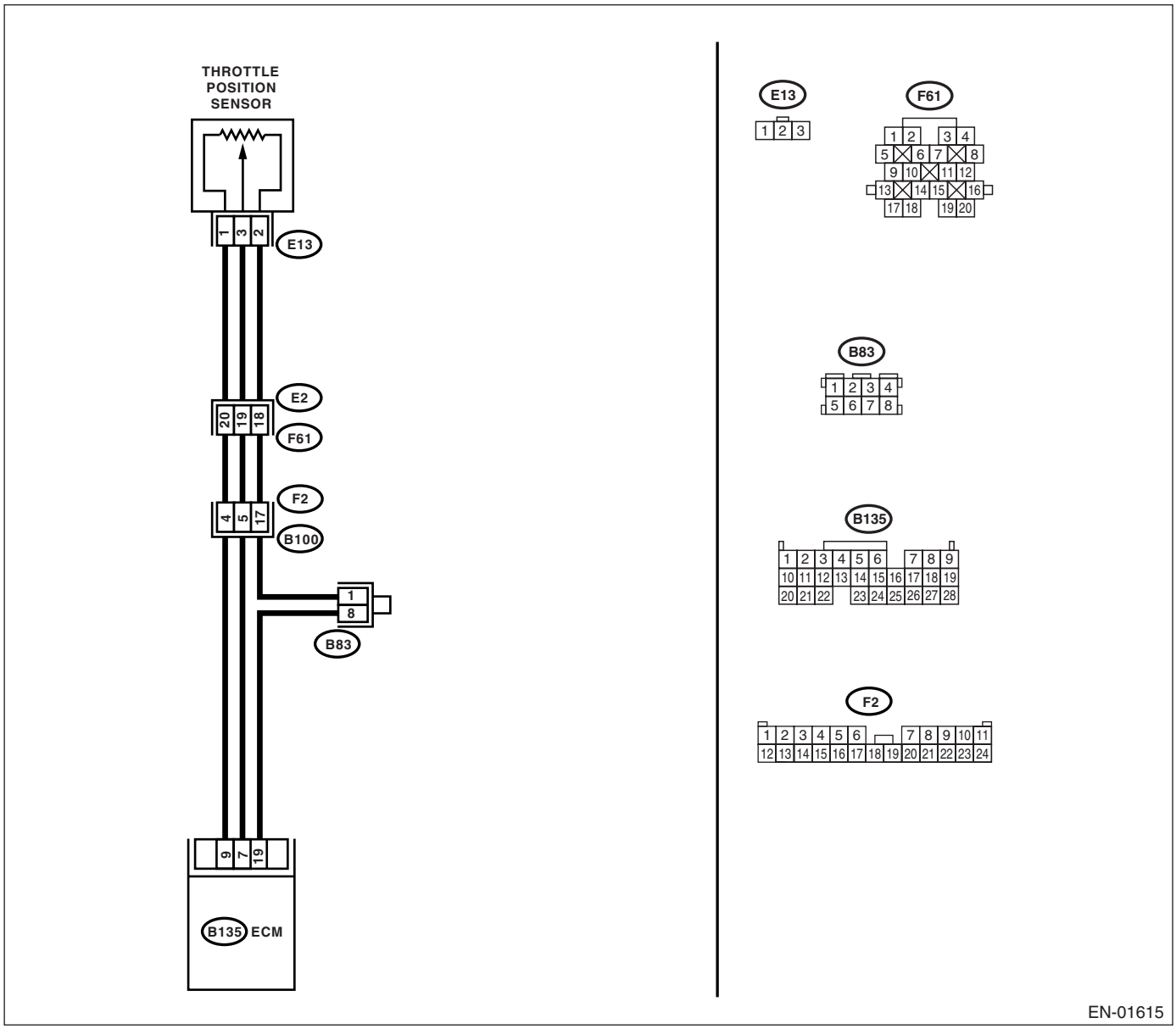
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage more than 4.7 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from throttle position sensor. 3) Measure the resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.7 V?	Repair the battery short circuit in harness between throttle position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Replace the throttle position sensor. <Ref. to FU(H4DOTC)-31, Throttle Position Sensor.>

T: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-48, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

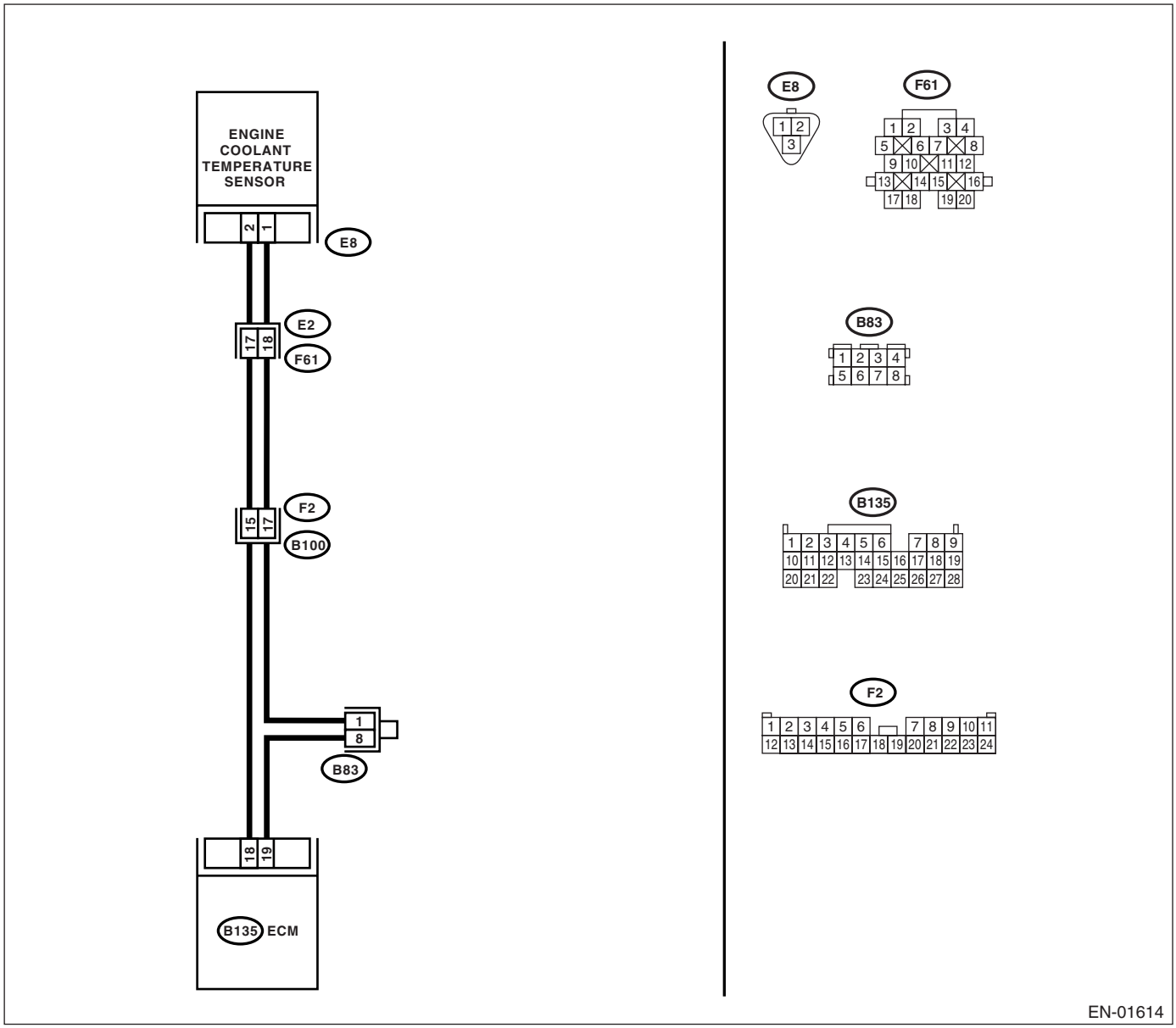
TROUBLE SYMPTOM:

Engine will not return to idling.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step **2.**
2	**CHECK ENGINE COOLING SYSTEM.** NOTE: Check the following items. • Thermostat open stuck • Coolant level • Coolant freeze • Tire diameter	Is there a fault in engine cooling system?	Replace the thermostat. <Ref. to CO(H4SO)-17, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>

U: DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-50, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Thermostat remains open.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK VEHICLE CONDITION.**	Was the vehicle driven or idled with the engine partially submerged under water?	In this case, it is not necessary to inspect DTC P0128.	Go to step **2.**
2	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Codes (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK ENGINE COOLANT.**	Are coolant level and mixture ratio of cooling water to antifreeze solution correct?	Go to step **4.**	Replace the engine coolant. <Ref. to CO(H4SO)-12, REPLACEMENT, Engine Coolant.>
4	**CHECK RADIATOR FAN.** 1) Start the engine. 2) Check radiator fan operation.	Does the radiator fan continuously rotate for more than 3 minutes during idling?	Repair radiator fan circuit. <Ref. to CO(H4SO)-22, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-23, Radiator Sub Fan and Fan Motor.>.	Replace the thermostat. <Ref. to CO(H4SO)-17, Thermostat.>

V: DTC P0129 ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-52, DTC P0129 BAROMETRIC PRESSURE TOO LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 **CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is built into ECM.	NOTE: It is not necessary to inspect DTC P0129.

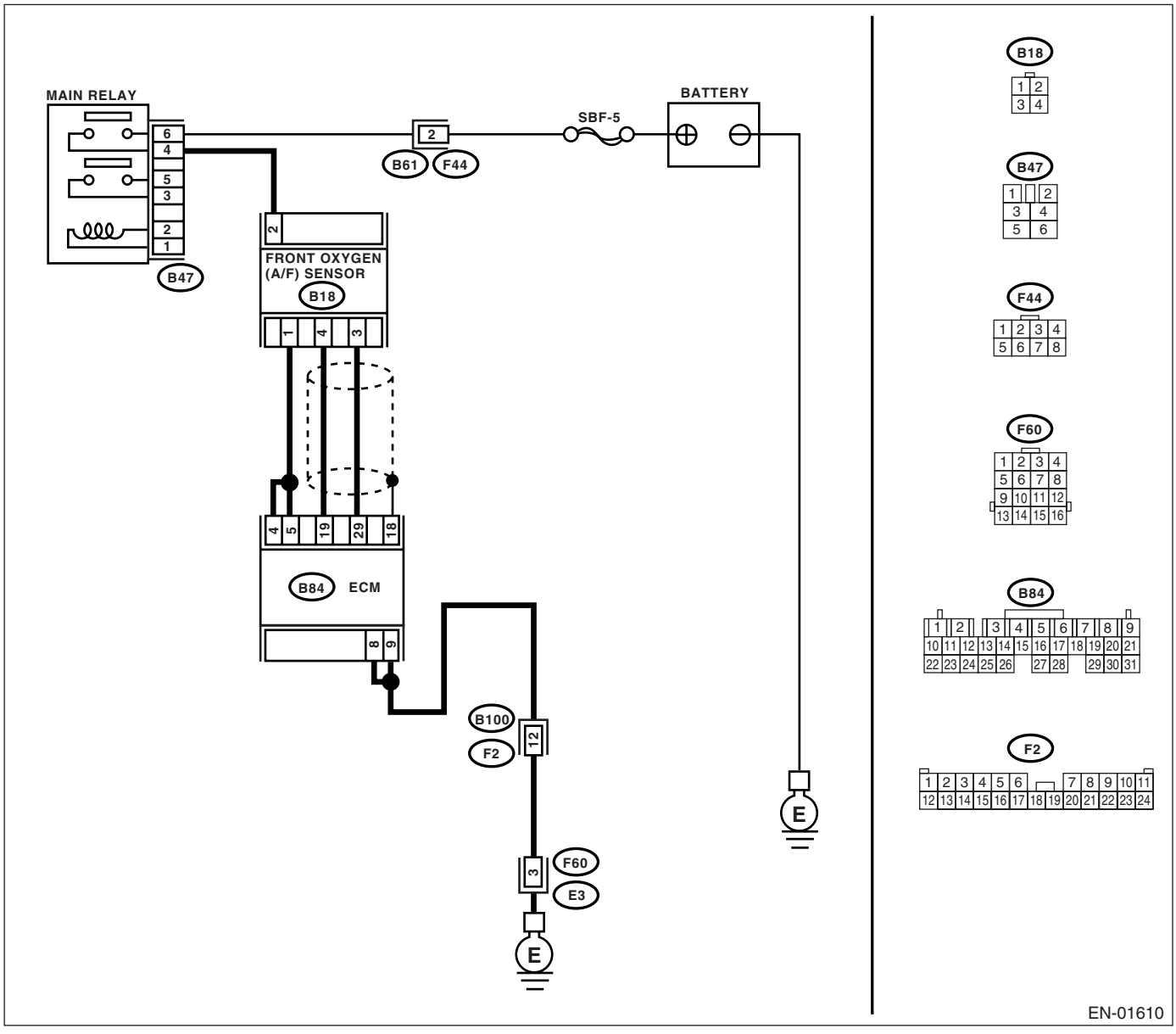
W: DTC P0130 O_2 SENSOR CIRCUIT (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-53, DTC P0130 O_2 SENSOR CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT (A/F) OXYGEN SENSOR DATA.** 1) Start the engine. 2) While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 70°C (158°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read the data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value 0.85 — 1.15 (in idling)?	Go to step **3.**	Go to step **4.**
3	**CHECK REAR OXYGEN SENSOR SIGNAL.** 1) Race the engine at speeds from idling to 5,000 rpm for a total of 5 cycles. NOTE: To increase the engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approx. 5 seconds, and quickly release accelerator pedal to decrease engine speed. 2) Operate the LED operation mode for engine. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.>	Does the LED of {Rear O_2 Rich Signal} blink?	Repair the poor contact in front oxygen (A/F) sensor and rear oxygen sensor connector.	Check the rear oxygen sensor circuit. <Ref. to FU(H4DOTC)-45, Rear Oxygen Sensor.>
4	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness of front oxygen (A/F) sensor • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty parts.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-43, Front Oxygen (A/F) Sensor.>

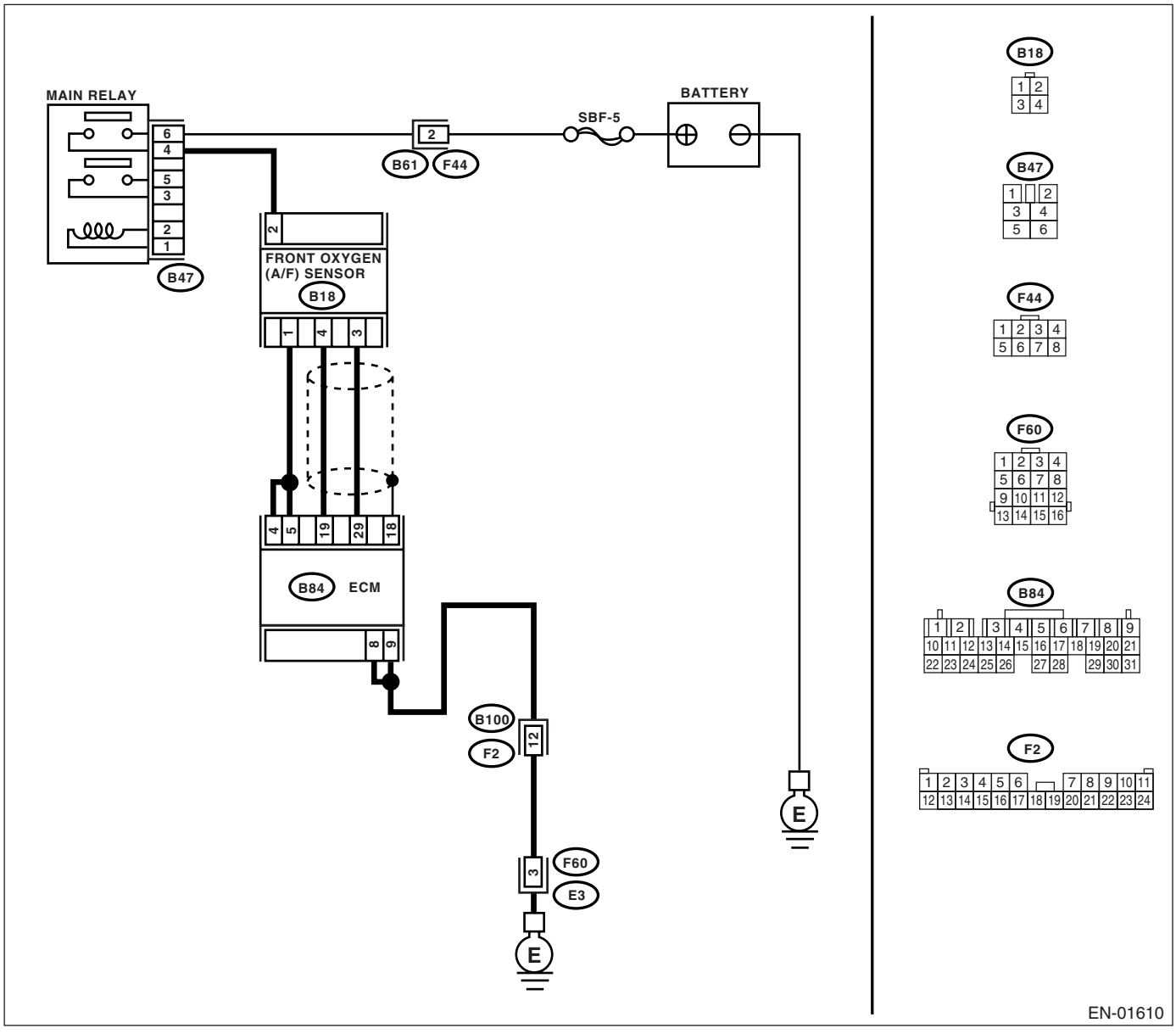
X: DTC P0133 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-55, DTC P0133 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** NOTE: Check the following items. • Loose installation of front portion of exhaust pipe onto cylinder heads • Loose connection between front exhaust pipe and front catalytic converter • Damage of exhaust pipe resulting in a hole	Is there a fault in exhaust system?	Repair the exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-43, Front Oxygen (A/F) Sensor.>

Y: DTC P0134 O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

NOTE:
For the diagnostic procedure, refer to DTC P0130. <Ref. to EN(H4DOTC)(diag)-126, DTC P0130 O_2 SENSOR CIRCUIT (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

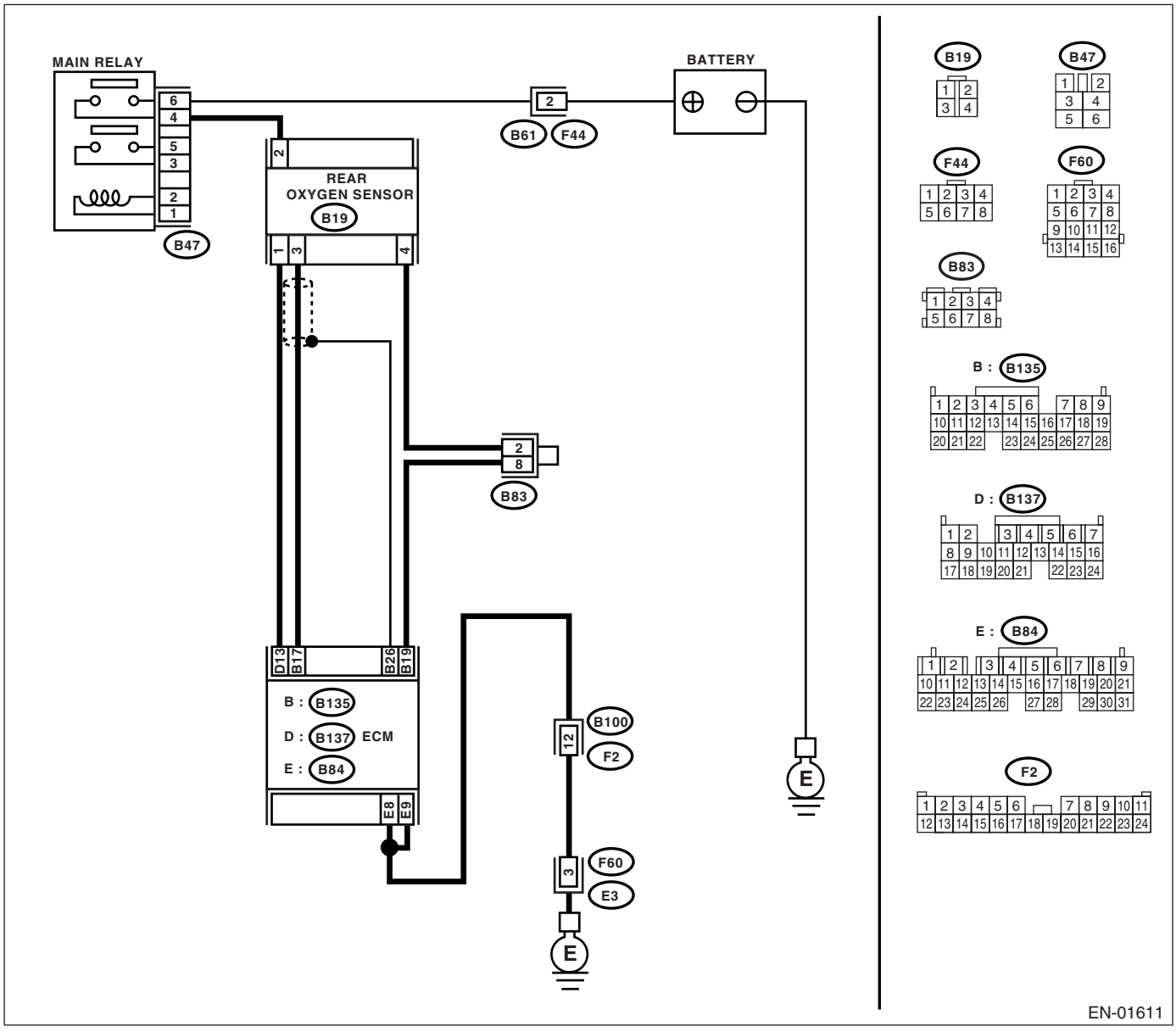
Z: DTC P0137 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-60, DTC P0137 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for 2 minutes. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Does the value fluctuate?	Go to step **6.**	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool.	Is the voltage 0.2 — 0.4 V?	Go to step **4.**	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-45, Rear Oxygen Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 17 — (B19) No. 3:***	Is the resistance more than 3 Ω?	Repair the open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(B19) No. 3 (+) — Engine ground (−):***	Is the voltage more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-45, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

	Step	Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-45, Rear Oxygen Sensor.>

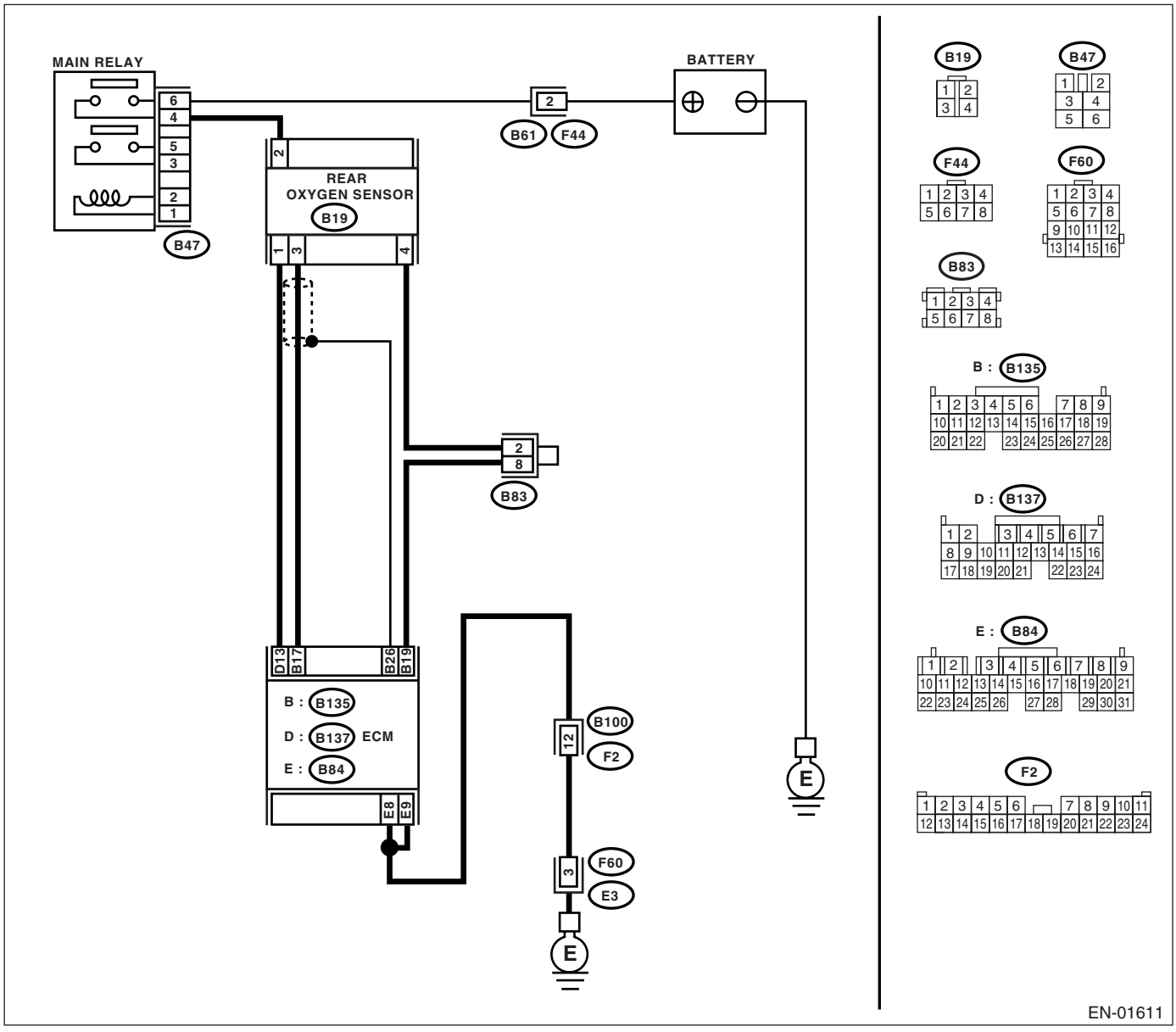
AA:DTC P0138 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-62, DTC P0138 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for 2 minutes. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Does the value fluctuate?	Go to step **6.**	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool.	Is the voltage 0.2 — 0.4 V?	Go to step **4.**	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-45, Rear Oxygen Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 17 — (B19) No. 3:***	Is the resistance more than 3 Ω?	Repair the open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(B19) No. 3 (+) — Engine ground (−):***	Is the voltage more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-45, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

Step		Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-45, Rear Oxygen Sensor.>

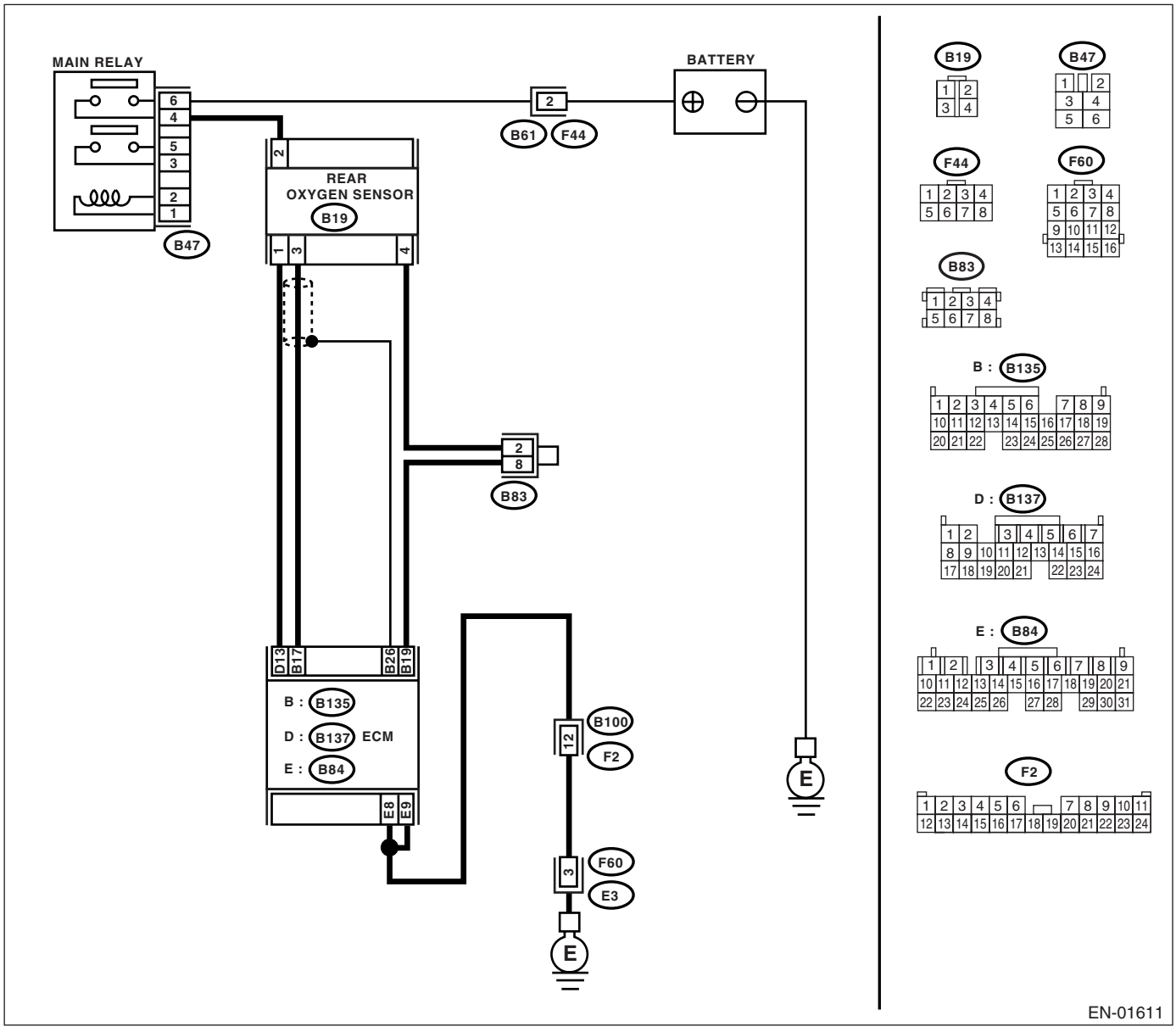
AB:DTC P0139 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-64, DTC P0139 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-45, Rear Oxygen Sensor.>

AC:DTC P0171 SYSTEM TOO LEAN (BANK 1)

NOTE:
For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(H4DOTC)(diag)-138, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AD:DTC P0172 SYSTEM TOO RICH (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-70, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **3.**
3	**CHECK FUEL PRESSURE.** **Warning:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel on the floor.** 1) Release the fuel pressure. (1)Disconnect the connector from fuel pump relay. (2)Start the engine and run it until it stalls. (3)After the engine stalls, crank it for 5 more seconds. (4)Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install the fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)?	Go to step **4.**	Repair the following items. Fuel pressure too high: • Clogged fuel return line or bent hose Fuel pressure too low: • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
4	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: • If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.	Is the measured value 206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)?	Go to step **5.**	Repair the following items. Fuel pressure too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
5	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature more than 60°C (140°F)?	Go to step **6.**	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>
6	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within the followings? Ignition ON: 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) Idling: 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)	Go to step **7.**	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-32, Mass Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
7	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Subtract ambient temperature from intake air temperature. Is the obtained value −10°C — 50°C (14°F — 122°F)?	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-32, Mass Air Flow and Intake Air Temperature Sensor.>

AE:DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE

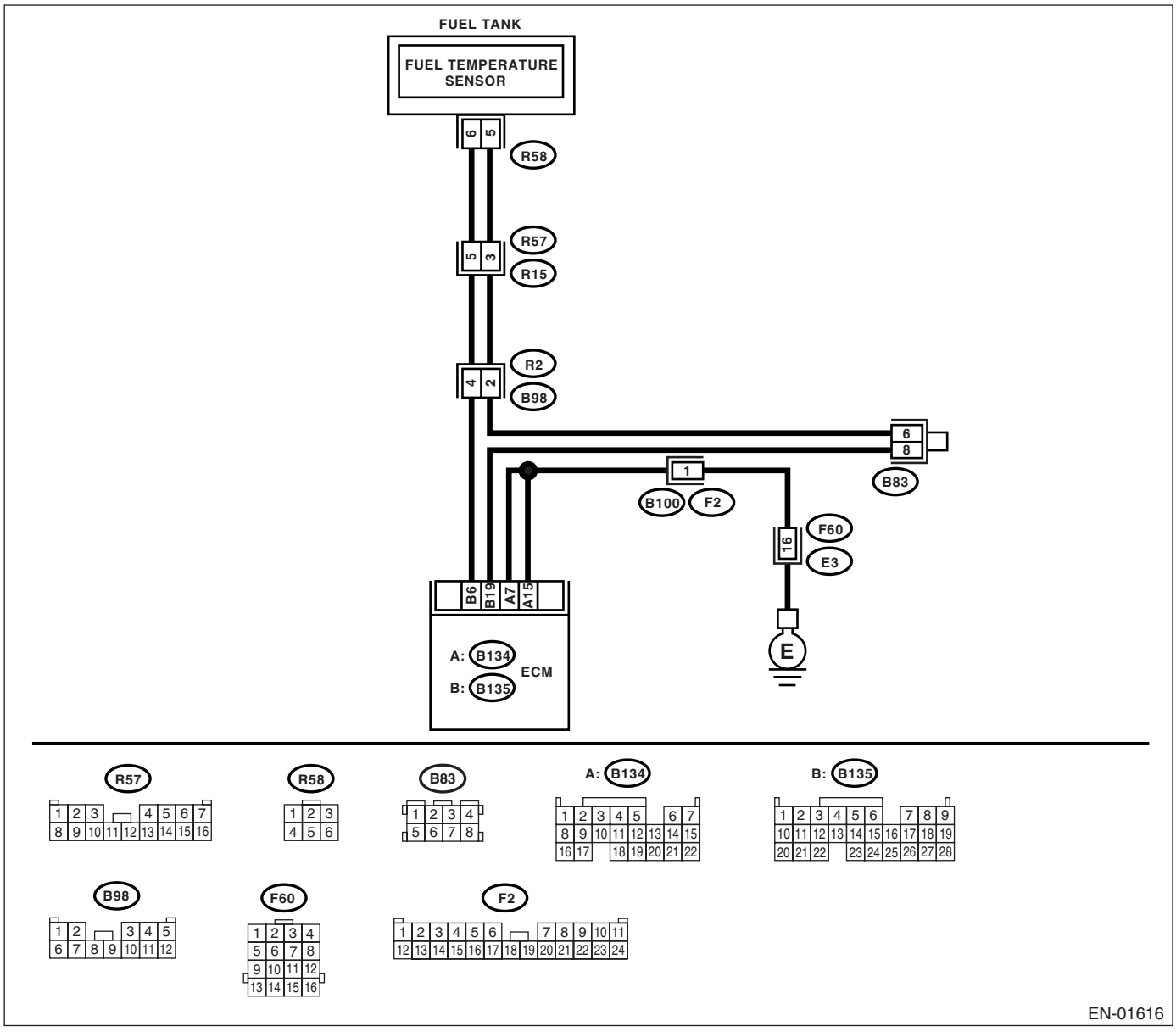
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-73, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	CHECK FOR OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Codes (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0181.	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-9, Fuel Temperature Sensor.>

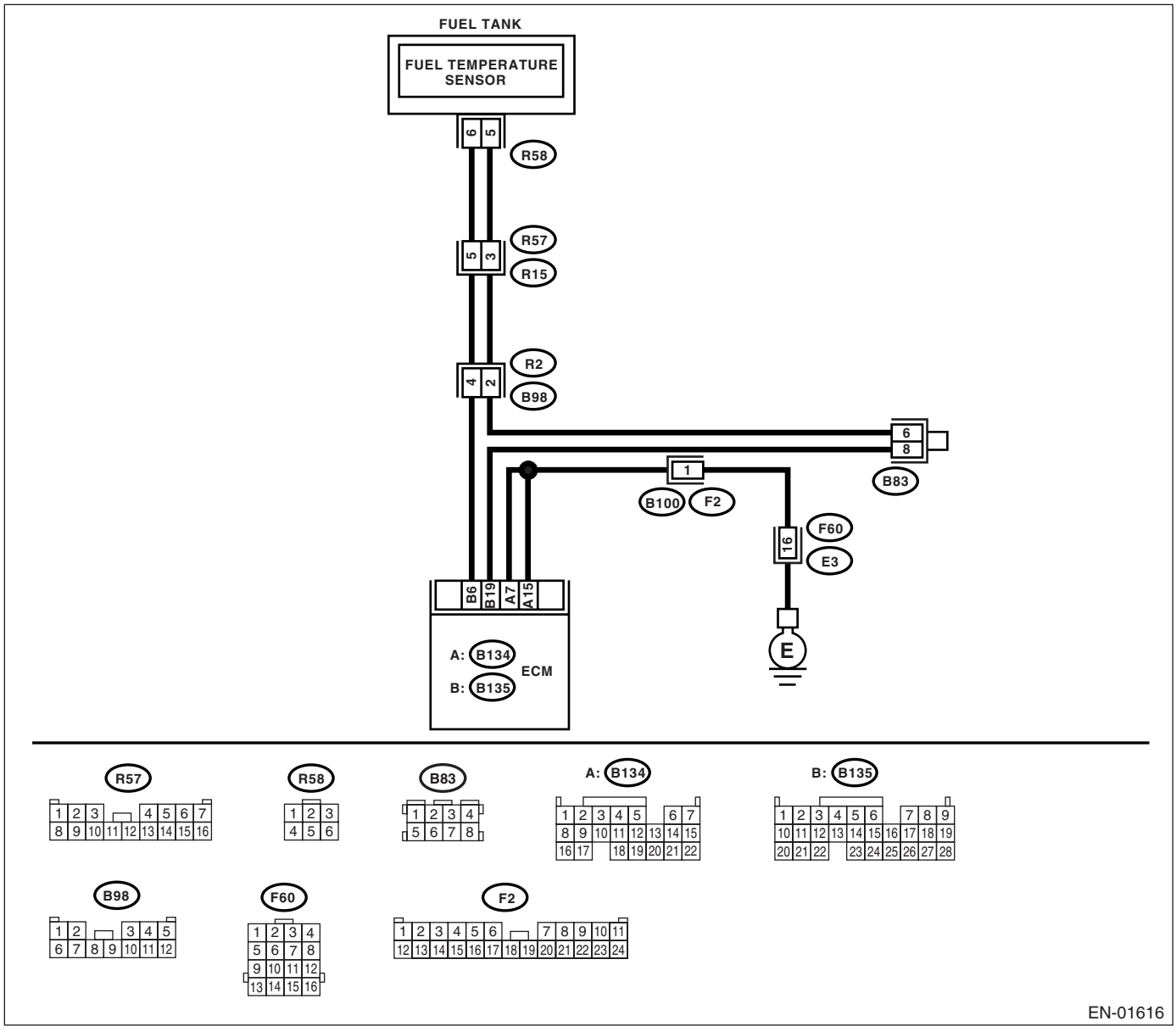
AF:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-76, DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature more than 150°C (302°F)?	Go to step **2.**	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.
2	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove the access hole lid. 3) Disconnect the connector from fuel pump. 4) Turn ignition switch to ON. 5) Read the data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature less than −40°C (−40°F)?	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-9, Fuel Temperature Sensor.>	Repair short circuit to ground in harness between fuel pump and ECM connector.

AG:DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT

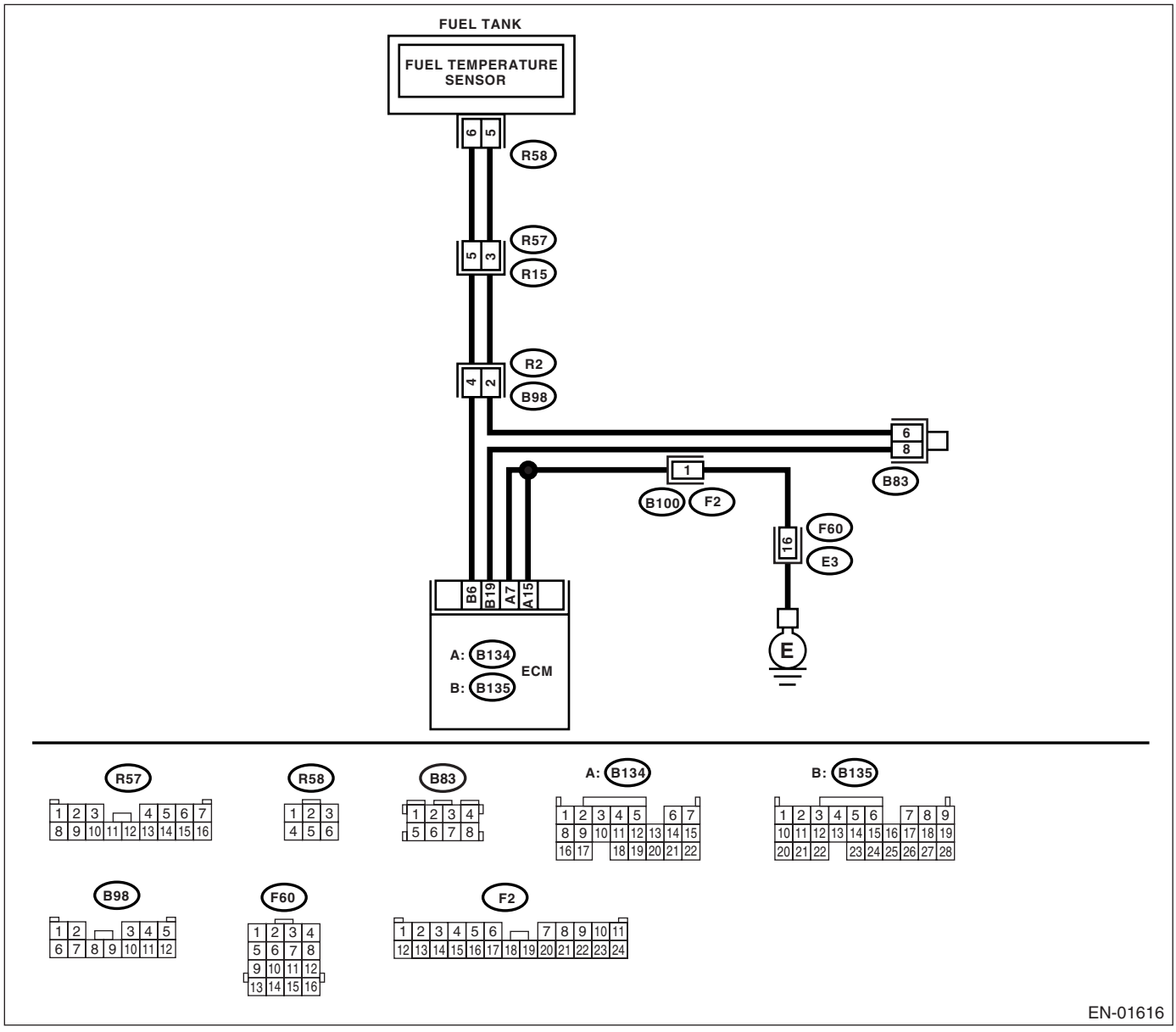
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-78, DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature less than −40°C (−40°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Remove the access hole lid. 3) Disconnect the connector from fuel pump. 4) Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and fuel pump connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and fuel pump connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 4 V?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between fuel pump connector and ECM. ***Connector & terminal*** ***(R58) No. 5 — (B135) No. 19:***	Is the resistance less than 1 Ω?	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-9, Fuel Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

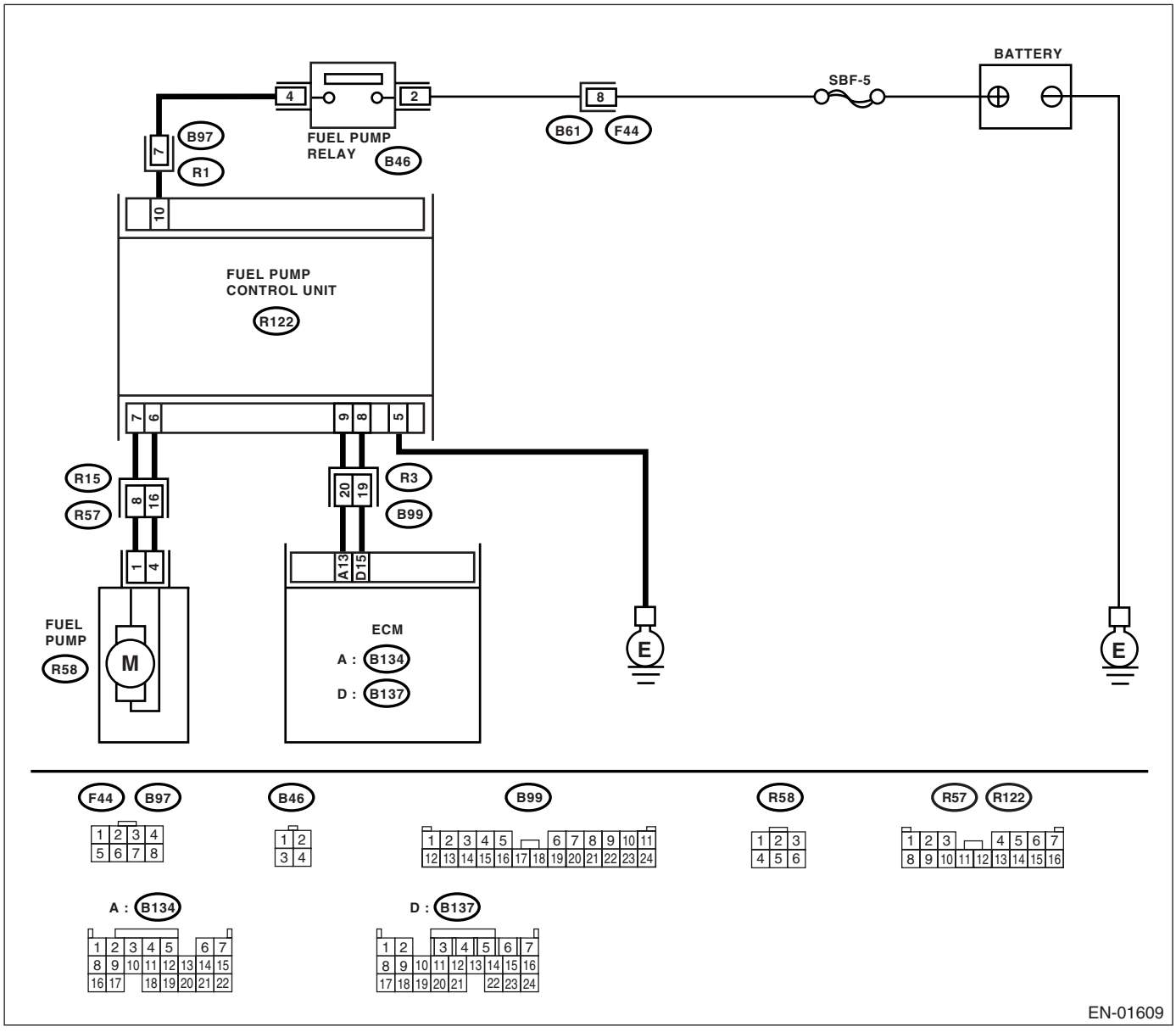
AH:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-81, ECM OPERATING AT DTC SETTING, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel pump control unit. 3) Turn the ignition switch to ON. 4) Measure the voltage between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Repair the power supply circuit. NOTE: In this case repair the following: • Open or ground short circuit in harness between fuel pump relay and fuel pump control unit • Poor contact in fuel pump control unit connector • Poor contact in fuel pump relay connector
2	**CHECK GROUND CIRCUIT OF FUEL PUMP CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit between fuel pump control unit and chassis ground • Poor contact in fuel pump control unit connector
3	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.** 1) Disconnect the connector from fuel pump. 2) Measure the resistance of harness between fuel pump control unit and fuel pump connector. ***Connector & terminal*** ***(R122) No. 7 — (R58) No. 1:*** ***(R122) No. 6 — (R58) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit between fuel pump control unit and fuel pump.
4	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.** Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 7 — Chassis ground:*** ***(R122) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit between fuel pump control unit and fuel pump.

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between fuel pump control unit and ECM connector. ***Connector & terminal*** ***(R122) No. 9 — (B134) No. 13:*** ***(R122) No. 8 — (B137) No. 15:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit between fuel pump control unit and ECM • Poor contact in fuel pump control unit and ECM connector
6	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.** Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 9 — Chassis ground:*** ***(R122) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit between fuel pump control unit and ECM.
7	**CHECK POOR CONTACT.** Check poor contact in ECM and fuel pump control unit connector.	Is there poor contact in ECM and fuel pump control unit connector?	Repair the poor contact in ECM and fuel pump control unit.	Replace the fuel pump control unit. <Ref. to FU(H4DOTC)-51, Fuel Pump Control Unit.>

AI: DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-82, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

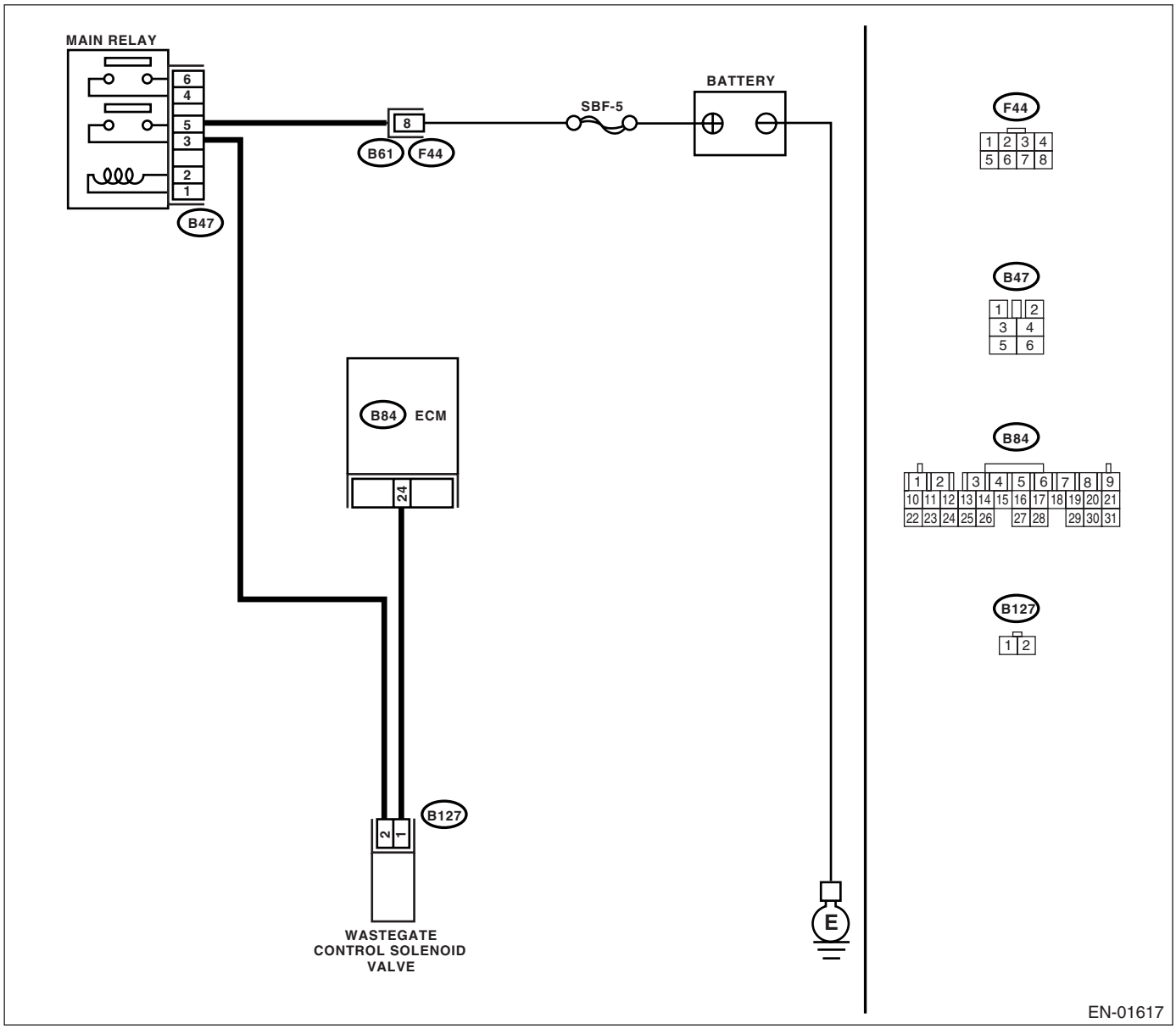
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0244.	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC)-42, Wastegate Control Solenoid Valve.>

AJ:DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-84, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

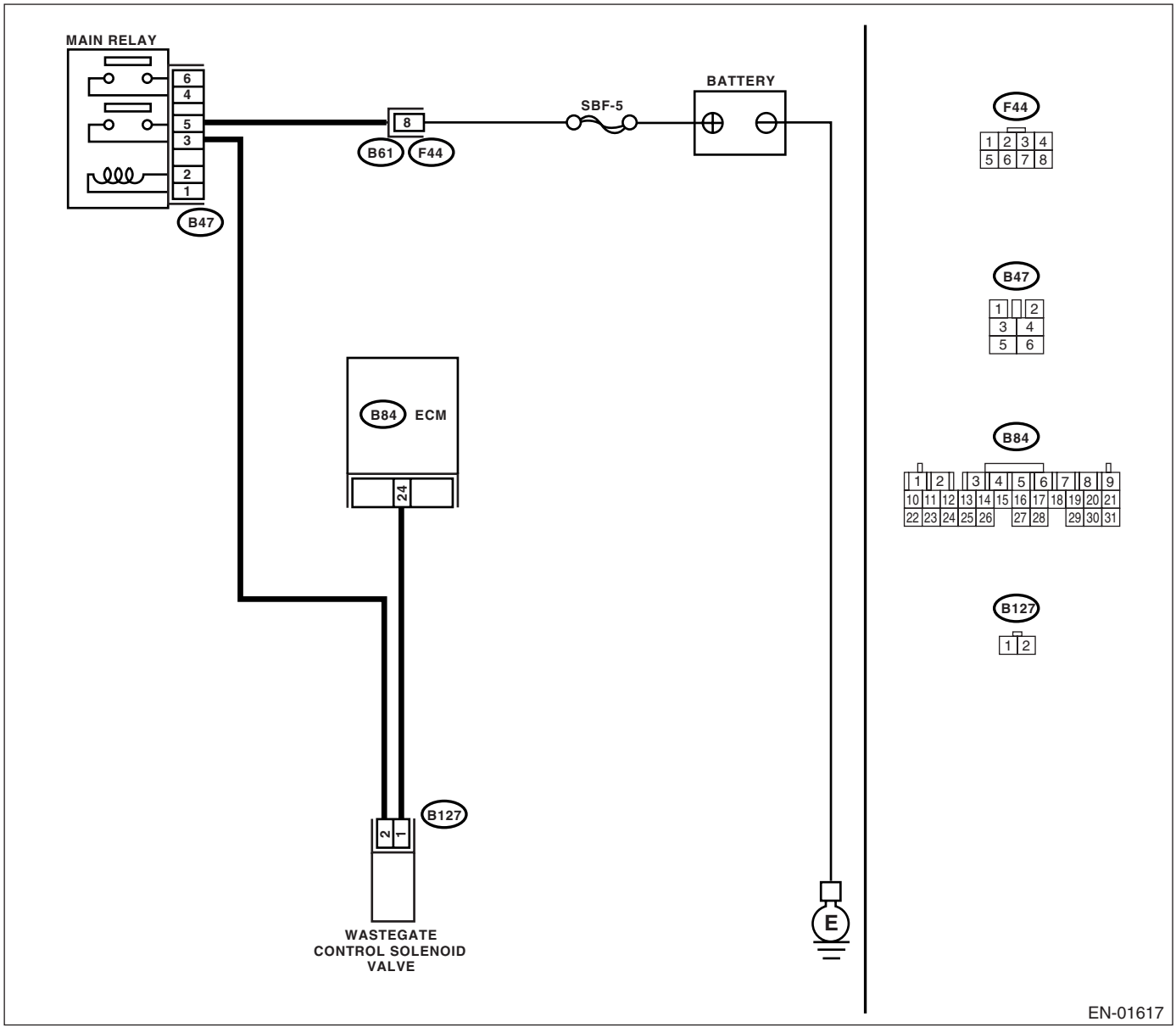
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 24 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.	Go to step **2.**
2	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from wastegate control solenoid valve and ECM. 3) Measure the resistance of harness between wastegate control solenoid valve connector and engine ground. ***Connector & terminal*** ***(B127) No. 1 — Engine ground:***	Is the resistance less than 10 Ω?	Repair the ground short circuit in harness between ECM and wastegate control solenoid valve connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and wastegate control solenoid valve of harness connector. ***Connector & terminal*** ***(B84) No. 24 — (B127) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between ECM and wastegate control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and wastegate control solenoid valve connector
4	**CHECK WASTEGATE CONTROL SOLENOID VALVE.** 1) Remove the wastegate control solenoid valve. 2) Measure the resistance between wastegate control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 30 — 40 Ω?	Go to step **5.**	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC)-42, Wastegate Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO WASTEGATE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between wastegate control solenoid valve and engine ground. ***Connector & terminal*** ***(B127) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Repair the open circuit in harness between main relay and wastegate control solenoid valve connector.
6	**CHECK POOR CONTACT.** Check poor contact in wastegate control solenoid valve connector.	Is there poor contact in wastegate control solenoid valve connector?	Repair the poor contact in wastegate control solenoid valve connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AK:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-86, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

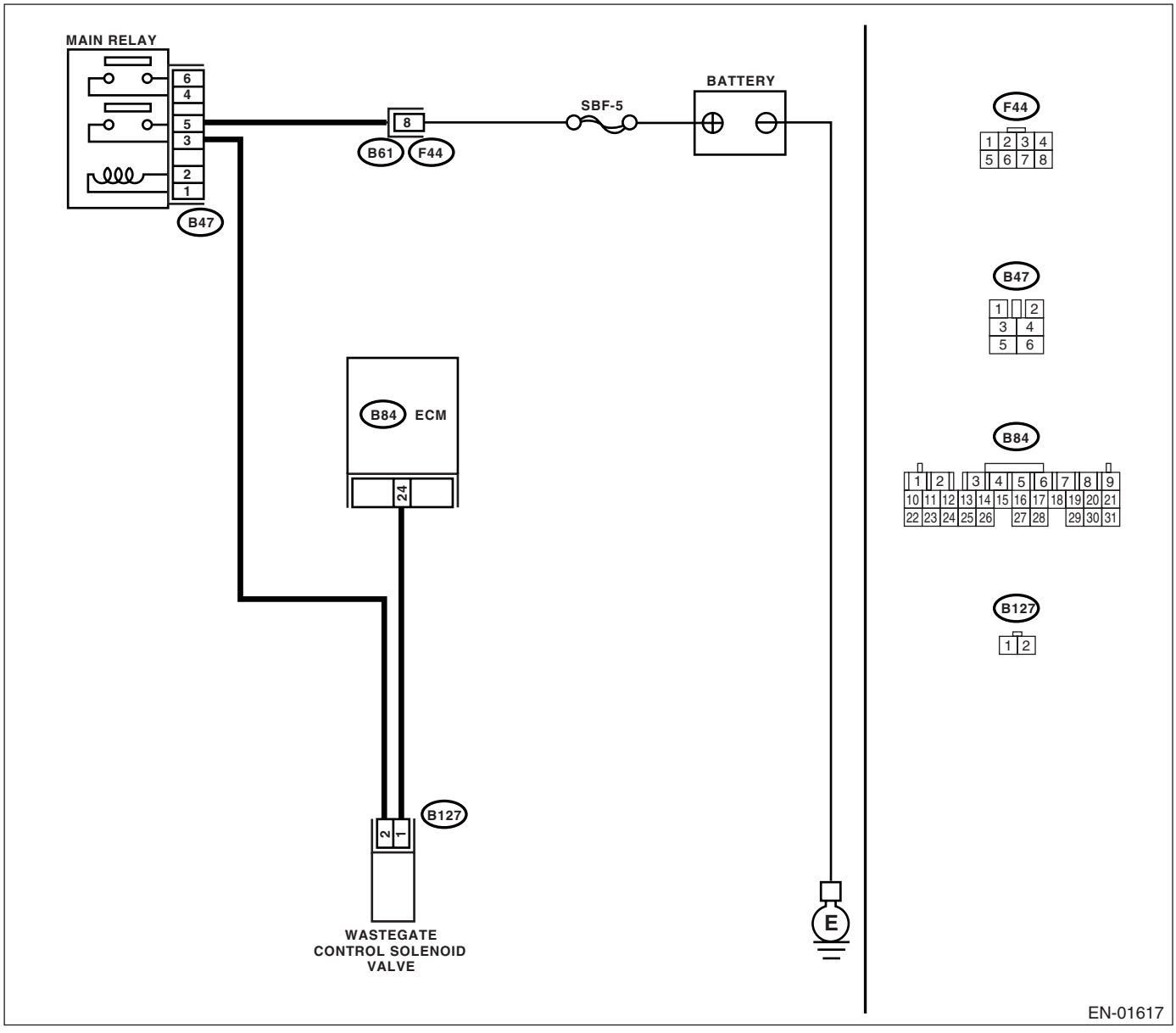
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 24 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>
3	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from wastegate control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 24 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and wastegate control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Go to step **4.**
4	**CHECK WASTEGATE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between wastegate control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the wastegate control solenoid valve <Ref. to FU(H4DOTC)-42, Wastegate Control Solenoid Valve.> and ECM <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>

AL:DTC P0301 CYLINDER 1 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)(diag)-157, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AM:DTC P0302 CYLINDER 2 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)(diag)-157, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AN:DTC P0303 CYLINDER 3 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)(diag)-157, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AO:DTC P0304 CYLINDER 4 MISFIRE DETECTED

DTC DETECTING CONDITION:

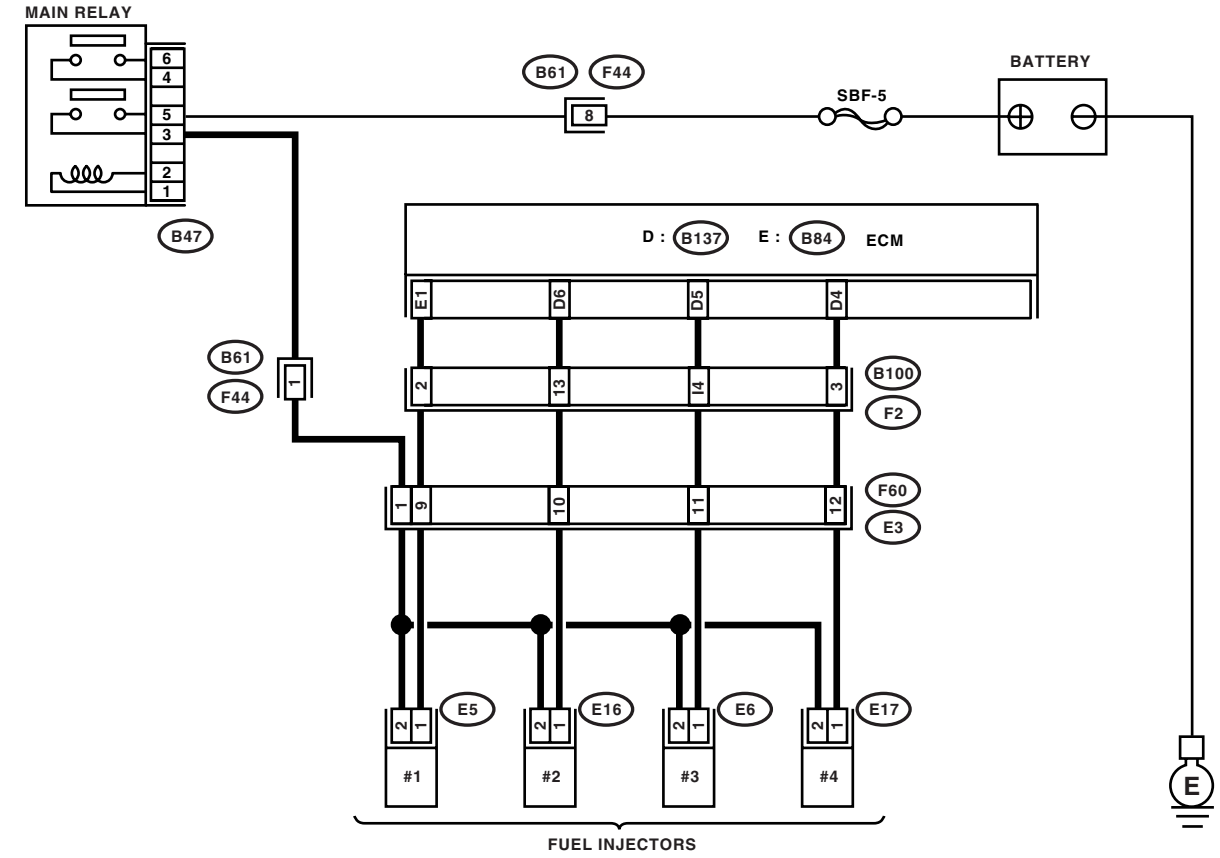
- Two consecutive driving cycles with fault
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-94, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

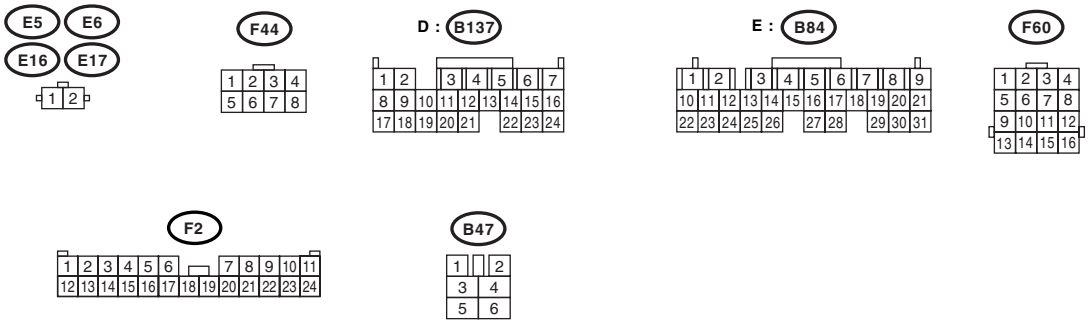
TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling
- Rough driving

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-01297

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B84) No. 1 (+) — Chassis ground (−):*** ***#2 (B137) No. 6 (+) — Chassis ground (−):*** ***#3 (B137) No. 5 (+) — Chassis ground (−):*** ***#4 (B137) No. 4 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **7.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Disconnect the connector from ECM. 4) Measure the resistance between ECM connector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 1 — Engine ground:*** ***#2 (E16) No. 1 — Engine ground:*** ***#3 (E6) No. 1 — Engine ground:*** ***#4 (E17) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the ground short circuit in harness between fuel injector and ECM connector.
4	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders. ***Connector & terminal*** ***#1 (B84) No. 1 — (E5) No. 1:*** ***#2 (B137) No. 6 — (E16) No. 1:*** ***#3 (B137) No. 5 — (E6) No. 1:*** ***#4 (B137) No. 4 — (E17) No. 1:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
5	**CHECK FUEL INJECTOR.** Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **6.**	Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-35, Fuel Injector.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY LINE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel injector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the poor contact in all connectors in fuel injector circuit.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel injector connector on faulty cylinders • Poor contact in coupling connector • Poor contact in main relay connector • Poor contact in fuel injector connector on faulty cylinders
7	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinder. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B84) No. 1 (+) — Chassis ground (–):*** ***#2 (B137) No. 6 (+) — Chassis ground (–):*** ***#3 (B137) No. 5 (+) — Chassis ground (–):*** ***#4 (B137) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and fuel injector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Go to step **8.**
8	**CHECK FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the faulty fuel injector <Ref. to FU(H4DOTC)-35, Fuel Injector.> and ECM <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Go to step **9.**
9	**CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.**	Is the camshaft position sensor or crankshaft position sensor loosely installed?	Tighten the camshaft position sensor or crankshaft position sensor.	Go to step **10.**
10	**CHECK CRANKSHAFT SPROCKET.** Remove the timing belt cover.	Is the crankshaft sprocket rusted or does it have broken teeth?	Replace the crankshaft sprocket. <Ref. to ME(H4DOTC)-55, Crankshaft Sprocket.>	Go to step **11.**
11	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block.	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(H4DOTC)-46, Timing Belt Assembly.>	Go to step **12.**

	Step	Check	Yes	No
12	**CHECK FUEL LEVEL.**	Is the fuel meter indication higher than the “Lower” level?	Go to step **13.**	Replenish the fuel so fuel meter indication is higher than the “Lower” level. After replenishing fuel; Go to step **13.**
13	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Clear the memory using Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-46, Clear Memory Mode.> 2) Start the engine, and drive the vehicle more than 10 minutes.	Is the malfunction indicator light coming on or blinking?	Go to step **15.**	Go to step **14.**
14	**CHECK CAUSE OF MISFIRE DIAGNOSED.**	Was the cause of misfire diagnosed when the engine is running?	Finish the diagnostics operation, if the engine has no abnormality.	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in ignition coil connector • Poor contact in fuel injector connector on faulty cylinders • Poor contact in ECM connector • Poor contact in coupling connector
15	**CHECK AIR INTAKE SYSTEM.**	Is there a fault in air intake system?	Repair the air intake system. NOTE: Check the following items: • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses?	Go to step **16.**
16	**CHECK CYLINDER.**	Is there a fault in that cylinder?	Repair or replace the faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression pressure	Go to DTC P0171 and P0172. <Ref. to EN(H4DOTC)(diag)-137, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AP:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-95, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

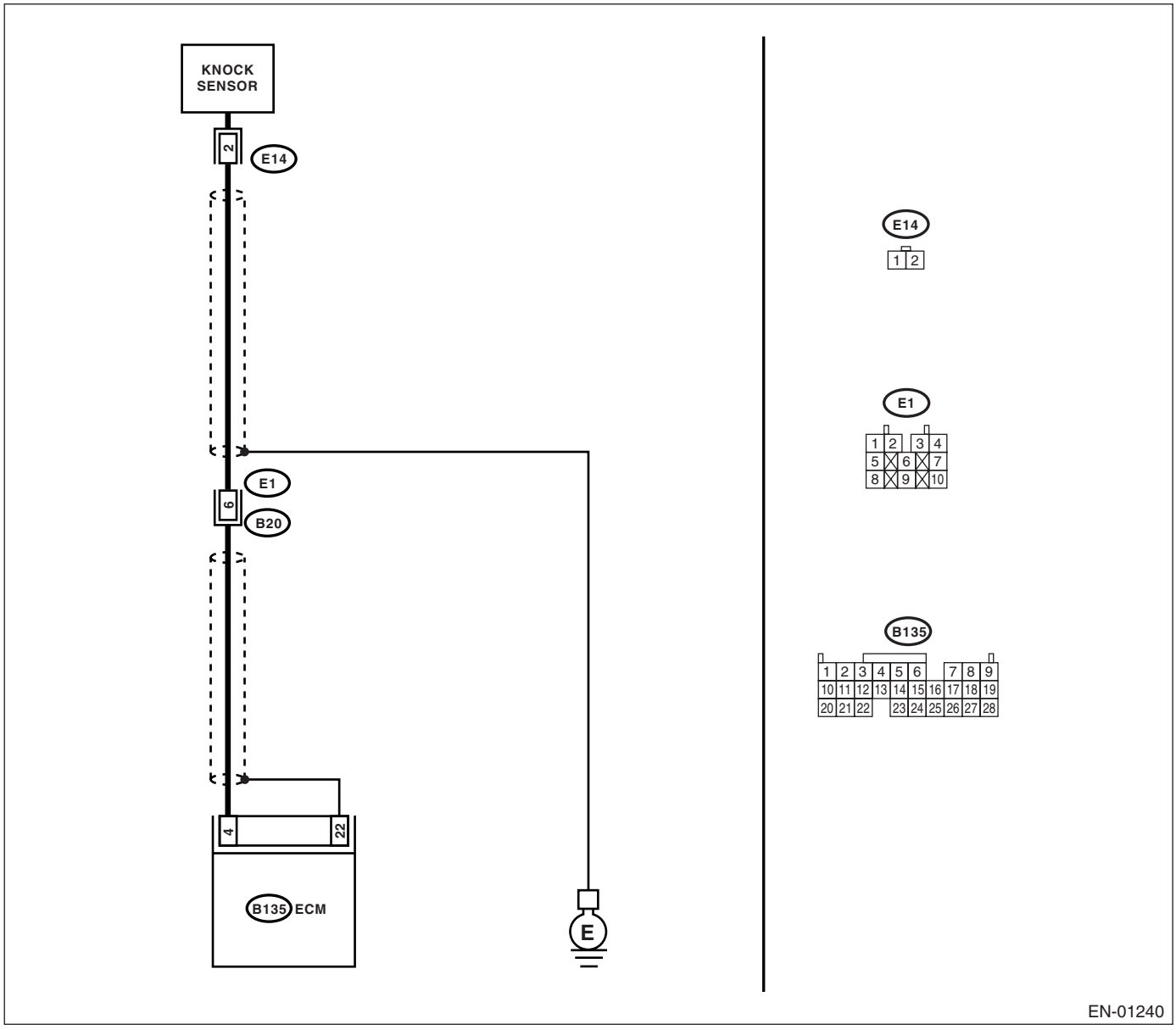
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM harness connector and chassis ground. ***Connector & terminal*** ***(B135) No. 4 — Chassis ground:***	Is the resistance more than 700 kΩ?	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. ***Terminals*** ***No. 2 — Engine ground:***	Is the resistance more than 700 kΩ?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Poor contact in knock sensor connector • Poor contact in coupling connector
3	**CHECK CONDITION OF KNOCK SENSOR INSTALLATION.**	Is the knock sensor installation bolt tightened securely?	Replace the knock sensor. <Ref. to FU(H4DOTC)-30, Knock Sensor.>	Tighten the knock sensor installation bolt securely.

AQ:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-97, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

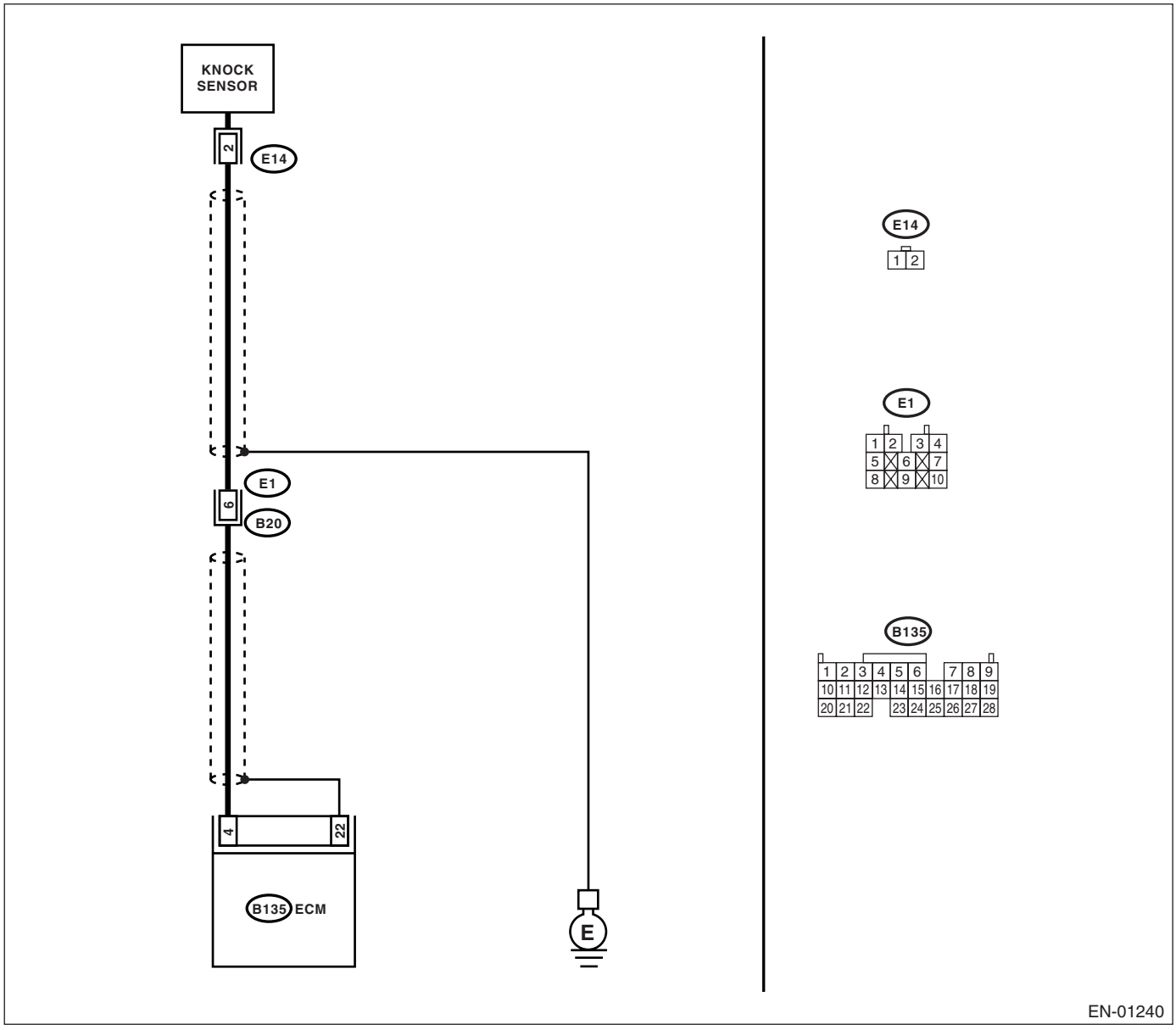
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 4 — Chassis ground:***	Is the resistance less than 400 kΩ?	Go to step **2.**	Go to step **3.**
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. ***Terminals*** ***No. 2 — Engine ground:***	Is the resistance less than 400 kΩ?	Replace the knock sensor. <Ref. to FU(H4DOTC)-30, Knock Sensor.>	Repair the ground short circuit in harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors is shielded. Repair the short circuit of harness together with shield.
3	**CHECK INPUT SIGNAL FOR ECM.** 1) Connect the connectors to ECM and knock sensor. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 4 (+) — Chassis ground (−):***	Is the voltage more than 2 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in knock sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Repair the poor contact in ECM connector.

AR:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-99, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

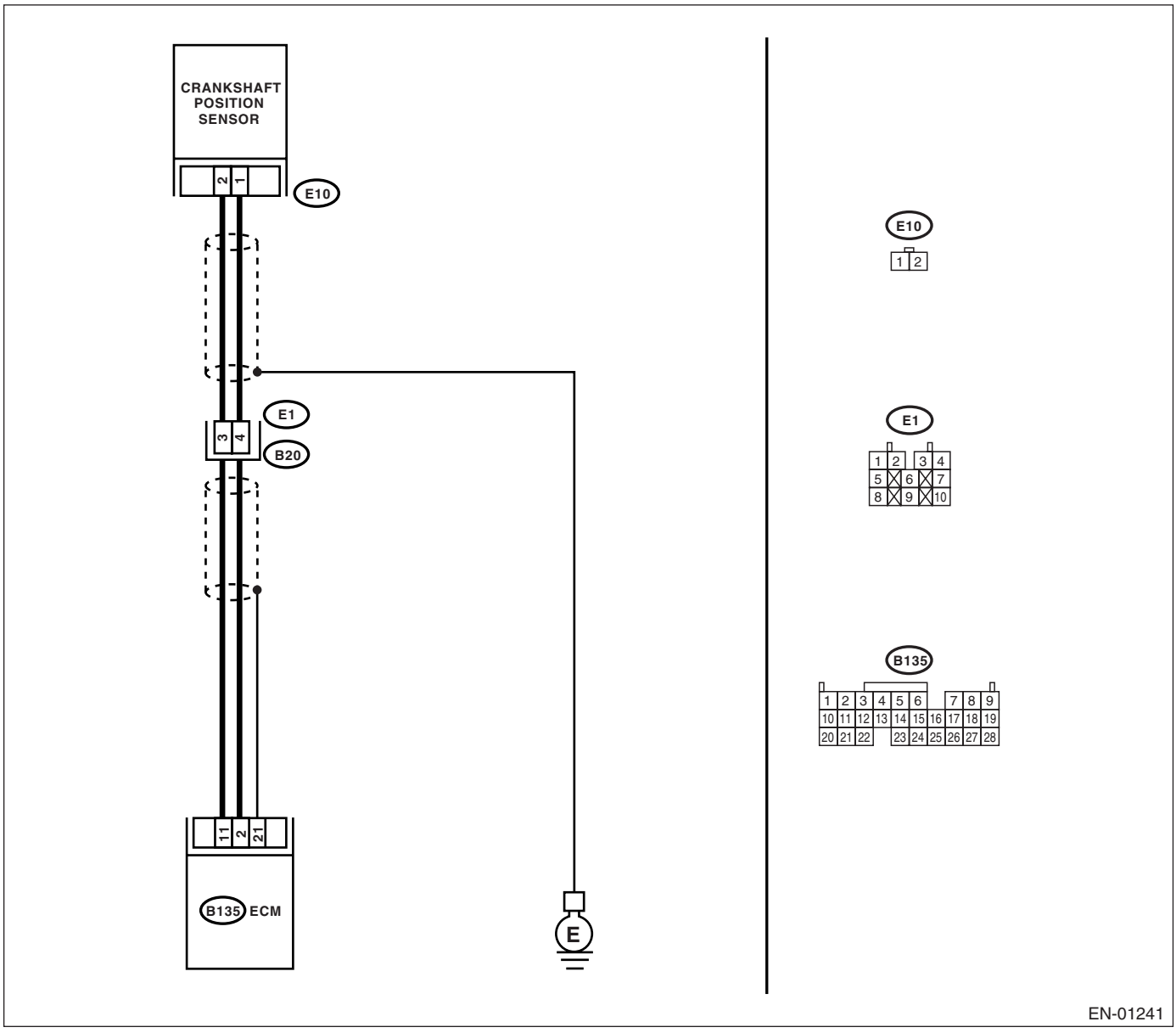
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from crankshaft position sensor. 3) Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the resistance more than 100 kΩ?	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **2.**
2	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the ground short circuit in harness between crankshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.
3	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
4	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.**	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **5.**	Tighten the crankshaft position sensor installation bolt securely.
5	**CHECK CRANKSHAFT POSITION SENSOR.** 1) Remove the crankshaft position sensor. 2) Measure the resistance between connector terminals of crankshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 — 4 kΩ?	Repair the poor contact in crankshaft position sensor connector.	Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-28, Crankshaft Position Sensor.>

AS:DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-101, DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

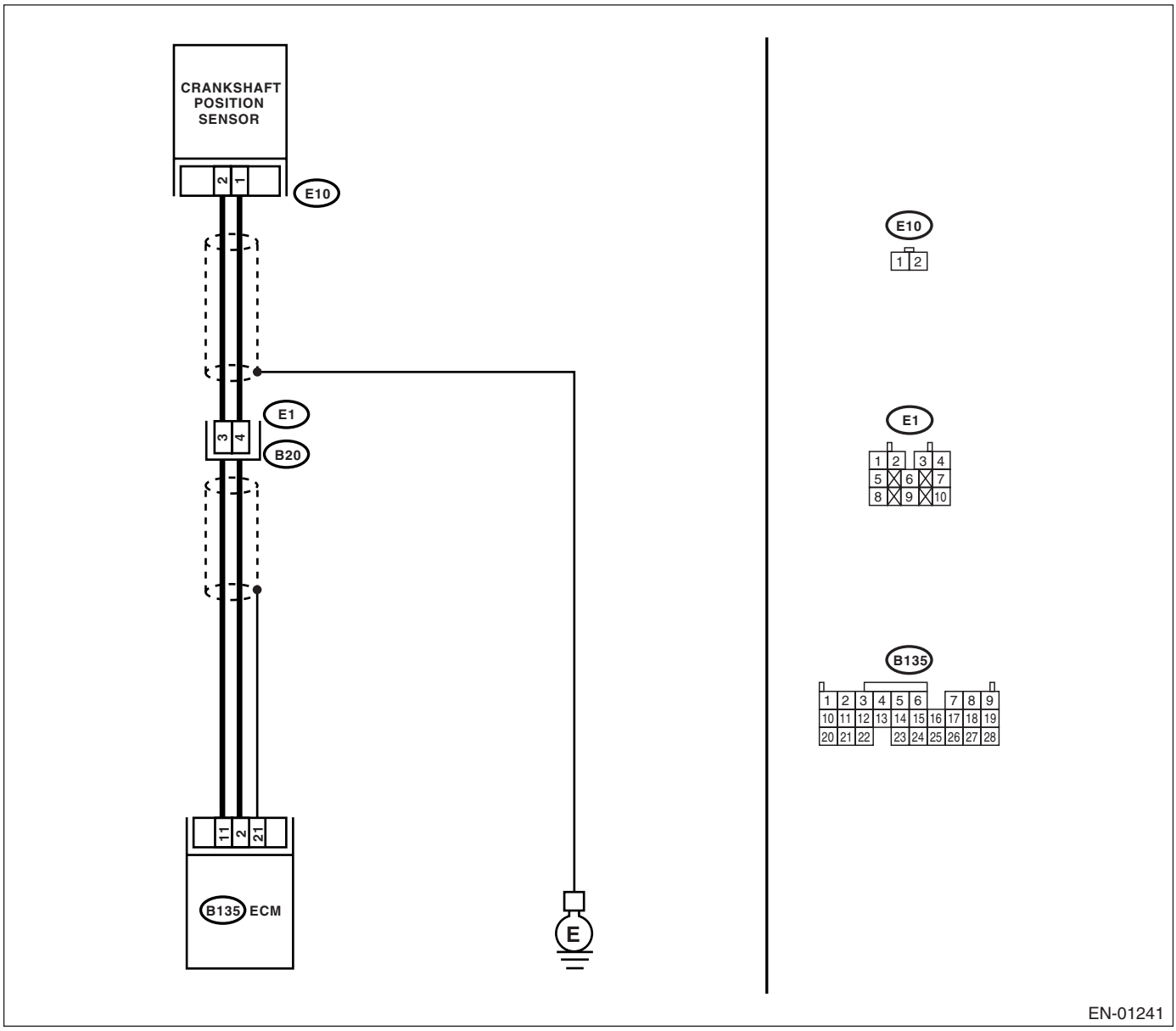
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Turn the ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **3.**	Tighten the crankshaft position sensor installation bolt securely.
3	**CHECK CRANKSHAFT SPROCKET.** Remove the front belt cover.	Are the crankshaft sprocket teeth cracked or damaged?	Replace the crankshaft sprocket. <Ref. to FU(H4DOTC)-28, Crankshaft Position Sensor.>	Go to step **4.**
4	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block.	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(H4DOTC)-46, Timing Belt Assembly.>	Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-28, Crankshaft Position Sensor.>

AT:DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-103, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

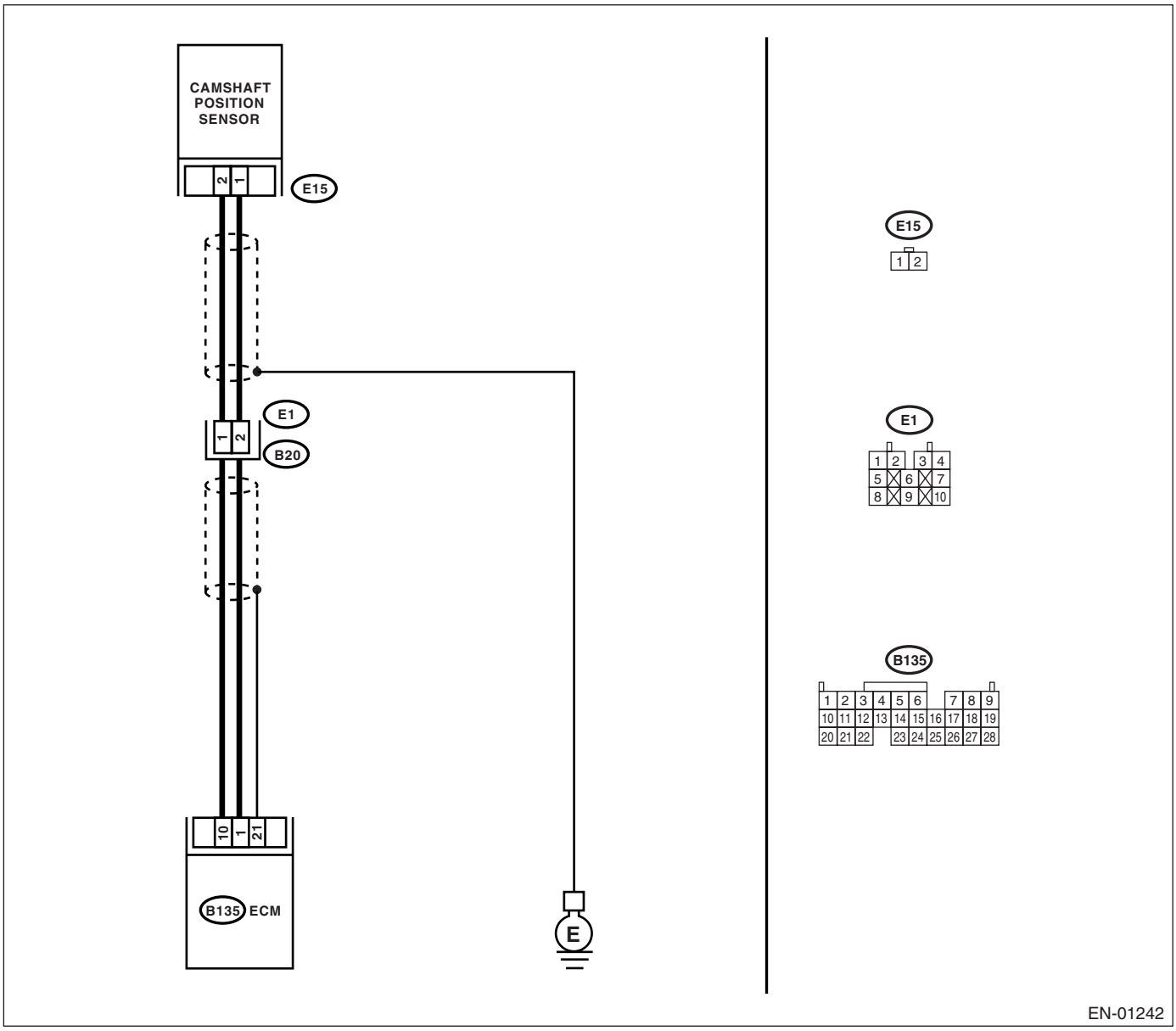
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the resistance more than 100 kΩ?	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **2.**
2	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the ground short circuit in harness between camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair the ground short circuit in harness together with shield.
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
4	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **5.**	Tighten the camshaft position sensor installation bolt securely.
5	**CHECK CAMSHAFT POSITION SENSOR.** 1) Remove the camshaft position sensor. 2) Measure the resistance between connector terminals of camshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 — 4 kΩ?	Repair the poor contact in camshaft position sensor connector.	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-29, Camshaft Position Sensor.>

AU:DTC P0341 CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-108, ECM OPERATING AT DTC SETTING, DTC P0341 CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

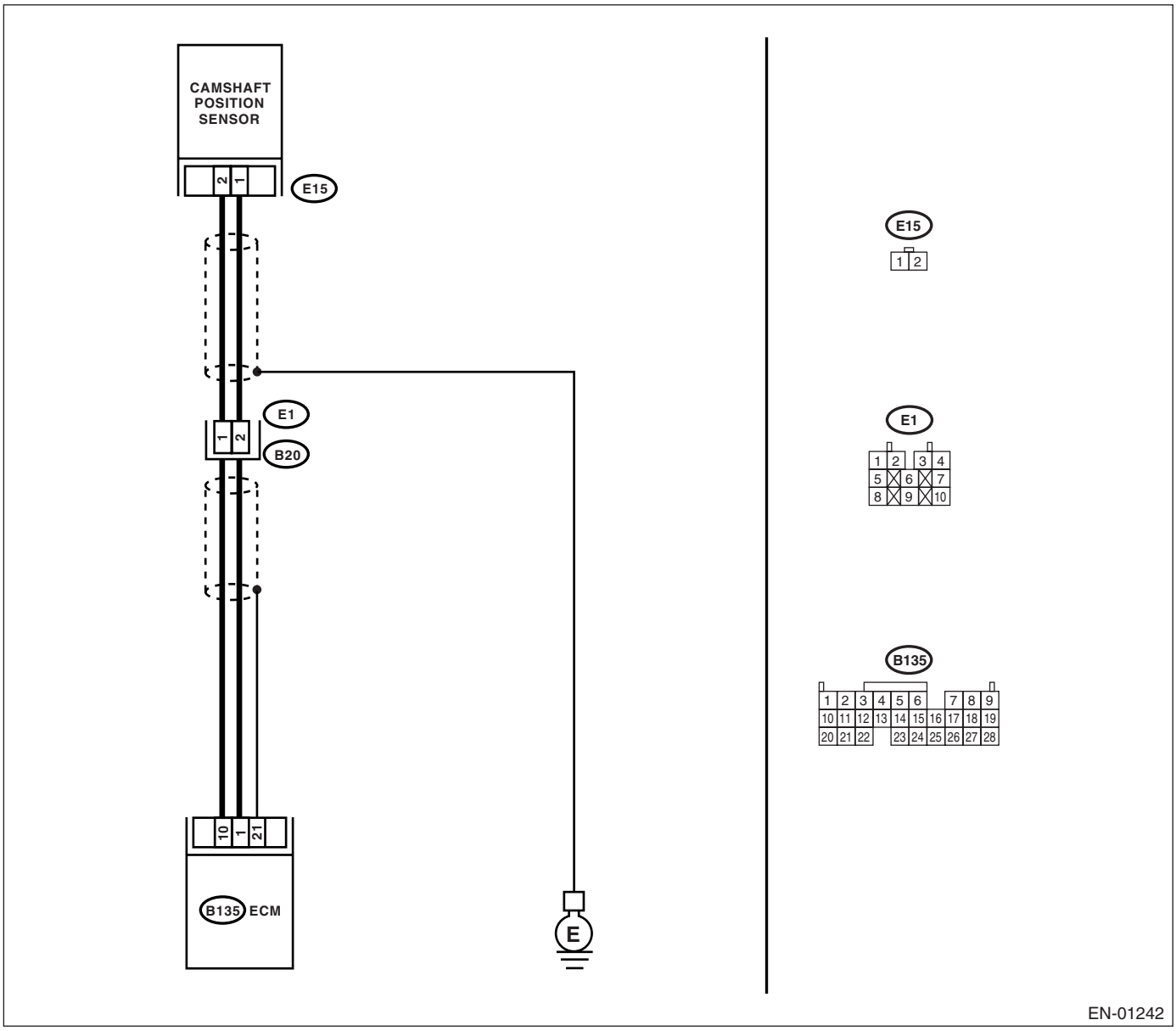
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the resistance more than 100 kΩ?	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **3.**
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the resistance less than 10 Ω?	Go to step **4.**	Repair the ground short circuit in harness between camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **6.**	Tighten the camshaft position sensor installation bolt securely.

	Step	Check	Yes	No
6	**CHECK CAMSHAFT POSITION SENSOR.** 1) Remove the camshaft position sensor. 2) Measure the resistance between connector terminals of camshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 — 4 kΩ?	Go to step **7.**	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-29, Camshaft Position Sensor.>
7	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.** Turn the ignition switch to OFF.	Is the camshaft position sensor installation bolt tightened securely?	Go to step **8.**	Tighten the camshaft position sensor installation bolt securely.
8	**CHECK CAMSHAFT SPROCKET.** Remove the front belt cover. <Ref. to ME(H4DOTC)-45, Timing Belt Cover.>	Are the camshaft sprocket teeth cracked or damaged?	Replace the camshaft sprocket. <Ref. to ME(H4DOTC)-54, Camshaft Sprocket.>	Go to step **9.**
9	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the camshaft, and align alignment mark on camshaft sprocket with alignment mark on timing belt cover LH.	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(H4DOTC)-46, Timing Belt Assembly.>	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-29, Camshaft Position Sensor.>

AV:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-109, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

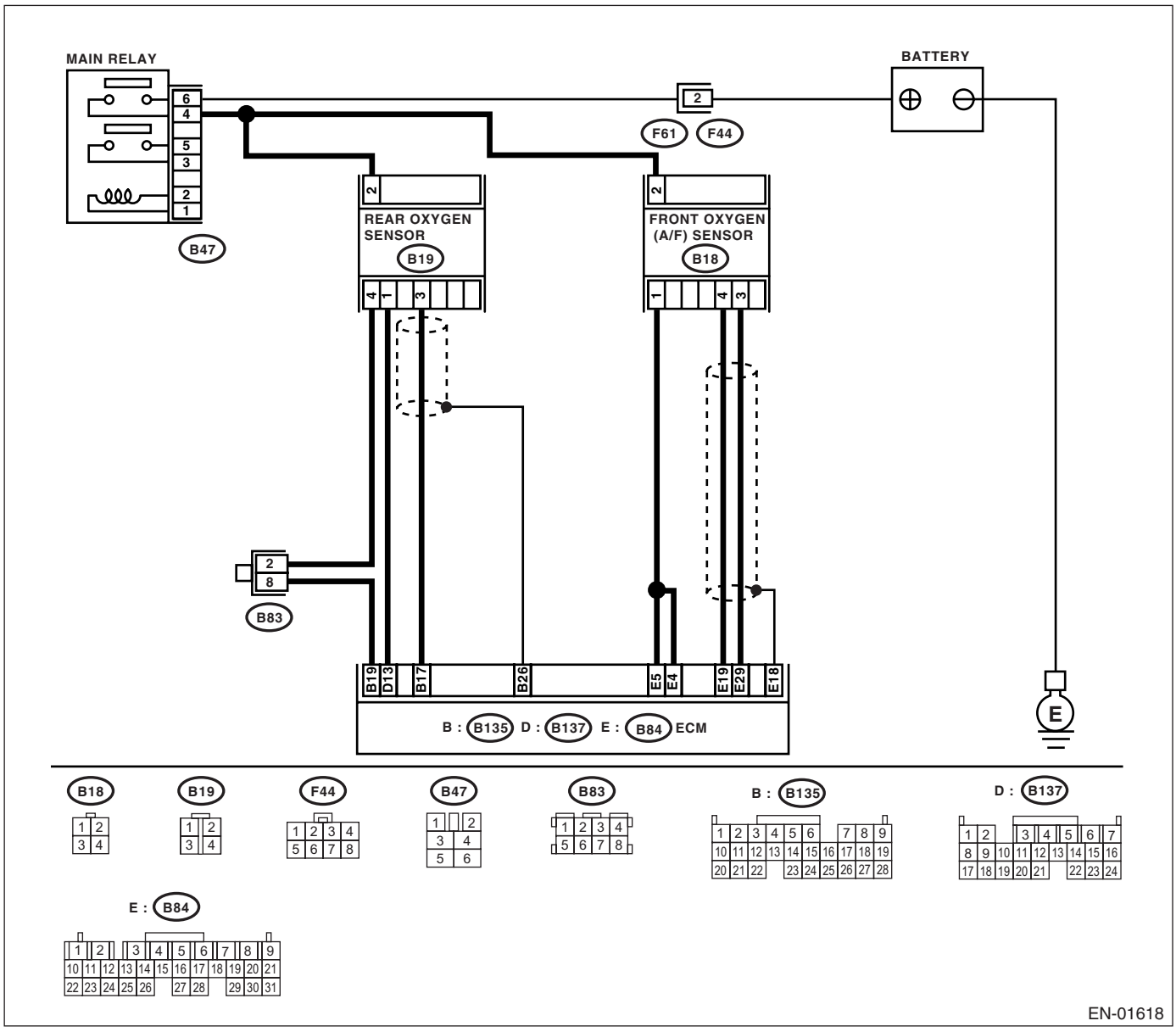
TROUBLE SYMPTOM:

- Engine stalls.
- Idle mixture is out of specifications.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. NOTE: Check the following positions. • Between cylinder head and front exhaust pipe • Between front exhaust pipe and front catalytic converter • Between front catalytic converter and rear catalytic converter	Is there a fault in exhaust system?	Repair or replace the exhaust system. <Ref. to EX(H4DOTC)-2, General Description.>	Go to step **3.**
3	**CHECK REAR CATALYTIC CONVERTER.** Separate the rear catalytic converter from rear exhaust pipe.	Is there damage at rear face of rear catalyst?	Replace the front catalytic converter. <Ref. to EC(H4DOTC)-3, Front Catalytic Converter.> and rear catalytic converter <Ref. to EC(H4DOTC)-4, Rear Catalytic Converter.>	Go to step **4.**
4	**CHECK FRONT CATALYTIC CONVERTER.** Remove the front catalytic converter.	Is there damage at rear face or front face of front catalyst?	Replace the front catalytic converter. <Ref. to EC(H4DOTC)-3, Front Catalytic Converter.>	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AW:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

DTC DETECTING CONDITION:

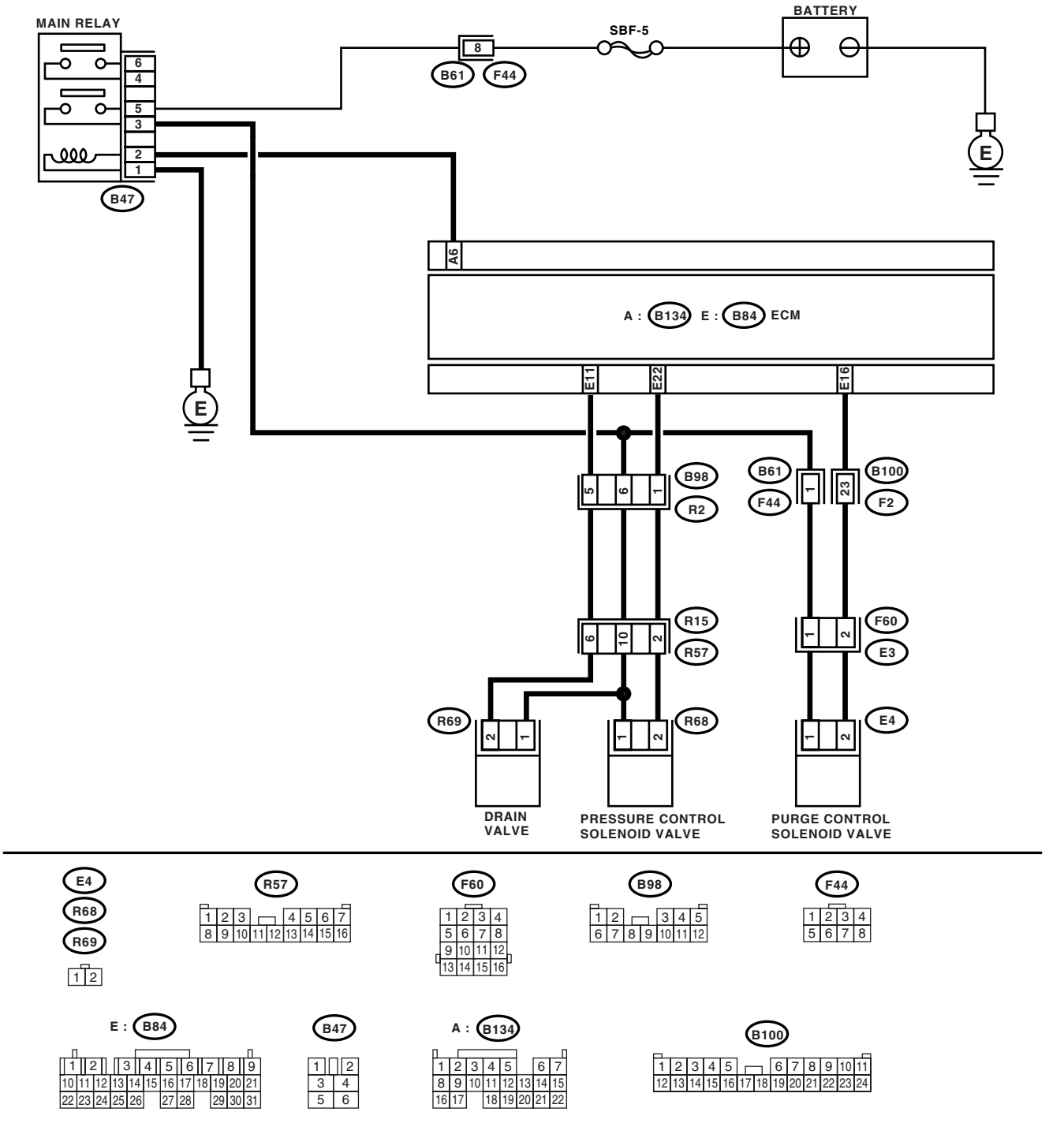
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-112, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Fuel odor
- There is a hole of more than 1.0 mm (0.04 in) dia. in evaporation system or fuel tank.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01619

	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap SUBARU genuine?	Go to step **4.**	Replace with a SUBARU genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-56, Fuel Filler Pipe.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **6.**	Replace the drain valve. <Ref. to EC(H4DOTC)-19, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **7.**	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-7, Purge Control Solenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **8.**	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-13, Pressure Control Solenoid Valve.>

	Step	Check	Yes	No
8	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn ignition switch to OFF.	Is there a hole of more than 1.0 mm (0.04 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-69, Fuel Delivery, Return and Evaporation Lines.>	Go to step **9.**
9	**CHECK CANISTER.**	Is the canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the canister. <Ref. to EC(H4DOTC)-6, Canister.>	Go to step **10.**
10	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4DOTC)-53, Fuel Tank.>	Is the fuel tank damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-53, Fuel Tank.>	Go to step **11.**
11	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 1.0 mm (0.04 in) dia., cracks, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AX:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

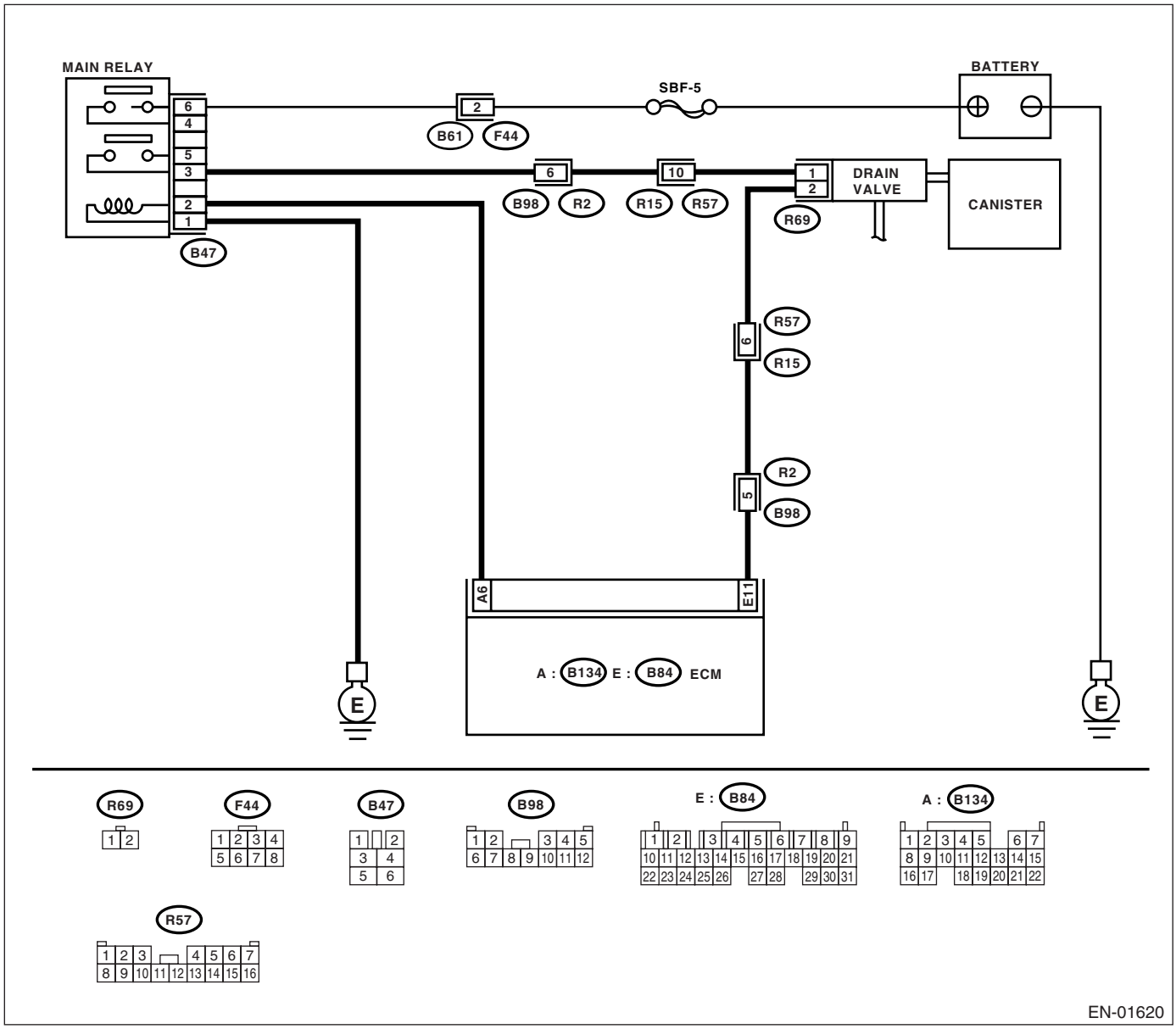
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-135, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 11 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in drain valve connector • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connectors from drain valve and ECM. 3) Measure the resistance of harness between drain valve connector and chassis ground. ***Connector & terminal*** ***(R69) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair short circuit to ground in harness between ECM and drain valve connector.
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and drain valve connector. ***Connector & terminal*** ***(B84) No. 11 — (R69) No. 2:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and drain valve connector • Poor contact in coupling connector
5	**CHECK DRAIN VALVE.** Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Go to step **6.**	Replace the drain valve. <Ref. to EC(H4DOTC)-19, Drain Valve.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO DRAIN VALVE.** 1) Turn ignition switch to ON. 2) Measure the voltage between drain valve and chassis ground. ***Connector & terminal*** ***(R69) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and drain valve • Poor contact in coupling connector • Poor contact in main relay connector
7	**CHECK FOR POOR CONTACT.** Check for poor contact in drain valve connector.	Is there poor contact in drain valve connector?	Repair poor contact in drain valve connector.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

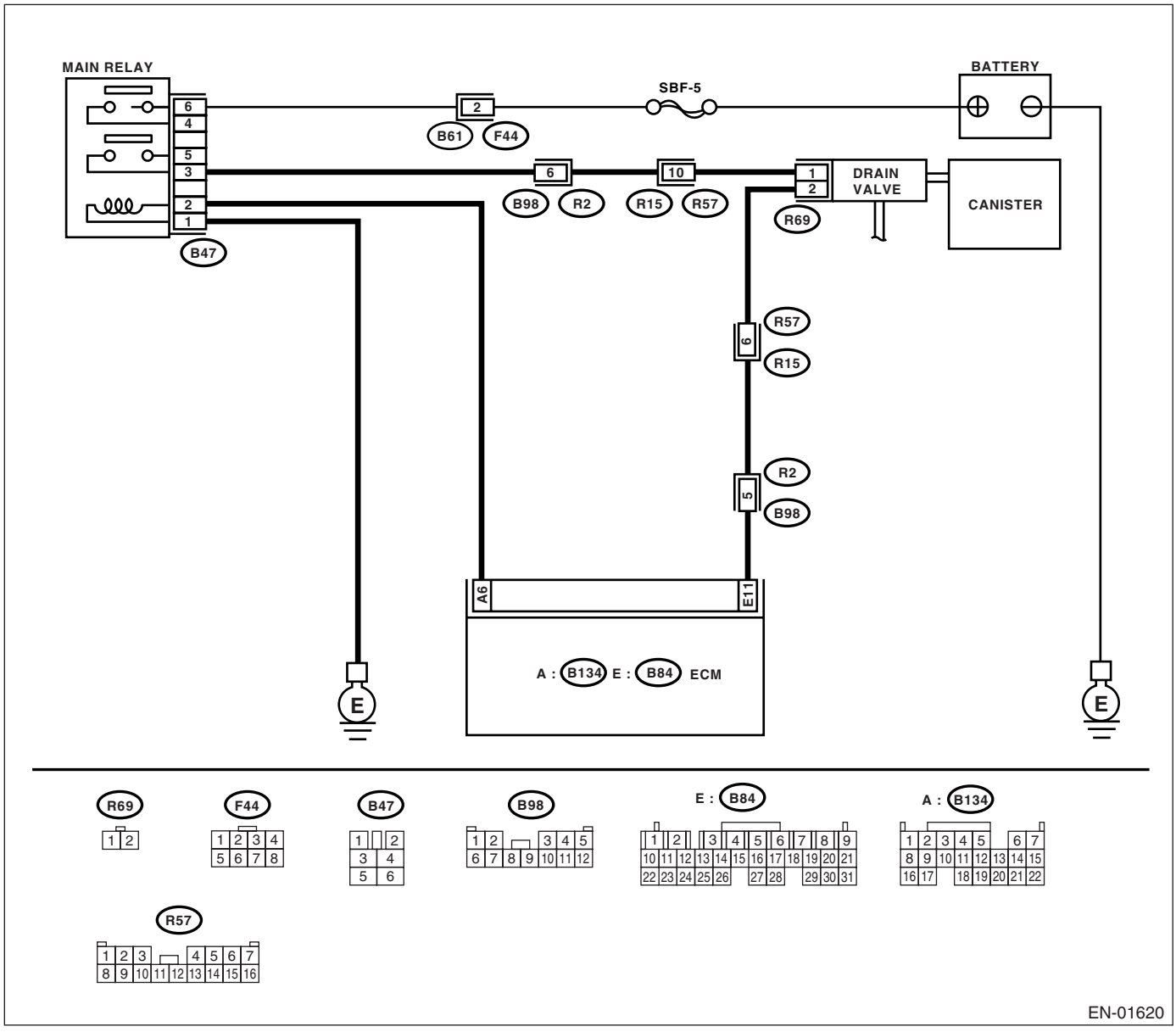
AY:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-137, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01620

	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) While operating the drain valve, measure voltage between ECM and chassis ground. NOTE: Drain valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B84) No. 11 (+) — Chassis ground (–):***	Does the resistance change within 0 — 10 V?	Go to step **2.**	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. In this case, repair poor contact in ECM connector.
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 11 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from drain valve. 3) Turn ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 11 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and drain valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Turn ignition switch to OFF. 2) Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the drain valve <Ref. to EC(H4DOTC)-19, Drain Valve.> and ECM <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>.	Go to step **6.**
6	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>

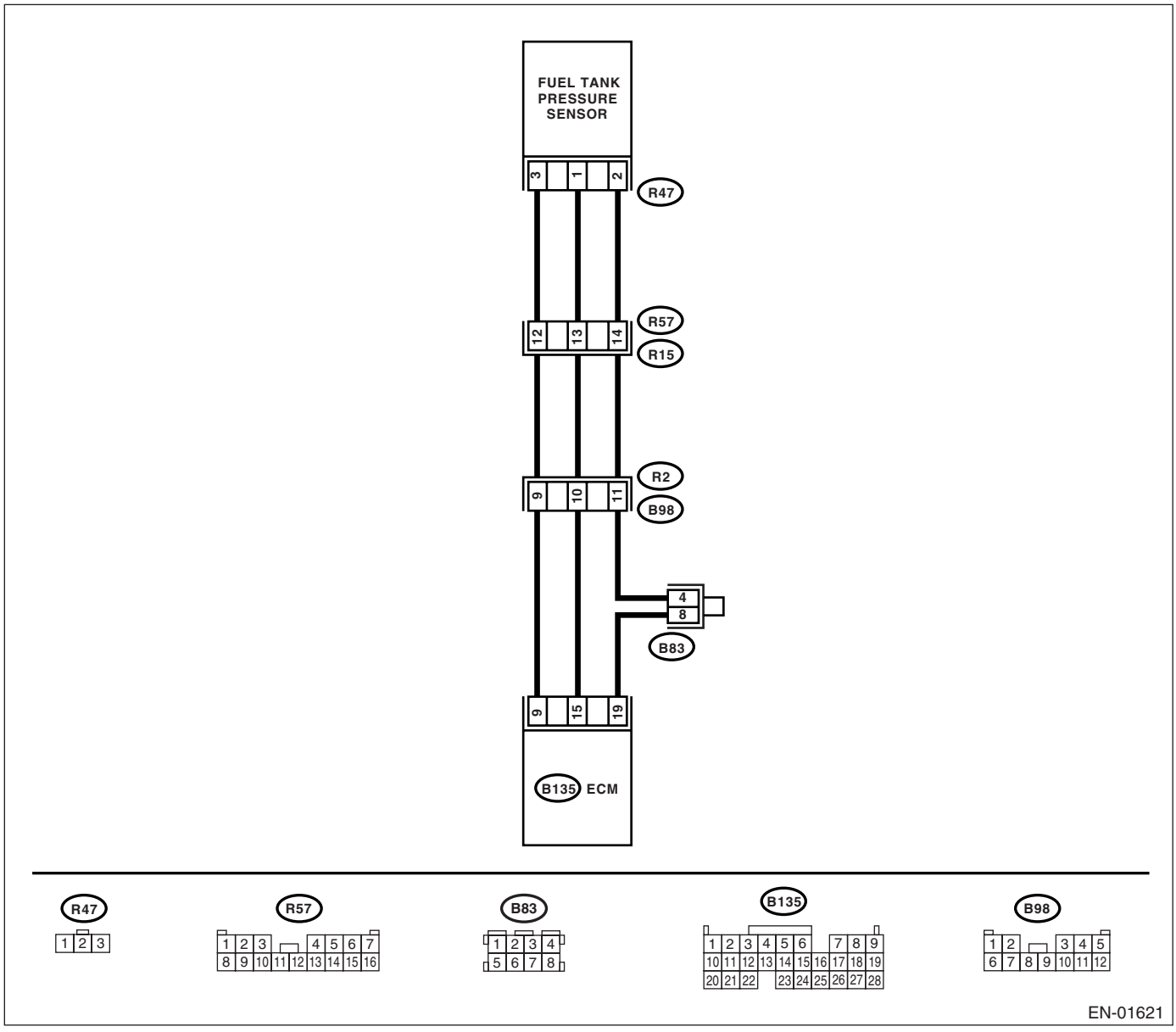
AZ:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-139, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK PRESSURE/VACUUM LINE.** NOTE: Check the following items. • Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank • Disconnection, leakage and clogging of air ventilation hoses and pipes between fuel filler pipe and fuel tank	Is there a fault in pressure/vacuum line?	Repair or replace the hoses and pipes.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-11, Fuel Tank Pressure Sensor.>

BA:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

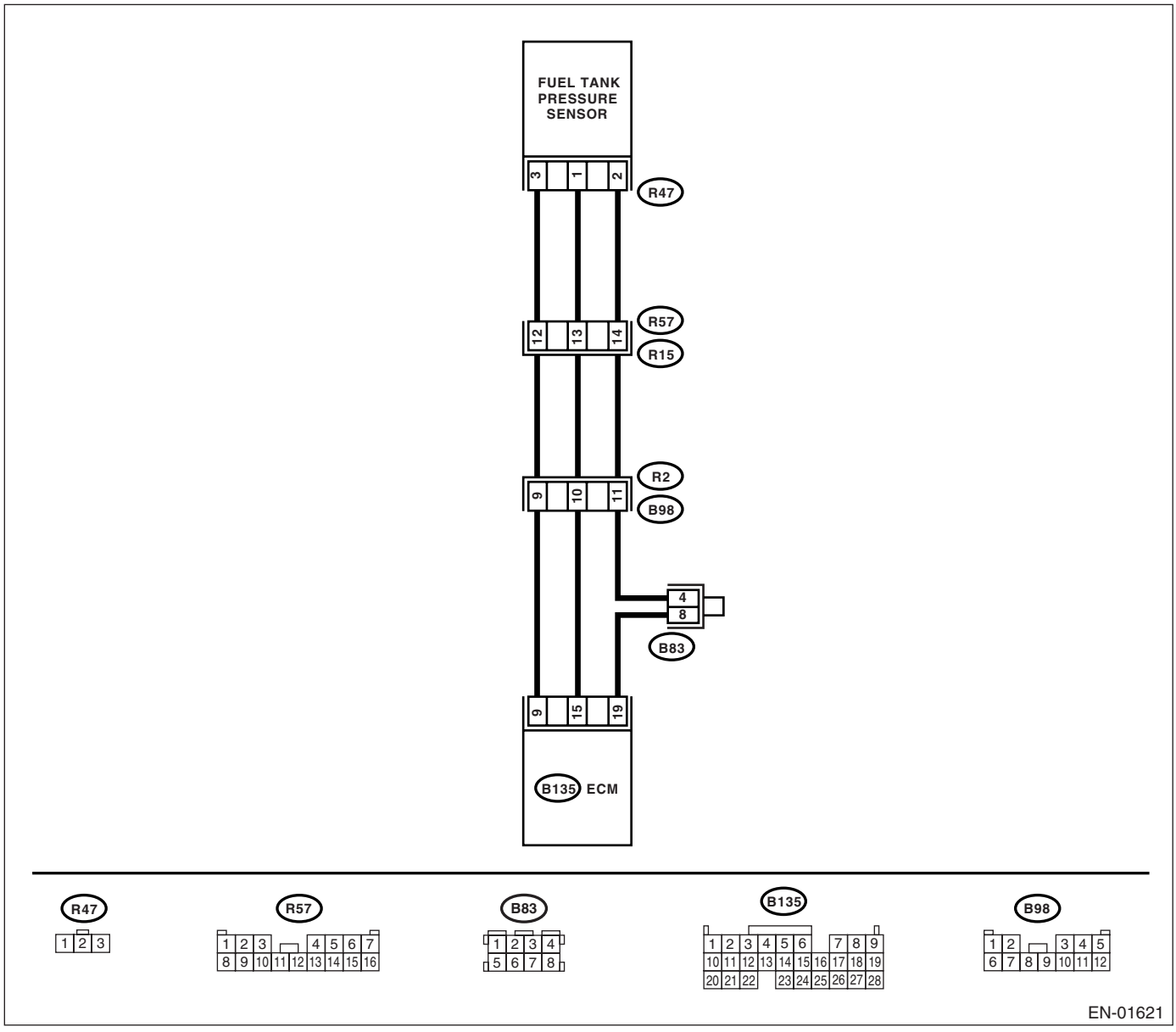
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-141, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove the fuel filler cap. 3) Install the fuel filler cap. 4) Turn ignition switch to ON. 5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured valve less than –2.8 kPa (–21.0 mmHg, –0.827 inHg)?	Go to step **2.**	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.
2	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Repair poor contact in ECM connector.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 15 (+) — Chassis ground (–):***	Is the voltage less than 0.2 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read the data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.>	Does the measured value exceed the specified value by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Remove the rear seat cushion. 3) Separate rear wiring harness and fuel tank cord. 4) Turn ignition switch to ON. 5) Measure the voltage between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R15) No. 12 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B135) No. 19 — (R15) No. 14:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector • Poor contact in joint connector
8	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** Measure the resistance of harness between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R15) No. 14 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair short circuit to ground in harness between ECM and rear wiring harness connector.
9	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel tank pressure sensor. 2) Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 12 — (R47) No. 3:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair open circuit in fuel tank cord.
10	**CHECK FUEL TANK CORD.** Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 14 — (R47) No. 2:***	Is the resistance less than 1 Ω?	Go to step **11.**	Repair open circuit in fuel tank cord.
11	**CHECK FUEL TANK CORD.** Measure the resistance of harness between fuel tank pressure sensor connector and engine ground. ***Connector & terminal*** ***(R47) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **12.**	Repair short circuit to ground in fuel tank cord.
12	**CHECK FOR POOR CONTACT.** Check for poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-11, Fuel Tank Pressure Sensor.>

BB:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

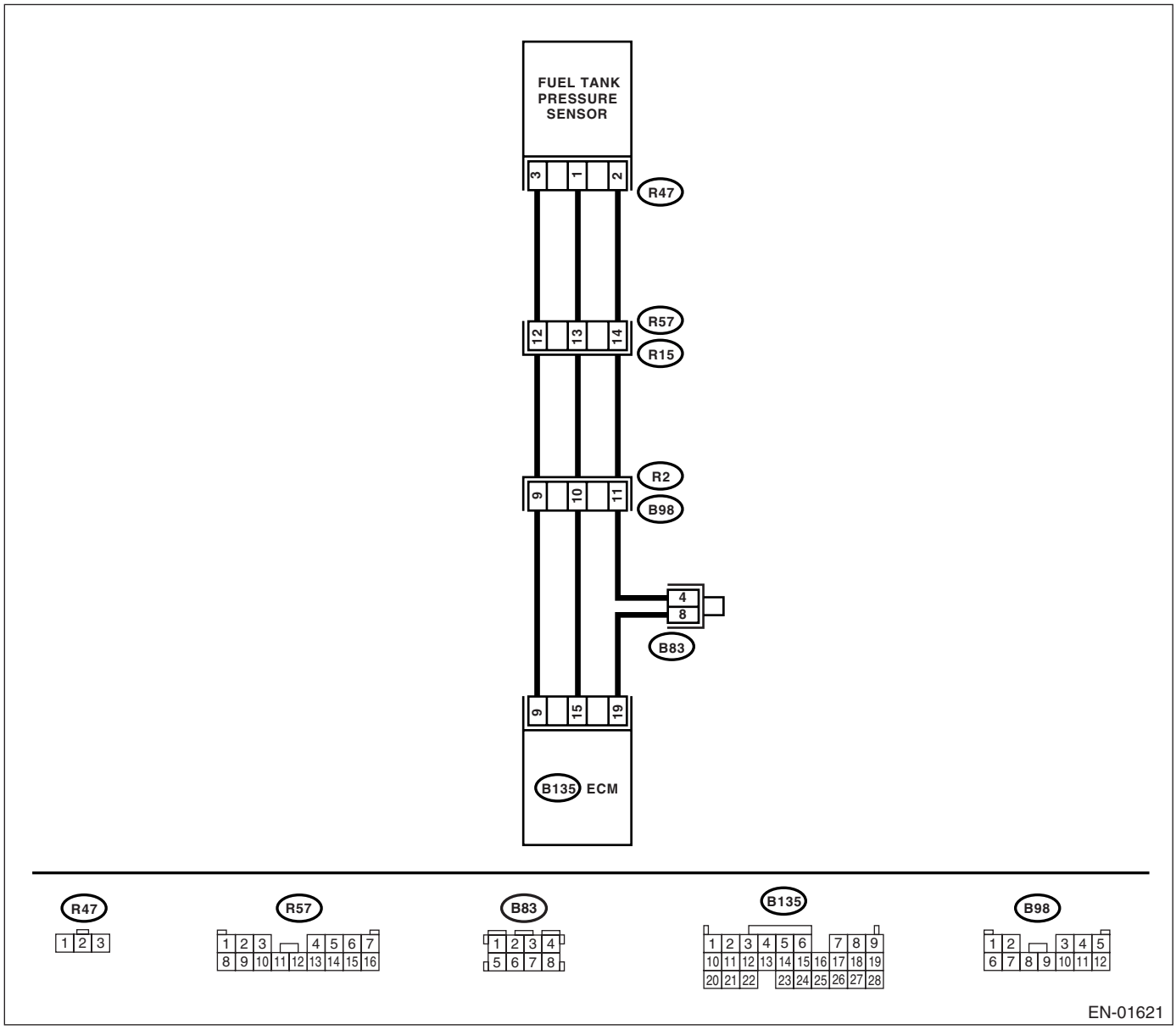
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-143, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove the fuel filler cap. 3) Install the fuel filler cap. 4) Turn ignition switch to ON. 5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)	Go to step **11.**	Go to step **2.**
2	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (−):***	Does the measured value exceed the specified value by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 15 (+) — Chassis ground (−):***	Is the voltage less than 0.2 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read the data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.>	Does the measured value exceed −2.8 kPa (−21.0 mmHg, −0.827 inHg) by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Remove the rear seat cushion. 3) Separate rear wiring harness and fuel tank cord. 4) Turn ignition switch to ON. 5) Measure the voltage between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R15) No. 12 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B135) No. 15 — (R15) No. 13:*** ***(B135) No. 19 — (R15) No. 14:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector
8	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel tank pressure sensor. 2) Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 13 — (R47) No. 1:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair open circuit in fuel tank cord.
9	**CHECK FUEL TANK CORD.** Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 14 — (R47) No. 2:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair open circuit in fuel tank cord.
10	**CHECK FOR POOR CONTACT.** Check for poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-11, Fuel Tank Pressure Sensor.>
11	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from fuel tank pressure sensor. 3) Turn ignition switch to ON. 4) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)?	Repair short circuit to battery in harness between ECM and fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-11, Fuel Tank Pressure Sensor.>

BC:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-144, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

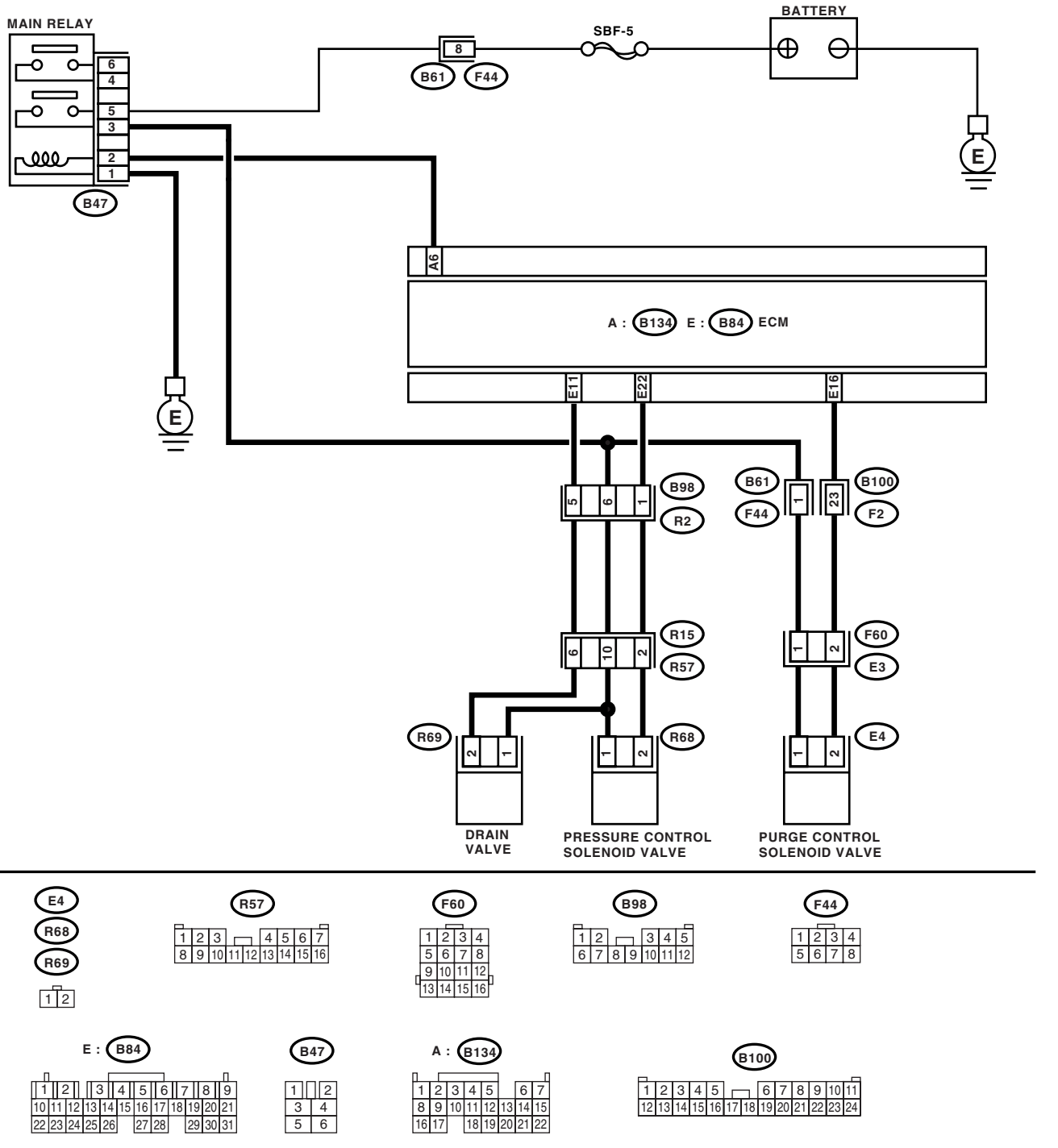
TROUBLE SYMPTOM:

- Fuel odor
- There is a hole of more than 0.5 mm (0.020 in) dia. in evaporation system or fuel tank.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01619

	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap SUBARU genuine?	Go to step **4.**	Replace with a SUBARU genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-56, Fuel Filler Pipe.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **6.**	Replace the drain valve. <Ref. to EC(H4DOTC)-19, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **7.**	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-7, Purge Control Solenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **8.**	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-7, Purge Control Solenoid Valve.>

	Step	Check	Yes	No
8	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn ignition switch to OFF.	Is there a hole of more than 0.5 mm (0.020 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-69, Fuel Delivery, Return and Evaporation Lines.>	Go to step **9.**
9	**CHECK CANISTER.**	Is the canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the canister. <Ref. to EC(H4DOTC)-6, Canister.>	Go to step **10.**
10	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4DOTC)-53, Fuel Tank.>	Is the fuel tank damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-53, Fuel Tank.>	Go to step **11.**
11	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BD:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-144, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>

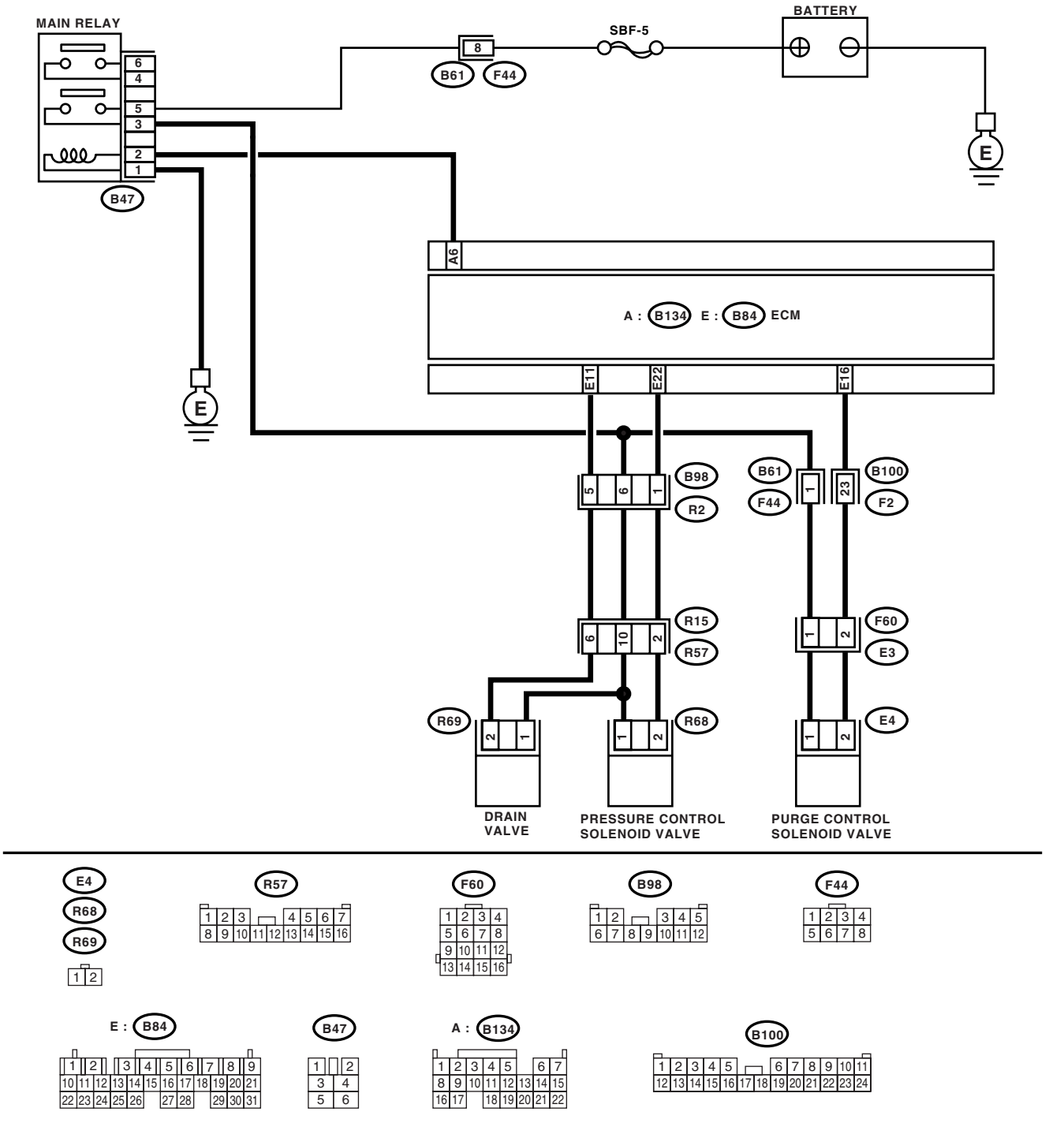
TROUBLE SYMPTOM:

- Fuel odor
- Fuel filler cap is loose or not installed.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap SUBARU genuine?	Go to step **4.**	Replace with a SUBARU genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-56, Fuel Filler Pipe.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **6.**	Replace the drain valve. <Ref. to EC(H4DOTC)-19, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Does the purge control solenoid valve operate?	Go to step **7.**	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-7, Purge Control Solenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **8.**	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-7, Purge Control Solenoid Valve.>
8	**CHECK CANISTER.**	Is the canister damaged?	Repair or replace the canister. <Ref. to EC(H4DOTC)-6, Canister.>	Go to step **9.**

	Step	Check	Yes	No
9	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4DOTC)-53, Fuel Tank.>	Is the fuel tank damaged?	Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-53, Fuel Tank.>	Go to step **10.**
10	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging, or disconnections, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BE:DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-145, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

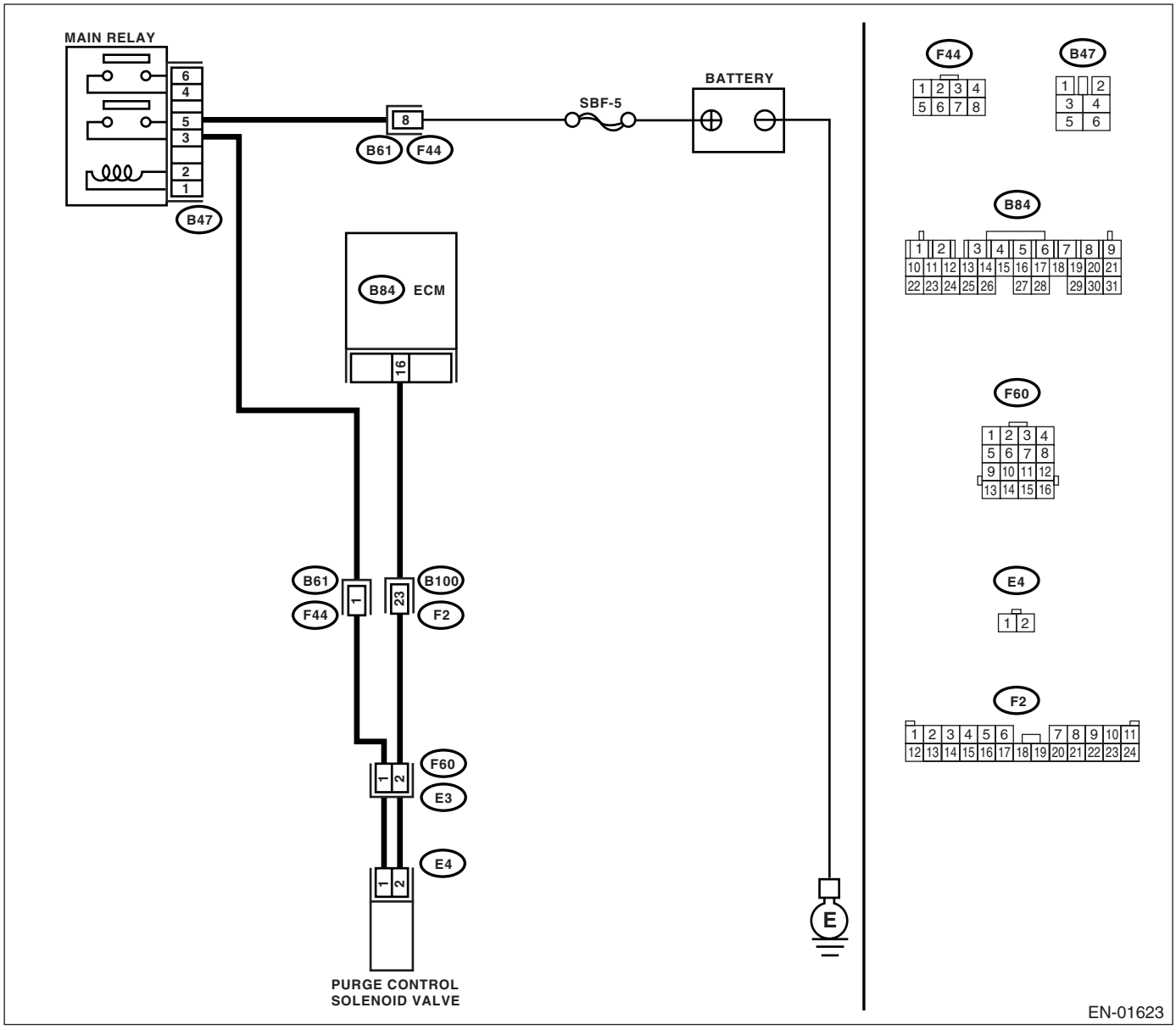
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.	Go to step **2.**
2	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from purge control solenoid valve and ECM. 3) Measure the resistance of harness between purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the ground short circuit in harness between ECM and purge control solenoid valve connector.
3	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and purge control solenoid valve of harness connector. ***Connector & terminal*** ***(B84) No. 16 — (E4) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between ECM and purge control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector
4	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Remove the purge control solenoid valve. 2) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Go to step **5.**	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-7, Purge Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve and engine ground. ***Connector & terminal*** ***(E4) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Repair the open circuit in harness between main relay and purge control solenoid valve connector.
6	**CHECK POOR CONTACT.** Check poor contact in purge control solenoid valve connector.	Is there poor contact in purge control solenoid valve connector?	Repair the poor contact in purge control solenoid valve connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BF:DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-147, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

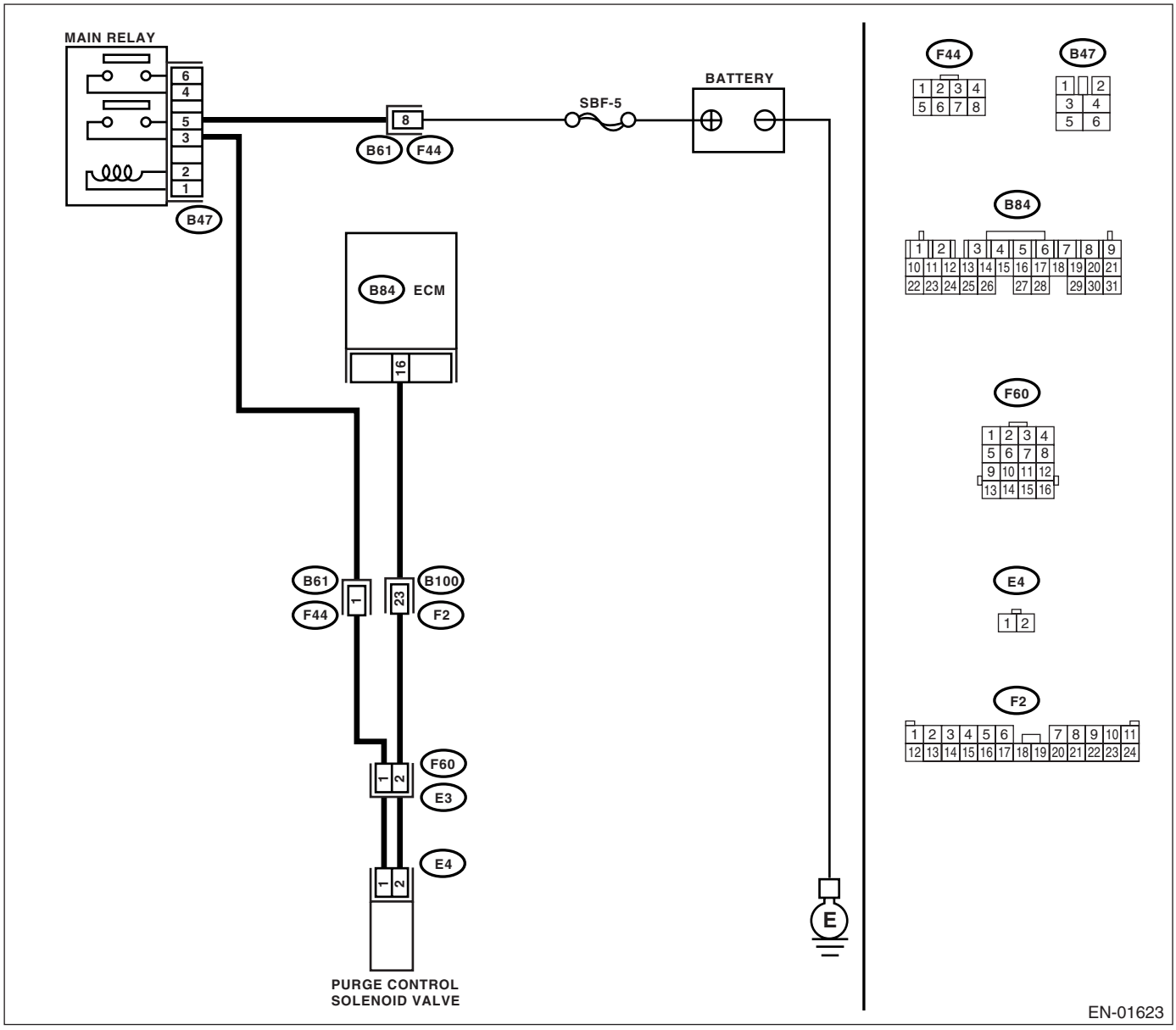
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) While operating the purge control solenoid valve, measure the voltage between ECM and chassis ground. NOTE: Purge control solenoid valve operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B84) No. 16 (+) — Chassis ground (–):***	Is the voltage 0 — 13 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 16 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POOR CONTACT.** Check the poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 16 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the purge control solenoid valve <Ref. to EC(H4DOTC)-7, Purge Control Solenoid Valve.> and ECM <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>

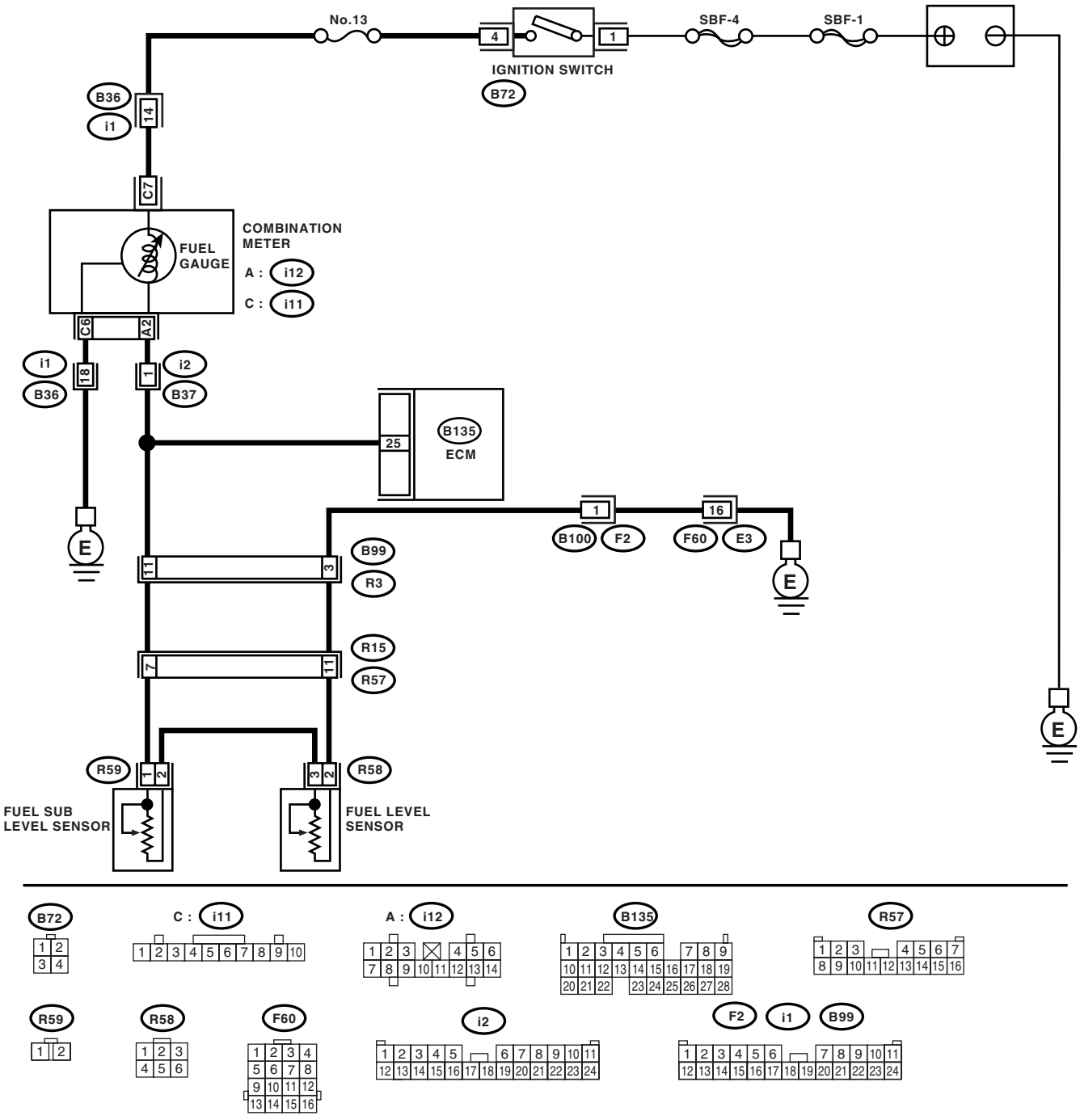
BG:DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-149, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01624

Step		Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0461.	Replace the fuel level sensor. <Ref. to FU(H4DOTC)-63, Fuel Level Sensor.> and fuel sub level sensor <Ref. to FU(H4DOTC)-64, Fuel Sub Level Sensor.>

BH:DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT

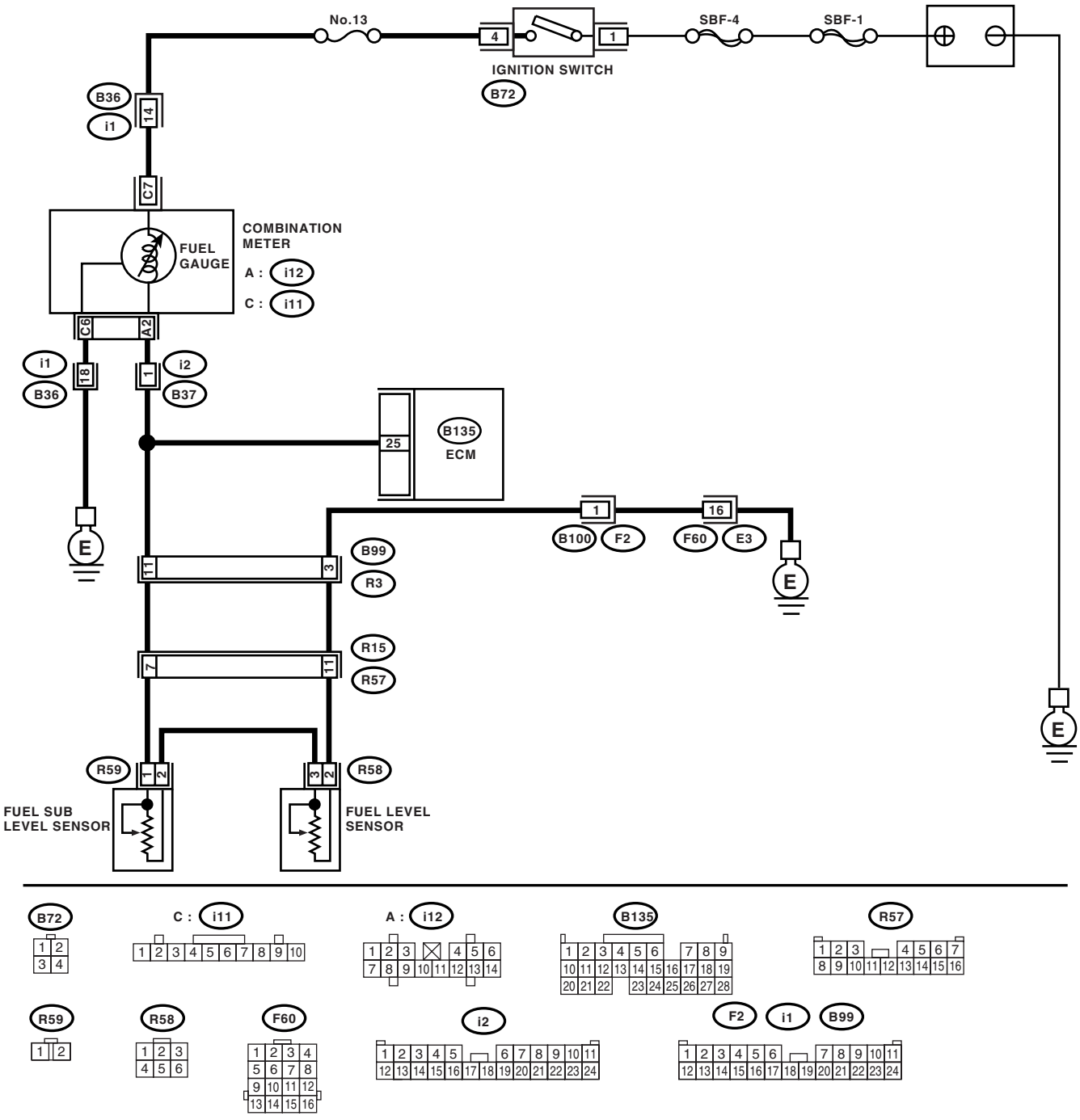
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-151, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01624

	Step	Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does the speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (−):***	Is the voltage less than 0.12 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)** Read the data of fuel level sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.>	Does the voltage change, while shaking the ECM harness and connector?	Repair the poor contact in ECM connector.	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in combination meter connector • Poor contact in ECM connector • Poor contact in coupling connectors
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Separate the fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (−):***	Is the voltage more than 0.12 V?	Go to step **5.**	Go to step **6.**
5	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from connector (i11), (i12) and ECM connector. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 25 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit in harness between ECM and combination meter connector.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** Measure the resistance between ECM and combination meter connector. ***Connector & terminal*** ***(B135) No. 25 — (i12) No. 2:***	Is the resistance less than 10 Ω?	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>	Repair the open circuit between ECM and combination meter connector. NOTE: In this case, repair the following: Poor contact in coupling connector
7	**CHECK FUEL TANK CORD.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel sub level sensor. 3) Measure the resistance between fuel sub level sensor and chassis ground. ***Connector & terminal*** ***(R59) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the ground short circuit in fuel tank cord.
8	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel pump assembly. 2) Measure the resistance between fuel pump assembly and chassis ground. ***Connector & terminal*** ***(R59) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the ground short circuit in fuel tank cord.
9	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-61, Fuel Pump.> 2) Measure the resistance between fuel level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 2 — No. 3:***	Is the resistance 0.5 — 2.5 Ω?	Go to step **10.**	Replace the fuel level sensor.
10	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-64, Fuel Sub Level Sensor.> 2) Measure the resistance between fuel sub level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 0.5 — 2.5 Ω?	Repair the poor contact in harness between ECM and combination meter connector.	Replace the fuel sub level sensor.

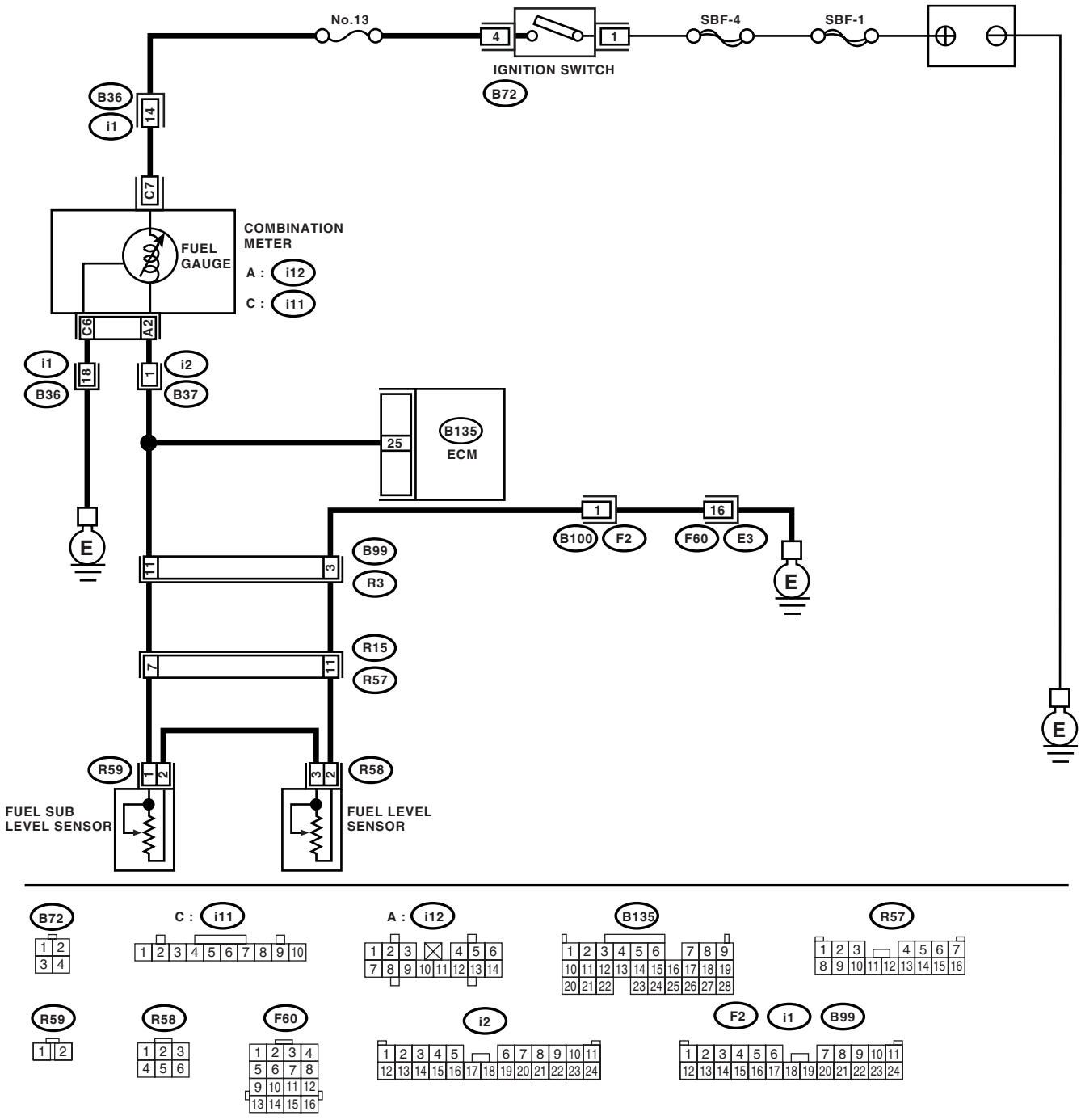
BI: DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-153, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01624

	Step	Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does the speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (−):***	Is the voltage more than 4.75 V?	Go to step **3.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in fuel pump connector • Poor contact in coupling connector
3	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter connector (i11) and ECM connector. 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (−):***	Is the voltage more than 4.75 V?	Go to step **4.**	Repair the battery short circuit between ECM and combination meter connector.
4	**CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD.** 1) Turn the ignition switch to OFF. 2) Separate the fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Measure the resistance between ECM and fuel tank cord. ***Connector & terminal*** ***(B135) No. 25 — (R15) No. 7:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the open circuit between ECM and fuel tank cord.
5	**CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND.** Measure the resistance between fuel tank cord and chassis ground. ***Connector & terminal*** ***(R15) No. 11 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **6.**	Repair the open circuit between fuel tank cord and chassis ground. NOTE: In this case, repair the following: Poor contact in coupling connectors
6	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel level sensor. 2) Measure the resistance between fuel level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 11 — (R58) No. 2:***	Is the resistance less than 10 Ω?	Go to step **7.**	Repair the open circuit between coupling connector and fuel level sensor.

	Step	Check	Yes	No
7	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel sub level sensor. 2) Measure the resistance between fuel level sensor and fuel sub level sensor. ***Connector & terminal*** ***(R58) No. 3 — (R59) No. 2:***	Is the resistance less than 10 Ω	Go to step **8.**	Repair the open circuit between fuel level sensor and fuel sub level sensor.
8	**CHECK FUEL TANK CORD.** Measure the resistance between fuel sub level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 7 — (R59) No. 1:***	Is the resistance less than 10 Ω?	Go to step **9.**	Repair the open circuit between coupling connector and fuel sub level sensor.
9	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-61, Fuel Pump.> 2) While moving the fuel level sensor float up and down, measure the resistance between fuel level sensor terminals. ***Terminals*** ***No. 2 — No. 3:***	Is the resistance more than 53 Ω?	Replace the fuel level sensor. <Ref. to FU(H4DOTC)-63, Fuel Level Sensor.>	Go to step **10.**
10	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-64, Fuel Sub Level Sensor.> 2) While moving the fuel sub level sensor float up and down, measure the resistance between fuel sub level sensor terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance more than 45 Ω?	Replace the fuel sub level sensor. <Ref. to FU(H4DOTC)-64, Fuel Sub Level Sensor.>	Replace the combination meter. <Ref. to IDI-10, Combination Meter Assembly.>

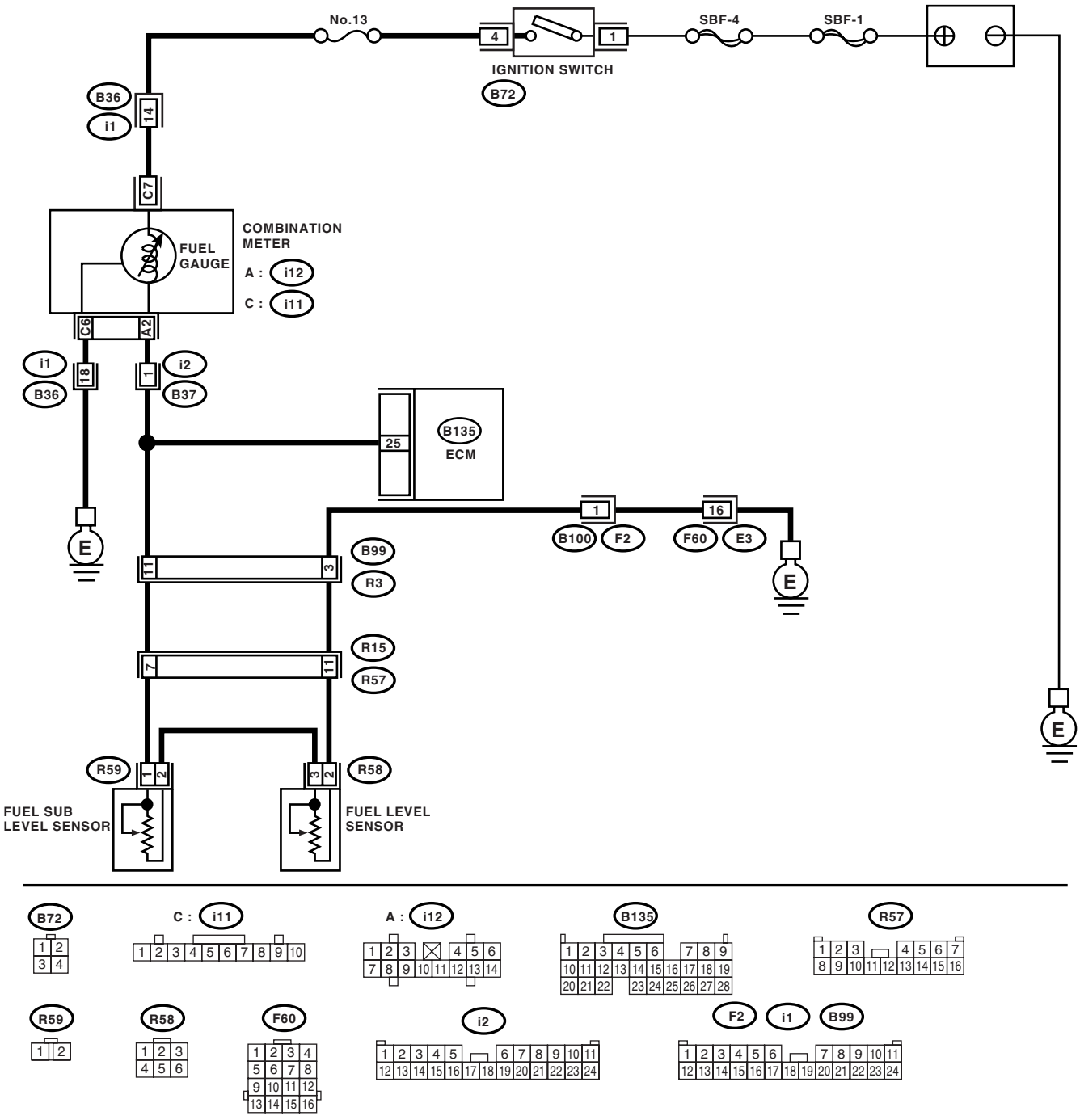
BJ:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-155, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01624

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-61, Fuel Pump.> 2) While moving the fuel level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 3 — No. 2:***	Does the resistance change smoothly?	Go to step **3.**	Replace the fuel level sensor. <Ref. to FU(H4DOTC)-63, Fuel Level Sensor.>
3	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-64, Fuel Sub Level Sensor.> 2) While moving the fuel sub level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 1 — No. 2:***	Does the resistance change smoothly?	Repair the poor contact in ECM, combination meter and coupling connectors.	Replace the fuel sub level sensor. <Ref. to FU(H4DOTC)-64, Fuel Sub Level Sensor.>

BK:DTC P0483 COOLING FAN RATIONALITY CHECK

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-158, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

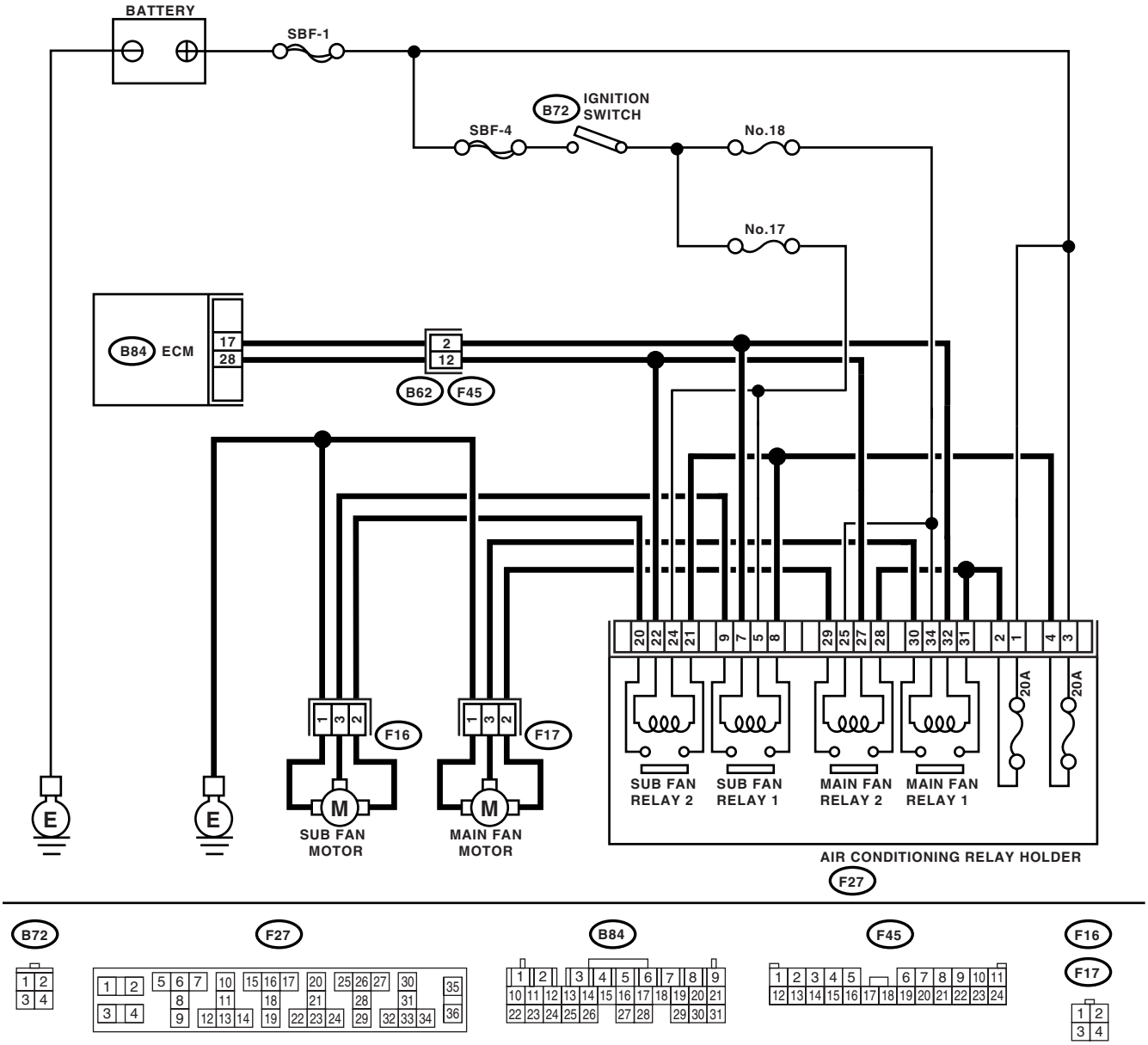
- Occurrence of noise
- Overheating

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

NOTE:
If the vehicle, with the engine idling, is placed very close to a wall or another vehicle, preventing normal cooling function, the OBD system may detect malfunction.

WIRING DIAGRAM:



EN-01625

Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Check the radiator fan, fan motor and thermostat. <Ref. to CO(H4SO)-22, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-23, Radiator Sub Fan and Fan Motor.> If thermostat is stuck, replace thermostat.

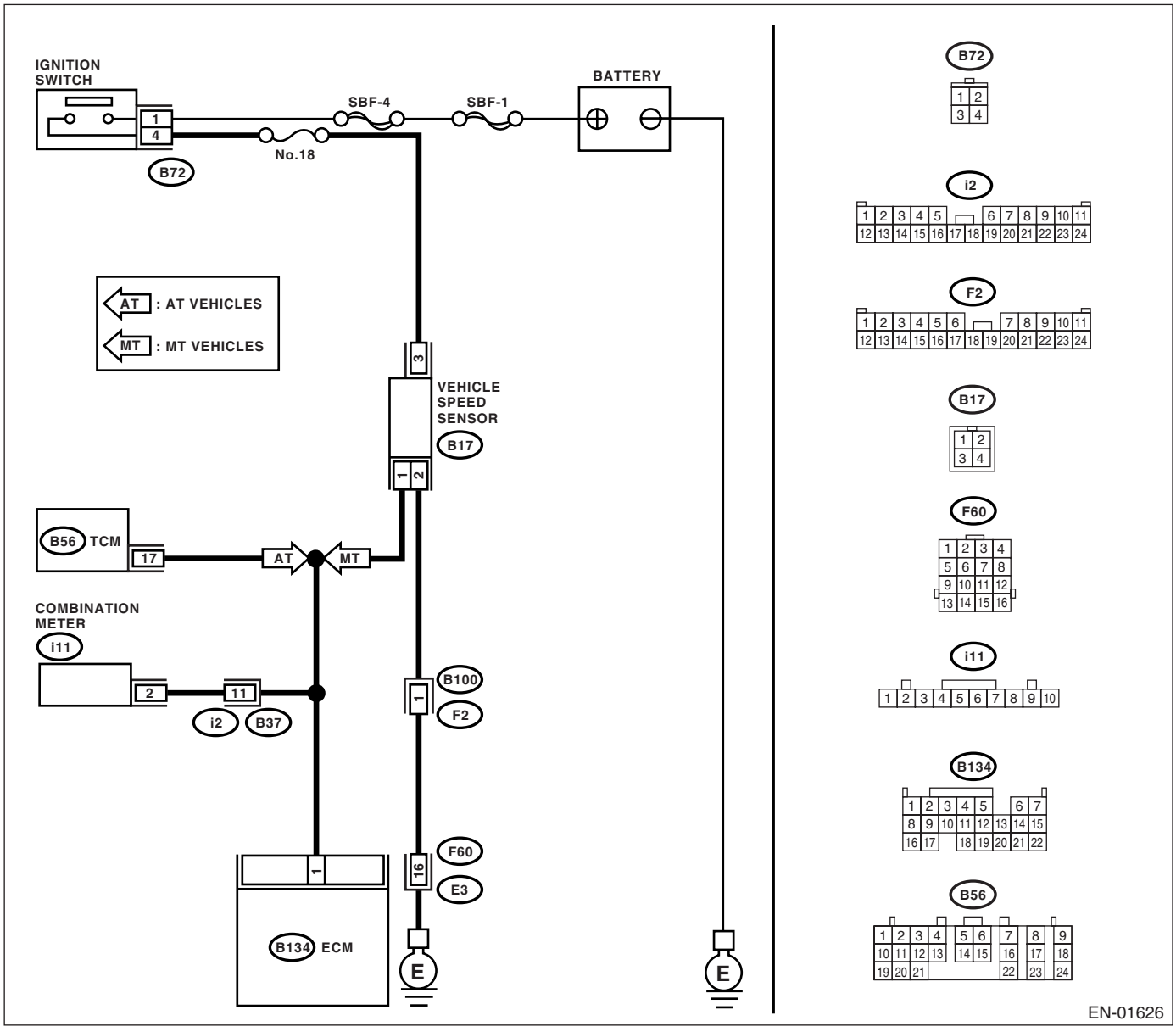
BL:DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-160, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the transmission type AT?	Go to step **2.**	Go to step **4.**
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and TCM. 3) Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 17 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the ground short circuit in harness between ECM and TCM connector.
3	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Contact your SOA Service Center.
4	**CHECK HARENESS BETWEEN VEHICLE SPEED SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from vehicle speed sensor and ECM. 3) Measure the resistance of harness between vehicle speed sensor connector and chassis ground. ***Connector & terminal*** ***(B17) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit in harness between vehicle speed sensor and ECM connector.
5	**CHECK POOR CONTACT.** Check poor contact in the vehicle speed sensor connector.	Is there poor contact in the vehicle speed sensor connector?	Repair poor contact in the vehicle speed sensor connector.	Replace the vehicle speed sensor. <Ref. to 5MT-38, Vehicle Speed Sensor.>

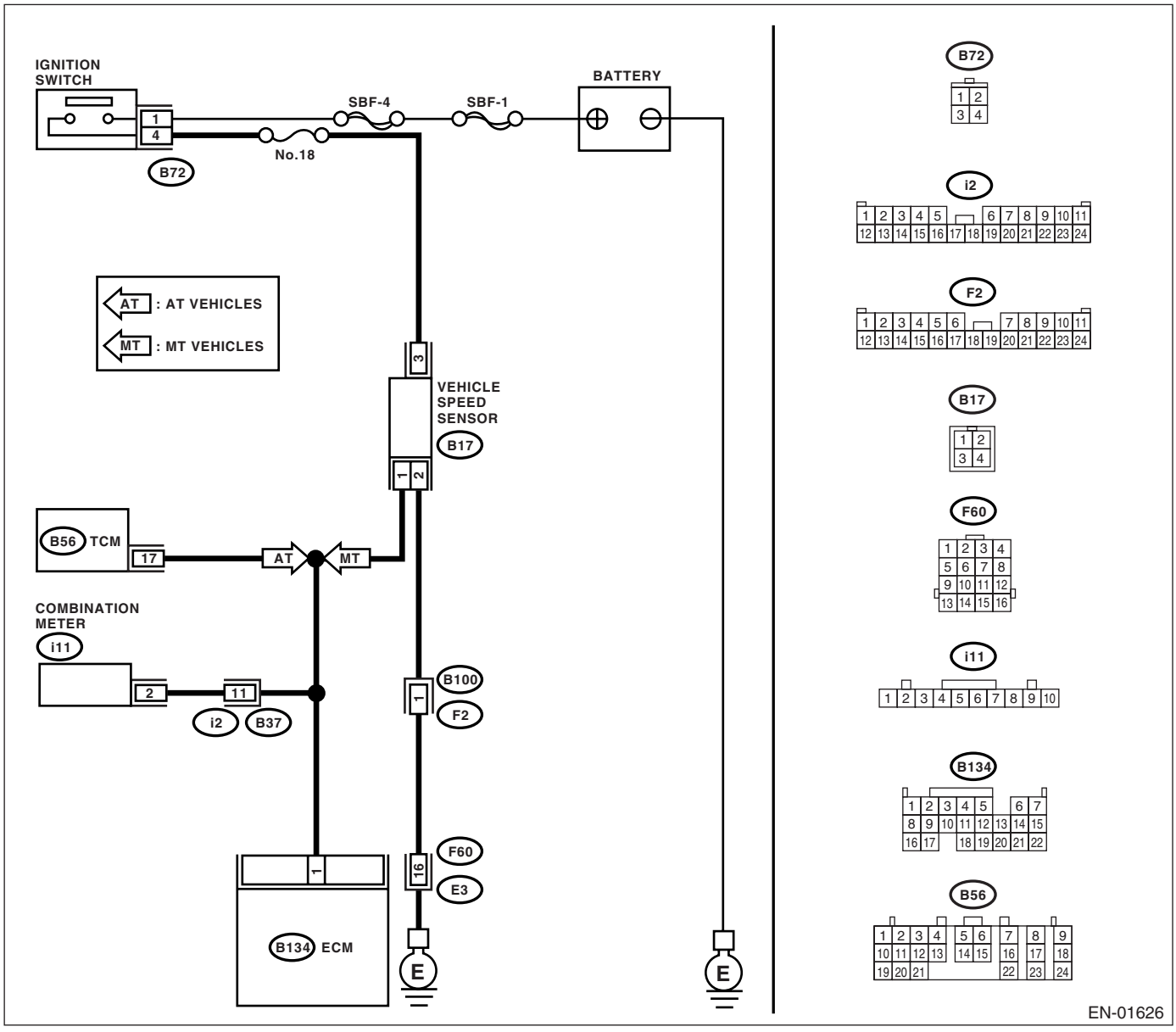
BM:DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-161, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the transmission type AT?	Go to step **2.**	Go to step **3.**
2	**CHECK DTC P0720 ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0720?	Check the front vehicle speed sensor signal circuit. <Ref. to 4AT(diag)-52, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK SPEEDOMETER OPERATION IN COMBINATION METER.**	Does the speedometer operate normally?	Go to step **4.**	Check the speedometer. <Ref. to IDI-14, Speedometer.>
4	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from combination meter. 3) Measure the resistance between ECM and combination meter. ***Connector & terminal*** ***(B134) No. 1 — (i11) No. 2:***	Is the resistance less than 10 Ω?	Repair the poor contact in ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in ECM connector • Poor contact in combination meter connector • Poor contact in coupling connector

BN:DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-162, DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

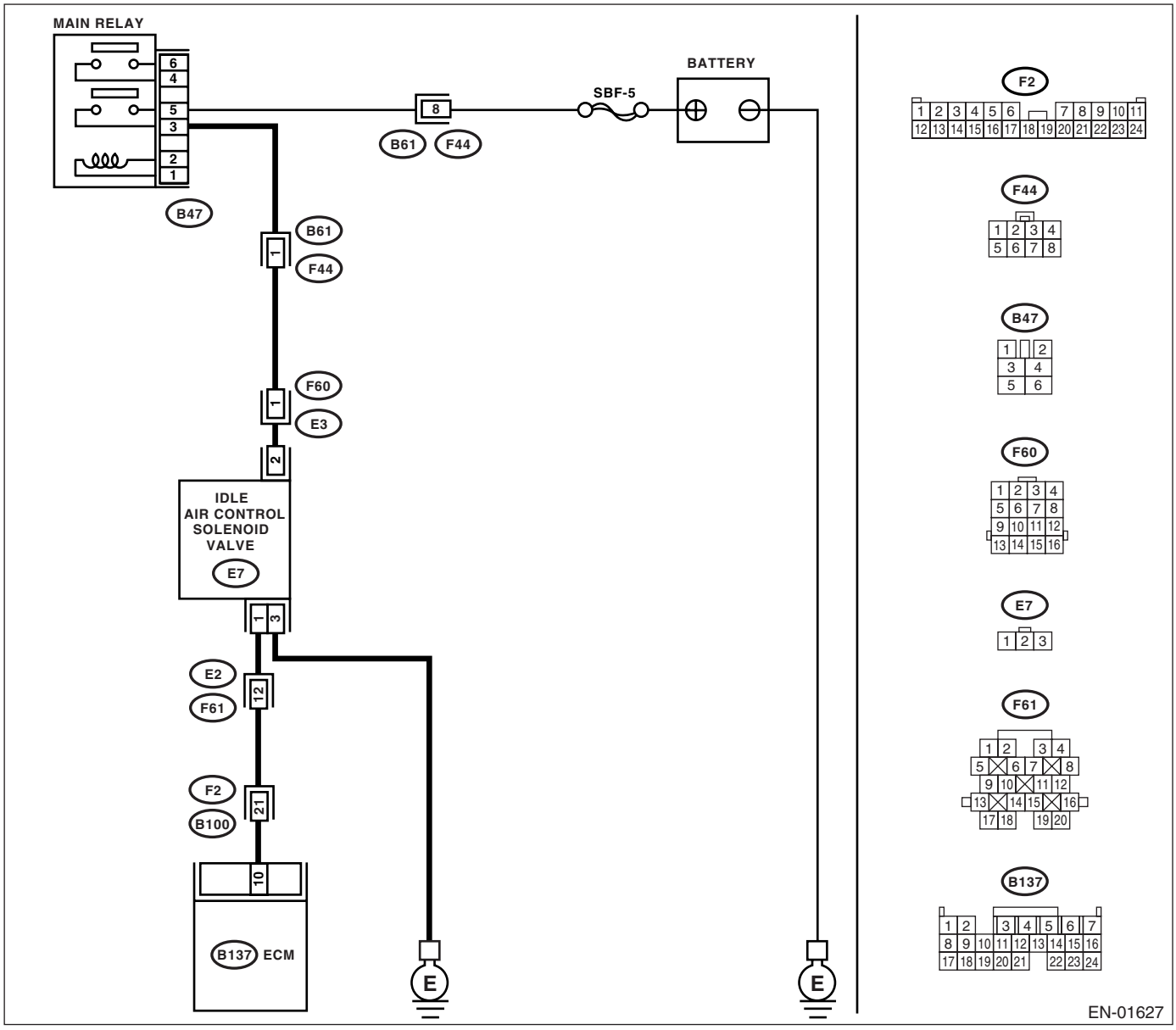
TROUBLE SYMPTOM:

- Engine is difficult to start.
- Engine does not start.
- Erroneous idling
- Engine stalls.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	Go to step **2.**
2	**CHECK IDLE AIR CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Remove the idle air control solenoid valve from throttle body. <Ref. to FU(H4DOTC)-34, REMOVAL, Idle Air Control Solenoid Valve.> 3) Using an air gun, force air into the idle air control solenoid valve by-pass air inlet. Confirm that forced air subsequently escapes from both main air passage and assist air passage.	Does air flow out?	Go to step **4.**	Replace the idle air control solenoid valve. <Ref. to FU(H4DOTC)-34, Idle Air Control Solenoid Valve.> After replace, Go to step **3.**
3	**CHECK IDLE AIR CONTROL SOLENOID VALVE DUTY RATIO.** 1) Turn the ignition switch to ON. 2) Start the engine, and warm-up the engine. 3) Turn all accessory switches to OFF. 4) Read the data of idle air control solenoid valve duty ratio using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the duty ratio more than 60%?	Go to step **4.**	END.
4	**CHECK BY-PASS AIR LINE.** 1) Turn the ignition switch to OFF. 2) Remove the idle air control solenoid valve from throttle body. <Ref. to FU(H4DOTC)-34, REMOVAL, Idle Air Control Solenoid Valve.> 3) Remove the throttle body to intake manifold. <Ref. to FU(H4DOTC)-13, REMOVAL, Throttle Body.> 4) Using an air gun, force air into the solenoid valve installation area and throttle valve interior. Confirm that forced air subsequently escapes from both these areas.	Does air flow out?	Replace the idle air control solenoid valve. <Ref. to FU(H4DOTC)-34, Idle Air Control Solenoid Valve.>	Replace the throttle body. <Ref. to FU(H4DOTC)-13, Throttle Body.>

BO:DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-164, DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

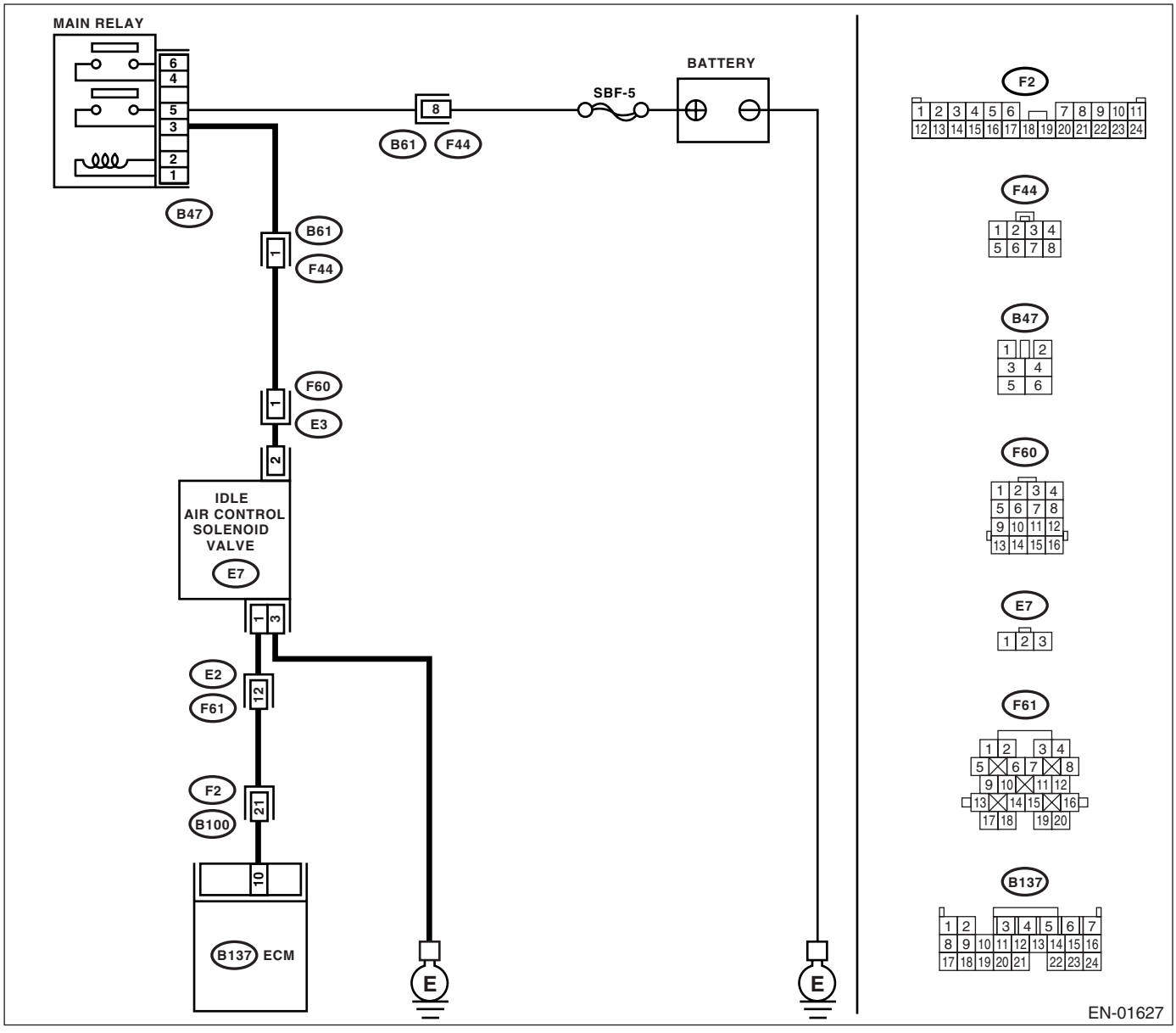
TROUBLE SYMPTOM:

Engine keeps running at higher revolution than specified idling revolution.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step **2.**
2	**CHECK THROTTLE CABLE.**	Does the throttle cable have play for adjustment?	Go to step **3.**	Adjust the throttle cable. <Ref. to SP(H4SO)-6, INSTALLATION, Accelerator Control Cable.>
3	**CHECK AIR INTAKE SYSTEM.** 1) Turn the ignition switch to ON. 2) Start the engine, and idle it. 3) Check the following items. • Loose installation of intake manifold, idle air control solenoid valve and throttle body • Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket • Disconnections of vacuum hoses	Is there a fault in air intake system?	Repair the air suction and leaks.	Replace the idle air control solenoid valve. <Ref. to FU(H4DOTC)-34, Idle Air Control Solenoid Valve.>

BP:DTC P0508 IDLE CONTROL SYSTEM CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-166, DTC P0508 IDLE CONTROL SYSTEM CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

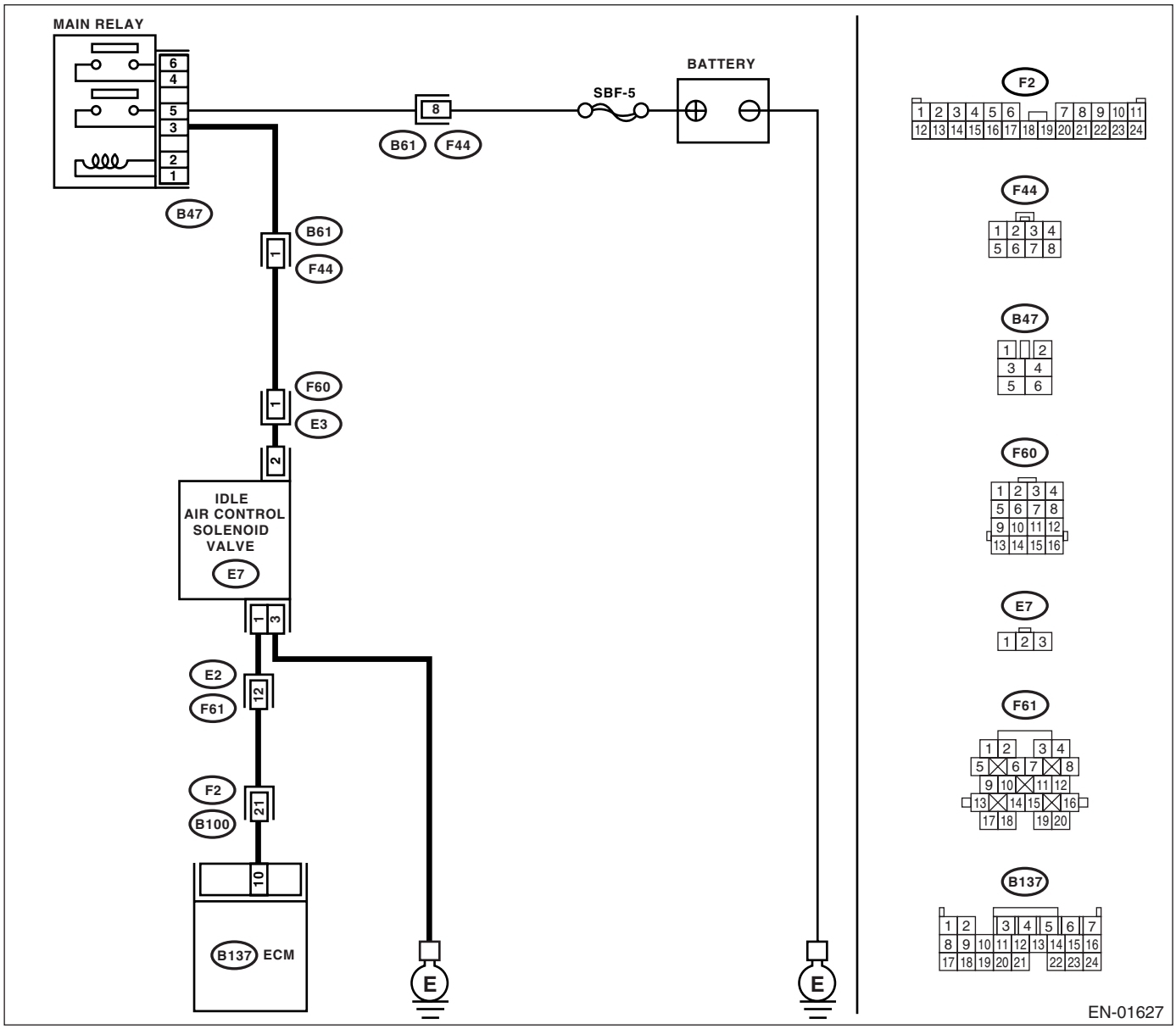
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Engine breathing

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 3 V?	Repair the poor contact in ECM connector.	Go to step **2.**
2	**CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from idle air control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between idle air control solenoid valve and engine ground. ***Connector & terminal*** ***(E7) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between idle air control solenoid valve and main relay connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and idle air control solenoid valve connector. ***Connector & terminal*** ***(B137) No. 10 — (E7) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and idle air control solenoid valve connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit in harness between ECM and idle air control solenoid valve connector.
5	**CHECK GROUND CIRCUIT OF IDLE AIR CONTROL SOLENOID VALVE.** Measure the resistance of harness between idle air control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E7) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **6.**	Repair the open circuit in harness between idle air control solenoid valve connector and engine ground cable.
6	**CHECK POOR CONTACT.** Check poor contact in ECM and idle air control solenoid valve connectors.	Is there poor contact in ECM and idle air control solenoid valve connectors?	Repair the poor contact in ECM and idle air control solenoid valve connectors.	Replace the idle air control solenoid valve. <Ref. to FU(H4DOTC)-34, Idle Air Control Solenoid Valve.>

BQ:DTC P0509 IDLE CONTROL SYSTEM CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-168, DTC P0509 IDLE CONTROL SYSTEM CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

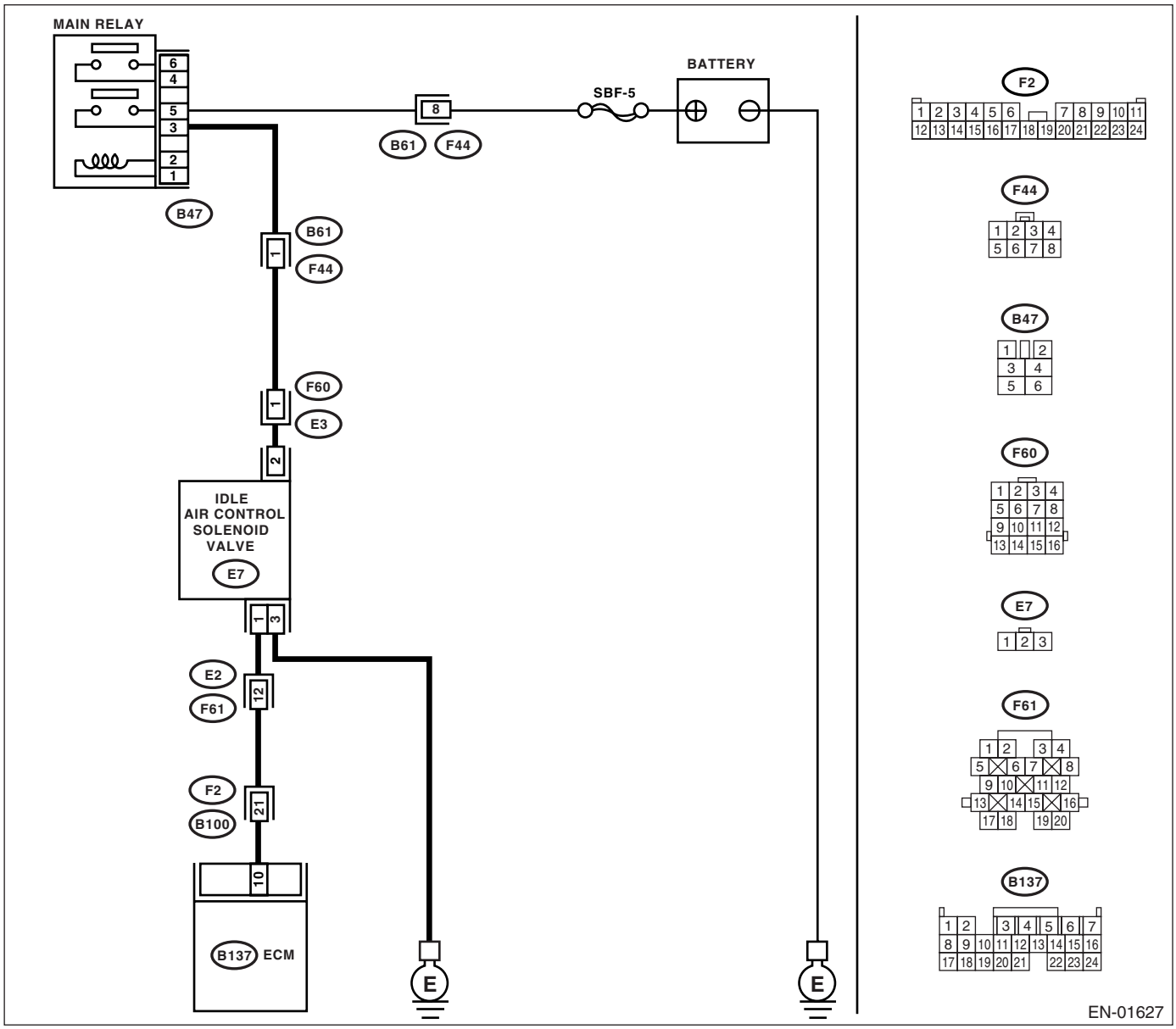
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Engine breathing

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK THROTTLE CABLE.**	Does the throttle cable have play for adjustment?	Go to step **2.**	Adjust the throttle cable. <Ref. to SP(H4SO)-6, INSTALLATION, Accelerator Control Cable.>
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Go to step **4.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from idle air control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Replace the idle air control solenoid valve. <Ref. to FU(H4DOTC)-34, Idle Air Control Solenoid Valve.> and ECM <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 10 (+) — Chassis ground (−):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BR:DTC P0512 STARTER REQUEST CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-170, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

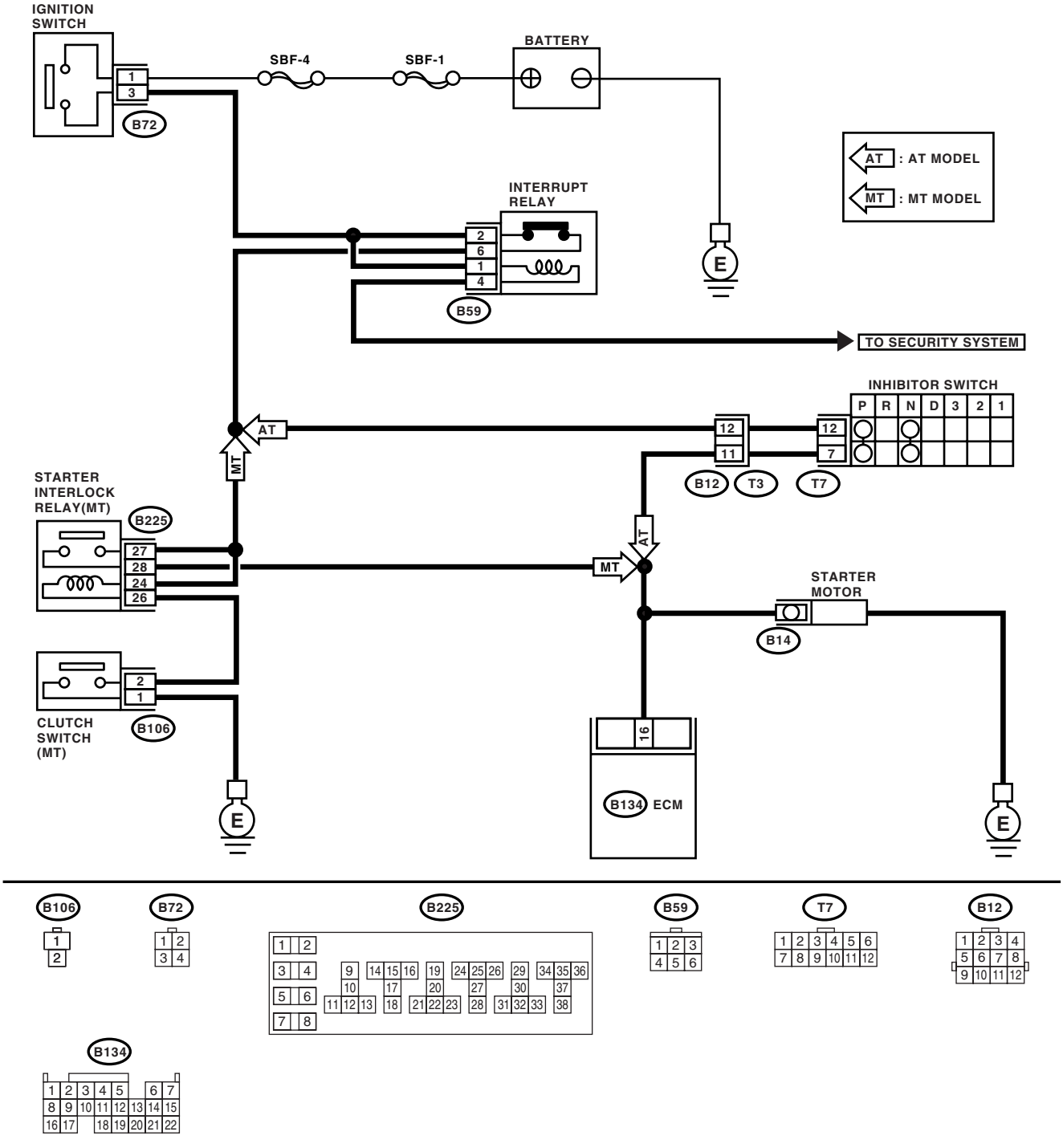
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01607

Step		Check	Yes	No
1	CHECK OPERATION OF STARTER MOTOR.	Does the starter motor operate when ignition switch is turned to ON?	Repair the battery short circuit in starter motor circuit. After repair, replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Check the starter motor circuit. <Ref. to EN(H4DOTC)(diag)-59, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

BS:DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-171, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

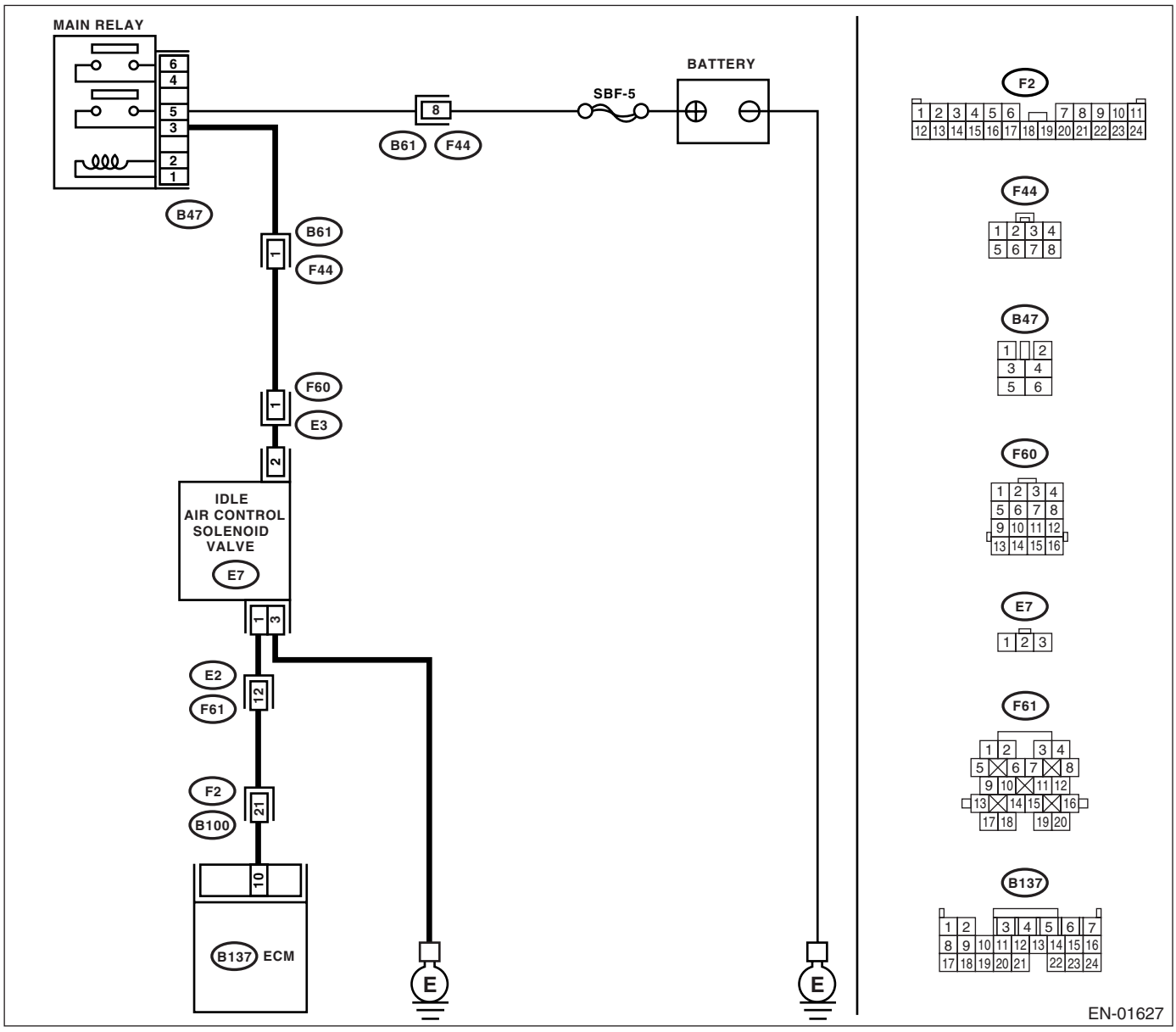
TROUBLE SYMPTOM:

- Engine keeps running at higher revolution than specified idling revolution.
- Fuel is cut according to fail-safe function.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0519.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1) Turn the ignition switch to ON. 2) Start the engine, and idle it. 3) Check the following items. • Loose installation of intake manifold, idle air control solenoid valve and throttle body • Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket • Disconnections of vacuum hoses	Is there a fault in air intake system?	Repair the air suction and leaks.	Go to step **3.**
3	**CHECK THROTTLE CABLE.**	Does the throttle cable have play for adjustment?	Go to step **4.**	Adjust the throttle cable. <Ref. to SP(H4SO)-6, INSTALLATION, Accelerator Control Cable.>
4	**CHECK AIR BY-PASS LINE.** 1) Turn the ignition switch to OFF. 2) Remove the idle air control solenoid valve from throttle body. <Ref. to FU(H4DOTC)-34, Idle Air Control Solenoid Valve.> 3) Confirm that there are no foreign particles in by-pass air line.	Are foreign particles in by-pass air line?	Remove the foreign particles from by-pass air line.	Replace the idle air control solenoid valve. <Ref. to FU(H4DOTC)-34, Idle Air Control Solenoid Valve.>

BT:DTC P0545 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW-BANK 1

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-173, DTC P0545 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW-BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

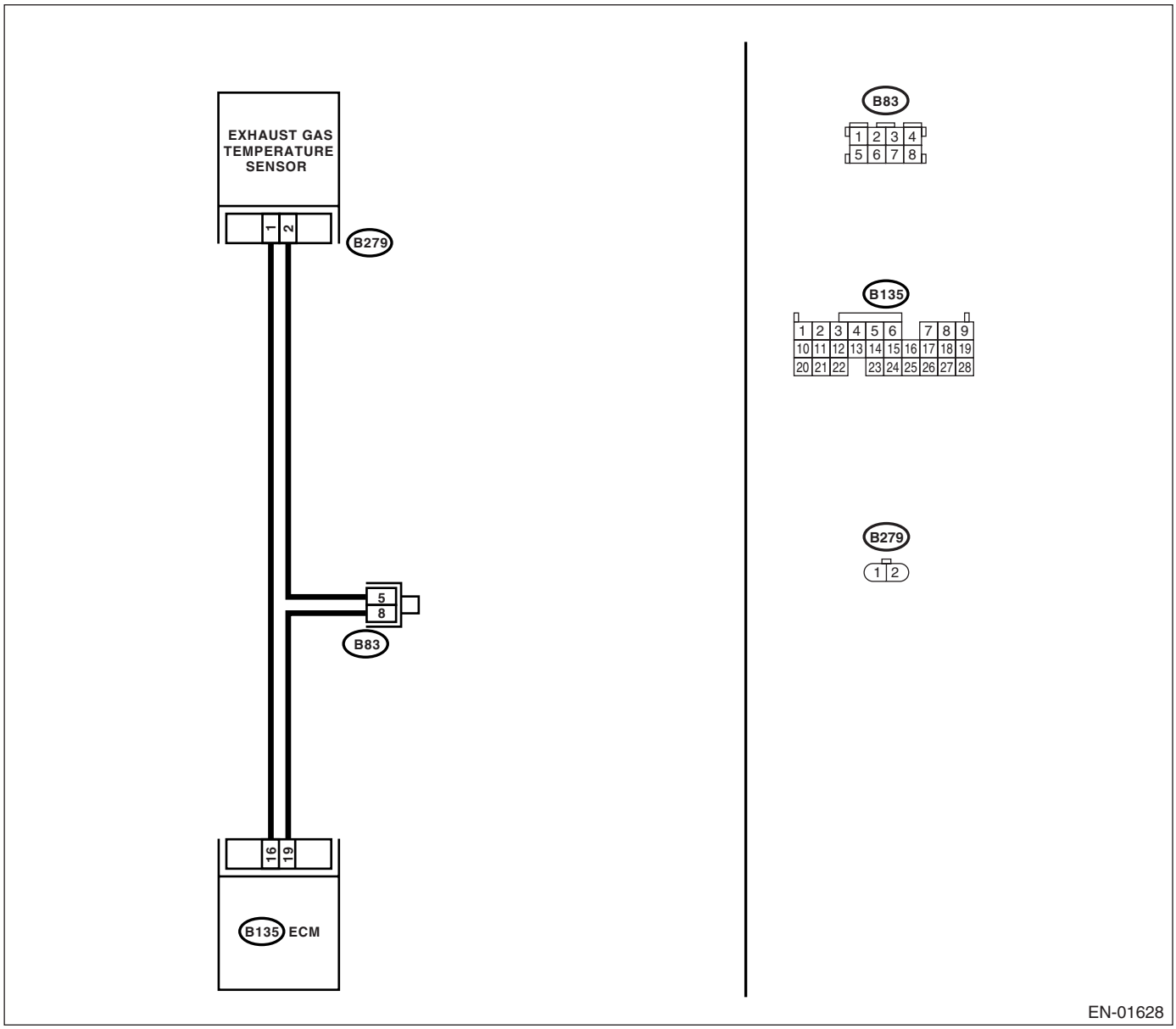
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of exhaust gas temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature more than 1200°C (2192°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in exhaust gas temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from exhaust gas temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of exhaust gas temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature less than 372°C (702°F)?	Replace the exhaust gas temperature sensor. <Ref. to FU(H4DOTC)-47, Exhaust Temperature Sensor.>	Repair the ground short circuit in harness between exhaust gas temperature sensor and ECM connector.

BU:DTC P0546 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH-BANK 1

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-175, DTC P0546 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH-BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

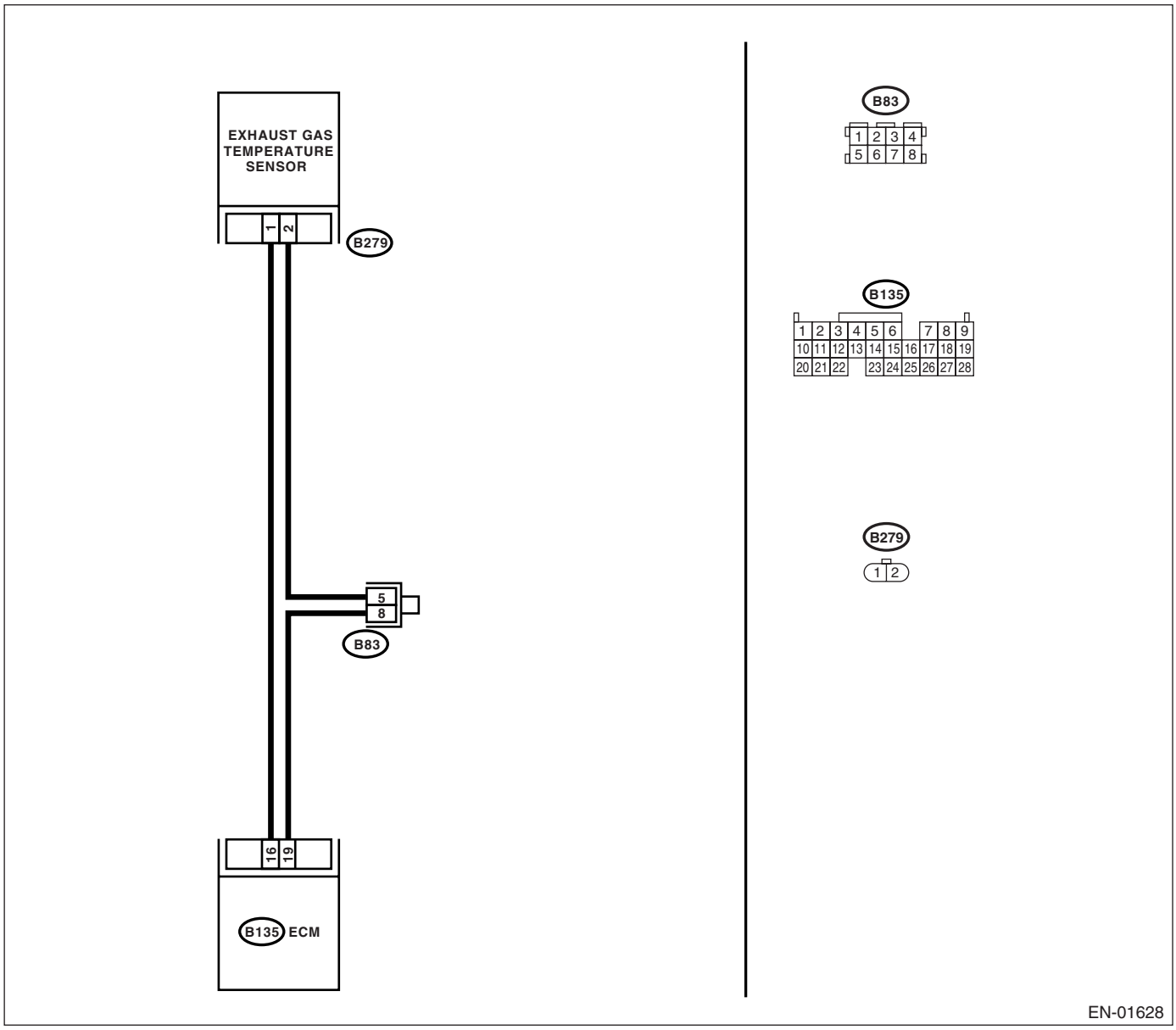
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of exhaust gas temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature less than 372°C (702°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in exhaust gas temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from exhaust gas temperature sensor. 3) Measure the voltage between exhaust gas temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and exhaust gas temperature sensor connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between exhaust gas temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and exhaust gas temperature sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between exhaust gas temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 1 (+) — Engine ground (−):***	Is the voltage more than 4 V?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and exhaust gas temperature sensor connector • Poor contact in exhaust gas temperature sensor connector • Poor contact in ECM connector • Poor contact in joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between exhaust gas temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the exhaust gas temperature sensor. <Ref. to FU(H4DOTC)-47, Exhaust Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and exhaust gas temperature sensor connector • Poor contact in exhaust gas temperature sensor connector • Poor contact in ECM connector • Poor contact in joint connector

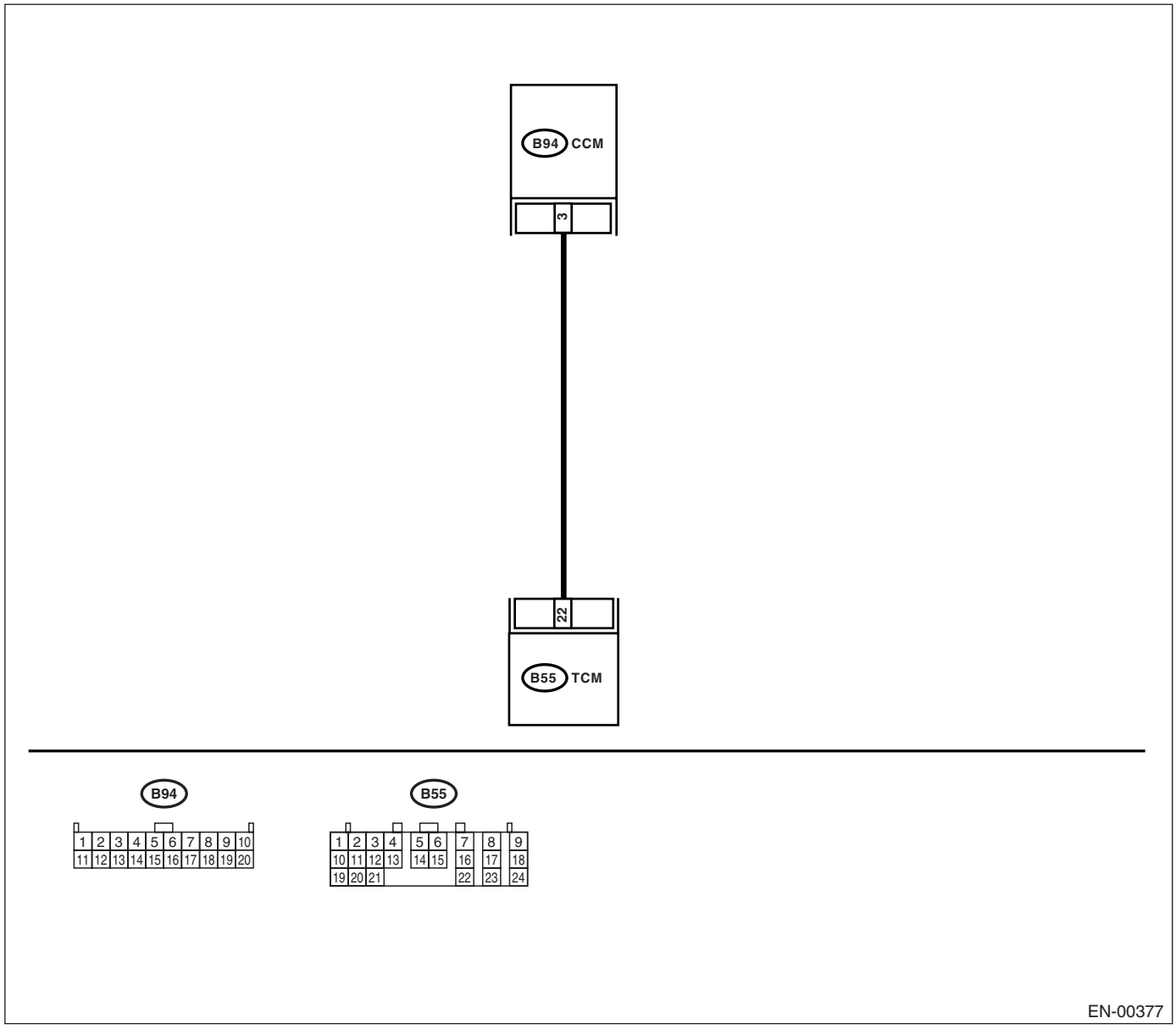
BV:DTC P0565 CRUISE CONTROL ON SIGNAL

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-177, DTC P0565 CRUISE CONTROL ON SIGNAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and CCM. 3) Measure the resistance of harness between TCM and CCM connector. ***Connector & terminal*** ***(B55) No. 22 — (B94) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and CCM connector.
2	**CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 22 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and CCM connector.
3	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connector to TCM and CCM. 2) Lift-up the vehicle or set the vehicle on free rollers. **CAUTION:** **On AWD models, raise all wheels off ground.** 3) Start the engine. 4) Turn the cruise control main switch to ON. 5) Move the select lever to “D” range and slowly increase vehicle speed to 50 km/h (31 MPH). 6) Turn the cruise control command switch to ON. 7) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 22 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **4.**	Check the cruise control command switch circuit. <Ref. to CC-7, INSPECTION, Cruise Control Command Switch.>
4	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair the poor contact in TCM connector.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

BW:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-178, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

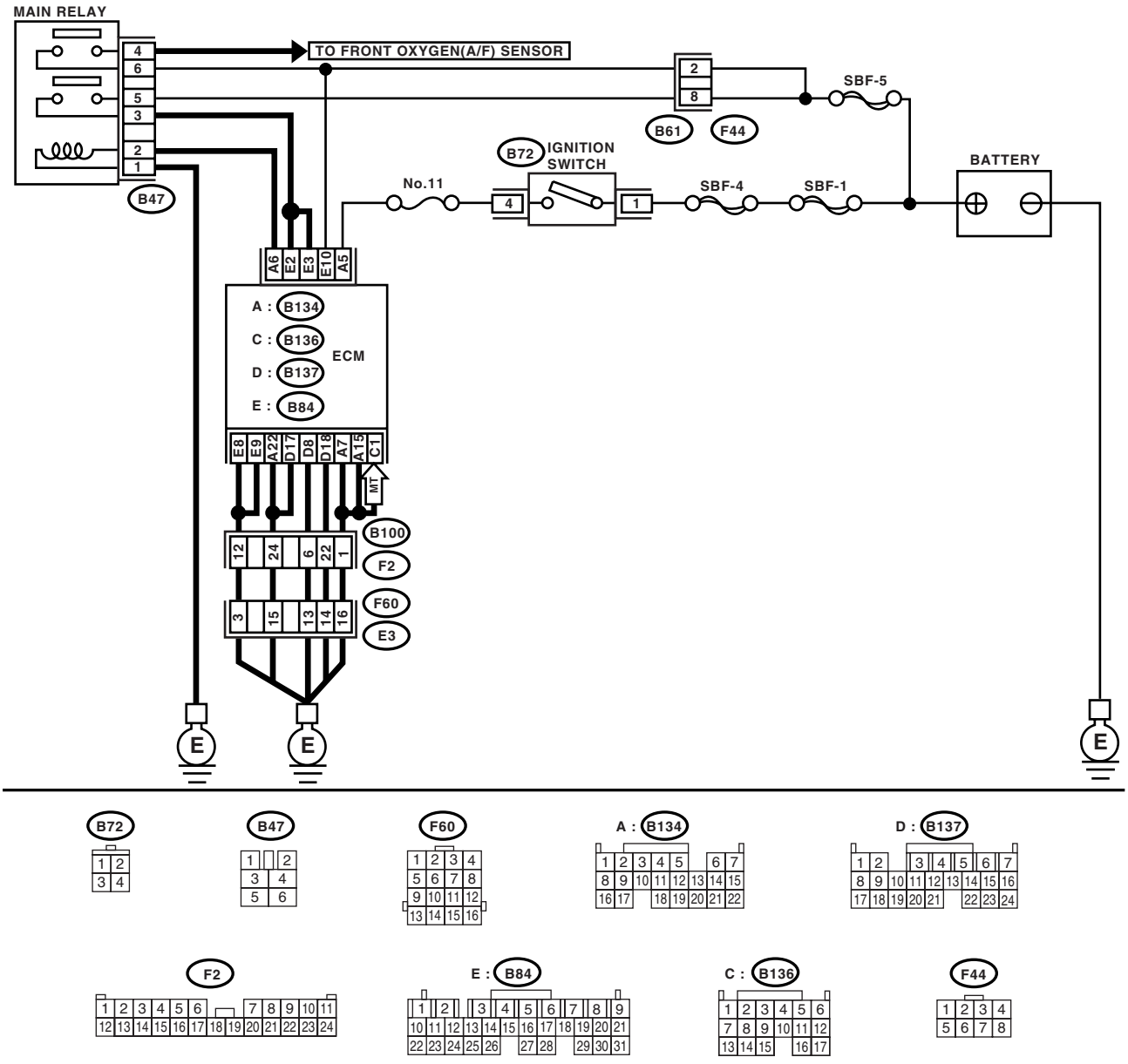
TROUBLE SYMPTOM:

- Engine does not start.
- Engine stalls.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01608

Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0604?	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	A temporary poor contact.

BX:DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-179, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

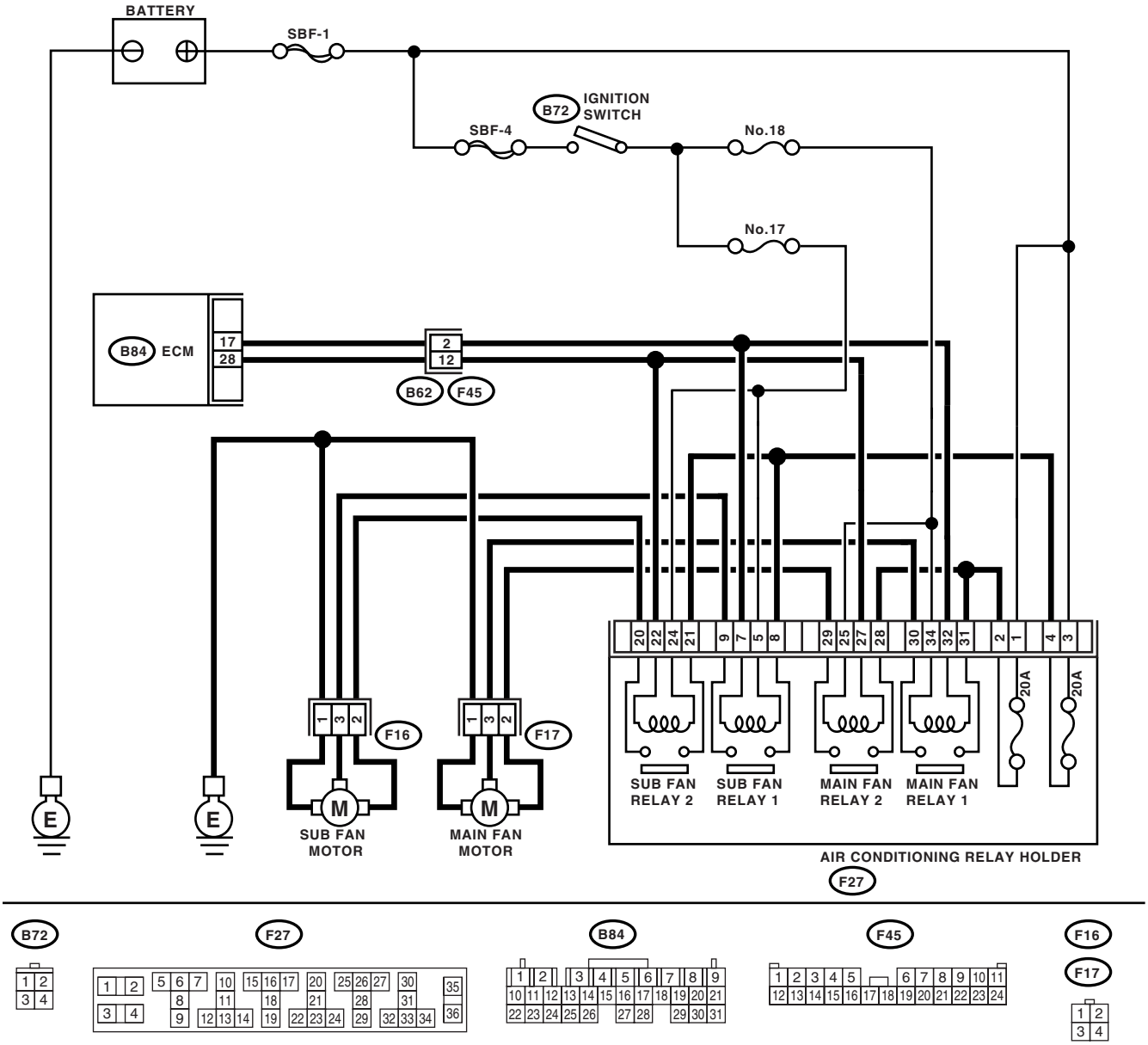
TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01625

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector. 3) Turn the ignition switch to ON. 4) While operating the radiator fan relay, measure voltage between ECM terminal and ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> ***Connector & terminal*** ***(B84) No. 17 (+) — Chassis ground (−):*** ***(B84) No. 28 (+) — Chassis ground (−):***	Does the voltage change 0 — 10 V?	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK GROUND SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 17 — Chassis ground:*** ***(B84) No. 28 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in radiator fan relay control circuit.
3	**CHECK POWER SUPPLY FOR RELAY.** 1) Remove the main fan relay 1 and main fan relay 2 from A/C relay holder. 2) Turn the ignition switch to ON. 3) Measure the voltage between fuse and relay box (F/B) connector and chassis ground. ***Connector & terminal*** ***(F27) No. 27 (+) — Chassis ground (−):*** ***(F27) No. 32 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.
4	**CHECK MAIN FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between main fan relay terminals. ***Terminals*** ***No. 32 — No. 34: (Main fan relay 1)*** ***No. 25 — No. 27: (Main fan relay 2)***	Is the resistance 87 — 107 Ω?	Go to step **5.**	Replace the main fan relay.
5	**CHECK OPEN CIRCUIT IN MAIN FAN RELAY CONTROL CIRCUIT.** Measure the resistance of harness between ECM and fan relay connector. ***Connector & terminal*** ***(B84) No. 17 — (F27) No. 32:*** ***(B84) No. 28 — (F27) No. 27:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fan relay connector • Poor contact in coupling connector
6	**CHECK POOR CONTACT.** Check poor contact in ECM or fan relay connector.	Is there poor contact in ECM or fan relay connector?	Repair poor contact in ECM or fan relay connector.	Contact your SOA Service Center.

BY:DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-180, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

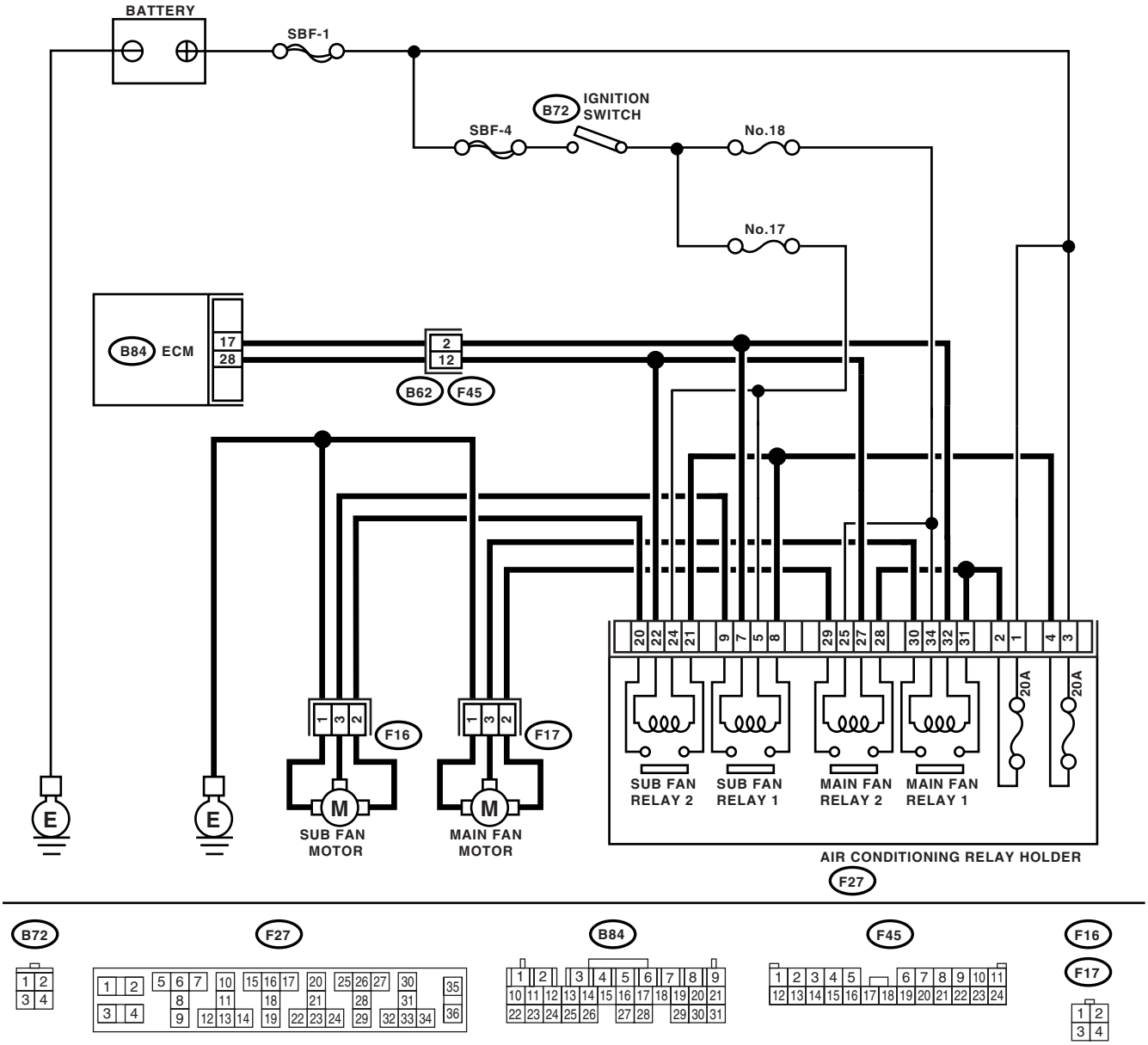
TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01625

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector. 3) Turn the ignition switch to ON. 4) While operating the radiator fan relay, measure the voltage between ECM and chassis ground. NOTE: Radiator fan relay operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B84) No. 17 (+) — Chassis ground (−):*** ***(B84) No. 28 (+) — Chassis ground (−):***	Does the voltage change 0 — 10 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.	Go to step **2.**
2	**CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Remove the fan relay 1, fan relay 2 and fan mode relay. 3) Disconnect the test mode connector. 4) Turn the ignition switch to ON. 5) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 17 (+) — Chassis ground (−):*** ***(B84) No. 28 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in radiator fan relay control circuit. After repair, replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Go to step **3.**
3	**CHECK MAIN FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay. 3) Measure the resistance between main fan relay terminals. ***Terminals*** ***No. 30 — No. 31: (Main fan relay 1)*** ***No. 28 — No. 29: (Main fan relay 2)***	Is the resistance less than 1 Ω?	Replace the main fan relay and ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Go to step **4.**
4	**CHECK SUB FAN RELAY.** 1) Remove the sub fan relay. 2) Measure the resistance between sub fan relay terminals. ***Terminals*** ***No. 8 — No. 9: (Sub fan relay 1)*** ***No. 20 — No. 21: (Sub fan relay 2)***	Is the resistance less than 1 Ω?	Replace the sub fan relay and ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>

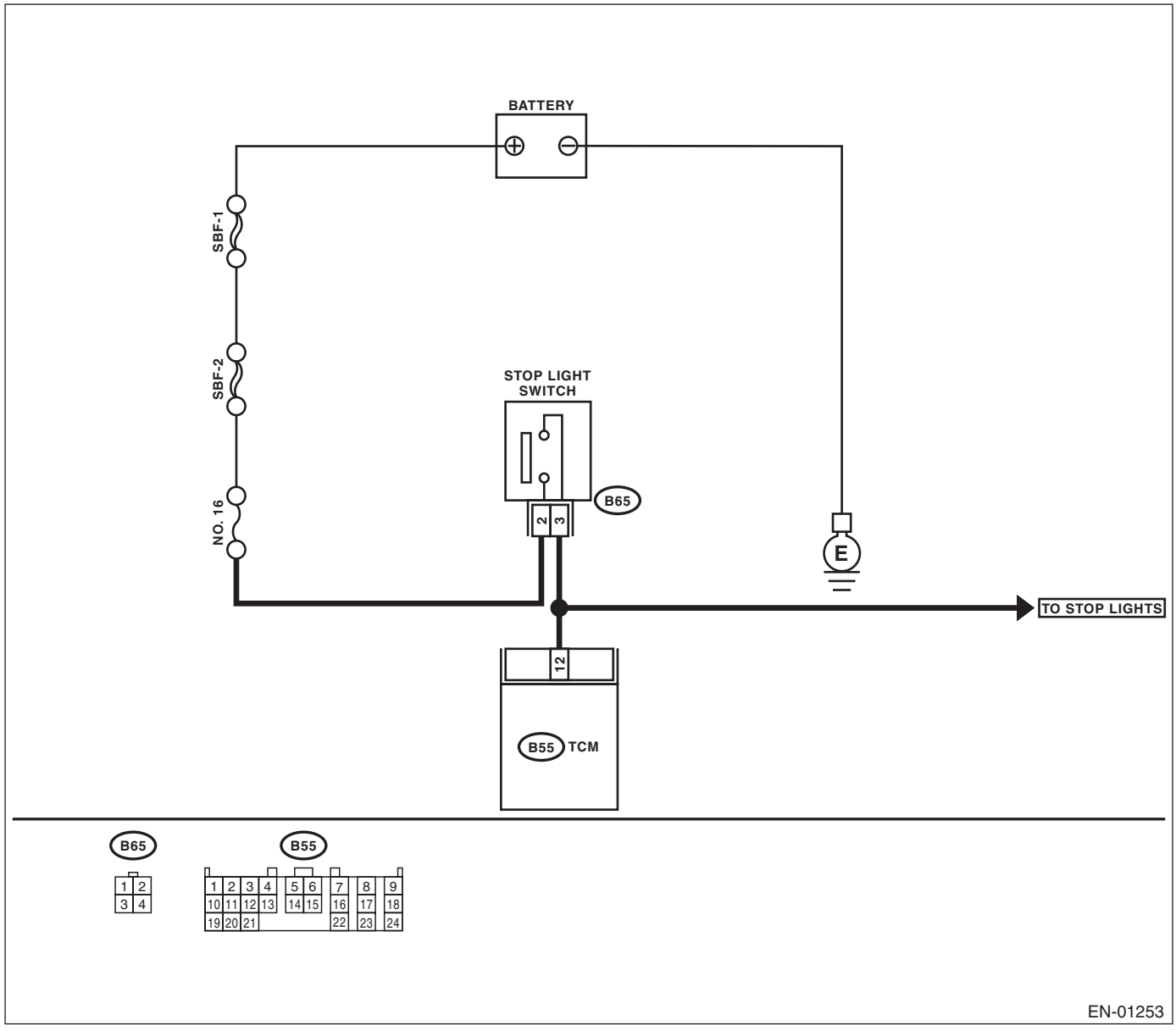
BZ:DTC P0703 TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-181, DTC P0703 TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OPERATION OF BRAKE LIGHT.**	Does the brake light come on when depressing the brake pedal?	Go to step **2.**	Repair or replace the brake light circuit.
2	**CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.** 1) Disconnect the connectors from TCM and brake light switch. 2) Measure the resistance of harness between TCM and brake light switch connector. ***Connector & terminal*** ***(B55) No. 12 — (B65) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair or replace the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between TCM and brake light switch connector • Poor contact in TCM connector • Poor contact in brake light switch connector
3	**CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 12 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the ground short circuit in harness between TCM and brake light switch connector.
4	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and brake light switch. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 12 (+) — Chassis ground (−):***	Is the voltage less than 1 V when releasing the brake pedal?	Go to step **5.**	Adjust or replace the brake light switch. <Ref. to LI-7, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
5	**CHECK INPUT SIGNAL FOR TCM.** Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 12 (+) — Chassis ground (−):***	Is the voltage more than 10 V when depressing the brake pedal?	Go to step **6.**	Adjust or replace the brake light switch. <Ref. to LI-7, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair the poor contact in TCM connector.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

CA:DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT)

GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-182, DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
For the diagnostic procedure, refer to AT section. <Ref. to 4AT(diag)-104, CHECK INHIBITOR SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>

CB:DTC P0710 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT

GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-183, DTC P0710 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
For the diagnostic procedure, refer to AT section. <Ref. to 4AT(diag)-43, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CC:DTC P0716 TORQUE CONVERTER TURBINE SPEED SENSOR

GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-184, DTC P0716 INPUT/TURBINE SPEED SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
For the diagnostic procedure, refer to AT section. <Ref. to 4AT(diag)-57, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CD:DTC P0720 OUTPUT SPEED SENSOR CIRCUIT

GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-185, DTC P0720 OUTPUT SPEED SENSOR CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
For the diagnostic procedure, refer to AT section. <Ref. to 4AT(diag)-52, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CE:DTC P0726 ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE

GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-186, DTC P0726 ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
For the diagnostic procedure, refer to AT section. <Ref. to 4AT(diag)-39, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CF:DTC P0731 GEAR 1 INCORRECT RATIO

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H4DOTC)(diag)-255, DTC P0734 GEAR 4 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CG:DTC P0732 GEAR 2 INCORRECT RATIO

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H4DOTC)(diag)-255, DTC P0734 GEAR 4 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CH:DTC P0733 GEAR 3 INCORRECT RATIO

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H4DOTC)(diag)-255, DTC P0734 GEAR 4 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CI: DTC P0734 GEAR 4 INCORRECT RATIO

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-190, DTC P0734 GEAR 4 INCORRECT RATIO, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Shift point too high or too low; engine brake not effective in “3” range; excessive shift shock; excessive tight corner “braking”

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK THROTTLE POSITION SENSOR CIRCUIT.** Check the throttle position sensor circuit. <Ref. to 4AT(diag)-46, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in throttle position sensor circuit?	Repair or replace the throttle position sensor circuit.	Go to step **3.**
3	**CHECK FRONT VEHICLE SPEED SENSOR CIRCUIT.** Check the front vehicle speed sensor circuit. <Ref. to 4AT(diag)-52, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in front vehicle speed sensor circuit?	Repair or replace the vehicle speed sensor 2 circuit.	Go to step **4.**
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.** Check the torque converter turbine speed sensor circuit. <Ref. to 4AT(diag)-57, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in torque converter turbine speed sensor circuit?	Repair or replace the torque converter turbine speed sensor circuit.	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair the poor contact in TCM connector.	Go to step **6.**
6	**CHECK MECHANICAL TROUBLE.** Check mechanical trouble in automatic transmission.	Is there any mechanical trouble in automatic transmission?	Repair or replace the automatic transmission. <Ref. to 4AT-32, INSPECTION, Road Test.>	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

CJ:DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-191, DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- No lock-up (after engine warm-up)
- No shift or excessive tight corner “braking”

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK LOCK-UP DUTY SOLENOID CIRCUIT.** Check the lock-up duty solenoid circuit. <Ref. to 4AT(diag)-87, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in lock-up duty solenoid circuit?	Repair or replace the lock-up duty solenoid circuit.	Go to step **3.**
3	**CHECK THROTTLE POSITION SENSOR CIRCUIT.** Check the throttle position sensor circuit. <Ref. to 4AT(diag)-46, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in throttle position sensor circuit?	Repair or replace the throttle position sensor circuit.	Go to step **4.**
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.** Check the torque converter turbine speed sensor circuit. <Ref. to 4AT(diag)-57, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in torque converter turbine speed sensor circuit?	Repair or replace the torque converter turbine speed sensor circuit.	Go to step **5.**
5	**CHECK ENGINE SPEED INPUT CIRCUIT.** Check the engine speed input circuit. <Ref. to 4AT(diag)-39, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in engine speed input circuit?	Repair or replace the engine speed input circuit.	Go to step **6.**
6	**CHECK INHIBITOR SWITCH CIRCUIT.** Check the inhibitor switch circuit. <Ref. to 4AT(diag)-104, CHECK INHIBITOR SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Is there any trouble in inhibitor switch circuit?	Repair or replace the inhibitor switch circuit.	Go to step **7.**

	Step	Check	Yes	No
7	**CHECK BRAKE LIGHT SWITCH CIRCUIT.** Check the brake light switch circuit. <Ref. to 4AT(diag)-103, CHECK BRAKE SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Is there any trouble in brake light switch circuit?	Repair or replace the brake light switch circuit.	Go to step **8.**
8	**CHECK ATF TEMPERATURE SENSOR CIRCUIT.** Check the ATF temperature sensor circuit. <Ref. to 4AT(diag)-43, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in ATF temperature sensor circuit?	Repair or replace the ATF temperature sensor circuit.	Go to step **9.**
9	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair the poor contact in TCM connector.	Go to step **10.**
10	**CHECK MECHANICAL TROUBLE.** Check mechanical trouble in automatic transmission.	Is there any mechanical trouble in automatic transmission?	Repair or replace the automatic transmission. <Ref. to 4AT-32, INSPECTION, Road Test.>	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

CK:DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL

GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-192, DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
For the diagnostic procedure, refer to AT section. <Ref. to 4AT(diag)-87, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CL:DTC P0748 PRESSURE CONTROL SOLENOID “A” ELECTRICAL

GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-193, DTC P0748 PRESSURE CONTROL SOLENOID “A” ELECTRICAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
For the diagnostic procedure, refer to AT section. <Ref. to 4AT(diag)-78, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CM:DTC P0753 SHIFT SOLENOID “A” ELECTRICAL

GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-194, DTC P0753 SHIFT SOLENOID “A” ELECTRICAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
For the diagnostic procedure, refer to AT section. <Ref. to 4AT(diag)-65, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CN:DTC P0758 SHIFT SOLENOID “B” ELECTRICAL

GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-195, DTC P0758 SHIFT SOLENOID “B” ELECTRICAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
For the diagnostic procedure, refer to AT section. <Ref. to 4AT(diag)-68, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CO:DTC P0771 LOW CLUTCH TIMING SOLENOID

GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-196, DTC P0771 SHIFT SOLENOID “E” PERFORMANCE OR STUCK OFF, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
For the diagnostic procedure, refer to AT section. <Ref. to 4AT(diag)-71, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CP:DTC P0778 PRESSURECONTROL SOLENOID “B” ELECTRICAL

GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-197, DTC P0778 PRESSURE CONTROL SOLENOID “B” ELECTRICAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
For the diagnostic procedure, refer to AT section. <Ref. to 4AT(diag)-83, DTC 76 2-4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CQ:DTC P0785 SHIFT/TIMING SOLENOID

GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-198, DTC P0785 SHIFT/TIMING SOLENOID, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
For the diagnostic procedure, refer to AT section. <Ref. to 4AT(diag)-74, DTC 74 2-4 BRAKE TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CR:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-199, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

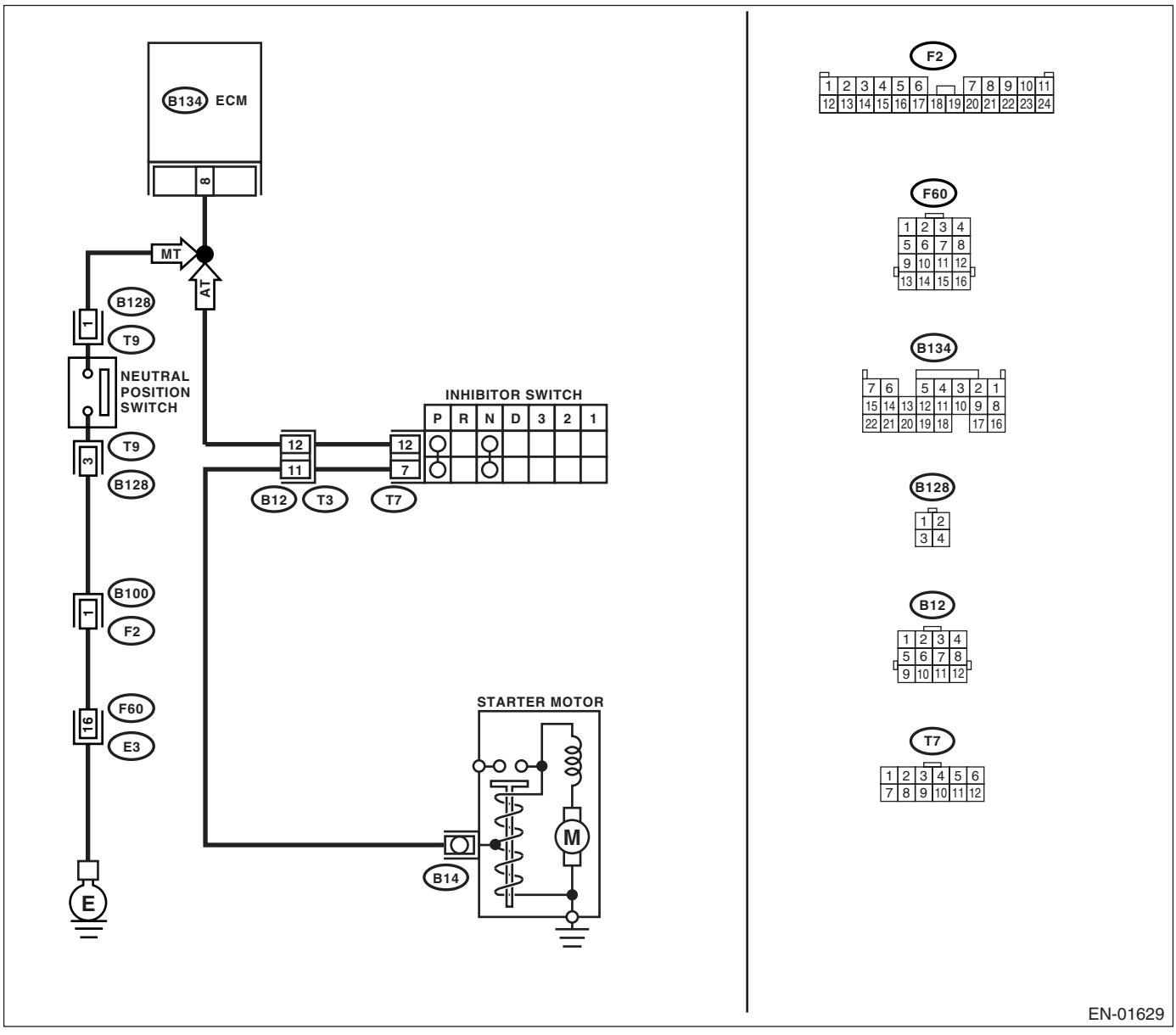
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DTC P0705 ON DISPLAY.**	Is DTC P0705 indicated?	Inspect DTC P0705 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. 2) Place the select lever except for "N" and "P" positions. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (−):***	Is the voltage 4.5 — 5.5 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T3). 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between ECM and transmission harness connector.
4	**CHECK TRANSMISSION HARNESS CONNECTOR.** 1) Disconnect the connector from inhibitor switch. 2) Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(T3) No. 12 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair ground short circuit in harness between transmission harness and inhibitor switch connector.
5	**CHECK INHIBITOR SWITCH.** Measure the resistance between inhibitor switch connector the receptacle's terminals in selector lever except for "N" position. ***Terminals*** ***No. 7 — No. 12:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Replace the inhibitor switch. <Ref. to 4AT-46, Inhibitor Switch.>
6	**CHECK SELECTOR CABLE CONNECTION.**	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-26, INSPECTION, Select Cable.>	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

CS:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-200, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

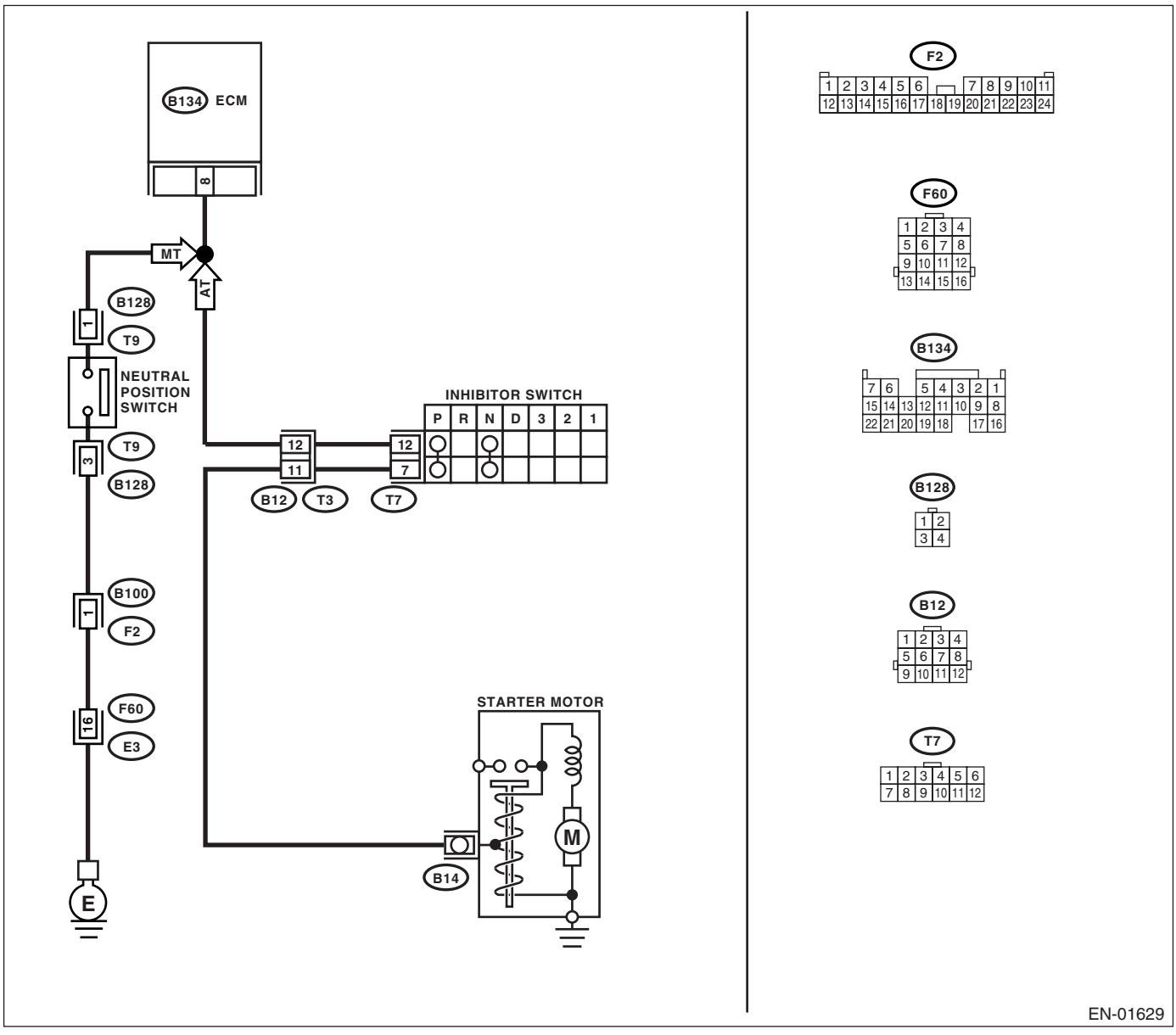
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. 2) Place the shift lever in neutral. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Place the shift lever in a position except for neutral. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact your SOA Service Center.
4	**CHECK NEUTRAL POSITION SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission harness. 3) Place the shift lever in neutral. 4) Measure the resistance between transmission harness and connector terminals. ***Connector & terminal*** ***(T9) No. 1 — No. 3:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair short circuit in transmission harness or replace neutral position switch.
5	**CHECK NEUTRAL POSITION SWITCH.** 1) Place the shift lever in a position except for neutral. 2) Measure the resistance between transmission harness connector terminals.	Is the resistance less than 1 Ω?	Go to step **6.**	Repair short circuit in transmission harness or replace neutral position switch.
6	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair ground short circuit in harness between ECM and transmission harness connector.
7	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and transmission harness connector. ***Connector & terminal*** ***(B134) No. 8 — (B128) No. 1:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between ECM and transmission harness connector.
8	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(B128) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **9.**	Repair open circuit between transmission harness connector and engine ground terminal.
9	**CHECK POOR CONTACT.** Check poor contact in transmission harness connector.	Is there poor contact in transmission harness connector?	Repair poor contact in transmission harness connector.	Contact your SOA Service Center.

CT:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-201, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

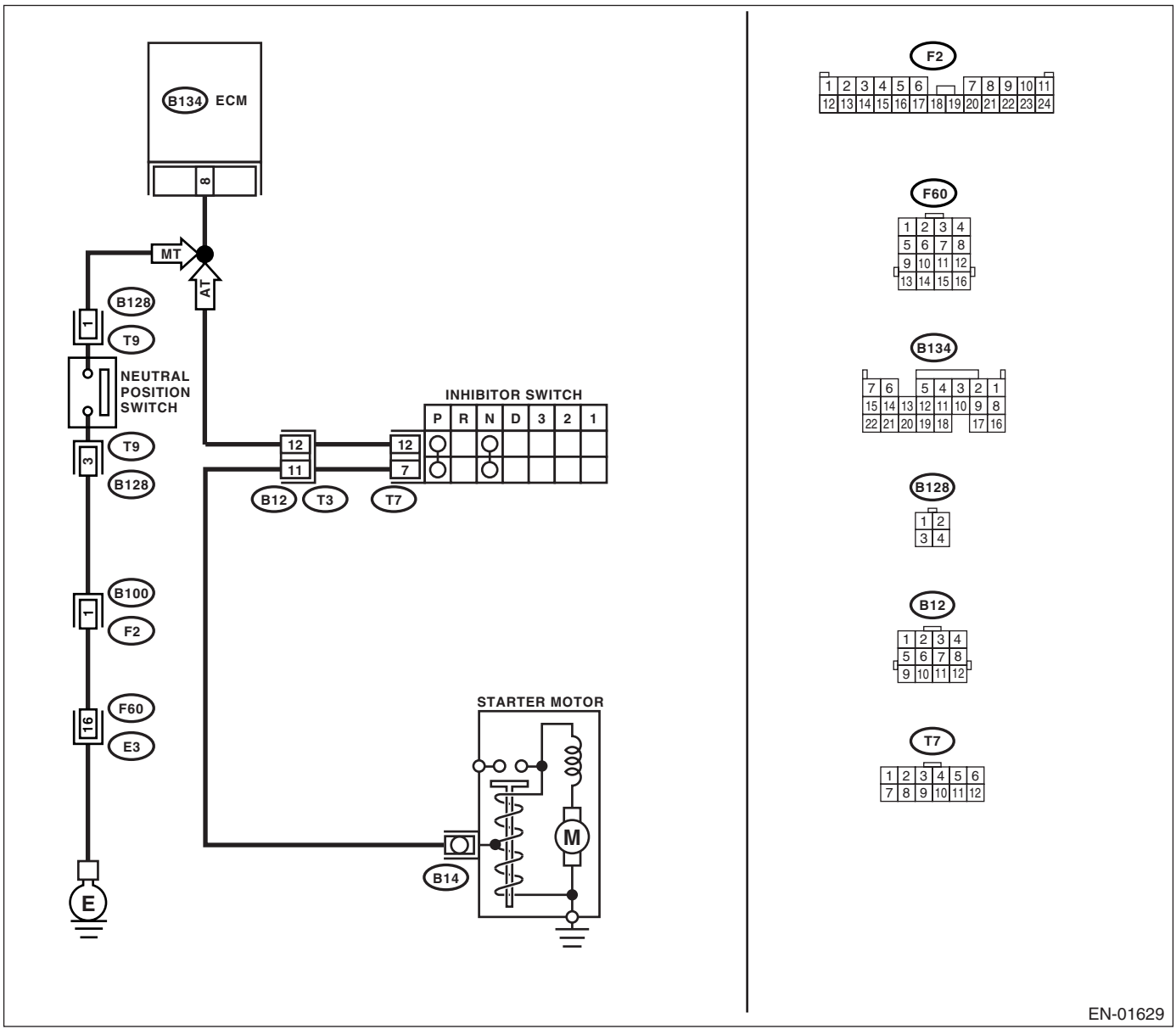
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DTC P0705 ON DISPLAY.**	Is DTC P0705 indicated?	Inspect DTC P0705 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground in selector lever "N" and "P" positions. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **3.**	Go to step **5.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground in selector lever except for "N" and "P" positions. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (−):***	Is the voltage 4.5 — 5.5 V?	Go to step **4.**	Go to step **5.**
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and inhibitor switch connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and inhibitor switch. 3) Measure the resistance of harness between ECM and inhibitor switch connector. ***Connector & terminal*** ***(B134) No. 8 — (T7) No. 12:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and inhibitor switch connector • Poor contact in coupling connector • Poor contact in inhibitor switch connector • Poor contact in ECM connector

	Step	Check	Yes	No
7	**CHECK INHIBITOR SWITCH GROUND LINE.** Measure the resistance of harness between inhibitor switch connector and engine ground. ***Connector & terminal*** ***(T7) No. 7 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **8.**	Repair open circuit in harness between inhibitor switch connector and starter motor ground line. NOTE: In this case, repair the following: • Open circuit in harness between inhibitor switch connector and starter motor ground line • Poor contact in starter motor connector • Poor contact in starter motor ground • Starter motor
8	**CHECK INHIBITOR SWITCH.** Measure the resistance between inhibitor switch connector receptacle's terminals in selector lever "N" and "P" positions. ***Terminals*** ***No. 7 — No. 12:***	Is the resistance less than 1 Ω?	Go to step **9.**	Replace the inhibitor switch. <Ref. to 4AT-46, Inhibitor Switch.>
9	**CHECK SELECTOR CABLE CONNECTION.**	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-26, INSPECTION, Select Cable.>	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

CU:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-202, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

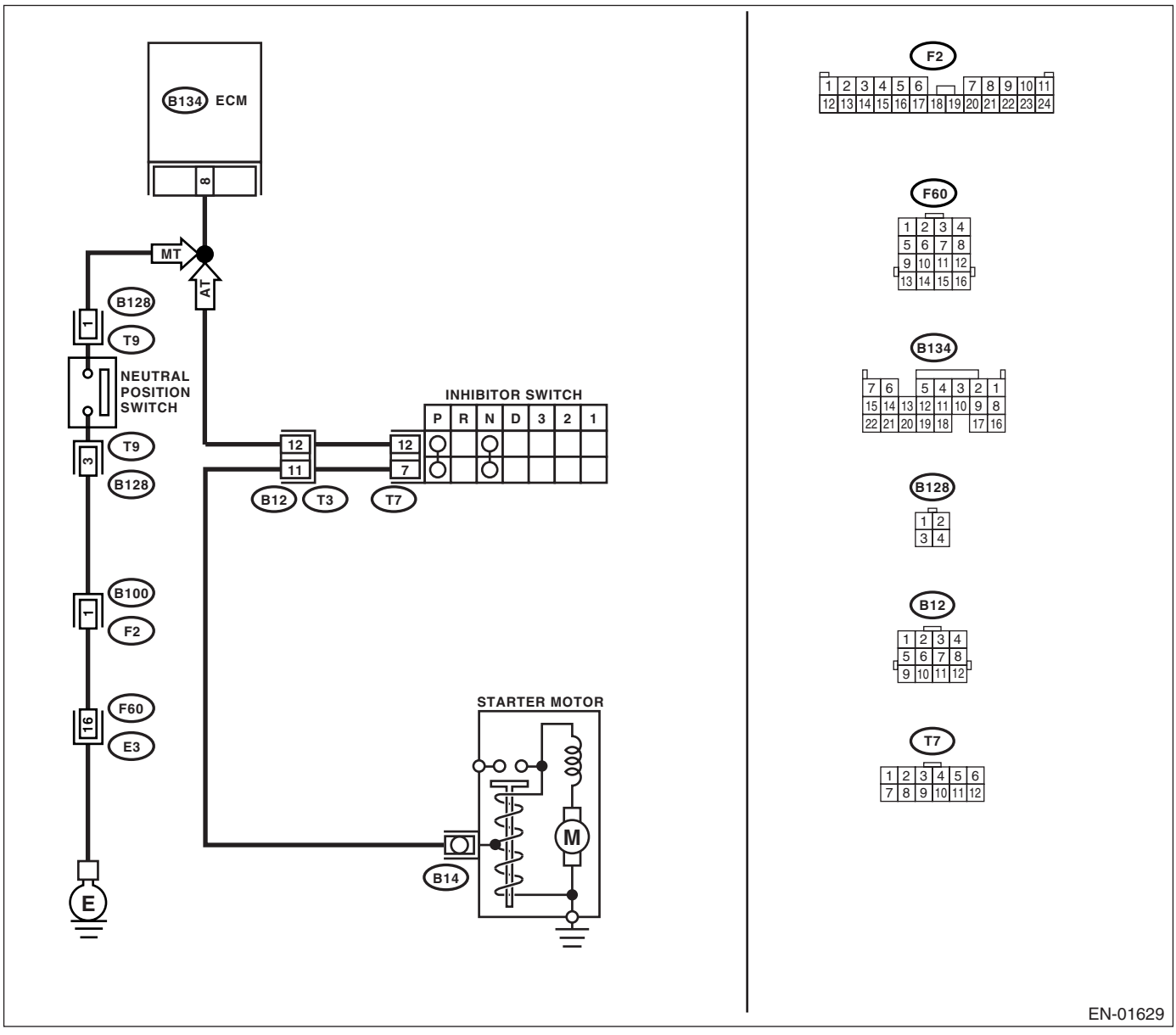
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. 2) Set the shift lever to except neutral position. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Set the shift lever to neutral position. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Contact your SOA Service Center.
4	**CHECK INPUT SIGNAL FOR ECM.** 1) Disconnect ECM connector from ECM. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and transmission connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T9). 3) Measure the resistance of harness between ECM and neutral switch connector. ***Connector & terminal*** ***(B134) No. 8 — (B128) No. 1:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and transmission harness • Poor contact in transmission harness connector • Poor contact in ECM connector
6	**CHECK NEUTRAL POSITION SWITCH GROUND LINE.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(B128) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **7.**	Repair the open circuit in harness of neutral position switch ground line.
7	**CHECK NEUTRAL POSITION SWITCH.** 1) Set the shift lever to except neutral position. 2) Measure the resistance between transmission harness connector receptacle's terminals. ***Terminals*** ***No. 1 — No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Replace the neutral position switch.
8	**CHECK POOR CONTACT.** Check poor contact in the transmission harness connector.	Is there poor contact in the transmission harness connector?	Repair poor contact in transmission harness connector.	Contact your SOA Service Center.

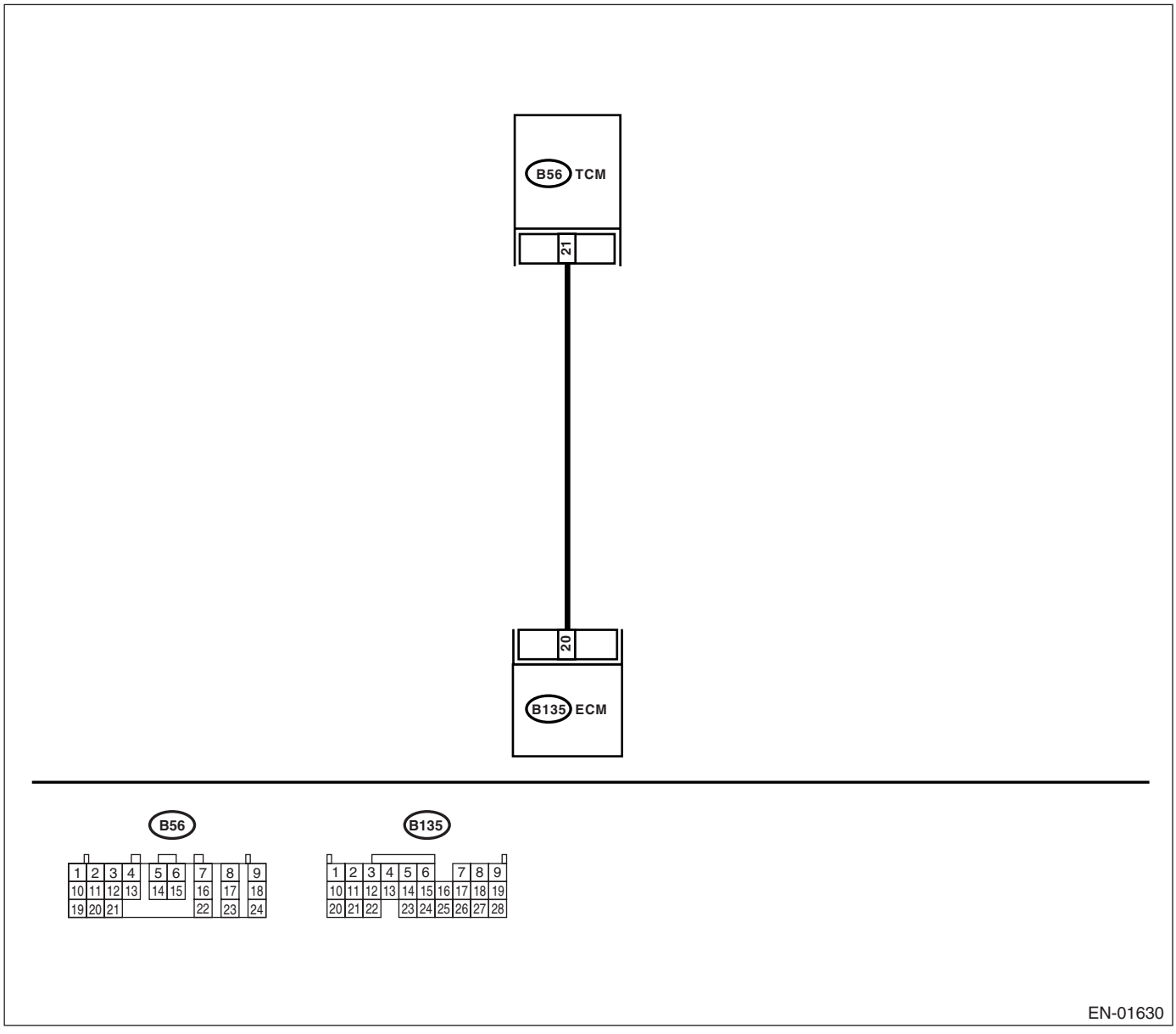
CV:DTC P0864 TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-203, DTC P0864 TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DRIVING CONDITION.** 1) Start and warm-up the engine until the radiator fan makes one complete rotation. 2) Drive the vehicle.	Is the AT shift control functioning properly?	Go to step **2.**	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>
2	**CHECK ACCESSORY.**	Are car phone and/or CB installed on vehicle?	Repair the grounding line of car phone or CB system.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

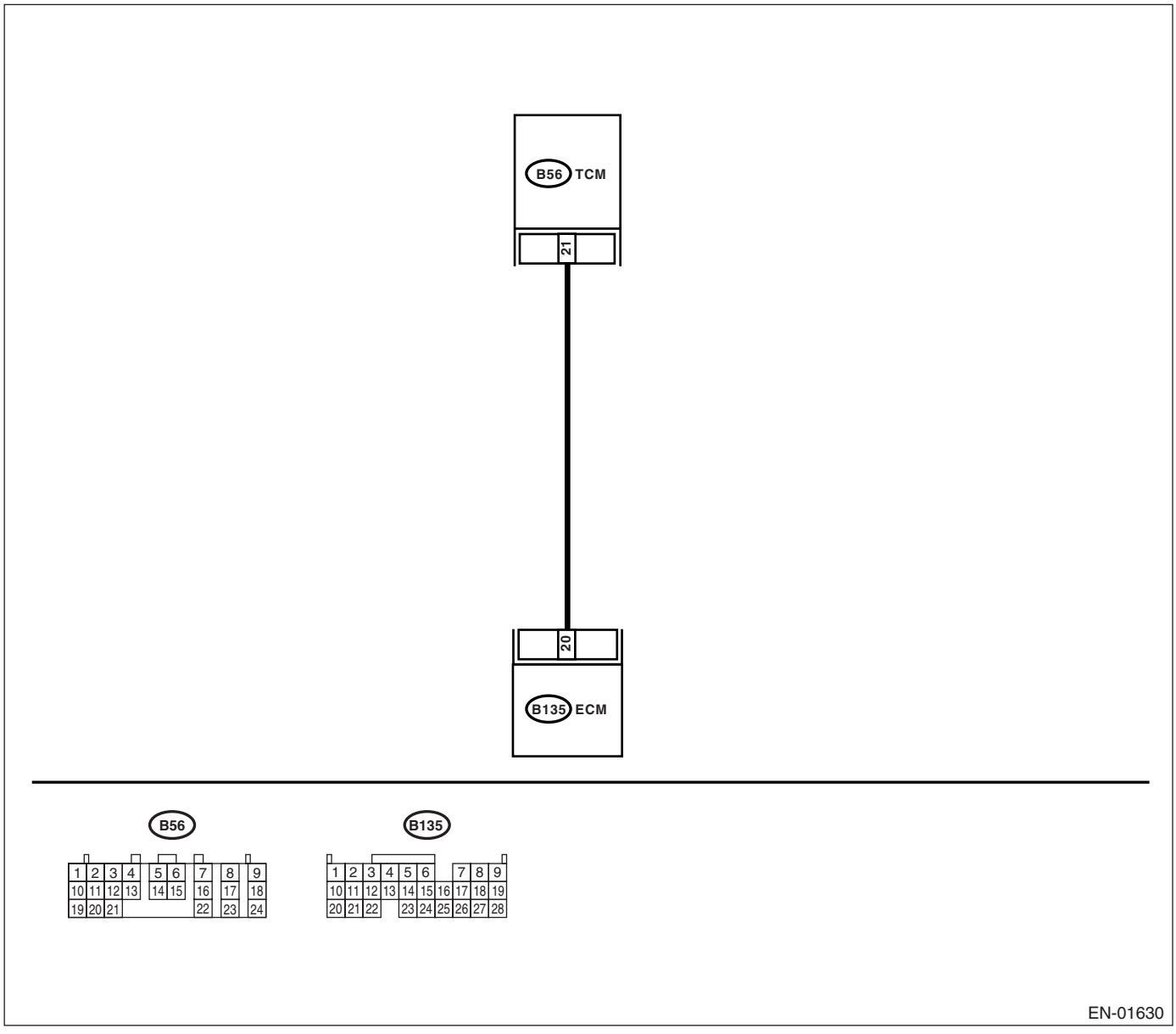
CW:DTC P0865 TCM COMMUNICATION CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-204, DTC P0865 TCM COMMUNICATION CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. NOTE: In this case, repair the following: • Poor contact in ECM connector • Poor contact in TCM connector
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and TCM. 3) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the ground short circuit in harness between ECM and TCM connector.
3	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (−):***	Is the voltage more than 5 V?	Go to step **4.**	Repair the poor contact in ECM connector.
4	**CHECK DTC FOR AUTOMATIC TRANSMISSION.** Read the DTC for automatic transmission. <Ref. to 4AT(diag)-24, Read Diagnostic Trouble Code (DTC).>	Does the DTC appear for automatic transmission?	Inspect the DTC for automatic transmission. <Ref. to 4AT(diag)-39, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

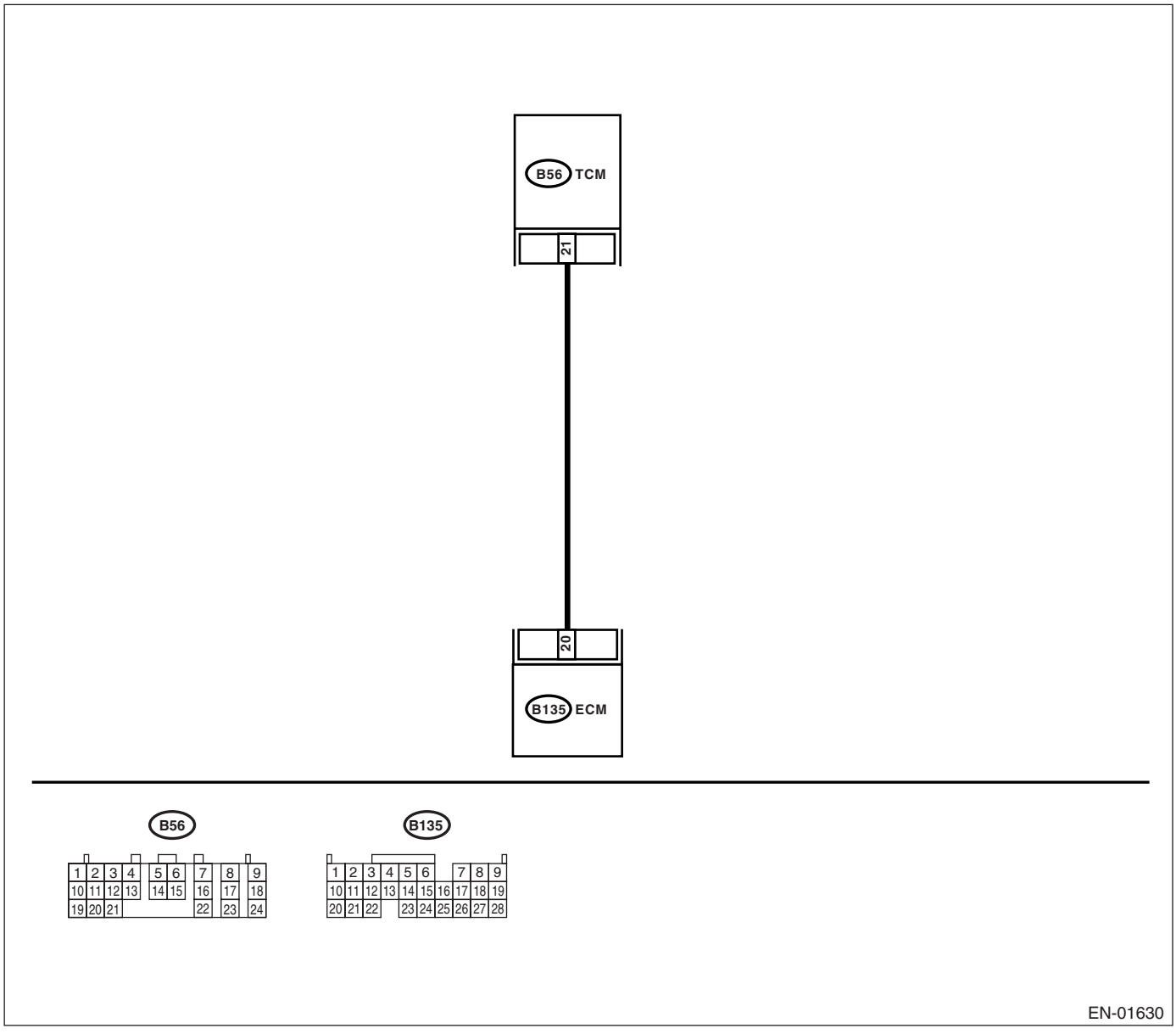
CX:DTC P0866 TCM COMMUNICATION CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-205, DTC P0866 TCM COMMUNICATION CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (−):***	Is the voltage more than 4 V?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Repair the poor contact in ECM connector.	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 20 (+) — Chassis ground (−):***	Does the voltage change between 1 and 4 V while monitoring the value with voltage meter?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. NOTE: In this case, repair the following: • Poor contact in ECM connector • Poor contact in TCM connector	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 20 (+) — Chassis ground (−):***	Is the voltage more than 4 V?	Go to step **6.**	Repair the open circuit in harness between ECM and TCM connector.
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair the poor contact in TCM connector.	Check the TCM power supply line and grounding line.

CY:DTC P1086 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-206, DTC P1086 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

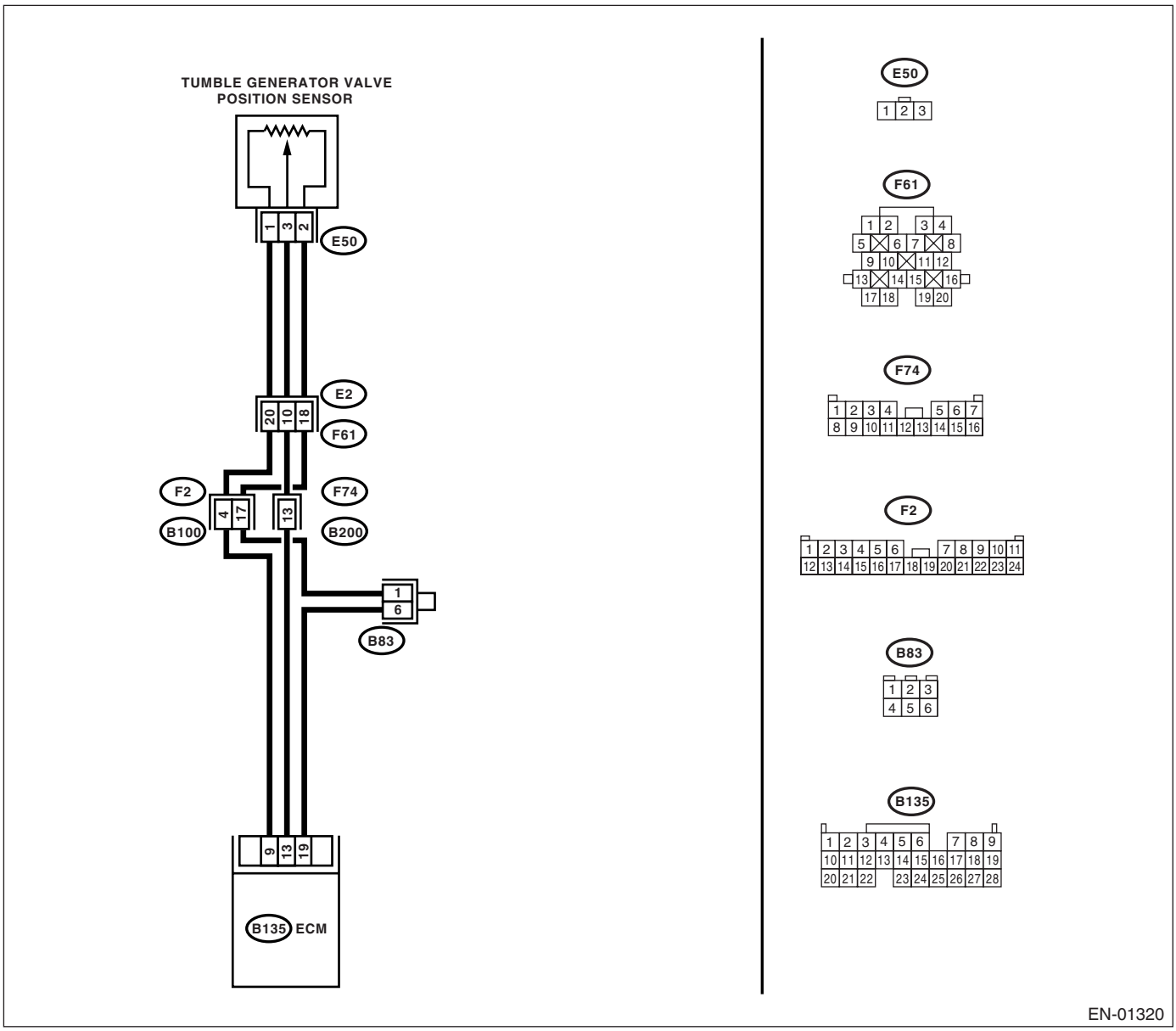
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage less than 0.1 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 13 (+) — Chassis ground (–):***	Is the voltage less than 0.1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)** Measure the voltage between ECM connector and chassis ground.	Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change?	Repair the poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from tumble generator valve position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 1 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector. ***Connector & terminal*** ***(B135) No. 13 — (E50) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the ground short circuit in harness between tumble generator valve position sensor and ECM connector.
9	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve position sensor connector.	Is there poor contact in tumble generator valve position sensor connector?	Repair the poor contact in tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-40, Tumble Generator Valve Position Sensor.>

CZ:DTC P1087 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-208, DTC P1087 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

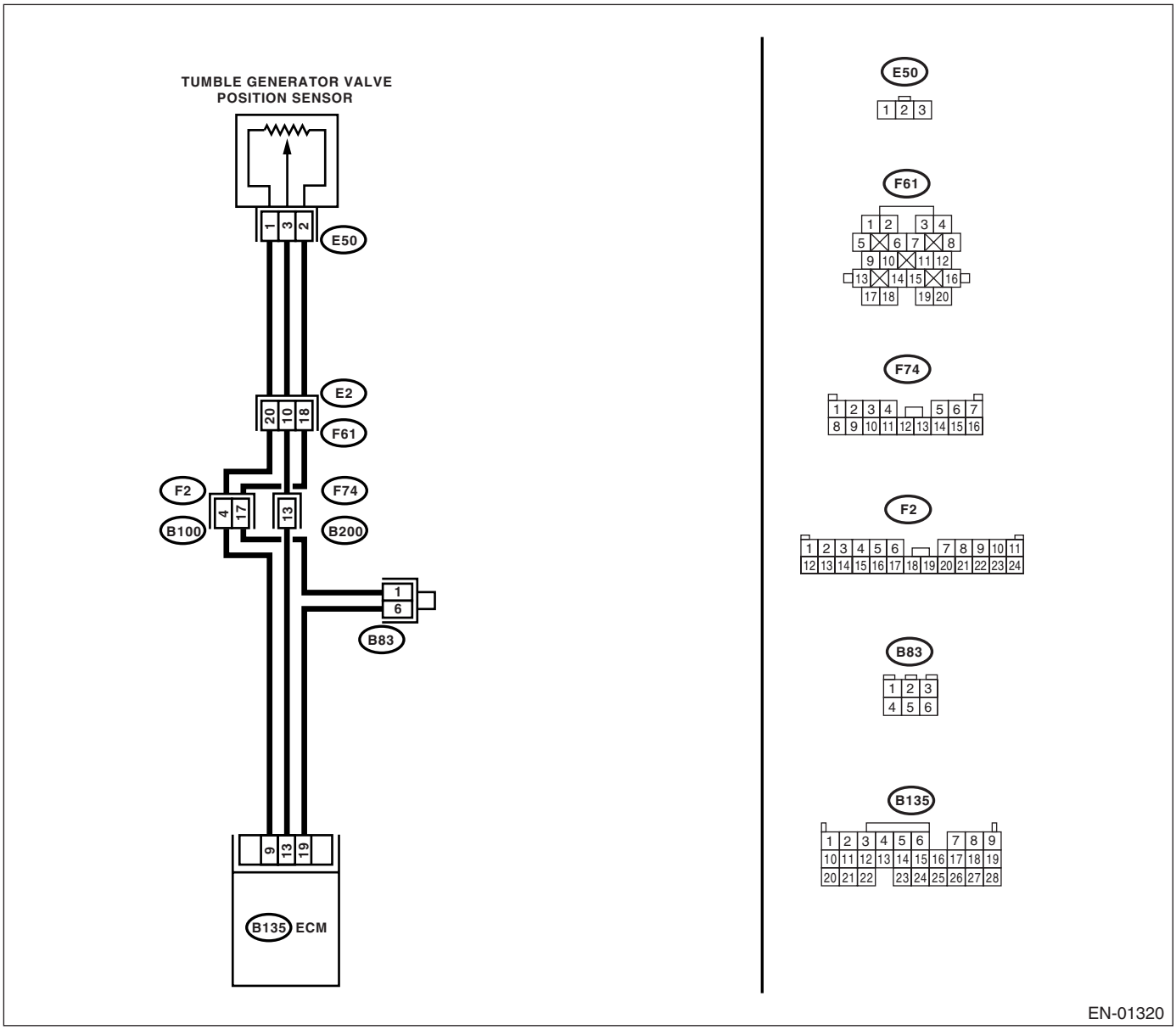
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage more than 4.9 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.9 V?	Repair the battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-40, Tumble Generator Valve Position Sensor.>

DA:DTC P1088 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-210, DTC P1088 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

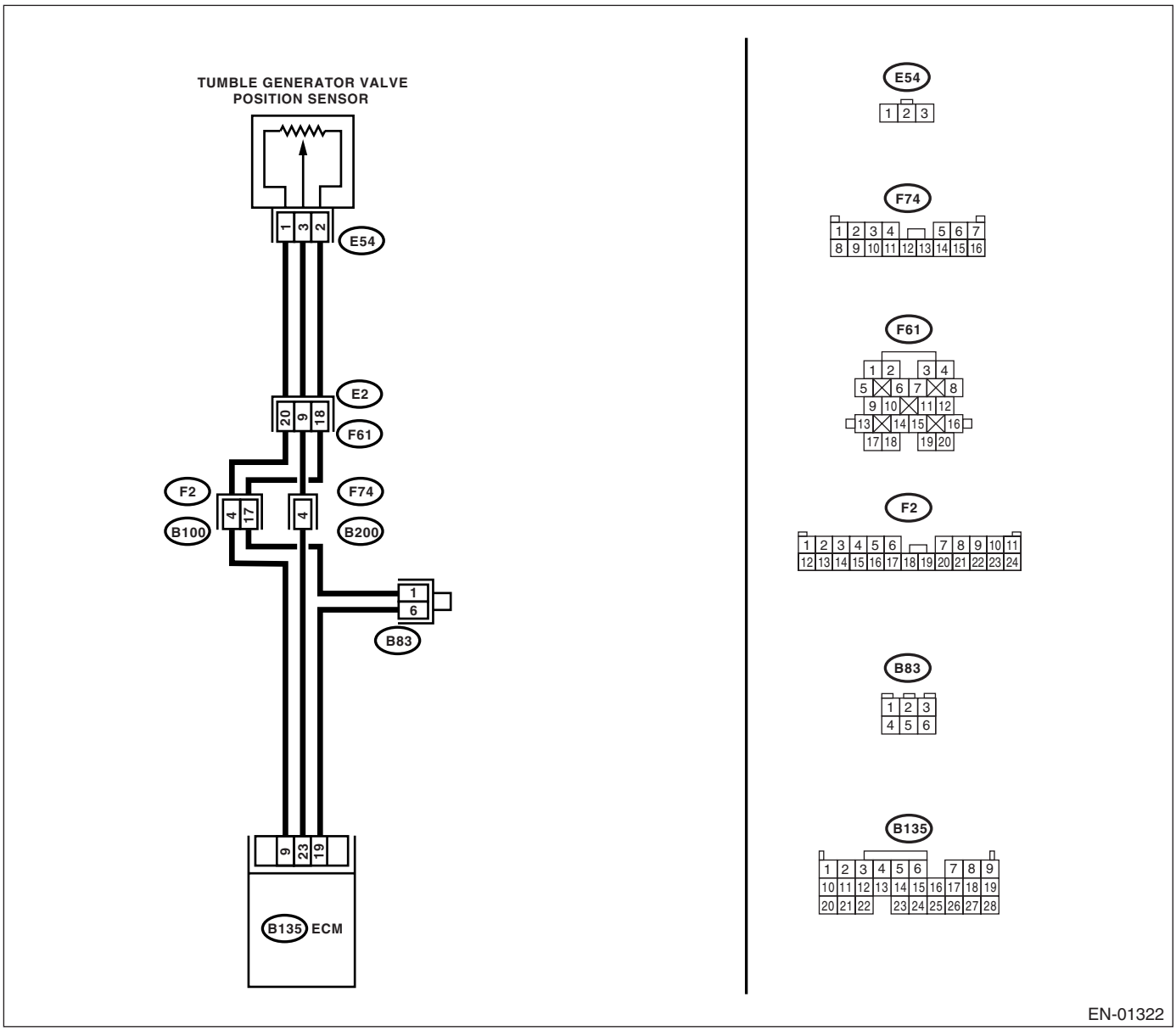
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage less than 0.1 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (–):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 23 (+) — Chassis ground (–):***	Is the voltage less than 0.1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)** Measure the voltage between ECM connector and chassis ground.	Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change?	Repair the poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from tumble generator valve position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 1 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector. ***Connector & terminal*** ***(B135) No. 23 — (E54) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the ground short circuit in harness between tumble generator valve position sensor and ECM connector.
9	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve position sensor connector.	Is there poor contact in tumble generator valve position sensor connector?	Repair the poor contact in tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-40, Tumble Generator Valve Position Sensor.>

DB:DTC P1089 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-212, DTC P1089 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

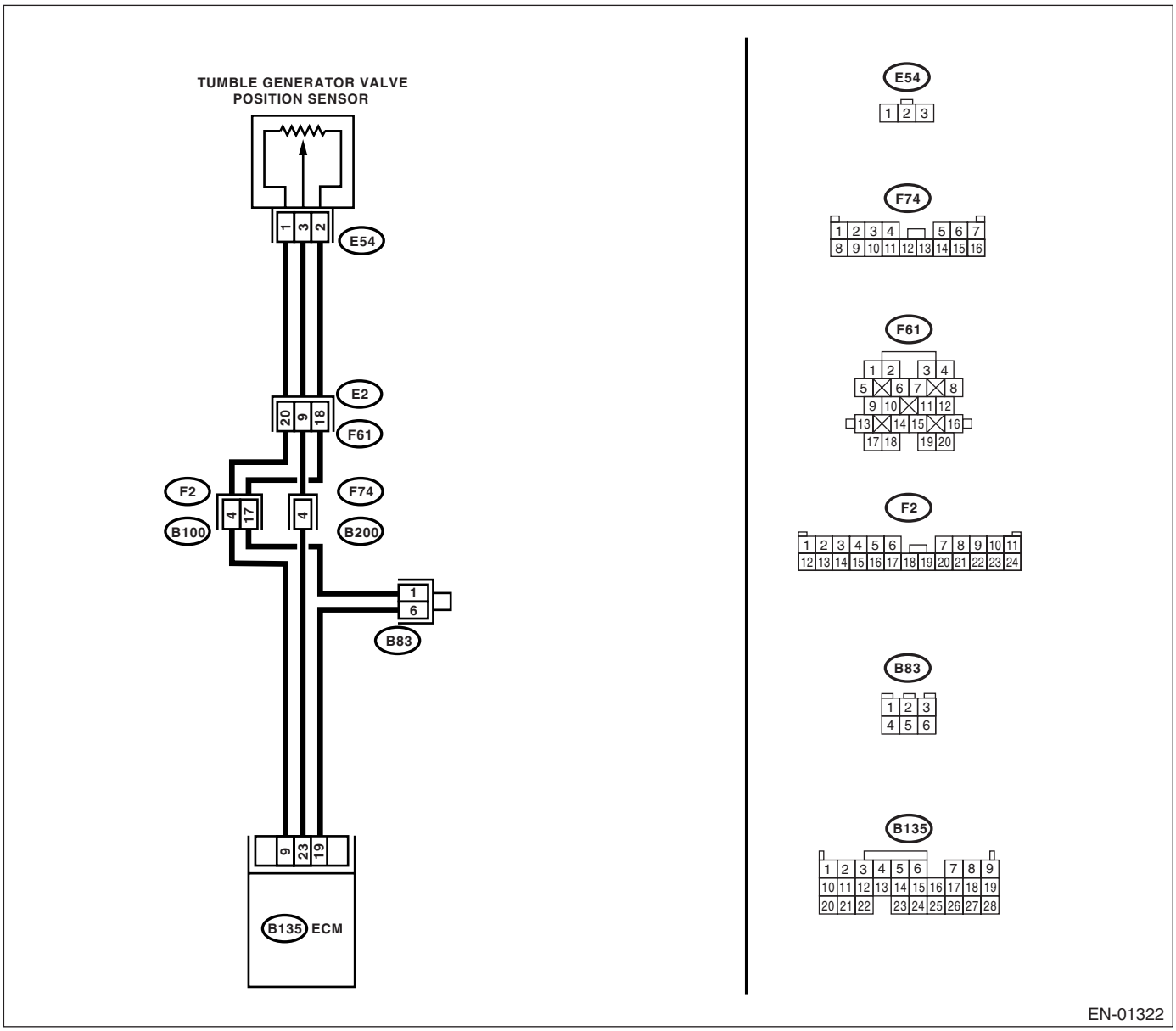
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage more than 4.9 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.9 V?	Repair the battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-40, Tumble Generator Valve Position Sensor.>

DC:DTC P1090 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-214, DTC P1090 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE RH.** 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-39, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

DD:DTC P1091 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-215, DTC P1091 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)" <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE RH.** 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-39, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

DE:DTC P1092 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-216, DTC P1092 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE LH.** 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-39, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

DF:DTC P1093 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-217, DTC P1093 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE LH.** 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-39, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

DG:DTC P1094 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN)

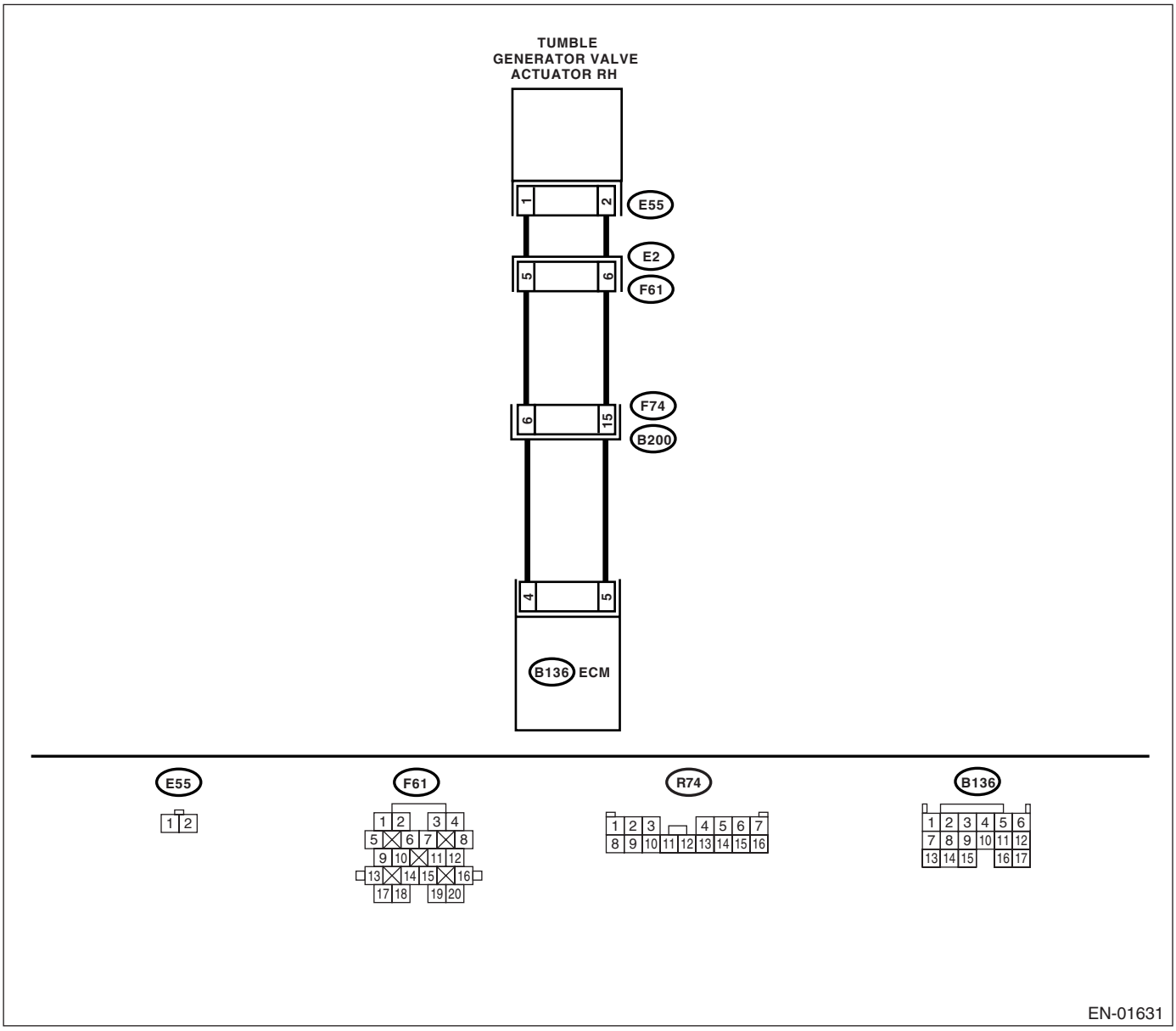
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-218, DTC P1094 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector. ***Connector & terminal*** ***(E55) No. 1 — (B136) No. 4:*** ***(E55) No. 2 — (B136) No. 5:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit between ECM and tumble generator valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and tumble generator valve actuator connector. • Poor contact in coupling connector.
2	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve actuator connector.	Is there poor contact in tumble generator valve actuator connector?	Repair the poor contact in tumble generator valve actuator connector.	Replace the tumble generator valve Actuator. <Ref. to FU(H4DOTC)-41, Tumble Generator Valve Actuator.>

DH:DTC P1095 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT)

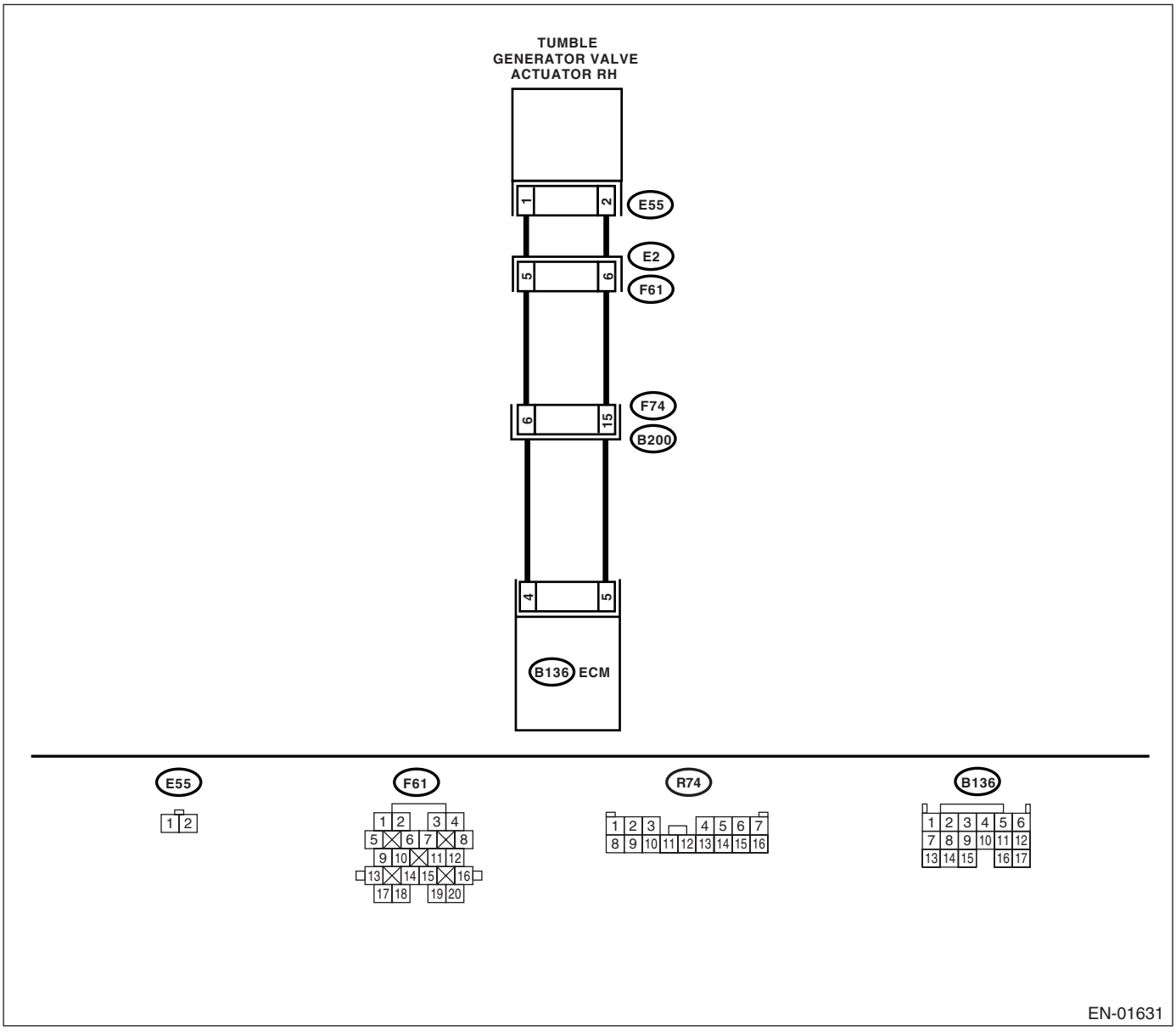
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-220, DTC P1095 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve connector. 3) Measure the voltage between tumble generator valve actuator and chassis ground. ***Connector & terminal*** ***(E55) No. 1 (+) — Chassis ground (−):*** ***(E55) No. 2 (+) — Chassis ground (−):***	Is the voltage less than 5 V?	Replace the tumble generator valve Actuator. <Ref. to FU(H4DOTC)-41, Tumble Generator Valve Actuator.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

DI: DTC P1096 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN)

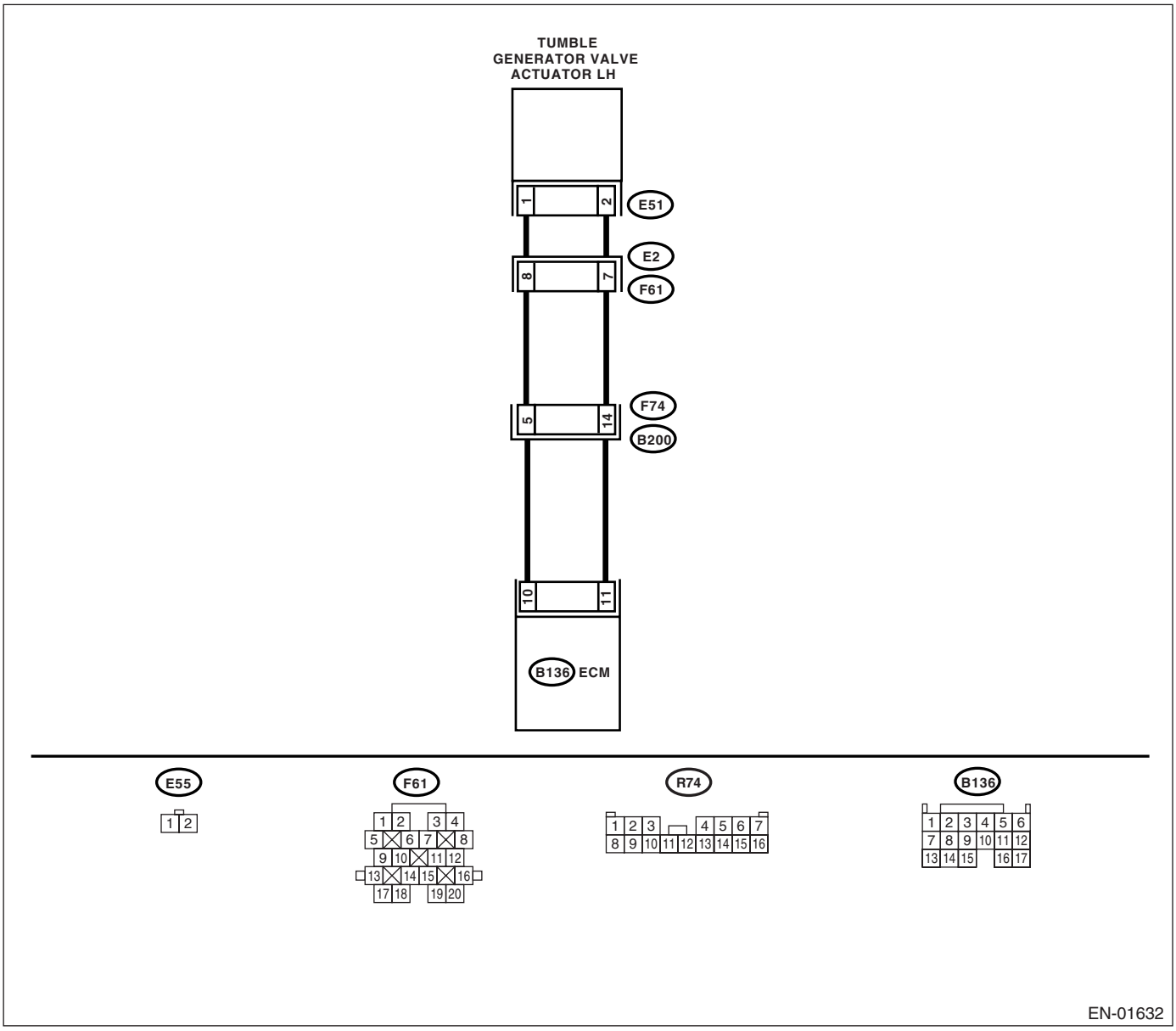
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-222, DTC P1096 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector. ***Connector & terminal*** ***(E51) No. 1 — (B136) No. 10:*** ***(E51) No. 2 — (B136) No. 11:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit between ECM and tumble generator valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and tumble generator valve actuator connector. • Poor contact in coupling connector.
2	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve actuator connector.	Is there poor contact in tumble generator valve actuator connector?	Repair the poor contact in tumble generator valve actuator connector.	Replace the tumble generator valve Actuator. <Ref. to FU(H4DOTC)-41, Tumble Generator Valve Actuator.>

DJ:DTC P1097 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT)

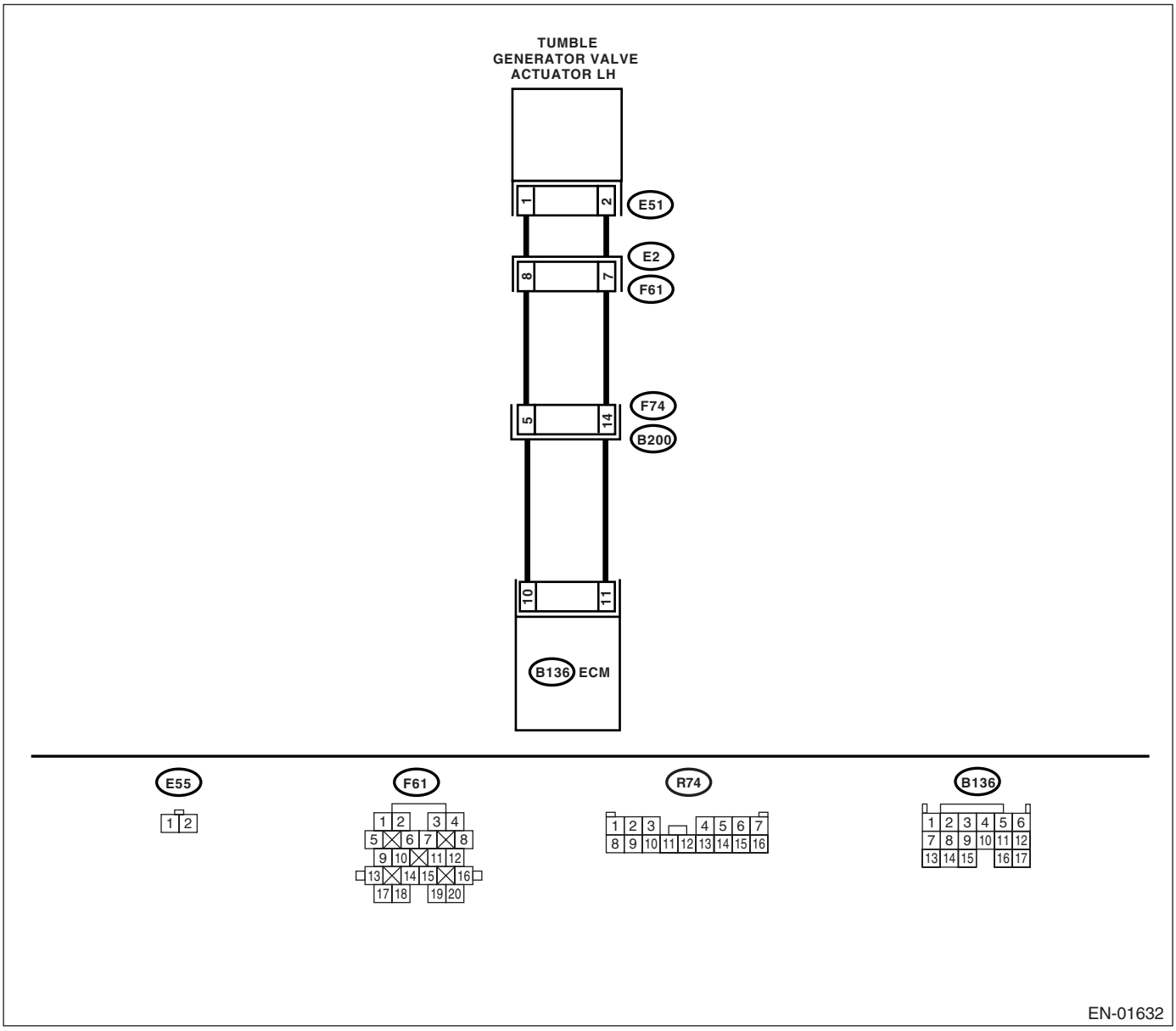
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-224, DTC P1097 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve connector. 3) Measure the voltage between tumble generator valve actuator and chassis ground. ***Connector & terminal*** ***(E51) No. 1 (+) — Chassis ground (–):*** ***(E51) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 5 V?	Replace the tumble generator valve Actuator. <Ref. to FU(H4DOTC)-41, Tumble Generator Valve Actuator.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

DK:DTC P1110 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-226, DTC P1110 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1110?	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is built into ECM.	A temporary poor contact.

DL:DTC P1111 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-227, DTC P1111 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1111?	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is built into ECM.	A temporary poor contact.

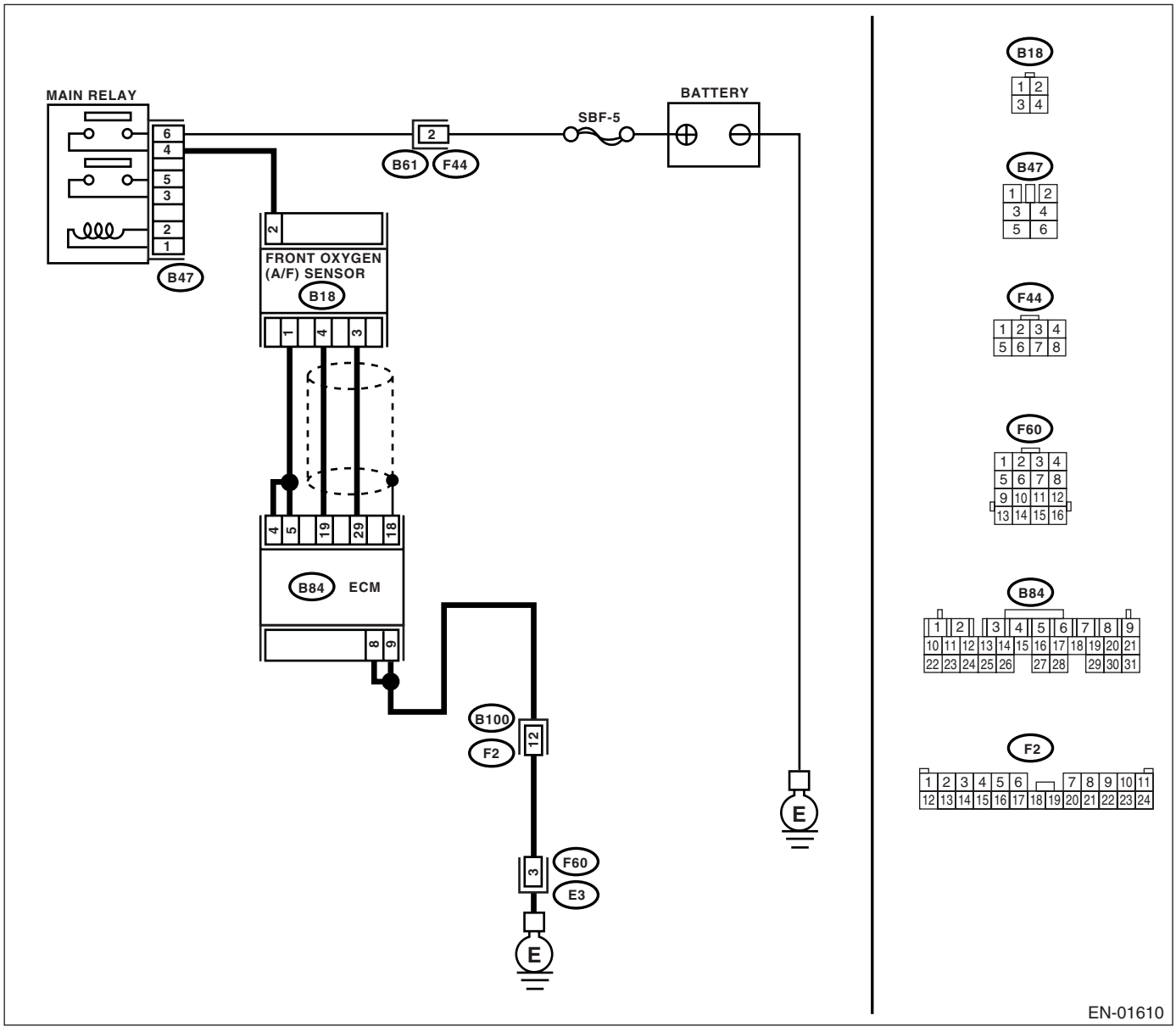
DM:DTC P1134 A/F SENSOR MICRO-COMPUTER PROBLEM

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-228, DTC P1134 A/F SENSOR MICRO-COMPUTER PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1134?	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	A temporary poor contact.

DN:DTC P1152 O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1)

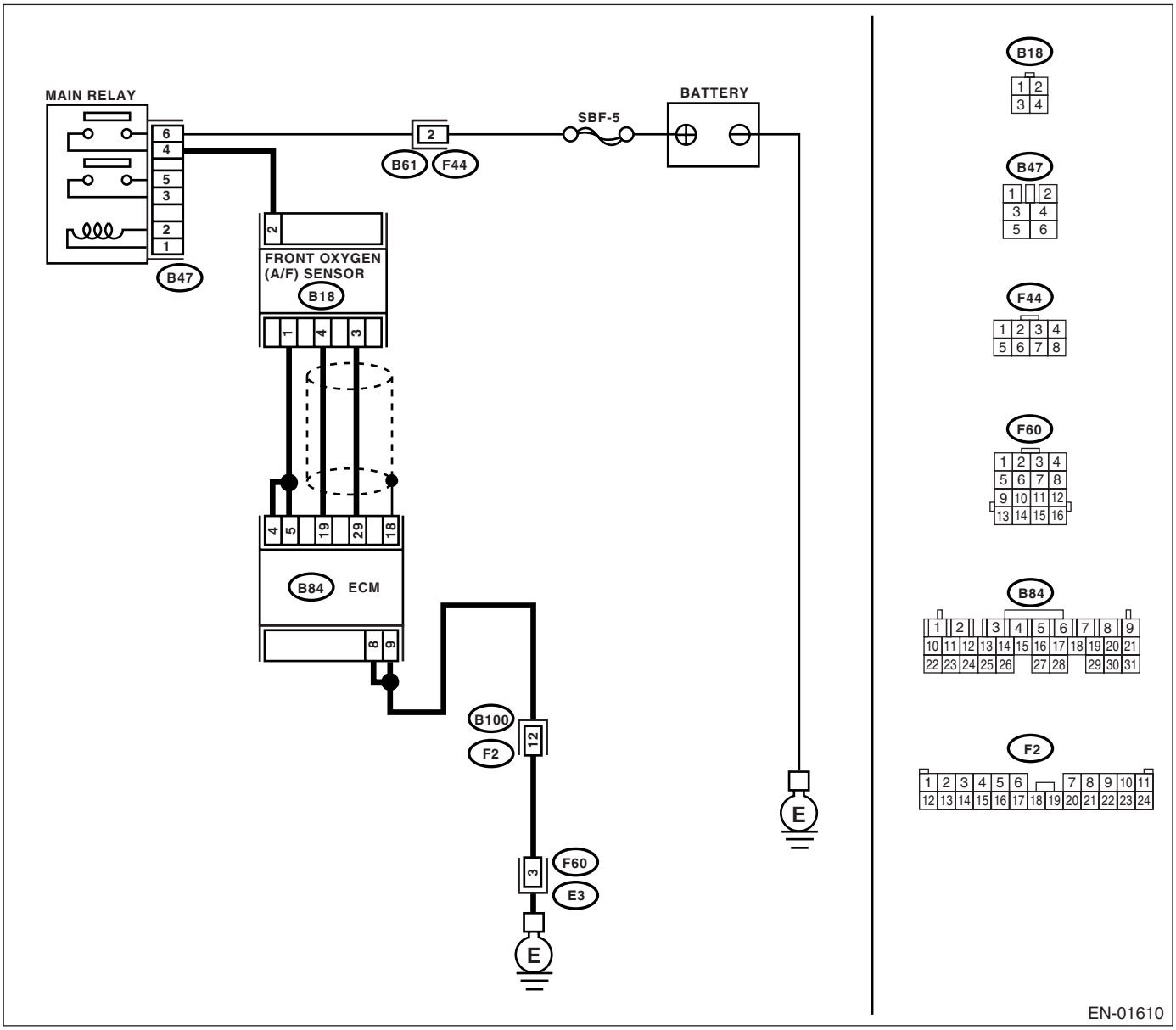
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-230, DTC P1152 O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B84) No. 29 — (B18) No. 3:*** ***(B84) No. 19 — (B18) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
2	**CHECK POOR CONTACT.** Check poor contact in front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair the poor contact in front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-43, Front Oxygen (A/F) Sensor.>

DO:DTC P1153 O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

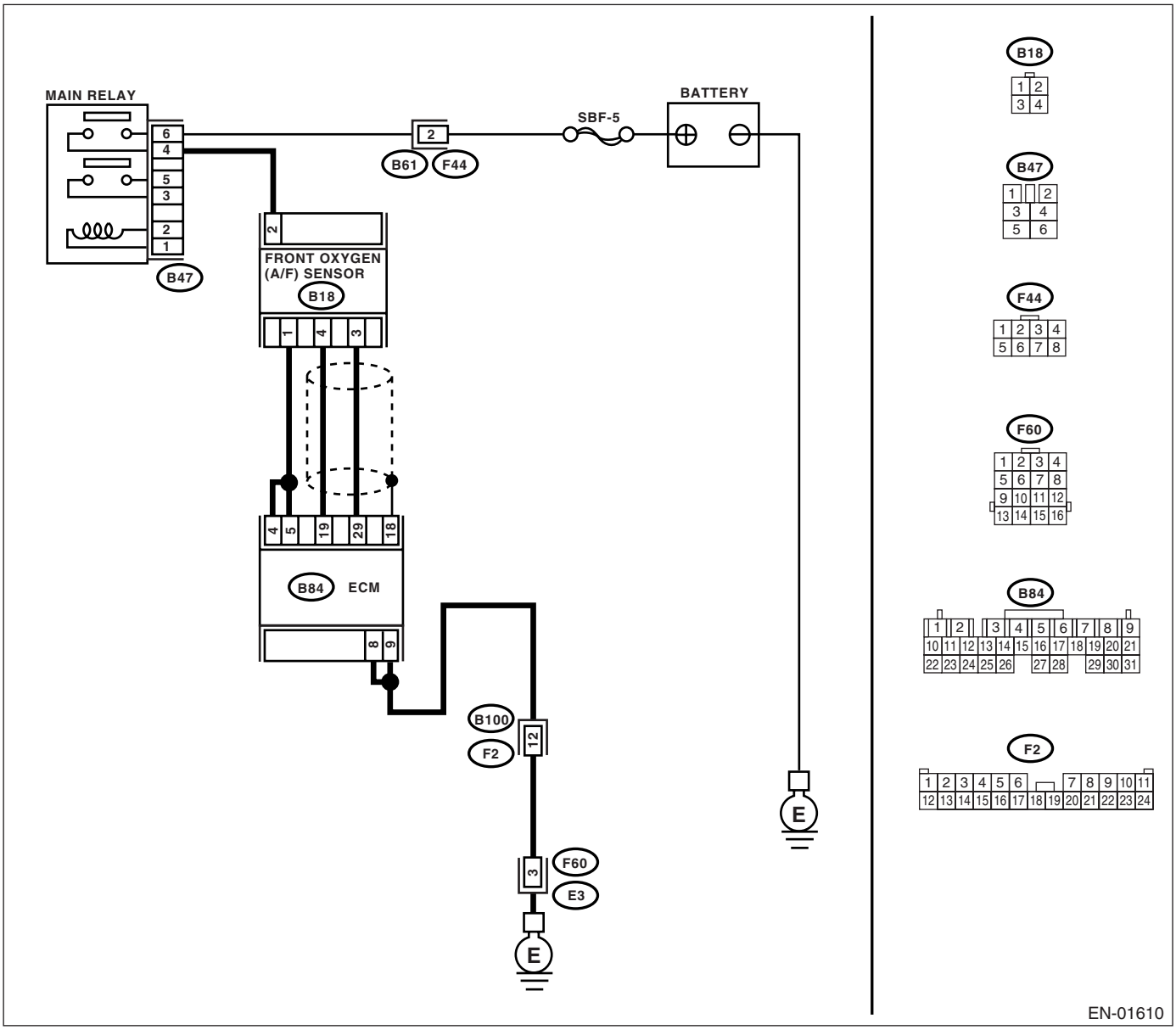
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-233, DTC P1153 O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 19 — Chassis ground:***	Is the resistance more than 1 MΩ?	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 29 — Chassis ground:***	Is the resistance more than 1 MΩ?	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **5.**
4	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Repair the poor contact in ECM connector.
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 29 (+) — Chassis ground (−):***	Is the voltage more than 4.95 V?	Go to step **6.**	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-43, Front Oxygen (A/F) Sensor.>
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 29 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Repair the poor contact in ECM connector.

DP:DTC P1301 MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-235, DTC P1301 MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS), Diagnostic Trouble Code (DTC) Detecting Criteria.>

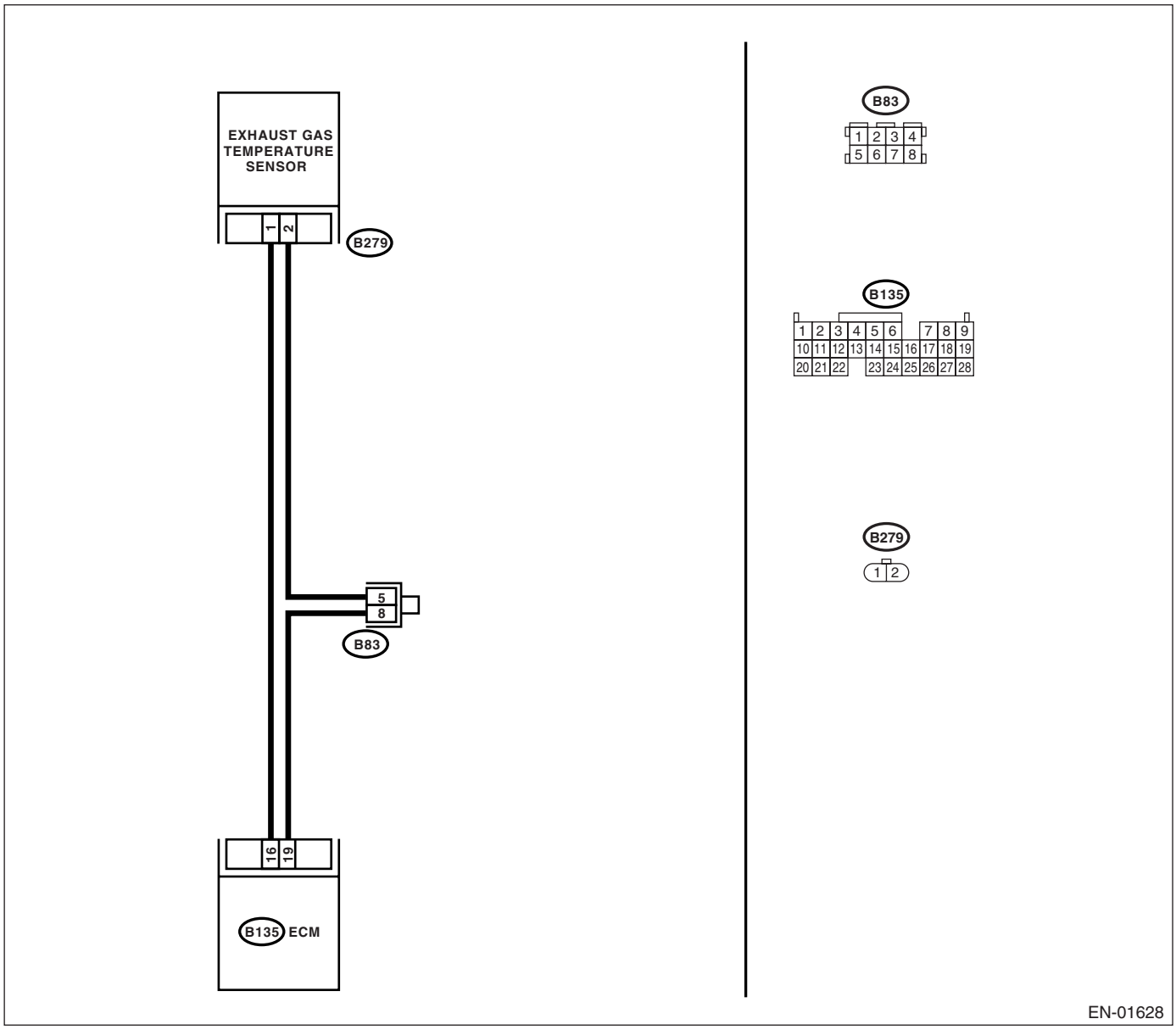
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC.** Conduct the troubleshooting for all DTC P0301, P0302, P0303 and P0304. <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Does failure for repair or replacement exist?	Repair or replace the failure, then replace precatalytic converter.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

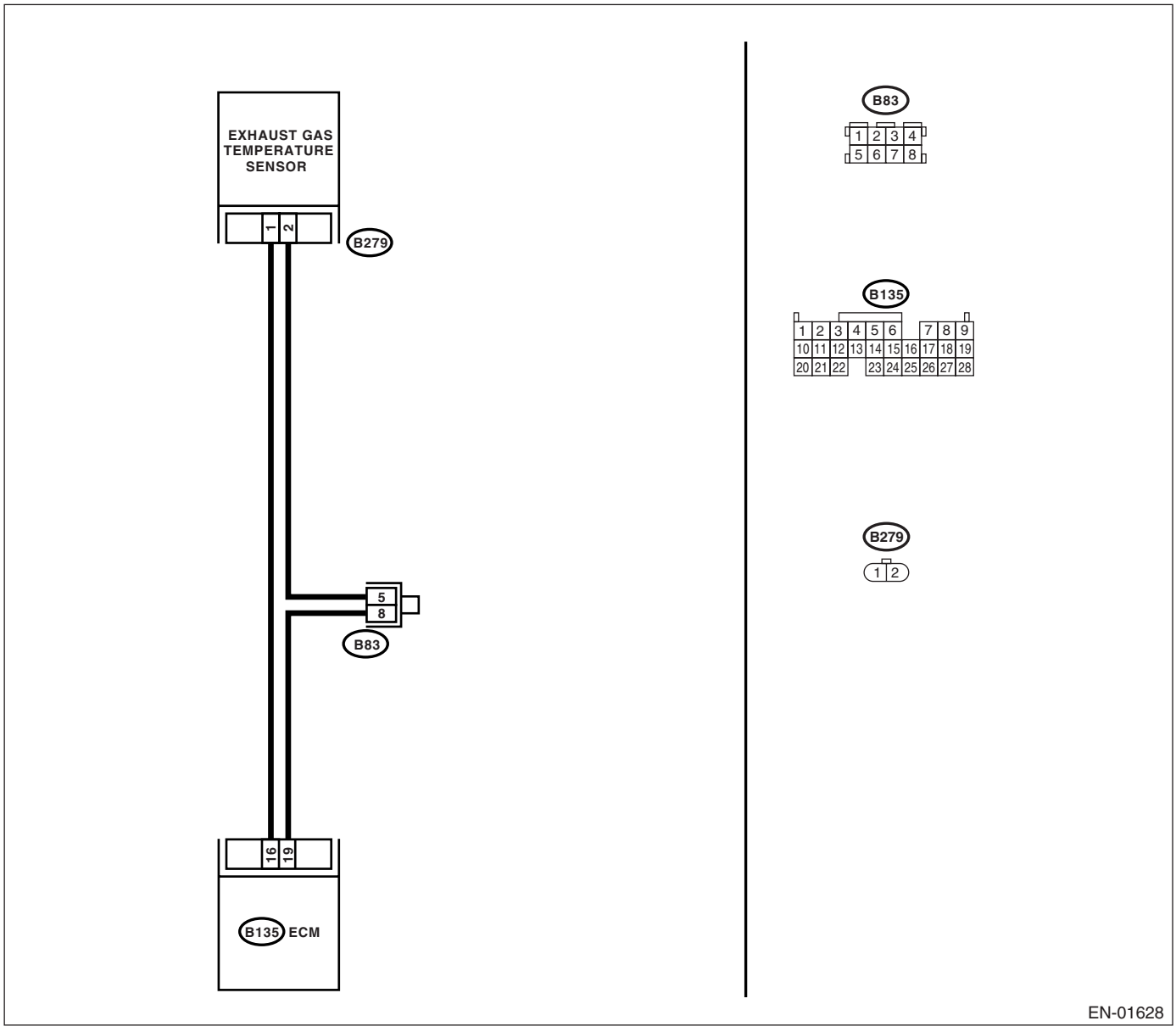
DQ:DTC P1312 EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-236, DTC P1312 EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1312.	Replace the exhaust gas temperature sensor. <Ref. to FU(H4DOTC)-47, Exhaust Temperature Sensor.>

DR:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

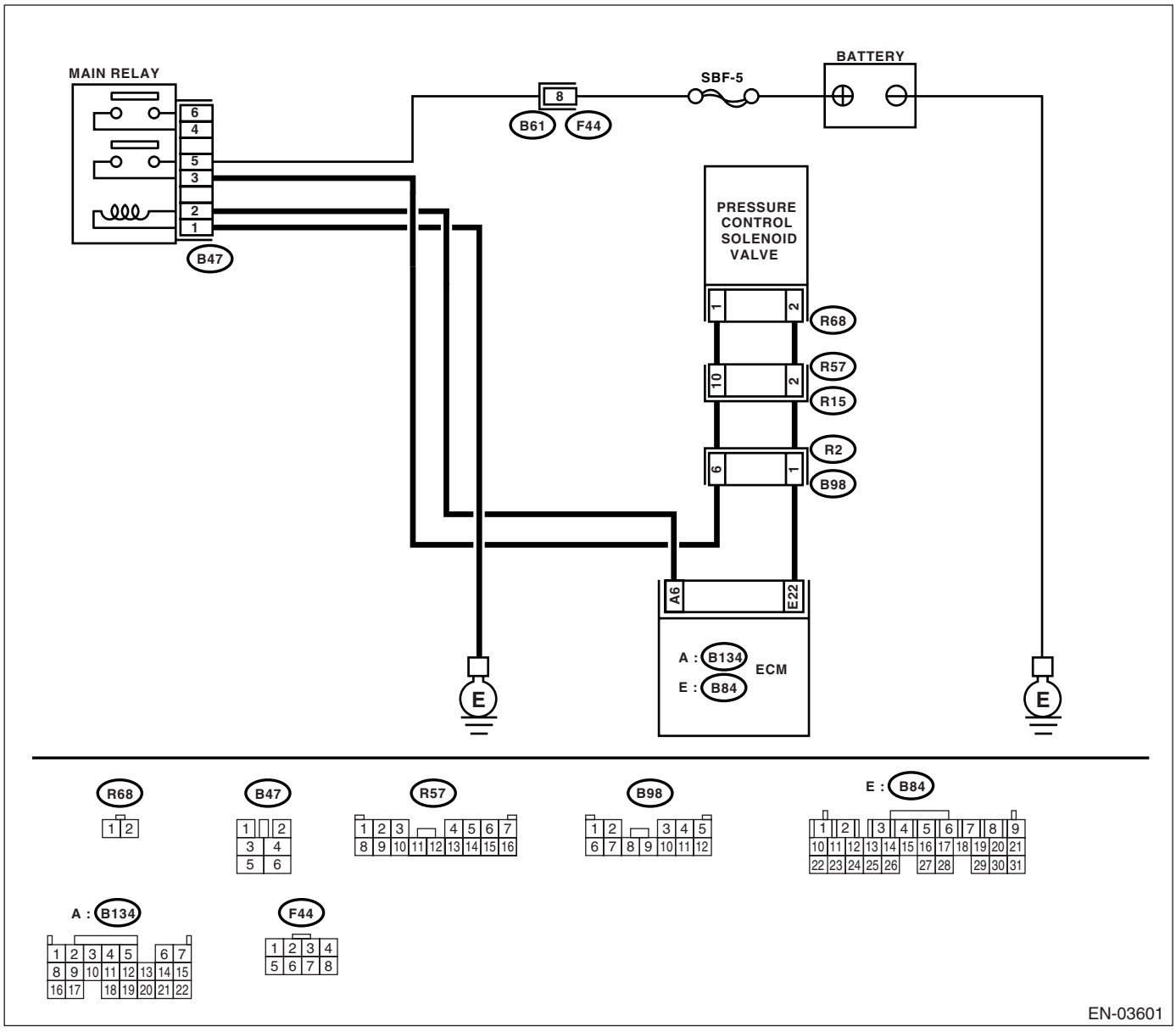
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-237, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 22 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
3	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connectors from pressure control solenoid valve and ECM. 3) Measure the resistance of harness between pressure control solenoid valve connector and chassis ground. ***Connector & terminal*** ***(R68) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair short circuit to ground in harness between ECM and pressure control solenoid valve connector.
4	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and pressure control solenoid valve connector. ***Connector & terminal*** ***(B84) No. 22 — (R68) No. 2:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and pressure control solenoid valve connector • Poor contact in coupling connector
5	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Measure the resistance between pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Go to step **6.**	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-13, Pressure Control Solenoid Valve.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO PRESSURE CONTROL SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure the voltage between pressure control solenoid valve and chassis ground. ***Connector & terminal*** ***(R68) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and pressure control solenoid valve connector • Poor contact in coupling connector • Poor contact in main relay connector
7	**CHECK FOR POOR CONTACT.** Check for poor contact in pressure control solenoid valve connector.	Is there poor contact in pressure control solenoid valve connector?	Repair poor contact in pressure control solenoid valve connector.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

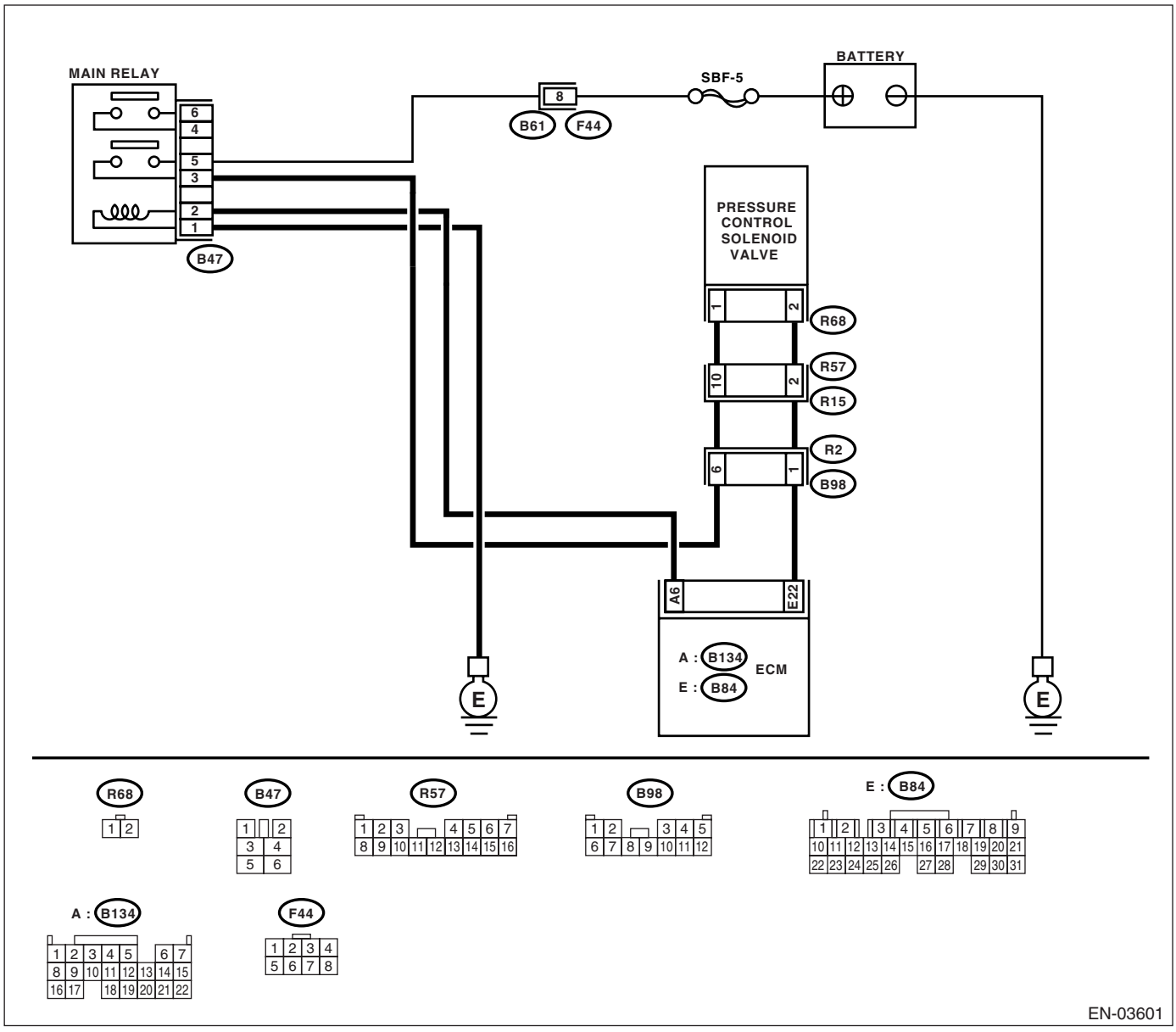
DS:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-239, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) While operating the pressure control solenoid valve, measure voltage between ECM and chassis ground. NOTE: Pressure control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B84) No. 22 (+) — Chassis ground (−):***	Does the voltage value change 0 — 10 V?	Go to step **2.**	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. In this case, repair poor contact in ECM connector.
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 22 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from pressure control solenoid valve. 3) Turn ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 22 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and pressure control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK PRESSURE CONTROL SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Measure the resistance between pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the pressure control solenoid valve <Ref. to EC(H4DOTC)-13, Pressure Control Solenoid Valve.> and the ECM <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>.	Go to step **6.**
6	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>

DT:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-240, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

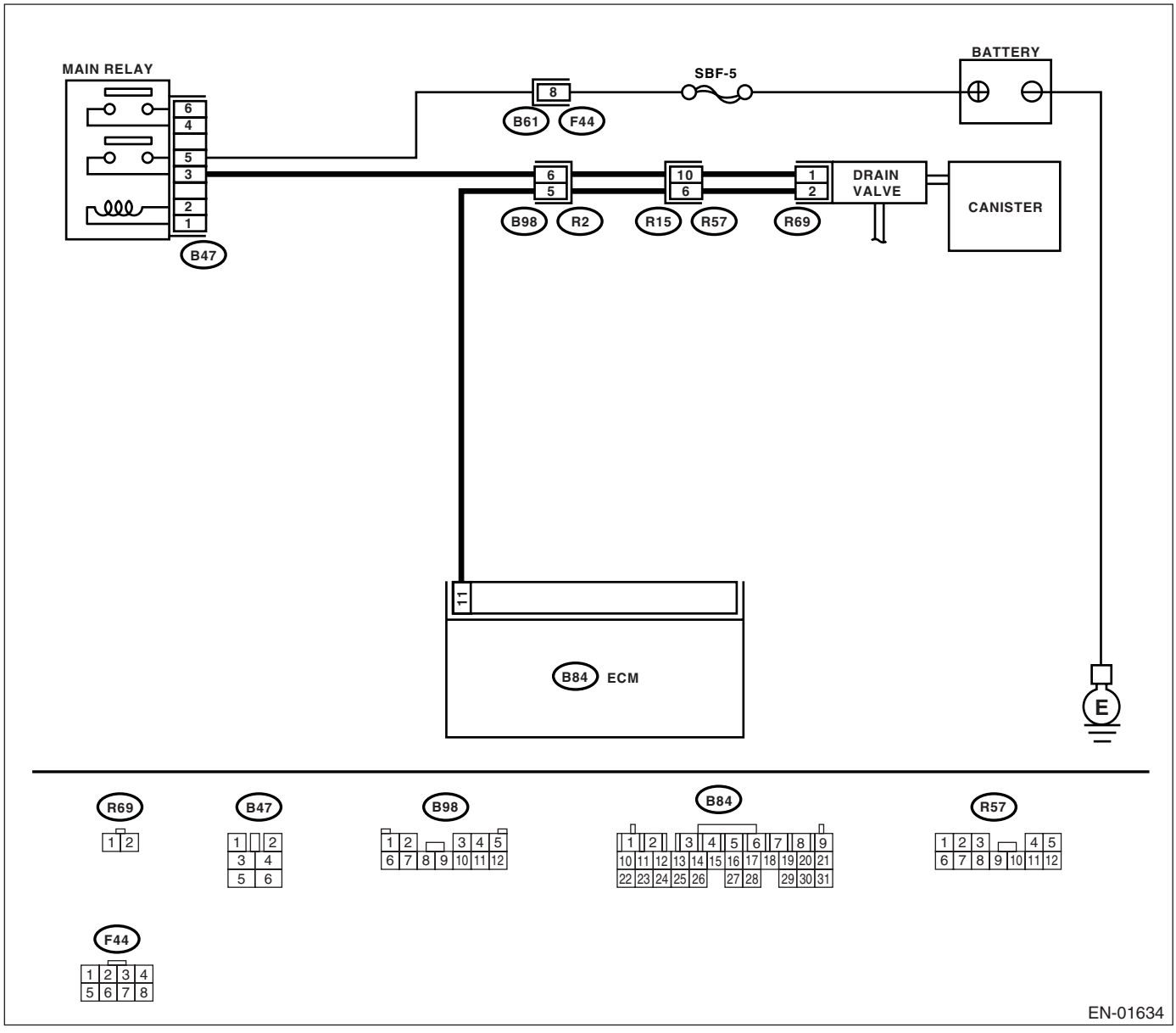
TROUBLE SYMPTOM:

Improper fuel supply

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK VENT LINE HOSES.** Check the following items. • Clogging of vent hoses between canister and drain valve • Clogging of vent hose between drain valve and air filter • Clogging of drain filter	Is there a fault in vent line?	Repair or replace faulty parts.	Go to step **3.**
3	**CHECK DRAIN VALVE OPERATION.** 1) Turn ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-47, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Replace the drain valve. <Ref. to EC(H4DOTC)-19, Drain Valve.>

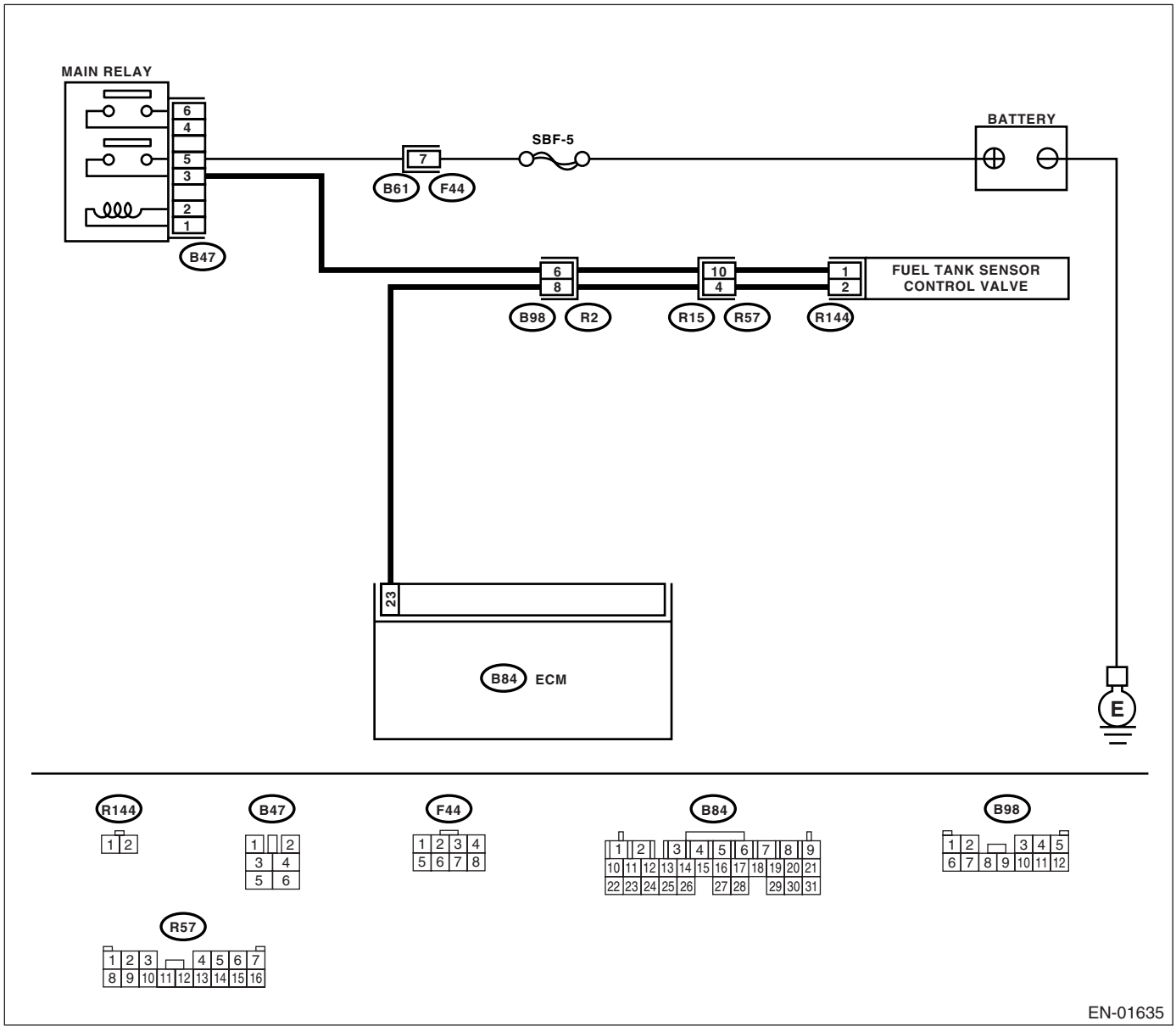
DU:DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-241, DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 23 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. (However, the possibility of poor contact still remains.)j NOTE: In this case, repair the following: • Poor contact in fuel tank sensor control valve connector • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connectors from fuel tank sensor control valve and ECM. 3) Measure the resistance of harness between fuel tank sensor control valve connector and chassis ground. ***Connector & terminal*** ***(R144) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair short circuit to ground in harness between ECM and fuel tank sensor control valve connector.
4	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and fuel tank sensor control valve connector. ***Connector & terminal*** ***(B84) No. 23 — (R144) No. 2:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel tank sensor control valve connector • Poor contact in coupling connector
5	**CHECK FUEL TANK SENSOR CONTROL VALVE.** Measure the resistance between fuel tank sensor control valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Go to step **6.**	Replace the fuel tank sensor control valve. <Ref. to EC(H4DOTC)-19, Drain Valve.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO FUEL TANK SENSOR CONTROL VALVE.** 1) Turn ignition switch to ON. 2) Measure the voltage between fuel tank sensor control valve and chassis ground. ***Connector & terminal*** ***(R144) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel tank sensor control valve • Poor contact in coupling connector • Poor contact in main relay connector
7	**CHECK FOR POOR CONTACT.** Check for poor contact in fuel tank sensor control valve connector.	Is there poor contact in fuel tank sensor control valve connector?	Repair poor contact in fuel tank sensor control valve connector.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

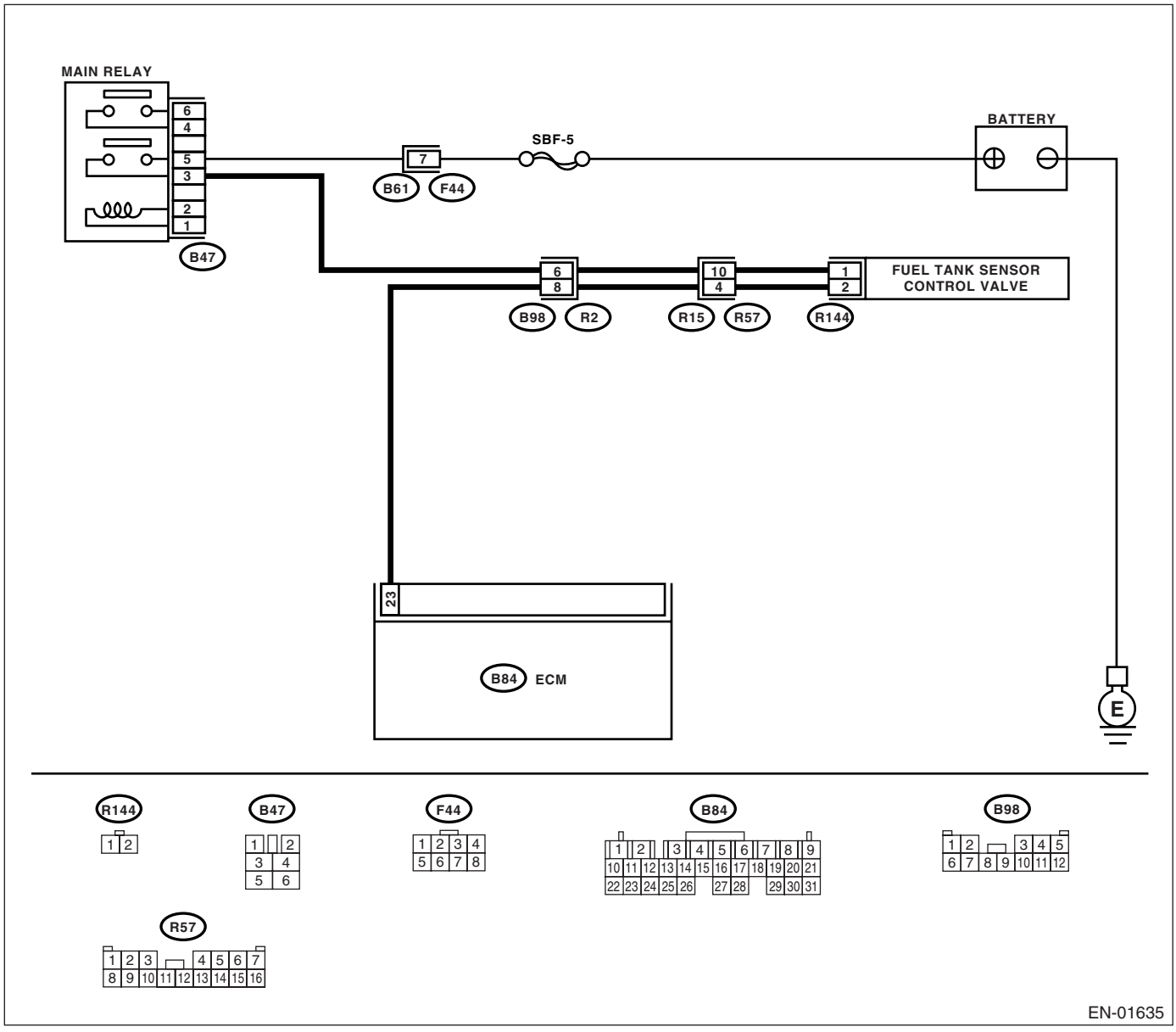
DV:DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-243, DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 23 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Go to step **2.**
2	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>
3	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from fuel tank sensor control valve. 3) Turn ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 23 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and fuel tank sensor control valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>	Go to step **4.**
4	**CHECK FUEL TANK SENSOR CONTROL VALVE.** 1) Turn ignition switch to OFF. 2) Measure the resistance between fuel tank sensor control valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the fuel tank sensor control valve <Ref. to EC(H4DOTC)-12, Fuel Tank Sensor Control Valve.> and the ECM <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>.	Go to step **5.**
5	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>

DW:DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE

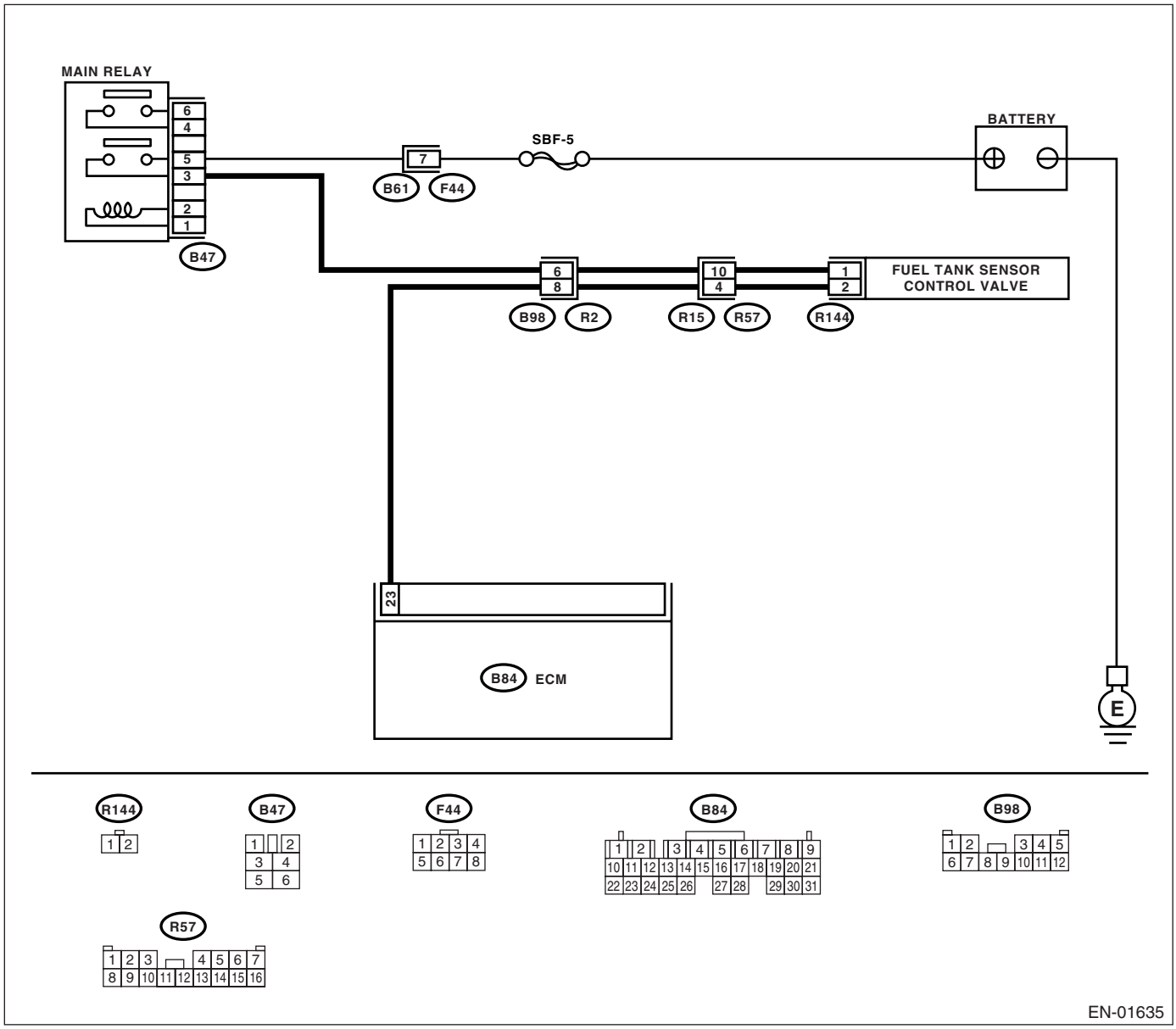
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-245, DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using the “List of Diagnostic Trouble Codes (DTC)”. <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK EVAPORATIVE EMISSION LINE.** NOTE: Check the following items. • Disconnection, leakage and clogging of hoses between fuel tank pressure sensor and fuel tank. • Disconnection, leakage and clogging of hoses and pipes between fuel filler pipe and fuel tank.	Is there any trouble in evaporative emission line?	Repair the hoses and pipes.	Replace the fuel tank pressure sensor.

DX:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-248, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

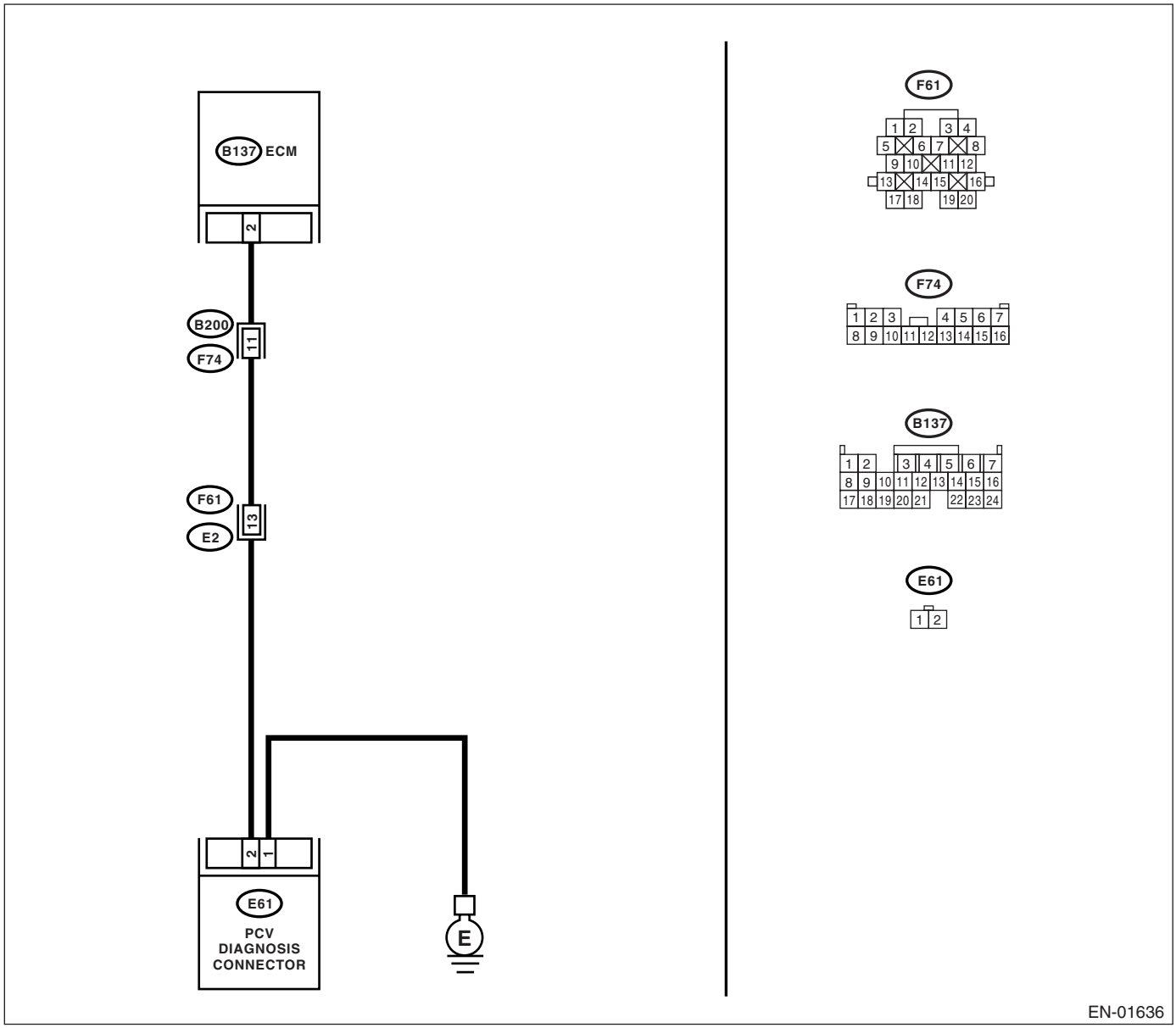
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK BLOW-BY HOSE.** Check the blow-by hose.	Is there disconnection or crack in blow-by hose?	Replace or repair blow-by hose.	Go to step **2.**
2	**INSPECT HARNESS BETWEEN PCV DIAGNOSIS CONNECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from PCV diagnosis connector and ECM. 3) Measure the resistance of harness between PCV diagnosis connector and ECM connector. ***Connector & terminal*** ***(B137) No. 2 — (E61) No. 2:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair open circuit in harness between PCV diagnosis connector and ECM.
3	**INSPECT HARNESS BETWEEN PCV DIAGNOSIS CONNECTOR AND ECM CONNECTOR.** Measure the resistance of harness between PCV diagnosis connector and chassis ground. ***Connector & terminal*** ***(B137) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair short circuit to chassis ground in harness between PCV diagnosis connector and ECM.
4	**INSPECT PCV DIAGNOSIS CONNECTOR GROUND CIRCUIT.** Measure the resistance between PCV diagnosis connector and engine ground. ***Connector & terminal*** ***(B61) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair PCV diagnosis connector ground circuit.
5	**INSPECT PCV DIAGNOSIS CONNECTOR.** Measure the resistance between PCV diagnosis connector and terminal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Repair poor contact in ECM and PCV diagnosis connector.	Replace PCV diagnosis connector.

DY:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-250, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

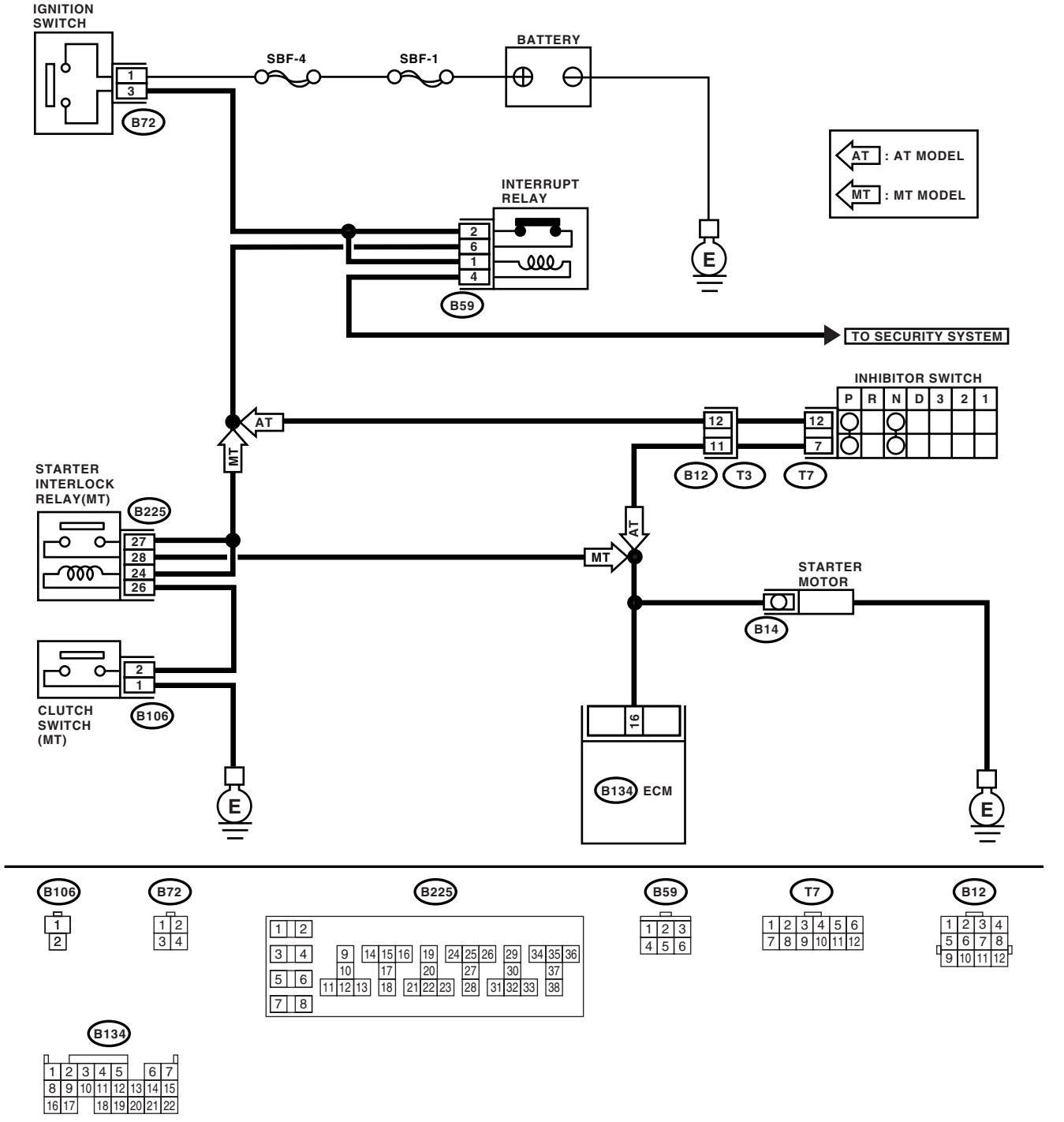
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01607

Step		Check	Yes	No
1	CHECK OPERATION OF STARTER MOTOR.	Does the starter motor operate when ignition switch is turned to START?	Repair the harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between ECM and starter motor connector • Poor contact in ECM connector	Check the starter motor circuit. <Ref. to EN(H4DOTC)(diag)-59, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DZ:DTC P1544 EXHAUST GAS TEMPERATURE TOO HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-251, DTC P1544 EXHAUST GAS TEMPERATURE TOO HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

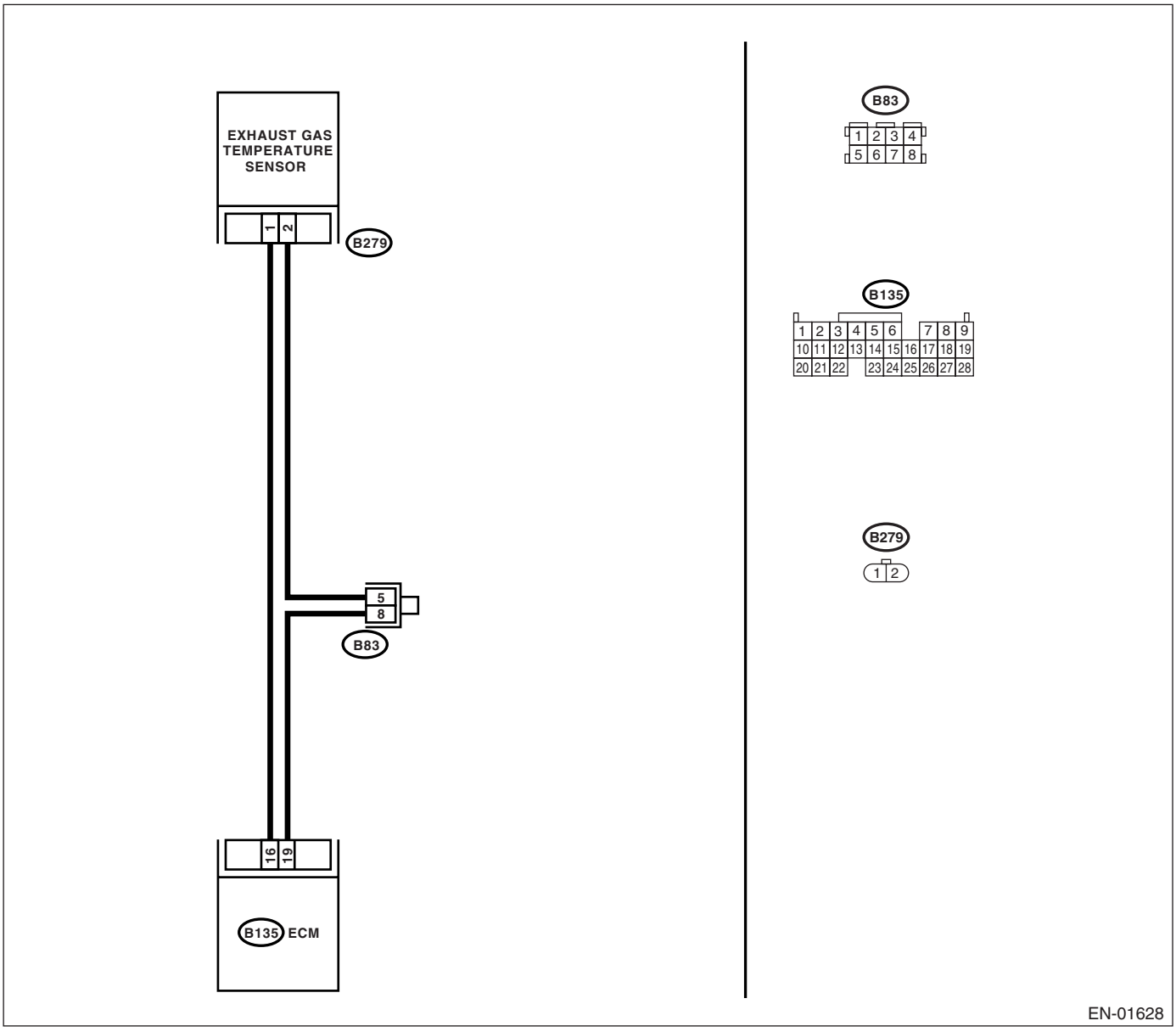
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1544.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. • Loose installation of exhaust manifold • Cracks or hole of exhaust manifold • Loose installation of front oxygen (A/F) sensor	Is there a fault in exhaust system?	Repair or replace the failure, then replace precatalytic converter.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

EA:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

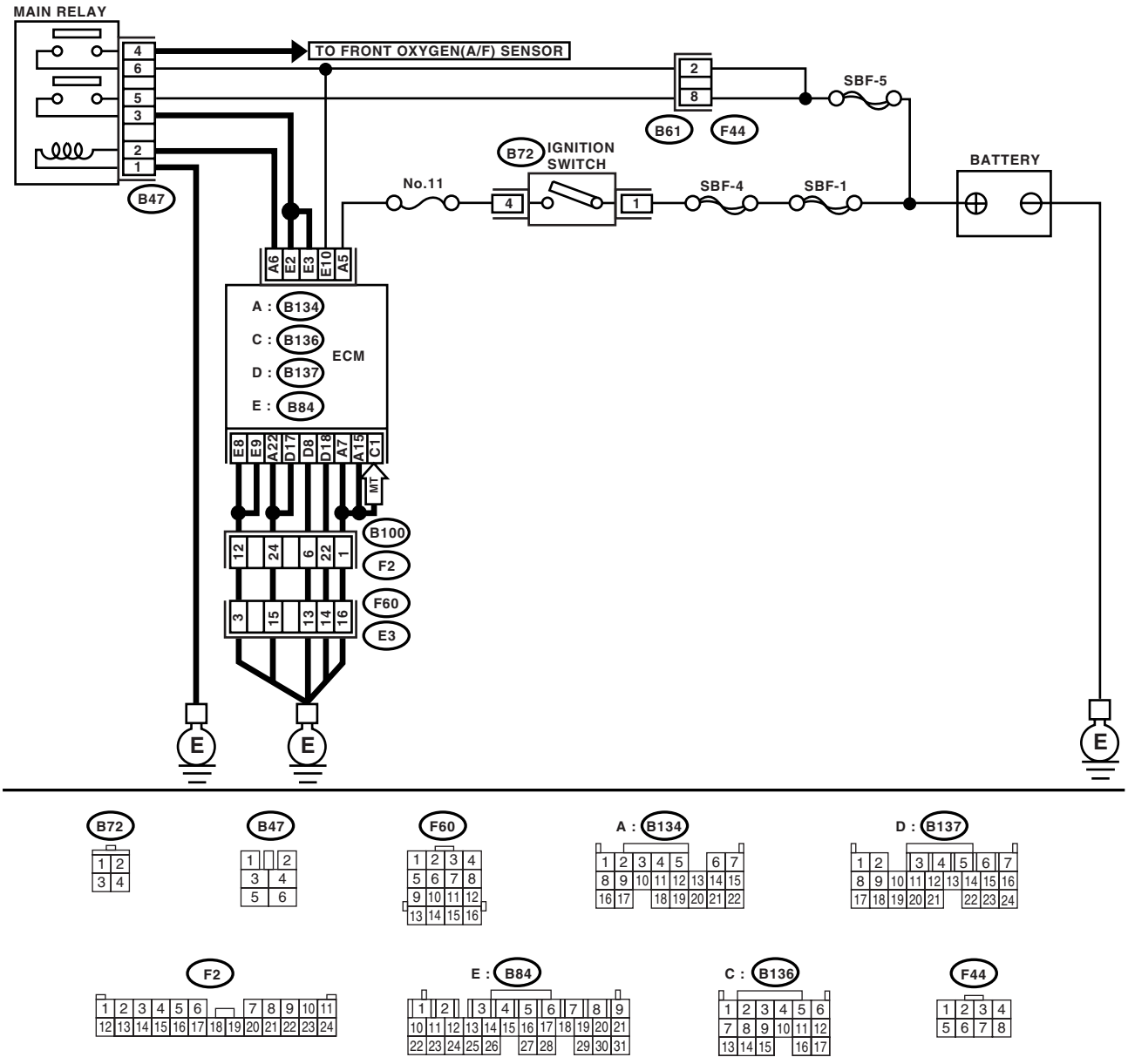
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-252, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01608

	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 10 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair the ground short circuit in harness between ECM connector and battery terminal.	Go to step **3.**
3	**CHECK FUSE SBF-5.**	Is the fuse blown?	Replace the fuse.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and battery • Poor contact in ECM connector • Poor contact in battery terminal

EB:DTC P1700 THROTTLE POSITION SENSOR

GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-253, DTC P1700 THROTTLE POSITION SENSOR CIRCUIT MALFUNCTION FOR AT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:
For the diagnostic procedure, refer to AT section. <Ref. to 4AT(diag)-46, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

EC:DTC P1711 ENGINE TORQUE CONTROL SIGNAL 1 CIRCUIT MALFUNCTION

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-255, DTC P1711 ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

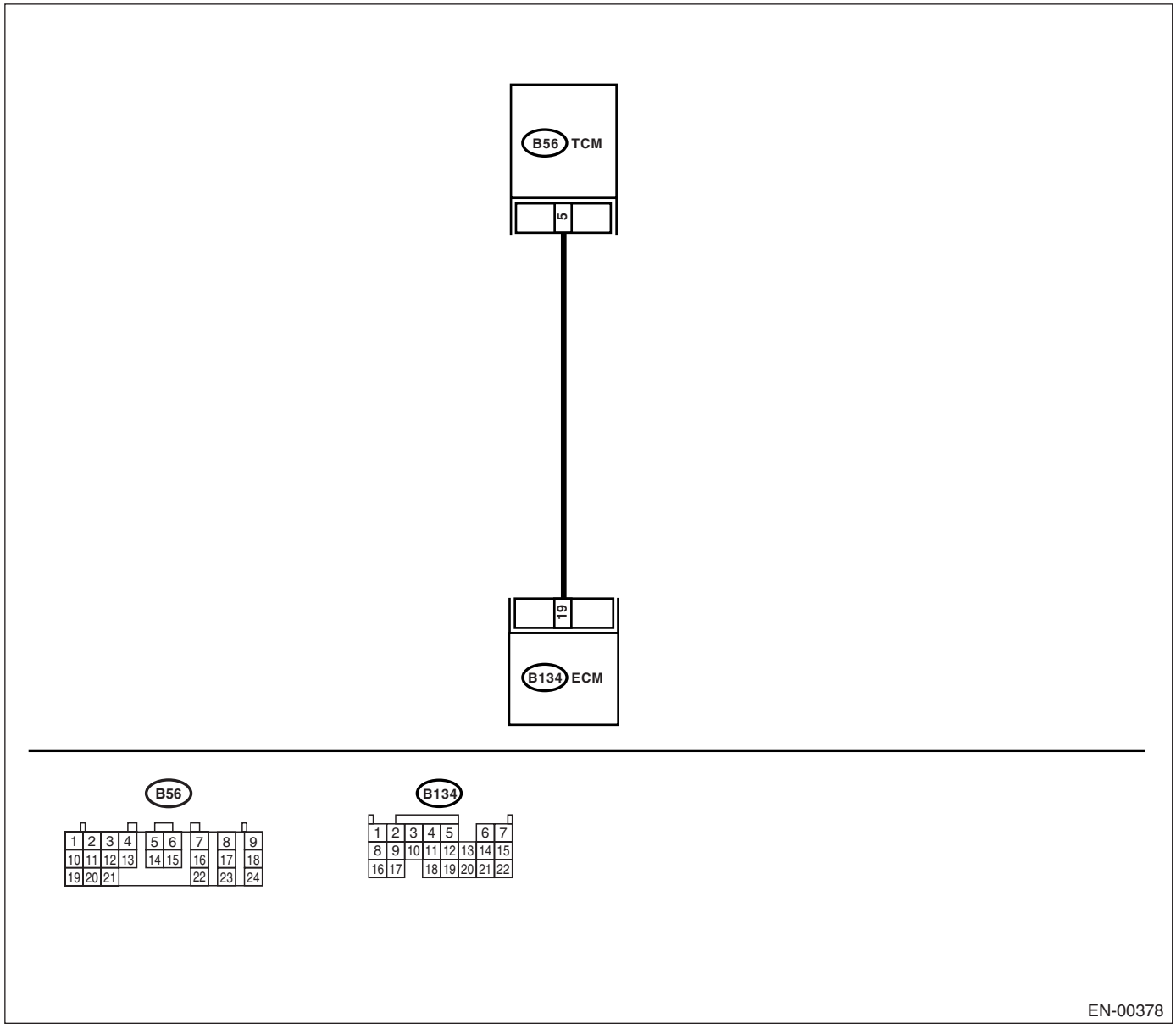
TROUBLE SYMPTOM:

Excessive shift shock

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and TCM. 3) Measure the resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***(B134) No. 19 — (B56) No. 5:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit in harness between ECM and TCM connector.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the ground short circuit in harness between ECM and TCM connector.
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair the poor contact in TCM connector.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

ED:DTC P1712 ENGINE TORQUE CONTROL SIGNAL 2 CIRCUIT MALFUNCTION

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-256, DTC P1712 ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

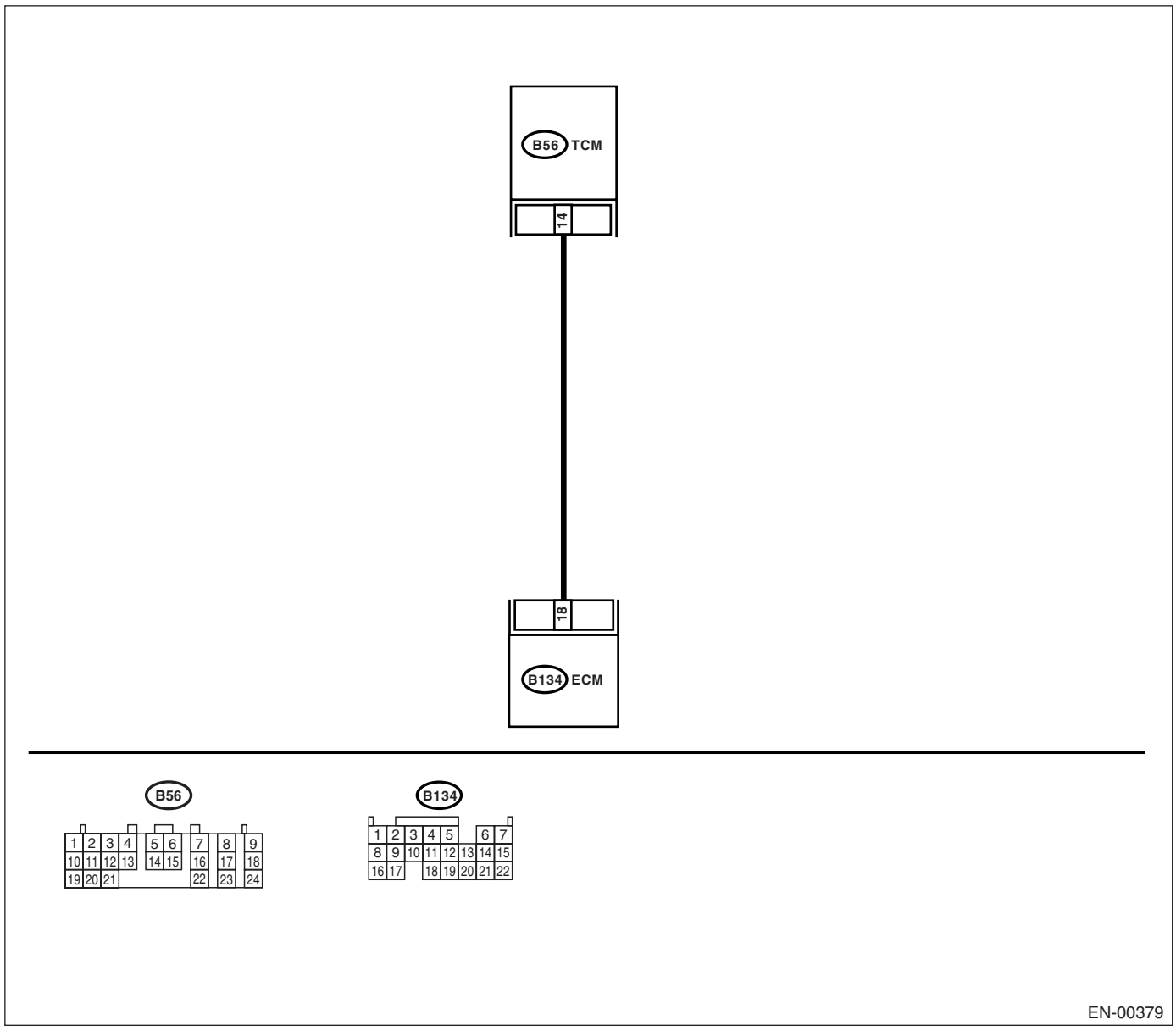
TROUBLE SYMPTOM:

Excessive shift shock

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 18 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 18 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-48, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and TCM. 3) Measure the resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***(B134) No. 18 — (B56) No. 4:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit in harness between ECM and TCM connector.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 18 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the ground short circuit in harness between ECM and TCM connector.
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair the poor contact in TCM connector.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

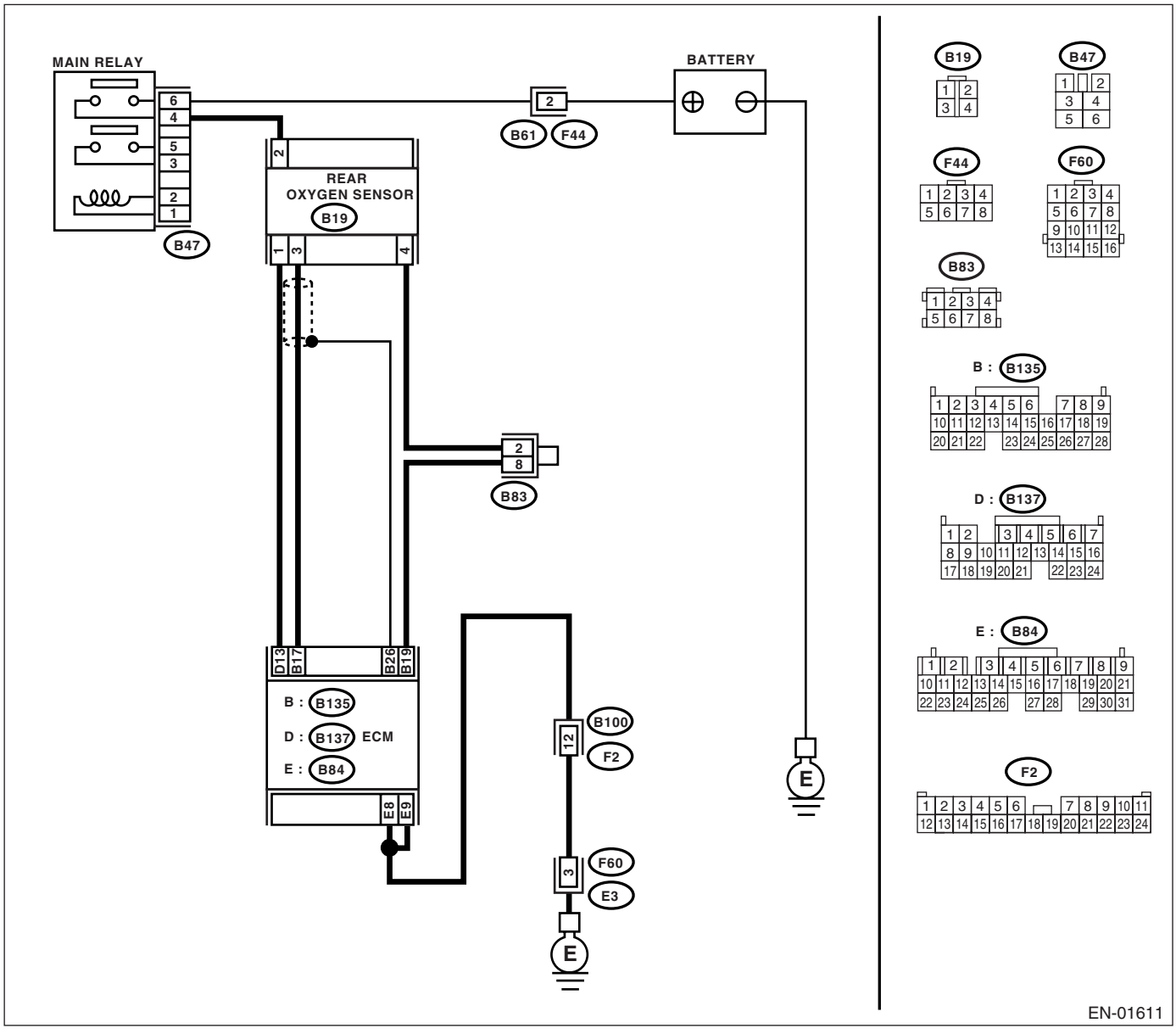
EE:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-257, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for 2 minutes. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Does the value fluctuate?	Go to step **6.**	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool.	Is the voltage 0.2 — 0.4 V?	Go to step **4.**	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-45, Rear Oxygen Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 17 — (B19) No. 3:***	Is the resistance more than 3 Ω?	Repair the open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(B19) No. 3 (+) — Engine ground (−):***	Is the voltage more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-45, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

	Step	Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty parts.	Go to step **7.**
7	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **8.**
8	**CHECK FUEL PRESSURE.** **Warning:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel on the floor.** 1) Release the fuel pressure. (1)Disconnect the connector from fuel pump relay. (2)Start the engine and run it until it stalls. (3)After the engine stalls, crank it for 5 more seconds. (4)Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install the fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)?	Go to step **9.**	Repair the following items. Fuel pressure too high: • Clogged fuel return line or bent hose Fuel pressure too low: • Improper fuel pump discharge • Clogged fuel supply line
9	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: • If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.	Is the measured value 206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)?	Go to step **10.**	Repair the following items. Fuel pressure too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
10	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature more than 60°C (140°F)?	Go to step **11.**	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>
11	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within the followings? Ignition ON: 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) Idling: 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)	Go to step **12.**	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-32, Mass Air Flow and Intake Air Temperature Sensor.>
12	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Subtract ambient temperature from intake air temperature. Is the obtained value −10°C — 50°C (14°F — 122°F)?	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-32, Mass Air Flow and Intake Air Temperature Sensor.>

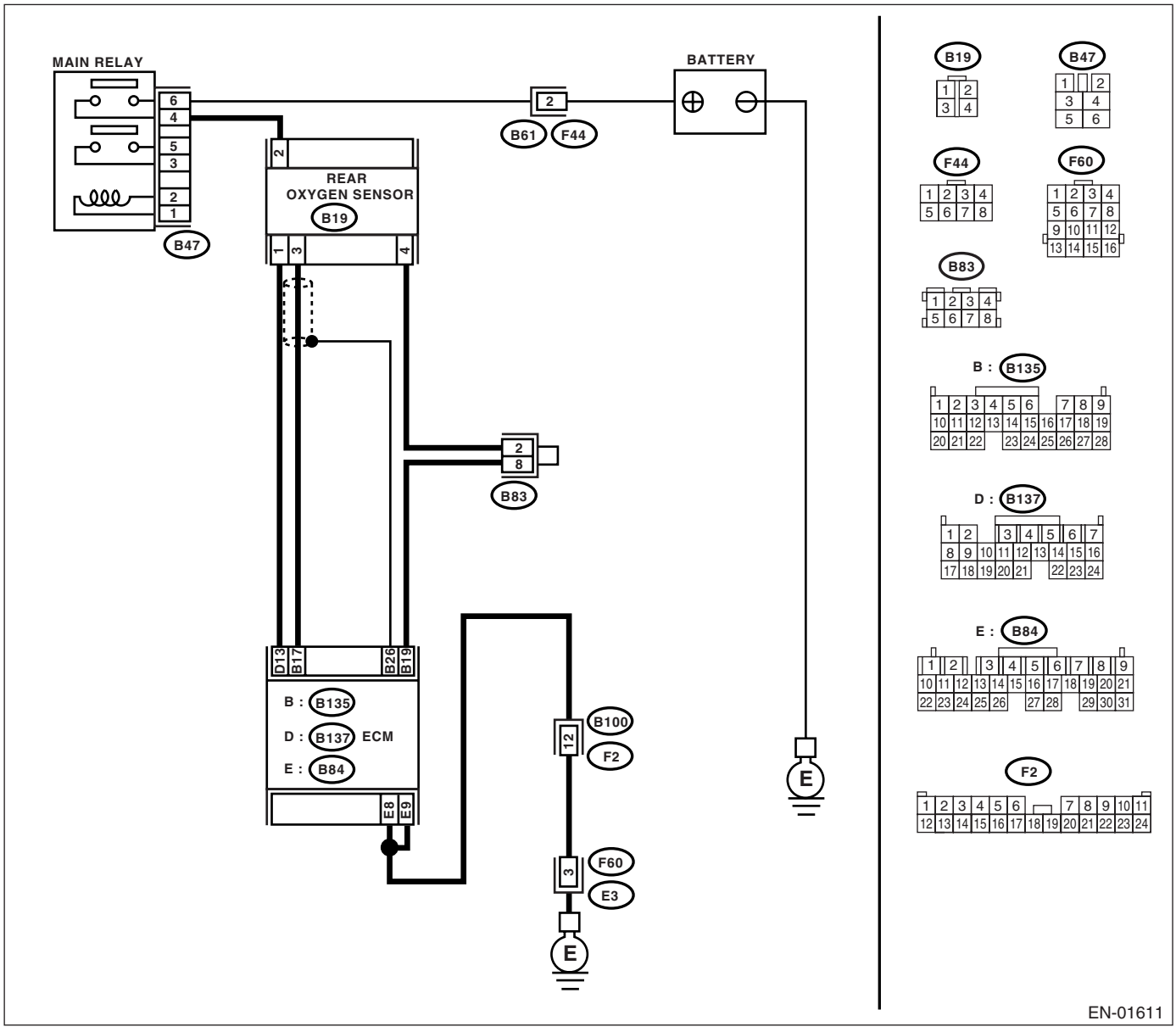
EF:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-259, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-46, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-39, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(H4DOTC)(diag)-71, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for 2 minutes. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Does the value fluctuate?	Go to step **6.**	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool.	Is the voltage 0.2 — 0.4 V?	Go to step **4.**	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-45, Rear Oxygen Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 17 — (B19) No. 3:***	Is the resistance more than 3 Ω?	Repair the open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(B19) No. 3 (+) — Engine ground (−):***	Is the voltage more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-45, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

	Step	Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty parts.	Go to step **7.**
7	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **8.**
8	**CHECK FUEL PRESSURE.** **Warning:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel on the floor.** 1) Release the fuel pressure. (1)Disconnect the connector from fuel pump relay. (2)Start the engine and run it until it stalls. (3)After the engine stalls, crank it for 5 more seconds. (4)Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install the fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)?	Go to step **9.**	Repair the following items. Fuel pressure too high: • Clogged fuel return line or bent hose Fuel pressure too low: • Improper fuel pump discharge • Clogged fuel supply line
9	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: • If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.	Is the measured value 206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)?	Go to step **10.**	Repair the following items. Fuel pressure too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
10	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature more than 60°C (140°F)?	Go to step **11.**	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>
11	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within the followings? Ignition ON: 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) Idling: 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)	Go to step **12.**	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-32, Mass Air Flow and Intake Air Temperature Sensor.>
12	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Subtract ambient temperature from intake air temperature. Is the obtained value −10°C — 50°C (14°F — 122°F)?	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-32, Mass Air Flow and Intake Air Temperature Sensor.>

20.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(H4DOTC)-97, Engine Noise.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Idle air control solenoid valve 2) Manifold absolute pressure sensor 3) Mass air flow and intake temperature sensor 4) Ignition parts (*1) 5) Engine coolant temperature sensor (*2) 6) Crankshaft position sensor (*3) 7) Camshaft position sensor (*3) 8) Fuel injection parts (*4)
2. Rough idling	1) Idle air control solenoid valve 2) Manifold absolute pressure sensor 3) Mass air flow and intake temperature sensor 4) Engine coolant temperature sensor (*2) 5) Ignition parts (*1) 6) Air intake system (*5) 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Crankshaft position sensor (*3) 10) Camshaft position sensor (*3) 11) Oxygen sensor 12) Fuel pump and fuel pump relay
3. Engine does not return to idle.	1) Idle air control solenoid valve 2) Engine coolant temperature sensor 3) Accelerator cable (*6) 4) Throttle position sensor 5) Manifold absolute pressure sensor 6) Mass air flow sensor
4. Poor acceleration	1) Manifold absolute pressure sensor 2) Mass air flow and intake temperature sensor 3) Throttle position sensor 5) Fuel pump and fuel pump relay 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) A/C switch and A/C cut relay 10) Engine torque control signal circuit 11) Ignition parts (*1)
5. Engine stalls or engine sags or hesitates at acceleration.	1) Manifold absolute pressure sensor 2) Mass air flow and intake temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Purge control solenoid valve 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Fuel pump and fuel pump relay

Symptom	Problem parts
6. Surge	1) Manifold absolute pressure sensor 2) Mass air flow and intake temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Fuel injection parts (*4) 7) Throttle position sensor 8) Fuel pump and fuel pump relay
7. Spark knock	1) Manifold absolute pressure sensor 2) Mass air flow and intake temperature sensor 3) Engine coolant temperature sensor 4) Knock sensor 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay
8. After-burning in exhaust system	1) Manifold absolute pressure sensor 2) Mass air flow and intake temperature sensor 3) Engine coolant temperature sensor (*2) 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay

*1: Check ignition coil & ignitor ASSY and spark plug.
*2: Indicate the symptom occurring only in cold temperatures.
*3: Ensure the secure installation.
*4: Check fuel injector, fuel pressure regulator and fuel filter.
*5: Inspect air leak in air intake system.
*6: Adjust accelerator cable.

GENERAL DESCRIPTION

GD(H4DOTC)

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2. Diagnostic Trouble Code (DTC) Detecting Criteria 9

1. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Description	Index
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-9, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-11, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-13, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-15, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-17, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0068	Manifold Pressure Sensor Range/ Performance	<Ref. to GD(H4DOTC)-19, DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to GD(H4DOTC)-21, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to GD(H4DOTC)-23, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to GD(H4DOTC)-25, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to GD(H4DOTC)-27, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to GD(H4DOTC)-29, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0111	Intake Air Temperature Circuit Range/Performance	<Ref. to GD(H4DOTC)-31, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to GD(H4DOTC)-33, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0113	Intake Air Temperature Circuit High Input	<Ref. to GD(H4DOTC)-35, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to GD(H4DOTC)-37, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to GD(H4DOTC)-39, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0121	Throttle/Pedal Position Sensor/ Switch “A” Circuit Range/Performance	<Ref. to GD(H4DOTC)-41, DTC P0121 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low Input	<Ref. to GD(H4DOTC)-44, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0123	Throttle/Pedal Position Sensor/ Switch “A” Circuit High Input	<Ref. to GD(H4DOTC)-46, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Description	Index
P0125	Insufficient Coolant Temperature For Closed Loop Fuel Control	<Ref. to GD(H4DOTC)-48, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to GD(H4DOTC)-50, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0129	Barometric Pressure Too Low	<Ref. to GD(H4DOTC)-52, DTC P0129 BAROMETRIC PRESSURE TOO LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0130	O_2 Sensor Circuit (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-53, DTC P0130 O_2 SENSOR CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-55, DTC P0133 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-58, DTC P0134 O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-60, DTC P0137 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-62, DTC P0138 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-64, DTC P0139 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System Too Lean (Bank 1)	<Ref. to GD(H4DOTC)-67, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System Too Rich (Bank 1)	<Ref. to GD(H4DOTC)-70, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	<Ref. to GD(H4DOTC)-73, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0182	Fuel Temperature Sensor “A” Circuit Low Input	<Ref. to GD(H4DOTC)-76, DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0183	Fuel Temperature Sensor “A” Circuit High Input	<Ref. to GD(H4DOTC)-78, DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0230	Fuel Pump Primary Circuit	<Ref. to GD(H4DOTC)-81, ECM OPERATING AT DTC SETTING, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0244	Turbo/Super Charger Wastegate Solenoid “A” Range/Performance	<Ref. to GD(H4DOTC)-82, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0245	Turbo/Super Charger Wastegate Solenoid “A” Low	<Ref. to GD(H4DOTC)-84, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0246	Turbo/Super Charger Wastegate Solenoid “A” High	<Ref. to GD(H4DOTC)-86, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 Misfire Detected	<Ref. to GD(H4DOTC)-88, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0302	Cylinder 2 Misfire Detected	<Ref. to GD(H4DOTC)-94, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 Misfire Detected	<Ref. to GD(H4DOTC)-94, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Description	Index
P0304	Cylinder 4 Misfire Detected	<Ref. to GD(H4DOTC)-94, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to GD(H4DOTC)-95, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to GD(H4DOTC)-97, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to GD(H4DOTC)-99, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to GD(H4DOTC)-101, DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to GD(H4DOTC)-103, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0341	Camshaft Position Sensor “A” Circuit Range/Performance (Bank 1 or Single Sensor)	<Ref. to GD(H4DOTC)-108, ECM OPERATING AT DTC SETTING, DTC P0341 CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to GD(H4DOTC)-109, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0442	Evaporative Emission Control System Leak Detected (Small Leak)	<Ref. to GD(H4DOTC)-112, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to GD(H4DOTC)-135, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to GD(H4DOTC)-137, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	<Ref. to GD(H4DOTC)-139, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to GD(H4DOTC)-141, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to GD(H4DOTC)-143, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	<Ref. to GD(H4DOTC)-144, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	<Ref. to GD(H4DOTC)-144, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to GD(H4DOTC)-145, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to GD(H4DOTC)-147, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0461	Fuel Level Sensor Circuit Range/Performance	<Ref. to GD(H4DOTC)-149, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Description	Index
P0462	Fuel Level Sensor Circuit Low Input	<Ref. to GD(H4DOTC)-151, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0463	Fuel Level Sensor Circuit High Input	<Ref. to GD(H4DOTC)-153, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(H4DOTC)-155, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0483	Cooling Fan Rationality Check	<Ref. to GD(H4DOTC)-158, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to GD(H4DOTC)-160, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0503	Vehicle Speed Sensor Intermittent/ Erratic/High	<Ref. to GD(H4DOTC)-161, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0506	Idle Control System Rpm Lower Than Expected	<Ref. to GD(H4DOTC)-162, DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0507	Idle Control System Rpm Higher Than Expected	<Ref. to GD(H4DOTC)-164, DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0508	Idle Control System Circuit Low	<Ref. to GD(H4DOTC)-166, DTC P0508 IDLE CONTROL SYSTEM CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0509	Idle Control System Circuit High	<Ref. to GD(H4DOTC)-168, DTC P0509 IDLE CONTROL SYSTEM CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(H4DOTC)-170, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to GD(H4DOTC)-171, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0545	Exhaust Gas Temperature Sensor Circuit Low-Bank 1	<Ref. to GD(H4DOTC)-173, DTC P0545 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW-BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0546	Exhaust Gas Temperature Sensor Circuit High-Bank 1	<Ref. to GD(H4DOTC)-175, DTC P0546 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH-BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0565	Cruise Control ON Signal	<Ref. to GD(H4DOTC)-177, DTC P0565 CRUISE CONTROL ON SIGNAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(H4DOTC)-178, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to GD(H4DOTC)-179, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0692	Cooling Fan 1 Control Circuit High	<Ref. to GD(H4DOTC)-180, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0703	Torque Converter/Brake Switch “B” Circuit	<Ref. to GD(H4DOTC)-181, DTC P0703 TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0705	Transmission Range Sensor Circuit (PRNDL Input)	<Ref. to GD(H4DOTC)-182, DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0710	Transmission Fluid Temperature Sensor Circuit	<Ref. to GD(H4DOTC)-183, DTC P0710 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0716	Input/Turbine Speed Sensor Circuit Range/Performance	<Ref. to GD(H4DOTC)-184, DTC P0716 INPUT/TURBINE SPEED SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0720	Output Speed Sensor Circuit	<Ref. to GD(H4DOTC)-185, DTC P0720 OUTPUT SPEED SENSOR CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Description	Index
P0726	Engine Speed Input Circuit Range/ Performance	<Ref. to GD(H4DOTC)-186, DTC P0726 ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0731	Gear 1 Incorrect Ratio	<Ref. to GD(H4DOTC)-187, DTC P0731 GEAR 1 INCORRECT RATIO, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0732	Gear 2 Incorrect Ratio	<Ref. to GD(H4DOTC)-188, DTC P0732 GEAR 2 INCORRECT RATIO, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0733	Gear 3 Incorrect Ratio	<Ref. to GD(H4DOTC)-189, DTC P0733 GEAR 3 INCORRECT RATIO, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0734	Gear 4 Incorrect Ratio	<Ref. to GD(H4DOTC)-190, DTC P0734 GEAR 4 INCORRECT RATIO, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0741	Torque Converter Clutch Circuit Performance or Stuck OFF	<Ref. to GD(H4DOTC)-191, DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0743	Torque Converter Clutch Circuit Electrical	<Ref. to GD(H4DOTC)-192, DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0748	Pressure Control Solenoid “A” Electrical	<Ref. to GD(H4DOTC)-193, DTC P0748 PRESSURE CONTROL SOLENOID “A” ELECTRICAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0753	Shift Solenoid “A” Electrical	<Ref. to GD(H4DOTC)-194, DTC P0753 SHIFT SOLENOID “A” ELECTRICAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0758	Shift Solenoid “B” Electrical	<Ref. to GD(H4DOTC)-195, DTC P0758 SHIFT SOLENOID “B” ELECTRICAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0771	Shift Solenoid “E” Performance or Stuck OFF	<Ref. to GD(H4DOTC)-196, DTC P0771 SHIFT SOLENOID “E” PERFORMANCE OR STUCK OFF, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0778	Pressure Control Solenoid “B” Electrical	<Ref. to GD(H4DOTC)-197, DTC P0778 PRESSURE CONTROL SOLENOID “B” ELECTRICAL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0785	Shift/Timing Solenoid	<Ref. to GD(H4DOTC)-198, DTC P0785 SHIFT/TIMING SOLENOID, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Neutral Switch Input Circuit Low (AT Model)	<Ref. to GD(H4DOTC)-199, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Neutral Switch Input Circuit Low (MT Model)	<Ref. to GD(H4DOTC)-200, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Neutral Switch Input Circuit High (AT Model)	<Ref. to GD(H4DOTC)-201, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Neutral Switch Input Circuit High (MT Model)	<Ref. to GD(H4DOTC)-202, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0864	TCM Communication Circuit Range/Performance	<Ref. to GD(H4DOTC)-203, DTC P0864 TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0865	TCM Communication Circuit Low	<Ref. to GD(H4DOTC)-204, DTC P0865 TCM COMMUNICATION CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0866	TCM Communication Circuit High	<Ref. to GD(H4DOTC)-205, DTC P0866 TCM COMMUNICATION CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1086	Tumble Generated Valve Position Sensor 2 Circuit Low	<Ref. to GD(H4DOTC)-206, DTC P1086 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1087	Tumble Generated Valve Position Sensor 2 Circuit High	<Ref. to GD(H4DOTC)-208, DTC P1087 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1088	Tumble Generated Valve Position Sensor 1 Circuit Low	<Ref. to GD(H4DOTC)-210, DTC P1088 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Description	Index
P1089	Tumble Generated Valve Position Sensor 1 Circuit High	<Ref. to GD(H4DOTC)-212, DTC P1089 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1090	Tumble Generated Valve System 1 (Valve Open)	<Ref. to GD(H4DOTC)-214, DTC P1090 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1091	Tumble Generated Valve System 1 (Valve Close)	<Ref. to GD(H4DOTC)-215, DTC P1091 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1092	Tumble Generated Valve System 2 (Valve Open)	<Ref. to GD(H4DOTC)-216, DTC P1092 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1093	Tumble Generated Valve System 2 (Valve Close)	<Ref. to GD(H4DOTC)-217, DTC P1093 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1094	Tumble Generated Valve Signal 1 Circuit Malfunction (Open)	<Ref. to GD(H4DOTC)-218, DTC P1094 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1095	Tumble Generated Valve Signal 1 Circuit Malfunction (Short)	<Ref. to GD(H4DOTC)-220, DTC P1095 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1096	Tumble Generated Valve Signal 2 Circuit Malfunction (Open)	<Ref. to GD(H4DOTC)-222, DTC P1096 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1097	Tumble Generated Valve Signal 2 Circuit Malfunction (Short)	<Ref. to GD(H4DOTC)-224, DTC P1097 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1110	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)	<Ref. to GD(H4DOTC)-226, DTC P1110 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1111	Atmospheric Pressure Sensor Circuit Malfunction (High Input)	<Ref. to GD(H4DOTC)-227, DTC P1111 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1134	A/F Sensor Micro-Computer Problem	<Ref. to GD(H4DOTC)-228, DTC P1134 A/F SENSOR MICRO-COMPUTER PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1152	O_2 Sensor Circuit Range/Performance (Low) (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-230, DTC P1152 O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1153	O_2 Sensor Circuit Range/Performance (High) (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-233, DTC P1153 O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1301	Misfire Detected (High Temperature Exhaust Gas)	<Ref. to GD(H4DOTC)-235, DTC P1301 MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1312	Exhaust Gas Temperature Sensor Malfunction	<Ref. to GD(H4DOTC)-236, DTC P1312 EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to GD(H4DOTC)-237, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to GD(H4DOTC)-239, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to GD(H4DOTC)-240, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Description	Index
P1446	Fuel Tank Sensor Control Valve Circuit Low	<Ref. to GD(H4DOTC)-241, DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1447	Fuel Tank Sensor Control Valve Circuit High	<Ref. to GD(H4DOTC)-243, DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1448	Fuel Tank Sensor Control Valve Range Performance	<Ref. to GD(H4DOTC)-245, DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1491	Positive Crankcase Ventilation (Blow-By) Function Problem	<Ref. to GD(H4DOTC)-248, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1518	Starter Switch Circuit Low Input	<Ref. to GD(H4DOTC)-250, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1544	Exhaust Gas Temperature Too High	<Ref. to GD(H4DOTC)-251, DTC P1544 EXHAUST GAS TEMPERATURE TOO HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to GD(H4DOTC)-252, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1700	Throttle Position Sensor Circuit Malfunction For AT	<Ref. to GD(H4DOTC)-253, DTC P1700 THROTTLE POSITION SENSOR CIRCUIT MALFUNCTION FOR AT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1711	Engine Torque Control Signal #1 Circuit Malfunction	<Ref. to GD(H4DOTC)-255, DTC P1711 ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1712	Engine Torque Control Signal #2 Circuit Malfunction	<Ref. to GD(H4DOTC)-256, DTC P1712 ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to GD(H4DOTC)-257, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to GD(H4DOTC)-259, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

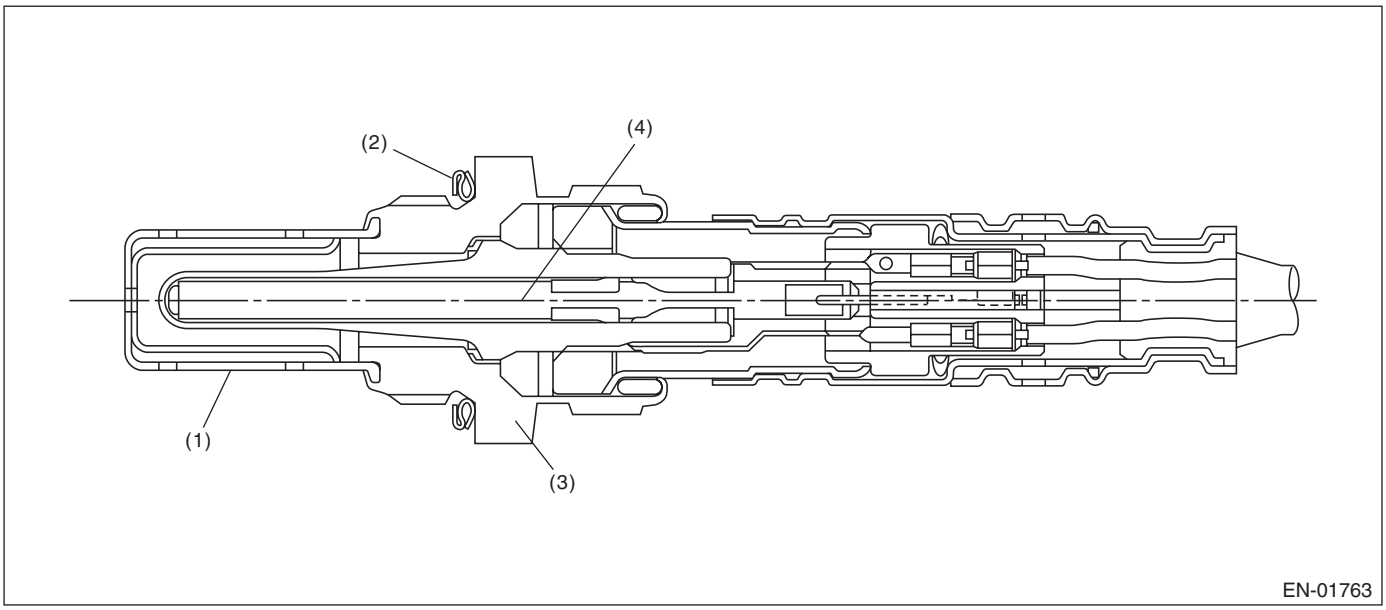
2. Diagnostic Trouble Code (DTC) Detecting Criteria

A: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of front oxygen (A/F) sensor heater.
Judge NG when impedance of front oxygen (A/F) sensor is larger than the standard value by referring to the engine condition such as fuel shut-off in deceleration, etc.

2. COMPONENT DESCRIPTION



(1) Protection tube
(2) Gasket
(3) Sensor housing
(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	60 seconds or more
Battery voltage	> 10.9 V
After fuel shut-off	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously in 60 seconds after starting engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the continuous time of not completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Impedance of front oxygen (A/F) sensor	> 52 Ω

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

9. ECM OPERATING AT DTC SETTING

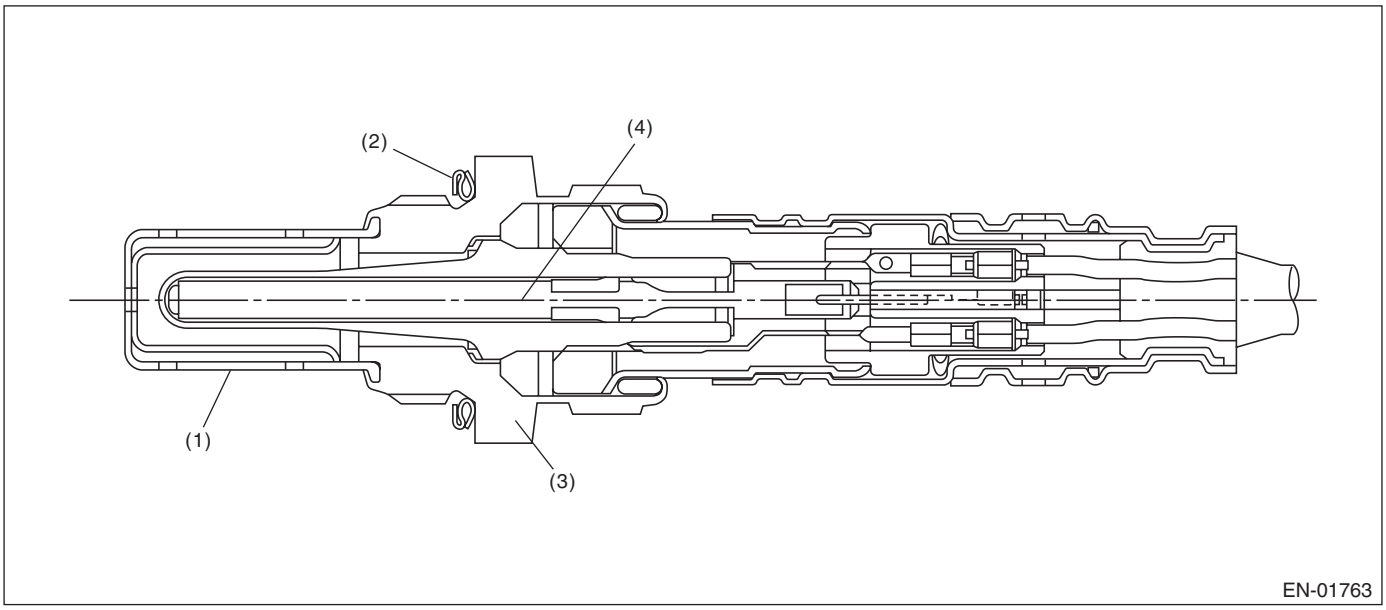
Memorize the freeze frame data. (For test mode $02)

B: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of front oxygen (A/F) sensor heater. Diagnosis is performed using front oxygen (A/F) sensor IC, and communication is established between front oxygen (A/F) sensor IC and main IC. Front oxygen (A/F) sensor IC judges NG when the data of voltage and current is abnormal with heater turned on or off.

2. COMPONENT DESCRIPTION



(1) Protection tube
(2) Gasket
(3) Sensor housing
(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD

Front oxygen (A/F) sensor IC judges NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (4.6 seconds). Front oxygen (A/F) sensor IC judges OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Heater circuit	ON
• Voltage	< 5 V
• Current	< 1.5 A

Time Needed for Diagnosis: 4.6 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor IC communication: Not allowed to communicate
- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

9. ECM OPERATING AT DTC SETTING

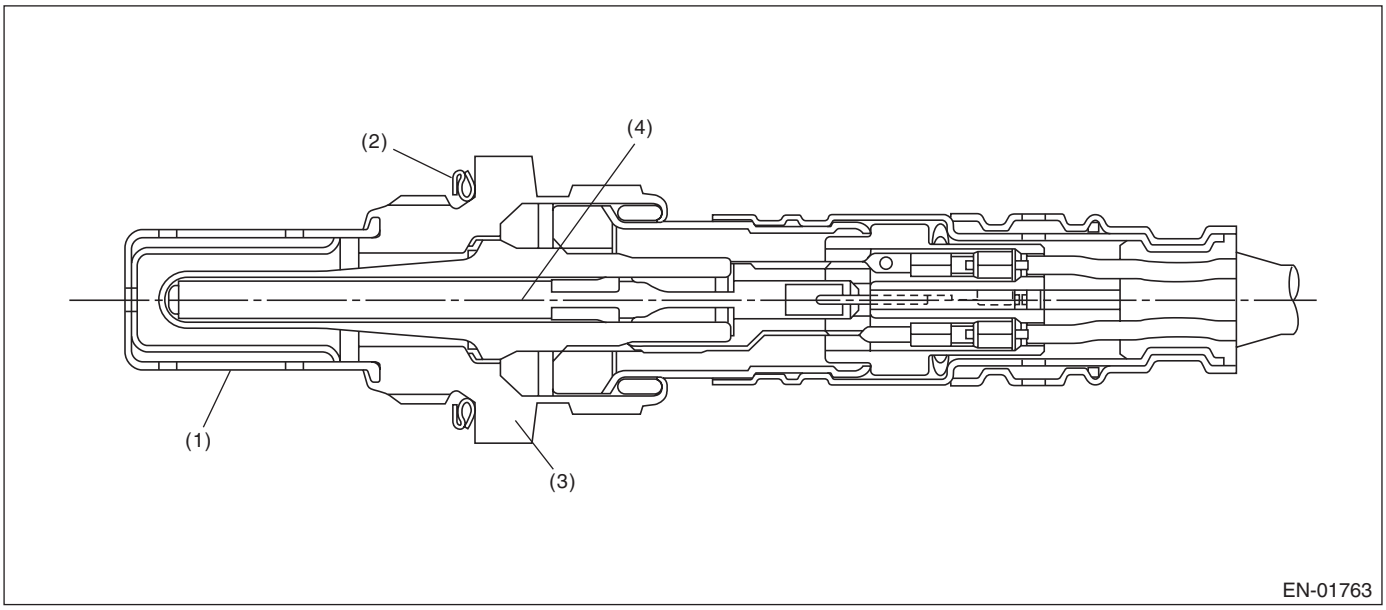
Memorize the freeze frame data. (For test mode $02)

C: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of front oxygen (A/F) sensor heater. Diagnosis is performed using front oxygen (A/F) sensor IC, and communication is established between front oxygen (A/F) sensor IC and main IC. Front oxygen (A/F) sensor IC judges NG when the data of voltage and current is abnormal with heater turned on or off.

2. COMPONENT DESCRIPTION



(1) Protection tube
(2) Gasket
(3) Sensor housing
(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD

Front oxygen (A/F) sensor IC judges NG when the continuous time until completing one of the malfunction criteria below becomes more than the time needed for diagnosis (4.6 seconds). Front oxygen (A/F) sensor IC judges OK and clear NG when any of the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Heater circuit	OFF
• Voltage	> 5 V
• Current	> 1.5 A
• Heater current	≥ 23 A

Time Needed for Diagnosis: 4.6 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- GST communication: Mode$01 “Failure” is indicated in A/F feedback control condition
- Purge control: Not allowed to purge

9. ECM OPERATING AT DTC SETTING

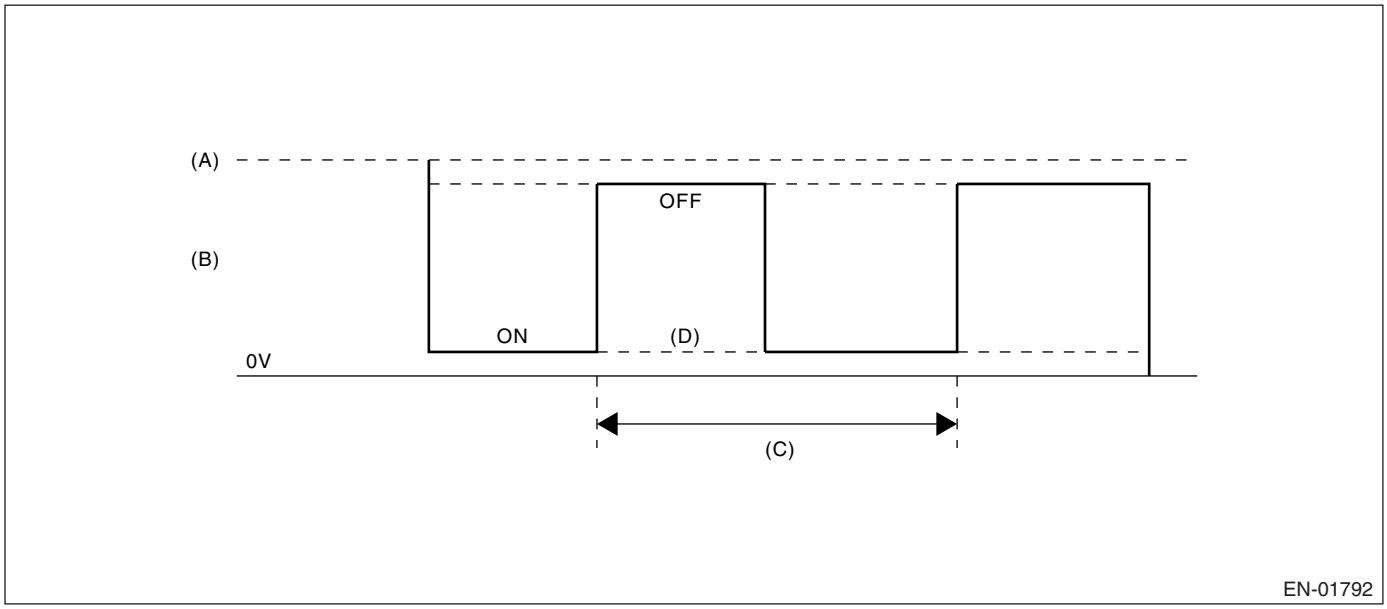
Memorize the freeze frame data. (For test mode $02)

D: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of rear oxygen sensor heater. Rear oxygen sensor heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage. Calculate the Max. and Min. values of heater output terminal voltage. When the Max. value does not increased, it means Low malfunction.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Rear oxygen sensor heater output voltage
(C) 262 milliseconds (cycles)
(D) Low malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Before or after starting the engine	After starting the engine
Battery voltage	> 10.9 V
Duty ratio of heater output	19.9 ←→ 79.6%
Engine speed	< 4,500 rpm

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Max. heater voltage	< 10.12 V

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

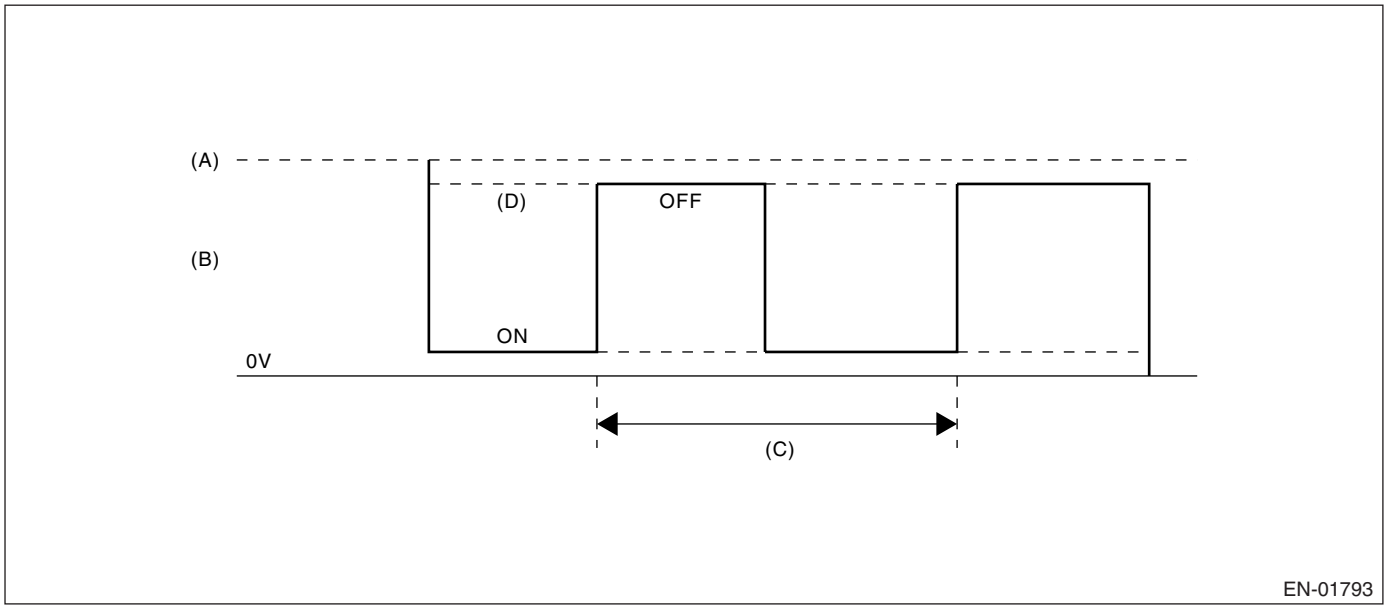
Memorize the freeze frame data. (For test mode $02)

E: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of rear oxygen heater. Rear oxygen heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage. Calculate the Max. and Min. values of heater output terminal voltage. When the Min. value does not decreased, it means High malfunction.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Rear oxygen sensor heater output voltage
(C) 262 milliseconds (cycles)
(D) High malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Before or after starting the engine	After starting the engine
Battery voltage	> 10.9 V
Duty ratio of heater output	19.9 ←→ 79.6%
Engine speed	< 4,500 rpm

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Min. heater voltage	> 1.92 V

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

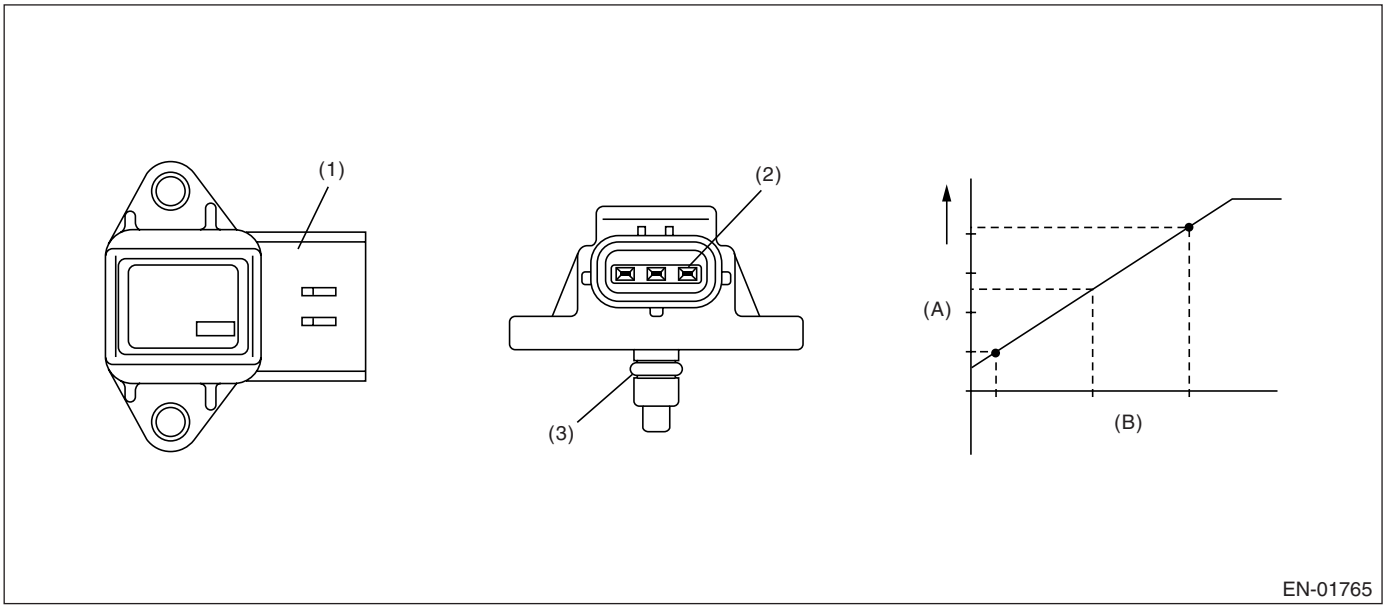
Memorize the freeze frame data. (For test mode $02)

F: DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake manifold pressure sensor output property. Judge NG when the intake air pressure AD value is Low whereas it seemed to be High from the viewpoint of engine condition, or when it is High whereas it seemed to be Low from the engine condition.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when either Low side or High side becomes NG. Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2,500 rpm
Throttle position	≥ 10°
Output voltage	< 1.0 V
High side	
Engine speed	600 ←→ 900 rpm
Throttle position	< 1.3°
Output voltage	≥ 2.6 V

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when both Low side and High side become OK. Judge OK when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2,500 rpm
Throttle position	≥ 10°
Output voltage	≥ 1.0 V
High side	
Engine speed	600 ←→ 900 rpm
Throttle position	< 1.3°
Output voltage	< 2.6 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.

9. ECM OPERATING AT DTC SETTING

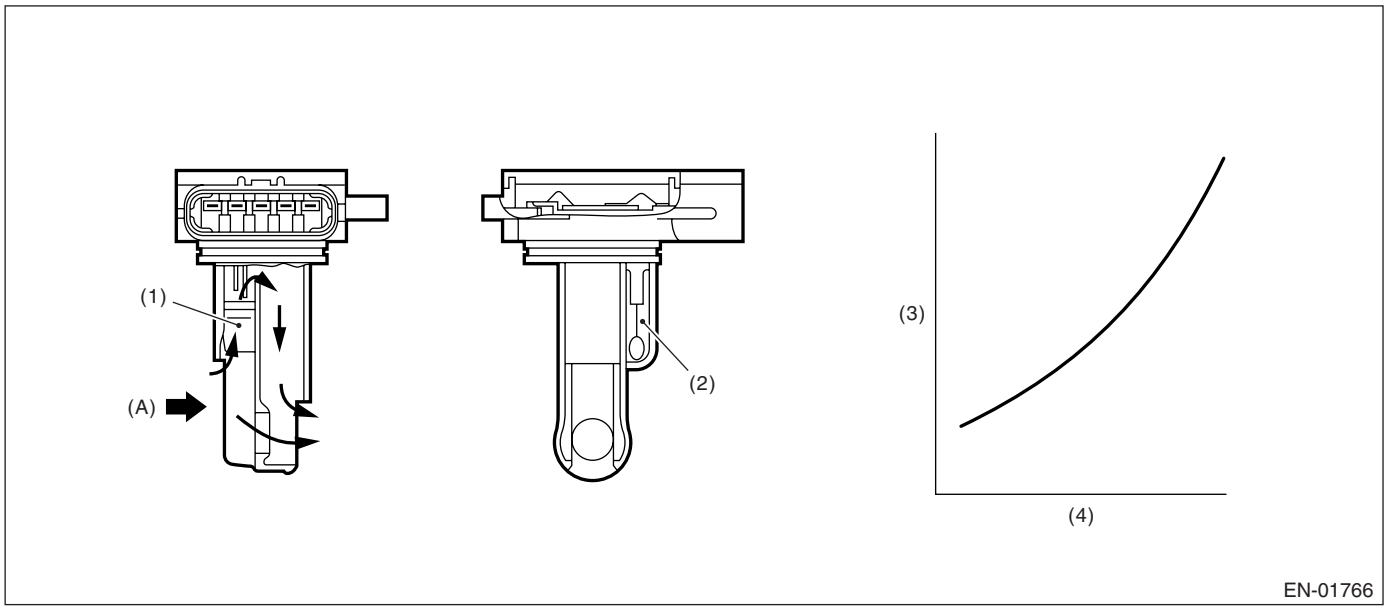
Memorize the freeze frame data. (For test mode $02)

G: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output property. Judge Low side NG when the air flow voltage indicates low value in spite of the driving condition that the air flow voltage might be high; otherwise, judge High side NG when the air flow voltage indicates high value in spite of the driving condition that the air flow voltage might be low. Judge air flow sensor property NG when the Low side or High side becomes NG.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Intake air volume (kg/s)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more then the time needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Low side NG	
Output voltage	< 1.5 V
Engine speed	≥ 2,500 rpm
Throttle angle	≥ 15°
Intake manifold pressure	≥ 53.3 kPa (400 mmHg, 15.7 inHg)
High side NG	
Output voltage	≥ 2.5 V
Engine speed	550 ←→ 900 rpm
Throttle angle	< 1.92°
Intake manifold pressure	< 46.7 kPa (350 mmHg, 13.8 inHg)

Time Needed for Diagnosis:

Low side	3 seconds
High side	10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK the when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Low side NG	
Output voltage	≥ 1.5 V
Engine speed	≥ 2,500 rpm
Throttle angle	≥ 15°
Intake manifold pressure	≥ 53.3 kPa (400 mmHg, 15.7 inHg)
High side NG	
Output voltage	< 2.5 V
Engine speed	550 ←→ 900 rpm
Throttle angle	< 1.92°
Intake manifold pressure	< 46.7 kPa (350 mmHg, 13.8 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

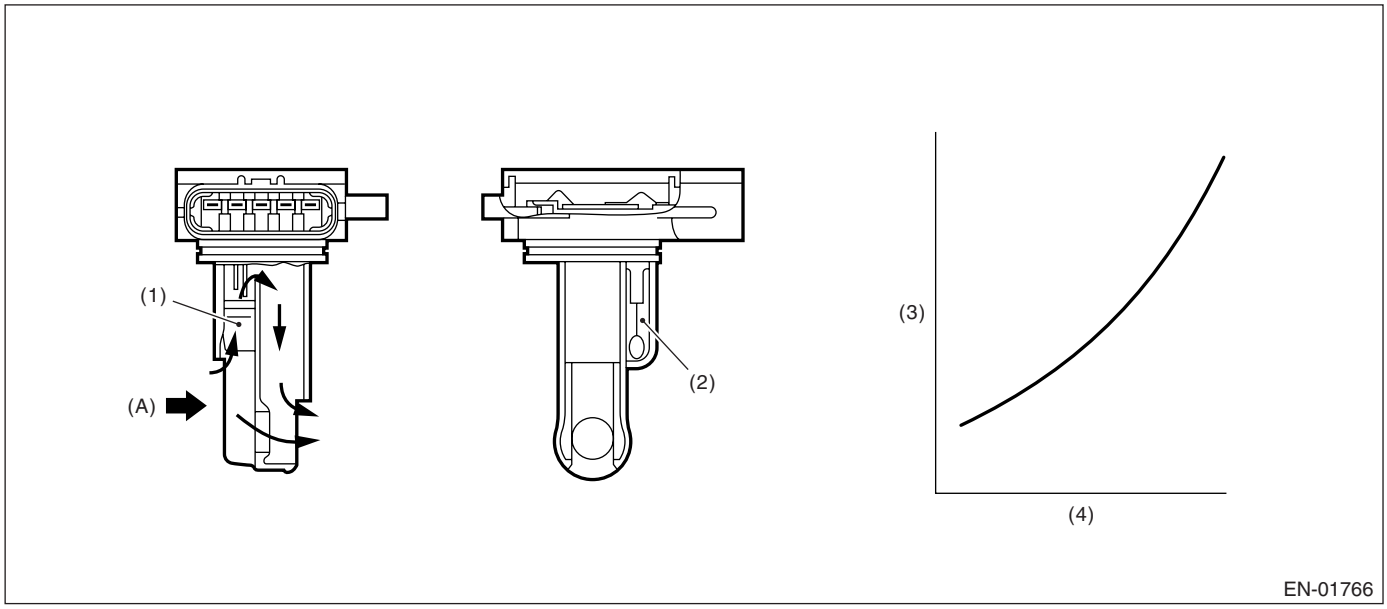
Memorize the freeze frame data. (For test mode $02)

H: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Intake air volume (kg/s)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.2 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

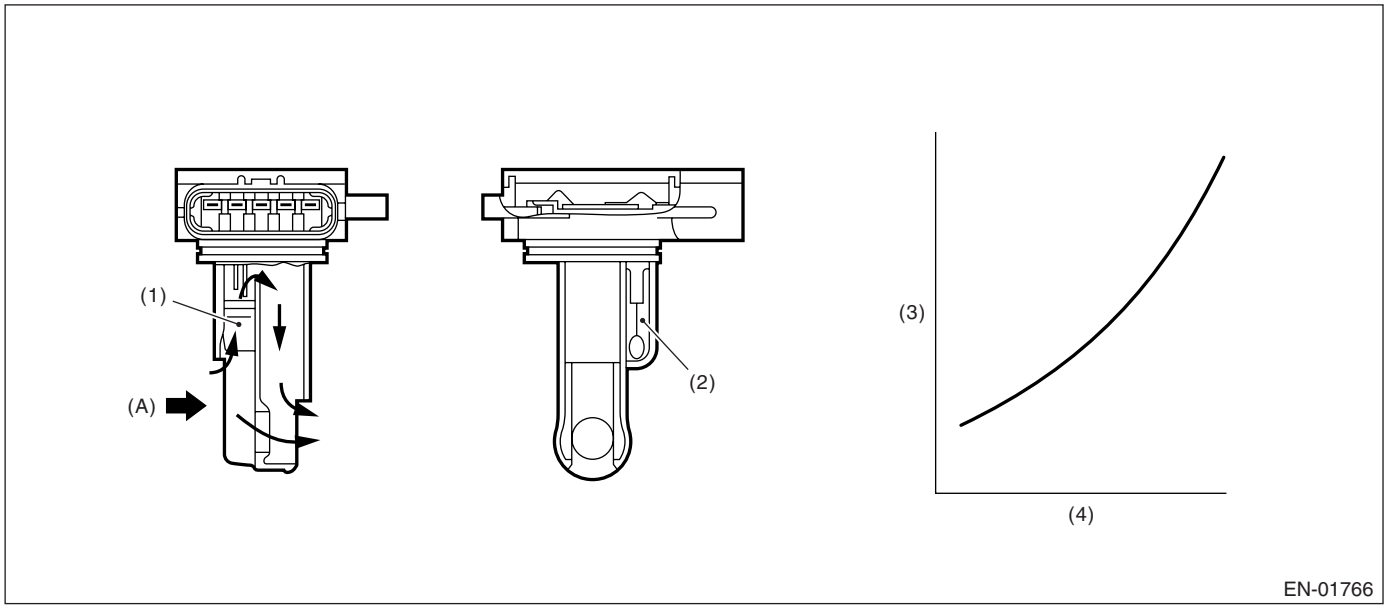
Memorize the freeze frame data. (For test mode $02)

I: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Intake air volume (kg/s)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.71 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

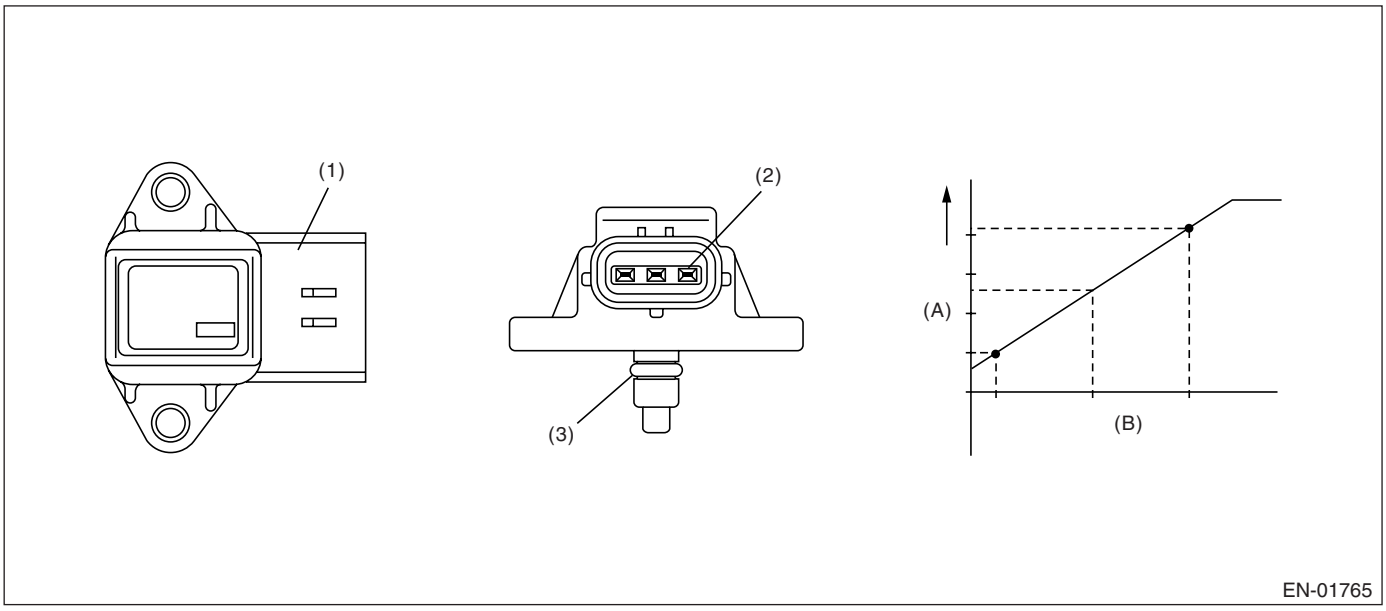
Memorize the freeze frame data. (For test mode $02)

J: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.7 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.

9. ECM OPERATING AT DTC SETTING

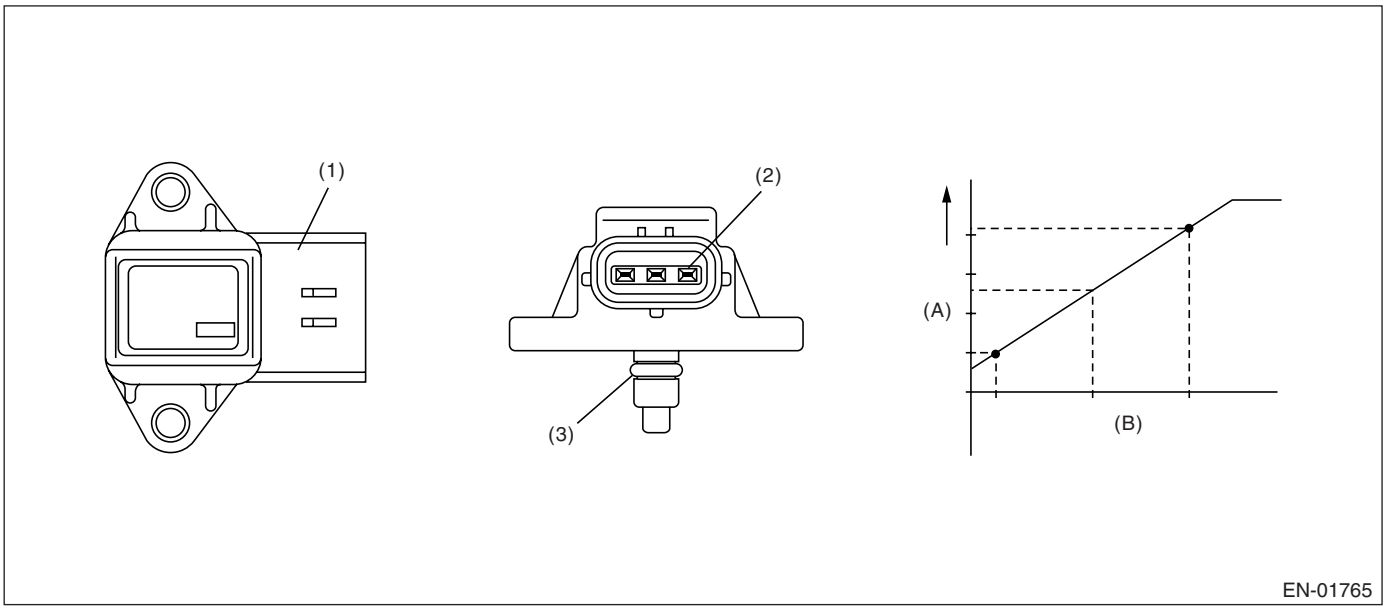
Memorize the freeze frame data. (For test mode $02)

K: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.93 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.

9. ECM OPERATING AT DTC SETTING

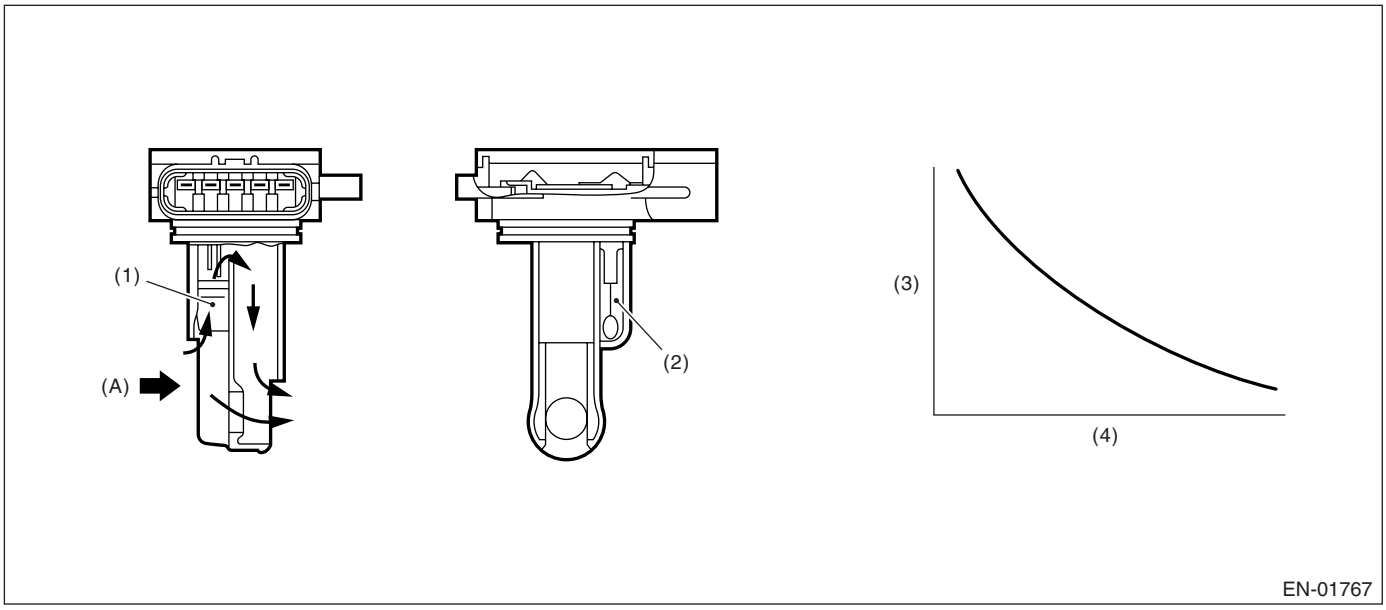
Memorize the freeze frame data. (For test mode $02)

L: DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property. Judge NG when the intake air temperature is not varied whereas it seemed to be varied from the viewpoint of engine condition.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance (Ω)
(4) Intake air temperature °C (°F)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Coolant temp. before engine start	< 30°C (86°F)
Coolant temperature	> 75°C (167°F)
Battery voltage	≥ 10.9 V
Continuous time when the vehicle speed is less than 50 km/h (31 MPH)	600 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is completed after idling from starting the cooled engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	< 20 mV (It is equal to approx. 0.5°C (33°F) around 25°.)
Exhaust temperature above 500°C (932°F)	60 seconds or more

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	≥ 20 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATING AT DTC SETTING

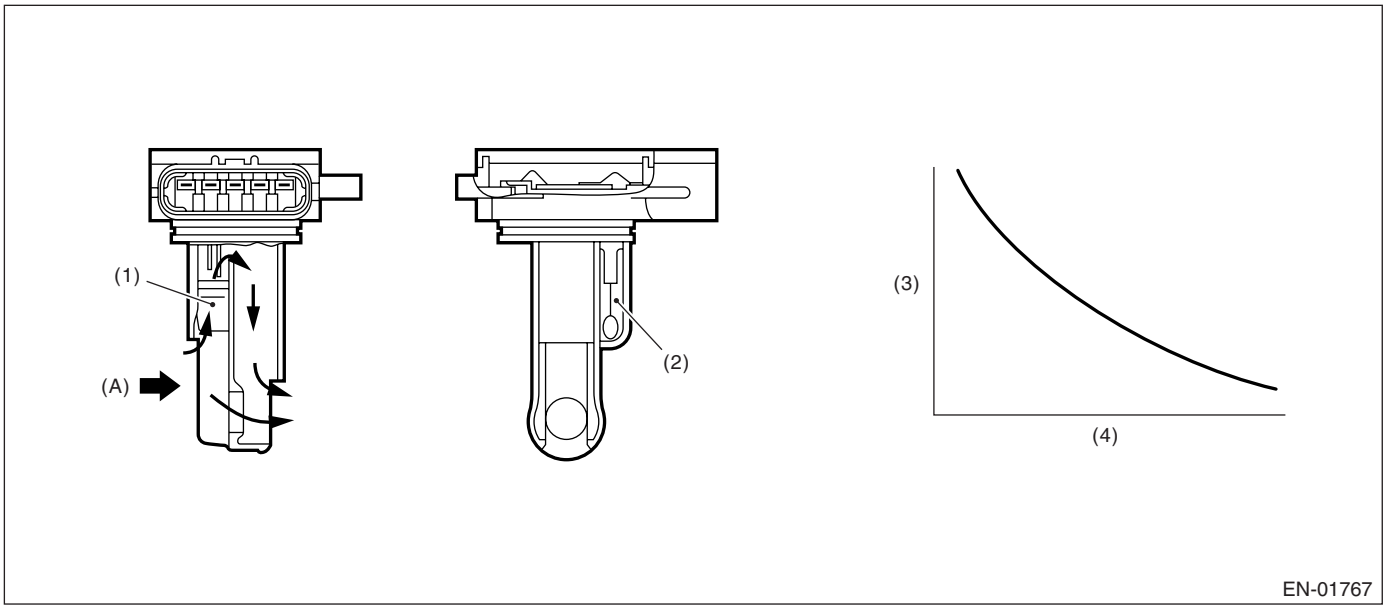
Memorize the freeze frame data. (For test mode $02)

M: DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance (Ω)
(4) Intake air temperature °C (°F)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.23 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.23 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATING AT DTC SETTING

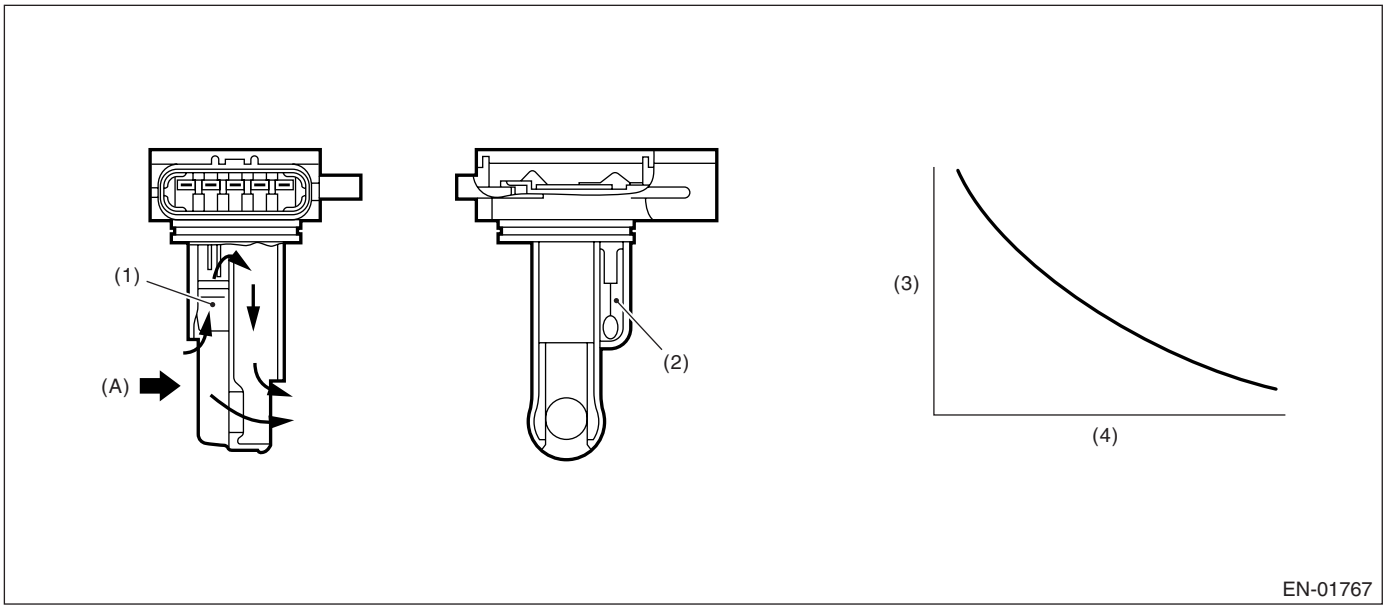
Memorize the freeze frame data. (For test mode $02)

N: DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance (Ω)
(4) Intake air temperature °C (°F)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.23 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATING AT DTC SETTING

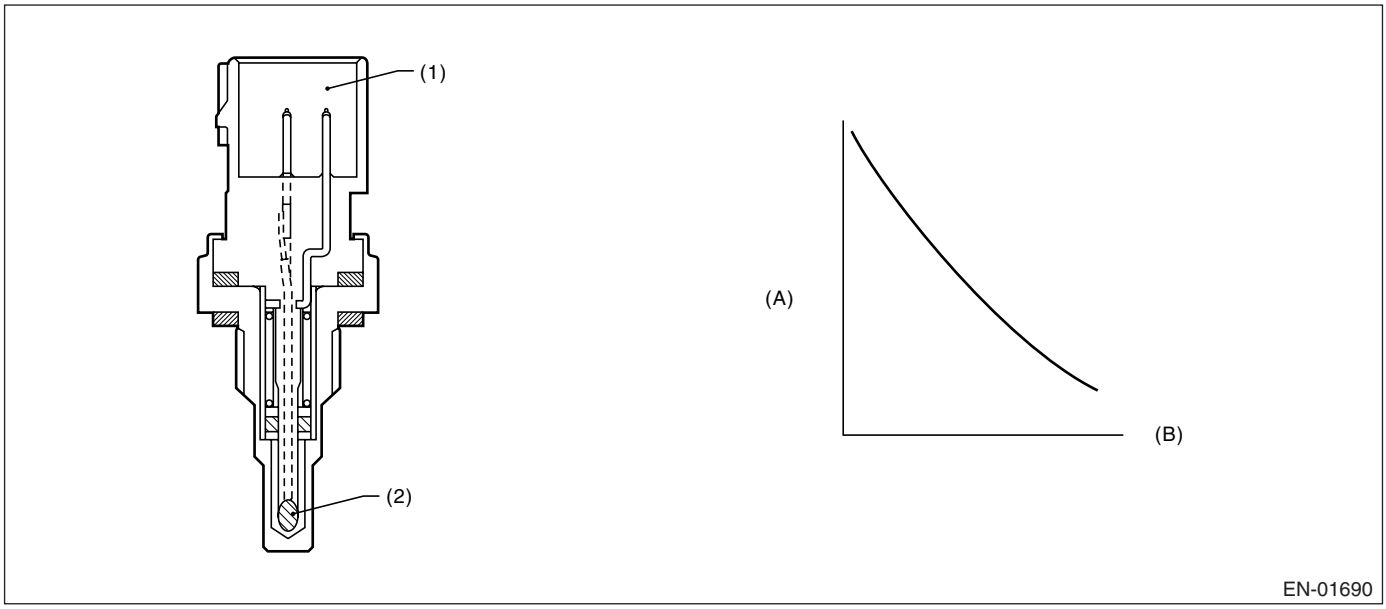
Memorize the freeze frame data. (For test mode $02)

O: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.23 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.

9. ECM OPERATING AT DTC SETTING

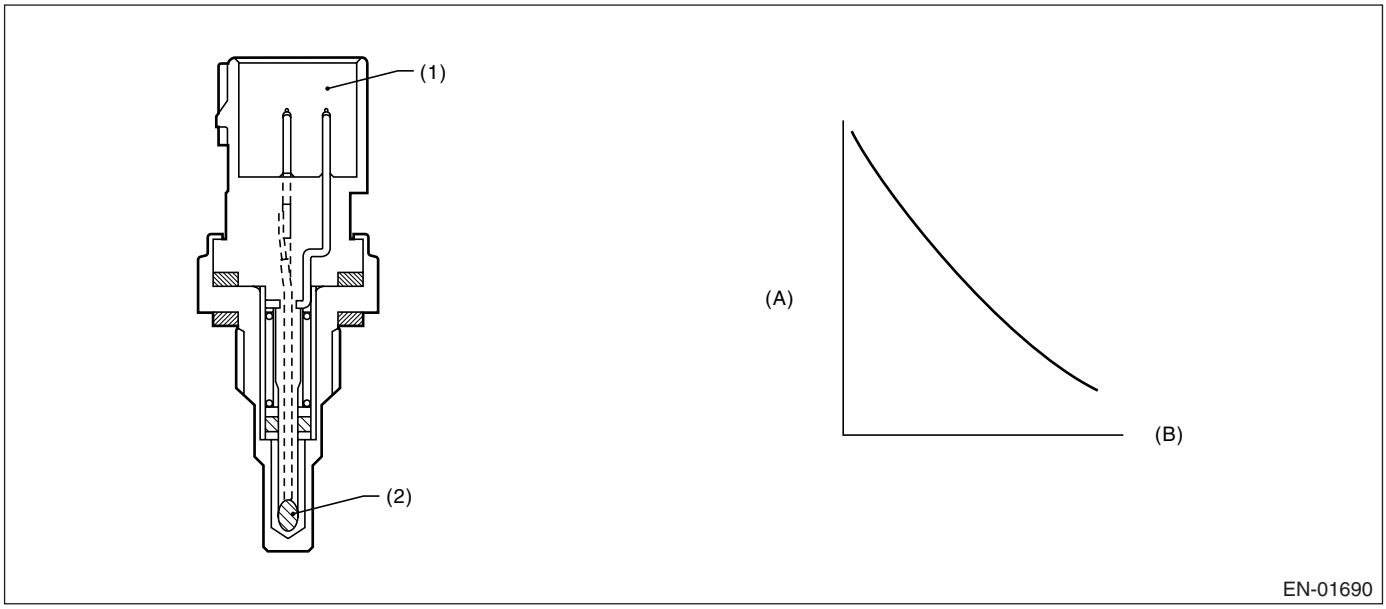
Memorize the freeze frame data. (For test mode $02)

P: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.

9. ECM OPERATING AT DTC SETTING

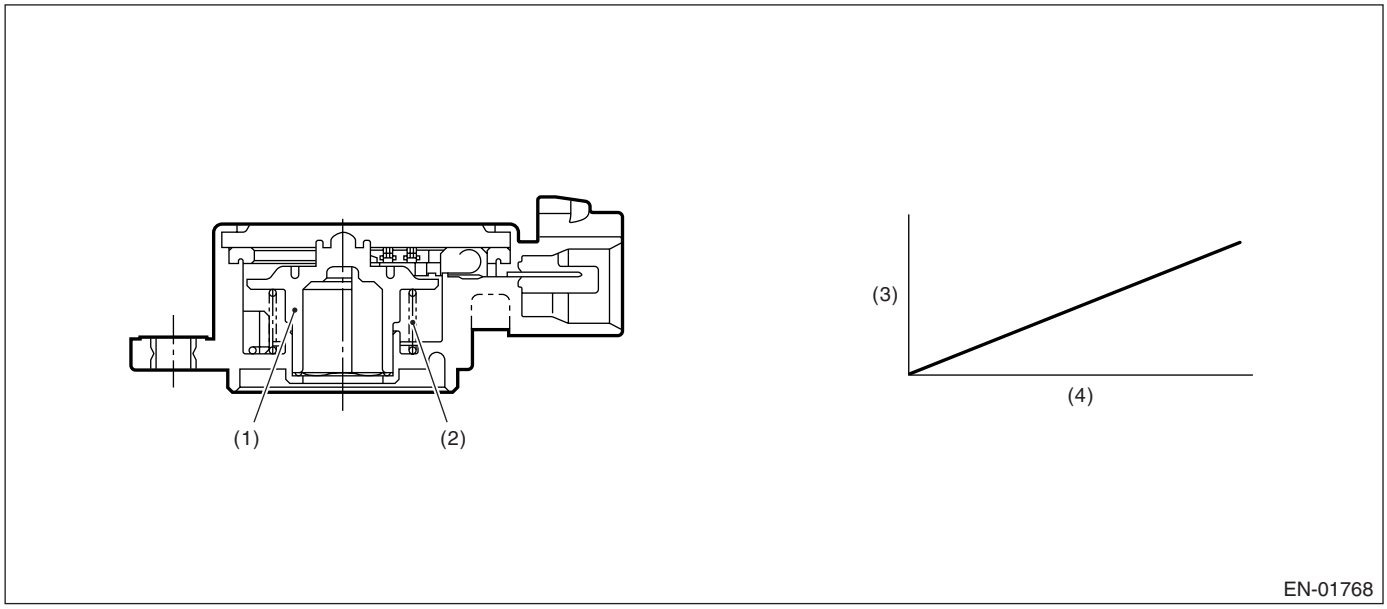
Memorize the freeze frame data. (For test mode $02)

Q: DTC P0121 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of throttle position sensor output property. Judge NG when the throttle opening is largely different from the estimated value of throttle opening.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Throttle valve opening angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	> 75°C (167°F)
Intake air temperature	> −10°C (14°F)
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Battery voltage	> 10.9 V
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when one of the malfunctions below is completed such as Low malfunction (1), Low malfunction (2) and High malfunction.

Judgment Value

Malfunction Criteria	Threshold Value
Low malfunction (1): Judge NG when the continuous time of completing the malfunction criteria below becomes more than 10 seconds.	
(Estimated value of throttle opening — output) throttle angle	≥ 20°
Engine speed	1,000 ←→ 3,200 rpm
Engine load (gn)	0.2 ←→ 1.0 g/rev
Intake air change during 0.5 engine rev.	< 0.01 g/rev
Manifold absolute pressure	< Atmosphere −6.67 kPa (−50 mmHg, −1.97 inHg)
Low malfunction (2): Judge NG when the continuous time of completing the malfunction criteria below becomes more than 10 seconds × 6 times.	
Engine speed	≥ 1,600 rpm
Engine load (gn)	≥ 0.2 g/rev
Throttle opening	< 2°
Elapsed time after engine starting	≥ 5 seconds
High malfunction: Judge NG when the continuous time of completing the malfunction criteria below becomes more than 10 seconds.	
(Output — estimated value of throttle opening) throttle angle	≥ 20°
Engine speed	1,000 ←→ 3,200 rpm
Engine load (gn)	0.2 ←→ 1.0 g/rev
Intake air change during 0.5 engine rev.	< 0.01 g/rev
Manifold absolute pressure	< Atmosphere −6.67 kPa (−50 mmHg, −1.97 inHg)

Estimated value of throttle opening: It is supposed from engine speed and engine load.

Time Needed for Diagnosis:

Low malfunction (1), High malfunction	10 seconds
Low malfunction (2)	10 seconds × 6 times.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when all of the malfunctions below are not completed such as Low malfunction (1), Low malfunction (2) and High malfunction.

Judgment Value

Malfunction Criteria	Threshold Value
Low malfunction (1): Judge OK when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.	
(Estimated value of throttle opening — output) throttle angle	< 20°
Engine speed	1,000 ←→ 3,200 rpm
Engine load (gn)	0.2 ←→ 1.0 g/rev
Intake air change during 0.5 engine rev.	< 0.01 g/rev
Manifold absolute pressure	< Atmosphere −6.67 kPa (−50 mmHg, −1.97 inHg)
Low malfunction (2): Judge OK when the malfunction criteria below are completed.	
Throttle opening	≥ 2°
Elapsed time after engine starting	≥ 5 seconds
High malfunction: Judge OK when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.	
(Output — estimated value of throttle opening) throttle angle	< 20°
Engine speed	1,000 ←→ 3,200 rpm
Engine load (gn)	0.2 ←→ 1.0 g/rev
Intake air change during 0.5 engine rev.	< 0.01 g/rev
Manifold absolute pressure	< Atmosphere −6.67 kPa (−50 mmHg, −1.97 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Throttle position sensor process: Fix the throttle opening at 6.4°.
- ISC open loop compensation: Fix the amount of ISC open loop compensation at 5%.
- ISC feedback compensation: Not allowed to calculate the amount of ISC feedback compensation.

9. ECM OPERATING AT DTC SETTING

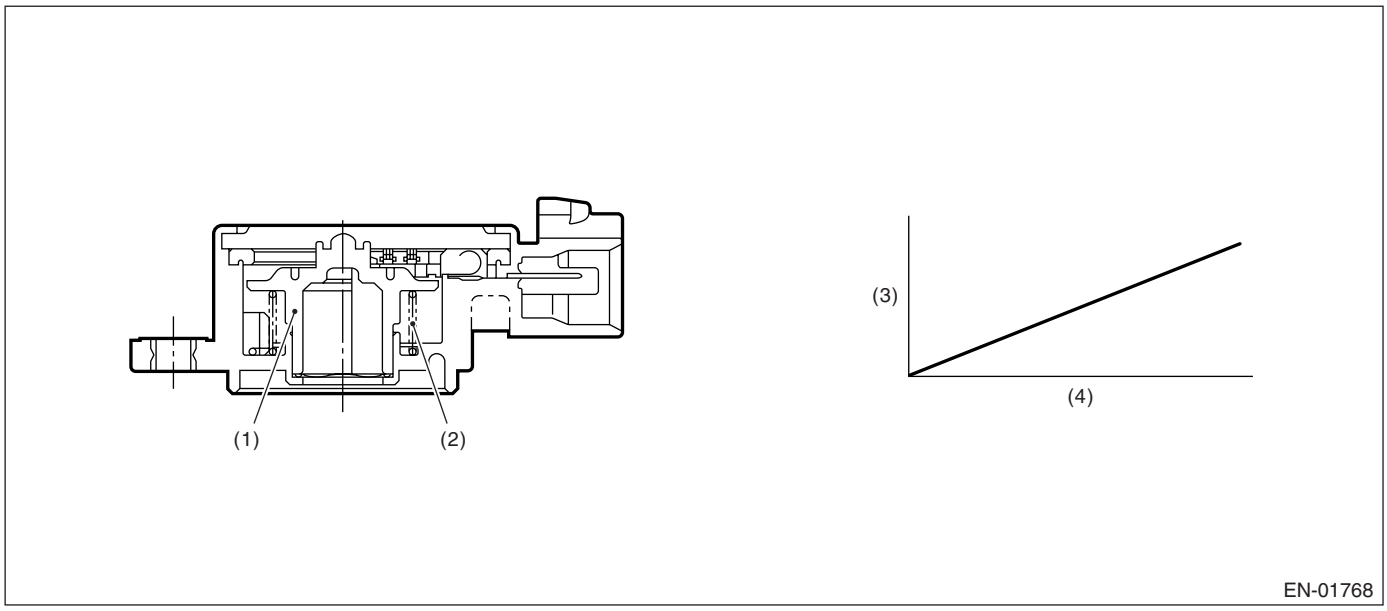
Memorize the freeze frame data. (For test mode $02)

R: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Throttle valve opening angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.15 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.15 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Throttle position sensor process: Fix the throttle opening at 6.4°.
- ISC open loop compensation: Fix the amount of ISC open loop compensation at 5%.
- ISC feedback compensation: Not allowed to calculate the amount of ISC feedback compensation.

9. ECM OPERATING AT DTC SETTING

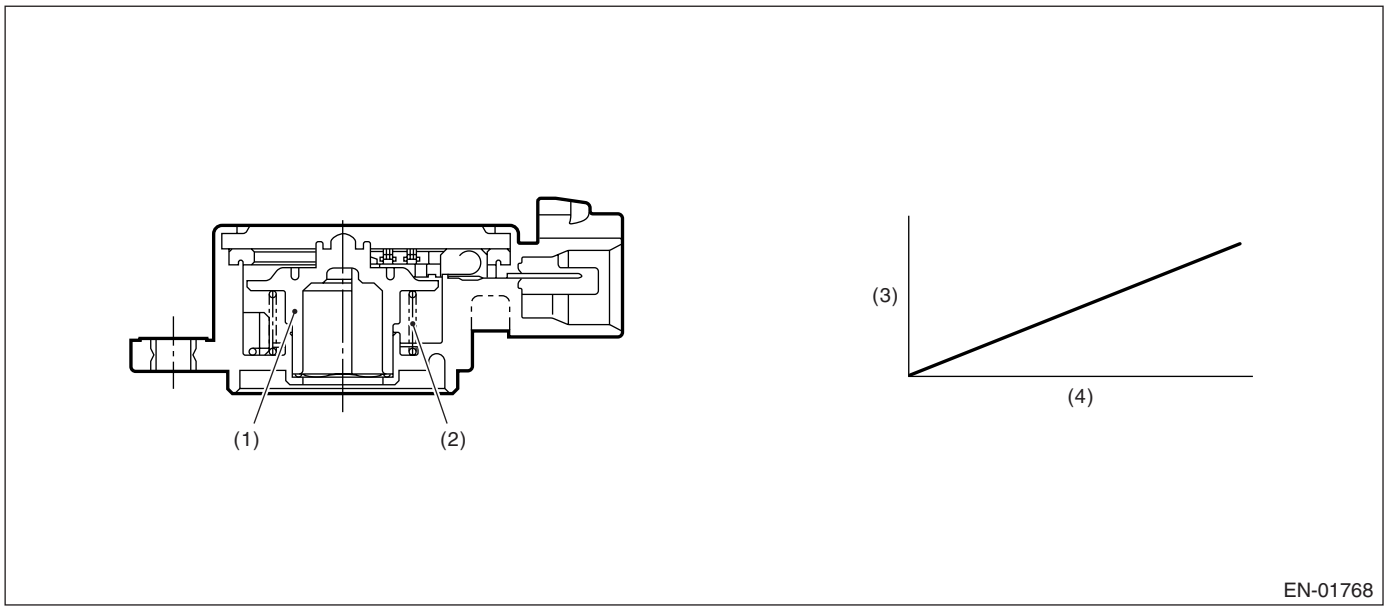
Memorize the freeze frame data. (For test mode $02)

S: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Throttle valve opening angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.71 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.71 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Throttle position sensor process: Fix the throttle opening at 6.4°.
- ISC open loop compensation: Fix the amount of ISC open loop compensation at 5%.
- ISC feedback compensation: Not allowed to calculate the amount of ISC feedback compensation.

9. ECM OPERATING AT DTC SETTING

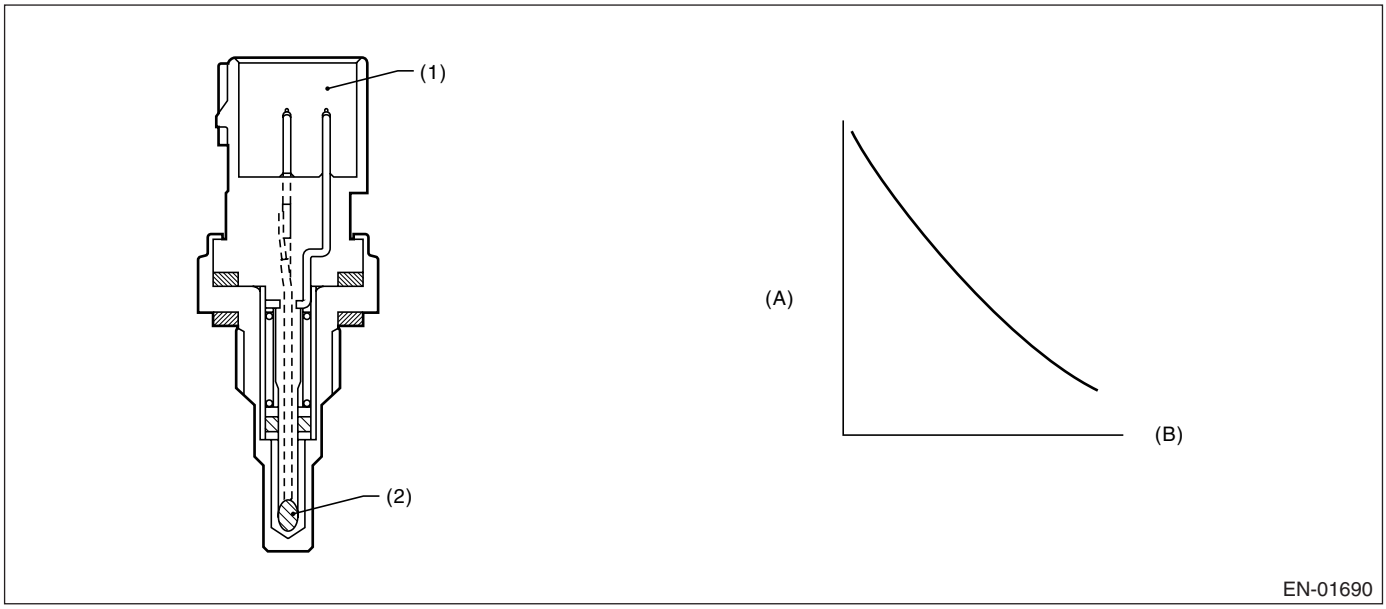
Memorize the freeze frame data. (For test mode $02)

T: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature output property. Judge NG when the engine coolant temperature does not rise whereas it seemed to rise from the viewpoint of the engine condition.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Diagnosis of engine coolant temperature sensor property	Not finished
Engine speed	≥ 500 rpm
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 20°C (68°F)
Timer for diagnosis after engine starting	≥ Timer judgment value after engine starting

Timer for diagnosis after engine starting
a) Timer stop at fuel cut mode.
b) During the driving conditions except a) above, timer count up by 65.5 milliseconds + TWCNT milliseconds at every 65.5 milliseconds.

Where, TWCNT is determined as follows,
TWCNT = 0 at idle switch ON,
TWCNT show on the following table at idle switch OFF.

Temp. °C (°F)	Vehicle speed km/h (MPH)							
	0 (0)	8 (4.97)	16 (9.94)	24 (14.9)	32 (19.9)	40 (24.9)	48 (29.8)	56 (34.8)
−20 (−4)	0 ms	1.67 ms	3.33 ms	5.00 ms	13.11 ms	10.00 ms	19.66 ms	26.21 ms
−10 (14)	0 ms	13.11 ms	19.66 ms	32.77 ms	52.43 ms	72.09 ms	58.98 ms	45.88 ms
0 (32)	0 ms	18.24 ms	45.88 ms	72.09 ms	111.41 ms	150.73 ms	131.07 ms	104.86 ms
10 (50)	0 ms	39.32 ms	85.2 ms	124.52 ms	190.05 ms	229.38 ms	229.38 ms	183.50 ms

Judgment value of timer after engine starting
$t = 429.5 - 6.685 \times Ti$
Ti is the lowest coolant temperature after starting the engine.
Time Needed for Diagnosis: To be determined. (It is varied by the Min. engine coolant temperature and engine conditions such as vehicle speed and engine coolant temperature.)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 20°C (68°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.

9. ECM OPERATING AT DTC SETTING

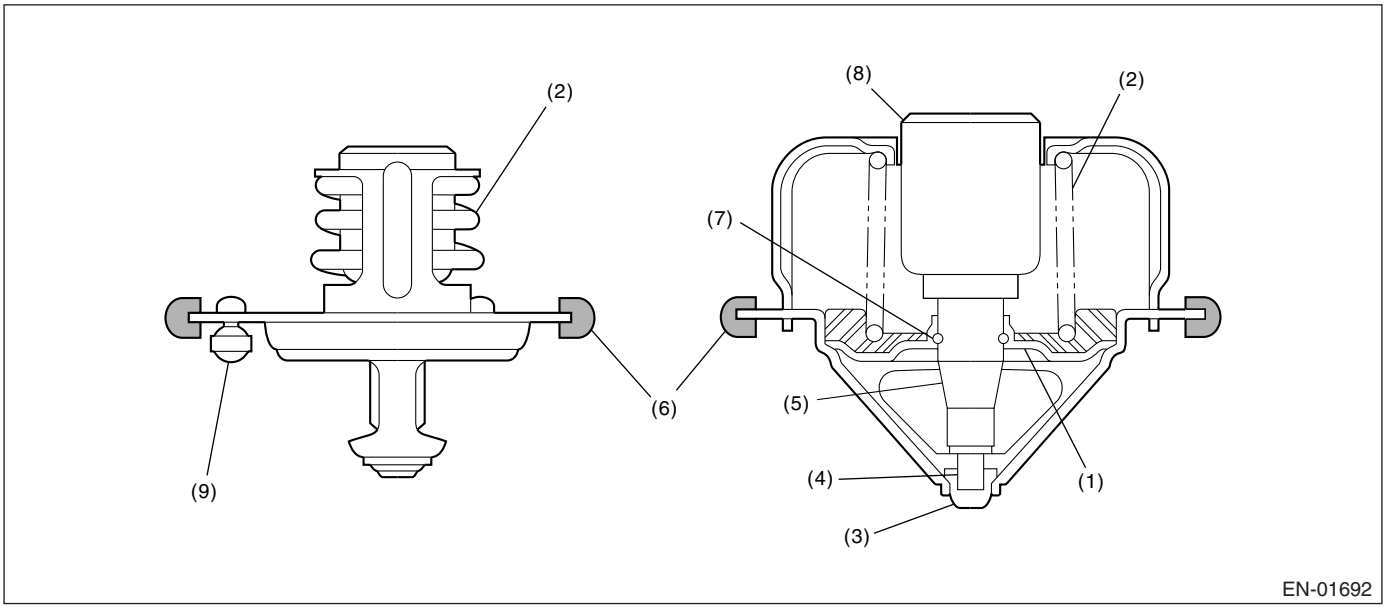
Memorize the freeze frame data. (For test mode $02)

U: DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of thermostat function. Judge NG when the engine coolant temperature is lower than the estimated engine coolant temperature and the difference between them is large. Judge OK when the engine coolant temperature becomes 75°C (167°F) and the difference is small before judging NG.

2. COMPONENT DESCRIPTION



(1) Valve
(2) Spring
(3) Stopper
(4) Piston
(5) Guide
(6) Rubber packing
(7) Stop ring
(8) Wax element
(9) Jiggle valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 30 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Estimated ambient air temperature	≥ −7°C (19.4°F)
Thermostat malfunction diagnosis	Not finished
Engine coolant temperature at engine starting	< 55°C (131°F)
Estimated coolant temperature	≥ 75°C (167°F)
Engine coolant temperature	< 75°C (167°F)
(Estimated − measured) coolant temperature	> 20°C (68°F)

Time Needed for Diagnosis: 30 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Estimated ambient air temperature	≥ −7°C (19.4°F)
Thermostat malfunction diagnosis	Not finished
Engine coolant temperature at engine starting	< 55°C (131°F)
Engine coolant temperature	≥ 75°C (167°F)
(Estimated − measured) coolant temperature	≤ 20°C (68°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

V: DTC P0129 BAROMETRIC PRESSURE TOO LOW

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of atmospheric pressure sensor output property. Judge NG when the atmospheric pressure sensor output is largely different from the intake manifold pressure at engine starting.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed at engine starting	< 300 rpm
Vehicle speed	< 1 km/h (0.62 MPH)
Diagnosis for atmospheric pressure sensor property	Not finished

4. GENERAL DRIVING CYCLE

Perform the diagnosis once turning the ignition switch to ON.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.33 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
|Atmospheric – manifold absolute pressure|	≥ 26.7 kPa (200 mmHg, 7.88 inHg)
|Intake manifold pressure at engine starting – manifold absolute pressure|	< 1.33 kPa (10 mmHg, 2.95 inHg)

Time Needed for Diagnosis: 0.33 seconds
Malfunction Indicator Light Illumination: Detect when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 0.26 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
|Atmospheric – manifold absolute pressure|	< 26.7 kPa (200 mmHg, 7.88 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101 kPa (760 mmHg, 29.8 inHg).

9. ECM OPERATING AT DTC SETTING

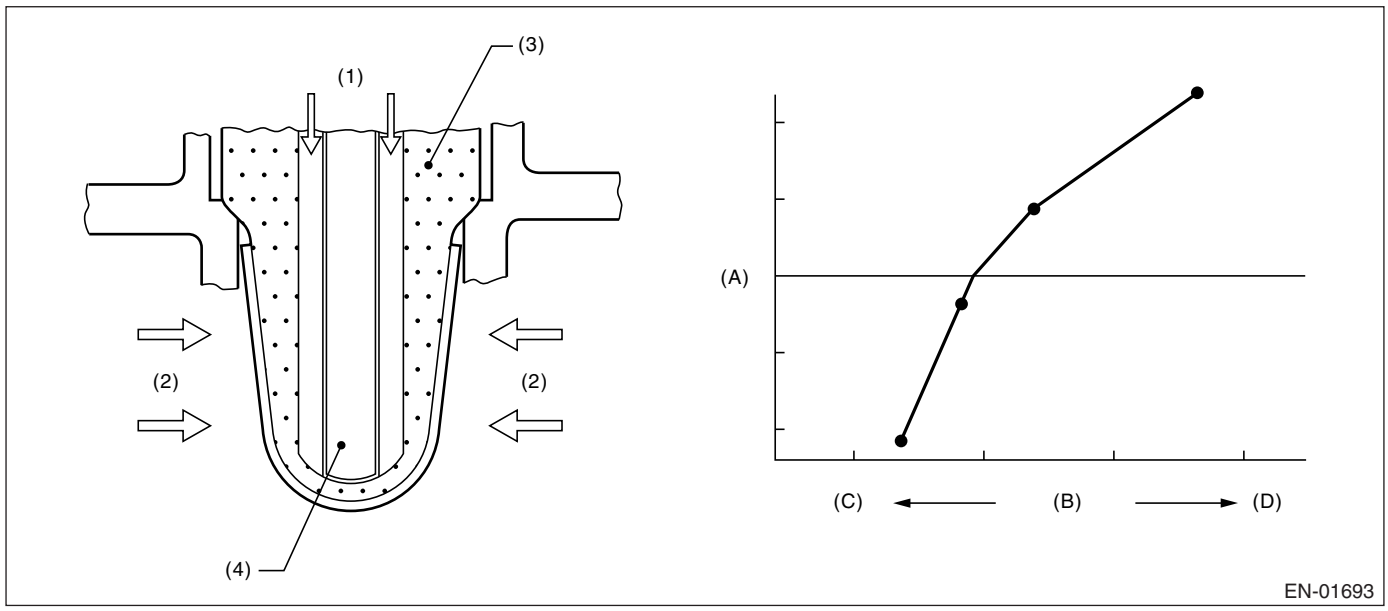
Memorize the freeze frame data. (For test mode $02)

W: DTC P0130 O_2 SENSOR CIRCUIT (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the short circuit of front oxygen (A/F) sensor heater. Diagnosis is performed using front oxygen (A/F) sensor IC, and communication is established between front oxygen (A/F) sensor IC and main IC. Front oxygen (A/F) sensor judges NG when the data of voltage (AFC, AFV) is abnormal.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Front oxygen (A/F) sensor judges NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (4.6 seconds). Front oxygen (A/F) sensor judges OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	(Battery voltage short) AFC > 4.5 V or AFV > 4.95 V (Ground short) AFC < 3.5 V or AFV < 2.5 V

Time Needed for Diagnosis: 4.6 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor IC communication: Not allowed to communicate
- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

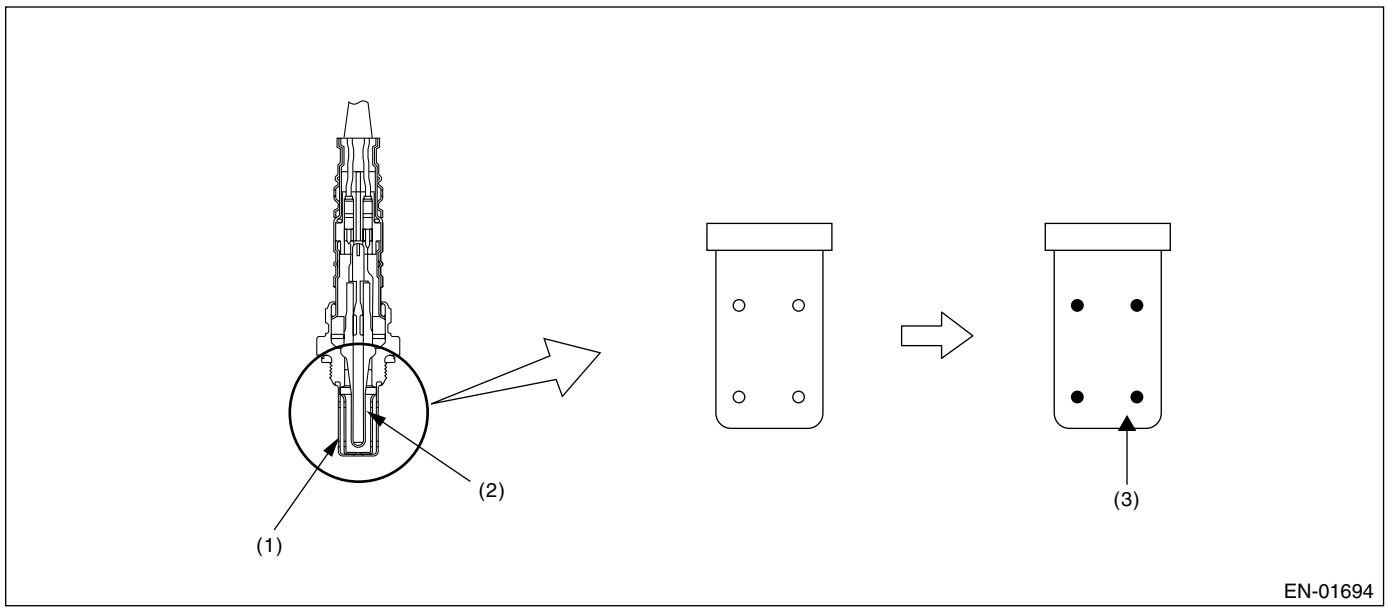
9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

X: DTC P0133 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

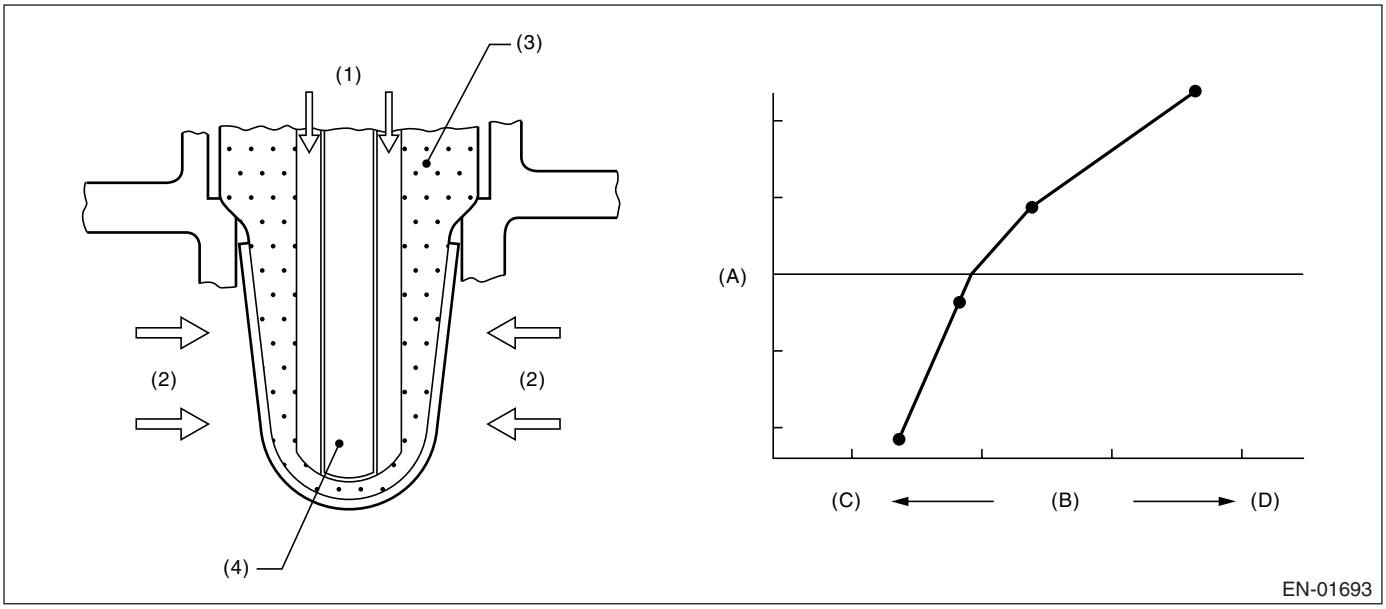
1. OUTLINE OF DIAGNOSIS

Detect time-lag of front oxygen (A/F) sensor response. Front oxygen (A/F) sensor cover has some ventilation holes for exhaust gas. Clogged ventilation holes are diagnosed. When the holes are clogged, the A/F output variation becomes slow comparing with the actual A/F variation because oxygen which reaches the zirconia layer is insufficient. Therefore, if the cover has clogged holes, the rich to lean judgment in ECM is delayed when the change from rich to lean is caused.



(1) Cover
(2) Zirconia
(3) Clogging

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Diagnosis of A/F response	Not done
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback	operating
Impedance of front oxygen (A/F) sensor	0 ←→ 52 Ω
After engine starting	120 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Engine speed	1,000 ←→ 3,200 rpm
Vehicle speed	10 ←→ 120 km/h (6.21 ←→ 74.6 MPH)
Amount of intake air	10 ←→ 31 g/s
Engine load change during 0.5 engine rev.	≤ 0.01 g/rev
All conditions for EVAP canister purge	to be in enable
Learning value of EVAP conc. during purge	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis only once at a constant speed of 10 to 120 km/h (6.21 to 74.6 MPH) in 120 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Integrate the difference of faf in every 131 milliseconds and difference of λ value.
After integrate 1,640 times (215 seconds), calculate the diagnosis value.
Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
parafca = td2faf/td2lmd where, td2faf (N) = td2faf (n−1) + |d2faf (n)| td2lmd (N) = td2lmd (n−1) + |d2lmd (n)| add up for a total of 215 seconds d2faf (n) = (faf (n) − faf (n−1)) − (faf (n−1) − faf (n−2)) d2lmd (n) = (lmd (n) − lmd (n−1)) − (lmd (n−1) − lmd (n−2)) faf = main feedback compensation coefficient every 131 milliseconds lmd = output lambda every 131 milliseconds	≥ 0.30

Time Needed for Diagnosis: 215 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

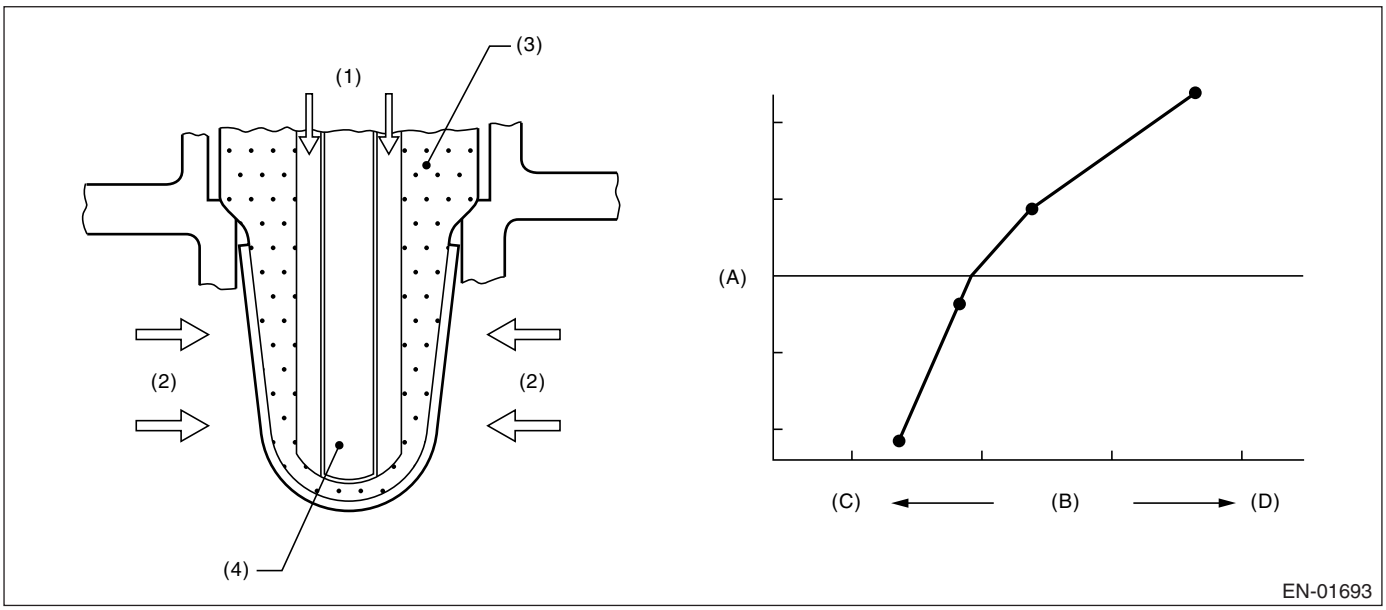
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

Y: DTC P0134 O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open circuit of front oxygen (A/F) sensor heater. Diagnosis is performed using front oxygen (A/F) sensor IC, and communication is established between front oxygen (A/F) sensor IC and main IC. Front oxygen (A/F) sensor judges NG when the impedance of front oxygen (A/F) sensor is abnormal.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Front oxygen (A/F) sensor judges NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (4.6 seconds). Front oxygen (A/F) sensor judges OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Impedance of front oxygen (A/F) sensor	> 500 Ω

Time Needed for Diagnosis: 4.6 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor IC communication: Not allowed to communicate
- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0.
- Purge control: Not allowed to purge

9. ECM OPERATING AT DTC SETTING

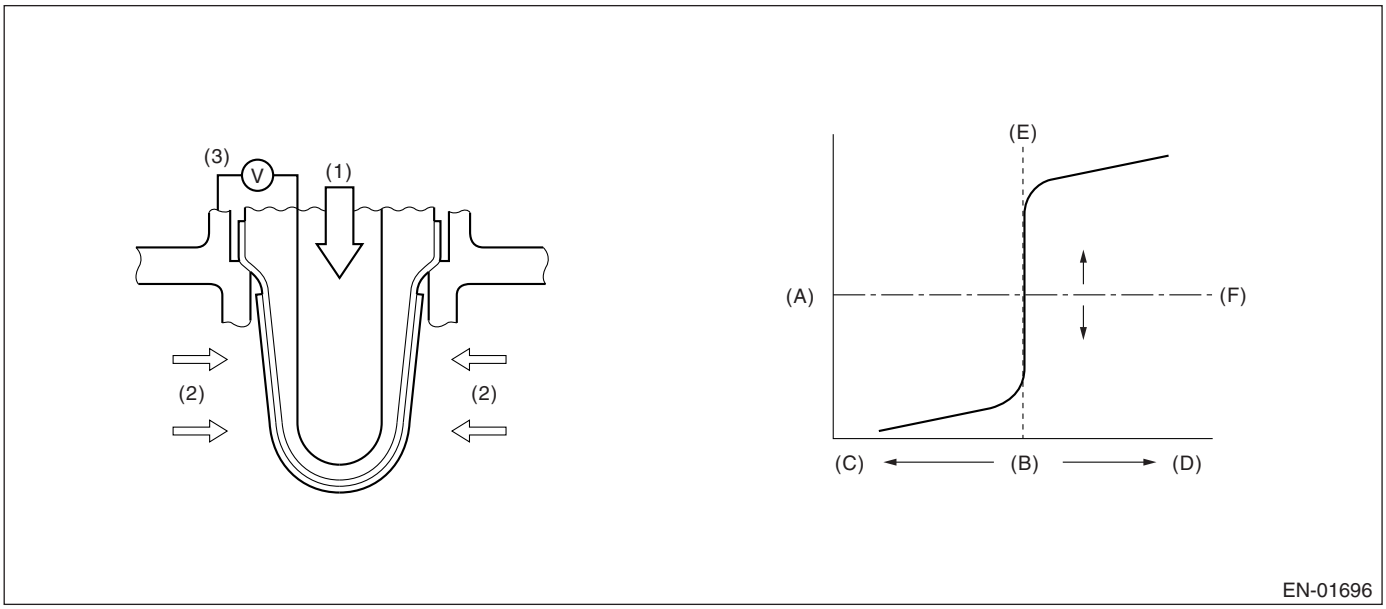
Memorize the freeze frame data. (For test mode $02)

Z: DTC P0137 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of rear oxygen sensor open or short circuit. Judge NG when the rear oxygen sensor voltage may be abnormal from rear oxygen sensor voltage value with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Low side diagnosis of rear oxygen sensor voltage with main feedback control	Incomplete
Closed loop control with main feedback control	In operation
Target output voltage of rear oxygen sensor with main feedback control	≥ 0.54 V
Amount of intake air with main feedback control	≥ 10 g/s
Engine coolant temperature with main feedback control	≥ 75°C (167°F)
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor with main feedback control	Not in limit value
Battery voltage with main feedback control	> 10.9 V
Cumulative time for completing the conditions with main feedback control	≥ 200 seconds
5 seconds or more fuel shut-off in decel.	Experienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Max. output voltage	< 490 mV

Time Needed for Diagnosis: 200 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Low side diagnosis of rear oxygen sensor voltage	Incomplete
Max. output voltage	≥ 490 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

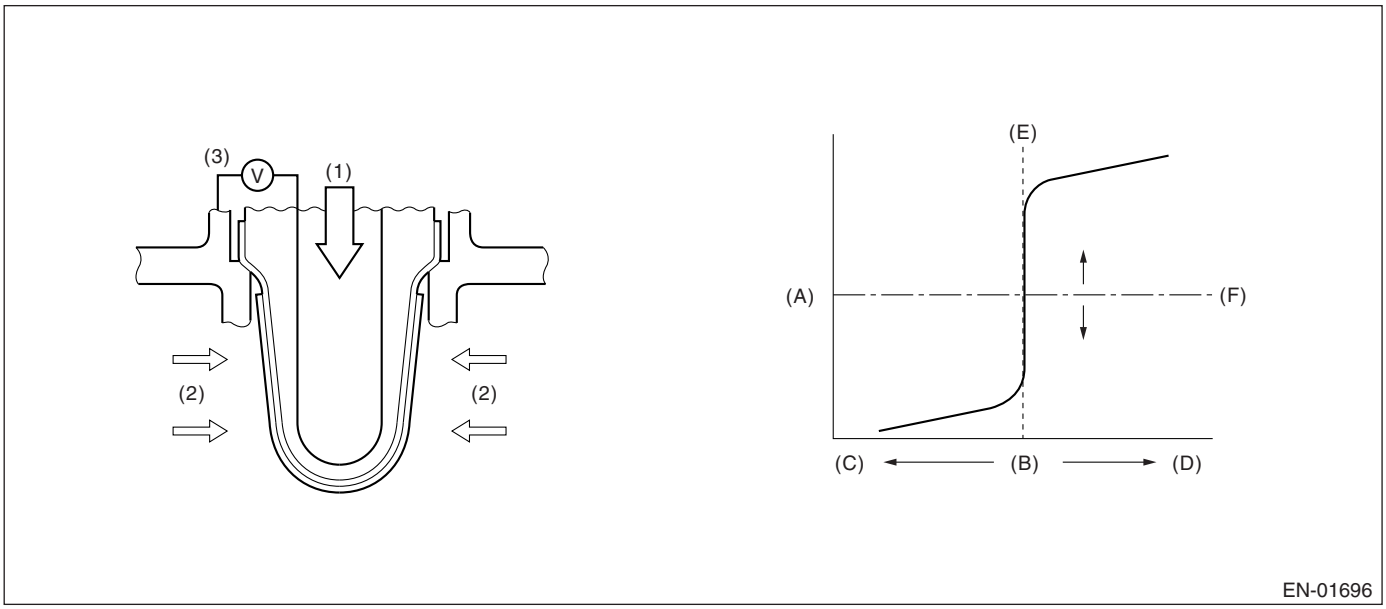
Memorize the freeze frame data. (For test mode $02)

AA:DTC P0138 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of rear oxygen sensor open or short circuit. Judge NG when the rear oxygen sensor voltage may be abnormal with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
High side diagnosis of rear oxygen sensor voltage with main feedback control	Incomplete
Closed loop control with main feedback control	In operation
Target output voltage of rear oxygen sensor with main feedback control	≥ 0.54 V
Amount of intake air with main feedback control	≥ 10 g/s
Engine coolant temperature with main feedback control	≥ 75°C (167°F)
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor with main feedback control	Not in limit value
Battery voltage with main feedback control	> 10.9 V
Cumulative time for completing the conditions with main feedback control	≥ 200 seconds
5 seconds or more fuel shut-off in decel.	Experienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Min. output voltage	> 250 mV

Time Needed for Diagnosis: 200 seconds
Malfunction Indicator Light Illumination: Detect when malfunction occurs in 2 continuous driving cycles.
• Normality Judgment

Judge OK when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
High side diagnosis of rear oxygen sensor voltage	Incomplete
Min. output voltage	≤ 250 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AB:DTC P0139 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

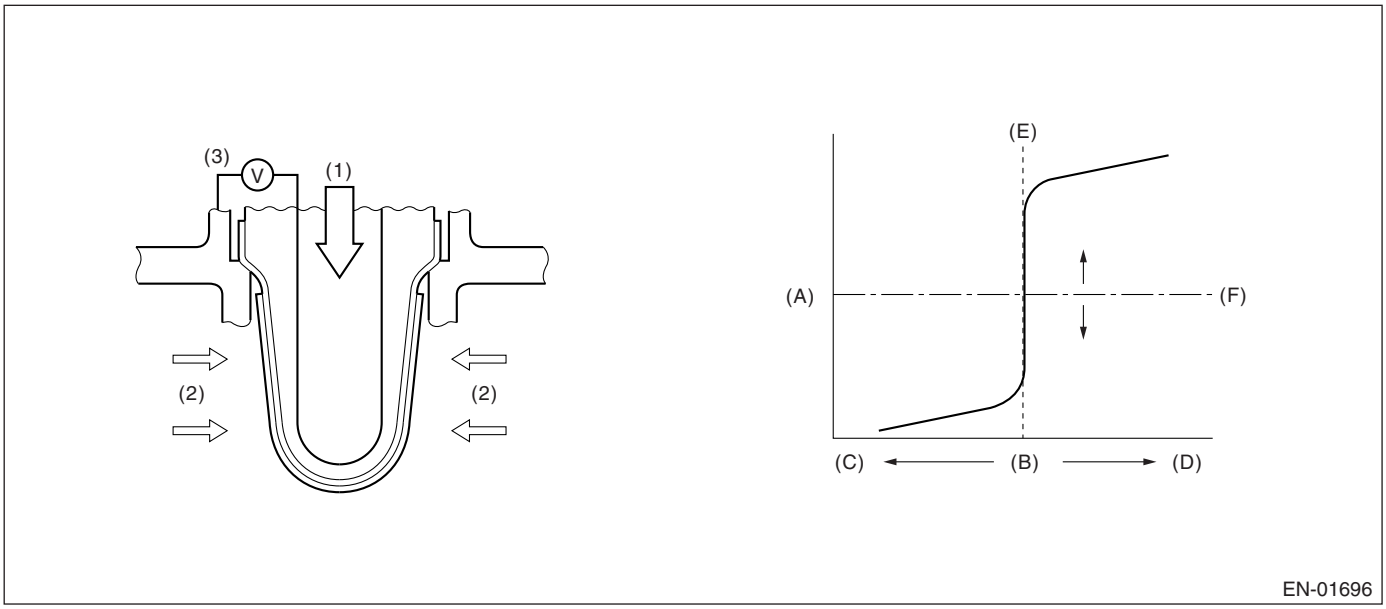
1. OUTLINE OF DIAGNOSIS

Detect the slow response of rear oxygen sensor.

• Diagnostic Method

Measure the response time of the output change of the rear oxygen sensor when the A/F ratio changes from rich to lean. And Judge NG when the measured response time is larger than the threshold value.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) Electromotive force

(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

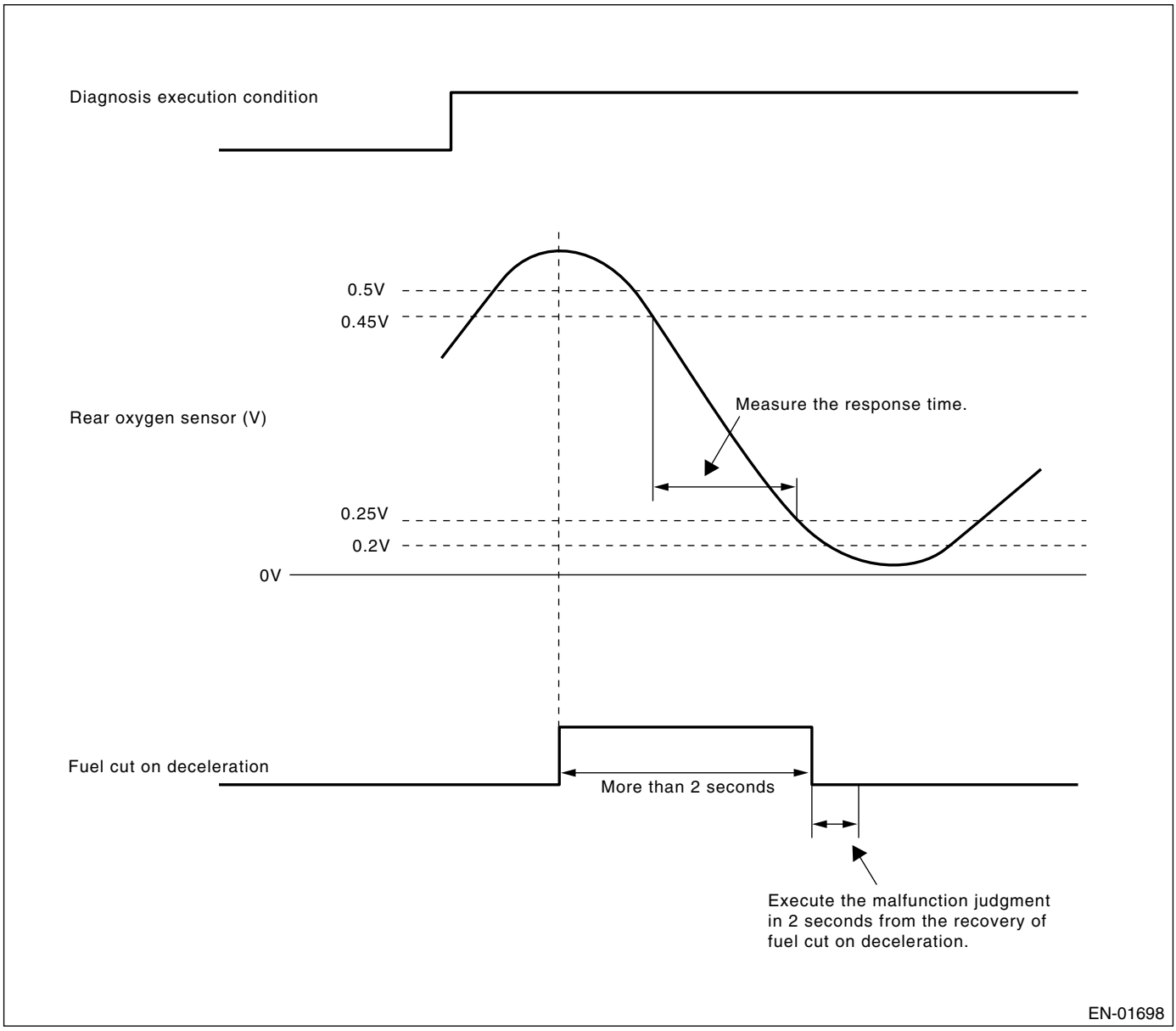
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F main feedback control condition	Completed
Deterioration diagnosis for rear oxygen sensor response	Not completed

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration in order to calculate the diagnostic value. (Pay attention to oxygen sensor voltage for the timing of deceleration.)

5. DIAGNOSTIC METHOD

When the rear oxygen sensor output voltage changes from 0.5 V (rich) to 0.2 V (lean), calculate the Min. value of response time regarded as judgment value while the output varies from 0.45 V to 0.25 V.



• Abnormality Judgment

Judge NG when the judgment value is larger than the threshold value after fuel shut-off in deceleration.
Response time (Diagnosis value) > Threshold value → Abnormal
Judge NG when the malfunction criteria below are completed in 2 seconds after the recovery of fuel shut-off in deceleration which requires 5 seconds or more. Judge OK when the malfunction criteria below are not completed regardless of the fuel shut-off in deceleration.

NOTE:
Variation time of rear oxygen sensor output voltage is short during fuel shut-off in deceleration. Carry out the NG judgment only after the fuel shut-off in deceleration. As for OK judgment, without the condition of fuel shut-off in deceleration, judge OK if the value is below the threshold value.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from rich (450 mV O_2 output) to lean (250 mV) if voltage reduces from 500 mV to 200 mV.	≥ 327 milliseconds

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

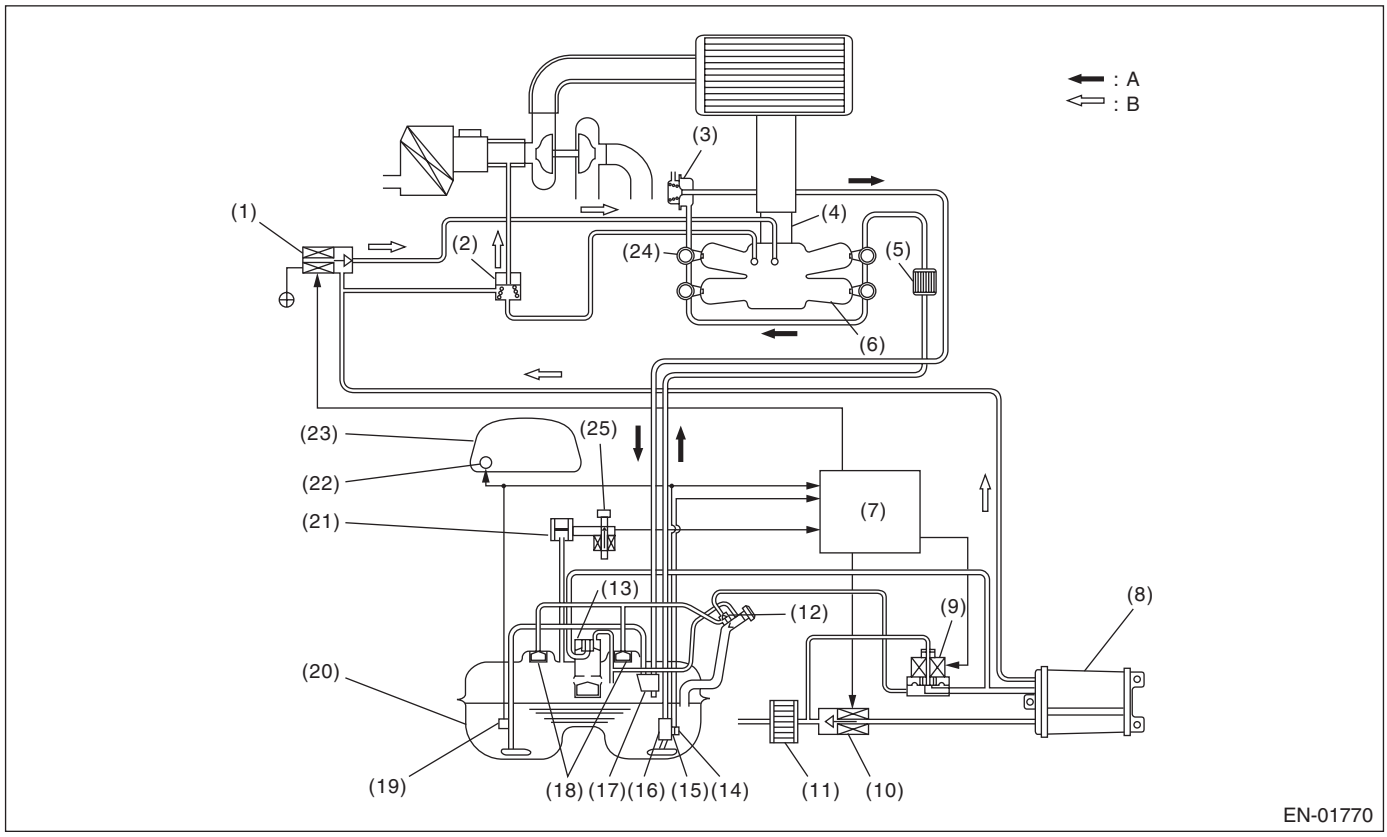
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AC:DTC P0171 SYSTEM TOO LEAN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

• Fuel System Diagnosis



(1) Purge control solenoid valve
(2) Purge valve
(3) Pressure regulator
(4) Throttle body
(5) Fuel filter
(6) Intake manifold
(7) Engine control module (ECM)
(8) Canister
(9) Pressure control solenoid valve
(10) Drain valve
(11) Drain filter
(12) Shut-off valve
(13) Vent valve
(14) Fuel temperature sensor
(15) Fuel level sensor
(16) Fuel pump
(17) Jet pump
(18) Fuel cut valve
(19) Fuel sub level sensor
(20) Fuel tank
(21) Fuel tank pressure sensor
(22) Fuel meter
(23) Combination meter
(24) Fuel injector
(25) Tank pressure switching solenoid valve

• Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	75 ←→ 119°C (167 ←→ 246°F)
Engine load	Map 5 or more
Intake air change during 0.5 engine rev.	≤ 0.01 g/rev
Learning value of EVAP conc. during purge	≤ 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	30 seconds or more

Map 5

Engine speed (rpm)	idle	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400
Measured value (g/rev)	na	0.181	0.173	0.154	0.169	0.171	0.181	0.193	0.201	0.211	0.208

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 60 km/h (37.3 MPH).

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd − tglmda) + faf + flaf	≥ fsobdL1
where,	See Map 4
sglmd = measured lambda	
tglmda = target lambda	fsobdL1 = lean side threshold value of fsobd
faf = main feedback compensation coefficient every 64 milliseconds	
flaf = main feedback learning compensation coefficient	

Map 4 Threshold value for fuel system malfunction criteria

Amount of air (g/s)	0	2.4	4.7	7	9.4	11.7	
fsobdL1 (%)	40	40	36.9	32.0	27.0	26.5	

Time Needed for Diagnosis: 10 seconds × 3 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd − tglmda) + faf + flaf	< 19%

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 driving cycles.
- When “Clear Memory” was performed

7. FAIL SAFE

Rich side malfunction
- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

8. ECM OPERATING AT DTC SETTING

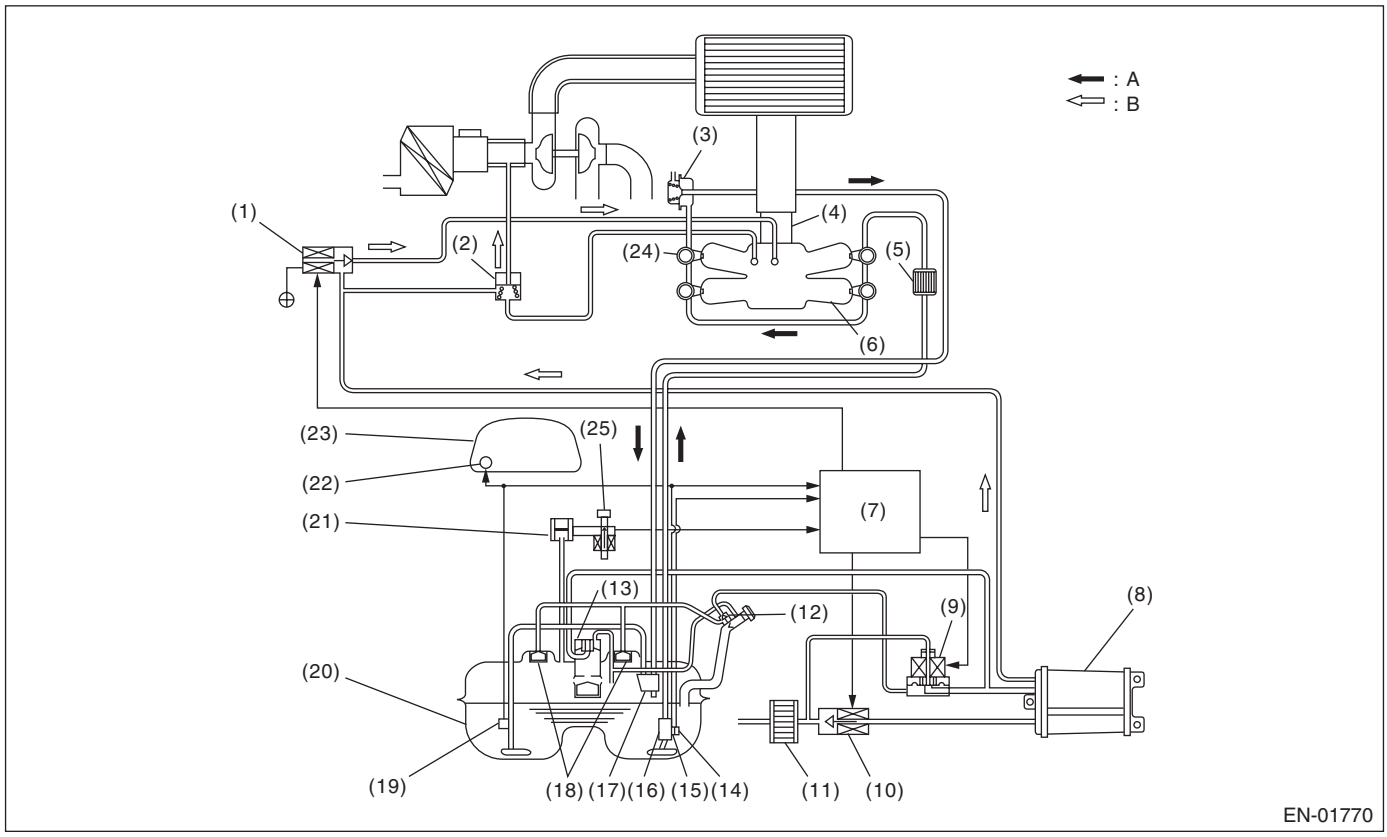
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AD:DTC P0172 SYSTEM TOO RICH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

• Fuel System Diagnosis



(1) Purge control solenoid valve
(2) Purge valve
(3) Pressure regulator
(4) Throttle body
(5) Fuel filter
(6) Intake manifold
(7) Engine control module (ECM)
(8) Canister
(9) Pressure control solenoid valve
(10) Drain valve
(11) Drain filter
(12) Shut-off valve
(13) Vent valve
(14) Fuel temperature sensor
(15) Fuel level sensor
(16) Fuel pump
(17) Jet pump
(18) Fuel cut valve
(19) Fuel sub level sensor
(20) Fuel tank
(21) Fuel tank pressure sensor
(22) Fuel meter
(23) Combination meter
(24) Fuel injector
(25) Tank pressure switching solenoid valve

• Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	75 ←→ 119°C (167 ←→ 246°F)
Engine load	Map 5 or more
Intake air change during 0.5 engine rev.	≤ 0.01 g/rev
Learning value of EVAP conc. during purge	≤ 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	30 seconds or more

Map 5

Engine speed (rpm)	idle	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400
Measured value (g/rev)	na	0.181	0.173	0.154	0.169	0.171	0.181	0.193	0.201	0.211	0.208

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 60 km/h (37.3 MPH).

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd − tglmda) + faf + flaf	≤ fsobdR1
where,	See Map 4
sglmd = measured lambda	fsobdR1 = rich side threshold value of fsobd
tglmda = target lambda	
faf = main feedback compensation coefficient every 64 milliseconds	
flaf = main feedback learning compensation coefficient	

Map 4

Amount of air (g/s)	0	2.4	4.7	7	9.4	11.7	
fsobdR1 (%)	−40	−40	−36.9	−32.0	−27.0	−27.0	

Time Needed for Diagnosis: 10 seconds × 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd − tglmda) + faf + flaf	≥ −20%

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When “Clear Memory” was performed

7. FAIL SAFE

Rich side malfunction
- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

8. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AE:DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE

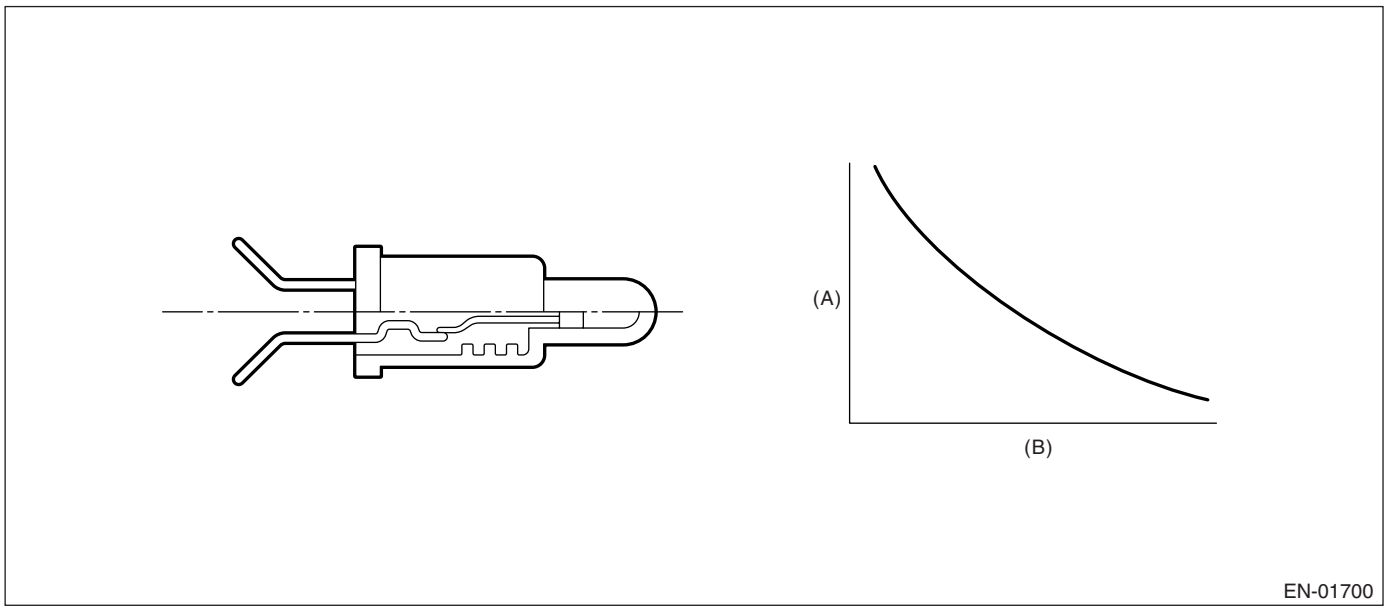
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel temperature sensor output property. Perform the diagnosis in two methods; namely, drift diagnosis and stuck diagnosis. Judge NG when either of them results in NG, and judge OK when both of them result in OK.

• Drift Diagnosis

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and make an NG judgment.

2. COMPONENT DESCRIPTION



(A) Resistance (Ω)
(B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 120 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	≥ 10 ℓ (2.64 US gal, 2.20 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature – engine coolant temperature at engine starting	> 10°C (50°F)
Fuel temperature – engine coolant temperature	≥ 10°C (50°F)
Battery voltage	> 10.9 V

Time Needed for Diagnosis: 120 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	≥ 10 ℓ (2.64 US gal, 2.20 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature – engine coolant temperature at engine starting	> 10°C (50°F)
Fuel temperature – engine coolant temperature	< 10°C (50°F)
Battery voltage	> 10.9 V

• Stuck Diagnosis

If the fuel temperature which might rise along with the engine idling (the cumulative amount of intake air after engine starting is large) does not increase, the engine is considered to be stuck and make an NG judgment.

6. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	20 seconds or more
Battery voltage	> 10.9 V

7. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

8. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 550 kg (1,212.5 lb)
Fuel temperature difference between Max. and Min.	< 3°C (37.4°F)

Time Needed for Diagnosis: To be determined.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 550 kg (1,212.5 lb)
Fuel temperature difference between Max. and Min.	≥ 3°C (37.4°F)

9. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

10.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

11.FAIL SAFE

None

12.ECM OPERATING AT DTC SETTING

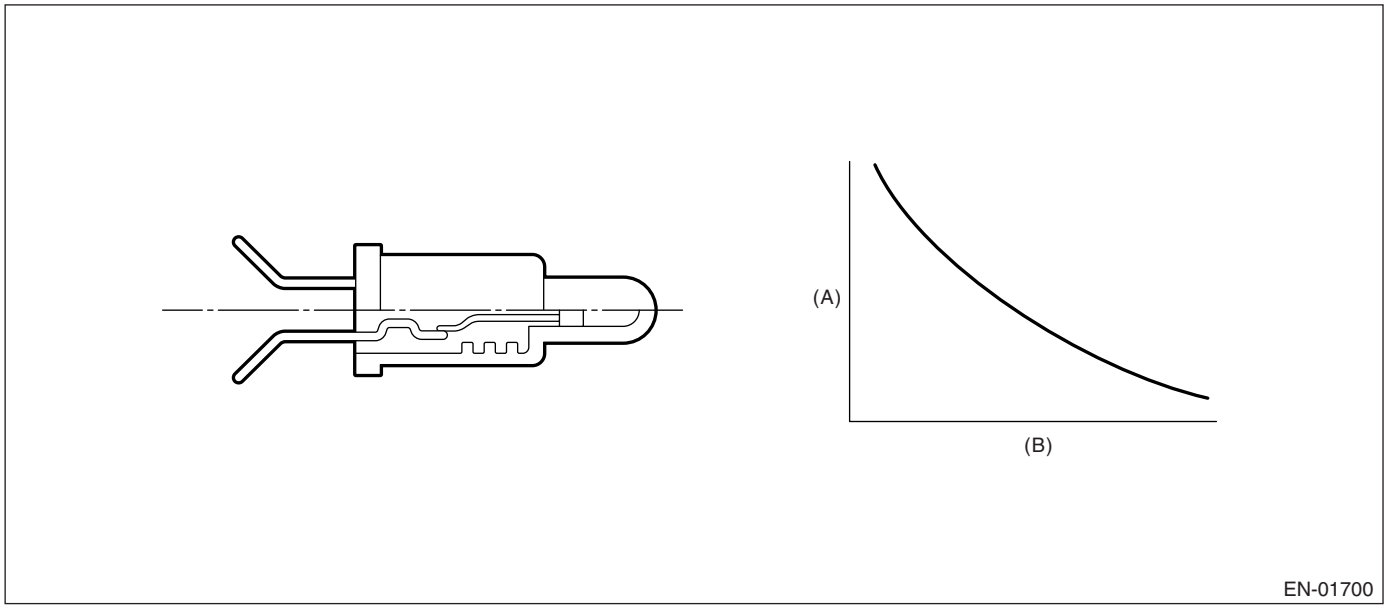
Memorize the freeze frame data. (For test mode $02)

AF:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(A) Resistance (Ω)
(B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.245 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.245 V
Battery voltage	≥ 10.9 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

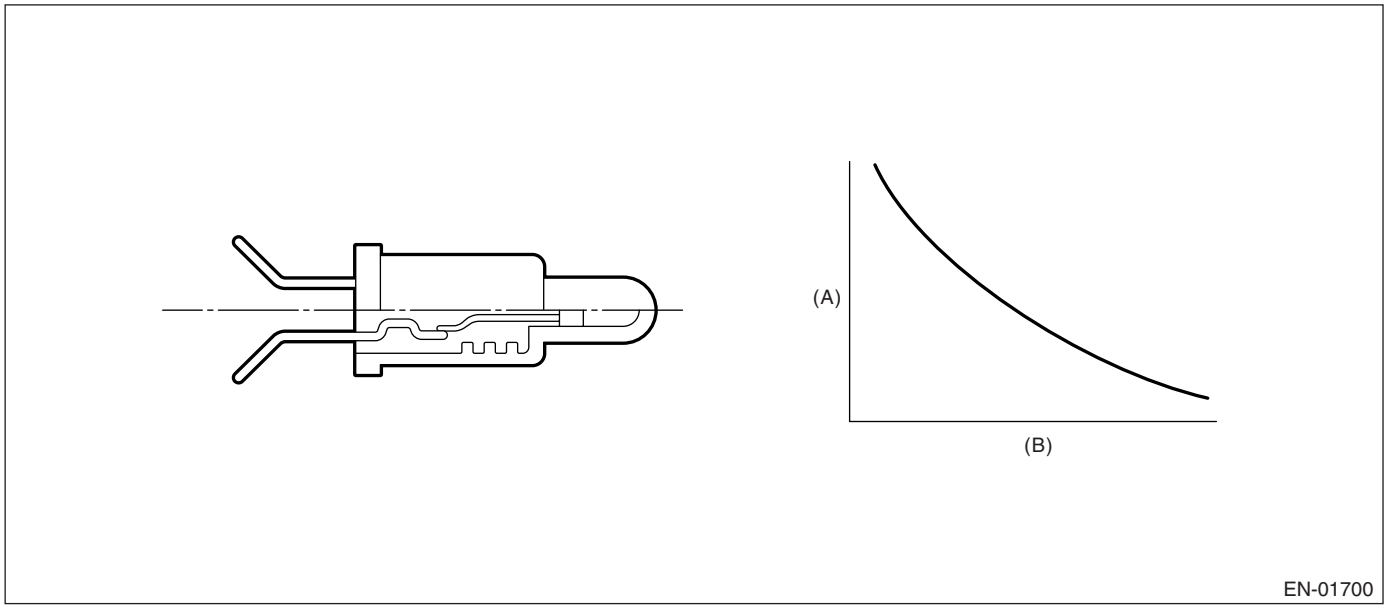
Memorize the freeze frame data. (For test mode $02)

AG:DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(A) Resistance (Ω)
(B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.72 V
Battery voltage	≥ 10.9 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

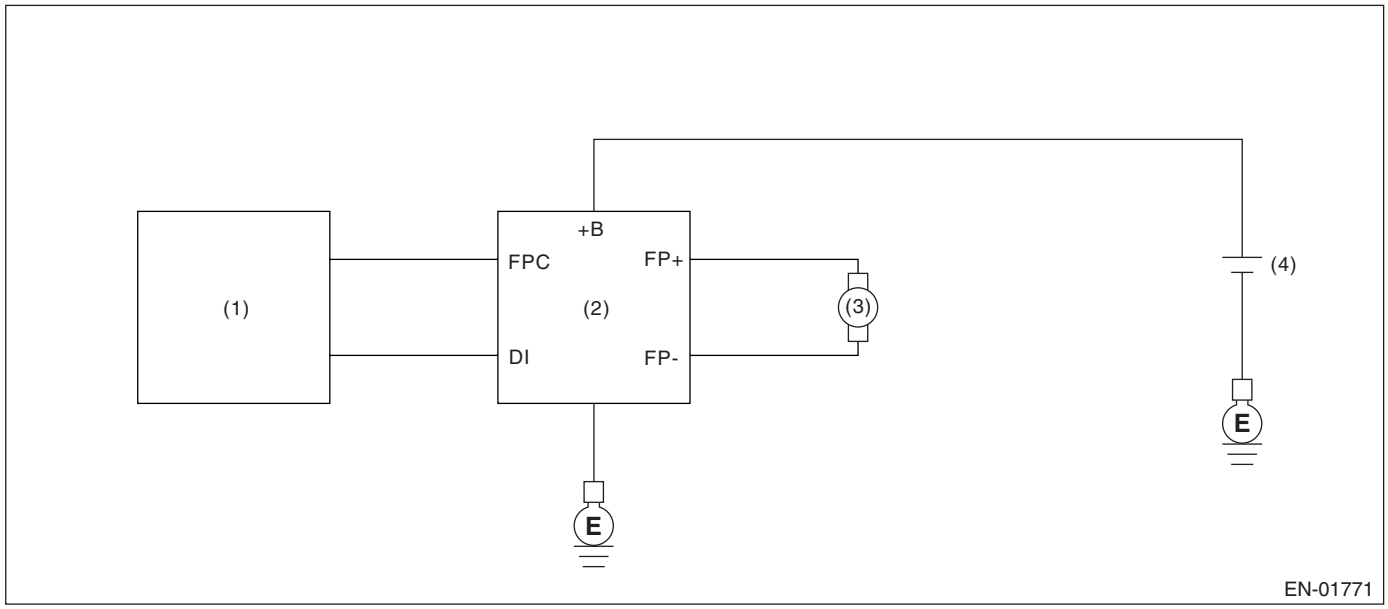
Memorize the freeze frame data. (For test mode $02)

AH:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel pump control unit. Judge NG when the NG signal is sent through a diagnostic line coming from the fuel pump control unit. Fuel pump control unit detects the open or short circuit malfunction for each line, and then sends NG signals if one of them is found NG.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel pump control unit
(3) Fuel pump
(4) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
After engine starting	30 seconds or more
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
After engine starting	30 seconds or more
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

OFF setting may be needed depending on the NG portion.

9. ECM OPERATING AT DTC SETTING

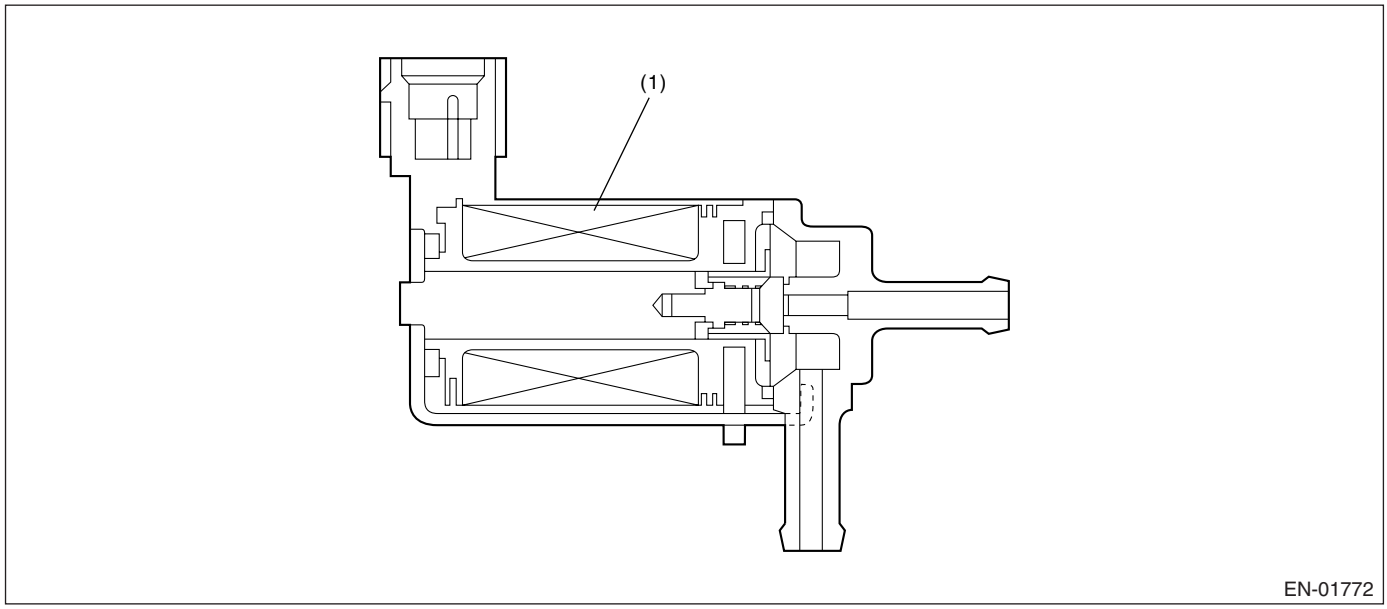
Memorize the freeze frame data. (For test mode $02)

AI: DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of wastegate control solenoid valve function. Judge NG when becoming high wastegate pressure.

2. COMPONENT DESCRIPTION



(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Intake manifold pressure	≥ 240 kPa (1,800 mmHg, 70.8 inHg)

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

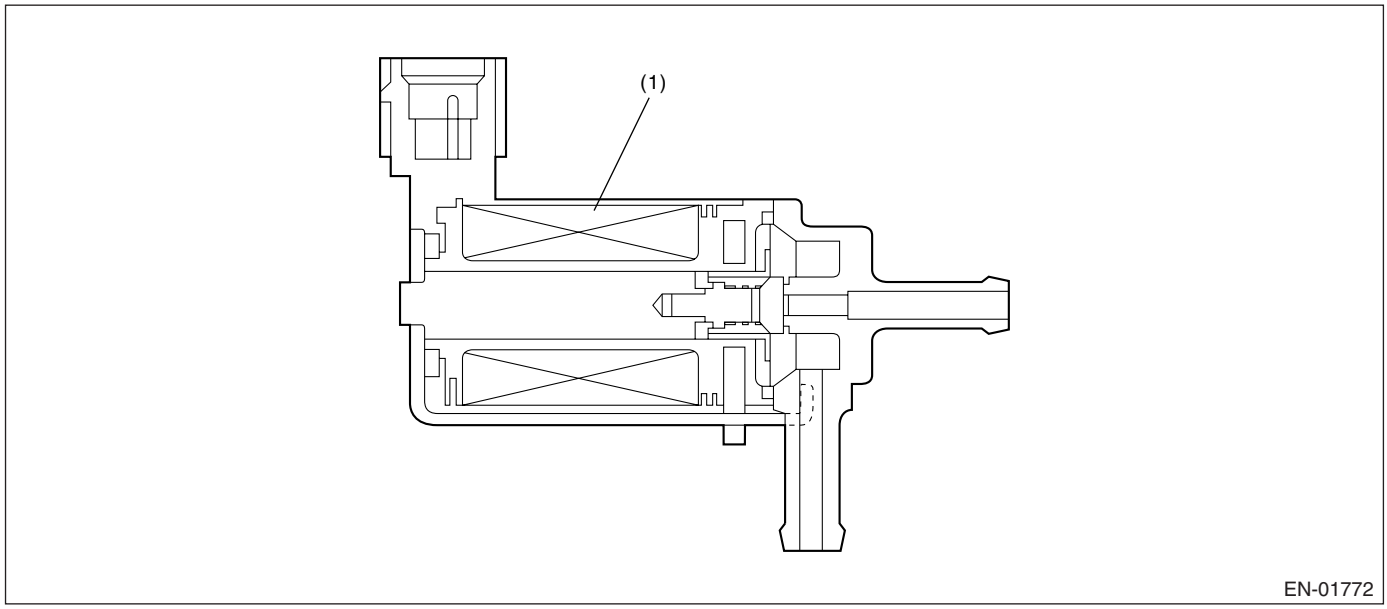
Memorize the freeze frame data. (For test mode $02)

AJ:DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of wastegate control solenoid valve. Judge NG when the terminal output voltage remains Low during outputting the duty signal.

2. COMPONENT DESCRIPTION



(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starts.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio for turbocharged pressure control when terminal output voltage is Low	< 75%

Time Needed for Diagnosis: 655 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

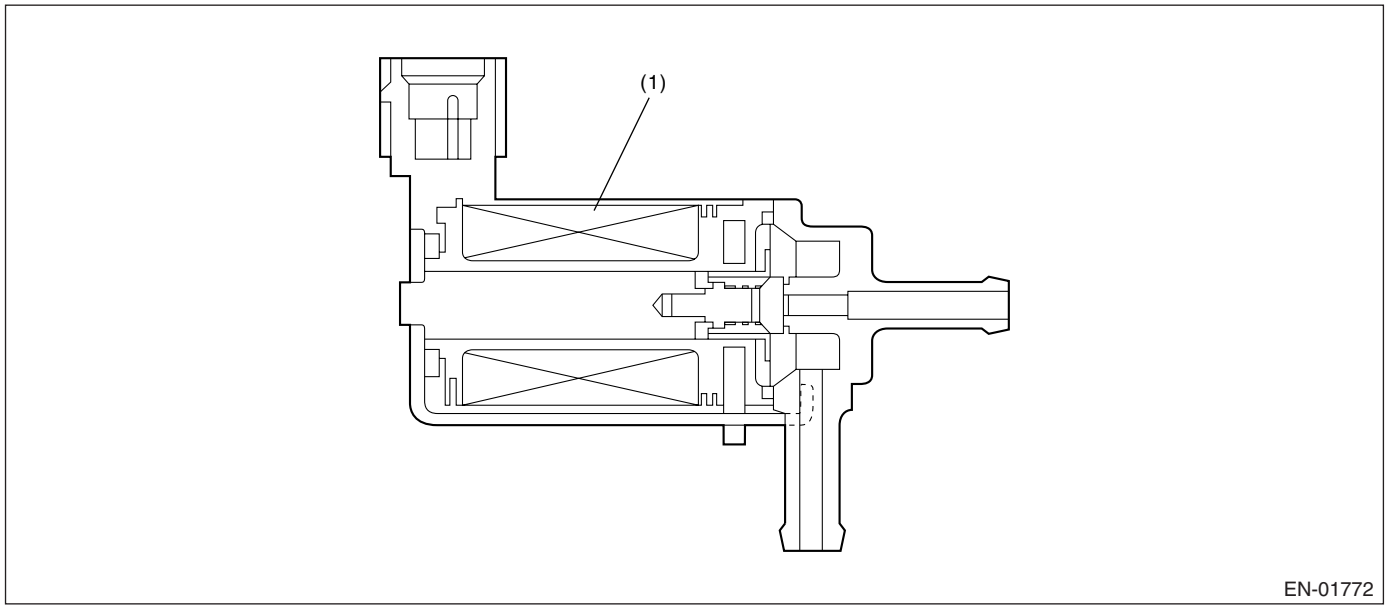
Memorize the freeze frame data. (For test mode $02)

AK:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of wastegate control solenoid valve. Judge NG when the terminal output voltage remains Low or High during outputting the duty signal.

2. COMPONENT DESCRIPTION



(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starts.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio for turbocharged pressure control when output terminal voltage is High	> 25%

Time Needed for Diagnosis: 655 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AL:DTC P0301 CYLINDER 1 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

Detect whether the misfire occurred or not. (Revolution fluctuation method) Monitoring the misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has three patterns below.

- Intermittent misfire (The same cylinder misfires in random, or different cylinders misfire in random.): FTP 1.5 times misfire
- Every time misfire (The same cylinder misfires every time.): FTP 1.5 times misfire, Catalyst damage misfire

The following detecting methods are adopted for these detection.

1) Intermittent misfire: FTP 1.5 times misfire
- 180° Interval Difference Method (MT: 1,800 rpm or less; AT: None)
- 360° Interval Difference Method (whole range)
- 720° Interval Difference Method (3,000 rpm or less)

2) Every time misfire: FTP 1.5 times misfire, Catalyst damage misfire
- 360° Interval Difference Method

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Intake manifold pressure change during 0.5 engine rev.	< 14.7 kPa (110 mmHg, 4.34 inHg) @AT
	< 16.0 kPa (120 mmHg, 4.72 inHg) @MT
Engine speed change	< 500 rpm / 32 milliseconds
Throttle position change during 16 milliseconds	< 10°
Fuel shut-off function	Not operating
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
AT torque control	Not operating
Air condition	Not switching ON ←→ OFF
Radiator fan	Not switching ON ←→ OFF
Power steering switch	Not switching ON ←→ OFF
Starter	ON or OFF or change from ON to OFF
Evaporative system leak check	Not in operation
Engine speed	500 — 7,000 rpm
Intake manifold pressure	> Map 3 or more
Battery voltage	≥ 8 V

Map3

MT (Vehicle Speed < 64.4 km/h (40 MPH))

rpm	700	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000
kPa (mmHg, inHg)	29.5 (221, 8.70)	28.5 (214, 8.41)	28.4 (213, 8.38)	28.4 (213, 8.38)	28.4 (213, 8.38)	26.5 (199, 7.82)	29.8 (223.5, 8.79)	31.6 (237, 9.32)	33.9 (254.5, 10.0)	35.1 (263, 10.4)	36.6 (274.5, 10.8)	41.7 (313, 12.3)	46.7 (350.5, 13.8)	52.3 (392, 15.4)

MT (Vehicle Speed ≥ 64.4 km/h (40 MPH))

rpm	700	1,000	1,500	2,000	2,500	3,000	3,500	4,000	700	4,500	5,000	5,500	6,000	6,500
kPa (mmHg, inHg)	29.5 (221, 8.70)	28.5 (214, 8.41)	34.9 (261.8, 10.3)	41.3 (309.5, 12.2)	43.6 (326.8, 12.9)	42.4 (318.1, 12.5)	47.1 (353.6, 13.9)	46.3 (347.1, 13.7)	29.5 (221, 8.70)	49.6 (371.9, 14.6)	49.1 (368.3, 14.5)	49.9 (374.2, 14.7)	50.7 (380.2, 15.0)	51.5 (386.1, 15.2)

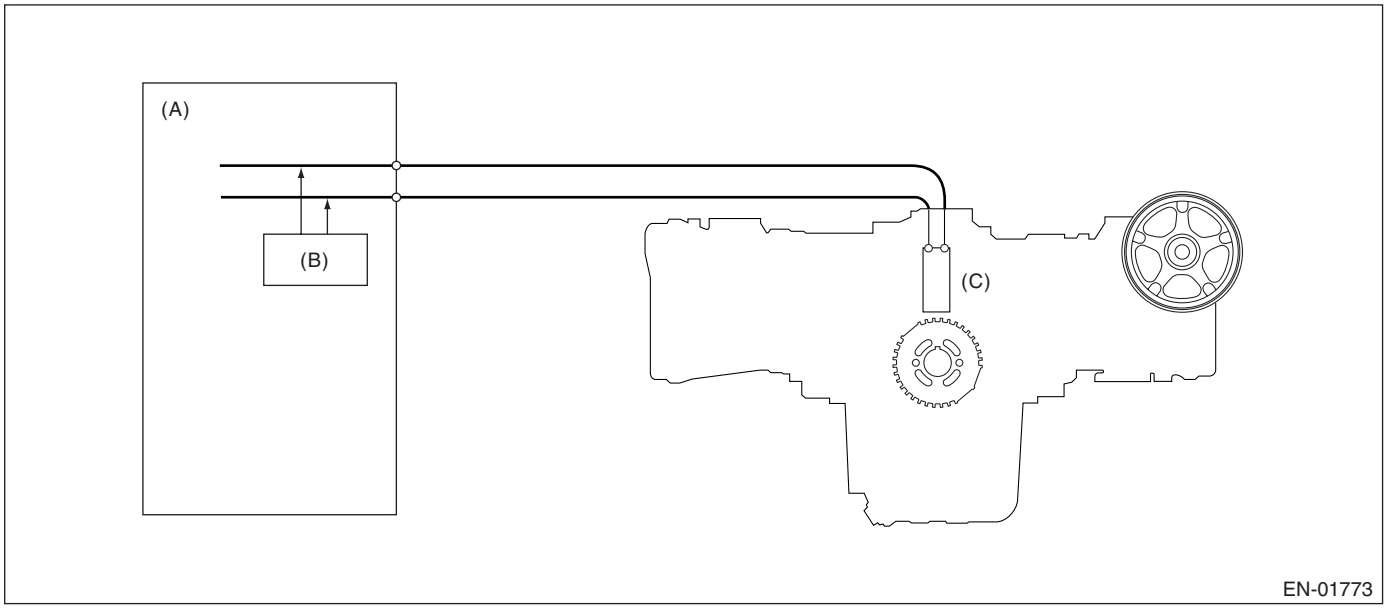
AT

rpm	700	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	7,000
kPa (mmHg, inHg)	32.7 (242, 9.65)	25.9 (194, 7.64)	26.1 (196, 7.70)	27.5 (206, 8.11)	28.4 (213, 8.38)	26.4 (198, 7.79)	31.8 (238.5, 9.38)	31.1 (256, 9.17)	35.8 (268.5, 10.6)	37.6 (282, 11.1)	39.0 (292.5, 11.5)	43.3 (325, 12.8)	48.6 (364.5, 14.3)	52.3 (392, 15.4)

3. GENERAL DRIVING CYCLE

- Detecting misfire is able to be carried out in the condition between idling and high revolution; however, idling condition is better for detecting misfire from the viewpoint of engine load and damage.
- Perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

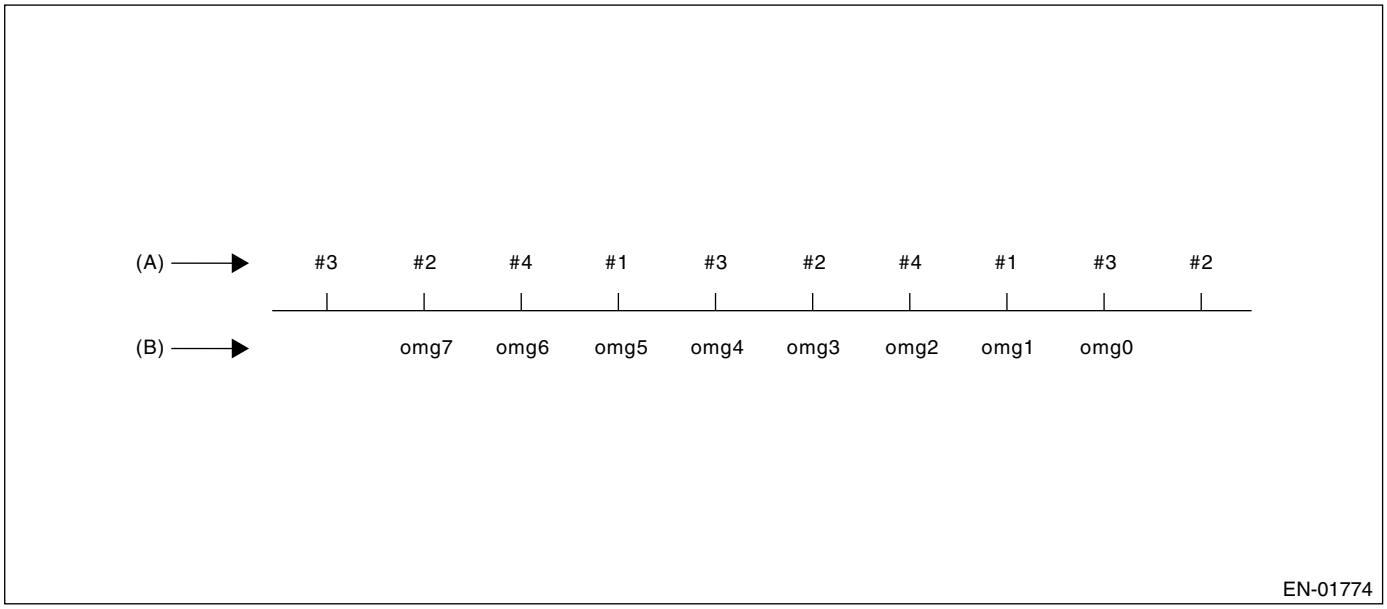


(A) Engine control module (ECM)
(B) Diagnosis circuit
(C) Crankshaft position sensor

When the misfire occurred, the engine speed is decreased and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed by the following formula, and judge whether the misfire occurs or not comparing the calculated result with judgment value. Counting the number of misfire up, and if the misfire ratio is higher during 1,000 rev. or 200 rev., judge NG for the corresponding cylinder.

Calculate the diagnostic value (from crankshaft position speed)	→	Misfire detection every single ignition (Compare diagnostic value with judgment value) • 180° Interval Difference Method • 360° Interval Difference Method • 720° Interval Difference Method	→	NG judgment (Judge misfire occurrence required by the law) (Compare number of misfire with judgment) • FTP1.5 times misfire NG judgment • Catalyst damage misfire NG judgment

As the following figure, pick out a random cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, and the following is the same.



(A) Ignition order
(B) Crankshaft position speed

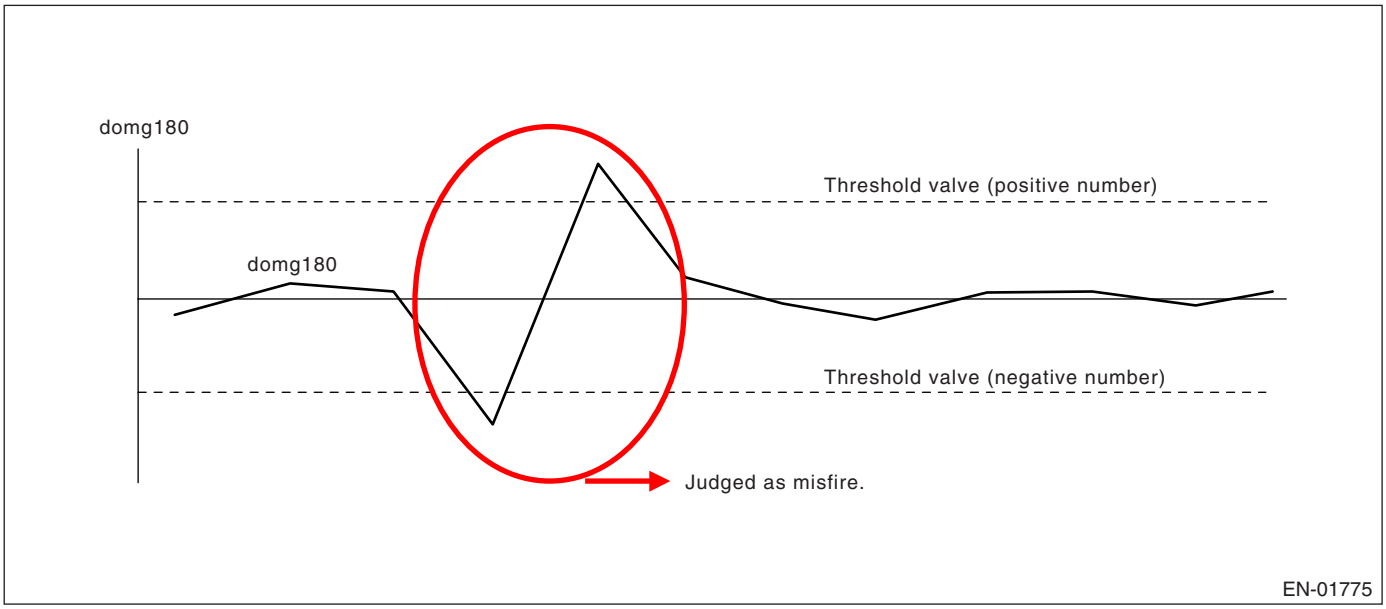
• 180° Interval Difference Method

Diagnosis value domg180 = (omg –1 omg 0) – (omg 7 – omg 1)/6

Judge misfire occurs in the following cases.

- domg 180 > judgment value of positive side
- domg 180 ≤ judgment value of negative side

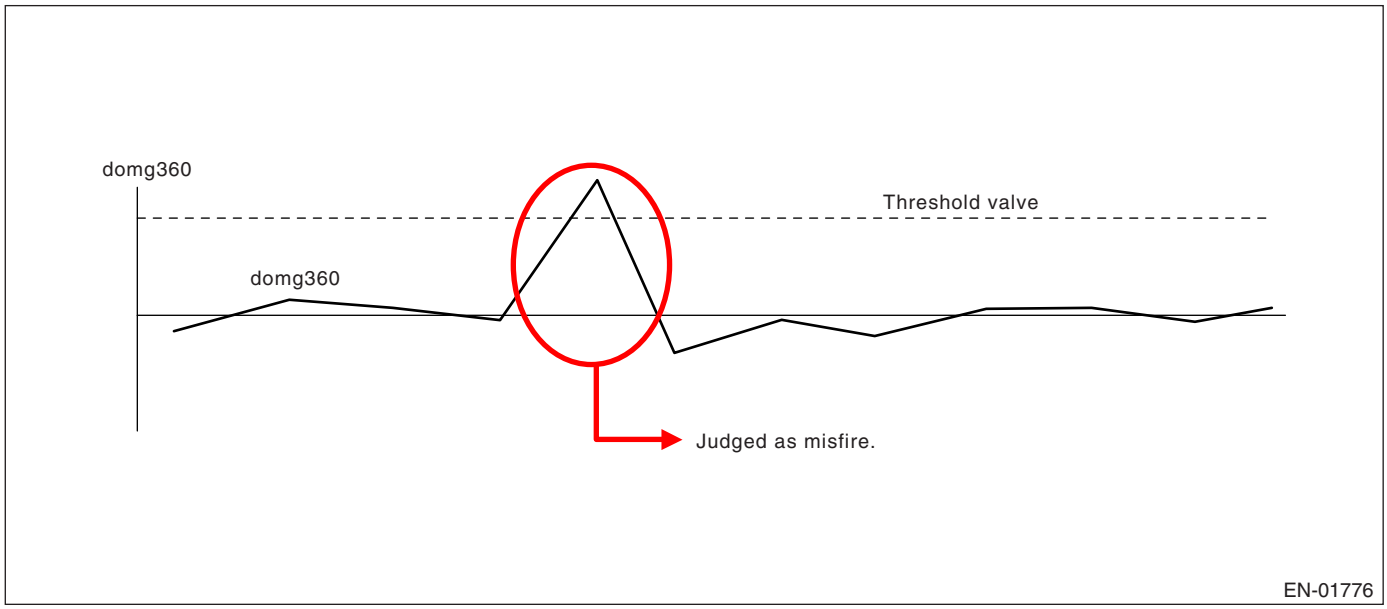
(judgment value before 180°CA)



• 360° Interval Difference Method

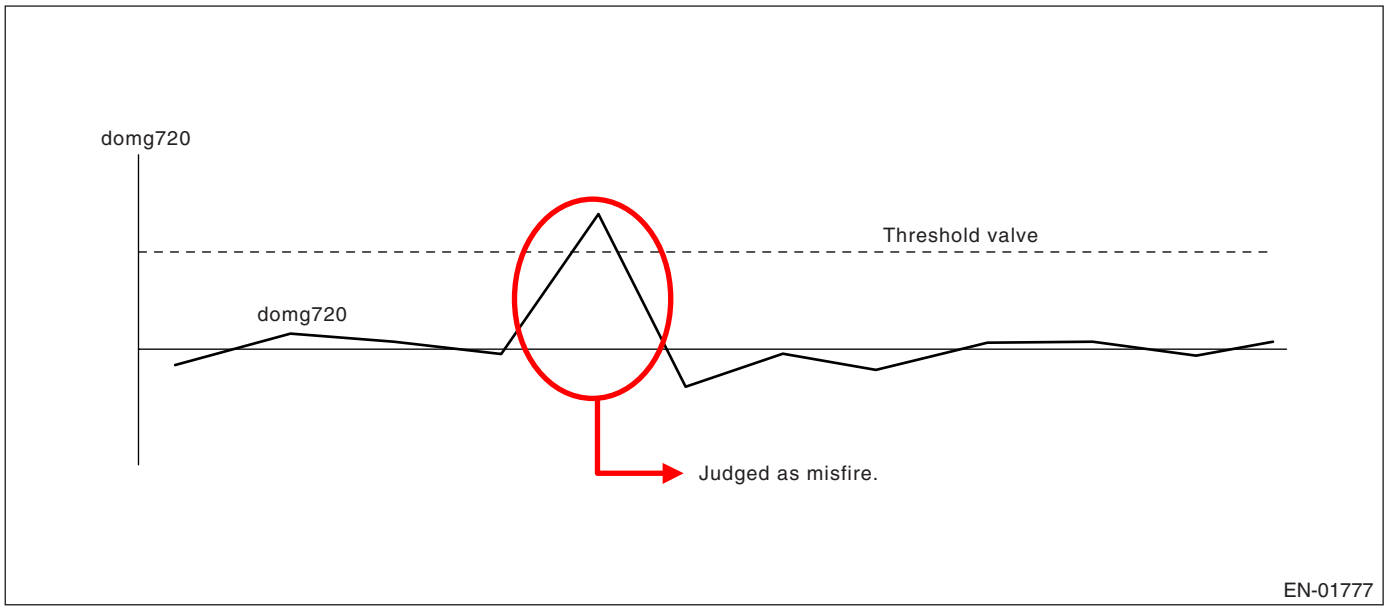
Diagnosis value domg 360 = (omg 1 – omg 0) – (omg 4 – omg 3)

Misfire judgment domg 360 > judgment value → Misfire occurs



• 720° Interval Difference Method

Diagnosis value	domg 720 = (omg 1 – omg 0) – (omg 7 – omg 6)		
Misfire judgment	domg 720 > judgment value	→	Misfire occurs



• FTP 1.5 times misfire (Misfire occurrence level affecting exhaust gas)

Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 1,000 engine revs.)

Malfunction Criteria	Threshold Value
FTP emission judgment value	> 1.0% in 1,000 revs.

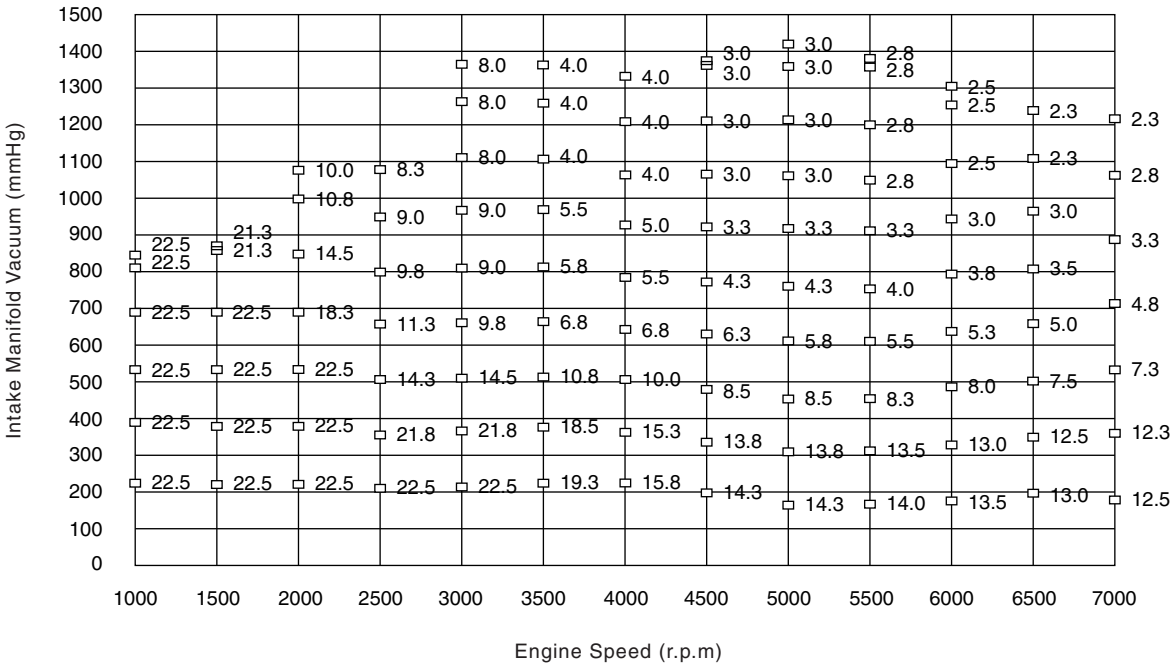
Time Needed for Diagnosis: 1,000 engine revs.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Catalyst damage misfire (Misfire occurrence level damaging catalyst)

Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 200 engine revs. (400 ignitions))

Malfunction Criteria	Threshold Value
Catalyst damage misfire judgment value	See Map 1

Map 1 Fault criteria threshold for misfire which would result in catalyst damage



These figures mean the misfire ratio (%) in 400 ignitions; for example, 22.5 (%) means 400 (ignition) × 22.5 (%) = 90 (ignition) or more, so this case is judged misfire.

Time Needed for Diagnosis: 200 engine revs.

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AM:DTC P0302 CYLINDER 2 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-88, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AN:DTC P0303 CYLINDER 3 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-88, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AO:DTC P0304 CYLINDER 4 MISFIRE DETECTED

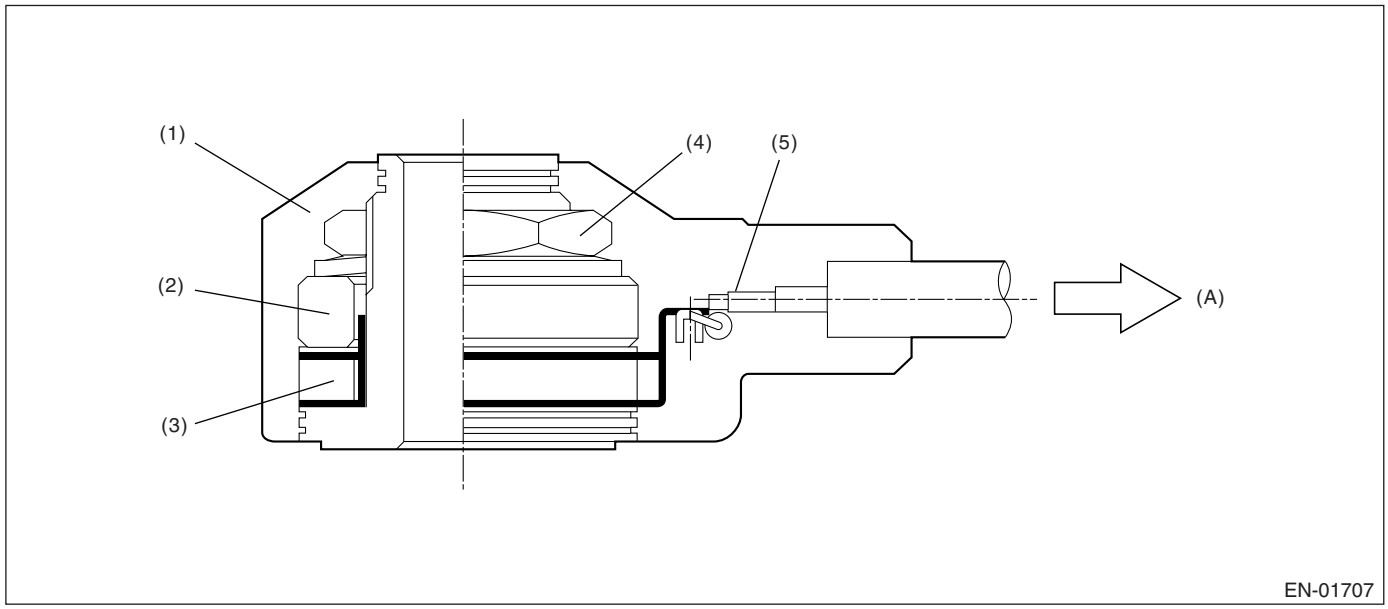
NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-88, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AP:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance
(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.2 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.2 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Ignition timing knock correction: Fixed at −5°CA (5°CA retarded angle)

9. ECM OPERATING AT DTC SETTING

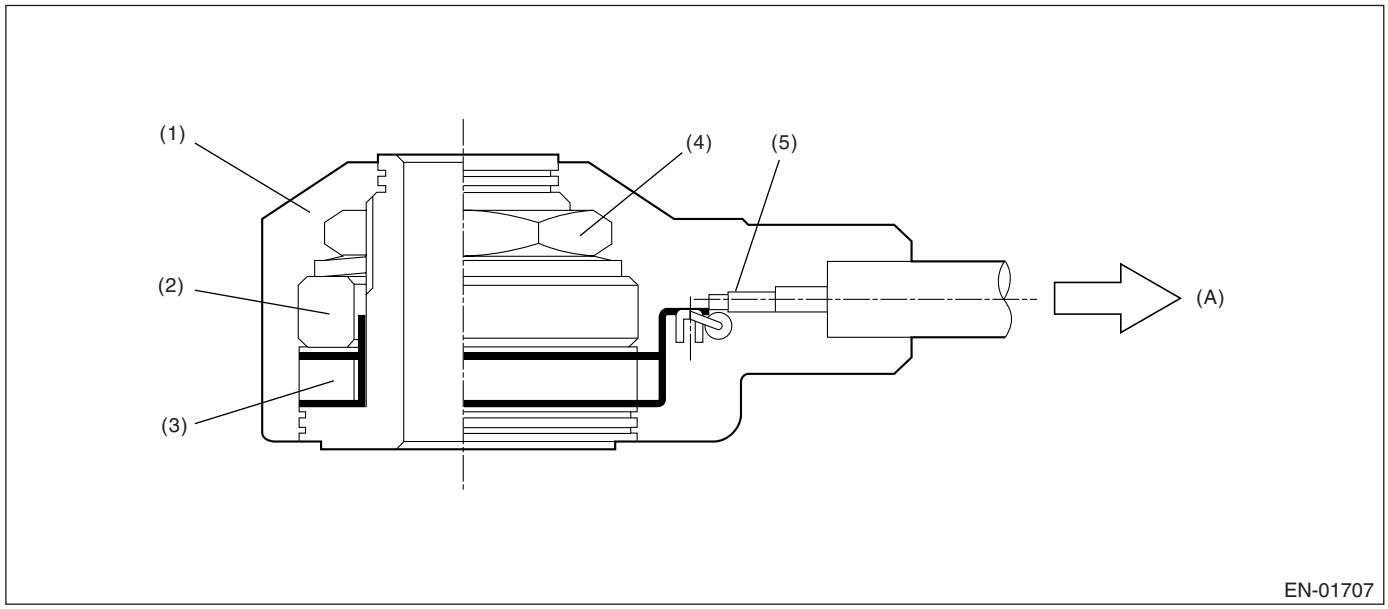
Memorize the freeze frame data. (For test mode $02)

AQ:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance
(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.8 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.8 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Ignition timing knock correction: Fixed at −5°CA (5°CA retarded angle)

9. ECM OPERATING AT DTC SETTING

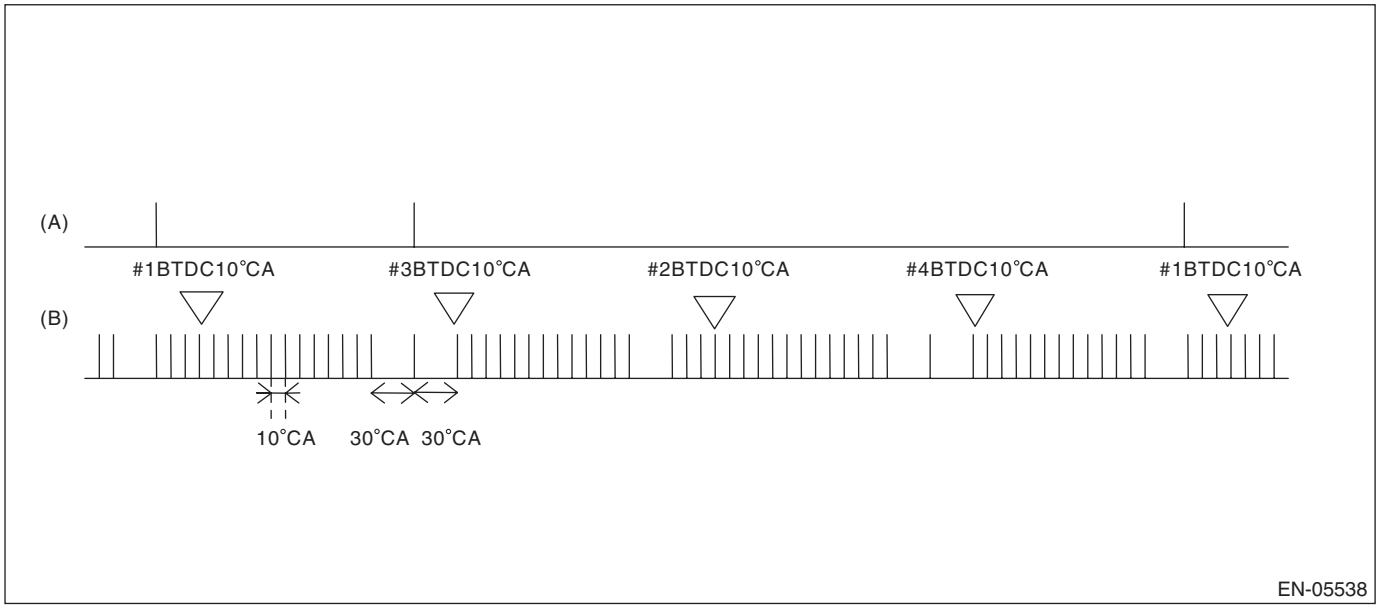
Memorize the freeze frame data. (For test mode $02)

AR:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

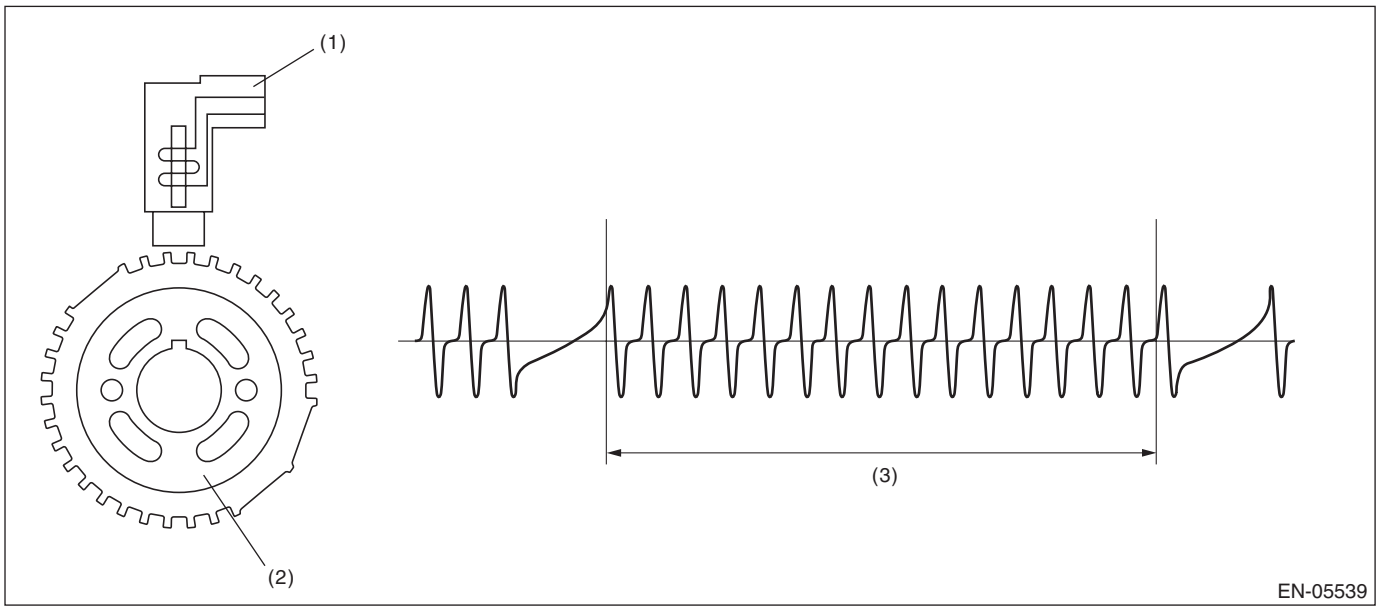
1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of crankshaft position sensor. Judge NG when the crankshaft signal does not input regardless of turning the starter.

2. COMPONENT DESCRIPTION



(A) Camshaft signal
(B) Crankshaft signal



(1) Crankshaft position sensor
(2) Crankshaft sprocket
(3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Crankshaft position sensor signal	Not detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	Input exists
Battery voltage	≥ 8 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

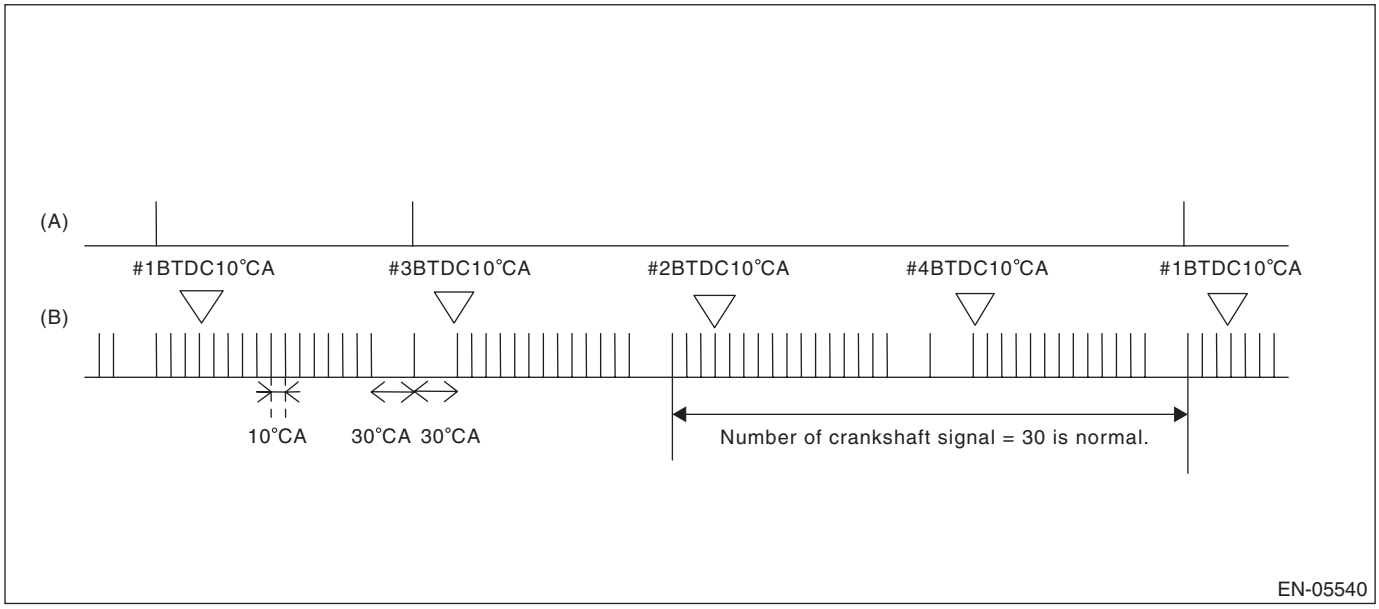
Memorize the freeze frame data. (For test mode $02)

AS:DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE

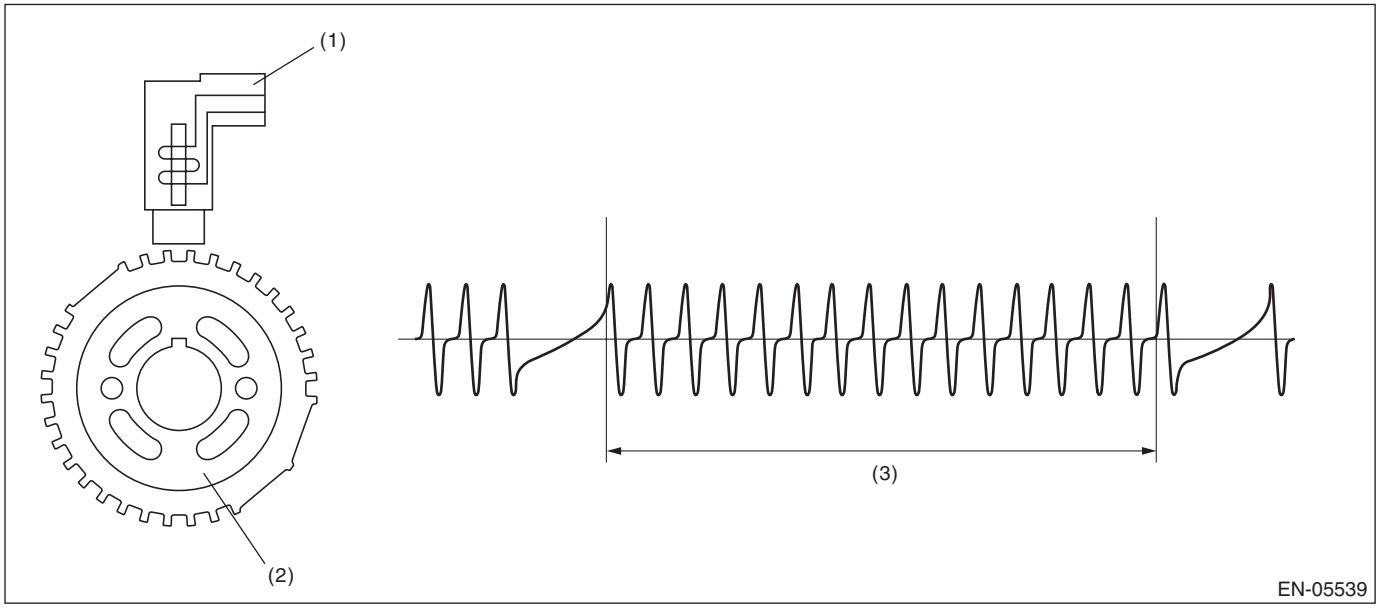
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of crankshaft position sensor output property. Judge NG when the number of crankshaft signal every 1 revolution becomes abnormal.

2. COMPONENT DESCRIPTION



(A) Camshaft signal
(B) Crankshaft signal



(1) Crankshaft position sensor
(2) Crankshaft sprocket
(3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8 V
Engine speed	< 3,000 rpm

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3,000 rpm engine speed.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when all the malfunction criteria below are completed more than 10 times in a row.
Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number distinction	Completed
Amount of crank sensor signal during 1 rev.	Not = 30

Time Needed for Diagnosis: 10 engine revs.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number distinction	Completed
Amount of crank sensor signal during 1 rev.	= 30

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

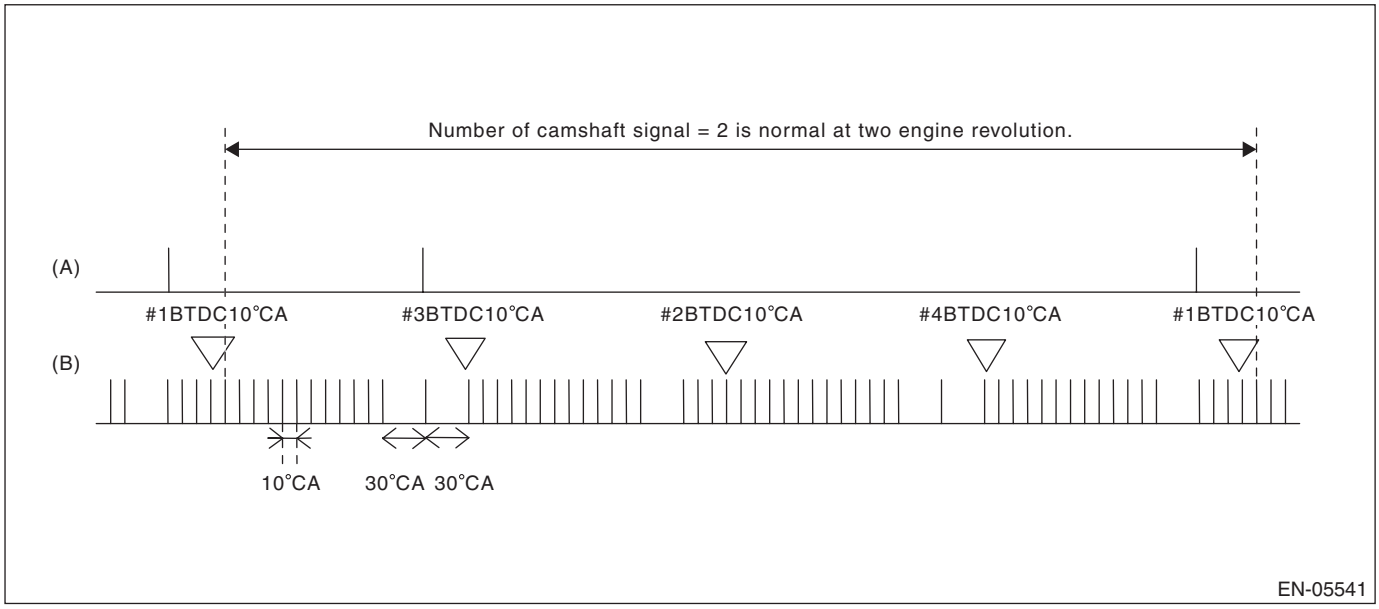
Memorize the freeze frame data. (For test mode $02)

AT:DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

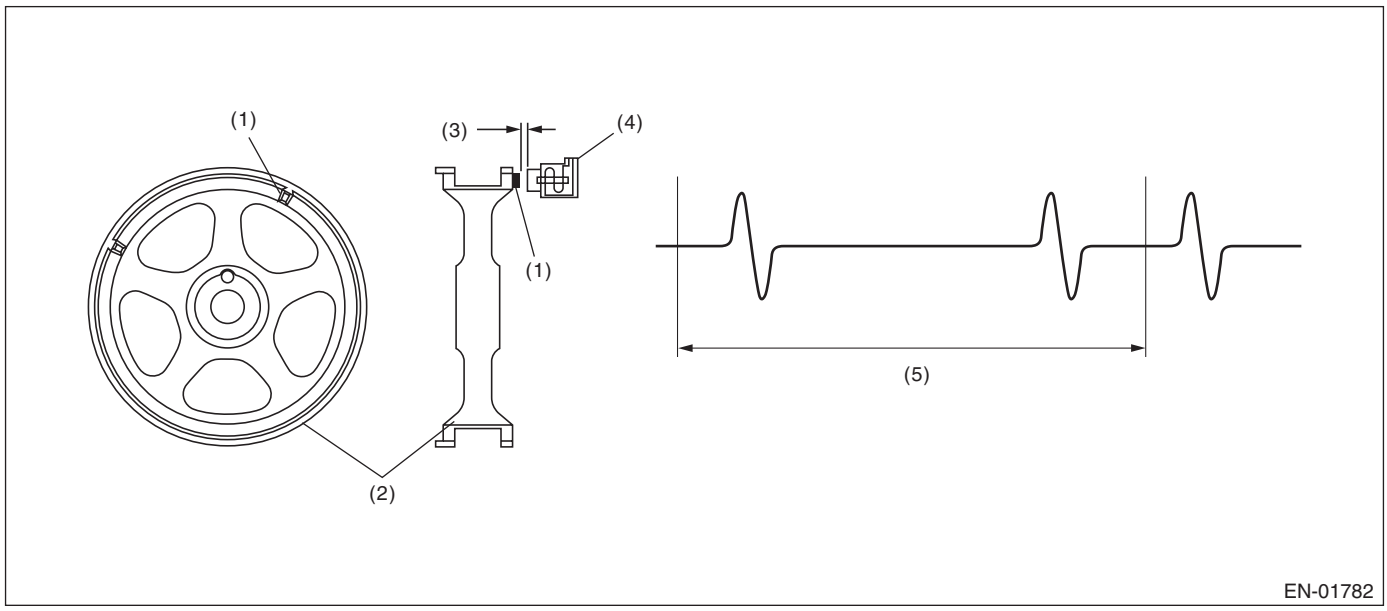
1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of camshaft position sensor. Judge NG when the number of camshaft signal remains to be abnormal.

2. COMPONENT DESCRIPTION



(A) Camshaft signal
(B) Crankshaft signal



(1) Boss
(2) Camshaft sprocket
(3) Air gap
(4) Camshaft position sensor
(5) Camshaft one revolution (Engine two revolutions)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the engine speed continues more than 8 revolutions.
Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
Amount of camshaft sensor signal during 2 revs.	≠ 2

Time Needed for Diagnosis: 8 revs.
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.
• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
Amount of camshaft sensor signal during 2 revs.	= 2

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

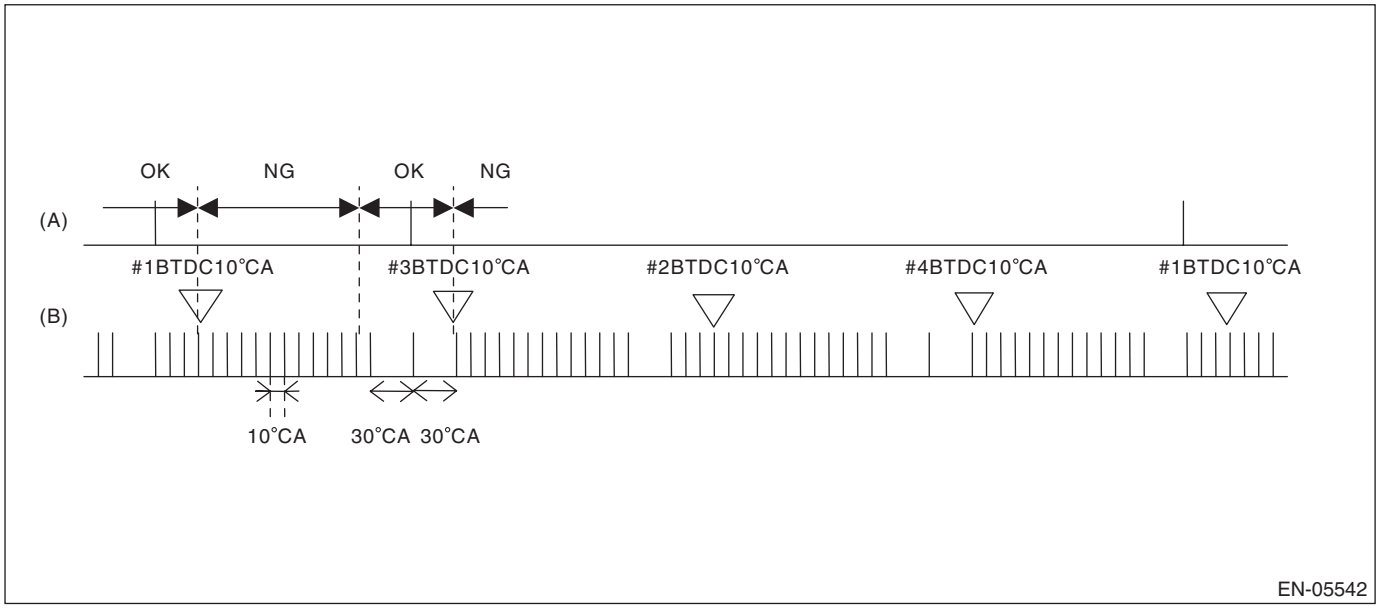
Memorize the freeze frame data. (For test mode $02)

AU:DTC P0341 CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR)

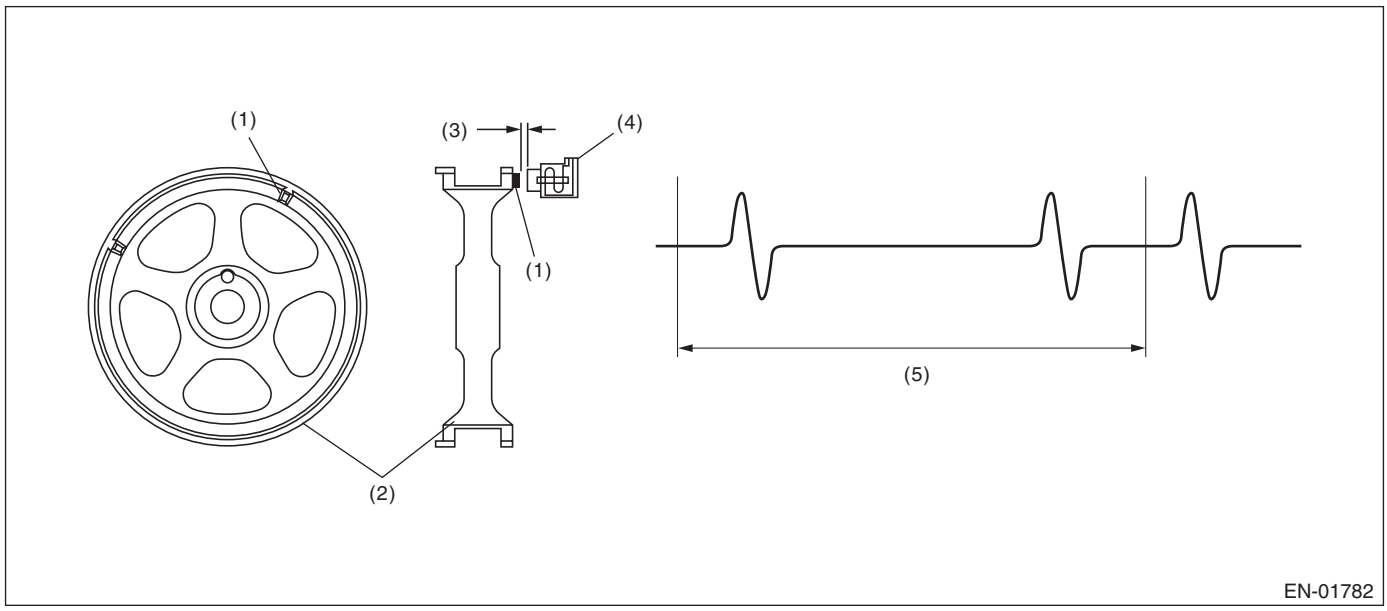
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of camshaft position sensor output property. Judge NG when the camshaft line signal input timing is shifted from the crankshaft signal because of timing belt tooth chip, etc.

2. COMPONENT DESCRIPTION



(A) Camshaft signal
(B) Crankshaft signal



(1) Boss
(2) Camshaft sprocket
(3) Air gap
(4) Camshaft position sensor
(5) Camshaft one revolution (Engine two revolutions)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Cylinder number distinction	Completed
Battery voltage	≥ 8 V
Engine speed	550 ←→ 1,000 rpm
Engine operation	In idle
Misfire	Not detect

4. GENERAL DRIVING CYCLE

Perform the diagnosis at idling continuously.

5. DIAGNOSTIC METHOD

Judge NG when the engine speed continues 5 revolutions for the malfunction criteria below. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Position of camshaft position sensor signal	Not between BTDC 10°CA and BTDC 80°CA

Time Needed for Diagnosis: 5 revs.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

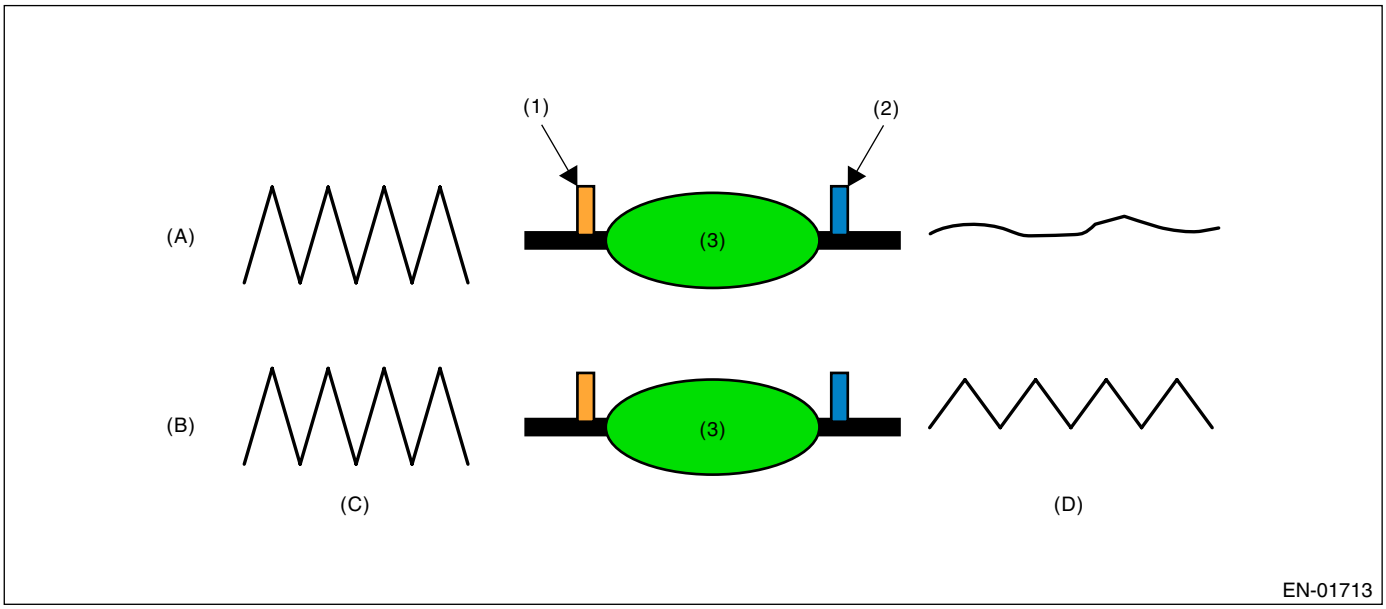
Memorize the freeze frame data. (For test mode $02)

AV:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the deterioration of catalyst function.
Though the rear oxygen sensor output would change slowly with a new catalyst, the sensor output with a deteriorated catalyst becomes high and the inversion time is shortened. For this reason, the catalyst diagnosis is carried out by monitoring the rear oxygen sensor output and comparing it with the front A/F sensor output.

2. COMPONENT DESCRIPTION



(1) Front oxygen (A/F) sensor
(2) Rear oxygen sensor
(3) Catalyst

(A) Normal
(B) Deterioration
(C) Front oxygen (A/F) sensor waveform
(D) Rear oxygen sensor waveform

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time for keep completing all secondary parameters	1.2 seconds or more
Catalyst deterioration diagnosis	Not finished
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 65°C (149°F)
Catalyst warm-up counter on Map 2	≥ 7,600
Misfire detection during 200 engine revs.	< 5 times
Learning value of evaporation gas density	< 0.20
Sub feedback	Operating
Evaporative system diagnostic	Not in operation
Difference between actual and target time lambda < 0.10	1,000 milliseconds or more
Vehicle speed	≥ 75 km/h (46.6 MPH)
Engine speed	1,600 ←→ 3,500 rpm
Amount of intake air	10 ←→ 36 g/s
Engine load change every 0.5 engine revs.	< 0.03 g/rev
Rear O_2 output change from below 600 mV to over	Experienced after fuel cut

• Map 2

Add the following value every 524.288 milliseconds.

Catalyst warm-up counter ≤ 7,500

Amount of intake air (g/s)	0	4.7	9.4	14.1	18.8	23.4	28.1	32.8	37.5	42.2	46.9	51.6
Integrated value for warm-up counter	−15.7	−1	15.9	31.7	47.5	63.3	79.1	94.8	111	126	126	126

Catalyst warm-up counter > 7,500

Amount of intake air (g/s)	0	4.7	9.4	14.1	18.8	23.4	28.1	32.8	37.5	42.2	46.9	51.6
Integrated value for warm-up counter	−5.3	− 2	6.3	8.4	9.9	11.0	12.0	12.8	13.5	14.1	14.6	15.1

4. GENERAL DRIVING CYCLE

Perform the diagnosis once at the constant vehicle speed from 80 to 100 km/h (49.7 to 62.1 MPH).

5. DIAGNOSTIC METHOD

After the malfunction criterias are completed, calculate the output fluctuation value of front oxygen (A/F) sensor and output fluctuation value of rear oxygen sensor.
Calculate the diagnosis value when the front oxygen (A/F) sensor output fluctuation value more than specified value.
Regard the A/F response properties and diagnosis value as parameters for judgment value.
Judge NG when the malfunction criteria below are completed, and judge OK when they are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated variation of output voltage of rear oxygen sensor per 32 milliseconds × 4 divided by accumulated variation of lambda of front oxygen (A/F) sensor per 32 milliseconds × 4	≥ Map 3

Map 3

Diagnosis value	0.15	0.2	0.25	0.3
Judgment value	4	6.5	9	12

Time Needed for Diagnosis: 20 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

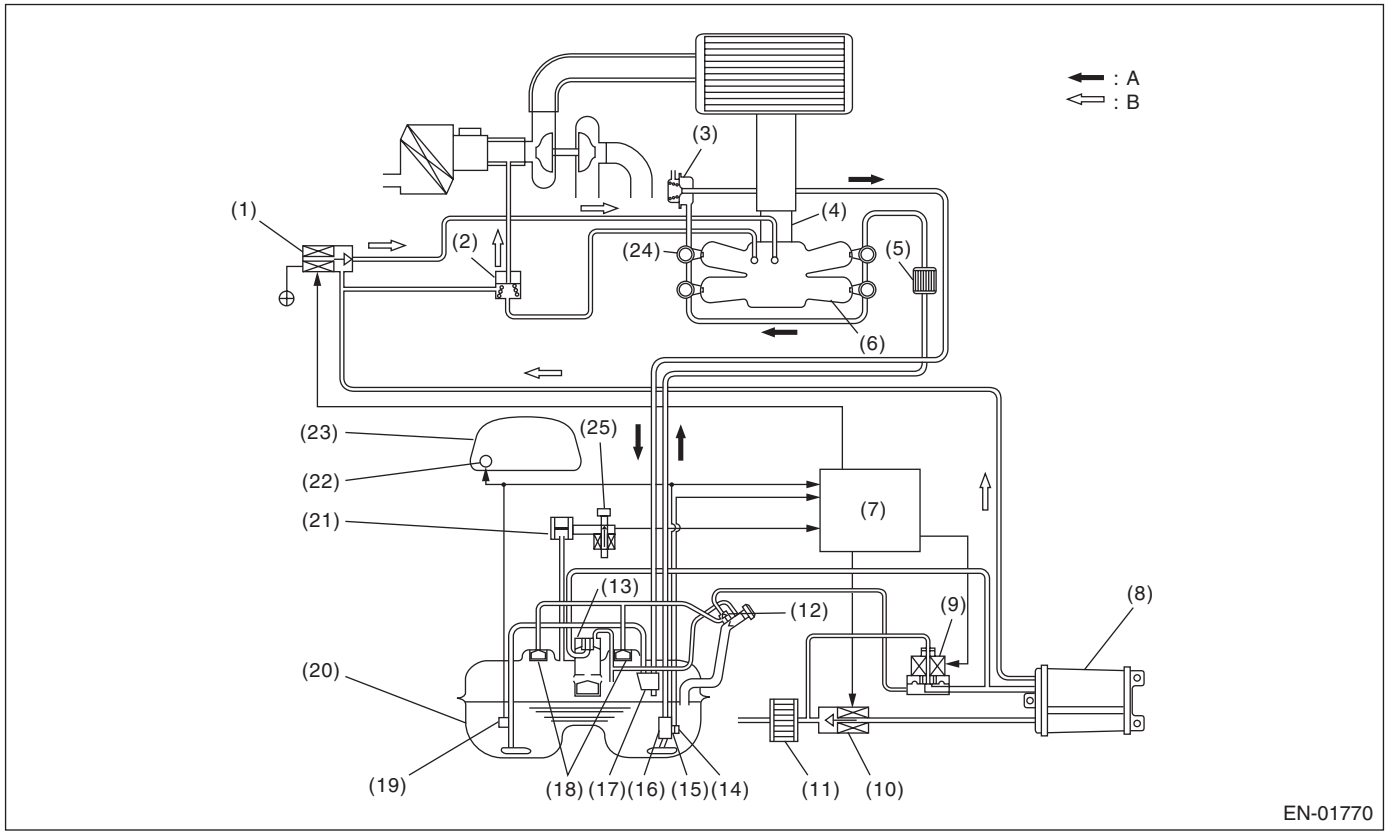
9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

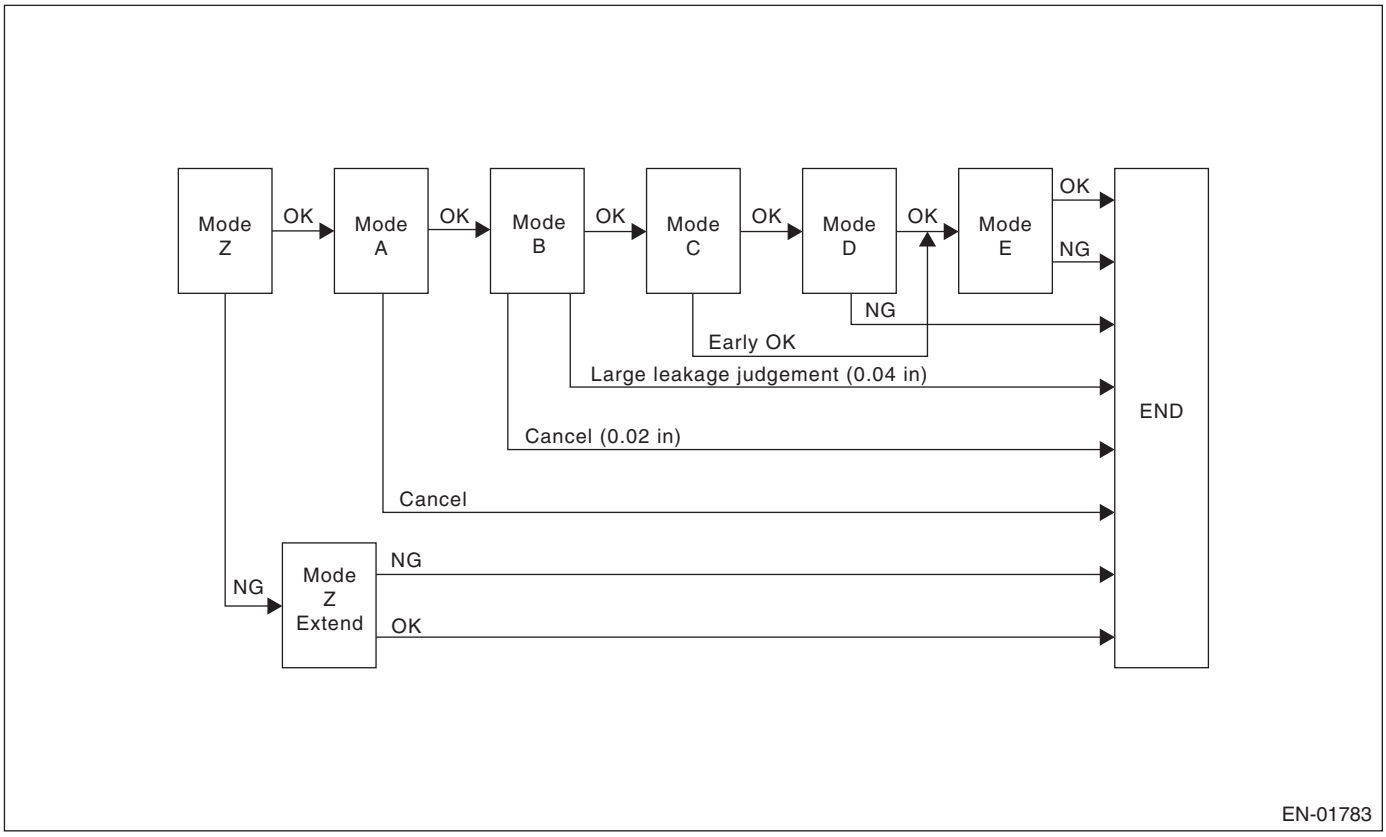
AW:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

1. OUTLINE OF DIAGNOSIS

Perform the diagnosis of leakage of fuels system and valve functions.



(1) Purge control solenoid valve
(2) Purge valve
(3) Pressure regulator
(4) Throttle body
(5) Fuel filter
(6) Intake manifold
(7) Engine control module (ECM)
(8) Canister
(9) Pressure control solenoid valve
(10) Drain valve
(11) Drain filter
(12) Shut-off valve
(13) Vent valve
(14) Fuel temperature sensor
(15) Fuel level sensor
(16) Fuel pump
(17) Jet pump
(18) Fuel cut valve
(19) Fuel sub level sensor
(20) Fuel tank
(21) Fuel tank pressure sensor
(22) Fuel meter
(23) Combination meter
(24) Fuel injector
(25) Tank pressure switching solenoid valve



In this system diagnosis, filter tank pressure is changed. And leakage andnormality & abnormality of valve operation are judged by monitoring the pressure change status using the fuel tank pressure sensor. The diagnosis is performed in the order of Z (0.04-inch diagnosis only), Mode A, Mode B, Mode C, Mode D and Mode E.

0.04-inch Diagnosis

Mode	Mode Description	Diagnosis Period
Mode Z (Purge control solenoid valve open fail diagnosis/drain valve closed fail diagnosis)	Perform the diagnosis of purge control solenoid valve open fail and drain valve closed fail depending on the magnitude of the tank pressure change after diagnosis started.	3 — 16 seconds
Mode A (Evaluation of EVAP. generation amount)	Calculate the tank pressure change amount (P1).	16 seconds
Mode B (Negative pressure sealed/large leak judgment)	Introduce the intake manifold pressure into the fuel tank. If the tank pressure cannot be reduced, diagnose that there is large leakage.	4 — 35 seconds
Mode C (Pressure increase check/premature OK judgment)	Wait until the tank pressure returns to the target value. If the pressure does not return, perform the premature OK judgment.	4 — 15 seconds
Mode D (Negative pressure change amount measurement/EVAP. leakage diagnosis)	Calculate the tank pressure change amount (P2), and measure the diagnosis value using P1 calculated in Mode A. Perform the EVAP. leakage diagnosis using the diagnosis value.	12 — 16 seconds
Mode E (Drain valve property abnormality diagnosis)	Perform the drain valveproperty abnormality diagnosis depending on the magnitude of the tank pressure change after the leakage diagnosis completed.	4 seconds

0.02-inch Diagnosis

Mode	Mode Description	Diagnosis Period
Mode A (Evaluation of EVAP. generation amount)	Calculate the tank pressure change amount (P1).	29 seconds
Mode B (Negative pressure seal)	Introduce the intake manifold pressure into the fuel tank, and reduce the tank pressure to the target pressure.	10 — 20 seconds
Mode C (Pressure increase check/premature OK judgment)	Wait until the tank pressure returns to the target value. If the tank pressure does not return, perform the premature OK judgment.	5 — 20 seconds
Mode D (Negative pressure change amount measurement/EVAP. leakage diagnosis)	Calculate the tank pressure change value (P2), measure the diagnosis value using P1 calculated in Mode A. Perform the EVAP. leakage diagnosis using the diagnosis value.	20 — 25 seconds
Mode E (Drain valve property abnormality diagnosis)	Perform the drain valve property abnormality diagnosis depending on the magnitude of the tank pressure change after the leakage diagnosis completed.	4 seconds

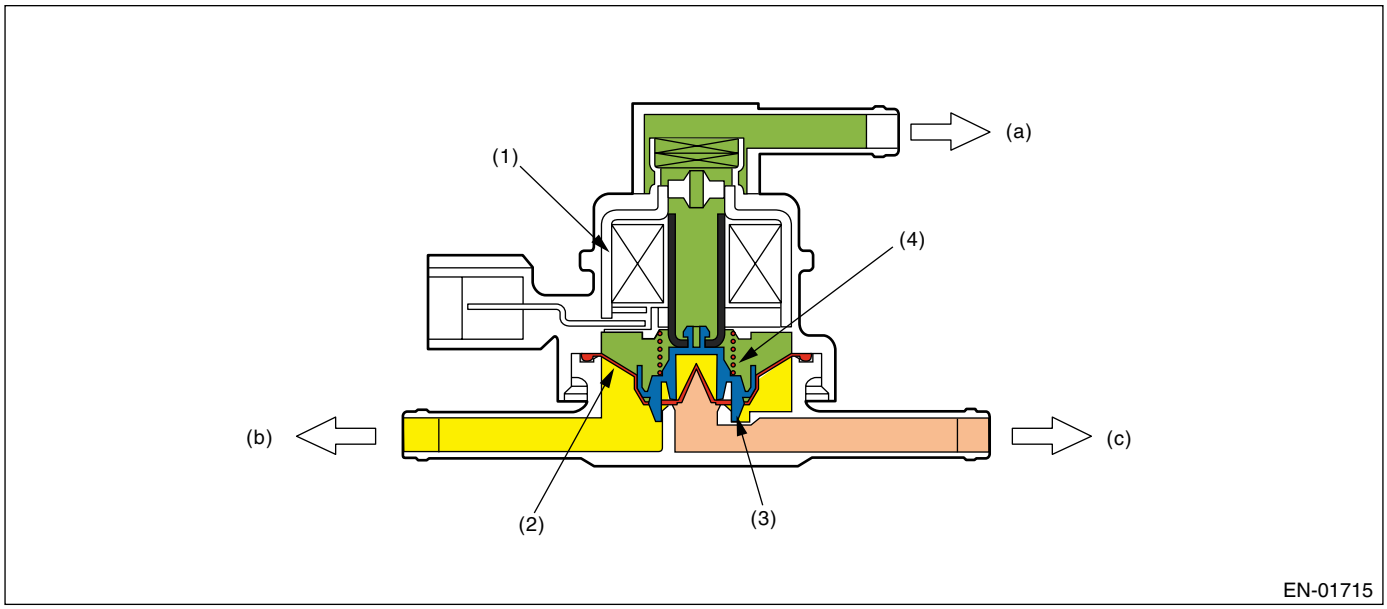
Mode table for Evaporative Emission Control System diagnosis

Mode	Normal conditions	Diagnostic item	DTC
Mode Z	Nearly same as atmospheric pressure (equivalent pressure of 0 kPa (0 mmHg, 0 inHg))	CCV is judged to be stuck closed.	P1443
		CPC is judged to be stuck open.	P0457
Mode A	Pressure is in proportion to amount of evaporative emission.	—	—
Mode B	Negative pressure is formed due to intake manifold negative pressure	Judged as large leak	P0457
Mode C	Target pressure is reached.	—	—
Mode D	Pressure change is small.	EVAP system is judged to have large leak [1.0 mm (0.04 in.)].	P0442
		EVAP system is judged to have small leak [0.5 mm (0.02 in.)].	P0456
Mode E	Return to atmospheric pressure	CCV property	P1443

2. COMPONENT DESCRIPTION

• Pressure Control Solenoid Valve

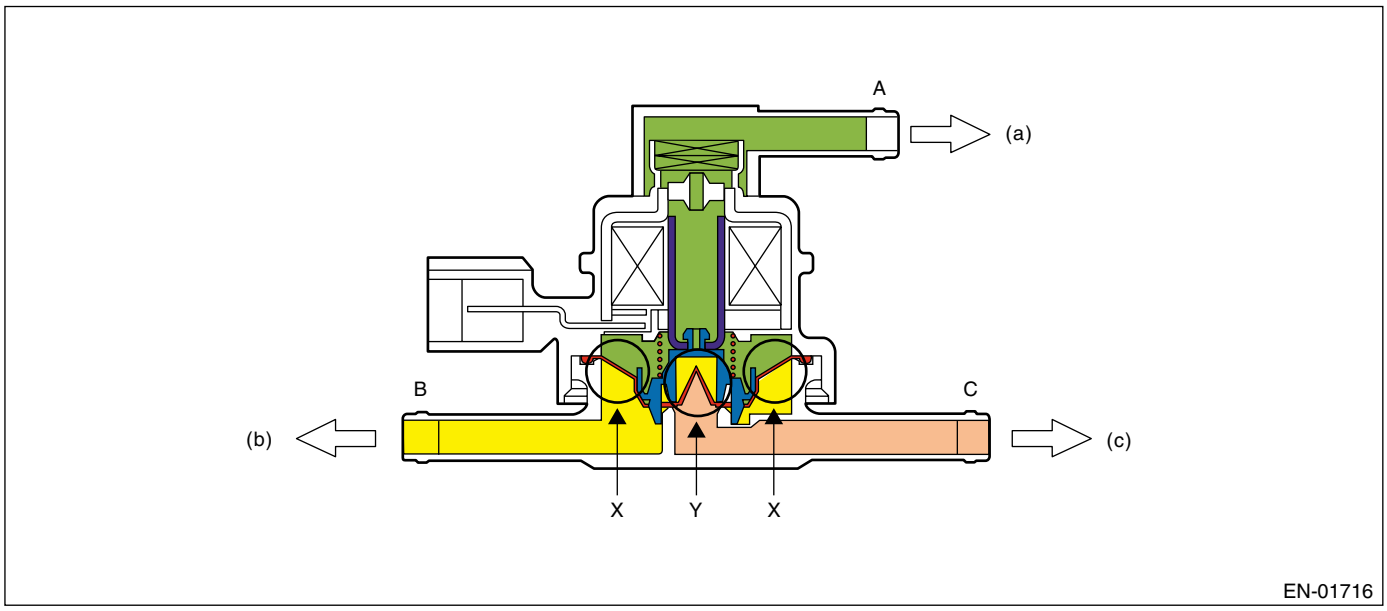
Pressure control solenoid valve maintains the fuel tank pressure equal to the atmospheric air pressure. Normally, the solenoid is set to OFF, and the valve mechanically opens and closes in accordance with the difference between the tank pressure and atmospheric air pressure, and the tank pressure and canister pressure.
The solenoid which is set to ON forces to open the valve.



(1) Solenoid
(2) Diaphragm
(3) Valve
(4) Spring
(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

• Valve Operation and Air Flow

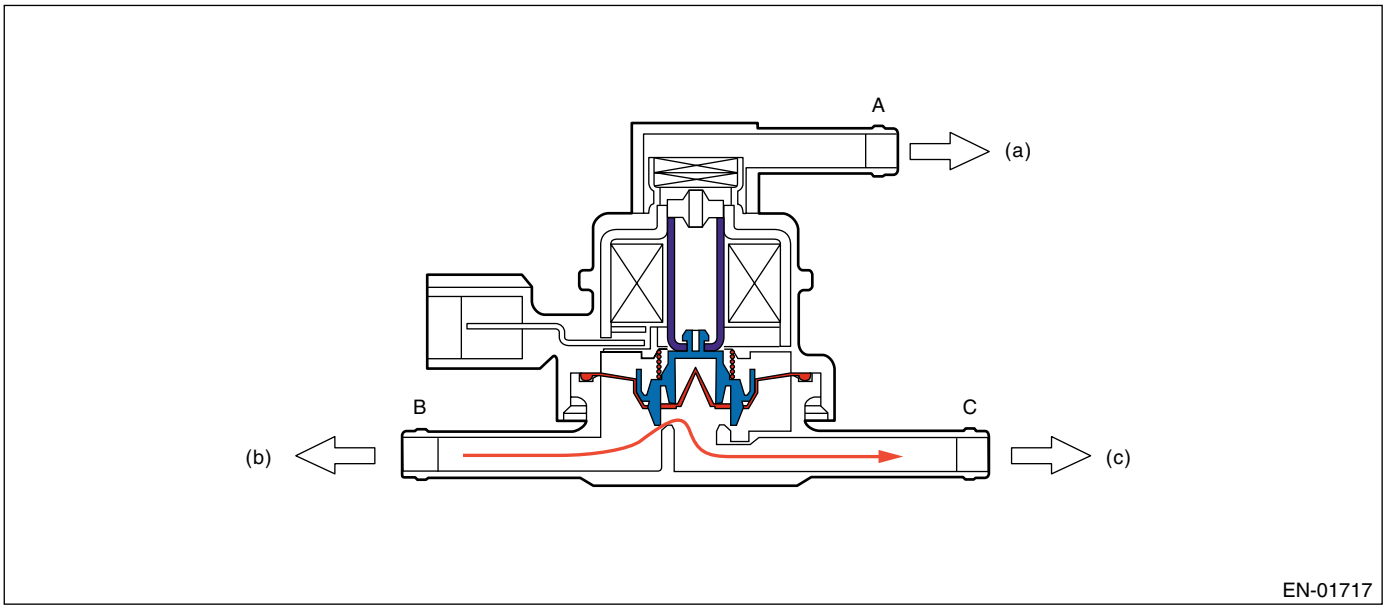
As in the X parts below, there are the area with atmospheric air pressure above the diaphragm and the area with tank pressure below the diaphragm. Also, as in the Y parts below, there are the area with tank pressure above the diaphragm and the area with canister pressure below the diaphragm. In the table below the air flow from each port in accordance with pressure difference is shown with the atmospheric air pressure port A, tank pressure port B and canister pressure port C.



(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

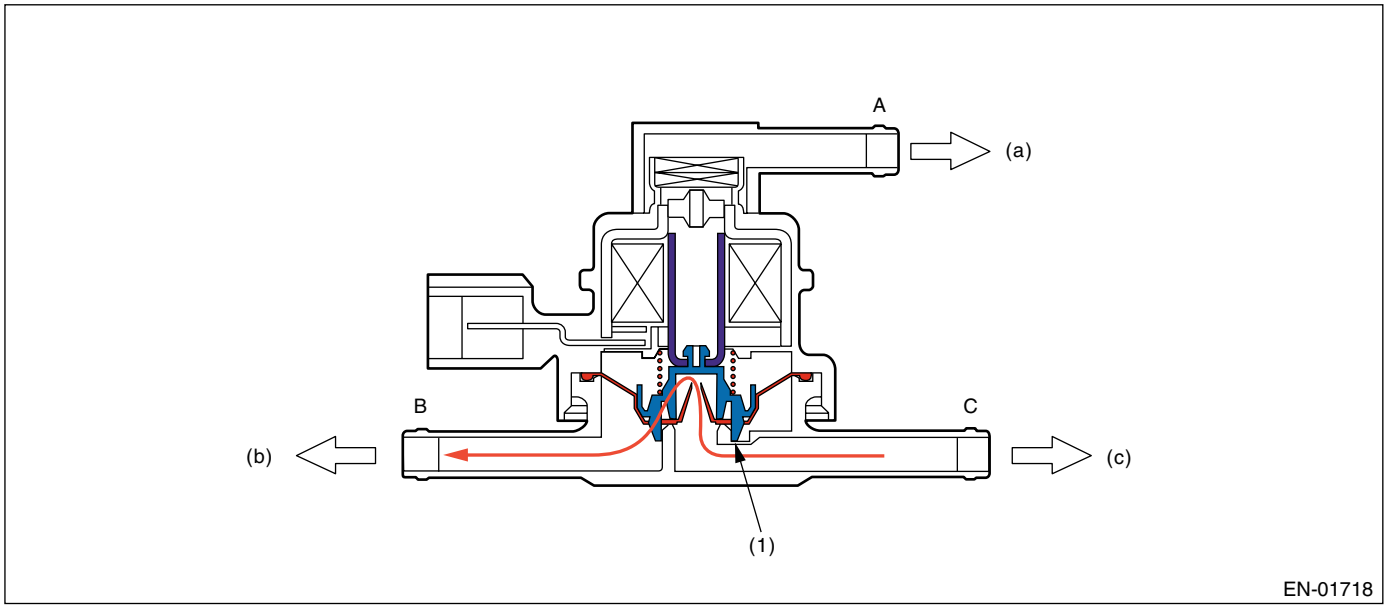
Pressure Status	Flow
A < B (Solenoid OFF)	B → C
B < C (Solenoid OFF)	C → B
Solenoid ON	B ←→ C

When A < B (Solenoid OFF)



(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

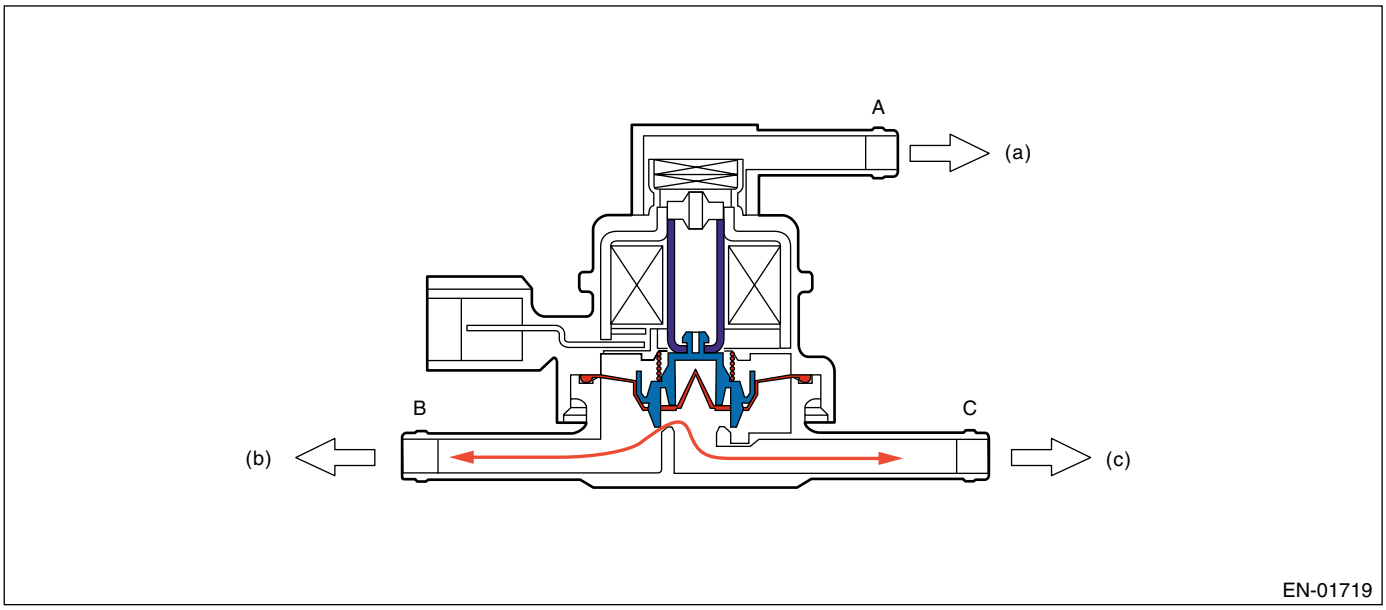
When B < C (Solenoid OFF)



(1) Valve

(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

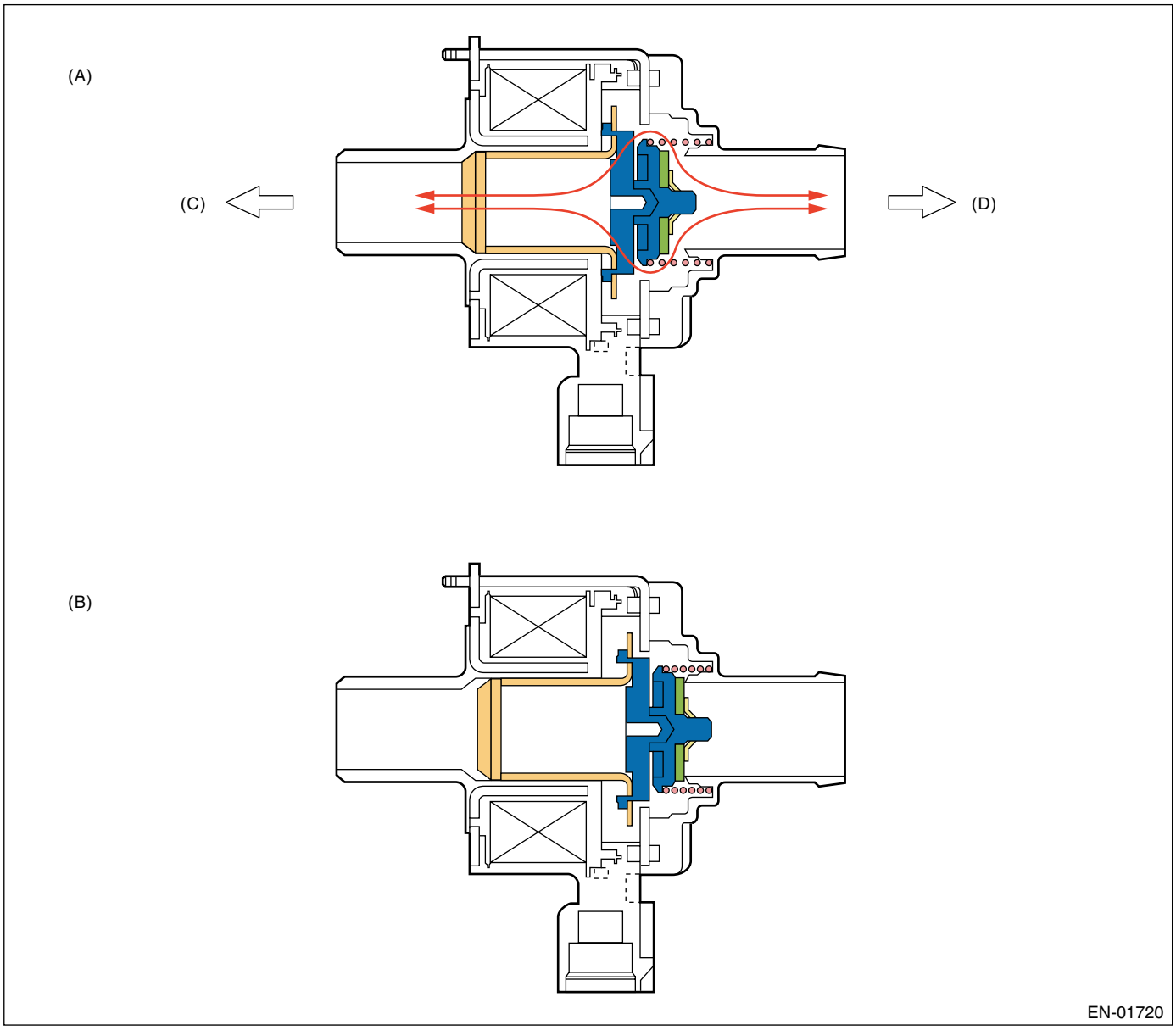
When solenoid is ON



(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

• CCV

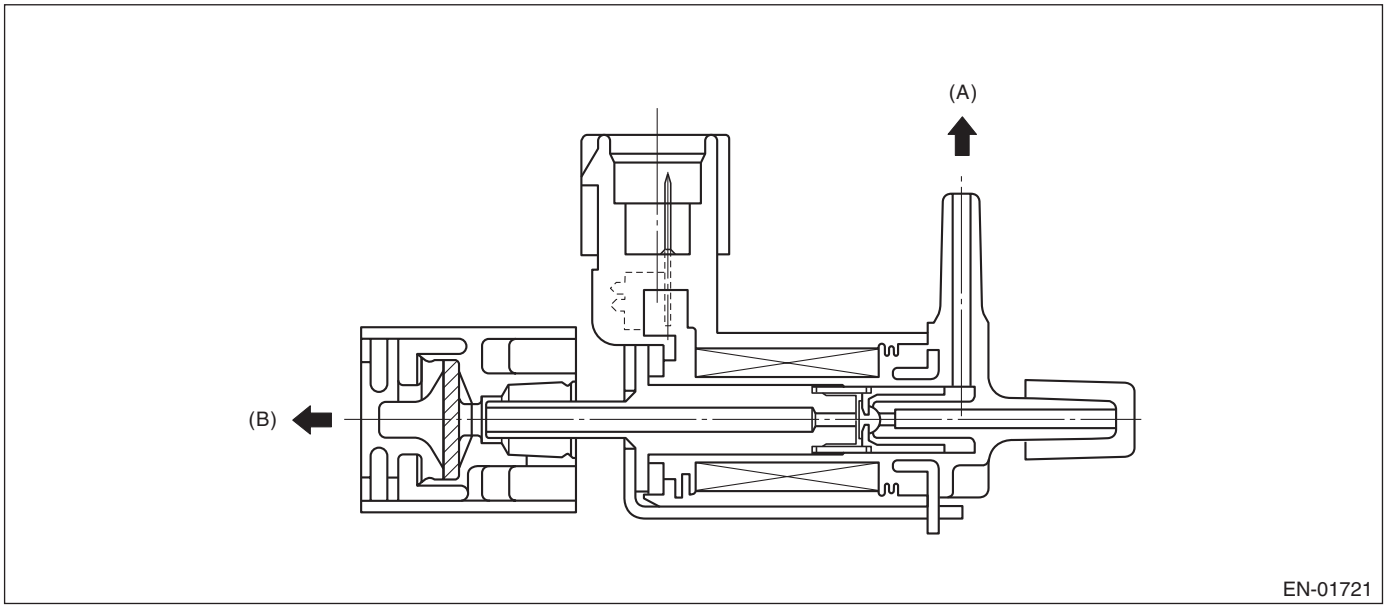
CCV controls the ambient air to be introduced to the canister.



(A) Open (Solenoid OFF)
(B) Close (Solenoid ON)
(C) Filter
(D) Canister

• Tank Pressure Switching Solenoid

One of the atmospheric pressure switching solenoid valves is connected to fuel tank pressure sensor and the other is released to atmosphere. The passage to fuel tank pressure sensor is usually released to atmosphere because the solenoid is set to OFF, but the solenoid which is set to ON closes the passage open to atmosphere.

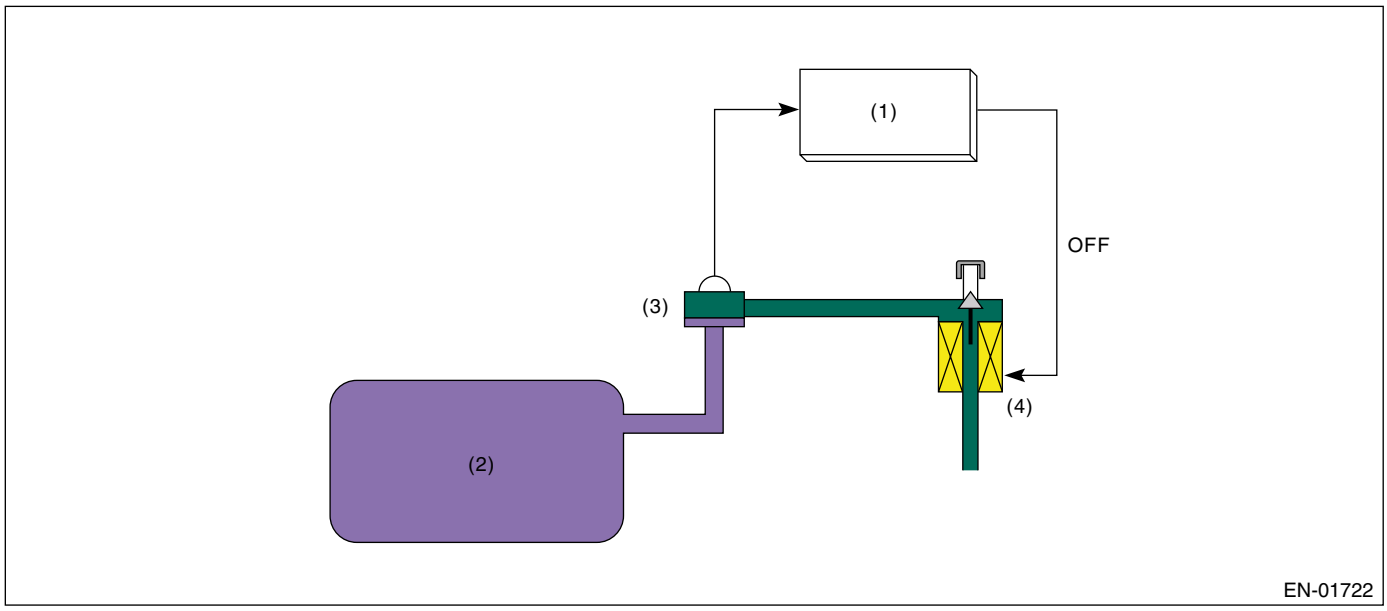


(A) Fuel tank pressure sensor
(B) Ambient air

Purpose of this solenoid

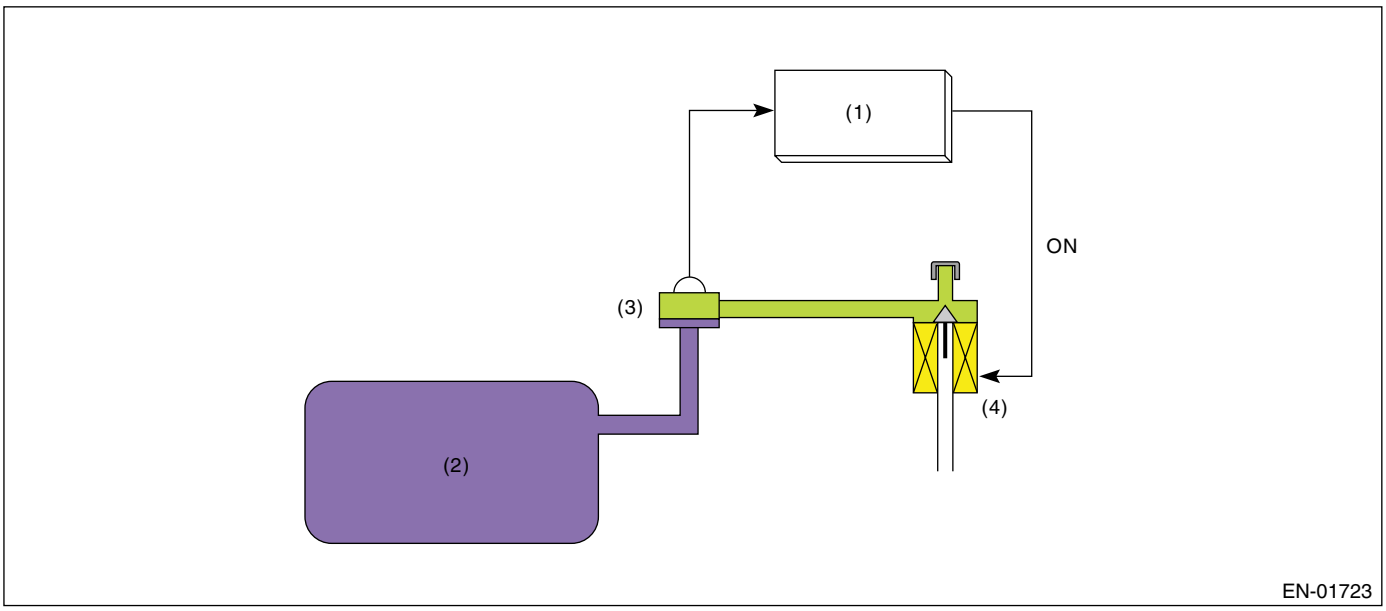
Fuel tank pressure sensor detects the difference between the atmospheric air pressure and the tank pressure, and the ECM monitors the pressure difference.

Even if the tank pressure is constant, the atmospheric air pressure varies depending on the driving height, and the pressure signal transmitted to ECM will change.



(1) Engine control module (ECM)
(2) Fuel tank
(3) Fuel tank pressure sensor
(4) Atmospheric pressure switching solenoid

Especially, in the small leakage [0.5 mm (0.02 inch)], minute change in the tank pressure has to be detected. This diagnosis period is long (approx. 29 seconds). And if the driving height changes during the diagnosis, the atmospheric air pressure changes. In this case, it becomes difficult to precisely detect the tank pressure variation, causing erroneous diagnosis. Therefore, using the atmospheric pressure switching solenoid, atmospheric air is sealed between the fuel tank pressure sensor and atmospheric pressure switching solenoid, maintaining the air pressure constant and enabling the detection of minute variation of tank pressure.



(1) Engine control module (ECM)
(2) Fuel tank
(3) Fuel tank pressure sensor
(4) Atmospheric pressure switching solenoid

NOTE:
ECM also has the atmospheric air pressure sensor, and always monitors atmospheric air. However, as the monitoring range is large, that is, 53.3 to 107 kPa (400 to 800 mmHg, 15.7 to 31.6 inHg), it is not suitable for detection of minute pressure variation.
In the case of small leakage diagnosis, the tank pressure variation is very small, that is, 0.13 to 0.26 kPa (1 to 2 mmHg, 0.04 to 0.08 inHg), and the fuel tank pressure sensor is equipped.

3. ENABLE CONDITION

0.04-inch Diagnosis

Secondary Parameters	Enable Conditions
Evaporation diagnosis	Incomplete
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Total time of canister purge operation	120 seconds or more
After engine starting	856 seconds or more
Learning value of evaporation gas density	≤ 0.08
Engine speed	1,050 ←→ 6,500 rpm
Fuel tank pressure	≥ −4.0 kPa (−30 mmHg, −1.2 inHg)
Atmospheric pressure − Intake manifold vacuum (relative pressure)	≥ 13.3 kPa (100 mmHg, 3.92 inHg)
Vehicle speed	≥ 32 km/h (20 MPH)
Fuel level	9 ←→ 51 ℓ (2.38 ←→ 13.5 US gal, 1.98 ←→ 11.2 Imp gal)
A/F feedback control	In operation
Fuel temperature	−10 ←→ 45°C (14 ←→ 113°F)
Intake air temperature	≥ −10°C (14°F)
Pressure change per second	< 0.13 kPa (0.95 mmHg, 0.04 inHg)
Min. pressure change per second − Max. pressure change per second	< 0.23 kPa (1.75 mmHg, 0.07 inHg)
Fuel level change	< 3 ℓ (0.79 US gal, 0.66 Imp gal)/131 milliseconds
Air fuel ratio	> 0.76

0.02-inch Diagnosis

Secondary Parameters	Enable Conditions
(At starting a diagnosis)	
EVAP. diagnosis	Incomplete
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Since last incomplete diagnosis event of 0.02-inch leakage	≥ 120 seconds
Total time of canister purge operation	120 second or more
After engine starting	335 second or more
Fuel temperature, or the time after engine start with coolant temperature of 40°C (104°F) or below	−10 ←→ 35°C (14 ←→ 95°F) < 2,400 seconds
Fuel level	9 ←→ 51 ℓ (2.38 ←→ 13.5 US gal, 1.98 ←→ 11.2 Imp gal)
(Ambient (estimate) − fuel) temperature	< 1°C (1.8°F)
Fuel tank pressure below −3.01 kPa (−22.8 mmHg, −0.88 inHg) (during same driving cycle, Intake manifold vacuum (relative pressure))	Up to 2 times
Atmospheric − Intake manifold vacuum (relative pressure)	≥ 13.3 kPa (100 mmHg, 3.92 inHg)
Fuel tank pressure	−0.67 to 0.93 kPa (−5 to 7 mmHg, −0.20 to 0.27 inHg)
Vehicle speed	≥ 68 km/h (42 MPH)
A/F feedback control	In operation
Ambient temperature (estimate)	≥ −10°C (14°F)
(During diagnosis)	
P1	−0.07 ←→ 0.13 kPa (−0.5 ←→ 1 mmHg, −0.02 ←→ 0.04 inHg)
Pressure change per second	< 0.13 kPa (0.95 mmHg, 0.04 inHg)
Fuel level change	1.5 ←→ 3 ℓ (0.4 ←→ 0.8 US gal, 0.3 ←→ 0.7 Imp gal)
Tank pressure	< 0.93 kPa (7 mmHg, 0.27 inHg)
Min. tank pressure change per second − Max. tank pressure change per second	< 0.23 kPa (1.75 mmHg, 0.07 inHg)
Change of atmospheric pressure during P1 calculation	−0.07 ←→ 0.15 kPa (−0.5 ←→ 1.125 mmHg, −0.02 ←→ 0.04 inHg)
Change of atmospheric pressure during P2 calculation	−0.15 ←→ 0.15 kPa (−1.125 ←→ 1.125 mmHg, −0.04 ←→ 0.04 inHg)

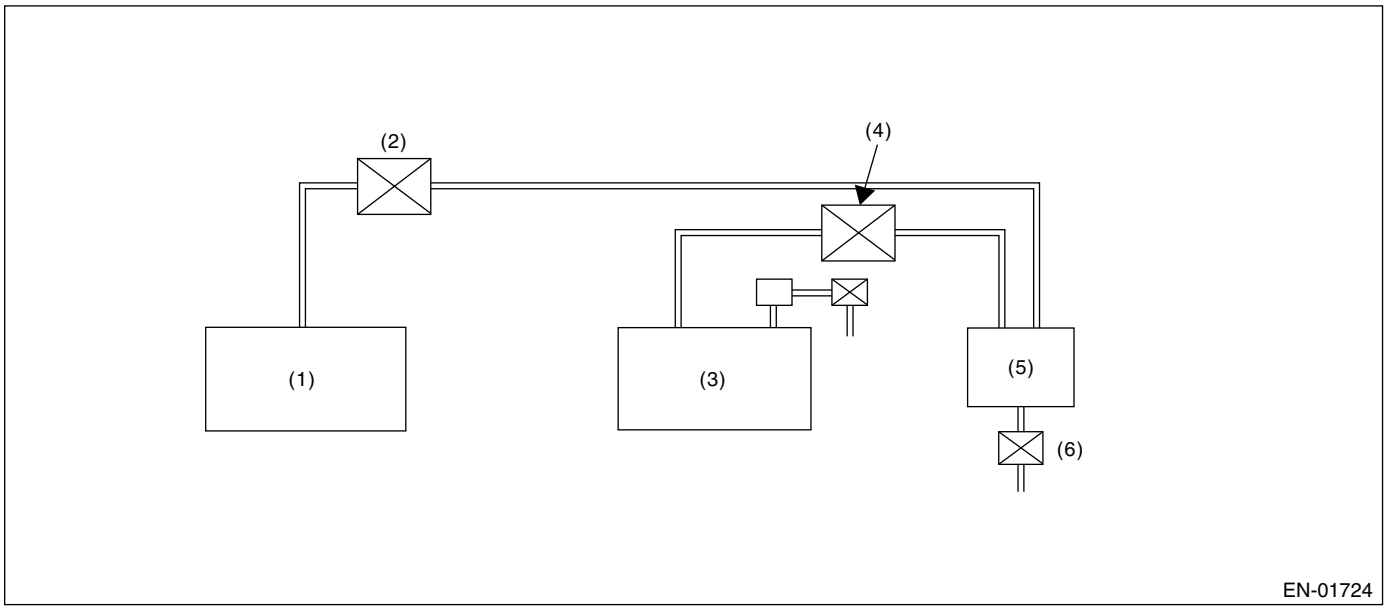
4. GENERAL DRIVING CYCLE

0.04-inch Diagnosis
Perform the diagnosis only once in 856 seconds or more after starting the engine constantly at 32 km/h (20 MPH) or more.
Pay attention to the fuel temperature and fuel level.
0.02-inch Diagnosis
Perform the diagnosis in 335 seconds after starting the engine constantly at 68 km/h (42 MPH) or more, and perform OK/NG judgment.
If OK/NG judgment is not possible, repeat the diagnosis.
Pay attention to the fuel temperature and fuel level.

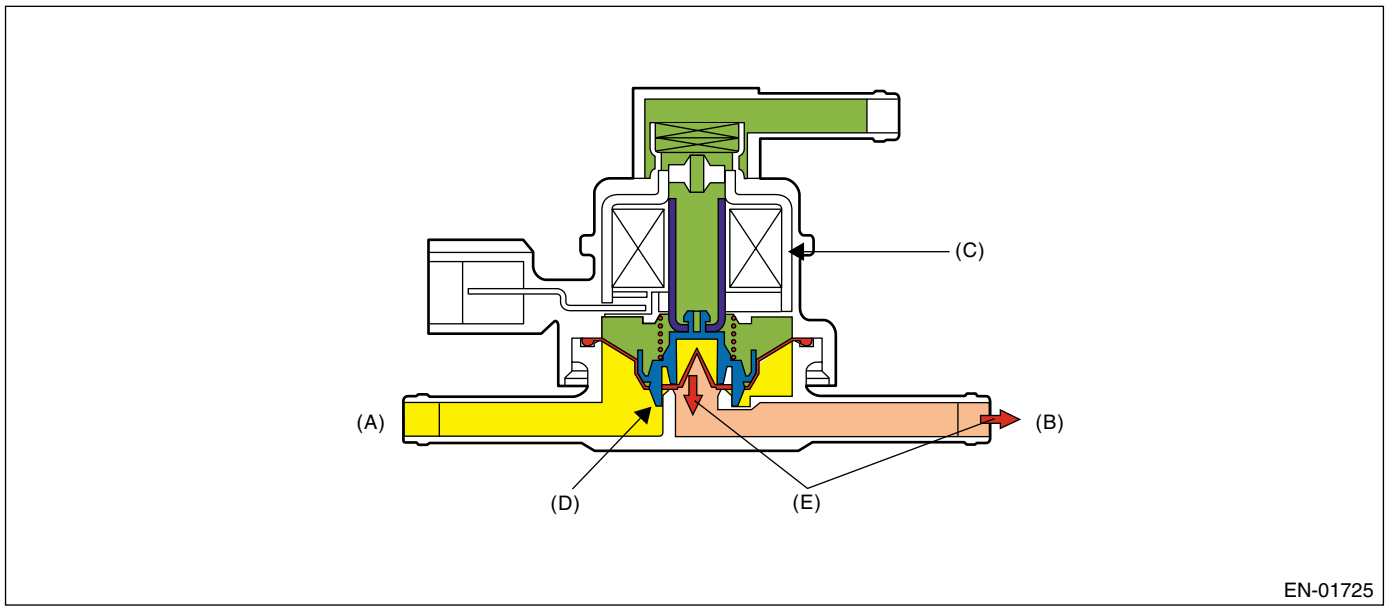
5. DIAGNOSTIC METHOD

• Diagnosing Function of Drain Valve and Purge Control Solenoid Valve

DTC
P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)
P1443 Vent Control Solenoid Valve Function Problem
Purpose of Mode Z
When performing the leakage diagnosis of EVAP system, CCV and CPC have to operate normally. Therefore, mode Z is used to diagnose the CCV close fixation and CPC open fixation.
If the CCV closed fixation trouble or CPC open fixation trouble is detected, the evaporation system leakage diagnosis is cancelled.
If the CCV closed fixation trouble occurred, negative pressure is generated from the engine to PCV when PCV is closed and CPC is opened. In this status, the pressure control solenoid valve solenoid, which is set to ON, does not open the valve for its structure when the negative pressure is larger than electromagnetic force.

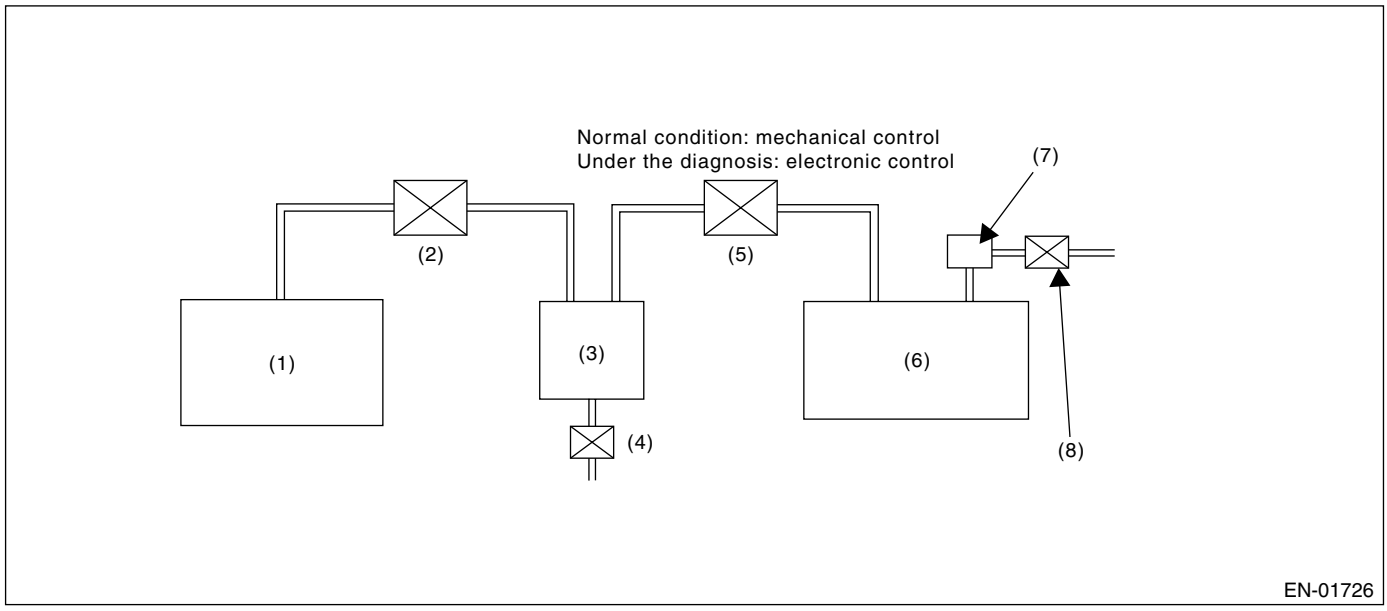


(1) Engine
(2) Purge control solenoid valve (Open)
(3) Fuel tank
(4) Pressure control solenoid valve (Close)
(5) Canister
(6) Drain valve (Stuck close)



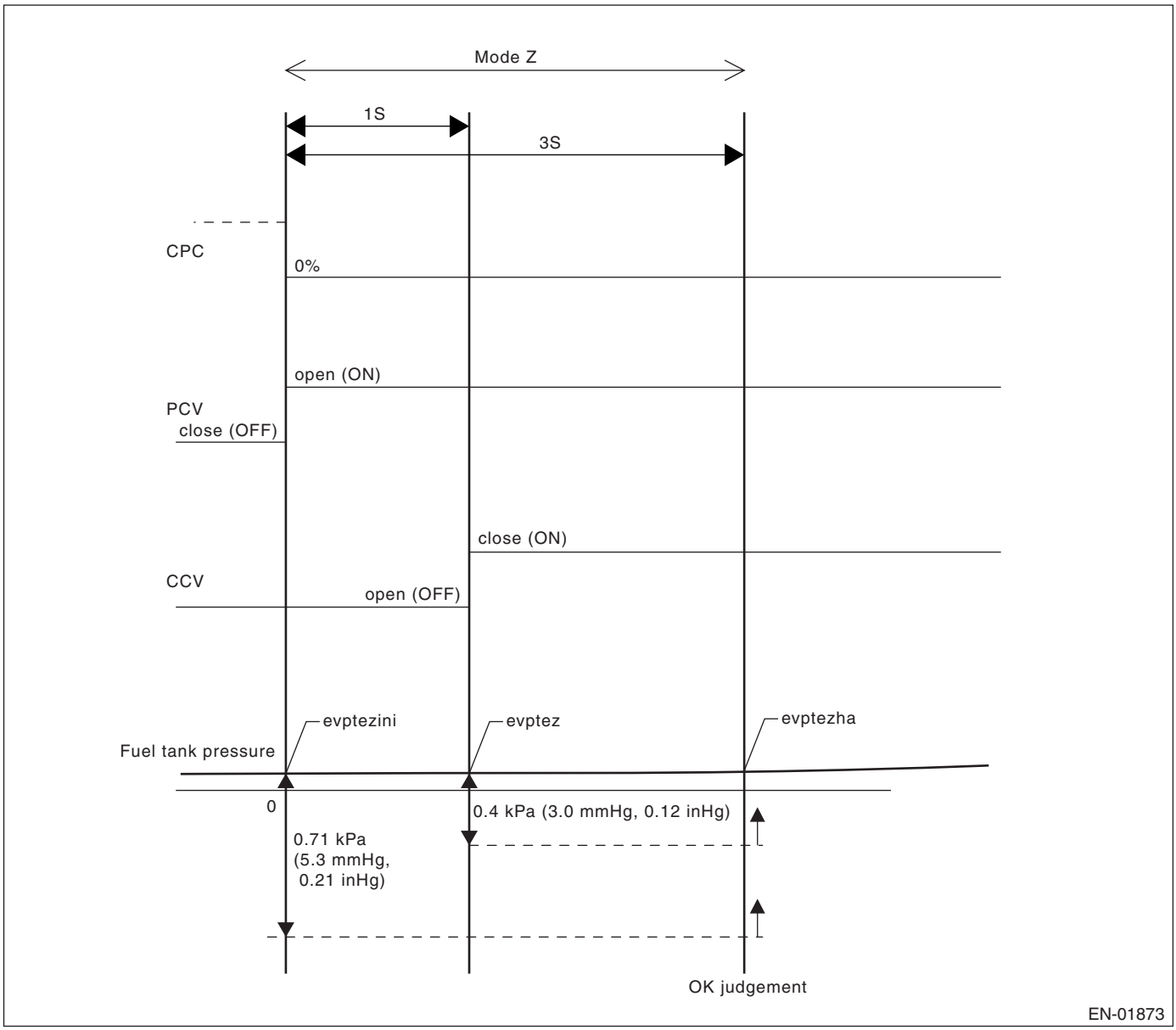
(A) To fuel tank
(B) To canister (Negative pressure)
(C) Solenoid ON
(D) Valve cannot be open.
(E) Negative pressure

Diagnostic method
CCV closed fixation diagnosis and CPC open fixation diagnosis are performed in mode Z as shown in the figure below.



(1) Engine
(2) Purge control solenoid valve
(3) Canister
(4) Drain valve
(5) Pressure control solenoid valve
(6) Fuel tank
(7) Fuel tank pressure sensor
(8) Atmospheric pressure switching solenoid

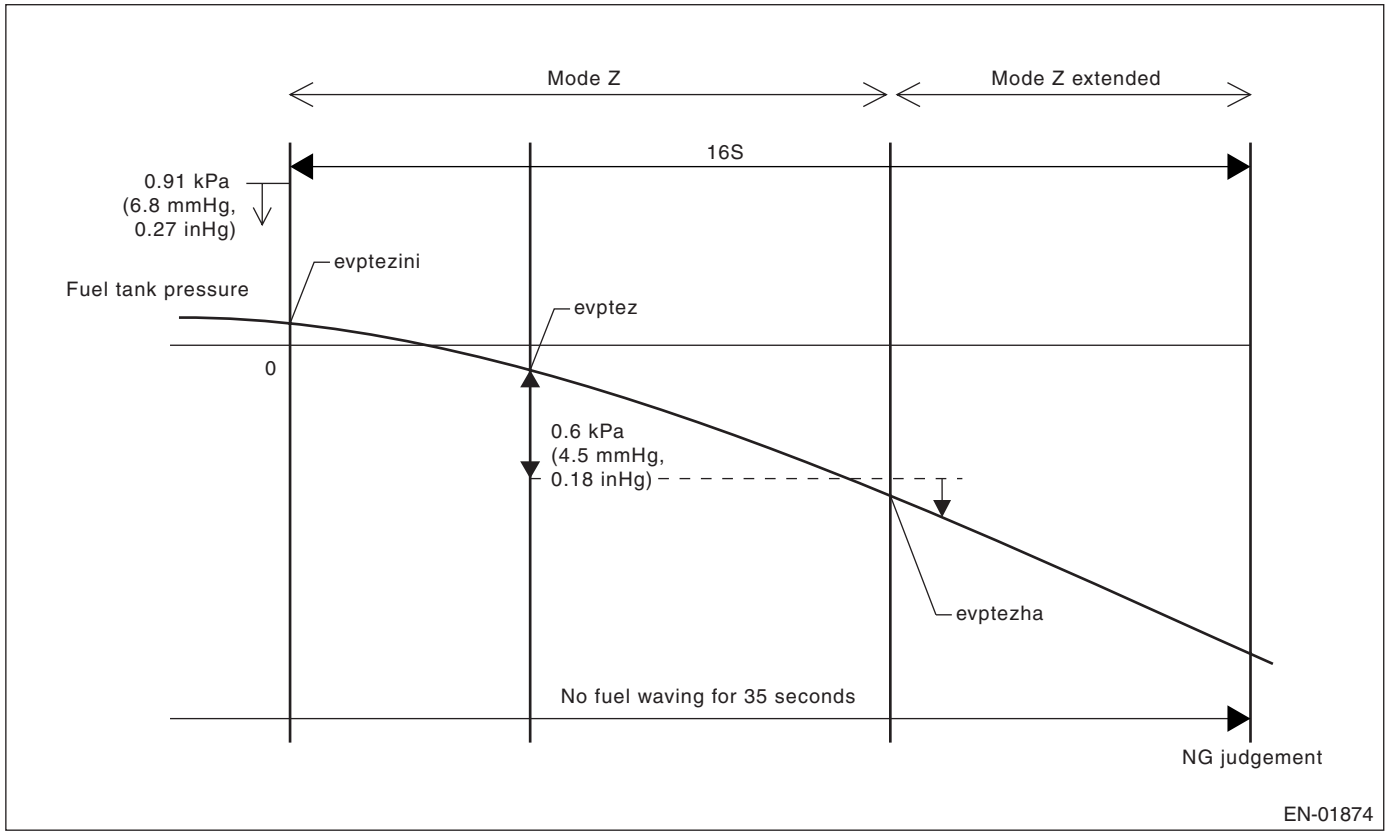
• Normal



Judge normal when the following conditions are completed at once.

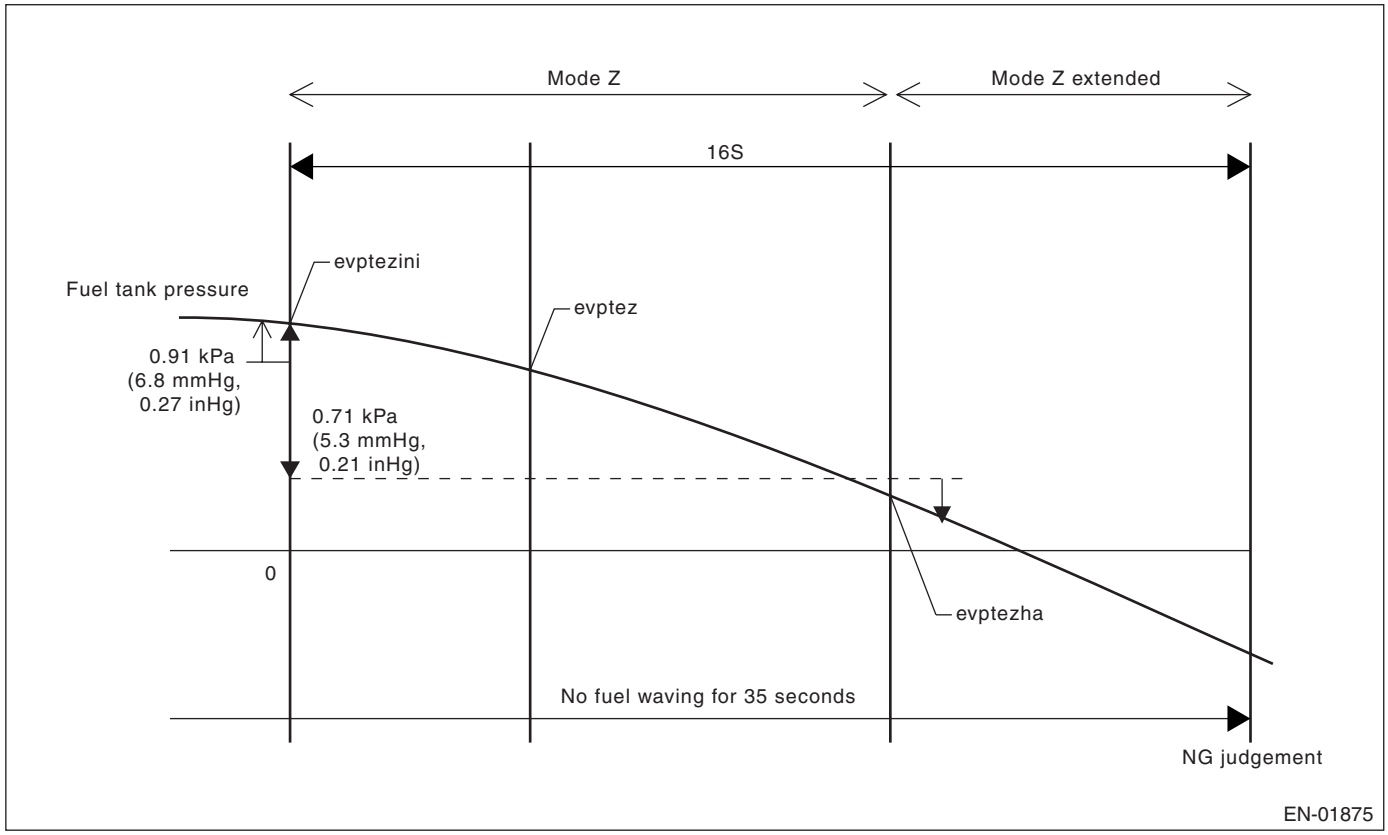
- evptez − evptezha ≤ 0.4 kPa (3.0 mmHg, 0.12 inHg)
- evptezini − evptezha ≤ 0.71 kPa (5.3 mmHg, 0.21 inHg)

• Purge control solenoid valve open fixation



Judge NG when the following conditions are completed at once.
- evptez − evptezha > 0.6 kPa (4.5 mmHg, 0.18 inHg)
- evptezini ≤ 0.91 kPa (6.8 mmHg, 0.27 inHg)
- Period without 3 ℓ (0.79 US gal, 0.67 Imp gal) or more fuel waving is 35 seconds or more.

• Drain valve close fixation



Judge NG when the following conditions are completed at once.
- evptez – evptezha > 0.71 kPa (5.3 mmHg, 0.21 inHg)
- evptezini > 0.91 kPa (6.8 mmHg, 0.27 inHg)
- Period without 3 L or more fuel waving is 35 seconds or more.

• Diagnosing Function of Drain Valve [P1443]

Perform the drain valve function diagnosis by monitoring the tank pressure variation in Mode Z.

Normality Judgment

Judge OK when following malfunction criterias are completed within 3 seconds after starting Mode Z, and move to Mode A in case of OK.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure in 1 second after Mode Z started) – (Tank pressure when terminating Mode Z)	≤ 0.40 kPa (3 mmHg, 0.12 inHg)	P1443
(Tank pressure when starting Mode Z) – (Tank pressure when terminating Mode Z)	≤ 0.71 kPa (5.3 mmHg, 0.21 inHg)	P0457

Abnormality Judgment

If OK judgment is not possible, prolong Mode Z (16 seconds), and judge NG when all of malfunction criterias are completed with considering the following conditions in 16 seconds.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Tank pressure when starting Mode Z	> 0.91 kPa (6.8 mmHg, 0.27 inHg)	P1443
(Tank pressure when starting Mode Z) – (Tank pressure when terminating Mode Z)	> 0.71 kPa (5.3 mmHg, 0.21 inHg)	
Period without fuel waving	≥ 35 seconds	

Time Needed for Diagnosis: 16 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.
When the drain valve closed fixation NG judgment is performed, terminate the evaporation diagnosis.
Cancel the Evap. diagnosis when the OK/NG judgment for drain valve close fixation and purge control solenoid valve open fixation cannot be made in Mode Z.

• Diagnosing Function of Purge Control Solenoid Valve [P0457]

Perform the function diagnosis of the purge control solenoid valve by monitoring the tank pressure in Mode Z.
Normality Judgment
Perform OK judgment in 3 seconds after starting Mode Z and move to Mode A if OK.
Diagnostic method and judgment value are the same as in case of purge control solenoid valve normal.
Abnormality Judgment
If OK judgment is not possible, prolong Mode Z (16 seconds), and judge NG when all of malfunction criterias are completed after 16 seconds considering the following conditions.
Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure in 1 second after Mode Z started) − (Tank pressure when terminating Mode Z)	> 0.60 kPa (4.5 mmHg, 0.18 inHg)	P0457
Tank pressure when starting Mode Z	≤ 0.91 kPa (6.8 mmHg, 0.27 inHg)	
Period without fuel waving	≥ 35 seconds	

Time Needed for Diagnosis: 16 seconds
Malfunction Indicator Light Illumination: Detect when malfunction occurs in two continuous drive cycles.
If the purge control solenoid valve open fixation NG judgment is performed, terminate the EVAP. diagnosis.
If OK/NG judgment of the drain valve closed fixation and purge control solenoid valve open fixation is not possible in Mode Z, cancel the EVAP. diagnosis.

• Leakage Diagnosis

DTC
P0442 Evaporative Emission Control System Leak Detected (Small Leak)
P0456 Evaporative Emission Control System Leak Detected (Very Small Leak)
P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)
Diagnostic Method
The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.
Mode A; (Estimation of evaporation abundance)
Calculate the tank pressure variation amount (P1). Move to Mode B after calculating P1.
Mode B; (Seal negative pressure)
Introduce the negative pressure of the intake manifold into the tank.
Approx. 0 → −1.4 kPa (0 → −10.5 mmHg, 0 → −0.41 inHg) (0.04-inch diagnosis)
Approx. 0 → −3.05 kPa (0 → −22.875 mmHg, 0 → −0.9 inHg) (0.02-inch diagnosis)
Move to Mode C when reaching the pressure above (target pressure).
Then, if the tank pressure does not become negative, judge that there is large leakage in the system. In 0.04-inch diagnosis, judge that there is large leakage (10 seconds or 25 seconds) and terminate the EVAP. diagnosis. In 0.02-inch diagnosis, cancel the diagnosis (20 seconds).
Abnormality Judgment
Judge NG (large leakage) when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(0.04-inch diagnosis) Period until reaching target negative pressure OR, Mode B period (Tank Pressure Min. Value in Mode B) − (Tank Pressure when starting Mode B)	 ≥ 25 seconds ≥ 10 seconds > −0.53 kPa (−4 mmHg, −0.16 inHg)	P0457

Mode C; (Check increasing pressure)

Stop the introduction of negative pressure. (Wait until returning to target pressure)
When returning to target pressure, move to Mode D.
Judge premature OK and move to Mode E when not returning in the determined period of time.

	Target Pressure	Premature OK Judgment Period
0.04-inch Diagnosis	−1.30 kPa (−9.75 mmHg, −0.38 inHg)	15 seconds
0.02-inch Diagnosis	−3.00 kPa (−22.5 mmHg, −0.89 inHg)	20 seconds

Mode D; (Measurement of negative pressure variation)

Monitor the tank pressure variation in Mode D. In this case, the tank pressure increases (close to atmospheric pressure) because the evaporator is generated. However, if there is leakage, the pressure increases additionally. P2 means the variation amount of this tank pressure. After calculating P2, perform the small leakage diagnosis, and move to Mode E if normal. Terminate the EVAP. diagnosis if abnormal.

When Terminating Mode D

By assigning the variation values of tank pressure, P1 and P2, in the following formula, judge the system small leakage. If the calculated judgment value is larger than the threshold value, judge that there is a failure.

0.04-inch Diagnosis

Judge NG when the malfunction criteria below is completed, and judge OK when the malfunction criteria below is not completed.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 − 1.5 × P1 P2 = Change of tank pressure in 16 seconds at mode D. P1 = Change of tank pressure in 16 seconds at mode A.	> 0.38 ←→ 0.81 kPa* (2.86 ←→ 6.08 mmHg, 0.11 ←→ 0.24 inHg) *Threshold value: Map (fuel level vs tank temperature)	P0442

*1.5: Correction value of the evaporator generation amount under negative pressure. (The more the negative pressure increases, the more the generation amount increases.)

0.02-inch Diagnosis

Abnormality Judgment

Judge NG when the malfunction criteria below is completed, and judge OK when the malfunction criteria below is not completed.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 − 1.5 × P1 P2 = Change of tank pressure in 22 seconds at mode D. P1 = Change of tank pressure in 22 seconds at mode A.	≥ 0.40 ←→ 0.97 kPa* (3 ←→ 7.3 mmHg, 0.12 ←→ 0.29 inHg) *Threshold value: Map (fuel level vs tank temperature)	P0456

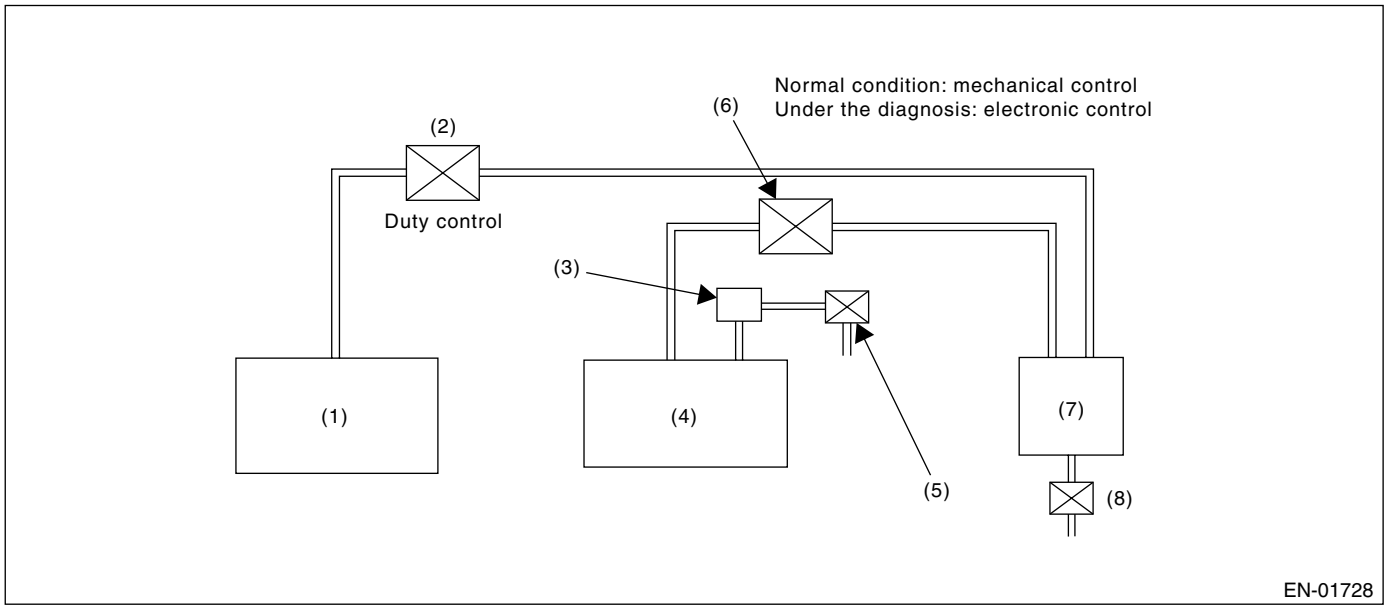
Normality Judgment

Judge OK when the malfunction criteria below is not completed.

Judgment Value

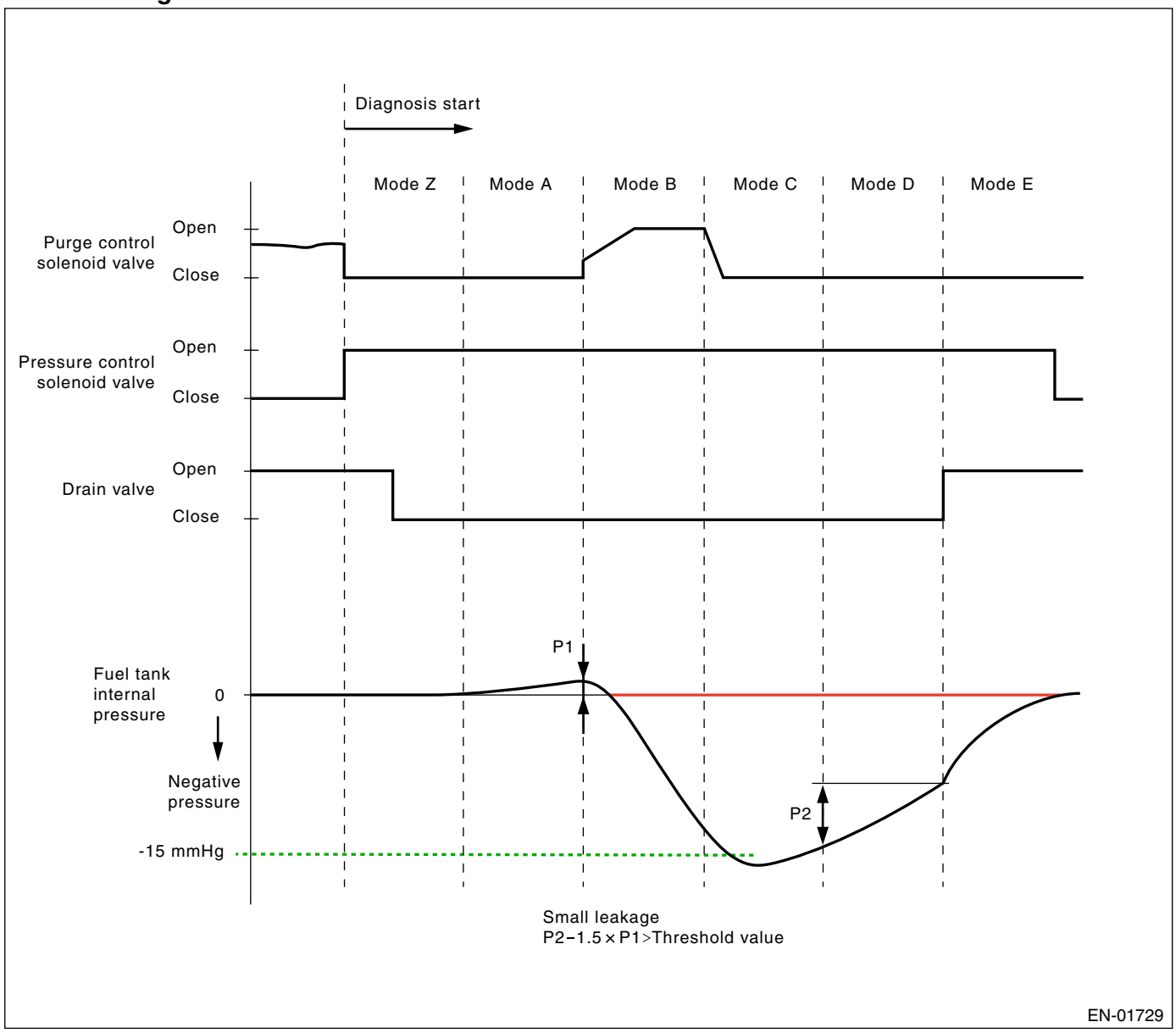
Malfunction Criteria	Threshold Value	DTC
P2 − 1.5 × P1 P2 = Change of tank pressure in 22 seconds at mode A. P1 = Change of tank pressure in 22 seconds at mode A.	< 0.31 ←→ 0.60 kPa* (2.3 ←→ 4.5 mmHg, 0.09 ←→ 0.18 inHg) *Threshold value: Map (fuel level vs tank temperature)	P0456

If OK/NG judgment is not possible, repeat the diagnosis.



(1) Engine
(2) Purge control solenoid valve
(3) Fuel tank pressure sensor
(4) Fuel tank
(5) Atmospheric pressure switching solenoid
(6) Pressure control solenoid valve
(7) Canister
(8) Drain valve

0.04-inch Diagnosis



• Drain Valve Property Diagnosis [P1443]

Mode E;

The tank pressure should return to the value equal to the atmospheric pressure after the evaporation diagnosis is terminated (Mode C normal judgment or Mode D termination). If the value does not return, judge that the drain valve is closed.

Judge NG when the following malfunction criteria is completed.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Fuel tank pressure difference between at the end of EVAP. system diagnosis and 4 seconds later.	< 0.36 kPa (2.72 mmHg, 0.11 inHg)	P1443

Time Needed for Diagnosis:

0.04 inches:	50 to 70 seconds
0.02 inches:	75 to 90 seconds

Malfunction Indicator Light Illumination: Detect when malfunction occurs in two continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Open the PCV when the drain valve malfunction occur.

9. ECM OPERATION AT DTC SETTING

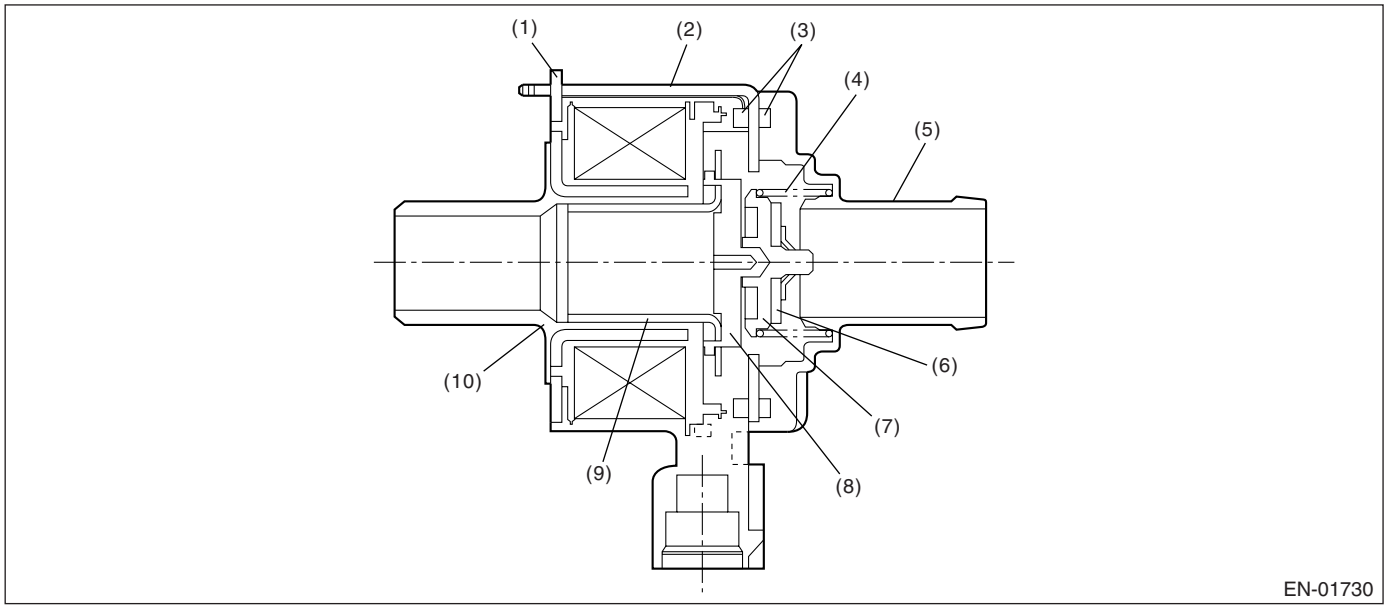
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AX:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.
Judge NG when the ECM output level is different from the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Magnetic plate
(2) Yoke
(3) Packing
(4) Spring
(5) Valve seat
(6) Valve
(7) Plate
(8) Retainer
(9) Movable core
(10) Bobbin

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends OFF signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

PCV control: Open the PCV solenoid.

9. ECM OPERATION AT DTC SETTING

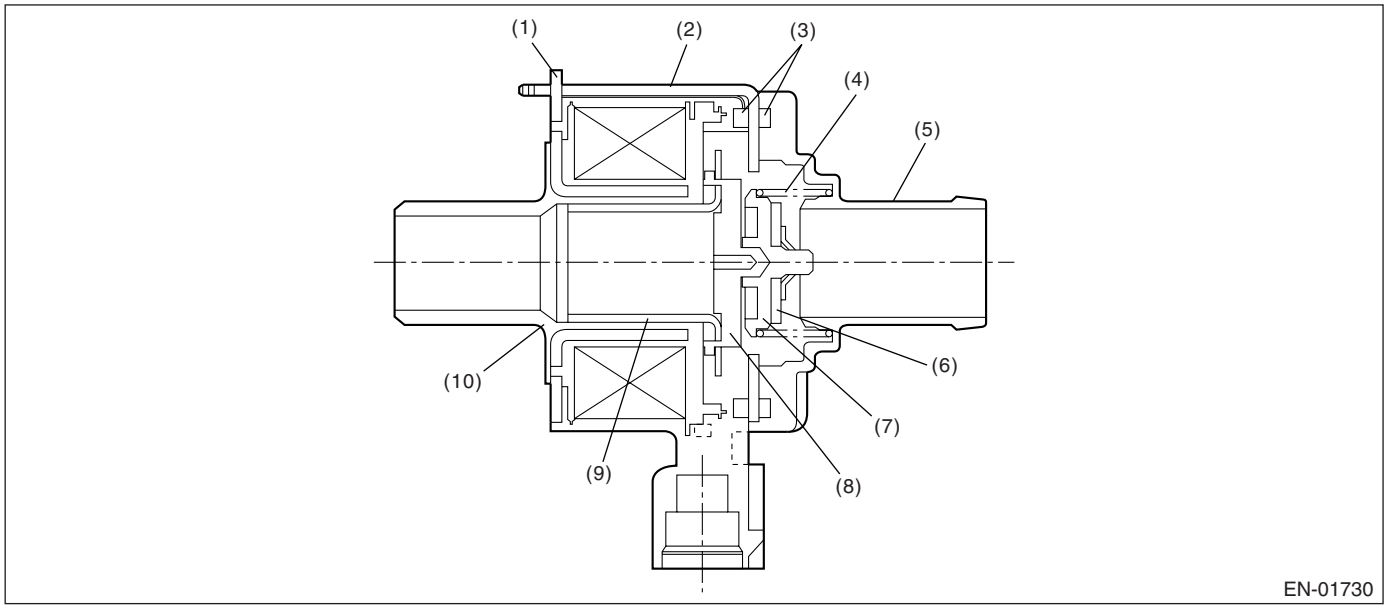
Memorize the freeze frame data. (For test mode $02)

AY:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.
Judge NG when the ECM output level is different from the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Magnetic plate
(2) Yoke
(3) Packing
(4) Spring
(5) Valve seat
(6) Valve
(7) Plate
(8) Retainer
(9) Movable core
(10) Bobbin

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends ON signal	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends ON signal	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

PCV control: Open the PCV solenoid.

9. ECM OPERATION AT DTC SETTING

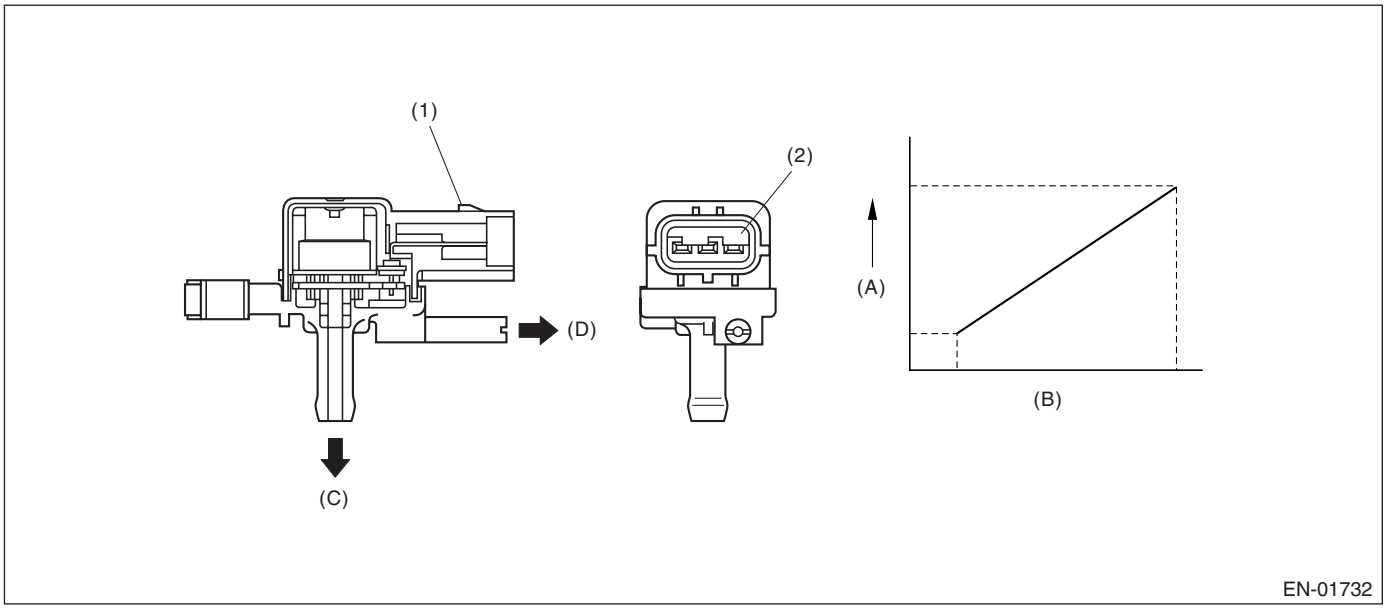
Memorize the freeze frame data. (For test mode $02)

AZ:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.
Judge NG when there is no pressure variation, which should exist in the tank, considering the engine status.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After starting the engine	60 second or more
Fuel level	≥ 18 ℓ (4.76 US gal, 3.96 Imp gal)
Fuel temperature	< 35°C (95°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Engine speed	< 6,500 rpm

4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously in 60 seconds or more after starting the engine.
- Be sure to check the fuel level and fuel temperature.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Number of times when the difference between the Max. fuel level and the Min., fuel level every 60 seconds is 2 ℓ (0.53 US gal, 0.44 Imp gal) or more (with enable condition completed)	≥ 16 times
Max. − Min. tank pressure (with enable condition completed)	< 0.05 kPa (0.375 mmHg, 0.02 inHg)
Max. − Min. fuel temperature (with enable condition completed)	≥ 7°C (44.6 °F)

If the fuel level (Max. − Min.) in every 60 seconds is less than 2 ℓ , extend 60 seconds more and make judgment with the Max. and Min. fuel level in 120 seconds.
If the difference did not appear though the time extended, extend the time (180, 240, 300 seconds) and continue the judgment.
Diagnosis counter will count up when the difference of fuel level (Max. − Min.) is more than 2 ℓ .
Time Needed for Diagnosis: 1 second × 16 times or more
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Max. − Min. tank pressure	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

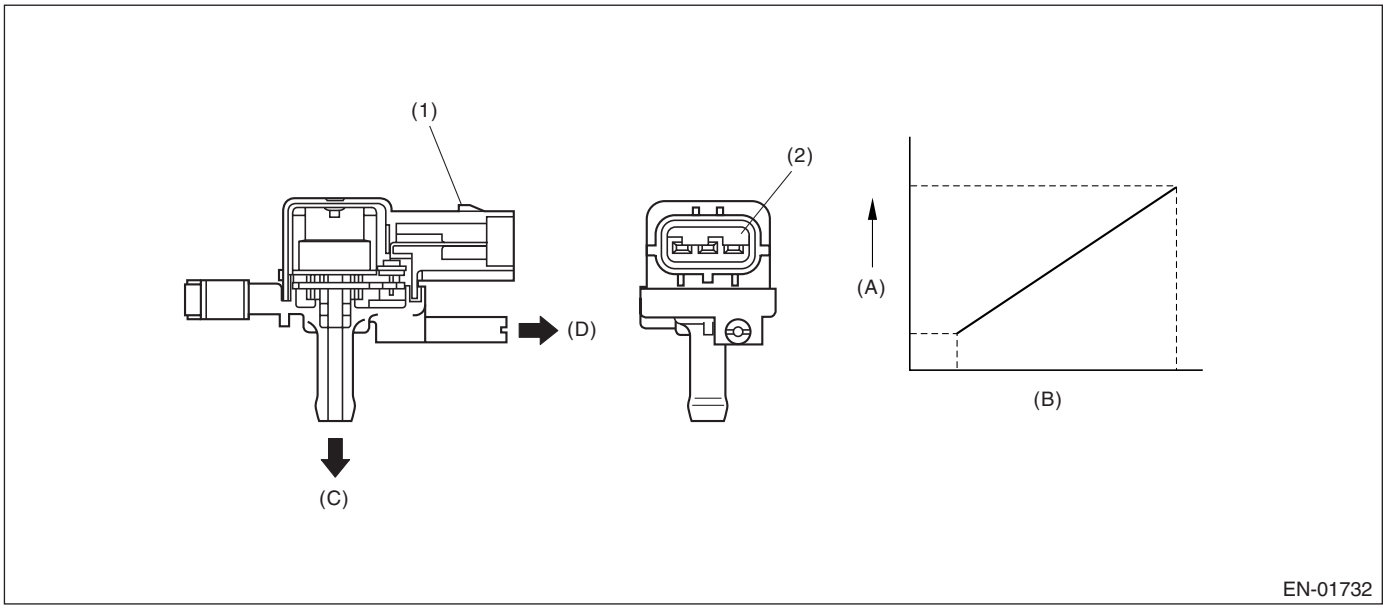
Memorize the freeze frame data. (For test mode $02)

BA:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION (USED WITH HIGH SIDE NORMAL/ABNORMAL JUDGMENT)

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 15 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< –7.33 kPa (–55 mmHg, –2.17 inHg)

Time Needed for Diagnosis: 15 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.
Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ −7.33 kPa (−55 mmHg, −2.17 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

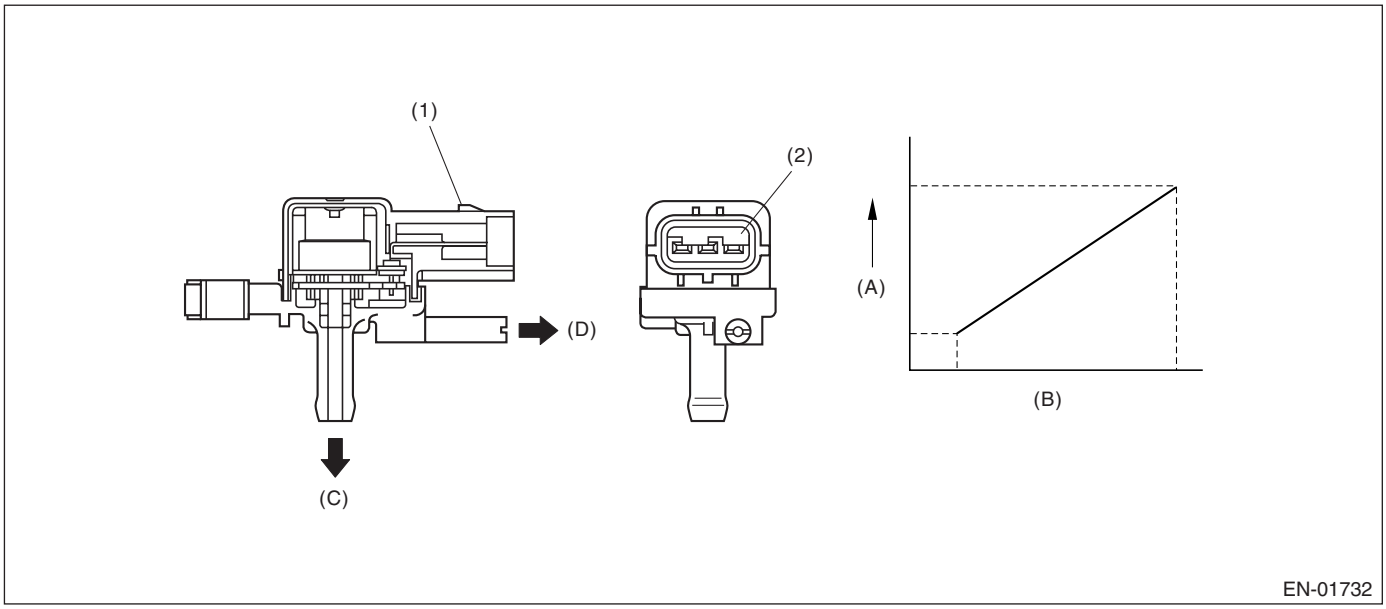
Memorize the freeze frame data. (For test mode $02)

BB:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the breaking/shortage of the fuel tank pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time when all conditions are completed.	≥ 5 seconds
Vehicle speed	≥ 2 km/h (1.24 MPH)
All conditions of EVAP canister purge	Complete
Evaporation gas density learning value	≤ 0.08
Main feedback compensation coefficient	≥ 0.9
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis when purging.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 15 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.33 kPa (55 mmHg, 2.17 inHg)
Fuel temperature	< 35°C (95°F)
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)

Time Needed for Diagnosis: 15 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.33 kPa (55 mmHg, 2.17 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BC:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4DOTC)-112, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BD:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)

1. OUTLINE OF DIAGNOSIS

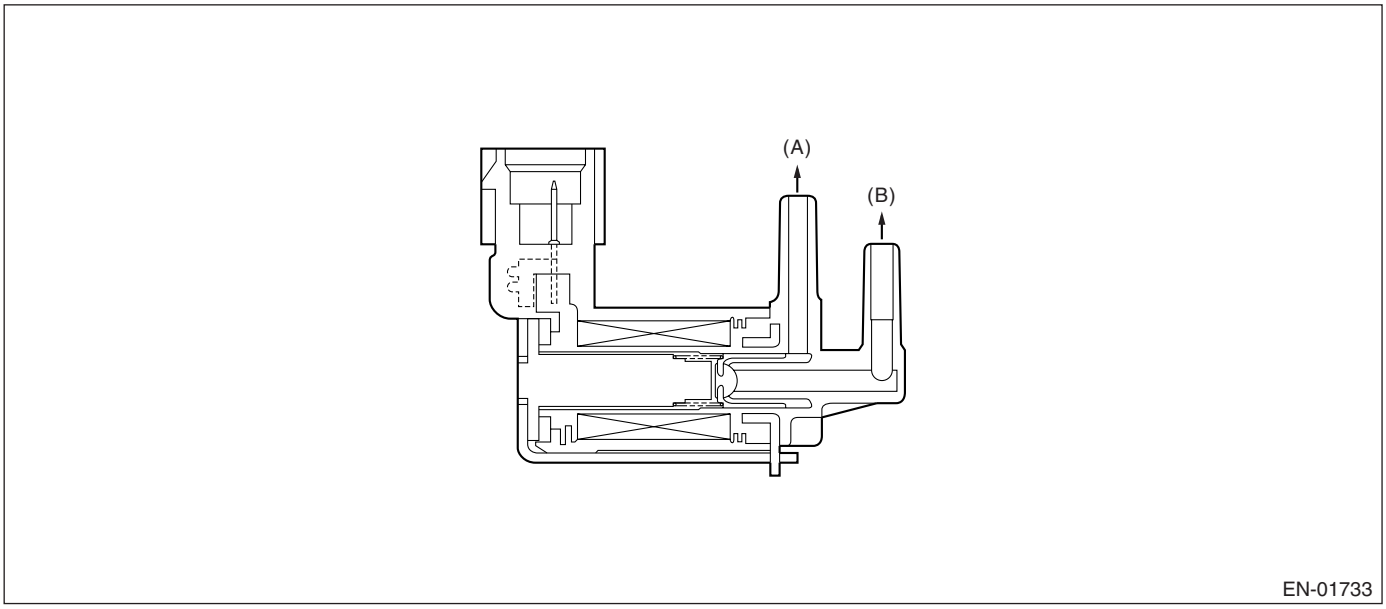
For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4DOTC)-112, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BE:DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) To canister
(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio of 'ON'	< 75%
Terminal output voltage	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.
Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

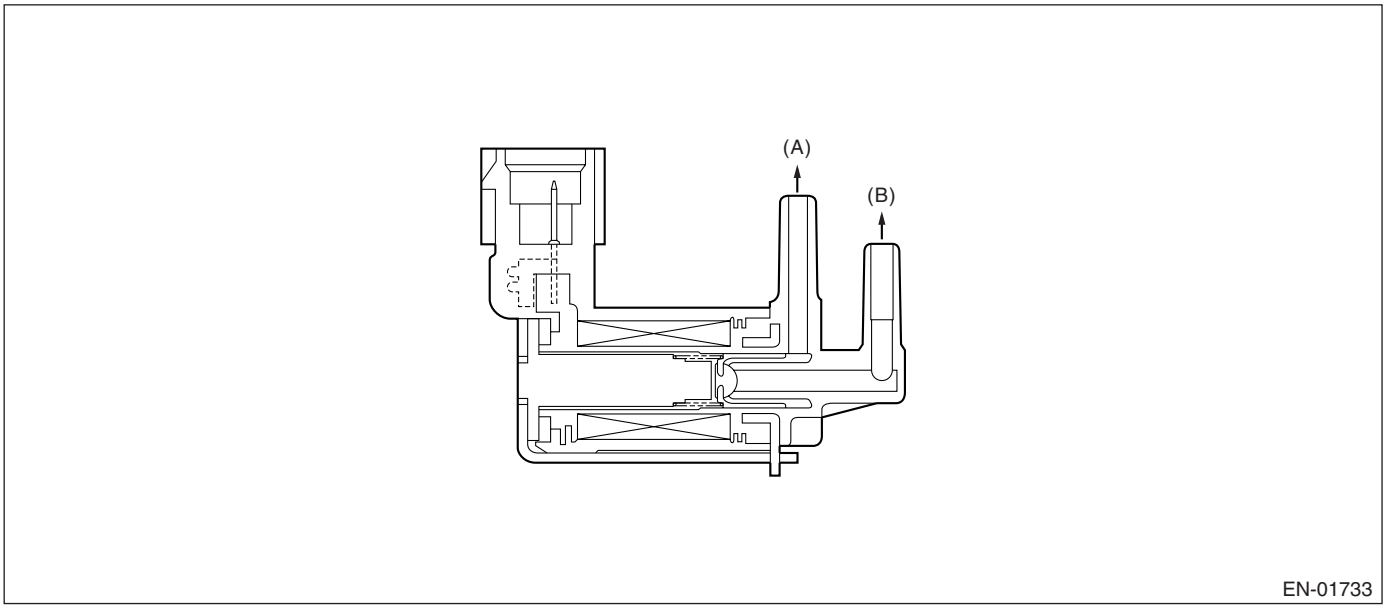
Memorize the freeze frame data. (For test mode $02)

BF:DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) To canister
(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio of 'ON'	≥ 25%
Terminal output voltage	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.
Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

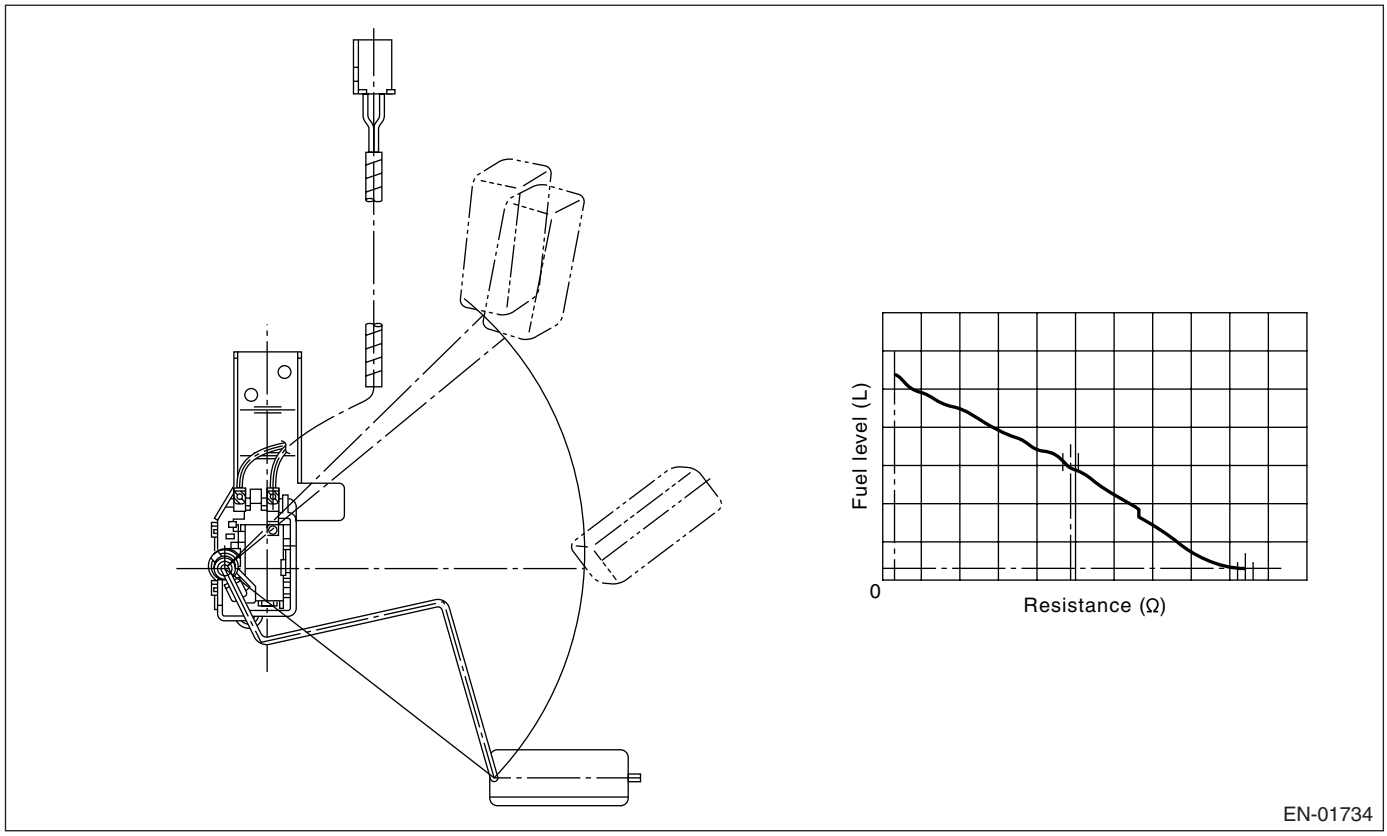
Memorize the freeze frame data. (For test mode $02)

BG:DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel level sensor output property.
Judge NG when the fuel level does not vary whereas it seemed to vary be in a usual driving speed.

2. COMPONENT DESCRIPTION



3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max.– Min. fuel level output	< 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
Engine speed	< 6,500 rpm

Time Needed for Diagnosis: To be determined.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max.– Min. fuel level output	≥ 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
Engine speed	< 6,500 rpm

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

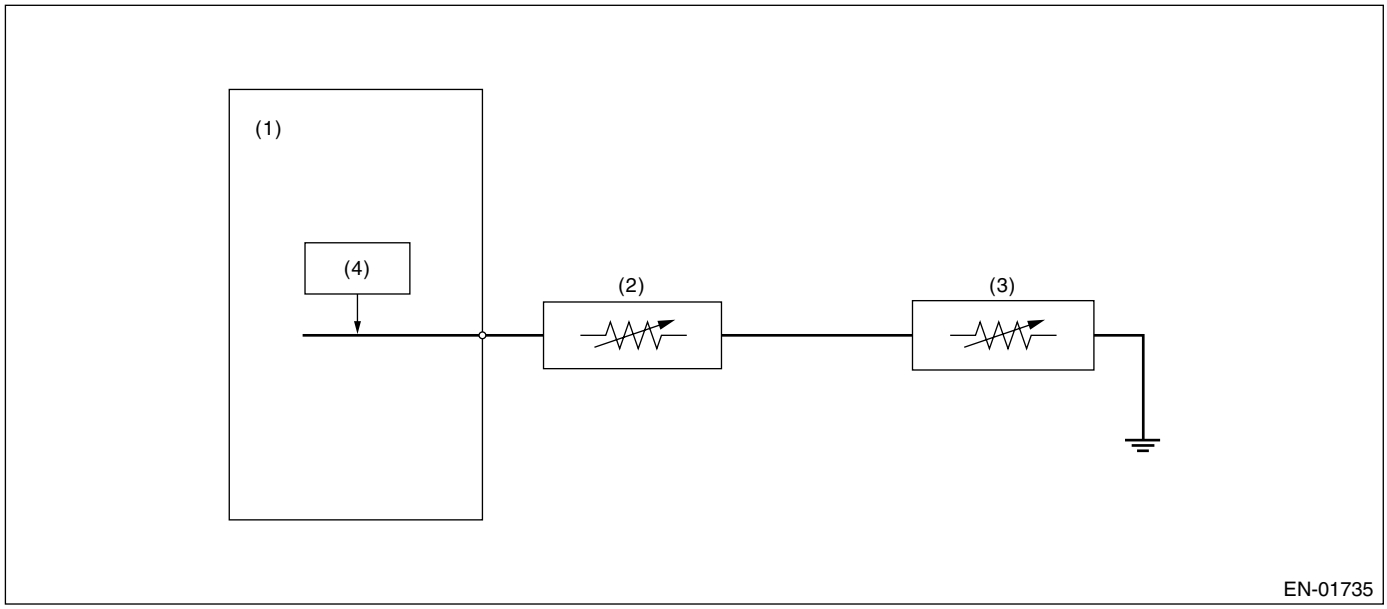
Memorize the freeze frame data. (For test mode $02)

BH:DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more < 0.01 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more ≥ 0.01 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

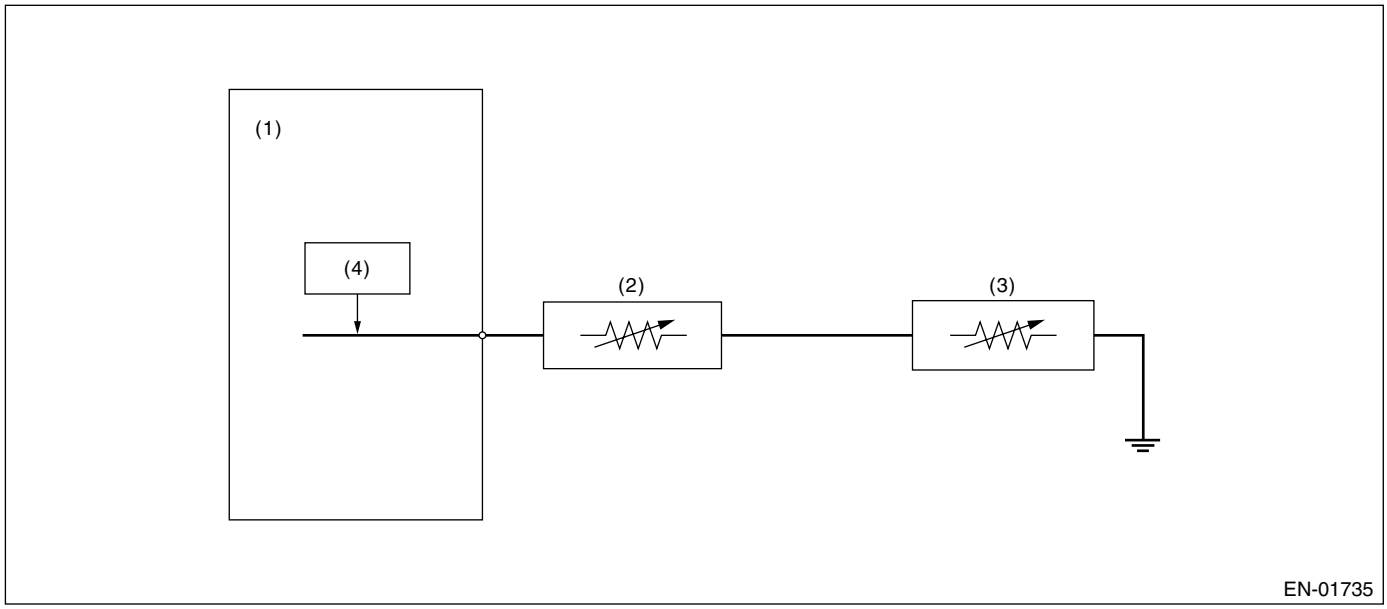
Memorize the freeze frame data. (For test mode $02)

BI: DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (one second).

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	≥ 4.95 V

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	< 4.95 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BJ:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of unstable output from fuel level sensor caused by noise.
Judge NG when the max. value and cumulative value of output voltage variation of fuel level sensor is larger than the threshold value.

2. ENABLE CONDITION

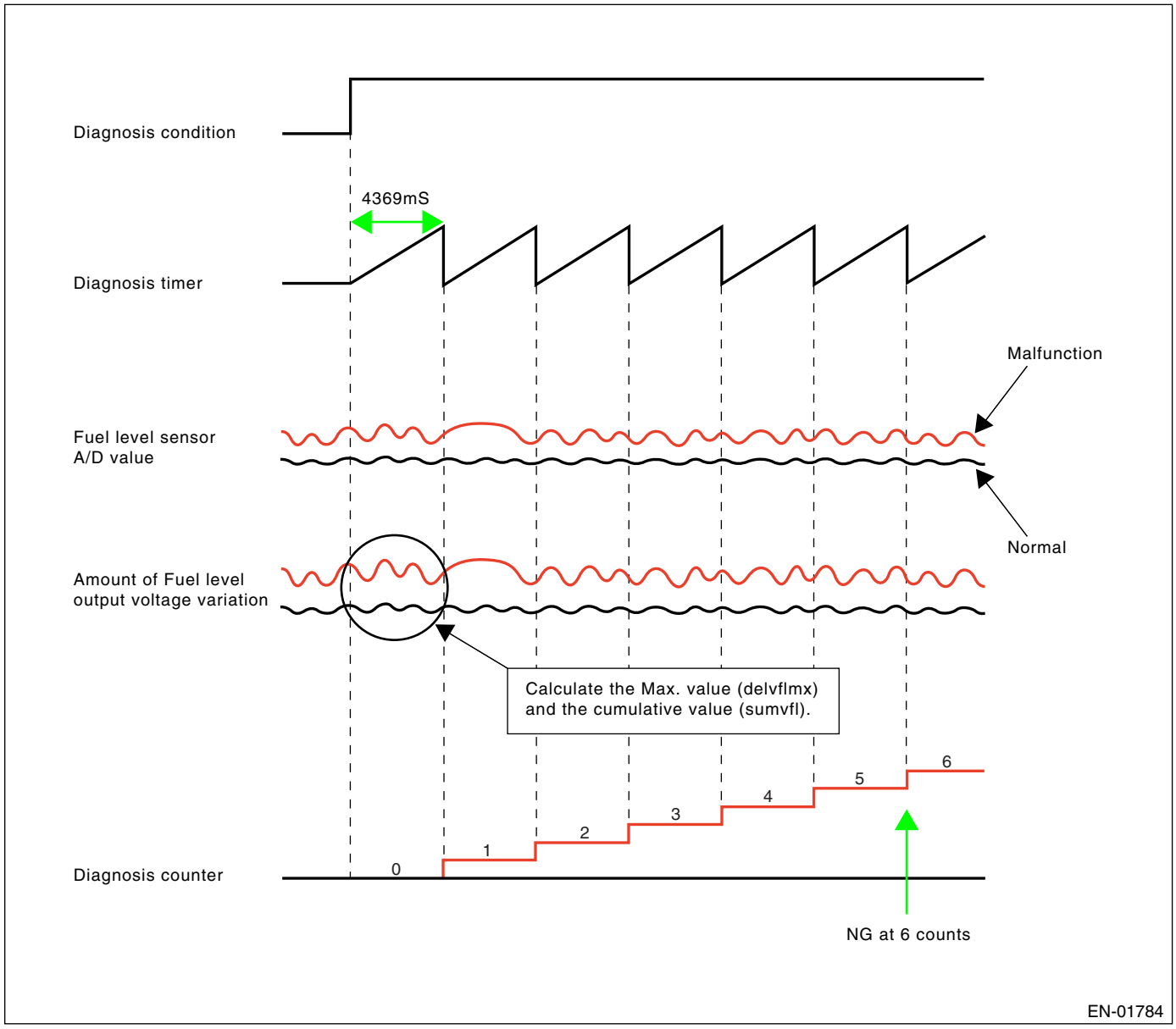
Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
After engine starting	1 second or more
Ignition switch	ON
Battery voltage	> 10.9 V
Idle switch	ON
Fuel level	9 ←→ 51 ℓ (2.4 ←→ 13.4 US gal, 1.98 ←→ 11.2 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	10 seconds or more

3. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously in idling condition.
- Pay attention to the fuel level.

4. DIAGNOSTIC METHOD

Calculate the Max. value (delflmax) and cumulative value (sumfl) of output voltage variation of fuel level sensor during 4,369 milliseconds. Judge it normal when both max. and cumulative values are not over the threshold value. Otherwise, when either of them is over the threshold value, count the diagnosis counter up. And judge NG if the counter indicated 6 counts.



• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Integrated times of the condition reaching follows, DELFLMAX ≥ 0.2 V or SUMFL ≥ 5 V where, DELFLMAX is Max. deviation of sensor output during 4,369 milliseconds. SUMFL is integrated value of sensor output deviation during 4,369 milliseconds.	≥ 6 times

Do not count the diagnosis counter up when the following conditions are completed during 4,369 milliseconds.

Max − Min of tank pressure during 4,369 milliseconds	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)
Max − Min of battery voltage during 4,369 milliseconds	≥ 0.4 V

Time Needed for Diagnosis: 4,369 milliseconds × 6 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
DELFLMAX	< 0.2 V
SUMFL Where, DELFLMAX is Max. deviation of sensor output during 4,369 milliseconds. SUMFL is integrated value of sensor output deviation during 4,369 milliseconds.	< 5 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BK:DTC P0483 COOLING FAN RATIONALITY CHECK

1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the radiator fan.
Judge NG when the engine coolant temperature slowly decreases even when the radiator fan is rotating.

2. ENABLE CONDITION

Diagnostic enable condition is completed if the radiator fan changes from OFF to ON when all of the conditions below are completed. When one of the conditions below is not completed, the diagnostic enable condition is not completed.

Secondary Parameters	Enable Conditions
Engine Speed	600 — 900 rpm
Idle switch	ON
Vehicle speed	< 2 km/h (1.2 MPH)
Battery voltage	≥ 0.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the radiator fan changes from OFF to ON when idling.

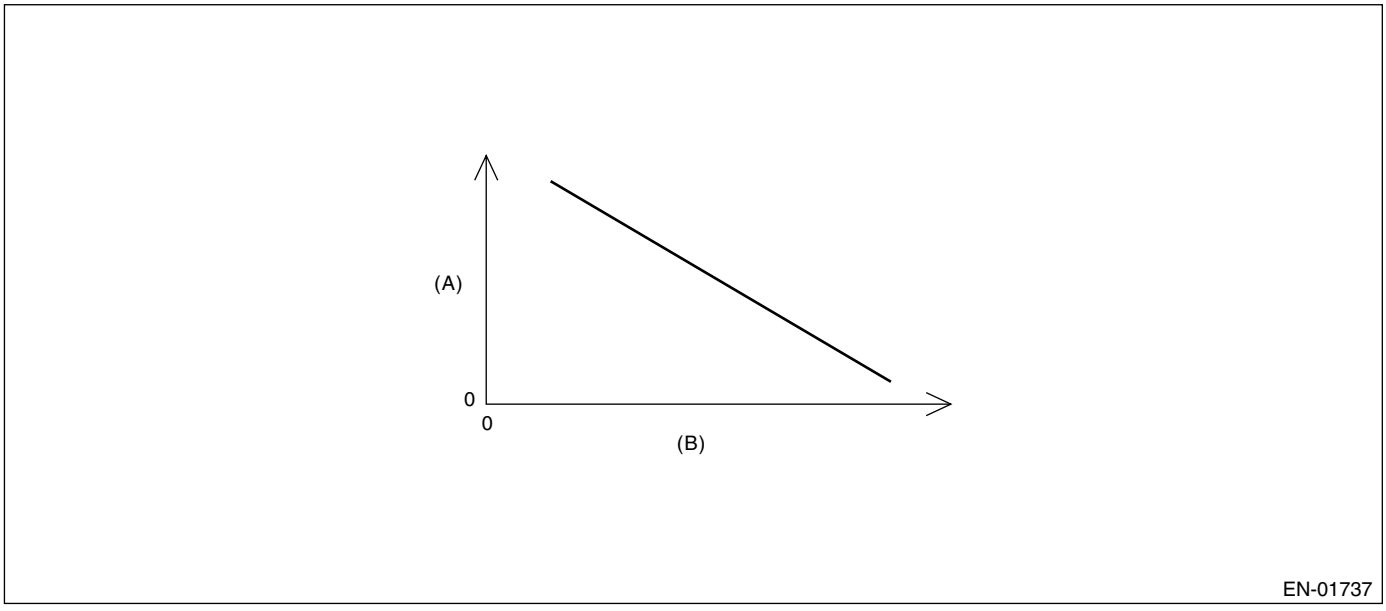
4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 minutes.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 96°C (204.8°F)
Engine coolant temperature sensor A/D value − Engine coolant temperature sensor A/D value Min. value (Min. value with radiator fan OFF → ON)	< 15 mV (Approx. 1°C (1.8°F))



(A) Engine coolant temperature °C (°F)
(B) A/D value (V)

Time Needed for Diagnosis: 5 minutes

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature sensor A/D value − Engine coolant temperature sensor A/D value Min. value (Min. value with radiator fan OFF → ON)	≥ 15 mV (Approx. 1°C (1.8°F))

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BL:DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.
Judge NG when low vehicle speed (0 km/h (0 MPH)) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4,000 rpm
Fuel cut in decel.	Operating
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 4 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.
Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1

Time Needed for Diagnosis: 4 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

- Throttle position sensor signal process: All closed points learning / Not allowed to increase.
- Vehicle speed sensor signal process: Vehicle speed = 0 km/h (0 MPH)
- Fuel cut control: Vehicle speed = 0 km/h (0 MPH) / Not allowed to carry out the fuel cut. High vehicle speed / Not allowed to carry out the fuel cut.
- ISC open loop compensation: Fix the open loop compensation at 5%
- ISC feedback control: Not allowed to calculate the amount of ISC feedback.
- Air conditioner control: Not allowed to resume the air conditioner that is cut with the throttle fully opened.
- Radiator fan control: Both main and sub fan are in High driving.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BM:DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.
Judge NG when high vehicle speed (240 km/h (149.1 MPH) or more) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4,000 rpm
Fuel cut in decel.	Operating
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration.

4. DIAGNOSTIC METHOD

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 4 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.
Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 240

Time Needed for Diagnosis: 4 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

- Throttle position sensor signal process: All closed points learning / Not allowed to increase.
- Vehicle speed sensor signal process: Vehicle speed = 0 km/h (0 MPH)
- Fuel cut control: Vehicle speed = 0 km/h (0 MPH) / Not allowed to carry out the fuel cut. High vehicle speed / Not allowed to carry out the fuel cut.
- ISC open loop compensation: Fix the open loop compensation at 5%
- ISC feedback control: Not allowed to calculate the amount of ISC feedback.
- Air conditioner control: Not allowed to resume the air conditioner that is cut with the throttle fully opened.
- Radiator fan control: Both main and sub fan are in High driving.

8. ECM OPERATION AT DTC SETTING

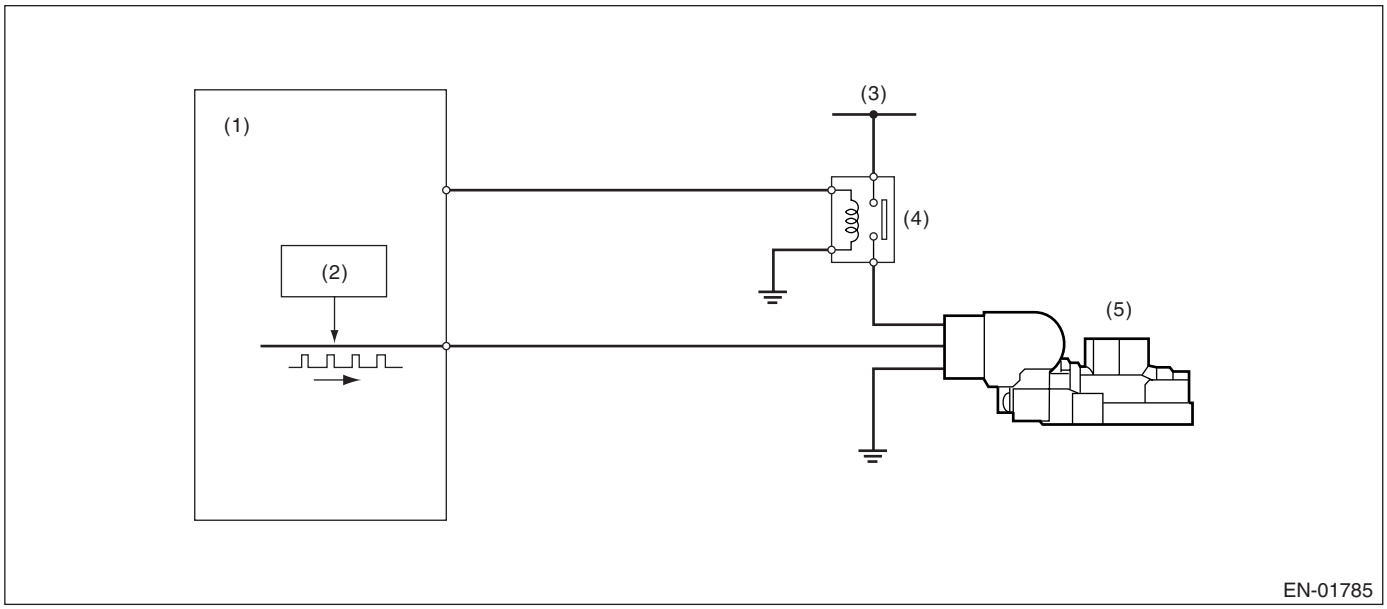
Memorize the freeze frame data. (For test mode $02)

BN:DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling.
Judge NG when actual engine speed is not close to target engine speed during idling.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Detecting circuit
(3) Battery voltage
(4) Main relay
(5) Idle air control solenoid valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
After engine starting	10 seconds or more
Feedback in ISC	In operation
Measured lambda	0.90 ←→ 1.1
After air condition switching ON-OFF, OFF-ON	5 seconds or more
After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg)	> 5 seconds
After neutral switch ON-OFF event	> 5 seconds
Vehicle speed	0 km/h (0 MPH)

4. GENERAL DRIVING CYCLE

Always perform diagnosis during idling after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds × 3 times).

Judgment Value

Malfunction Criteria	Threshold Value
Actual − target engine speed	< −100 rpm
Feedback correction for idle air control solenoid valve	Max.

Time Needed for Diagnosis: 10 seconds × 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Actual − target engine speed	≥ −100 rpm

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel.

9. ECM OPERATION AT DTC SETTING

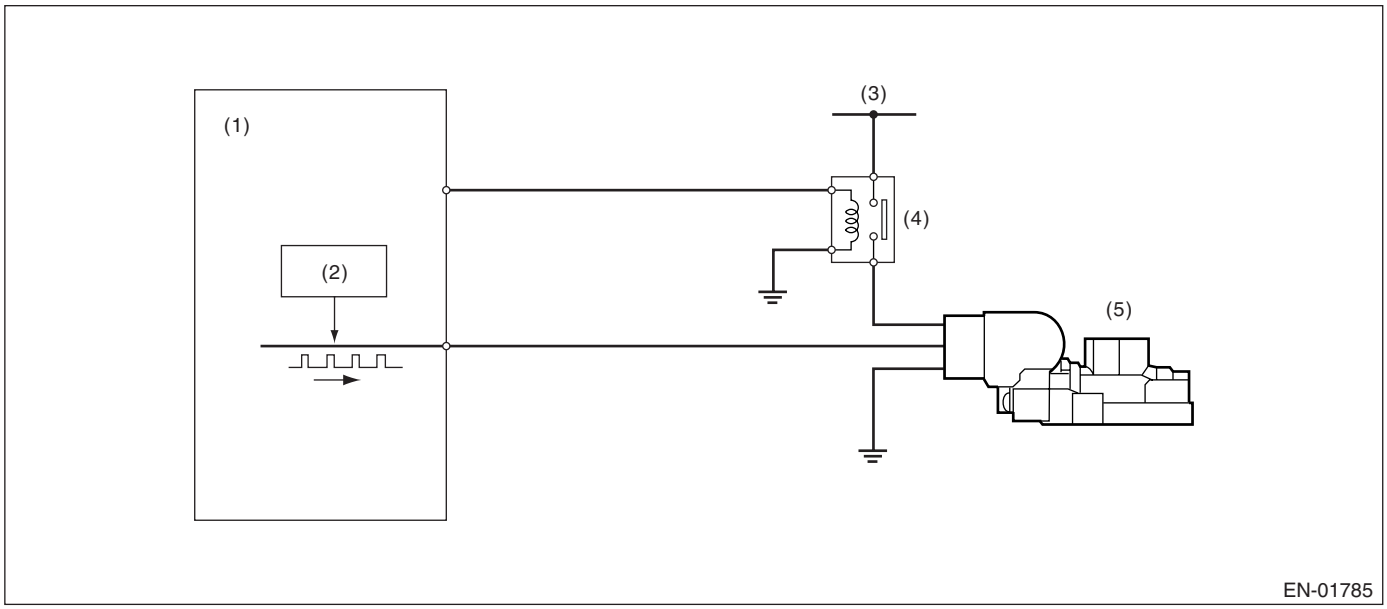
Memorize the freeze frame data. (For test mode $02)

BO:DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling.
Judge NG when actual engine speed is not close to target engine speed during idling.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Detecting circuit
(3) Battery voltage
(4) Main relay
(5) Idle air control solenoid valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
After engine starting	10 seconds or more
Feedback in ISC	In operation
Lambda	0.90 ←→ 1.1
After air condition switching ON-OFF, OFF-ON	5 seconds or more
After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg)	> 5 seconds
After neutral switch ON-OFF event	> 5 seconds
Vehicle speed	0 km/h (0 MPH)

4. GENERAL DRIVING CYCLE

Always perform diagnosis during idling after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds × 3 times).

Judgment Value

Malfunction Criteria	Threshold Value
Actual – target eng. speed	≥ 200 rpm
Feedback correction for idle air control solenoid valve	Min.

Time Needed for Diagnosis: 10 seconds × 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Actual – target eng. speed	< 200 rpm

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel.

9. ECM OPERATION AT DTC SETTING

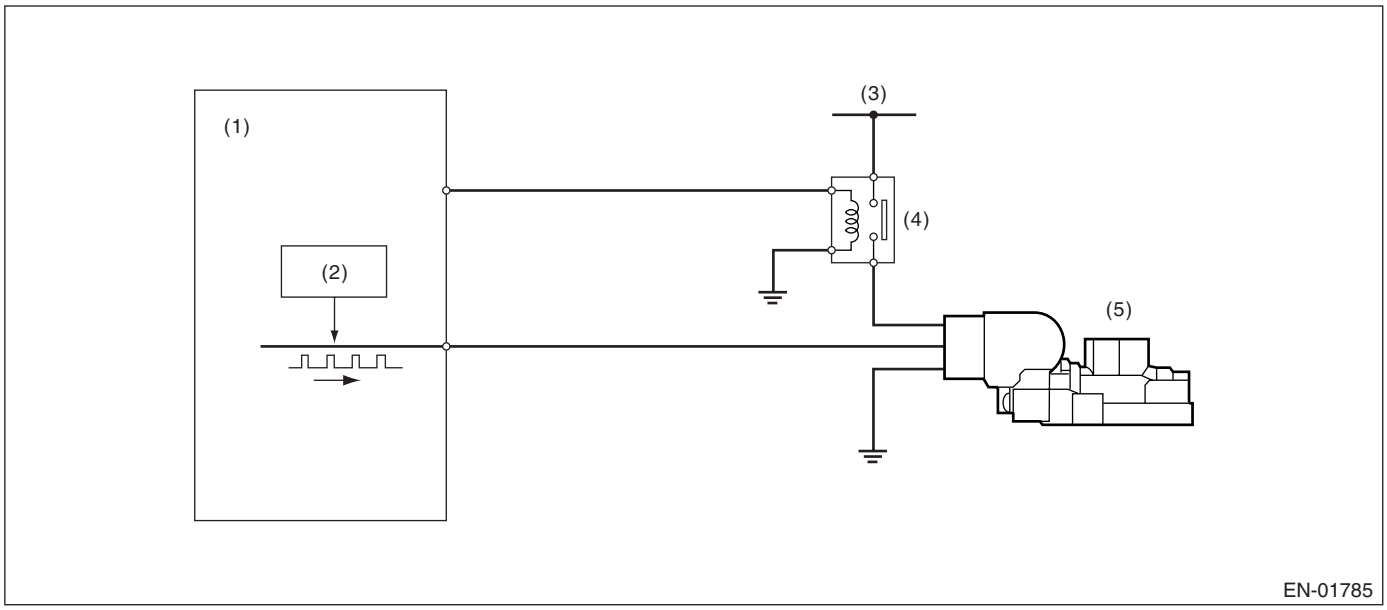
Memorize the freeze frame data. (For test mode $02)

BP:DTC P0508 IDLE CONTROL SYSTEM CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit in idle air control solenoid valve.
Period of idle air control solenoid valve is 4 milliseconds and it is too short.
Judge OK/NG in accordance with the number of change of OFF to ON signal.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Detecting circuit
(3) Battery voltage
(4) Main relay
(5) Idle air control solenoid valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	1 second or more
Idle air control solenoid valve duty ratio	5 — 95%
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Number of change that idle air control solenoid valve signal during 64 milliseconds.	≤ 8 (160 at normal since the cycle is 4 milliseconds)

Time Needed for Diagnosis: 64 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Idle air control solenoid valve feedback correction: Not allowed to calculate ifb (idle air control solenoid valve feedback amount)
- Fuel shut-off: Shut-off fuel for only #1 and #2 cylinder, or for all cylinder in accordance with vehicle speed, engine speed, throttle position
- Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel

9. ECM OPERATION AT DTC SETTING

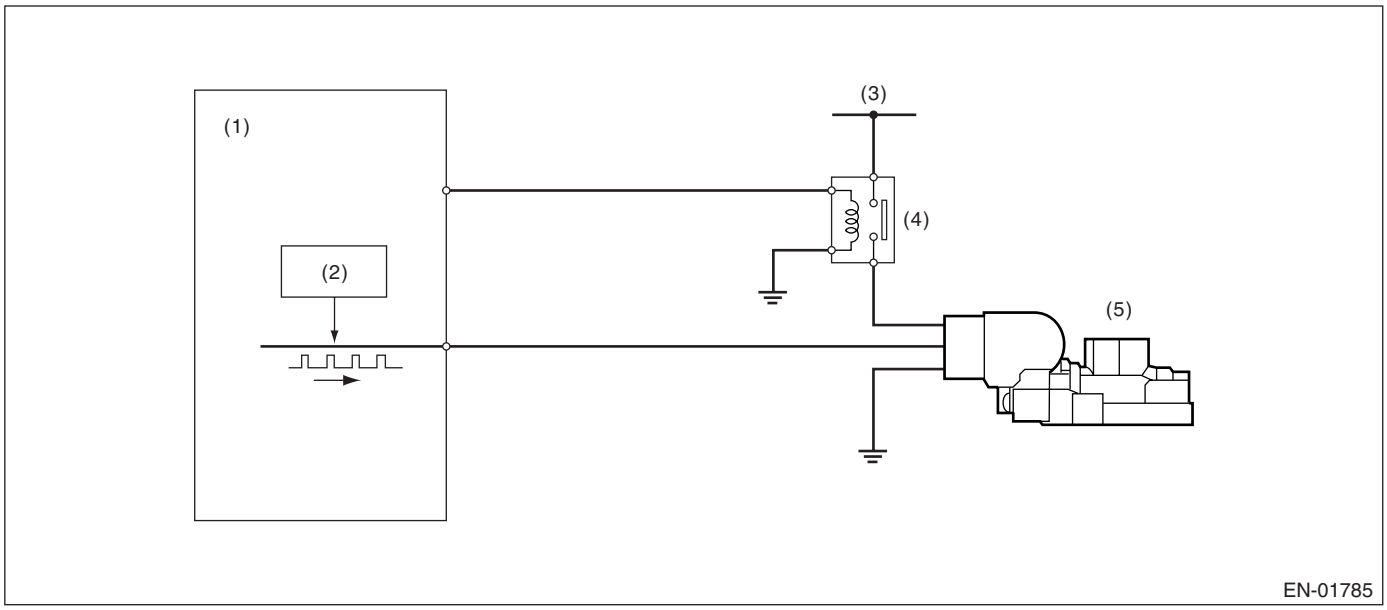
Memorize the freeze frame data. (For test mode $02)

BQ:DTC P0509 IDLE CONTROL SYSTEM CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit in idle air control solenoid valve.
Period of idle air control solenoid valve is 4 milliseconds and it is too short.
Judge OK/NG in accordance with the number of change of OFF to ON signal.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Detecting circuit
(3) Battery voltage
(4) Main relay
(5) Idle air control solenoid valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	1 second or more
Idle air control solenoid valve duty ratio	5 — 95%
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Number of change that idle air control solenoid valve signal during 64 milliseconds	≥ 225 (160 at normal since the cycle is 4 milliseconds)

Time Needed for Diagnosis: 64 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Idle air control solenoid valve feedback correction: Not allowed to calculate ifb (idle air control solenoid valve feedback amount)
- Fuel shut-off: Shut-off fuel for only #1 and #2 cylinder, or for all cylinder in accordance with vehicle speed, engine speed, throttle position
- Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BR:DTC P0512 STARTER REQUEST CIRCUIT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.
Judge ON NG when the starter SW signal remains to be on.
Judge OFF NG when the engine starts without starter experience.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 minutes.

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	> 500 rpm
Starter SW	ON
Battery voltage	> 8 V

Time Needed for Diagnosis: 180 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge ON OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Starter SW	OFF
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

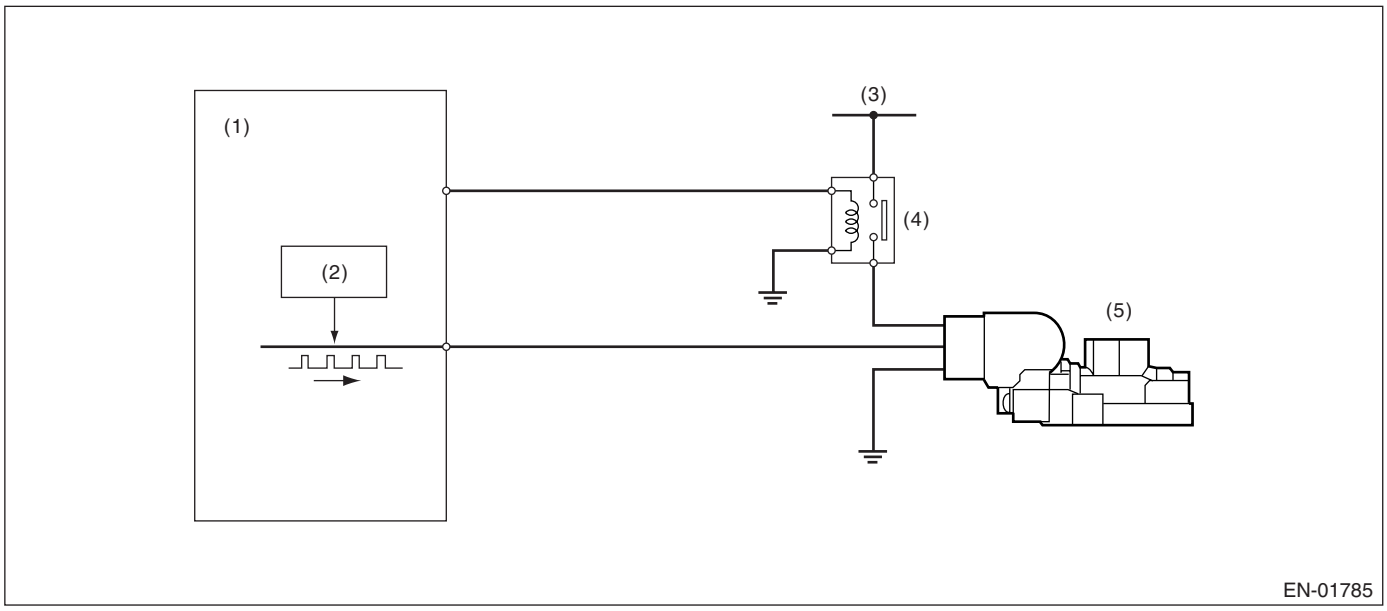
Memorize the freeze frame data. (For test mode $02)

BS:DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that engine speed increases more than that in normal condition during idling.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Detecting circuit
(3) Battery voltage
(4) Main relay
(5) Idle air control solenoid valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Feedback in ISC	In operation
Vehicle speed	< 4 km/h (2.49 MPH)
After engine starting	1 seconds or more

4. GENERAL DRIVING CYCLE

Always perform diagnosis at less than 4 km/h (2.49 MPH) of vehicle speed.

5. DIAGNOSTIC METHOD

• Abnormality Judgment 1

Judge NG when the continuous time until completing the all malfunction criteria below becomes more than the time needed for diagnosis (2 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	≥ 1,000 rpm
Feedback value for ISC	≤ 0
Engine speed change every 180 degree engine rev.	≥ –5 rpm

• Abnormality Judgment 2

Judge NG when the continuous time until completing the all malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	≥ 1,000 rpm
Feedback value for ISC	≤ 0

Time Needed for Diagnosis: 2 seconds or 5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	< 200 rpm

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Fuel shut-off: Shut-off fuel for only #1 and #2 cylinder, or for all cylinder in accordance with vehicle speed, engine speed, throttle position

9. ECM OPERATION AT DTC SETTING

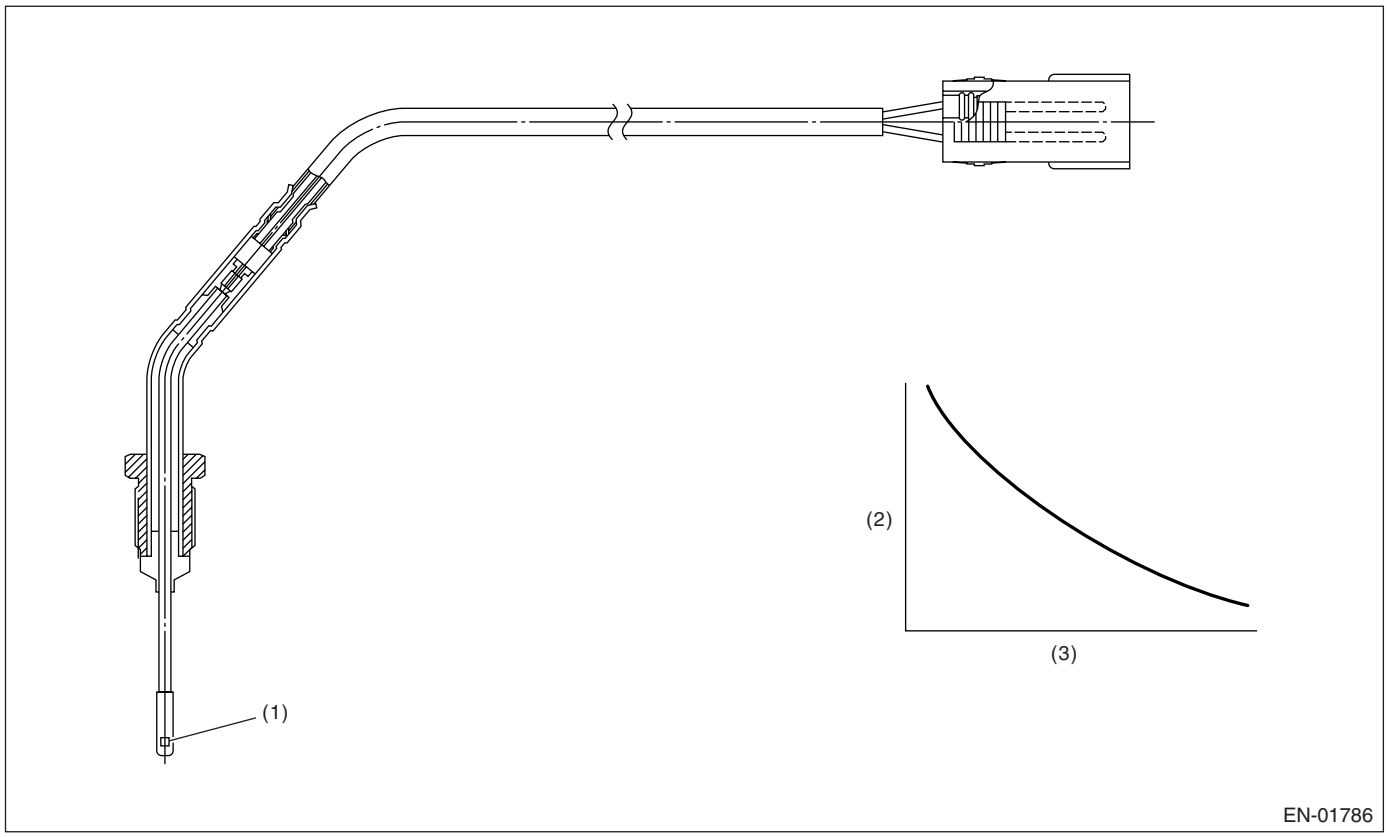
Memorize the freeze frame data. (For test mode $02)

BT:DTC P0545 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW-BANK 1

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of exhaust temperature sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Thermistor
(2) Resistance value (kΩ)
(3) Exhaust temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Sensor output voltage	< 0.15 V
Amount of intake air	< 100 g/s

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.
• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor output voltage	≥ 0.15 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

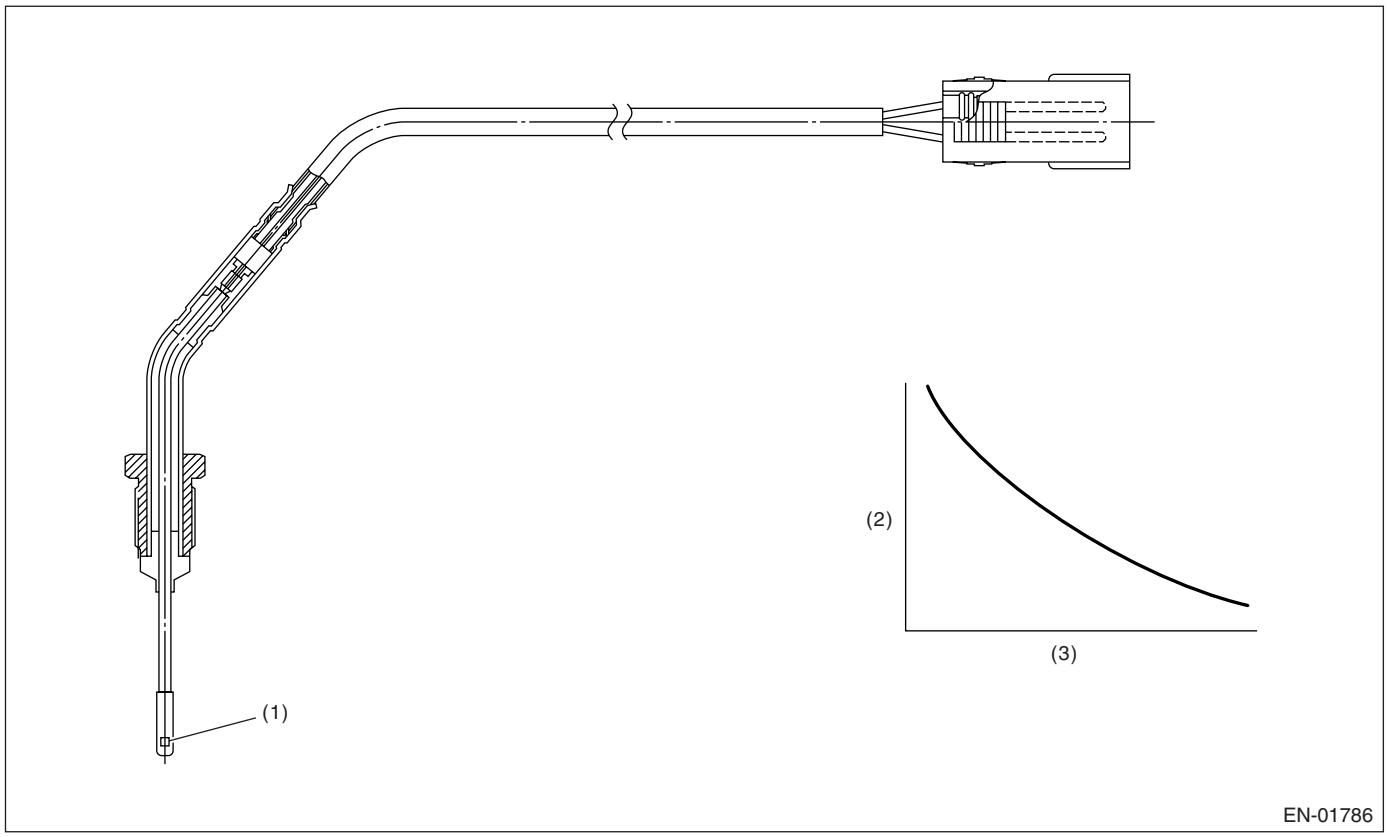
Memorize the freeze frame data. (For test mode $02)

BU:DTC P0546 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH-BANK 1

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of exhaust temperature sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Thermistor
(2) Resistance value (kΩ)
(3) Exhaust temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than the time needed for diagnosis (30 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
After engine starting	240 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Vehicle speed	≥ 65 km/h (40.4 MPH)
Engine speed	≥ 1,800 rpm
Engine load (gn)	≥ 0.6 g/rev
Fuel cut event	Not operating
After the recovery from fuel cut event	30 seconds or more
Sensor output voltage	≥ 4.72 V

Time Needed for Diagnosis: 30 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor output voltage	< 4.72 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BV:DTC P0565 CRUISE CONTROL ON SIGNAL

1. OUTLINE OF DIAGNOSIS

Judge NG when the cruise control set signal is continued to be ON for a certain period of time at the vehicle speed less than 20 km/h (12 MPH).

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed	≤ 20 km/h (12.4 MPH)

3. GENERAL DRIVING CYCLE

Always perform diagnosis at vehicle speed 20 km/h (12.4 MPH) or less.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Canceling signal	No signal

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BW:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the micro-computer (RAM).
Normally, zero-clear all the RAM area in the initial routine. And judge NG when the total of all the RAM after the clear is not $0000.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

Perform the diagnosis in the initial routine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis immediately after IG key SW is turned ON.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Total of all the RAM after the zero-clear the all the normal RAM area.	Not to 0

Time Needed for Diagnosis: Undecided
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BX:DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.
Judge NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits OFF signal	High level

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BY:DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.
Judge NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits ON signal	High level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits ON signal	Low level

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BZ:DTC P0703 TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT

1. OUTLINE OF DIAGNOSIS

Judge NG when the AT brake switch circuit becomes battery short, ground short or open circuit.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed change	30 to 0 km/h (18.6 to 0 MPH) 0 to 30 km/h (0 to 18.6 MPH)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
ON signal	No signal
OFF signal	No signal

Time Needed for Diagnosis: 10 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CA:DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT)

1. OUTLINE OF DIAGNOSIS

Judge NG when the “D” range switch becomes ground short or open circuit.

2. COMPONENT DESCRIPTION

Inhibitor switch ensures the safety at engine start. This switch is installed to the right side of transmission case, and operated by selector lever. When the selector lever is in the “P” or “N” range, the engine will start because the electric circuit in inhibitor switch is closed and the starter circuit is connected. When the selector lever is in the “R”, “D”, “3”, “2” or “1” range, the electric circuit in inhibitor switch is open; therefore, the engine cannot be cranked. In the “R” range, the back-up light will illuminate because the back-up light circuit in the switch is connected. In addition to the functions above, the inhibitor switch has the circuit which detects the selected range position at the present and transmits the range signal to the TCM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Shift	“N” to “3”
Vehicle speed	≥ 60 km/h (37 MPH)
Engine speed	> 500 rpm
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
“D” signal continuously	Not detected
Simultaneous signal	≥ 2

Time Needed for Diagnosis:
- 63.75 seconds
- 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CB:DTC P0710 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT

1. OUTLINE OF DIAGNOSIS

- Judge NG when ATF temperature sensor becomes open circuit, battery short or ground short.
- Judge NG when ATF temperature sensor is faulty.

2. COMPONENT DESCRIPTION

ATF temperature sensor is installed to the hydraulic control valve body of transmission as a unit with transmission harness. This sensor detects ATF temperature and outputs it as electric resistance signal.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.1 V
Output at ≥ 80 km/h (50 MPH) after 5 minutes from reaching more than 4.8 V	≥ 4.7 V

Time Needed for Diagnosis: 63.75 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control ATF temperature at a constant temperature 80°C (176°F)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CC:DTC P0716 INPUT/TURBINE SPEED SENSOR CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge NG when the turbine speed signal is not transmitted for some reasons.

2. COMPONENT DESCRIPTION

Torque converter turbine speed sensor (output shaft speed sensor) is installed to the outside of transmission case. This sensor detects the turbine speed of torque converter by the peripheral speed of high clutch drum connected to input shaft. And then it transmits the sine wave signal (32 pulses per rev.) to TCM. TCM calculates the ratio of the input shaft speed to vehicle speed, and then makes a judgment whether to shift or not.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 1,500 rpm
Vehicle speed	≥ 40 km/h (25 MPH)
Range switch	“D”, “3”, “2” or “1”

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below were continued for 2 seconds.
(1) Except “P”, “N”, “R” ranges and inhibitor switch is normal.
(2) Engine speed is more than 3,000 rpm.
(3) Vehicle speed is 30 km/h (19 MPH) and vehicle speed sensor is normal.
(4) Turbine speed is more than 600 rpm.

Judgment Value

Malfunction Criteria	Threshold Value
Output from turbine shaft speed	< 600 rpm

Time Needed for Diagnosis: 2 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CD:DTC P0720 OUTPUT SPEED SENSOR CIRCUIT

1. OUTLINE OF DIAGNOSIS

Judge NG when an abnormal large signal is input to the front vehicle speed sensor, or no signal is input to the rear vehicle speed sensor.

2. COMPONENT DESCRIPTION

This vehicle speed sensor (output shaft speed sensor) is installed to the outside of transmission case.
This sensor detects the front wheel speed, and transmits the sine wave signal (32 pulses per rev.) to TCM.
TCM converts the signal to pulse signal, and transmits to both of the ECM and the combination meter.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed	≥ 20 km/h (12 MPH)

4. GENERAL DRIVING CYCLE

Always perform the diagnosis with more than 20 km/h (12 MPH) vehicle speed.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed sensor	
Front	≥ 255 km/h (158 MPH)
Rear	= 0 km/h (0 MPH)
Front vehicle speed sensor(During vehicle running at 20 km/h)	= 0 km/h (0 MPH)

Time Needed for Diagnosis: 63.75 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Use the normal vehicle speed sensor signal when either of them is normal.
- Use the vehicle speed calculated from the current gear position and turbine speed when both front and rear wheels are troubled.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CE:DTC P0726 ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge NG when the engine speed is not input in the status of running the engine.

2. COMPONENT DESCRIPTION

Engine speed sensor is installed to the outside of engine body and crank part. This sensor detects the crank speed, and transmits the sine wave signal (2 pulses per rev.) to TCM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Output from mass air flow sensor	≥ 1.12 — 1.52 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	≤ 400 rpm

Time Needed for Diagnosis: 63.75 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CF:DTC P0731 GEAR 1 INCORRECT RATIO

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	≥ 15°
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	"D", "3", "2" or "1"
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Always perform the diagnosis with less than 10 km/h (6 MPH) vehicle speed.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.
(1) Vehicle speed is more than 10 km/h (6 MPH).
(2) Throttle sensor is more than a certain angle.
(3) Shifted to "D", "3", "2" or "1" range, and range signal is normal.
(4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR/(1st gear ratio) where, GR = (vehicle speed sensor 1 output)/ (turbine shaft speed sensor output)	> 110% or < 90%

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CG:DTC P0732 GEAR 2 INCORRECT RATIO

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	≥ 15°
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	“D”, “3”, “2” or “1”
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Always perform the diagnosis with less than 10 km/h (6 MPH) vehicle speeds.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.
(1) Vehicle speed is more than 10 km/h (6 MPH).
(2) Throttle sensor is more than a certain angle.
(3) Shifted to “D”, “3”, “2” or “1” range, and range signal is normal.
(4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR/(2nd gear ratio) Where, GR = (Vehicle speed sensor 1 output)/ (Turbine shaft speed sensor output)	> 110% or < 90%

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CH:DTC P0733 GEAR 3 INCORRECT RATIO

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	≥ 15°
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	“D”, “3”, “2” or “1”
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Always perform the diagnosis with less than 10 km/h (6 MPH) vehicle speeds.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.
(1) Vehicle speed is more than 10 km/h (6 MPH).
(2) Throttle sensor is more than a certain angle.
(3) Shifted to “D”, “3”, “2” or “1” range, and range signal is normal.
(4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR/(3rd gear ratio) Where, GR = (Vehicle speed sensor 1 output)/ (Turbine shaft speed sensor output)	> 110% or < 90%

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CI: DTC P0734 GEAR 4 INCORRECT RATIO

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	≥ 15°
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	"D", "3", "2" or "1"
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Always perform the diagnosis with less than 10 km/h (6 MPH) vehicle speeds.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.
(1) Vehicle speed is more than 10 km/h (6 MPH).
(2) Throttle sensor is more than a certain angle.
(3) Shifted to "D", "3", "2" or "1" range, and range signal is normal.
(4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR/(4th gear ratio) Where, GR = (Vehicle speed sensor 1 output)/ (Turbine shaft speed sensor output)	> 110% or < 90%

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CJ:DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF

1. OUTLINE OF DIAGNOSIS

Judge NG when the engine speed is different from the turbine speed for some reasons at AT lock-up.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
In 4th gear position, duty ratio for duty solenoid valve	≥ 90%

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed ≥ (output shaft speed × 4th gear ratio × 9/8)	

Time Needed for Diagnosis: 10.2 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Not allowed to lock up.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CK:DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL

1. OUTLINE OF DIAGNOSIS

Judge NG when the lock-up duty solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Lock-up duty solenoid is installed to the transmission hydraulic control valve body. The duty ratio is controlled by the signal from TCM. This allows the lock-up clutch to be connected or released smoothly by controlling the lock-up control valve.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 0.14 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CL:DTC P0748 PRESSURE CONTROL SOLENOID “A” ELECTRICAL

1. OUTLINE OF DIAGNOSIS

Judge NG when the line pressure duty solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Line pressure duty solenoid is installed to the transmission hydraulic control valve body. The duty ratio is controlled by the signal from TCM. This allows controlling the pressure modifier valve and accumulator control valve A, and allows the line pressure to be adjusted to the pressure appropriate for driving condition.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 0.14 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CM:DTC P0753 SHIFT SOLENOID “A” ELECTRICAL

1. OUTLINE OF DIAGNOSIS

Judge NG when the shift solenoid 1 becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Shift solenoid 1 Shift solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. Gear positions will change depending on the solenoid condition which is ON or OFF.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Collector voltage of transistor (Vc) for solenoid valve is inconsistent with signal from ECM	

Time Needed for Diagnosis: 30 milliseconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CN:DTC P0758 SHIFT SOLENOID “B” ELECTRICAL

1. OUTLINE OF DIAGNOSIS

Judge NG when the shift solenoid 2 becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Shift solenoid 2 Shift solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. Gear positions will change depending on the solenoid condition which is ON or OFF.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc for solenoid valve is inconsistent with signal from ECM	

Time Needed for Diagnosis: 30 milliseconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CO:DTC P0771 SHIFT SOLENOID “E” PERFORMANCE OR STUCK OFF

1. OUTLINE OF DIAGNOSIS

Judge NG when the low clutch timing solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Low clutch timing solenoid Low clutch timing solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. This allows controlling the low clutch timing valve B and reverse inhibitor valve.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 30 milliseconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CP:DTC P0778 PRESSURE CONTROL SOLENOID “B” ELECTRICAL

1. OUTLINE OF DIAGNOSIS

Judge NG when the 2-4 brake duty solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

2-4 brake duty solenoid is installed to the transmission hydraulic control valve body. The duty ratio is controlled by the signal from TCM. This solenoid decreases the change gear shock by adjusting the 2-4 brake pressure during 2-4 brake operation.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 0.14 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CQ:DTC P0785 SHIFT/TIMING SOLENOID

1. OUTLINE OF DIAGNOSIS

Judge NG when the 2-4 brake timing solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

2-4 brake timing solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. This allows controlling the 2-4 brake timing valve B and decreases the change gear shock.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 30 milliseconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CR:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.
Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting the engine	2 seconds or more
Starter switch	OFF
Engine speed	≥ 500 rpm

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 100 seconds. Judge OK and clear NG when the malfunction criteria below are not completed.
Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal when park/neutral = “ON” & any other switches = “OFF” on AT	OFF

Time Needed for Diagnosis: 100 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CS:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.
Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting the engine	2 seconds or more
Starter switch	OFF
Engine speed	≥ 500 rpm

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	ON continues
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm	
b) Vehicle speed = 64 km/h (40 MPH) & engine speed 1,600 — 2,550 rpm	

Time Needed for Diagnosis: 3 monitoring
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CT:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.
Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting the engine	2 seconds or more
Starter switch	OFF
Engine speed	≥ 500 rpm

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than100 seconds. Judge OK and clear NG when the malfunction criteria below are not completed.
Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal when park/neutral = “OFF” & any other switches = “ON” on AT	ON

Time Needed for Diagnosis: 100 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CU:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.
Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting the engine	2 seconds or more
Starter switch	OFF
Engine speed	≥ 500 rpm

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	OFF continues
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm	
b) Vehicle speed = 64 km/h (40 MPH) & engine speed 1,600 — 2,550 rpm	

Time Needed for Diagnosis: 3 monitoring
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CV:DTC P0864 TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect malfunction of communication of AT diagnosis.
Judge NG when communication format is disagreement.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm
Vehicle speed	> 0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Perform diagnosis during the vehicle running.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (60 seconds). Judge OK and clear NG when receiving normal data.
Judgment Value

Malfunction Criteria	Threshold Value
AT malfunction data reception control	Not receive normal data

Time Needed for Diagnosis: 60 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CW:DTC P0865 TCM COMMUNICATION CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit in AT diagnosis line.
Judge NG when the AT diagnosis input line signal remains Low.

2. COMPONENT DESCRIPTION

Data frame as “Start signal (Low_40 ms + High_20 ms) → Data → End signal” is transmitted every approx. 1 second.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm
Vehicle speed	> 0 km/h (0 MPH)

4. GENERAL DRIVING CYCLE

Perform diagnosis during the vehicle running.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (3 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
AT diagnosis input line signal	Low

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CX:DTC P0866 TCM COMMUNICATION CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit in AT diagnosis line.
Judge NG when the AT diagnosis input line signal remains High.

2. COMPONENT DESCRIPTION

Data frame as “Start signal (Low_40 ms + High_20 ms) → Data → End signal” is transmitted every approx. 1 second.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm
Vehicle speed	> 0 km/h (0 MPH)

4. GENERAL DRIVING CYCLE

Perform diagnosis during the vehicle running.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (3 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
AT diagnosis input line signal	High

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

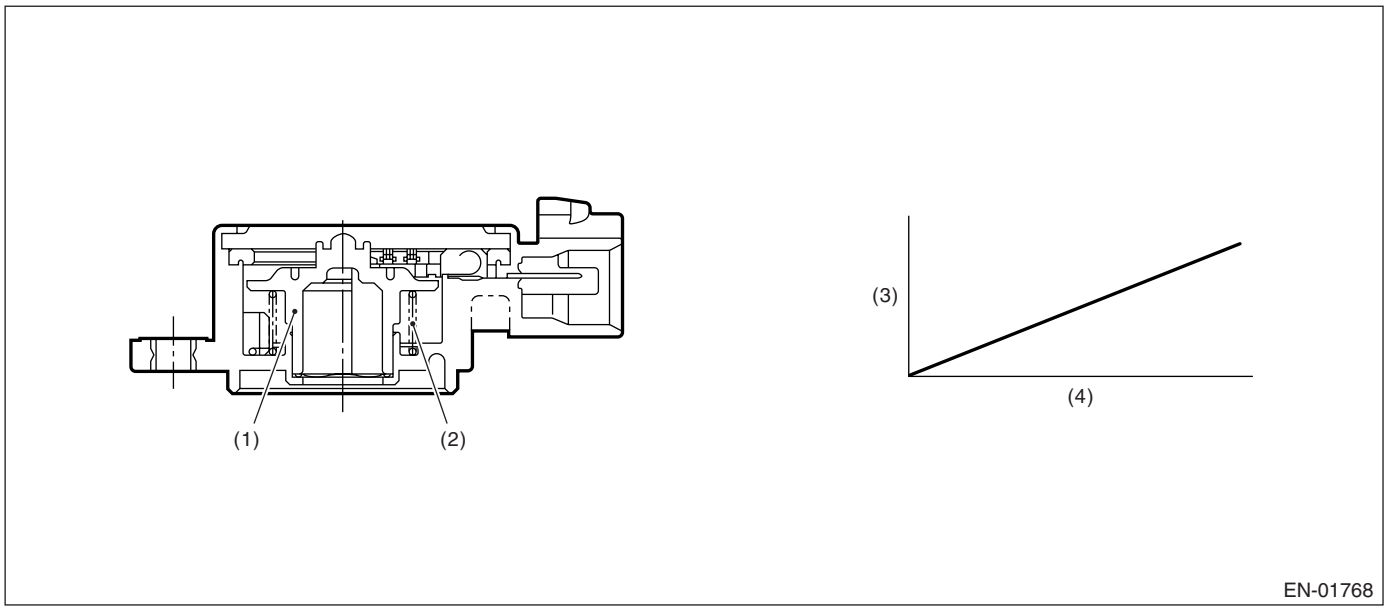
Memorize the freeze frame data. (For test mode $02)

CY:DTC P1086 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generated valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.135 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve position
- Learning of tumble generated valve position fully closed and date renewed to close side.
- Learning of tumble generated valve position fully opened and date renewed to open side.

9. ECM OPERATION AT DTC SETTING

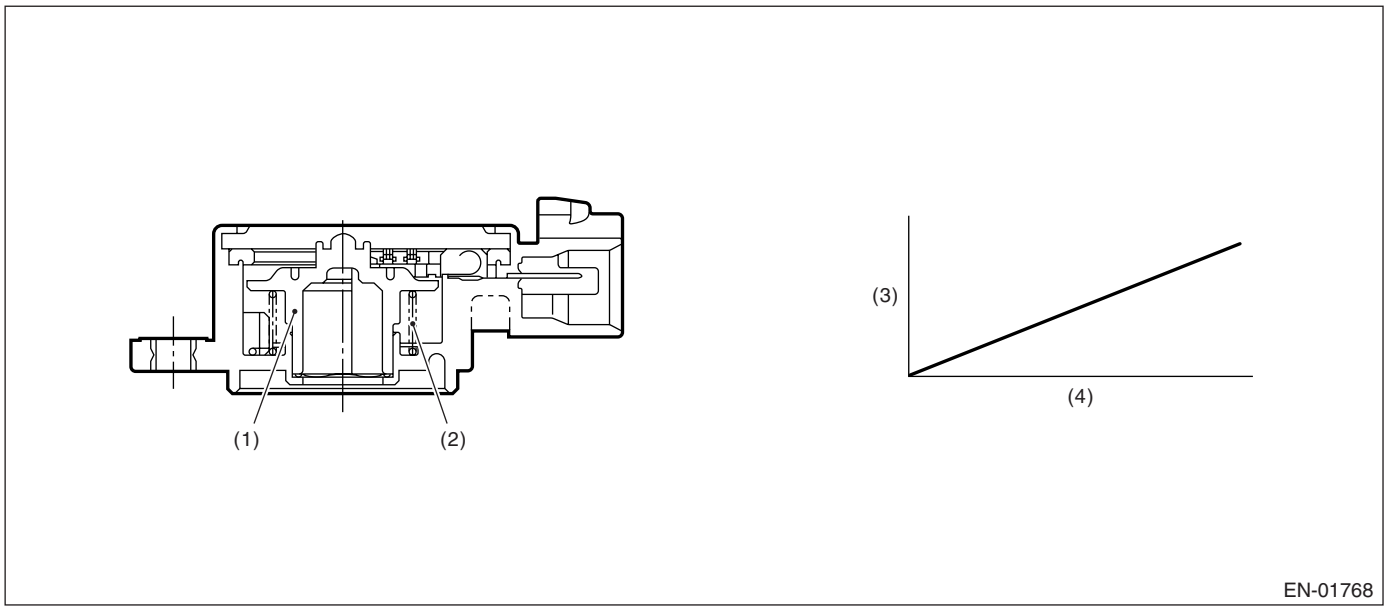
Memorize the freeze frame data. (For test mode $02)

CZ:DTC P1087 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generated valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.85 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve position
- Learning of tumble generated valve position fully closed and date renewed to close side.
- Learning of tumble generated valve position fully opened and date renewed to open side.

9. ECM OPERATION AT DTC SETTING

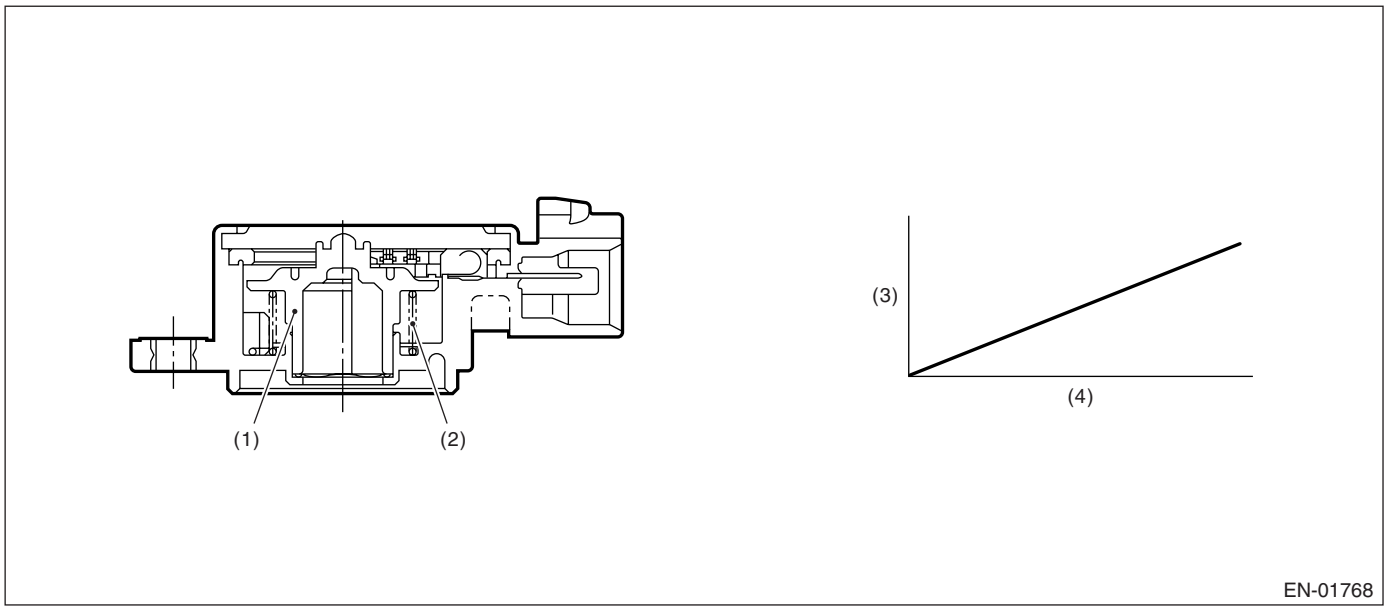
Memorize the freeze frame data. (For test mode $02)

DA:DTC P1088 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generated valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.135 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve position
- Learning of tumble generated valve position fully closed and date renewed to close side.
- Learning of tumble generated valve position fully opened and date renewed to open side.

9. ECM OPERATION AT DTC SETTING

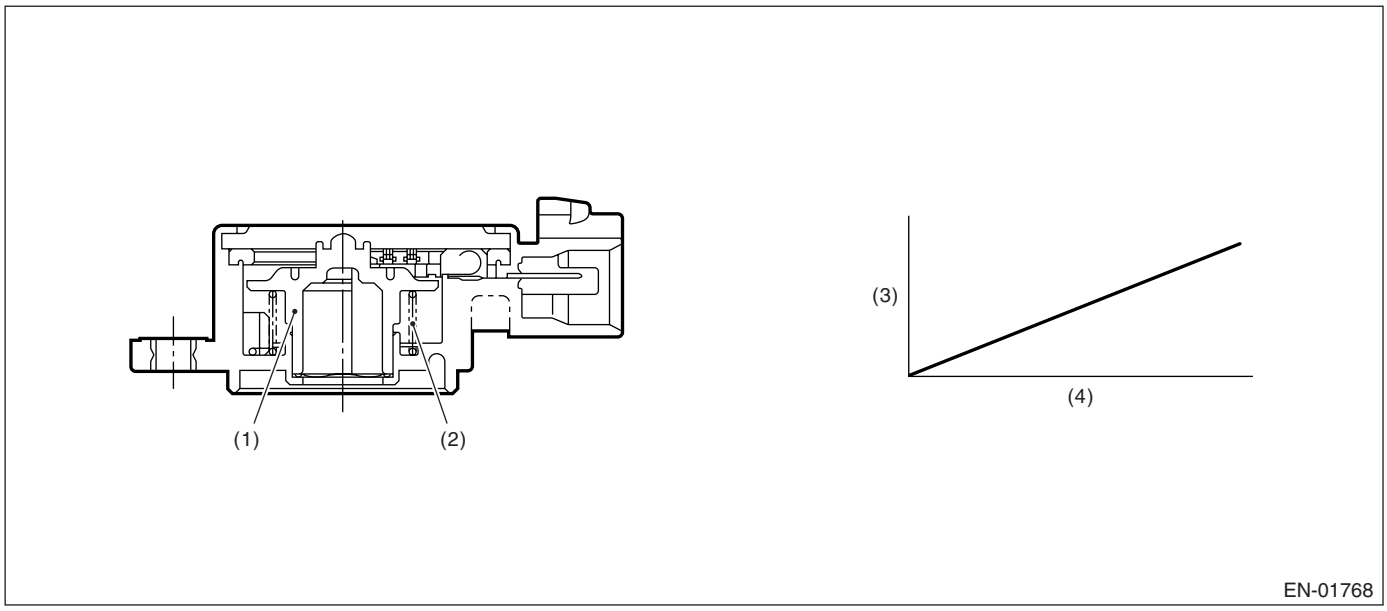
Memorize the freeze frame data. (For test mode $02)

DB:DTC P1089 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generated valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.85 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve position
- Learning of tumble generated valve position fully closed and date renewed to close side.
- Learning of tumble generated valve position fully opened and date renewed to open side.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DC:DTC P1090 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.
Judge open fixing malfunction when the opening degree is large even after finishing the tumble generated valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.
Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	≥ 67.4°
Tumble generated valve “close” signal output	1.4 seconds or more

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.
• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	< 67.4°
Tumble generated valve “close” signal output	1.4 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to the closing side.
- For tumble generated valve all opening points learning, not allowed to update to the opening side.

Tumble generated valve control
- Output the open signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DD:DTC P1091 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.
Judge close fixing malfunction when the opening degree is small even after finishing the tumble generated valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	< 67.4°
Tumble generated valve “open” signal output	1.4 seconds or more

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	≥ 67.4°
Tumble generated valve “open” signal output	1.4 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to the closing side.
- For tumble generated valve all opening points learning, not allowed to update to the opening side.

Tumble generated valve control
- Output the close signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DE:DTC P1092 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.
Judge open fixing malfunction when the opening degree is large even after finishing the tumble generated valve closing driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.
Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	≥ 67.4°
Tumble generated valve “close” signal output	1.4 seconds or more

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.
• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	< 67.4°
Tumble generated valve “close” signal output	1.4 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to the closing side.
- For tumble generated valve all opening points learning, not allowed to update to the opening side.

Tumble generated valve control
- Output the open signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DF:DTC P1093 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.
Judge close fixing malfunction when the opening degree is small even after finishing the tumble generated valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	< 67.4°
Tumble generated valve “open” signal output	1.4 seconds or more

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	≥ 67.4°
Tumble generated valve “open” signal output	1.4 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to the closing side.
- For tumble generated valve all opening points learning, not allowed to update to the opening side.

Tumble generated valve control
- Output the close signal.

8. ECM OPERATION AT DTC SETTING

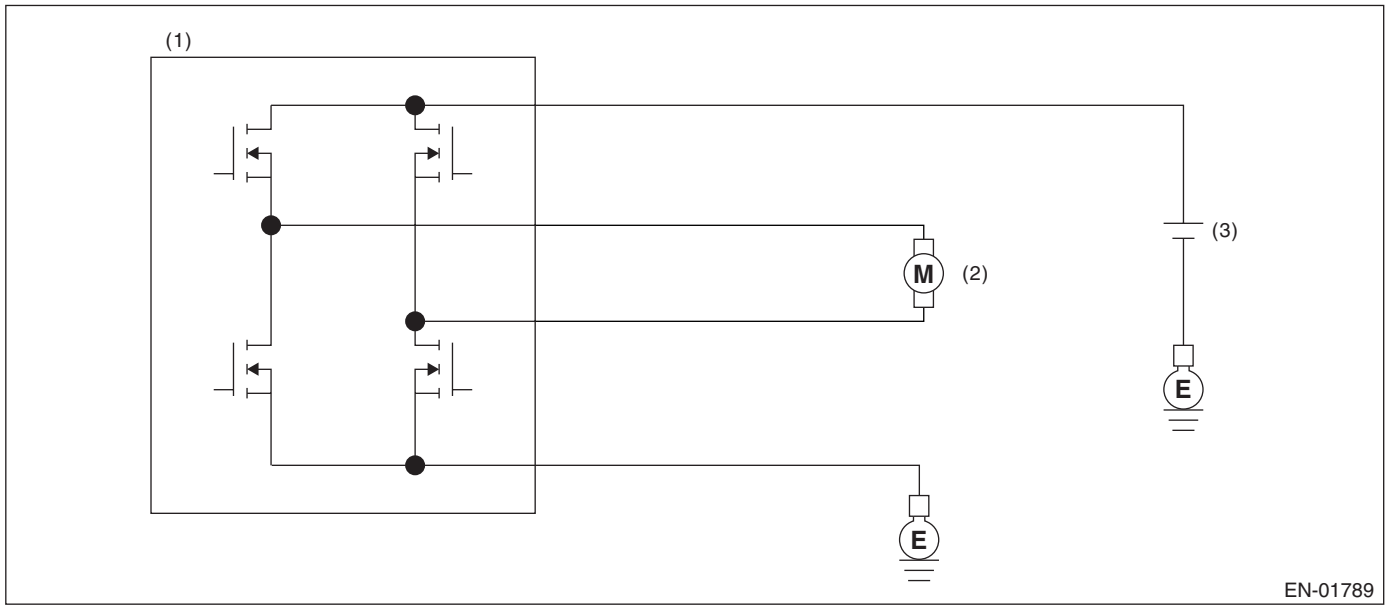
Memorize the freeze frame data. (For test mode $02)

DG:DTC P1094 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.
Judge NG when the open signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Tumble generated valve
(3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generated valve driving IC, and then NG signal is sent to main IC. At the main IC, judge NG when the NG signal is sent for 1 second in a row. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Current	< 5 mA

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to closing side.
- For tumble generated valve all opening points learning, not allowed to update to opening side.

Tumble generated valve control
- Not allowed to move.

9. ECM OPERATION AT DTC SETTING

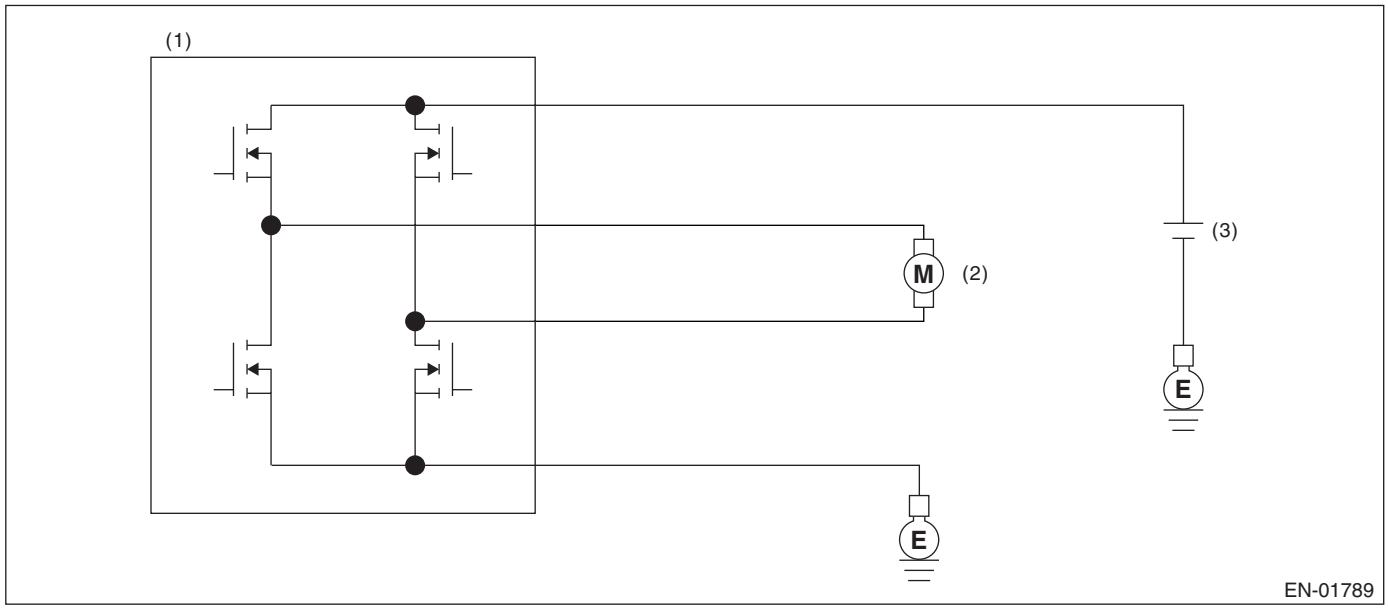
Memorize the freeze frame data. (For test mode $02)

DH:DTC P1095 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.
Judge NG when the overcurrent signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Tumble generated valve
(3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generated valve driving IC, and then NG signal is sent to main IC. At the main IC, judge NG when the NG signal is sent for 1 second in a row. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Current	> 3 A

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to closing side.
- For tumble generated valve all opening points learning, not allowed to update to opening side.

Tumble generated valve control
- Not allowed to move.

9. ECM OPERATION AT DTC SETTING

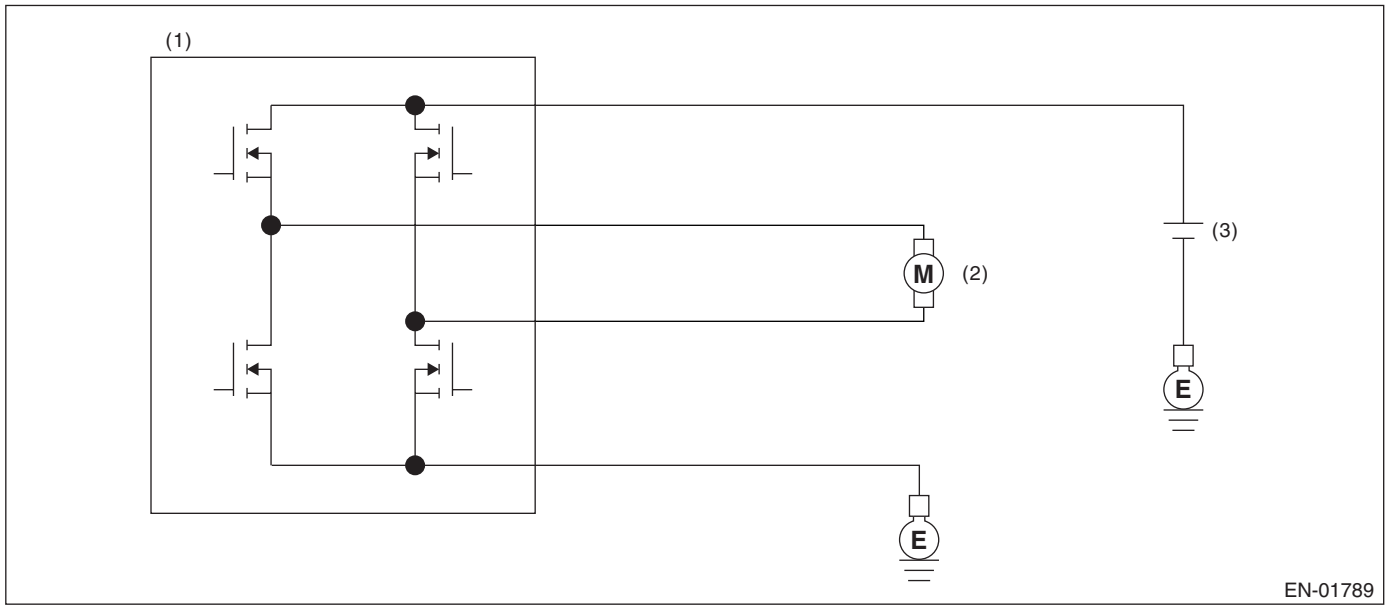
Memorize the freeze frame data. (For test mode $02)

DI: DTC P1096 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.
Judge NG when the open signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Tumble generated valve
(3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generated valve driving IC, and then NG signal is sent to main IC. At the main IC, judge NG when the NG signal is sent for 1 second in a row. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Current	< 5 mA

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to closing side.
- For tumble generated valve all opening points learning, not allowed to update to opening side.

Tumble generated valve control
- Not allowed to move.

9. ECM OPERATION AT DTC SETTING

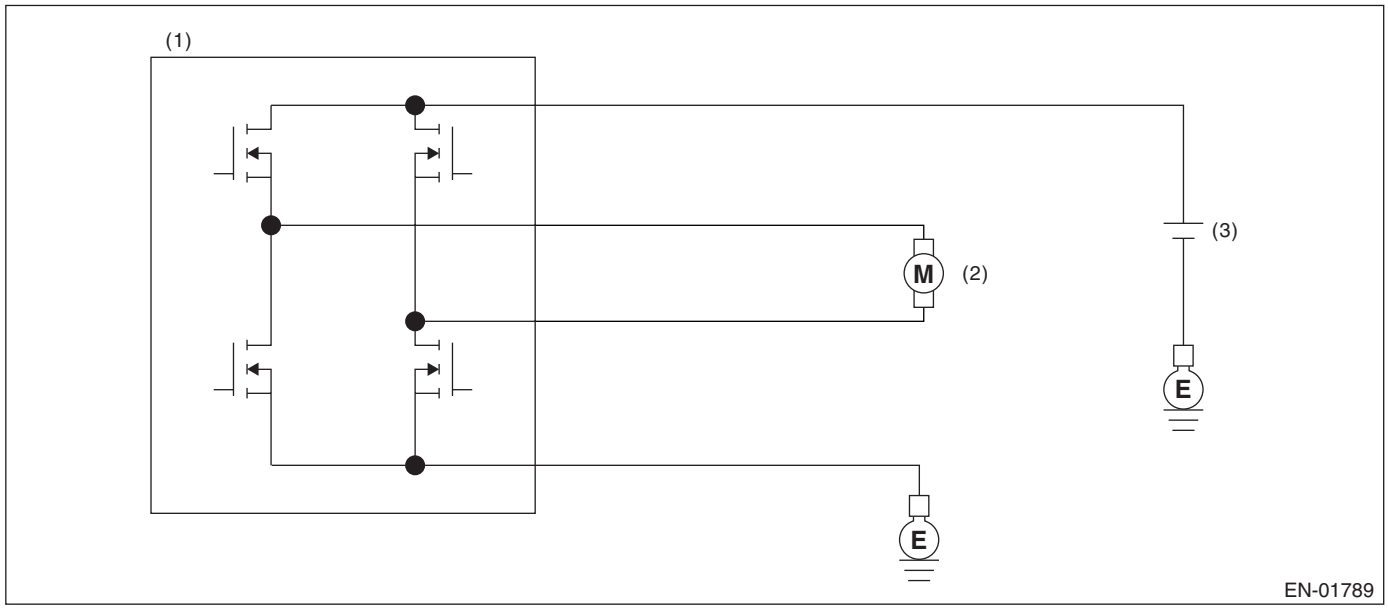
Memorize the freeze frame data. (For test mode $02)

DJ:DTC P1097 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.
Judge NG when the overcurrent signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Tumble generated valve
(3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generated valve driving IC, and then NG signal is sent to main IC. At the main IC, judge NG when the NG signal is sent for 1 second in a row. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Current	> 3 A

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to closing side.
- For tumble generated valve all opening points learning, not allowed to update to opening side.

Tumble generated valve control
- Not allowed to move.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DK:DTC P1110 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 1.0 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 1.0 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DL:DTC P1111 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 4.78 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 4.78 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

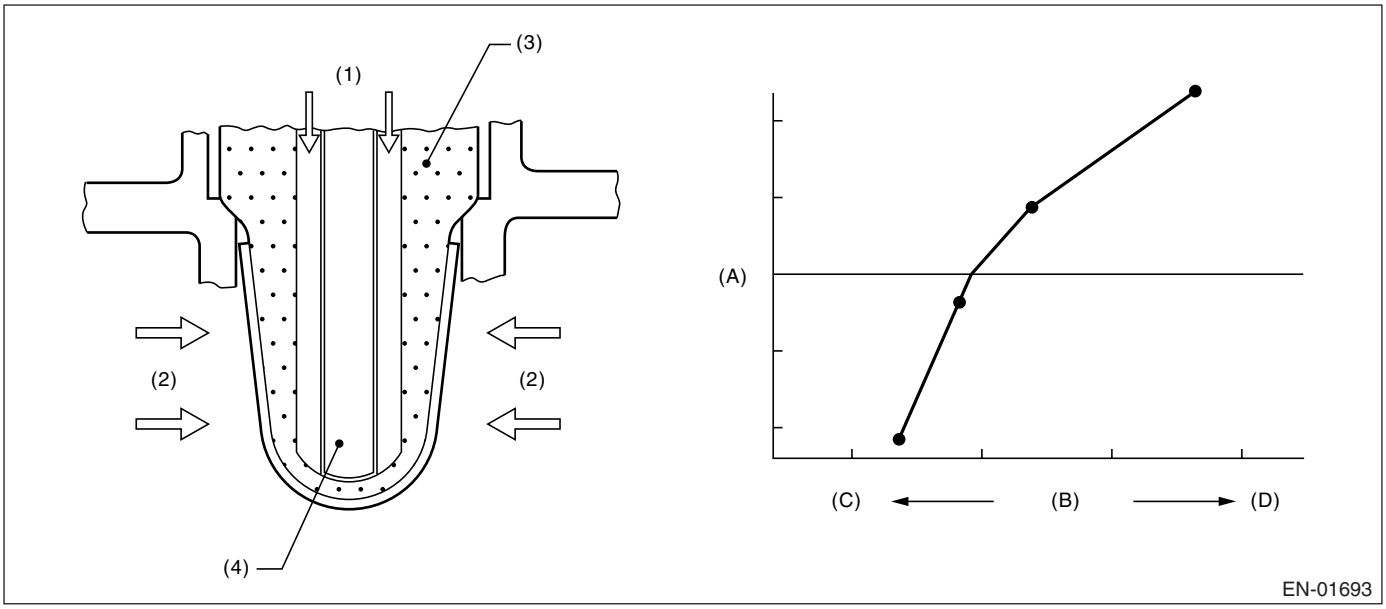
Memorize the freeze frame data. (For test mode $02)

DM:DTC P1134 A/F SENSOR MICRO-COMPUTER PROBLEM

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of IC communication.
Judge NG when the IC communication malfunction occurs.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Continuous 6 times communication error to main CPU	≥ 2 sets

Time Needed for Diagnosis: Not determined
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.
• Normality Judgment

Judge OK when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Normal communication	2 times in a row

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- A/F IC communication: Not allowed to communicate.
- A/F main learning compensation: Not allowed to calculate.
- Compensation at high temperature restart: Set min. value 0.3 → usually.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

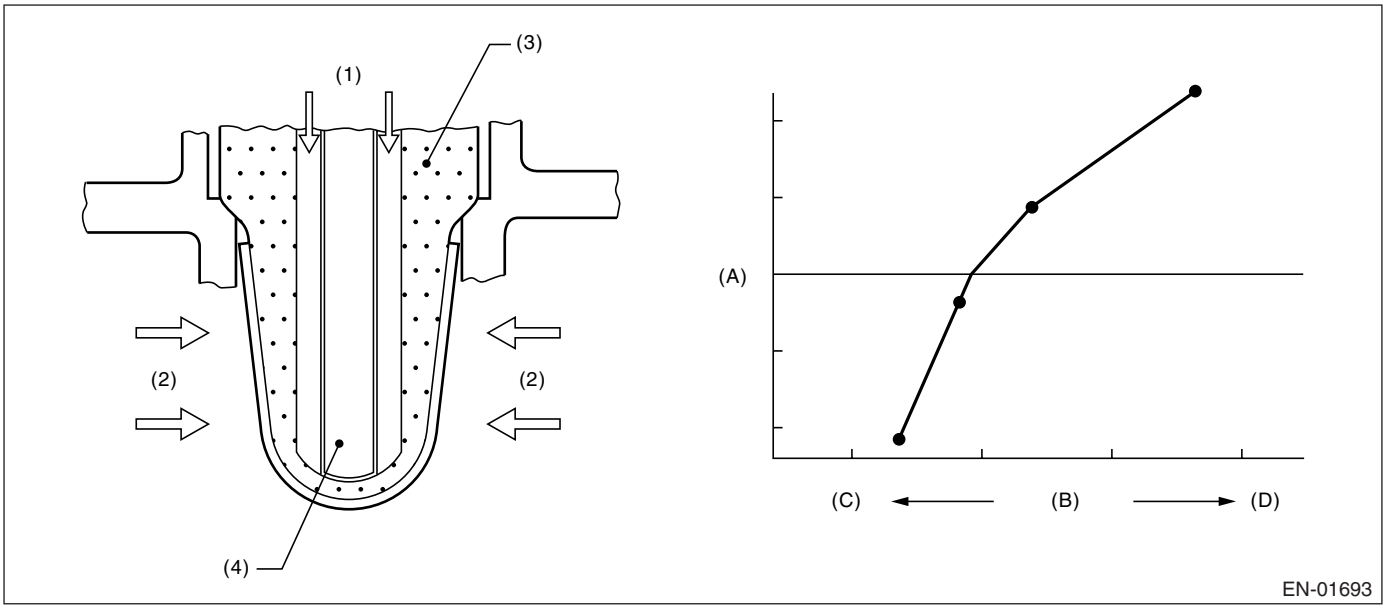
Memorize the freeze frame data. (For test mode $02)

DN:DTC P1152 O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1)

1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains Low.
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.
Lambda value = Actual air fuel ratio/Theoretical air fuel ratio
Lambda > 1: Lean
Lambda < 1: Rich

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters to be in enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Operating
Rear oxygen sensor output voltage – feedback target voltage	–0.2 V ←→ 0.1 V
or rear oxygen sensor sub feedback compensation coefficient	On Min.
or rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 6 g/s
Load change during 0.5 engine rev.	≤ 0.01 g/rev
Impedance of front oxygen (A/F) sensor	0 ←→ 52 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output lambda when rear oxygen sensor sub feedback compensation coefficient being at not high limit	≤ 0.85

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

9. ECM OPERATION AT DTC SETTING

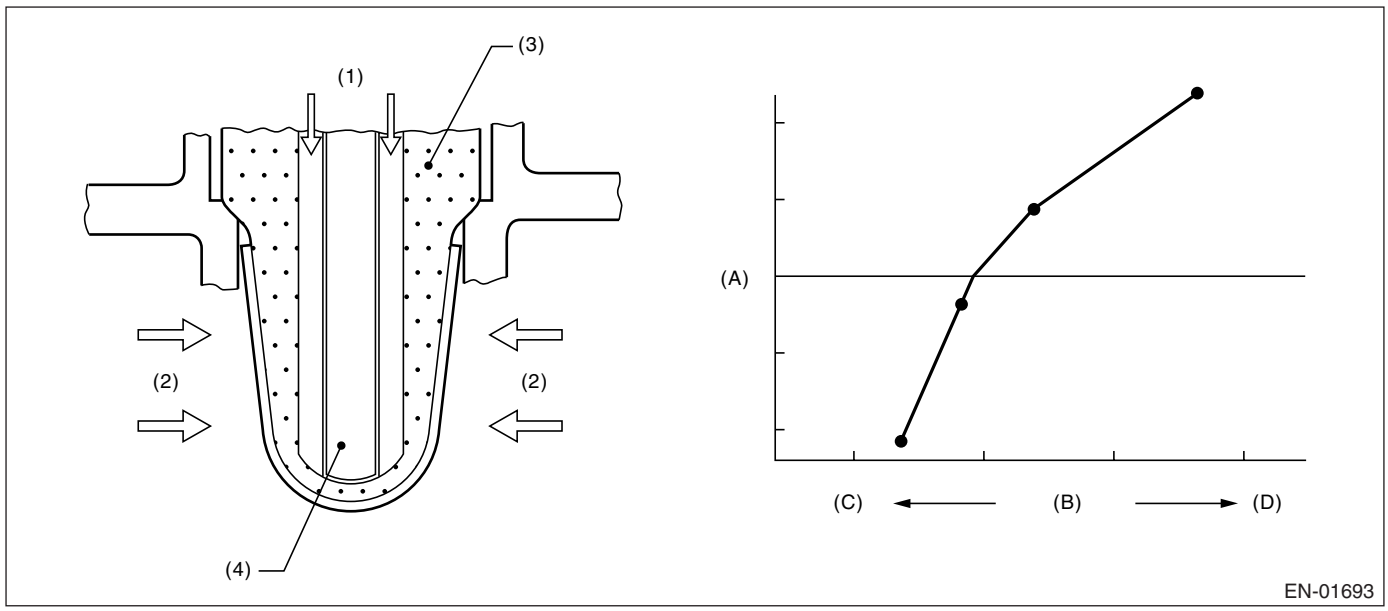
Memorize the freeze frame data. (For test mode $02)

DO:DTC P1153 O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains High.
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.
Lambda value = Actual air fuel ratio/Theoretical air fuel ratio
Lambda > 1: Lean
Lambda < 1: Rich

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters to be in enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Operating
Rear oxygen sensor output voltage – feedback target voltage	–0.2 V ←→ 0.1 V

Secondary Parameters	Enable Conditions
or rear oxygen sensor sub feedback compensation coefficient	On Min.
or rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 6 g/s
Load change during 0.5 engine rev.	≤ 0.01 g/rev
Impedance of front oxygen (A/F) sensor	0 ←→ 52 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output lambda when rear O_2 sensor sub feedback compensation coefficient value being at not low limit	≥ 1.15

Time Needed for Diagnosis: 10 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DP:DTC P1301 MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS)

1. OUTLINE OF DIAGNOSIS

Detect whether the misfire occurred or not. (Exhaust temperature method)
Judge NG when the exhaust temperature is high.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition SW	ON
Battery voltage	≥ 10.9 V
Atmosphere	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Starter	OFF

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below continue 200 engine revs. (400 ignitions) in a row.
Judgment Value

Malfunction Criteria	Threshold Value
Amount of intake air	< 60 g/s
Exhaust temperature	> 1,050°C (1,922°F)

Time Needed for Diagnosis: 200 engine revs.
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DQ:DTC P1312 EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of exhaust temperature sensor output property.
Judge NG when the exhaust temperature remains high or low whereas it seemed to vary from the viewpoint of driving condition.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	240 seconds or more
Engine coolant temperature at engine start	≤ 40°C (104°F)
Engine coolant temperature	≥ 75°C (167°F)
Intake air temperature at engine start	≥ 0°C (32°F)
Estimate ambient temperature	≥ 0°C (32°F)
Vehicle speed	≥ 65 km/h (40 MPH)
Engine speed	≥ 2,400 rpm
Engine load	≥ 0.85 g/rev
Lambda value	0.75 ←→ 1.25

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at more than 65 km/h (40 MPH) in 240 seconds and more after starting the engine in cool condition.
Pay attention to the coolant temperature at engine starting.

4. DIAGNOSTIC METHOD

Judge NG when one of the malfunction criteria below is completed, and judge OK and clear the NG when all of the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Min. exhaust temperature from engine starting	≥ 700°C (1,292°F)
Max. exhaust temperature from engine starting	< 500°C (932°F)

Time Needed for Diagnosis: 0 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

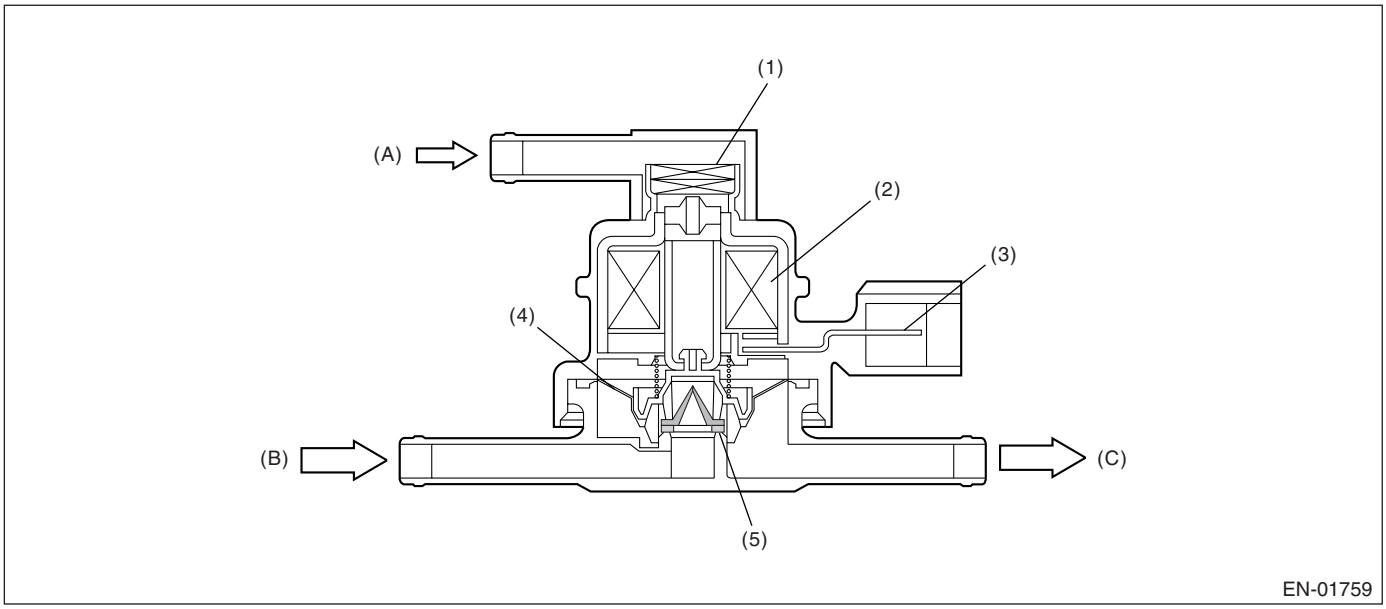
Memorize the freeze frame data. (For test mode $02)

DR:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve. Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve

(A) Atmospheric pressure
(B) Shut off valve
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs off signal	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

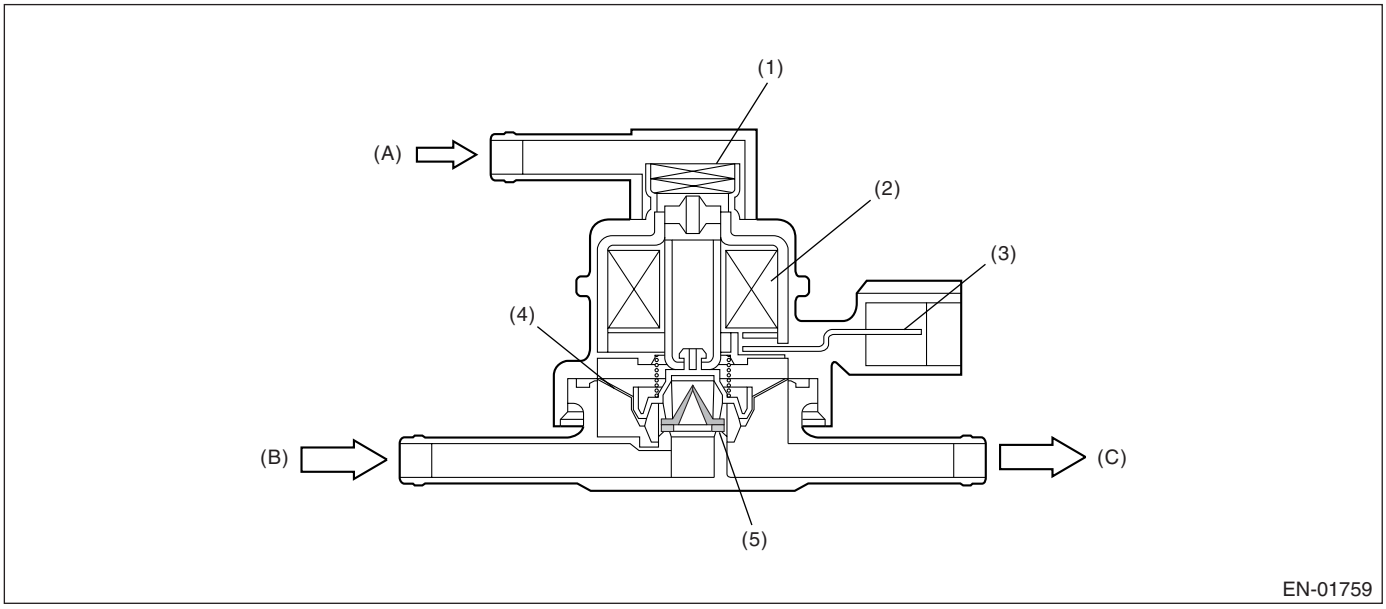
Memorize the freeze frame data. (For test mode $02)

DS:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve
(A) Atmospheric pressure
(B) Shut off valve
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs off signal	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DT:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

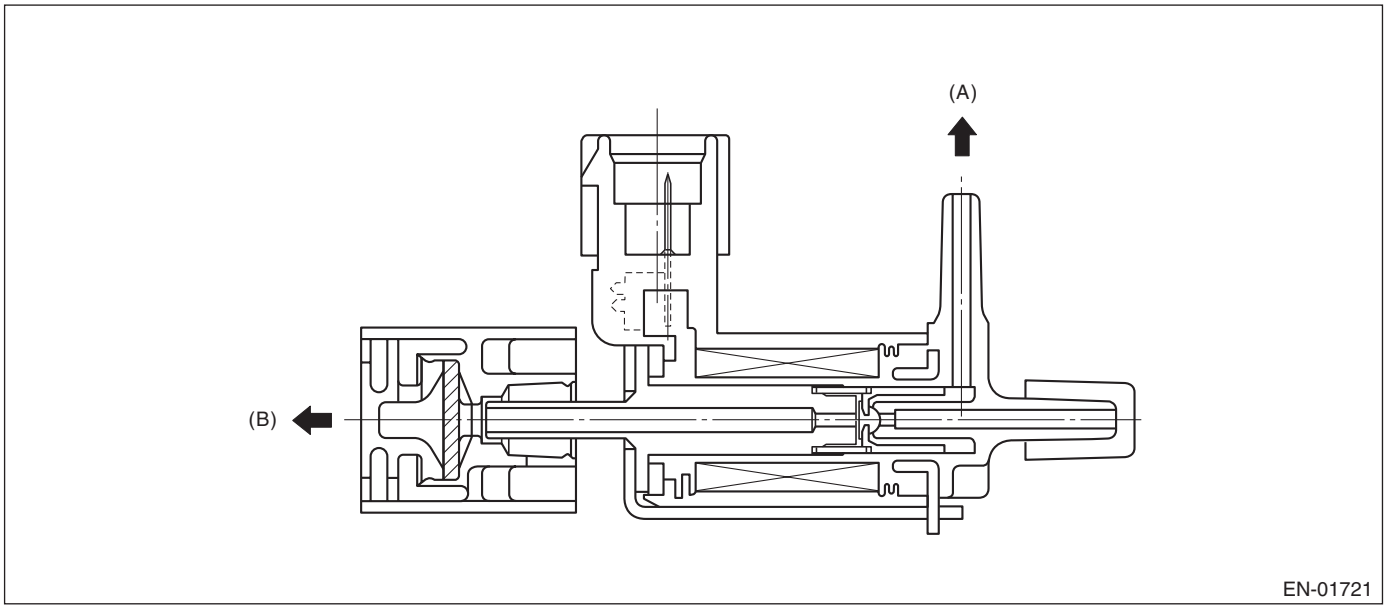
For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4DOTC)-112, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DU:DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure switching solenoid.
Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) Fuel tank pressure sensor
(B) Ambient air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

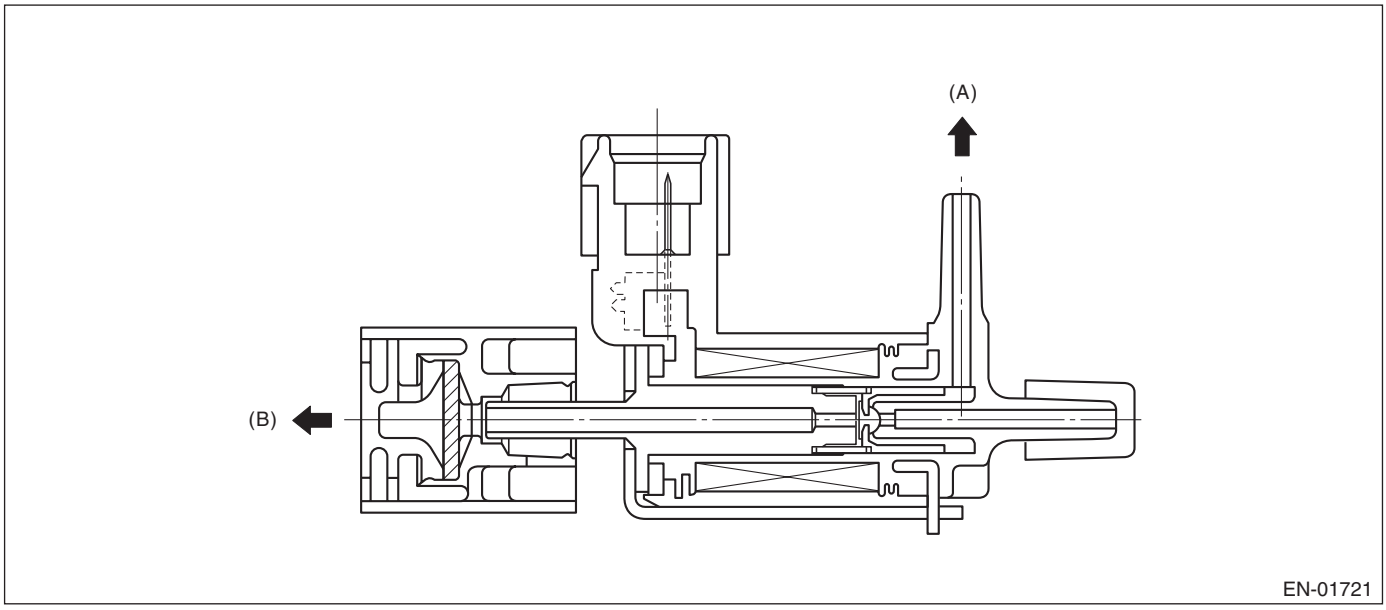
Memorize the freeze frame data. (For test mode $02)

DV:DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure switching solenoid.
Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) Fuel tank pressure sensor
(B) Ambient air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sent ON signals	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

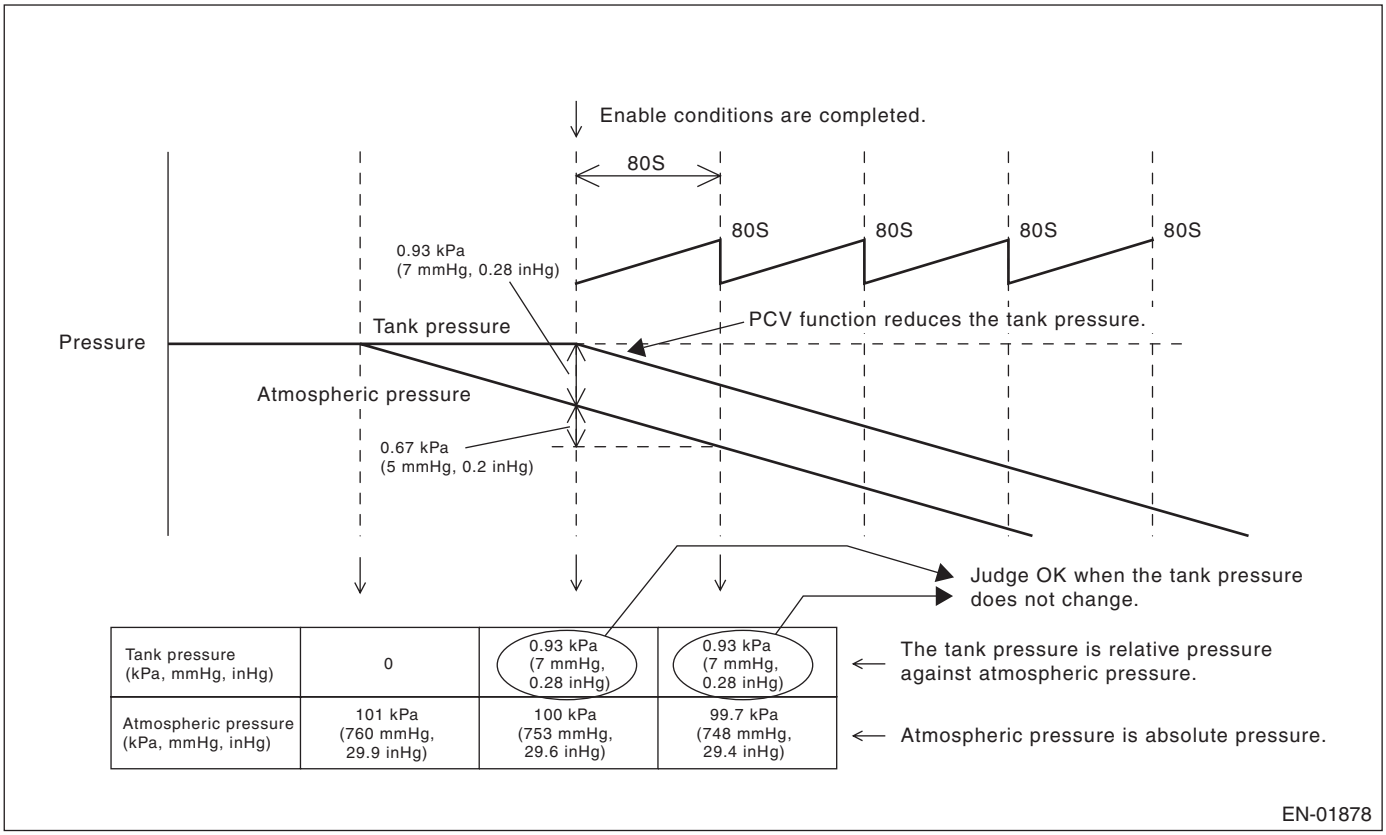
DW:DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure switching solenoid function abnormality.
The tank pressure sensor is a relative pressure sensor, which normally compares the pressure with the atmospheric pressure. The tank pressure switching solenoid is a solenoid, which shifts the compare space from opening to closed during the EVAP diagnosis. Detect the malfunction that the compare space remains closed. (Not judge NG after enable condition completed but assume NG before enable condition completed.)

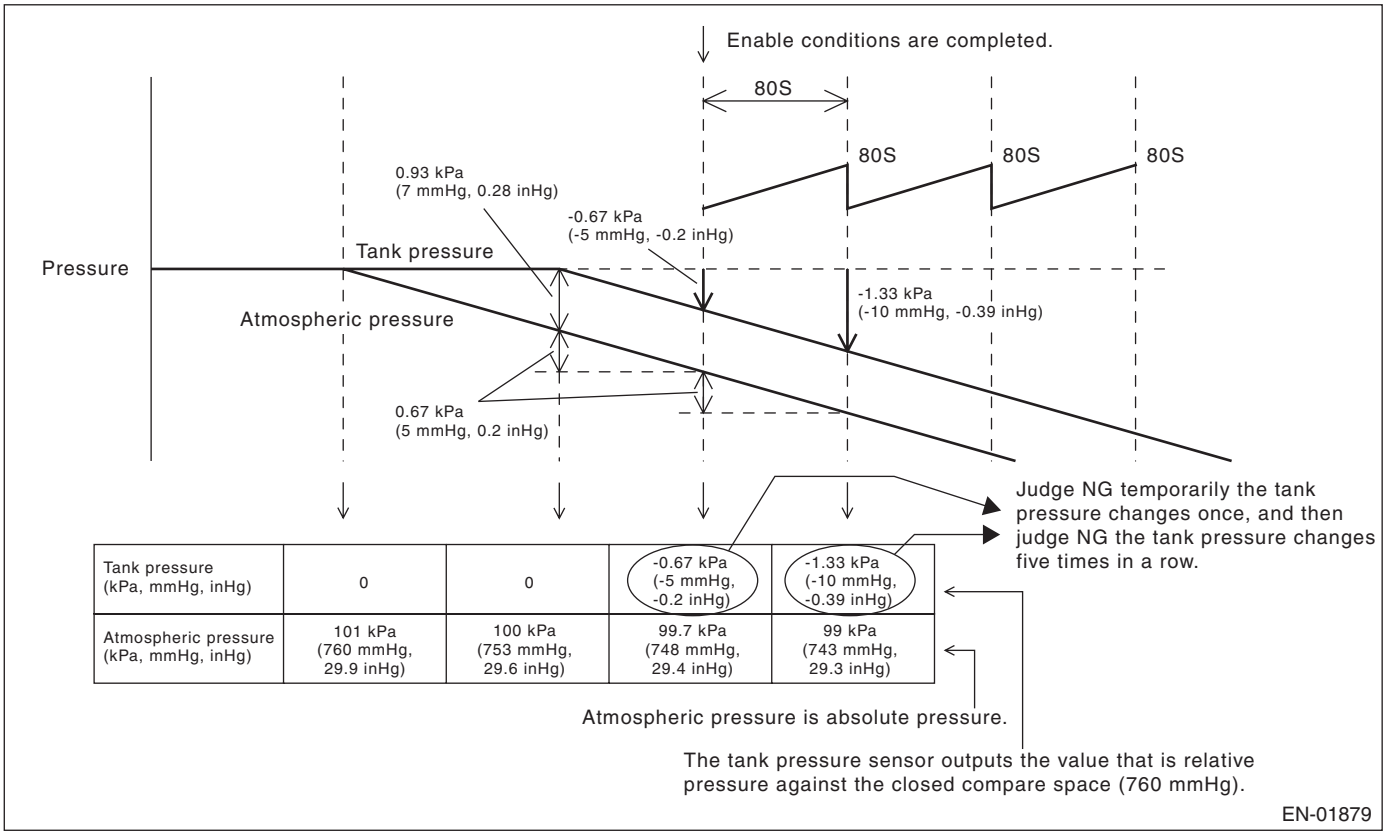
• Normality Judgment

Judge OK when the fuel tank pressure does not change (or changes by less than 0.67 kPa (5 mmHg, 0.2 inHg)) at atmospheric pressure changing by 0.67 kPa (5 mmHg, 0.2 inHg) or more per 80 seconds.



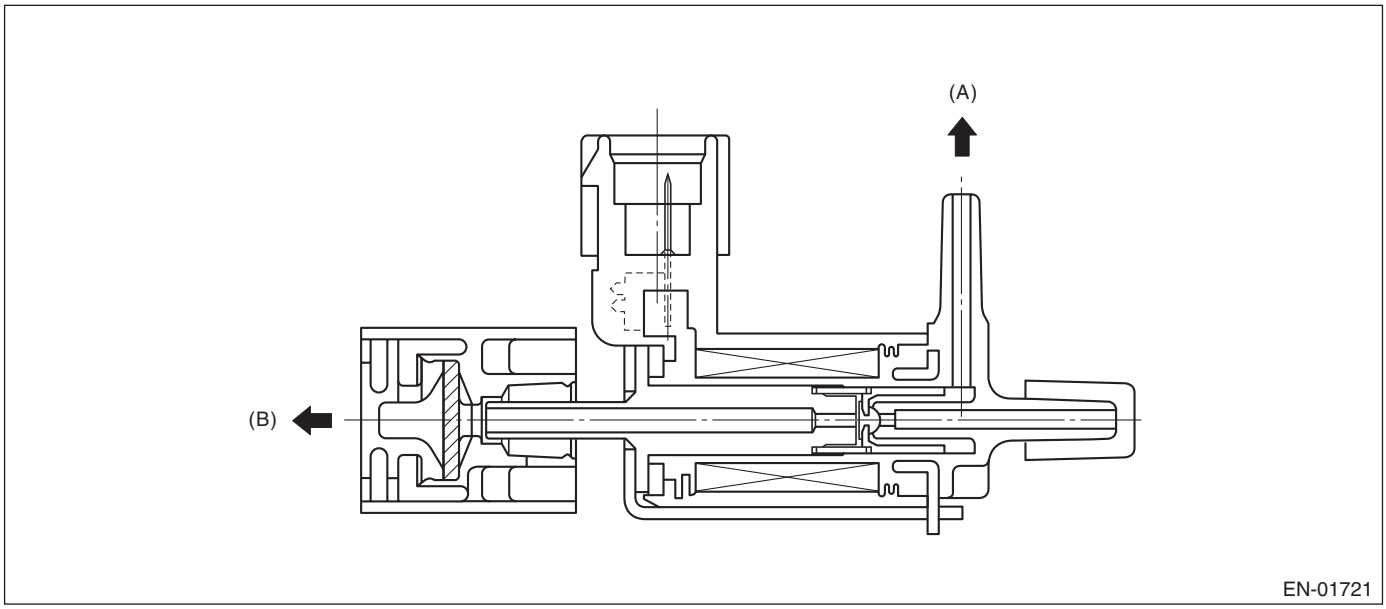
• Abnormality Judgment

Judge NG temporarily when the fuel tank pressure changes by 0.67 kPa (5 mmHg, 0.2 inHg) or more at atmospheric pressure changing by 0.67 kPa (5 mmHg, 0.2 inHg) or more per 80 seconds, and then judge NG when the previous condition is completed 5 times in a row.



Tank pressure (kPa, mmHg, inHg)	0	0	-0.67 kPa (-5 mmHg, -0.2 inHg)	-1.33 kPa (-10 mmHg, -0.39 inHg)
Atmospheric pressure (kPa, mmHg, inHg)	101 kPa (760 mmHg, 29.9 inHg)	100 kPa (753 mmHg, 29.6 inHg)	99.7 kPa (748 mmHg, 29.4 inHg)	99 kPa (743 mmHg, 29.3 inHg)

2. COMPONENT DESCRIPTION



(A) Fuel tank pressure sensor
(B) Ambient air

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V
Fuel level	9 ←→ 51 ℓ (2.38 ←→ 13.3 US gal, 1.98 ←→ 11.2 Imp gal)
Evaporation system diagnosis	Not in operation
After starting the engine	80 seconds or more
Fuel tank pressure	< −0.67 kPa (−5 mmHg, −0.2 inHg) or > −0.93 kPa (7 mmHg, 0.28 inHg)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the fuel tank pressure is large or small in 80 seconds or more after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below is completed 5 times.

Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric air change in 80 seconds	≥ 0.67 kPa (5 mmHg, 0.2 inHg)
Fuel tank pressure change in 80 seconds	≥ 0.67 kPa (5 mmHg, 0.2 inHg)
Fuel level change	< 3 ℓ (0.79 US gal, 0.7 Imp gal)

Time Needed for Diagnosis: 80 seconds × 5 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric air change in 80 seconds	≥ 0.67 kPa (5 mmHg, 0.2 inHg)
Fuel tank pressure change in 80 seconds	< 0.67 kPa (5 mmHg, 0.2 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

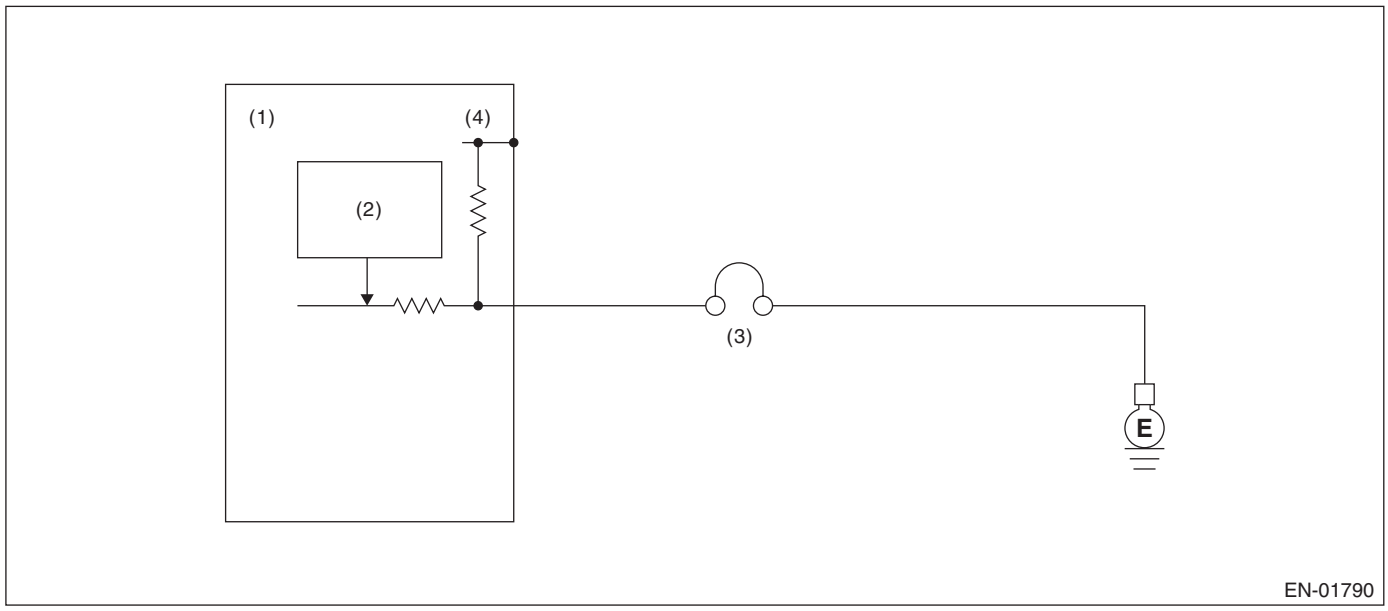
Memorize the freeze frame data. (For test mode $02)

DX:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

Detect the blow-by hose release abnormality.
Judge NG when the diagnosis terminal voltage is high.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Detecting circuit
(3) PCV diagnosis connector
(4) 5 V

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSIS METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Before and after starting the engine	After starting the engine
Positive crankcase ventilation diagnosis voltage	High

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Before and after starting the engine	After starting the engine
Positive crankcase ventilation diagnosis voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was performed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnosis value and trouble standard value. (For test mode $06)

DY:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.
Judge OFF NG when the engine starts without starter SW signal.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge OFF NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1 km/h (0.62 MPH)
It took more than 0.8 seconds at engine starting, and then it turned after engine starting.	
Starter ON	Not experienced
Starter ON diagnosis	Not diagnosed
Battery voltage	> 8 V

Time Needed for Diagnosis: Not determined.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OFF OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Starter ON	Experienced
Starter ON diagnosis	Diagnosed
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DZ:DTC P1544 EXHAUST GAS TEMPERATURE TOO HIGH

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of high exhaust gas temperature.
Judge NG when the exhaust gas becomes too high.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 8.2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel cut event	Not operating
After fuel cut	≥ 1 milliseconds
Exhaust temperature	≥ 1,050°C (1,922°F)

Time Needed for Diagnosis: 8.2 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 8.2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Exhaust temperature	< 550°C (1,022°F)

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

EA:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the back-up voltage circuit.
Judge NG when the back-up voltage becomes smaller than the battery voltage.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power	< Battery voltage × 0.7
Battery voltage	≥ 10.9 V
Before and after starting the engine	After starting the engine

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	≥ Battery voltage × 0.7
Battery voltage	≥ 10.9 V
Before and after starting the engine	After starting the engine

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

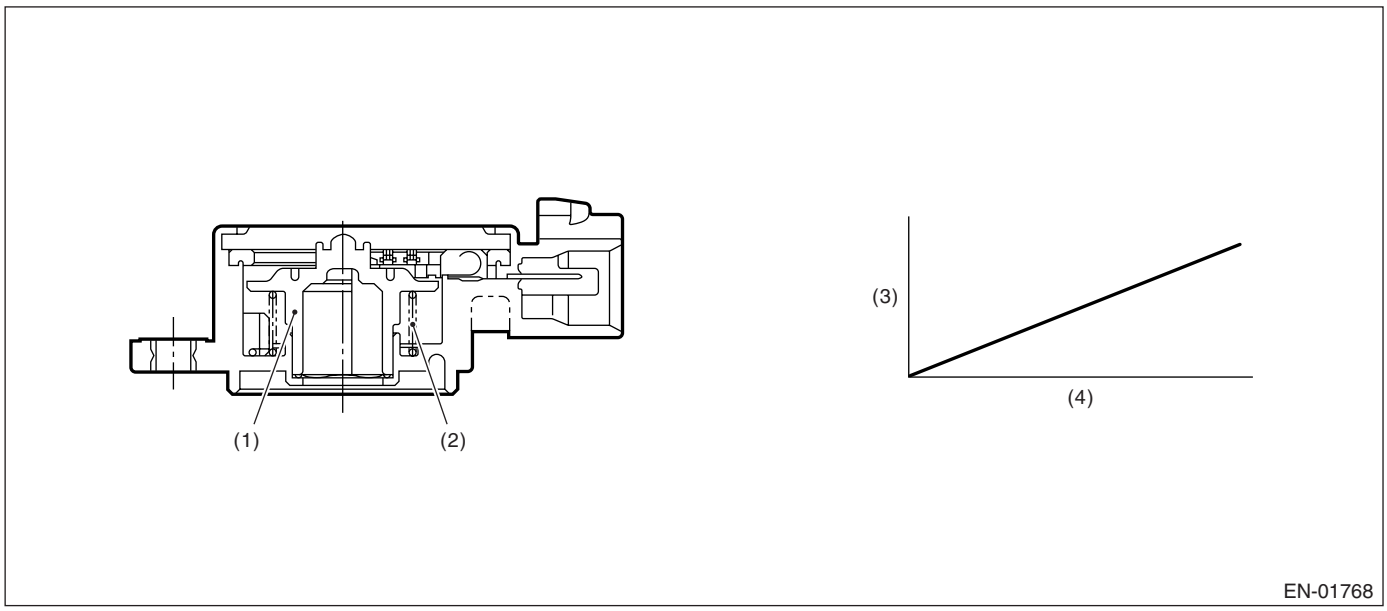
Memorize the freeze frame data. (For test mode $02)

EB:DTC P1700 THROTTLE POSITION SENSOR CIRCUIT MALFUNCTION FOR AT

1. OUTLINE OF DIAGNOSIS

Judge NG when the voltage from throttle sensor is out of specified value.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Throttle valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.1 or ≥ 4.6 V

Time Needed for Diagnosis: 63.75 seconds
Malfunction Indicator Light Illumination: Detect when malfunction occurs in two continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Make the throttle angle to 3/8, and the line pressure and 2-4B pressure to maximum.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

EC:DTC P1711 ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION

1. OUTLINE OF DIAGNOSIS

Judge NG when detecting the difference 250 times in a row by comparing the CPU output with signal line output every 10 milliseconds.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Collector voltage of transistor (Vc) at “ON” signal from TCM	High level
Collector voltage of transistor (Vc) at “OFF” signal from ECM	Low level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

ED:DTC P1712 ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION

1. OUTLINE OF DIAGNOSIS

Judge NG when detecting the difference 250 times in a row by comparing the CPU output with signal line output every 10 milliseconds.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	High level
Vc at “OFF” signal from ECM	Low level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

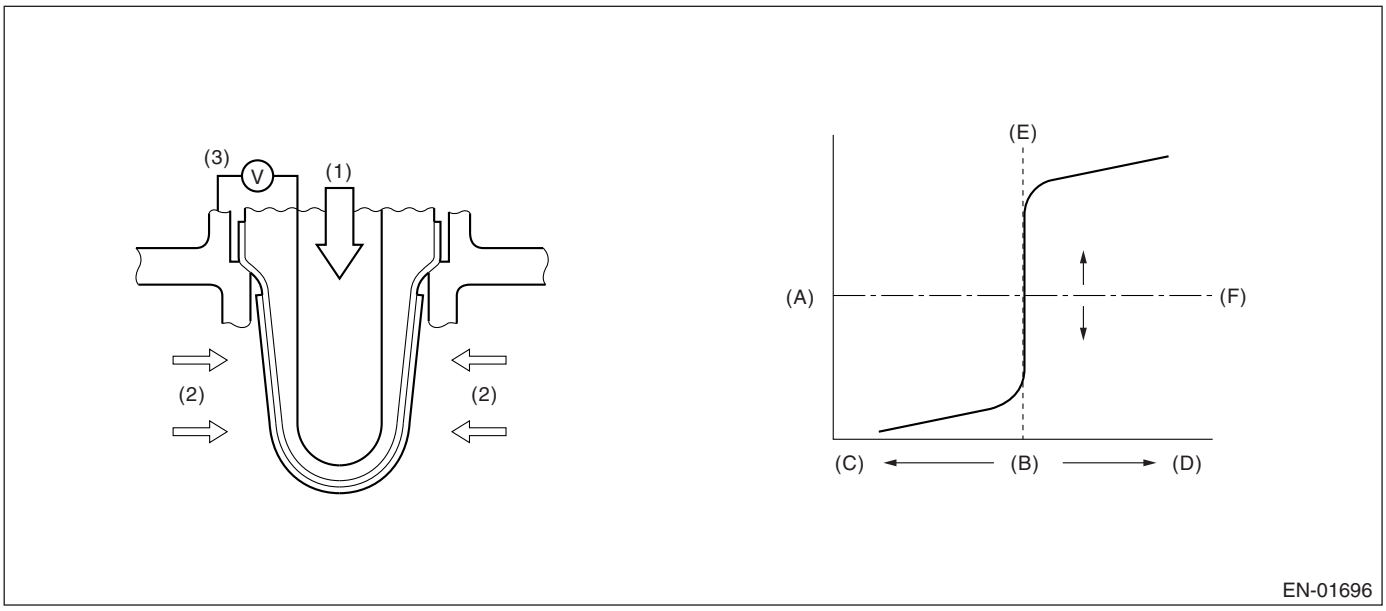
Memorize the freeze frame data. (For test mode $02)

EE:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.
Sub feedback control amount sticks to lean sides during sub feedback control.
Judge NG when the rear oxygen sensor output does not come close to target voltage (slice level).

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Main feedback	In operation
Sub feedback	In operation
Amount of intake air	≥ 9 g/sec
Sub feedback	Sticks to the limit value (lean side)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 80 km/h (50 MPH).

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Calculate the continuous time from the sticking of sub feedback control amount to lean side and cumulative deviation (sumdelo 2) of rear oxygen sensor voltage and target voltage.
Judge NG when the malfunction criteria below are completed after 300 seconds have passed continuously.
Judgment Value

Malfunction Criteria	Threshold Value
sumdelo2 = sumdelo2 + (rvo2 − rsl) where: rvo2 = sensing voltage of O_2 sensor rsl = target voltage of O_2 sensor	> −2,750 V

Time Needed for Diagnosis: 300 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the rear oxygen output is reversed, and during 4 seconds after that, the sub feedback control amount does not stick to rich or lean sides.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

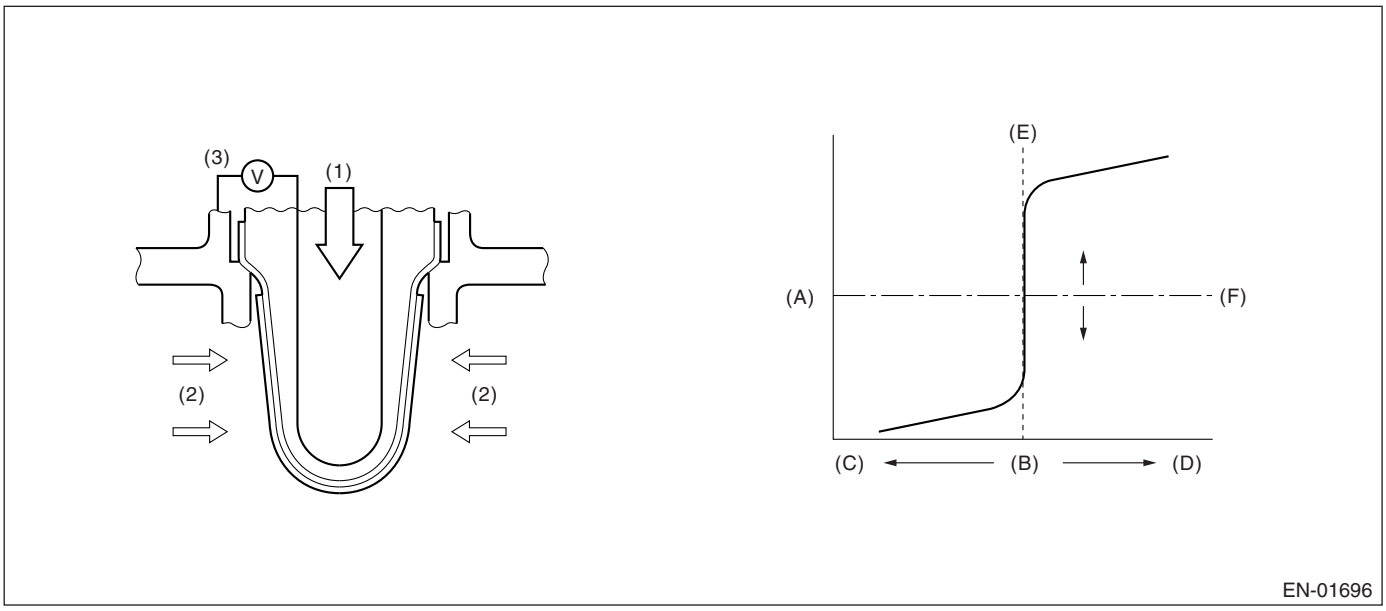
Memorize the freeze frame data. (For test mode $02)

EF:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.
Sub feedback control amount sticks to rich sides during sub feedback control.
Judge NG when the rear oxygen sensor output does not come close to target voltage (slice level).

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Main feedback	In operation
Sub feedback	In operation
Amount of intake air	≥ 9 g/sec
Sub feedback	Sticks to the limit value (rich side)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 80 km/h (50 MPH).

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Calculate the continuous time from the sticking of sub feedback control amount to rich side and cumulative deviation (sumdelo 2) of rear oxygen sensor voltage and target voltage.
Judge NG when the malfunction criteria below are completed after 300 seconds have passed continuously.
Judgment Value

Malfunction Criteria	Threshold Value
sumdelo2 = sumdelo2 + (rvo2 − rsl) where: rvo2 = sensing voltage of O_2 sensor rsl = target voltage of O_2 sensor	> 850 V

Time Needed for Diagnosis: 300 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous drive cycles.

• Normality Judgment

Judge OK and clear the NG when the rear oxygen output is reversed, and during 4 seconds after that, the sub feedback control amount does not stick to rich or lean sides.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

ENGINE SECTION 3

FUEL INJECTION (FUEL SYSTEMS)	FU(STi)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(STi)
INTAKE (INDUCTION)	IN(STi)
MECHANICAL	ME(STi)
EXHAUST	EX(STi)
COOLING	CO(STi)
LUBRICATION	LU(STi)
SPEED CONTROL SYSTEMS	SP(STi)
IGNITION	IG(STi)
STARTING/CHARGING SYSTEMS	SC(STi)
ENGINE (DIAGNOSTICS)	EN(STi)(diag)
GENERAL DESCRIPTION	GD(STi)

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

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

FUJI HEAVY INDUSTRIES LTD.

G1870BE4

FUEL INJECTION (FUEL SYSTEMS)

FU(STi)

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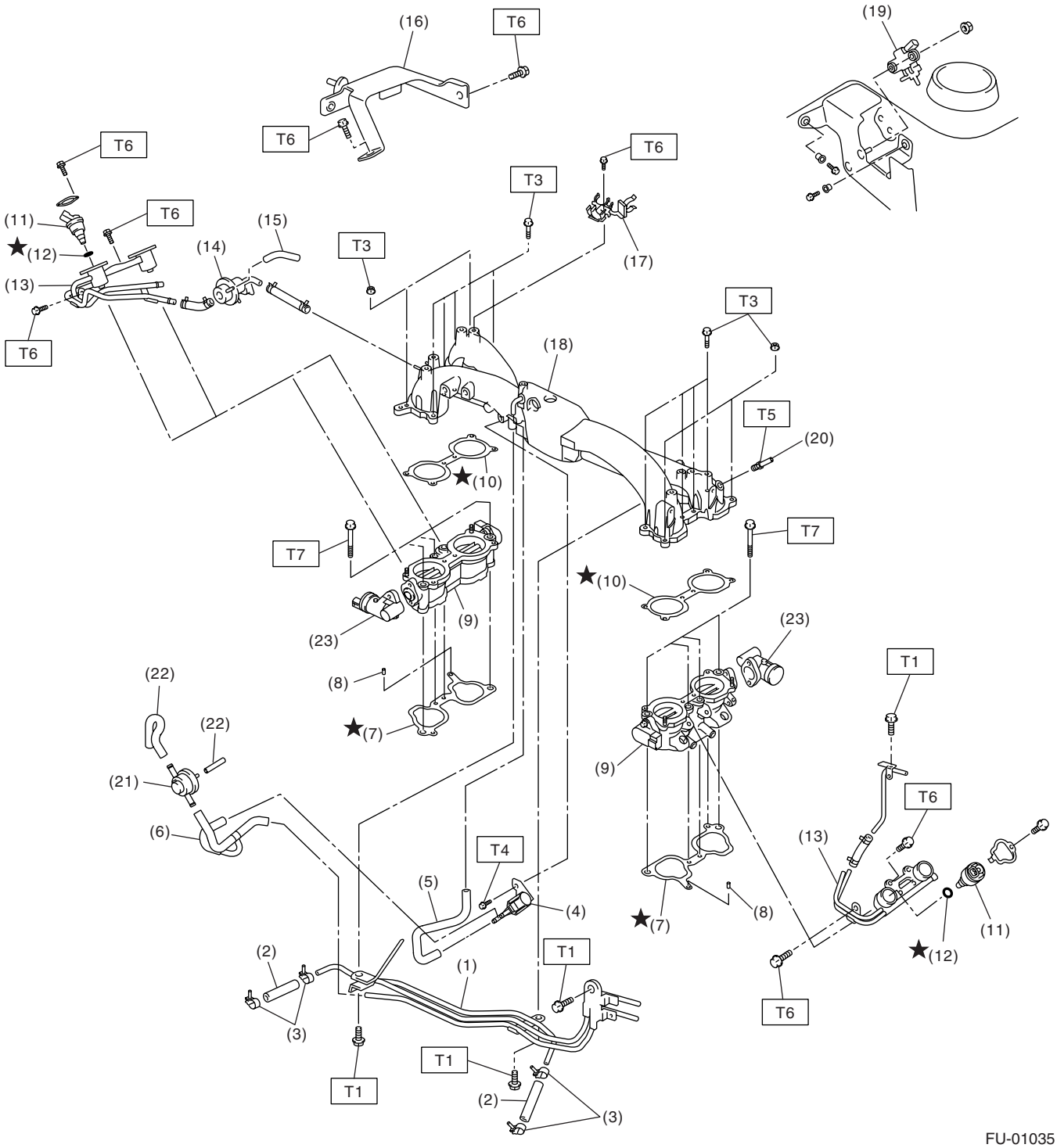
1. General Description

A: SPECIFICATIONS

Fuel tank	Capacity	60 ℓ (15.9 US gal, 13.2 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	450 — 677 kPa (4.59 — 6.9 kg/cm^2, 65.27 — 98.2 psi)
	Discharge flow	More than 145 ℓ (38.3 US gal, 31.9 Imp gal)/h [12 V at 300 kPa (3.06 kg/cm^2, 43.5 psi)]
Fuel filter		Cartridge type

B: COMPONENT

1. INTAKE MANIFOLD

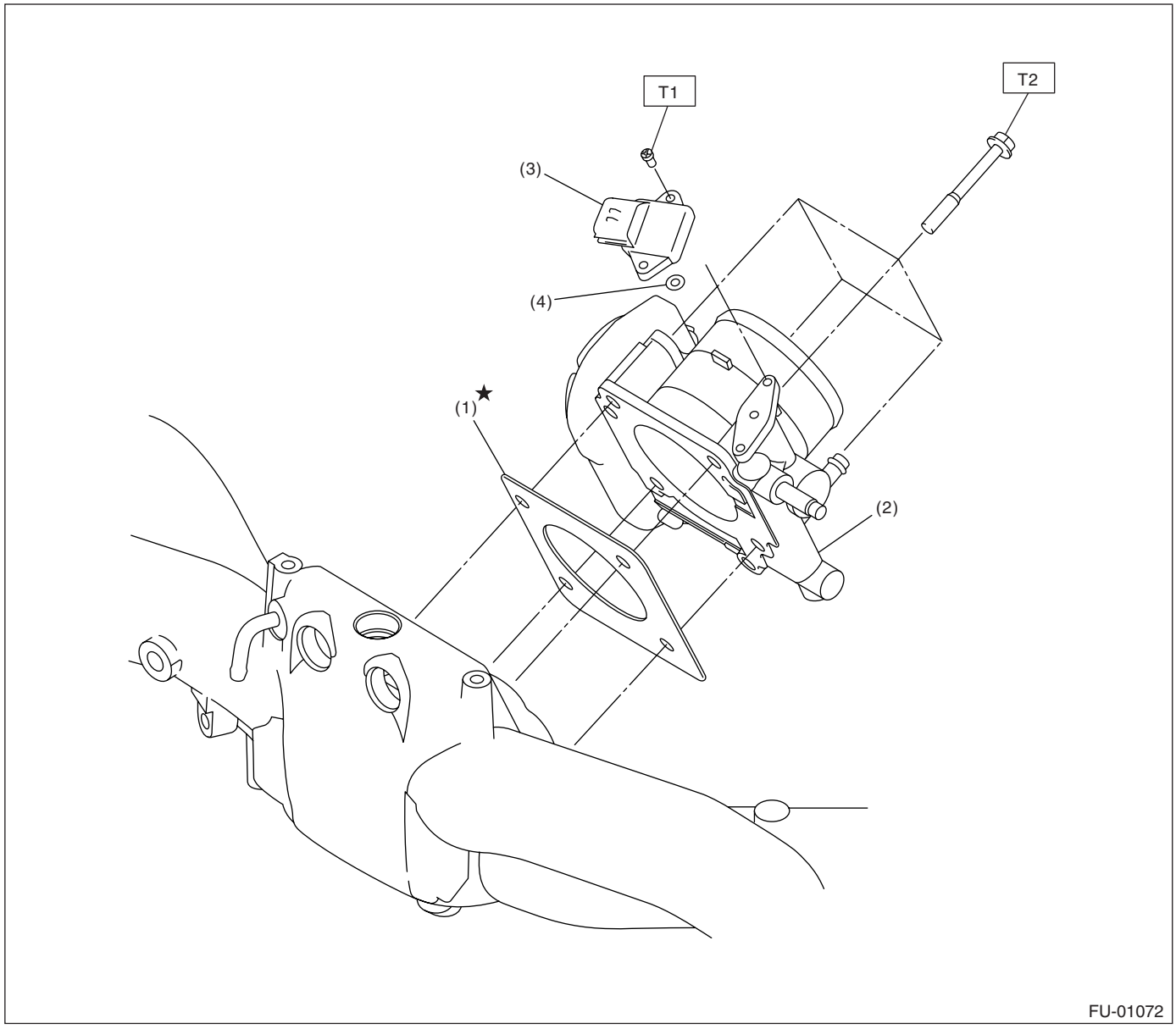


FU-01035

(1) Fuel pipe ASSY
(2) Fuel hose
(3) Clip
(4) Purge control solenoid valve
(5) Vacuum hose
(6) Vacuum control hose
(7) Intake manifold gasket
(8) Guide pin
(9) Tumble generator valve ASSY
(10) Tumble generator valve gasket
(11) Fuel injector
(12) O-ring
(13) Fuel injector pipe
(14) Pressure regulator
(15) Pressure regulator hose
(16) Fuel pipe protector RH
(17) Blow-by hose stay
(18) Intake manifold
(19) Wastegate control solenoid valve ASSY
(20) Nipple
(21) Purge valve
(22) Purge hose
(23) Tumble generator valve actuator

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.9 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 8.25 (0.84, 6.1)
T4: 16 (1.6, 11.8)
T5: 17 (1.73, 12.5)
T6: 19 (1.94, 13.7)
T7: 25 (2.5, 18.1)

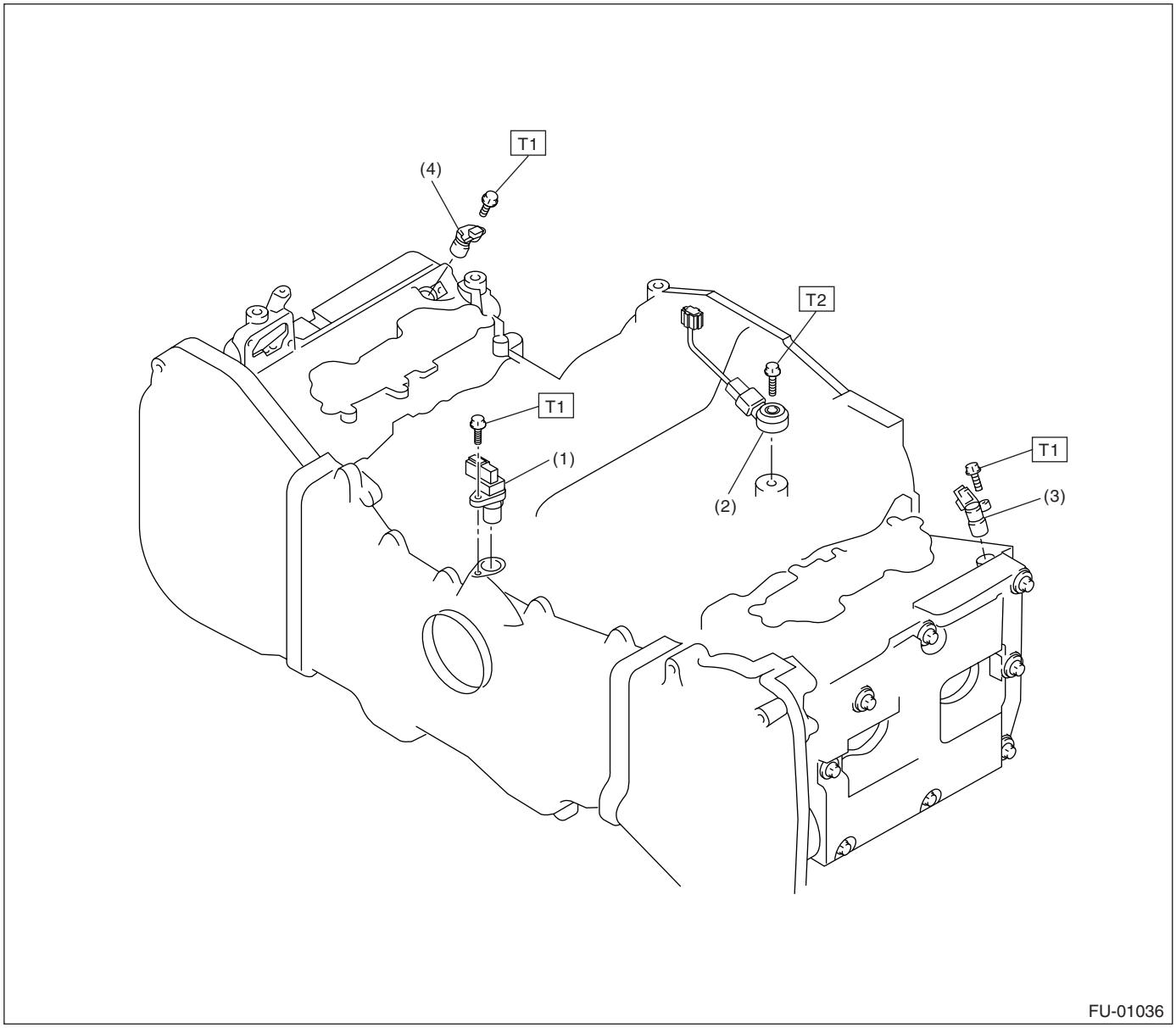
2. AIR INTAKE SYSTEM



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

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.6 (0.16, 1.2)
T2: 8 (0.8, 5.8)

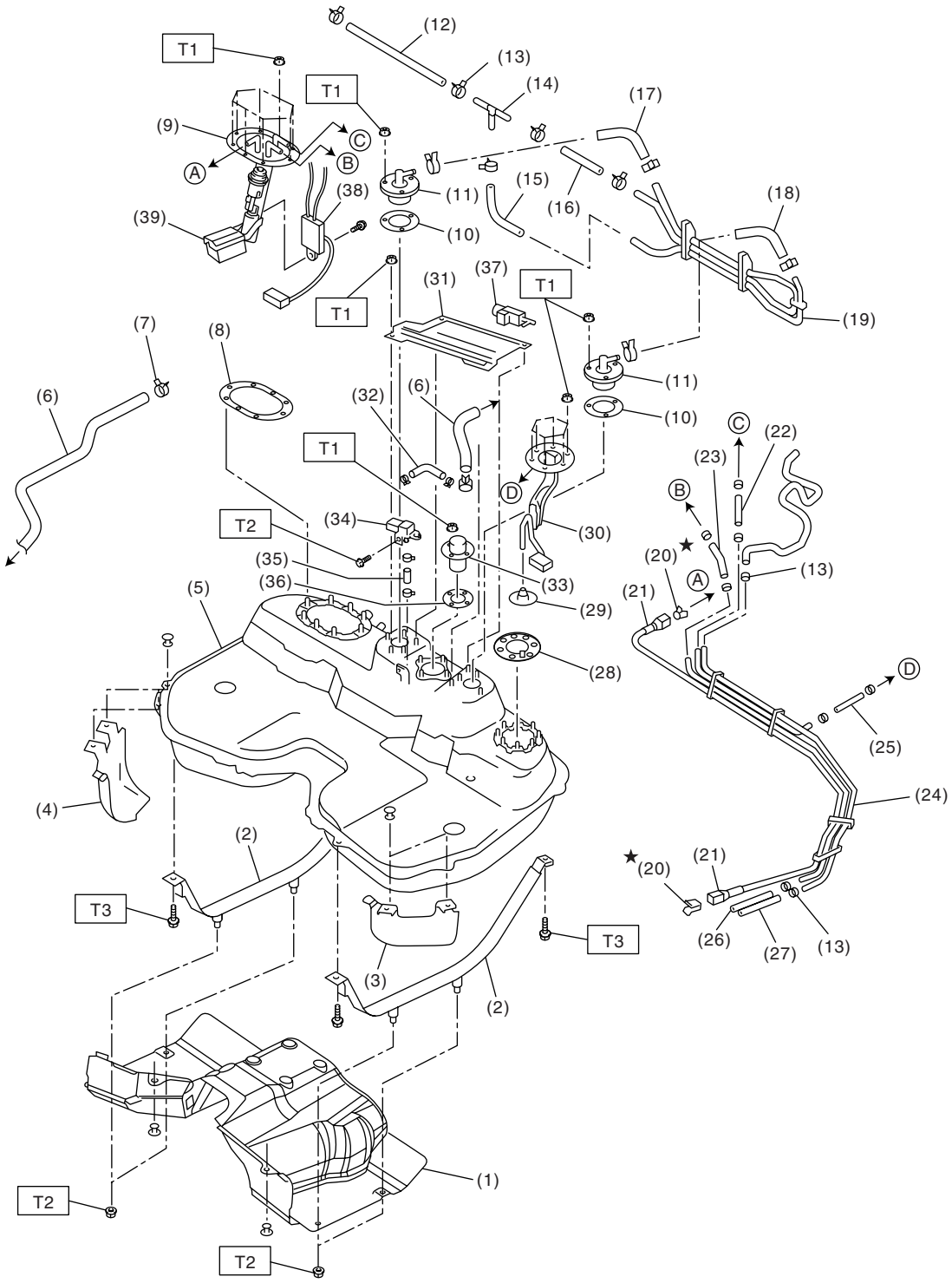
3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



(1) Crankshaft position sensor
(2) Knock sensor
(3) Camshaft position sensor LH
(4) Camshaft position sensor RH

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 24 (2.4, 17.4)

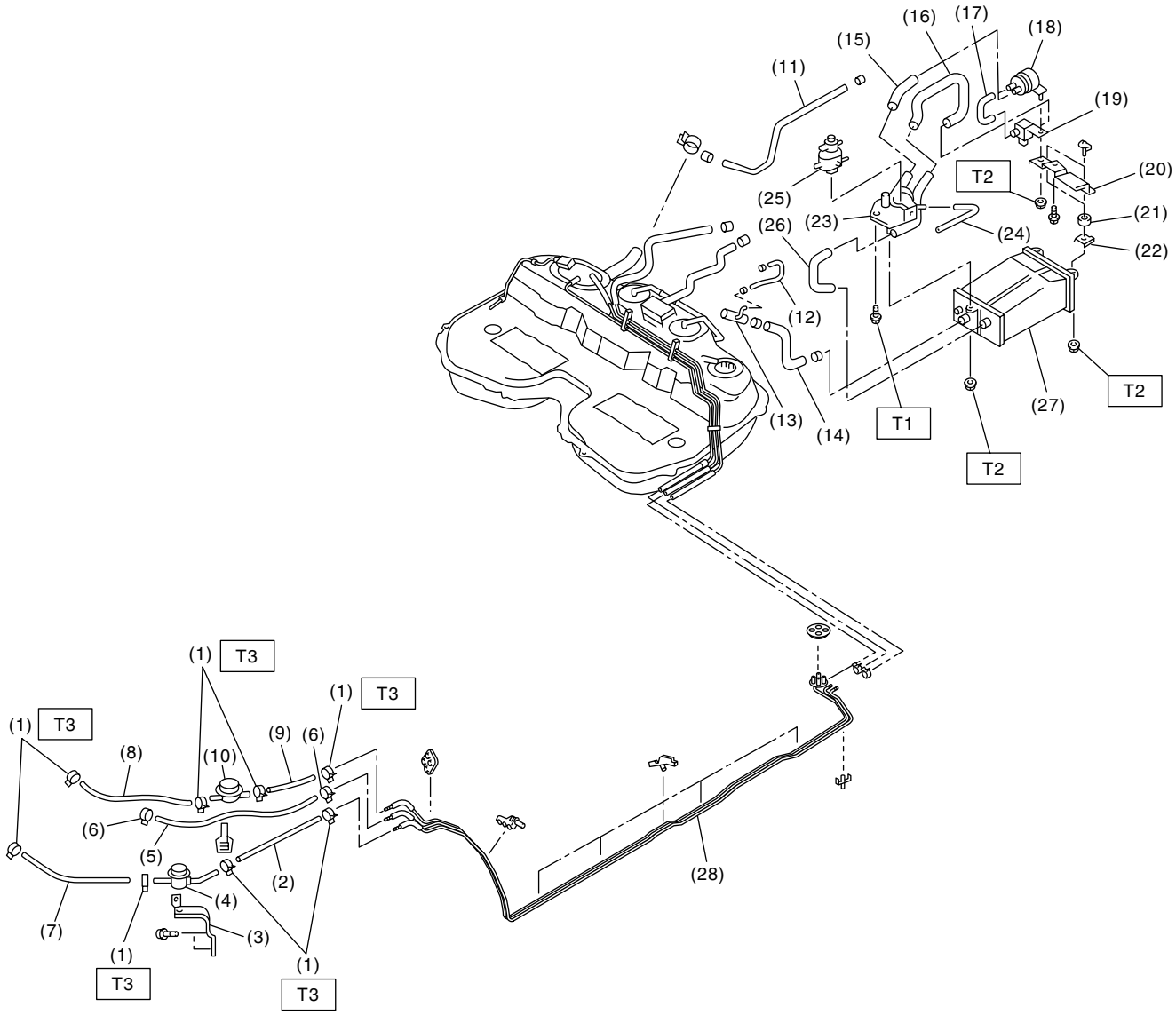
4. FUEL TANK


(12)
T1
(13)
(14)
(17)
T1
(9)
C
A
B
(38)
(11)
(15)
(16)
(18)
(39)
(10)
(31)
(37)
T1
T1
(19)
(7)
(8)
(11)
(6)
(32)
(6)
(10)
C
(22)
(23)
T1
B
D
T2
(34)
(30)
(20)
(35)
(33)
(13)
(36)
A
(21)
(5)
(29)
D
(28)
(25)
(24)
(4)
(2)
(20)
(21)
T3
T3
(26)
(27)
(13)
(3)
(2)
(1)
T2
T2
FU-01060

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

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

5. FUEL LINE

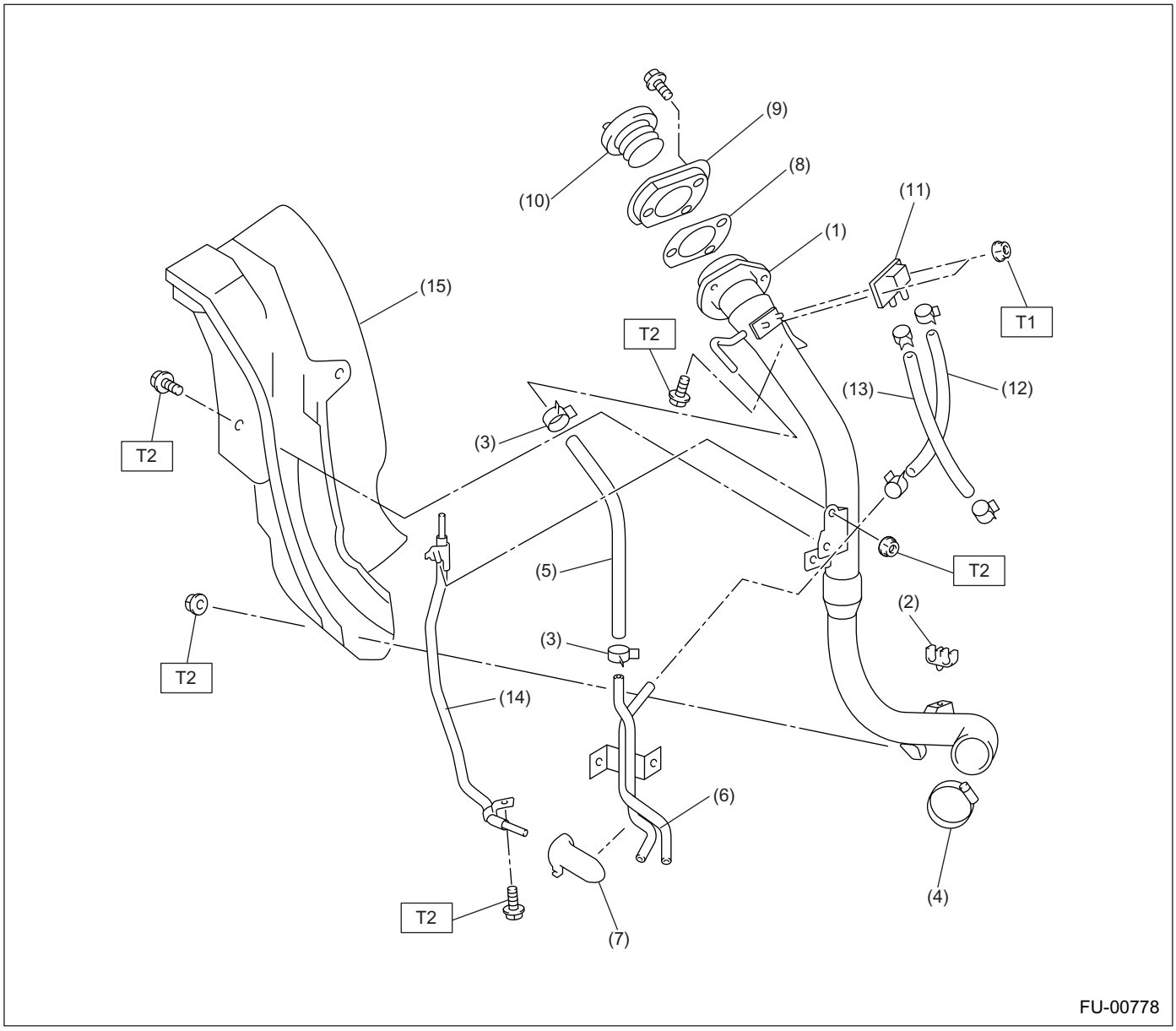


FU-01069

(1) Clamp
(2) Fuel delivery hose A
(3) Hose bracket
(4) Fuel damper (delivery)
(5) Evaporation hose
(6) Clip
(7) Fuel delivery hose B
(8) Fuel return hose A
(9) Fuel return hose B
(10) Fuel damper (return)
(11) Evaporation hose J
(12) Evaporation hose K
(13) Joint pipe
(14) Canister hose A
(15) Air filter hose A
(16) Drain valve hose
(17) Air filter hose B
(18) Drain filter
(19) Drain valve
(20) Canister upper bracket
(21) Cushion rubber
(22) Canister lower bracket
(23) Canister holder
(24) Evaporation hose L
(25) Pressure control solenoid valve
(26) Canister hose B
(27) Canister
(28) Fuel pipe ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)
T2: 23 (2.3, 16.6)
T3: 1.25 (0.13, 0.94)

6. FUEL FILLER PIPE



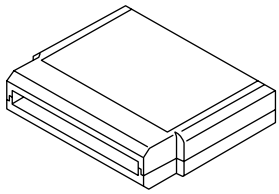
(1) Fuel filler pipe ASSY
(2) Evaporation hose holder
(3) Clip
(4) Clamp
(5) Evaporation hose A
(6) Evaporation pipe
(7) Evaporation pipe holder
(8) Filler pipe packing
(9) Filler ring
(10) Filler cap
(11) Shut valve
(12) Evaporation hose B
(13) Evaporation hose C
(14) Joint pipe
(15) Fuel filler pipe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

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 7.5 (0.76, 5.5)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect negative terminal from battery.
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

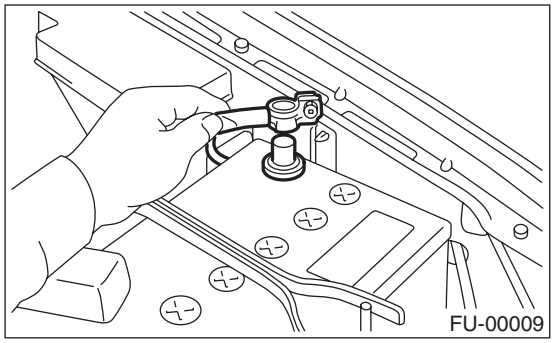
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems.

2. Throttle Body

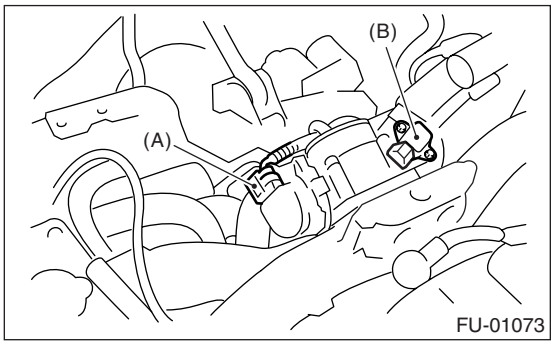
A: REMOVAL

1) Disconnect the ground cable from battery.

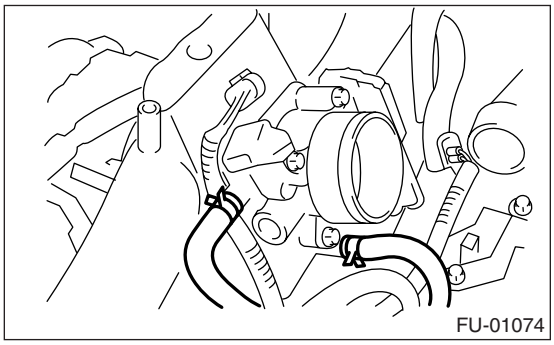


2) Remove the intercooler. <Ref. to IN(STi)-10, REMOVAL, Intercooler.>

3) Disconnect the connector from the throttle position sensor (A) and manifold absolute pressure sensor (B).



4) Disconnect the engine coolant hoses from the throttle body.



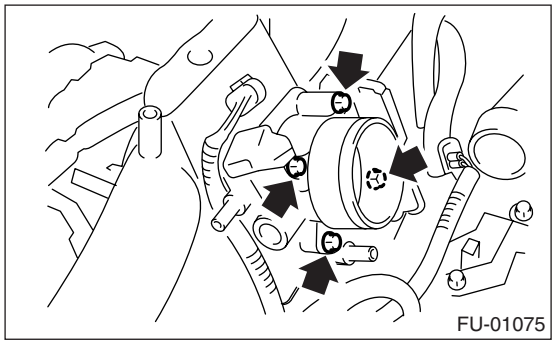
5) Remove the bolts which secure the throttle body to intake manifold.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use a new gasket.

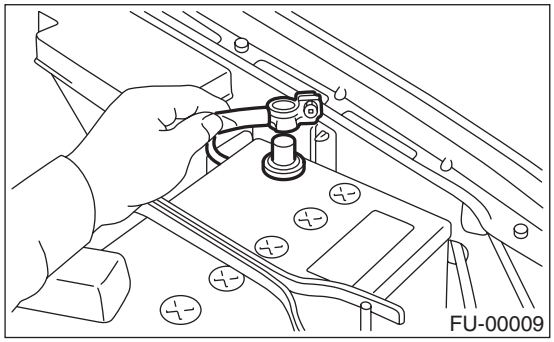
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



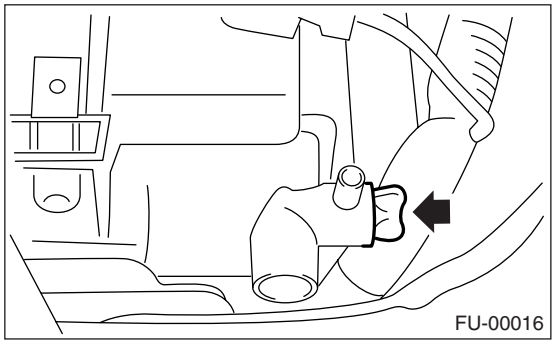
3. Intake Manifold

A: REMOVAL

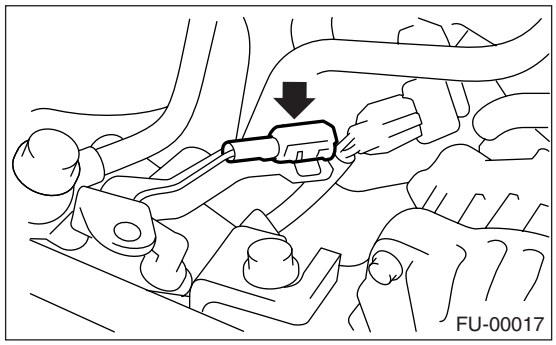
1) Release the fuel pressure. <Ref. to FU(STi)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.



4) Lift up the vehicle.
5) Remove the under cover.
6) Drain the engine coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt).

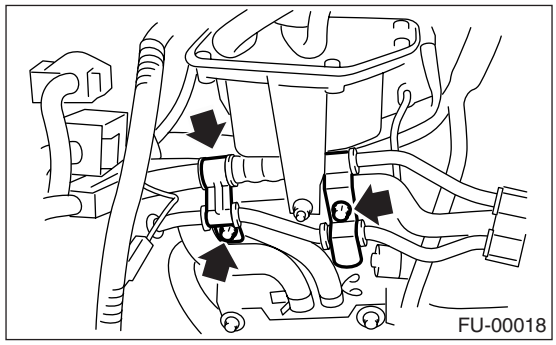


7) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(STi)-7, REMOVAL, Air Cleaner.>
8) Remove the air cleaner element.
9) Remove the intercooler. <Ref. to IN(STi)-10, REMOVAL, Intercooler.>
10) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-32, REMOVAL, Coolant Filler Tank.>
11) Remove the power steering pump.
(1) Remove the front side V-belt.<Ref. to ME(STi)-41, REMOVAL, V-belt.>
(2) Disconnect the power steering switch connector.

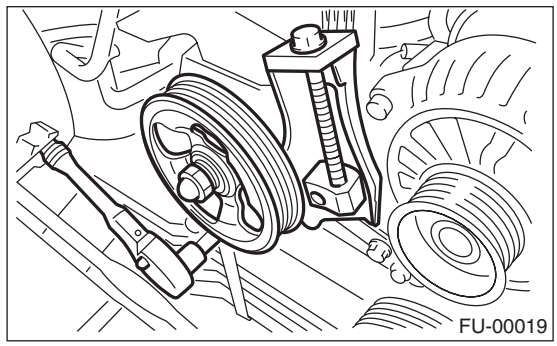


(3) Remove the bolts which secure the power steering pipe brackets to the intake manifold.

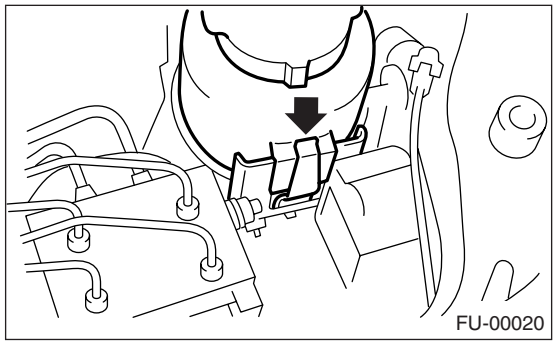
NOTE:
Do not disconnect the power steering hose.



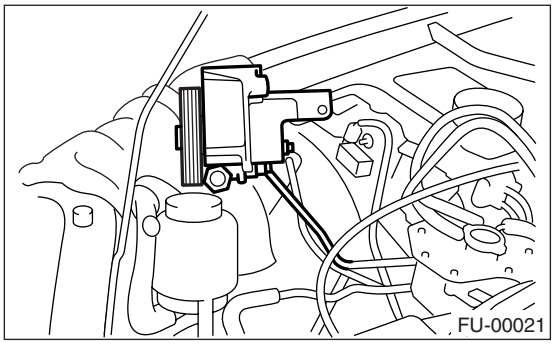
(4) Remove the bolts which secure the power steering pump bracket.



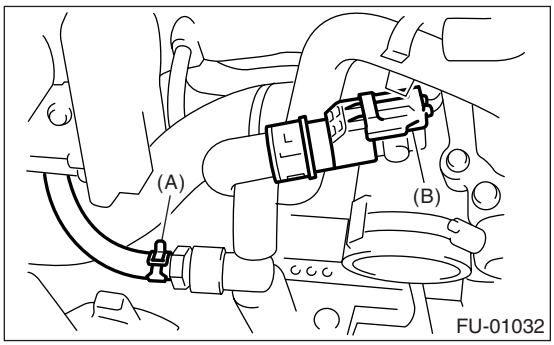
(5) Remove the power steering tank from the bracket by pulling it upward.



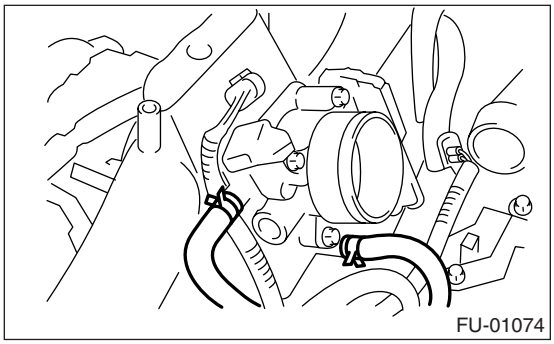
(6) Place the power steering pump on the right side wheel apron.



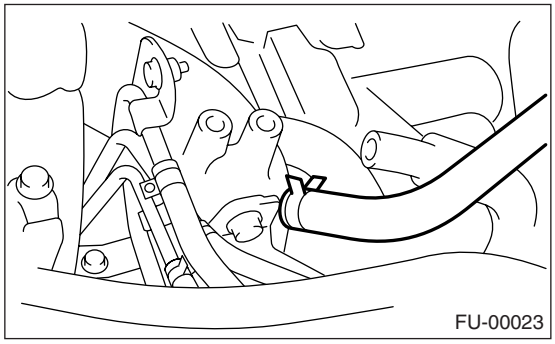
12) Disconnect the emission hose (A) and connector (B) from the PCV hose assembly.



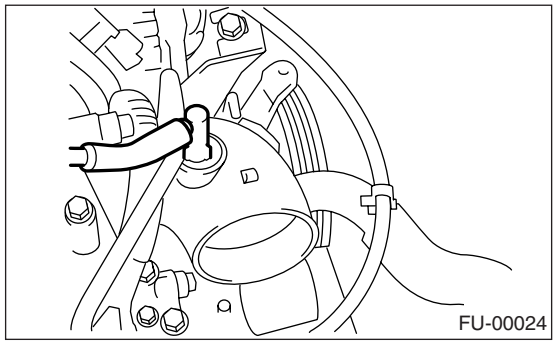
13) Disconnect the engine coolant hoses from the throttle body.



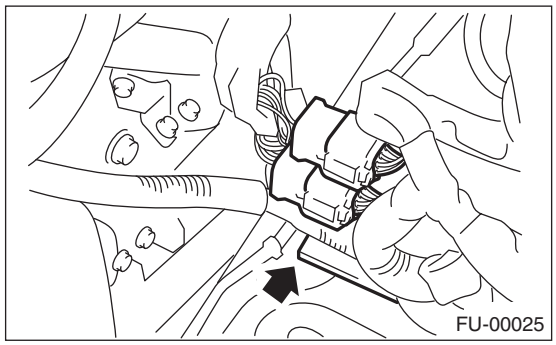
14) Disconnect the brake booster hose.

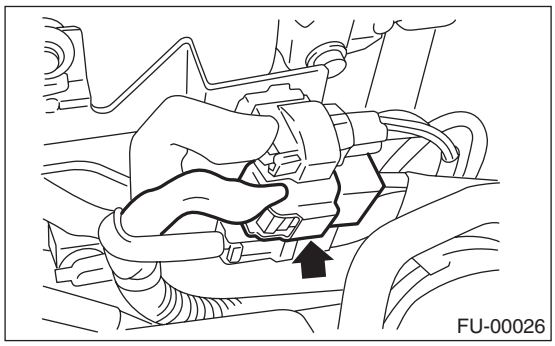


15) Disconnect the pressure hose from the intake duct.

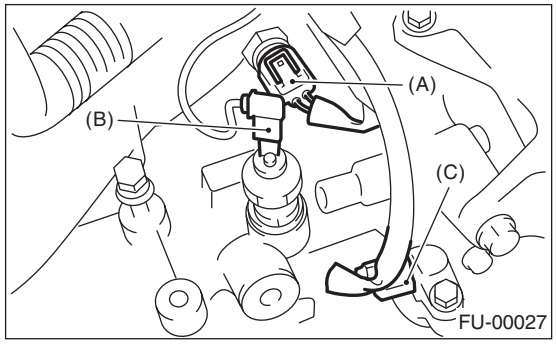


16) Disconnect the engine harness connectors from the bulkhead harness connectors.

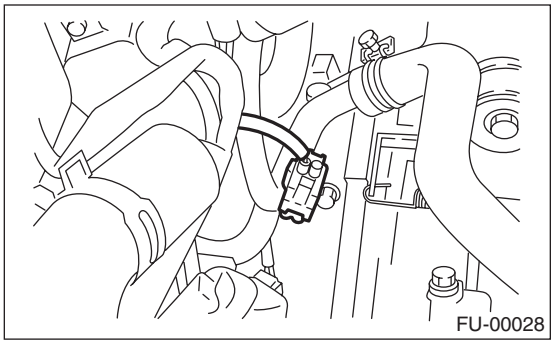




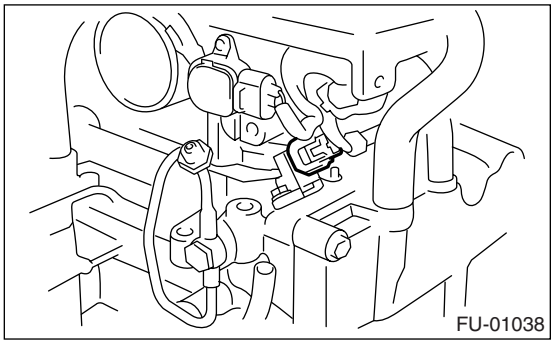
17) Disconnect the connectors from the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



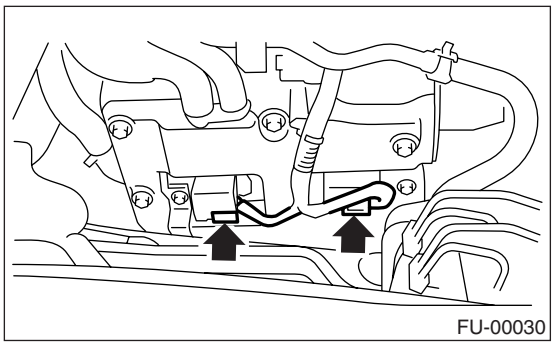
18) Disconnect the knock sensor connector.



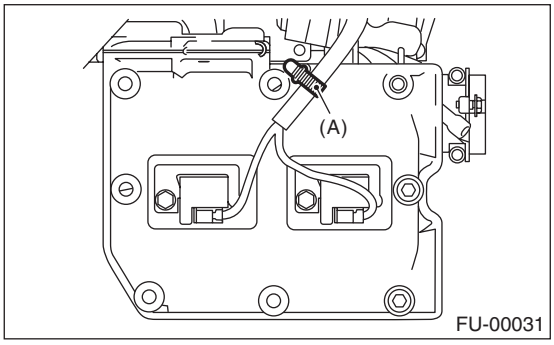
19) Disconnect the connector from the camshaft position sensor.



20) Disconnect the connector from the ignition coil.

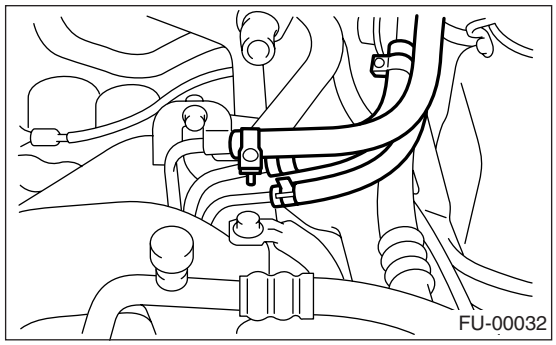


21) Disconnect the engine harness fixed by clip (A) from the bracket.

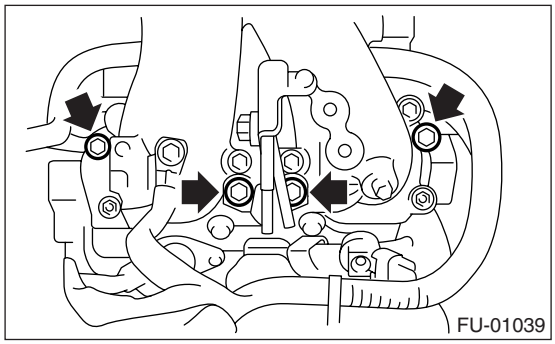


22) Disconnect the fuel delivery hose, return hose and evaporation hose.

CAUTION:
- **Do not spill fuel.**
- **Catch fuel from hoses in a container or cloth.**



23) Remove the bolts which secure the intake manifold to the cylinder heads.



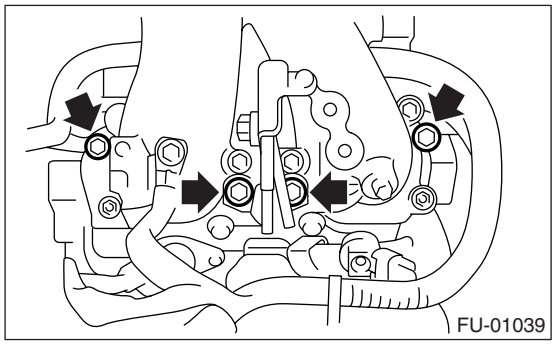
24) Remove the intake manifold.

B: INSTALLATION

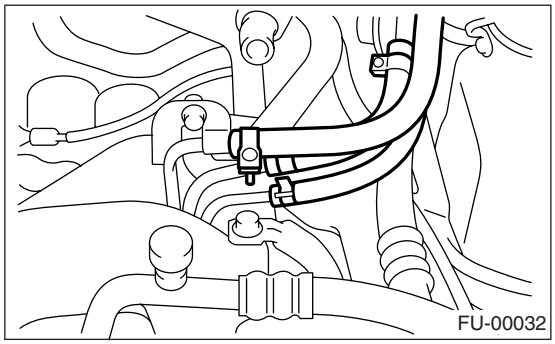
1) Install the intake manifold onto cylinder heads.

NOTE:
Always use new gaskets.

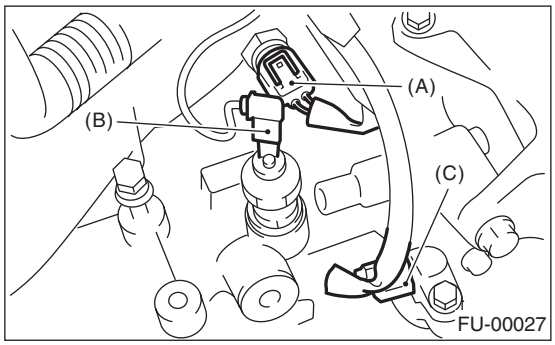
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



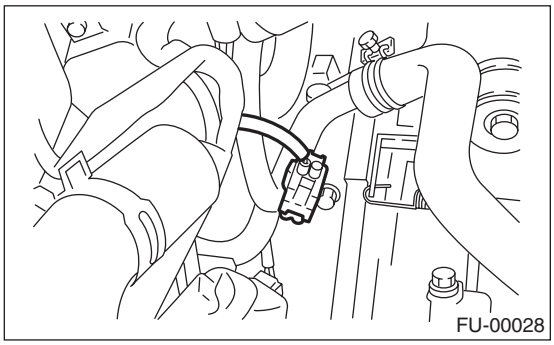
2) Connect the fuel delivery hose, return hose and evaporation hose.



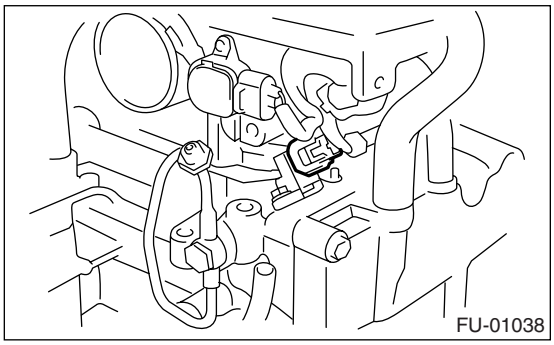
3) Connect the connector to the oil pressure switch (B), crankshaft position sensor (C) and engine coolant temperature sensor (A).



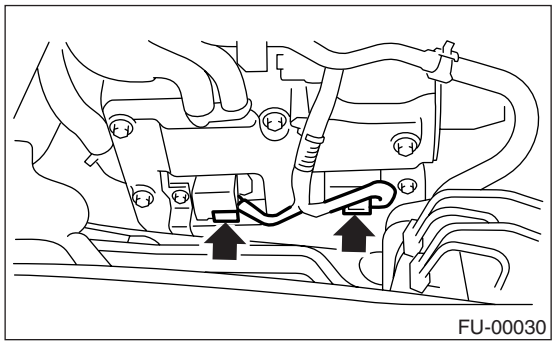
4) Connect the connector to the knock sensor.



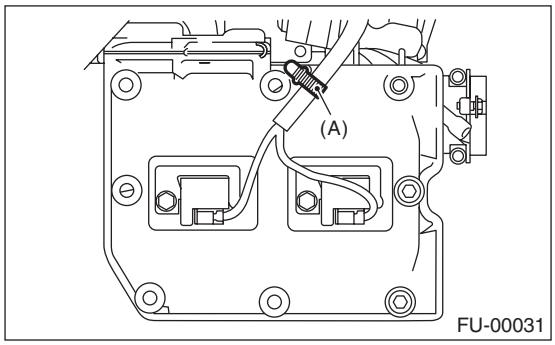
5) Connect the connector to the camshaft position sensor.



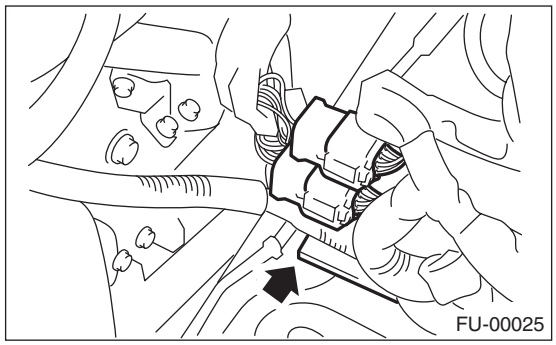
6) Connect the connector to the ignition coil.

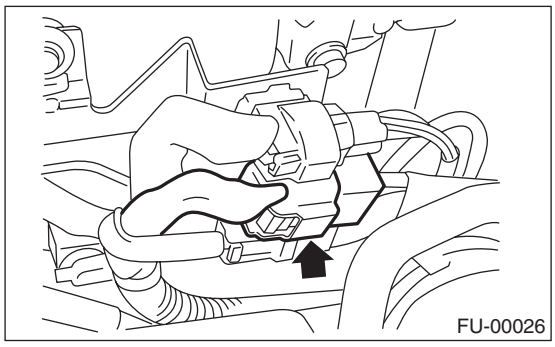


7) Connect the engine harness with clip (A) to the bracket.

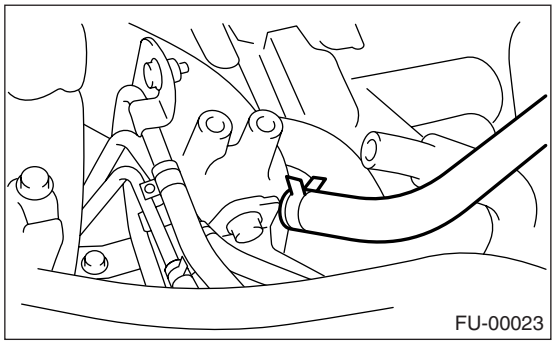


8) Connect the engine harness connector to the bulkhead harness connectors.

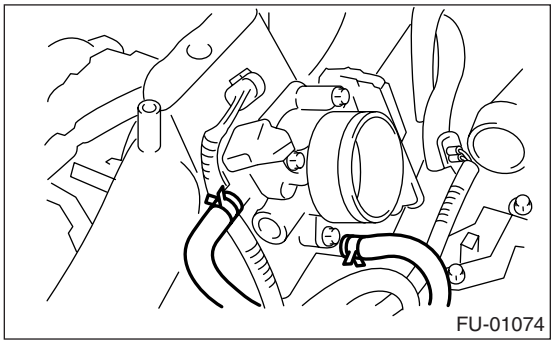




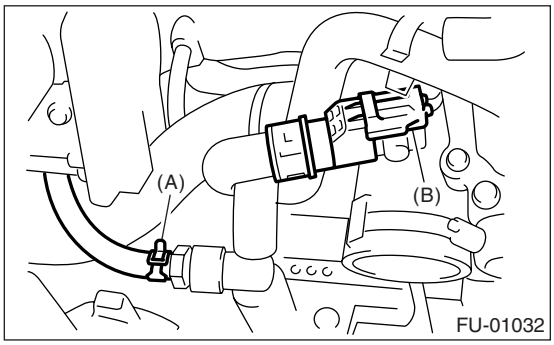
9) Connect the brake booster vacuum hose.



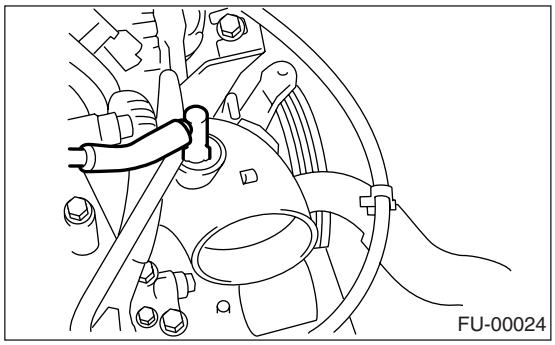
10) Connect the engine coolant hoses to the throttle body.



11) Connect the emission hose (A) and connector (B) to the PCV hose assembly.

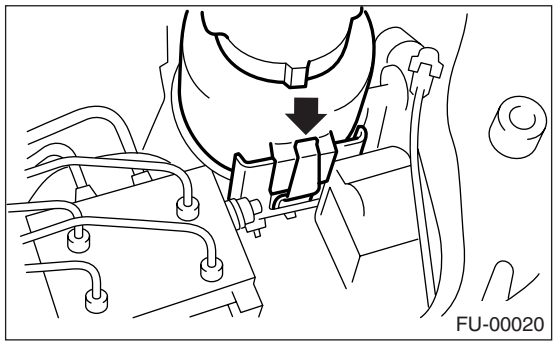


12) Connect the pressure hose to the intake duct.

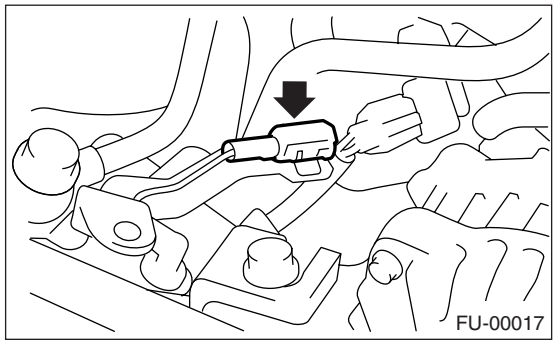


13) Install the power steering pump.

(1) Install the power steering tank on the bracket.

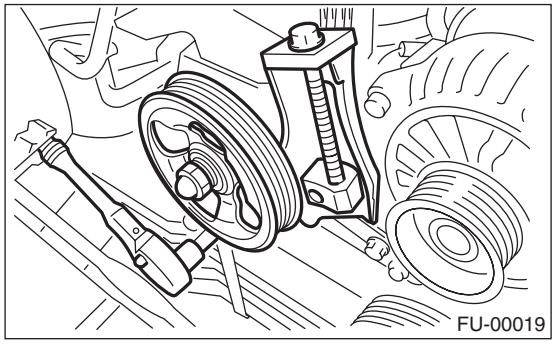


(2) Connect the connector to the power steering pump switch.

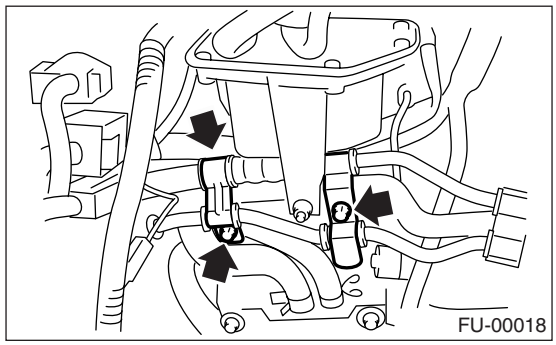


(3) Install the power steering pump, and tighten the bolts.

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



(4) Install the power steering pipe brackets on the intake manifold RH.



(5) Install the front side V-belt.<Ref. to ME(STi)-41, INSTALLATION, V-belt.>

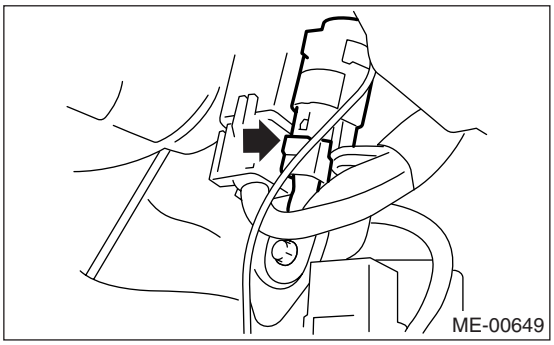
14) Install the coolant filler tank. <Ref. to CO(H4DOTC)-32, INSTALLATION, Coolant Filler Tank.>

15) Install the intercooler. <Ref. to IN(STi)-10, INSTALLATION, Intercooler.>

16) Install the air cleaner element.

17) Install the air cleaner upper cover and air intake duct as a unit. <Ref. to IN(STi)-7, INSTALLATION, Air Cleaner.>

18) Connect the connector to the fuel pump relay.



19) Connect the battery ground cable to battery.

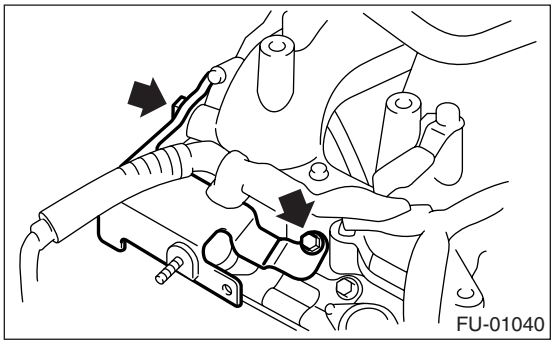
20) Lift up the vehicle.

21) Install the under cover.

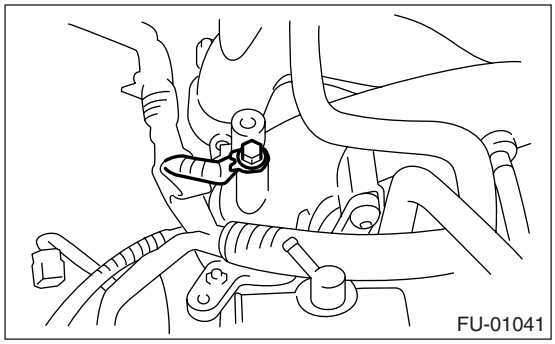
22) Fill the engine coolant. <Ref. to CO(H4DOTC)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

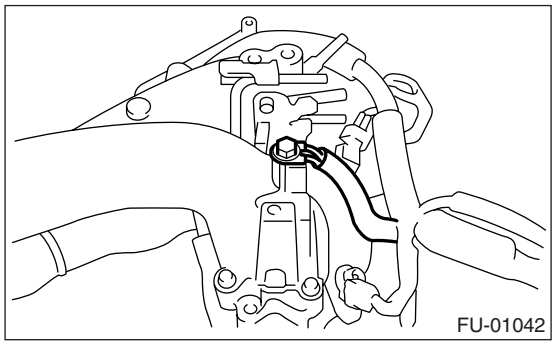
C: DISASSEMBLY

1) Remove the fuel pipe protector RH.

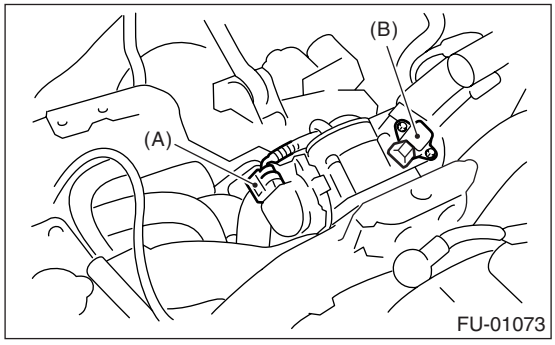


2) Remove the engine ground terminal from the intake manifold.

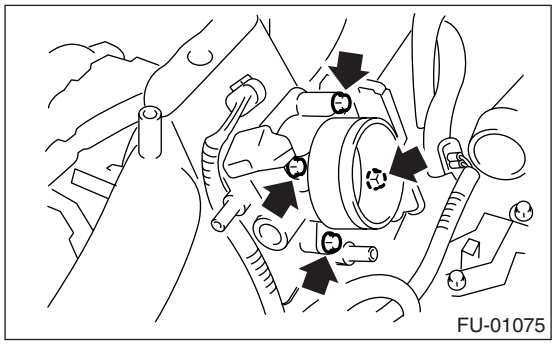




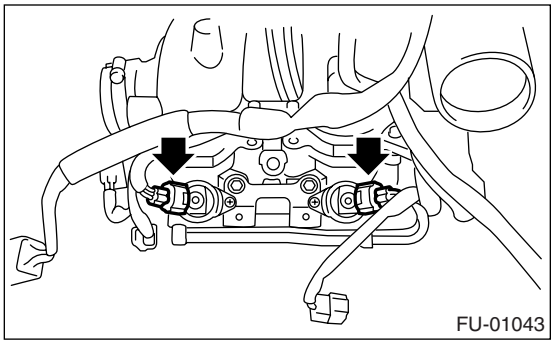
3) Disconnect the connector from the throttle position sensor (A) and manifold absolute pressure sensor (B).



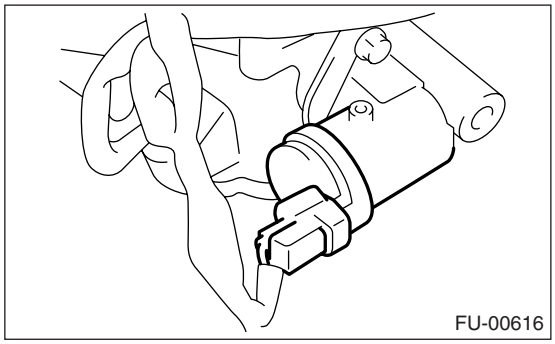
4) Remove the throttle body from the intake manifold.



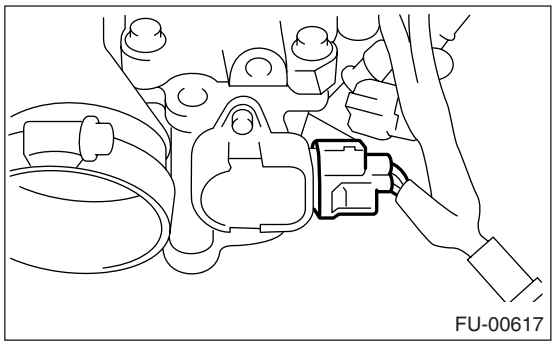
5) Disconnect the connector from the fuel injector.



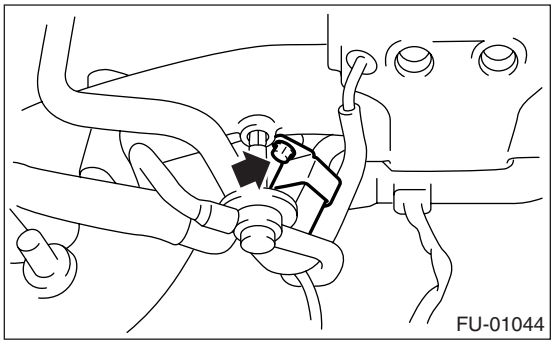
6) Disconnect the connector from the tumble generator valve actuator.



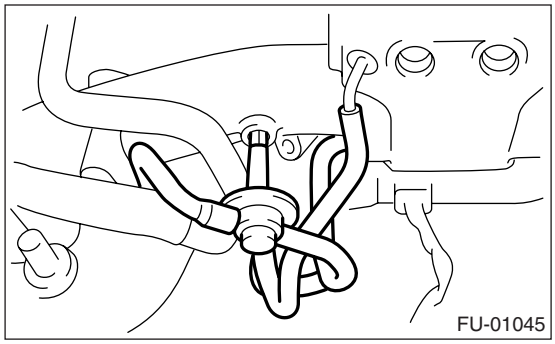
7) Disconnect the connector from the tumble generator valve sensor.



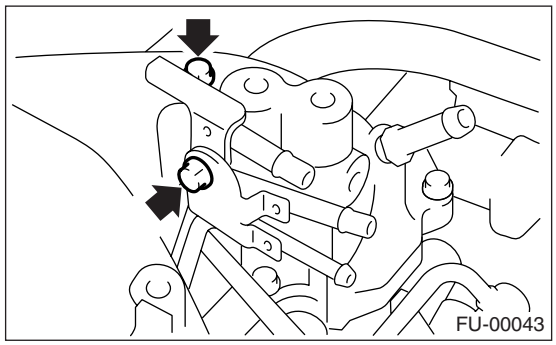
8) Disconnect the connector from the purge control solenoid valve.
9) Remove the purge control solenoid valve.



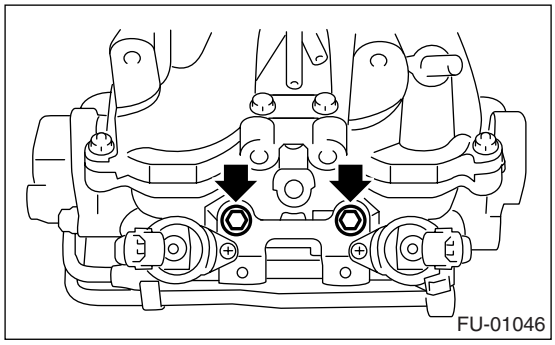
10) Disconnect the evaporation hose and purge valve from the intake manifold.

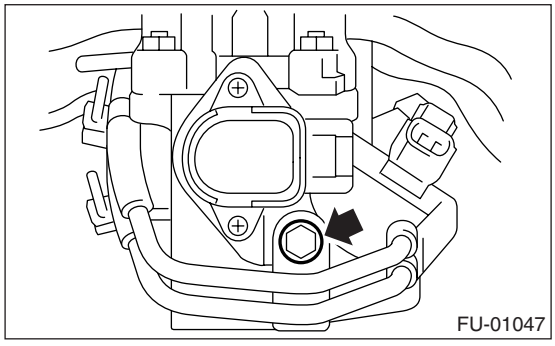


11) Remove the two bolts which hold the fuel pipes on the left side of intake manifold.

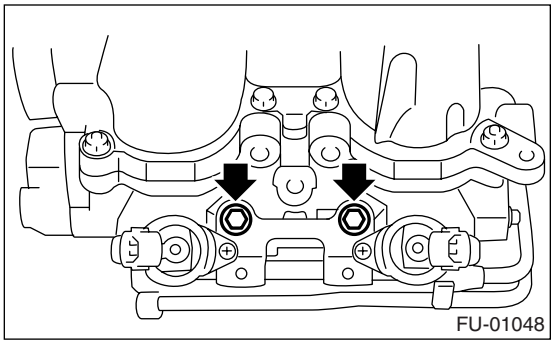


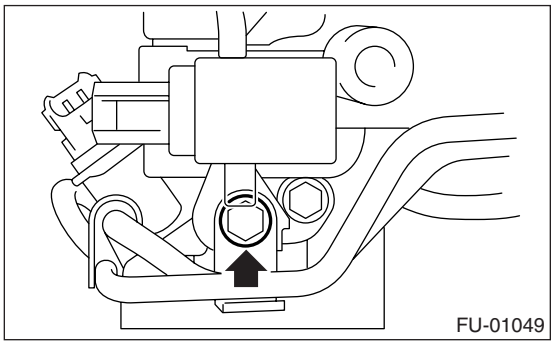
12) Remove the bolt which hold the fuel injector pipe onto intake manifold.
• LH SIDE



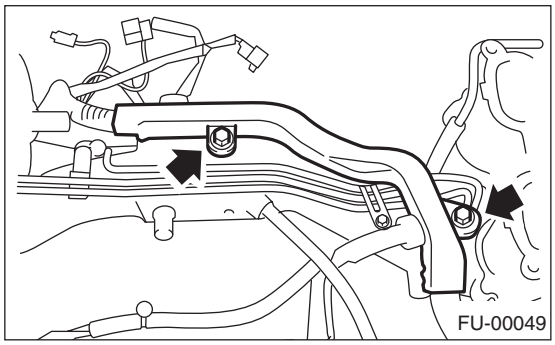


• RH SIDE

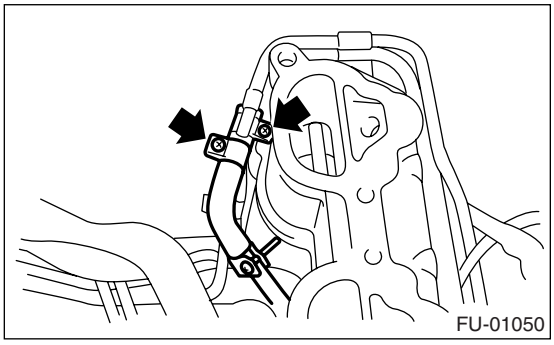




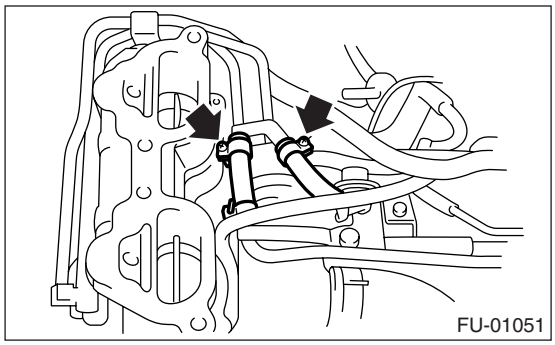
13) Remove the harness bracket which holds the engine harness onto intake manifold.



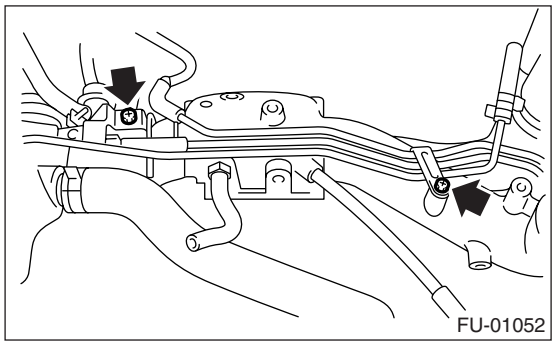
14) Remove the engine harness from the intake manifold.
15) Loosen the clamp which holds the front left side fuel hose to injector pipe, and then remove the pipe from clamp.



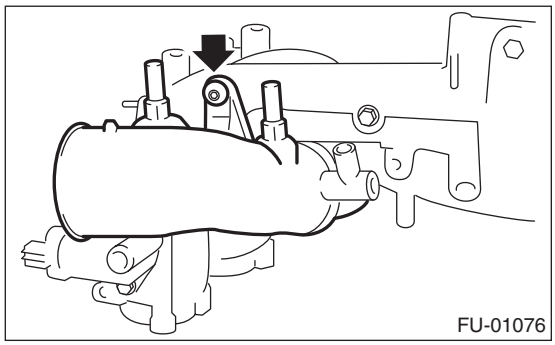
16) Loosen the clamp which holds the right side fuel hose to injector pipe, and then remove the pipe from clamp.



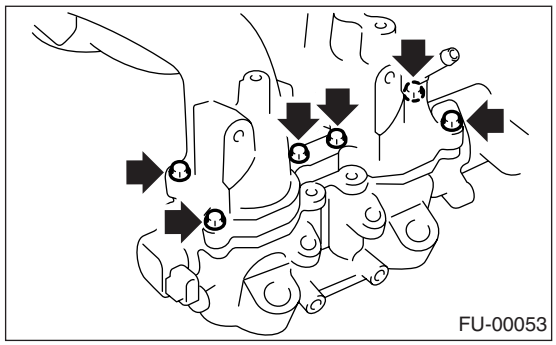
17) Remove the bolts which install the fuel pipe on intake manifold.



18) Remove the fuel pipe assembly and pressure regulator from the intake manifold.
19) Remove the intake duct from the intake manifold.



20) Remove the tumble generator valve assembly from the intake manifold.

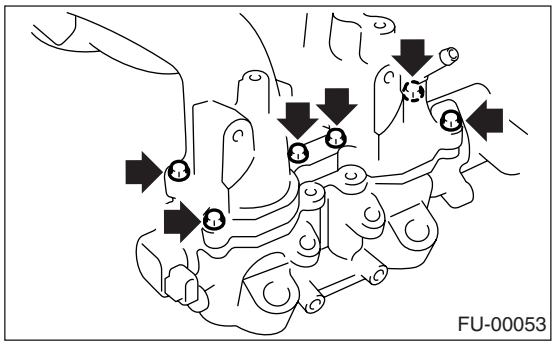


D: ASSEMBLY

NOTE:
Replace the gasket with a new one.

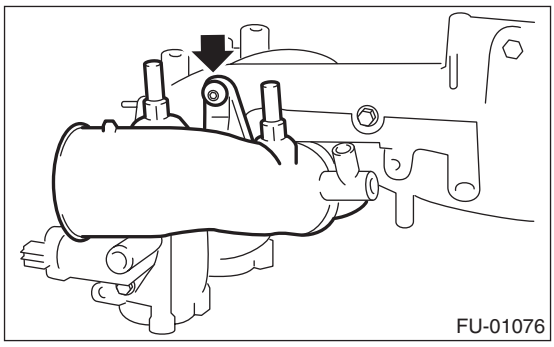
1) Install the tumble generator valve assembly to the intake manifold.

Tightening torque:
8.25 N·m (0.84 kgf-m, 6.1 ft-lb)



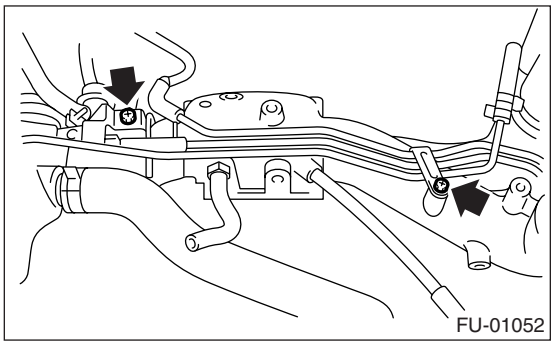
2) Install the air intake duct to the intake manifold.

Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



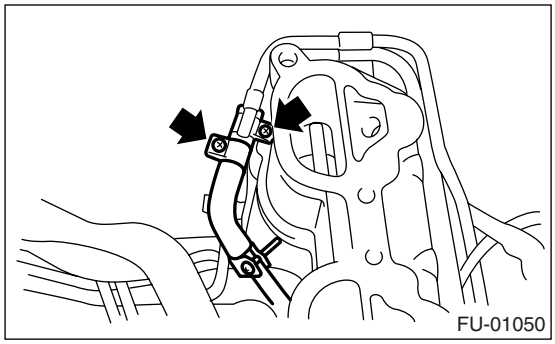
3) Install the fuel pipe assembly and pressure regulator to the intake manifold.

Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)

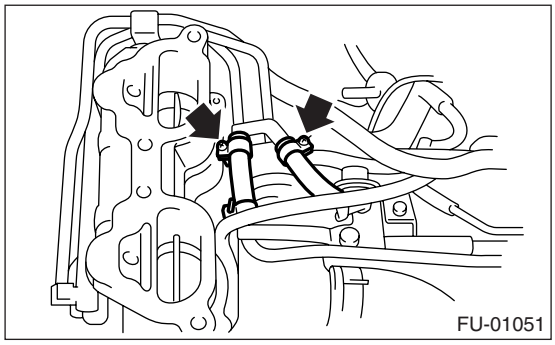


4) Install the fuel injector pipe LH.

5) Connect the left side fuel hose to injector pipe, and tighten the clamp screw.

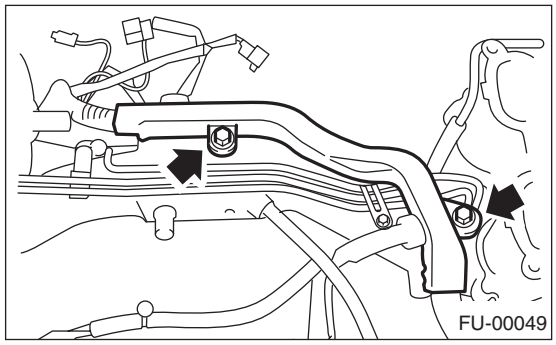


6) Install the fuel injector pipe RH.
7) Connect the right side fuel hose to injector pipe, and tighten the clamp screw.



8) Install the engine harness to the intake manifold.
9) Install the harness bracket which holds the engine harness onto intake manifold.

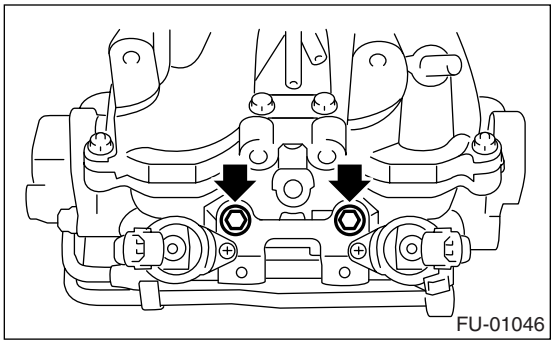
Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)

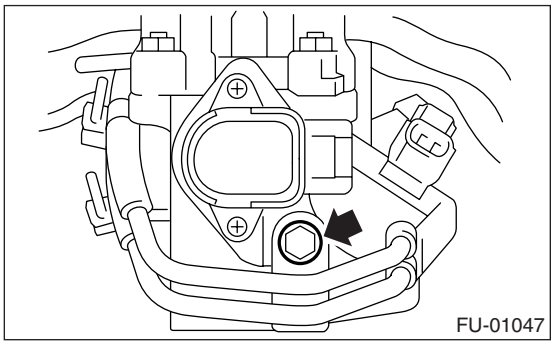


10) Tighten the bolts which install the fuel injector pipe onto intake manifold.

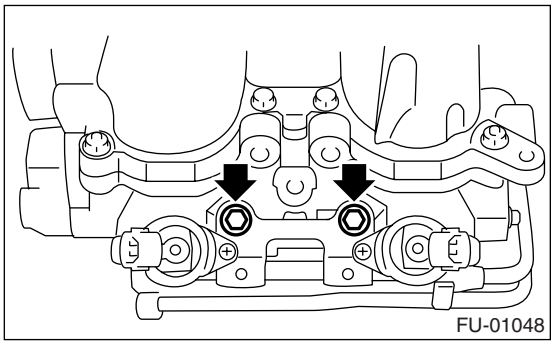
Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)

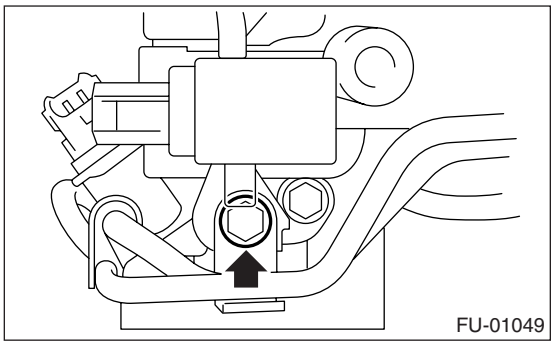
- LH SIDE





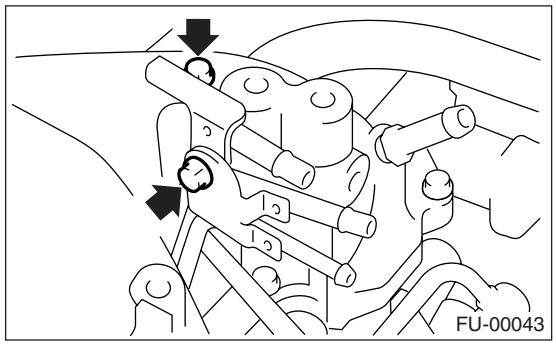
- RH SIDE





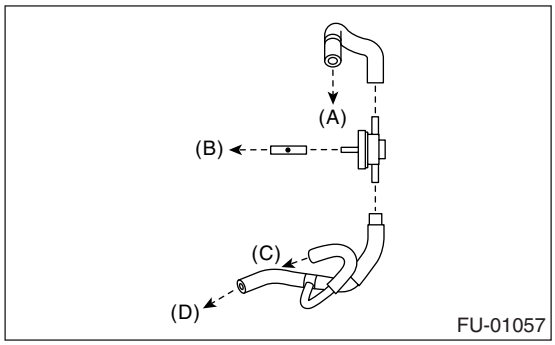
11) Tighten the two bolts which install the fuel pipes on the left side of intake manifold.

Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)



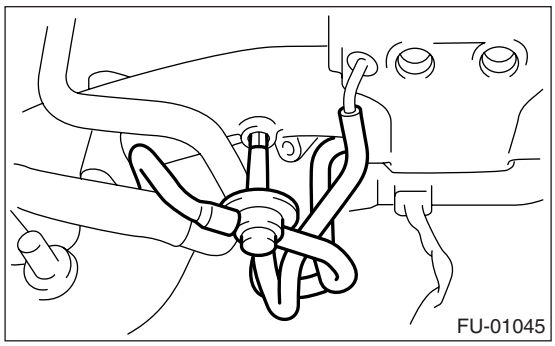
12) Connect the evaporation hoses to the purge valve.

NOTE:
Connect the evaporation hoses as shown in the figure.



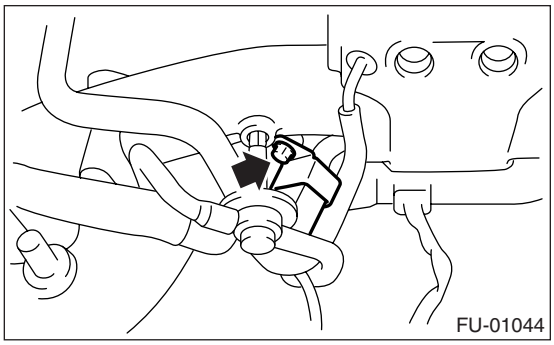
(A) To intake duct
(B) To intake manifold
(C) To purge control solenoid valve
(D) To fuel pipe ASSY

13) Connect the evaporation hose and purge valve to the intake manifold.



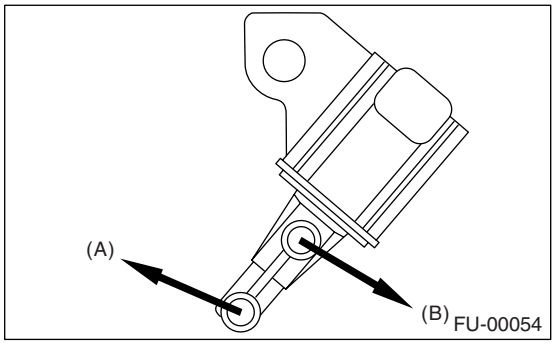
14) Install the purge control solenoid valve.

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



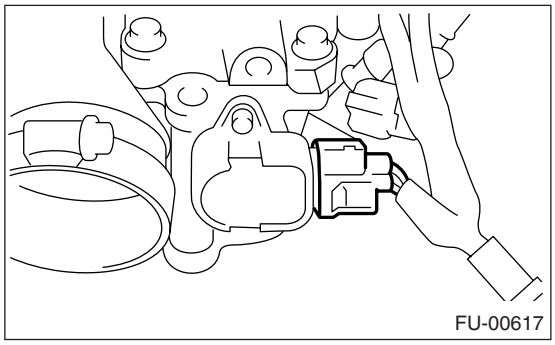
15) Connect the hoses to the purge control solenoid valve.

NOTE:
Connect the evaporation hoses as shown in the figure.

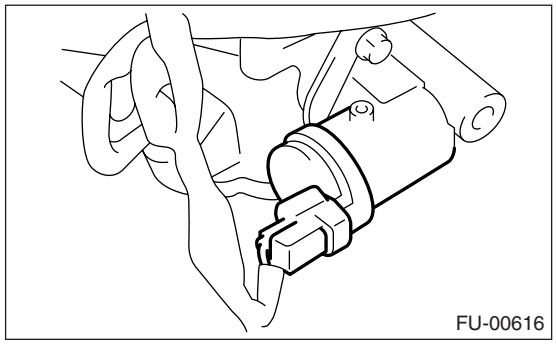


(A) To purge valve
(B) To intake manifold

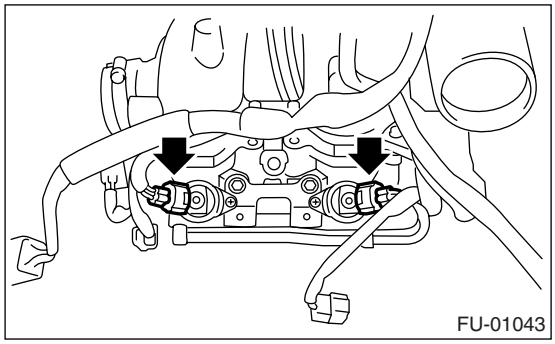
16) Connect the connector to the purge control solenoid valve.
17) Connect the connector to the tumble generator valve sensor.



18) Connect the connector to the tumble generator valve actuator.



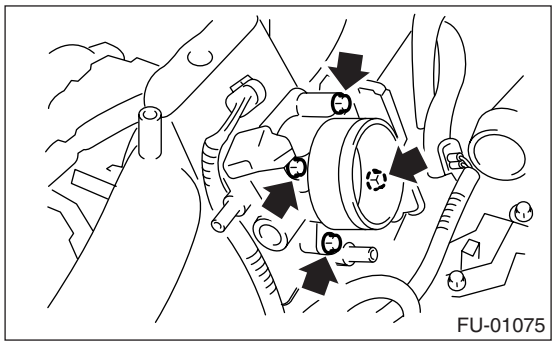
19) Connect the connector to the fuel injector.



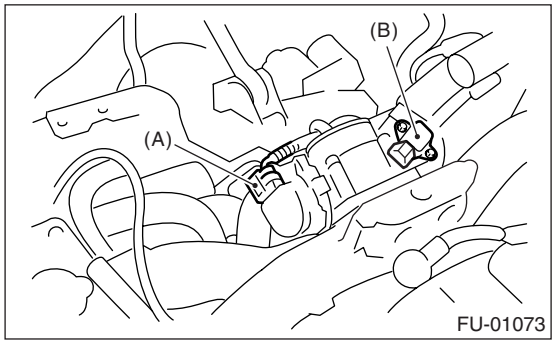
20) Install the throttle body to the intake manifold.

NOTE:
Replace the gasket with a new one.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

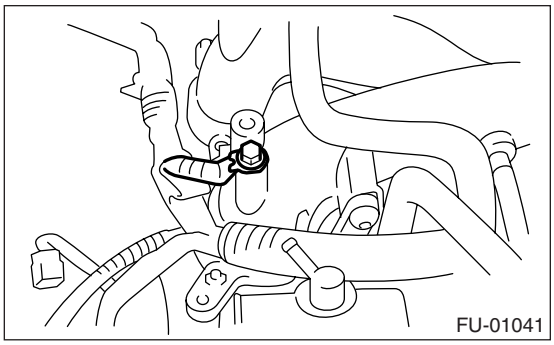


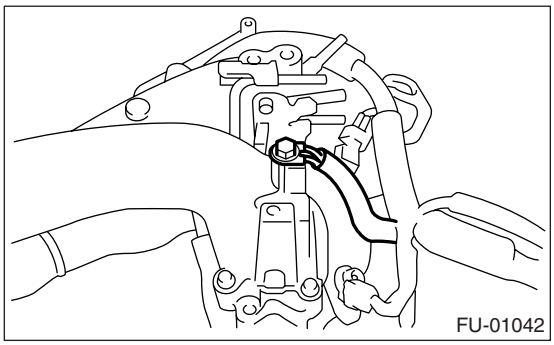
21) Connect the connector to the throttle position sensor (A) and manifold absolute pressure sensor (B).



22) Install the engine ground terminal to the intake manifold.

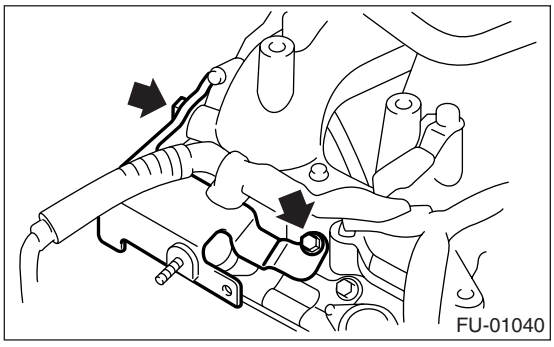
Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)





23) Install the fuel pipe protector RH.

Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



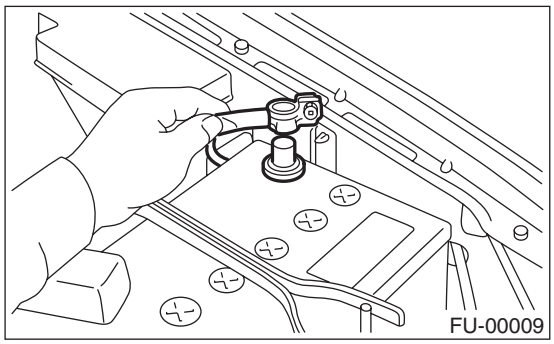
E: INSPECTION

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

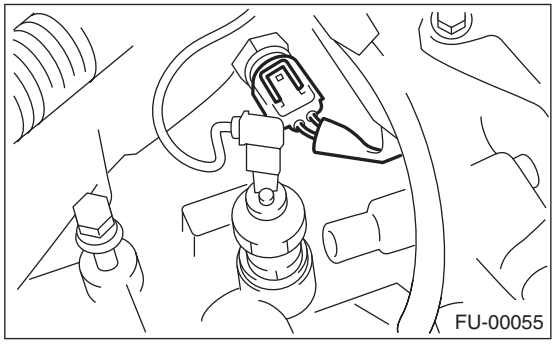
4. Engine Coolant Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the generator. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>
3) Drain the engine coolant. <Ref. to CO(H4DOTC)-17, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
4) Disconnect the connector from the engine coolant temperature sensor.



5) Remove the engine coolant temperature sensor.

B: INSTALLATION

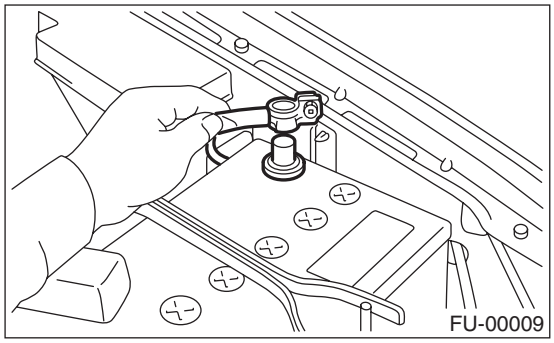
Install in the reverse order of removal.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

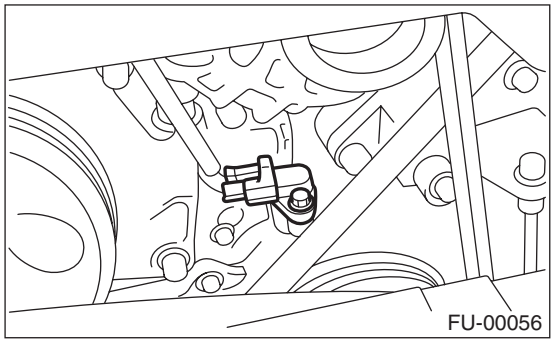
5. Crankshaft Position Sensor

A: REMOVAL

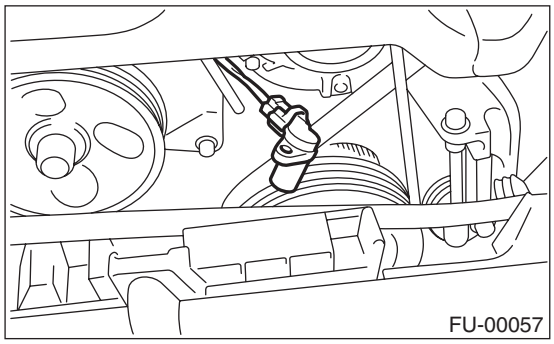
1) Disconnect the ground cable from battery.



2) Remove the bolt which installs the crankshaft position sensor to cylinder block.



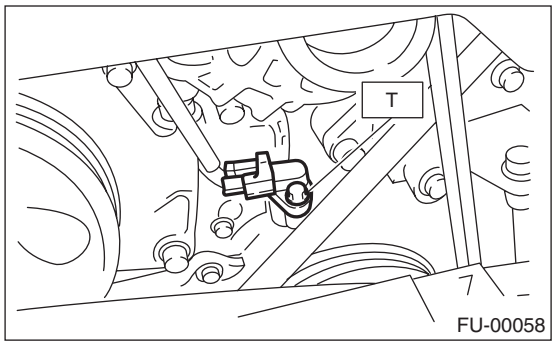
3) Remove the crankshaft position sensor, and disconnect the connector from it.



B: INSTALLATION

Install in the reverse order of removal.

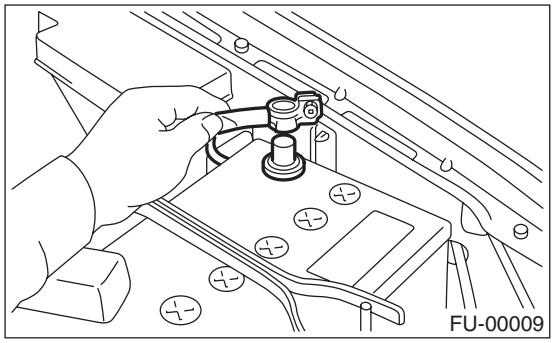
Tightening torque:
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



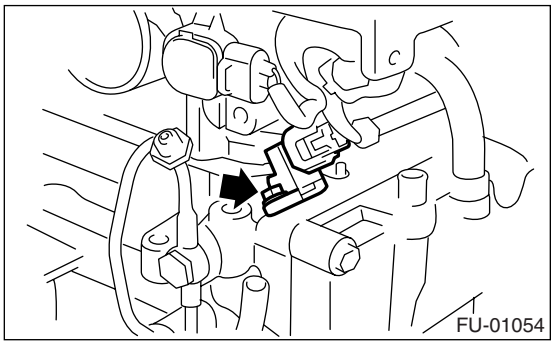
6. Camshaft Position Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector from the camshaft position sensor RH.
3) Remove the camshaft position sensor RH from the backside of cylinder head.

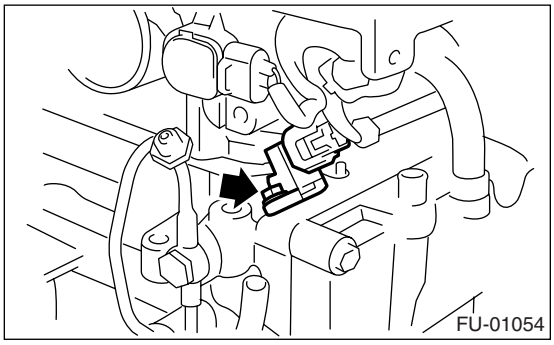


4) Remove the camshaft position sensor LH same as RH side.

B: INSTALLATION

Install in the reverse order of removal.

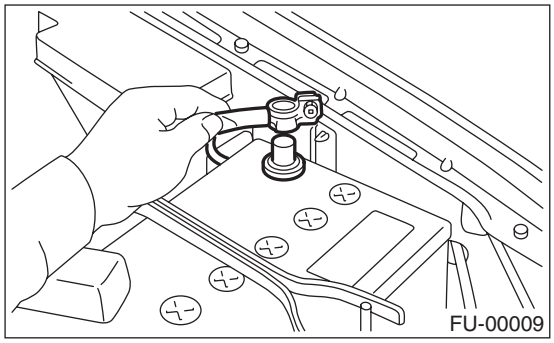
Tightening torque:
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



7. Knock Sensor

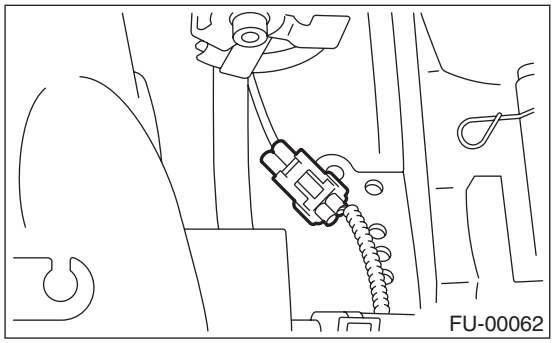
A: REMOVAL

1) Disconnect the ground cable from battery.

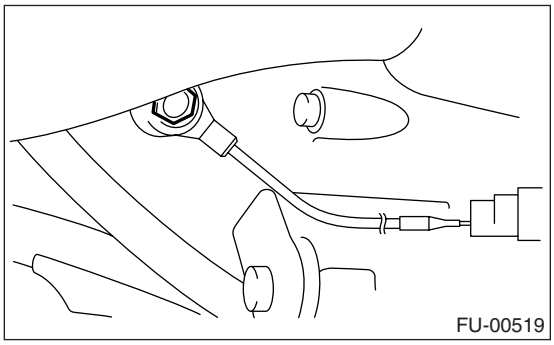


2) Remove the intercooler. <Ref. to IN(STi)-10, REMOVAL, Intercooler.>

3) Disconnect the knock sensor connector.



4) Remove the knock sensor from the cylinder block.

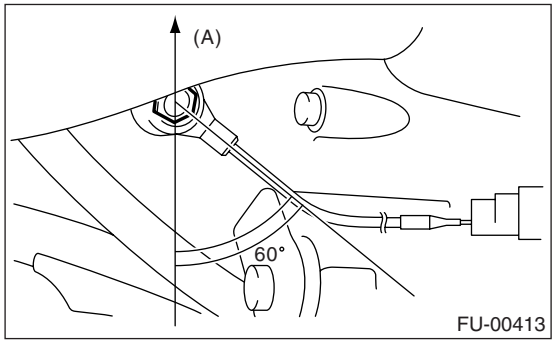


B: INSTALLATION

1) Install the knock sensor to the cylinder block.

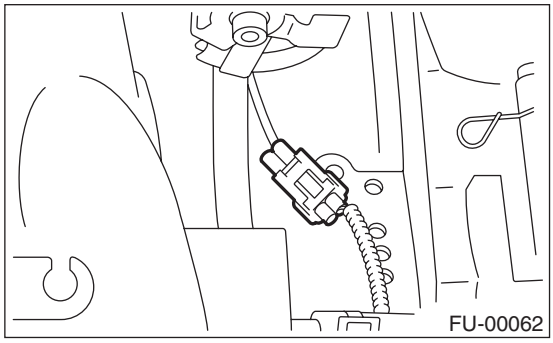
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

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



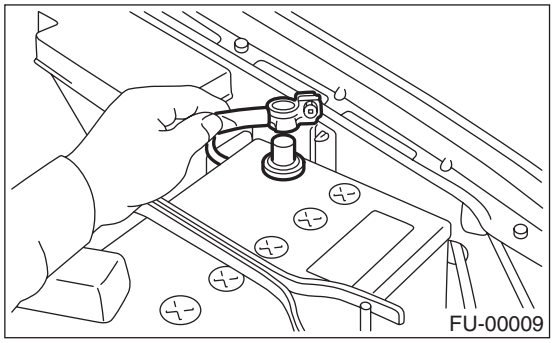
(A) Front side

2) Connect the knock sensor connector.



3) Install the intercooler. <Ref. to IN(STi)-10, INSTALLATION, Intercooler.>

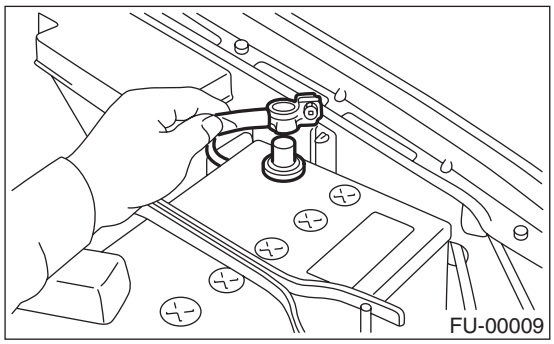
4) Connect the battery ground cable to battery.



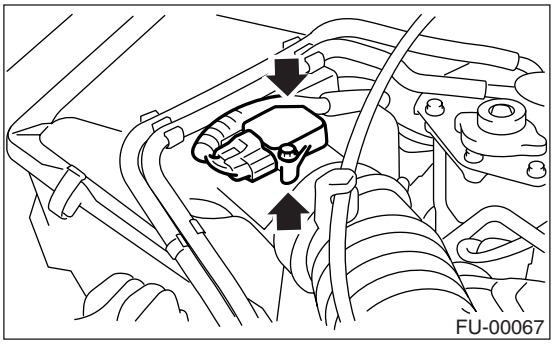
8. Mass Air Flow and Intake Air Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector from mass air flow and intake air temperature sensor.
3) Remove the mass air flow and intake air temperature sensor.



B: INSTALLATION

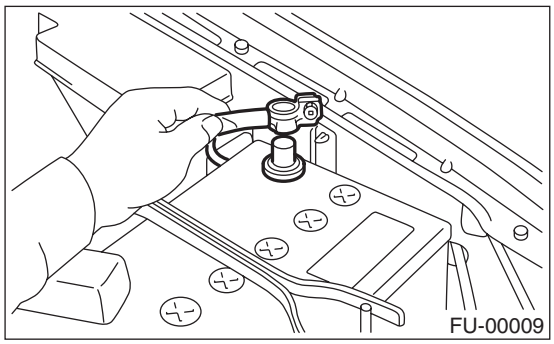
Install in the reverse order of removal.

Tightening torque:
1.7 N·m (0.17 kgf-m, 1.3 ft-lb)

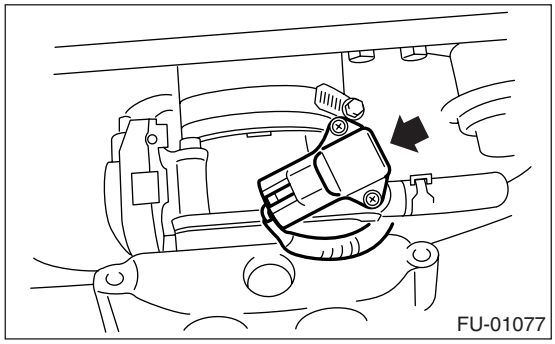
9. Manifold Absolute Pressure Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connectors from manifold absolute pressure sensor.



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

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace the O-rings for the manifold absolute pressure sensor with new ones.

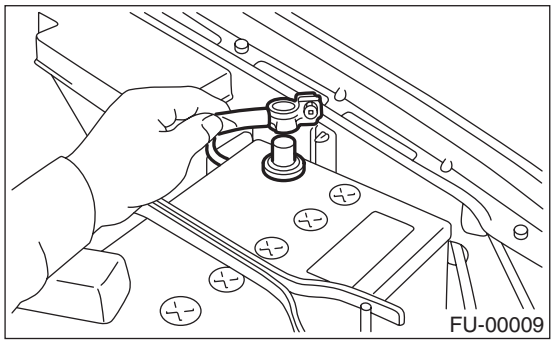
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

10.Fuel Injector

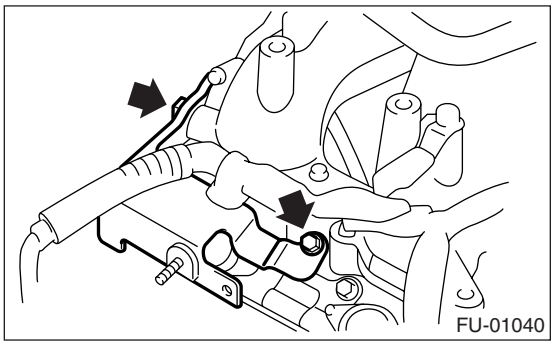
A: REMOVAL

1. RH SIDE

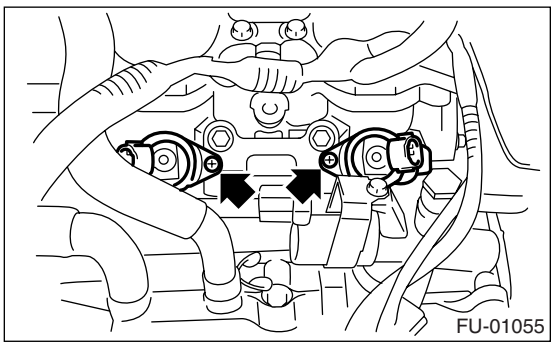
1) Release the fuel pressure. <Ref. to FU(STi)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler flap lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.



4) Remove the fuel pipe protector RH.

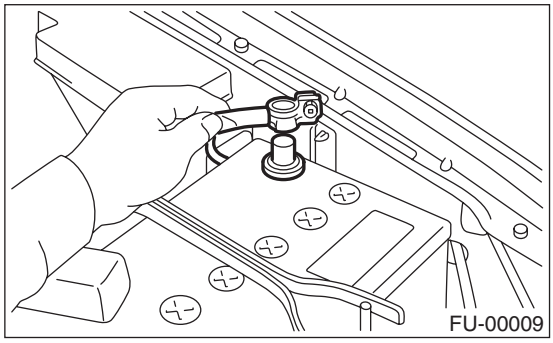


5) Disconnect the connector from the fuel injector.
6) Remove the screw and remove the fuel injector.

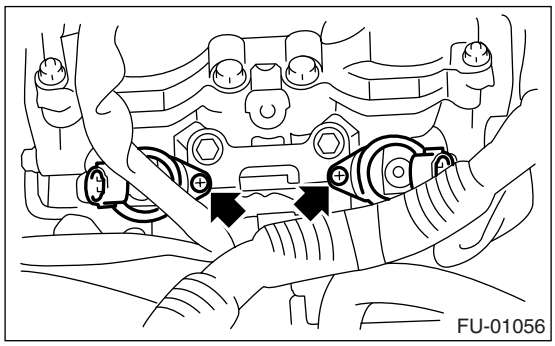


2. LH SIDE

1) Release the fuel pressure. <Ref. to FU(STi)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler flap lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.



4) Remove the intake manifold. <Ref. to FU(STi)-13, REMOVAL, Intake Manifold.>
5) Disconnect the connector from the fuel injector.
6) Remove the screw and remove the fuel injector.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

NOTE:
Replace the O-rings with new ones.

2. LH SIDE

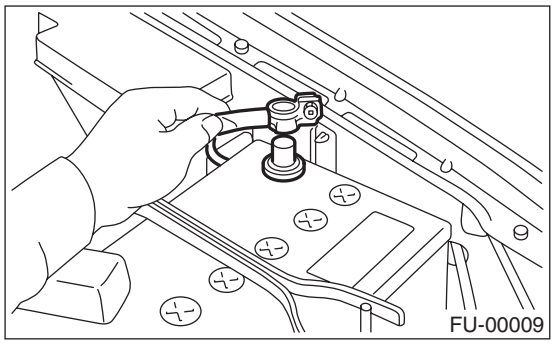
Install in the reverse order of removal.

NOTE:
Replace the O-rings with new ones.

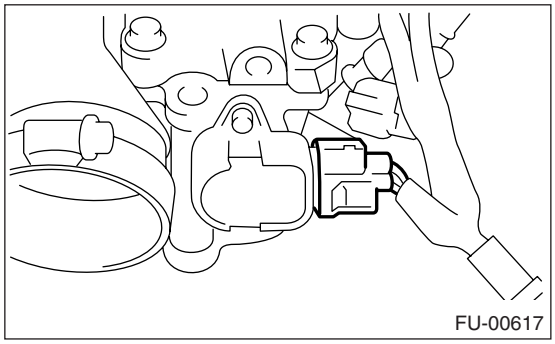
11.Tumble Generator Valve Assembly

A: REMOVAL

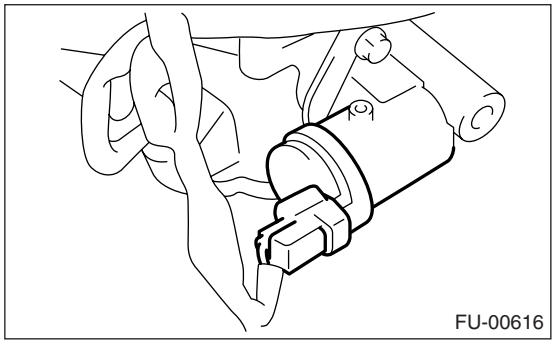
1) Release the fuel pressure. <Ref. to FU(STi)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.



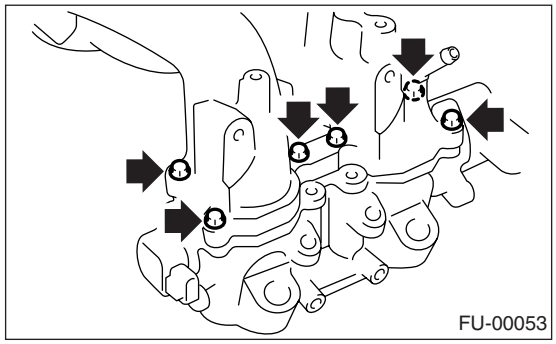
4) Remove the intake manifold. <Ref. to FU(STi)-13, REMOVAL, Intake Manifold.>
5) Disconnect the connector from the tumble generator valve sensor.



6) Disconnect the connector from the tumble generator valve actuator.



7) Remove the fuel injector. <Ref. to FU(STi)-31, REMOVAL, Fuel Injector.>
8) Remove the tumble generator valve body from the intake manifold.

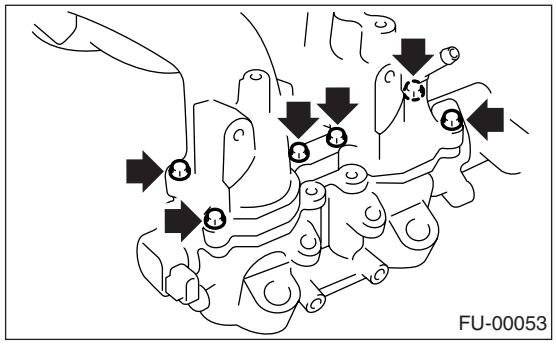


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use new gaskets.

Tightening torque:
8.25 N·m (0.84 kgf-m, 6.1 ft-lb)



12. Tumble Generator Valve Position Sensor

A: SPECIFICATION

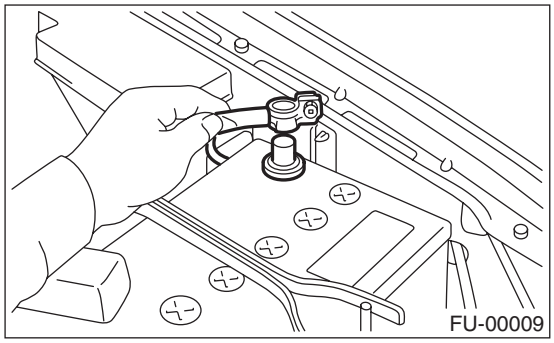
Do not remove the tumble generator valve position sensor from tumble generator valve assembly, since it cannot be adjusted during installation.
Refer to “Tumble Generator Valve Assembly” for removal and installation procedures. <Ref. to FU(STi)-32, REMOVAL, Tumble Generator Valve Assembly.> <Ref. to FU(STi)-32, INSTALLATION, Tumble Generator Valve Assembly.>

13. Tumble Generator Valve Actuator

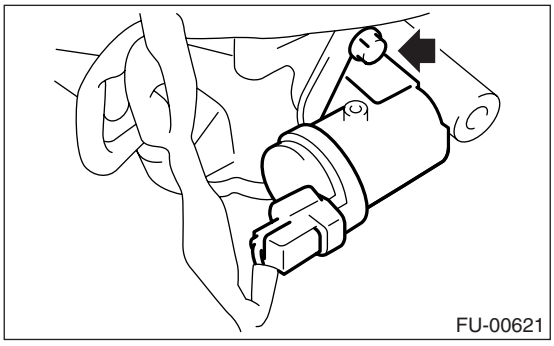
A: REMOVAL

1. RH SIDE

1) Release the fuel pressure. <Ref. to FU(STi)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.

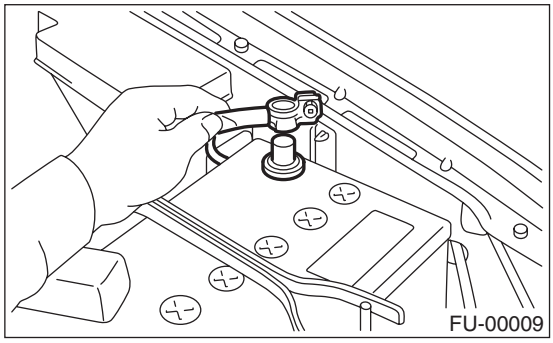


4) Remove the intake manifold. <Ref. to FU(STi)-13, REMOVAL, Intake Manifold.>
5) Disconnect the connector from tumble generator valve actuator RH.
6) Remove the tumble generator valve actuator RH.

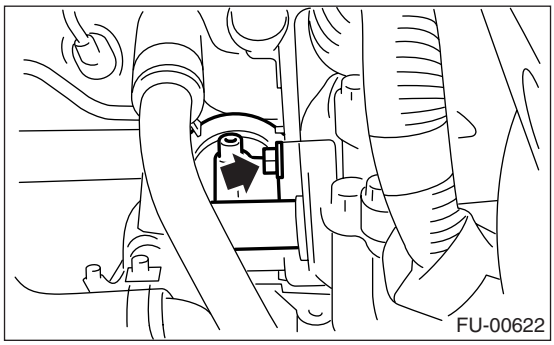


2. LH SIDE

1) Release the fuel pressure. <Ref. to FU(STi)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.



4) Disconnect the connector from tumble generator valve actuator LH.
5) Remove the tumble generator valve actuator LH.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

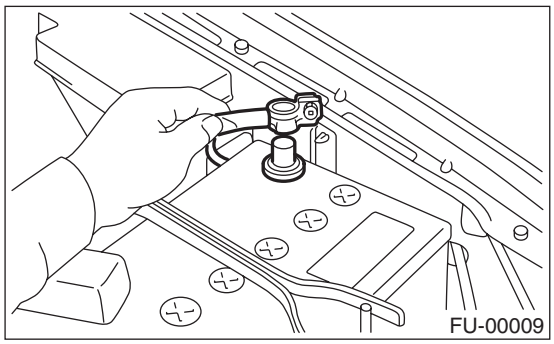
2. LH SIDE

Install in the reverse order of removal.

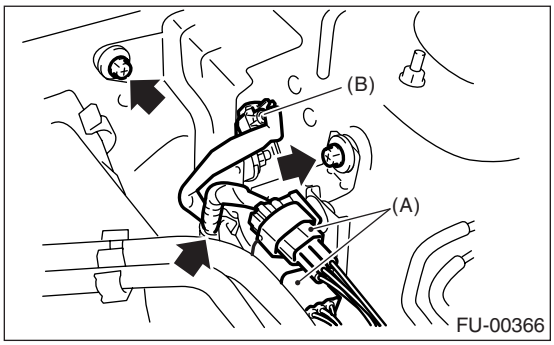
14. Wastegate Control Solenoid Valve

A: REMOVAL

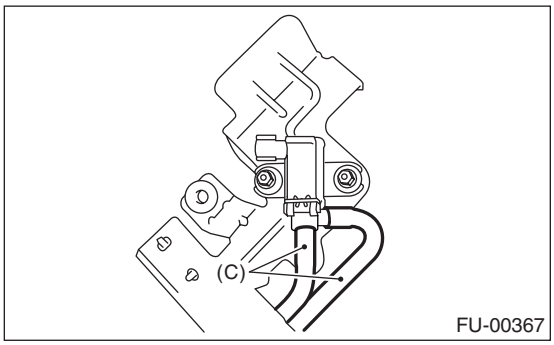
1) Disconnect the ground cable from battery.



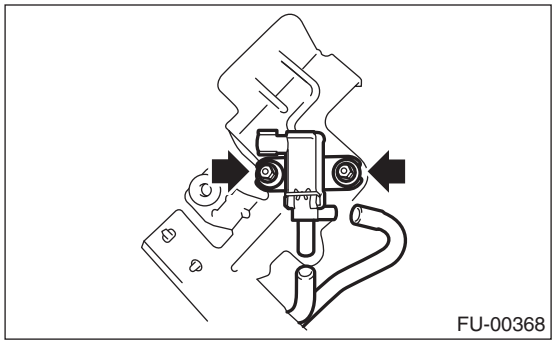
2) Disconnect the engine harness connector (A) from bracket.
3) Disconnect the connector (B) from wastegate control solenoid valve.
4) Remove the bracket from body.



5) Disconnect the pressure hoses (C) from wastegate control solenoid valve.



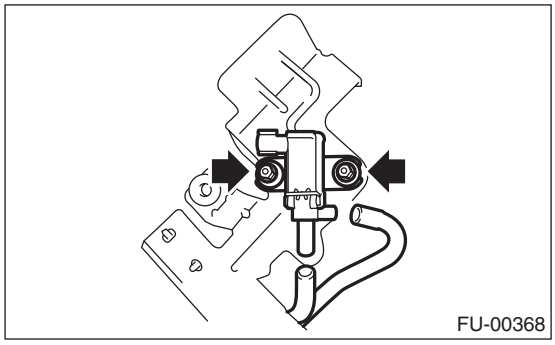
6) Remove the wastegate control solenoid valve from bracket.



B: INSTALLATION

Install in the reverse order of removal.

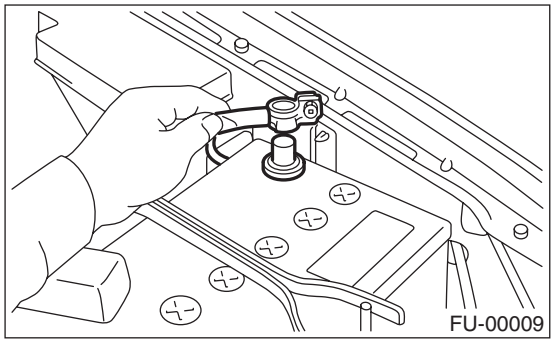
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



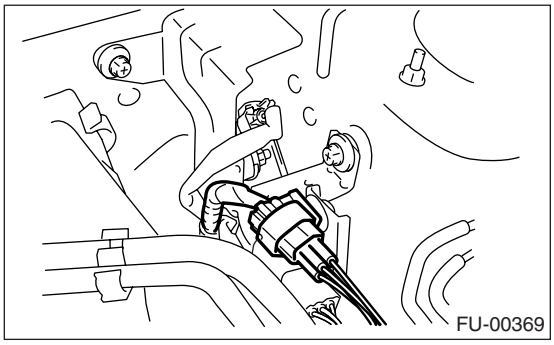
15.Front Oxygen (A/F) Sensor

A: REMOVAL

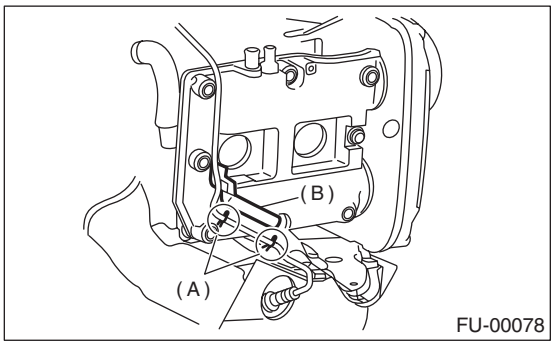
1) Disconnect the ground cable from battery.



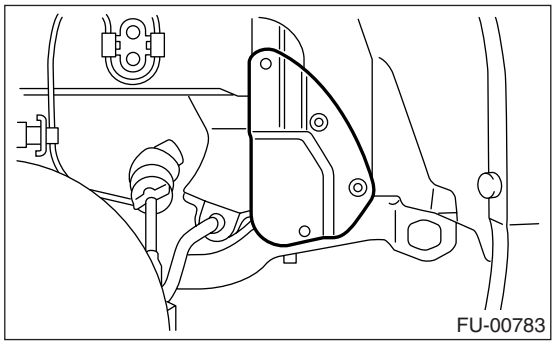
2) Disconnect the connector from the front oxygen (A/F) sensor.



3) Disconnect the engine harness fixed by clip (A) from the bracket (B).



4) Remove the front right side wheel.
5) Lift-up the vehicle.
6) Remove the service hole cover.

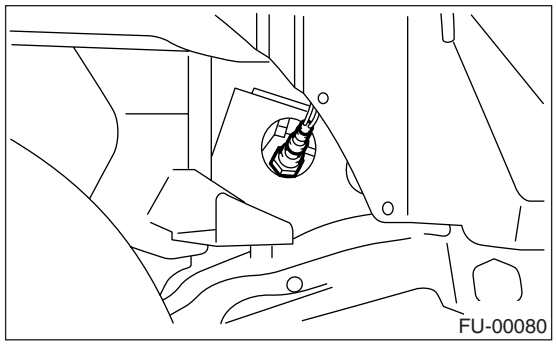


7) Apply SUBARU CRC or its equivalent to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

8) Remove the front oxygen (A/F) sensor.

CAUTION:
When removing the oxygen (A/F) sensor, wait until exhaust pipe cools; otherwise, it will damage exhaust pipe.



B: INSTALLATION

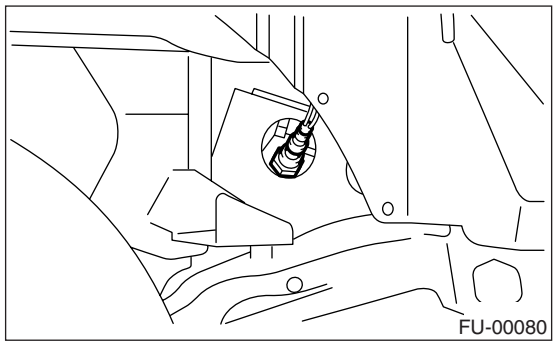
1) Before installing front oxygen (A/F) sensor, apply anti-seize compound only to the threaded portion of front oxygen (A/F) sensor to make the next removal easier.

Anti-seize compound:
SS-30 by JET LUBE

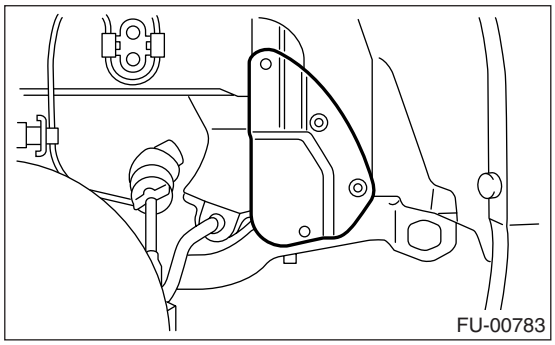
CAUTION:
Never apply anti-seize compound to protector of front oxygen (A/F) sensor.

2) Install the front oxygen (A/F) sensor.

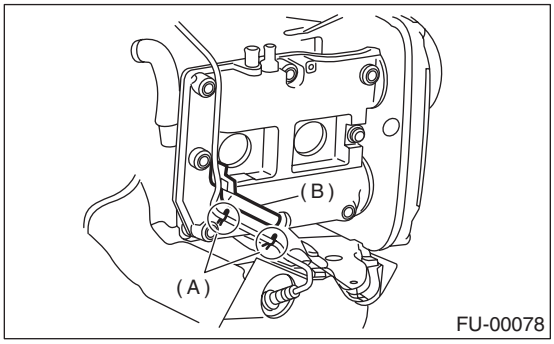
Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)



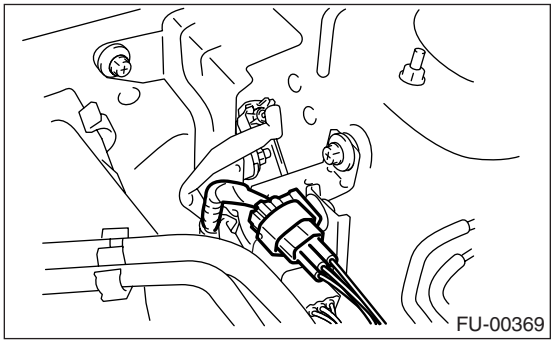
3) Install the service hole cover.



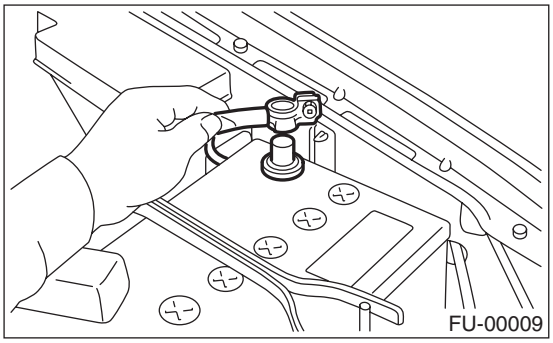
4) Lower the vehicle.
5) Install the front right side wheel.
6) Connect the engine harness to the bracket (B) using clips (A).



7) Connect the connector of front oxygen (A/F) sensor.



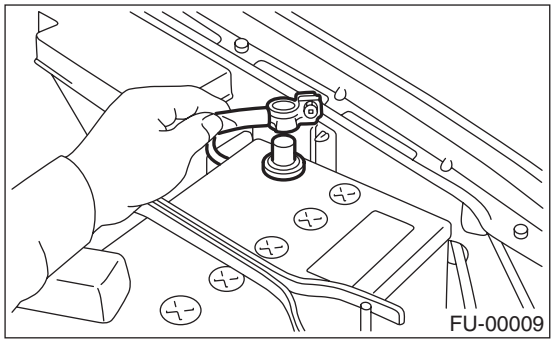
8) Connect the battery ground cable to battery.



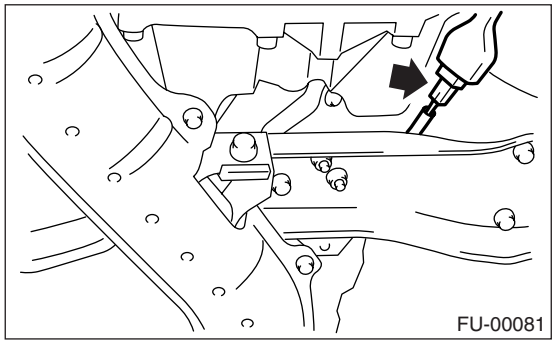
16.Rear Oxygen Sensor

A: REMOVAL

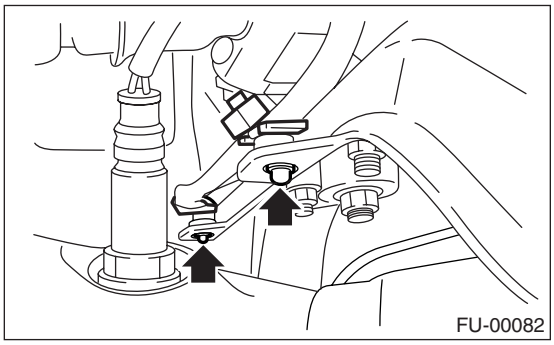
1) Disconnect the ground cable from battery.



2) Lift-up the vehicle.
3) Disconnect the connector from the rear oxygen sensor.



4) Remove the clip by pulling out from the upper side of crossmember.

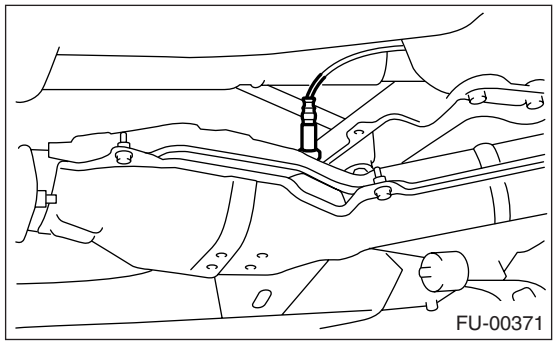


5) Apply SUBARU CRC or its equivalent to the threaded portion of rear oxygen sensor, and leave it for one minute or more.

SUBARU CRC (Part No. 004301003)

6) Remove the rear oxygen sensor.

CAUTION:
When removing the oxygen sensor, wait until exhaust pipe cools; otherwise, it will damage exhaust pipe.



B: INSTALLATION

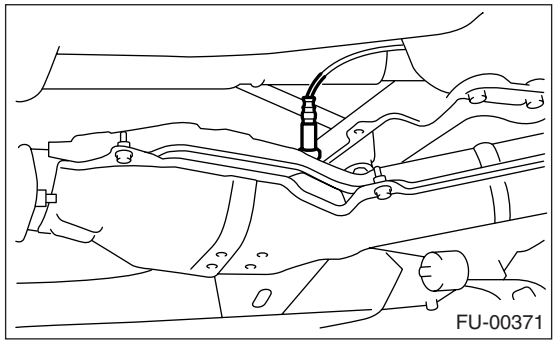
1) Before installing rear oxygen sensor, apply anti-seize compound only to the threaded portion of rear oxygen sensor to make the next removal easier.

CAUTION:
Never apply anti-seize compound to protector of rear oxygen sensor.

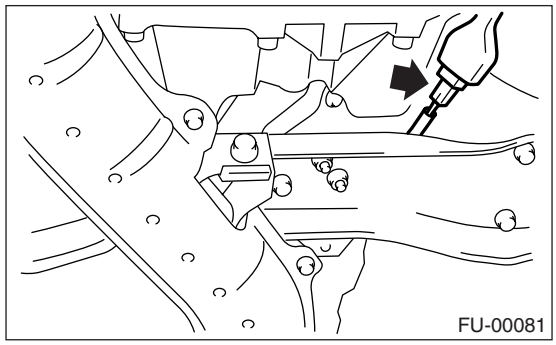
Anti-seize compound:
SS-30 by JET LUBE

2) Install the rear oxygen sensor.

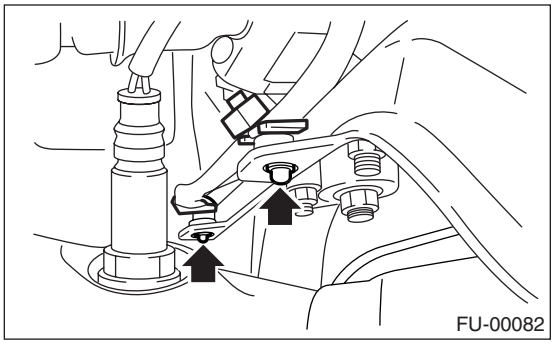
Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



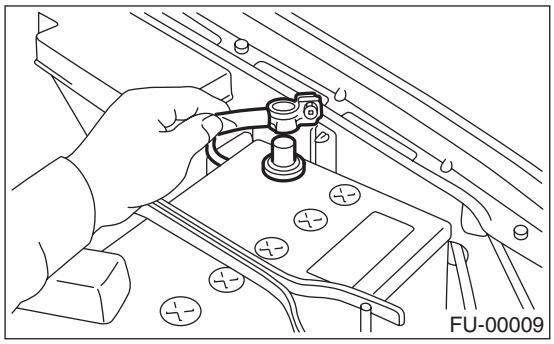
3) Connect the connector to the rear oxygen sensor.



4) Connect the clip to the crossmember.



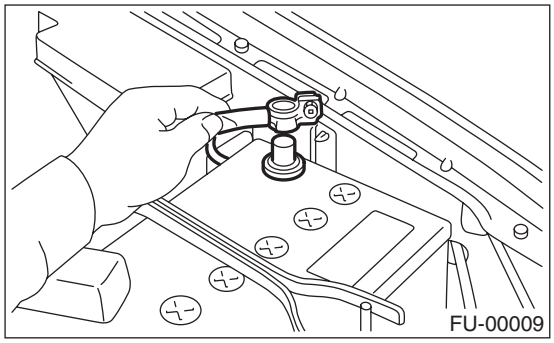
5) Lower the vehicle.
6) Connect the battery ground cable to battery.



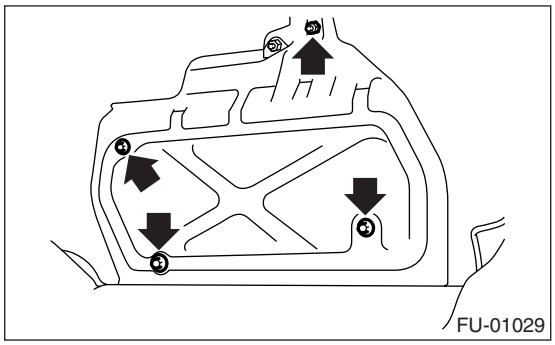
17.Engine Control Module (ECM)

A: REMOVAL

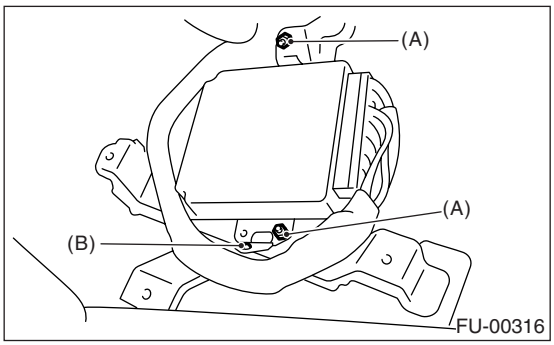
1) Disconnect the ground cable from battery.



2) Remove the lower inner trim of the passenger side.
<Ref. to EI-49, REMOVAL, Lower Inner Trim.>
3) Detach the floor mat of the front passenger seat.
4) Remove the protect cover.



5) Remove the nuts (A) which hold ECM to the bracket.
6) Remove the clip (B) from the bracket.



7) Disconnect the ECM connectors and take out the ECM.

B: INSTALLATION

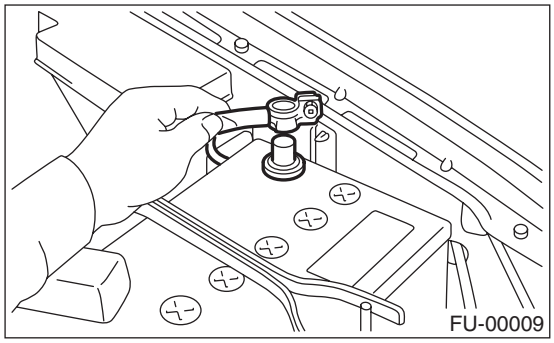
Install in the reverse order of removal.

NOTE:
When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage to the fuel injection system.

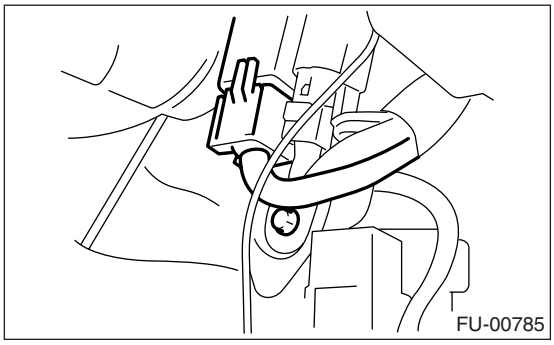
18.Main Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the passenger's side front side sill cover.
3) Remove the bolt which holds the main relay bracket on the body.
4) Disconnect the connectors from the main relay.



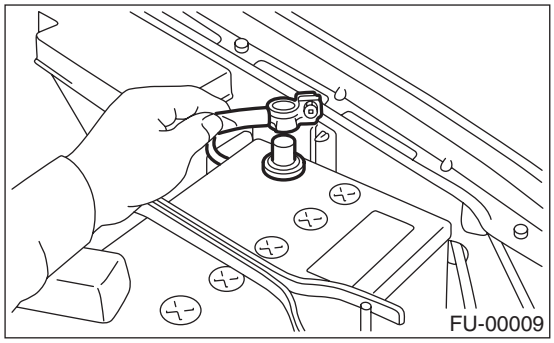
B: INSTALLATION

Install in the reverse order of removal.

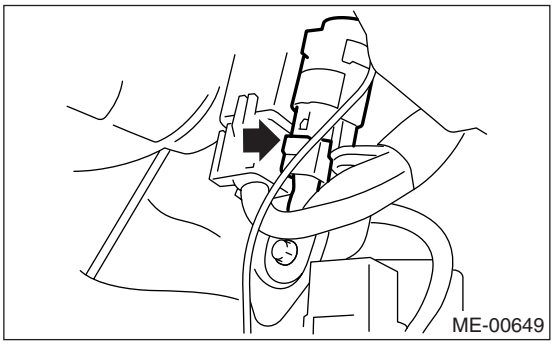
19.Fuel Pump Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the passenger's side front side sill cover.
3) Remove the bolt which holds fuel pump relay bracket on the body.
4) Disconnect the connector from the fuel pump relay.



5) Remove the fuel pump relay from the mounting bracket.

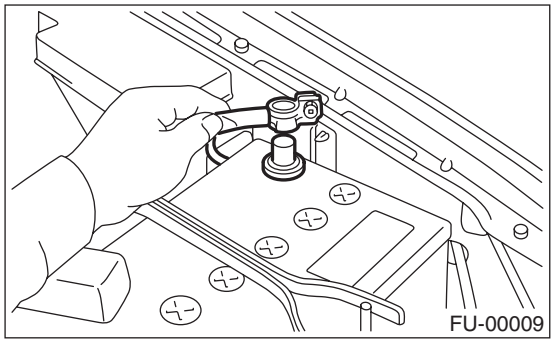
B: INSTALLATION

Install in the reverse order of removal.

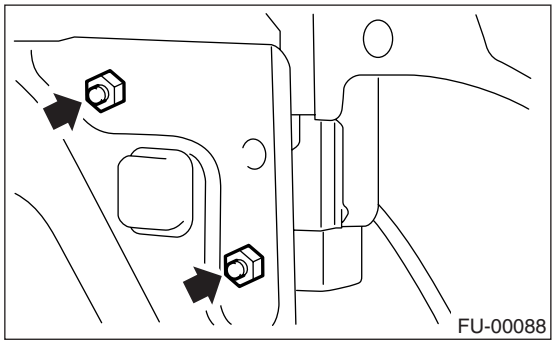
20.Fuel Pump Control Unit

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the rear quarter trim. <Ref. to EI-50, REMOVAL, Rear Quarter Trim.>
3) Disconnect the connector from the fuel pump control unit.
4) Remove the fuel pump control unit.



B: INSTALLATION

Install in the reverse order of removal.

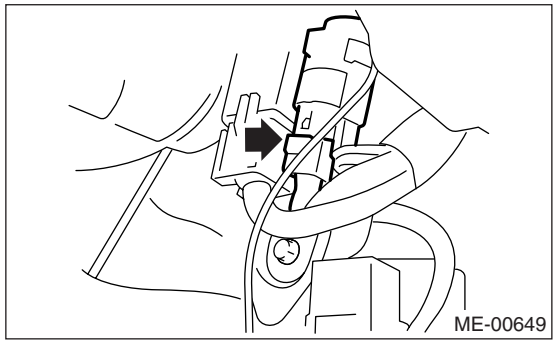
21.Fuel

A: PROCEDURE

1. RELEASING OF FUEL PRESSURE

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill the fuel.**

1) Disconnect the connector from the fuel pump relay.

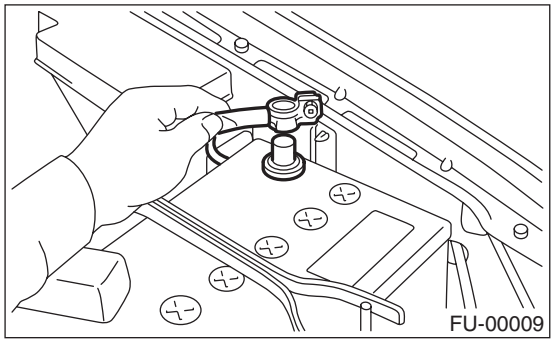


2) Start and run the engine until it stalls.
3) After the engine stalls, crank it for five more seconds.
4) Turn the ignition switch to OFF.

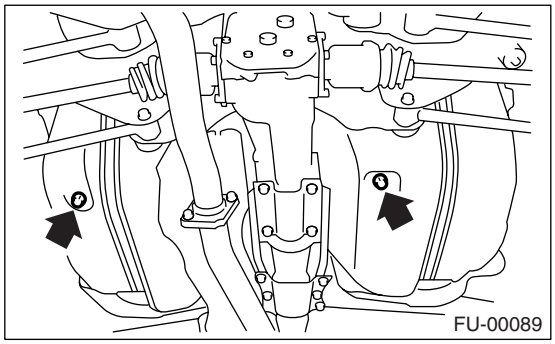
2. DRAINING FUEL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill the fuel.**

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.

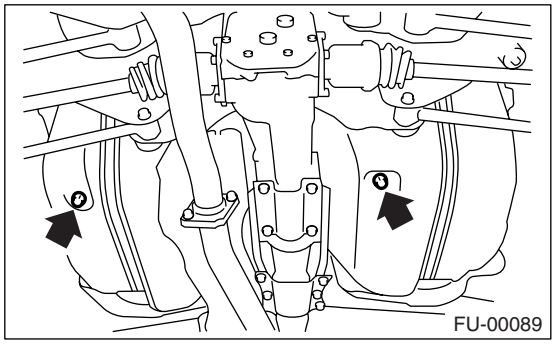


3) Open the fuel filler flap lid, and remove the fuel filler cap.
4) Lift-up the vehicle.
5) Drain the fuel from the fuel tank.
Set a container under the vehicle, and remove drain plug from the fuel tank.



6) Tighten the fuel drain plug.

Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)

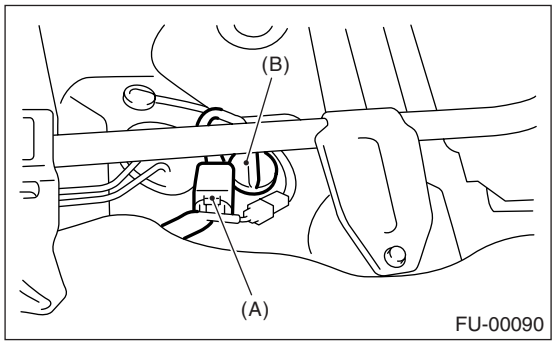


22.Fuel Tank

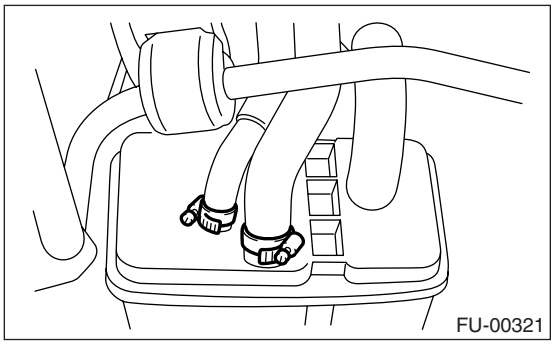
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill the fuel.**

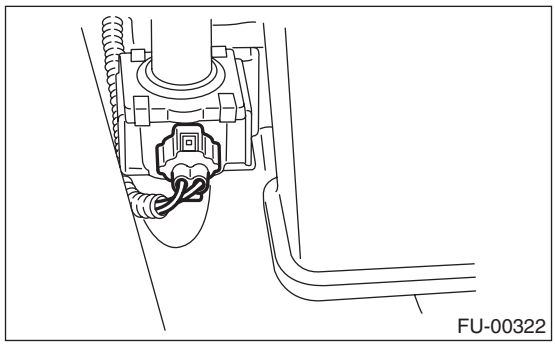
1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(STi)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Drain the fuel from the fuel tank. <Ref. to FU(STi)-44, DRAINING FUEL, PROCEDURE, Fuel.>
4) Remove the rear seat.
5) Disconnect the connector (A) of fuel tank cord to the rear harness.
6) Push the grommet (B) which holds the fuel tank cord on floor panel into under the body.



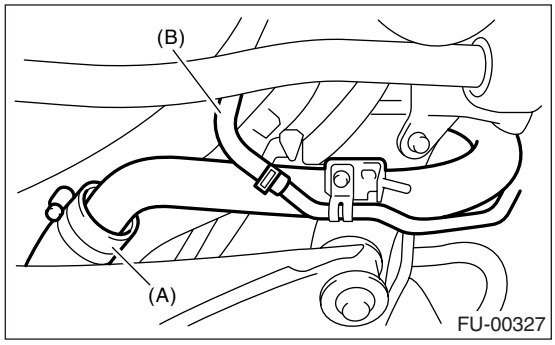
7) Remove the rear crossmember. <Ref. to RS-18, REMOVAL, Rear Crossmember.>
8) Move the clamp, and disconnect the evaporation hose from canister.



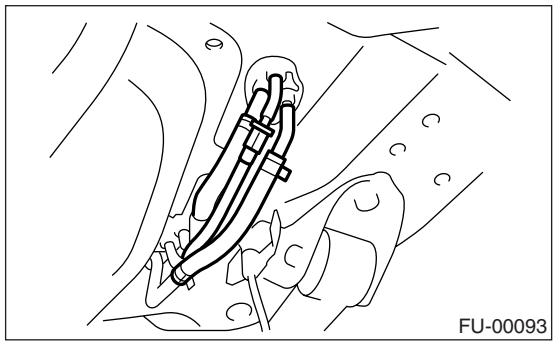
9) Disconnect the connector from the pressure control solenoid valve.
10) Disconnect the connector from the drain valve.



11) Loosen the clamp and disconnect the fuel filler hose (A) from fuel filler pipe.
12) Move the clip, and disconnect the evaporation hose (B).

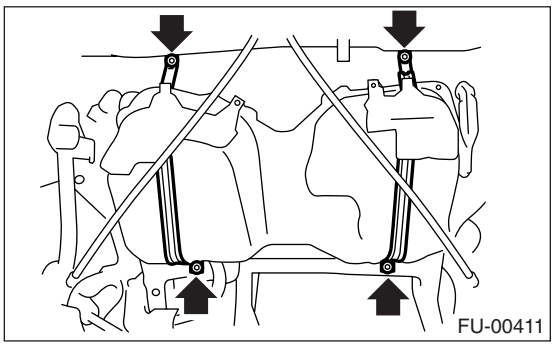


13) Move the clips, and disconnect the quick connector. <Ref. to FU(STi)-60, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
14) Disconnect the fuel hoses.



15) Support the fuel tank with transmission jack, remove the bolts from bands and dismount the fuel tank from vehicle.

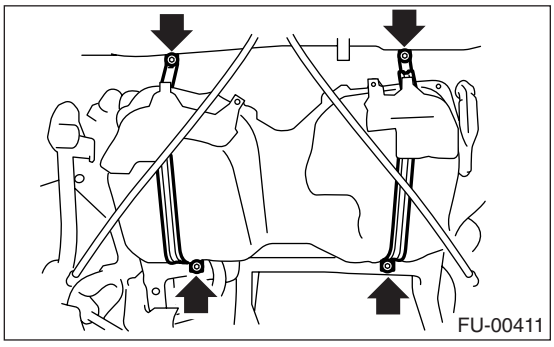
WARNING:
A helper is required to perform this work.



B: INSTALLATION

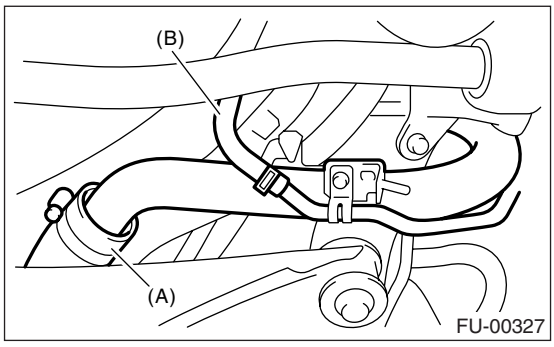
1) Support the fuel tank with transmission jack and push the fuel tank harness into the access hole with grommet.
2) Set the fuel tank and temporarily tighten the bolts of fuel tank bands.

WARNING:
A helper is required to perform this work.

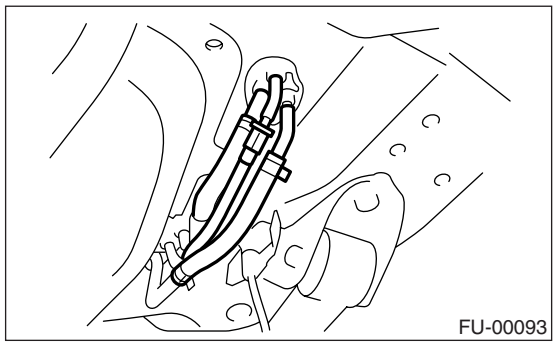


3) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.

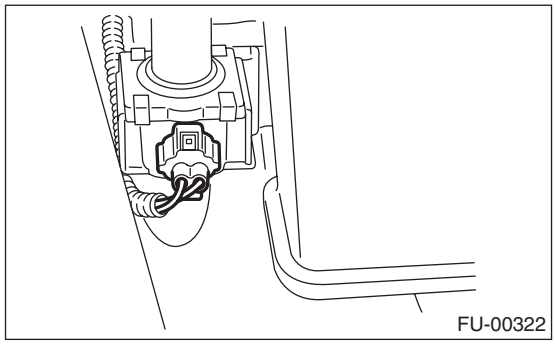
CAUTION:
Do not allow clips to touch air vent hose (B) and rear suspension crossmember.



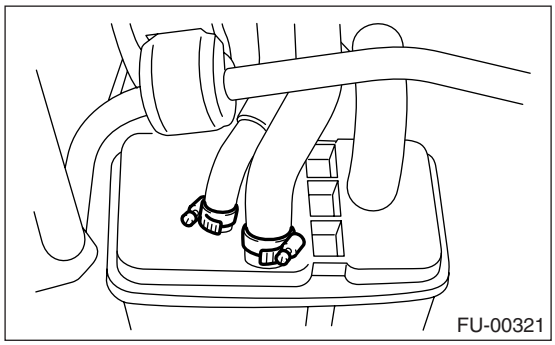
4) Connect the fuel hoses, and hold them with clips and quick connector. <Ref. to FU(STi)-61, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>



5) Connect the connector to the drain valve.

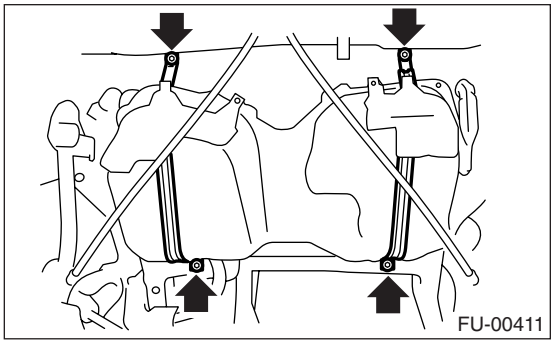


6) Connect the connector to the pressure control solenoid valve.
7) Connect the evaporation hose to the canister, and hold them with clamp.

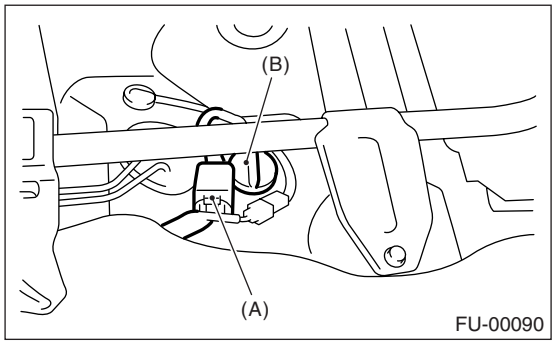


8) Tighten the band mounting bolts.

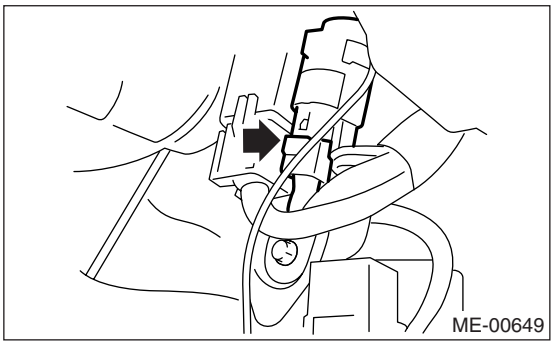
Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



9) Install the rear crossmember. <Ref. to RS-18, INSTALLATION, Rear Crossmember.>
10) Connect the connector (A) to the fuel tank cord and plug the service hole with grommet (B).



11) Set the rear seat and floor mat.
12) Connect the connector to the fuel pump relay.



C: INSPECTION

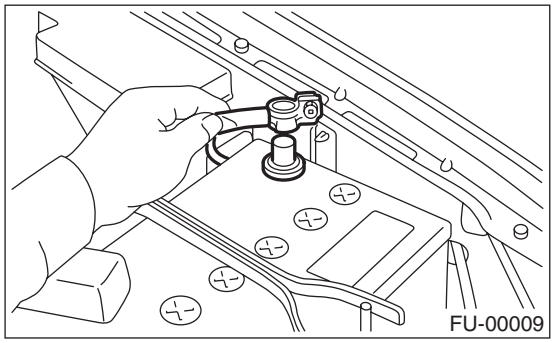
1) Make sure there are no cracks, holes, or other damage on the fuel tank.
2) Make sure that the fuel hoses and fuel pipes are not cracked and the connections are tightened firmly.

23.Fuel Filler Pipe

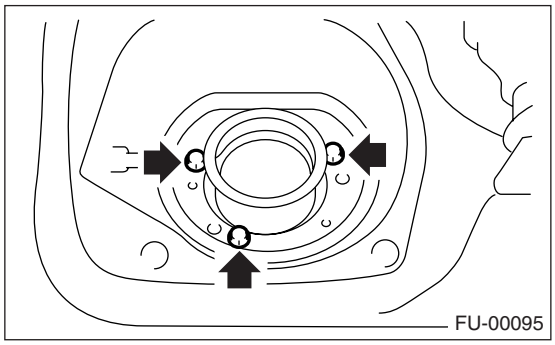
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill the fuel.**

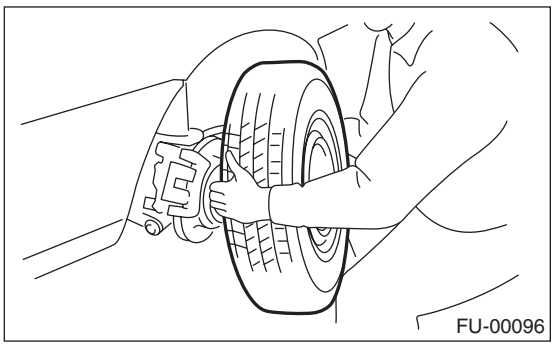
1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(STi)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Open the fuel filler flap lid and remove the filler cap.
4) Disconnect the ground cable from battery.


FU-00009

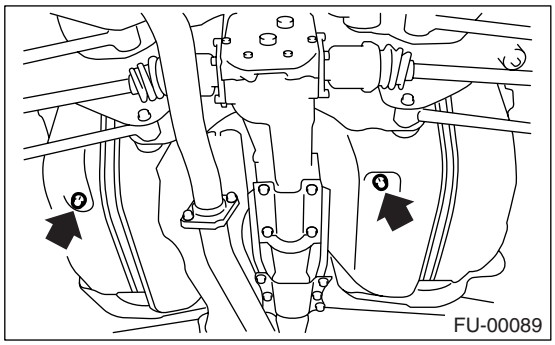
5) Remove the screws holding packing.


FU-00095

6) Loosen the rear right side wheel nuts.
7) Lift-up the vehicle.
8) Remove the rear right side wheel.

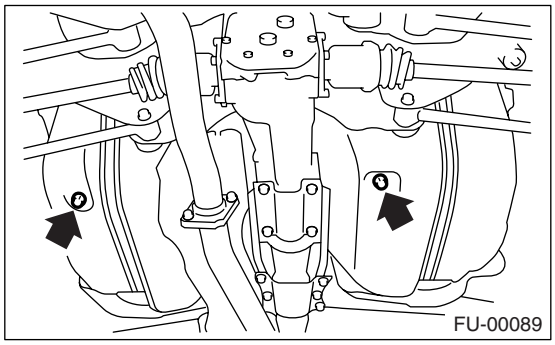

FU-00096

9) Drain the fuel from fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.

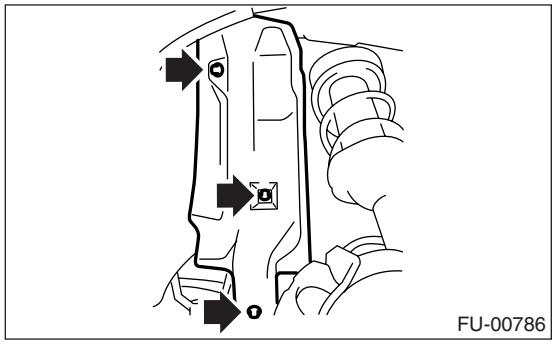

FU-00089

10) Tighten the fuel drain plug and then install the front right side tank cover.

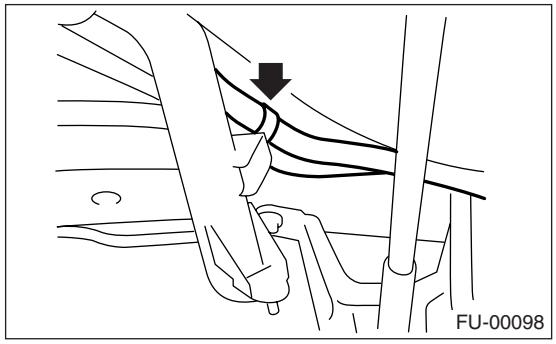
Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)


FU-00089

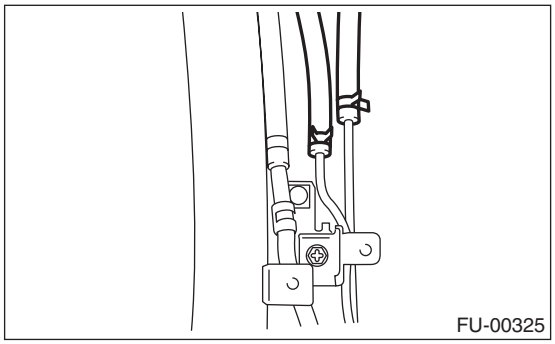
11) Remove the fuel filler pipe protector.


FU-00786

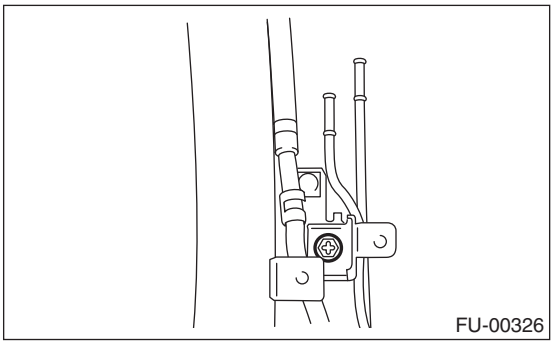
12) Separate the evaporation hoses from the clip of fuel filler pipe.


FU-00098

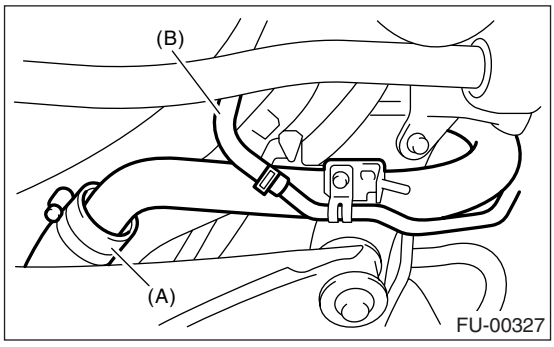
13) Disconnect the evaporation hoses from the pipes.



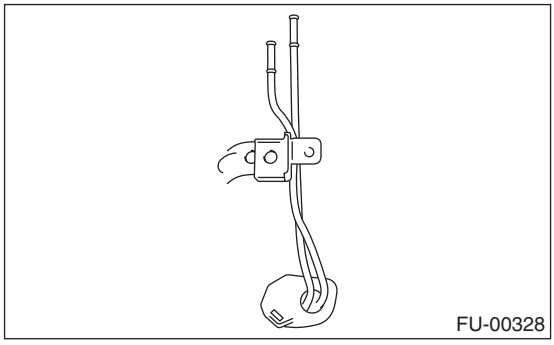
14) Remove the bolts which hold fuel filler pipe bracket on the body.



15) Loosen the clamp, and disconnect the fuel filler hose (A) from fuel filler pipe.
16) Move the clip, and disconnect the evaporation hose (B).

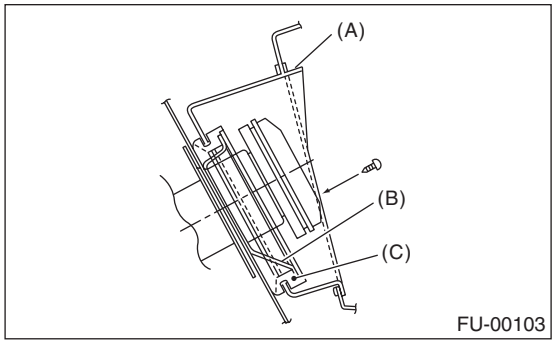


17) Remove the fuel filler pipe to the underside of vehicle.
18) Remove the air vent pipe together with clip from the body.



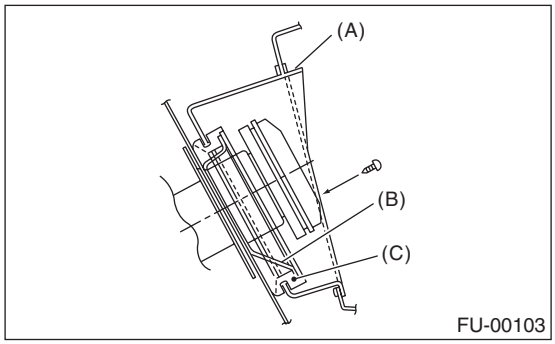
B: INSTALLATION

1) Hold the fuel filler flap open.
2) Set the fuel saucer (A) with rubber packing (C), and then insert the fuel filler pipe into the hole from the inside of apron.

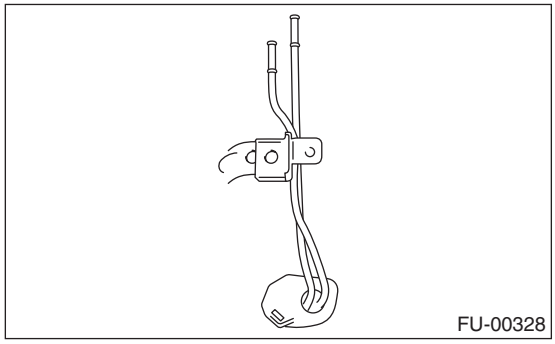


3) Align the holes in fuel filler pipe neck and set the cup (B), and tighten the screws.

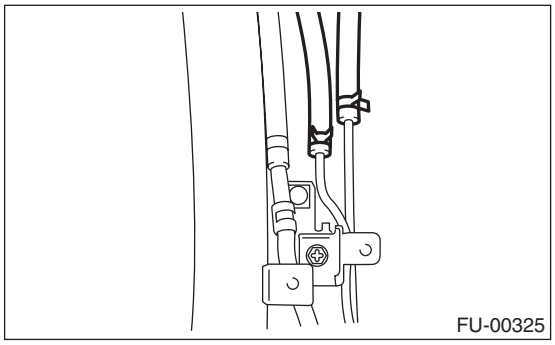
NOTE:
If the edges of rubber packing are folded toward the inside, straighten them with a screwdriver.



4) Install the evaporation pipes.

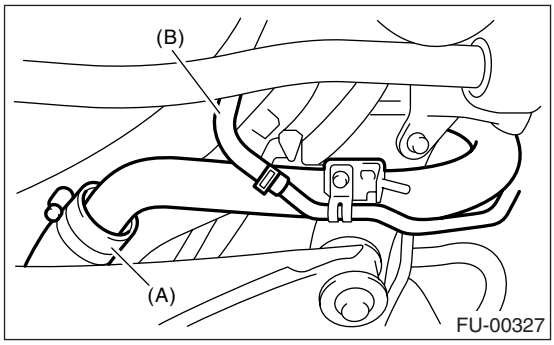


5) Connect the evaporation hose to pipes.



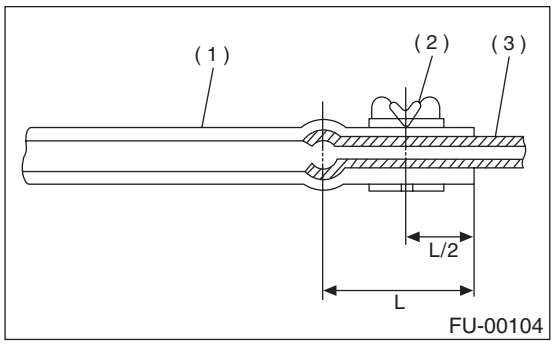
6) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe, and then tighten the clamp.

CAUTION:
Do not allow clips to touch air vent hose (B) and rear suspension crossmember.



7) Insert the air vent hose approx. 25 to 30 mm (0.98 to 1.18 in) into the lower end of air vent pipe, and then hold the clip.

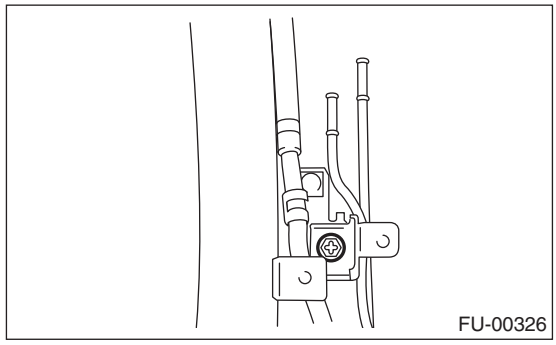
L = 27.5±2.5 mm (1.083±0.098 in)



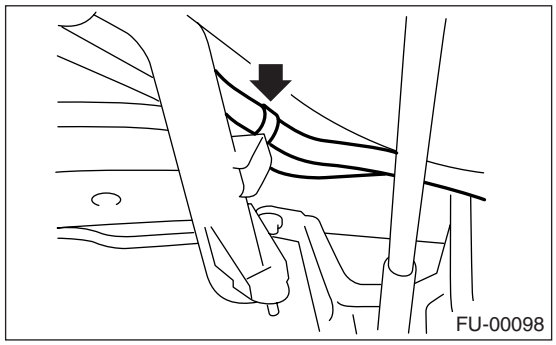
(1) Hose
(2) Clip
(3) Pipe

8) Tighten the bolt which holds fuel filler pipe bracket on the body.

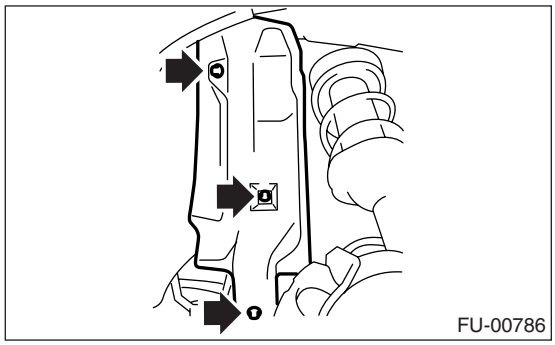
Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



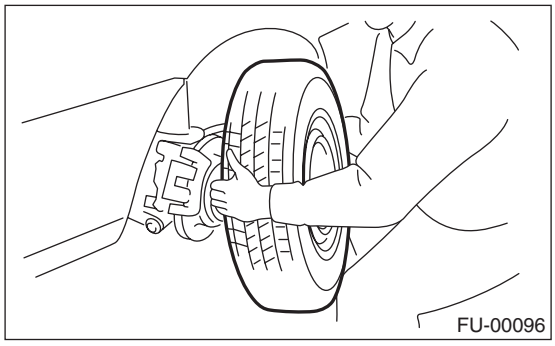
9) Tighten the bolts which hold evaporation hoses onto the clip of fuel filler pipe.



10) Install the fuel filler pipe protector.

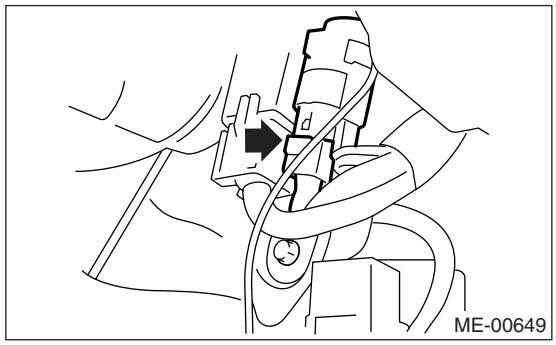


11) Install the rear right wheel.

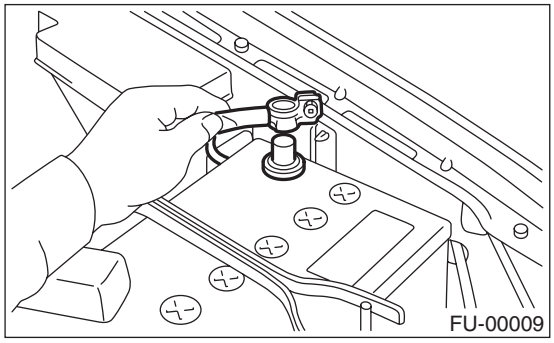


12) Lower the vehicle.
13) Tighten the wheel nuts.

14) Connect the connector to the fuel pump relay.

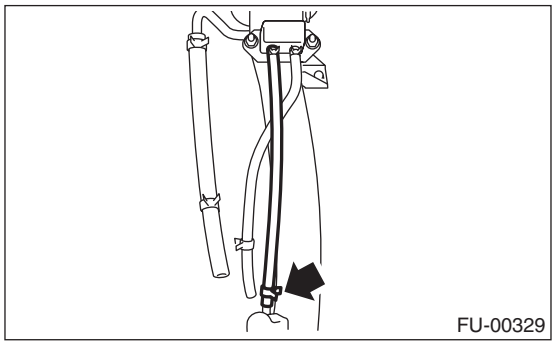


15) Connect the battery ground cable to battery.

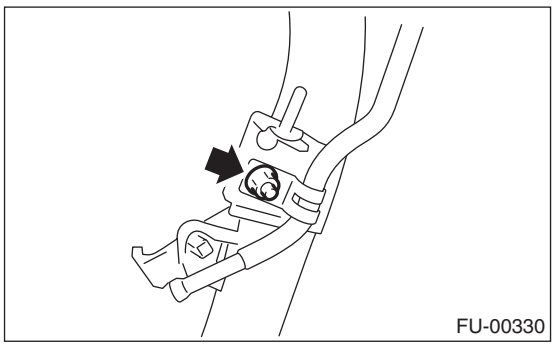


C: DISASSEMBLY

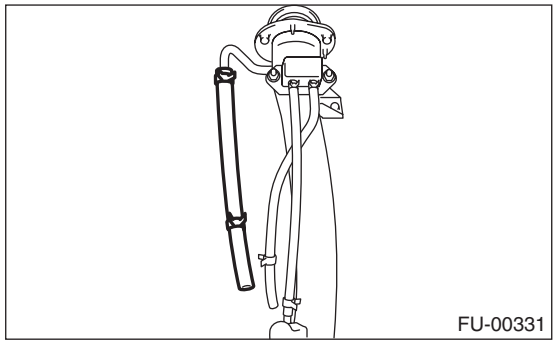
1) Move the clip, and disconnect the evaporation hose from joint pipe.



2) Remove the bolt which installs the joint pipe on fuel filler pipe.



3) Disconnect the evaporation hose from the fuel filler pipe.

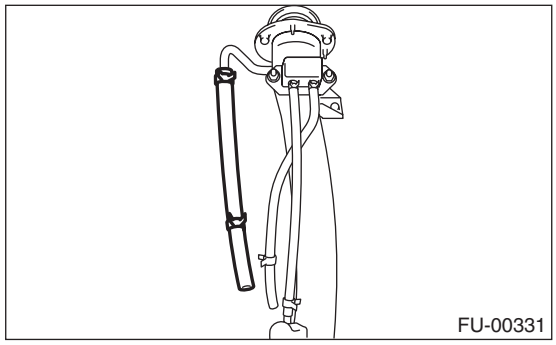


4) Remove the shut valve from the fuel filler pipe. <Ref. to EC(STi)-17, REMOVAL, Shut Valve.>

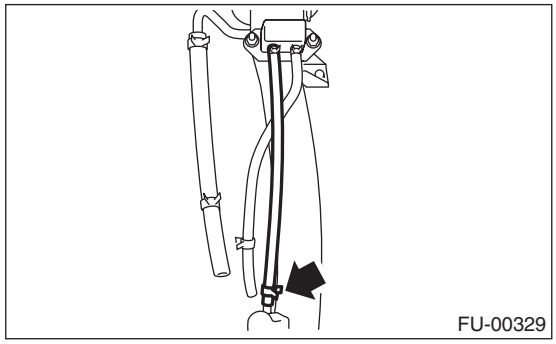
D: ASSEMBLY

1) Install the shut valve on the fuel filler pipe. <Ref. to EC(STi)-17, INSTALLATION, Shut Valve.>

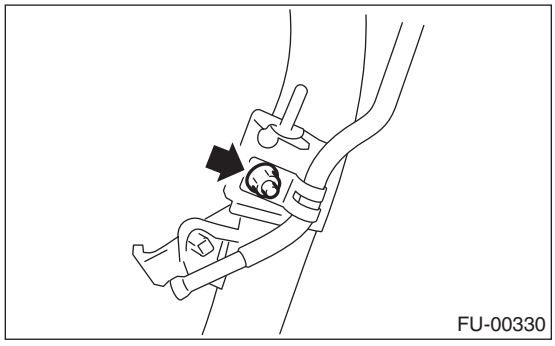
2) Connect the evaporation hose to the fuel filler pipe.



3) Connect the evaporation hose to the evaporation pipe.



4) Install the evaporation pipe to the fuel filler pipe.



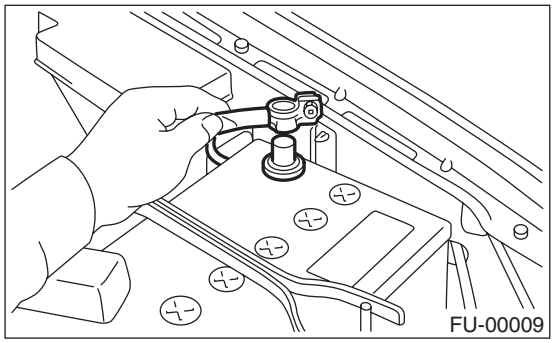
24.Fuel Pump

A: REMOVAL

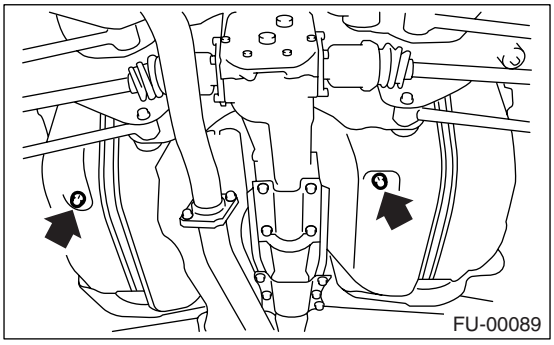
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill the fuel.**

NOTE:
Fuel pump assembly consists of fuel pump and fuel level sensor.

1) Release the fuel pressure. <Ref. to FU(STi)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler flap lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.

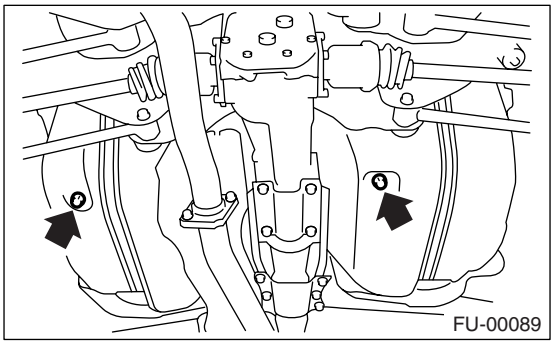

FU-00009

4) Lift-up the vehicle.
5) Drain the fuel from fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.

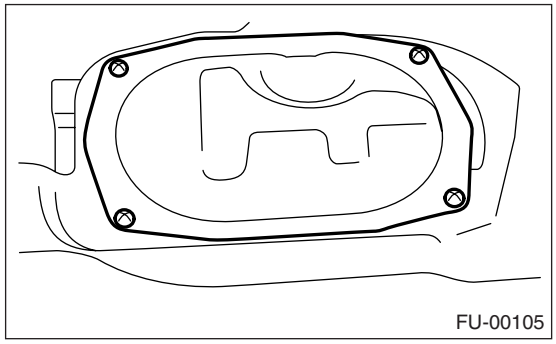

FU-00089

6) Tighten the fuel drain plug.

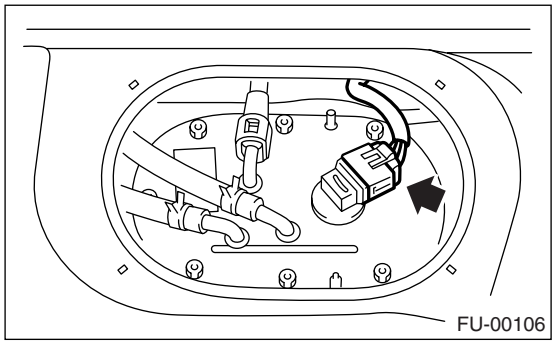
Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)


FU-00089

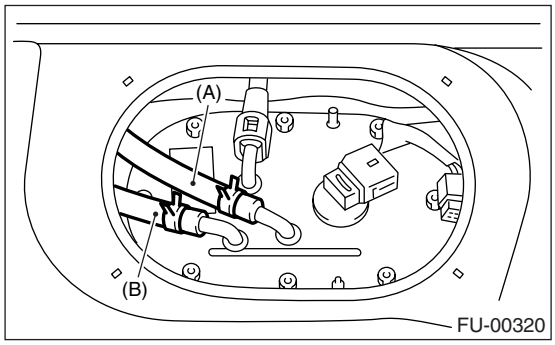
7) Raise the rear seat and turn the floor mat up.
8) Remove the access hole lid.


FU-00105

9) Disconnect the connector from the fuel pump.

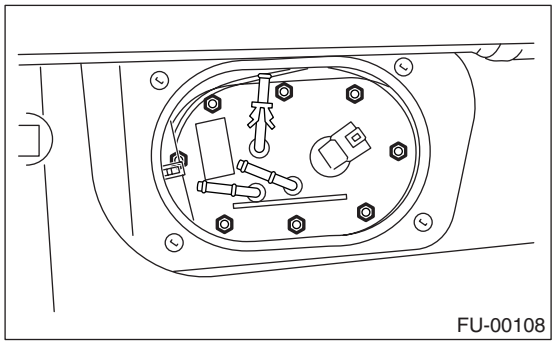

FU-00106

10) Disconnect the quick connector and then disconnect the fuel delivery hose (A). <Ref. to FU(STi)-60, Fuel Delivery, Return and Evaporation Lines.>
11) Move the clips, and then disconnect the fuel return hose (A) and jet pump hose (B).



FU-00320

12) Remove the nuts which install the fuel pump assembly onto fuel tank.


FU-00108

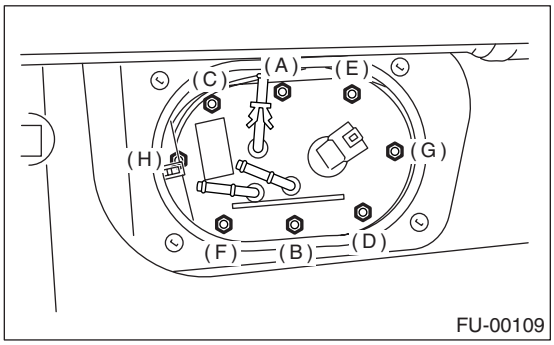
13) Take off the fuel pump assembly from the fuel tank.

B: INSTALLATION

Carefully following the steps below, install in the reverse order of removal.

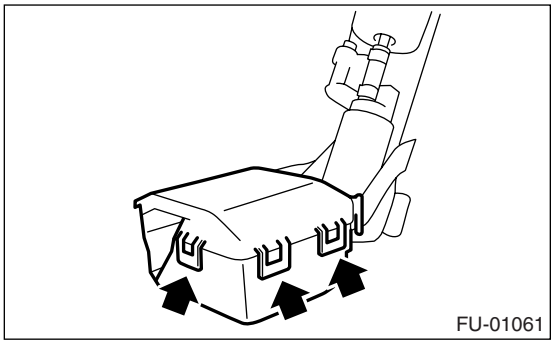
NOTE:
Always use new gaskets.
(1) Ensure the sealing portion is free from fuel or foreign particles before installation.
(2) Tighten the nuts to the specified torque in alphabetical sequence as shown in the figure.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

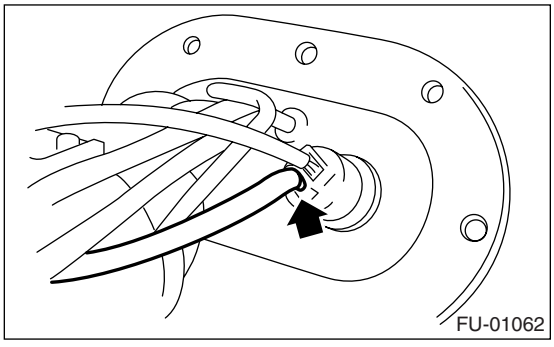


C: DISASSEMBLY

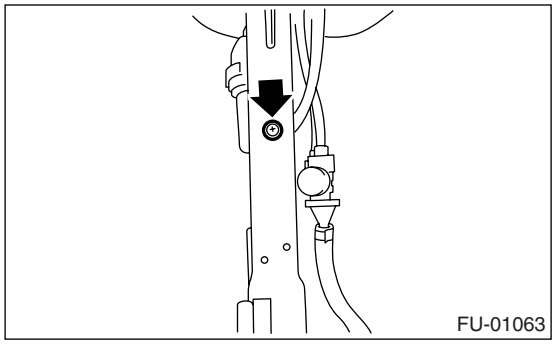
1) Separate the chamber into upper and lower parts, and then remove them.



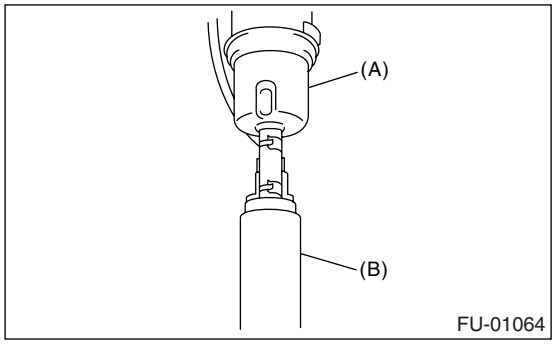
2) Disconnect the connector of fuel pump.



3) Remove the screw and remove the fuel pump and fuel filter.



4) Separate the fuel filter from fuel pump.



(A) Fuel filter
(B) Fuel pump

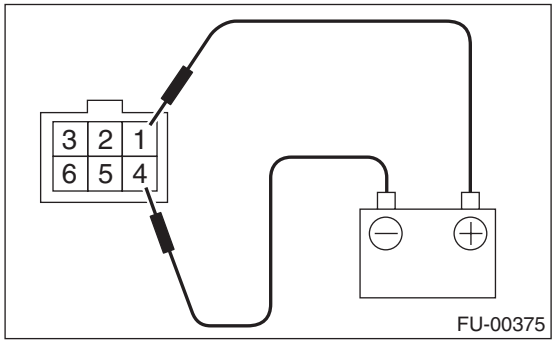
D: ASSEMBLY

Assemble in the reverse order of disassembly.

E: INSPECTION

Connect the lead harness to the connector terminal of fuel pump and apply battery power supply to check whether the pump operate.

WARNING:
• Wipe off the fuel completely.
• Keep battery as far apart from fuel pump as possible.
• Be sure to turn the battery supply ON and OFF on the battery side.
• Do not run fuel pump for a long time under non-load condition.



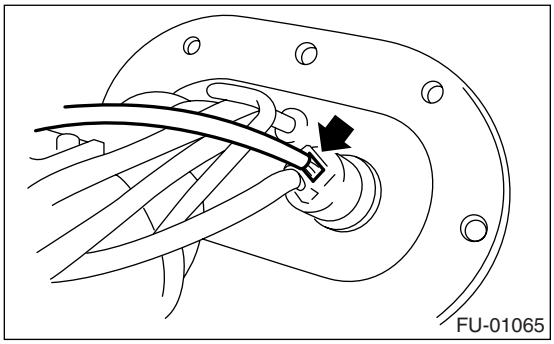
25.Fuel Level Sensor

A: REMOVAL

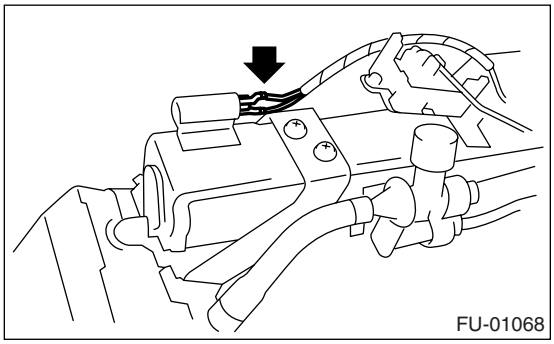
WARNING:
- **Place “NO FIRE” signs near the working area.**
- **Be careful not to spill the fuel.**

NOTE:
Fuel level sensor is built in fuel pump assembly.

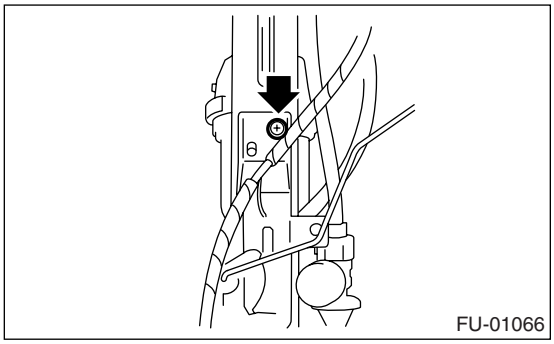
1) Remove the fuel pump assembly. <Ref. to FU(STi)-52, REMOVAL, Fuel Pump.>
2) Disconnect the connector from the fuel pump bracket.



3) Remove the fuel temperature sensor.



4) Remove the bolt which installs the fuel level sensor on mounting bracket.



B: INSTALLATION

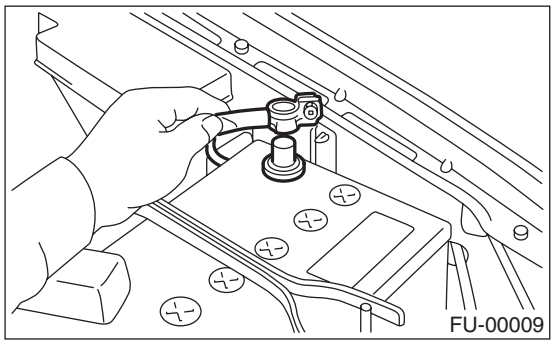
Install in the reverse order of removal.

26.Fuel Sub Level Sensor

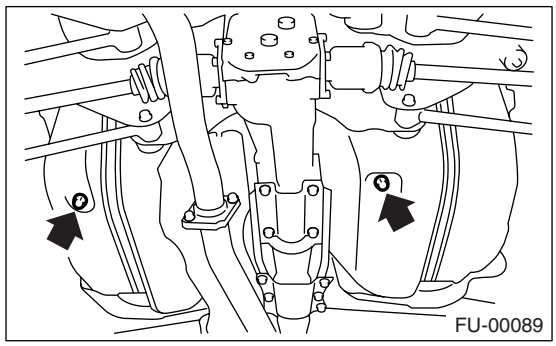
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill the fuel.**

1) Disconnect the ground cable from battery.

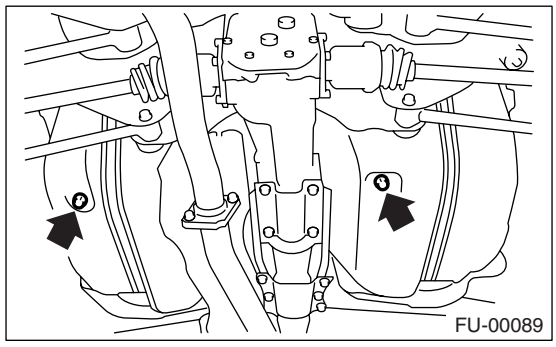


2) Lift-up the vehicle.
3) Drain the fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.

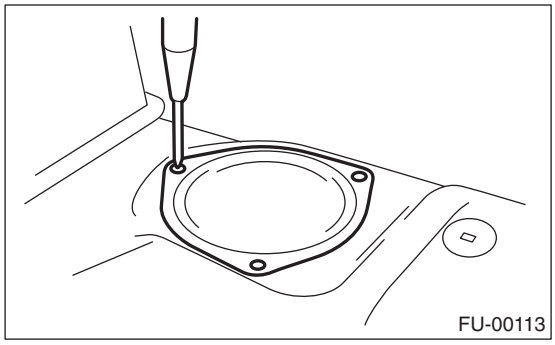


4) Tighten the fuel drain plug.

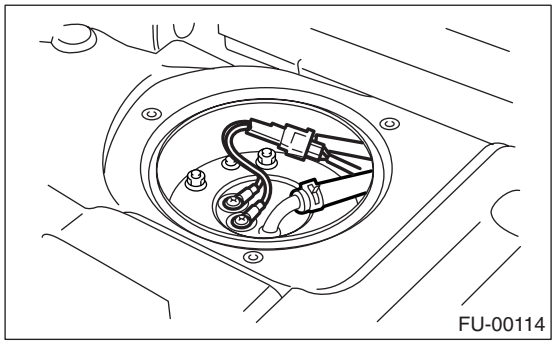
Tightening torque:
26 N·m (2.65 kgf-m, 19.2 ft-lb)



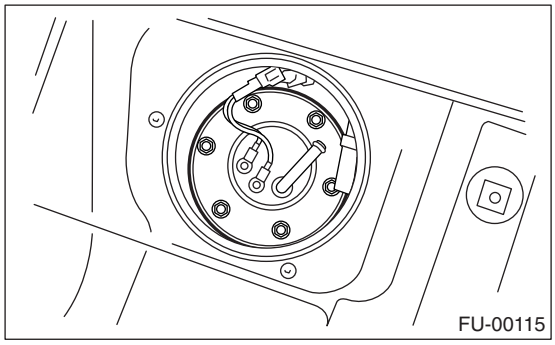
5) Remove the rear seat.
6) Remove the service hole cover.



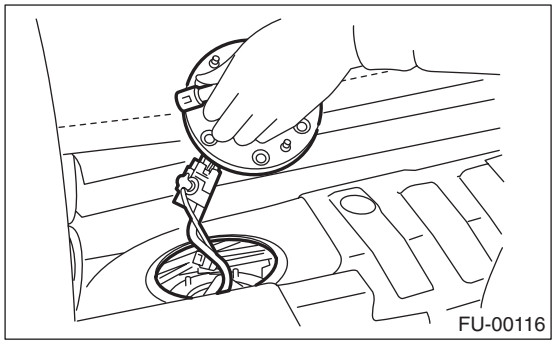
7) Disconnect the connector from the fuel sub level sensor.
8) Disconnect the fuel jet pump hose.



9) Remove the bolts which install the fuel sub level sensor on fuel tank.



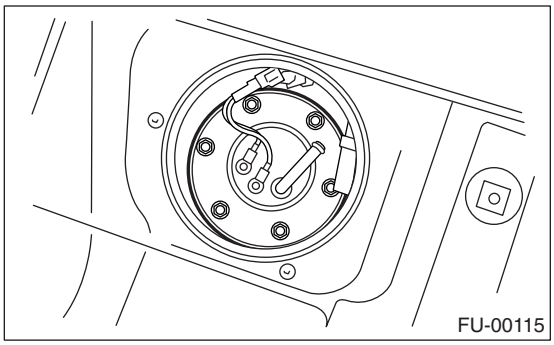
10) Remove the fuel sub level sensor.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



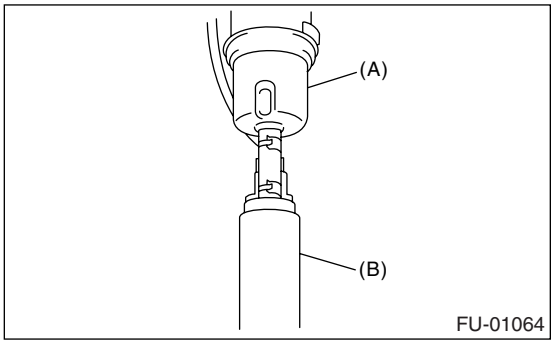
27.Fuel Filter

A: REMOVAL

WARNING:
- **Place “NO FIRE” signs near the working area.**
- **Be careful not to spill the fuel.**

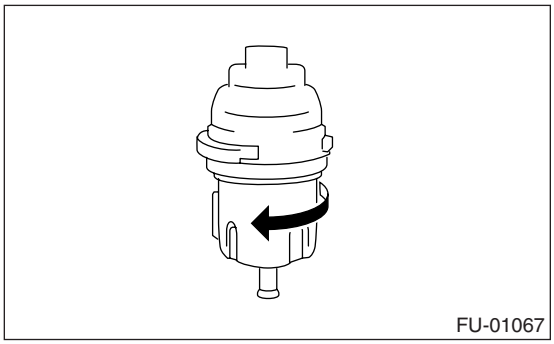
NOTE:
Fuel filter is built into the fuel pump assembly.

1) Release the fuel pressure. <Ref. to FU(STi)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Remove the fuel pump assembly. <Ref. to FU(STi)-52, REMOVAL, Fuel Pump.>
3) Remove the fuel pump. <Ref. to FU(STi)-53, DISASSEMBLY, Fuel Pump.>
4) Separate the fuel filter from fuel pump.



(A) Fuel filter
(B) Fuel pump

5) Turn the filter holder around to the arrow direction, and then remove the filter.



B: INSTALLATION

CAUTION:
- **If fuel hoses are damaged at the connecting portion, replace them with new ones.**
- **If clamps are badly damaged, replace them with new ones.**

Install in the reverse order of removal.

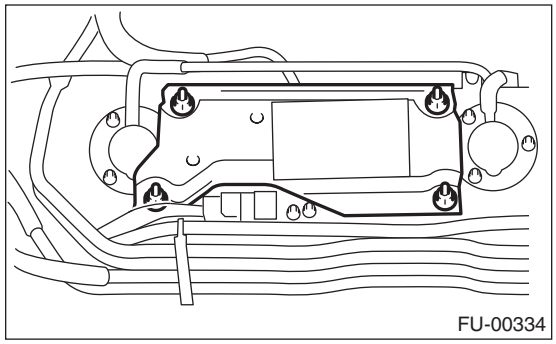
C: INSPECTION

1) Check the inside of fuel filter for dirt and water sediment.
2) If it is clogged, or if replacement interval has been reached, replace it.

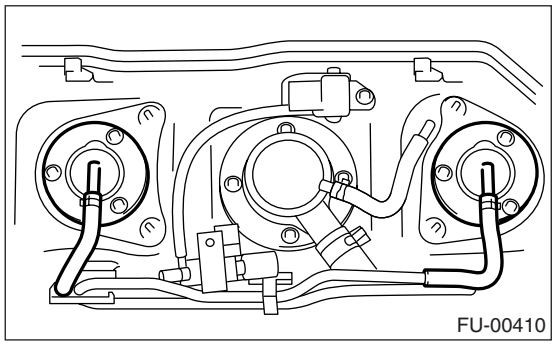
28.Fuel Cut Valve

A: REMOVAL

1) Remove the fuel tank. <Ref. to FU(STi)-45, REMOVAL, Fuel Tank.>
2) Remove the protect cover.


FU-00334

3) Move the clip and disconnect the evaporation hose from fuel cut valve.

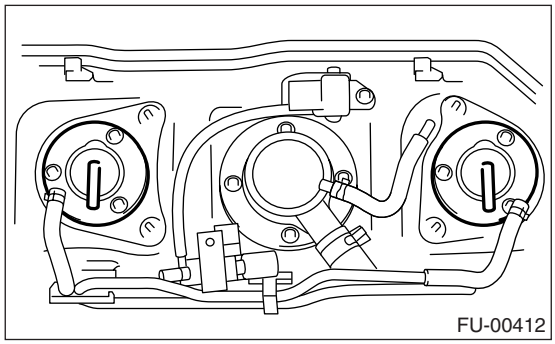

FU-00410

4) Remove the bolts which install the fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

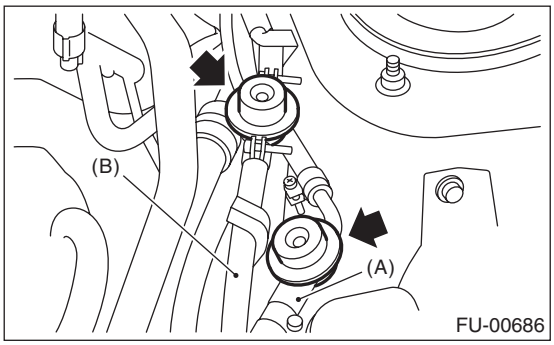
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)


FU-00412

29.Fuel Damper Valve

A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(STi)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Remove the fuel damper valve from the fuel delivery line (A) and fuel return line (B).



B: INSTALLATION

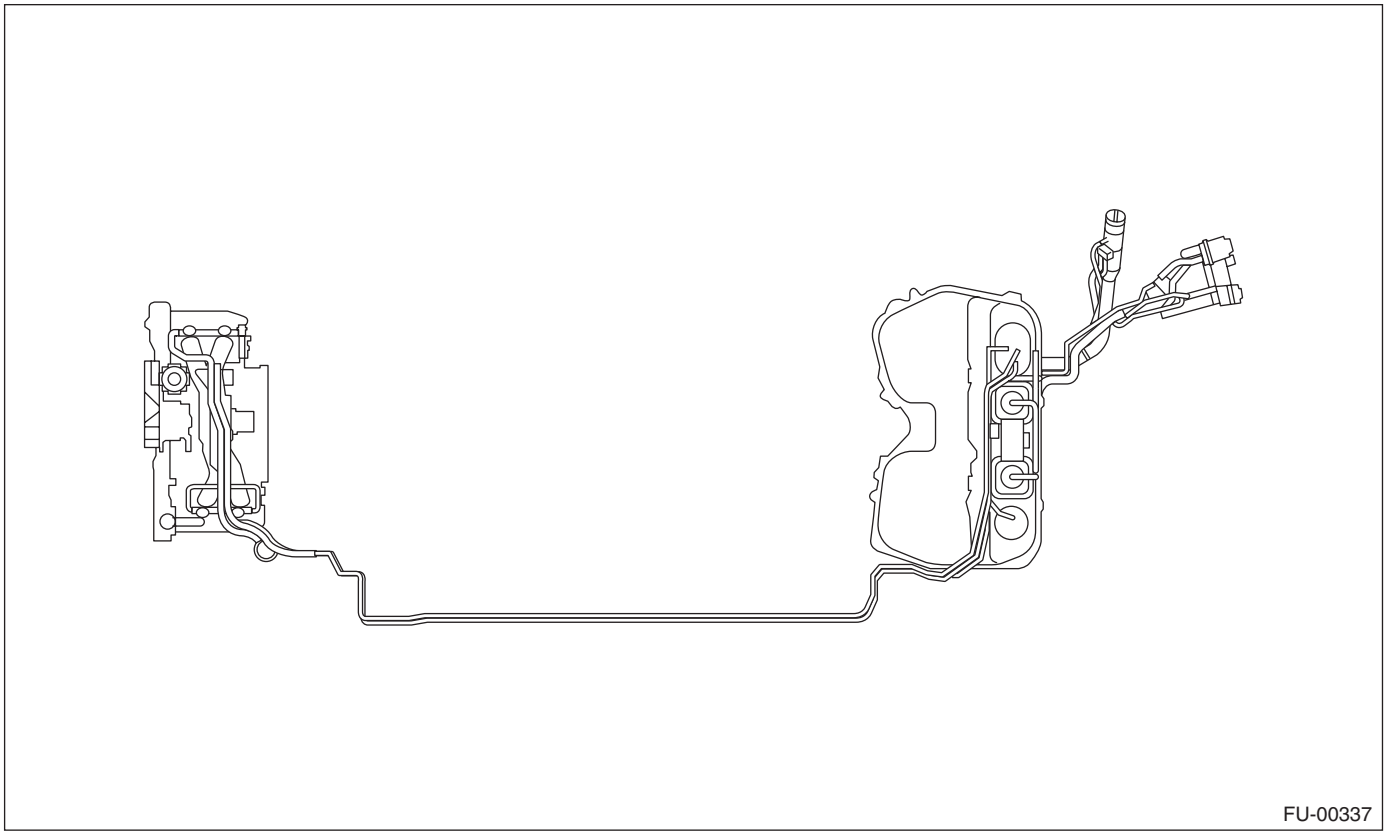
Install in the reverse order of removal.

Tightening torque:
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)

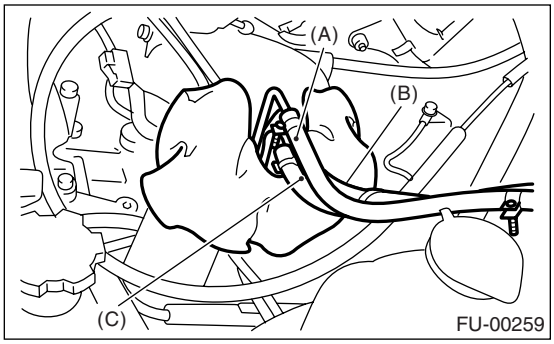
30.Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

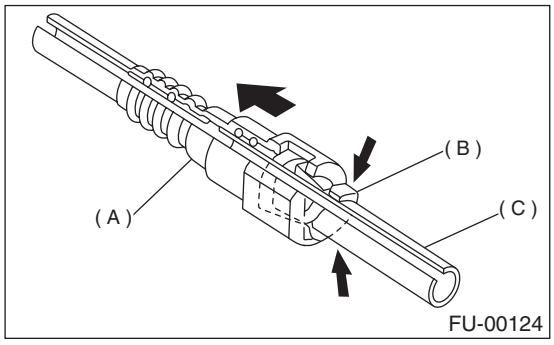
1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(STi)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Open the fuel filler flap lid and remove the fuel filler cap.
4) Remove the floor mat. <Ref. to EI-57, REMOVAL, Floor Mat.>
5) Remove the fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.



6) In engine compartment, detach the fuel delivery hose (A), return hose (B) and evaporation hose (C).



7) Lift-up the vehicle.
8) Separate the quick connector on the fuel delivery line.
(1) Clean the pipe and connector, if they are covered with dust.
(2) Hold the connector (A) and push retainer (B) down.
(3) Pull out the connector (A) from retainer (B).

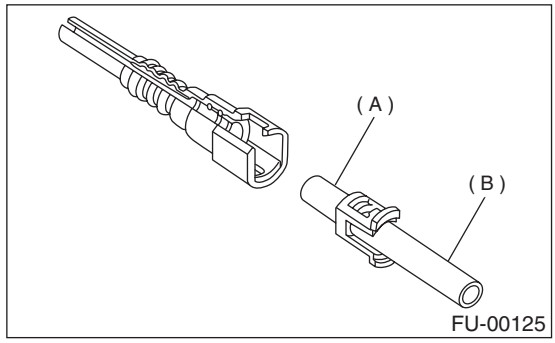


(A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

1) Connect the quick connector on the fuel delivery line.

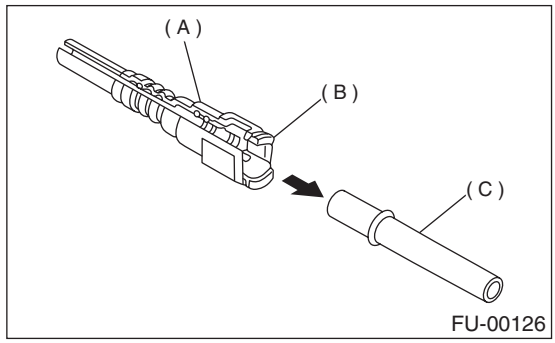
NOTE:
- Always use a new retainer.
- Make sure that the connected portion is not damaged or has no dust. If necessary, clean seal surface of pipe.



(A) Seal surface
(B) Pipe

(1) Set a new retainer (B) to connector (A).
(2) Push the pipe into the connector completely.

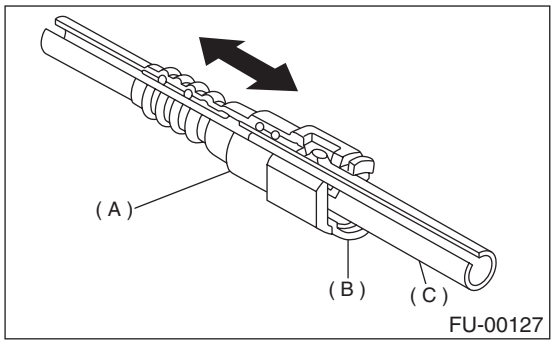
NOTE:
At this time, two clicking sounds are heard.



(A) Connector
(B) Retainer
(C) Pipe

CAUTION:
• Pull the connector to ensure it is connected securely.
• Ensure the two retainer pawls are engaged in their mating positions in the connector.

• Be sure to inspect hoses and their connections for any leakage of fuel.

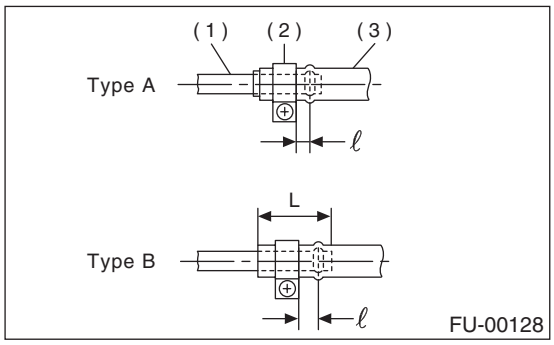


(A) Connector
(B) Retainer
(C) Pipe

2) Connect the fuel delivery hose and return hose to the pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).
Type A: When the fitting length is specified.
Type B: When the fitting length is not specified.

ℓ : 2.5±1.5 mm (0.098±0.059 in)

L: 22.5±2.5 mm (0.886±0.098 in)

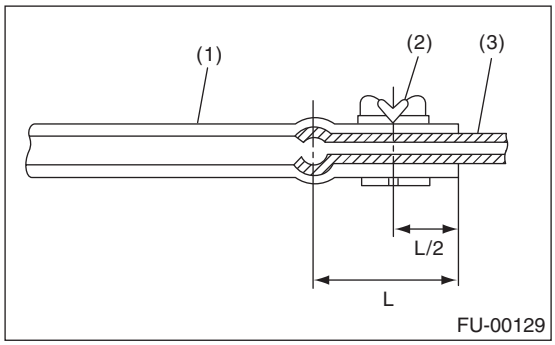


(1) Fitting
(2) Clamp
(3) Hose

3) Connect the evaporation hose to the pipe with an overlap of 15 to 20 mm (0.59 to 0.79 in).

L = 17.5±2.5 mm (0.689±0.098 in)

CAUTION:
Be sure to inspect hoses and their connections for any leakage of fuel.



(1) Hose
(2) Clip
(3) Pipe

C: INSPECTION

1) Make sure there are no cracks on the fuel pipes and fuel hoses.
2) Make sure the fuel pipe and fuel hose connections are tightened firmly.

31.Fuel System Trouble in General

A: INSPECTION

Trouble and possible cause		Corrective action
1. Insufficient fuel supply to the injector		
1)	Fuel pump will not operate.	
	❍ Defective terminal contact.	Inspect connections, especially ground, and tighten securely.
	❍ Trouble in electromagnetic or electronic circuit parts.	Replace fuel pump.
2)	Lowering of fuel pump function.	Replace fuel pump.
3)	Clogged dust or water in the fuel filter.	Replace fuel filter, clean or replace fuel tank.
4)	Clogged or bent fuel pipe or hose.	Clean, correct or replace fuel pipe or hose.
5)	Air is mixed in the fuel system.	Inspect or retighten each connection part.
6)	Clogged or bent breather tube or pipe.	Clean, correct or replace air breather tube or pipe.
7)	Damaged diaphragm of pressure regulator.	Replace.
2. Leakage or blow out fuel		
1)	Loosened joints of the fuel pipe.	Retightening.
2)	Cracked fuel pipe, hose and fuel tank.	Replace.
3)	Defective welding part on the fuel tank.	Replace.
4)	Defective drain packing of the fuel tank.	Replace.
5)	Clogged or bent air breather tube or air vent tube.	Clean, correct or replace air breather tube or air vent tube.
3. Gasoline smell inside of compartment		
1)	Loose joints at air breather tube, air vent tube and fuel filler pipe.	Retightening.
2)	Defective packing air tightness on the fuel saucer.	Correct or replace packing.
3)	Cracked fuel separator.	Replace separator.
4)	Inoperative fuel pump modulator or circuit.	Replace.
4. Defective fuel meter indicator		
1)	Defective operation of fuel level sensor.	Replace.
2)	Defective operation of fuel meter.	Replace.
5. Noise		
1)	Large operation noise or vibration of fuel pump.	Replace.

NOTE:

• When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank.

To prevent water condensation.

(1) Top off the fuel tank or drain the fuel completely.

(2) Drain the water condensation from the fuel filter.

• Refilling the fuel tank.

Refill the fuel tank while there is still some fuel left in the tank.

• Protecting the fuel system against freezing and water condensation.

(3) Cold areas

In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use an anti-freeze solution in the cooling system. Refueling will also complement the effect of anti-freeze solution each time the fuel level drops to about one-half. After the winter season, drain the water which may have accumulated in the fuel filter and fuel tank in the manner same as that described under Affected areas below.

(4) Affected areas

When the water condensation is notched in the fuel filter, drain the water from both the fuel filter and fuel tank or use a water removing agent (or anti-freeze solution) in the fuel tank.

• Observe the instructions, notes, etc., indicated on the label affixed to the anti-freeze solution (water removing agent) container before use.

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES)
EC(STi)

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10.	Fuel Tank Sensor Control Valve	11
11.	Pressure Control Solenoid Valve	12
12.	Drain Filter	14
13.	Vent Valve	16
14.	Shut Valve	17
15.	Drain Valve	18
16.	PCV Hose Assembly	20

1. General Description

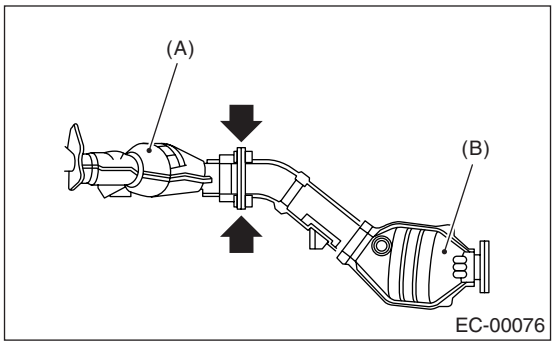
A: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the negative terminal from battery.

2. Front Catalytic Converter

A: REMOVAL

1) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
2) Separate the front catalytic converter (A) from rear catalytic converter (B).



B: INSTALLATION

NOTE:
- Replace the gaskets with new ones.
- Install in the reverse order of removal.

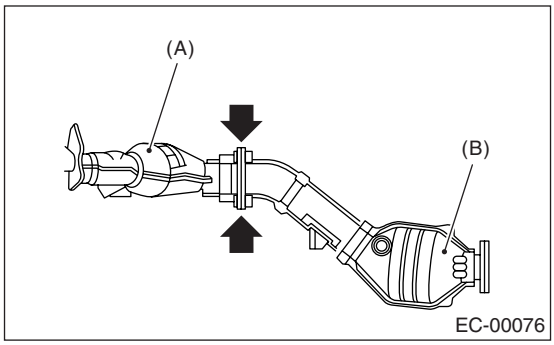
C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

3. Rear Catalytic Converter

A: REMOVAL

1) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
2) Separate the rear catalytic converter (B) from front catalytic converter (A).



B: INSTALLATION

NOTE:
- Replace the gaskets with new ones.
- Install in the reverse order of removal.

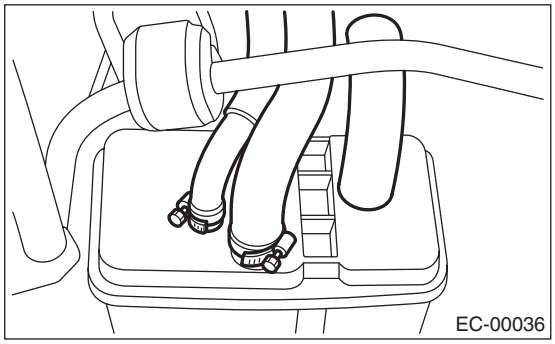
C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

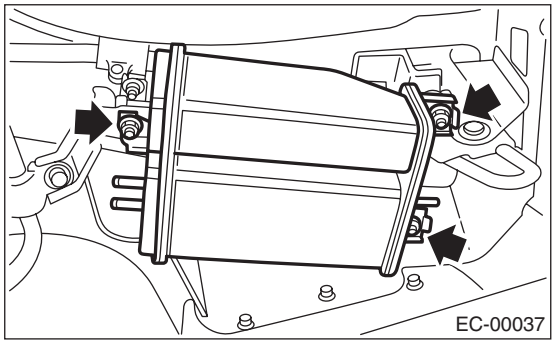
4. Canister

A: REMOVAL

1) Lift-up the vehicle.
2) Loosen the two clamps which hold two canister hoses, and disconnect the evaporation three hoses from canister.



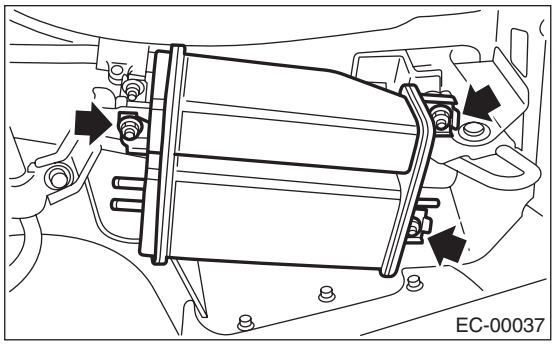
3) Remove the canister from body.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
23 N·m (2.3 kgf-m, 17 ft-lb)



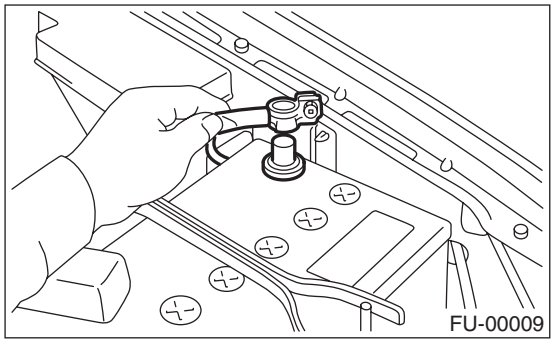
C: INSPECTION

Make sure the canister and canister hoses are not cracked or loose.

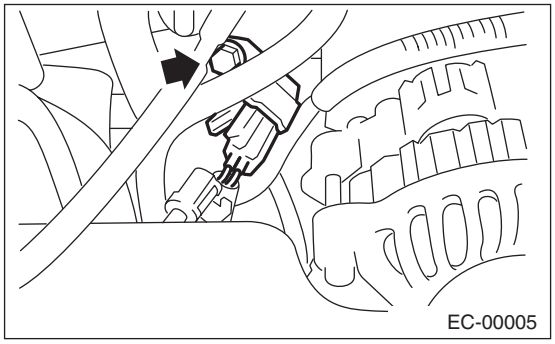
5. Purge Control Solenoid Valve

A: REMOVAL

1) Disconnect the ground terminal from battery.



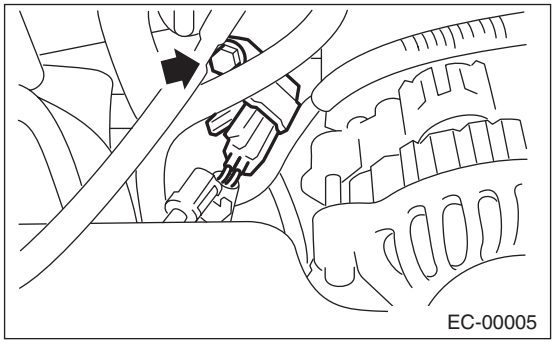
2) Disconnect the connector and hoses from purge control solenoid valve.
3) Remove the bolt which installs the purge control solenoid valve onto intake manifold.



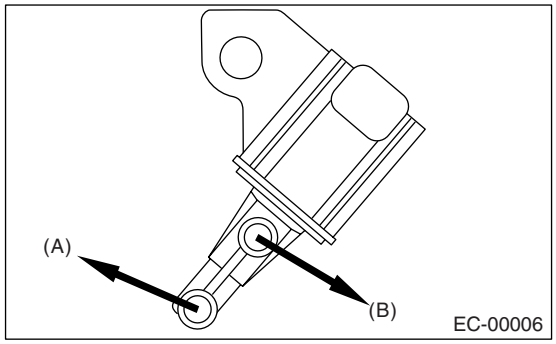
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



NOTE:
Connect the evaporation hoses as shown in the figure.



(A) To purge value
(B) To intake manifold

C: INSPECTION

Make sure the hoses are not cracked or loose.

6. Main Fuel Level Sensor

A: REMOVAL

For work procedures, refer to FU(STi) section. <Ref. to FU(STi)-54, REMOVAL, Fuel Level Sensor.>

B: INSTALLATION

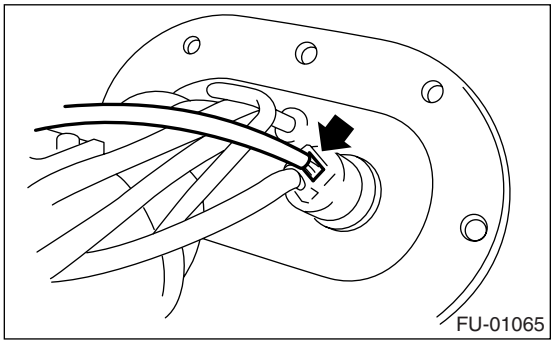
For work procedures, refer to FU(STi) section. <Ref. to FU(STi)-54, INSTALLATION, Fuel Level Sensor.>

7. Fuel Temperature Sensor

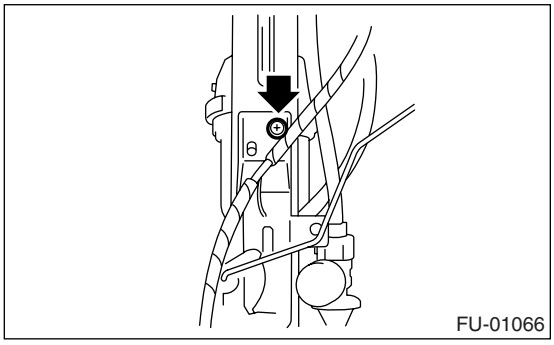
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

1) Remove the fuel pump assembly. <Ref. to FU(STi)-52, REMOVAL, Fuel Pump.>
2) Disconnect the connector from fuel pump bracket.



3) Remove the main fuel level sensor from fuel pump assembly. <Ref. to FU(STi)-54, REMOVAL, Fuel Level Sensor.>



NOTE:
Fuel temperature sensor is a unit with the fuel pump. If replacing it, replace as a fuel pump.

B: INSTALLATION

Install in the reverse order of removal.

8. Fuel Sub Level Sensor

A: REMOVAL

For work procedures, refer to FU(STi) section. <Ref. to FU(STi)-55, REMOVAL, Fuel Sub Level Sensor.>

B: INSTALLATION

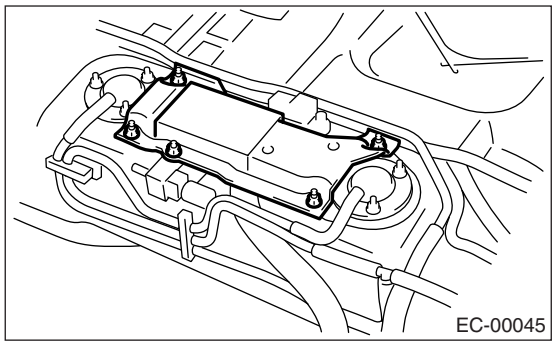
For work procedures, refer to FU(STi) section. <Ref. to FU(STi)-56, INSTALLATION, Fuel Sub Level Sensor.>

9. Fuel Tank Pressure Sensor

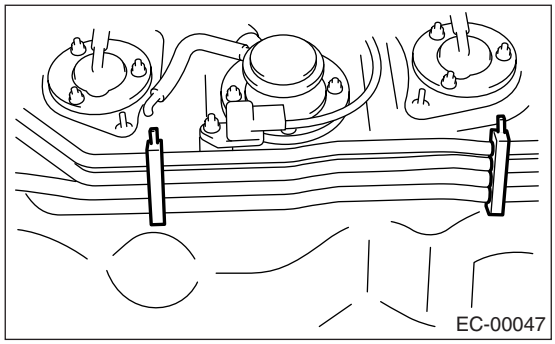
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

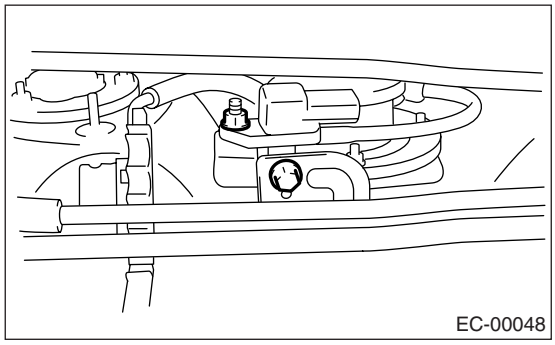
1) Remove the fuel tank. <Ref. to FU(STi)-45, REMOVAL, Fuel Tank.>
2) Remove the protector cover.



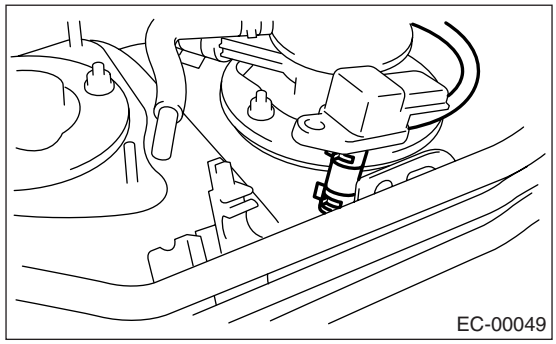
3) Disconnect the connector from fuel pressure sensor.
4) Release the clips which hold fuel pipes onto fuel tank.



5) Remove the bolt and nut which hold the fuel tank pressure sensor onto the bracket.



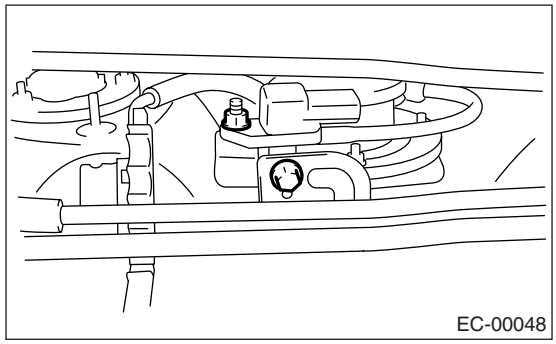
6) Disconnect the pressure hose from fuel tank pressure sensor.



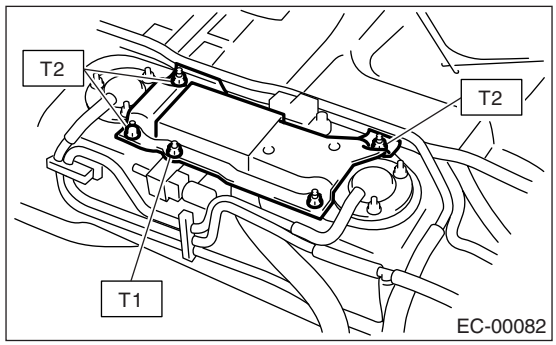
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



Tightening torque:
T1: 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)
T2: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

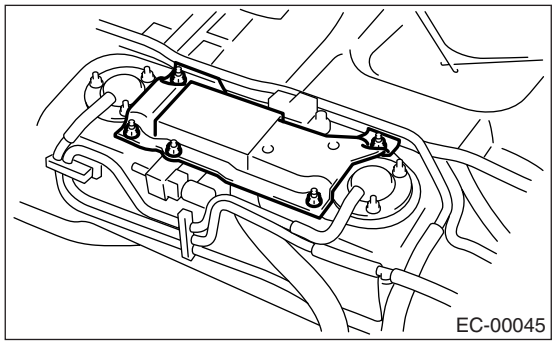
Make sure the hoses are not cracked or loose.

10.Fuel Tank Sensor Control Valve

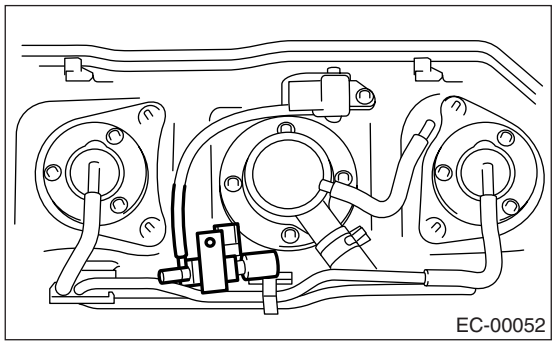
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

1) Remove the fuel tank. <Ref. to FU(STi)-45, REMOVAL, Fuel Tank.>
2) Remove the protector cover.



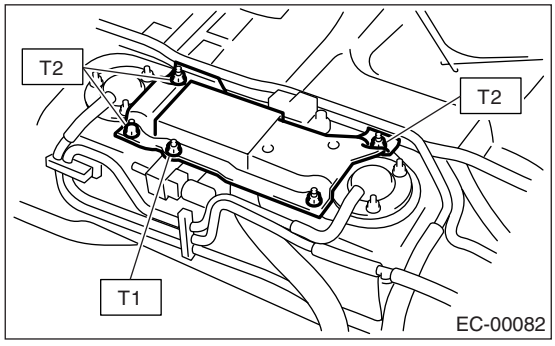
3) Disconnect the connector from fuel tank sensor control valve.
4) Disconnect hose and remove fuel tank sensor control valve.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
T1: 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)
T2: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



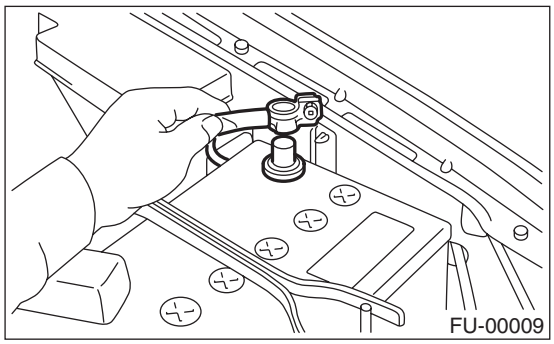
C: INSPECTION

Make sure the hoses are not cracked or loose.

11.Pressure Control Solenoid Valve

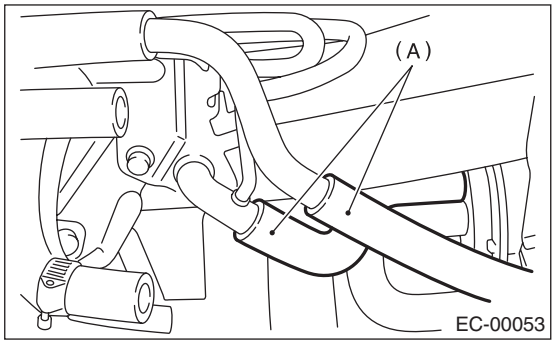
A: REMOVAL

1) Disconnect the ground terminal from battery.

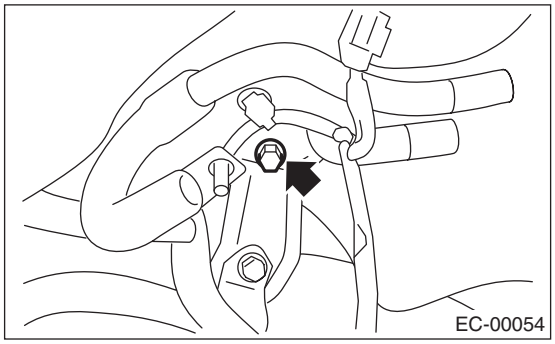


2) Remove the canister. <Ref. to EC(STi)-5, REMOVAL, Canister.>

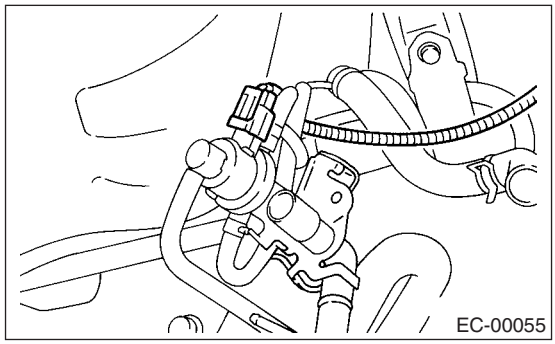
3) Disconnect the evaporation hoses (A) from joint pipes.



4) Remove the bolt which installs pressure control solenoid valve holding bracket on body.

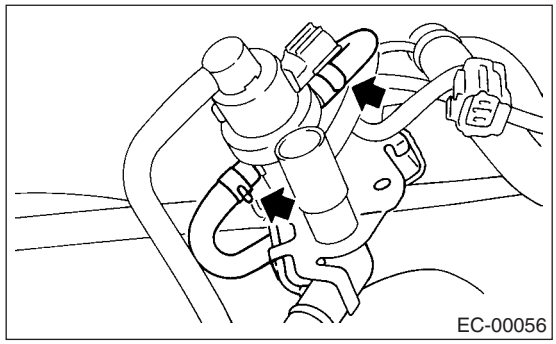


5) Disconnect the connector from pressure control solenoid valve.

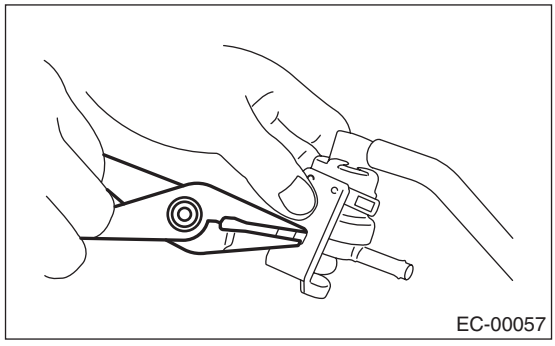


6) Disconnect the two evaporation hoses from pressure control solenoid valve.

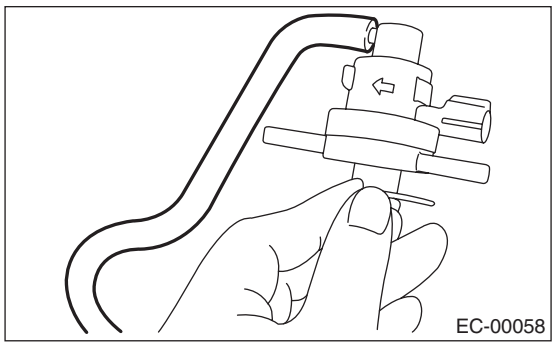
7) Remove the pressure control solenoid valve with bracket.



8) Remove the pressure control solenoid valve from bracket.



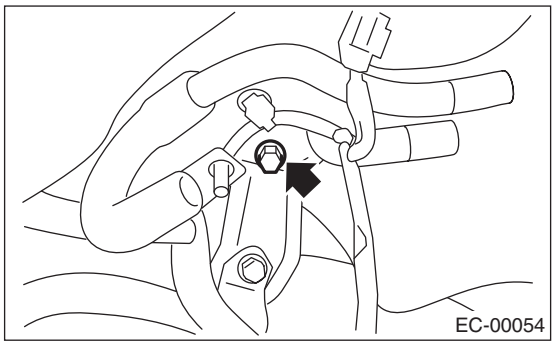
9) Disconnect the vacuum hose from pressure control solenoid valve.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
17.6 N·m (1.8 kgf-m, 13.0 ft-lb)



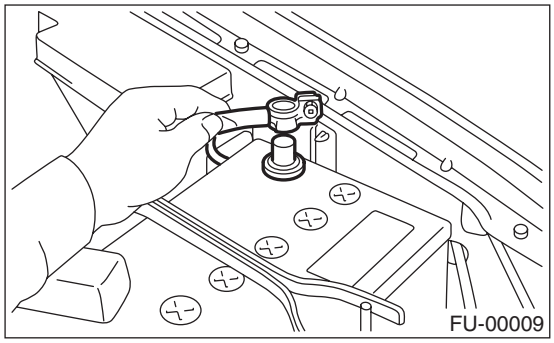
C: INSPECTION

Make sure the hoses are not cracked or loose.

12.Drain Filter

A: REMOVAL

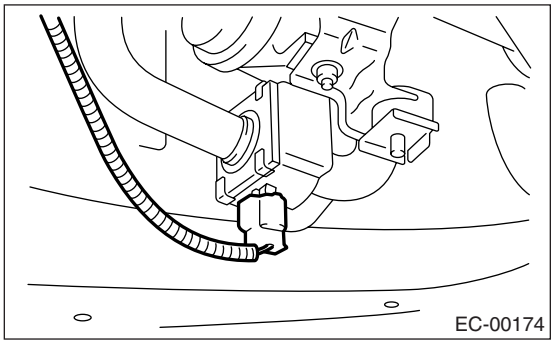
1) Disconnect the ground terminal from battery.



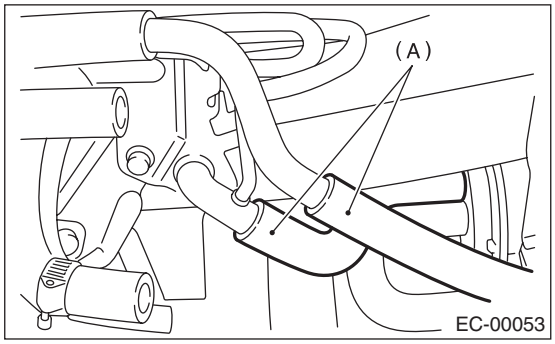
2) Lift-up the vehicle.

3) Remove the canister. <Ref. to EC(STi)-5, REMOVAL, Canister.>

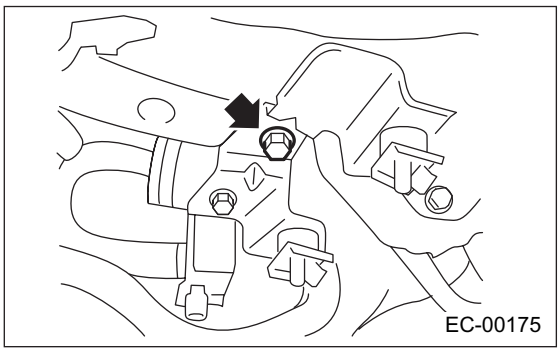
4) Disconnect the connector from drain valve.



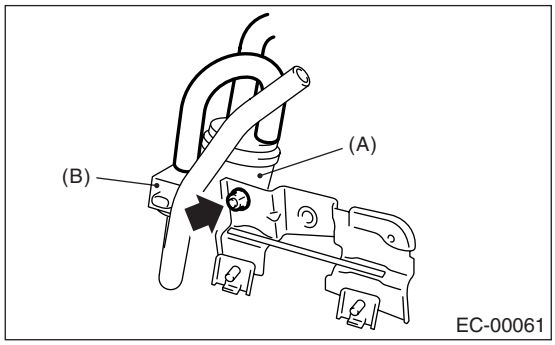
5) Disconnector the evaporation hoses (A) from joint pipes.



6) Remove the bolt which installs the drain filter and drain valve brackets on body, and remove them as a unit.



7) Disconnect the evaporation hoses, and remove the drain filter from the bracket.

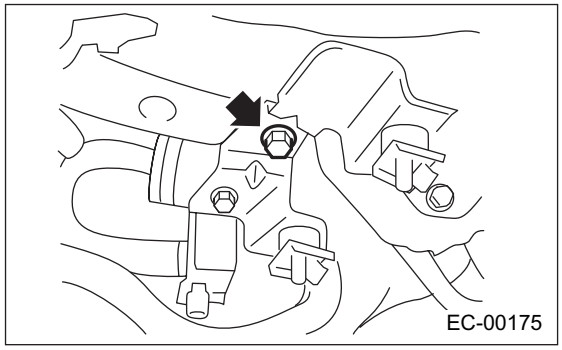


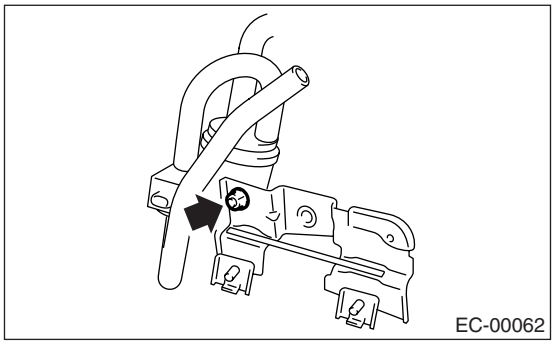
(A) Drain filter
(B) Drain valve

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
23 N·m (2.3 kgf-m, 17 ft-lb)





C: INSPECTION

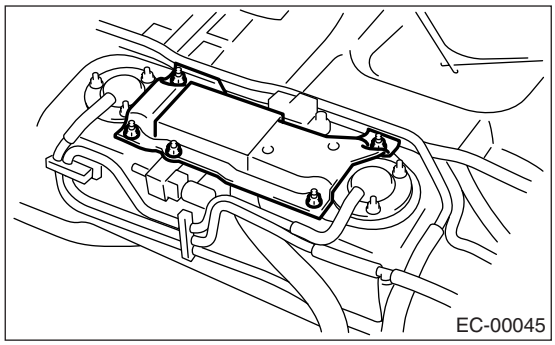
1) Make sure all hoses are installed correctly.
2) Make sure the hoses are not cracked or loose.

13.Vent Valve

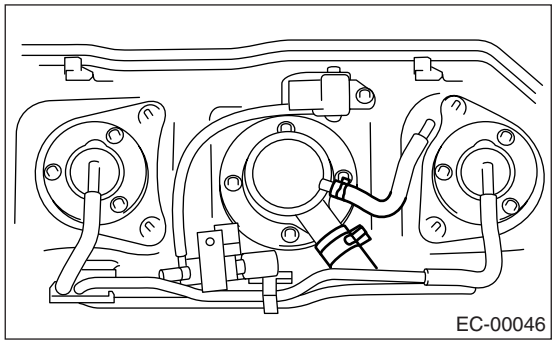
A: REMOVAL

WARNING:
- **Place “NO FIRE” signs near the working area.**
- **Be careful not to spill fuel.**

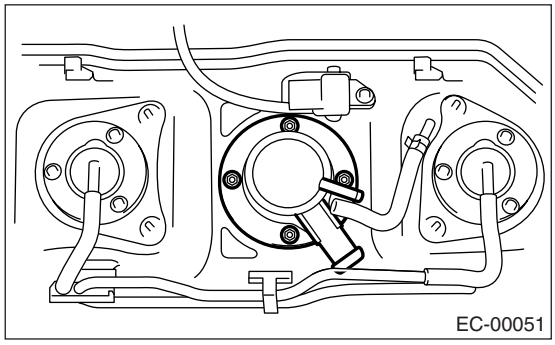
1) Remove the fuel tank. <Ref. to FU(STi)-45, REMOVAL, Fuel Tank.>
2) Remove the protector cover.



3) Remove the clips, and disconnect the hoses from vent valve.



4) Remove the nuts and then remove the vent valve.

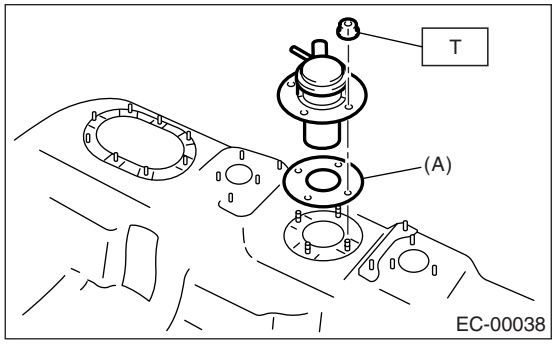


B: INSTALLATION

Install in the reverse order of removal.

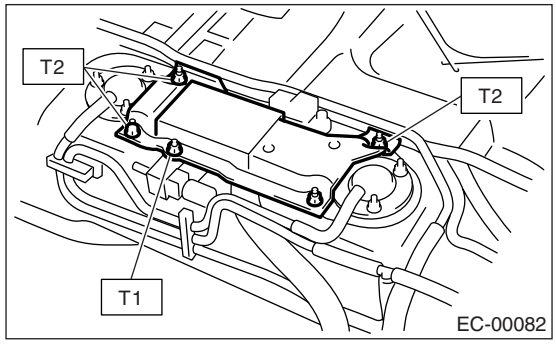
NOTE:
Replace the rubber seat with a new one.

Tightening torque:
T: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



(A) Rubber seat

Tightening torque:
T1: 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)
T2: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

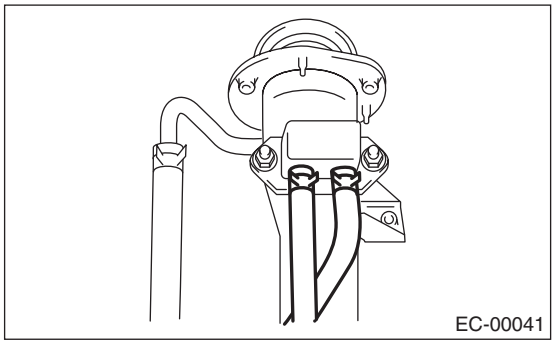
Make sure the hoses are not cracked or loose.

14.Shut Valve

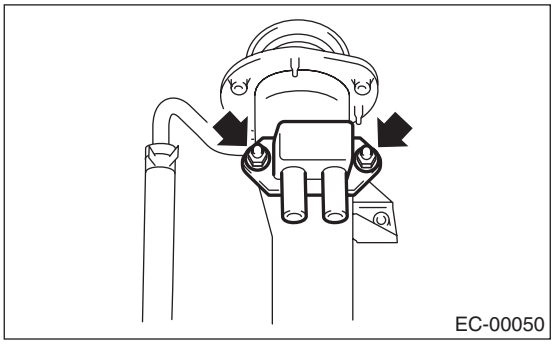
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

1) Remove the fuel filler pipe. <Ref. to FU(STi)-48, REMOVAL, Fuel Filler Pipe.>
2) Disconnect the evaporation hoses from shut valve.



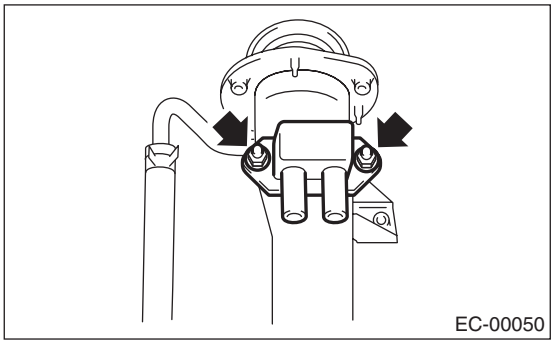
3) Remove the shut valve from fuel filler pipe.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.5 N·m (0.46 kgf-m, 3.3 ft-lb)



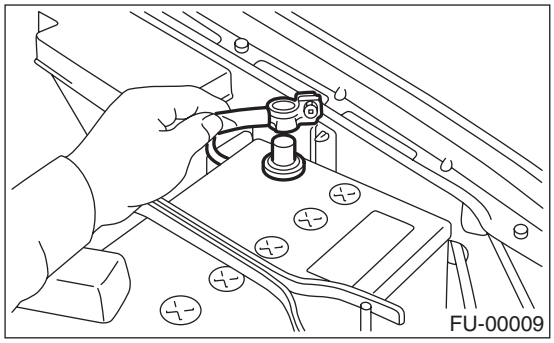
C: INSPECTION

Make sure the hoses are not cracked or loose.

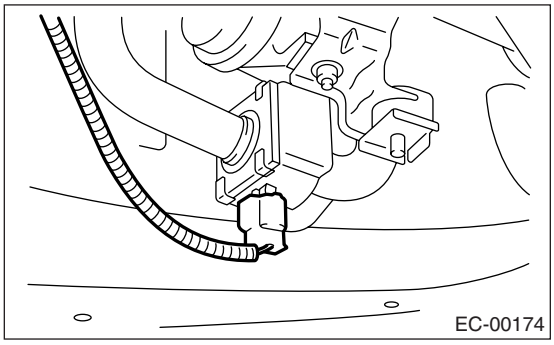
15.Drain Valve

A: REMOVAL

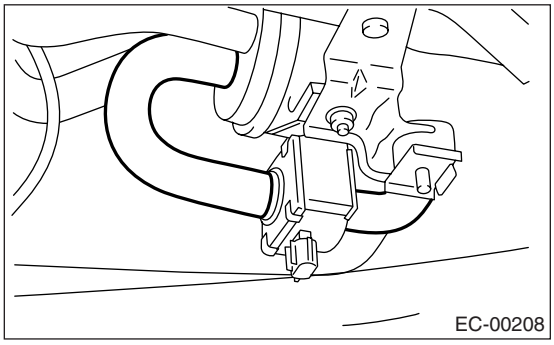
1) Disconnect the ground terminal from battery.



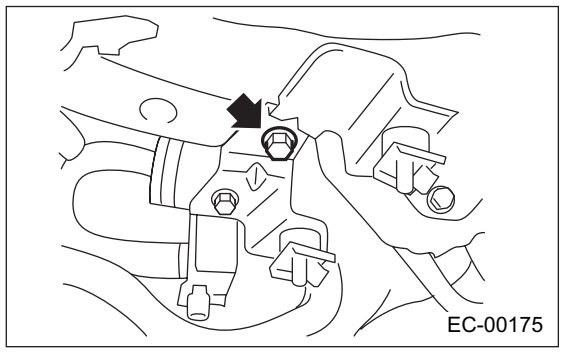
2) Lift-up the vehicle.
3) Remove the canister. <Ref. to EC(STi)-5, REMOVAL, Canister.>
4) Disconnect the connector from drain valve.



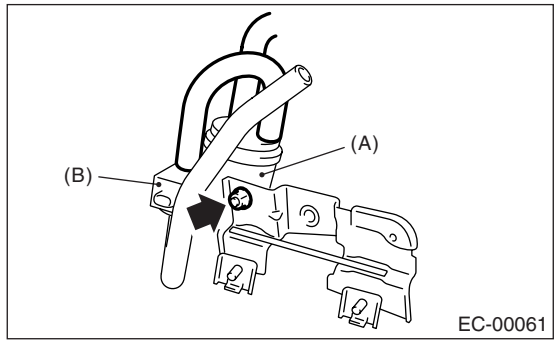
5) Disconnect the evaporation hoses from drain valve.



6) Remove the bolt which installs the drain filter and drain valve brackets on body, and remove them as a unit.



7) Remove the drain valve from bracket.

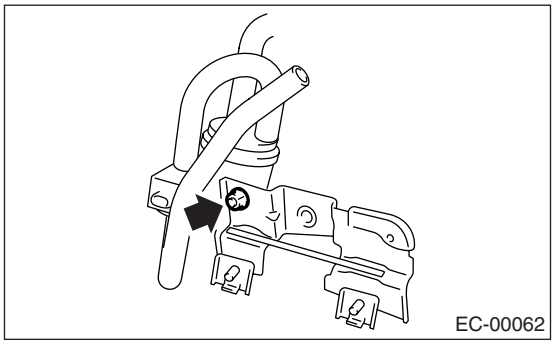


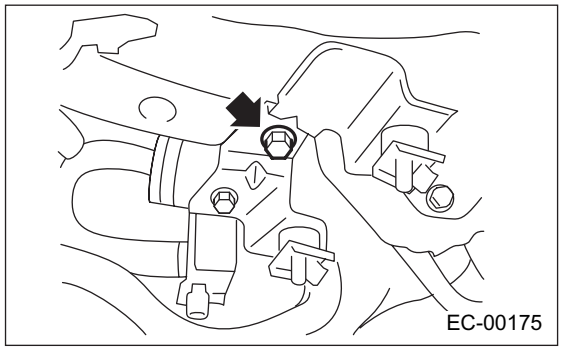
(A) Drain filter
(B) Drain valve

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
23 N·m (2.3 kgf-m, 17 ft-lb)





C: INSPECTION

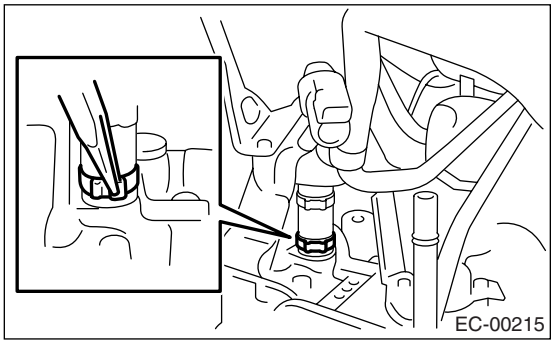
1) Make sure all hoses are installed correctly.
2) Make sure the hoses are not cracked or loose.

16.PCV Hose Assembly

A: REMOVAL

CAUTION:
Removal is not allowed except for the damage of PCV hose, diagnosis connector and PCV valve.

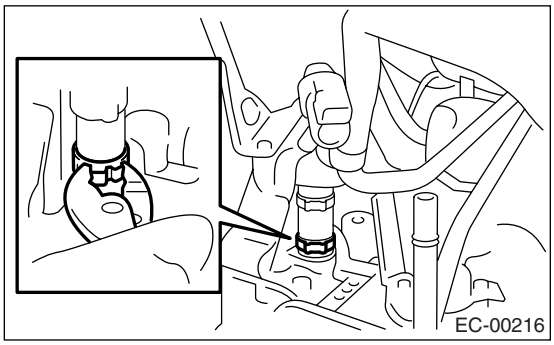
1) Remove the intake manifold.
<Ref. to FU(STi)-13, REMOVAL, Intake Manifold.>
2) Remove the clamp using pliers, etc. and then remove the PCV hose assembly.



B: INSTALLATION

NOTE:
Replace the clamp with a new one.

1) Install the PCV hose assembly and lock it with a clamp clipped by pliers.



2) Install the intake manifold.
<Ref. to FU(STi)-15, INSTALLATION, Intake Manifold.>

INTAKE (INDUCTION)

IN(STi)

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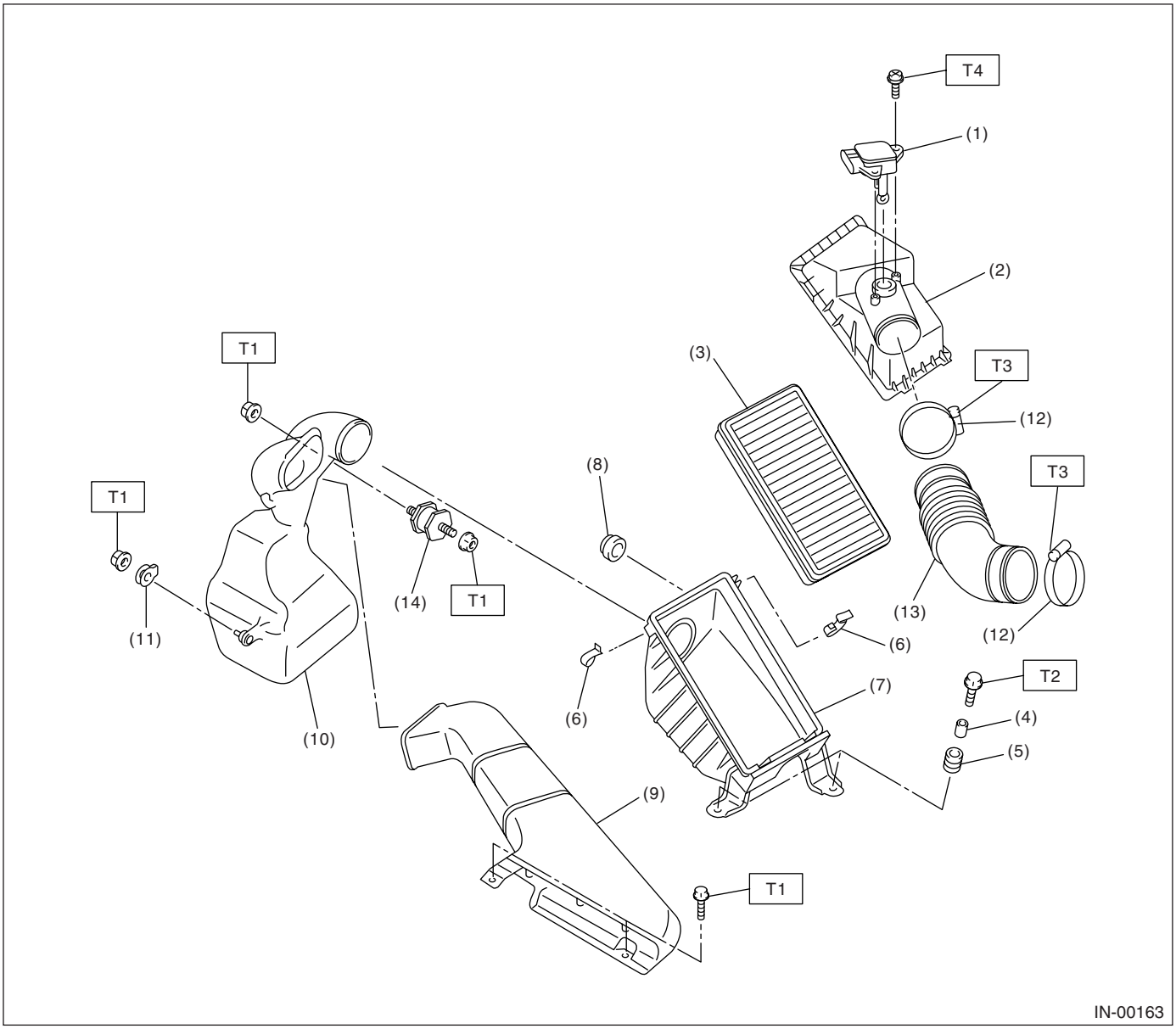
3. Air Intake Duct....8
4. Intake Duct 9
5. Intercooler 10
6. Turbocharger....12
7. Air By-pass Valve....14
8. Resonator Chamber....15
9. Intercooler Water Spray Tank 16
10. Intercooler Water Spray Nozzle 17

1. General Description

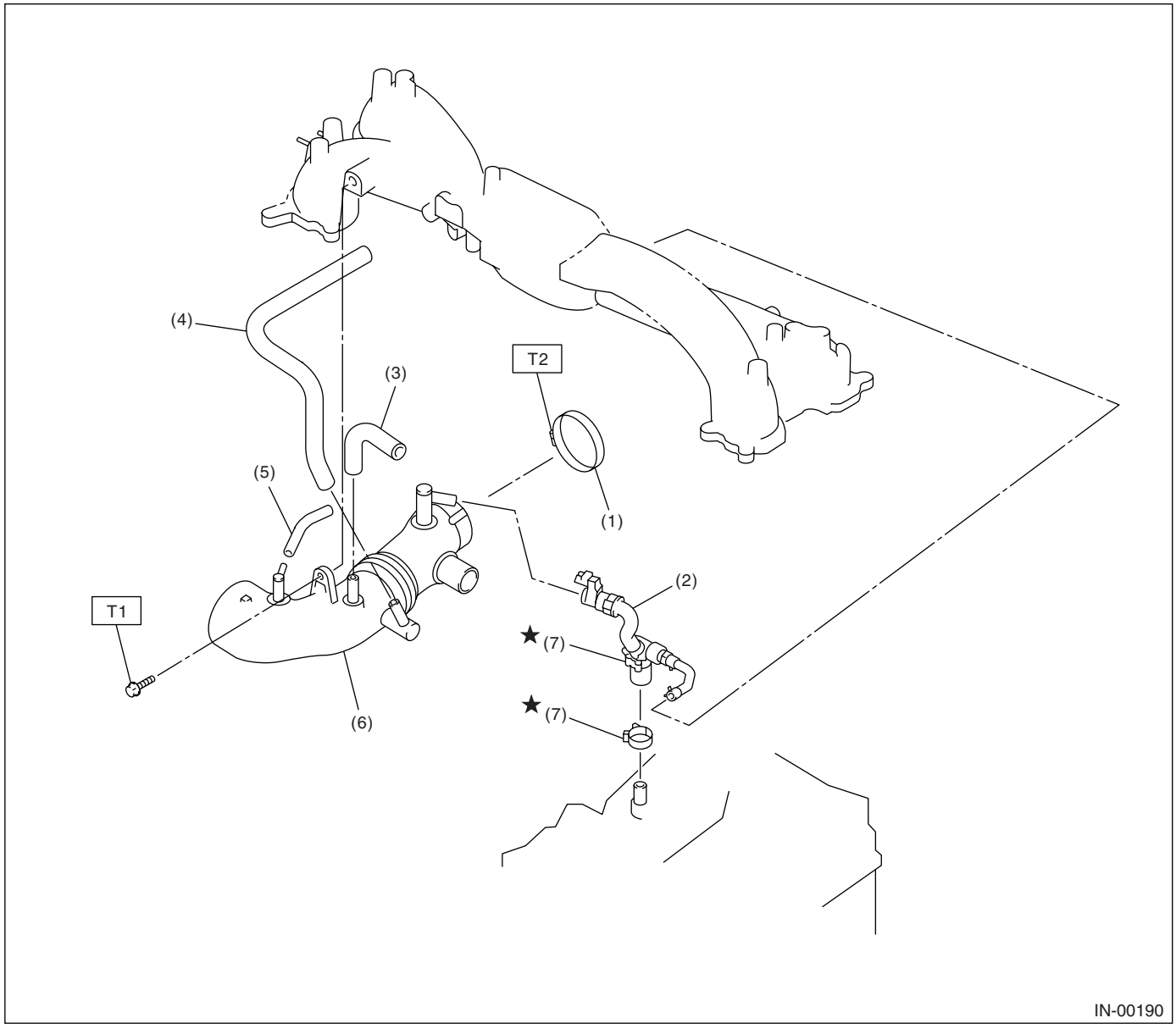
A: COMPONENT

1. AIR CLEANER



(1)	Mass air flow and intake air temperature sensor	(7)	Air cleaner lower case	(14)	Cushion
(2)	Air cleaner upper cover	(8)	Cushion rubber		
(3)	Air cleaner element	(9)	Air intake duct	***Tightening torque: N·m (kgf-m, ft-lb)***	
(4)	Spacer	(10)	Resonator chamber ASSY	***T1: 7.5 (0.76, 5.5)***	
(5)	Bushing	(11)	Cushion rubber	***T2: 33 (3.4, 24.6)***	
(6)	Clip	(12)	Clamp	***T3: 2.5 (0.25, 1.8)***	
		(13)	Air intake boot	***T4: 1.7 (0.17, 1.2)***	

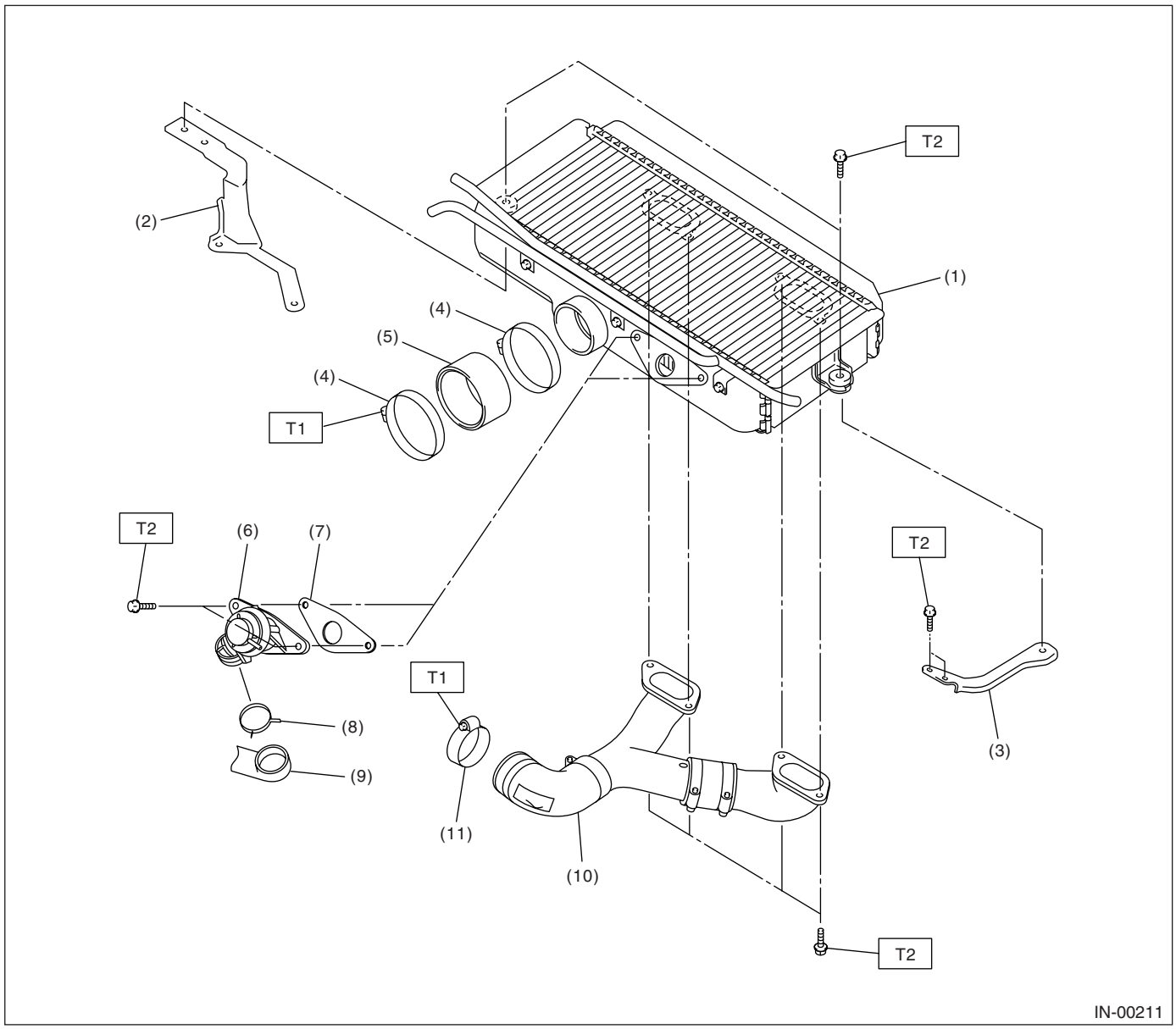
2. INTAKE DUCT



(1) Clamp
(2) PCV hose ASSY
(3) Air by-pass hose A
(4) Air by-pass hose B
(5) Air by-pass hose C
(6) Intake duct
(7) Clamp

Tightening torque: N·m (kgf-m, ft-lb)
T1: 19 (1.9, 13.7)
T2: 3 (0.3, 2.2)

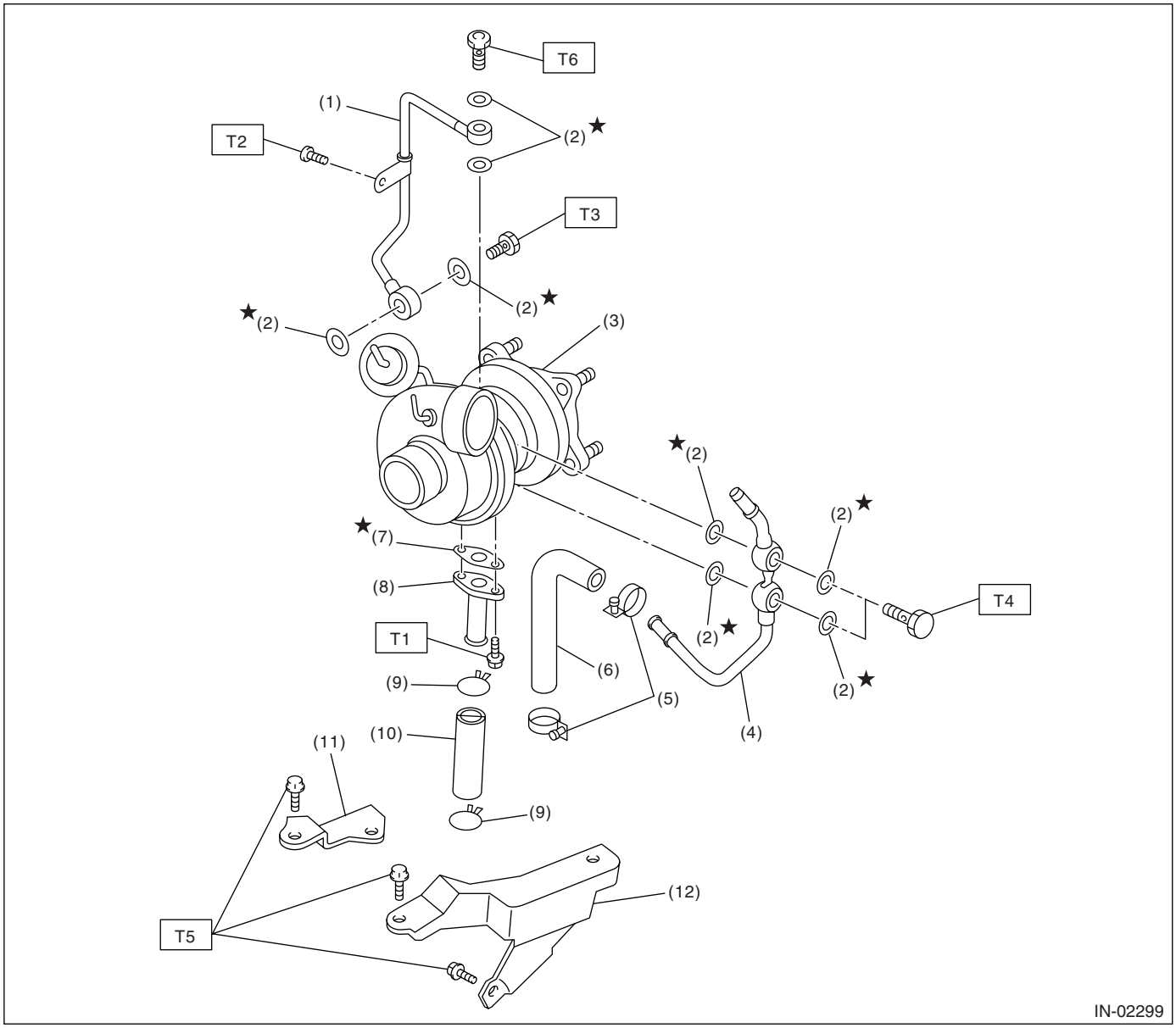
3. INTERCOOLER



(1) Intercooler
(2) Intercooler bracket RH
(3) Intercooler bracket LH
(4) Clamp
(5) Air intake duct
(6) Air by-pass valve
(7) Gasket
(8) Clamp
(9) Air by-pass hose A
(10) Intercooler duct
(11) Clamp

Tightening torque: N·m (kgf-m, ft-lb)
T1: 3 (0.3, 2.2)
T2: 16 (1.6, 11.6)

4. TURBOCHARGER

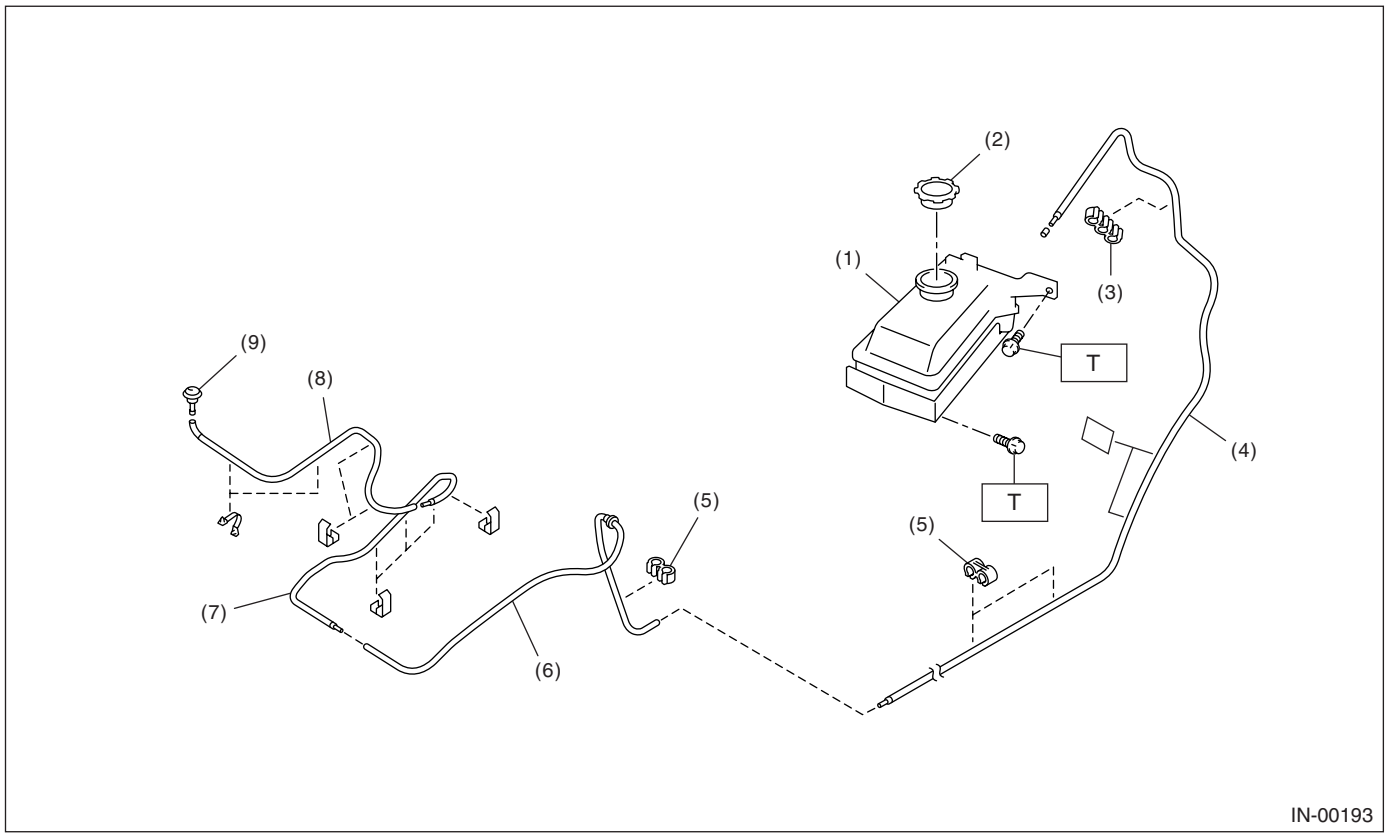


(1)	Oil inlet pipe	(8)	Oil outlet pipe
(2)	Metal gasket	(9)	Clip
(3)	Turbocharger	(10)	Oil outlet hose
(4)	Water pipe	(11)	Turbocharger bracket RH
(5)	Clamp	(12)	Turbocharger bracket LH
(6)	Engine coolant hose		
(7)	Gasket		

Tightening torque: N·m (kgf-m, ft-lb)

T1: 4.4 (0.45, 3.3)
T2: 4.9 (0.50, 3.6)
T3: 29 (3.0, 21.7)
T4: 35 (3.6, 25.8)
T5: 33 (3.4, 24.6)
T6: 16 (1.6, 11.6)

5. INTERCOOLER WATER SPRAY



(1) Water tank ASSY
(2) Water tank cap
(3) Clamp
(4) Rear hose
(5) Clamp
(6) Center hose
(7) Front hose
(8) Intercooler hose
(9) Nozzle

Tightening torque: N·m (kgf-m, ft-lb)
T: 6.0 (0.61, 4.4)

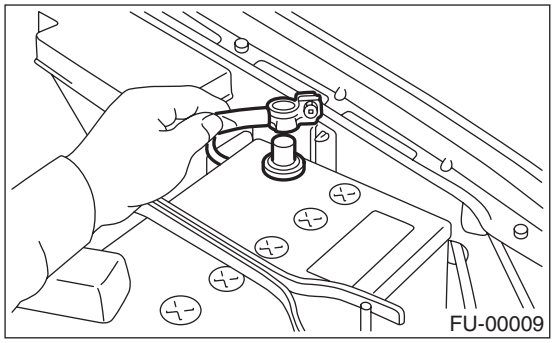
B: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensor or units, be sure to disconnect the ground cable from battery.

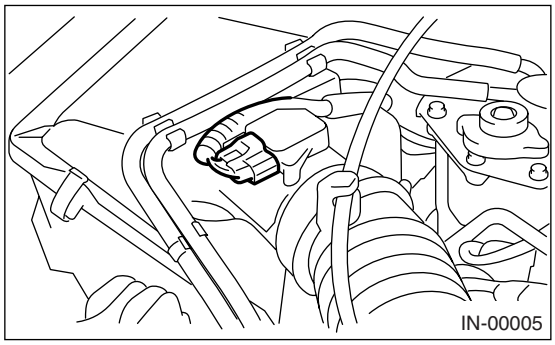
2. Air Cleaner

A: REMOVAL

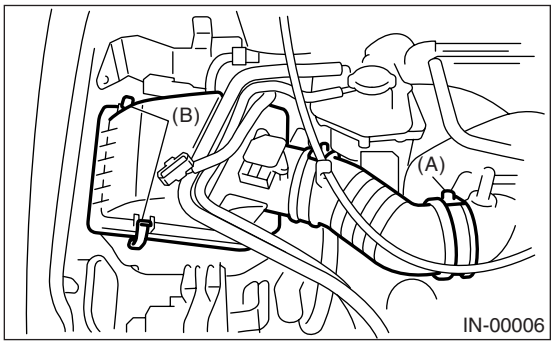
1) Disconnect the ground cable from battery.



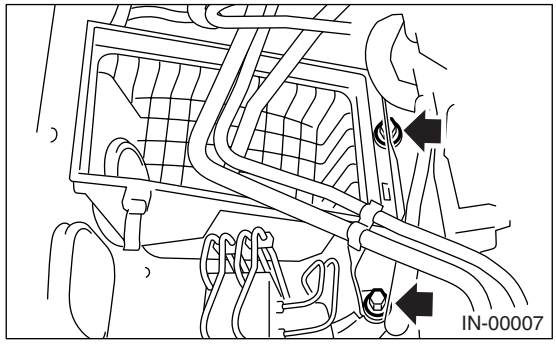
2) Disconnect the connector from mass air flow sensor.



3) Loosen the clamp (A) which connects the air intake boot and intake duct.
4) Remove the clip (B) from air cleaner upper cover.



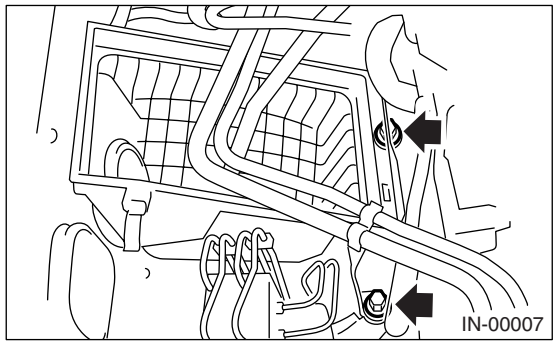
5) Remove the air cleaner upper cover.
6) Remove the air cleaner element.
7) Remove the air cleaner lower case.



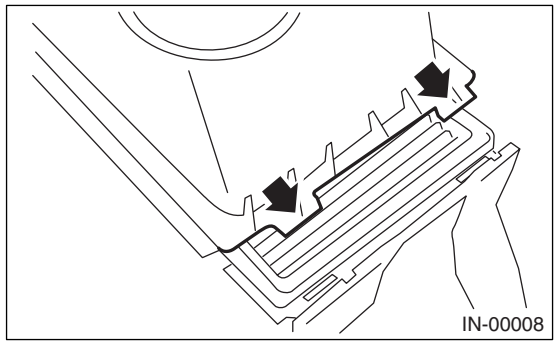
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)



NOTE:
Before installing the air cleaner upper cover, align the holes with protruding portions of air cleaner lower case, then secure the upper cover to the lower case.



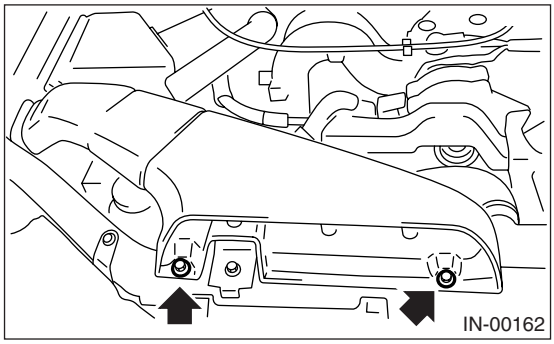
C: INSPECTION

Replace it if excessively damaged or dirty.

3. Air Intake Duct

A: REMOVAL

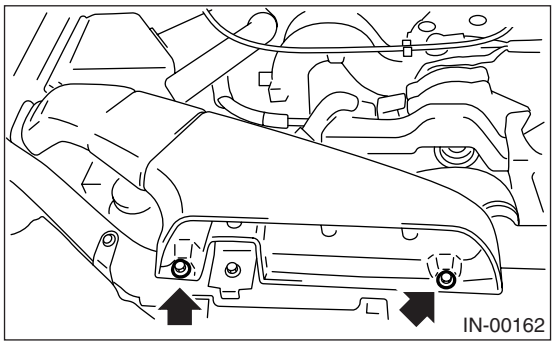
Remove the bolts which install the air intake duct on front side of body.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



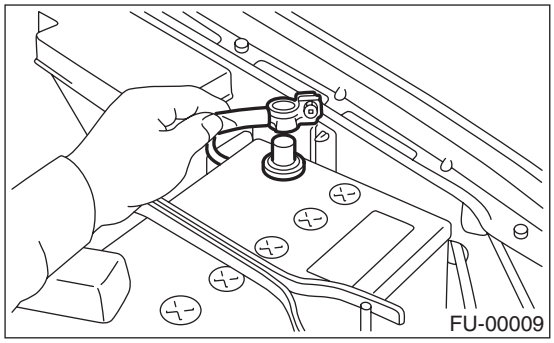
C: INSPECTION

1) Inspect for cracks and loose connections.
2) Inspect that no foreign objects are mixed in air intake duct.

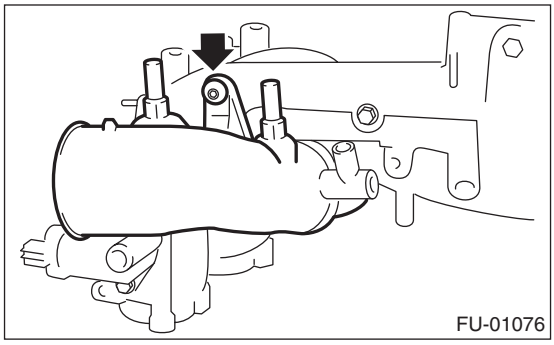
4. Intake Duct

A: REMOVAL

1) Disconnect the ground cable from battery.



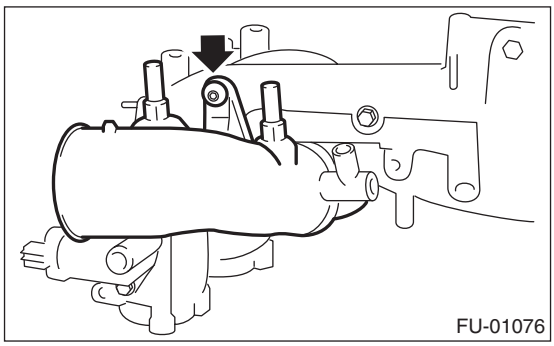
2) Remove the intake manifold. <Ref. to FU(STi)-13, REMOVAL, Intake Manifold.>
3) Remove the sensor, engine harness and fuel pipe attached to intake manifold. <Ref. to FU(STi)-18, DISASSEMBLY, Intake Manifold.>
4) Remove the intake duct from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

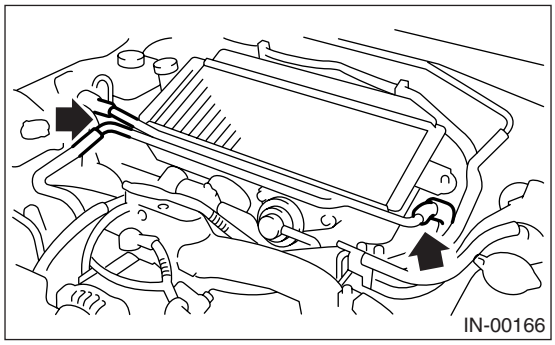
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



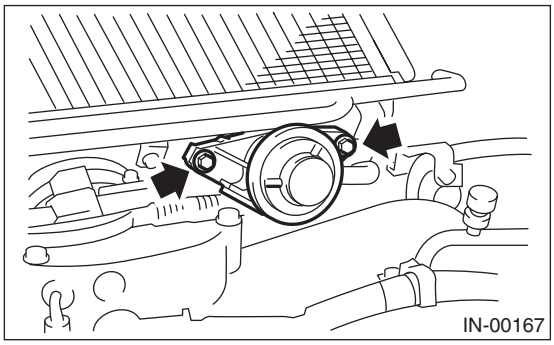
5. Intercooler

A: REMOVAL

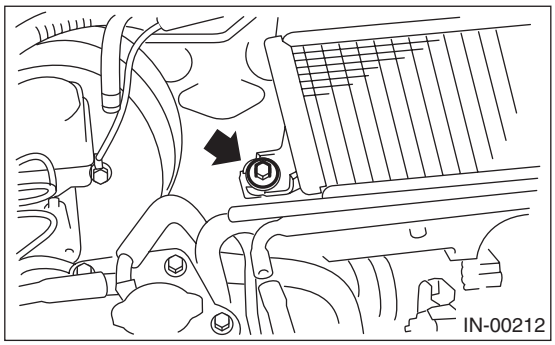
1) Disconnect the air by-pass hoses from intercooler.

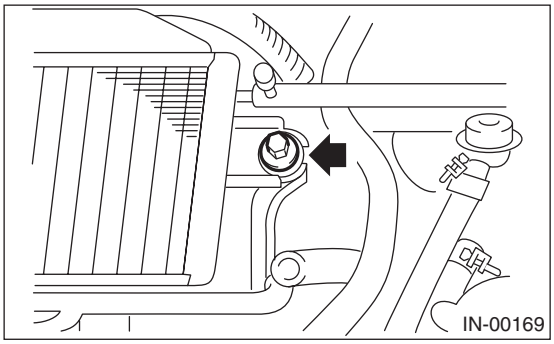


2) Separate the air by-pass valve from intercooler.



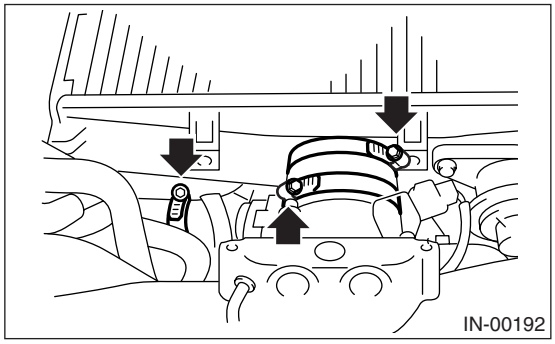
3) Remove the bolts which secure the intercooler to bracket.





4) Separate the intercooler air duct from turbocharger.

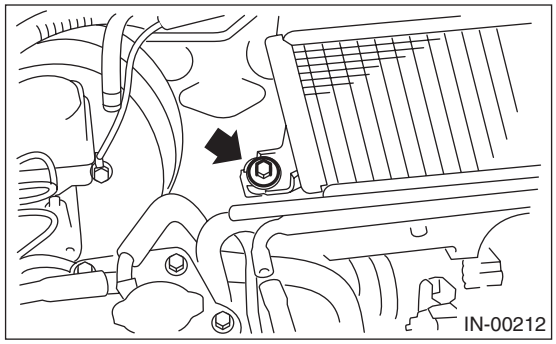
5) Separate the intercooler from throttle body.

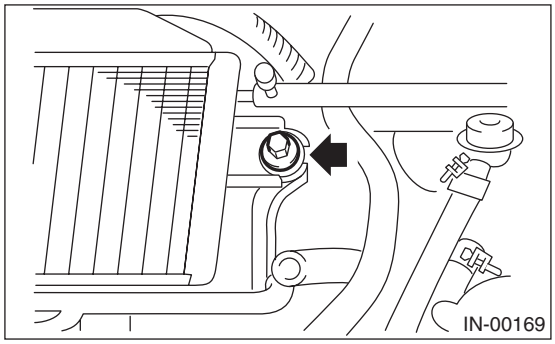


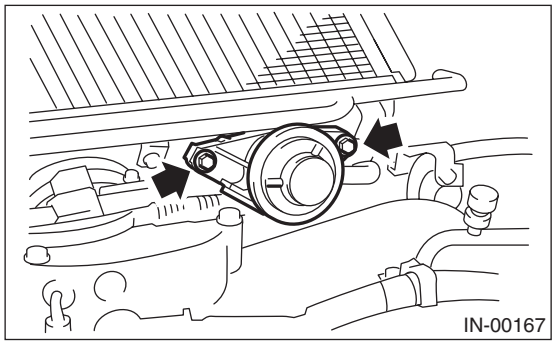
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)

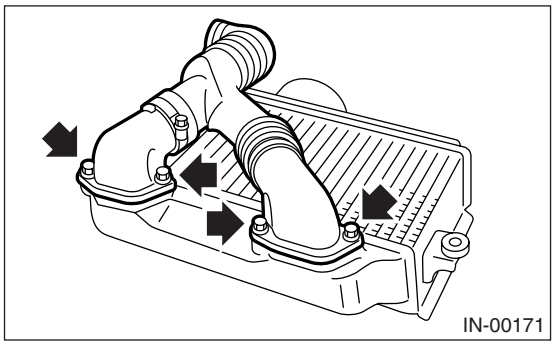






C: DISASSEMBLY

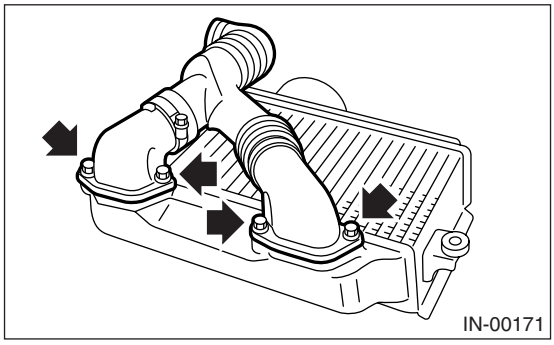
Remove the intercooler ducts from intercooler.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

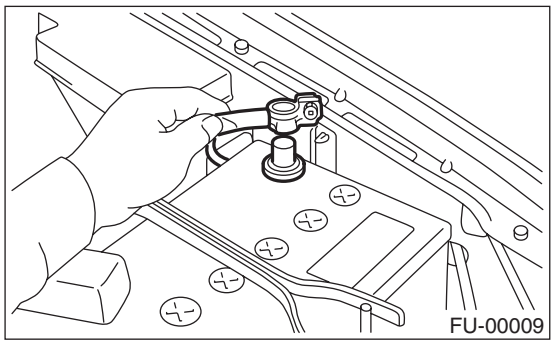
Tightening torque:
16 N·m (1.6 kgf-m, 11.7 ft-lb)



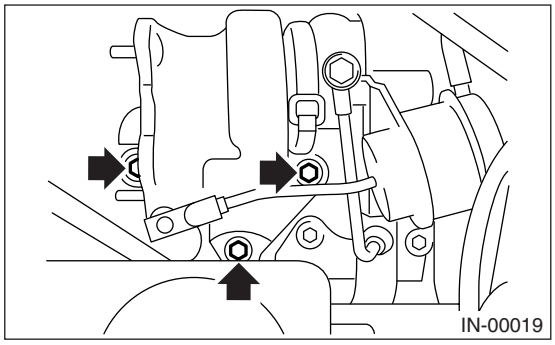
6. Turbocharger

A: REMOVAL

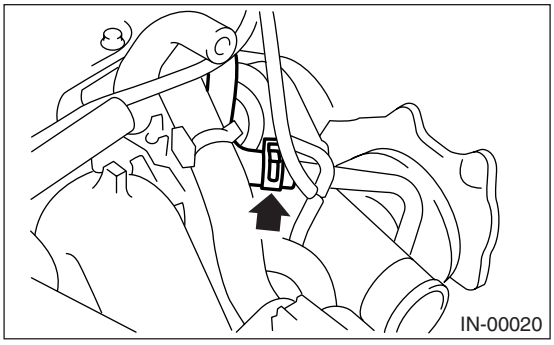
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



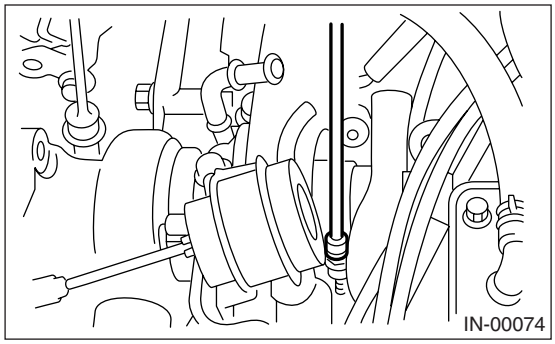
3) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
4) Lower the vehicle.
5) Separate the turbocharger joint pipe from turbocharger.



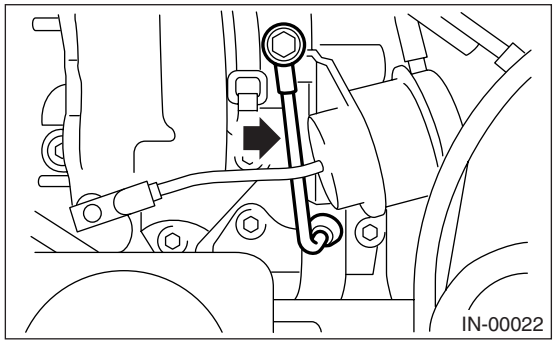
6) Disconnect the engine coolant hose which is connected to coolant filler tank.



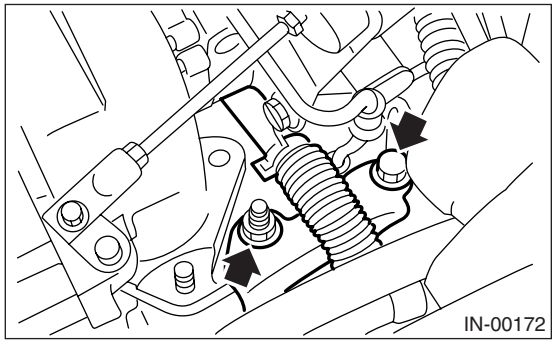
7) Loosen the clamp which secures the turbocharger to intake duct.



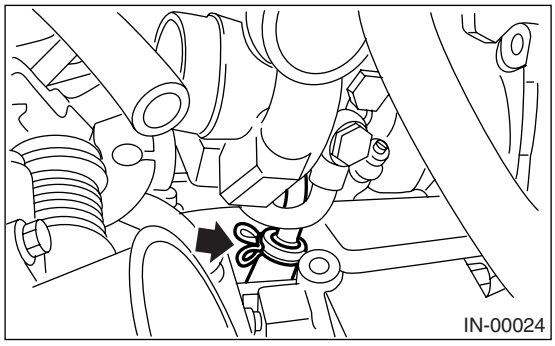
8) Remove the bolt which secures the bracket of oil pipe to turbocharger.
9) Remove the oil pipe from turbocharger.



10) Disconnect the engine coolant hose.
11) Remove the turbocharger bracket.



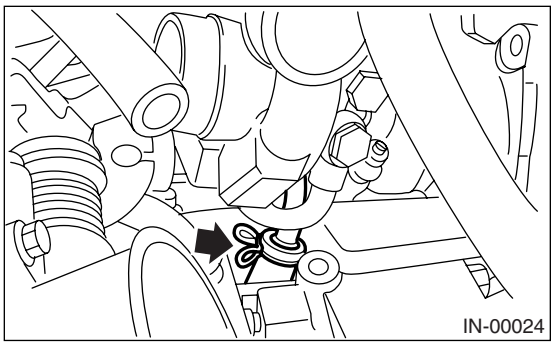
12) Disconnect the oil outlet hose from pipe.



13) Take out the turbocharger from engine compartment.

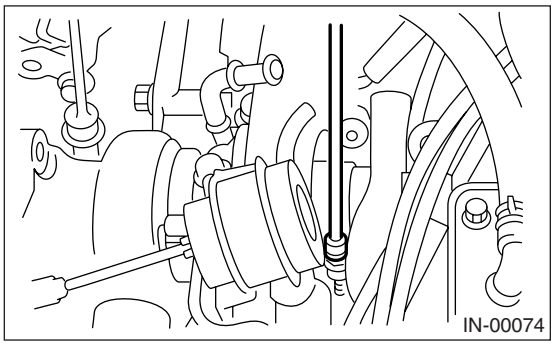
B: INSTALLATION

1) Connect the oil outlet hose to outlet pipe.



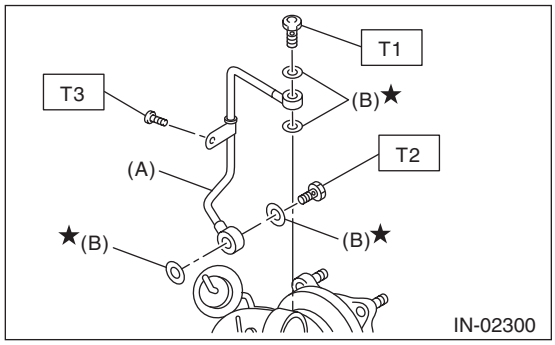
2) Install the turbocharger to intake duct.

Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)



3) Install the oil pipe to turbocharger.

Tightening torque:
T1: 16 N·m (1.6 kgf-m, 11.6 ft-lb)
T2: 29 N·m (3.0 kgf-m, 21.7 ft-lb)
T3: 4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

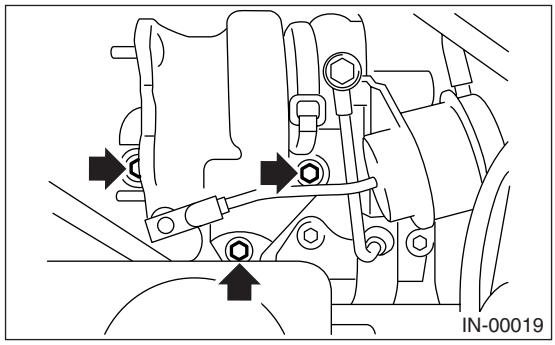


(A) Oil inlet pipe
(B) Metal gasket

4) Install the joint pipe to turbocharger.

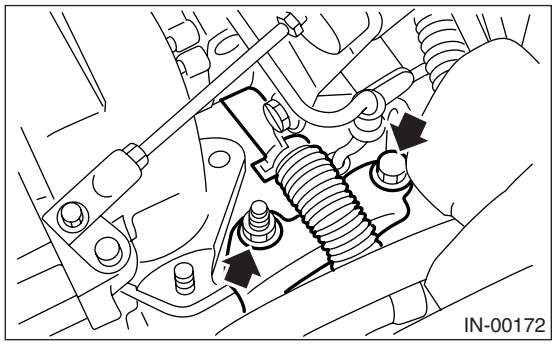
NOTE:
Replace the gasket with a new one.

Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

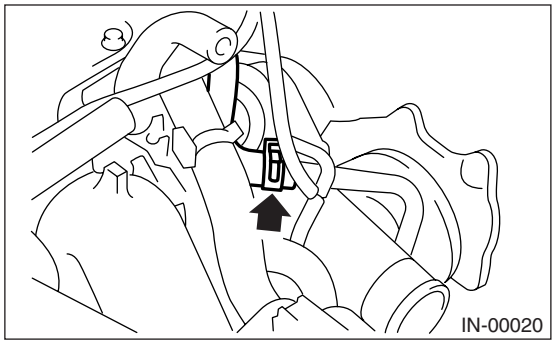


5) Connect the engine coolant hose.
6) Install the turbocharger bracket.

Tightening torque:
33 N·m (3.4 kgf-m, 24.6 ft-lb)



7) Connect the engine coolant hose which is connected to coolant filler tank.

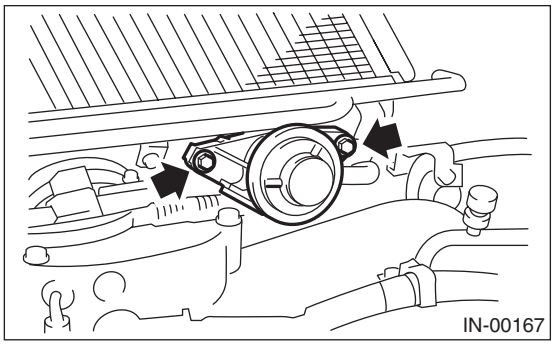


8) Lift-up the vehicle.
9) Install the center exhaust pipe. <Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>

7. Air By-pass Valve

A: REMOVAL

1) Remove the air by-pass valve from intercooler.

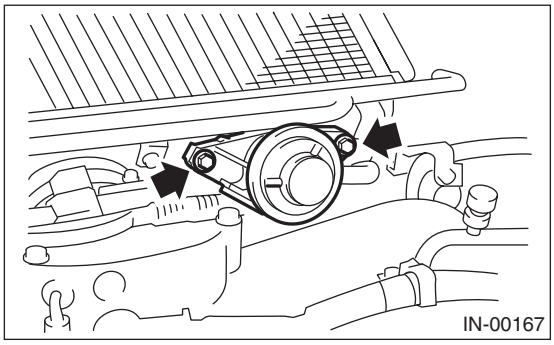


2) Disconnect the air by-pass hoses from air by-pass valve.

B: INSTALLATION

Install in the reverse order of removal.

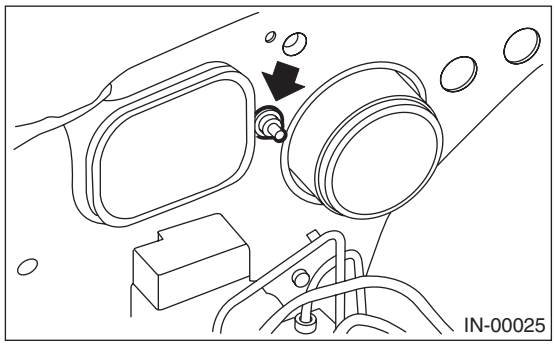
Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



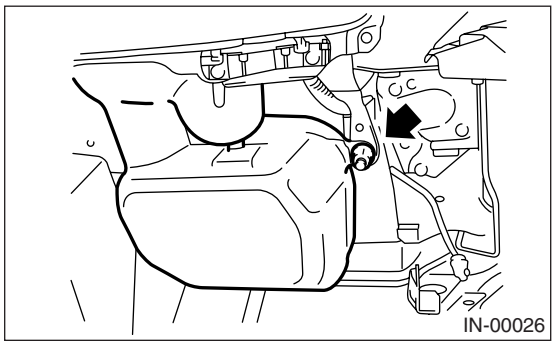
8. Resonator Chamber

A: REMOVAL

1) Set the vehicle on a lift.
2) Remove the air intake duct. <Ref. to IN(STi)-8, REMOVAL, Air Intake Duct.>
3) Remove the air cleaner lower case. <Ref. to IN(STi)-7, REMOVAL, Air Cleaner.>
4) Remove the resonator chamber mounting bolt on right side of engine compartment.



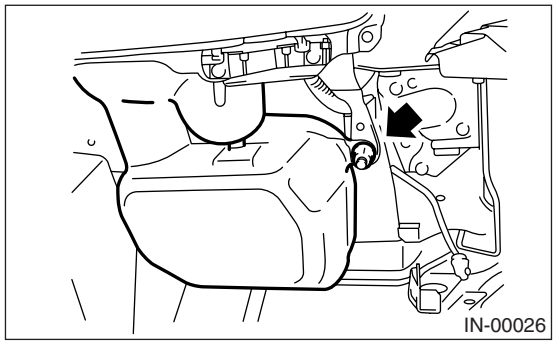
5) Remove the front right tire, and lift up the vehicle.
6) Remove the front mudguard RH.
7) Remove the resonator chamber from the inside front fender.

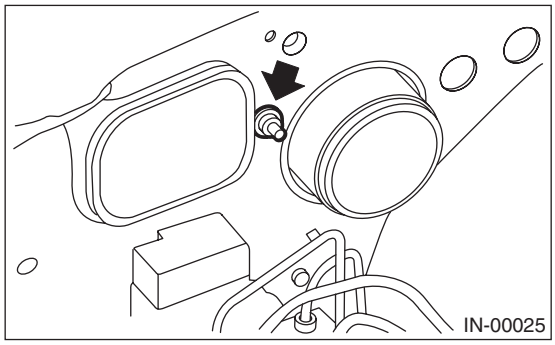


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)





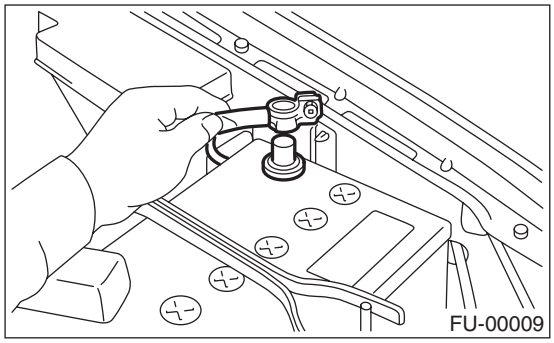
C: INSPECTION

Inspect for cracks and loose connections. Check that no foreign objects are mixed in resonator chamber.

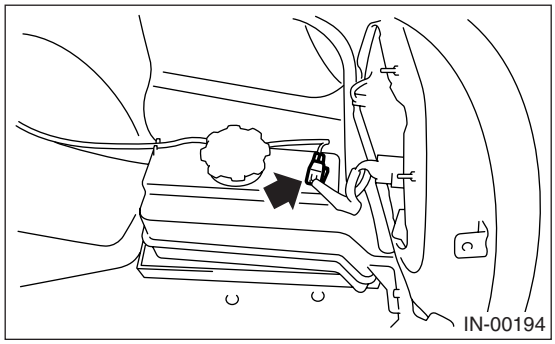
9. Intercooler Water Spray Tank

A: REMOVAL

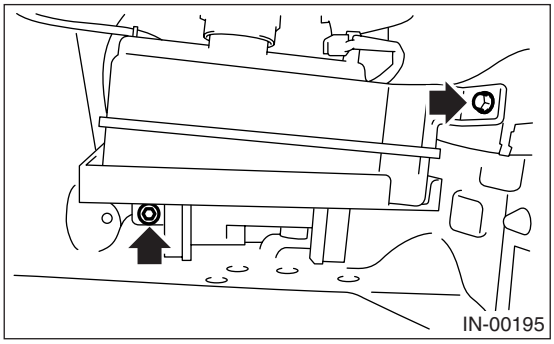
1) Disconnect the ground cable from battery.



2) Remove the trunk trim. <Ref. to EI-56, REMOVAL, Trunk Trim.>
3) Disconnect the water tank connector.



4) Remove the two water tank installation bolts.



5) Remove the hose between body and water tank, then remove the water tank.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
6.0 N·m (0.61 kgf-m, 4.4 ft-lb)

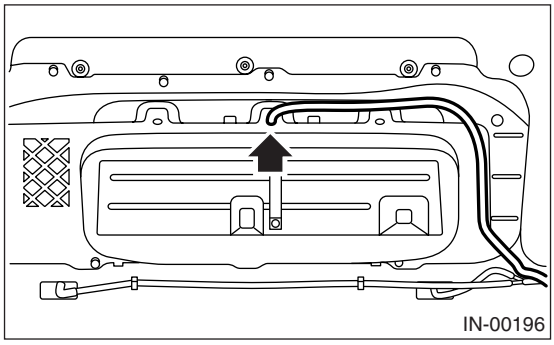
C: INSPECTION

1) Make sure the hose is not deformed, damaged, cracked or clogged.
2) Make sure the water tank is not damaged or cracked

10.Intercooler Water Spray Nozzle

A: REMOVAL

1) Open the front hood.
2) Disconnect the connecting part of hose.
3) Push the clip of nozzle upward with the clip pressed by fingers from inside of front hood.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Make sure the hose and nozzle are not deformed, damaged, cracked or clogged.

MECHANICAL

ME(STi)

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1. General Description

A: SPECIFICATIONS

Engine	Type			Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine
	Valve arrangement			Belt driven, double overhead camshaft, 4-valve/cylinder
	Bore × Stroke mm (in)			99.5 × 79.0 (3.917 × 3.110)
	Piston displacement cm^3 (cu in)			2,457 (150)
	Compression ratio			8.2
	Compression pressure (at 200 — 300 rpm) kPa (kgf/cm^2, psi)			981 — 1,177 (10 — 12, 142 — 171)
	Number of piston rings			Pressure ring: 2, Oil ring: 1
	Intake valve timing	Opening	Max. retard	ATDC 5°
			Min. advance	BTDC 15°
		Closing	Max. retard	ABDC 65°
			Min. advance	ABDC 45°
	Exhaust valve timing	Opening		BBDC 55°
		Closing		ATDC 5°
	Valve clearance	Intake mm (in)		$0.20^{+0.04}_{-0.06}$ ($0.0079^{+0.0016}_{-0.0024}$)
		Exhaust mm (in)		0.35±0.05 (0.0138±0.0020)
	Idling speed [At neutral position on MT] rpm			700±100 (No load) 800±100 (A/C switch ON)
	Firing order			1 → 3 → 2 → 4
	Ignition timing BTDC/rpm			17°±10°/700

NOTE:
STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter OS: Oversize US: Undersize

Belt tension adjuster	Protrusion of adjuster rod			5.2 — 6.2 mm (0.205 — 0.244 in)
Belt tensioner	Spacer O.D.			17.955 — 17.975 mm (0.7069 — 0.7077 in)
	Tensioner bush I.D.			18.0 — 18.08 mm (0.7087 — 0.7118 in)
	Clearance between spacer and bush		STD	0.025 — 0.125 mm (0.0010 — 0.0049 in)
			Limit	0.175 mm (0.0069 in)
	Side clearance of spacer		STD	0.2 — 0.55 mm (0.0079 — 0.0217 in)
			Limit	0.81 mm (0.0319 in)
Camshaft	Bend limit			0.020 mm (0.00079 in)
	Thrust clearance		STD	0.068 — 0.116 mm (0.0027 — 0.0046 in)
			Limit	0.14 mm (0.0055 in)
	Cam lobe height	Intake	STD	46.55 — 46.65 mm (1.833 — 1.837 in)
			Limit	46.45 mm (1.829 in)
		Exhaust	STD	46.75 — 46.85 mm (1.841 — 1.844 in)
			Limit	46.65 mm (1.837 in)
	Journal O.D.	STD	Front	37.946 — 37.963 mm (1.4939 — 1.4946 in)
			Center rear	29.946 — 29.963 mm (1.1790 — 1.1796 in)
	Oil clearance		STD	0.037 — 0.072 mm (0.0015 — 0.0028 in)
			Limit	0.10 mm (0.0039 in)
Cylinder head	Surface warpage limit			0.05 mm (0.0020 in)
	Surface grinding limit			0.3 mm (0.012 in)
	Standard height			127.5 mm (5.02 in)

Valve seat	Refacing angle			90°
	Contacting width	Intake	STD	1.0 mm (0.039 in)
			Limit	1.7 mm (0.067 in)
		Exhaust	STD	1.5 mm (0.059 in)
			Limit	2.2 mm (0.087 in)
Valve guide	Inner diameter			6.000 — 6.012 mm (0.2362 — 0.2367 in)
	Protrusion above head			15.8 — 16.2 mm (0.622 — 0.638 in)
Valve	Head edge thickness	Intake	STD	1.2 mm (0.047 in)
			Limit	0.8 mm (0.031 in)
		Exhaust	STD	1.5 mm (0.059 in)
			Limit	0.8 mm (0.031 in)
	Stem diameter		Intake	5.955 — 5.970 mm (0.2344 — 0.2350 in)
			Exhaust	5.945 — 5.960 mm (0.2341 — 0.2346 in)
	Stem oil clearance	STD	Intake	0.030 — 0.057 mm (0.0012 — 0.0022 in)
			Exhaust	0.040 — 0.067 mm (0.0016 — 0.0026 in)
		Limit	—	0.15 mm (0.0059 in)
	Overall length		Intake	104.4 mm (4.110 in)
			Exhaust	104.65 mm (4.120 in)
Valve spring	Free length			47.32 mm (1.863 in)
	Squareness			2.5°, 2.1 mm (0.083 in)
	Tension/spring height		Set	205 — 235 N (20.9 — 24.0 kgf, 46.1 — 52.8 lb)/ 36.0 mm (1.417 in)
			Lift	426 — 490 N (43.4 — 50.0 kgf, 95.8 — 110 lb)/ 26.50 mm (1.043 in)
Cylinder block	Surface warpage limit (mating with cylinder head)			0.05 mm (0.0020 in)
	Surface grinding limit			0.1 mm (0.004 in)
	Standard height			201.0 mm (7.91 in)
	Cylinder bore	STD	A	99.505 — 99.515 mm (3.9175 — 3.9179 in)
			B	99.495 — 99.505 mm (3.9171 — 3.9175 in)
	Taper		STD	0.015 mm (0.0006 in)
			Limit	0.050 mm (0.0020 in)
	Out-of-roundness		STD	0.010 mm (0.0004 in)
			Limit	0.050 mm (0.0020 in)
	Piston clearance		STD	–0.010 — 0.010 mm (–0.0004 — 0.0004 in)
			Limit	0.030 mm (0.0012 in)
	Enlarging (boring) limit			0.5 mm (0.020 in)
Piston	Outer diameter	STD	A	99.505 — 99.515 mm (3.9175 — 3.9179 in)
			B	99.495 — 99.505 mm (3.9171 — 3.9175 in)
		0.25 mm (0.0098 in) OS		99.745 — 99.765 mm (3.9270 — 3.9278 in)
		0.50 mm (0.0197 in) OS		99.995 — 100.015 mm (3.9368 — 3.9376 in)
Piston pin	Standard clearance between piston pin and hole in piston		STD	0.004 — 0.008 mm (0.0002 — 0.0003 in)
			Limit	0.020 mm (0.0008 in)
	Degree of fit			Piston pin must be fitted into position with thumb at 20°C (68°F).

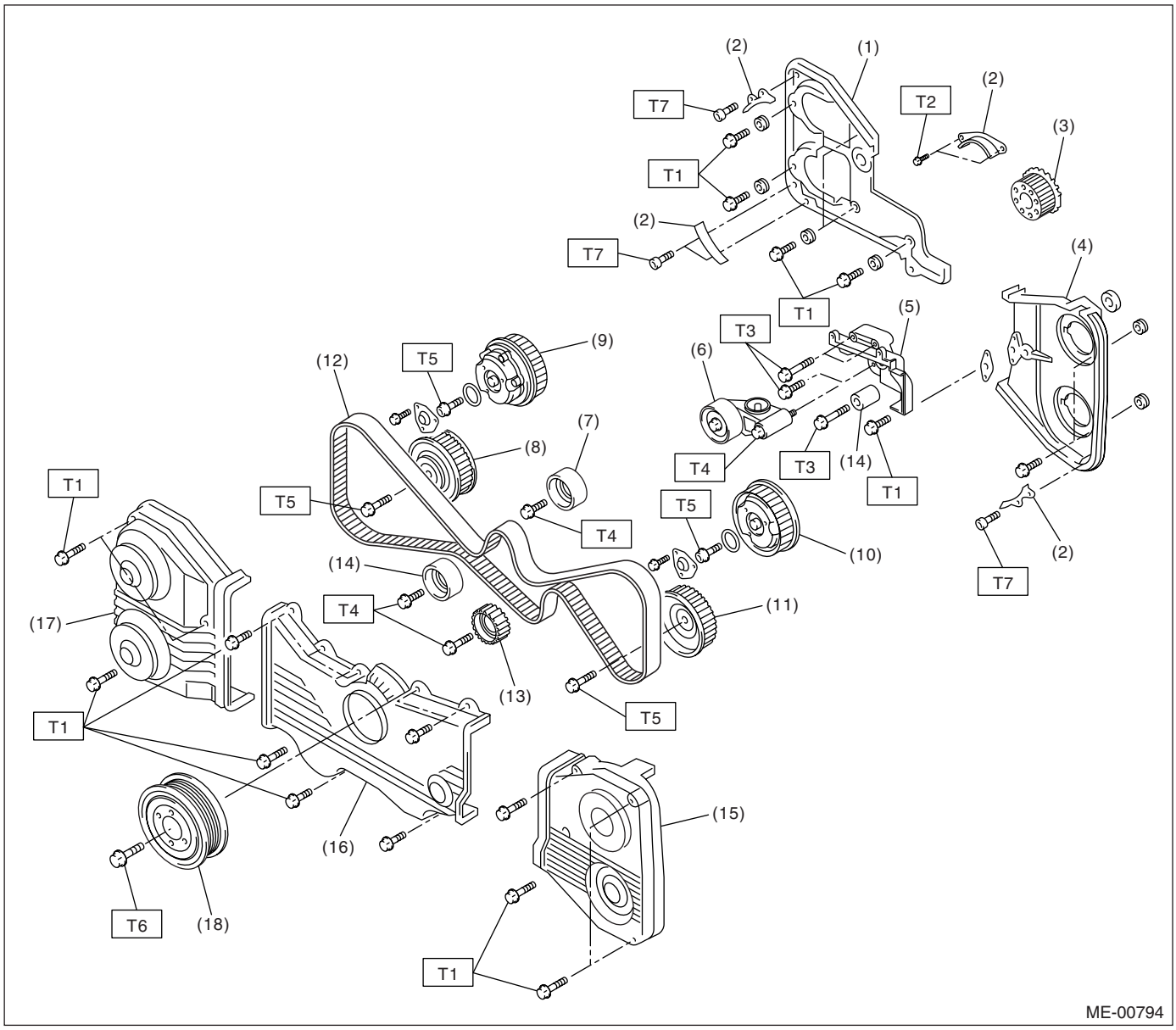
Piston ring	Piston ring gap	Top ring	STD	0.20 — 0.25 mm (0.0079 — 0.0098 in)
			Limit	1.0 mm (0.039 in)
		Second ring	STD	0.37 — 0.52 mm (0.015 — 0.020 in)
			Limit	1.0 mm (0.039 in)
		Oil ring	STD	0.20 — 0.50 mm (0.0079 — 0.020 in)
			Limit	1.5 mm (0.059 in)
	Clearance between piston ring and piston ring groove	Top ring	STD	0.040 — 0.080 mm (0.0016 — 0.0031 in)
			Limit	0.15 mm (0.0059 in)
		Second ring	STD	0.030 — 0.070 mm (0.0012 — 0.0028 in)
			Limit	0.15 mm (0.0059 in)
Connecting rod	Bend twist per 100 mm (3.94 in) in length		Limit	0.10 mm (0.0039 in)
	Side clearance		STD	0.070 — 0.330 mm (0.0028 — 0.0130 in)
			Limit	0.4 mm (0.016 in)
Connecting rod bearing	Oil clearance		STD	0.017 — 0.045 mm (0.0007 — 0.0018 in)
			Limit	0.05 mm (0.0020 in)
	Thickness at center portion		STD	1.490 — 1.502 mm (0.0587 — 0.0591 in)
			0.03 mm (0.0012 in) US	1.504 — 1.512 mm (0.0592 — 0.0595 in)
			0.05 mm (0.0020 in) US	1.514 — 1.522 mm (0.0596 — 0.0599 in)
			0.25 mm (0.0098 in) US	1.614 — 1.622 mm (0.0635 — 0.0639 in)
Connecting rod bushing	Clearance between piston pin and bushing		STD	0 — 0.022 mm (0 — 0.0009 in)
			Limit	0.030 mm (0.0012 in)

Crankshaft	Bend limit			0.035 mm (0.0014 in)
	Crank pin and crank journal	Out-of-roundness		0.005 mm (0.0002 in) or less
		Grinding limit		0.25 mm (0.0098 in)
	Crank pin outer diameter		STD	51.984 — 52.000 mm (2.0466 — 2.0472 in)
			0.03 mm (0.0012 in) US	51.954 — 51.970 mm (2.0454 — 2.0461 in)
			0.05 mm (0.0020 in) US	51.934 — 51.950 mm (2.0447 — 2.0453 in)
			0.25 mm (0.0098 in) US	51.734 — 51.750 mm (2.0368 — 2.0374 in)
	Crank journal outer diameter	#1, #3, #5	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
		#2, #4	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
	Thrust clearance		STD	0.030 — 0.115 mm (0.0012 — 0.0045 in)
			Limit	0.25 mm (0.0098 in)
	Oil clearance	#1	STD	0.003 — 0.030 mm (0.00012 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#2	STD	0.012 — 0.033 mm (0.0004 — 0.0012 in)
			Limit	0.045 mm (0.0018 in)
		#3	STD	0.003 — 0.030 mm (0.00012 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#4	STD	0.012 — 0.033 mm (0.0004 — 0.0012 in)
			Limit	0.045 mm (0.0018 in)
		#5	STD	0.010 — 0.031 mm (0.0004 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)

Crankshaft bearing	Crankshaft bearing thickness	#1, #3	STD	1.998 — 2.011 mm (0.0787 — 0.0792 in)
			0.03 mm (0.0012 in) US	2.017 — 2.020 mm (0.0794 — 0.0795 in)
			0.05 mm (0.0020 in) US	2.027 — 2.030 mm (0.0798 — 0.0799 in)
			0.25 mm (0.0098 in) US	2.127 — 2.130 mm (0.0837 — 0.0839 in)
		#2, #4, #5	STD	2.000 — 2.013 mm (0.0787 — 0.0793 in)
			0.03 mm (0.0012 in) US	2.019 — 2.022 mm (0.0795 — 0.0796 in)
			0.05 mm (0.0020 in) US	2.029 — 2.032 mm (0.0799 — 0.0800 in)
			0.25 mm (0.0098 in) US	2.129 — 2.132 mm (0.0838 — 0.0839 in)

B: COMPONENT

1. TIMING BELT

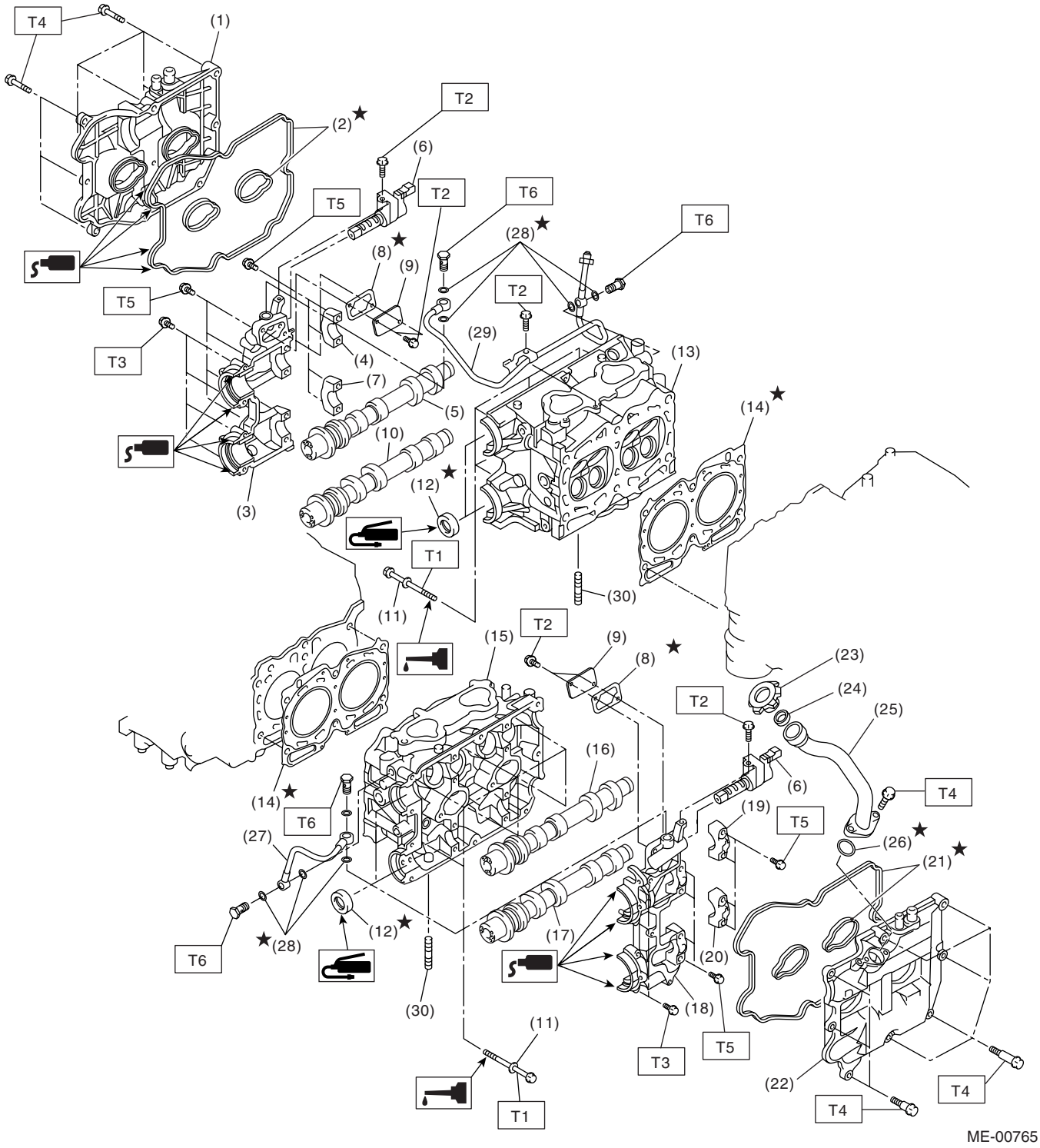


(1) Timing belt cover No. 2 (RH)
(2) Timing belt guide
(3) Crankshaft sprocket
(4) Timing belt cover No. 2 (LH)
(5) Tensioner bracket
(6) Automatic belt tension adjuster ASSY
(7) Belt idler
(8) Exhaust camshaft sprocket (RH)
(9) Intake camshaft sprocket (RH)
(10) Intake camshaft sprocket (LH)
(11) Exhaust camshaft sprocket (LH)
(12) Timing belt
(13) Belt idler No. 2
(14) Belt idler
(15) Timing belt cover (LH)
(16) Front belt cover
(17) Timing belt cover (RH)
(18) Crankshaft pulley

Tightening torque: N·m (kgf-m, ft-lb)

T1: 5 (0.5, 3.6)
T2: 10 (1.0, 7)
T3: 25 (2.5, 18.1)
T4: 39 (4.0, 28.9)
T5: <Ref. to ME(STi)-55, INSTALLATION, Crankshaft Sprocket.>
T6: <Ref. to ME(STi)-44, INSTALLATION, Crankshaft Pulley.>
T7: 6.4 (0.65, 4.7)

2. CYLINDER HEAD AND CAMSHAFT

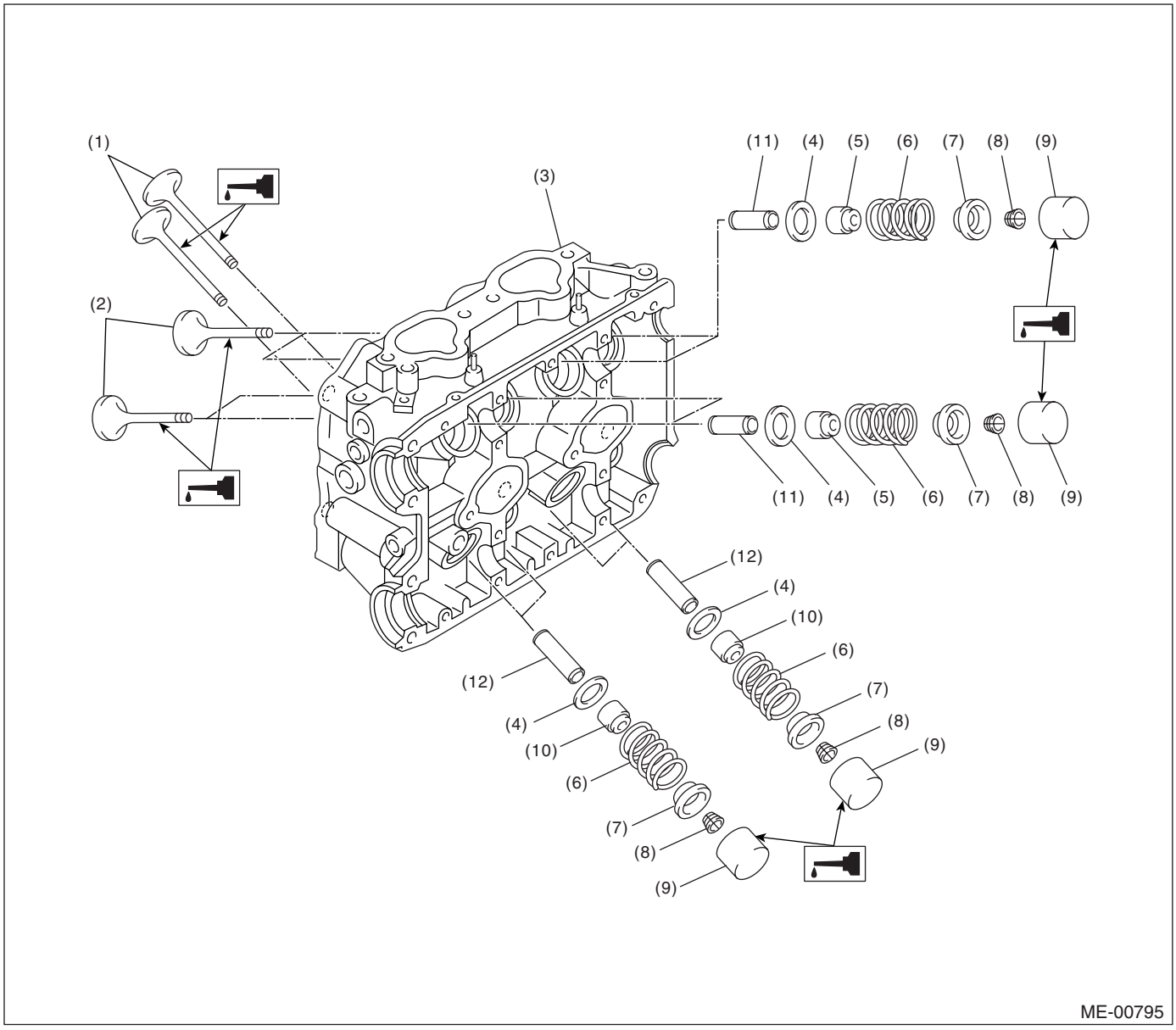


(1) Rocker cover (RH)
(2) Rocker cover gasket (RH)
(3) Camshaft cap (Front RH)
(4) Intake camshaft cap (RH)
(5) Intake camshaft (RH)
(6) Variable valve timing solenoid valve
(7) Exhaust camshaft cap (Center RH)
(8) Gasket
(9) Oil return cover
(10) Exhaust camshaft (RH)
(11) Cylinder head bolt
(12) Oil seal
(13) Cylinder head (RH)
(14) Cylinder head gasket
(15) Cylinder head (LH)
(16) Intake camshaft (LH)
(17) Exhaust camshaft (LH)
(18) Camshaft cap (Front LH)
(19) Intake camshaft cap (Rear LH)
(20) Exhaust camshaft cap (Rear LH)
(21) Rocker cover gasket (LH)
(22) Rocker cover (LH)
(23) Oil filler cap
(24) Gasket
(25) Oil filler duct
(26) O-ring
(27) Oil pipe (LH)
(28) Gasket
(29) Oil pipe (RH)
(30) Stud bolt

Tightening torque: N·m (kgf-m, ft-lb)

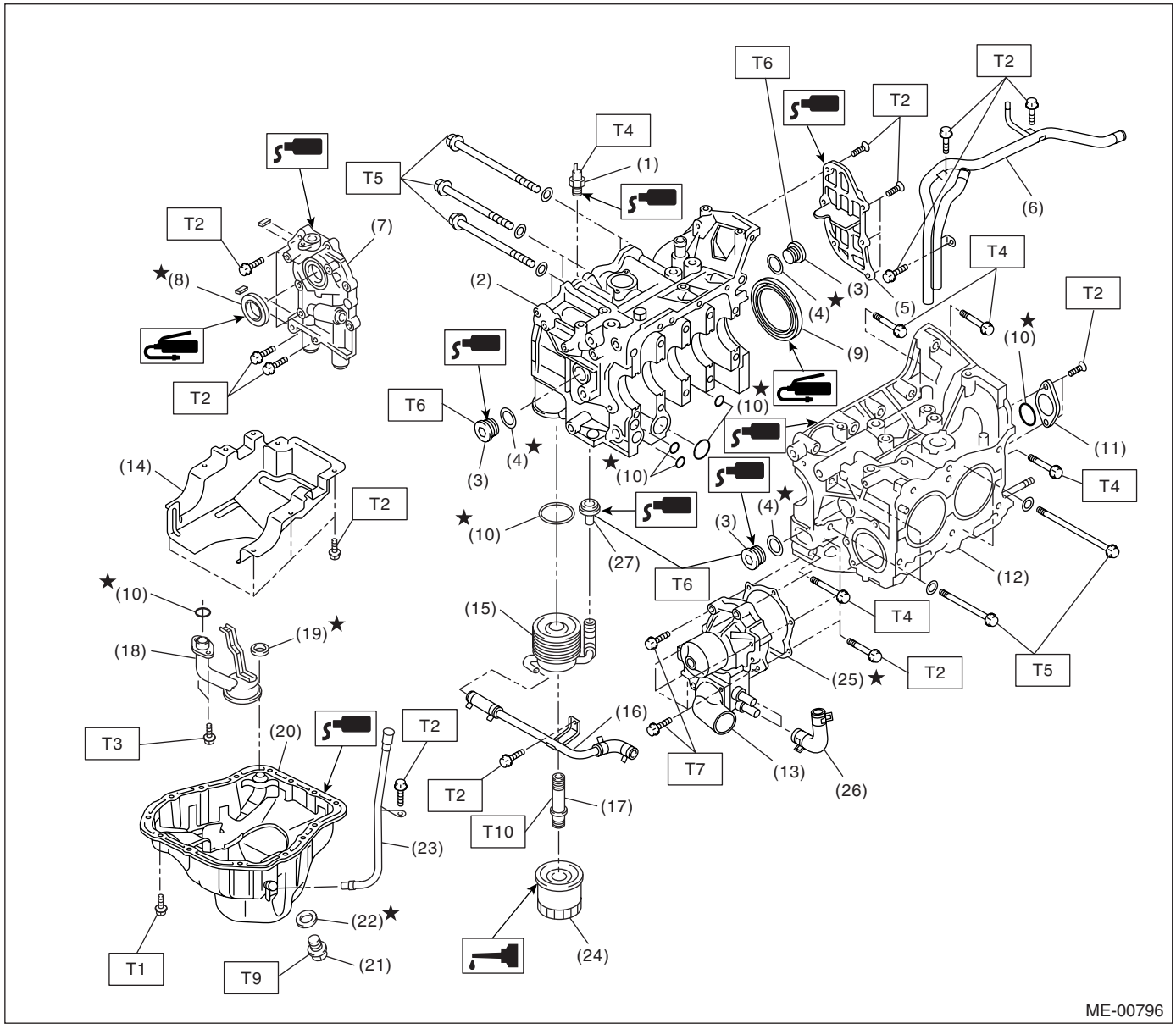
T1:	***<Ref. to ME(STi)-62, INSTALLATION, Cylinder Head Assembly.>***
T2:	***8 (0.8, 5.9)***
T3:	***10 (1.0, 7)***
T4:	***6.4 (0.65, 4.7)***
T5:	***20 (2.0, 14.5)***
T6:	***29 (3.0, 21.4)***

3. CYLINDER HEAD AND VALVE ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Cylinder head
(4) Valve spring seat
(5) Intake valve oil seal
(6) Valve spring
(7) Retainer
(8) Retainer key
(9) Valve lifter
(10) Exhaust valve oil seal
(11) Intake valve guide
(12) Exhaust valve guide

4. CYLINDER BLOCK



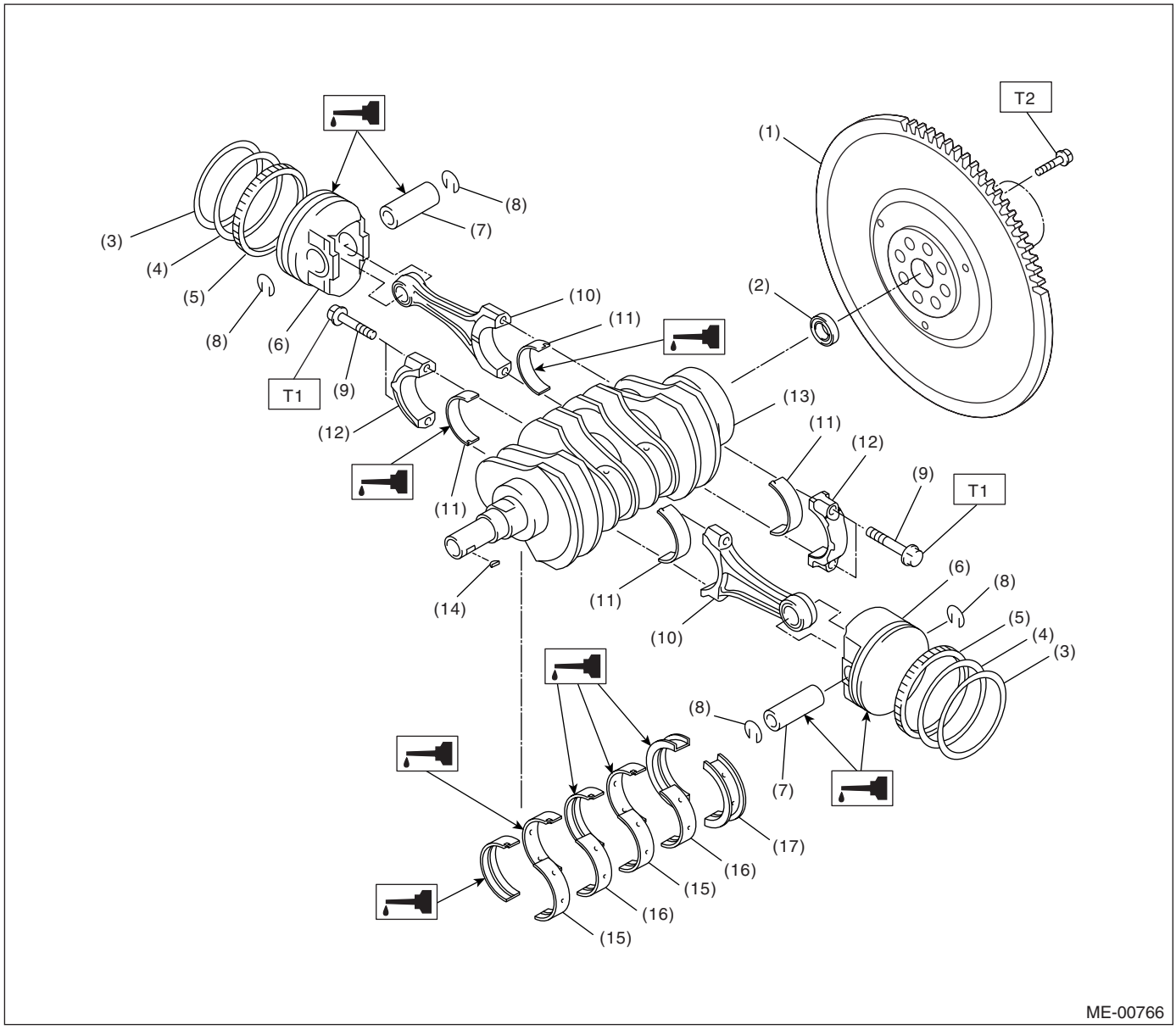
ME-00796

(1) Oil pressure switch
(2) Cylinder block (RH)
(3) Service hole plug
(4) Gasket
(5) Oil separator cover
(6) Water by-pass pipe
(7) Oil pump
(8) Front oil seal
(9) Rear oil seal
(10) O-ring
(11) Service hole cover
(12) Cylinder block (LH)
(13) Water pump
(14) Baffle plate
(15) Oil cooler
(16) Water by-pass pipe
(17) Connector
(18) Oil strainer
(19) Gasket
(20) Oil pan
(21) Drain plug
(22) Metal gasket
(23) Oil level gauge guide
(24) Oil filter
(25) Gasket
(26) Water pump hose
(27) Plug

Tightening torque: N·m (kgf-m, ft-lb)

T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7.2)
T4: 25 (2.5, 18.1)
T5: <Ref. to ME(STi)-73, INSTALLATION, Cylinder Block.>
T6: 69 (7.0, 50.9)
T7: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)
T8: 16 (1.6, 11.6)
T9: 44 (4.5, 33)
T10: 54 (5.5, 40)

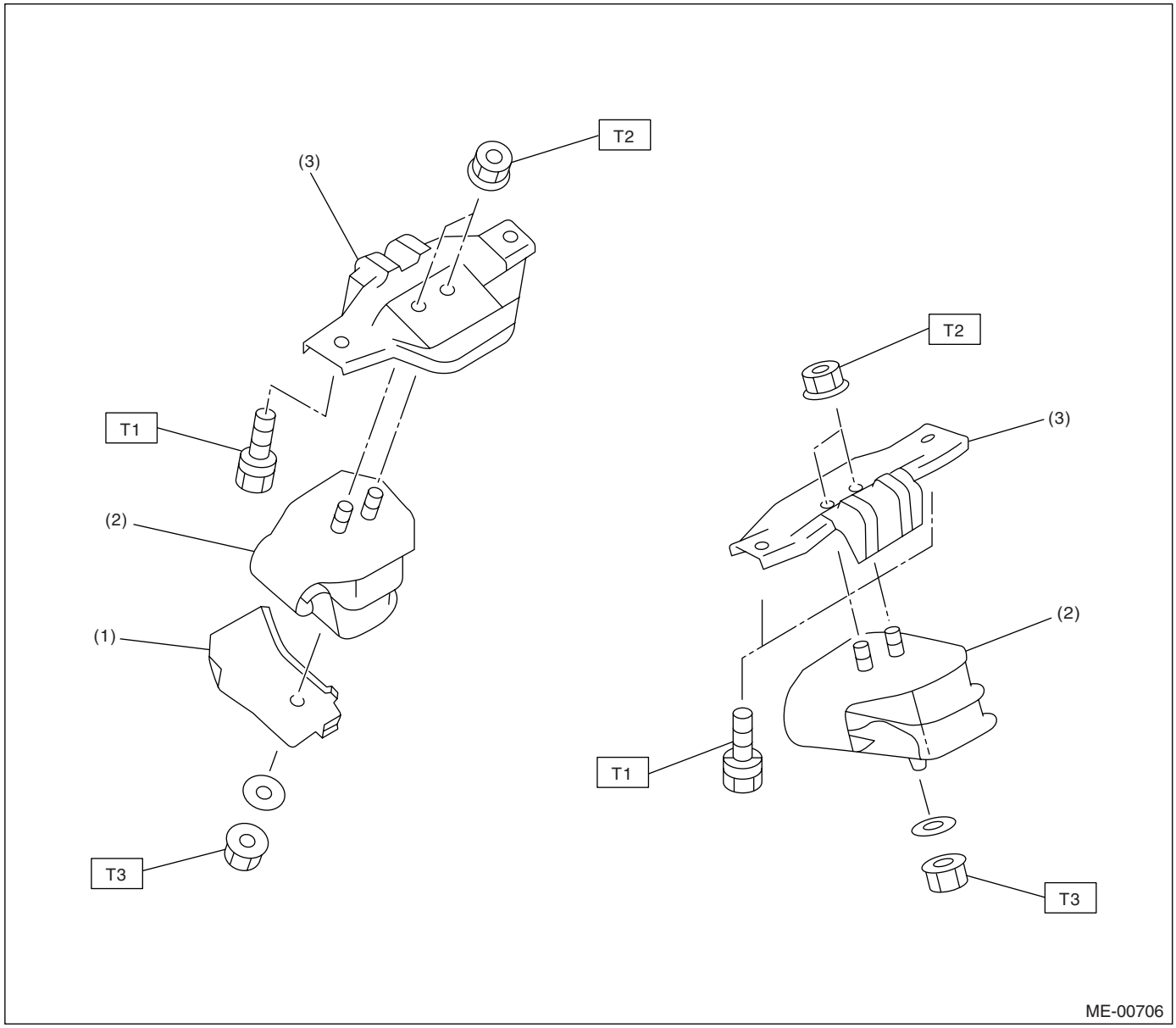
5. CRANKSHAFT AND PISTON



(1) Flywheel
(2) Ball bearing
(3) Top ring
(4) Second ring
(5) Oil ring
(6) Piston
(7) Piston pin
(8) Circlip
(9) Connecting rod bolt
(10) Connecting rod
(11) Connecting rod bearing
(12) Connecting rod cap
(13) Crankshaft
(14) Woodruff key
(15) Crankshaft bearing #1, #3
(16) Crankshaft bearing #2, #4
(17) Crankshaft bearing #5

Tightening torque: N·m (kgf-m, ft-lb)
T1: 52 (5.3, 38.4)
T2: 75 (7.6, 55.3)

6. ENGINE MOUNTING



(1) Heat shield cover
(2) Front cushion rubber
(3) Front engine mounting bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 25.8)
T2: 42 (4.3, 30.9)
T3: 85 (8.7, 62.7)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
• All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
• Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
• Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
• All removed parts, if to be reused, should be reinstalled in the original positions and directions.
• Bolts, nuts and washers should be replaced with new ones as required.
• Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
• Remove or install the engine in an area where chain hoists, lifting devices, etc. are available for ready use.
• Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
• Prior to starting work, prepare the following: Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
• Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

D: PREPARATION TOOL

1. SPECIAL TOOLS

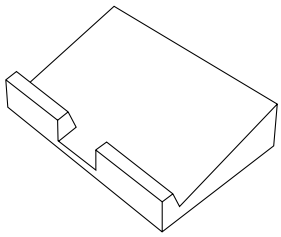
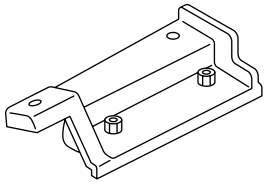
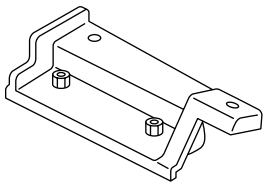
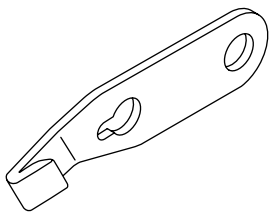
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498267600	498267600	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve springs.
 ST-498457000	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817000).
 ST-498457100	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817000).
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crankshaft pulley bolt, etc.

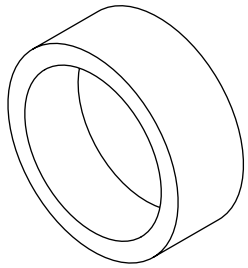
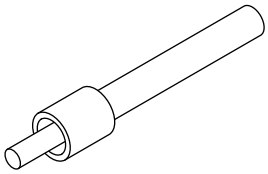
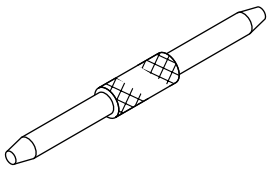
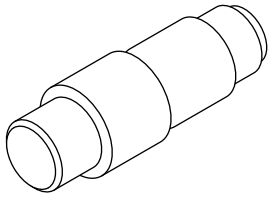
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398744300	498747300	PISTON GUIDE	Used for installing piston in cylinder for 2.5 L engine.
 ST-498857100	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 ST-499017100	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 ST-499037100	499037100	CONNECTING ROD BUSHING REMOVER & INSTALLER	Used for removing and installing connecting rod bushing.

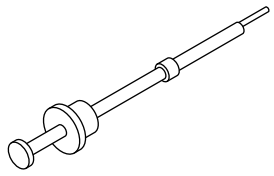
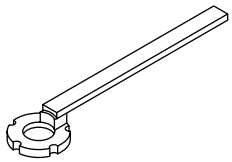
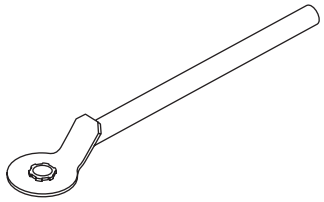
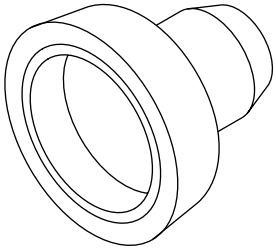
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499097600	499097600	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 ST-499207400	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing exhaust camshaft sprocket.
 ST-499977500	499977500	CAMSHAFT SPROCKET WRENCH	Used for removing and installing intake camshaft sprocket.
 ST-499587200	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).

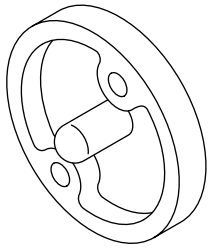
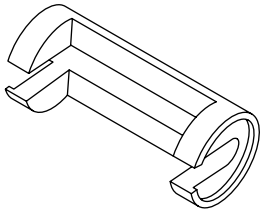
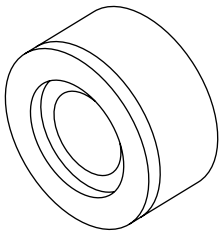
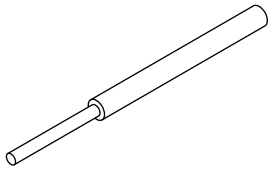
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499597100	499597100	CRANKSHAFT OIL SEAL GUIDE	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 ST18251AA020	18251AA020	VALVE GUIDE ADJUSTER	Used for installing intake and exhaust valve guides.
 ST-499767200	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.

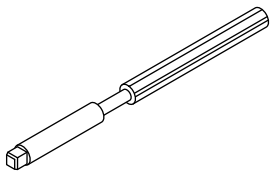
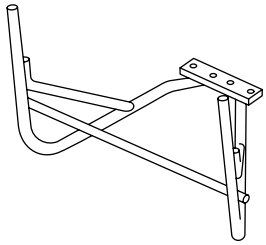
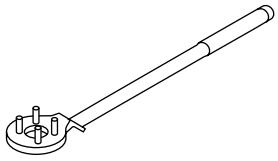
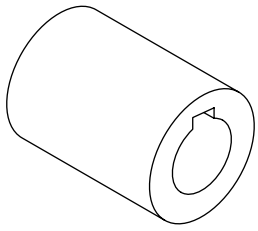
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499767400	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST-499817000	499817000	ENGINE STAND	• Stand used for engine disassembly and assembly. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).
 ST-499977100	499977100	CRANKSHAFT PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.

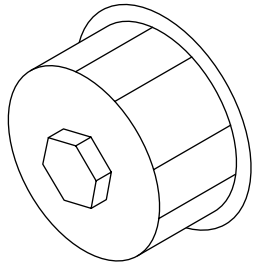
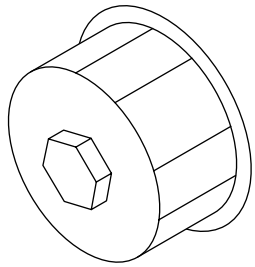
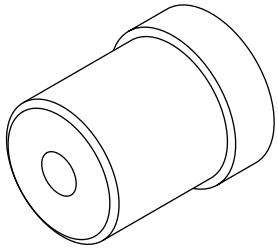
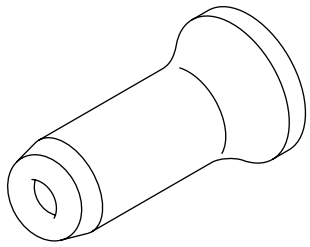
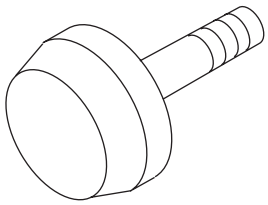
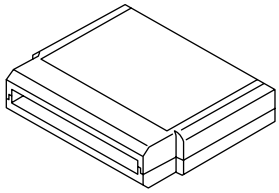
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing the oil filter. (Outer diameter : 68 mm (2.68 in))
 ST18332AA010	18332AA010	OIL FILTER WRENCH	Used for removing and installing the oil filter. (Outer diameter : 65 mm (2.56 in))
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.
 ST-499587600	499587600	OIL SEAL INSTALLER	Used for installing camshaft oil seal for DOHC engine.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499597200	499597200	OIL SEAL GUIDE	• Used for installing camshaft oil seal for DOHC engine. • Used with OIL SEAL GUIDE (499587600).
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Compression Gauge	Used for measuring compression.

E: PROCEDURE

It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- V-belt
- Timing Belt
- Camshaft
- Cylinder Head

2. Compression

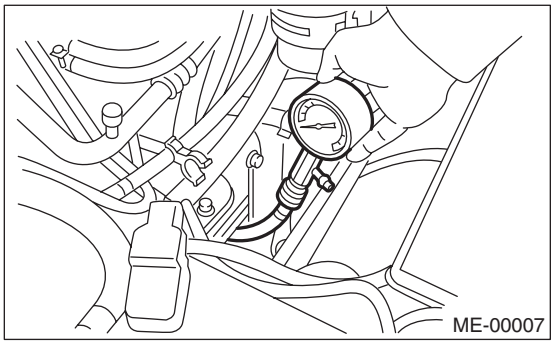
A: INSPECTION

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

1) After warming-up the engine, turn the ignition switch to OFF.
2) Make sure that the battery is fully charged.
3) Release the fuel pressure. <Ref. to FU(STi)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
4) Remove all the spark plugs. <Ref. to IG(STi)-4, REMOVAL, Spark Plug.>
5) Fully open the throttle valve.
6) Check the starter motor for satisfactory performance and operation.
7) Hold the compression gauge tight against spark plug hole.

NOTE:
When using a screw-in type compression gauge, the screw (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.

8) Crank the engine by means of starter motor, and then read the maximum value on the gauge when the pointer is steady.



9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):
Standard
981 — 1,177 kPa (10 — 12 kgf/cm^2, 142 — 171 psi)
Limit
882 kPa (9.0 kgf/cm^2, 128 psi)
Difference between cylinders
Less than 49 kPa (0.5 kgf/cm^2, 7 psi)

3. Idle Speed

A: INSPECTION

1. USING SUBARU SELECT MONITOR

1) Before checking the idle speed, check the following:
   (1) Ensure the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and that the hoses are connected properly.
   (2) Ensure the malfunction indicator light does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and then turn the ignition switch to OFF.
4) Insert the cartridge to SUBARU SELECT MONITOR.
5) Connect the SUBARU SELECT MONITOR to data link connector.
6) Turn the ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
7) Select the {2. Each System Check} in Main Menu.
8) Select the {Engine Control System} in Selection Menu.
9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.
10) Select the {1.12 Data Display} in Data Display Menu.
11) Start the engine, and then read the engine idle speed.
12) Check the idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF)

Idle speed [No load and gears in neutral]:
700±100 rpm

13) Check the idle speed when loaded. (Turn the air conditioning switch to “ON” and operate the compressor for at least 1 minute before measurement.)

Idle speed [A/C “ON”, no load and gears in neutral]:
800±100 rpm

NOTE:
As idle speed is controlled by the automatic adjustment type, it can not be adjusted manually. If the idle speed is out of specifications, refer to General On-board Diagnosis Table under “Engine Control System”. <Ref. to EN(STi)(diag)-2, Basic Diagnostic Procedure.>

4. Ignition Timing

A: INSPECTION

1. USING SUBARU SELECT MONITOR

1) Before checking the ignition timing speed, check the following:
   (1) Ensure the air cleaner element is free from clogging, spark plugs are in good condition, and that hoses are connected properly.
   (2) Ensure the malfunction indicator light does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and then turn the ignition switch to OFF.
4) Insert the cartridge to SUBARU SELECT MONITOR.
5) Connect the SUBARU SELECT MONITOR to data link connector.
6) Turn the ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
7) Select the {2. Each System Check} in Main Menu.
8) Select the {Engine Control System} in Selection Menu.
9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.
10) Select the {1.12 Data Display} in Data Display Menu.
11) Start the engine and check the ignition timing at idle speed.

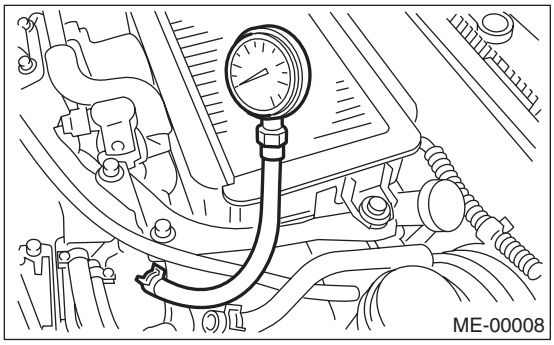
Ignition timing [BTDC/rpm]:
17°±10°/700

If the timing is not correct, check the ignition control system. Refer to Engine Control System. <Ref. to EN(STi)(diag)-2, Basic Diagnostic Procedure.>

5. Intake Manifold Vacuum

A: INSPECTION

1) Warm-up the engine.
2) Disconnect the brake vacuum hose, and then install the vacuum gauge to hose fitting on manifold.
3) Keep the engine at the idle speed, and then read the vacuum gauge indication.
By observing the gauge needle movement, the internal condition of engine can be diagnosed as described below.



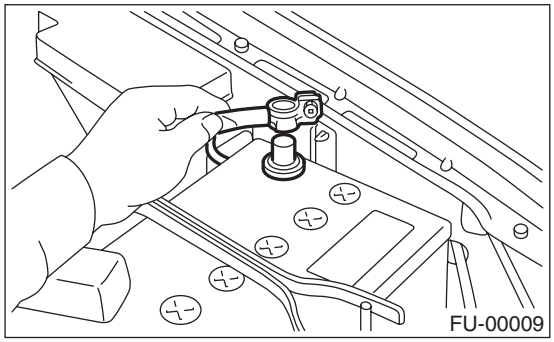
Vacuum pressure (at idling, A/C "OFF"):
Less than −60.0 kPa (−450 mmHg, −17.72 in-Hg)

Diagnosis of engine condition by measurement of manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket or disconnection or damaged vacuum hose
2. When engine speed is reduced slowly from higher speed, needle stops temporarily when it is lowering or becomes steady above normal position.	Back pressure too high, or exhaust system clogged
3. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
4. Needle drops suddenly and intermittently from normal position.	Sticky valves
5. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve springs
6. Needle vibrates above and below normal position in narrow range.	Defective ignition system or throttle chamber idle adjustment

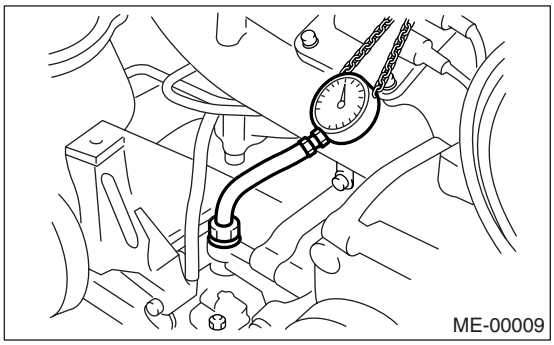
6. Engine Oil Pressure

A: INSPECTION

1) Remove the oil pressure switch from engine cylinder block. <Ref. to LU(STi)-18, REMOVAL, Oil Pressure Switch.>
2) Connect the oil pressure gauge hose to cylinder block.
3) Connect the battery ground cable to battery.



4) Start the engine, and then measure the oil pressure.



Oil pressure:
98 kPa (1.0 kgf/cm^2, 14 psi) or more at 800 rpm
294 kPa (3.0 kgf/cm^2, 43 psi) or more at 5,000 rpm

- If the oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU(STi)-21, INSPECTION, Engine Lubrication System Trouble in General.>
- If the oil pressure warning light is turned ON and oil pressure is in specification, replace the oil pressure switch. <Ref. to LU(STi)-21, INSPECTION, Engine Lubrication System Trouble in General.>

NOTE:
The specified data is based on an engine oil temperature of 80°C (176°F).

5) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU(STi)-18, INSTALLATION, Oil Pressure Switch.>

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

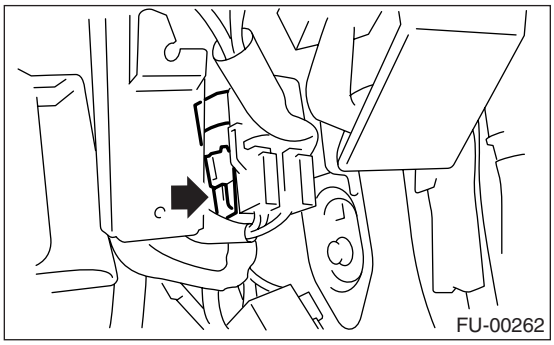
7. Fuel Pressure

A: INSPECTION

CAUTION:
Before removing the fuel pressure gauge, release the fuel pressure.

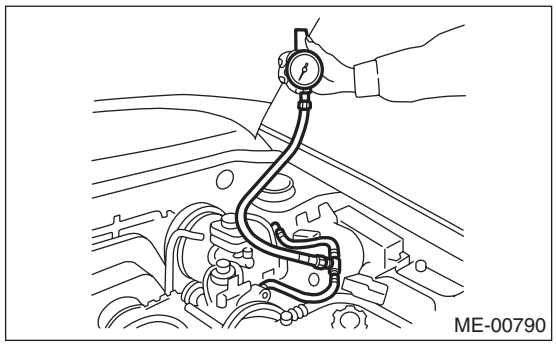
NOTE:
If out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.

1) Release the fuel pressure. <Ref. to FU(STi)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel flap lid, and then remove the fuel filler cap.
3) Disconnect the fuel delivery hoses, and then connect the fuel pressure gauge.
4) Connect the connector of fuel pump relay.



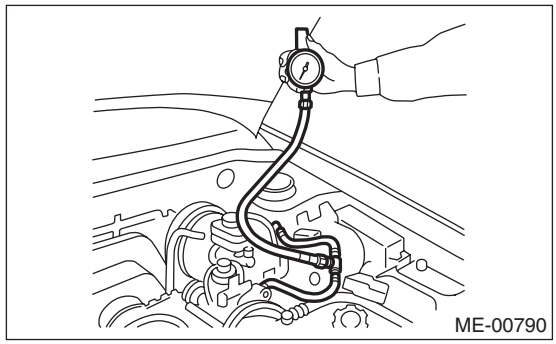
5) Start the engine.
6) Measure the fuel pressure while disconnecting the pressure regulator vacuum hose from intake manifold.

Fuel pressure:
Standard; 284 — 314 kPa (2.9 — 3.2 kgf/cm^2, 41 — 46 psi)



7) After connecting the pressure regulator vacuum hose, measure the fuel pressure.

Fuel pressure:
Standard; 230 — 260 kPa (2.35 — 2.65 kgf/cm^2, 33 — 38 psi)



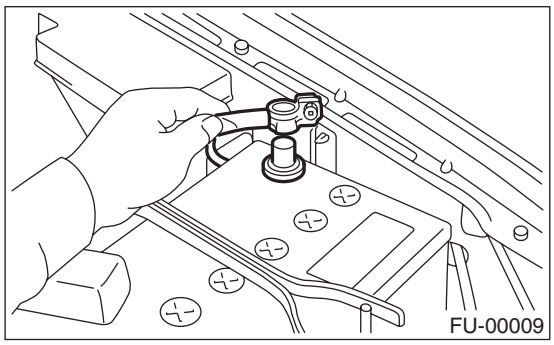
NOTE:
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm^2, 1 to 3 psi) higher than standard values during high-altitude operations.

8. Valve Clearance

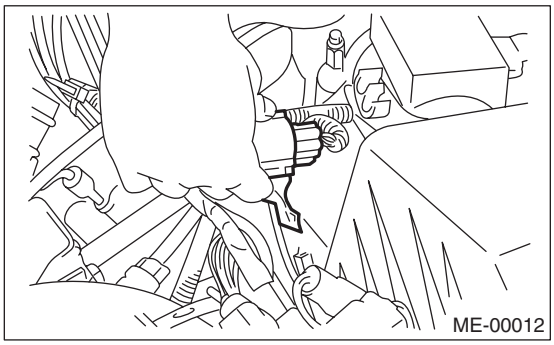
A: INSPECTION

Inspection and adjustment of the valve clearance should be performed while engine is cold.

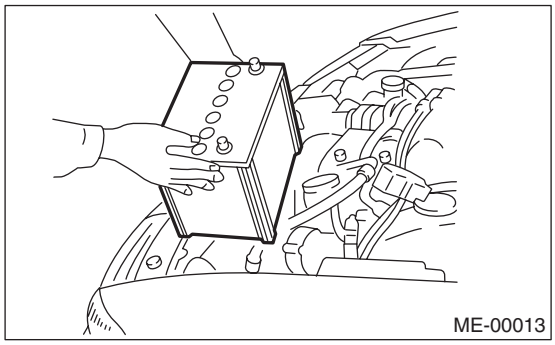
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



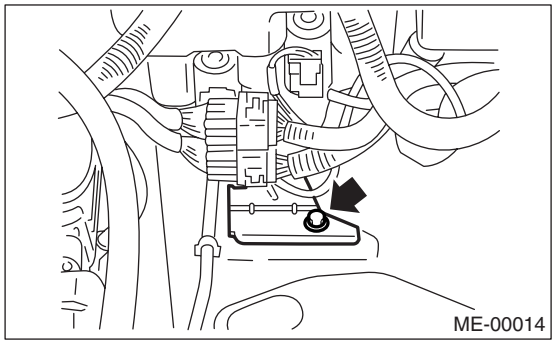
3) Remove the air intake duct. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Intake Duct.>
4) Remove the bolts which secure the timing belt cover (RH).
5) Lift-up the vehicle.
6) Remove the under cover.
7) Loosen the remaining bolts which secure the timing belt cover (RH), and then remove the timing belt cover.
8) Lower the vehicle.
9) When inspecting the #1 and #3 cylinders:
   (1) Pull out the engine harness connector with bracket from air cleaner upper cover.



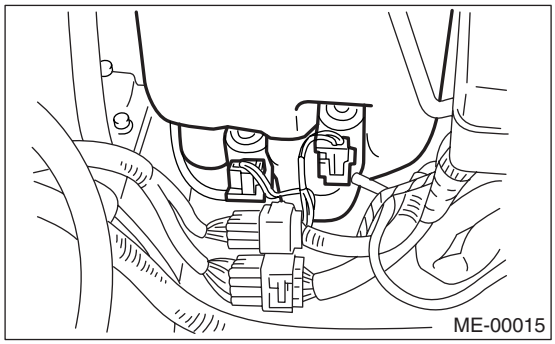
   (2) Remove the air cleaner case. <Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner.>
   (3) Disconnect the ignition coil connector.
   (4) Remove the ignition coil.
   (5) Place a suitable container under the vehicle.
   (6) Disconnect the PCV hose from rocker cover (RH).
   (7) Remove the bolts, and then remove the rocker cover (RH).
10) When inspecting the #2 and #4 cylinders:
   (1) Disconnect the battery cable, and then remove the battery and battery carrier.



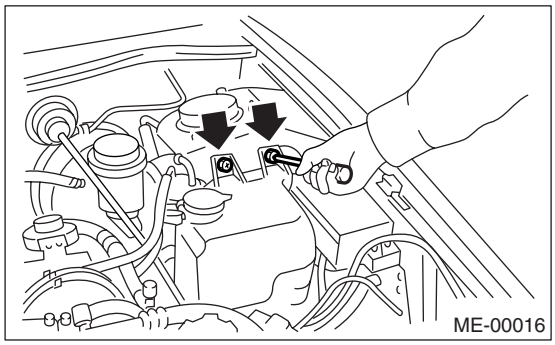
   (2) Remove the bolt which secures the engine harness bracket onto body.



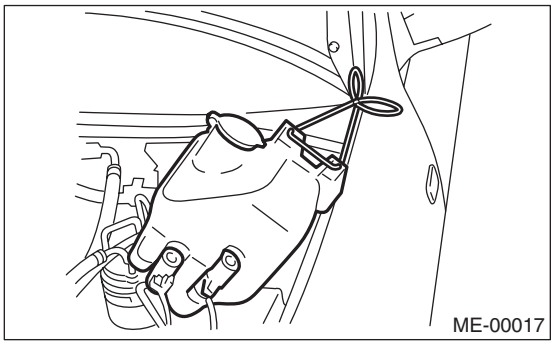
   (3) Disconnect the washer motor connectors.



   (4) Remove the washer tank mounting bolts.



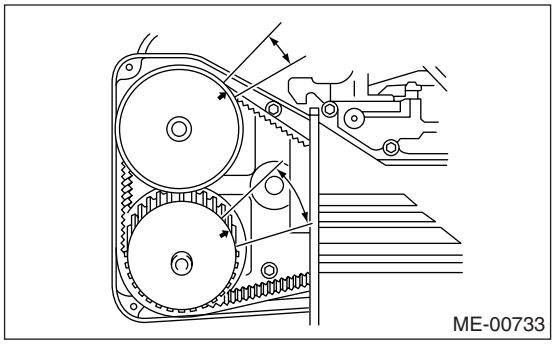
(5) Move the washer tank upward.



(6) Disconnect the ignition coil connector.
(7) Remove the ignition coil.
(8) Place a suitable container under the vehicle.
(9) Disconnect the PCV hose from rocker cover (LH).
(10) Remove the bolts, and then remove the rocker cover (LH).

11) Turn the crankshaft pulley clockwise until arrow mark on the camshaft sprocket is set to position shown in the figure.

NOTE:
Turn the crankshaft using socket wrench.

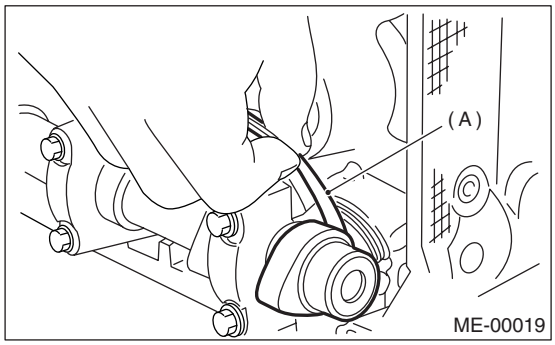


12) Measure the #1 cylinder intake valve and #3 cylinder exhaust valve clearance by using thickness gauge (A).

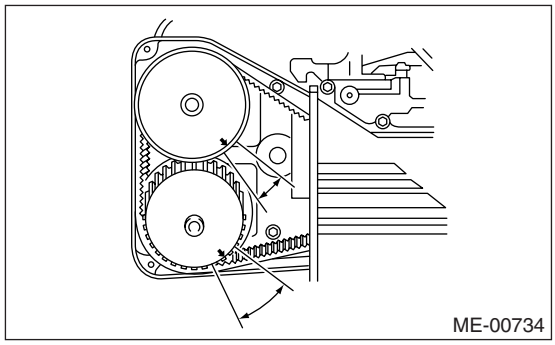
NOTE:
• Insert the thickness gauge in as horizontal a direction as possible with respect to the shim.
• Measure the exhaust valve clearances while lifting-up the vehicle.

Valve clearance:
Intake: $0.20^{+0.04}_{-0.06}$ mm ($0.0079^{+0.0016}_{-0.024}$ in)
Exhaust: 0.35±0.05 mm (0.0138±0.0020 in)

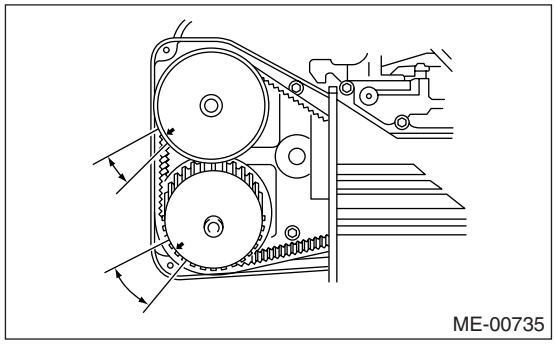
NOTE:
If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.



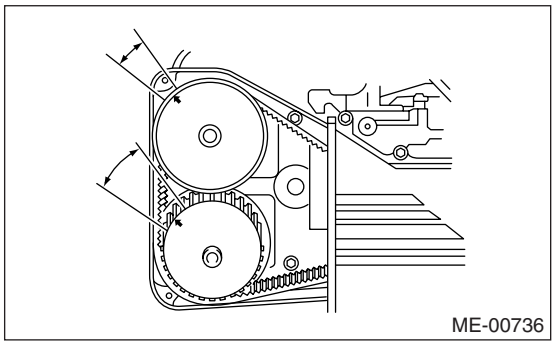
13) If necessary, adjust the valve clearance. <Ref. to ME(STi)-30, ADJUSTMENT, Valve Clearance.>
14) Further turn the crankshaft pulley clockwise. Using the same procedures described previously, and then measure the valve clearances again.
(1) Set the arrow mark on camshaft sprocket to position shown in the figure, and then measure the #2 cylinder exhaust valve and #3 cylinder intake valve clearances.



(2) Set the arrow mark on camshaft sprocket to position shown in the figure, and then measure the #2 cylinder intake valve and #4 cylinder exhaust valve clearances.

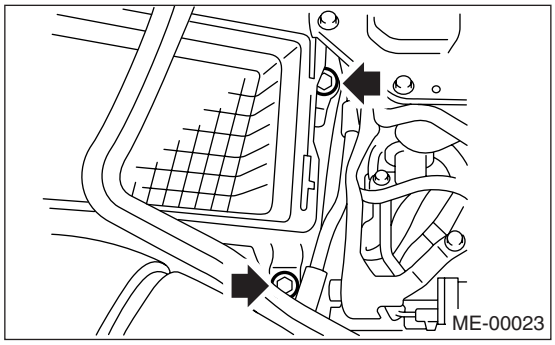


(3) Set the arrow mark on camshaft sprocket to position shown in the figure, and then measure the #1 cylinder exhaust valve and #4 cylinder intake valve clearances.


ME-00736

15) After inspection, install the related parts in the reverse order of removal.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)

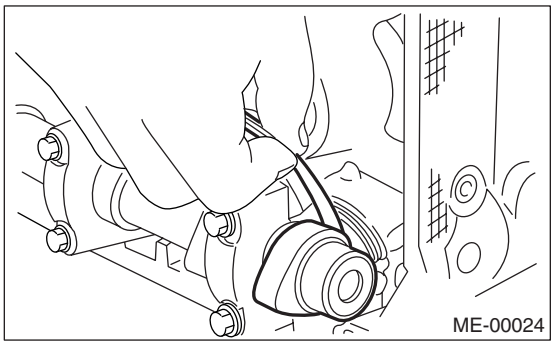

ME-00023

B: ADJUSTMENT

CAUTION:
Adjustment of the valve clearance should be performed while engine is cold.

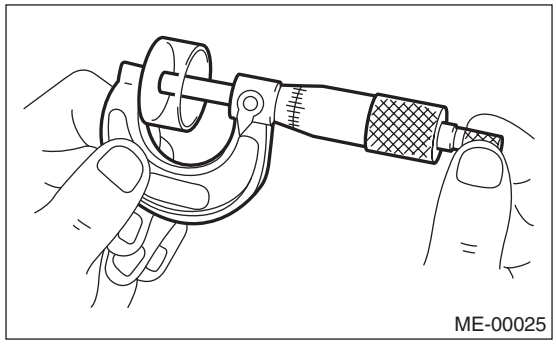
1) Measure all valve clearances. <Ref. to ME(STi)-28, INSPECTION, Valve Clearance.>

NOTE:
Record each valve clearance after it has been measured.


ME-00024

2) Remove the camshaft. <Ref. to ME(STi)-56, REMOVAL, Camshaft.>
3) Remove the valve lifter.

4) Measure the thickness of valve lifter with a micrometer.


ME-00025

5) Select a valve lifter of suitable thickness using measured valve clearance and valve lifter thickness, by referring to the following table.

Unit: mm
Intake valve: S = (V + T) – 0.20 Exhaust valve: S = (V + T) – 0.35
S: Required thickness of valve lifter V: Measured valve clearance T: Used valve lifter thickness

Part No.	Thickness mm (in)
13228 AB101	4.68 (0.1843)
13228 AB111	4.69 (0.1846)
13228 AB121	4.70 (0.1850)
13228 AB131	4.71 (0.1854)
13228 AB141	4.72 (0.1858)
13228 AB151	4.73 (0.1862)
13228 AB161	4.74 (0.1866)
13228 AB171	4.75 (0.1870)
13228 AB181	4.76 (0.1874)
13228 AB191	4.77 (0.1878)
13228 AB201	4.78 (0.1882)
13228 AB211	4.79 (0.1886)
13228 AB221	4.80 (0.1890)
13228 AB231	4.81 (0.1894)
13228 AB241	4.82 (0.1898)
13228 AB251	4.83 (0.1902)
13228 AB261	4.84 (0.1906)
13228 AB271	4.85 (0.1909)
13228 AB281	4.86 (0.1913)
13228 AB291	4.87 (0.1917)
13228 AB301	4.88 (0.1921)
13228 AB311	4.89 (0.1925)
13228 AB321	4.90 (0.1929)
13228 AB331	4.91 (0.1933)
13228 AB341	4.92 (0.1937)
13228 AB351	4.93 (0.1941)
13228 AB361	4.94 (0.1945)
13228 AB371	4.95 (0.1949)
13228 AB381	4.96 (0.1953)

Part No.	Thickness mm (in)
13228 AB391	4.97 (0.1957)
13228 AB401	4.98 (0.1961)
13228 AB411	4.99 (0.1965)
13228 AB421	5.00 (0.1969)
13228 AB431	5.01 (0.1972)
13228 AB441	5.02 (0.1976)
13228 AB451	5.03 (0.1980)
13228 AB461	5.04 (0.1984)
13228 AB471	5.05 (0.1988)
13228 AB481	5.06 (0.1992)
13228 AB491	5.07 (0.1996)
13228 AB501	5.08 (0.2000)
13228 AB511	5.09 (0.2004)
13228 AB521	5.10 (0.2008)
13228 AB531	5.11 (0.2012)
13228 AB541	5.12 (0.2016)
13228 AB551	5.13 (0.2020)
13228 AB561	5.14 (0.2024)
13228 AB571	5.15 (0.2028)
13228 AB581	5.16 (0.2031)
13228 AB591	5.17 (0.2035)
13228 AB601	5.18 (0.2039)
13228 AB611	5.19 (0.2043)
13228 AB621	5.20 (0.2047)
13228 AB631	5.21 (0.2051)
13228 AB641	5.22 (0.2055)
13228 AB651	5.23 (0.2059)
13228 AB661	5.24 (0.2063)
13228 AB671	5.25 (0.2067)
13228 AB681	5.26 (0.2071)
13228 AB691	5.27 (0.2075)
13228 AB701	4.38 (0.1724)
13228 AB711	4.40 (0.1732)
13228 AB721	4.42 (0.1740)
13228 AB731	4.44 (0.1748)
13228 AB741	4.46 (0.1756)
13228 AB751	4.48 (0.1764)
13228 AB761	4.50 (0.1771)
13228 AB771	4.52 (0.1780)
13228 AB781	4.54 (0.1787)
13228 AB791	4.56 (0.1795)
13228 AB801	4.58 (0.1803)
13228 AB811	4.60 (0.1811)
13228 AB821	4.62 (0.1819)
13228 AB831	4.64 (0.1827)
13228 AB841	4.66 (0.1835)
13228 AB851	5.29 (0.2083)
13228 AB861	5.31 (0.2091)
13228 AB871	5.33 (0.2098)
13228 AB881	5.35 (0.2106)
13228 AB891	5.37 (0.2114)

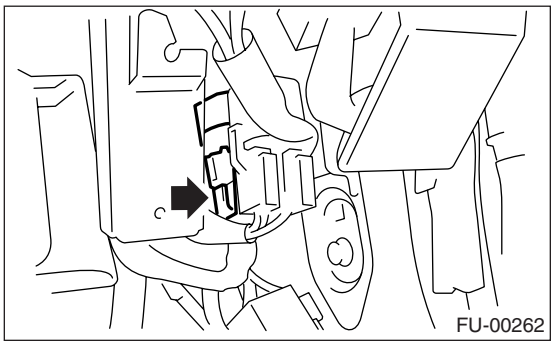
Part No.	Thickness mm (in)
13228 AB901	5.39 (0.2122)
13228 AB911	5.41 (0.2123)
13228 AB921	5.43 (0.2138)
13228 AB931	5.45 (0.2146)
13228 AB941	5.47 (0.2154)
13228 AB951	5.49 (0.2161)
13228 AB961	5.51 (0.2169)
13228 AB971	5.53 (0.2177)
13228 AB981	5.55 (0.2185)
13228 AB991	5.57 (0.2193)
13228 AC001	5.59 (0.2201)
13228 AC011	5.61 (0.2209)
13228 AC021	5.63 (0.2217)
13228 AC031	5.65 (0.2224)

6) Inspect all valves for clearance again at this stage. If the valve clearance is not correct, repeat the procedure over again from the first step.
7) After inspection, install the related parts in the reverse order of removal.

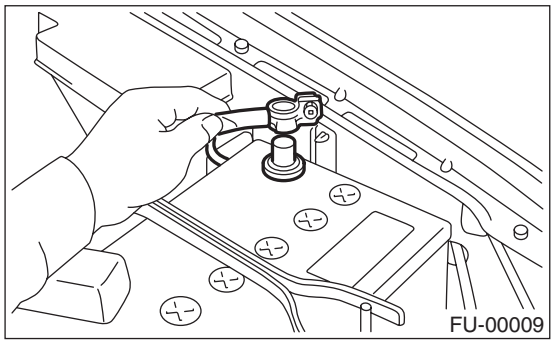
9. Engine Assembly

A: REMOVAL

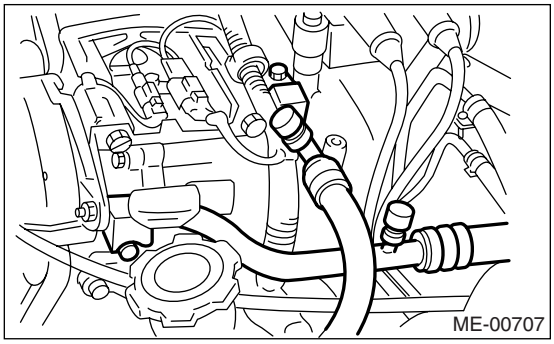
1) Set the vehicle on a lift.
2) Open the front hood fully, and then support with the hood stay.
3) Collect the refrigerant from A/C system.
4) Release the fuel pressure.
   (1) Disconnect the fuel pump relay connector.



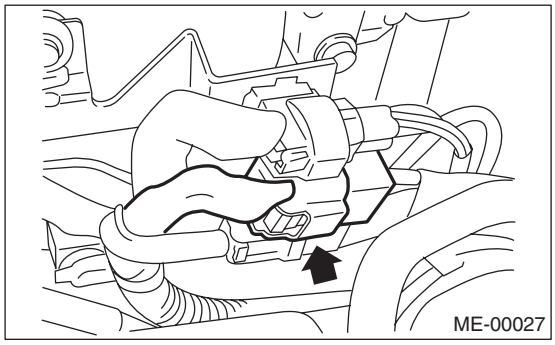
   (2) Start the engine, and run until stalls.
   (3) After the engine stalls, crank it for 5 seconds more.
   (4) Turn the ignition switch to OFF.
5) Remove the filler cap.
6) Disconnect the ground cable from battery.



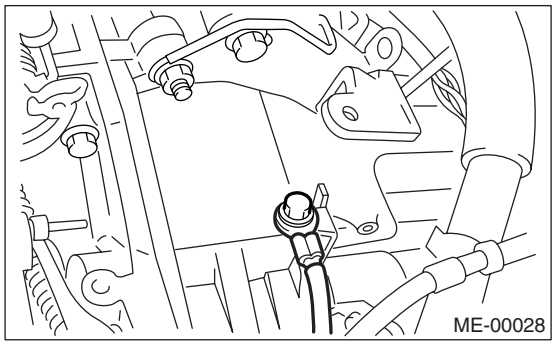
7) Remove the radiator from vehicle. <Ref. to CO(H4DOTC)-22, REMOVAL, Radiator.>
8) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-32, REMOVAL, Coolant Filler Tank.>
9) Disconnect the A/C pressure hoses from A/C compressor.



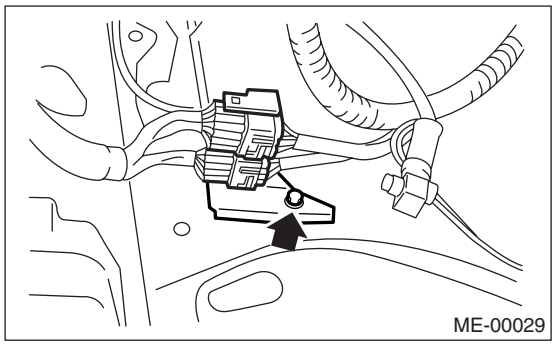
10) Remove the intercooler. <Ref. to IN(STi)-10, REMOVAL, Intercooler.>
11) Disconnect the following connectors and cable.
   (1) Engine harness connector



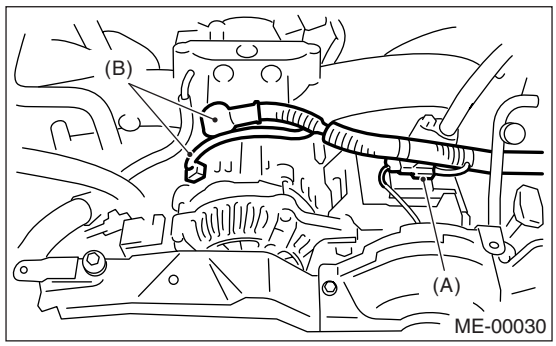
   (2) Engine ground terminal



   (3) Engine harness connector

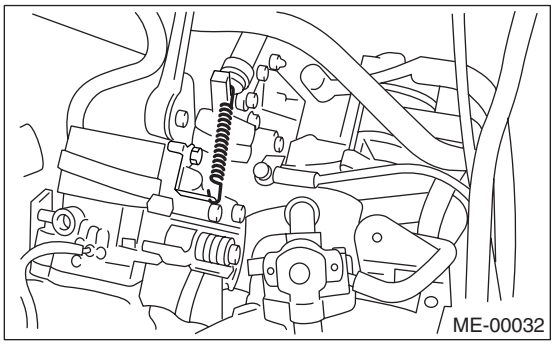


   (4) Generator connector, terminal and A/C compressor connectors

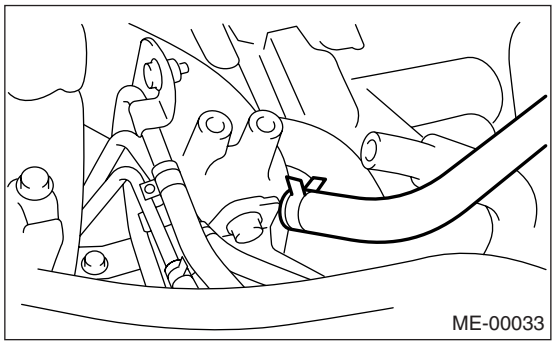


   (A) A/C compressor connector
   (B) Generator connector and terminal

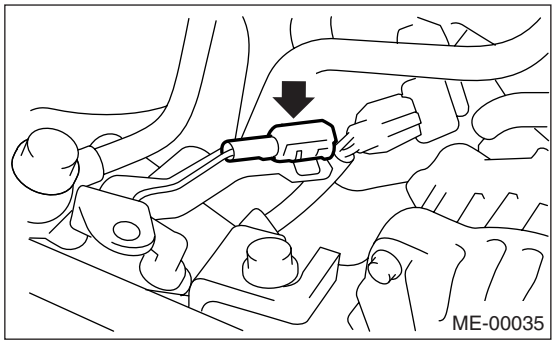
(5) Clutch release spring



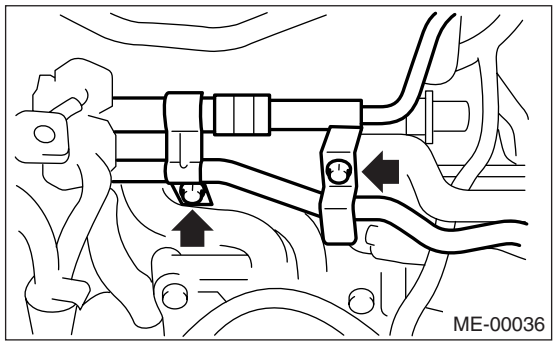
12) Disconnect the following hoses.
(1) Brake booster vacuum hose



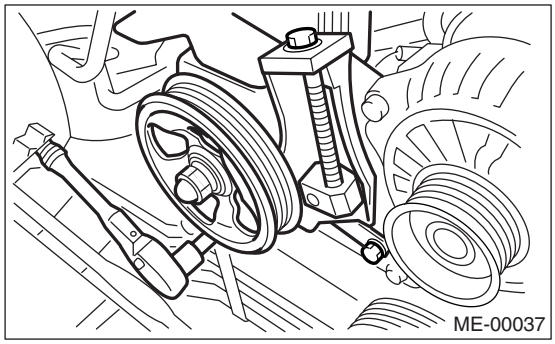
(2) Heater inlet outlet hose
13) Remove the power steering pump from bracket.
(1) Loosen the lock bolt and slider bolt, and then remove the front side V-belt. <Ref. to ME(STi)-41, FRONT SIDE BELT, REMOVAL, V-belt.>
(2) Disconnect the power steering switch connector.



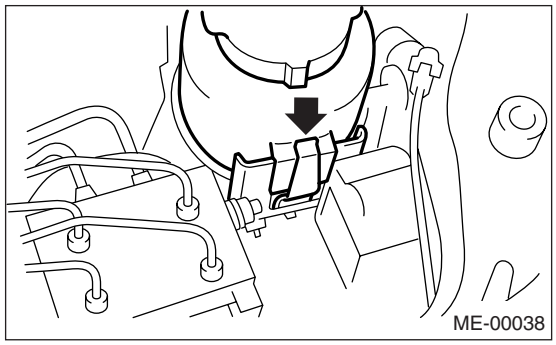
(3) Remove the pipe with bracket from intake manifold.



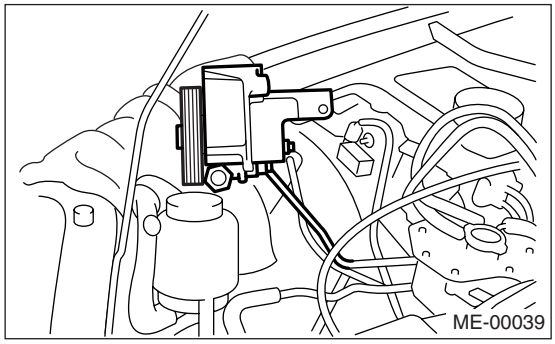
(4) Remove the power steering pump from engine.



(5) Remove the power steering tank from bracket by pulling it upward.

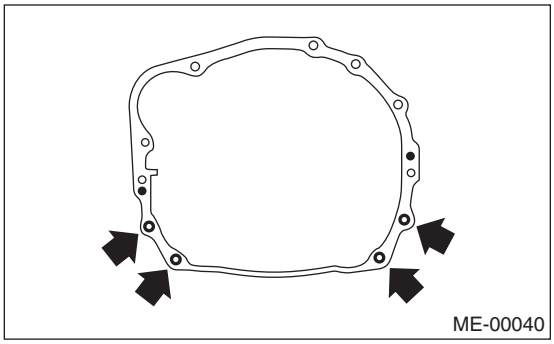


(6) Place the power steering pump on right side wheel apron.

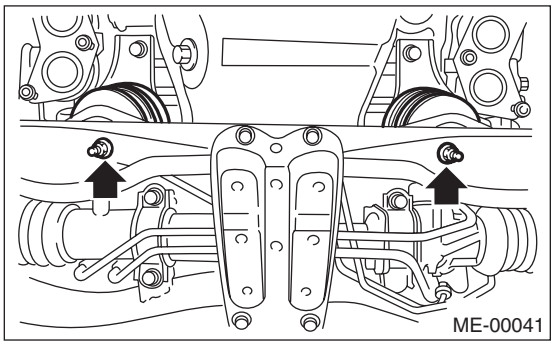


14) Lift-up the vehicle.
15) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>

16) Remove the nuts which hold the lower side of transmission to engine.



17) Remove the nuts which install the front cushion rubber onto front crossmember.

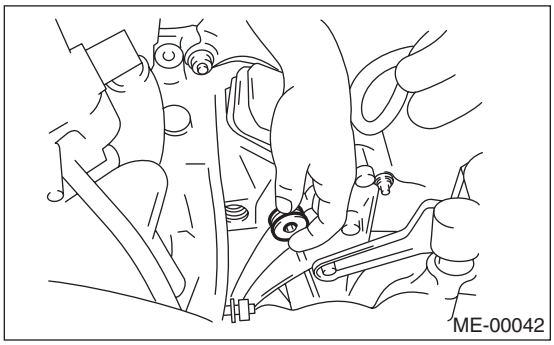


18) Lower the vehicle.

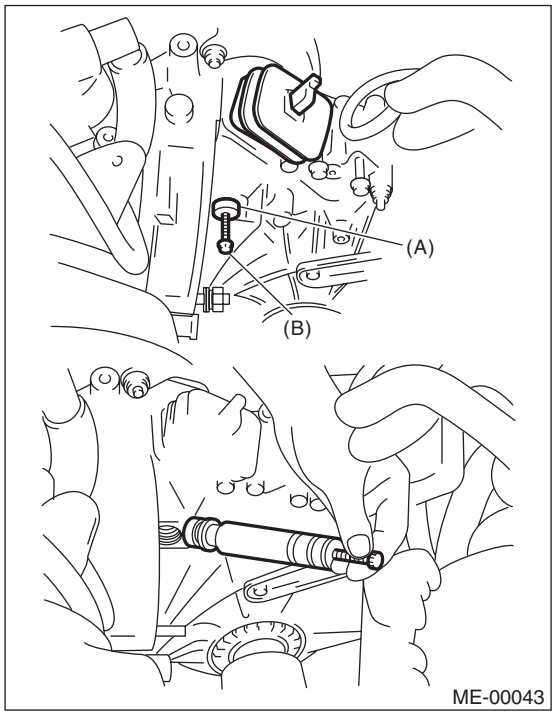
19) Separate the clutch release fork from release bearing.

(1) Remove the clutch operating cylinder from transmission.

(2) Remove the plug using a 10 mm hexagon wrench.



(3) Screw the 6 mm dia. bolt into release fork shaft, and remove it.

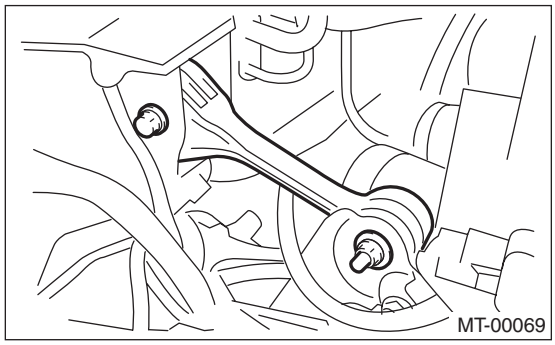


(A) Shaft
(B) Bolt

(4) Raise the release fork, and then unfasten the release bearing tabs to free release fork.

NOTE:
Step (4) is required to prevent interference with engine when removing the engine from transmission.

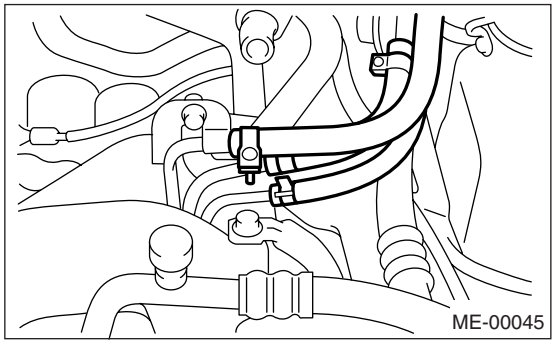
20) Remove the pitching stopper.



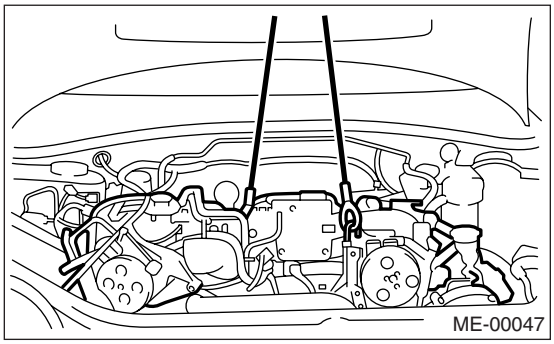
21) Disconnect the fuel delivery hose, return hose and evaporation hose.

NOTE:
- Catch fuel from the hose into container.

• Disconnect the hose with its end wrapped with cloth to prevent fuel from splashing.

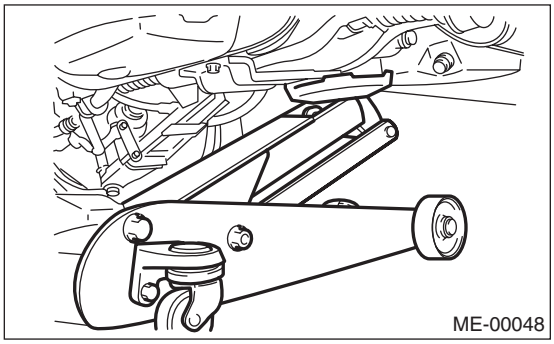

ME-00045

22) Support the engine with a lifting device and wire ropes.


ME-00047

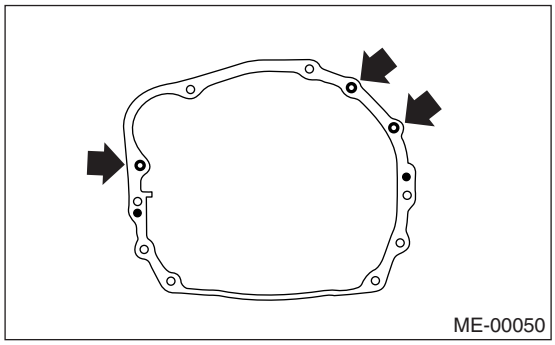
23) Support the transmission with a garage jack.

NOTE:
Before moving the engine away from transmission, check to be sure no work has been overlooked. Doing this is very important in order to facilitate re-installation and because transmission lowers under its own weight.


ME-00048

24) Separation of the engine and transmission.
(1) Remove the starter. <Ref. to SC(H4SO)-7, REMOVAL, Starter.>

(2) Remove the bolts which hold the right upper side of transmission to engine.


ME-00050

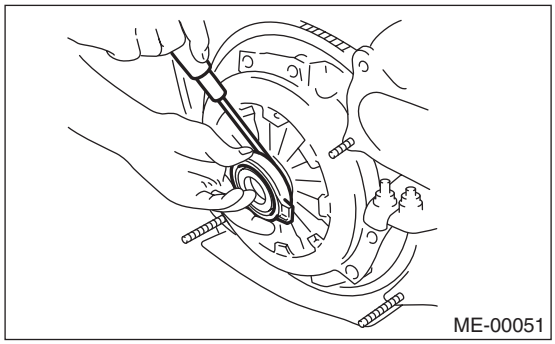
25) Remove the engine from vehicle.
(1) Slightly raise the engine.
(2) Raise the transmission with garage jack.
(3) Move the engine horizontally until the mainshaft is withdrawn from clutch cover.
(4) Slowly move the engine away from engine compartment.

NOTE:
Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

26) Remove the front cushion rubbers.

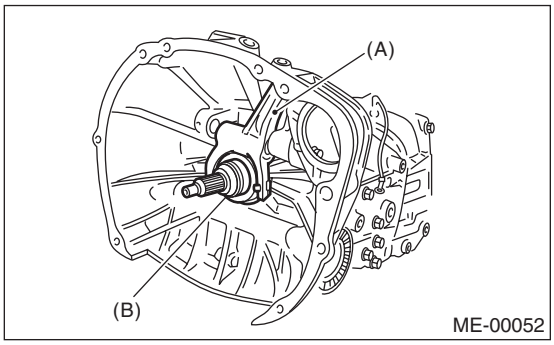
B: INSTALLATION

1) Install the clutch release fork and bearing onto transmission.
(1) Remove the release bearing from clutch cover with flat type screw driver.


ME-00051

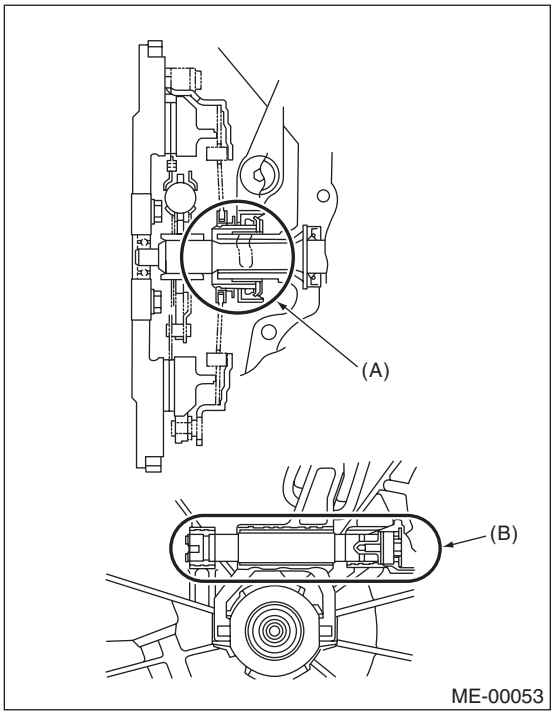
(2) Install the release bearing on transmission.

(3) Install the release fork into release bearing tab.



(A) Release fork
(B) Release bearing

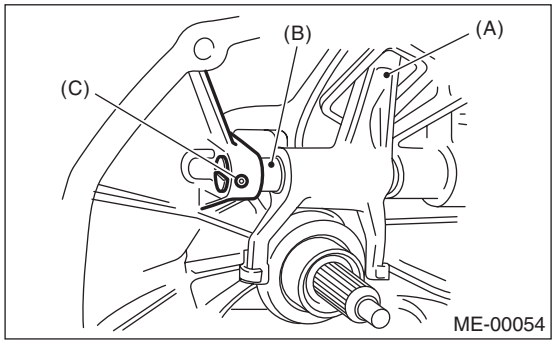
(4) Apply grease to the specified points.
- Spline FX2200
- Shaft SUNLIGHT 2



(A) Spline (FX2200)
(B) Shaft (SUNLIGHT 2)

(5) Insert the release fork shaft into release fork.

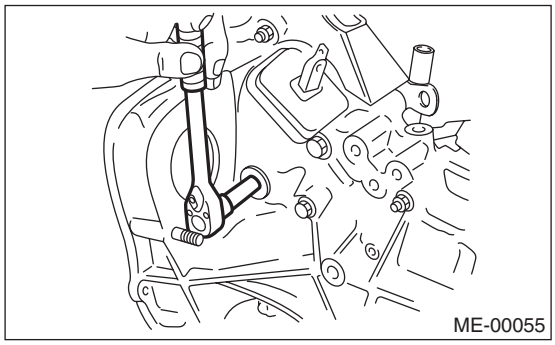
CAUTION:
Make sure the cutout portion of release fork shaft contacts spring pin.



(A) Release fork
(B) Release shaft
(C) Spring pin

(6) Tighten the plug.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)



2) Install the front cushion rubbers to engine.

Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

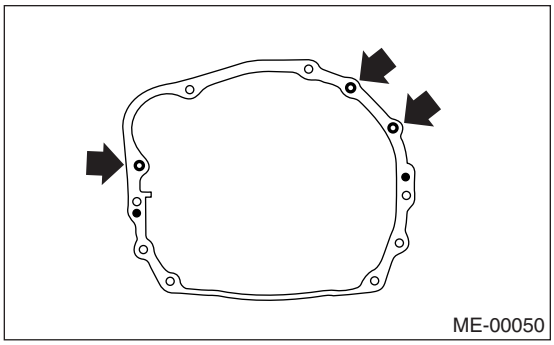
3) Install the engine onto transmission.
(1) Position the engine in engine compartment, and then align it with the transmission.

NOTE:
Be careful not to damage the adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

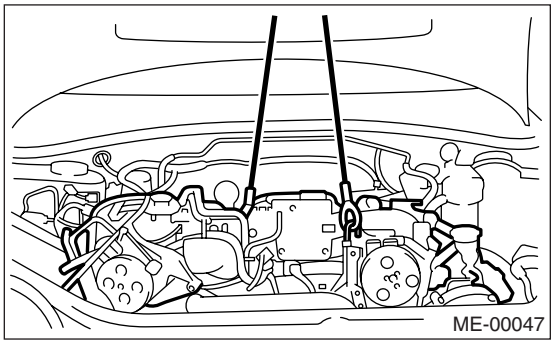
(2) Apply a small amount of grease to the splines of mainshaft.

4) Tighten the bolts which hold the right upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

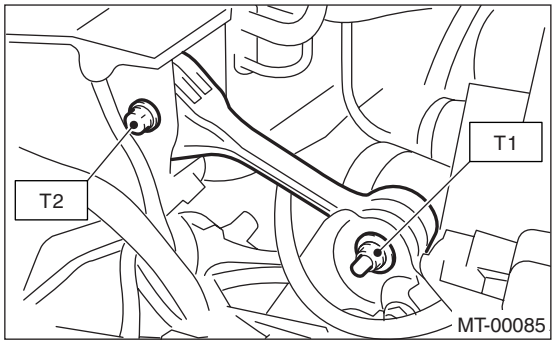


5) Remove the lifting device and wire ropes.
6) Remove the garage jack.



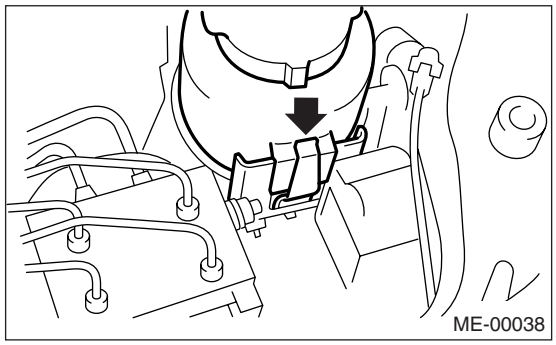
7) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



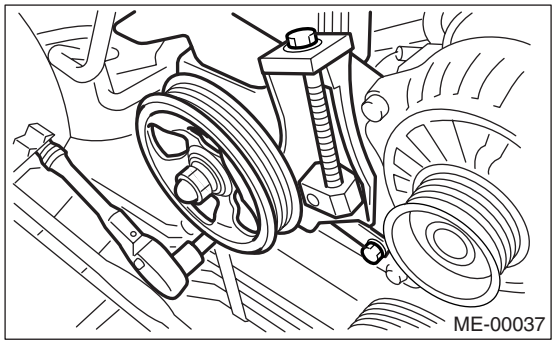
8) Install the power steering pump on bracket.

(1) Install the power steering tank on bracket.

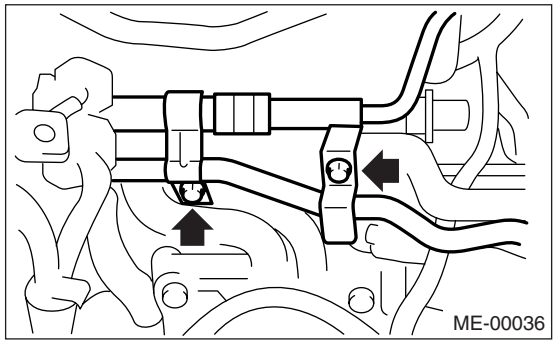


(2) Install the power steering pump.

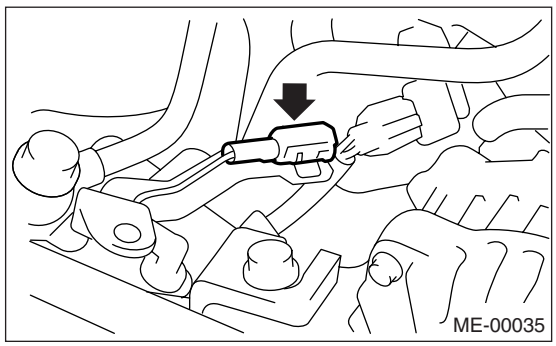
Tightening torque:
20.1 N·m (2.05 kgf-m, 14.8 ft-lb)



(3) Install the power steering pipe bracket on intake manifold RH.



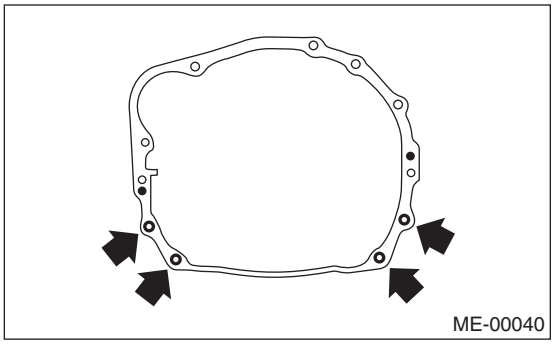
(4) Connect the power steering switch connector.



(5) Install the front side V-belt, and adjust it. <Ref. to ME(STi)-41, FRONT SIDE BELT, INSTALLATION, V-belt.>

9) Lift-up the vehicle.
10) Tighten the nuts which hold the lower side of transmission to engine.

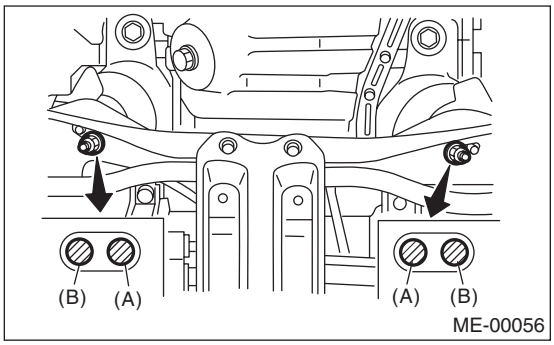
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



11) Tighten the nuts which install the front cushion rubber onto crossmember.

Tightening torque:
85 N·m (8.7 kgf-m, 62.7 ft-lb)

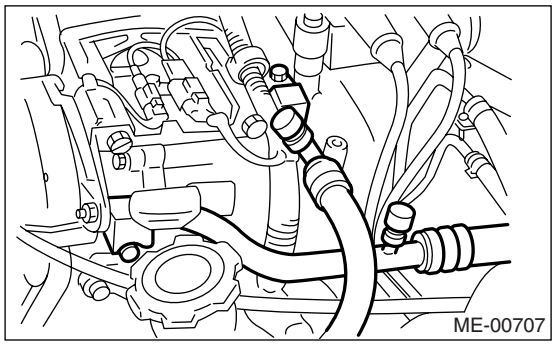
NOTE:
Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



12) Install the center exhaust pipe.
<Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>
13) Lower the vehicle.
14) Connect the following hoses:
(1) Fuel delivery hose, return hose and evaporation hose
(2) Heater inlet and outlet hoses
(3) Brake booster vacuum hose
15) Connect the following connectors and terminals:
(1) Engine ground terminal
(2) Engine harness connectors
(3) Generator connector and terminal
(4) A/C compressor connectors
16) Install the air intake system.
(1) Install the intercooler. <Ref. to IN(STi)-10, INSTALLATION, Intercooler.>
(2) Install the air cleaner element and air cleaner upper cover.
(3) Install the engine harness connector bracket.
(4) Install the filler hose to air cleaner case.
17) Install the A/C pressure hoses.

NOTE:
Use new O-rings.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



18) Install the radiator. <Ref. to CO(H4DOTC)-23, INSTALLATION, Radiator.>
19) Install the coolant filler tank. <Ref. to CO(H4DOTC)-32, INSTALLATION, Coolant Filler Tank.>
20) Install the window washer tank.
21) Install the battery in the vehicle, and then connect the cables.
22) Fill coolant.
<Ref. to CO(H4DOTC)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
23) Charge the A/C system with refrigerant.
<Ref. to AC-21, PROCEDURE, Refrigerant Charging Procedure.>
24) Remove the front hood stay, and close the front hood.
25) Take off the vehicle from lift arms.

10.Engine Mounting

A: REMOVAL

1) Remove the engine assembly. <Ref. to ME(STi)-32, REMOVAL, Engine Assembly.>
2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Engine mounting;
35 N·m (3.6 kgf-m, 25.8 ft-lb)

C: INSPECTION

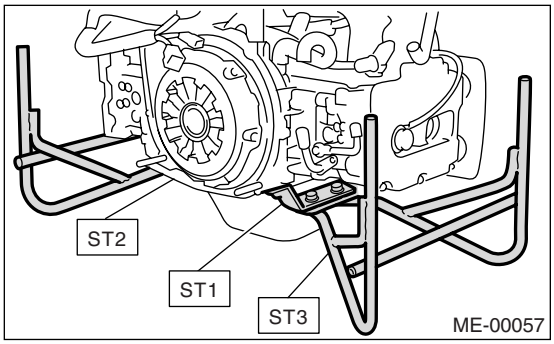
Make sure there are no cracks or other damage.

11.Preparation for Overhaul

A: PROCEDURE

1) After removing the engine from body, secure it in the ST shown below.

ST1	498457000	ENGINE STAND ADAPTER RH
ST2	498457100	ENGINE STAND ADAPTER LH
ST3	499817000	ENGINE STAND



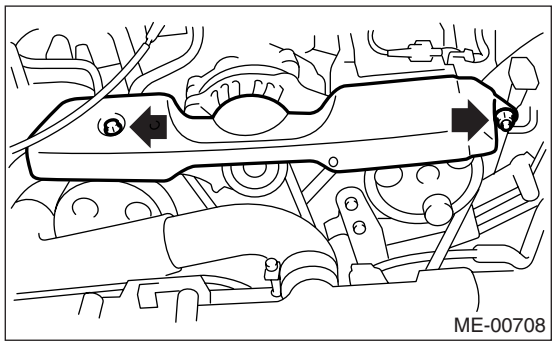
2) In this section the procedures described under each index are all connected and stated in order. It will be the complete procedure for overhauling of the engine itself when you go through all steps in the process.
Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

12.V-belt

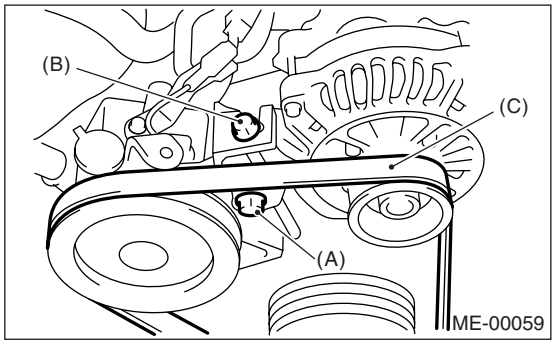
A: REMOVAL

1. FRONT SIDE BELT

1) Remove the V-belt cover.

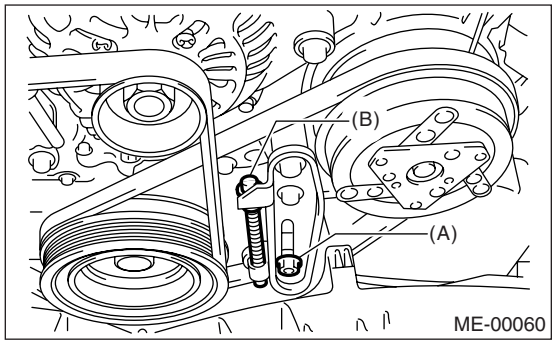


2) Loosen the lock bolt (A).
3) Loosen the slider bolt (B).
4) Remove the front side belt (C).

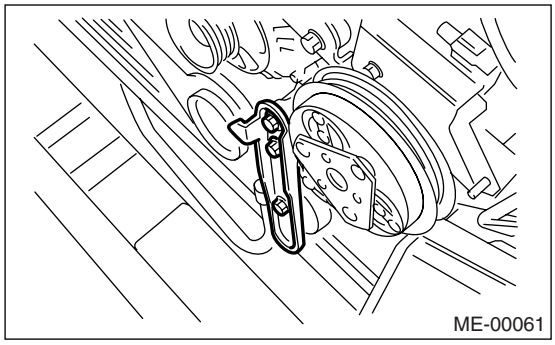


2. REAR SIDE BELT

1) Loosen the lock nut (A).
2) Loosen the slider bolt (B).



3) Remove the A/C belt.
4) Remove the A/C belt tensioner.



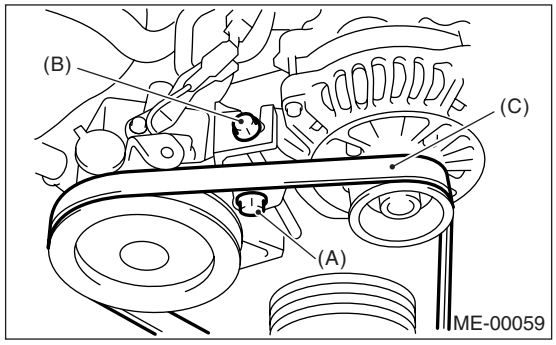
B: INSTALLATION

1. FRONT SIDE BELT

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

1) Install the belt (C), and tighten the slider bolt so as to obtain the specified belt tension <Ref. to ME(STi)-42, INSPECTION, V-belt.>
2) Tighten the lock bolt (A).
3) Tighten the slider bolt (B).

Tightening torque:
Lock bolt through bolt:
25 N·m (2.5 kgf-m, 18.1 ft-lb)
Slider bolt:
8 N·m (0.8 kgf-m, 5.5 ft-lb)

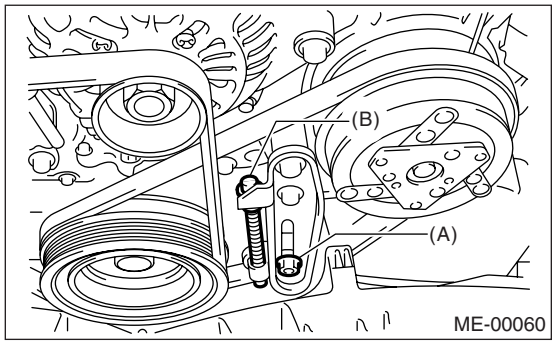


4) Idle the engine for approx. 5 min. to normalize the V-belt. (With using tension gauge)
5) Stop the engine, and then check the belt tension and adjust it. (With using tension gauge)
6) Idle the engine for approx. 1 min. to normalize the V-belt. (With using tension gauge)
7) Stop the engine, and then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

2. REAR SIDE BELT

1) Install the belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(STi)-42, INSPECTION, V-belt.>
2) Tighten the lock nut (A).

Tightening torque:
Lock nut (A);
22.6 N·m (2.3 kgf-m, 16.6 ft-lb)



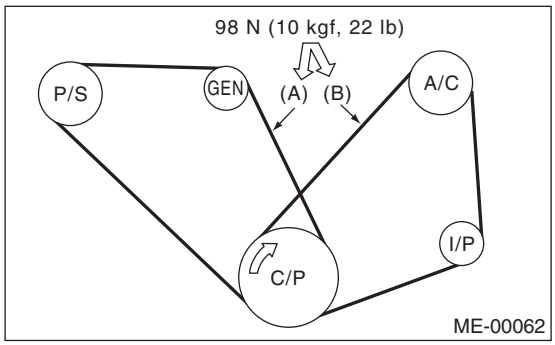
3) Idle the engine for approx. 5 min. to normalize the V-belt. (With using tension gauge)
4) Stop the engine, and then check the belt tension and adjust it. (With using tension gauge)
5) Idle the engine for approx. 1 min. to normalize the V-belt. (With using tension gauge)
6) Stop the engine, and then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

C: INSPECTION

1. WITHOUT USING BELT TENSION GAUGE

1) Replace the belts, if cracks, fraying or wear is found.
2) Check the drive belt tension and adjust it if necessary by changing generator installing position and/or idler pulley installing position.

Belt tension
(A)
replaced: 7 — 9 mm (0.276 — 0.354 in)
reused: 9 — 11 mm (0.354 — 0.433 in)
(B)*
replaced: 7.5 — 8.5 mm (0.295 — 0.335 in)
reused: 9.0 — 10.0 mm (0.354 — 0.394 in)
****: with air conditioner***



C/P	Crankshaft pulley
GEN	Generator
P/S	Power steering oil pump pulley
A/C	Air conditioning compressor pulley
I/P	Idler pulley

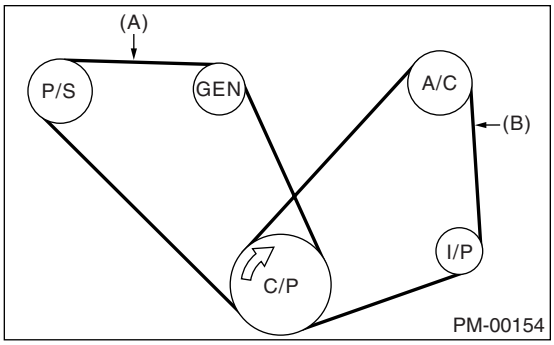
2. WITH USING BELT TENSION GAUGE

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

Belt tension

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

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

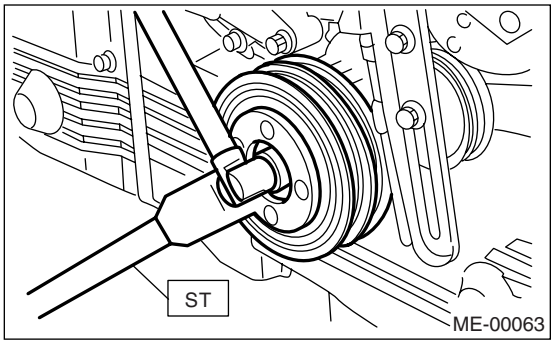


(A) Front side belt
(B) Rear side belt
C/P Crankshaft pulley
GEN Generator
P/S Power steering oil pump pulley
A/C A/C compressor pulley
I/P Idler pulley

13.Crankshaft Pulley

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(STi)-41, REMOVAL, V-belt.>
2) Remove the crankshaft pulley bolt. To lock the crankshaft, use ST.
ST 499977100 CRANKSHAFT PULLEY WRENCH



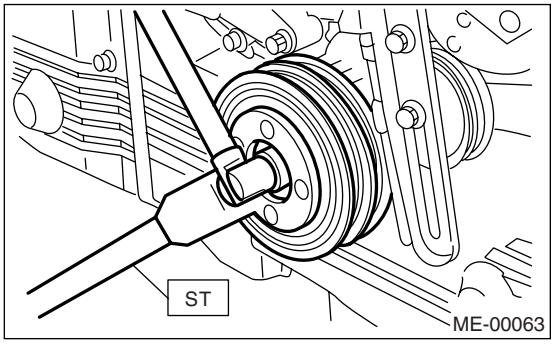
3) Remove the crankshaft pulley.

B: INSTALLATION

1) Install the crankshaft pulley.
2) Install the pulley bolt.
To lock the crankshaft, use ST.
ST 499977100 CRANKSHAFT PULLEY WRENCH

(1) Clean the crankshaft pulley thread using an air gun.
(2) Apply engine oil to the crankshaft pulley bolt seat and thread.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crankshaft pulley bolts.

Tightening torque:
180 N·m (18.3 kgf-m, 132.7 ft-lb)



3) Confirm that the tightening angle of crankshaft pulley bolt is 65 degrees or more. If the tightening angle of crankshaft pulley bolt is less than 65 degrees, conduct the following procedures.

CAUTION:
If the tightening angle of crankshaft pulley bolt is less than 65 degrees, the bolt should be damaged. In this case, the bolt must be replaced.

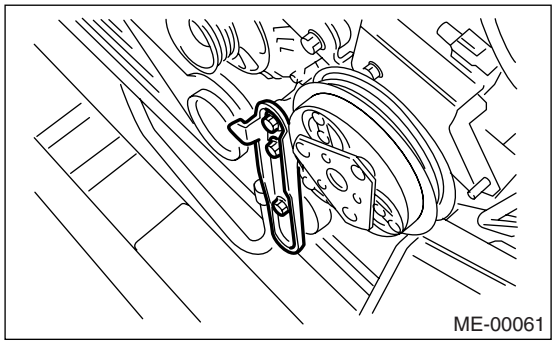
(1) Replace the crankshaft pulley bolts and clean them.

Crankshaft pulley bolt:
12369AA011

(2) Clean the crankshaft thread using an air gun.
(3) Apply engine oil to the crankshaft pulley bolt seat and thread.
(4) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(5) Tighten the crankshaft pulley bolts keeping them in an angle between 65 degrees and 75 degrees.

NOTE:
Conduct the tightening procedures by confirming the turning angle of crankshaft pulley bolt referring to the gauge indicated on timing belt cover.

4) Install the A/C belt tensioner.



5) Install the V-belt. <Ref. to ME(STi)-41, INSTALLATION, V-belt.>

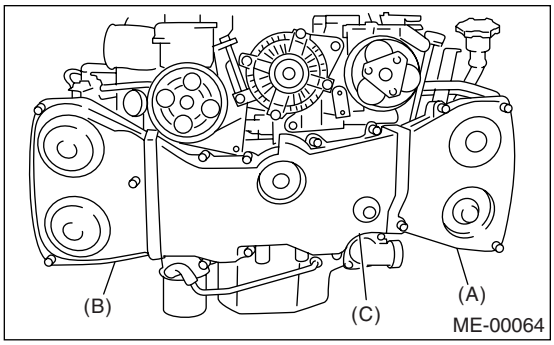
C: INSPECTION

1) Make sure the V-belt is not worn or otherwise damaged.
2) Check the tension of the belt. <Ref. to ME(STi)-42, INSPECTION, V-belt.>

14.Timing Belt Cover

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(STi)-41, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(STi)-44, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover (LH) (A).
4) Remove the timing belt cover (RH) (B).
5) Remove the front timing belt cover (C).



B: INSTALLATION

1) Install the front timing belt cover (C).

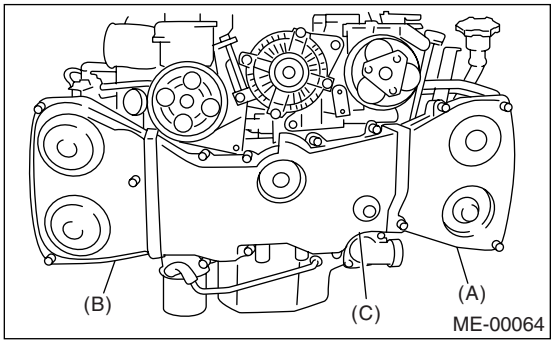
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

2) Install the timing belt cover (RH) (B).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

3) Install the timing belt cover (LH) (A).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



4) Install the crankshaft pulley. <Ref. to ME(STi)-44, INSTALLATION, Crankshaft Pulley.>
5) Install the V-belt. <Ref. to ME(STi)-41, INSTALLATION, V-belt.>

C: INSPECTION

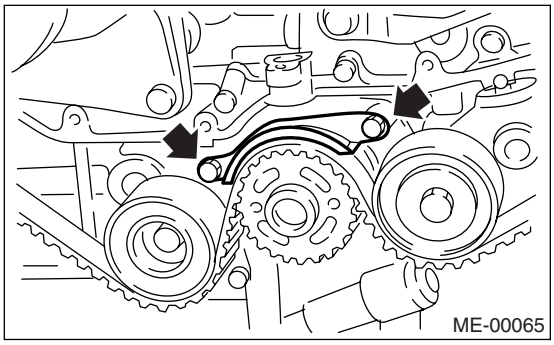
Make sure the cover is not damaged.

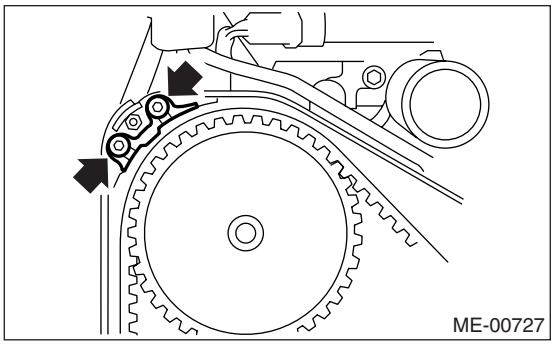
15.Timing Belt Assembly

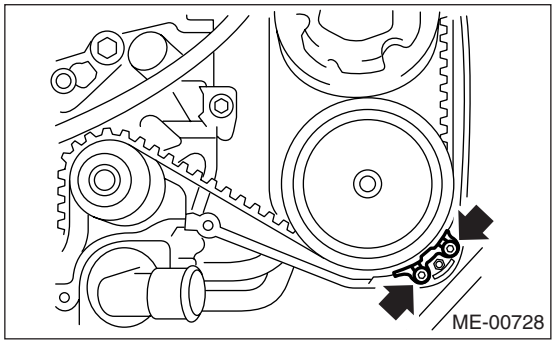
A: REMOVAL

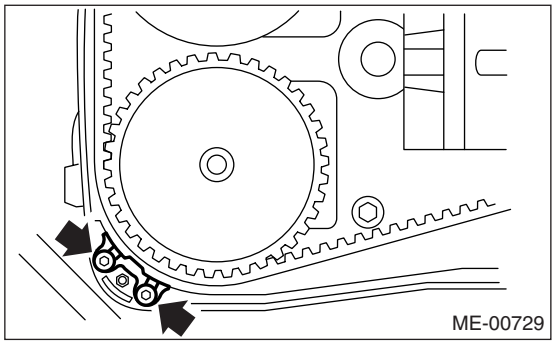
1. TIMING BELT

1) Remove the V-belt. <Ref. to ME(STi)-41, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(STi)-44, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(STi)-45, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt guides.


ME-00065

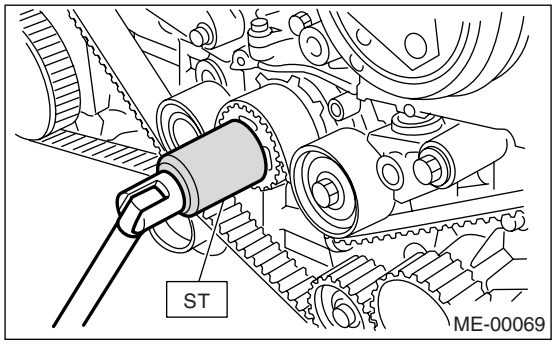

ME-00727


ME-00728


ME-00729

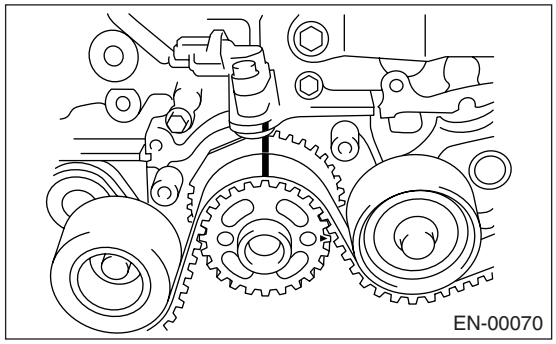
5) If the alignment mark and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing the timing belt as follows:
(1) Turn the crankshaft using ST, and align the alignment marks on crankshaft sprocket, intake camshaft sprocket (LH), exhaust camshaft sprocket (LH), intake camshaft sprocket (RH) and exhaust camshaft sprocket (RH) with notches of timing belt cover and cylinder block.

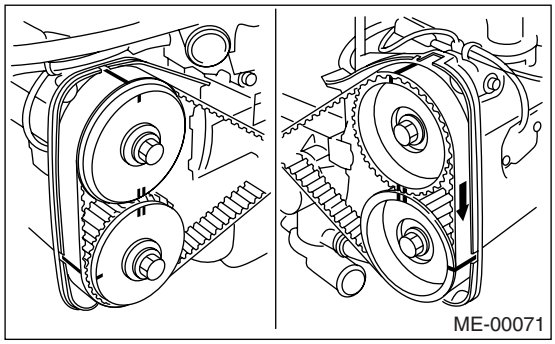
ST 499987500 CRANKSHAFT SOCKET



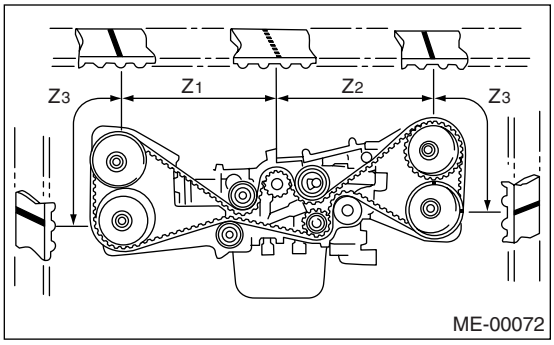
ME-00069

(2) Using white paint, put alignment and/or arrow marks on the timing belts in relation to the sprockets.

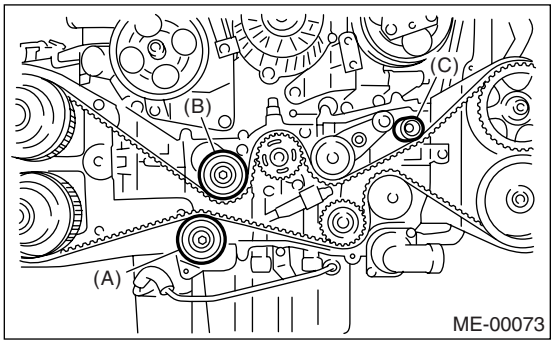

EN-00070


ME-00071

Z_1: 54.5 tooth length
Z_2: 51 tooth length
Z_3: 28 tooth length



6) Remove the belt idler (A).

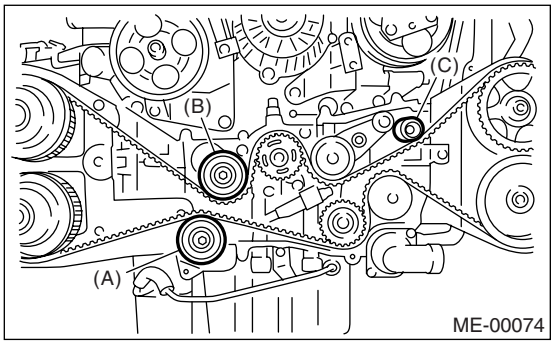


7) Remove the timing belt.

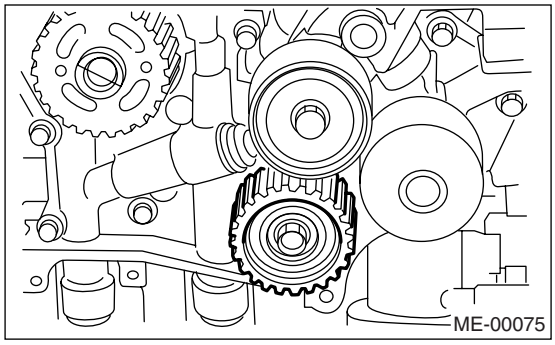
CAUTION:
After the timing belt has been removed, never rotate the intake and exhaust, camshaft sprocket. If the camshaft sprocket is rotated, the intake and exhaust valve heads strike together and valve stems are bent.

2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

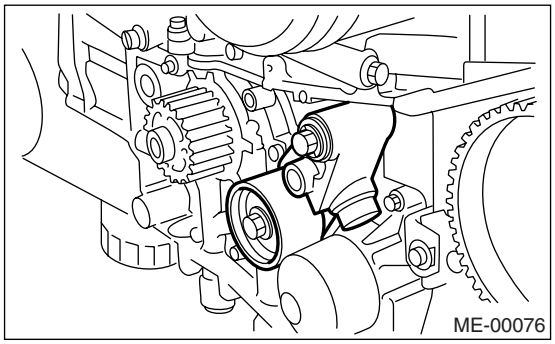
1) Remove the belt idler (B) and (C).



2) Remove the belt idler No. 2.



3) Remove the automatic belt tension adjuster assembly.



B: INSTALLATION

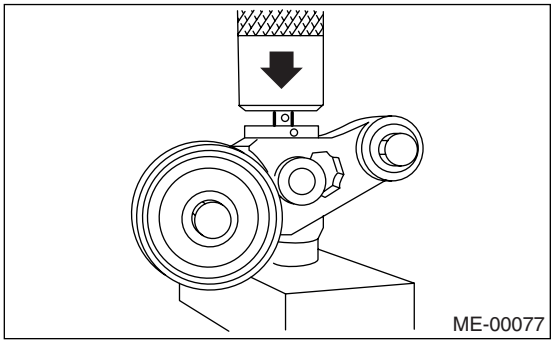
1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

1) Preparation for installation of automatic belt tension adjuster assembly:

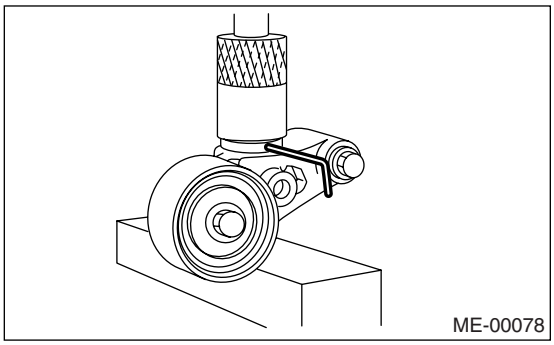
NOTE:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push the adjuster rod vertically.
• Press-in the push adjuster rod gradually taking more than 3 minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
• Press the adjuster rod as far as the end surface of cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
• Do not release the press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to the vertical pressing tool.

(2) Slowly move the adjuster rod down with a pressure of 165 N (16.8 kgf, 37.1 lb) or more until the adjuster rod is aligned with the stopper pin hole in the cylinder.

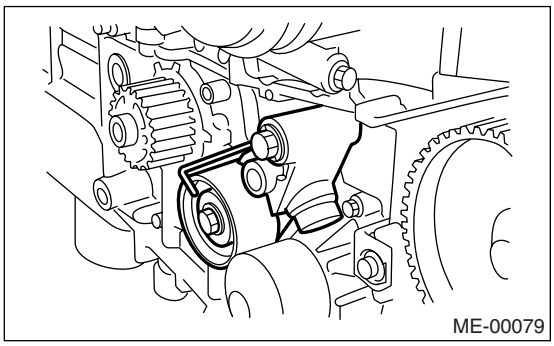


(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (0.08 in) (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.



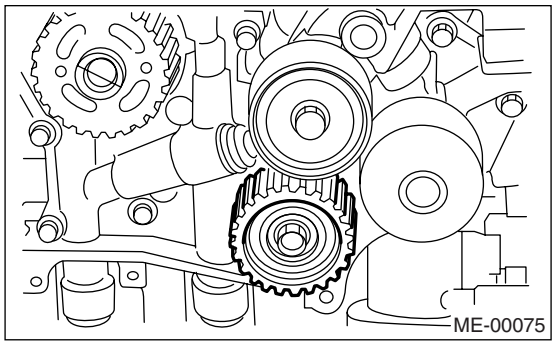
2) Install the automatic belt tension adjuster assembly.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



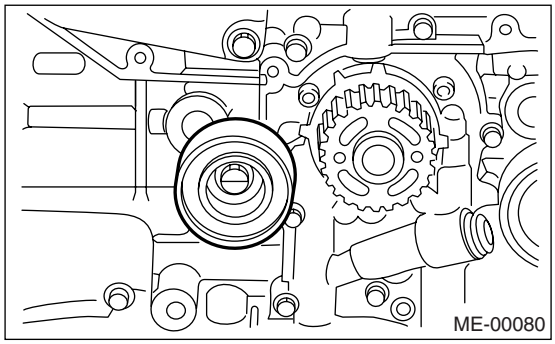
3) Install the belt idler No. 2.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



4) Install the belt idler.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

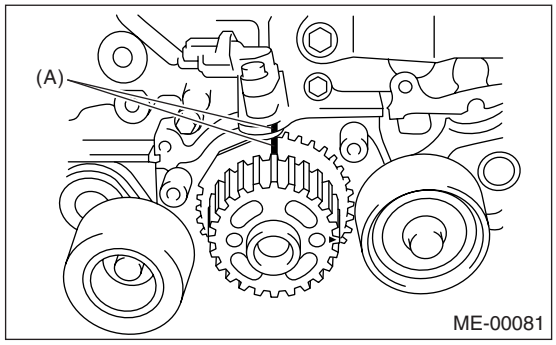


2. TIMING BELT

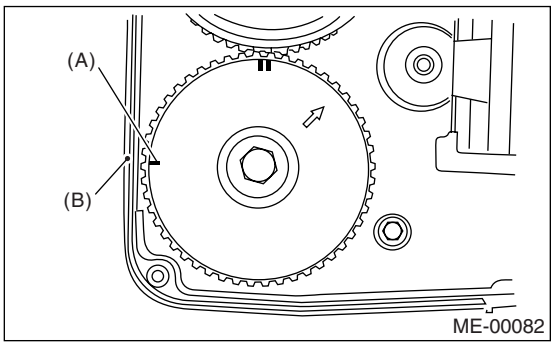
1) Preparation for installation of automatic belt tension adjuster assembly. <Ref. to ME(STi)-53, AUTOMATIC BELT TENSION ADJUSTER, INSPECTION, Timing Belt Assembly.>

2) Crankshaft and camshaft sprocket alignment.

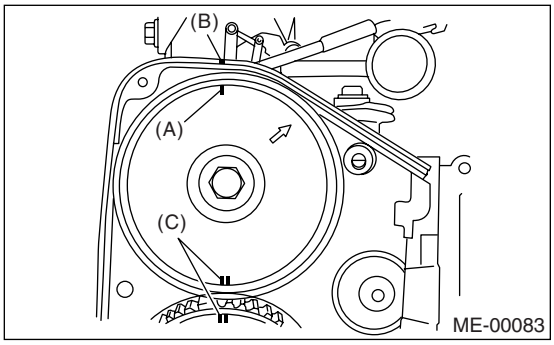
(1) Align mark (A) on the crankshaft sprocket with mark on the oil pump cover at cylinder block.



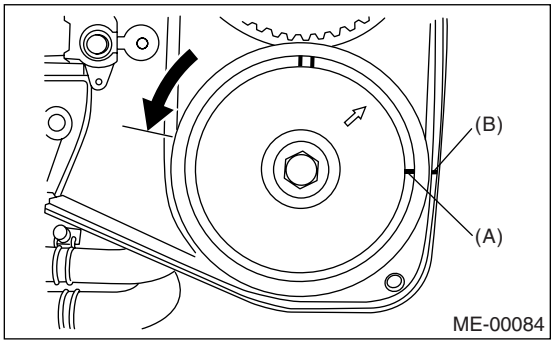
(2) Align single line mark (A) on the exhaust camshaft sprocket (RH) with notch (B) on timing belt cover.



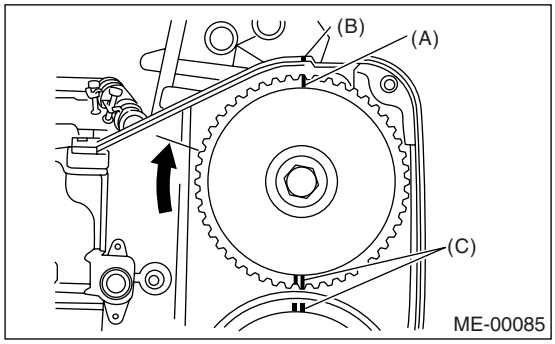
(3) Align single line mark (A) on the intake camshaft sprocket (RH) with notch (B) on timing belt cover.
(Make sure double lines (C) on intake camshaft and exhaust camshaft sprockets are aligned.)



(4) Align single line mark (A) on exhaust camshaft sprocket (LH) with notch (B) on timing belt cover by turning the sprocket counterclockwise (as viewed from front of engine).

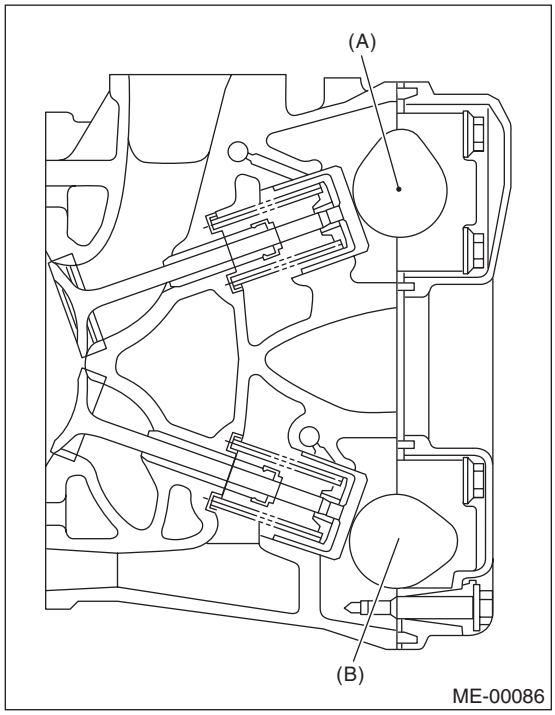


(5) Align the single line mark (A) on intake camshaft sprocket (LH) with notch (B) on timing belt cover by turning the sprocket clockwise (as viewed from front of engine).
Ensure the double lines (C) on intake and exhaust camshaft sprockets are aligned.



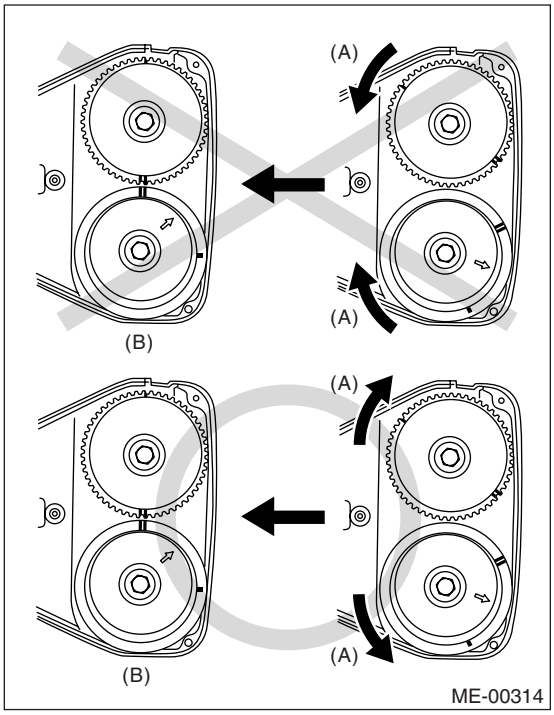
(6) Ensure the camshaft and crankshaft sprockets are positioned properly.

CAUTION:
• Intake and exhaust camshafts for this DOHC engine can be independently rotated with the timing belts removed. As can be seen from the figure, if the intake and exhaust valves are lifted simultaneously, their heads will interfere with each other, resulting in bent valves.



(A) Intake camshaft
(B) Exhaust camshaft

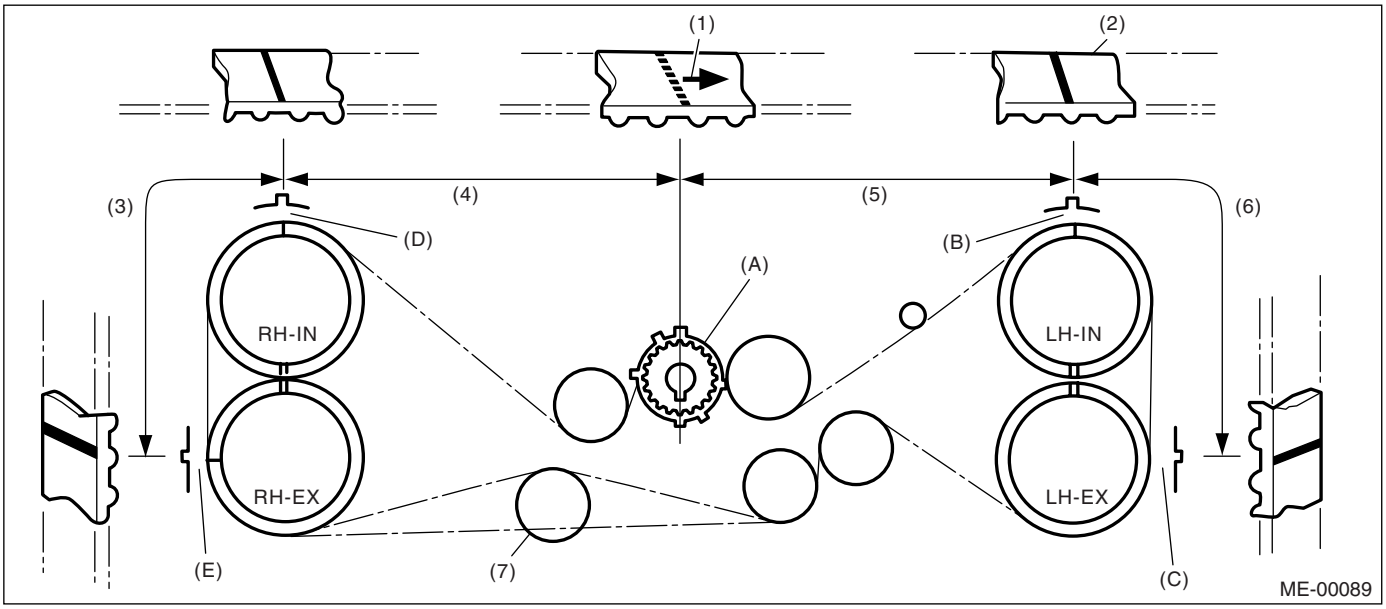
• When the timing belts are not installed, four camshafts are held at the "zero-lift" position, where all cams on camshafts do not push the intake and exhaust valves down. (Under this condition, all valves remain unlifted.)
• When the camshafts are rotated to install the timing belts, #2 intake and #4 exhaust cam of camshafts (LH) are held to push their corresponding valves down. (Under this condition, these valves are held lifted.) Camshafts (RH) are held so that their cams do not push valves down.
• Camshafts (LH) must be rotated from the "zero-lift" position to the position where the timing belt is to be installed at as small an angle as possible, in order to prevent mutual interference of intake and exhaust valve heads.
• Do not allow the camshafts to rotate in the direction shown in the figure as this causes both intake and exhaust valves to lift simultaneously, resulting in interference with their heads.



(A) Rotating direction
(B) Timing belt installation position

3) Installation of timing belt:
Align the alignment mark on timing belt with marks on sprockets in alphabetical order shown in the figure. While aligning marks, position the timing belt properly.

CAUTION:
• Disengagement of more than three timing belt teeth may result in interference between the valve and piston.
• Ensure the belt's rotating direction is correct.

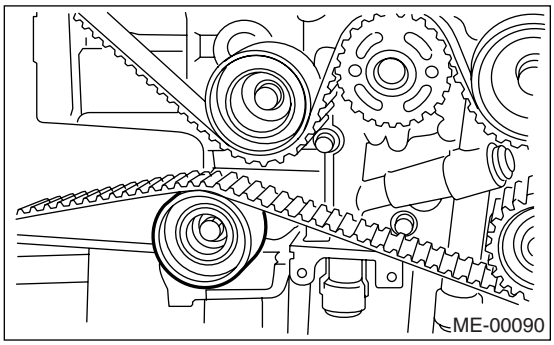


(1) Arrow mark
(2) Timing belt
(3) 28 tooth length
(4) 54.5 tooth length
(5) 51 tooth length
(6) 28 tooth length
(7) Install it in the end

4) Install the belt idlers.

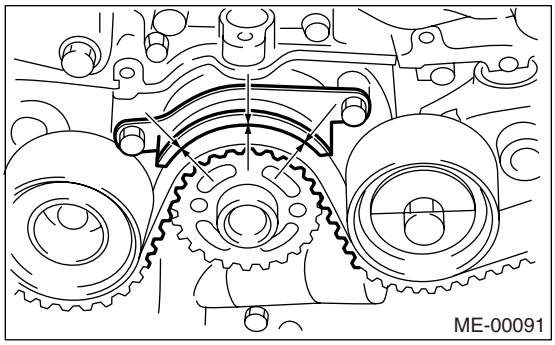
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

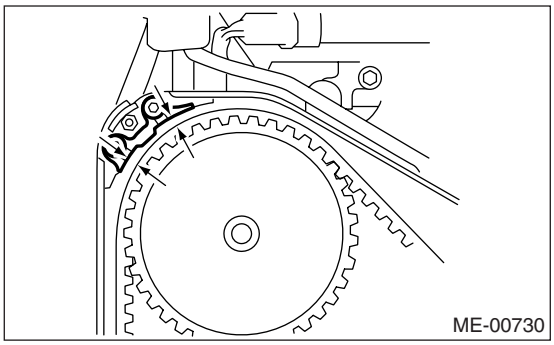
NOTE:
Make sure that the marks on the timing belt and sprockets are aligned.

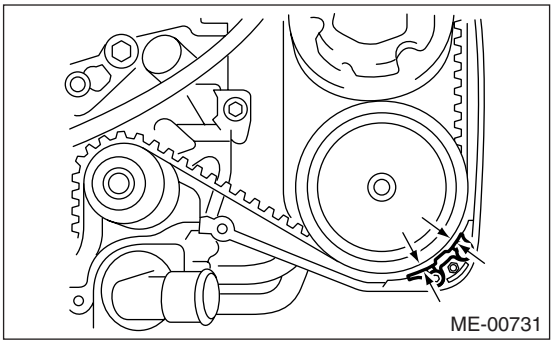


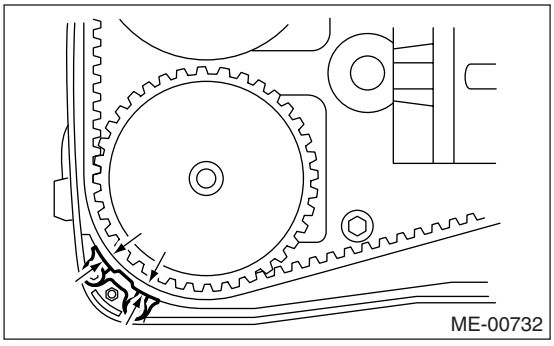
5) After ensuring that the marks on the timing belt and sprockets are aligned, remove the stopper pin from tensioner adjuster.
6) Install the timing belt guide.
(1) Temporarily tighten the bolts.
(2) Check and adjust the clearance between timing belt and timing belt guide.

Clearance:
1.0±0.5 mm (0.039±0.020 in)


ME-00091

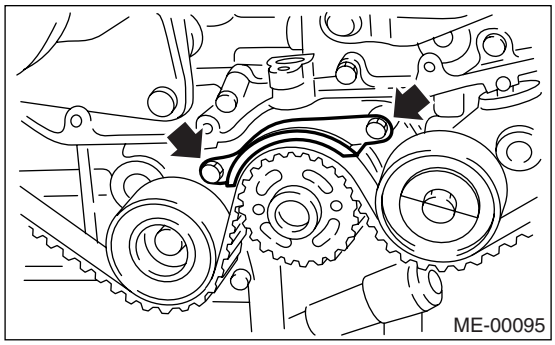

ME-00730


ME-00731

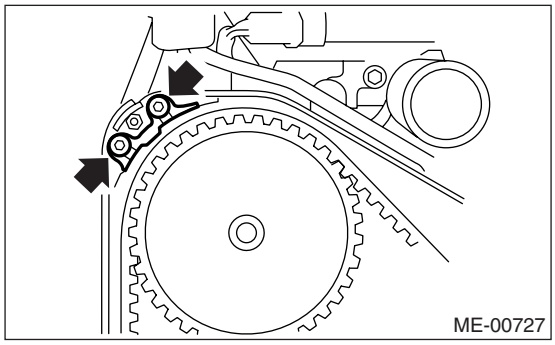

ME-00732

(3) Tighten the bolts.

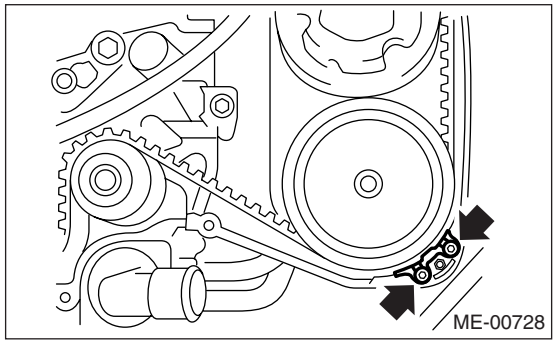
Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)


ME-00095

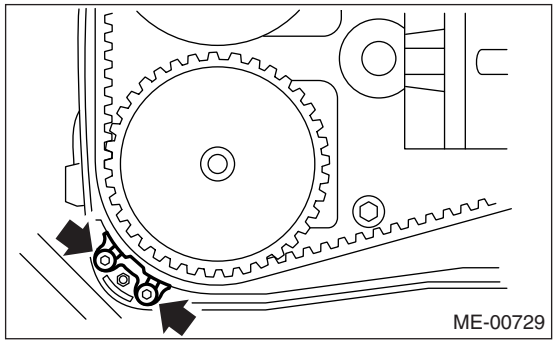
Tightening torque:
6.4 N·m (0.7 kgf-m, 5.1 ft-lb)


ME-00727

Tightening torque:
6.4 N·m (0.7 kgf-m, 5.1 ft-lb)


ME-00728

Tightening torque:
6.4 N·m (0.7 kgf-m, 5.1 ft-lb)


ME-00729

7) Install the timing belt cover. <Ref. to ME(STi)-45, INSTALLATION, Timing Belt Cover.>

8) Install the crankshaft pulley. <Ref. to ME(STi)-44, INSTALLATION, Crankshaft Pulley.>
9) Install the V-belt. <Ref. to ME(STi)-41, INSTALLATION, V-belt.>

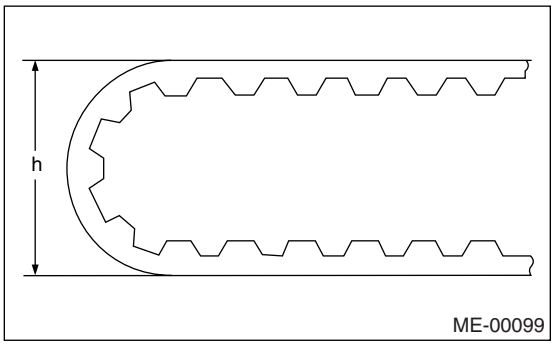
C: INSPECTION

1. TIMING BELT

1) Check the timing belt teeth for breaks, cracks, and wear. If any fault is found, replace the belt.
2) Check the condition of back side of belt; if any crack is found, replace the belt.

NOTE:
• Be careful not to let oil, grease or coolant contact the belt. Remove quickly and thoroughly if this happens.
• Do not bend the belt sharply.

Bending radius: h
60 mm (2.36 in) or more



2. AUTOMATIC BELT TENSION ADJUSTER

1) Visually check the oil seals for leaks, and rod ends for abnormal wear or scratches. If necessary, replace the automatic belt tension adjuster assembly.

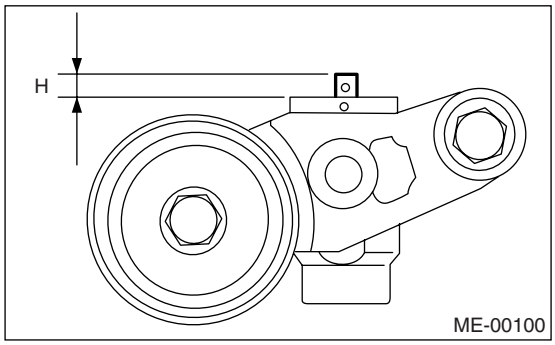
NOTE:
Slight traces of oil at rod's oil seal does not indicate a problem.

2) Check that the adjuster rod does not move when a pressure of 165 N (16.8 kgf, 37.1 lb) is applied to it. This is to check adjuster rod stiffness.
3) If the adjuster rod is not stiff and moves freely when applying 165 N (16.8 kgf, 37.1 lb), check it using the following procedures:
(1) Slowly press the adjuster rod down to the end surface of the cylinder. Repeat this motion 2 or 3 times.
(2) With the adjuster rod moved all the way up, apply a pressure of 165 N (16.8 kgf, 37.1 lb) to it. Check the adjuster rod stiffness.
(3) If the adjuster rod is not stiff and moves down, replace the automatic belt tension adjuster assembly with a new one.

NOTE:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push the adjuster rod vertically.
• Press-in the push adjuster rod gradually taking more than 3 minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
• Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.

4) Measure the extension of rod beyond the body. If it is not within specifications, replace with a new one.

Rod extension: H
5.7±0.5 mm (0.224±0.020 in)



3. BELT TENSION PULLEY

1) Check the mating surfaces of timing belt and contact point of adjuster rod for abnormal wear or scratches. Replace the belt tension pulley if faulty.
2) Check the belt tension pulley for smooth rotation. Replace if noise or excessive play is noted.
3) Check the belt tension pulley for grease leakage.

4. BELT IDLER

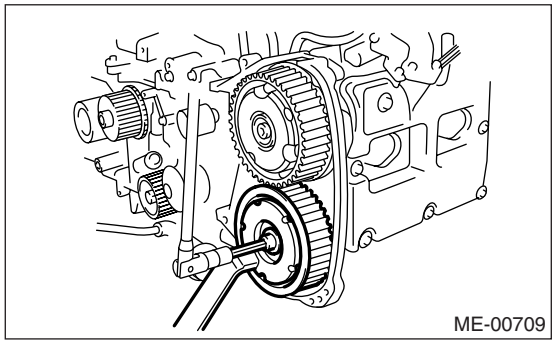
1) Check the belt idler for smooth rotation. Replace if noise or excessive play is noted.
2) Check the outer contacting surfaces of idler pulley for abnormal wear and scratches.
3) Check the belt idler for grease leakage.

16.Camshaft Sprocket

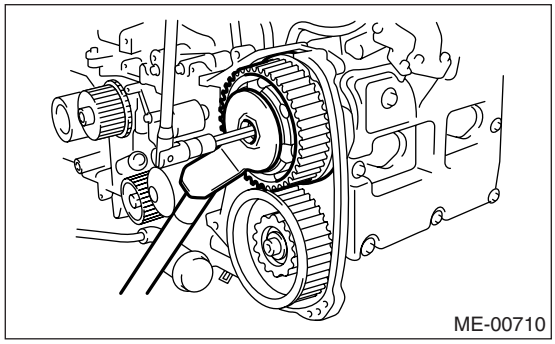
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(STi)-41, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(STi)-44, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(STi)-45, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(STi)-46, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprockets. To lock the camshaft, use ST.

ST 499207400 CAMSHAFT SPROCKET WRENCH



ST 499977500 CAMSHAFT SPROCKET WRENCH



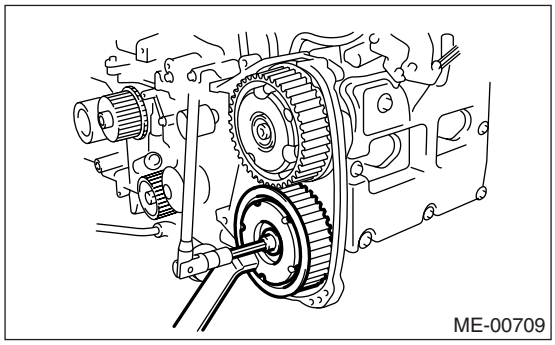
B: INSTALLATION

1) Install the camshaft sprocket. To lock the camshaft, use ST.

NOTE:
Do not confuse camshaft sprockets (RH) and (LH) during installation.

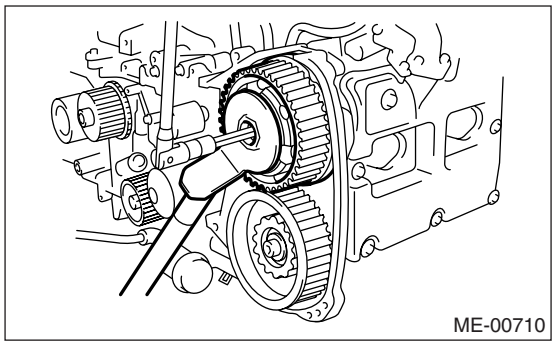
ST 499207400 CAMSHAFT SPROCKET WRENCH

Tightening torque:
98 N·m (10 kgf-m, 72.4 ft-lb)



ST 499977500 CAMSHAFT SPROCKET WRENCH

Tightening torque:
29.5 N·m (3.0 kgf-m, 21.8 ft-lb), and then tighten 45° furthermore



2) Install the timing belt assembly. <Ref. to ME(STi)-47, INSTALLATION, Timing Belt Assembly.>
3) Install the timing belt cover. <Ref. to ME(STi)-45, INSTALLATION, Timing Belt Cover.>
4) Install the crankshaft pulley. <Ref. to ME(STi)-44, INSTALLATION, Crankshaft Pulley.>
5) Install the V-belt. <Ref. to ME(STi)-41, INSTALLATION, V-belt.>

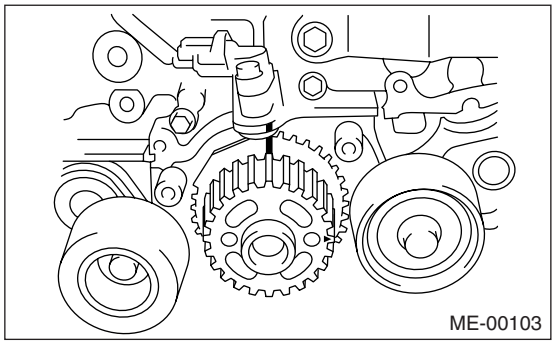
C: INSPECTION

1) Check the sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.
3) Check the crankshaft sprocket notch used for sensor for damage and contamination of foreign matter.

17.Crankshaft Sprocket

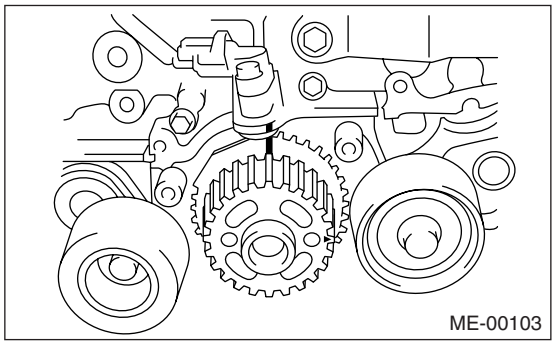
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(STi)-41, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(STi)-44, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(STi)-45, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(STi)-46, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(STi)-54, REMOVAL, Camshaft Sprocket.>
6) Remove the crankshaft sprocket.



B: INSTALLATION

1) Install the crankshaft sprocket.



2) Install the camshaft sprocket. <Ref. to ME(STi)-54, INSTALLATION, Camshaft Sprocket.>
3) Install the timing belt assembly. <Ref. to ME(STi)-47, INSTALLATION, Timing Belt Assembly.>
4) Install the timing belt cover. <Ref. to ME(STi)-45, INSTALLATION, Timing Belt Cover.>
5) Install the crankshaft pulley. <Ref. to ME(STi)-44, INSTALLATION, Crankshaft Pulley.>
6) Install the V-belt. <Ref. to ME(STi)-41, INSTALLATION, V-belt.>

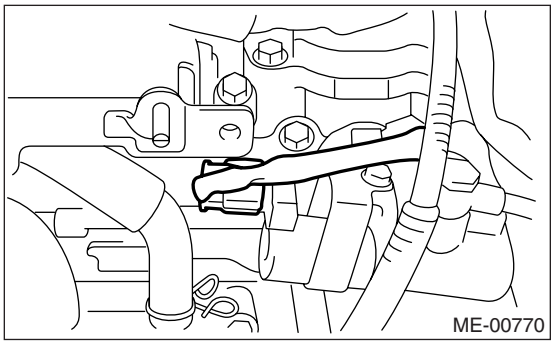
C: INSPECTION

1) Check the sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.
3) Check the crankshaft sprocket notch used for sensor for damage and contamination of foreign matter.

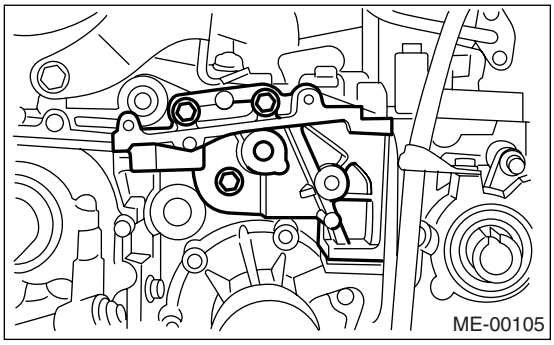
18.Camshaft

A: REMOVAL

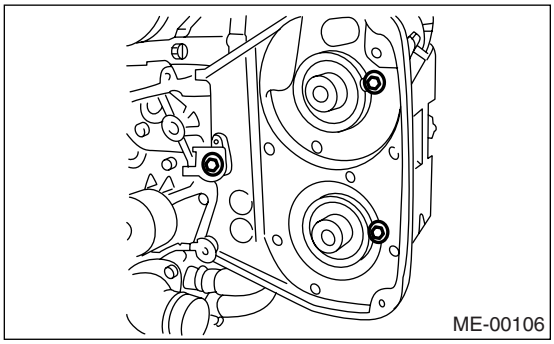
1) Remove the V-belt. <Ref. to ME(STi)-41, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(STi)-44, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(STi)-45, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(STi)-46, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(STi)-44, REMOVAL, Crankshaft Pulley.>
6) Remove the crankshaft sprocket. <Ref. to ME(STi)-55, REMOVAL, Crankshaft Sprocket.>
7) Disconnect the variable valve timing solenoid valve assembly connector.


ME-00770

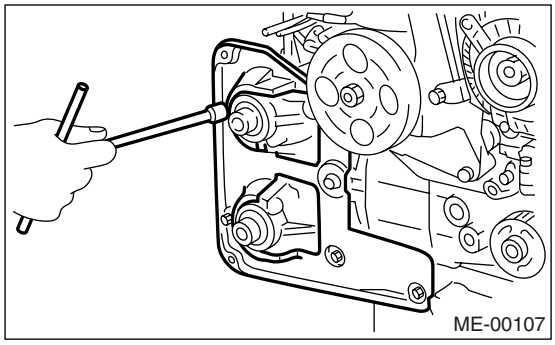
8) Remove the tensioner bracket.


ME-00105

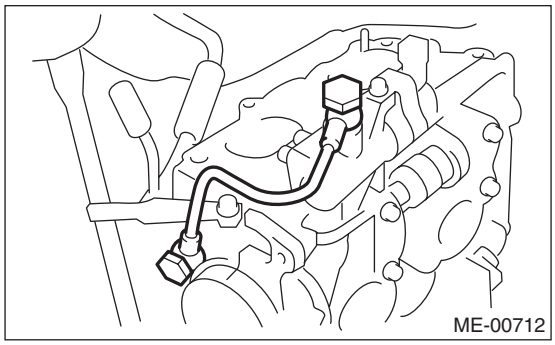
9) Remove the timing belt cover No. 2 (LH).


ME-00106

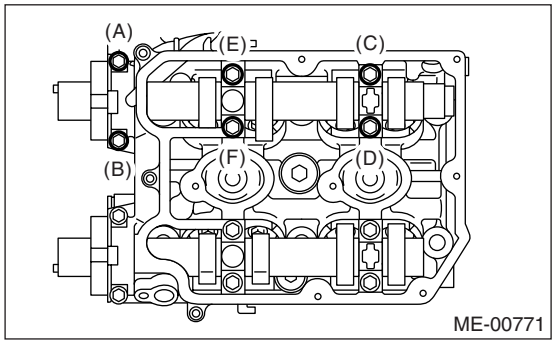
10) Remove the timing belt cover No. 2 (RH).


ME-00107

11) Remove the spark plug cord.
12) Remove the oil level gauge guide. (LH side)
13) Remove the rocker cover and gasket.
14) Remove the oil pipe.


ME-00712

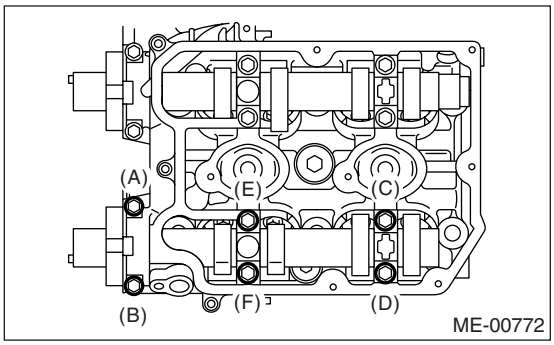
15) Loosen the variable valve timing solenoid valve assembly and intake camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



ME-00771

16) Remove the variable valve timing solenoid valve assembly, intake camshaft cap, and camshaft.

17) Loosen the exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



18) Remove the exhaust camshaft cap and camshaft.

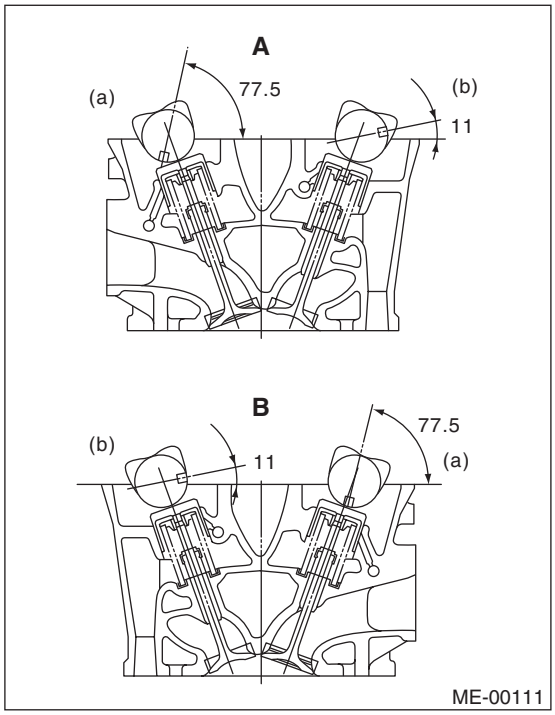
NOTE:
Arrange the camshaft caps in order so that they can be installed in their original positions.

19) Similarly, remove the camshafts (RH) and related parts.

B: INSTALLATION

1) Camshaft installation: Apply engine oil to cylinder head at camshaft bearing location before installing the camshaft. Install the camshaft so that each valve is close to or in contact with “base circle” of cam lobe.

NOTE:
• When the camshafts are positioned as shown in the figure, camshafts need to be rotated at a minimum to align with the timing belt during installation.
• Camshaft (RH) need not be rotated when set at position shown in the figure. Intake camshaft (LH): Rotate 80° clockwise. Exhaust camshaft (LH): Rotate 45° counterclockwise.

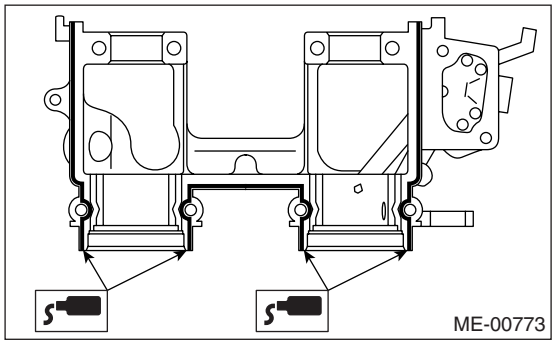


A Cylinder head (LH)
B Cylinder head (RH)
(a) Intake camshaft
(b) Exhaust camshaft

2) Camshaft cap and variable valve timing solenoid valve assembly installation:
(1) Apply fluid packing sparingly to cap mating surface.

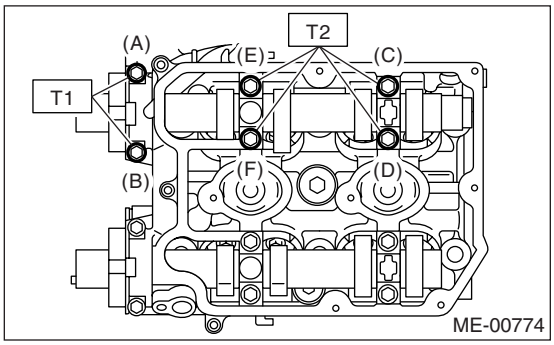
NOTE:
Do not apply fluid packing excessively. Failure to do so may cause excess packing to come out and flow toward the oil seal, resulting in oil leaks.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



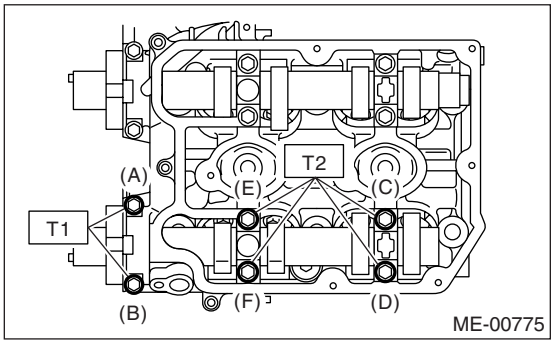
(2) Apply engine oil to cap bearing surface and install the cap on camshaft as shown by identification mark (A).
(3) Gradually tighten the camshaft cap and oil control valve assembly in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.

Tightening torque:
T1: 10 N·m (1.0 kgf-m, 7 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



(4) Similarly, tighten cap on the exhaust side. After tightening cap, ensure the camshaft rotates only slightly while holding it at "base" circle.

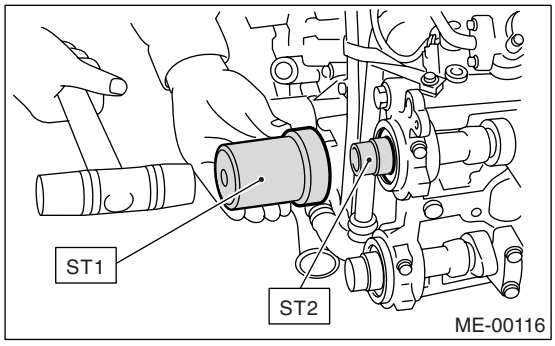
Tightening torque:
T1: 10 N·m (1.0 kgf-m, 7 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



3) Camshaft oil seal installation: Apply grease to new oil seal lips and press onto front end of camshaft by using ST1 and ST2.

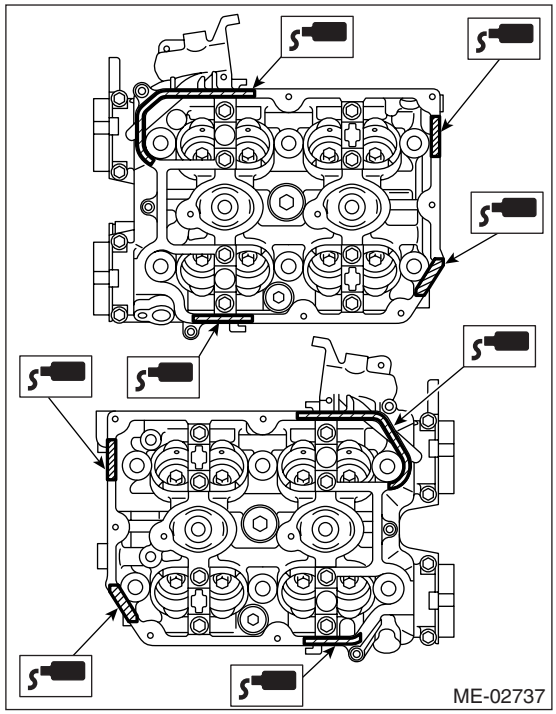
NOTE:
Use a new oil seal.

ST1 499587600 OIL SEAL GUIDE
ST2 499597200 OIL SEAL GUIDE



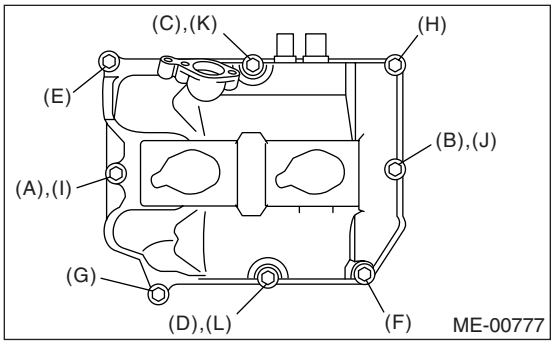
4) Rocker cover installation:
(1) Install the gasket on rocker cover. Install the peripheral gasket and ignition coil gasket.
(2) Apply fluid packing to the specified point of cylinder head.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



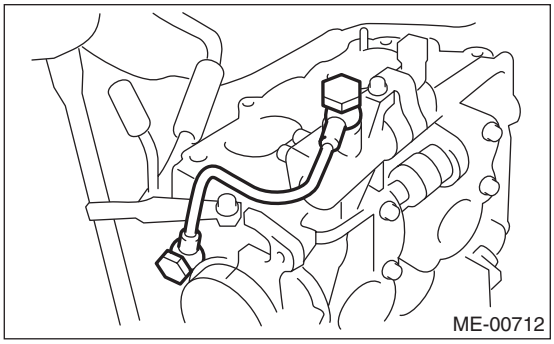
(3) Install the rocker cover on cylinder head. Ensure the gasket is properly positioned during installation.
(4) Tighten the rocker cover tightening bolt in alphabetical sequence shown in the figure, and then tighten to specified torque.

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

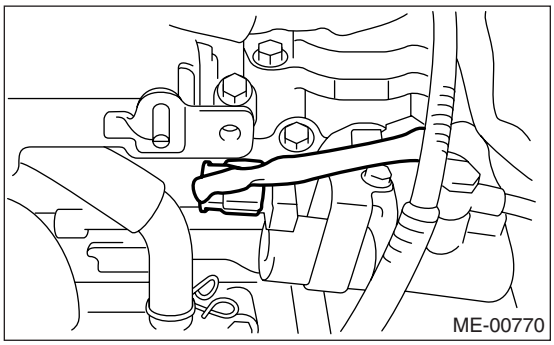


5) Install the oil pipe.

Tightening torque:
29 N·m (3.0 kgf-m, 21.4 ft-lb)

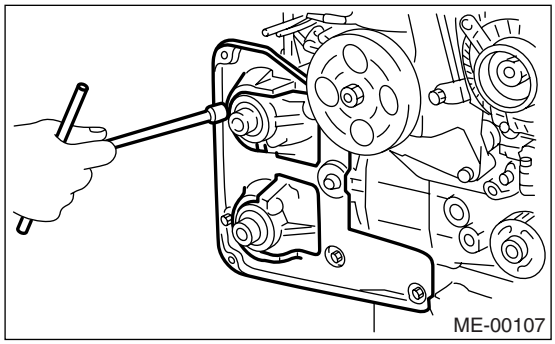


6) Connect the variable valve timing solenoid valve connector.



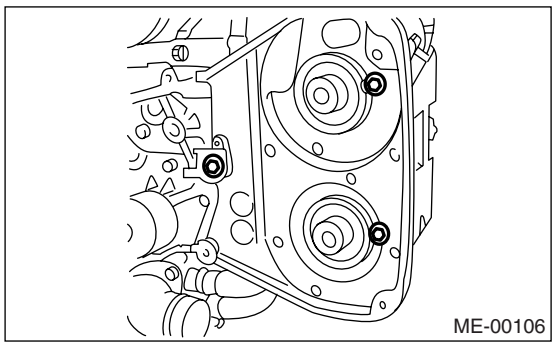
7) Install the spark plug cord.
8) Similarly, install the parts on right-hand side.
9) Install the timing belt cover No. 2 (RH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



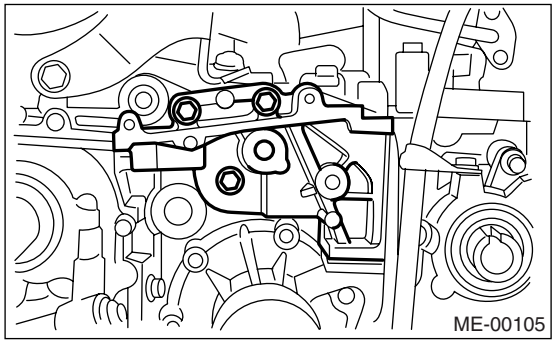
10) Install the timing belt cover No. 2 (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



11) Install the tensioner bracket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



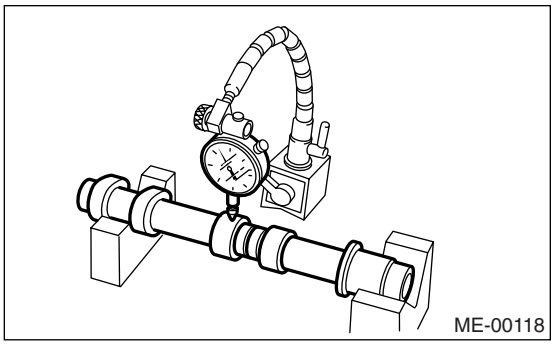
12) Install the crankshaft sprocket. <Ref. to ME(STi)-55, INSTALLATION, Crankshaft Sprocket.>
13) Install the camshaft sprockets. <Ref. to ME(STi)-54, INSTALLATION, Camshaft Sprocket.>
14) Install the timing belt assembly. <Ref. to ME(STi)-47, INSTALLATION, Timing Belt Assembly.>
15) Install the timing belt cover. <Ref. to ME(STi)-45, INSTALLATION, Timing Belt Cover.>
16) Install the crankshaft pulley. <Ref. to ME(STi)-44, INSTALLATION, Crankshaft Pulley.>

17) Install the V-belt. <Ref. to ME(STi)-41, INSTALLATION, V-belt.>

C: INSPECTION

1) Measure the bend, and repair or replace if necessary.

Limit:
0.020 mm (0.00079 in)

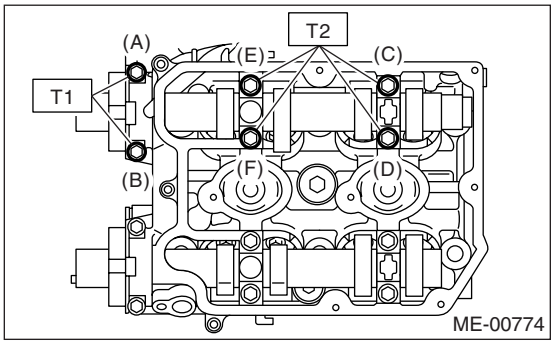


2) Check the journal for damage and wear. Replace if faulty.
3) Measure the outside diameter of camshaft journal. If the journal diameter is not as specified, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard	37.946 — 37.963 mm (1.4939 — 1.4946 in)	29.946 — 29.963 mm (1.1790 — 1.1796 in)

4) Measurement of the camshaft journal oil clearance:
(1) Clean the bearing caps and camshaft journals.
(2) Place the camshafts on cylinder head. (Without installing the valve rocker.)
(3) Place a plastigauge across each of the camshaft journals.
(4) Gradually tighten the cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.
Do not turn the camshaft.

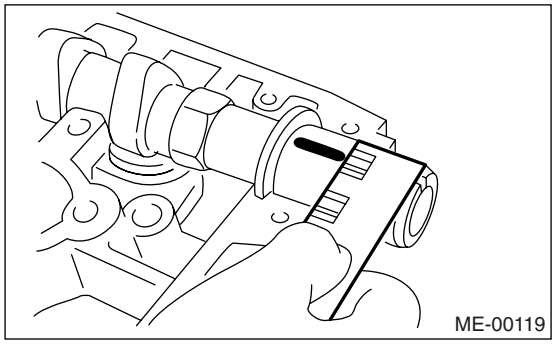
Tightening torque:
T1: 10 N·m (1.0 kgf-m, 7.2 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



(5) Remove the bearing caps.
(6) Measure the widest point of plastigauge on each journal. If the oil clearance exceeds the limit, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

Standard:
0.037 — 0.072 mm (0.0015 — 0.0028 in)

Limit:
0.10 mm (0.0039 in)



(7) Completely remove the plastigauge.

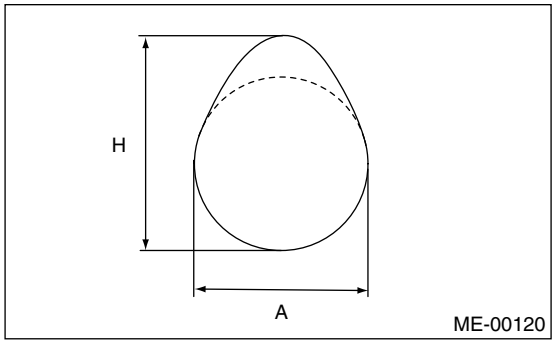
5) Check the cam face condition; remove the minor faults by grinding with oil stone. Measure the cam height H, replace if the limit has been exceeded.

Cam height: H

Standard:
Intake:
46.55 — 46.65 mm (1.833 — 1.837 in)
Exhaust:
46.75 — 46.85 mm (1.841 — 1.844 in)

Limit:
Intake:
46.45 mm (1.829 in)
Exhaust:
46.65 mm (1.837 in)

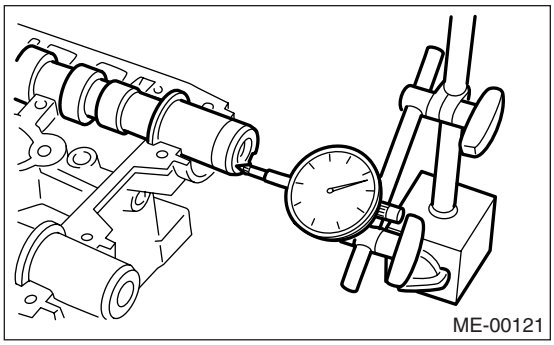
Cam base circle diameter A:
37.0 mm (1.457 in)



6) Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace the caps and cylinder head as a set. If necessary, replace the camshaft.

Standard:
0.068 — 0.116 mm (0.0027 — 0.0046 in)

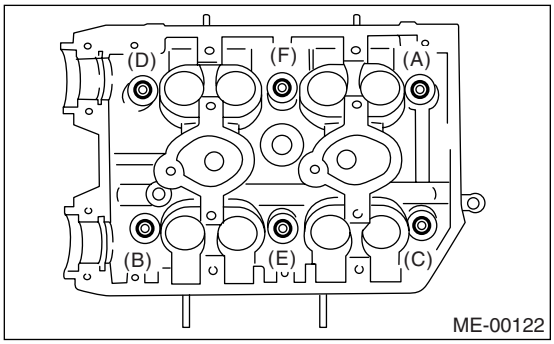
Limit:
0.14 mm (0.0055 in)



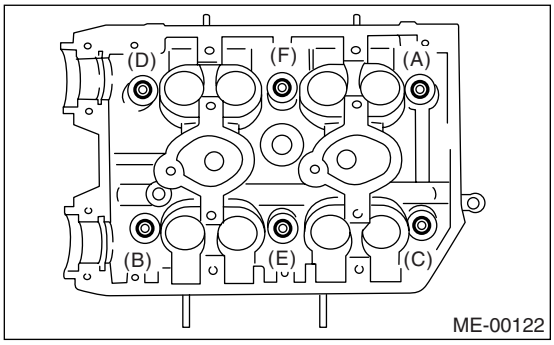
19.Cylinder Head Assembly

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(STi)-41, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(STi)-44, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(STi)-45, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(STi)-46, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(STi)-54, REMOVAL, Camshaft Sprocket.>
6) Remove the intake manifold. <Ref. to FU(STi)-13, REMOVAL, Intake Manifold.>
7) Remove the bolt which installs the A/C compressor bracket on cylinder head.
8) Remove the camshaft. <Ref. to ME(STi)-56, REMOVAL, Camshaft.>
9) Remove the cylinder head bolts in alphabetical sequence shown in the figure.
Leave bolts (A) and (D) engaged by three or four threads to prevent the cylinder head from falling.



10) While tapping the cylinder head with a plastic hammer, separate it from cylinder block. Remove the bolts (A) and (D) to remove cylinder head.



11) Remove the cylinder head gasket.

NOTE:
Do not scratch the mating surface of cylinder head and cylinder block.

12) Similarly, remove the cylinder head (RH).

B: INSTALLATION

1) Install the cylinder head and gaskets on cylinder block.

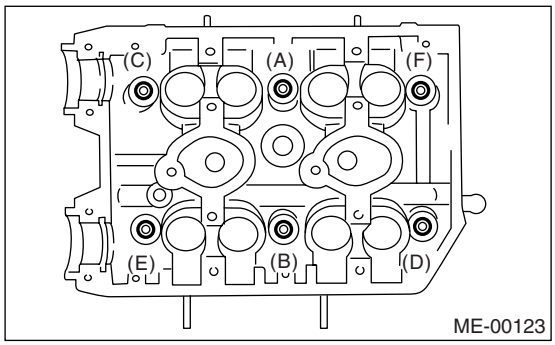
NOTE:
- Use new cylinder head gaskets.
- Be careful not to scratch the mating surface of cylinder head and cylinder block.

2) Tighten the cylinder head bolts.
   (1) Apply a coat of engine oil to the washers and bolt threads.
   (2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence.
   (3) Tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence again.
   (4) Back off all bolts by 180° first; back them off by 180° again in reverse order of installation.
   (5) Tighten all bolts to 49 N·m (5.0 kgf-m, 36 ft-lb) in alphabetical sequence.
   (6) Tighten all bolts 80 to 90° in alphabetical sequence.
   (7) Tighten all bolts by 40 to 45° in alphabetical sequence again.

NOTE:
Do not tighten the bolts by more than 45°.

   (8) Further tighten all bolts (A) and (B) by 40 to 45°.

NOTE:
Ensure that the total “re-tightening angle” in the previous two steps do not exceed 90°.



3) Install the camshaft. <Ref. to ME(STi)-57, INSTALLATION, Camshaft.>
4) Install the A/C compressor bracket on cylinder head.
5) Install the intake manifold. <Ref. to FU(STi)-15, INSTALLATION, Intake Manifold.><Ref. to FU(STi)-44, RELEASING OF FUEL PRESSURE, Fuel.>
6) Install the camshaft sprocket. <Ref. to ME(STi)-54, INSTALLATION, Camshaft Sprocket.>
7) Install the timing belt assembly. <Ref. to ME(STi)-47, INSTALLATION, Timing Belt Assembly.>

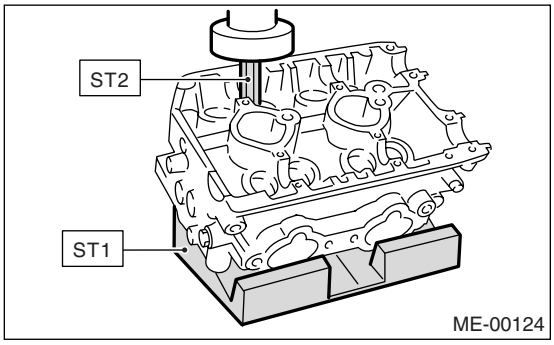
8) Install the timing belt cover. <Ref. to ME(STi)-45, INSTALLATION, Timing Belt Cover.>
9) Install the crankshaft pulley. <Ref. to ME(STi)-44, INSTALLATION, Crankshaft Pulley.>
10) Install the V-belt. <Ref. to ME(STi)-41, INSTALLATION, V-belt.>

C: DISASSEMBLY

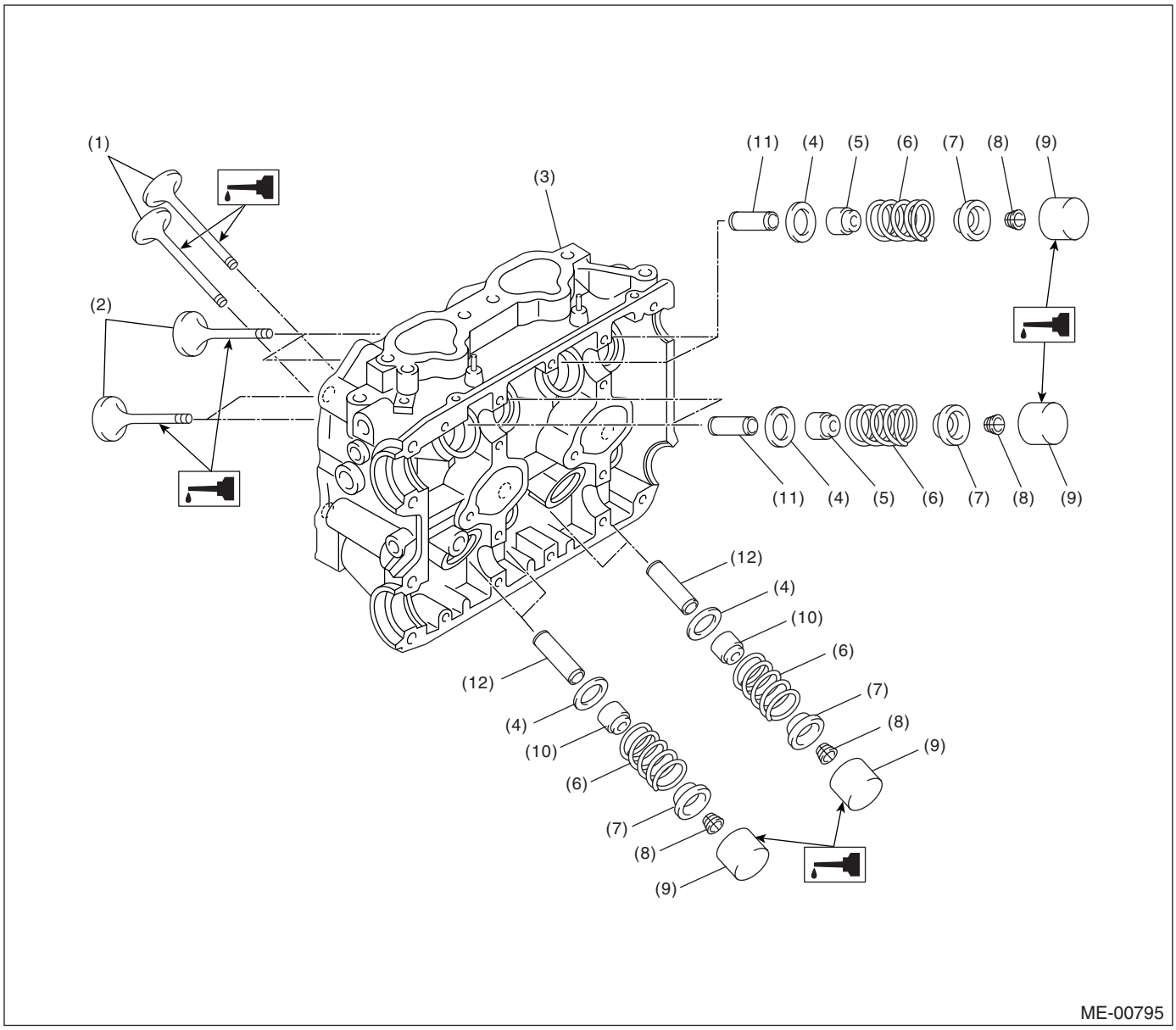
1) Remove the valve lifters.
2) Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

NOTE:
• Keep the removed parts in order for re-installing in their original positions.
• Mark each valve to prevent confusion.
• Use extreme care not to damage the lips of the intake valve oil seals and exhaust valve oil seals.



D: ASSEMBLY



(1)	Exhaust valve	(5)	Intake valve oil seal	(9)	Valve lifter
(2)	Intake valve	(6)	Valve spring	(10)	Exhaust valve oil seal
(3)	Cylinder head	(7)	Retainer	(11)	Intake valve guide
(4)	Valve spring seat	(8)	Retainer key	(12)	Exhaust valve guide

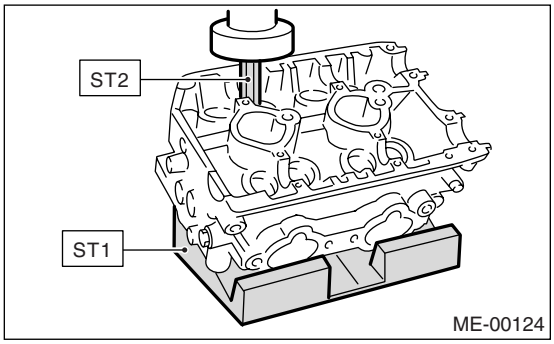
1) Installation of valve spring and valve:
   (1) Coat the stem of each valve with engine oil and insert the valve into valve guide.

NOTE:
When inserting the valve into valve guide, use special care not to damage the oil seal lip.

   (2) Set the cylinder head on ST1.
   (3) Install the valve spring and retainer using ST2.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

NOTE:
Be sure to install the valve springs with their close-coiled end facing the seat on cylinder head.



(4) Compress the valve spring, and then fit the valve spring retainer key.
(5) After installing, tap the valve spring retainers lightly with wooden hammer for better seating.

2) Apply oil to the surface of the valve lifter.
3) Install the valve lifter.

E: INSPECTION

1. CYLINDER HEAD

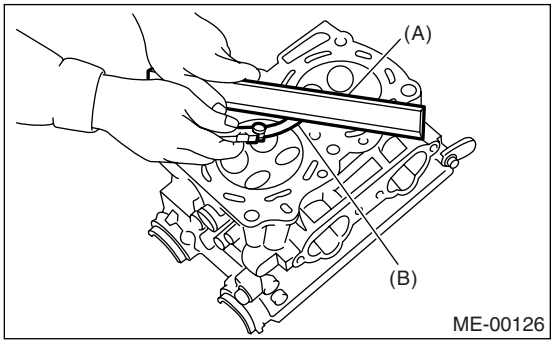
1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect the important areas by means of red check.
2) Measure the warping of the cylinder head surface that mates with crankcase by using a straight edge (A) and thickness gauge (B).
If the warping exceeds 0.05 mm (0.0020 in), regrind the surface with a surface grinder.

Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.3 mm (0.012 in)

Standard height of cylinder head:
127.5 mm (5.02 in)

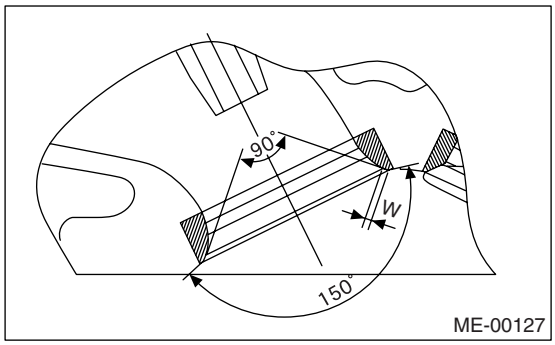
NOTE:
Uneven torque for the cylinder head nuts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.



2. VALVE SEAT

Inspect the intake and exhaust valve seats, and then correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

Valve seat width: W
Intake
Standard 1.0 mm (0.039 in)
Limit 1.7 mm (0.067 in)
Exhaust
Standard 1.5 mm (0.059 in)
Limit 2.2 mm (0.087 in)



3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

Clearance between the valve guide and valve stem:

Standard
Intake
0.030 — 0.057 mm (0.0012 — 0.0022 in)
Exhaust
0.040 — 0.067 mm (0.0016 — 0.0026 in)

Limit
0.15 mm (0.0059 in)

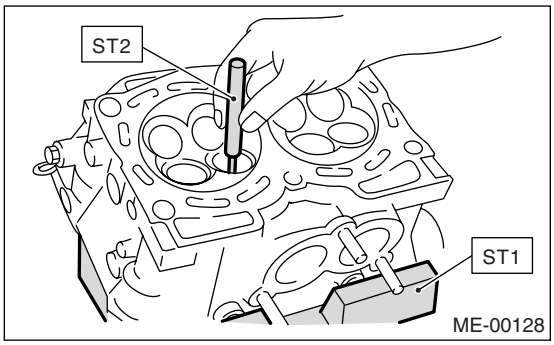
2) If the clearance between valve guide and stem exceeds the limit, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

Valve guide inner diameter:
6.000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameters:
Intake
5.955 — 5.970 mm (0.2344 — 0.2350 in)
Exhaust
5.945 — 5.960 mm (0.2341 — 0.2346 in)

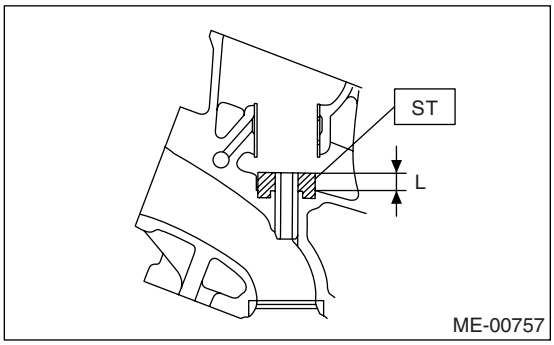
(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



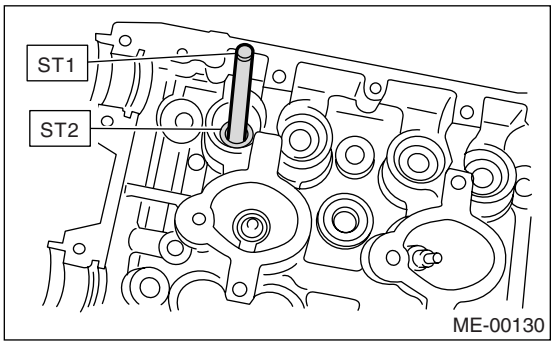
(3) Turn the cylinder head upside down and place ST as shown in the figure.

ST 18251AA020 VALVE GUIDE ADJUSTER



(4) Before installing a new valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.
(5) Put a new valve guide, coated with sufficient oil, in cylinder, and insert ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER
ST2 18251AA020 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion: L
15.8 — 16.2 mm (0.622 — 0.638 in)

(7) Ream the inside of valve guide with ST. Gently rotate the reamer clockwise while pressing it lightly into the valve guide, and return it also rotating clockwise. After reaming, clean the valve guide to remove chips.

ST 499767400 VALVE GUIDE REAMER

NOTE:
• Apply engine oil to the reamer when reaming.
• If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
• If the inner surface of the valve guide becomes lustrous and the reamer does not chip, use a new reamer or remedy the reamer.

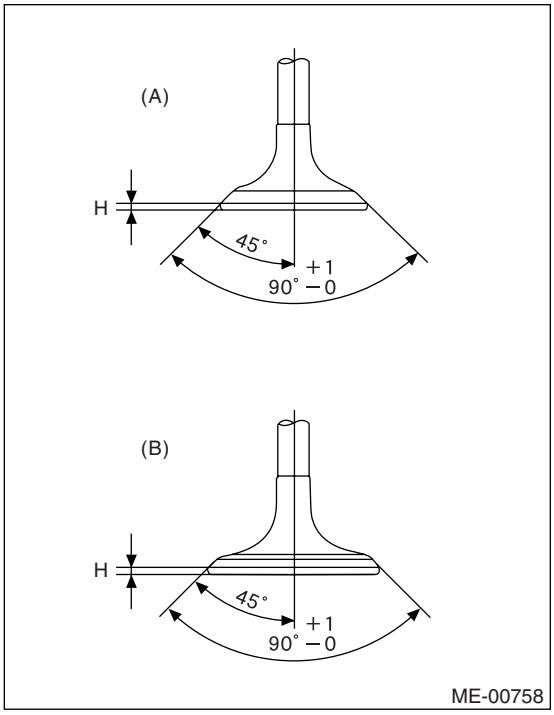
(8) Recheck the contact condition between valve and valve seat after replacing the valve guide.

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if “H” is less than the specified limit.

H:
Intake (A)
Standard 1.2 mm (0.047 in)
Limit 0.8 mm (0.031 in)
Exhaust (B)
Standard 1.5 mm (0.059 in)
Limit 0.8 mm (0.031 in)

Valve overall length:
Intake (A)
104.4 mm (4.110 in)
Exhaust (B)
104.65 mm (4.120 in)

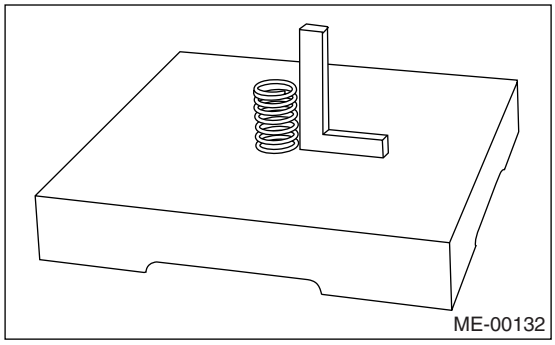


2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Install a new intake valve oil seal after lapping.

5. VALVE SPRINGS

1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not within specifications presented in the table.
2) To measure the squareness of valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

		Valve spring
Free length		47.32 mm (1.863 in)
Tension/spring height	Set	205 — 235 N (20.9 — 24.0 kgf, 46.1 — 52.8 lb) /36.0 mm (1.417 in)
	Lift	426 — 490 N (43.4 — 50.0 kgf, 95.8 — 110 lb) /26.45 mm (1.041 in)
Squareness		2.5°, 2.1 mm (0.083 in)



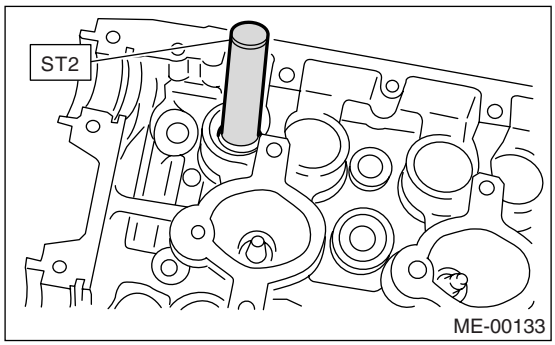
6. INTAKE AND EXHAUST VALVE OIL SEAL

Replace the oil seal with a new one, if the lip is damaged or spring out of place, or when the surfaces of intake valve and valve seat are reconditioned or intake valve guide is replaced.
1) Place the cylinder head on ST1.
2) Press in the oil seal to the specified dimension indicated in the figure by using ST2.
ST1 498267600 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE

NOTE:
- Apply engine oil to oil seal before press-fit.
- Differentiate between the intake valve oil seal and exhaust valve oil seal by noting their difference in color.

Color of rubber part:
Intake [Black] Exhaust [Brown]

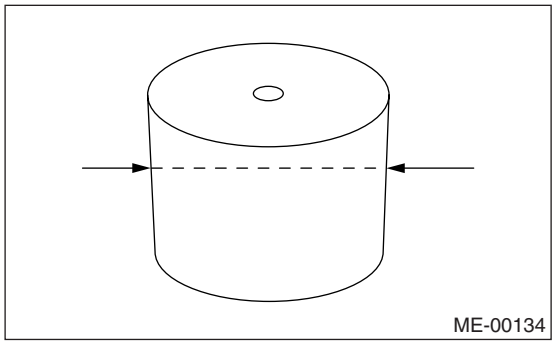
Color of spring part:
Intake [White] Exhaust [White]



7. VALVE LIFTER

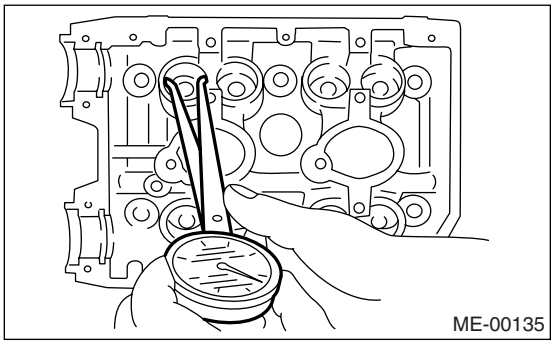
1) Visually check the valve lifter.
2) Measure the outer diameter of valve lifter.

Outer diameter:
34.959 — 34.975 mm (1.3763 — 1.3770 in)


ME-00134

3) Measure the inner diameter of valve lifter mating part on cylinder head.

Inner diameter:
34.994 — 35.016 mm (1.3777 — 1.3786 in)


ME-00135

NOTE:
If difference between outer diameter of valve lifter and inner diameter of valve lifter mating part is over the limit, replace the cylinder head.

Standard:
0.019 — 0.057 mm (0.0007 — 0.0022 in)

Limit:
0.100 mm (0.0039 in)

F: DISPOSAL

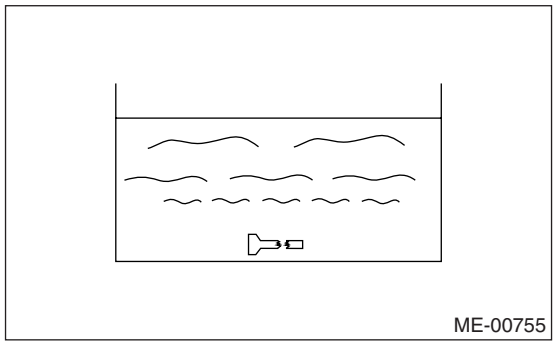
CAUTION:
• Metallic sodium is enclosed in the exhaust valve. Metallic sodium is extremely alkaline and may produce severe chemical reactions. Full consideration must therefore be given to the following points when handling or disposing of the valve.
• Since metallic sodium may cause blindness if contacted with the eyes, burns if contacted with the skin, and fire, do not deliberately take the valve apart.

1) If the valve is damaged, remove the valve and neutralize it by immersing it in water, and dispose of it in the same way that general steel materials are disposed of. The disposal method is described in the following.
(1) Wearing rubber gloves, remove the damaged valve from the cylinder head.
(2) Prepare a large receptacle (bucket or other container) in a well ventilated location, and fill the receptacle with water (at least 10 liters).
(3) Immerse the damaged valve in the receptacle.

CAUTION:
A severe reaction may occur, so stand at least 2 — 3 m from the receptacle. Because the reaction will produce hydrogen gas, moreover, keep the receptacle away from sparks or flames.

(4) Once the reaction is completed (about 4 — 5 hours have elapsed), carefully remove the valve using large pincers so that the reaction liquid does not contact your skin, and dispose of it with other parts that are being disposed of.
(5) The reaction liquid is a strong alkaline solution, so it must be disposed of in accordance with local regulations.

CAUTION:
Make sure the reaction liquid does not contact your skin. If contact with skin occurs, immediately wash the affected area with large quantities of water.


ME-00755

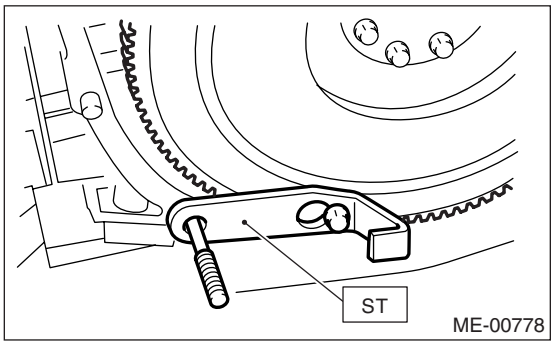
20.Cylinder Block

A: REMOVAL

NOTE:
Before conducting this procedure, drain the engine oil completely if applicable.

1) Remove the intake manifold. <Ref. to FU(STi)-13, REMOVAL, Intake Manifold.>
2) Remove the V-belt. <Ref. to ME(STi)-41, REMOVAL, V-belt.>
3) Remove the crankshaft pulley. <Ref. to ME(STi)-44, REMOVAL, Crankshaft Pulley.>
4) Remove the timing belt cover. <Ref. to ME(STi)-45, REMOVAL, Timing Belt Cover.>
5) Remove the timing belt assembly. <Ref. to ME(STi)-46, REMOVAL, Timing Belt Assembly.>
6) Remove the camshaft sprocket. <Ref. to ME(STi)-54, REMOVAL, Camshaft Sprocket.>
7) Remove the crankshaft sprocket. <Ref. to ME(STi)-55, REMOVAL, Crankshaft Sprocket.>
8) Remove the generator and A/C compressor with their brackets.
9) Remove the cylinder head assembly. <Ref. to ME(STi)-62, REMOVAL, Cylinder Head Assembly.>
10) Remove the clutch disc and cover. <Ref. to CL-11, REMOVAL, Clutch Disc and Cover.>
11) Remove the flywheel. <Ref. to CL-13, REMOVAL, Flywheel.>

ST 498497100 CRANKSHAFT STOPPER

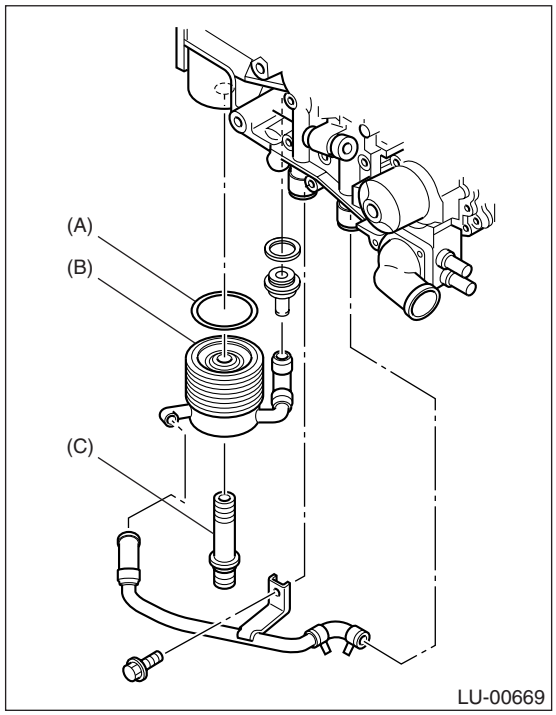


12) Remove the oil separator cover.
13) Remove the water by-pass pipe for heater.
14) Remove the oil filter.

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

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

15) Remove the oil cooler.

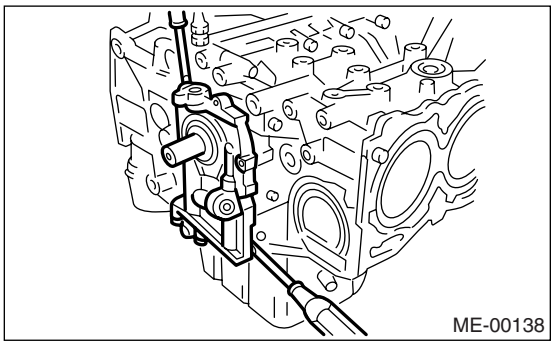


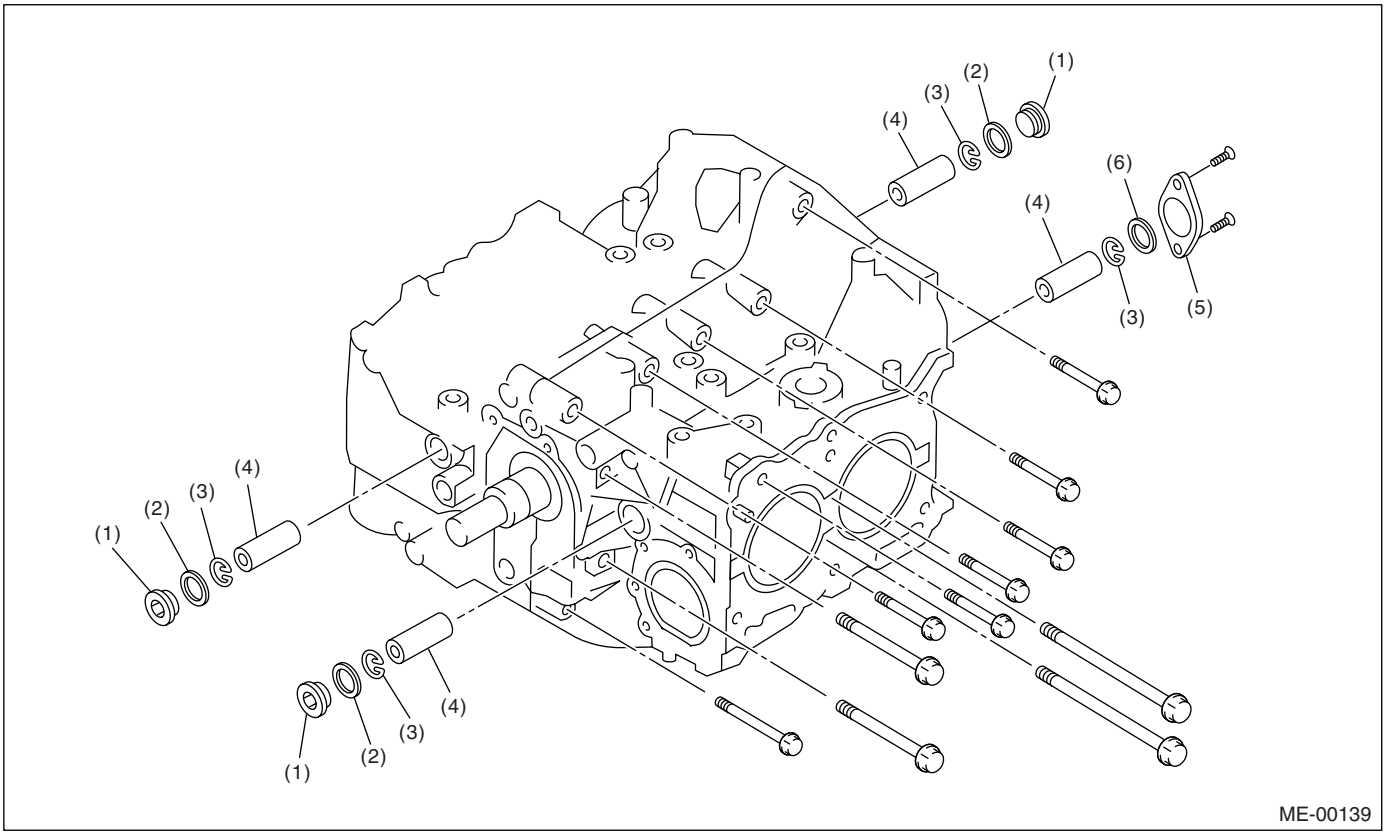
(A) Gasket
(B) Oil cooler
(C) Oil cooler connector

16) Removal of oil pan:
(1) Turn the cylinder block with #2 and #4 piston sides facing upward.
(2) Remove the bolts which secure oil pan to cylinder block.
(3) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance, and then remove the oil pan.
Do not use a screwdriver or similar tool in place of oil pan cutter.
17) Remove the oil strainer stay.
18) Remove the oil strainer.
19) Remove the baffle plate.
20) Remove the water pipes.
21) Remove the water pump.
22) Remove the oil pump from cylinder block.

Use a flat-bladed screwdriver as shown in the figure when removing the oil pump.

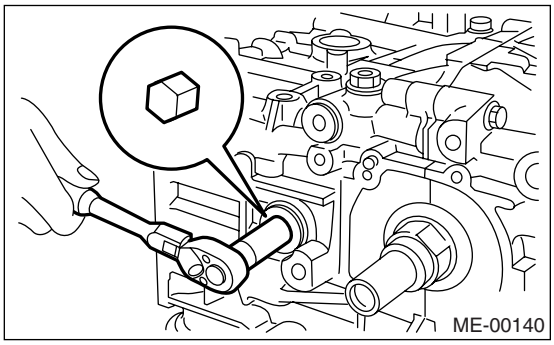
NOTE:
Be careful not to scratch the mating surface of cylinder block and oil pump.



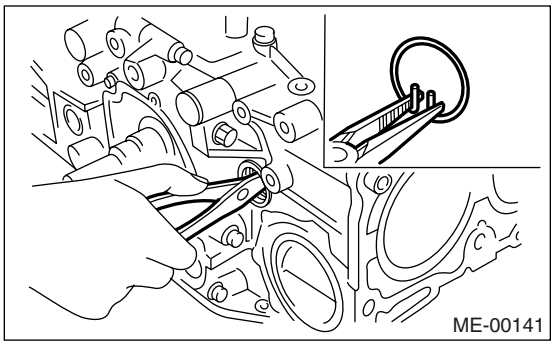


(1) Service hole plug
(2) Gasket
(3) Circlip
(4) Piston pin
(5) Service hole cover
(6) O-ring

23) Remove the service hole cover and service hole plugs using hexagon wrench [14 mm (0.55 in)].

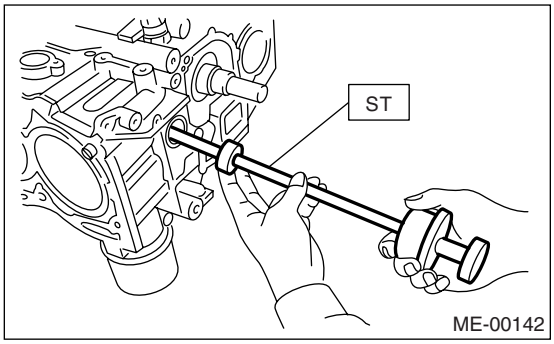


24) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, and then remove the piston circlip through service hole of #1 and #2 cylinders.



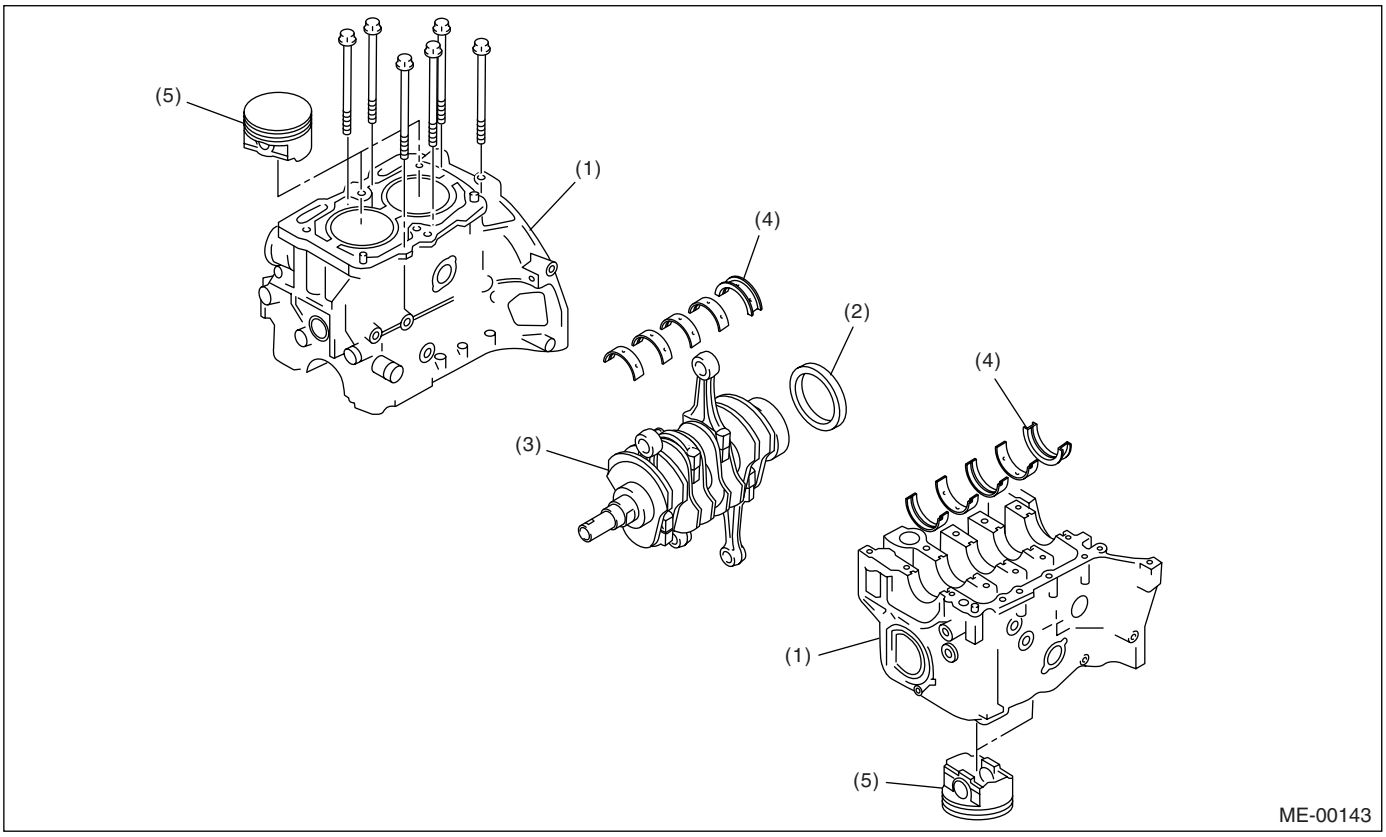
25) Draw out the piston pin from #1 and #2 pistons using ST.
ST 499097600 PISTON PIN REMOVER

NOTE:
Be careful not to confuse the original combination of piston, piston pin and cylinder.



26) Similarly remove the piston pins from #3 and #4 pistons.
27) Remove the bolts which connect the cylinder block on the side of #2 and #4 cylinders.
28) Back off the bolts which connect the cylinder block on the side of #1 and #3 cylinders two or three turns.
29) Set up the cylinder block so that #1 and #3 cylinders are on the upper side, then remove the cylinder block connecting bolts.
30) Separate the cylinder blocks (LH) and (RH).

NOTE:
When separating the cylinder block, do not allow the connecting rod to fall and damage the cylinder block.



(1) Cylinder block
(2) Rear oil seal
(3) Crankshaft
(4) Crankshaft bearing
(5) Piston

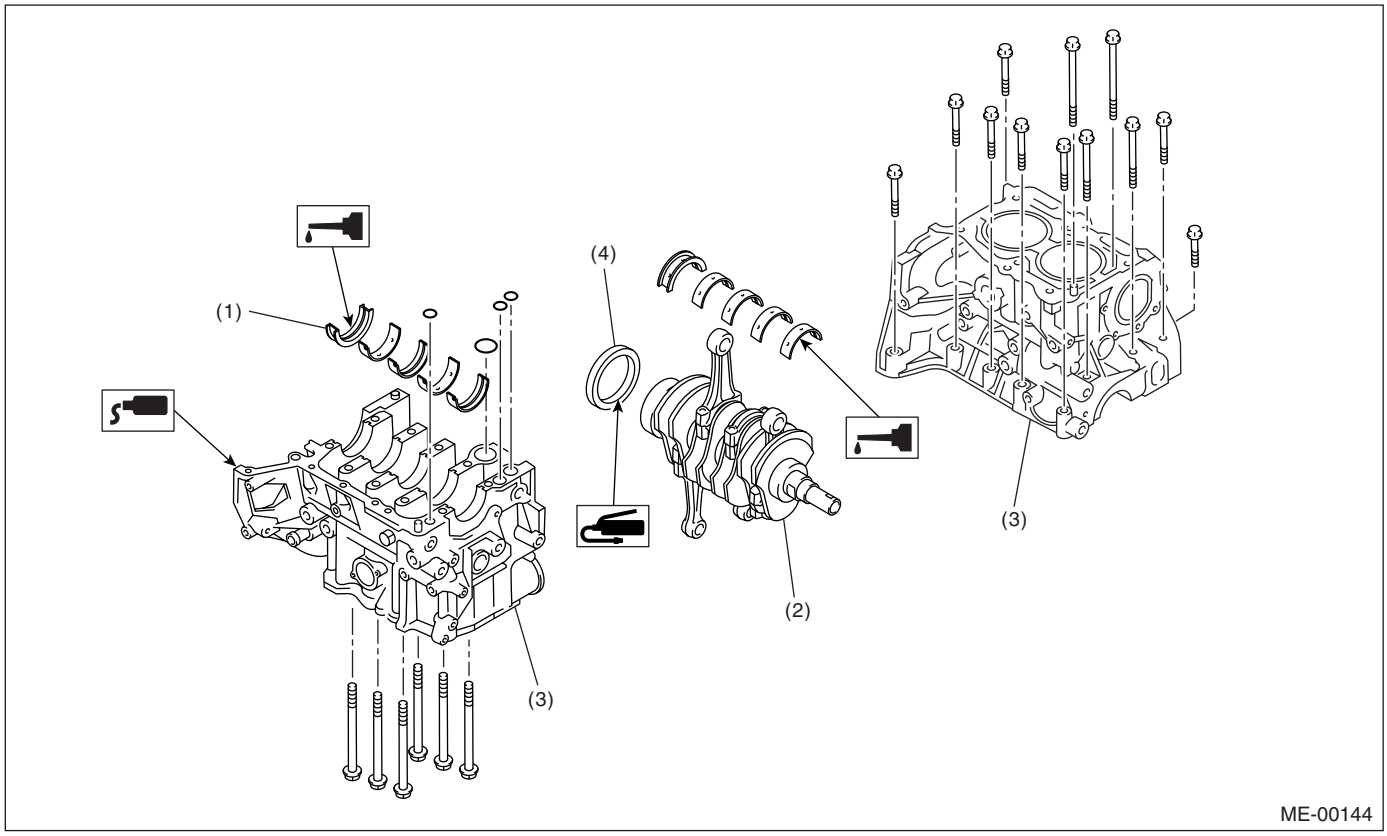
31) Remove the rear oil seal.
32) Remove the crankshaft together with connecting rod.
33) Remove the crankshaft bearings from cylinder block using a hammer handle.

NOTE:
Do not confuse the combination of crankshaft bearings. Press the bearing at the end opposite to locking lip.

34) Draw out each piston from cylinder block using a wooden bar or hammer handle.

NOTE:
Do not confuse the combination of piston and cylinder.

B: INSTALLATION

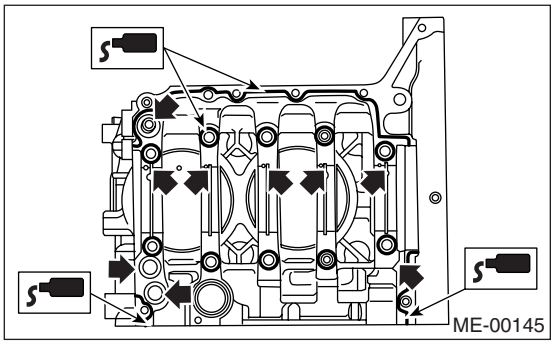


(1) Crankshaft bearing
(2) Crankshaft
(3) Cylinder block
(4) Rear oil seal

1) Remove oil in the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.
2) Position the crankshaft on #2 and #4 cylinder block.
3) Apply fluid packing to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

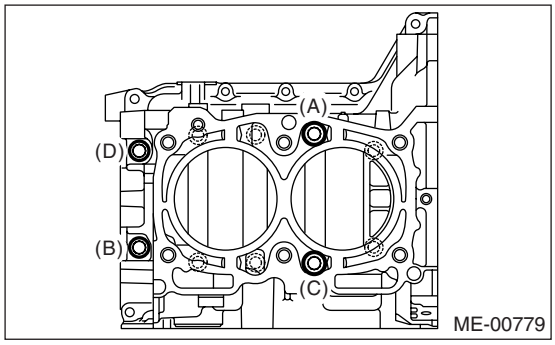
Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent

NOTE:
Do not allow fluid packing to jut into O-ring grooves, oil passages, bearing grooves, etc.



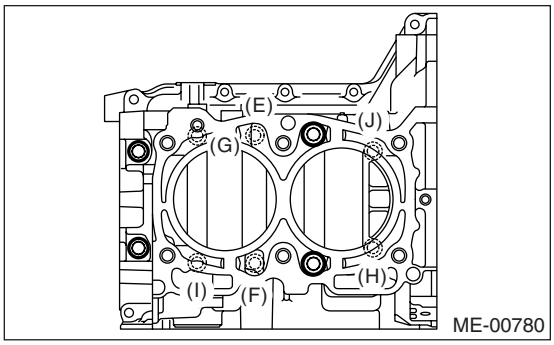
4) Apply engine oil to washers and thread of bolts.
5) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (LH side)

Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)



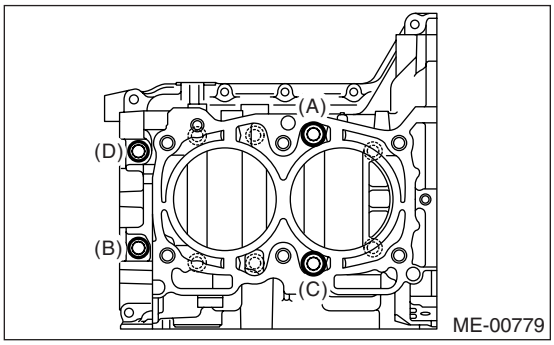
6) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (RH side)

Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)



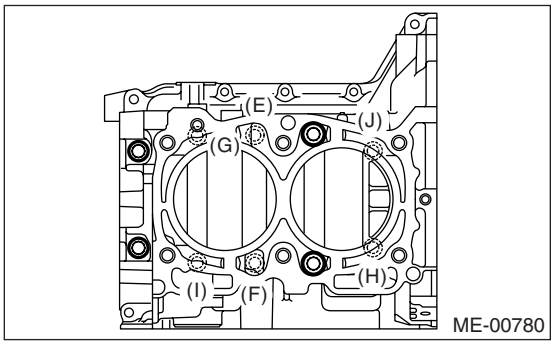
7) Further tighten the LH side bolts (A — D) in alphabetical sequence.

Tightening torque:
(A), (C): 20 N·m (2.0 kgf-m, 14.8 ft-lb)
(B), (D): 15 N·m (1.5 kgf-m, 10.8 ft-lb)

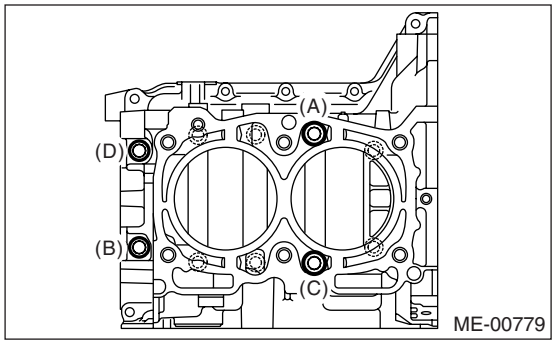


8) Further tighten the RH side bolts (E — J) in alphabetical sequence.

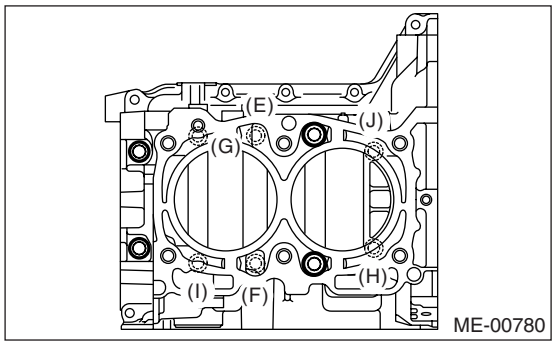
Tightening torque:
(E), (F), (G), (I): 20 N·m (2.0 kgf-m, 14.8 ft-lb)
(H), (J): 18 N·m (1.8 kgf-m, 13.3 ft-lb)



9) Further tighten the LH side bolts (A — D) by 90° in alphabetical sequence.

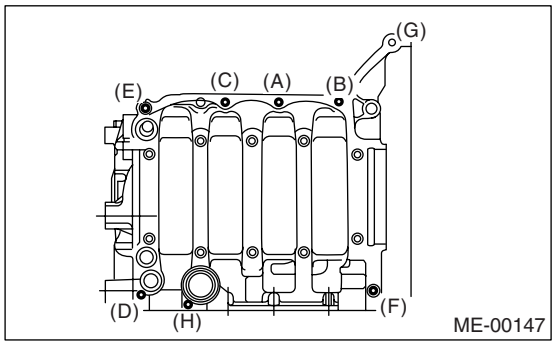


10) Further tighten the RH side bolts (E — J) by 90° in alphabetical sequence.



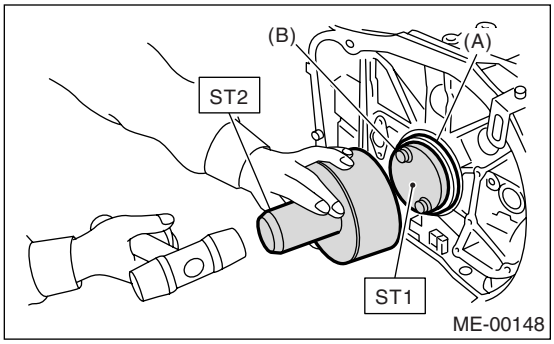
11) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

Tightening torque:
(A) — (G): 25 N·m (2.5 kgf-m, 18.1 ft-lb)
(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



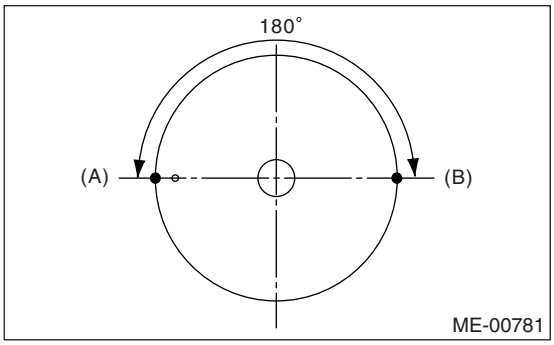
12) Install the rear oil seal using ST1 and ST2.
ST1 499597100 CRANKSHAFT OIL SEAL GUIDE

ST2 499587200 CRANKSHAFT OIL SEAL INSTALLER

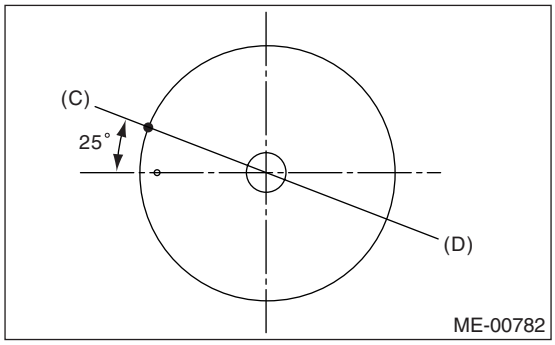


(A) Rear oil seal
(B) Flywheel attaching bolt

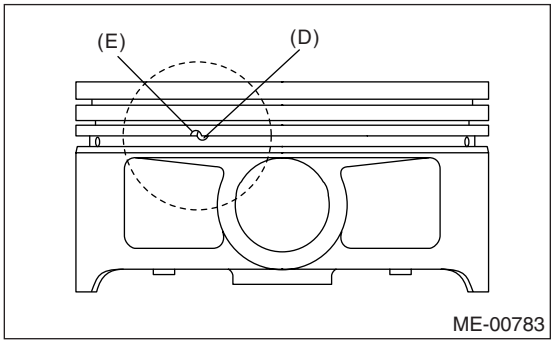
13) Position the top ring gap at (A) or (B) in the figure.
14) Position the second ring gap at 180° on the reverse side for the top ring gap.



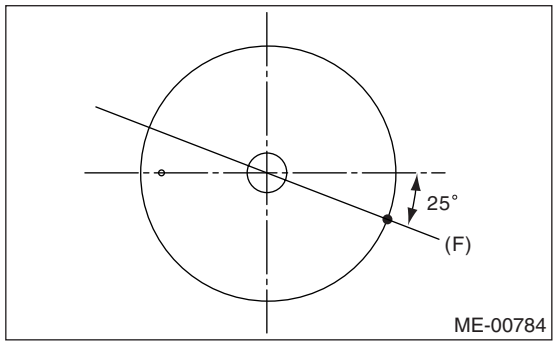
15) Position the upper rail gap at (C) in the figure.



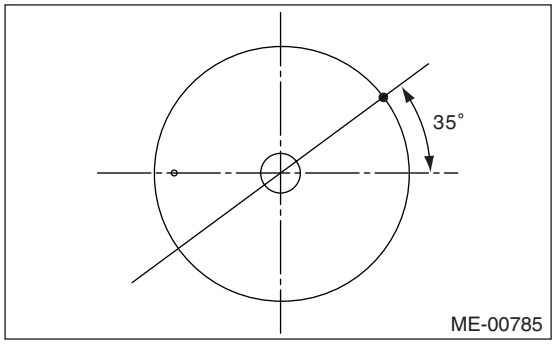
16) Align upper rail spin stopper (D) with piston side surface hole (E).



17) Position the expander gap at (F) in the figure.



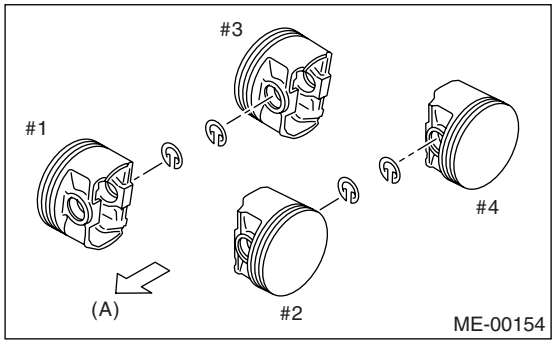
18) Position the lower rail gap at (G) in the figure.

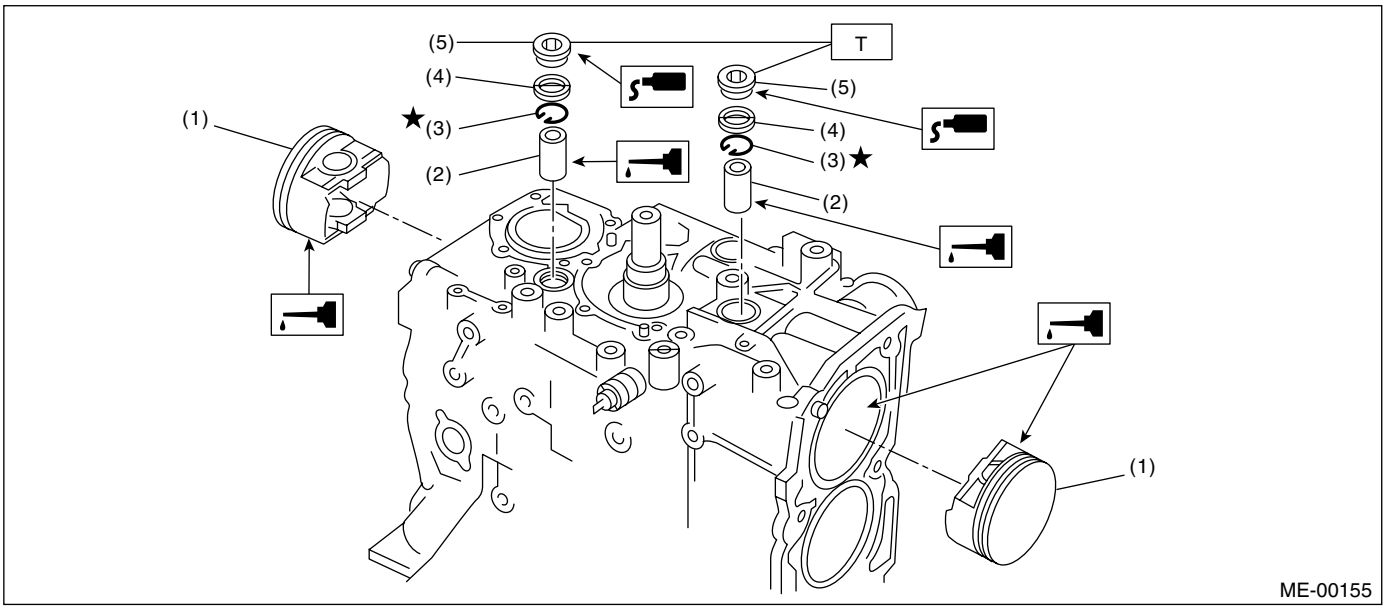


NOTE:
- Ensure ring gaps do not face the same direction.
- Ensure ring gaps are not within the piston skirt area.

19) Install the circlip.
Install the circlips in piston holes located opposite of service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

NOTE:
Use new circlips.





(1) Piston
(2) Piston pin
(3) Circlip
(4) Gasket
(5) Service hole plug

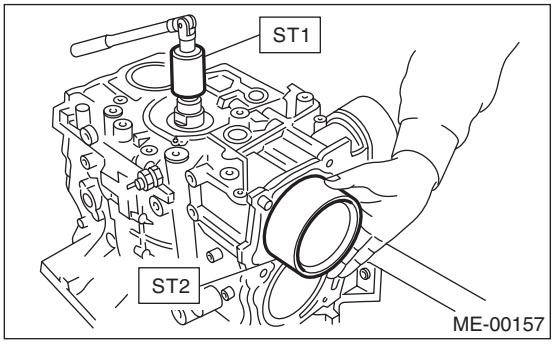
Tightening torque: N·m (kgf-m, ft-lb)
T: 70 (7.1, 51.4)

20) Installing the piston:
(1) Turn the cylinder block so that #1 and #2 cylinders face upward.
(2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

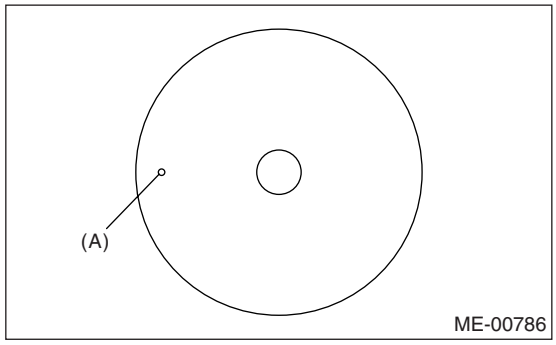
ST1 499987500 CRANKSHAFT SOCKET

(3) Apply a coat of engine oil to the pistons and cylinders and insert pistons in their cylinders using ST2.

ST2 498747300 PISTON GUIDE



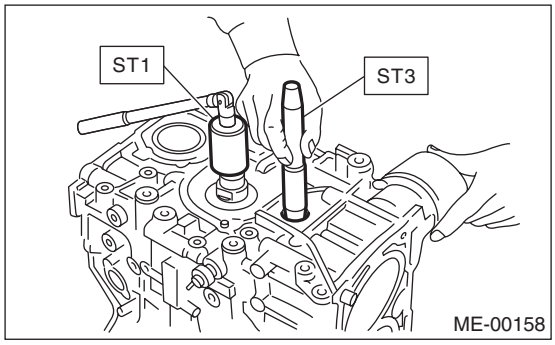
NOTE:
Piston front mark faces towards the front of the engine.



(A) Front mark

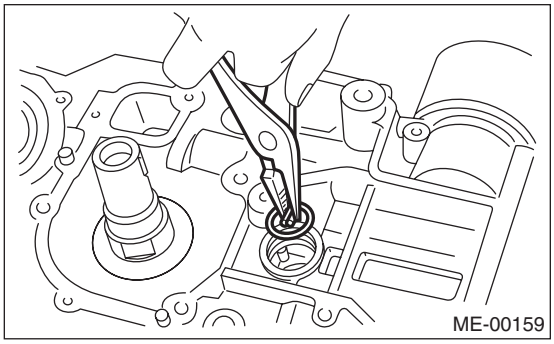
21) Installing piston pin:
(1) Apply a coat of engine oil to ST3, and then insert the ST3 into service hole to align piston pin hole with connecting rod small end.

ST3 499017100 PISTON PIN GUIDE



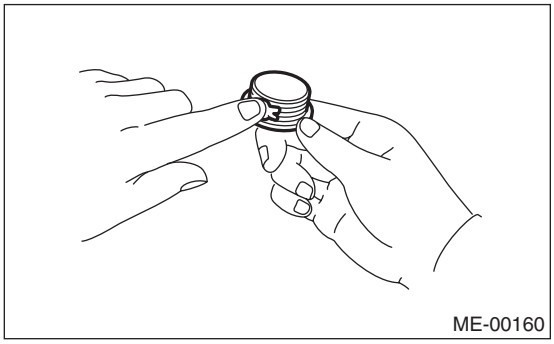
(2) Apply a coat of engine oil to the piston pin and insert piston pin into piston and connecting rod through service hole.
(3) Using the ST, install the circlip.

NOTE:
Use new circlips.



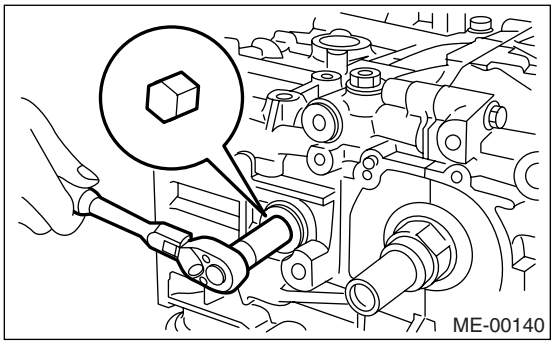
(4) Apply fluid packing around the service hole plug.

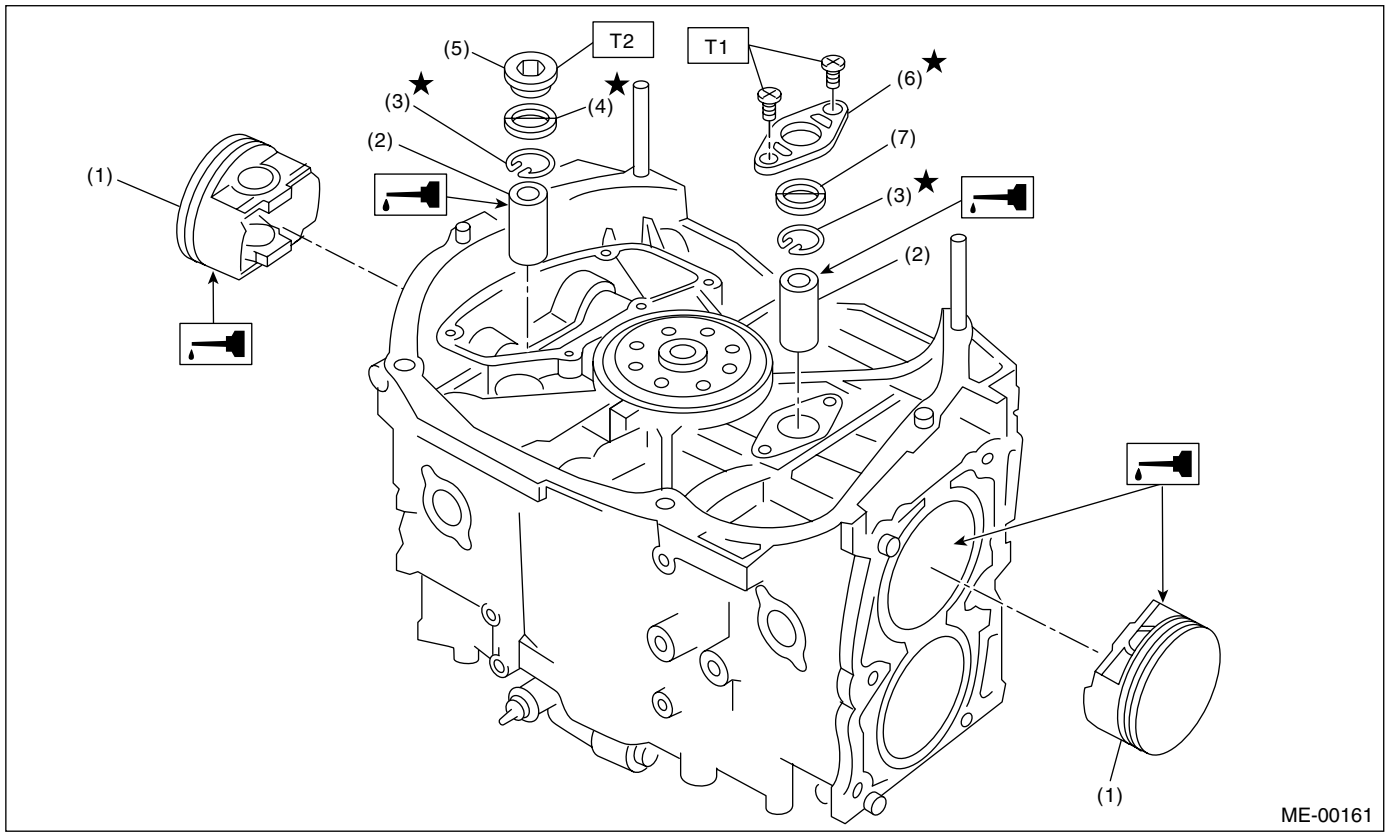
Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



(5) Install the service hole plug and gasket.

NOTE:
Use a new gasket.





(1) Piston
(2) Piston pin
(3) Circlip
(4) Gasket
(5) Service hole plug
(6) Service hole cover
(7) O-ring

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*6.4 (0.65, 4.7)*
T2:	*70 (7.1, 51.4)*

(6) Turn the cylinder block so that #3 and #4 cylinders face upward. Using the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.

22) Install the water pipe.

23) Install the baffle plate.

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

24) Install the oil strainer and O-ring

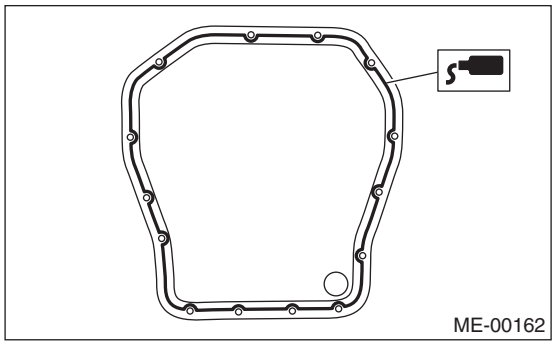
Tightening torque:
10 N·m (1.0 kgf-m, 7 ft-lb)

25) Install the oil strainer stay.

26) Apply fluid packing to the matching surfaces, and then install the oil pan.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent

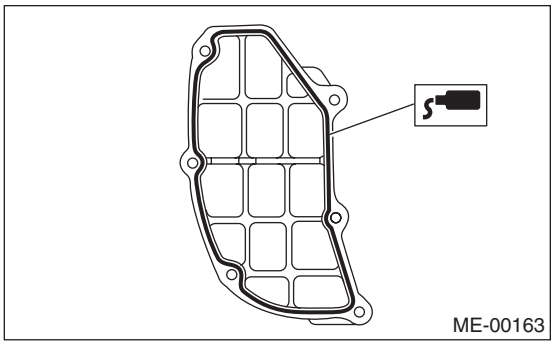
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



27) Apply fluid packing to the matching surfaces, and then install the oil separator cover.

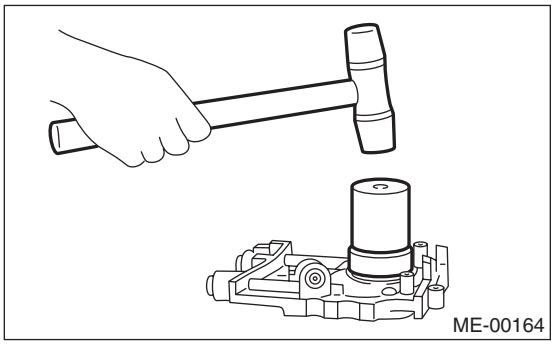
Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent

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



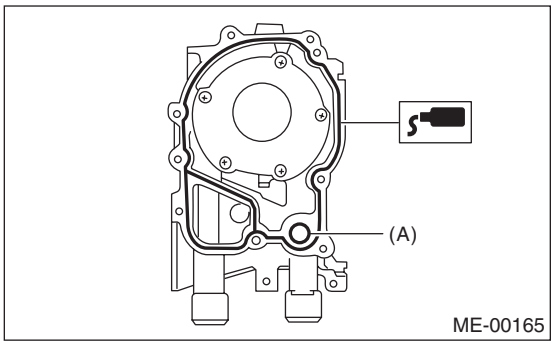
28) Install the flywheel. <Ref. to CL-13, INSTALLATION, Flywheel.>
29) Install the clutch disc and cover. <Ref. to CL-11, INSTALLATION, Clutch Disc and Cover.>
30) Installation of oil pump:
(1) Discard the front oil seal after removal. Replace with a new one using the ST.

ST 499587100 OIL SEAL INSTALLER



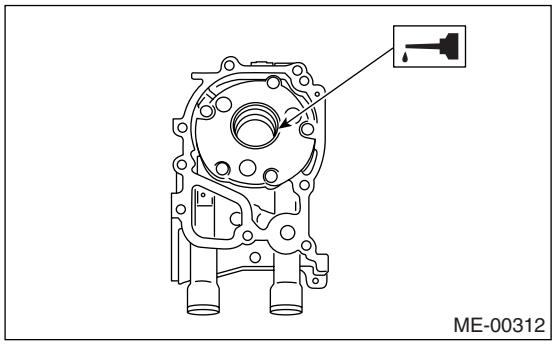
(2) Apply fluid packing to the matching surface of oil pump.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



(A) O-ring

(3) Apply a coat of engine oil to the inside of the oil seal.



(4) Install the oil pump on cylinder block. Be careful not to damage the oil seal during installation.

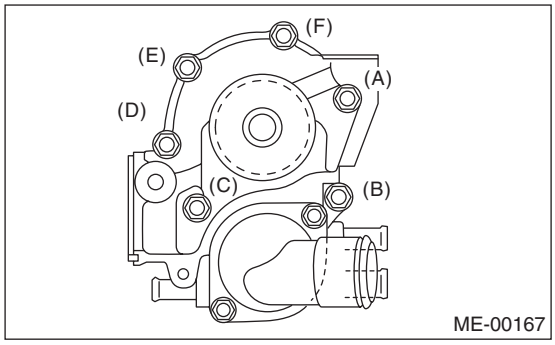
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

NOTE:
• Do not forget to install the O-ring and seal when installing the oil pump.
• Align the flat surface of oil pump's inner rotor with crankshaft before installation.

31) Install the water pump and gasket.

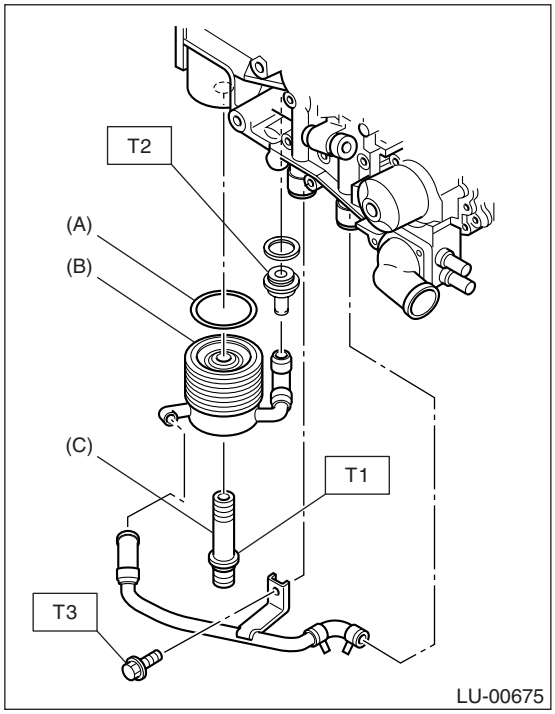
Tightening torque:
First; 12 N·m (1.2 kgf-m, 8.7 ft-lb)
Second; 12 N·m (1.2 kgf-m, 8.7 ft-lb)

NOTE:
• Be sure to use a new gasket.
• When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in the figure.



32) Install the water by-pass pipe for heater.
33) Install the oil cooler.

Tightening torque:
T1: 54 N·m (5.5 kgf-m, 40 ft-lb)
T2: 69 N·m (7.0 kgf-m, 50.6 ft-lb)
T3: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



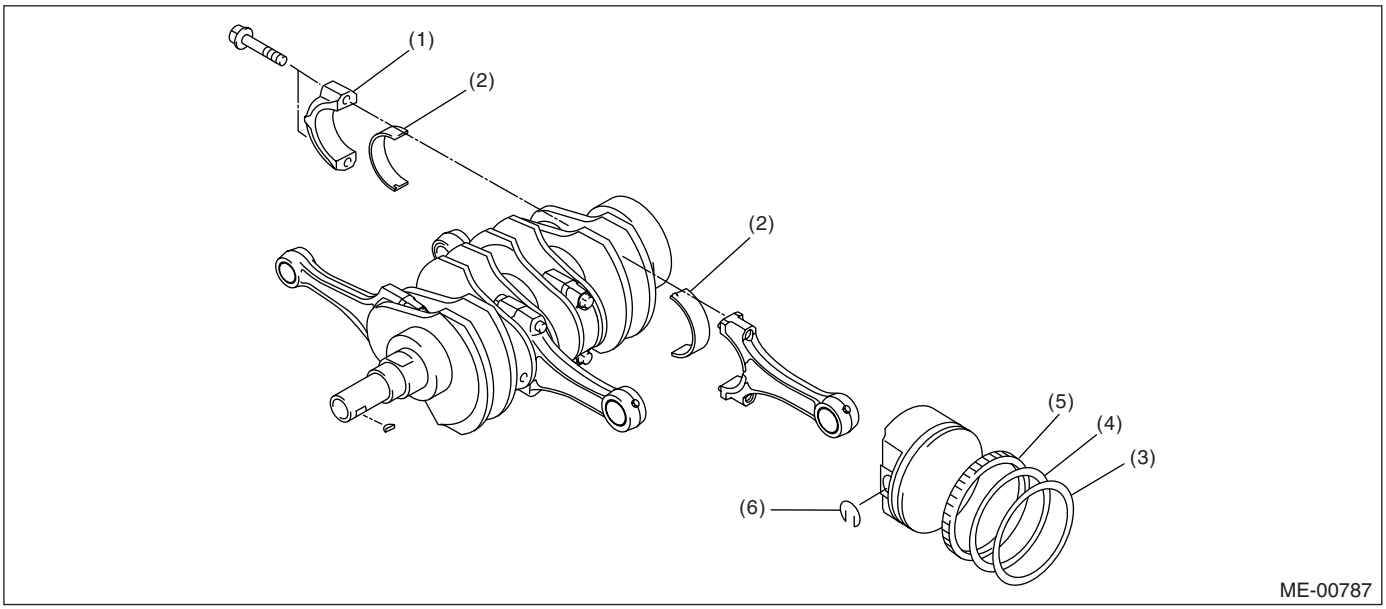
(A) O-ring
(B) Oil cooler
(C) Oil cooler connector

34) Install the oil filter using ST.
ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm)
ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm)
35) Install the water by-pass pipe between oil cooler and water pump.
36) Install the water pipe.

NOTE:
Always use a new O-ring.

37) Install the cylinder head assembly. <Ref. to ME(STi)-62, INSTALLATION, Cylinder Head Assembly.>
38) Install the oil level gauge guide and tighten the attaching bolt (LH side).
39) Install the rocker cover.
40) Install the crankshaft sprocket. <Ref. to ME(STi)-55, INSTALLATION, Crankshaft Sprocket.>
41) Install the camshaft sprocket. <Ref. to ME(STi)-54, INSTALLATION, Camshaft Sprocket.>
42) Install the timing belt assembly. <Ref. to ME(STi)-47, INSTALLATION, Timing Belt Assembly.>
43) Install the timing belt cover. <Ref. to ME(STi)-45, INSTALLATION, Timing Belt Cover.>
44) Install the crankshaft pulley. <Ref. to ME(STi)-44, INSTALLATION, Crankshaft Pulley.>
45) Install the generator and A/C compressor brackets on cylinder head.
46) Install the V-belt. <Ref. to ME(STi)-41, INSTALLATION, V-belt.>
47) Install the intake manifold. <Ref. to FU(STi)-13, REMOVAL, Intake Manifold.>

C: DISASSEMBLY



(1) Connecting rod cap
(2) Connecting rod bearing
(3) Top ring
(4) Second ring
(5) Oil ring
(6) Circlip

1) Remove the connecting rod cap.
2) Remove the connecting rod bearing.

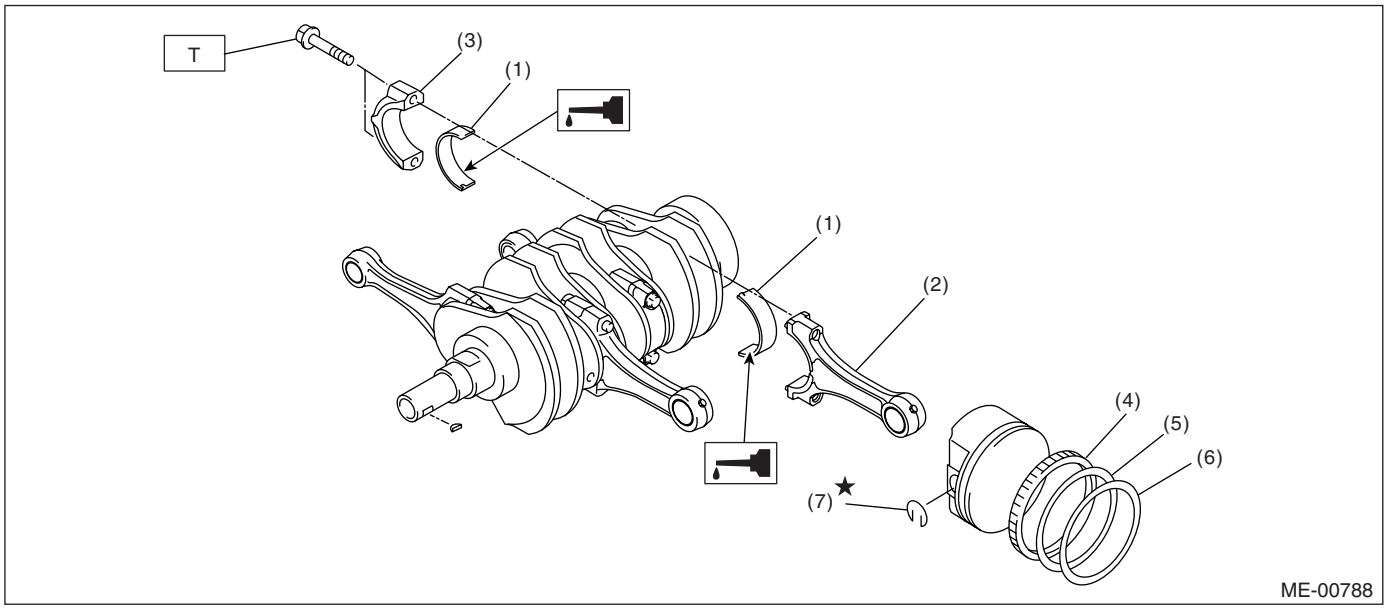
NOTE:
Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

3) Remove the piston rings using the piston ring expander.
4) Remove the oil ring by hand.

NOTE:
Arrange the removed piston rings in proper order to prevent confusion.

5) Remove the circlip.

D: ASSEMBLY



(1) Connecting rod bearing
(2) Connecting rod
(3) Connecting rod cap
(4) Oil ring
(5) Second ring
(6) Top ring
(7) Circlip

Tightening torque: N·m (kgf-m, ft-lb)
T: 52 (5.3, 38.4)

1) Apply oil to the surfaces of the connecting rod bearings. Install the connecting rod bearings on connecting rods and connecting rod caps.
2) Install the connecting rod on crankshaft.

NOTE:
Position each connecting rod with the side marked facing forward.

3) Install the connecting rod cap with connecting rod nut.
Ensure the arrow on connecting rod cap faces the front during installation.

NOTE:
• Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
• When tightening the connecting rod nuts, apply oil on the threads.

4) Install the oil ring spacer, upper rail and lower rail in this order by hand. Then install the second ring and top ring with a piston ring expander.

E: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks and damage. Especially, inspect the important parts by means of red lead check.
2) Check the oil passages for clogging.
3) Inspect the crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.1 mm (0.004 in)

Standard height of cylinder block:
201.0 mm (7.91 in)

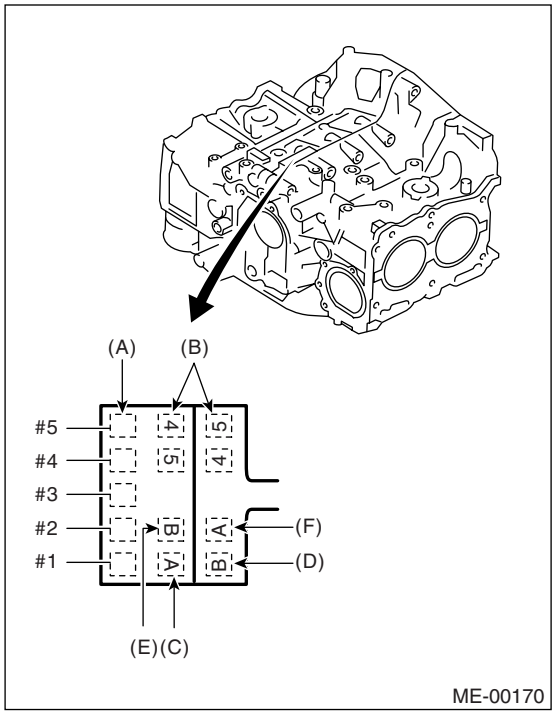
2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on cylinder block's front upper surface.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

NOTE:
Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as a guide line in selecting a standard piston.

Standard diameter:
A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)
B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)



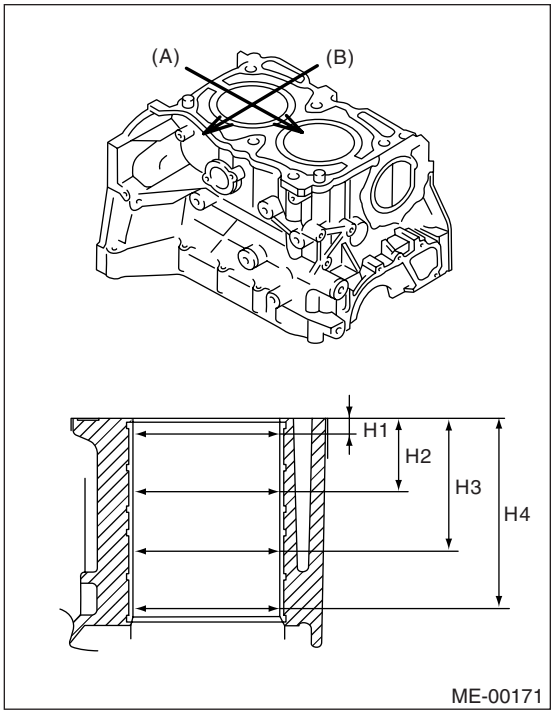
(A) Main journal size mark
(B) Cylinder block (RH)-(LH) combination mark
(C) #1 cylinder bore size mark
(D) #2 cylinder bore size mark
(E) #3 cylinder bore size mark
(F) #4 cylinder bore size mark

2) How to measure the inner diameter of each cylinder:
Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the figure, using a cylinder bore gauge.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Taper:
Standard
0.015 mm (0.0006 in)
Limit
0.050 mm (0.0020 in)

Out-of-roundness:
Standard
0.010 mm (0.0004 in)
Limit
0.050 mm (0.0020 in)



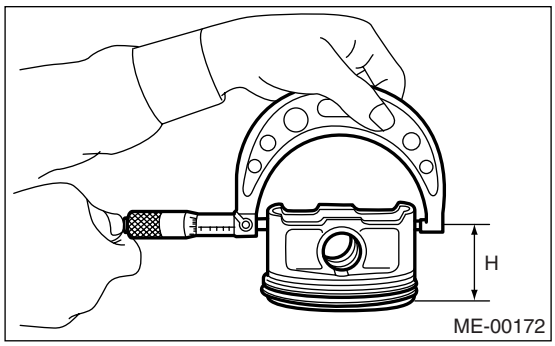
(A) Piston pin direction
(B) Thrust direction
H1: 10 mm (0.39 in)
H2: 45 mm (1.77 in)
H3: 80 mm (3.15 in)
H4: 115 mm (4.53 in)

3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.
4) How to measure the outer diameter of each piston:
Measure the outer diameter of each piston at the height shown in the figure. (Thrust direction)

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Piston grade point H:
38.2 mm (1.50 in)

Piston outer diameter:
Standard
A: 99.505 — 99.515 mm
(3.9175 — 3.9179 in)
B: 99.495 — 99.505 mm
(3.9171 — 3.9175 in)
0.25 mm (0.0098 in) oversize
99.745 — 99.765 mm
(3.9270 — 3.9278 in)
0.50 mm (0.0197 in) oversize
99.995 — 100.015 mm
(3.9368 — 3.9376 in)



5) Calculate the clearance between cylinder and piston.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Cylinder to piston clearance at 20°C (68°F):
Standard
–0.010 — 0.010 mm (–0.0004 — 0.0004 in)
Limit
0.030 mm (0.0012 in)

6) Boring and honing:
(1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the specified limit or if there is any damage on the cylinder wall, reboring it to use an oversize piston.

CAUTION:
When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons. Do not perform boring on one cylinder only, nor use an oversize piston for one cylinder only.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the crankcase.

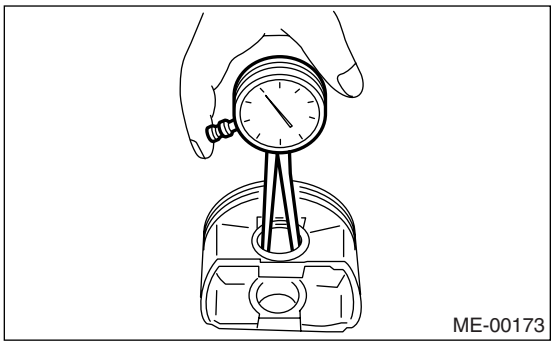
NOTE:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

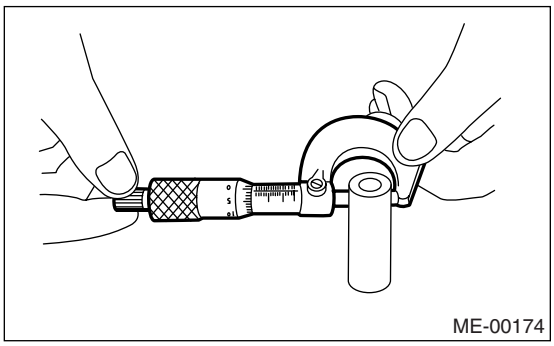
Limit of cylinder enlarging (boring):
0.5 mm (0.020 in)

3. PISTON AND PISTON PIN

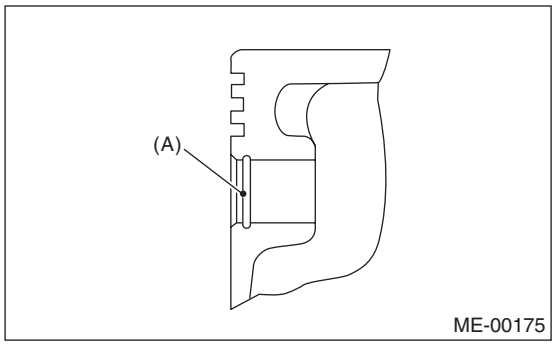
1) Check the pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.
2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(STi)-82, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not within specification, replace the piston or bore the cylinder to use an oversize piston.
3) Make sure that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if defective.

Standard clearance between piston pin and hole in piston:
Standard
0.004 — 0.008 mm (0.0002 — 0.0003 in)
Limit
0.020 mm (0.0008 in)


ME-00173


ME-00174

4) Check the circlip installation groove on piston for burr (A). If necessary, remove the burr from groove so that the piston pin can lightly move.



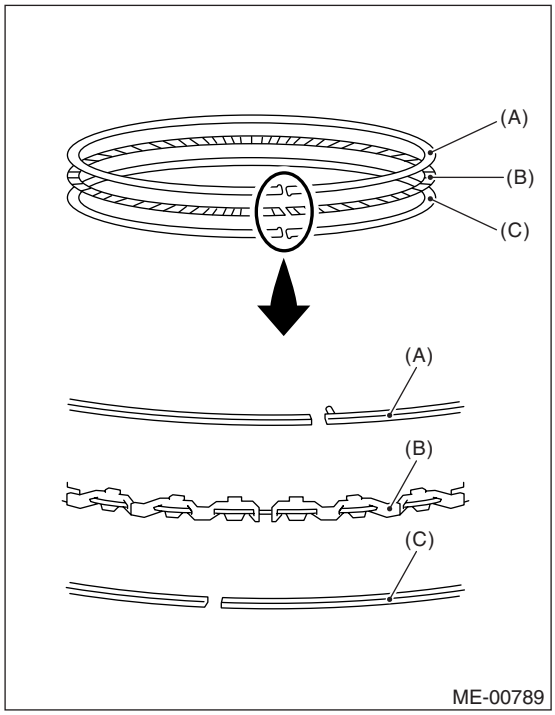
ME-00175

5) Check the piston pin circlip for distortion, cracks and wear.

4. PISTON RING

1) If the piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new one of the same size as the piston.

NOTE:
• Marks are shown on the end of top and second rings. When installing the rings to piston, face this mark upward.
• Oil ring consists of upper rail, expander and lower rail. When installing on piston, be careful of each rail's direction.

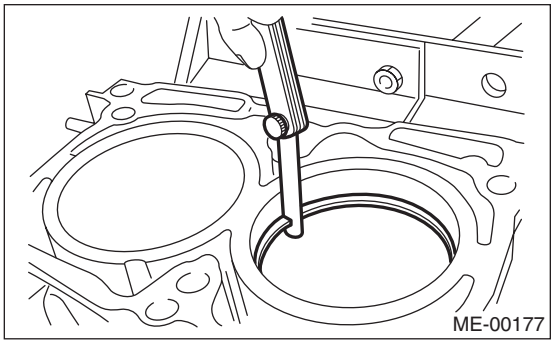


ME-00789

(A) Upper rail
(B) Expander
(C) Lower rail

2) Squarely place the piston ring and oil ring in cylinder, and then measure the piston ring gap with a thickness gauge.

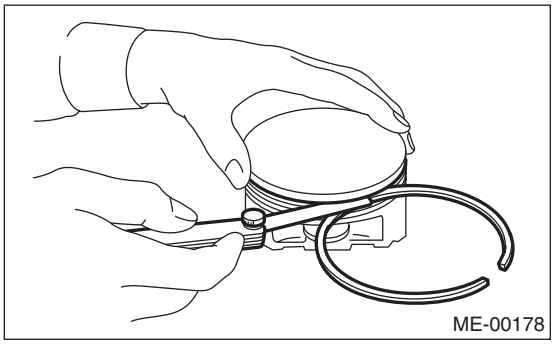
			Unit: mm (in)
		Standard	Limit
Piston ring gap	Top ring	0.20 — 0.25 (0.0079 — 0.0098)	1.0 (0.039)
	Second ring	0.37 — 0.52 (0.015 — 0.020)	1.0 (0.039)
	Oil ring rail	0.20 — 0.50 (0.0079 — 0.0197)	1.5 (0.059)


ME-00177

3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

NOTE:
Before measuring the clearance, clean the piston ring groove and piston ring.

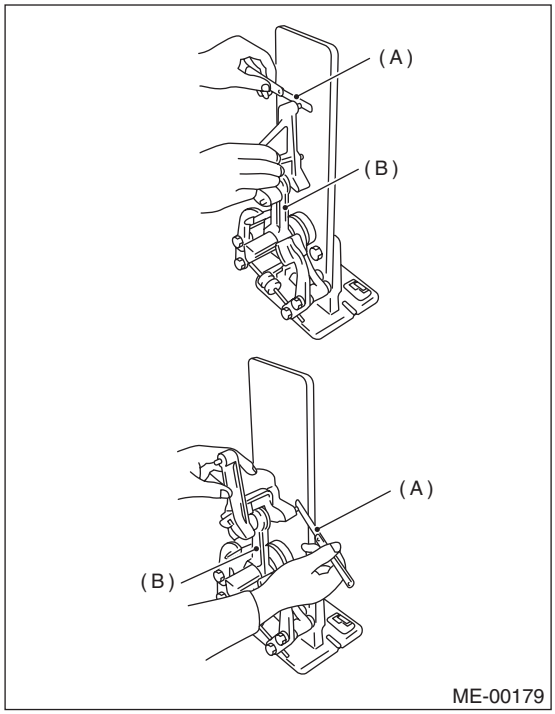
			Unit: mm (in)
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)


ME-00178

5. CONNECTING ROD

1) Replace the connecting rod, if the large or small end thrust surface is damaged.
2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)

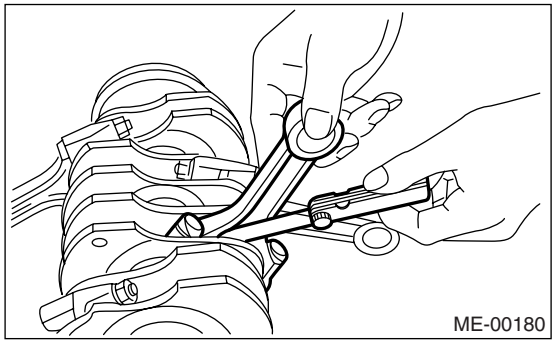


ME-00179

(A) Thickness gauge
(B) Connecting rod

3) Install the connecting rod fitted with bearing to crankshaft, and then measure the side clearance (thrust clearance). Replace the connecting rod if the side clearance exceeds the specified limit.

Connecting rod side clearance:
Standard
0.070 — 0.330 mm (0.0028 — 0.0130 in)
Limit
0.40 mm (0.016 in)


ME-00180

4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.
5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

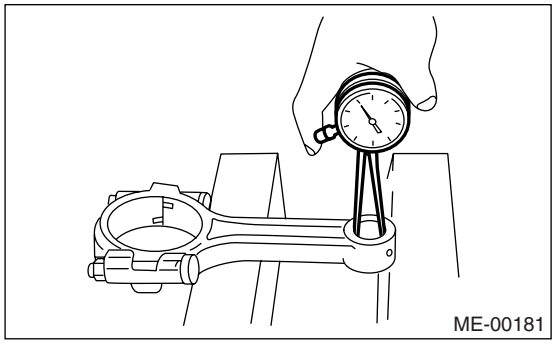
Connecting rod oil clearance:
Standard
0.017 — 0.045 mm (0.0007 — 0.0018 in)
Limit
0.050 mm (0.0020 in)

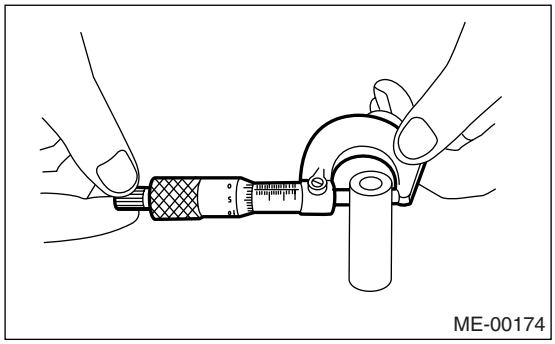
Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.490 — 1.502 (0.0587 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.504 — 1.512 (0.0592 — 0.0595)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.514 — 1.522 (0.0596 — 0.0599)	51.934 — 51.950 (2.0447 — 2.0453)
0.25 (0.0098) undersize	1.614 — 1.622 (0.0635 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

6) Inspect the bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at connecting rod small end.

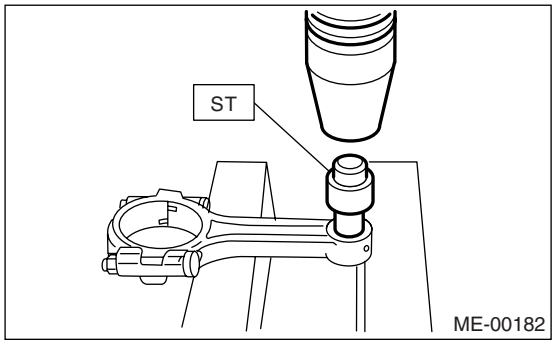
Clearance between piston pin and bushing:
Standard
0 — 0.022 mm (0 — 0.0009 in)
Limit
0.030 mm (0.0012 in)


ME-00181


ME-00174

7) Replacement procedure is as follows:
(1) Remove the bushing from connecting rod with ST and press.
(2) Press the bushing with ST after applying oil on the periphery of bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



ME-00182

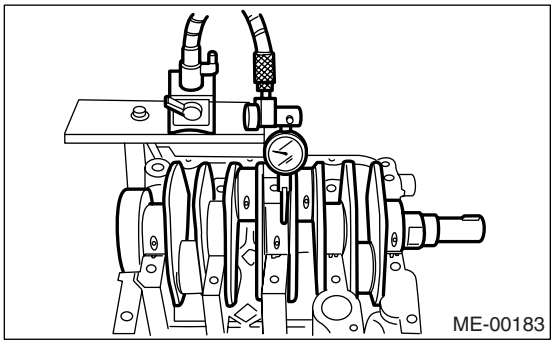
(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
(4) After the completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean the crankshaft completely and check for cracks by means of red lead check etc., and replace if defective.
2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

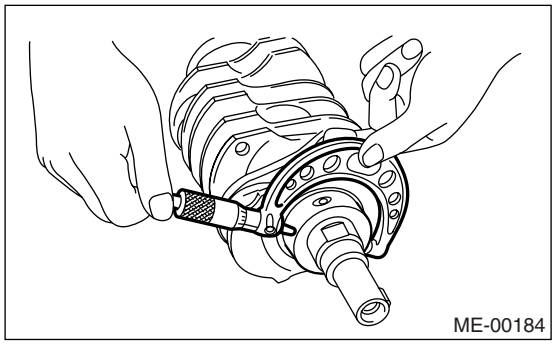
NOTE:
If a suitable V-block is not available, install the #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings and measure the crankshaft bend using a dial gauge.

Crankshaft bend limit:
0.035 mm (0.0014 in)



3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace the bearing with a suitable (undersize) one, and then replace or recondition the crankshaft as necessary. When grinding the crank journal or crank pin, finish them to specified dimensions according to the undersize bearing to be used.

Crank pin and crank journal:
Out-of-roundness
0.005 mm (0.0002 in) or less
Taper limit
0.07 mm (0.0028 in)
Grinding limit
0.250 mm (0.0098 in)



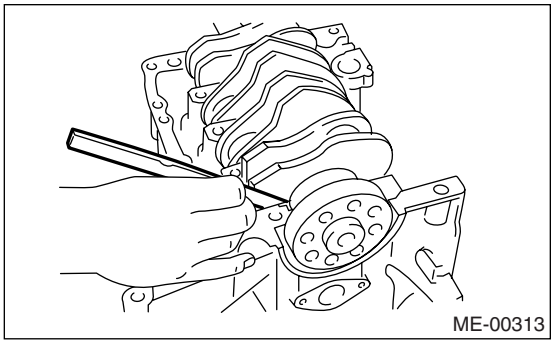
Unit: mm (in)

		Crank journal diameter		Crank pin outer diameter
		#1, #3, #5	#2, #4	
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.486 — 1.498 (0.0585 — 0.0590)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.504 — 1.512 (0.0592 — 0.0595)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	51.934 — 51.950 (2.0447 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.514 — 1.522 (0.0596 — 0.0599)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.614 — 1.622 (0.0635 — 0.0639)

O.D.: Outer Diameter

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace the bearing.

Crankshaft side clearance:
Standard
0.030 — 0.115 mm (0.0012 — 0.0045 in)
Limit
0.25 mm (0.0098 in)



5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.
6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace the defective bearing with an undersize one, and replace or recondition the crankshaft as necessary.

Unit: mm (in)

Crankshaft oil clearance		
#1	STD	0.003 — 0.030 (0.00012 — 0.0012)
	Limit	0.040 (0.0016)
#2	STD	0.012 — 0.033 (0.0004 — 0.0012)
	Limit	0.045 (0.0018)
#3	STD	0.003 — 0.033 (0.00012 — 0.0012)
	Limit	0.040 (0.0016)
#4	STD	0.012 — 0.033 (0.0004 — 0.0012)
	Limit	0.045 (0.0018)
#5	STD	0.010 — 0.031 (0.0004 — 0.0012)
	Limit	0.040 (0.0016)

21.Intake and Exhaust Valve

A: REMOVAL AND INSTALLATION

For operations related to intake and exhaust valve, refer to “19. Cylinder Head.” <Ref. to ME(STi)-62, REMOVAL, Cylinder Head Assembly.> and <Ref. to ME(STi)-62, INSTALLATION, Cylinder Head Assembly.>

22.Piston

A: REMOVAL AND INSTALLATION

For operations related to piston, refer to “20. Cylinder Block.” <Ref. to ME(STi)-69, REMOVAL, Cylinder Block.> and <Ref. to ME(STi)-73, INSTALLATION, Cylinder Block.>

23.Connecting Rod

A: REMOVAL AND INSTALLATION

For operations related to connecting rod, refer to “20. Cylinder Block.” <Ref. to ME(STi)-69, REMOVAL, Cylinder Block.> and <Ref. to ME(STi)-73, INSTALLATION, Cylinder Block.>

24.Crankshaft

A: REMOVAL AND INSTALLATION

For operations related to crankshaft, refer to “20. Cylinder Block.” <Ref. to ME(STi)-69, REMOVAL, Cylinder Block.> and <Ref. to ME(STi)-73, INSTALLATION, Cylinder Block.>

25.Engine Trouble in General

A: INSPECTION

NOTE:
“RANK” shown in the chart refers to the possibility of reason for the trouble in order (“Very often” to “Rarely”)
A — Very often
B — Sometimes
C — Rarely

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
1. Engine will not start.			
1) Starter does not turn.	Starter	Defective battery-to-starter harness	B
		Defective starter switch	C
		Defective inhibitor switch or neutral switch	C
		Defective starter	B
	Battery	Poor terminal connection	A
		Run-down battery	A
		Defective charging system	B
	Friction	Seizure of crankshaft and connecting rod bearing	C
		Seized camshaft	C
		Seized or stuck piston and cylinder	C
2) Initial combustion does not occur.	Starter	Defective starter	C
	Engine control system <Ref. to EN(STi)(diag)-2, Basic Diagnostic Procedure.>		A
	Fuel line	Defective fuel pump and relay	A
		Lack of or insufficient fuel	B
	Belt	Defective	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B
3) Initial combustion occurs.	Engine control system <Ref. to EN(STi)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Defective intake manifold gasket	B
		Defective throttle body gasket	B
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Defective	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
4) Engine stalls after initial combustion.	Engine control system <Ref. to EN(STi)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	B
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	C
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Dirty air cleaner element	C
	Fuel line	Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Defective	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B
2. Rough idle and engine stall	Engine control system <Ref. to EN(STi)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	C
		Loosened oil filler cap	B
		Dirty air cleaner element	C
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Defective timing	C
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	B
		Loosened cylinder head bolts or defective gasket	B
		Improper valve seating	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Lubrication system	Incorrect oil pressure	B
		Defective rocker cover gasket	C
	Cooling system	Overheating	C
	Others	Malfunction of evaporative emission control system	A
		Stuck or damaged throttle valve	B
		Accelerator cable out of adjustment	C

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
3. Low output, hesitation and poor acceleration	Engine control system <Ref. to EN(STi)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	B
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	A
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	B
		Loosened cylinder head bolts or defective gasket	B
		Improper valve seating	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Lubrication system	Incorrect oil pressure	B
	Cooling system	Overheating	C
		Over cooling	C
	Others	Malfunction of evaporative emission control system	A
4. Surging	Engine control system <Ref. to EN(STi)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	B
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	C
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Cooling system	Overheating	B
	Others	Malfunction of evaporative emission control system	C

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
5. Engine does not return to idle.	Engine control system <Ref. to EN(STi)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked vacuum hose	A
	Others	Stuck or damaged throttle valve	A
		Accelerator cable out of adjustment	B
6. Dieseling (Run-on)	Engine control system <Ref. to EN(STi)(diag)-2, Basic Diagnostic Procedure.>		A
	Cooling system	Overheating	B
	Others	Malfunction of evaporative emission control system	B
7. Afterburning in exhaust system	Engine control system <Ref. to EN(STi)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	C
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	B
		Defective PCV valve	B
		Loosened oil filler cap	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over cooling	C
	Others	Malfunction of evaporative emission control system	C
8. Knocking	Engine control system <Ref. to EN(STi)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened oil filler cap	B
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	C
		Incorrect valve timing	B
	Cooling system	Overheating	A
9. Excessive engine oil consumption	Intake system	Loosened or cracked PCV hose	A
		Defective PCV valve	B
		Loosened oil filler cap	C
	Compression	Defective valve stem	A
		Worn or stuck piston rings, cylinder and piston	A
	Lubrication system	Loosened oil pump attaching bolts and defective gasket	B
		Defective oil filter o-ring	B
		Defective crankshaft oil seal	B
		Defective rocker cover gasket	B
		Loosened oil drain plug or defective gasket	B
		Loosened oil pan fitting bolts or defective oil pan	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
10. Excessive fuel consumption	Engine control system <Ref. to EN(STi)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Dirty air cleaner element	A
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	B
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over cooling	C
	Others	Accelerator cable out of adjustment	B

26.Engine Noise

A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	• Valve mechanism is defective. • Incorrect valve clearance • Worn valve rocker • Worn camshaft • Broken valve spring
Heavy and dull clank	Oil pressure is low.	• Worn crankshaft main bearing • Worn connecting rod bearing (big end)
	Oil pressure is normal.	• Loose flywheel mounting bolts • Damaged engine mounting
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload.	• Ignition timing advanced • Accumulation of carbon inside combustion chamber • Wrong spark plug • Improper gasoline
Clank when engine speed is medium (1,000 to 2,000 rpm).	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn crankshaft main bearing • Worn bearing at crankshaft end of connecting rod
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn cylinder liner and piston ring • Broken or stuck piston ring • Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	• Unusually worn valve lifter • Worn cam gear • Worn camshaft journal bore in crankcase
Squeaky sound	—	• Insufficient generator lubrication
Rubbing sound	—	• Defective generator brush and rotor contact
Gear scream when starting engine	—	• Defective ignition starter switch • Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	• Loose drive belt • Defective water pump shaft
Hissing sound	—	• Loss of compression • Air leakage in air intake system, hoses, connections or manifolds
Timing belt noise	—	• Loose timing belt • Belt contacting case/adjacent part
Valve tappet noise	—	• Incorrect valve clearance

NOTE*:
When disconnecting the fuel injector connector, Malfunction Indicator Light illuminates and DTC is stored in ECM memory. Therefore, carry out the CLEAR MEMORY MODE <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.> after connecting the fuel injector connector.

EXHAUST

EX(STi)

Page
1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for STi model is as same as turbo model. <Ref. to EX(H4DOTC)-2, General Description.>

COOLING

CO(STi)

Page
1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for STi model is as same as turbo model. <Ref. to CO(H4DOTC)-2, General Description.>

LUBRICATION

LU(STi)

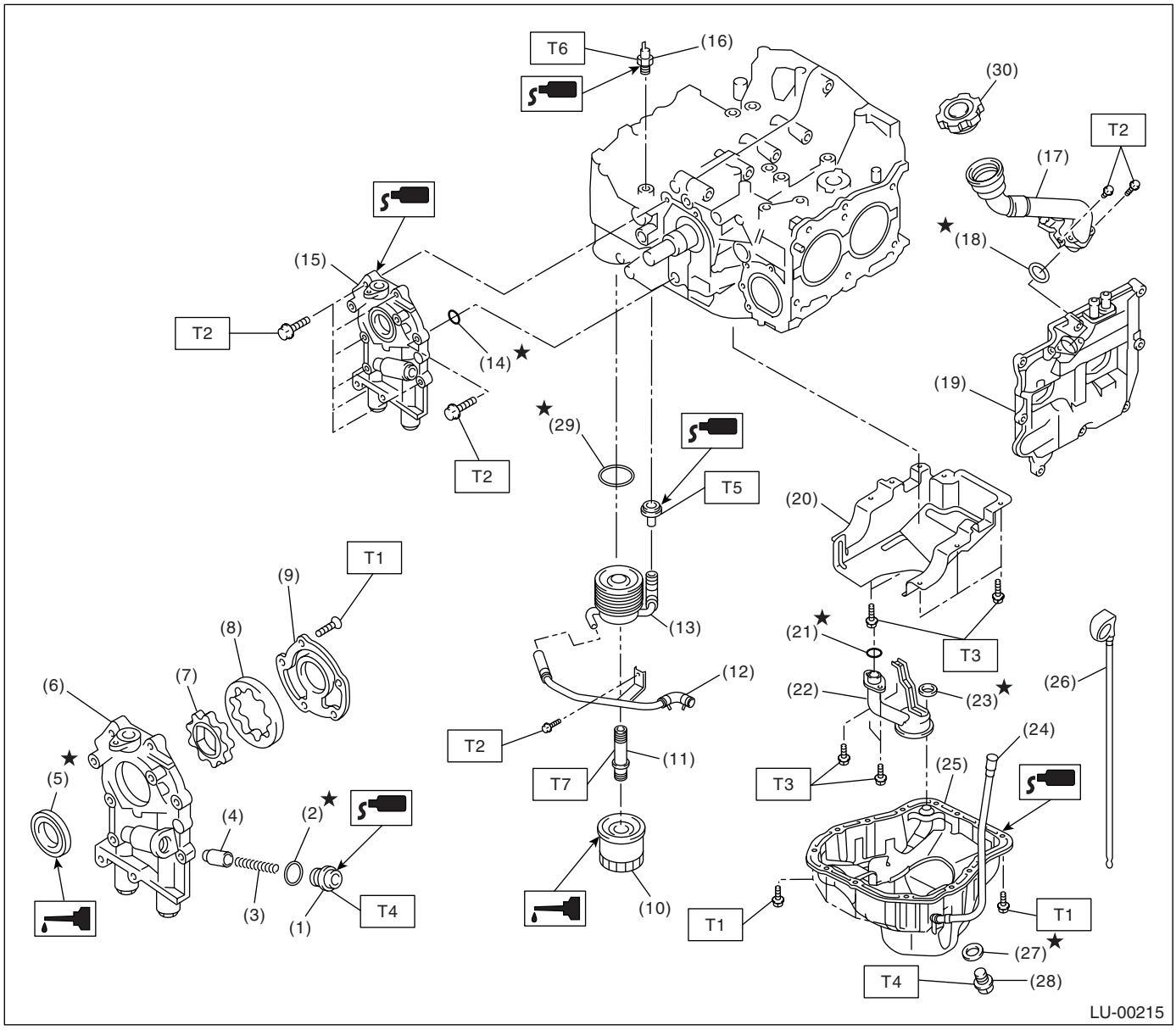
		Page
1.	General Description	2
2.	Oil Pressure System	6
3.	Engine Oil	8
4.	Oil Pump	10
5.	Oil Pan and Strainer	14
6.	Oil Pressure Switch	18
7.	Engine Oil Cooler	19
8.	Engine Oil Filter	20
9.	Engine Lubrication System Trouble in General	21

1. General Description

A: SPECIFICATIONS

Lubrication method				Forced lubrication
Oil pump	Pump type			Trochoid type
	Number of teeth	Inner rotor		9
		Outer rotor		10
	Outer rotor diameter × thickness			78 × 10 mm (3.07 × 0.39 in)
	Tip clearance between inner and outer rotor		STANDARD	0.04 — 0.14 mm (0.0016 — 0.0055 in)
			LIMIT	0.18 mm (0.0071 in)
	Side clearance between inner rotor and pump case		STANDARD	0.02 — 0.07 mm (0.0008 — 0.0028 in)
			LIMIT	0.12 mm (0.0047 in)
	Case clearance between outer rotor and pump case		STANDARD	0.10 — 0.175 mm (0.0039 — 0.0069 in)
			LIMIT	0.20 mm (0.0079 in)
	Capacity at 80°C (176°F)	600 rpm	Discharge pressure	98 kPa (1.0 kg/cm^2, 14 psi)
			Discharge quantity	4.6 ℓ (4.9 US qt, 4.0 Imp qt)/min.
		5,000 rpm	Discharge pressure	294 kPa (3.0 kg/cm^2, 43 psi)
			Discharge quantity	47.0 ℓ (49.7 US qt, 41.4 Imp qt)/min.
	Relief valve operation pressure			588 kPa (6.0 kg/cm^2, 85 psi)
Oil filter	Type			Full-flow filter type
	Filtration area			800 cm^2 (124 sq in)
	By-pass valve opening pressure			160 kPa (1.63 kg/cm^2, 23.2 psi)
	Outer diameter × width			68 × 65 mm (2.68 × 2.56 in)
	Oil filter to engine thread size			M 20 × 1.5
Oil pressure switch	Type			Immersed contact point type
	Working voltage — wattage			12 V — 3.4 W or less
	Warning light activation pressure			14.7 kPa (0.15 kg/cm^2, 2.1 psi)
	Proof pressure			More than 981 kPa (10 kg/cm^2, 142 psi)
Oil capacity (at replacement)				4.0 ℓ (4.2 US qt, 3.5 Imp qt)

B: COMPONENT



(1) Plug
(2) Gasket
(3) Relief valve spring
(4) Relief valve
(5) Oil seal
(6) Oil pump case
(7) Inner rotor
(8) Outer rotor
(9) Oil pump cover
(10) Oil filter
(11) Oil cooler connector
(12) Water by-pass pipe
(13) Oil cooler
(14) O-ring
(15) Oil pump ASSY
(16) Oil pressure switch
(17) Oil filler duct
(18) O-ring
(19) Rocker cover
(20) Baffle plate
(21) O-ring
(22) Oil strainer
(23) Gasket
(24) Oil level gauge guide
(25) Oil pan
(26) Oil level gauge
(27) Metal gasket
(28) Drain plug
(29) O-ring
(30) Oil filler cap

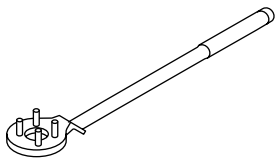
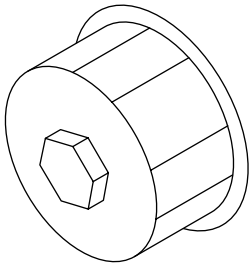
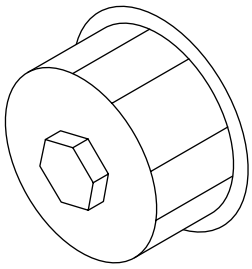
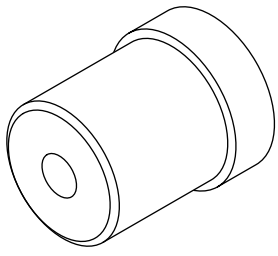
Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7.0)
T4: 44 (4.5, 32.5)
T5: 69 (7.0, 50.9)
T6: 25 (2.5, 18.1)
T7: 54 (5.5, 40)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

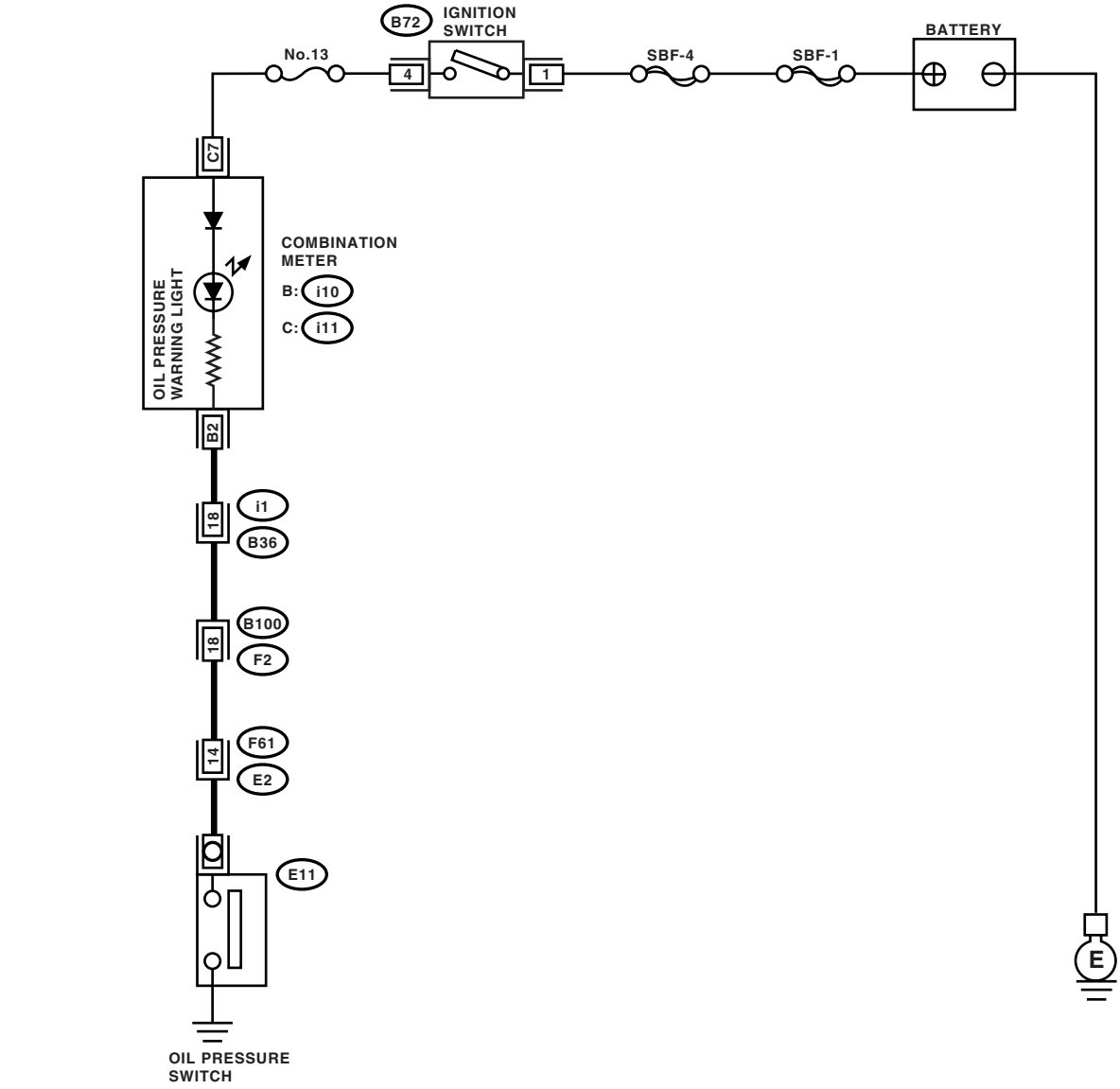
D: PREPARATION TOOL

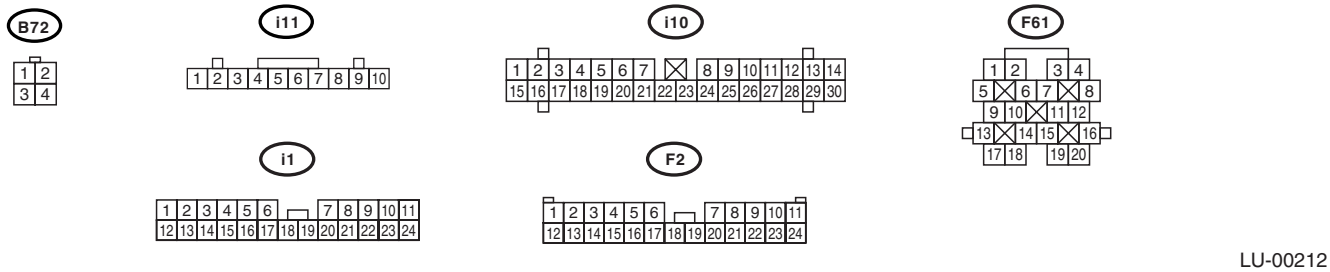
1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	49 9977100	CRANKSHAFT PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt.
 ST-498547000	18332AA000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in))
 ST-498547000	18332AA010	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in))
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil seal to oil pump.

2. Oil Pressure System

A: WIRING DIAGRAM





LU-00212

B: INSPECTION

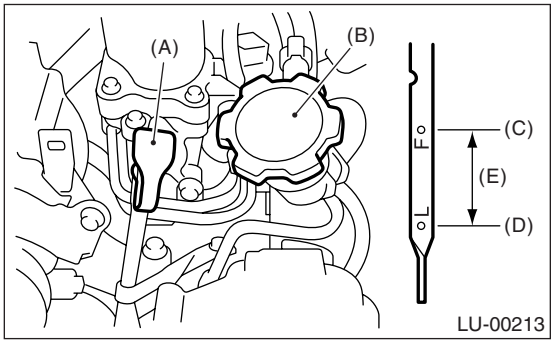
	Step	Check	Yes	No
1	**CHECK COMBINATION METER.** 1) Turn the ignition switch to ON. (engine OFF) 2) Check other warning lights.	Does the warning lights go on?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-3, INSPECTION, Combination Meter System.>
2	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND OIL PRESSURE SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from oil pressure switch. 3) Turn the ignition switch ON. 4) Measure the voltage of harness between the combination meter connector and chassis ground. ***Connector & terminal*** ***(E11) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Replace the oil pressure switch.	Go to step **3.**
3	**CHECK COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Measure the resistance of combination meter. ***Terminals*** ***No. C7 — No. B2:***	Is the resistance less than 10 Ω?	Replace the harness connector between combination meter and oil pressure switch.	Repair or replace the combination meter.

3. Engine Oil

A: INSPECTION

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe it clean.
3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in proper orientation.
4) Remove it again and note the reading. If the engine oil level is below the “L” line, add oil to bring the level up to “F” line.
5) After turning off the engine, wait a few minutes for oil to drain back into the oil pan before checking the level.
6) Just after driving or while the engine is warm, engine oil level may show in the range between the “F” line and notch mark. This is caused by thermal expansion of engine oil.

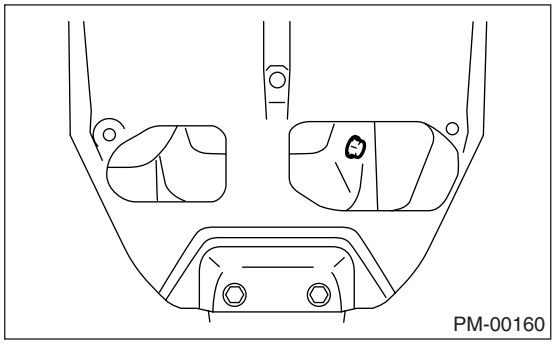
NOTE:
To prevent overfilling the engine oil, do not add oil above “F” line when the engine is cold.



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

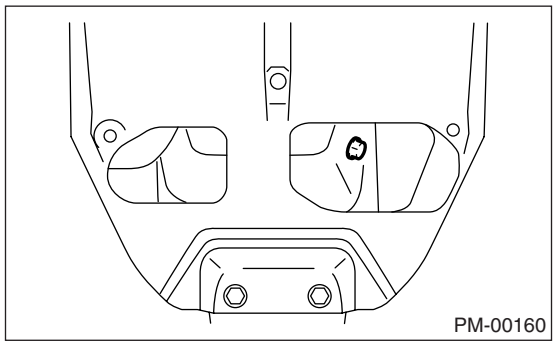
B: REPLACEMENT

1) Open the engine oil filler cap for quick draining of engine oil.
2) Drain the engine oil by loosening the engine oil drain plug.



3) Replace the drain plug gasket.
4) Tighten the engine oil drain plug after draining engine oil.

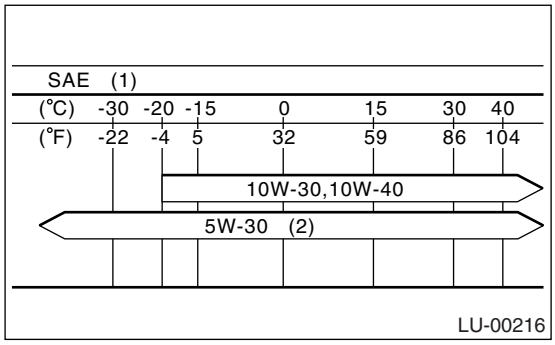
Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)



5) Install the service hole cover.
6) Fill engine oil through the filler pipe up to upper level on level gauge. Make sure that the vehicle is placed level when checking oil level. Use the engine oil of proper quality and viscosity, selected in accordance with the table in figure.

Recommended oil
ILSAC GF-3, which can be identified with the new API certification mark (Star burst mark) API classification SL with the words “ENERGY CONSERVING” (if you cannot obtain the oil with SL grade, you may use SJ grade “ENERGY CONSERVING” oil)

Engine oil capacity:
Upper level
4.0 ℓ (4.2 US qt, 3.5 Imp qt)
Lower level
3.0 ℓ (3.2 US qt, 2.6 Imp qt)



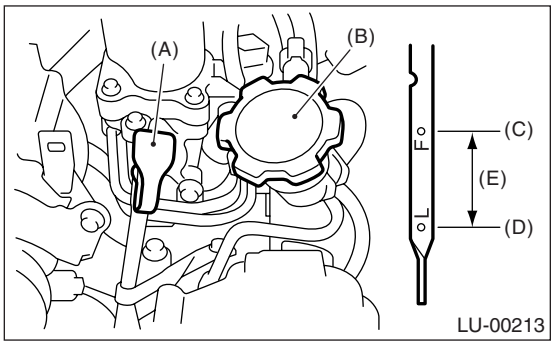
(1) SAE Viscosity No. and Applicable Temperature
(2) PREFERRED

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

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

NOTE:
If the vehicle is used in areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API classification: SL or SJ or SH
SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50.

7) Close the engine oil filler cap.
8) Start the engine and warm it up for a time.
9) After the engine stops, recheck the oil level. If necessary, add engine oil up to the upper level on level gauge.

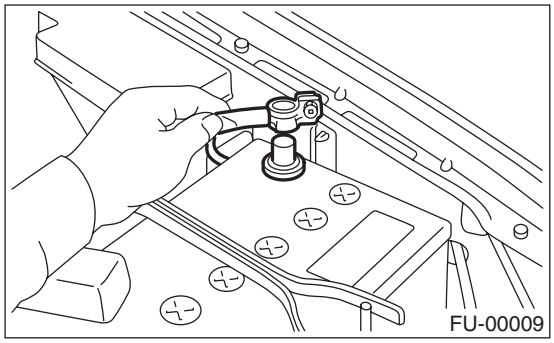


(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

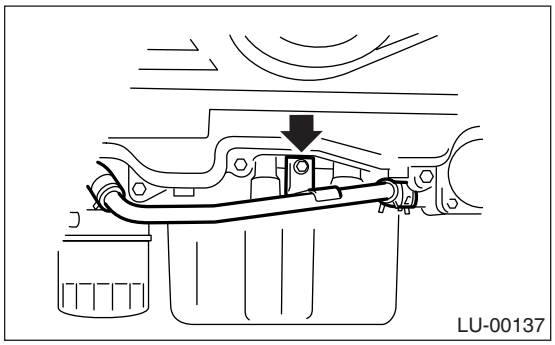
4. Oil Pump

A: REMOVAL

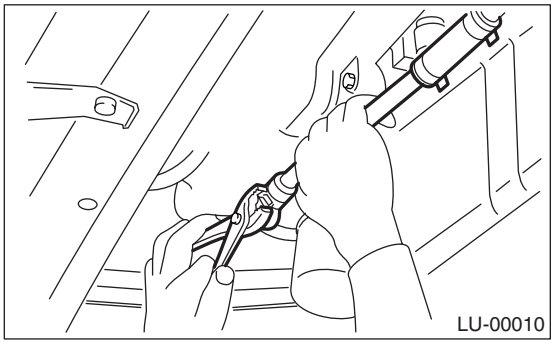
1) Disconnect the ground cable from battery.



2) Lift-up the vehicle.
3) Remove the under cover.
4) Remove the bolts which install the water pipe of oil cooler to oil pump.

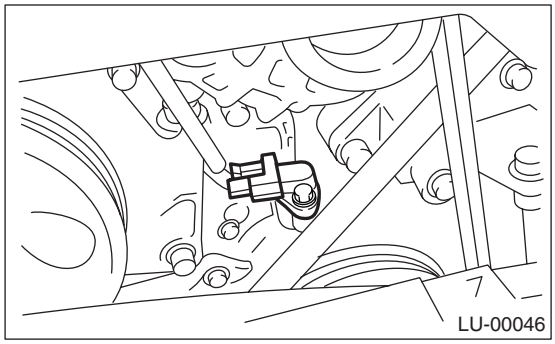


5) Remove the water pipe and hoses between oil cooler and water pump.

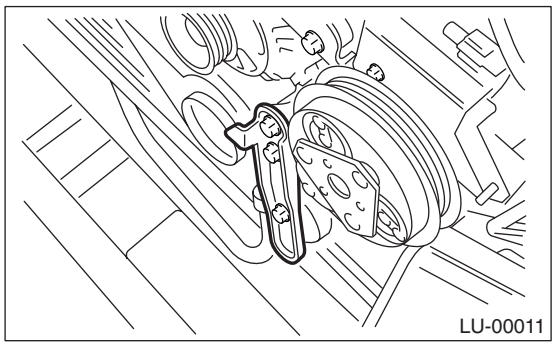


6) Remove the radiator. <Ref. to CO(H4DOTC)-22, REMOVAL, Radiator.>

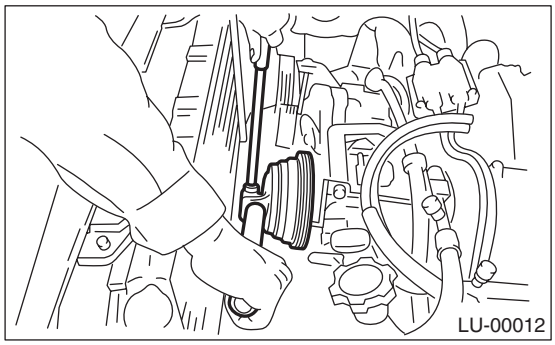
7) Remove the crankshaft position sensor.



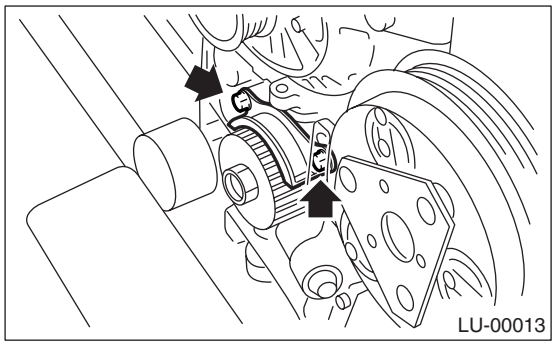
8) Remove the V-belts.
<Ref. to ME(STi)-41, REMOVAL, V-belt.>
9) Remove the rear side V-belt tensioner.



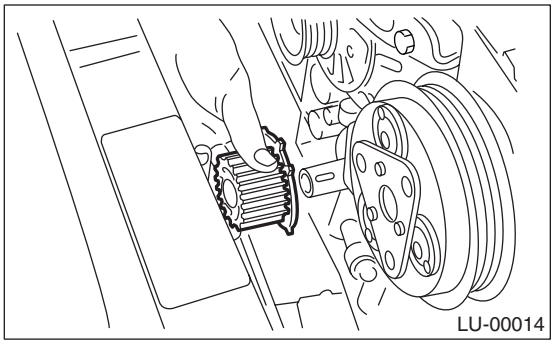
10) Remove the crankshaft pulley by using ST.
<Ref. to ME(STi)-44, REMOVAL, Crankshaft Pulley.>



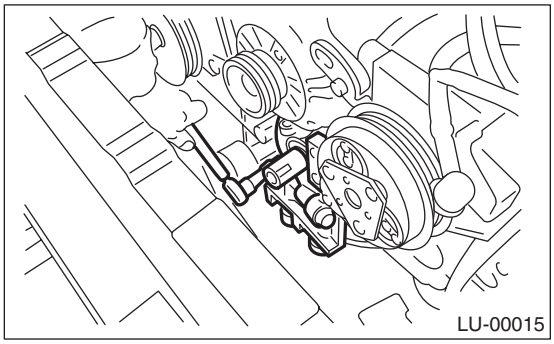
11) Remove the water pump. <Ref. to CO(H4DOTC)-19, REMOVAL, Water Pump.>
12) Remove the timing belt guide.



13) Remove the crankshaft sprocket.

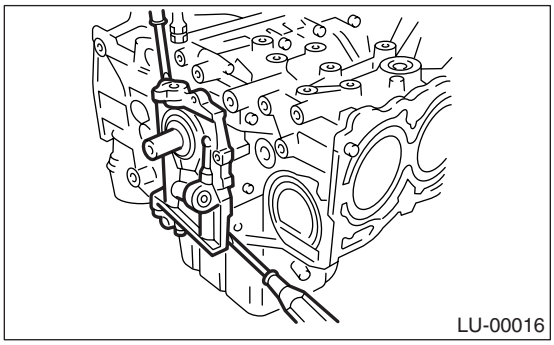


14) Remove the bolts which install the oil pump onto cylinder block.



15) Remove the oil pump using the flat tip screwdriver.

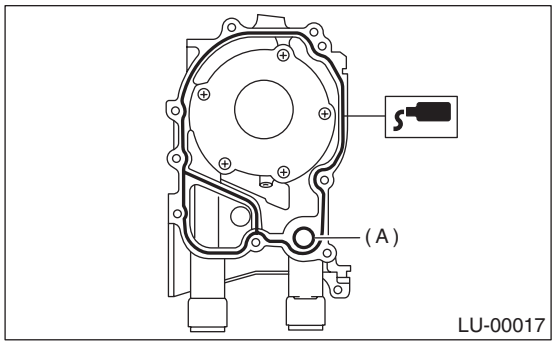
CAUTION:
Be careful not to scratch the mating surfaces of cylinder block and oil pump.



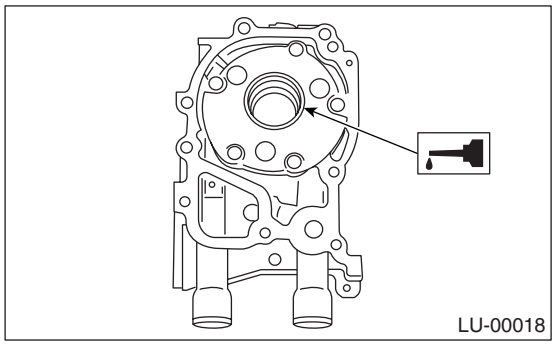
B: INSTALLATION

Install in the reverse order of removal.
Do the following:
1) Apply fluid packing to the matching surfaces of oil pump.

Fluid packing:
THREE BOND 1215 (Part No. 004403007) or equivalent



2) Replace the O-ring (A) with a new one.
3) Apply a coat of engine oil to the inside of oil seal.

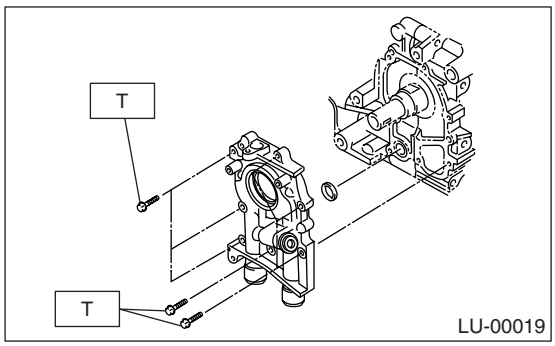


4) Be careful not to scratch the oil seal when installing the oil pump on cylinder block.
5) Position the oil pump, aligning the notched area with crankshaft, and push the oil pump straight.

CAUTION:
Make sure the oil seal lip is not folded.

6) Install the oil pump.

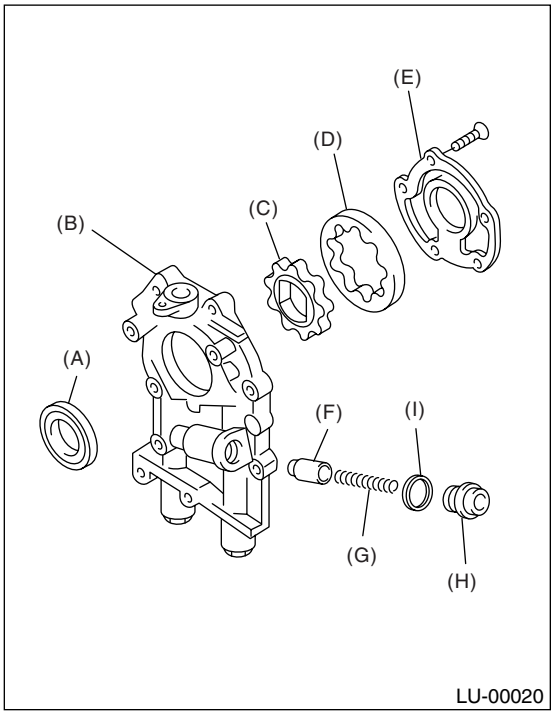
Tightening torque:
6.4 N·m (0.65 kgf -m, 4.7 ft-lb)



C: DISASSEMBLY

Remove the screws which secure the oil pump cover and disassemble oil pump. Inscribe alignment marks on the inner and outer rotors so that they can be replaced in their original positions during reassembly.

CAUTION:
Before disassembling the oil pump, remove the relief valve.

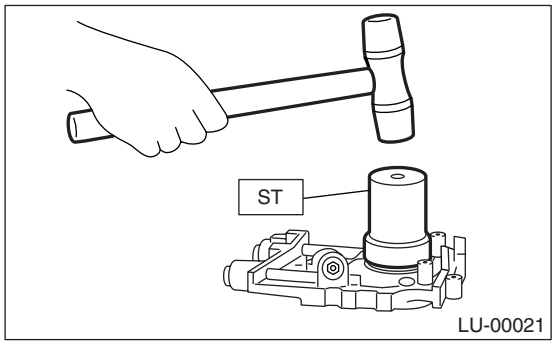


(A) Oil seal
(B) Pump case
(C) Inner rotor
(D) Outer rotor
(E) Pump cover
(F) Relief valve
(G) Relief valve spring
(H) Plug
(I) Gasket

D: ASSEMBLY

1) Install the front oil seal by using ST.
ST 499587100 OIL SEAL INSTALLER

NOTE:
Use a new oil seal.

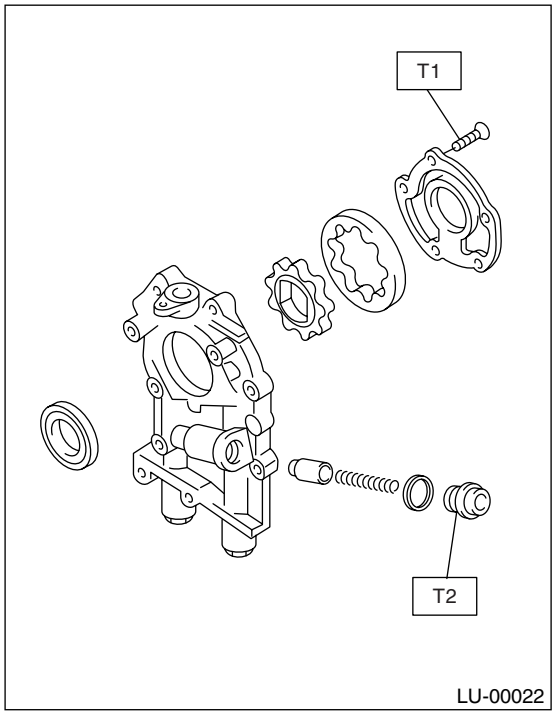


2) Apply a coat of engine oil to the inner and outer rotors.
3) Install the inner and outer rotors in their original positions.
4) Install the oil relief valve, relief valve spring and plug.

NOTE:
Use a new gasket.

5) Install the oil pump cover.

Tightening torque:
T1: 5 N·m (0.5 kgf-m, 3.6 ft-lb)
T2: 44 N·m (4.5 kgf-m, 32.5 ft-lb)

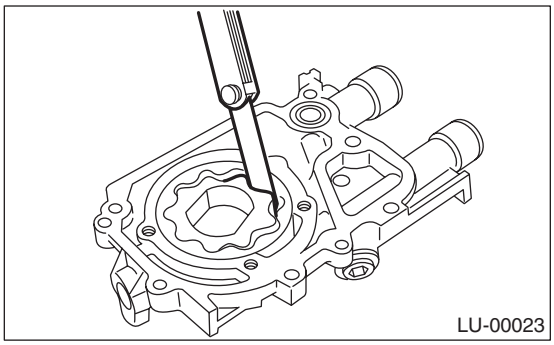


E: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. If clearance exceeds the limit, replace the rotors as a matched set.

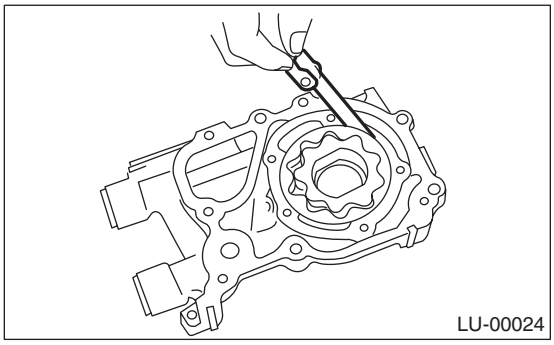
Tip clearance:
Standard
0.04 — 0.14 mm (0.0016 — 0.0055 in)
Limit
0.18 mm (0.0071 in)



2. CASE CLEARANCE

Measure the clearance between outer rotor and oil pump rotor housing. If clearance exceeds the limit, replace the rotor.

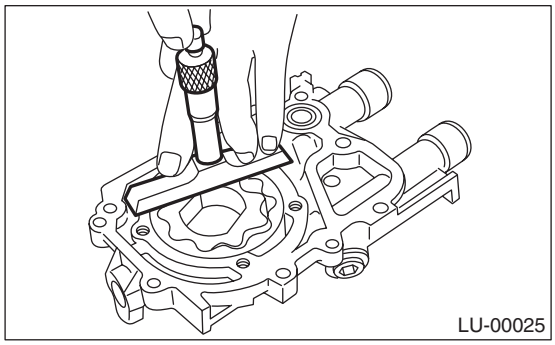
Case clearance:
Standard
0.10 — 0.175 mm (0.0039 — 0.0069 in)
Limit
0.20 mm (0.0079 in)



3. SIDE CLEARANCE

Measure the clearance between the oil pump inner rotor and pump cover. If clearance exceeds the limit, replace the rotor or pump body.

Side clearance:
Standard
0.02 — 0.07 mm (0.0008 — 0.0028 in)
Limit
0.12 mm (0.0047 in)



4. OIL RELIEF VALVE

Check the valve for fitting condition and damage, and the relief valve spring for damage and deterioration. Replace the parts if defective.

Relief valve spring:
Free length
73.7 mm (2.902 in)
Installed length
54.7 mm (2.154 in)
Load when installed
93.1 N (9.49 kgf, 20.88 lb)

5. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, worn rotor chamber, cracks, and other faults.

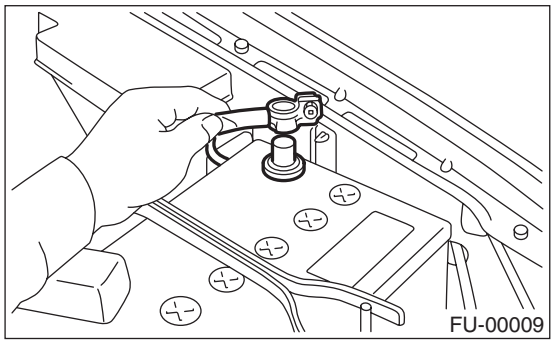
6. OIL SEAL

Check the oil seal lips for deformation, hardening, wear, etc. and replace if defective.

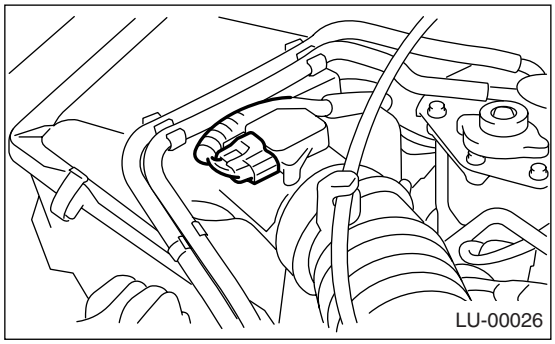
5. Oil Pan and Strainer

A: REMOVAL

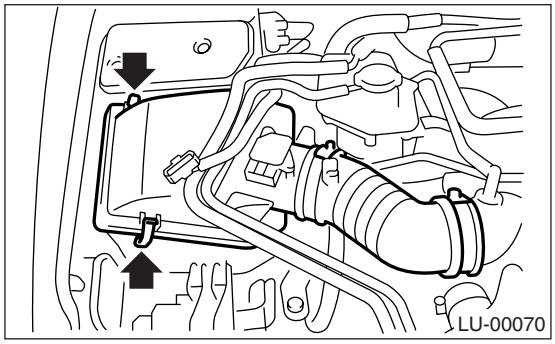
1) Set the vehicle on a lift.
2) Remove the front wheels.
3) Disconnect the ground cable from battery.



4) Disconnect the connector from mass air flow sensor.

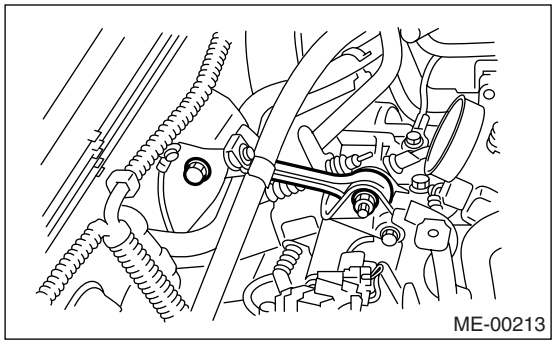


5) Remove the air intake boot and air cleaner upper cover.

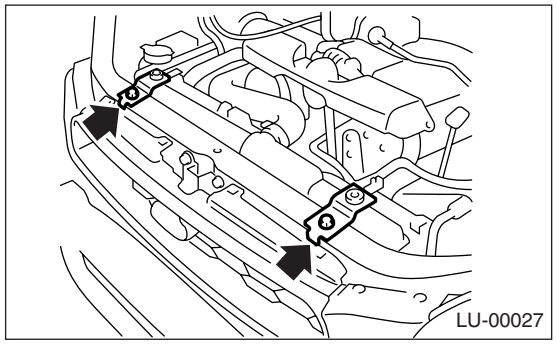


6) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>

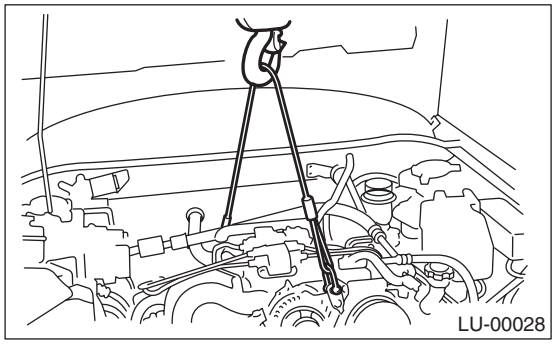
7) Remove the pitching stopper.



8) Remove the radiator upper brackets.



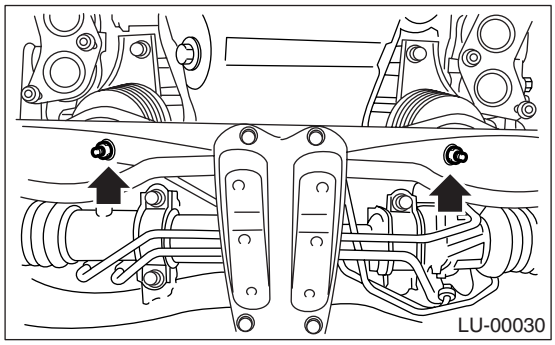
9) Support the engine with a lifting device and wire ropes.



10) Lift-up the vehicle.

CAUTION:
When lifting up the vehicle, rise up the wire rope together.

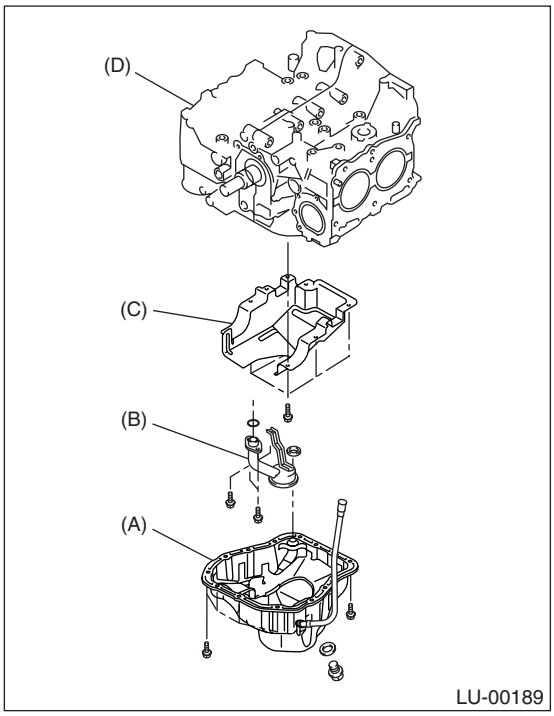
11) Remove the under cover.
12) Drain the engine oil.
13) Remove the nuts which install the front cushion rubber onto front crossmember.



14) Remove the bolts which install the oil pan on cylinder block while raising up engine.
15) Insert the oil pan cutter blade between cylinder block-to-oil pan clearance.

CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter.

16) Remove the oil strainer.
17) Remove the baffle plate.



(A) Oil pan
(B) Oil strainer
(C) Baffle plate
(D) Cylinder block

B: INSTALLATION

CAUTION:
Before installing the oil pan, clean sealant from oil pan and engine block.

1) Install the baffle plate.

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

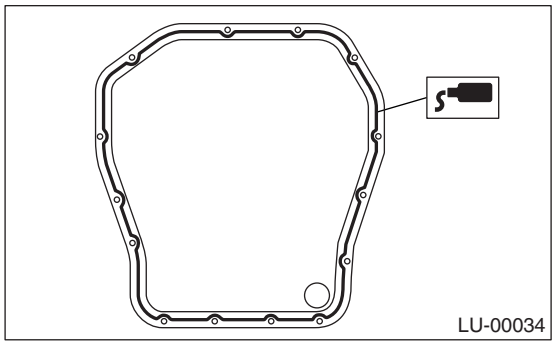
2) Install the oil strainer onto baffle plate.

NOTE:
Replace the O-ring with a new one.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)

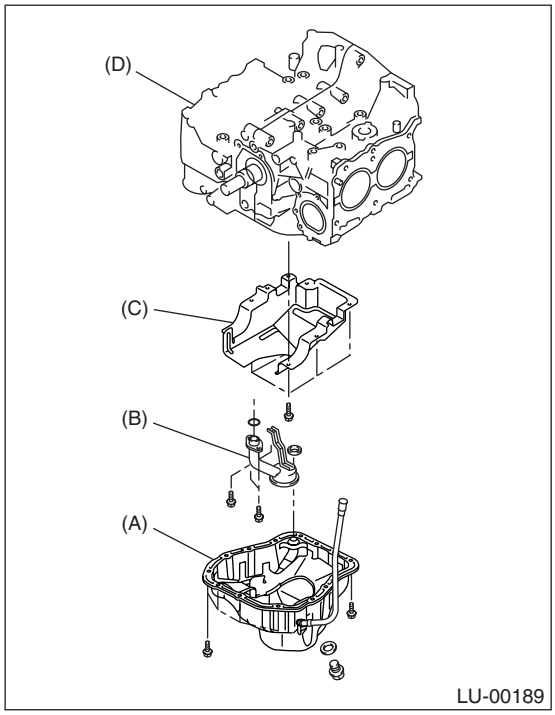
3) Apply fluid packing to the mating surfaces, and then install the oil pan.

Fluid packing:
THREE BOND 1215 (Part No. 004403007) or equivalent



4) Tighten the bolts which install the oil pan onto engine block.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

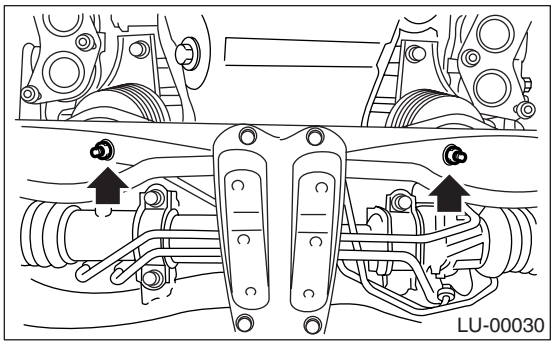


(A) Oil pan
(B) Oil strainer
(C) Baffle plate
(D) Cylinder block

5) Lower the engine onto front crossmember.

6) Tighten the nuts which install the front cushion rubber onto front crossmember.

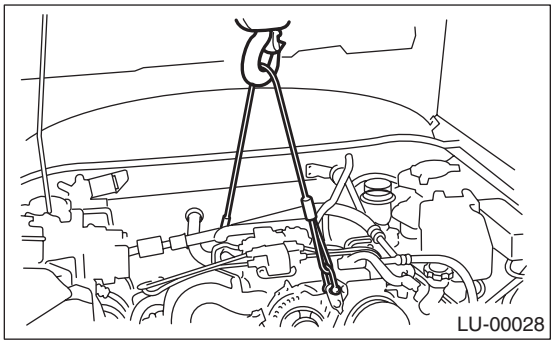
Tightening torque:
83 N·m (8.5 kgf-m, 61 ft-lb)



7) Install the under cover.
8) Lower the vehicle.

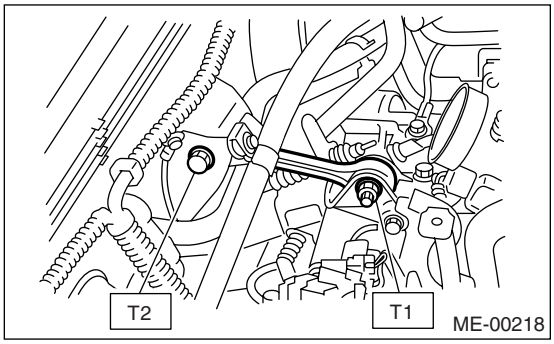
CAUTION:
When lowering the vehicle, lower the lifting device and wire rope together.

9) Remove the lifting device and steel cables.

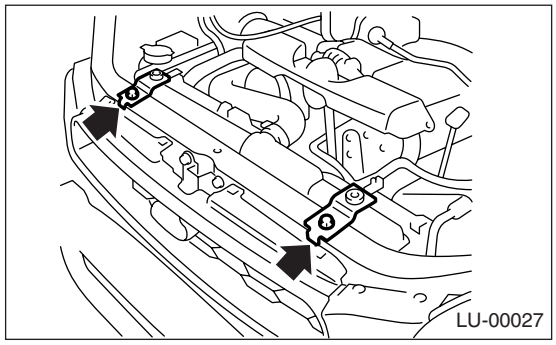


10) Install the pitching stopper.

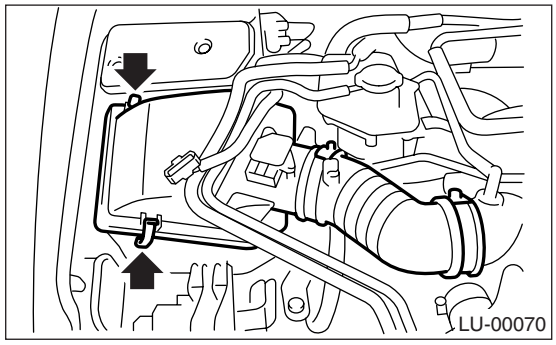
Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)



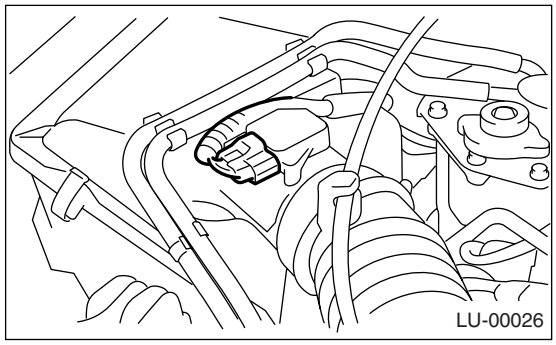
11) Install the radiator upper brackets.



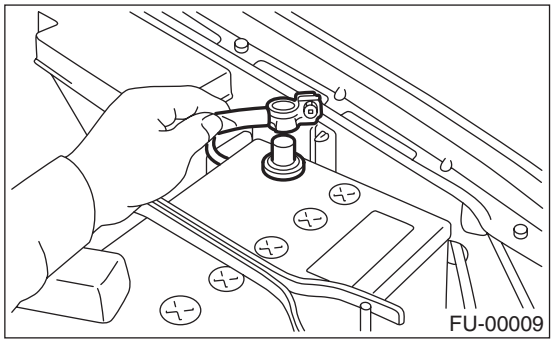
12) Install the intercooler. <Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>
13) Install the air intake boot and air cleaner upper cover.



14) Connect the connector to mass air flow sensor.



15) Install the front wheels.
16) Connect the battery ground cable to battery.



17) Fill engine oil. <Ref. to LU(STi)-8, INSPECTION, Engine Oil.>

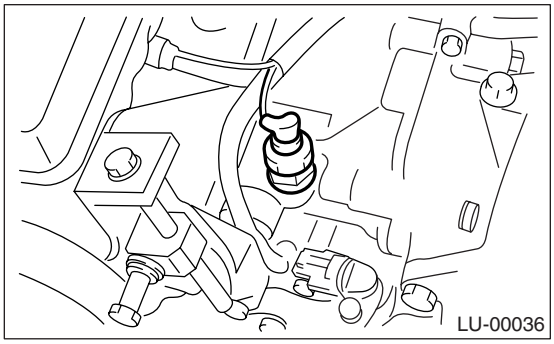
C: INSPECTION

By visual check, make sure the oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.

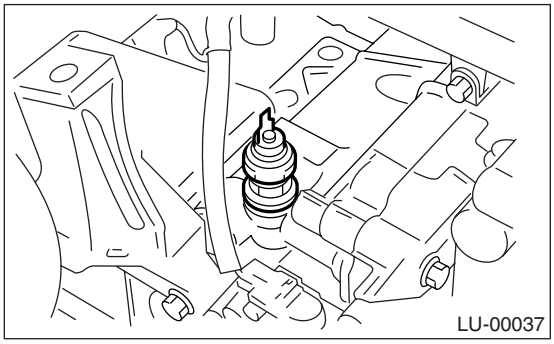
6. Oil Pressure Switch

A: REMOVAL

1) Remove the generator from bracket. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>
2) Disconnect the terminal from oil pressure switch.



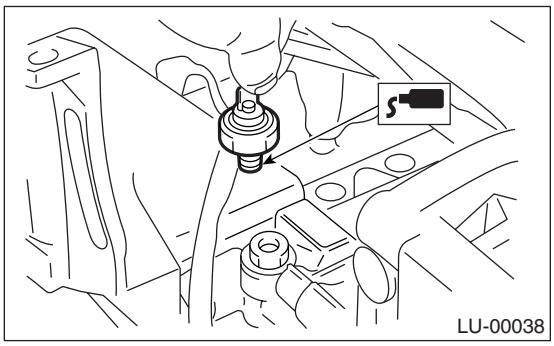
3) Remove the oil pressure switch.



B: INSTALLATION

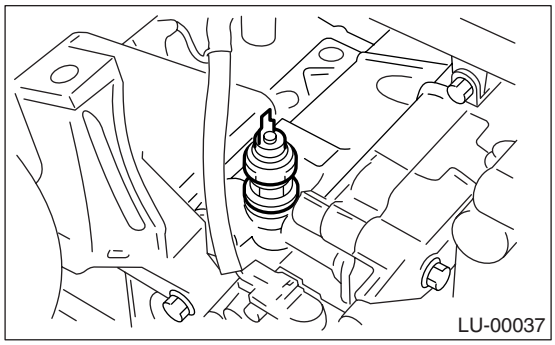
1) Apply fluid packing to the oil pressure switch threads.

Fluid packing:
THREE BOND 1324 (Part No. 004403007) or equivalent

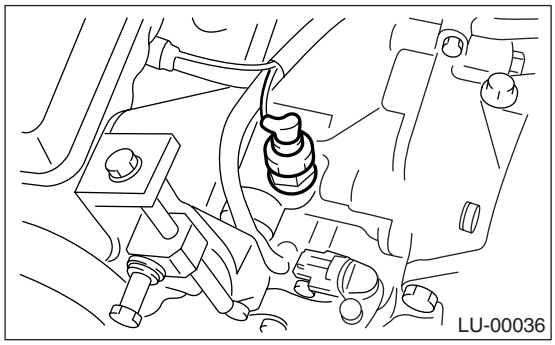


2) Install the oil pressure switch onto engine block.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



3) Connect the terminal of oil pressure switch.



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

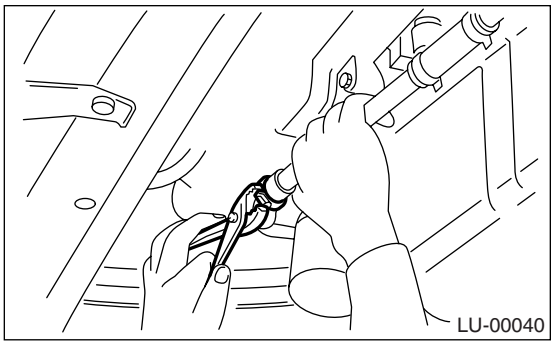
C: INSPECTION

Make sure oil does not leak or seep from where the oil pressure switch is installed.

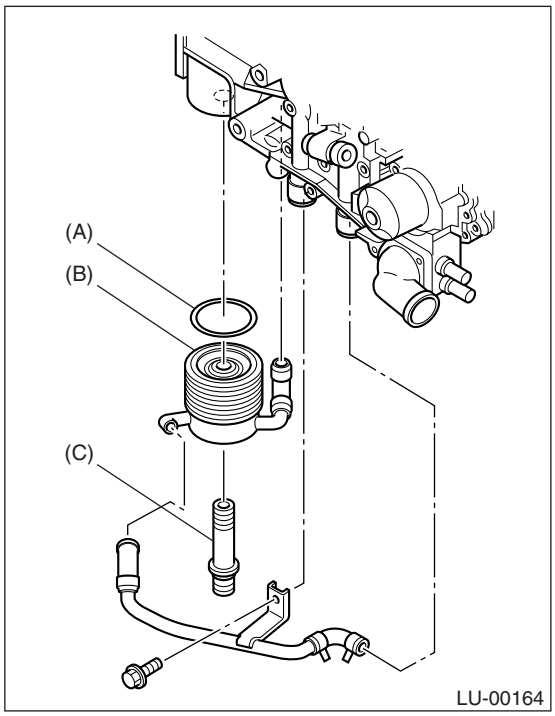
7. Engine Oil Cooler

A: REMOVAL

1) Lift-up the vehicle.
2) Remove the under cover.
3) Drain the engine oil.
4) Drain the engine coolant.
5) Remove the water by-pass pipe between oil cooler and water pump.



6) Remove the engine oil filter. <Ref. to LU(STi)-20, REMOVAL, Engine Oil Filter.>
7) Remove the connector, and then remove the oil cooler.



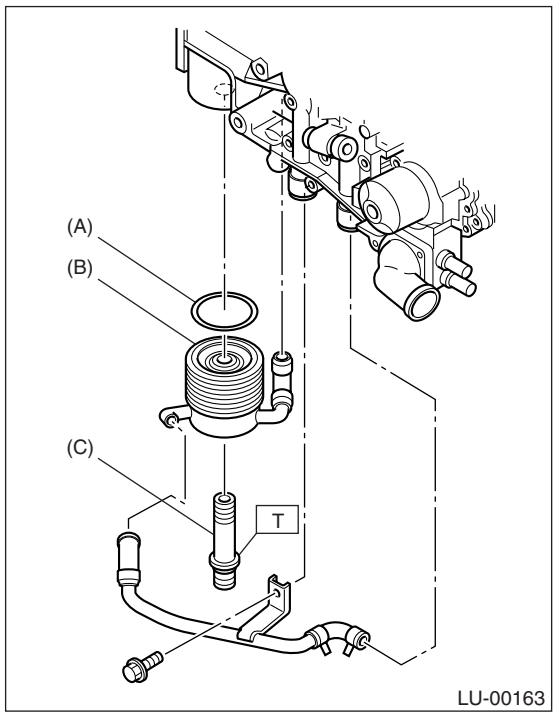
(A) O-ring
(B) Oil cooler
(C) Oil cooler connector

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
T: 54 N·m (5.5 kgf-m, 40 ft-lb)

NOTE:
Always use a new O-ring.



C: INSPECTION

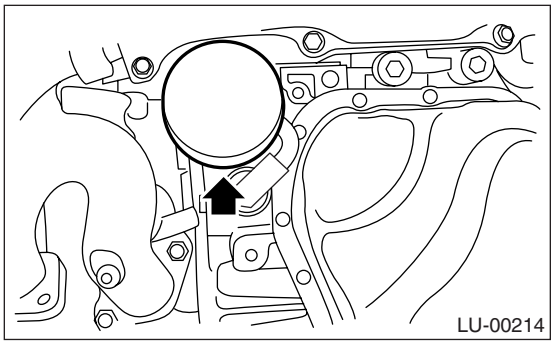
1) Check the coolant passages are not clogged using air blow method.
2) Check the mating surfaces of cylinder block, O-ring groove and oil filter for damage.

8. Engine Oil Filter

A: REMOVAL

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

ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))
ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))



B: INSTALLATION

1) Get a new oil filter and apply a thin coat of engine oil to seal rubber.
2) Install the oil filter by turning it by hand, being careful not to damage seal rubber.

- Tighten the oil filter 65 mm (2.56 in) in diameter by approx. 2/3 — 3/4 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler.
- Tighten the oil filter 68 mm (2.68 in) in diameter by approx. 1 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler.

CAUTION:
Do not tighten excessively, or oil may leak.

C: INSPECTION

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

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

2) Check the engine oil level. <Ref. to LU(STi)-8, INSPECTION, Engine Oil.>

9. Engine Lubrication System Trouble in General

A: INSPECTION

Before performing diagnostics, make sure that the engine oil level is correct and no oil leakage exists.

Trouble	Possible cause		Corrective action
1. Warning light remains on.	1) Oil pressure switch failure	Cracked diaphragm or oil leakage within switch	Replace.
		Broken spring or seized contacts	Replace.
	2) Low oil pressure	Clogged oil filter	Replace.
		Malfunction of oil by-pass valve of oil filter	Clean or replace.
		Malfunction of oil relief valve of oil pump	Clean or replace.
		Clogged oil passage	Clean.
		Excessive tip clearance and side clearance of oil pump rotor and gear	Replace.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Insufficient engine oil	Replenish.
		Broken pipe of oil strainer	Replace.
		Stuck oil pump rotor	Replace.
2. Warning light does not go on.	1) Poor contact of switch contact points		Replace.
	2) Disconnection of wiring		Repair.
3. Warning light flickers momentarily.	1) Poor contact at terminals		Repair.
	2) Defective wiring harness		Repair.
	3) Low oil pressure		Check for the same possible causes as listed in 1. — 2).

SPEED CONTROL SYSTEMS

SP(STi)

Page

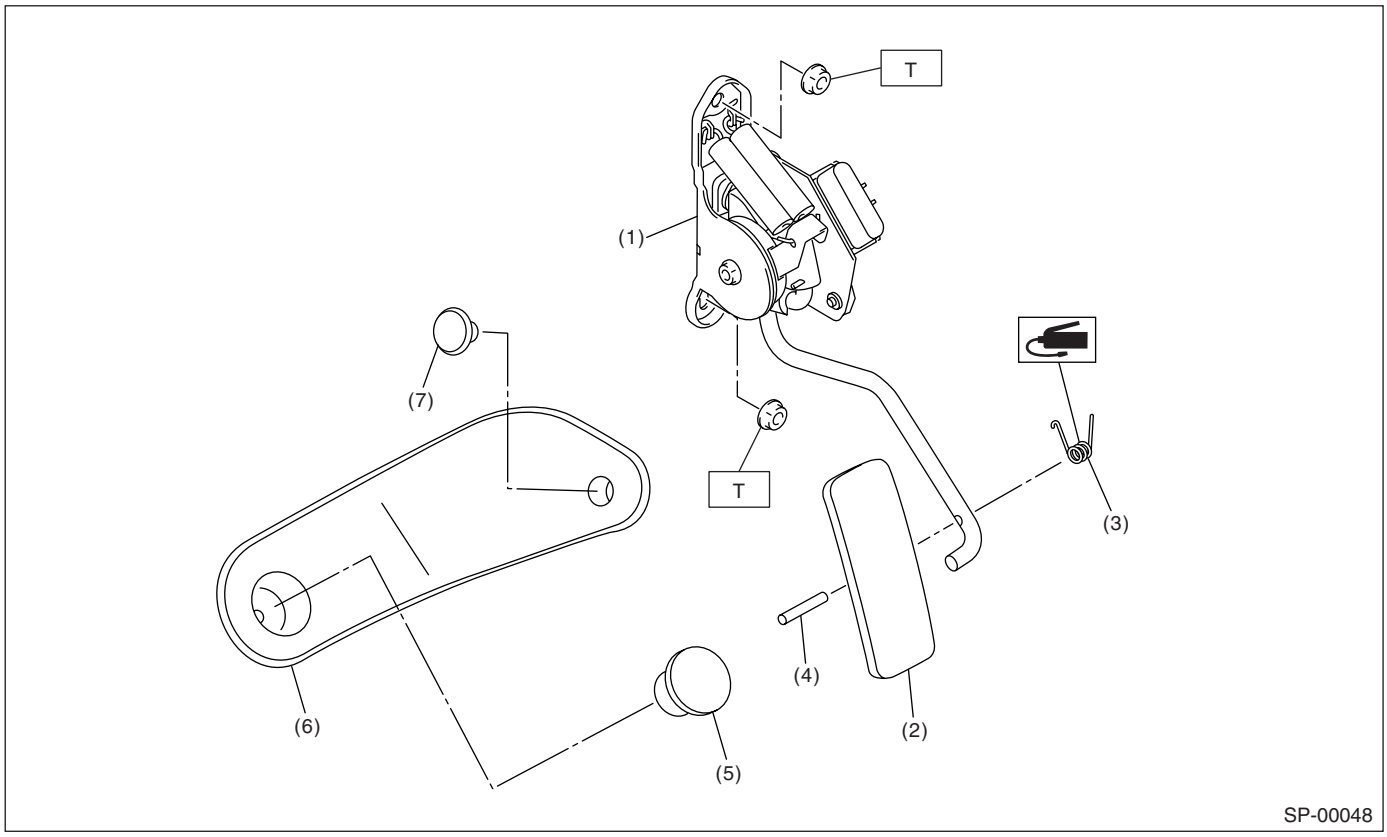
1. General Description 2
2. Accelerator Pedal 3

1. General Description

A: SPECIFICATION

Accelerator pedal	Free play	At pedal pad	0 — 4 mm (0 — 0.16 in)
	Stroke	At pedal pad	52 — 57 mm (2.05 — 2.24 in)

B: COMPONENT



(1) Accelerator pedal ASSY
(2) Accelerator pedal
(3) Accelerator pedal spring
(4) Spring pin
(5) Accelerator stopper
(6) Accelerator plate
(7) Clip

Tightening torque: N·m (kgf-m, ft-lb)
T: 18 (1.8, 13.0)

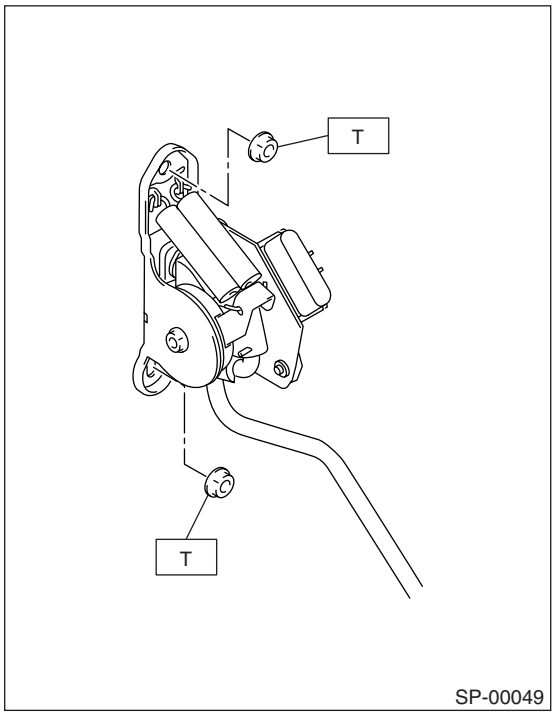
C: CAUTION

• Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination, including dirt and corrosion, before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Accelerator Pedal

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Disconnect the connector.
3) Remove the nuts which securing accelerator pedal assembly.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

C: DISASSEMBLY

NOTE:
Accelerator pedal for STi model is a non-disassemble part.

IGNITION

IG(STi)

Page

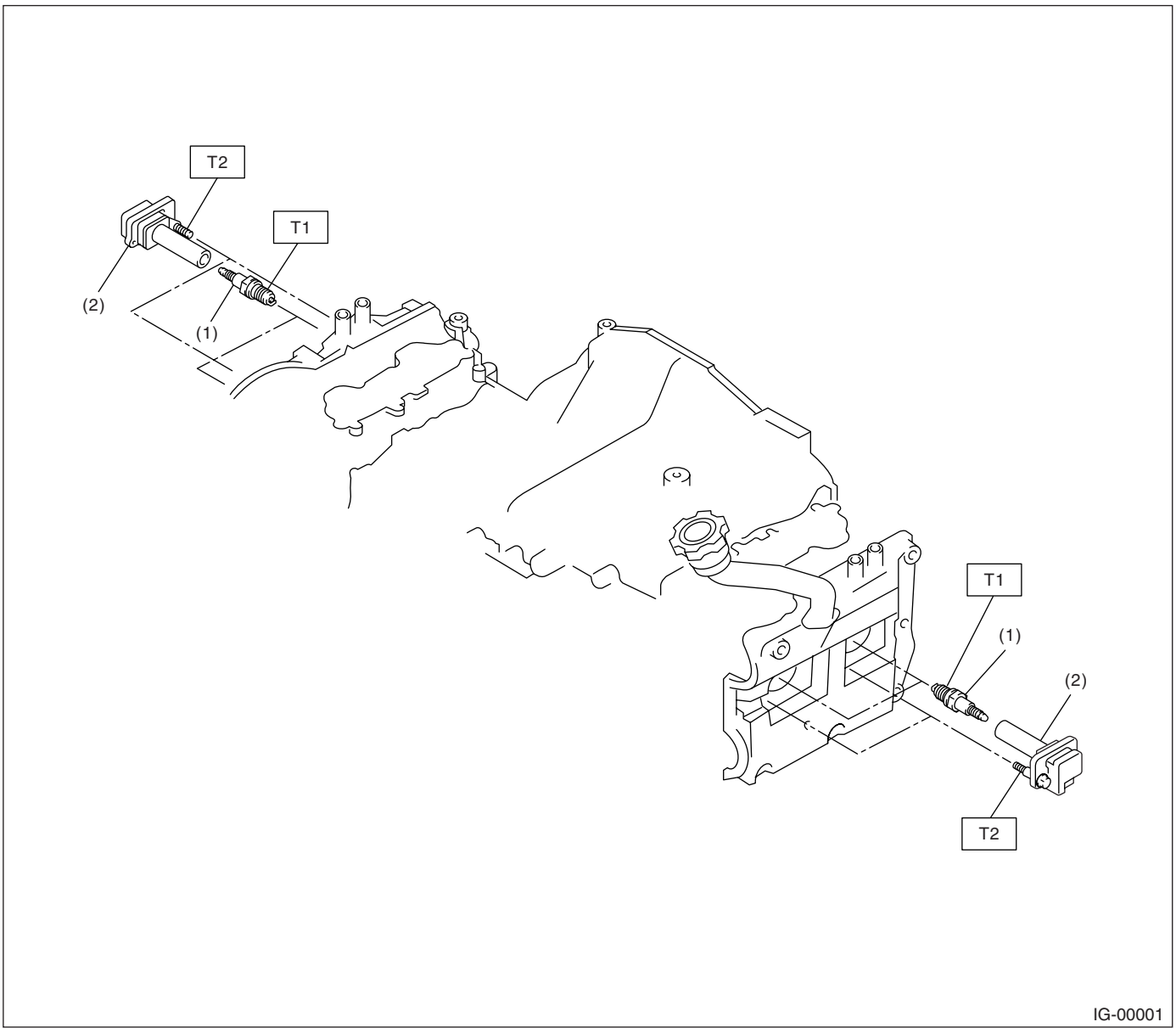
1. General Description 2
2. Spark Plug.....4
3. Ignition Coil & Ignitor ASSY 7

1. General Description

A: SPECIFICATIONS

Item		Designation
Ignition coil & ignitor assembly	Model	FK0186
	Ignition type	Direct ignition
	Manufacturer	DIAMOND
Spark plug	Type and manufacturer	NGK: ILFR6B
	Thread diameter, pitch, length mm	14, 1.25, 26.5
	Spark plug gap mm (in)	0.7 — 0.8 (0.028 — 0.031)
	Electrode	Platinum, Iridium

B: COMPONENT



(1) Spark plug
(2) Ignition coil & ignitor ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 21 (2.1, 15.2)
T2: 16 (1.6, 11.7)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Spark Plug

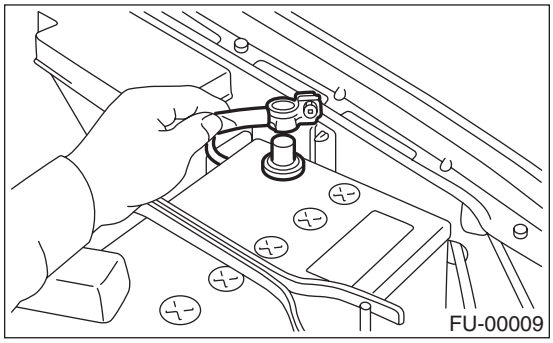
A: REMOVAL

CAUTION:
All spark plugs installed on an engine, must be of the same heat range.

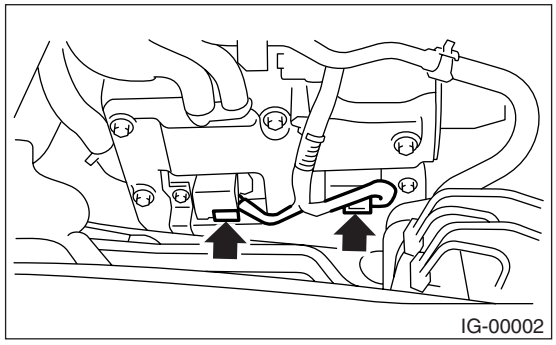
Spark plug:
NGK: ILFR6B

1. RH SIDE

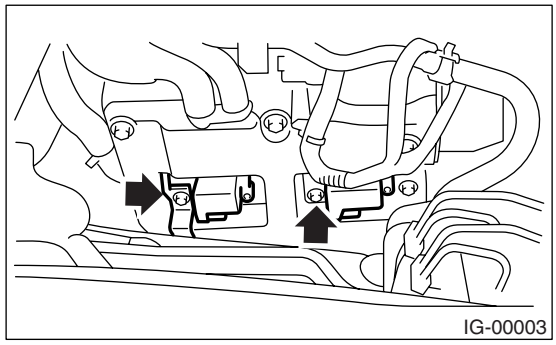
1) Disconnect the ground cable from battery.



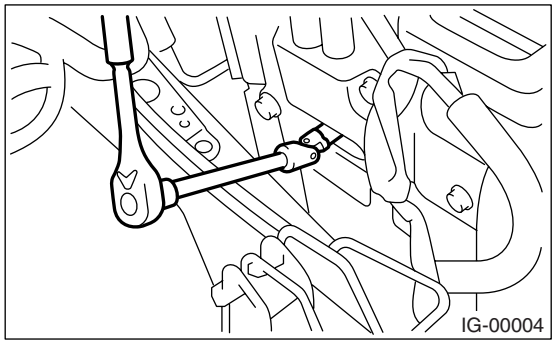
2) Remove the air cleaner lower case. <Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner.>
3) Disconnect the connector from ignition coil.



4) Remove the ignition coil.

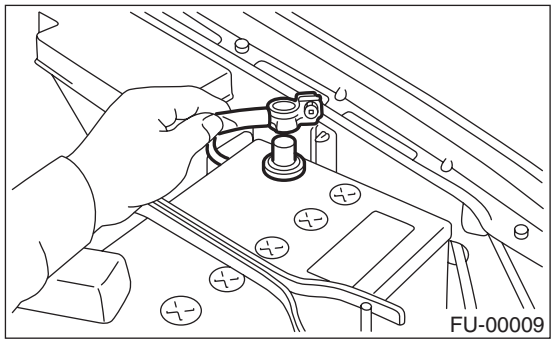


5) Remove the spark plugs with the spark plug sockets.

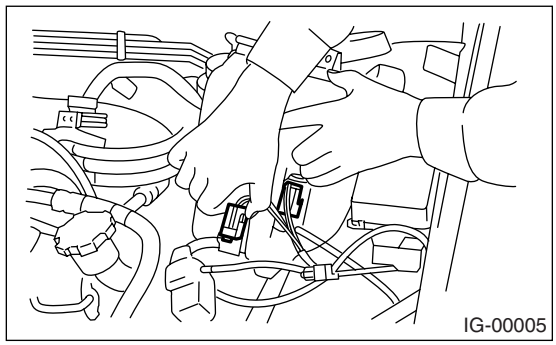


2. LH SIDE

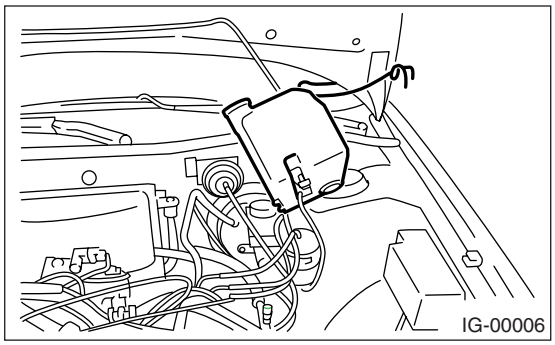
1) Disconnect the battery cables, and then remove the battery and battery carrier.



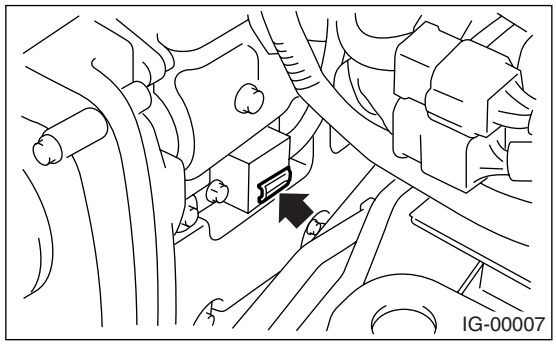
2) Disconnect the washer motor connector.



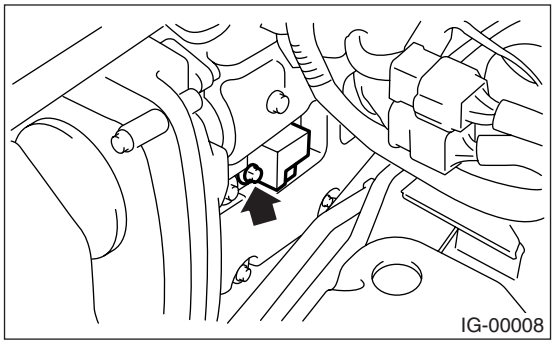
3) Disconnect the rear window glass washer hose from washer motor, then plug connection with a suitable cap.
4) Remove the two bolts which hold washer tank, then take the tank away from working area.



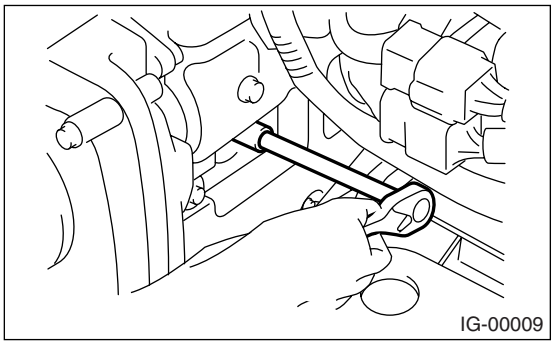
5) Disconnect the connector from ignition coil.



6) Remove the ignition coil.



7) Remove the spark plugs with the spark plug sockets.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 11.7 ft-lb)

NOTE:
The above torque should be only applied to new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

2. LH SIDE

Install in the reverse order of removal.

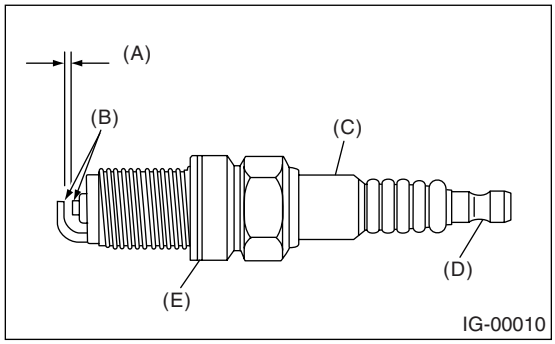
Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 11.7 ft-lb)

NOTE:
The above torque should be only applied to new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

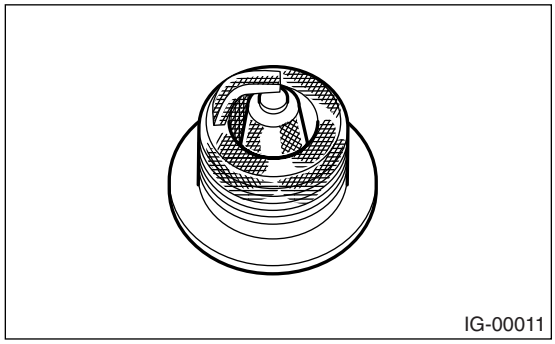
C: INSPECTION

Check the electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.

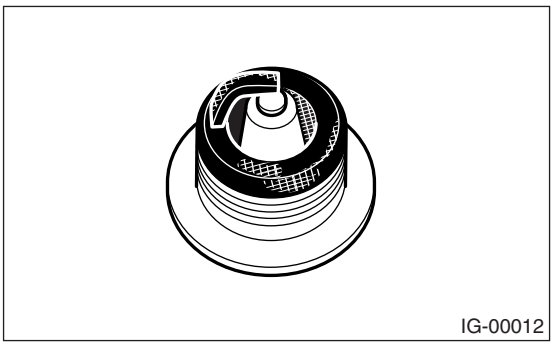


(A) Spark plug gap
(B) Carbon accumulation or wear
(C) Cracks
(D) Damage
(E) Damaged gasket

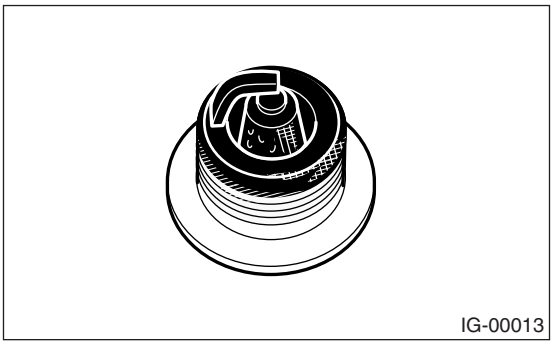
1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicates correct spark plug heat range.



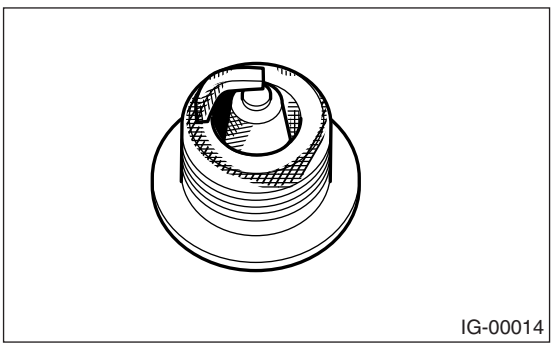
2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.
It is advisable to replace with plugs having hotter heat range.


IG-00012

3) Oil fouled:
Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems. If the same condition remains after repair, use a hotter plug.


IG-00013

4) Overheating:
White or light gray insulator with black or brown spots and bluish burnt electrodes indicates engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc. It is advisable to replace with plugs having colder heat range.

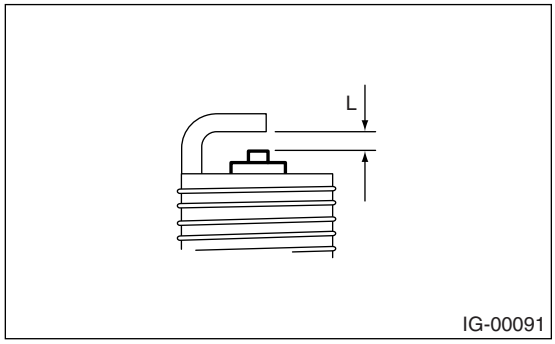

IG-00014

D: ADJUSTMENT

Clean the spark plugs with a wire brush. Clean and remove the carbon or oxide deposits, but do not wear away porcelain.
If deposits are too stubborn, replace the plugs.
After cleaning the spark plugs, correct the spark plug gap using a gap gauge.

NOTE:
Do not use spark plug cleaners, because the spark plugs are applied with iridium tips.

Spark plug gap: L
0.7 — 0.8 mm (0.028 — 0.031 in)



IG-00091

3. Ignition Coil & Ignitor ASSY

A: REMOVAL

Direct ignition type has been adopted. Refer to the “Spark Plug Removal” for removal procedure. <Ref. to IG(STi)-4, REMOVAL, Spark Plug.>

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
16 N·m (1.6 kgf-m, 11.7 ft-lb)

C: INSPECTION

For inspection, refer to the following. <Ref. to EN(H4DOTC)(diag)-65, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

Ignition Coil & Ignitor ASSY

STARTING/CHARGING SYSTEMS

SC(STi)

Page
1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for STi model is as same as turbo model. <Ref. to SC(H4DOTC)-2, General Description.>

ENGINE (DIAGNOSTICS)

EN(STi)(diag)

		Page
1.	Basic Diagnostic Procedure	2
2.	Check List for Interview	3
3.	General Description	5
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6.	Engine Condition Data	22
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13.	Clear Memory Mode	41
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19.	General Diagnostic Table	342

1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

	Step	Check	Yes	No
1	**CHECK ENGINE START FAILURE.** 1) Ask the customer when and how trouble occurred using the interview check list. <Ref. to EN(STi)(diag)-3, CHECK, Check List for Interview.> 2) Start the engine.	Does the engine start?	Go to step **2.**	Inspection using “Diagnostics for Engine Start Failure”. <Ref. to EN(STi)(diag)-53, Diagnostics for Engine Starting Failure.>
2	**CHECK ILLUMINATION OF MALFUNCTION INDICATOR LIGHT.**	Does the malfunction indicator light illuminate?	Go to step **3.**	Inspection using “General Diagnostics Table”. <Ref. to EN(STi)(diag)-342, General Diagnostic Table.>
3	**CHECK INDICATION OF DTC ON DISPLAY.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector. 3) Turn the ignition switch to ON and the Subaru Select Monitor or OBD-II general scan tool switch to ON. 4) Read the DTC on Subaru Select Monitor or OBD-II general scan tool.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Record the DTC code. Repair the trouble cause. <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).> Go to step **4.**	Repair the related parts. NOTE: If a DTC is not shown on display although malfunction indicator light illuminates, perform diagnostics of malfunction indicator light circuit or combination meter. <Ref. to EN(STi)(diag)-44, Malfunction Indicator Light.>
4	**PERFORM THE DIAGNOSIS.** 1) Perform the clear memory mode. <Ref. to EN(STi)(diag)-41, Clear Memory Mode.> 2) Perform the inspection mode. <Ref. to EN(STi)(diag)-34, Inspection Mode.>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Inspect using “Diagnostics Procedure with Diagnostic Trouble Code (DTC)”. <Ref. to EN(STi)(diag)-72, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

2. Check List for Interview

A: CHECK

1. CHECK LIST No. 1

Check the following items when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name		Engine No.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
VIN			miles
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others:		
Outdoor temperature	°C (°F)		
	❑ Hot ❑ Warm ❑ Cool ❑ Cold		
Place	❑ Highway ❑ Suburbs ❑ Inner city ❑ Uphill ❑ Downhill ❑ Rough road ❑ Others:		
Engine temperature	❑ Cold ❑ Warming-up ❑ After warming-up ❑ Any temperature ❑ Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	❑ Not affected ❑ At starting ❑ While idling ❑ At racing ❑ While accelerating ❑ While cruising ❑ While decelerating ❑ While turning (RH/LH)		
Headlight	❑ ON / ❑ OFF	Rear defogger	❑ ON / ❑ OFF
Blower	❑ ON / ❑ OFF	Radio	❑ ON / ❑ OFF
A/C compressor	❑ ON / ❑ OFF	CD/Cassette	❑ ON / ❑ OFF
Cooling fan	❑ ON / ❑ OFF	Car phone	❑ ON / ❑ OFF
Front wiper	❑ ON / ❑ OFF	CB	❑ ON / ❑ OFF
Rear wiper	❑ ON / ❑ OFF		

2. CHECK LIST No. 2

Check the following items about the vehicle's state when malfunction indicator light turns on.

NOTE:
Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. ❑ Yes / ❑ No
❑ Low fuel warning light ❑ Charge indicator light ❑ AT diagnostics indicator light ❑ ABS warning light ❑ Engine oil pressure warning light
b) Fuel level
• Lack of gasoline: ❑ Yes / ❑ No • Indicator position of fuel gauge: • Had run out of gas before: ❑ Yes / ❑ No
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ❑ Yes / ❑ No
• What:
d) Intentional connecting or disconnecting of hoses: ❑ Yes / ❑ No
• What:
e) Installing of parts other than genuine parts: ❑ Yes / ❑ No
• What: • Where:
f) Occurrence of noise: ❑ Yes / ❑ No
• From where: • What kind:
g) Occurrence of smell: ❑ Yes / ❑ No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: ❑ Yes / ❑ No
i) Troubles occurred
❑ Engine does not start. ❑ Engine stalls during idling. ❑ Engine stalls while driving. ❑ Engine speed decreases. ❑ Engine speed does not decrease. ❑ Rough idling ❑ Poor acceleration ❑ Back fire ❑ After fire ❑ No shift ❑ Excessive shift shock

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the ECM, main relay and fuel pump relay.

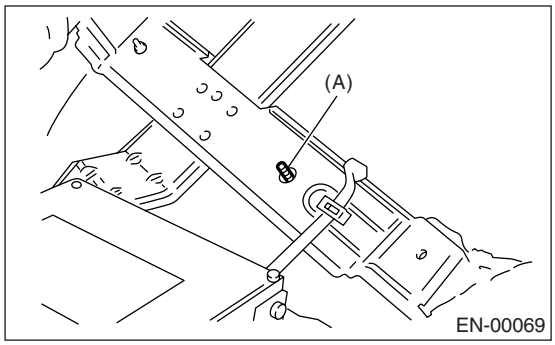
CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use the electrical test equipment on these circuit.
• Be careful not to damage the airbag system wiring harness when servicing the ECM, TCM, main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.
• The ECM will be destroyed instantly.
• The fuel injector and other part will be damaged in just a few minutes more.
3) Do not disconnect the battery cables while the engine is running.
• A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as ECM, etc.
4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn the ignition switch to OFF.
5) Poor contact has been identified as a primary cause of this problem. To measure the voltage and/or resistance of individual sensors or all electrical control modules at the harness side connector, use a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.
6) Before removing the ECM from located position, disconnect two cables on battery.
• Otherwise, the ECM may be damaged.

CAUTION:
When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on the fuel injection system.

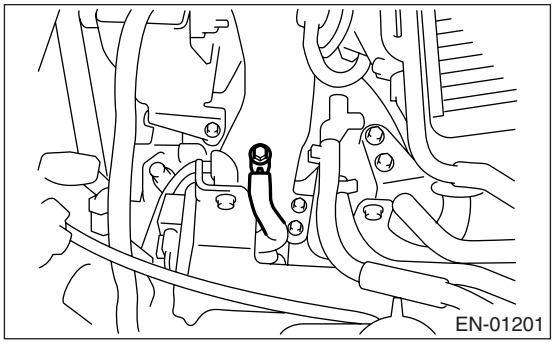
7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use the ECM mounting stud bolt at the body head grounding points when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

9) Use the engine grounding terminal or engine proper as the grounding point to the body, when measuring voltage and resistance in the engine compartment.



10) Every MFI-related part is a precision part. Do not drop them.
11) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:
• The antenna must be kept as far apart as possible from the control unit.
(The ECM is located under the steering column, inside of the instrument panel lower trim panel.)
• The antenna feeder must be placed as far as possible from ECM and MFI harness.
• Carefully adjust the antenna for correct matching.
• When mounting a large power type radio, pay special attention to the three items above mentioned.
• Incorrect installation of the radio may affect the operation of ECM.

12) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than 5 seconds to release pressure in the fuel system. If the engine starts during this operation, run it until it stops.

13) Diagnostics should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.
14) On model with ABS, when performing driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between front and rear wheels. After diagnosis of engine control system, perform the ABS memory clearance procedure of self-diagnosis system.

B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems:

1. BATTERY

1) Measure the battery voltage and specific gravity of electrolyte.

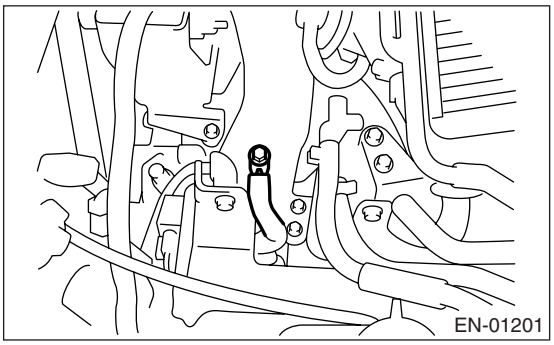
Standard voltage: 12 V

Specific gravity: Above 1.260

2) Check the condition of main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUNDING

Make sure the engine grounding terminal is properly connected to engine.



C: NOTE

1. DESCRIPTION

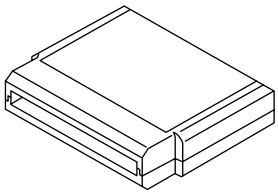
• The on-board diagnostics (OBD) system detects and indicates a fault in various inputs and outputs of complex electronic control. Malfunction indicator light in combination meter indicates occurrence of a fault or trouble.
• Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
• The OBD system incorporated with the vehicles within this engine family complies with Section 1968.1, California Code of Regulations (OBD-II regulation). The OBD system monitors the components and the system malfunction listed in Engine Section which affects on emissions.
• When the system decides that a malfunction occurs, malfunction indicator light illuminates. At the same time of malfunction indicator light illumination or blinking, a DTC and a freeze frame engine conditions are stored into on-board computer.
• The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction first.
• If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
• When the malfunction does not occur again for three consecutive driving cycles, malfunction indicator light is turned off, but DTC remains at on-board computer.
• The OBD-II system is capable of communication with a general scan tool (OBD-II general scan tool) formed by ISO 9141 CARB.
• The OBD-II diagnostics procedure is different from usual diagnostics procedure. When troubleshooting model with OBD-II, connect the Subaru Select Monitor or the OBD-II general scan tool to the vehicle.

2. ENGINE AND EMISSION CONTROL SYSTEM

• The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.
With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.
• Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.

The MFI system also has the following features:
- Reduced emission of harmful exhaust gases.
- Reduced in fuel consumption.
- Increased engine output.
- Superior acceleration and deceleration.
- Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

D: PREPARATION TOOL

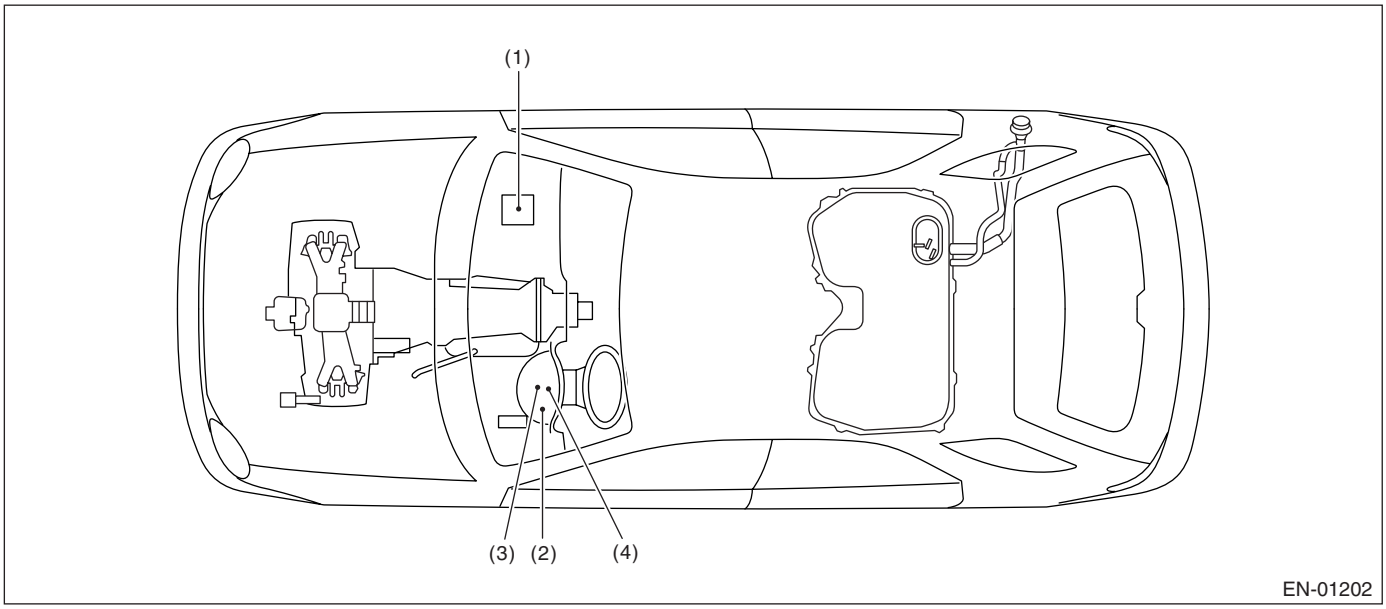
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

4. Electrical Components Location

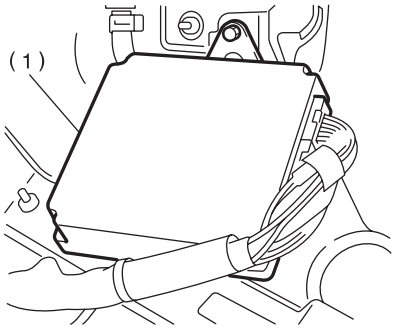
A: LOCATION

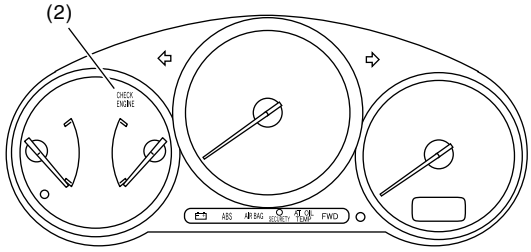
1. ENGINE

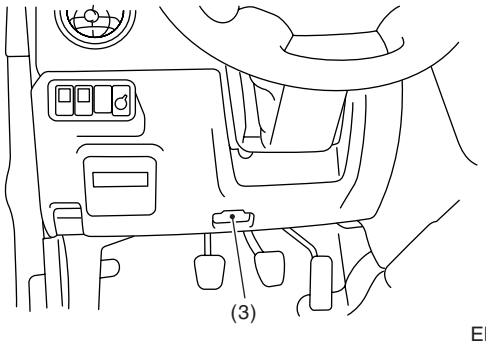
• Module

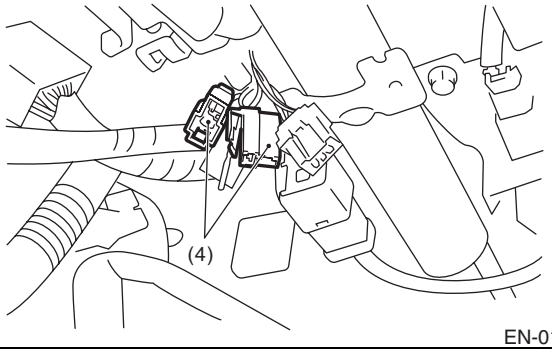


(1) Engine control module (ECM)
(2) Malfunction indicator light
(3) Data link connector
(4) Test mode connector

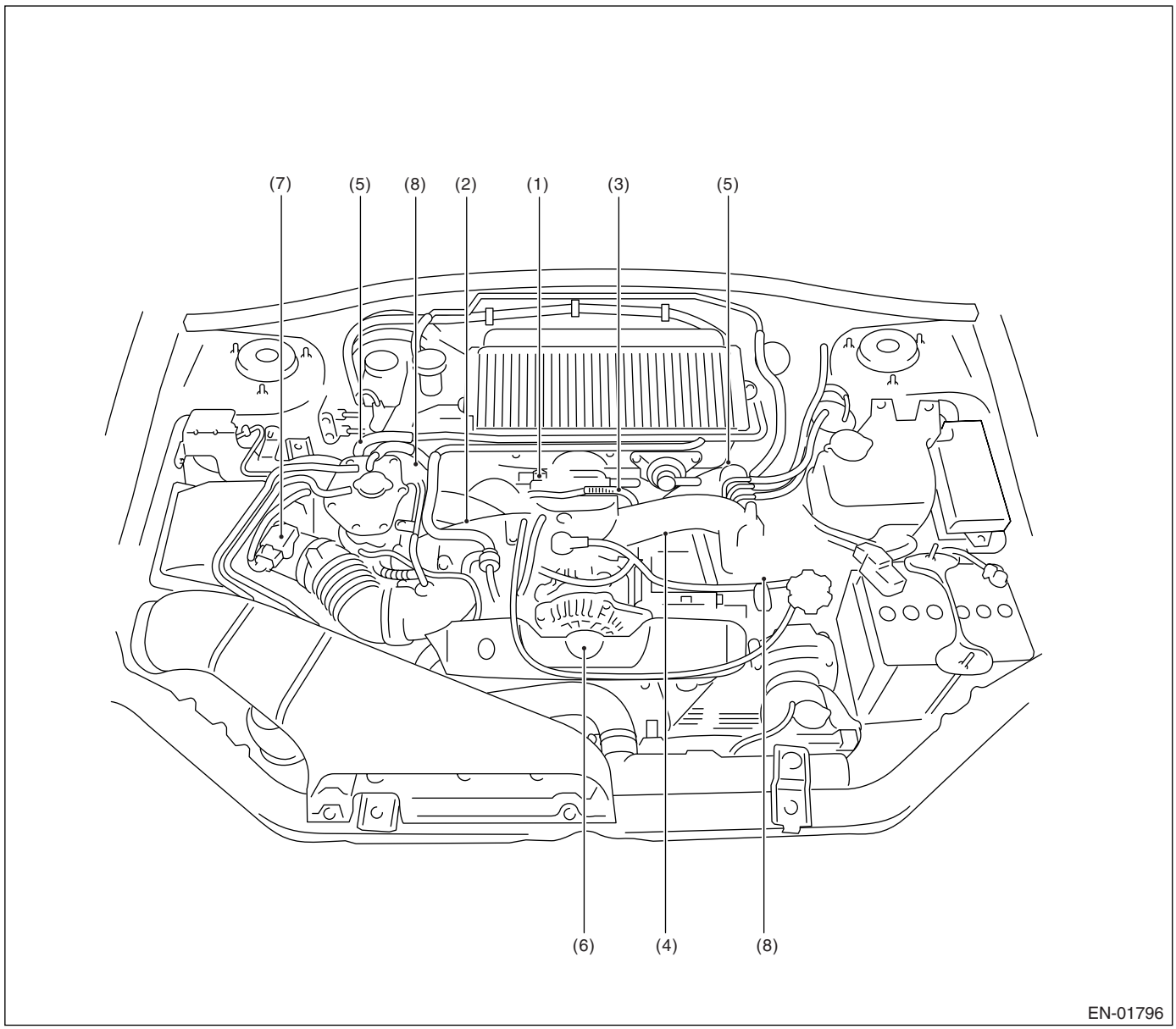






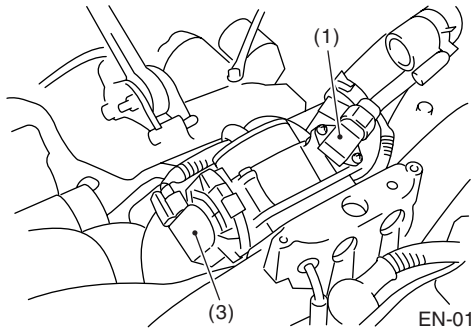


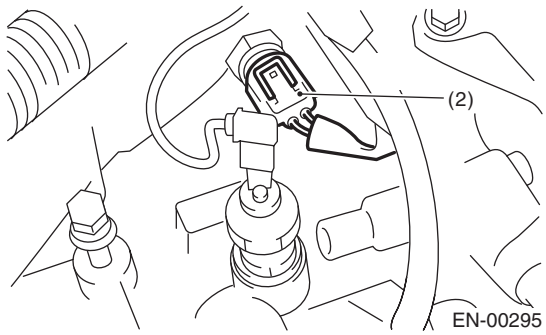
• Sensor

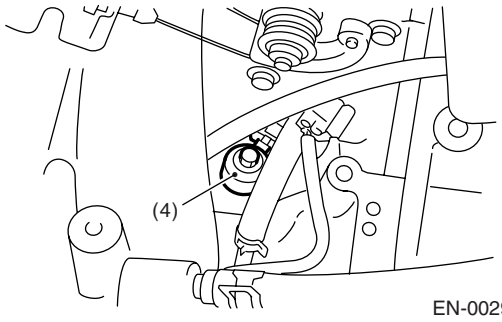


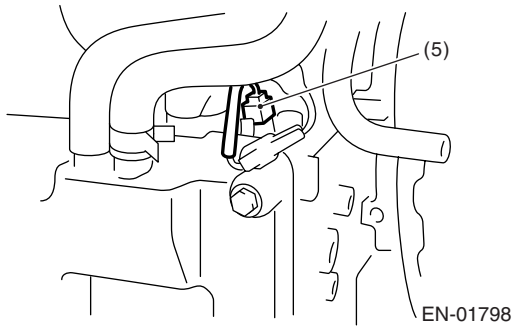
(1) Manifold absolute pressure sensor
(2) Engine coolant temperature sensor
(3) Electric throttle
(4) Knock sensor
(5) Camshaft position sensor
(6) Crankshaft position sensor
(7) Mass air flow and intake air temperature sensor
(8) Tumble generator valve position sensor

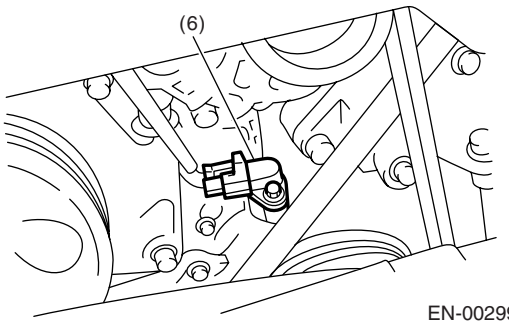
Electrical Components Location

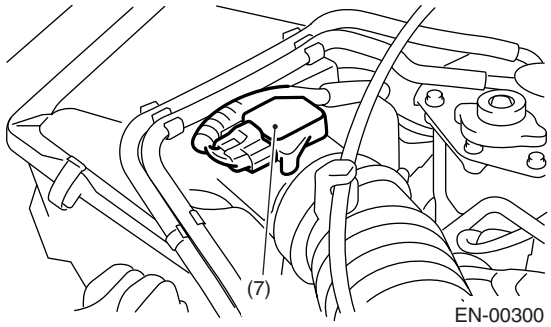


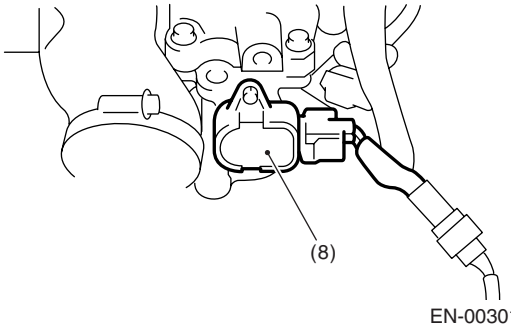


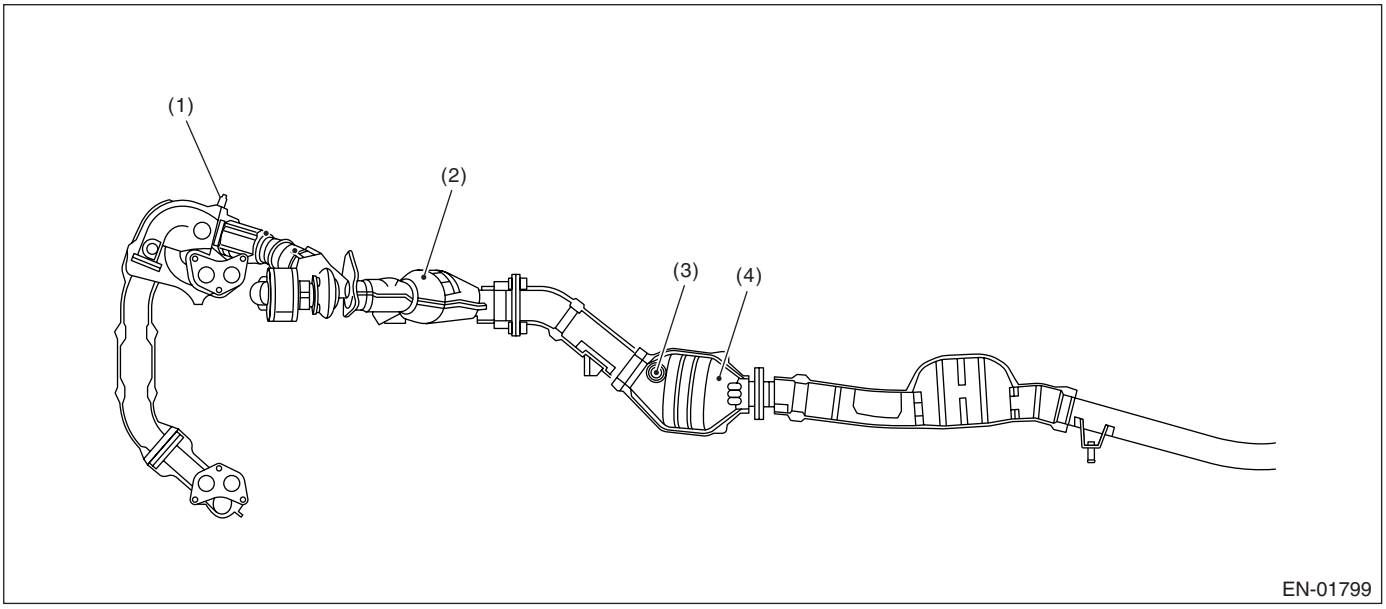




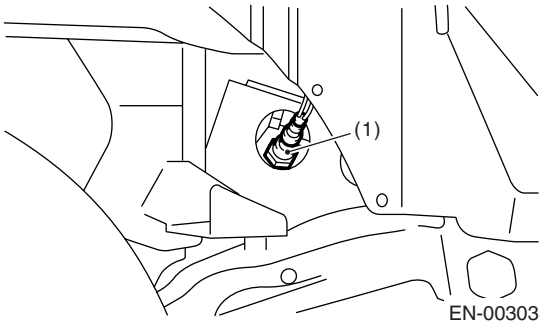


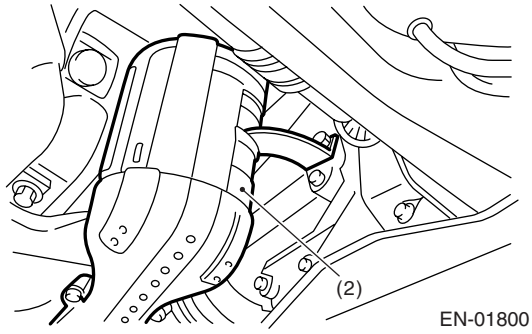


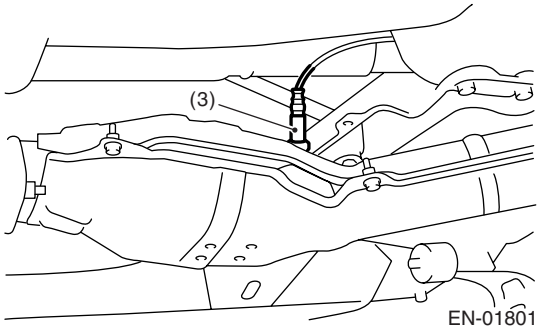


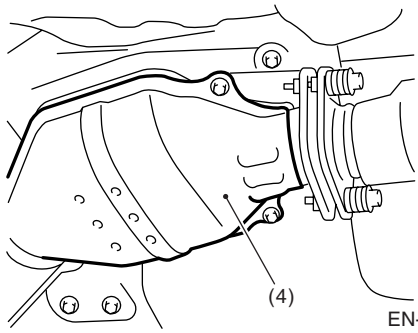


(1) Front oxygen (A/F) sensor
(2) Front catalytic converter
(3) Rear oxygen sensor
(4) Rear catalytic converter

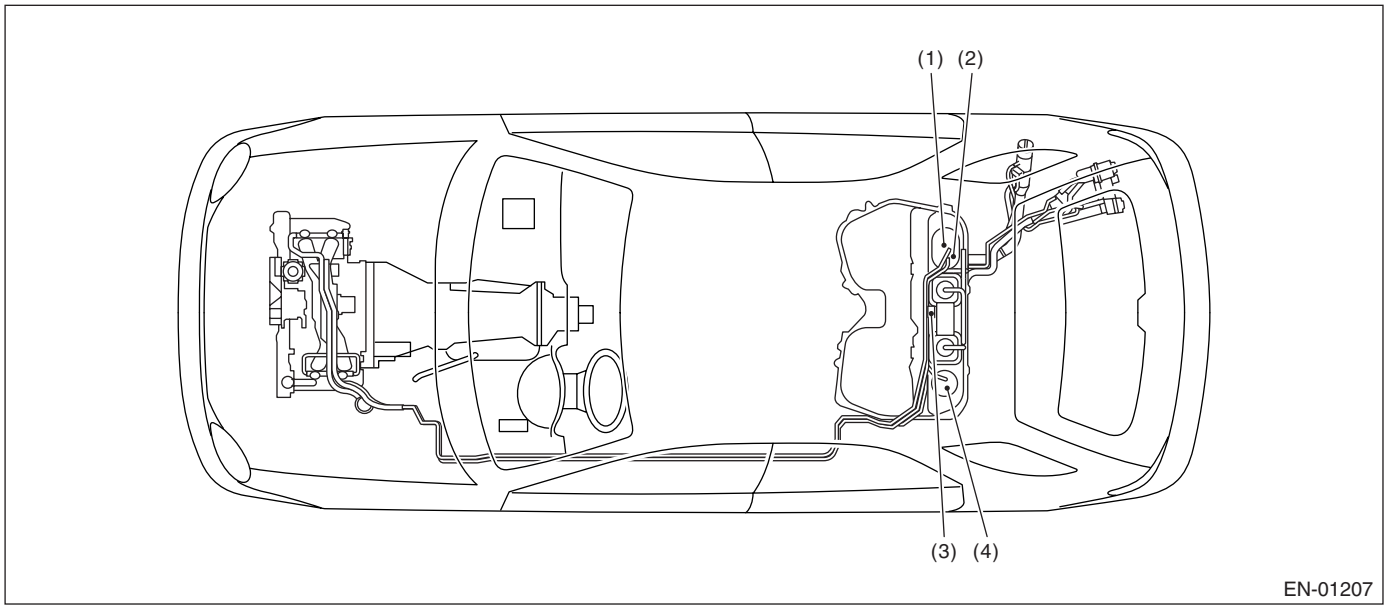




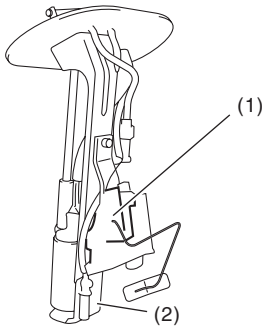


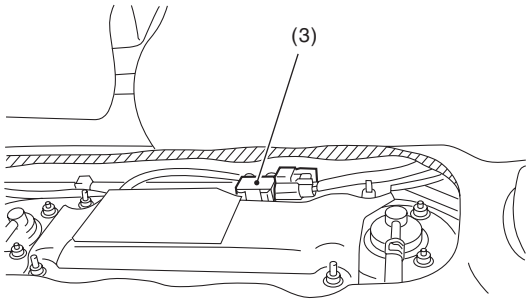


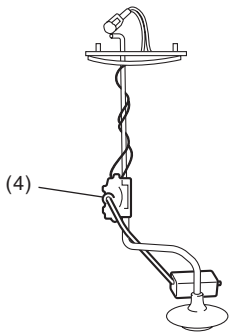
Electrical Components Location



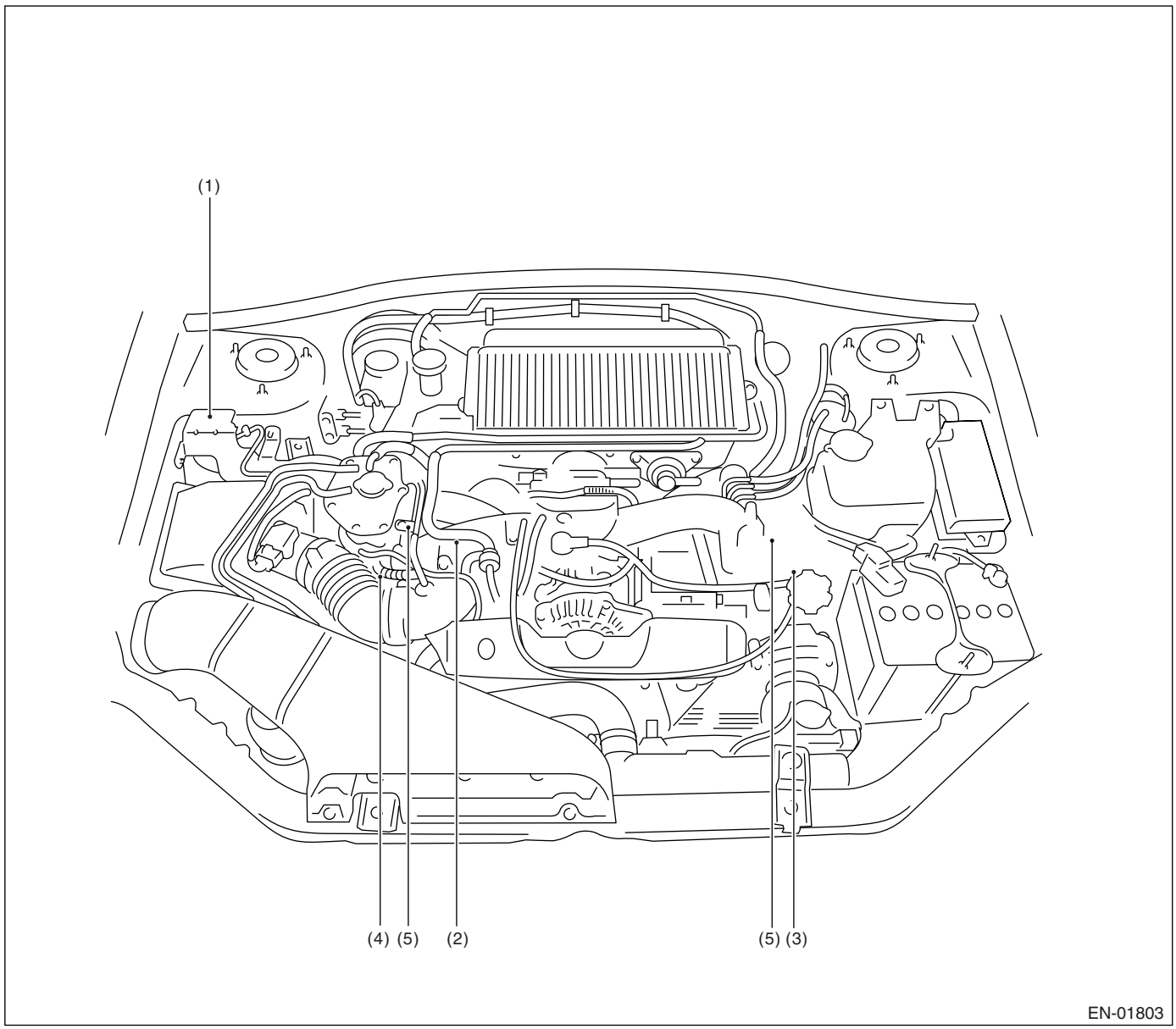
(1) Fuel level sensor
(2) Fuel temperature sensor
(3) Fuel tank pressure sensor
(4) Fuel sub level sensor



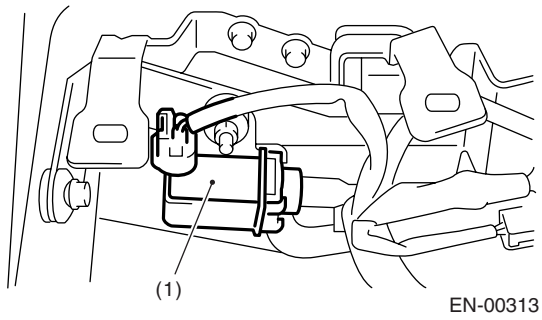




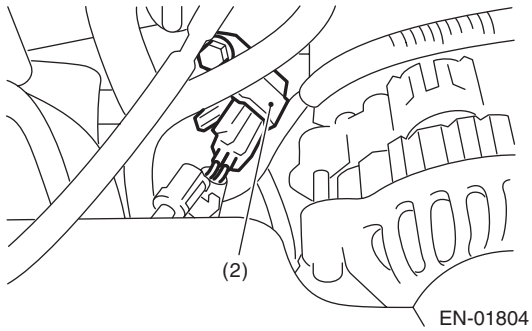
• Solenoid Valve, Actuator, Emission Control System Parts and Ignition System Parts



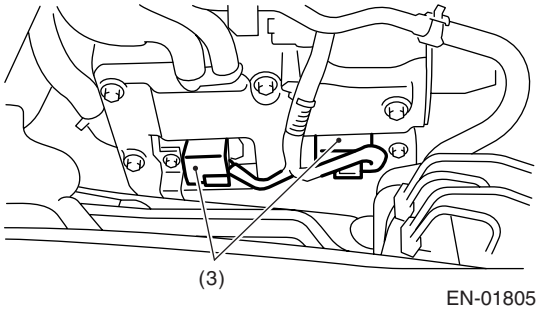
(1) Wastegate control solenoid valve
(2) Purge control solenoid valve
(3) Ignition coil
(4) Tumble generator valve actuator
(5) Variable valve timing solenoid valve



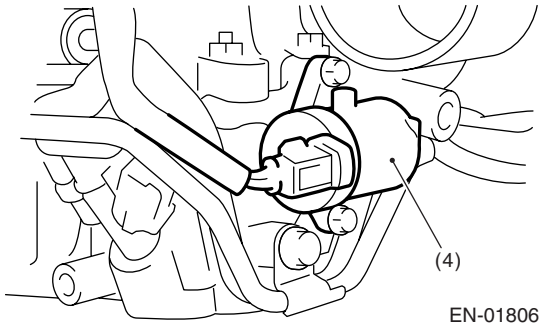
EN-00313



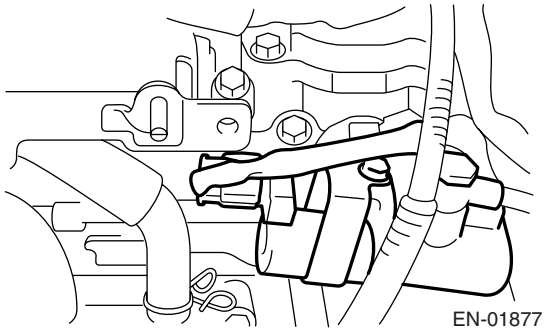
EN-01804



EN-01805



EN-01806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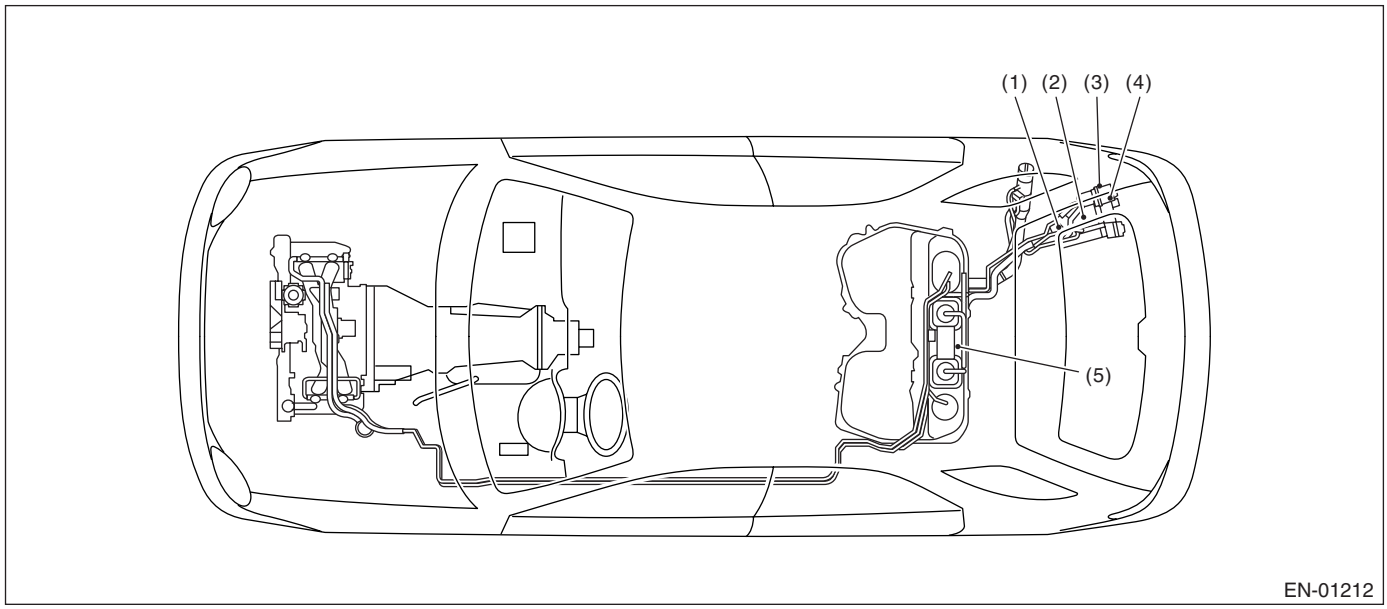
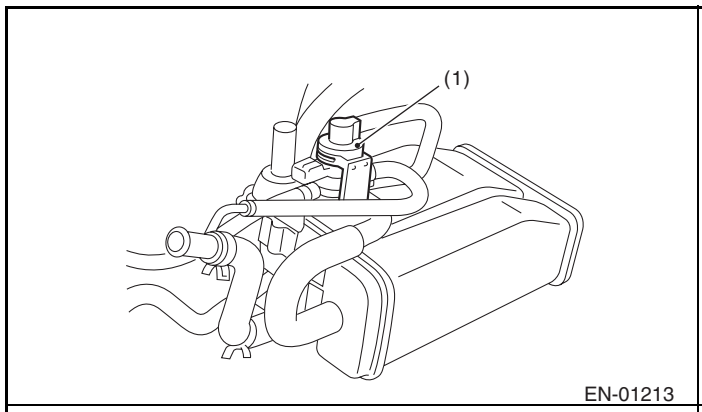
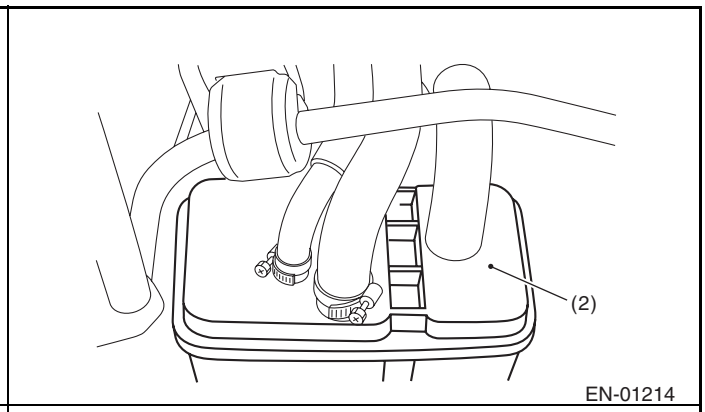
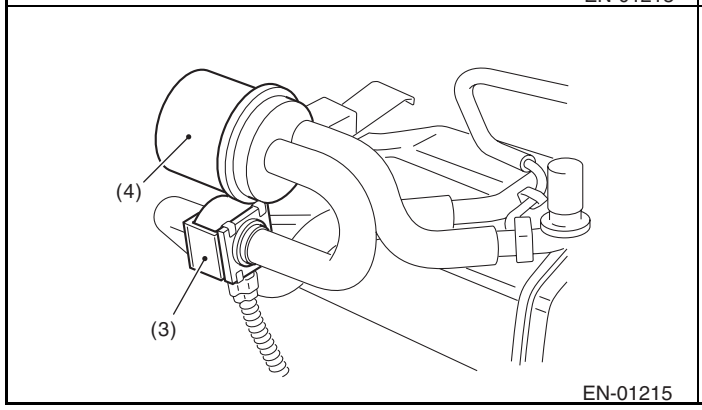
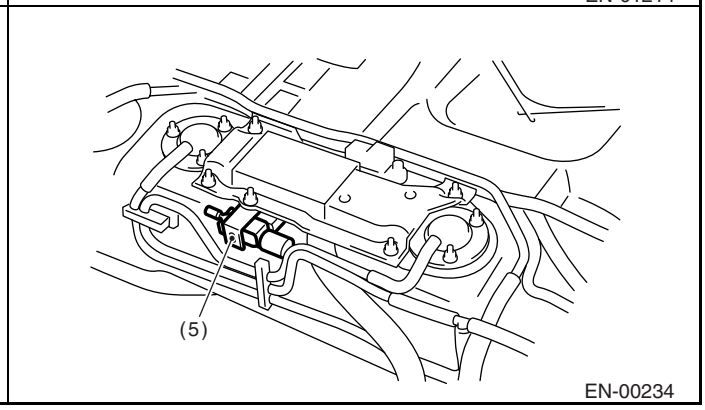


(1) Pressure control solenoid valve
(2) Canister
(3) Drain valve
(4) Drain filter
(5) Fuel tank sensor control valve

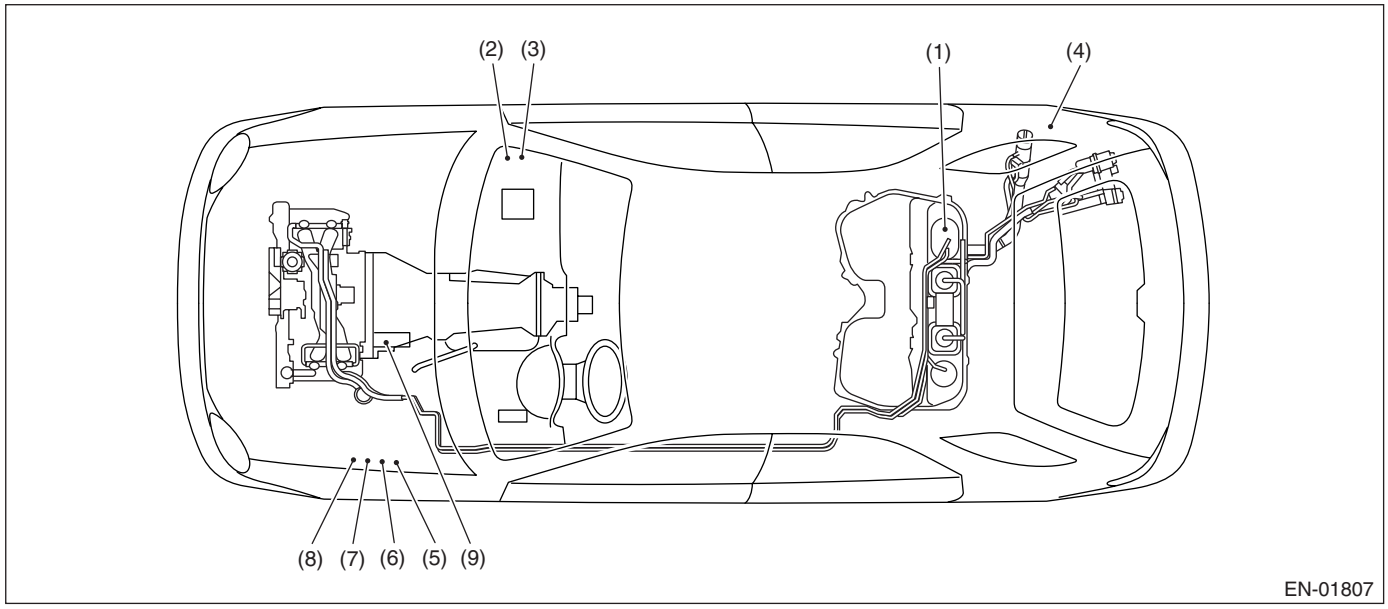




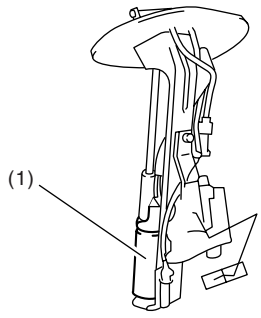


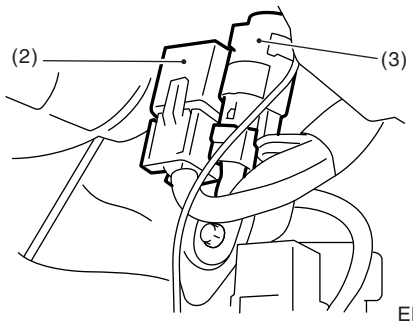


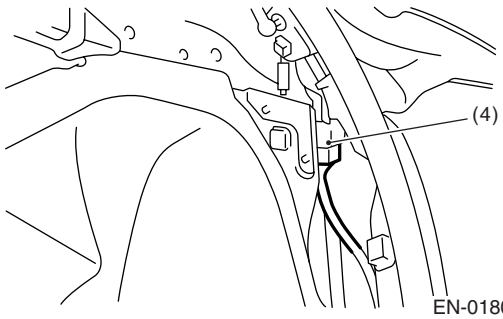
Electrical Components Location

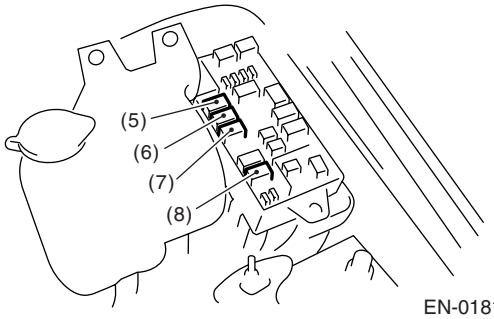


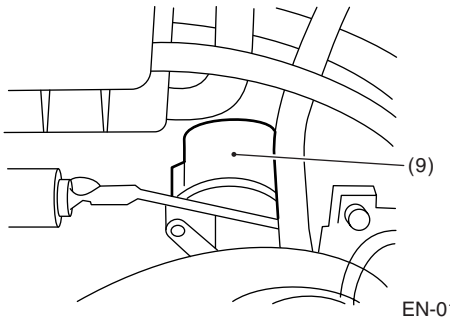
(1) Fuel pump
(2) Main relay
(3) Fuel pump relay
(4) Fuel pump control unit
(5) Radiator main fan relay 1
(6) Radiator main fan relay 2
(7) Radiator sub fan relay 1
(8) Radiator sub fan relay 2
(9) Starter





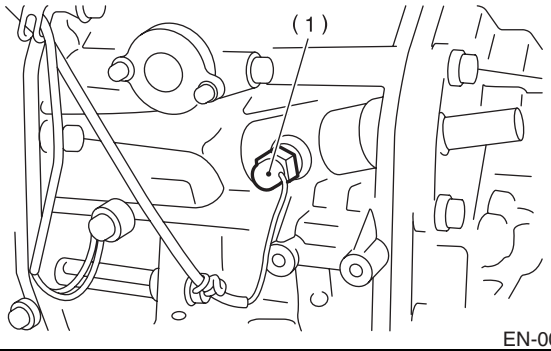






2. TRANSMISSION

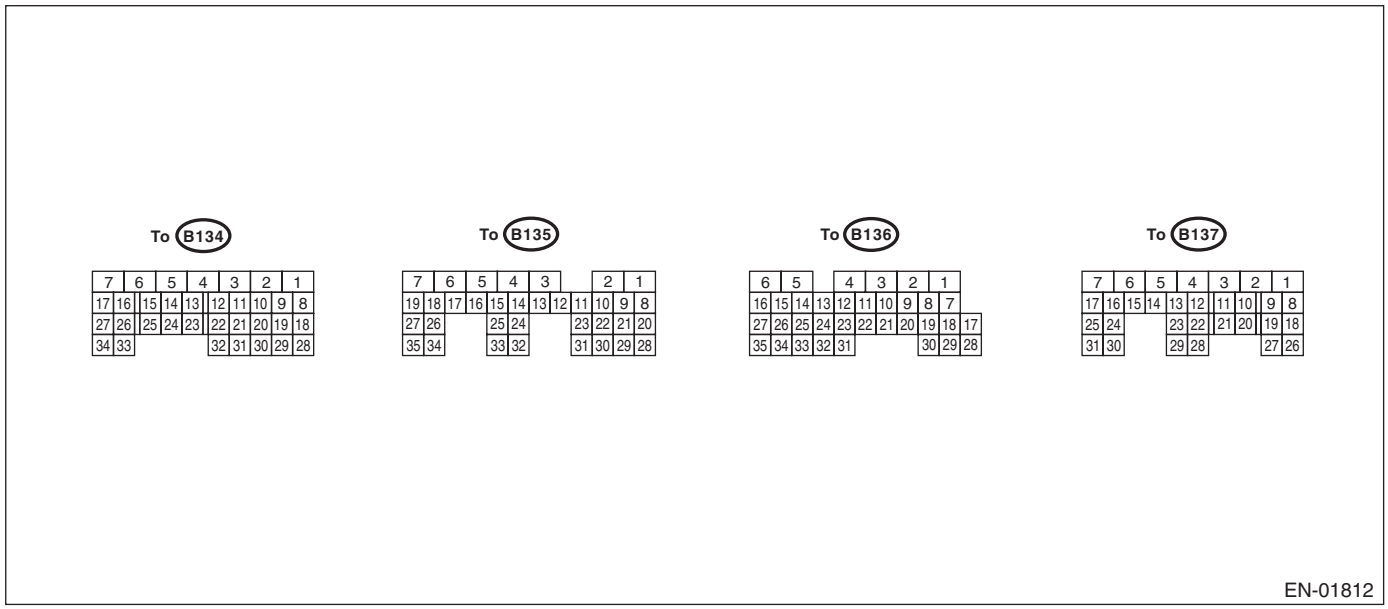
• Solenoid Valve and Switch



(1) Neutral position switch

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Crankshaft position sensor	Signal (+)	B135	10	0	–7 — +7	Sensor output waveform
	Signal (–)	B135	22	0	0	—
	Shield	B135	31	0	0	—
Rear oxygen sensor	Signal	B137	25	0	0 — 0.9	—
	Shield	B137	31	0	0	—
	GND (sensor)	B136	35	0	0	—
Front oxygen (A/F) sensor heater	Signal 1	B134	3	0 — 1.0	—	Sensor output waveform
	Signal 2	B134	2	0 — 1.0	—	Sensor output waveform
Rear oxygen sensor heater signal		B135	2	0 — 1.0	—	Sensor output waveform
Engine coolant temperature sensor	Signal	B136	14	1.0 — 1.4	1.0 — 1.4	After warm-up the engine.
	GND (sensor)	B136	35	0	0	After warm-up the engine.
Vehicle speed signal		B135	27	0 or 5	0 or 5	“5” and “0” are repeatedly displayed when vehicle is driven.
Mass air flow sensor	Signal	B136	23	—	0.3 — 4.5	—
	Shield	B136	32	0	0	—
	GND	B136	31	0	0	—
Intake air temperature sensor signal		B136	13	0.3 — 4.6	0.3 — 4.6	—
Tumble generator valve position sensor RH	Signal	B136	27	Fully closed: 3.8 — 4.9 Fully opened: 0.2 — 0.9		—
	Power supply	B136	16	5	5	—
	GND (sensor)	B136	35	0	0	—

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Tumble generator valve position sensor LH	Signal	B136	26	Fully closed: 3.8 — 4.9 Fully opened: 0.2 — 0.9		—
	Power supply	B136	16	5	5	—
	GND (sensor)	B136	35	0	0	—
Tumble generator valve RH (open)		B134	9	0 or 10 — 13	0 or 13 — 14	Sensor output waveform
Tumble generator valve RH (close)		B134	8	0 or 10 — 13	0 or 13 — 14	Sensor output waveform
Tumble generator valve LH (open)		B134	11	0 or 10 — 13	0 or 13 — 14	Sensor output waveform
Tumble generator valve LH (close)		B134	10	0 or 10 — 13	0 or 13 — 14	Sensor output waveform
Wastegate control solenoid valve		B134	32	0 or 10 — 13	0 or 13 — 14	Sensor output waveform
Starter switch		B137	8	0	0	Cranking: 8 — 14
A/C switch		B137	16	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		B137	15	10 — 13	13 — 14	—
Neutral position switch		B137	9	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Test mode connector		B137	14	5	5	When connected: 0
Knock sensor	Signal	B136	25	2.8	2.8	—
	Shield	B136	33	0	0	—
Back-up power supply		B135	19	10 — 13	13 — 14	Ignition switch “OFF”: 10 — 13
Control unit power supply		B135	5	10 — 13	13 — 14	—
		B135	6	10 — 13	13 — 14	—
Sensor power supply		B136	16	5	5	—
Ignition control	#1	B135	18	0	13 — 14	Waveform
	#2	B135	17	0	13 — 14	Waveform
	#3	B135	16	0	13 — 14	Waveform
	#4	B135	16	0	13 — 14	Waveform
Fuel injector	#1	B136	6	10 — 13	1 — 14	Waveform
	#2	B136	5	10 — 13	1 — 14	Waveform
	#3	B136	4	10 — 13	1 — 14	Waveform
	#4	B136	3	10 — 13	1 — 14	Waveform
Fuel pump control unit	Signal 1	B135	26	0 or 5	0 or 5	Sensor output waveform
	Signal 2	B137	28	10 — 13	13 — 14	—
A/C relay control		B133	33	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	—
Radiator fan relay 1 control		B135	25	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	—
Radiator fan relay 2 control		B135	24	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	Model with A/C only
Malfunction indicator lamp		B134	17	—	—	Light “ON”: 1 or less Light “OFF”: 10 — 14
Engine speed output		B134	23	—	0 — 13, or more	Waveform
Purge control solenoid valve		B134	14	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	Sensor output waveform

Engine Control Module (ECM) I/O Signal

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Manifold absolute pressure sensor	Signal	B136	22	1.7 — 2.4	1.1 — 1.6	—
	Power supply	B136	16	5	5	
	GND (sensor)	B136	35	0	0	
Fuel tank pressure sensor	Signal	B136	21	2.3 — 2.7	2.3 — 2.7	The valve operates when fuel filler cap is removed and reinstalled.
	GND (sensor)	B136	35	0	0	—
Pressure control solenoid valve		B134	12	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
Drain valve		B134	13	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
Fuel tank sensor control valve		B134	24	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
Fuel level sensor		B136	20	0.12 — 4.75	0.12 — 4.75	—
Fuel temperature sensor signal		B136	12	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C (75°F)
Blow-by leak diagnosis signal		B137	24	0	0	When disconnection (malfunction): 5
Small light switch		B137	12	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Blower fan switch		B137	13	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Rear defogger switch		B137	11	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Power steering oil pressure switch		B137	10	10 — 13	ON: 0 OFF: 13 — 14	—
Front oxygen (A/F) sensor signal (+)		B134	33	2.8 — 3.2	2.8 — 3.2	—
Front oxygen (A/F) sensor signal (−)		B134	26	2.4 — 2.7	2.4 — 2.7	—
Front oxygen (A/F) sensor shield		B134	25	0	0	—
SSM/GST communication line		B137	20	Less than 1 ↔ More than 4	Less than 1 ↔ More than 4	—
GND (injectors)		B137	7	0	0	—
GND (ignition system)		B135	12	0	0	—
GND (power supply)		B135	4	0	0	—
		B135	1	0	0	—
GND (control systems)		B137	1	0	0	—
		B137	2	0	0	—
GND (front oxygen (A/F) sensor heater 1)		B134	7	0	0	—
GND (front oxygen (A/F) sensor heater 2)		B134	6	0	0	—
Camshaft position sensor (LH)		B135	8	0 — 0.9	ON: 0 OFF: 4.7 — 5.3	Sensor output waveform
Camshaft position sensor (RH)		B135	9	0 — 0.9	ON: 0 OFF: 4.7 — 5.3	Sensor output waveform

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Electric throttle	Main	B136	18	0.64 — 0.72 Fully opened: 3.96	0.64 — 0.72 (After engine warm-up)	Fully closed: 0.6 Fully opened: 3.96
	Sub	B136	29	1.51 — 1.58 Fully opened: 4.17	1.51 — 1.58 (After engine warm-up)	Fully closed: 1.48 Fully opened: 4.17
	Power supply	B136	16	5	5	—
	GND (sensor)	B137	3	0	0	—
Electric throttle motor (+)		B137	5	Duty waveform	Duty waveform	Driving frequeney: 500 Hz
Electric throttle motor (–)		B137	4	Duty waveform	Duty waveform	Driving frequeney: 500 Hz
Electric throttle motor power supply		B137	6	10 — 13	13 — 14	—
Electric throttle motor relay		B135	35	ON: 010 OFF: — 13	ON: 0 OFF: 13 — 14	When ignition switch is ON: ON
Variable valve timing solenoid valve (LH)	Signal (+)	B134	19	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
	Signal (–)	B134	29	0	0	—
Variable valve timing solenoid valve (RH)	Signal (+)	B134	18	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
	Signal (–)	B134	28	0	0	—
Accelerator position sensor	Main	B136	17	Fully closed: 1 Fully opened: 3.5	Fully closed: 1 Fully opened: 3.5	—
	Power supply	B136	15	5	5	—
	GND (sensor)	B136	34	0	0	—
	Sub	B136	28	Fully closed: 1 Fully opened: 3.5	Fully closed: 1 Fully opened: 3.5	—
Cruise control set light		B134	16	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Main light		B134	15	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Clutch switch		B134	1	When clutch pedal is depressed: 0 When clutch pedal is released: 10 — 13	When clutch pedal is depressed: 0 When clutch pedal is released: 13 — 14	—
SET/COAST switch		B136	11	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Brake switch 1		B136	9	When brake pedal is depressed: 0 When brake pedal is released: 10 — 13	When brake pedal is depressed: 0 When brake pedal is released: 13 — 14	—
Brake switch 2		B136	8	When brake pedal is depressed: 10 — 13 When brake pedal is released: 0	When brake pedal is depressed: 13 — 14 When brake pedal is released: 0	—
RESUME/ACCEL switch		B136	10	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Main switch		B136	7	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Content	Specified data
Engine load	1.2 — 2.9 (%): Idling
	4.7 — 12.8 (%): 2,500 rpm racing

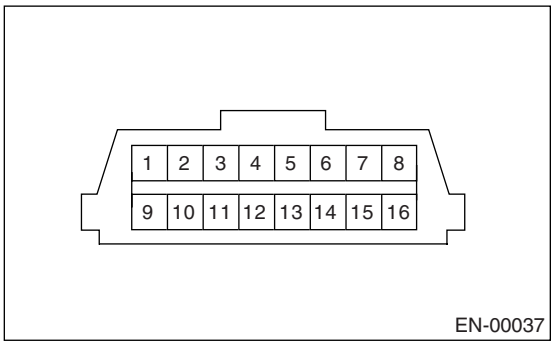
Measuring condition:
- After warm-up the engine.
- Gear position is in neutral position.
- A/C is turned to OFF.
- All accessory switches are turned to OFF.

7. Data Link Connector

A: NOTE

This connector is used both for the OBD-II general scan tools and Subaru Select Monitor.

CAUTION:
Do not connect any scan tools other than the OBD-II general scan tools and Subaru Select Monitor, because the circuit for Subaru Select Monitor may be damaged.



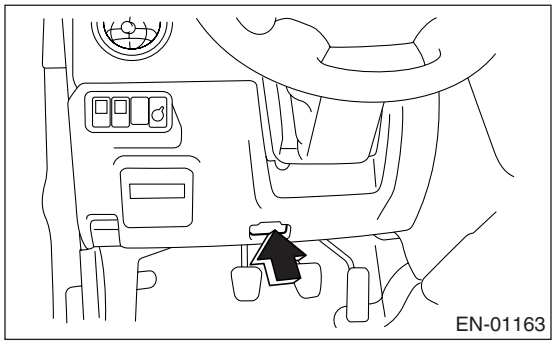
Terminal No.	Contents	Terminal No.	Contents
1	Power supply	9	Blank
2	Blank	10	Subaru Select Monitor/OBD-II general scan tool signal
3	Blank	11	Blank
4	Blank	12	Ground
5	Blank	13	Ground
6	Line end check signal 1	14	Blank
7	Blank	15	Blank
8	Line end check signal 2	16	Blank

8. OBD-II General Scan Tool

A: OPERATION

1. HOW TO USE OBD-II GENERAL SCAN TOOL

1) Prepare a general scan tool (OBD-II general scan tool) required by SAE J1978.
2) Open the cover and connect the OBD-II general scan tool to data link connector located in the lower portion of instrument panel (on the driver's side).



3) Using the OBD-II general scan tool, call up DTC and freeze frame data.
OBD-II general scan tool functions consist of:
(1) MODE $01: Current powertrain diagnostic data
(2) MODE $02: Powertrain freeze frame data
(3) MODE $03: Emission-related powertrain DTC
(4) MODE $04: Clear/Reset emission-related diagnostic information
(5) MODE $06: Request on-board monitoring test results for non-continuously monitored systems
(6) MODE $07: Request on-board monitoring test results for continuously monitored systems
(7) MODE $09: Request vehicle information
Read out the data according to repair procedures. (For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual.)

NOTE:
For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>

2. MODE $01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refers to data denoting the current operating condition of analog input/output, digital input/output and/or the powertrain system.
A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
01	Number of emission-related powertrain DTC and malfunction indicator light status and diagnosis support information	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate from mass air flow sensor	g/sec
11	Throttle valve absolute opening angle	%
13	Check whether oxygen sensor is installed.	—
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor	V and %
1C	Supporting OBD system	—
24	A/F value and A/F sensor output voltage	— and V
34	A/F value and A/F sensor current	— and mA

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access generic OBD-II PIDs (MODE $01).

3. MODE $02 (POWERTRAIN FREEZE FRAME DATA)

Refers to data denoting the operating condition when trouble is sensed by the on-board diagnosis system. A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
02	DTC that caused CARB required freeze frame data storage	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	mmHg
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate from mass air flow sensor	g/sec
11	Throttle valve opening angle	%
15	O_2 sensor output voltage and O_2 sensor short term fuel trim	V and %

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access freeze frame data (MODE $02).

4. MODE $03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODE (DTC))

Refer to Read Diagnostic Trouble Code (DTC) for information about data denoting emission-related powertrain DTC. <Ref. to EN(STi)(diag)-33, Read Diagnostic Trouble Code (DTC).>

5. MODE $04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refers to the mode used to clear or reset emission-related diagnostic information (OBD-II trouble diagnostic information).

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE $04).

6. MODE $06

Refer to test value of troubleshooting and data of test limit on support data bit sequence table. List of support data is shown in the following table.

TID	CID	Test value & Test limit
$01	$01	Catalyst system efficiency below threshold
$03	$01	Evaporative emission control system large leak
	$02	Evaporative emission control system small leak
	$03	Evaporative emission control system very small leak
$05	$01	O_2 sensor circuit slow response (Bank 1 Sensor 1)
$06	$01	O_2 sensor circuit (Bank 1 Sensor 2)
	$02	
$07	$01	O_2 sensor circuit slow response (Bank 1 Sensor 2)
$0C	$01	Coolant thermostat (Coolant temperature below thermostat regulating temperature)
$0F	$01	Drain valve range/performance
	$02	

7. MODE $07

Refer to data of DTC (pending code) for troubleshooting result about emission in first time.

8. MODE $09

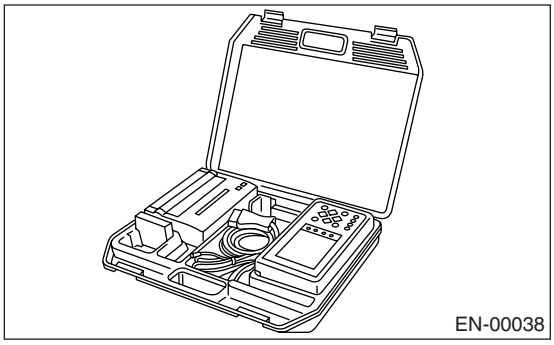
Refer to data of vehicle specification (VIN, calibration ID, etc.).

9. Subaru Select Monitor

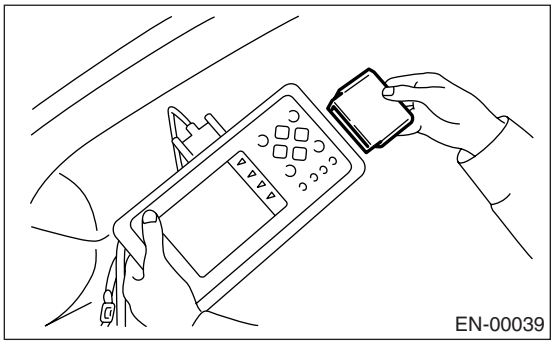
A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(STi)(diag)-7, PREPARATION TOOL, General Description.>

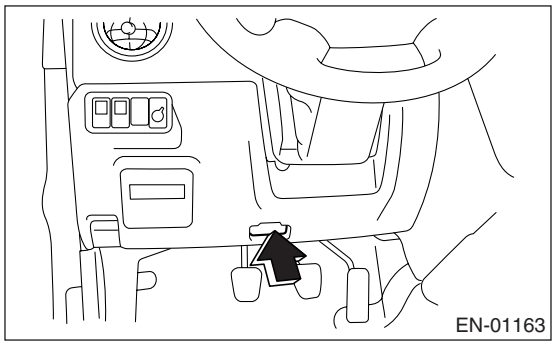


2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(STi)(diag)-7, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

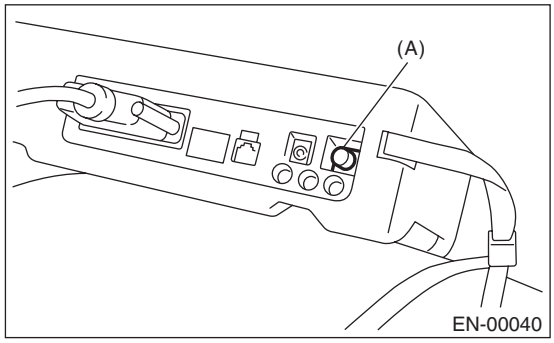
(1) Data link connector is located in the lower portion of instrument panel (on the driver's side).



(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

6) Using the Subaru Select Monitor, call up the DTC and various data, and then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (NORMAL MODE)

Refer to Read Diagnostic Trouble Code (DTC) for information about how to indicate DTC. <Ref. to EN(STi)(diag)-33, Read Diagnostic Trouble Code (DTC).>

3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (OBD MODE)

Refer to Read Diagnostic Trouble Code (DTC) for information about how to indicate DTC. <Ref. to EN(STi)(diag)-33, Read Diagnostic Trouble Code (DTC).>

4. READ CURRENT DATA FOR ENGINE. (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Vehicle speed signal	Vehicle Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Engine coolant temperature signal	Coolant Temp.	°C or °F
Ignition timing signal	Ignition Timing	deg
Throttle position signal	Throttle Opening Angle	%
Injection pulse width	Fuel Injection #1 Pulse	ms
Fuel pump duty control signal	Fuel Pump Duty	%
A/F sensor current	A/F Sensor #1 Current	mA
A/F sensor resistance	A/F Sensor #1 Resistance	ohm
Front oxygen (A/F) sensor lambda value	A/F Sensor #1	—
Rear oxygen sensor output signal	Rear O_2 Sensor	V
Short term fuel trim	A/F Correction #1	%
Knock sensor correction	Knocking Correction	deg
Atmospheric absolute pressure signal	Atmosphere Pressure	mmHg or kPa or inHg or psi
Intake manifold relative pressure signal	Mani. Relative Pressure	mmHg or kPa or inHg or psi
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
A/F correction (short term fuel trim) by rear oxygen sensor	A/F Correction #3	%
Long term whole fuel trim	A/F Learning #1	%
Canister purge control solenoid valve duty ratio	CPC Valve Duty Ratio	%
Primary supercharged pressure control signal	Primary Control	%
Tumble generator valve position sensor signal (right side)	TGV Position Sensor R	V
Tumble generator valve position sensor signal (left side)	TGV Position Sensor L	V
Accelerator position	Accel.Opening Angle	%
VVT advanced timing (R)	VVTAdv.Amount R	deg
VVT advanced timing (L)	VVTAdv.Amount L	deg
OCV duty ratio (R)	OCV Duty R	%
OCV duty ratio (L)	OCV Duty L	%
OCV duty current (R)	OCV Current R	mA
OCV duty current (L)	OCV Current L	mA
Throttle motor duty	Throttle Motor Duty	%
Throttle power supply voltage	Throttle Motor Voltage	V
Sub-throttle sensor voltage	Sub-Throttle Sensor	V
Main-throttle sensor voltage	Main-Throttle Sensor	V
Sub-accelerator sensor voltage	Sub-Accelerator Sensor	V
Main-accelerator sensor voltage	Main-Accelerator Sensor	V
Memorized cruise speed	Memorized Cruise Speed	km/h
Roughness Monitor for #1 cylinder	Roughness Monitor #1	—

Contents	Display	Unit of measure
Roughness Monitor for #2 cylinder	Roughness Monitor #2	—
Roughness Monitor for #3 cylinder	Roughness Monitor #3	—
Roughness Monitor for #4 cylinder	Roughness Monitor #4	—
Fuel level signal	Fuel Level	V
Intake air temperature signal	Intake Air Temp.	°C or °F
Mass air flow sensor signal	Mass Air Flow	g/s
Mass air flow sensor signal	Air Flow Sensor Voltage	V
Fuel tank pressure signal	Fuel Tank Pressure	mmHg or kPa or inHg or psi
Fuel temperature signal	Fuel Temp.	°C or °F
AT/MT identification signal	AT Vehicle ID Signal	ON or OFF
Fuel pressure control signal	PCV Solenoid Valve	ON or OFF
Drain valve signal	Vent. Solenoid Valve	ON or OFF
Tank sensor control solenoid valve signal	Tank Sensor Cntl Valve	ON or OFF
ETC Motor Relay	ETC Motor Relay	ON or OFF
Clutch SW	Clutch Switch	ON or OFF
Stop light SW	Stop Light Switch	ON or OFF
SET/COAST SW	SET/COAST Switch	ON or OFF
RESUME/ACCEL SW	RESUME/ACCEL Switch	ON or OFF
Brake SW	Brake Switch	ON or OFF
Main SW	Main Switch	ON or OFF
Ignition switch signal	Ignition Switch	ON or OFF
Test mode signal	Test Mode Signal	ON or OFF
Neutral position switch signal	Neutral Position Switch	ON or OFF
Air conditioning switch signal	A/C Switch	ON or OFF
Air conditioning signal	A/C Compressor Signal	ON or OFF
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF
Blow-by leak diagnosis SW	Blow-by Leak Connector	ON or OFF
Knocking signal	Knocking Signal	ON or OFF
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF
Power steering switch signal	P/S Switch	ON or OFF
Rear oxygen sensor rich signal	Rear O_2 Rich Signal	ON or OFF
Starter switch signal	Starter Switch	ON or OFF
Idle switch signal	Idle Switch	ON or OFF
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF
Rear defogger switch signal	Rear Defogger SW	ON or OFF
Blower fan switch signal	Blower Fan SW	ON or OFF
Small light switch signal	Light Switch	ON or OFF
Tumble generator valve output signal	TGV Output	ON or OFF
Tumble generator valve drive signal	TGV Drive	OPEN or CLOSE

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

5. READ CURRENT DATA FOR ENGINE. (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Current Data Display & Save} and press the [YES] key.
6) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
7) Using the scroll key, move the display screen up or down until desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Number of DTC	Number of DTC	—
Malfunction indicator light status	MI (MIL)	ON or OFF
Monitoring test of misfire	Misfire monitoring	Complete or incomplete
Monitoring test of fuel system	Fuel system monitoring	Complete or incomplete
Monitoring test of comprehensive component	Component monitoring	Complete or incomplete
Test of catalyst	Catalyst Diagnosis	Complete or incomplete
Test of heated catalyst	Heated catalyst	No support
Test of evaporative emission purge control system	Evaporative purge system	Complete or incomplete
Test of secondary air system	Secondary air system	No support
Test of air conditioning system refrigerant	A/C system refrigerant	No support
Test of oxygen sensor	Oxygen sensor	Complete or incomplete
Test of oxygen sensor heater	O_2 Heater Diagnosis	Complete or incomplete
Test of EGR system	EGR system	No support
Air fuel ratio control system for bank 1	Fuel System for Bank 1	—
Engine load data	Calculated load value	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Intake air amount	Mass Air Flow	g/s
Throttle position signal	Throttle Opening Angle	%
Oxygen sensor #11	Oxygen Sensor #11	—
Oxygen sensor #12	Oxygen Sensor #12	—
Rear oxygen sensor output signal	Oxygen Sensor #12	V
Air fuel ratio correction by rear oxygen sensor	Short term fuel trim #12	%
On-board diagnostic system	OBD System	CARB-OBD2
A/F sensor output signal	A/F sensor #11	V
A/F lambda signal	A/F sensor #11	—
A/F lambda signal #11	A/F sensor #11	—
A/F sensor current #11	A/F sensor #11	mA

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

6. READ FREEZE FRAME DATA FOR ENGINE. (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Freeze Frame Data} and press the [YES] key.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
DTC for freeze frame data	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank1	Closed loop or Open loop
Air fuel ratio control system for bank 2	Fuel system for Bank2	Open loop
O_2 sensor output voltage	Oxygen Sensor #12	V
Short term fuel trim by O_2 sensor	Short term fuel trim #12	%
Engine load data	Calculated load value	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Intake air amount	Mass Air Flow	g/s
Throttle position signal	Throttle Opening Angle	%

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

7. LED OPERATION MODE FOR ENGINE

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data & LED Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Message	LED "ON" requirements
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is turned to ON.
Test mode signal	Test Mode Signal	ON or OFF	When test mode connector is connected.
Neutral position switch signal	Neutral Position Switch	ON or OFF	When neutral position signal is entered.
Air conditioning switch signal	A/C Switch	ON or OFF	When air conditioning switch is turned ON.
Air conditioning relay signal	A/C Compressor Signal	ON or OFF	When air conditioning relay is in function.
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF	When radiator main fan relay is in function.
Knocking signal	Knocking Signal	ON or OFF	When knocking signal is entered.
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF	When radiator sub fan relay is in function.
Rear oxygen sensor rich signal	Rear O_2 Rich Signal	ON or OFF	When rear oxygen sensor mixture ratio is rich.
Starter switch signal	Starter Switch Signal	ON or OFF	When starter switch signal is entered.
Idle switch signal	Idle Switch Signal	ON or OFF	When idle switch signal is entered.
Crankshaft position sensor signal	Crankshaft Position Signal	ON or OFF	When crankshaft position sensor signal is entered.
Camshaft position sensor signal	Camshaft Position Signal	ON or OFF	When camshaft position sensor signal is entered.
Power steering switch signal	P/S Switch	ON or OFF	When power steering switch is entered.
Rear defogger switch signal	Rear Defogger Switch	ON or OFF	When rear defogger switch is turned ON.
Blower fan switch signal	Blower Fan Switch	ON or OFF	When blower fan switch is turned ON.
Small light switch signal	Light Switch	ON or OFF	When small light switch is turned ON.
Tumble generator valve actuator signal	TGV Output	ON or OFF	When TGV actuator signal is entered.
Tumble generator valve drive signal	TGV Drive	Close or Open	When TGV moves and valve opens.
Fuel pressure control solenoid	PCV Solenoid Valve	ON or OFF	When fuel pressure control solenoid valve is in function.
Drain valve signal	Vent. Solenoid Valve	ON or OFF	When drain valve is in function.
Fuel tank sensor control solenoid valve signal	Fuel Tank Sensor Ctrl Valve	ON or OFF	When tank sensor control solenoid valve is in function.
Blow-by leak diagnosis SW	Blow-by Leak Connector	ON or OFF	When connected.
Handle SW	Handle SW	RHD/LHD	When the vehicle is LHD model.
ETC motor relay	ETC Motor Relay	ON or OFF	When electric throttle is in function.
Clutch SW	Clutch SW	ON or OFF	When clutch switch is turned ON.
Stop SW	Stop Light Switch	ON or OFF	When stop light switch is turned ON.
SET/CST SW	SET/COAST Switch	ON or OFF	When SET/COAST switch is turned ON.
RES/ACC SW	RESUME/ACCEL Switch	ON or OFF	When RESUME/ACCEL switch is turned ON.
Brake SW	Brake Switch	ON or OFF	When brake switch is turned ON.
Main SW	Main Switch	ON or OFF	When main switch is turned ON.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

10.Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {DTC Display} and press the [YES] key.
5) On the «DTC Display» display screen, select the {Current DTC} or {History DTC} and press the [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {DTC Display} and press the [YES] key.
6) Make sure that a DTC is shown on the display screen.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>

3. OBD-II GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain DTC.
For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access emission-related powertrain DTC (MODE $03).

11.Inspection Mode

A: PROCEDURE

Carry out trouble diagnosis shown in the following DTC table.
When performing trouble diagnosis which is not shown in the DTC table, refer to the next item Drive cycle.
<Ref. to EN(STi)(diag)-39, Drive Cycle.>

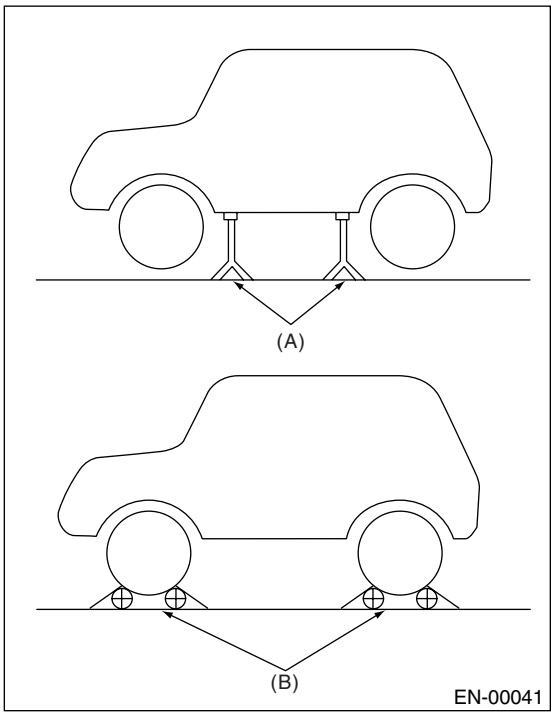
DTC	Item	Condition
P0011	“A” Camshaft Position-Timing Over-Advanced or System Performance (Bank 1)	—
P0021	“A” Camshaft Position-Timing Over-Advanced or System Performance (Bank 2)	—
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	—
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	—
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	—
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	—
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	—
P0101	Mass or Volume Air Flow Circuit Range/Performance	—
P0102	Mass or Volume Air Flow Circuit Low Input	—
P0103	Mass or Volume Air Flow Circuit High Input	—
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	—
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	—
P0112	Intake Air Temperature Circuit Low Input	—
P0113	Intake Air Temperature Circuit High Input	—
P0117	Engine Coolant Temperature Circuit Low Input	—
P0118	Engine Coolant Temperature Circuit High Input	—
P0122	Throttle/Pedal Position Sensor/Switch “A” Circuit Low Input	—
P0123	Throttle/Pedal Position Sensor/Switch “A” Circuit High Input	—
P0129	Atmospheric Pressure Sensor Circuit Range/Performance	—
P0131	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	—
P0132	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	—
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	—
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	—
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	—
P0182	Fuel Temperature Sensor “A” Circuit Low Input	—
P0183	Fuel Temperature Sensor “A” Circuit High Input	—
P0222	Throttle/Pedal Position Sensor/Switch “B” Circuit Low Input	—
P0223	Throttle/Pedal Position Sensor/Switch “B” Circuit High Input	—
P0230	Fuel Pump Primary Circuit	—
P0245	Turbo/Super Charger Wastegate Solenoid “A” Low	—
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	—
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	—
P0335	Crankshaft Position Sensor “A” Circuit	—
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	—
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	—
P0341	Camshaft Position Sensor “A” Circuit Range/Performance (Bank 1 or Single Sensor)	—
P0345	Camshaft Position Sensor “A” Circuit (Bank 2)	—
P0447	Evaporative Emission Control System Vent Control Circuit Open	—
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	—
P0452	Evaporative Emission Control System Pressure Sensor Low Input	—
P0453	Evaporative Emission Control System Pressure Sensor High Input	—

DTC	Item	Condition
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	—
P0462	Fuel Level Sensor Circuit Low Input	—
P0463	Fuel Level Sensor Circuit High Input	—
P0502	Vehicle Speed Sensor Circuit Low Input	—
P0503	Vehicle Speed Sensor Intermittent/Erratic/High	—
P0512	Starter Request Circuit	—
P0519	Idle Control System Malfunction (Fail-Safe)	—
P0604	Internal Control Module Random Access Memory (RAM) Error	—
P0605	Internal Control Module Read Only Memory (ROM) Error	—
P0607	Control Module Performance	—
P0638	Throttle Actuator Control Range/Performance (Bank 1)	—
P0691	Cooling Fan 1 Control Circuit Low	—
P0851	Neutral Switch Input Circuit Low	—
P0852	Neutral Switch Input Circuit High	—
P1086	Tumble Generated Valve Position Sensor 2 Circuit Low	—
P1087	Tumble Generated Valve Position Sensor 2 Circuit High	—
P1088	Tumble Generated Valve Position Sensor 1 Circuit Low	—
P1089	Tumble Generated Valve Position Sensor 1 Circuit High	—
P1091	Tumble Generated Valve System 1 (Valve Close)	—
P1093	Tumble Generated Valve System 2 (Valve Close)	—
P1094	Tumble Generated Valve Signal 1 Circuit Malfunction (Open)	—
P1095	Tumble Generated Valve Signal 1 Circuit Malfunction (Short)	—
P1096	Tumble Generated Valve Signal 2 Circuit Malfunction (Open)	—
P1097	Tumble Generated Valve Signal 2 Circuit Malfunction (Short)	—
P1110	Atmospheric Pressure sensor circuit malfunction (Low input)	—
P1111	Atmospheric Pressure sensor circuit malfunction (High input)	—
P1152	O_2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	—
P1153	O_2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	—
P1160	Return Spring Failure	—
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	—
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	—
P1446	Fuel Tank Sensor Control Valve Circuit Low	—
P1447	Fuel Tank Sensor Control Valve Circuit High	—
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	—
P1518	Starter Switch Circuit Low Input	—
P1560	Back-up Voltage Circuit Malfunction	—
P2088	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	—
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	—
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	—
P2093	OCV Solenoid Valve Signal A Circuit Short (Bank 2)	—
P2101	Throttle Actuator Control Motor Circuit Range/Performance	—
P2102	Throttle Actuator Control Motor Circuit Low	—
P2103	Throttle Actuator Control Motor Circuit High	—
P2109	Throttle/Pedal Position Sensor A Minimum Stop Performance	—
P2122	Throttle/Pedal Position Sensor/Switch “D” Circuit Low Input	—
P2123	Throttle/Pedal Position Sensor/Switch “D” Circuit High Input	—
P2127	Throttle/Pedal Position Sensor/Switch “E” Circuit Low Input	—
P2128	Throttle/Pedal Position Sensor/Switch “E” Circuit High Input	—
P2135	Throttle/Pedal Position Sensor/Switch “A” / “B” Voltage Rationality	—
P2138	Throttle/Pedal Position Sensor/Switch “D” / “E” Voltage Rationality	—

1. PREPARATION FOR THE INSPECTION MODE

1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)] and the battery voltage is 12 V or more.
2) Raise the vehicle using a garage jack and place on safety stands or drive the vehicle onto free rollers.

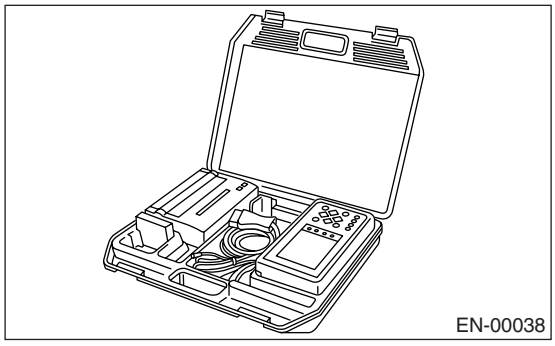
WARNING:
• Before raising the vehicle, ensure the parking brake is applied.
• Do not use a pantograph jack in place of a safety stand.
• Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
• Do not abruptly depress/release the clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
• In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.
• Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



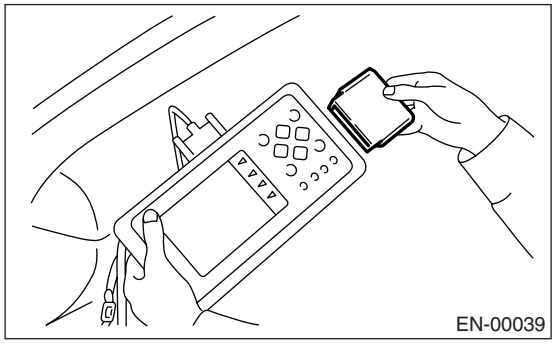
(A) Safety stand
(B) Free rollers

2. SUBARU SELECT MONITOR

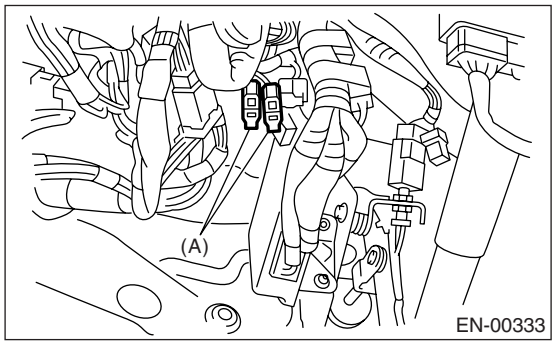
1) Warm up the engine.
2) Prepare the Subaru Select Monitor kit. <Ref. to EN(STi)(diag)-7, PREPARATION TOOL, General Description.>



3) Connect the diagnosis cable to Subaru Select Monitor.
4) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(STi)(diag)-7, PREPARATION TOOL, General Description.>

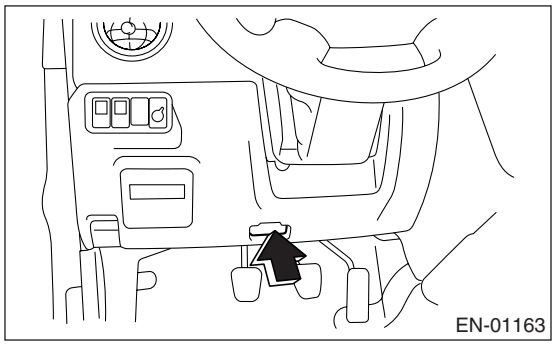


5) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



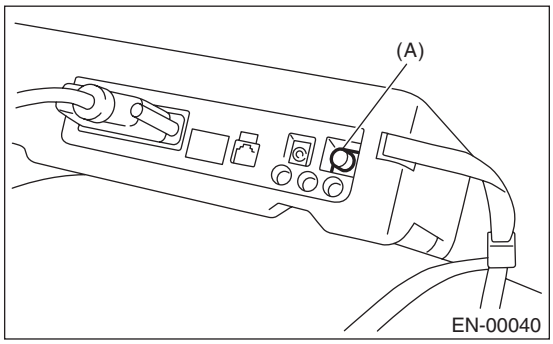
(A) Test mode connector

6) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.

7) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

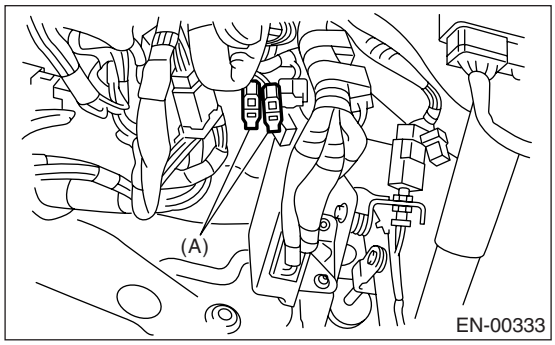
8) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
9) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
10) Press the [YES] key after the information of engine type is displayed.
11) On the «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press the [YES] key.
12) When the "Perform Inspection (Dealer Check) Mode?" is shown on the display screen, press the [YES] key.
13) Perform subsequent procedures as instructed on the display screen.

• If trouble still remains in the memory, the corresponding DTC appears on the display screen.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning the DTC, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>
• Release the parking brake.
• The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

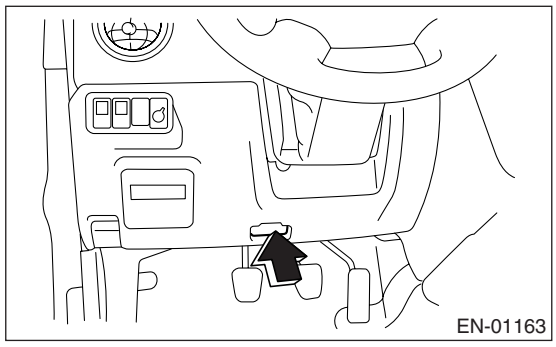
3. OBD-II GENERAL SCAN TOOL

1) Warm up the engine.
2) Connect the test mode connector (A) at the lower side of instrument panel (on the driver's side).



3) Connect the OBD-II general scan tool to its data link connector in the lower portion of instrument panel (on the driver's side).

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.



4) Start the engine.

NOTE:
Depress the clutch pedal when starting engine.

5) Using the shift lever, turn the "N" position switch to ON.
6) Keep the engine speed in 2,500 — 3,000 rpm range for 40 seconds.
7) Place the shift lever in "1st" gear and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:
• On AWD model, release the parking brake.

• The speed difference between front and rear wheels may light ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

8) Using the OBD-II general scan tool, check for DTC and record the result(s).

NOTE:
• For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.
• For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>

12.Drive Cycle

A: PROCEDURE

There are three drive patterns for the trouble diagnosis. Driving in the specified pattern allows to diagnose malfunctioning items listed below. After the malfunctioning items listed below are repaired, always check whether they correctly resume their functions by driving in the required drive pattern.

1. PREPARATION FOR THE DRIVE CYCLE

1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12 V or more.
2) Separate the test mode connector.

NOTE:
• Except for the engine coolant temperature specified items at starting, the diagnosis is carried out after engine warm up.
• Carry out the diagnosis which is marked * on DTC twice, then, after finishing first diagnosis, stop the engine and do second time at the same condition.

2. AFTER RUNNING 20 MINUTES AT 80 KM/H (50 MPH), IDLE ENGINE FOR 1 MINUTE.

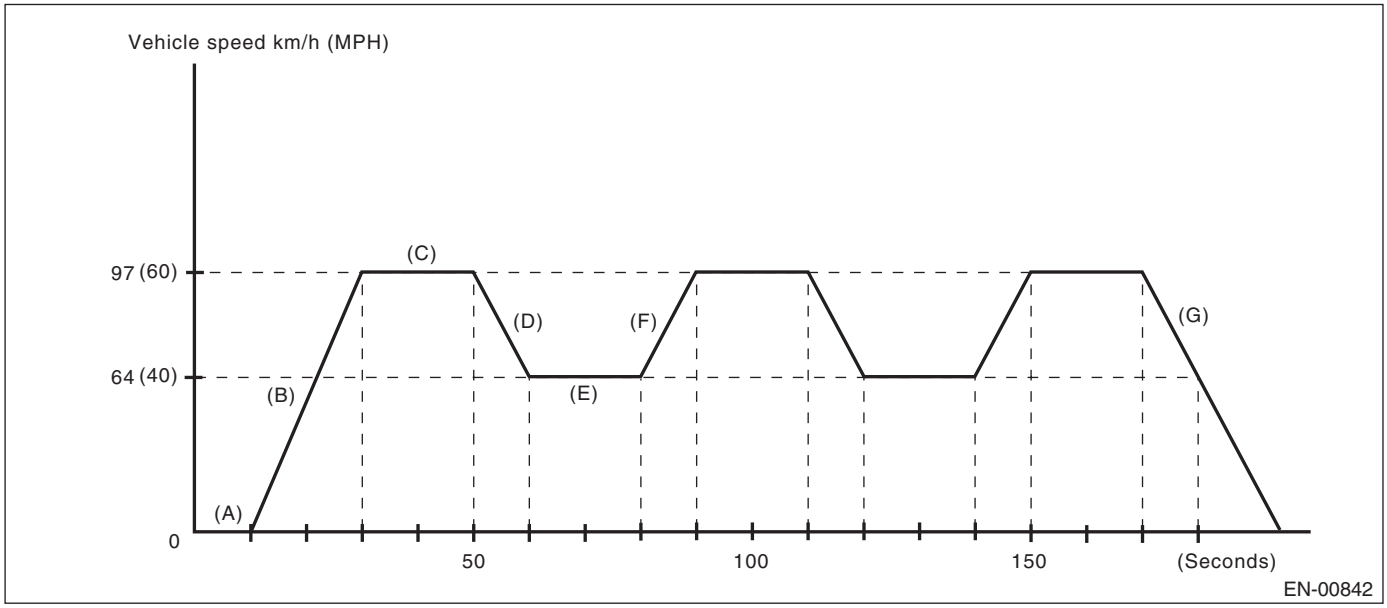
DTC	Item	Condition
*P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	Engine coolant temperature is less than 20°C (68°F) at engine start.
*P0128	Coolant Thermostat	Engine coolant temperature is less than 55°C (131°F) at engine start.
*P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	—
*P0181	Fuel Temperature Sensor A Performance Problem	—
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
*P0442	Evaporative Emission Control System Leak Detected (small leak)	—
*P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	—
*P0456	Evaporative Emission Control System Leak Detected (very small leak)	—
*P0457	Evaporative Emission Control System Leak Detected (fuel cap loose/off)	—
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	—
P0461	Fuel Level Sensor Circuit Range/Performance	—
P0692	Cooling Fan 1 Control Circuit High	—
P1443	Vent Control Solenoid Valve Function Problem	—
*P1448	Fuel Tank Sensor Control Valve Range/Performance	—
*P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	—
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	—

3. IDLE FOR 10 MINUTES

NOTE:
Before the diagnosis, drive the vehicle at 10 km/h (6 MPH) or more.

DTC	Item	Condition
*P0111	Intake Air Temperature Sensor Range/Performance Problem	Engine coolant temperature is less than 30°C (86°F) at engine start.
P0171	System too Lean (Bank 1)	—
P0172	System too Rich (Bank 1)	—
*P0464	Fuel Level Sensor Circuit Intermittent	—
*P0483	Cooling Fan Rationality Check	—
*P0506	Idle Control System RPM Lower Than Expected	—
*P0507	Idle Control System RPM Higher Than Expected	—

4. DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN



(A) Idle engine for 10 seconds or more.
(B) Accelerate to 97 km/h (60 MPH) within 20 seconds.
(C) Drive vehicle at 97 km/h (60 MPH) for 20 seconds.
(D) Decelerate with fully closed throttle to 64 km/h (40 MPH).
(E) Drive vehicle at 64 km/h (40 MPH) for 20 seconds.
(F) Accelerate to 97 km/h (60 MPH) within 10 seconds.
(G) Stop vehicle with throttle fully closed.

DTC	Item	Condition
P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	—
*P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	—
P0244	Turbo/Supercharger Wastegate Solenoid “A” Range/Performance	—
P0246	Turbo/Supercharger Wastegate Solenoid “A” High	—
*P0301	Cylinder 1 Misfire Detected	In some cases, diagnosis may complete at once.
*P0302	Cylinder 2 Misfire Detected	In some cases, diagnosis may complete at once.
*P0303	Cylinder 3 Misfire Detected	In some cases, diagnosis may complete at once.
*P0304	Cylinder 4 Misfire Detected	In some cases, diagnosis may complete at once.
P1090	Tumble Generated Valve System 1 (Valve Open)	—
P1092	Tumble Generated Valve System 2 (Valve Open)	—

13.Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
5) When the 'Done' and 'Turn Ignition Switch OFF' are shown on the display screen, turn the ignition switch to OFF, and then turn the Subaru Select Monitor to OFF.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after the information of engine type is displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {4. Diagnosis Code(s) Cleared} and press the [YES] key.
6) When the 'Clear Diagnostic Code?' is shown on the display screen, press the [YES] key.
7) Turn the ignition switch to OFF, and then turn the Subaru Select Monitor to OFF.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

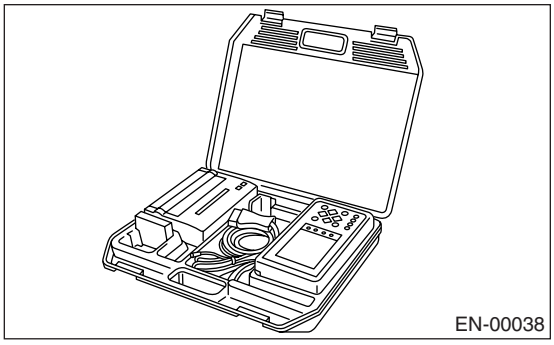
3. OBD-II GENERAL SCAN TOOL

For clear memory procedures using the OBD-II general scan tool, refer to the OBD-II General Scan Tool Instruction Manual.

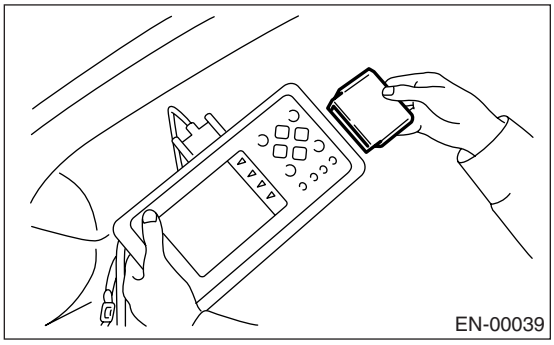
14.Compulsory Valve Operation Check Mode

A: OPERATION

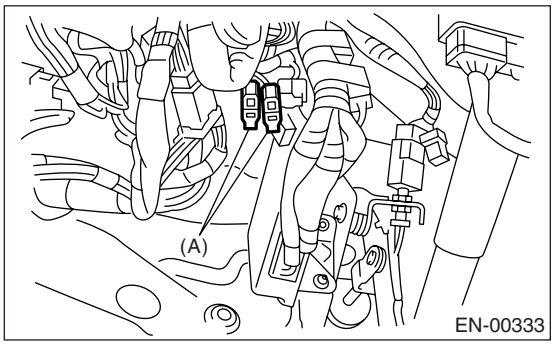
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(STi)(diag)-7, PREPARATION TOOL, General Description.>



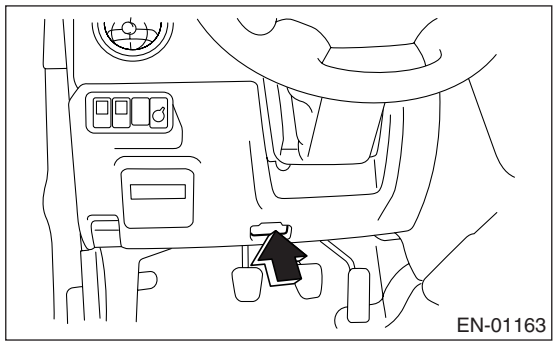
2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(STi)(diag)-7, PREPARATION TOOL, General Description.>



4) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).

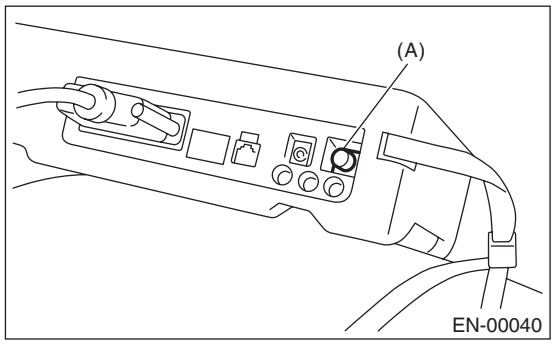


5) Connect the Subaru Select Monitor to data link connector located in the lower portion of instrument panel (on the driver's side).



CAUTION:
Do not connect scan tools except for the Subaru Select Monitor and OBD-II general scan tool.

6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

7) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
8) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
9) Press the [YES] key after the information of engine type is displayed.
10) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press the [YES] key.
11) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press the [YES] key.
12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press the [YES] key.
13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

• A list of support data is shown in the following table.

Contents	Display
Compulsory fuel pump relay operation check	Fuel Pump Relay
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Solenoid Valve
Compulsory pressure control solenoid valve operation check	PCV Solenoid Valve
Compulsory drain valve operation check	Vent. Control Solenoid Valve
Compulsory fuel tank sensor control valve operation check	Fuel Tank Sensor Control Valve

NOTE:
• The following parts will be displayed but not functional because they are not installed on the vehicle.

Display
EGR Solenoid Valve
ASV Solenoid Valve
FICD Solenoid
Pressure Switching Sol. 1
Pressure Switching Sol. 2
AAI Solenoid Valve
Turbocharger Wastegate Solenoid

• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

15.Malfunction Indicator Light

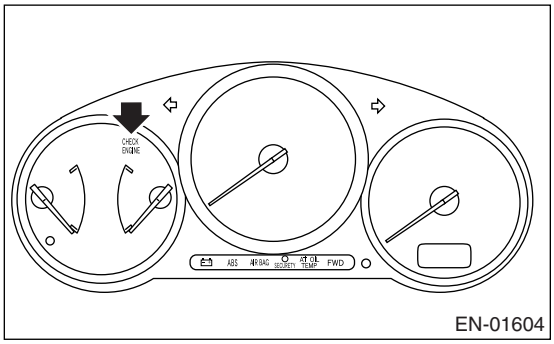
A: PROCEDURE

1. Activation of check malfunction indicator light. <Ref. to EN(STi)(diag)-45, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Check that the malfunction indicator light does not come on. <Ref. to EN(STi)(diag)-46, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON., Malfunction Indicator Light.>
↓
3. Check that the malfunction indicator light does not go off. <Ref. to EN(STi)(diag)-48, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF., Malfunction Indicator Light.>
↓
4. Check that the malfunction indicator light does not blink at a cycle of 3 Hz. <Ref. to EN(STi)(diag)-49, MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 HZ., Malfunction Indicator Light.>
↓
5. Check that the malfunction indicator light remains blinking at a cycle of 3 Hz. <Ref. to EN(STi)(diag)-51, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 HZ., Malfunction Indicator Light.>

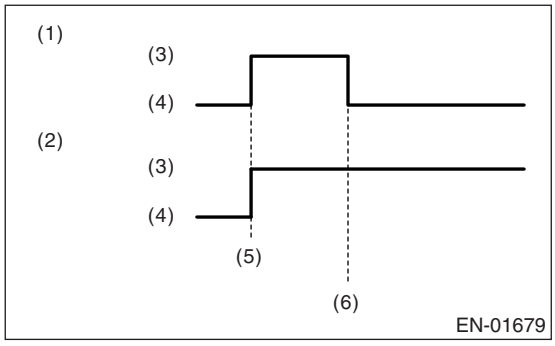
B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

1) When the ignition switch is turned to ON (engine off), the malfunction indicator light in the combination meter illuminates.

NOTE:
If the malfunction indicator light does not illuminate, perform diagnostics of the malfunction indicator light circuit or the combination meter circuit. <Ref. to EN(STi)(diag)-46, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON., Malfunction Indicator Light.>

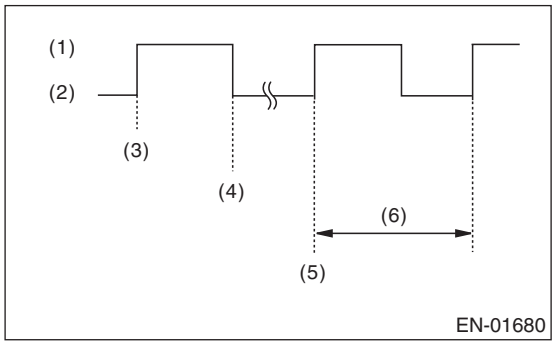


2) After starting the engine, the malfunction indicator light goes out. If it does not, either the engine or the emission control system is malfunctioning.



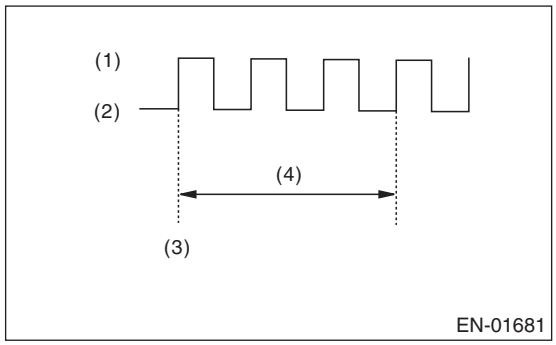
(1) No trouble
(2) Trouble occurs
(3) ON
(4) OFF
(5) Ignition switch ON
(6) Engine start

3) If the diagnosis system senses a misfire which could damage the catalyzer, the malfunction indicator light will blink at a cycle of 1 Hz.



(1) ON
(2) OFF
(3) Ignition switch ON
(4) Engine start
(5) Misfire start
(6) 1 second

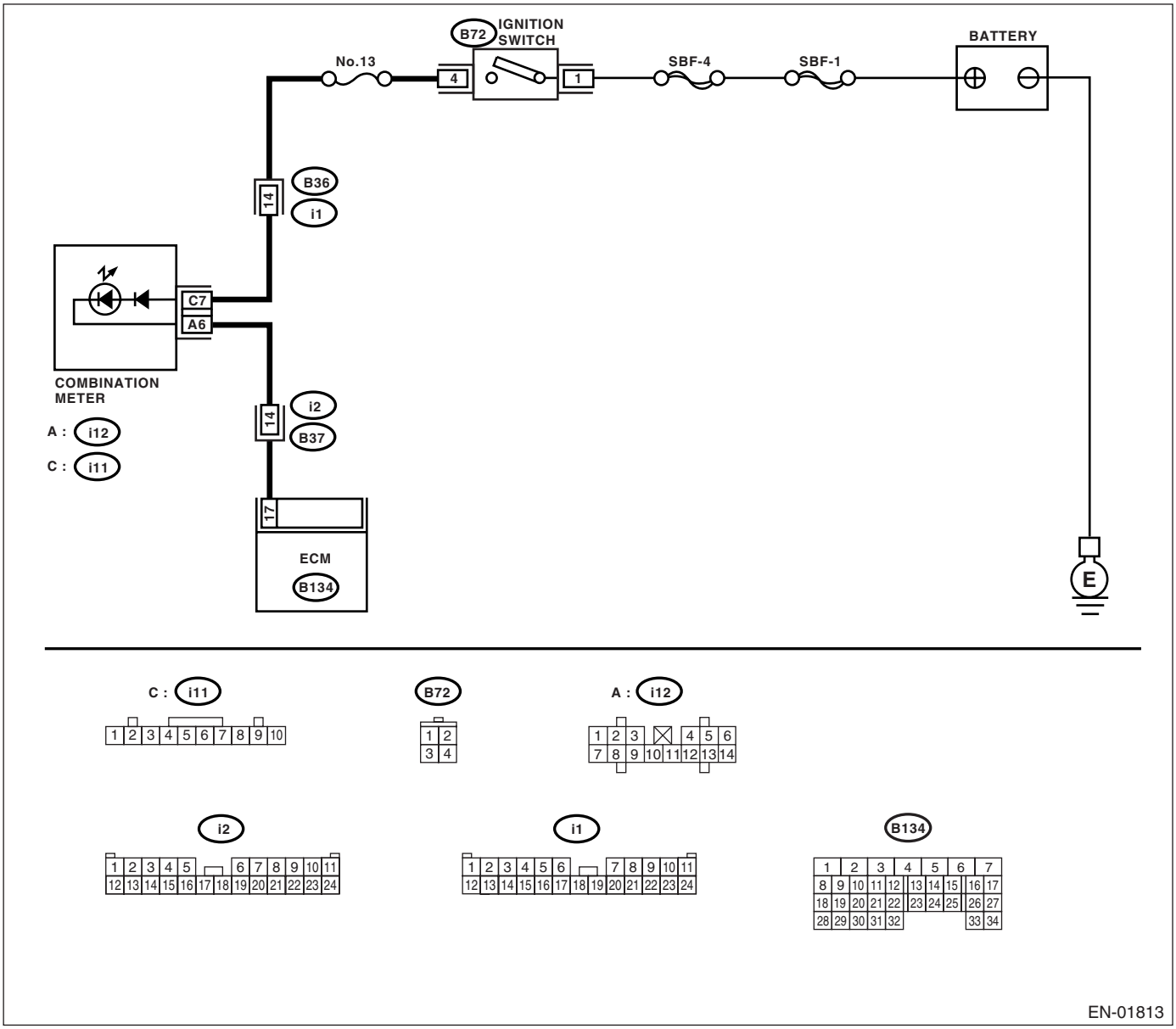
4) When the ignition switch is turned to ON (engine off) or to START with the test mode connector connected, the malfunction indicator light blinks at a cycle of 3 Hz.



(1) ON
(2) OFF
(3) Ignition switch ON
(4) 1 second

C: MALFUNCTION INDICATOR LIGHT DOES NOT COME ON.

DIAGNOSIS:
The malfunction indicator light circuit is shorted.
TROUBLE SYMPTOM:
When the ignition switch is turned to ON (engine OFF), malfunction indicator light does not come on.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 17 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **4.**	Go to step **2.**
2	**CHECK POOR CONTACT.**	Does the malfunction indicator light come on when shaking or pulling ECM connector and harness?	Repair the poor contact in ECM connector.	Go to step **3.**

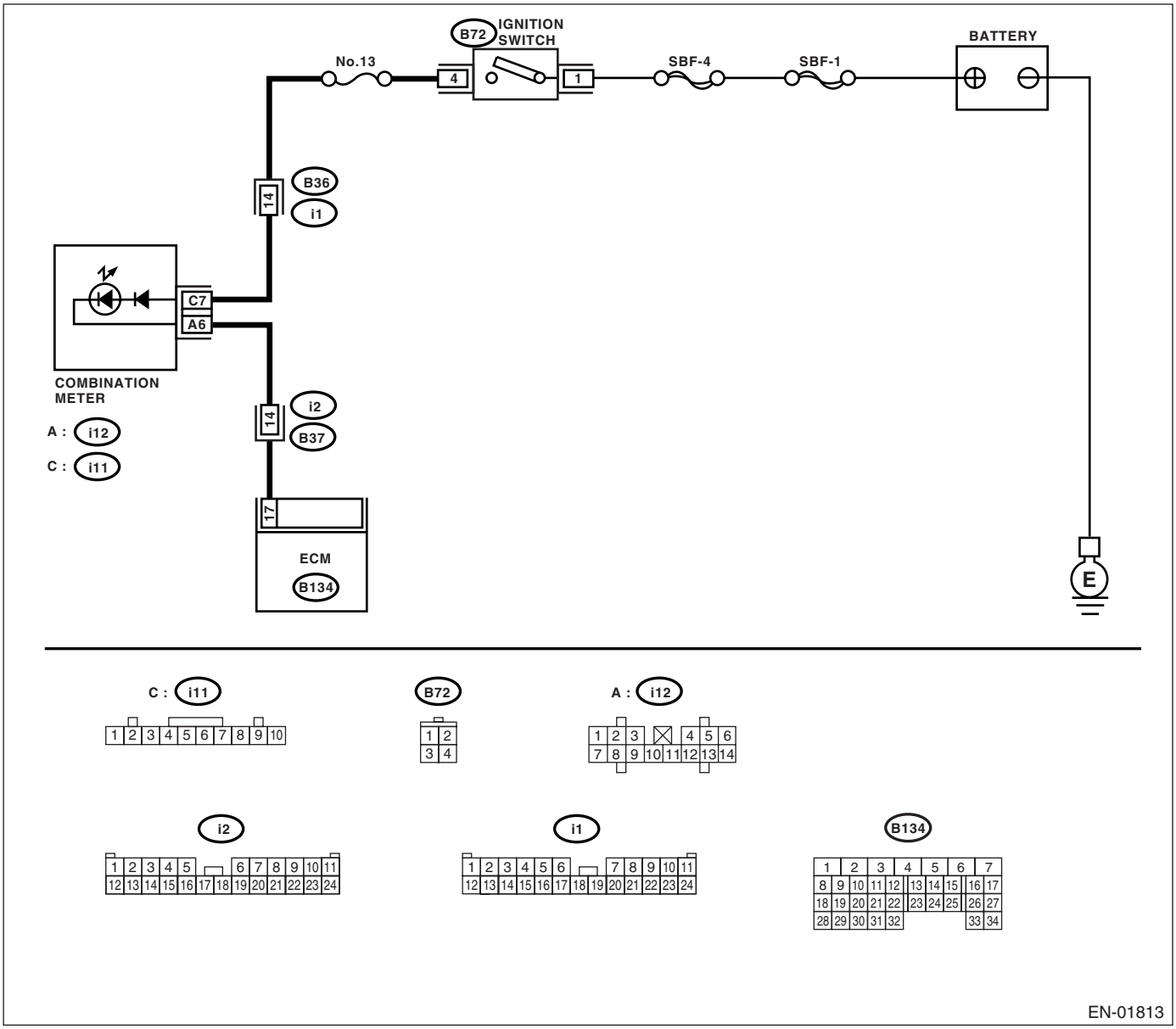
	Step	Check	Yes	No
3	**CHECK ECM CONNECTOR.**	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>	Repair the connection of ECM connector.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-10, Combination Meter Assembly.> 3) Disconnect the connector from ECM and combination meter. 4) Measure the resistance of harness between ECM and combination meter connector. ***Connector & terminal*** ***(B134) No. 17 — (i12) No. 6:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector
5	**CHECK POOR CONTACT.** Check poor contact in combination meter connector.	Is there poor contact in combination meter connector?	Repair the poor contact in combination meter connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i11) No. 7 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Replace the combination meter circuit board. <Ref. to IDI-10, Combination Meter Assembly.>	Check the following and repair if necessary. NOTE: • Blown out fuse (No. 13) • Open or short circuit in harness between fuse (No. 13) and battery terminal • Poor contact in ignition switch connector

D: MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF.

DIAGNOSIS:
The malfunction indicator light circuit is shorted.

TROUBLE SYMPTOM:
Although malfunction indicator light comes on when engine runs, but DTC is not shown on Subaru Select Monitor or OBD-II general scan tool display.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light come on?	Repair the short circuit in harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>

E: MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 Hz.

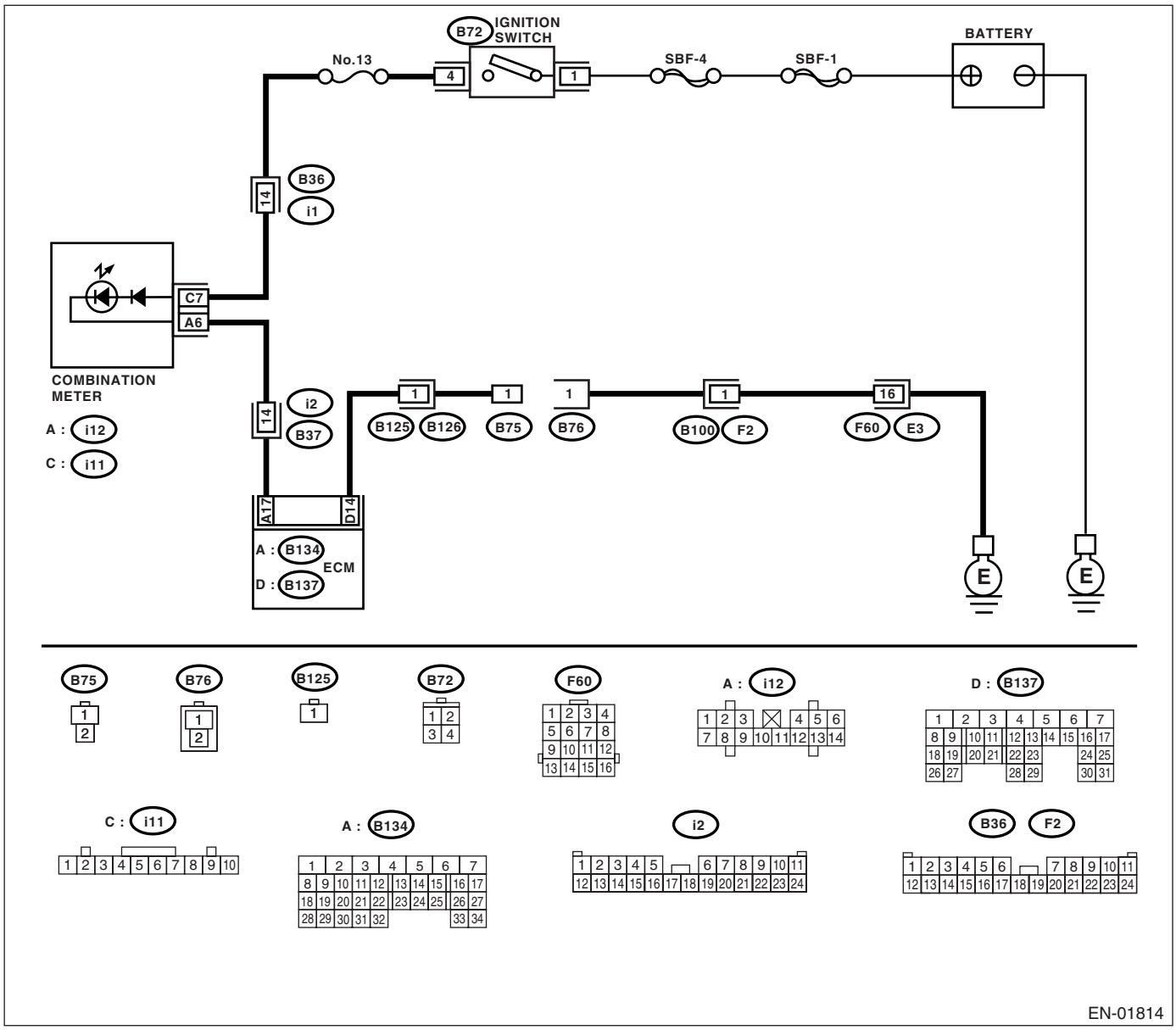
DIAGNOSIS:

- The malfunction indicator light circuit is open or shorted.
- Test mode connector circuit is open.

TROUBLE SYMPTOM:

During inspection mode, malfunction indicator light does not blink at a cycle of 3 Hz.

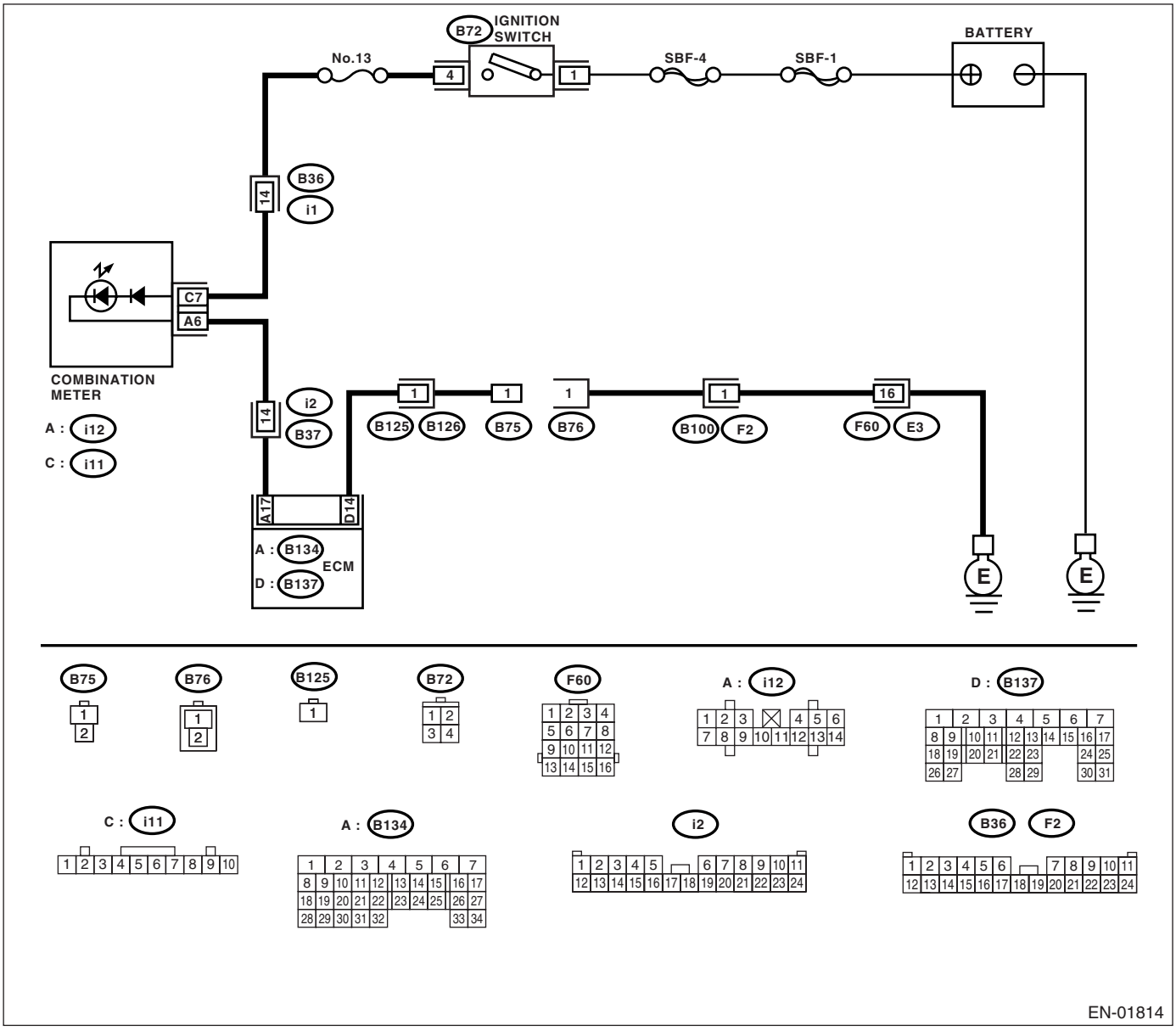
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Disconnect the test mode connector. 3) Turn the ignition switch to ON. (engine OFF)	Does the malfunction indicator light come on?	Go to step **2.**	Repair the malfunction indicator light circuit. <Ref. to EN(STi)(diag)-46, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON., Malfunction Indicator Light.>
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light come on?	Repair the ground short circuit in harness between combination meter and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between test mode connector and chassis ground. ***Connector & terminal*** ***(B76) No. 1 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between test mode connector and chassis ground
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.** 1) Connect the test mode connector. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 14 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between ECM and test mode connector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>

F: MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 Hz.

DIAGNOSIS:
Test mode connector circuit is shorted.
TROUBLE SYMPTOM:
Malfunction indicator light blinks at a cycle of 3 Hz when ignition switch is turned to ON.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK TEST MODE CONNECTOR.** 1) Disconnect the test mode connector. 2) Turn the ignition switch to ON.	Does the malfunction indicator light blink?	Go to step **2.**	System is in good order. NOTE: Malfunction indicator light blinks at a cycle of 3 Hz when test mode connector is connected.

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 14 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the short circuit in harness between ECM and test mode connector.	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>

16.Diagnostics for Engine Starting Failure

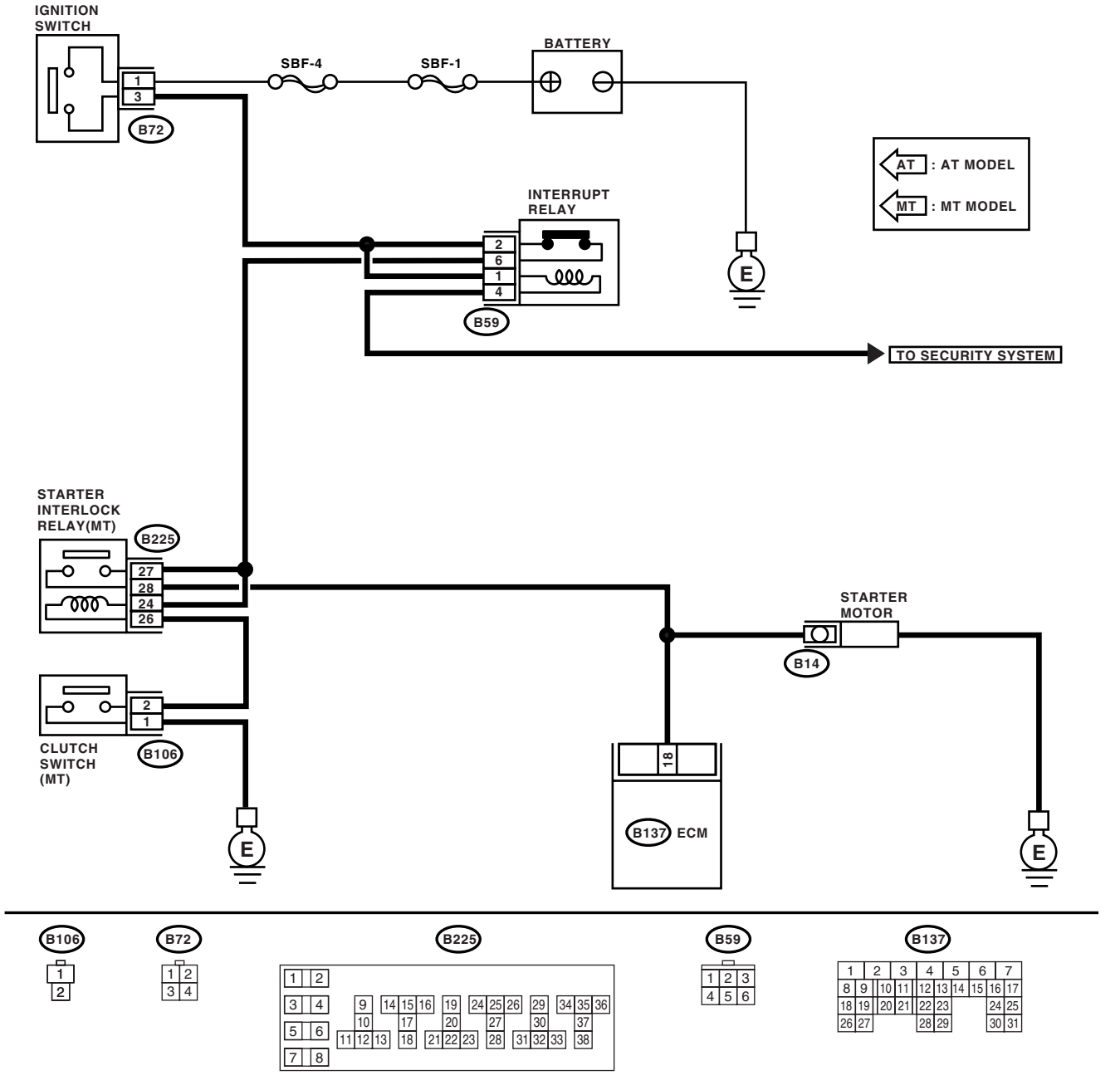
A: PROCEDURE

1. Check the fuel level.
↓
2. Inspection of starter motor circuit. <Ref. to EN(STi)(diag)-54, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ECM power supply and ground line. <Ref. to EN(STi)(diag)-57, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of ignition control system. <Ref. to EN(STi)(diag)-59, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel pump circuit. <Ref. to EN(STi)(diag)-62, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection of fuel injector circuit. <Ref. to EN(STi)(diag)-63, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

B: STARTER MOTOR CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



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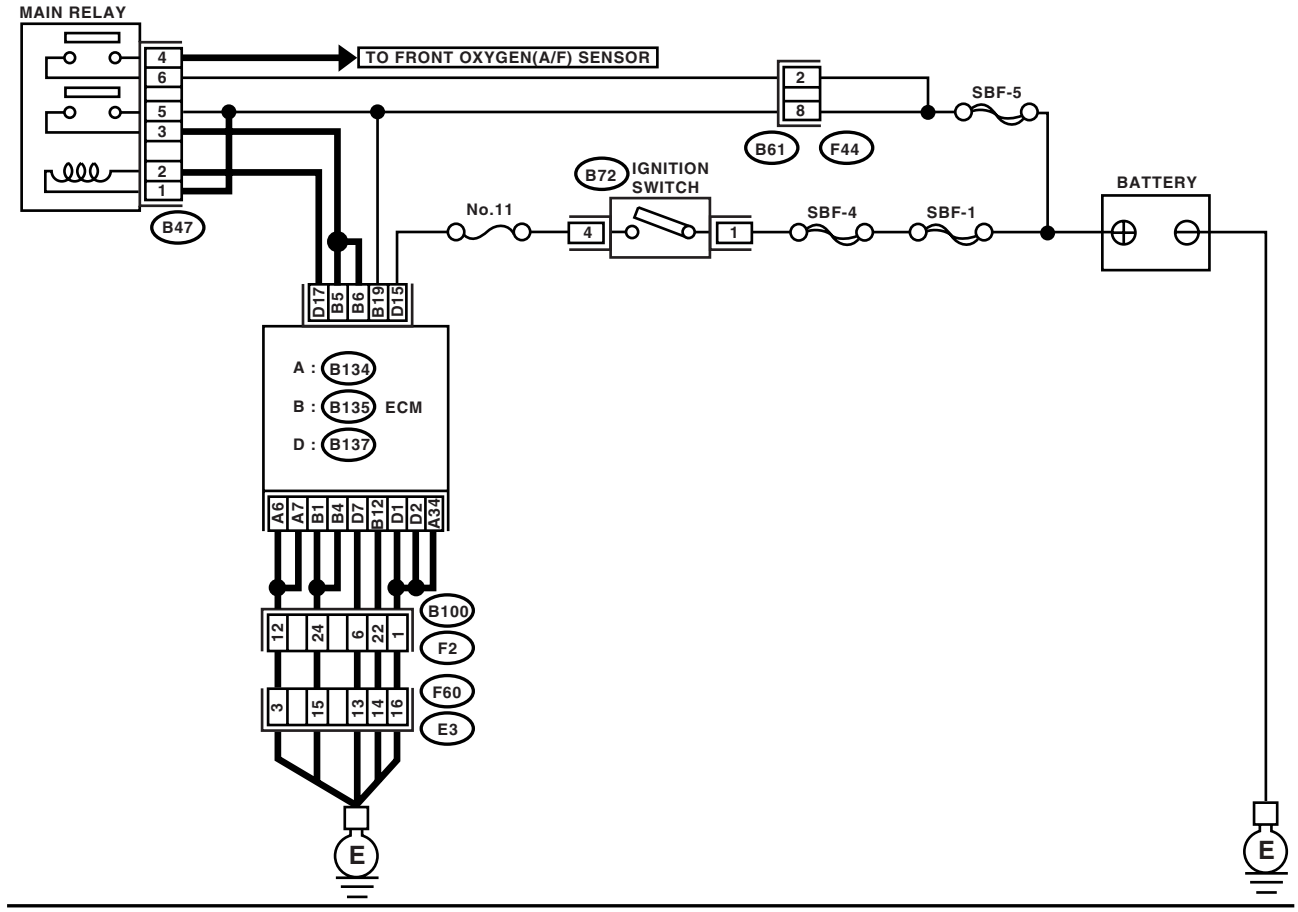
	Step	Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.**	Does the starter motor operate ?	Go to step **2.**	Go to step **3.**
2	**CHECK DTC.**	Is the DTC displayed? <Ref. to EN(STi)(diag)-33, OPERATION, Read Diagnostic Trouble Code (DTC).>	Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Repair the poor contact in ECM connector.
3	**CHECK INPUT SIGNAL FOR STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Turn the ignition switch to START. 4) Measure the power supply voltage between starter motor connector terminal and engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (−):*** NOTE: Depress the clutch pedal.	Is the voltage more than 10 V?	Go to step **4.**	Go to step **5.**
4	**CHECK GROUND CIRCUIT OF STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the terminal from starter motor. 3) Measure the resistance of ground cable between ground cable terminal and engine ground.	Is the resistance less than 5 Ω?	Check the starter motor. <Ref. to SC(H4SO)-7, Starter.>	Repair the open circuit of ground cable.
5	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1) Disconnect the connector from ignition switch. 2) Measure the power supply voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Check the following, repair if necessary. • Fuse is blown out. • Open circuit in harness between ignition switch and battery.
6	**CHECK IGNITION SWITCH.** 1) Disconnect the connector from ignition switch. 2) Measure the resistance between ignition switch terminals while turning ignition switch to START. ***Terminals*** ***No. 1 — No. 3:***	Is the resistance less than 5 Ω?	Go to step **7.**	Replace the ignition switch.

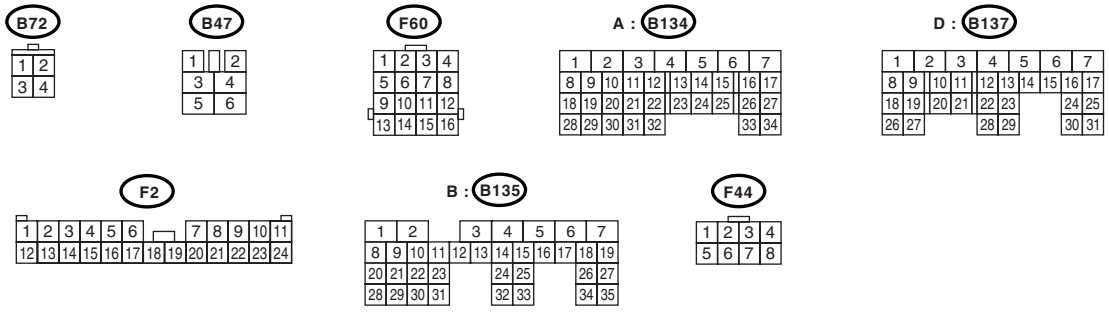
	Step	Check	Yes	No
7	**CHECK INPUT VOLTAGE OF STARTER INTERLOCK RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter interlock relay. 3) Connect the connector to ignition switch. 4) Measure the input voltage between starter interlock relay connector and chassis ground while turning ignition switch to START. ***Connector & terminal*** ***(B104) No. 27 (+) — Chassis ground (−):*** ***(B104) No. 24 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **8.**	Repair open or short circuit to ground in harness between starter interlock relay and ignition switch. NOTE: Check security system (if equipped). <Ref. to SL-20, Security System.>
8	**CHECK STARTER INTERLOCK RELAY.** 1) Connect the battery to starter interlock relay terminals No. 26 and No. 24. 2) Measure the resistance between starter interlock relay terminals. ***Terminals*** ***No. 27 — No. 28:***	Is the resistance less than 1 Ω?	Go to step **9.**	Replace the starter interlock relay.
9	**CHECK GROUND CIRCUIT OF CLUTCH SWITCH.** 1) Disconnect the connector from clutch switch. 2) Measure the resistance between clutch switch connector and chassis ground. ***Connector & terminal*** ***(B106) No. 1 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **10.**	Repair open circuit of ground cable.
10	**CHECK CLUTCH SWITCH.** Measure the resistance between clutch switch terminals while depressing the clutch pedal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Go to step **11.**	Replace the clutch switch. <Ref. to CL-28, Clutch Switch.>
11	**CHECK CLUTCH SWITCH CIRCUIT.** 1) Connect the connector to clutch switch. 2) Measure the resistance between starter interlock relay connector and chassis ground while depressing the clutch pedal. ***Connector & terminal*** ***(B104) No. 26 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair short circuit to ground in harness between starter interlock relay and starter motor.	Repair open circuit in harness between starter interlock relay and clutch switch.

C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-01816

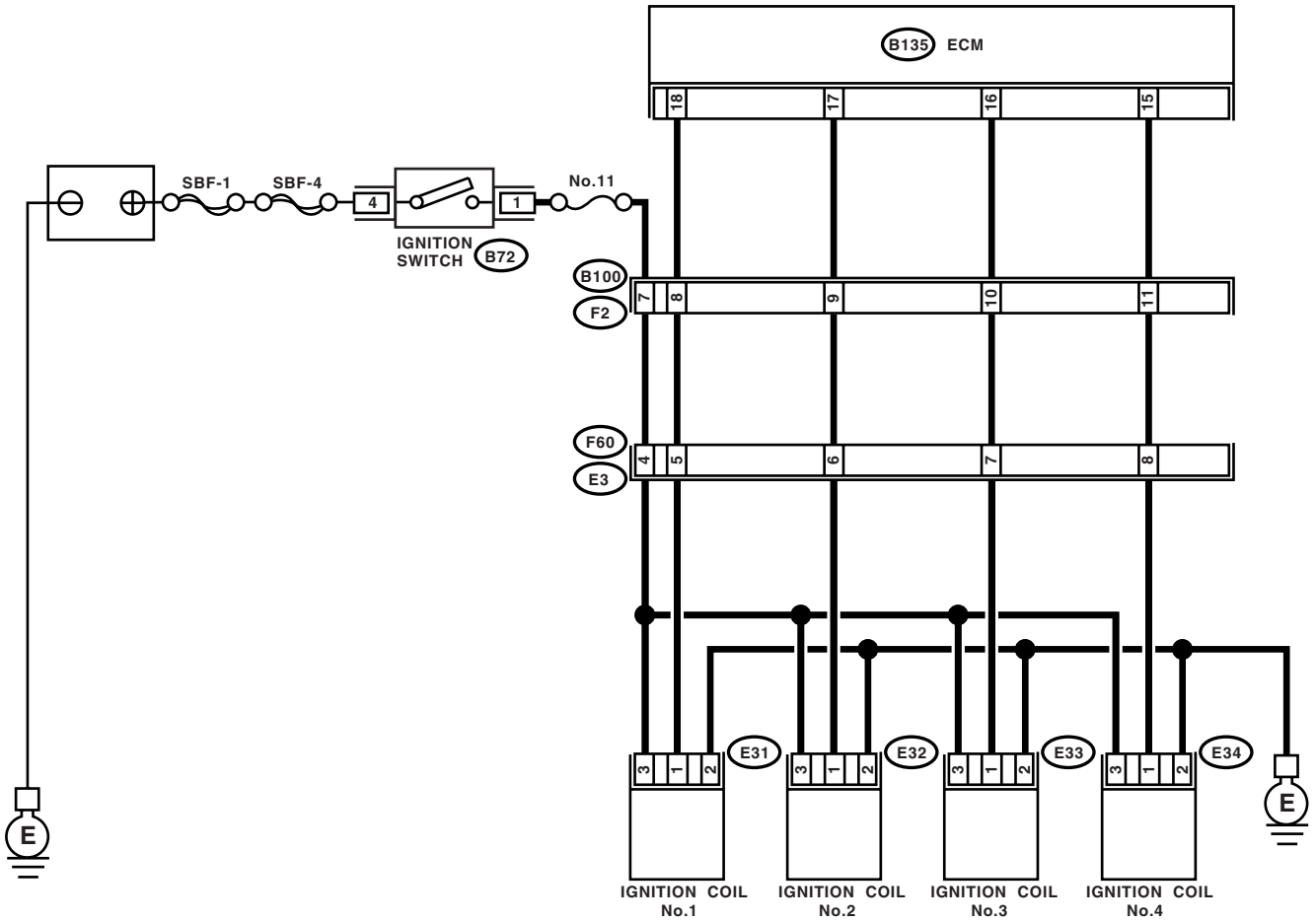
Diagnostics for Engine Starting Failure

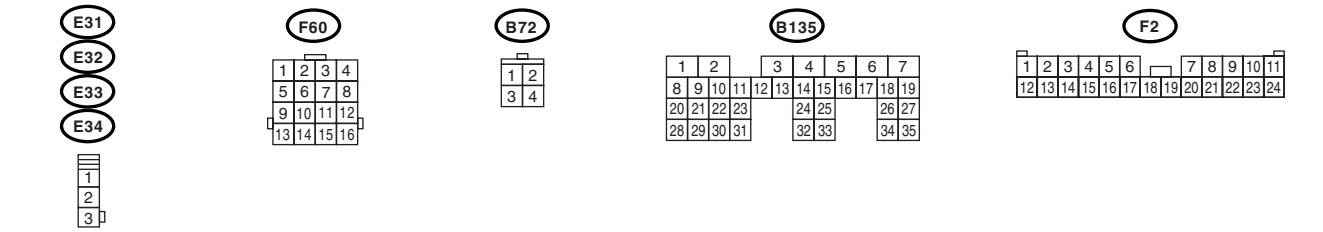
	Step	Check	Yes	No
1	**CHECK MAIN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 1 and No. 2. 4) Measure the resistance between main relay terminals. ***Terminals*** ***No. 3 — No. 5:*** ***No. 4 — No. 6:***	Is the resistance less than 10 Ω?	Go to step **2.**	Replace the main relay.
2	**CHECK GROUND CIRCUIT OF ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 6 — Chassis ground:*** ***(B134) No. 7 — Chassis ground:*** ***(B134) No. 34 — Chassis ground:*** ***(B135) No. 1 — Chassis ground:*** ***(B135) No. 4 — Chassis ground:*** ***(B135) No. 12 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the open circuit in harness between ECM connector and engine grounding terminal.
3	**CHECK INPUT VOLTAGE OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 19 (+) — Chassis ground (−):*** ***(B137) No. 15 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair the open or ground short circuit of power supply circuit.
4	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 1 (+) — Chassis ground (−):*** ***(B47) No. 5 (+) — Chassis ground (−):*** ***(B47) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **5.**	Repair the open or ground short circuit in harness of power supply circuit.
5	**CHECK INPUT VOLTAGE OF ECM.** 1) Connect the main relay connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (−):*** ***(B135) No. 6 (+) — Chassis ground (−):*** ***(B137) No. 17 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Check the ignition control system. <Ref. to EN(STi)(diag)-59, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair the open or ground short circuit in harness between ECM connector and main relay connector.

D: IGNITION CONTROL SYSTEM

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-01817

Diagnostics for Engine Starting Failure

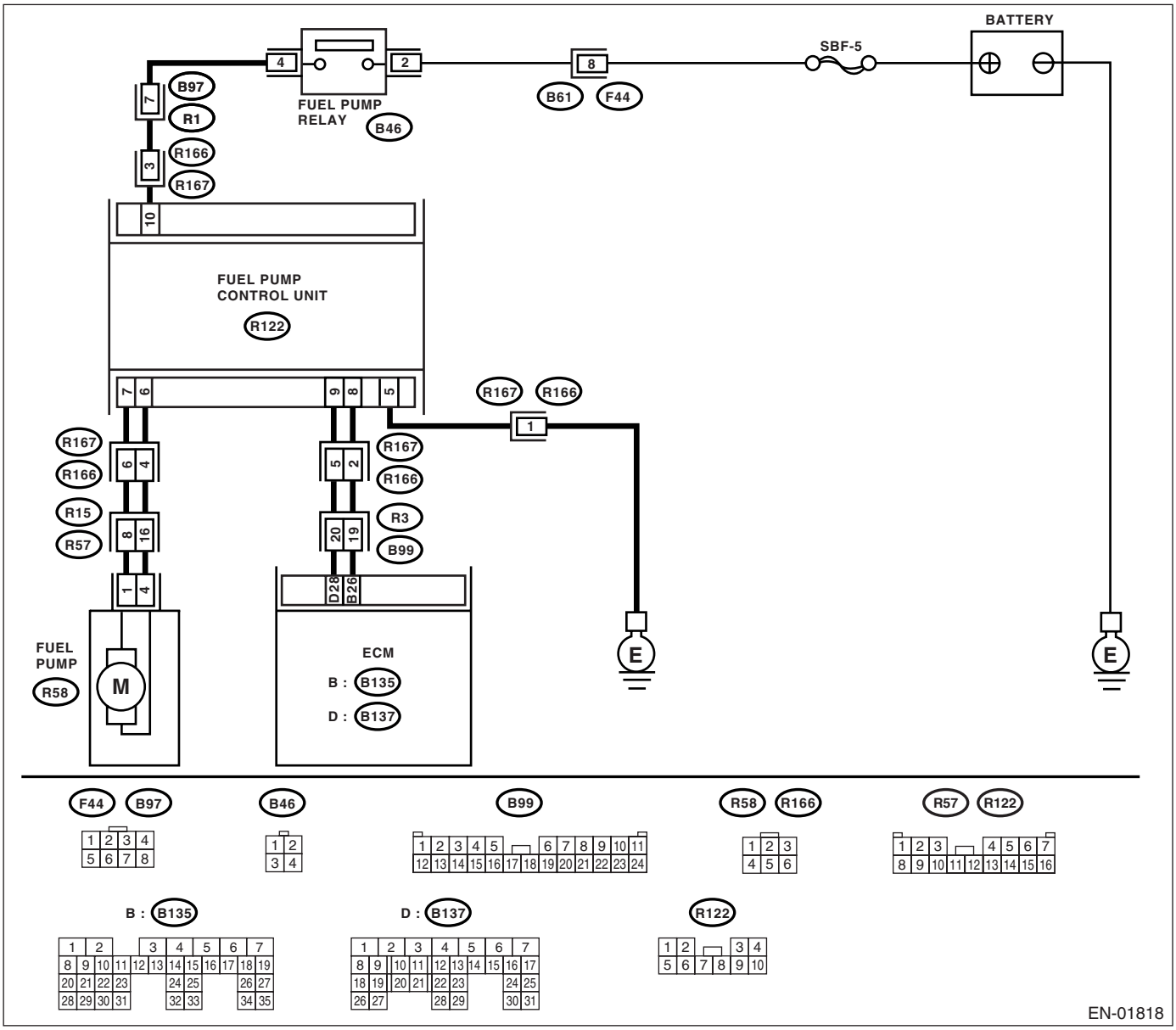
	Step	Check	Yes	No
1	**CHECK SPARK PLUG CONDITION.** 1) Remove the spark plug. <Ref. to IG(STi)-5, INSTALLATION, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(STi)-5, INSPECTION, Spark Plug.>	Is the spark plug's status OK?	Go to step **2.**	Replace the spark plug.
2	**CHECK IGNITION SYSTEM FOR SPARKS.** 1) Connect the spark plug to ignition coil. 2) Release the fuel pressure. <Ref. to FU(STi)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.> 3) Contact the spark plug's thread portion on engine. 4) While opening the throttle valve fully, crank engine to check that spark occurs at each cylinder.	Does spark occur at each cylinder?	Check the fuel pump system. <Ref. to EN(STi)(diag)-62, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **3.**
3	**CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSEMBLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition coil & ignitor assembly. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between ignition coil & ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E31) No. 3 (+) — Engine ground (−):*** ***(E32) No. 3 (+) — Engine ground (−):*** ***(E33) No. 3 (+) — Engine ground (−):*** ***(E34) No. 3 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil & ignitor assembly, and ignition switch connector • Poor contact in coupling connectors
4	**CHECK HARNESS OF IGNITION COIL & IGNITOR ASSEMBLY GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ignition coil & ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E31) No. 2 — Engine ground:*** ***(E32) No. 2 — Engine ground:*** ***(E33) No. 2 — Engine ground:*** ***(E34) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil & ignitor assembly connector and engine grounding terminal
5	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from ignition coil & ignitor assembly. 4) Measure the resistance of harness between ECM and ignition coil & ignitor assembly connector. ***Connector & terminal*** ***(B135) No. 15 — (E34) No. 1:*** ***(B135) No. 16 — (E33) No. 1:*** ***(B135) No. 17 — (E32) No. 1:*** ***(B135) No. 18 — (E31) No. 1:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and ignition coil & ignitor assembly connector • Poor contact in coupling connector

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** Measure the resistance of harness between ECM and engine ground. ***Connector & terminal:*** ***(B135) No. 15 — Engine ground:*** ***(B135) No. 16 — Engine ground:*** ***(B135) No. 17 — Engine ground:*** ***(B135) No. 18 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.
7	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ignition coil and ignitor assembly.

E: FUEL PUMP CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

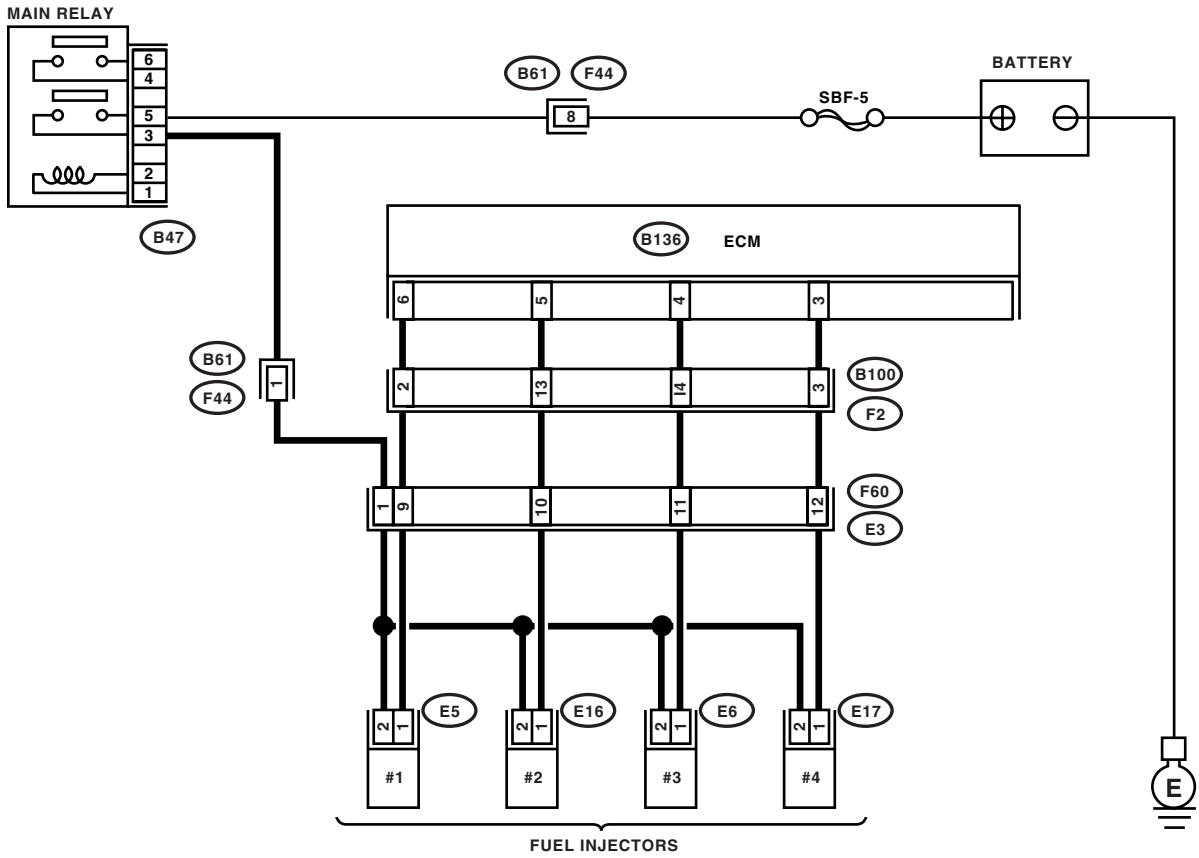


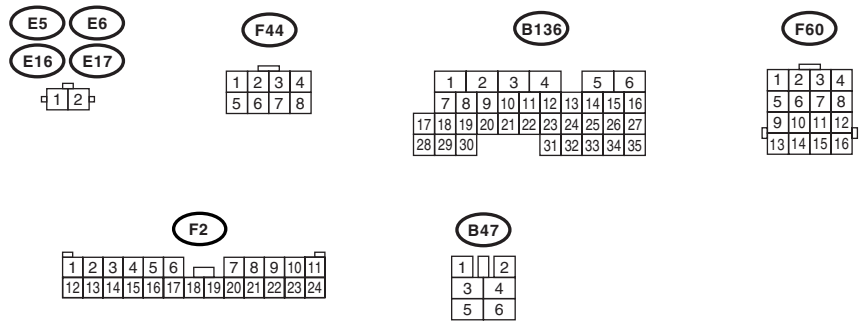
Step		Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that the fuel pump is in operation for 2 seconds when turning ignition switch to ON. NOTE: Fuel pump operation check can also be executed using the Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STi)(diag)-42, Compulsory Valve Operation Check Mode.>	Does the fuel pump produce "operating" sound?	Check the fuel injector circuit. <Ref. to EN(STi)(diag)-63, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Display the DTC. <Ref. to EN(STi)(diag)-33, OPERATION, Read Diagnostic Trouble Code (DTC).>

F: FUEL INJECTOR CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-01819

Diagnostics for Engine Starting Failure

	Step	Check	Yes	No
1	**CHECK OPERATION OF EACH FUEL INJECTOR.** While cranking the engine, check that each fuel injector emits “operating” sound. Use a sound scope or attach a screwdriver to injector for this check.	Does the fuel injector emit “operating” sound?	Check the fuel pressure. <Ref. to ME(STi)-27, INSPECTION, Fuel Pressure.>	Go to step **2.**
2	**CHECK POWER SUPPLY TO EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between the fuel injector terminal and engine ground. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (−):*** ***#2 (E16) No. 2 (+) — Engine ground (−):*** ***#3 (E6) No. 2 (+) — Engine ground (−):*** ***#4 (E17) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector • Poor contact in fuel injector connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B136) No. 6 — (E5) No. 1:*** ***(B136) No. 5 — (E16) No. 1:*** ***(B136) No. 4 — (E6) No. 1:*** ***(B136) No. 3 — (E6) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B136) No. 6 — Chassis ground:*** ***(B136) No. 5 — Chassis ground:*** ***(B136) No. 4 — Chassis ground:*** ***(B136) No. 3 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair the ground short circuit in harness between ECM and fuel injector connector.	Go to step **5.**
5	**CHECK EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between each fuel injector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **6.**	Replace the faulty fuel injector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Inspection using “General Diagnostic Table”. <Ref. to EN(STi)(diag)-342, INSPECTION, General Diagnostic Table.>

17.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Index
P0011	A Camshaft Position-Timing Over-Advanced or System Performance (Bank 1)	<Ref. to EN(STi)(diag)-72, DTC P0011 “A” CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0021	A Camshaft Position-Timing Over-Advanced or System Performance (Bank 2)	<Ref. to EN(STi)(diag)-73, DTC P0021 “A” CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to EN(STi)(diag)-74, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to EN(STi)(diag)-76, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to EN(STi)(diag)-79, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to EN(STi)(diag)-81, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to EN(STi)(diag)-84, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	<Ref. to EN(STi)(diag)-86, DTC P0068 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to EN(STi)(diag)-88, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to EN(STi)(diag)-90, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to EN(STi)(diag)-93, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to EN(STi)(diag)-95, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to EN(STi)(diag)-97, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0111	Intake Air Temperature Circuit Range/Performance	<Ref. to EN(STi)(diag)-99, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to EN(STi)(diag)-101, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake Air Temperature Circuit High Input	<Ref. to EN(STi)(diag)-103, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to EN(STi)(diag)-106, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to EN(STi)(diag)-108, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Item	Index
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low Input	<Ref. to EN(STi)(diag)-111, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle/Pedal Position Sensor/ Switch “A” Circuit High Input	<Ref. to EN(STi)(diag)-114, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to EN(STi)(diag)-118, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to EN(STi)(diag)-120, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0129	Atmospheric Pressure Sensor Circuit Range/Performance	<Ref. to EN(STi)(diag)-121, DTC P0129 ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0131	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to EN(STi)(diag)-122, DTC P0131 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to EN(STi)(diag)-124, DTC P0132 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to EN(STi)(diag)-126, DTC P0133 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to EN(STi)(diag)-128, DTC P0134 O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to EN(STi)(diag)-130, DTC P0137 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to EN(STi)(diag)-133, DTC P0138 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to EN(STi)(diag)-136, DTC P0139 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System too Lean (Bank 1)	<Ref. to EN(STi)(diag)-137, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System too Rich (Bank 1)	<Ref. to EN(STi)(diag)-138, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	<Ref. to EN(STi)(diag)-141, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0182	Fuel Temperature Sensor “A” Circuit Low Input	<Ref. to EN(STi)(diag)-143, DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0183	Fuel Temperature Sensor “A” Circuit High Input	<Ref. to EN(STi)(diag)-145, DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0222	Throttle/Pedal Position Sensor/ Switch “B” Circuit Low Input	<Ref. to EN(STi)(diag)-147, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0223	Throttle/Pedal Position Sensor/ Switch “B” Circuit High Input	<Ref. to EN(STi)(diag)-150, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P0230	Fuel Pump Primary Circuit	<Ref. to EN(STi)(diag)-154, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0244	Turbo/Super Charger Wastegate Solenoid “A” Range/Performance	<Ref. to EN(STi)(diag)-157, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0245	Turbo/Super Charger Wastegate Solenoid “A” Low	<Ref. to EN(STi)(diag)-159, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0246	Turbo/Super Charger Wastegate Solenoid “A” High	<Ref. to EN(STi)(diag)-161, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 misfire detected	<Ref. to EN(STi)(diag)-162, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 misfire detected	<Ref. to EN(STi)(diag)-162, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 misfire detected	<Ref. to EN(STi)(diag)-162, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 misfire detected	<Ref. to EN(STi)(diag)-163, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to EN(STi)(diag)-168, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to EN(STi)(diag)-170, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to EN(STi)(diag)-172, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to EN(STi)(diag)-174, DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to EN(STi)(diag)-176, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0345	Camshaft Position Sensor “A” Circuit (Bank 2)	<Ref. to EN(STi)(diag)-178, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(STi)(diag)-180, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0442	Evaporative Emission Control System Leak Detected (small leak)	<Ref. to EN(STi)(diag)-182, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to EN(STi)(diag)-186, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to EN(STi)(diag)-189, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	<Ref. to EN(STi)(diag)-191, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to EN(STi)(diag)-193, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to EN(STi)(diag)-196, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0456	Evaporative Emission Control System Leak Detected (very small leak)	<Ref. to EN(STi)(diag)-199, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0457	Evaporative Emission Control System Leak Detected (fuel cap loose/off)	<Ref. to EN(STi)(diag)-202, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to EN(STi)(diag)-206, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to EN(STi)(diag)-208, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel Level Sensor Circuit Range/Performance	<Ref. to EN(STi)(diag)-210, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel Level Sensor Circuit Low Input	<Ref. to EN(STi)(diag)-212, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0463	Fuel Level Sensor Circuit High Input	<Ref. to EN(STi)(diag)-216, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to EN(STi)(diag)-219, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling Fan Rationality Check	<Ref. to EN(STi)(diag)-221, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to EN(STi)(diag)-224, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0503	Vehicle Speed Sensor Intermittent/Erratic/High	<Ref. to EN(STi)(diag)-226, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle Control System RPM Lower Than Expected	<Ref. to EN(STi)(diag)-227, DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0507	Idle Control System RPM Higher Than Expected	<Ref. to EN(STi)(diag)-229, DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter Request Circuit	<Ref. to EN(STi)(diag)-231, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to EN(STi)(diag)-233, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(STi)(diag)-235, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0605	Internal Control Module Read Only Memory (ROM) Error	<Ref. to EN(STi)(diag)-237, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0607	Control Module Performance	<Ref. to EN(STi)(diag)-237, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to EN(STi)(diag)-239, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to EN(STi)(diag)-239, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P0692	Cooling Fan 1 Control Circuit High	<Ref. to EN(STi)(diag)-242, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Neutral Switch Input Circuit Low	<Ref. to EN(STi)(diag)-245, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Neutral Switch Input Circuit High	<Ref. to EN(STi)(diag)-247, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1086	Tumble Generated Valve Position Sensor 2 Circuit Low	<Ref. to EN(STi)(diag)-249, DTC P1086 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1087	Tumble Generated Valve Position Sensor 2 Circuit High	<Ref. to EN(STi)(diag)-252, DTC P1087 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1088	Tumble Generated Valve Position Sensor 1 Circuit Low	<Ref. to EN(STi)(diag)-254, DTC P1088 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1089	Tumble Generated Valve Position Sensor 1 Circuit High	<Ref. to EN(STi)(diag)-257, DTC P1089 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1090	Tumble Generated Valve System 1 (Valve Open)	<Ref. to EN(STi)(diag)-259, DTC P1090 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1091	Tumble Generated Valve System 1 (Valve Close)	<Ref. to EN(STi)(diag)-259, DTC P1091 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1092	Tumble Generated Valve System 2 (Valve Open)	<Ref. to EN(STi)(diag)-260, DTC P1092 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1093	Tumble Generated Valve System 2 (Valve Close)	<Ref. to EN(STi)(diag)-260, DTC P1093 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1094	Tumble Generated Valve Signal 1 Circuit Malfunction (Open)	<Ref. to EN(STi)(diag)-261, DTC P1094 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1095	Tumble Generated Valve Signal 1 Circuit Malfunction (Short)	<Ref. to EN(STi)(diag)-263, DTC P1095 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1096	Tumble Generated Valve Signal 2 Circuit Malfunction (Open)	<Ref. to EN(STi)(diag)-265, DTC P1096 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1097	Tumble Generated Valve Signal 2 Circuit Malfunction (Short)	<Ref. to EN(STi)(diag)-267, DTC P1097 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1110	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)	<Ref. to EN(STi)(diag)-268, DTC P1110 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1111	Atmospheric Pressure Sensor Circuit Malfunction (High Input)	<Ref. to EN(STi)(diag)-268, DTC P1111 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1152	O_2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to EN(STi)(diag)-269, DTC P1152 O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1153	O_2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to EN(STi)(diag)-271, DTC P1153 O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1160	Return Spring Failure	<Ref. to EN(STi)(diag)-272, DTC P1160 RETURN SPRING FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Item	Index
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to EN(STi)(diag)-273, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to EN(STi)(diag)-276, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to EN(STi)(diag)-278, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1446	Fuel Tank Sensor Control Valve Circuit Low	<Ref. to EN(STi)(diag)-280, DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1447	Fuel Tank Sensor Control Valve Circuit High	<Ref. to EN(STi)(diag)-283, DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1448	Fuel Tank Sensor Control Valve Range/Performance	<Ref. to EN(STi)(diag)-285, DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	<Ref. to EN(STi)(diag)-287, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter Switch Circuit Low Input	<Ref. to EN(STi)(diag)-288, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to EN(STi)(diag)-290, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2088	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	<Ref. to EN(STi)(diag)-293, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	<Ref. to EN(STi)(diag)-295, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	<Ref. to EN(STi)(diag)-297, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2093	OCV Solenoid Valve Signal A Circuit Short (Bank 2)	<Ref. to EN(STi)(diag)-299, DTC P2093 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to EN(STi)(diag)-301, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to EN(STi)(diag)-305, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to EN(STi)(diag)-309, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to EN(STi)(diag)-315, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to EN(STi)(diag)-318, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2109	Throttle/Pedal Position Sensor A Minimum Stop Performance	<Ref. to EN(STi)(diag)-319, DTC P2109 THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Index
P2122	Throttle/Pedal Position Sensor/ Switch “D” Circuit Low Input	<Ref. to EN(STi)(diag)-320, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2123	Throttle/Pedal Position Sensor/ Switch “D” Circuit High Input	<Ref. to EN(STi)(diag)-323, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2127	Throttle/Pedal Position Sensor/ Switch “E” Circuit Low Input	<Ref. to EN(STi)(diag)-326, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2128	Throttle/Pedal Position Sensor/ Switch “E” Circuit High Input	<Ref. to EN(STi)(diag)-329, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGHT INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2135	Throttle/Pedal Position Sensor/ Switch “A”/“B” Voltage Rationality	<Ref. to EN(STi)(diag)-332, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE RATIONALITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2138	Throttle/Pedal Position Sensor/ Switch “D”/“E” Voltage Rationality	<Ref. to EN(STi)(diag)-337, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE RATIONALITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

18.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0011 “A” CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:
- Engine stalls.
- Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Inspect the AVCS operating angle and variable valve timing solenoid valve duty output using Subaru Select Monitor and OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the AVCS operating angle more than approx. 0°C and the variable valve timing solenoid valve duty output more than approx. 10%?	Inspect the following items and repair or replace if necessary. • Engine oil (amount, contamination) • Oil pipe (clog) • variable valve timing solenoid valve (clog or contamination in oil passage, settling at spring, stuck at valve) • Intake camshaft (sludge, damage at camshaft) • Timing belt (timing mark aligning)	A temporary malfunction. Conduct the following to clean the oil passage. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil.

B: DTC P0021 "A" CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:
- Engine stalls.
- Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Inspect the AVCS operating angle and variable valve timing solenoid valve duty output using Subaru Select Monitor and OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the AVCS operating angle more than approx. 0°C and the variable valve timing solenoid valve duty output more than approx. 10%?	Inspect the following items and repair or replace if necessary. • Engine oil (amount, contamination) • Oil pipe (clog) • variable valve timing solenoid valve (clog or contamination in oil passage, settling at spring, stuck at valve) • Intake camshaft (sludge, damage at camshaft) • Timing belt (timing mark aligning)	A temporary malfunction. Conduct the following to clean the oil passage. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil.

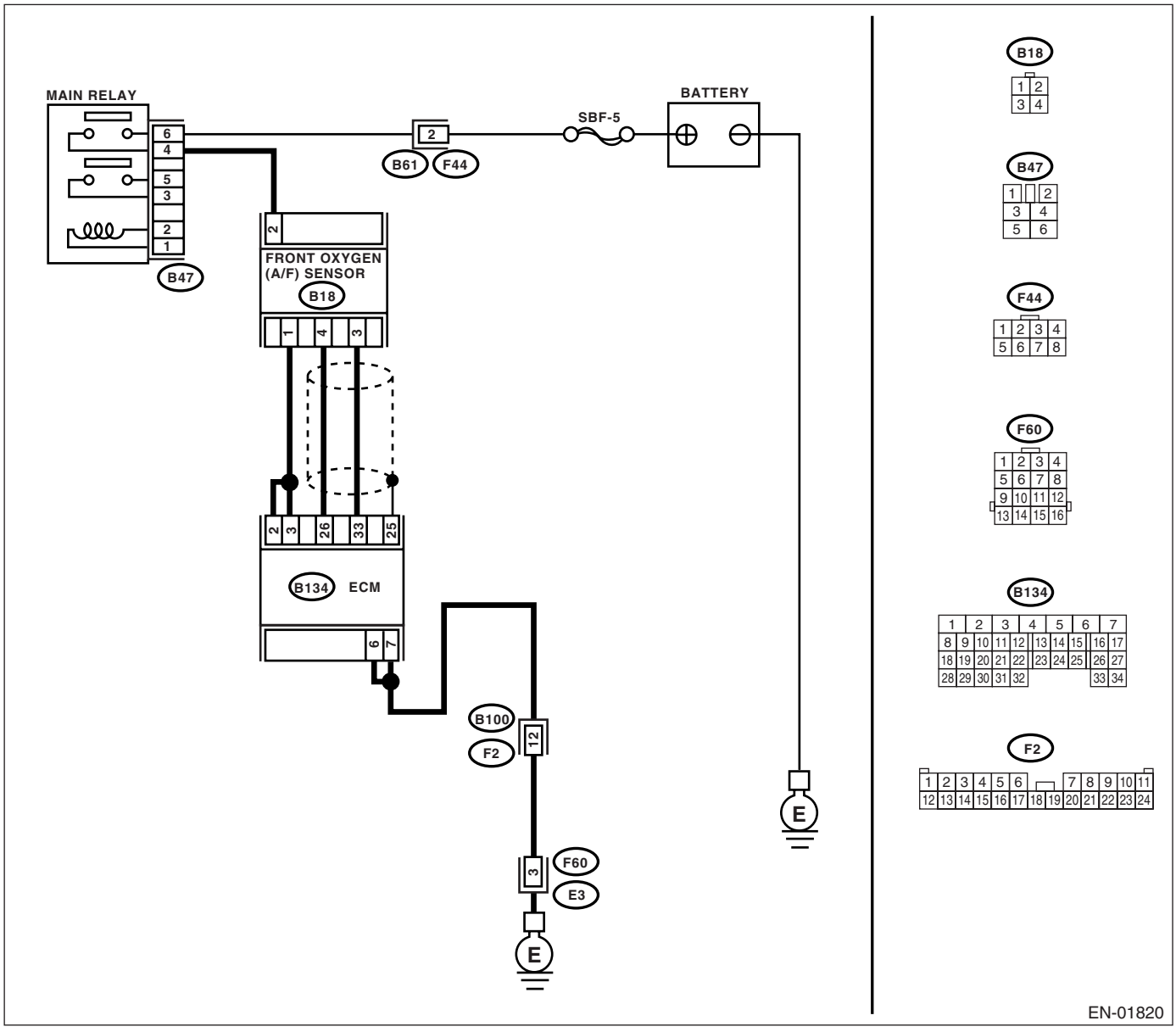
C: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-10, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start the engine and warm-up engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 4) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 5 — (B18) No. 1:*** ***(B134) No. 4 — (B18) No. 1:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 19 — (B18) No. 4:*** ***(B134) No. 29 — (B18) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between main relay and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B47) No. 4 — (B18) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance less than 5 Ω?	Go to step **5.**	Replace the front oxygen (A/F) sensor. <Ref. to FU(STi)-36, Front Oxygen (A/F) Sensor.>
5	**CHECK POOR CONTACT.** Check the poor contact in ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair the poor contact in ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(STi)-36, Front Oxygen (A/F) Sensor.>

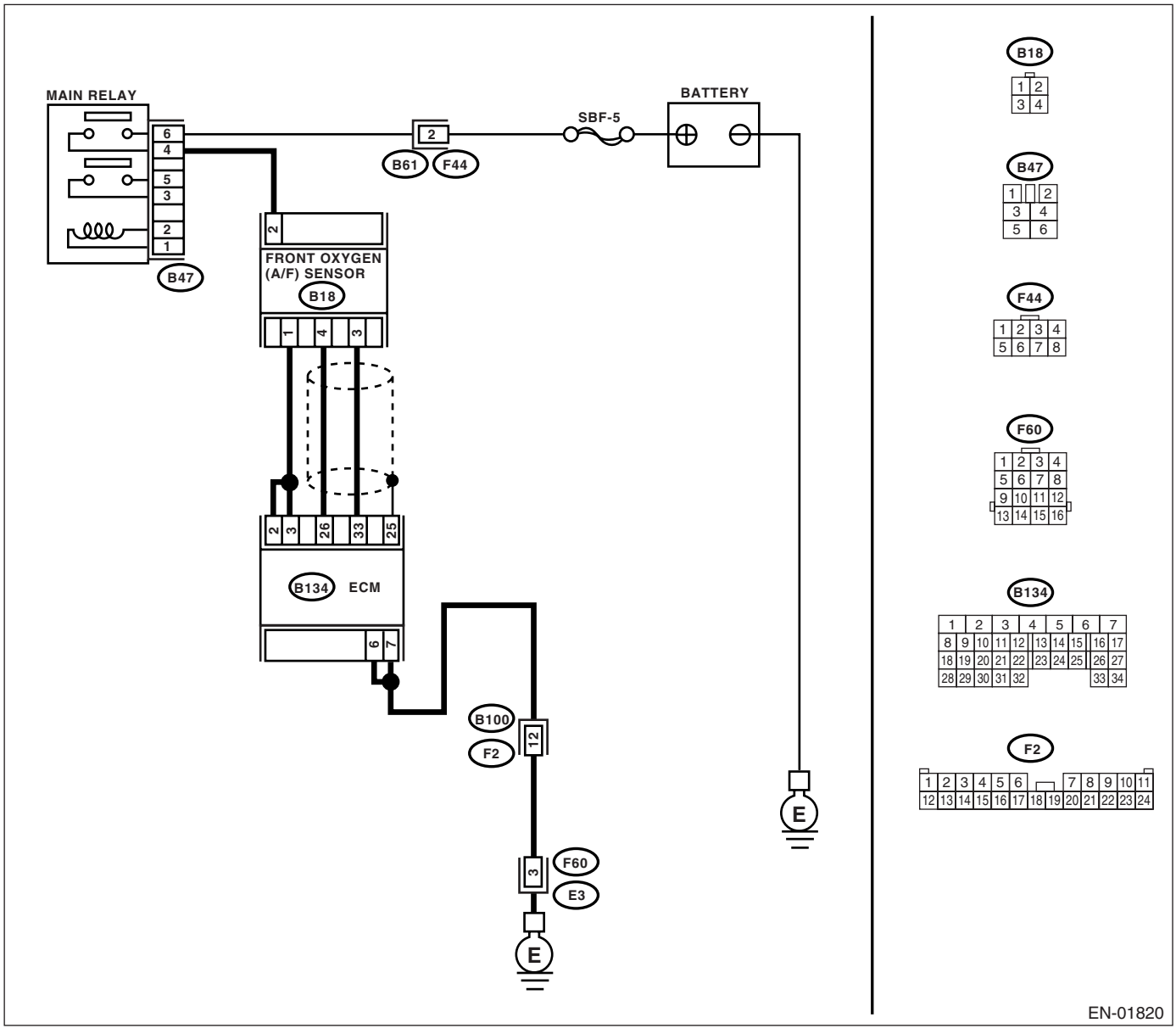
D: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-12, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & terminal*** ***(B18) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Repair the power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in main relay connector • Malfunction in main relay
2	**CHECK GROUND CIRCUIT OF ECM.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 6 — Chassis ground:*** ***(B134) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground cable • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the current more than 0.2 A?	Repair the poor contact in connector. NOTE: In this case, repair the following: • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (–):*** ***(B134) No. 3 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (–):*** ***(B134) No. 3 (+) — Chassis ground (–):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance less than 10 Ω?	Repair the harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Replace the front oxygen (A/F) sensor. <Ref. to FU(STi)-36, Front Oxygen (A/F) Sensor.>

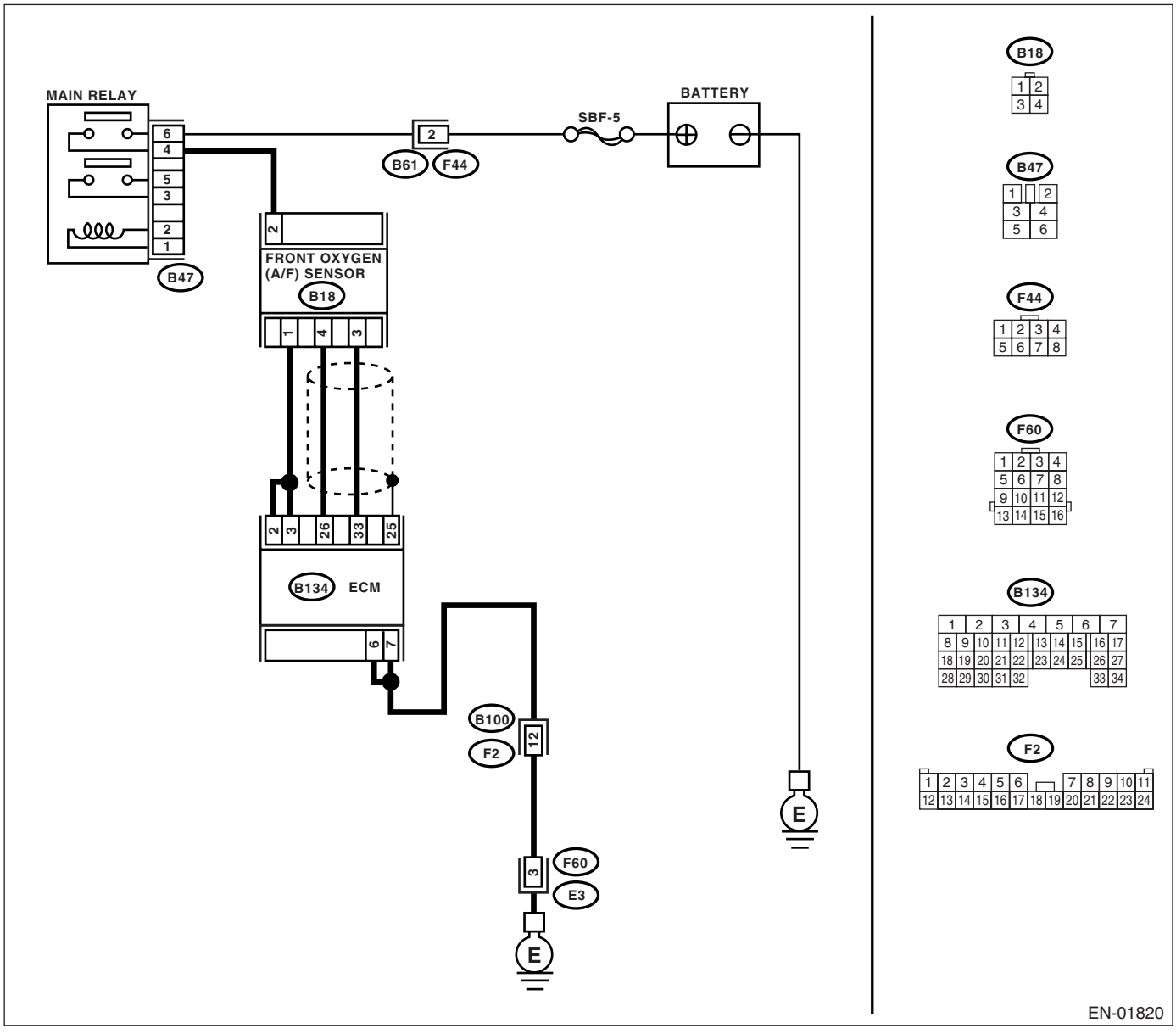
E: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-14, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (−):*** ***(B134) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **3.**	Go to step **2.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.** 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the current more than 2.3 A?	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>	END
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (−):*** ***(B134) No. 3 (+) — Chassis ground (−):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

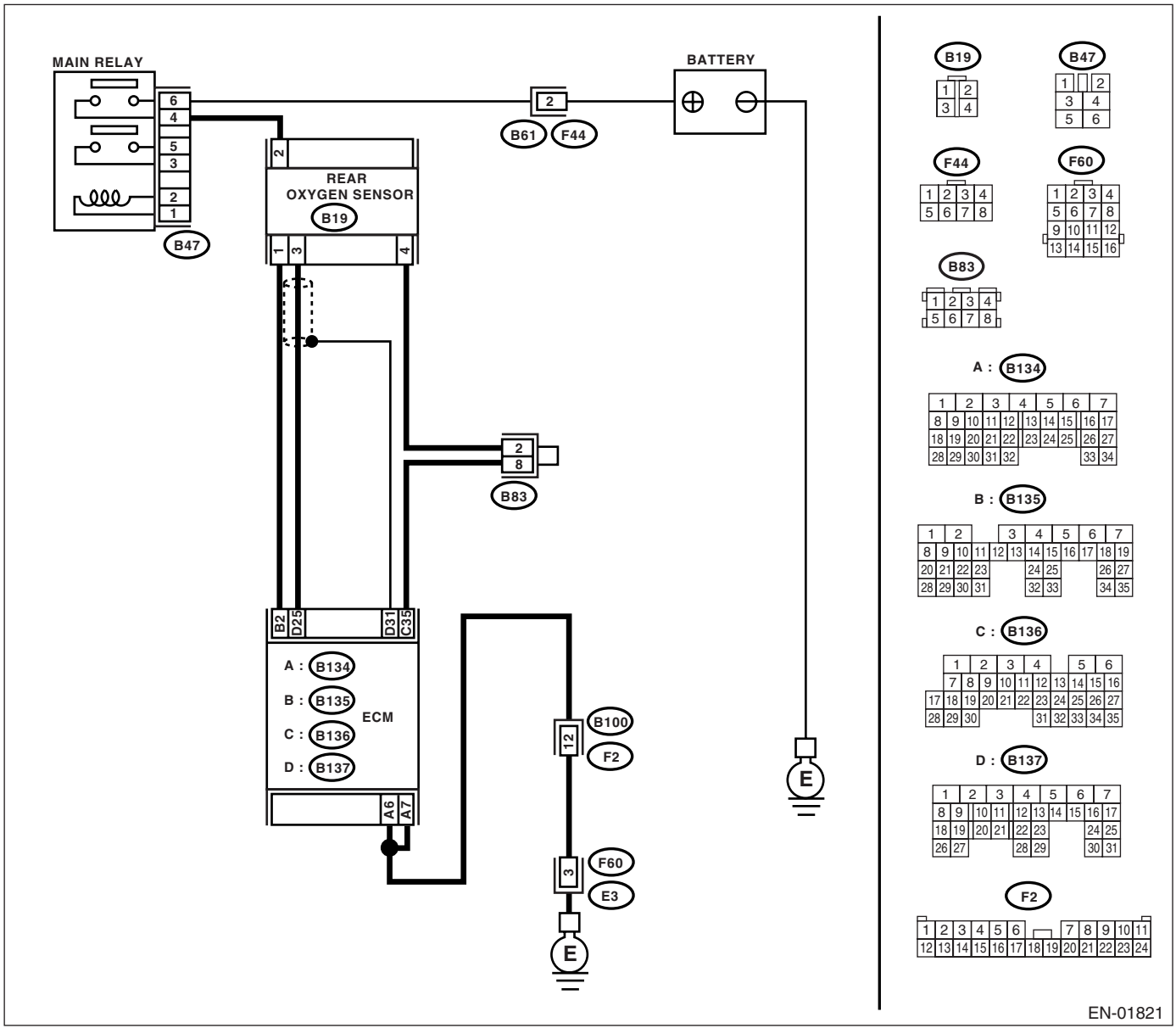
F: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-16, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 6 — Chassis ground:*** ***(B134) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground cable • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the current more than 0.2 A?	Repair the connector. NOTE: In this case, repair the following: • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **6.**	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 (+) — Chassis ground (–):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>	Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and engine ground or chassis ground. ***Connector & terminal*** ***(B19) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **7.**	Repair the power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in main relay connector • Malfunction in main relay
7	**CHECK REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between rear oxygen sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 30 Ω?	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Replace the rear oxygen sensor. <Ref. to FU(STi)-38, Rear Oxygen Sensor.>

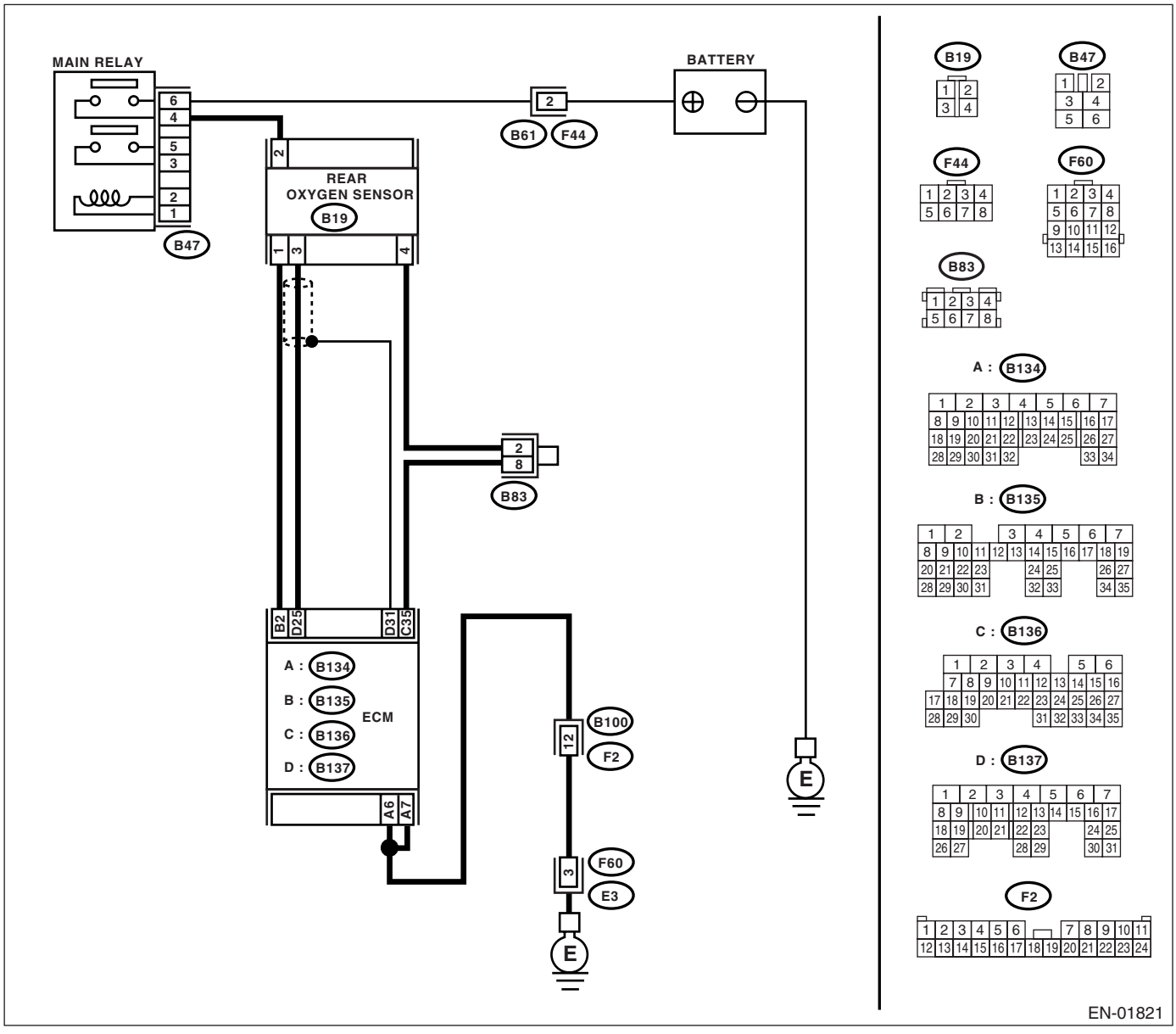
G: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-18, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK CURRENT DATA.** 1) Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. 2) Turn the ignition switch to ON. 3) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the current more than 7 A?	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>	END
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	END

H: DTC P0068 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-20, DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/ PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

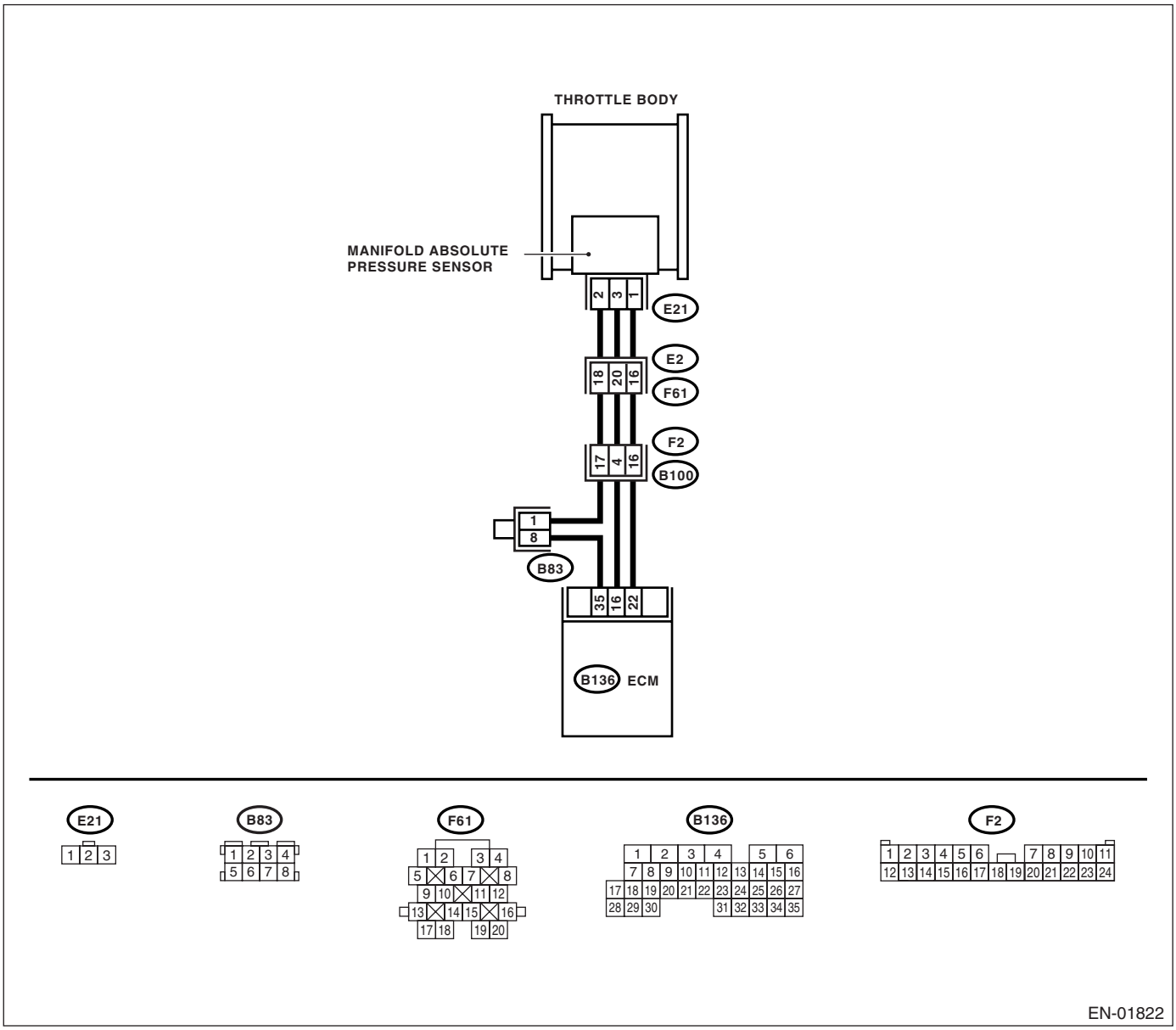
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK IDLE SWITCH SIGNAL.** 1) Turn the ignition switch to ON. 2) Operate the LED operation mode for engine using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.>	Does the LED of {Idle Switch Signal} come on?	Go to step **2.**	Check the throttle position sensor circuit. <Ref. to EN(STi)(diag)-332, DTC P2135 THROTTLE/ PEDAL POSITION SENSOR/ SWITCH "A"/"B" VOLTAGE RATIONALITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.
2	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC. "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.	Go to step **3.**
3	**CHECK CONDITION OF MANIFOLD ABSOLUTE PRESSURE SENSOR.**	Is the manifold absolute pressure sensor installation bolt tightened securely?	Go to step **4.**	Tighten the manifold absolute pressure sensor installation bolt securely.
4	**CHECK CONDITION OF THROTTLE BODY.**	Is the throttle body installation bolt tightened securely?	Replace the manifold absolute pressure sensor. <Ref. to FU(STi)-30, Manifold Absolute Pressure Sensor.>	Tighten the throttle body installation bolt securely.

I: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

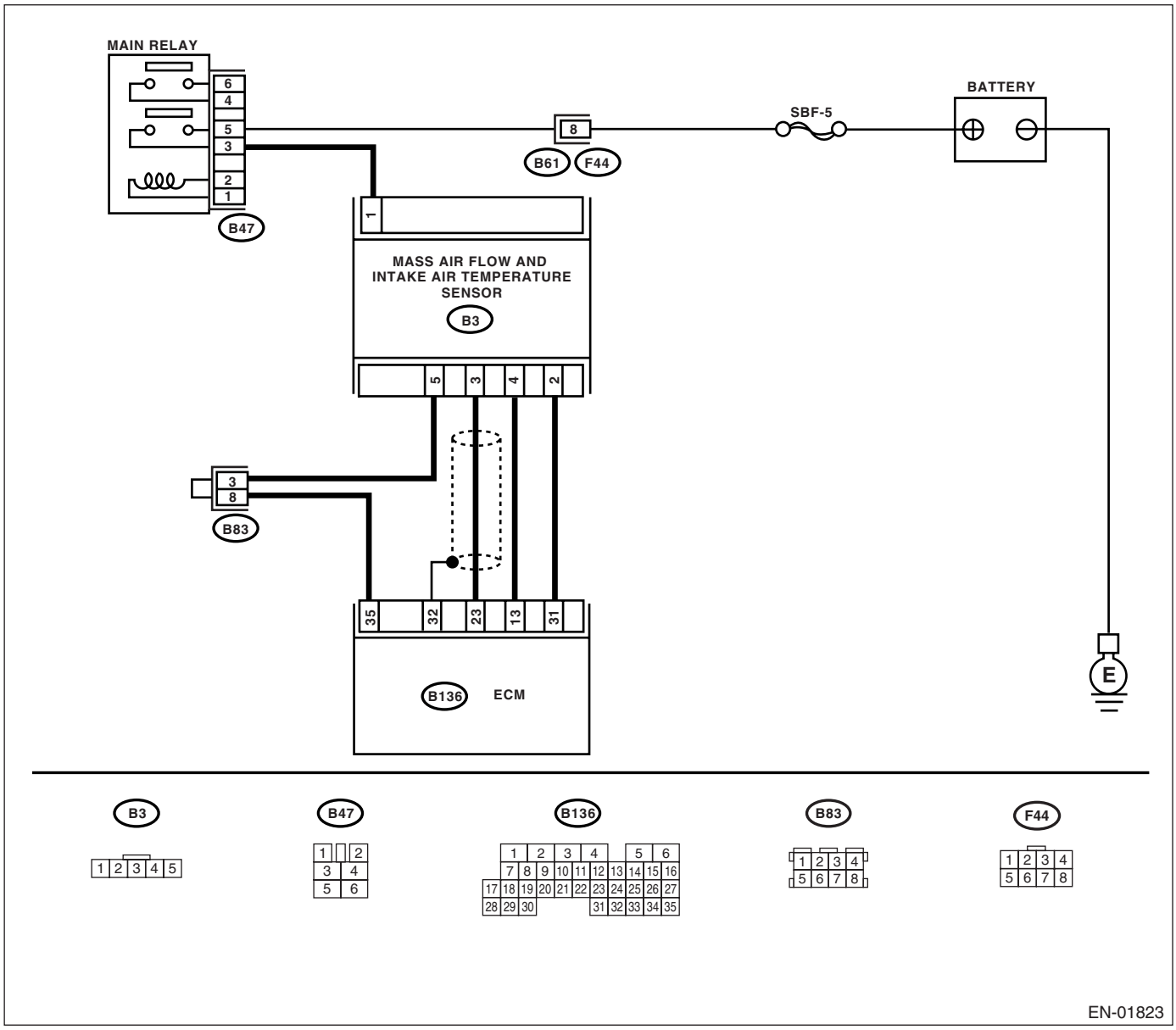
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-22, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0101.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(STi)-29, Mass Air Flow and Intake Air Temperature Sensor.>

J: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-25, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

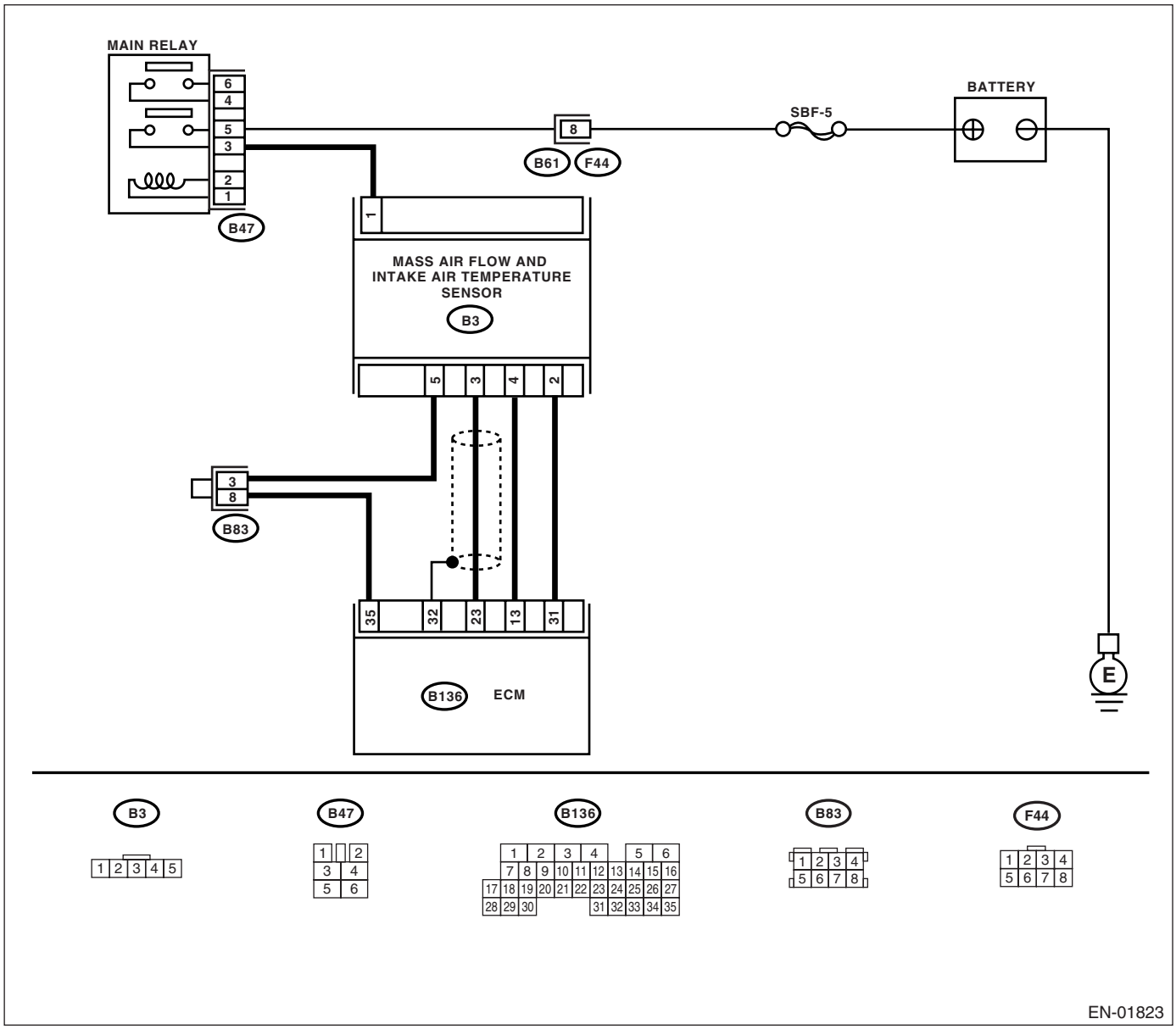
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector. 3) Turn the ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON. 4) Start the engine. 5) Read the mass air flow sensor voltage using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage 0.2 — 4.7 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in the mass air flow sensor. NOTE: In this case, repair the following: • Open or ground short circuit in harness between mass air flow sensor and ECM connector • Poor contact in mass air flow sensor or ECM connector	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground while engine is idling. ***Connector & terminal*** ***(B136) No. 23 (+) — Chassis ground (−):***	Is the voltage less than 0.2 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).** Measure the voltage between ECM connector and chassis ground while engine is idling.	Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow sensor connector and chassis ground. ***Connector & terminal*** ***(B3) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 5 V?	Go to step **5.**	Repair the open circuit between mass air flow sensor and main relay.

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and mass air flow sensor connector. ***Connector & terminal*** ***(B136) No. 23 — (B3) No. 3:*** ***(B136) No. 31 — (B3) No. 2:*** ***(B136) No. 35 — (B3) No. 5:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit between ECM and mass air flow sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 23 — Chassis ground:*** ***(B136) No. 31 — Chassis ground:*** ***(B136) No. 35 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit between ECM and mass air flow sensor connector.
7	**CHECK POOR CONTACT** Check poor contact in mass air flow sensor connector.	Is there poor contact in mass air flow sensor connector?	Repair the poor contact in mass air flow sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(STi)-29, Mass Air Flow and Intake Air Temperature Sensor.>

K: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-27, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

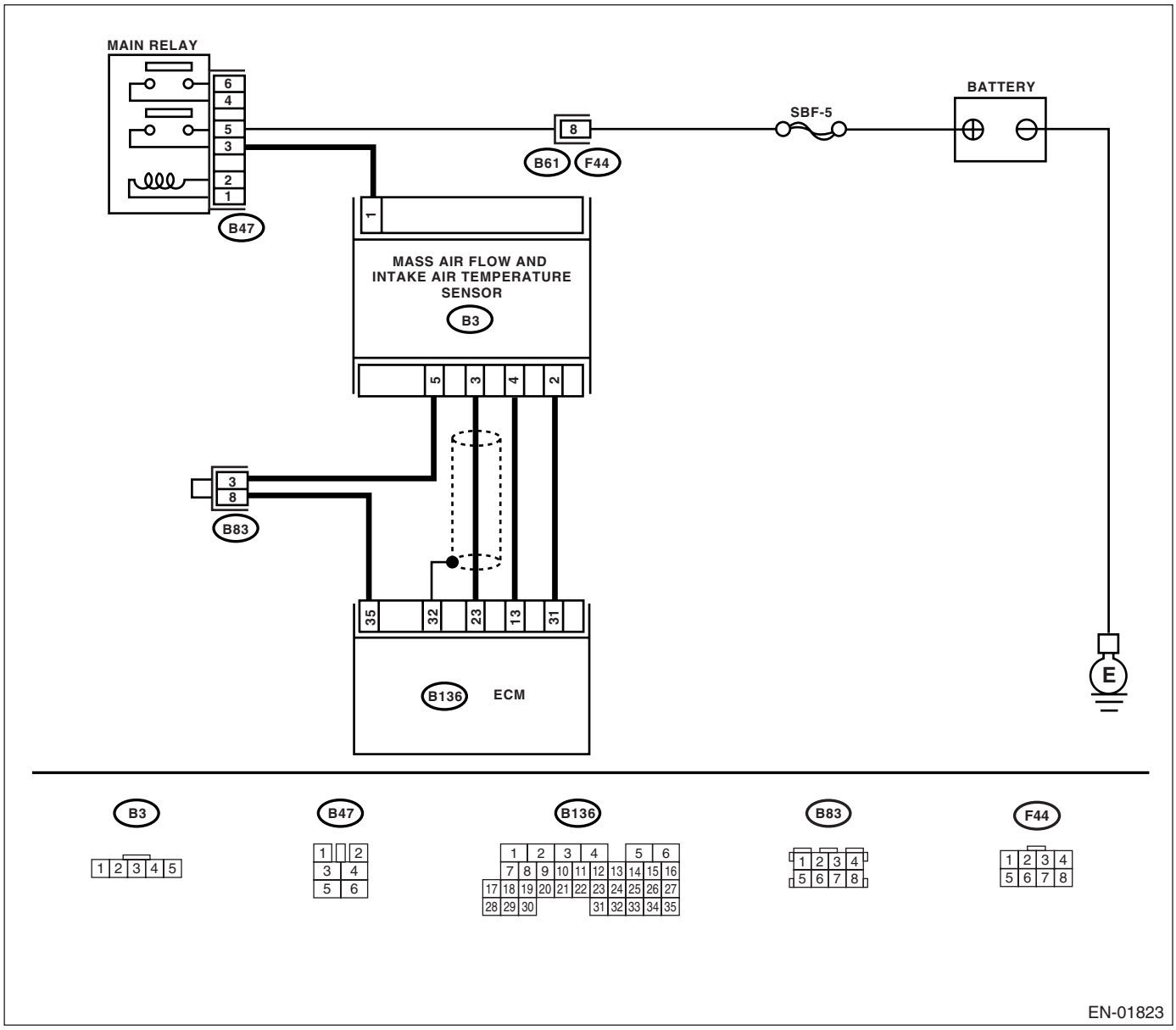
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector. 3) Turn the ignition switch to ON and Subaru Select Monitor or OBD-II general scan tool switch to ON. 4) Start the engine. 5) Read the mass air flow sensor voltage using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage 0.2 — 4.7 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow sensor connector and chassis ground. ***Connector & terminal*** ***(B3) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 5 V?	Repair the battery short of harness between mass air flow sensor connector and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connector and mass air flow sensor connector. ***Connector & terminal*** ***(B3) No. 2 — (B136) No. 31:***	Is the resistance less than 1 Ω?	Replace the mass air flow sensor. <Ref. to FU(STi)-29, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the open harness between mass air flow sensor connector and ECM connector.

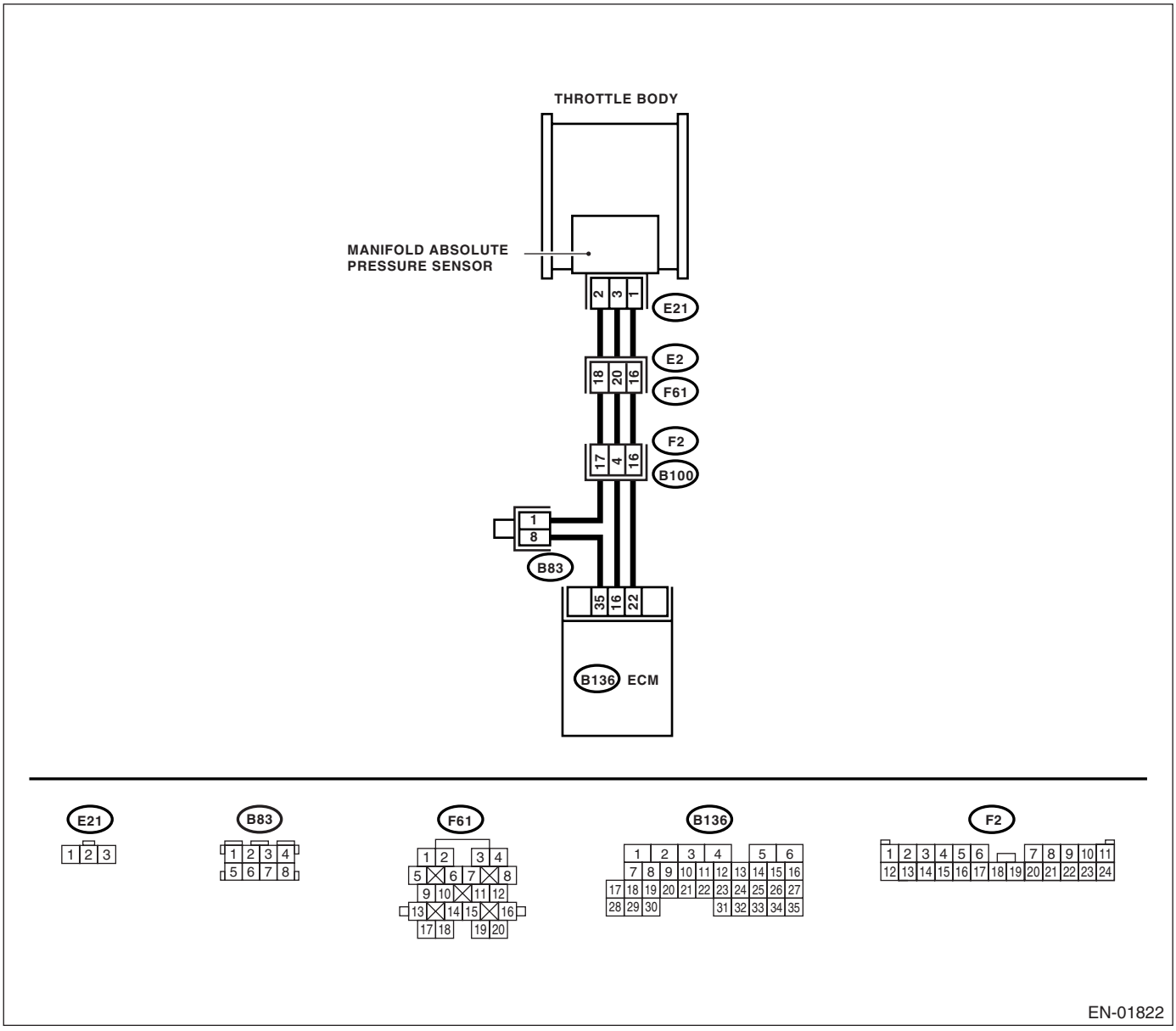
L: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-29, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **3.**	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 22 (+) — Chassis ground (−):***	Is the voltage less than 0.7 V?	Go to step **4.**	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **5.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
5	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B136) No. 35 — (E21) No. 2:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit in harness between ECM and manifold absolute pressure sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact in manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair the poor contact in manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(STi)-30, Manifold Absolute Pressure Sensor.>

M: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

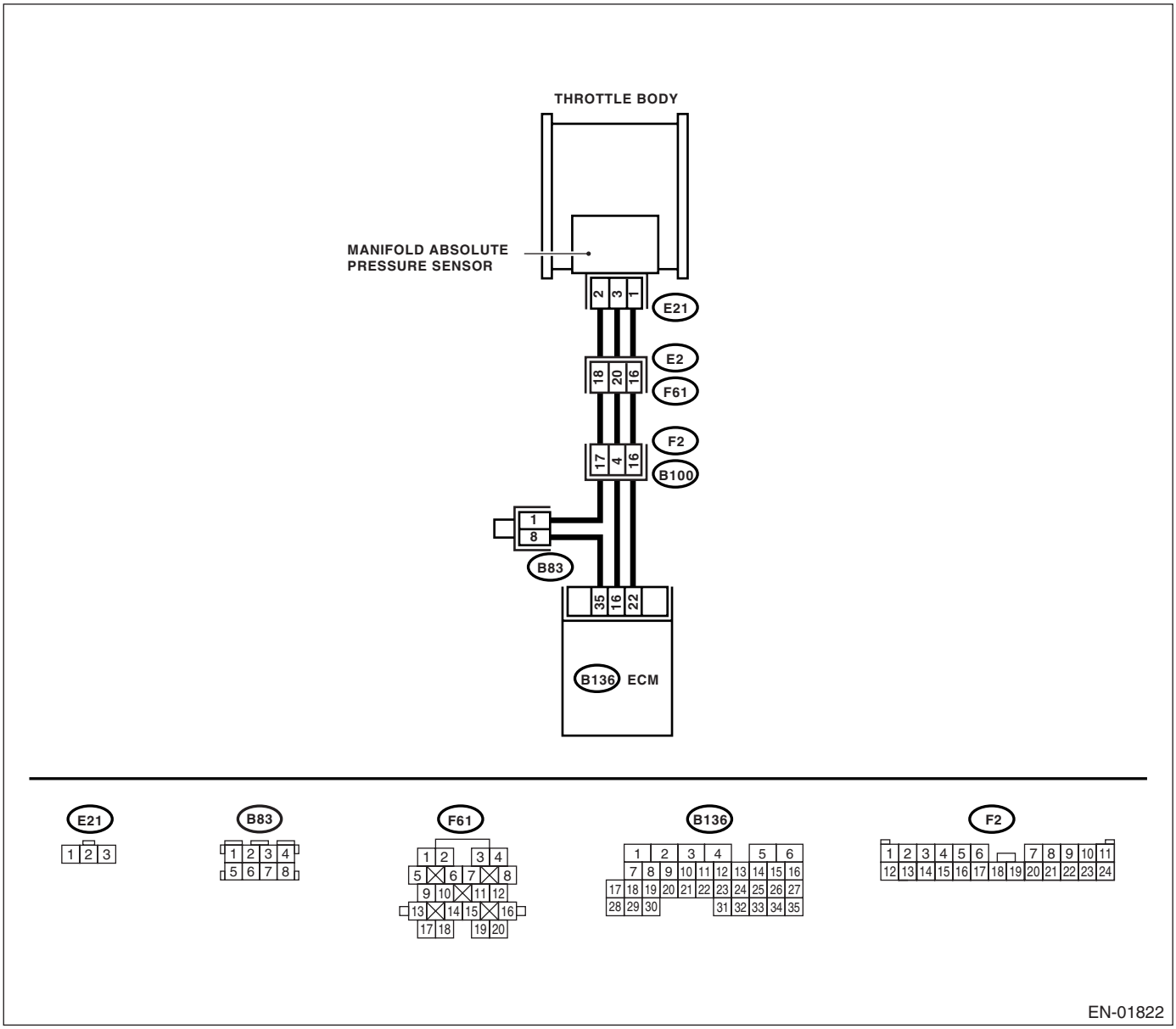
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-31, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/ BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **3.**	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 22 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **4.**	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **5.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
5	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B136) No. 22 — (E21) No. 1:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B136) No. 35 — (E21) No. 2:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact in manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair the poor contact in manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(STi)-30, Manifold Absolute Pressure Sensor.>

N: DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-33, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

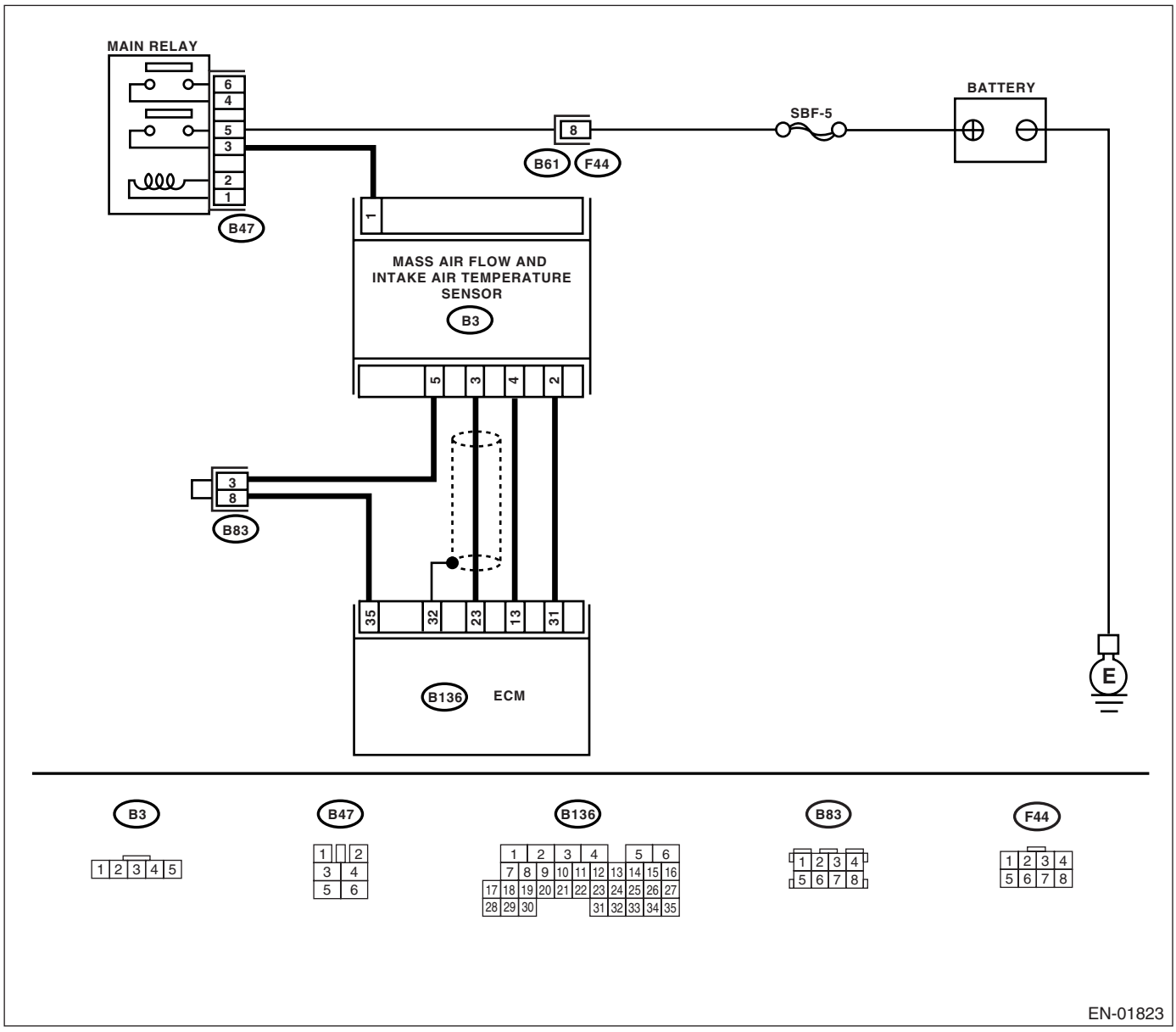
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0111.	Go to step **2.**
2	**CHECK ENGINE COOLANT TEMPERATURE.** 1) Start the engine and warm it up completely. 2) Measure the engine coolant temperature using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the engine coolant temperature 75°C (167°F) — 95°C (203°F)?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(STi)-29, Mass Air Flow and Intake Air Temperature Sensor.>	Inspect the DTC P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>

O: DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-35, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

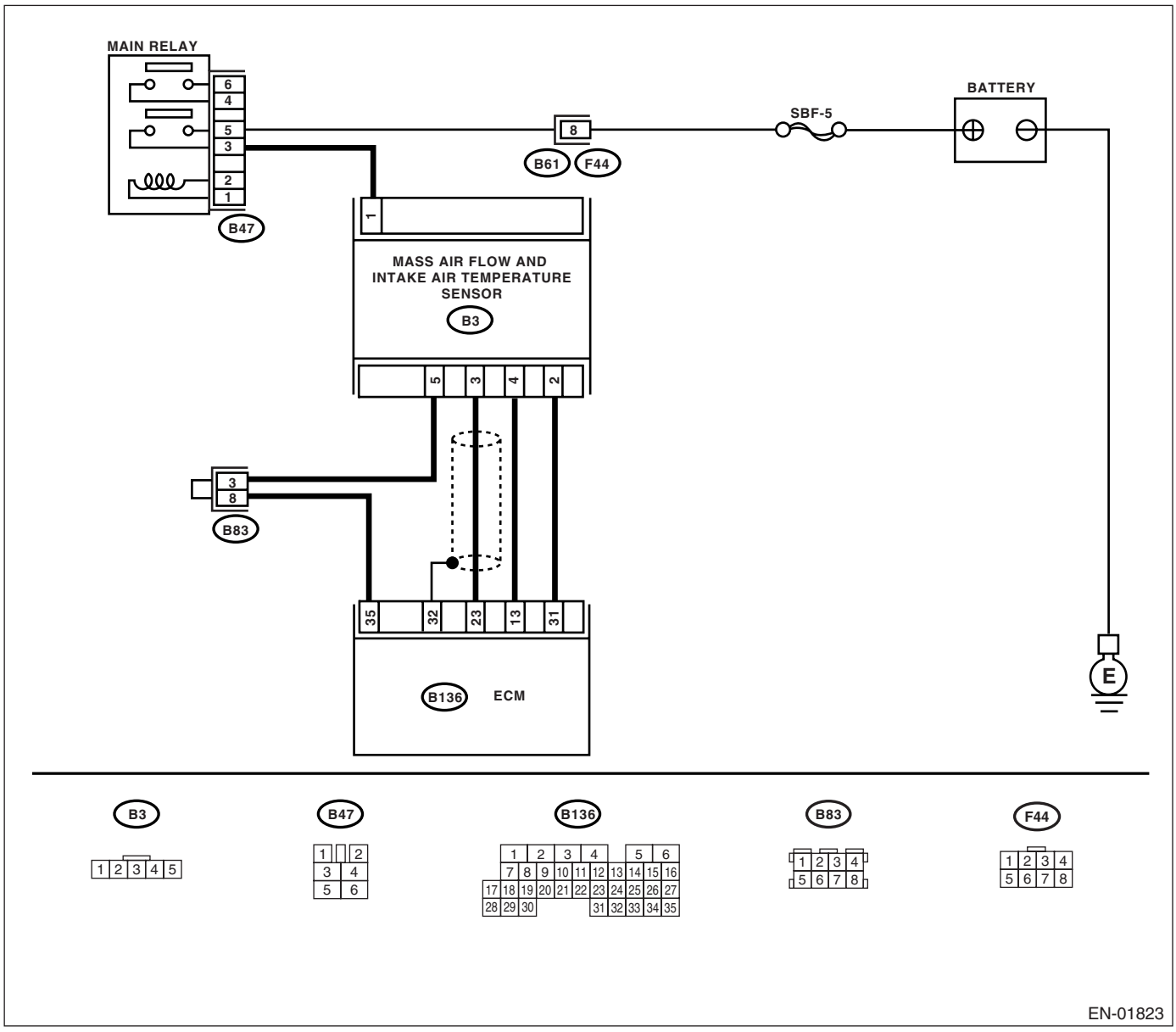
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature more than 55°C (131°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow and intake air temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature less than −36°C (−33°F)?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(STi)-29, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the ground short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.

P: DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-37, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

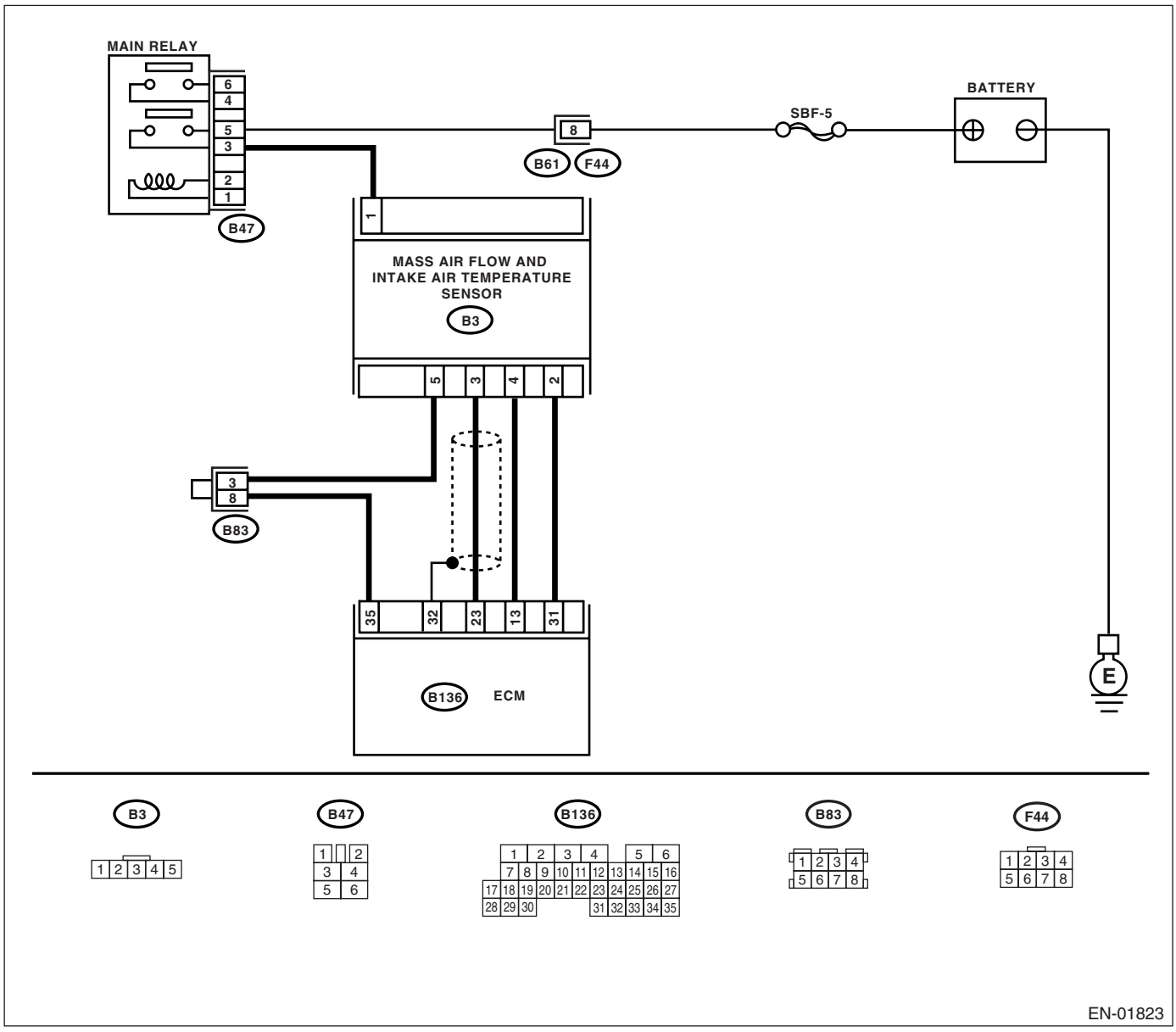
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature less than −36°C (−33°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow and intake air temperature sensor. 3) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between mass air flow and intake air temperature sensor and manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (−):***	Is the voltage more than 4 V?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between mass air flow and intake air temperature sensor and engine ground. ***Connector & terminal*** ***(B3) No. 5 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(STi)-29, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

Q: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-39, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

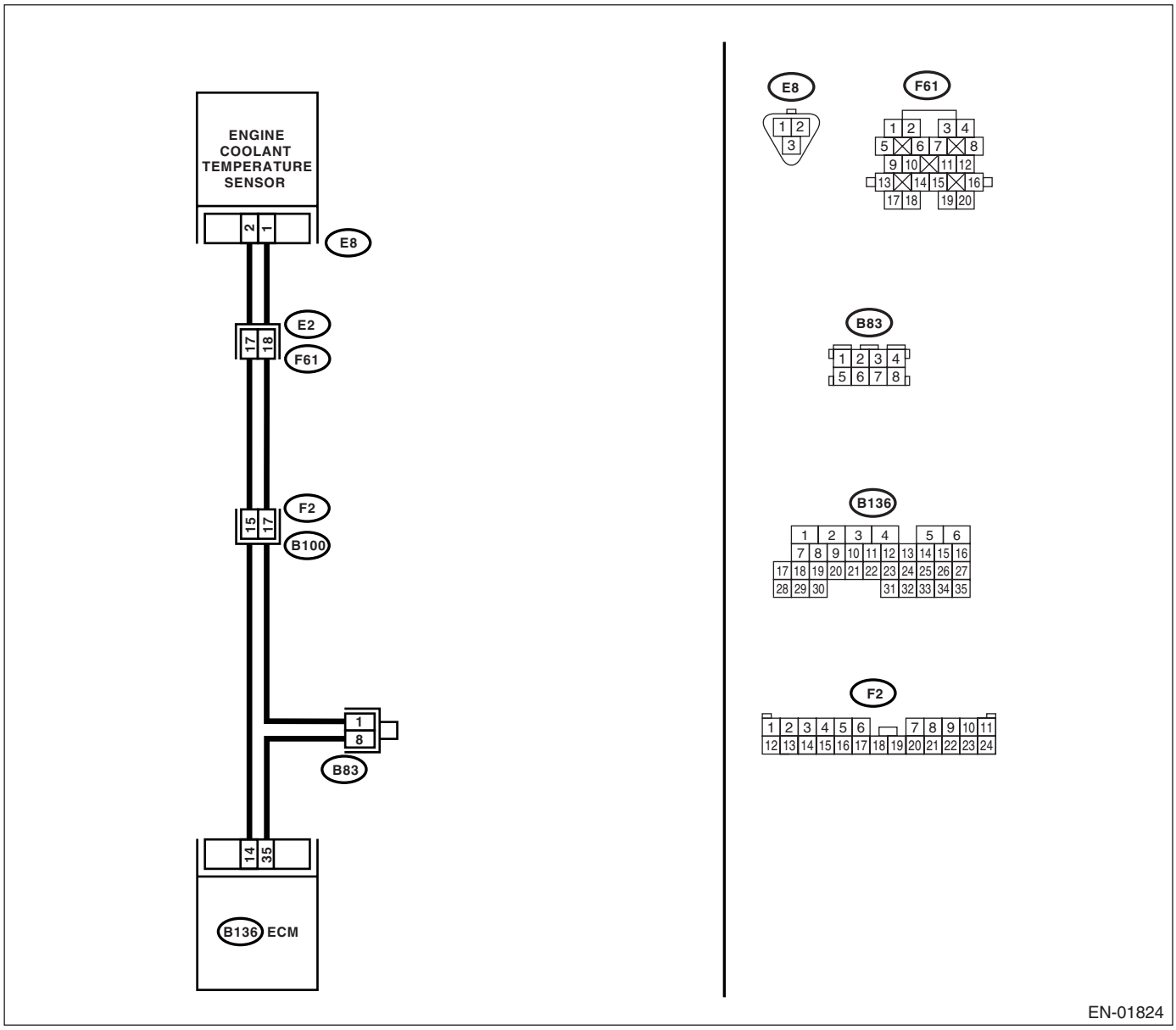
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature more than 120°C (248°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from engine coolant temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature less than −40°C (−40°F)?	Replace the engine coolant temperature sensor. <Ref. to FU(STi)-25, Engine Coolant Temperature Sensor.>	Repair the ground short circuit in harness between engine coolant temperature sensor and ECM connector.

R: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-41, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

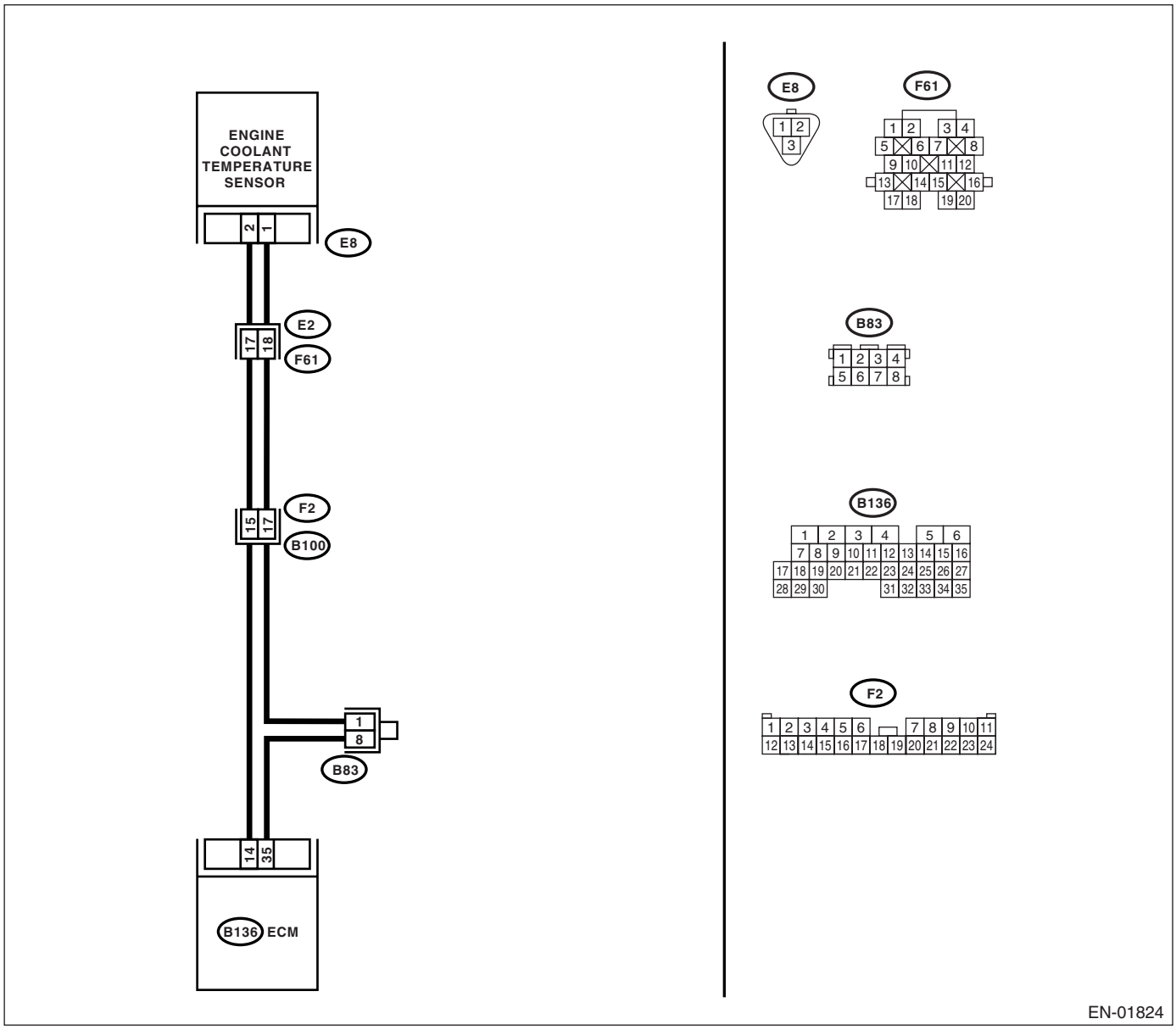
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature less than −40°C (−40°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from engine coolant temperature sensor. 3) Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (−):***	Is the voltage more than 4 V?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the engine coolant temperature sensor. <Ref. to FU(STi)-25, Engine Coolant Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

S: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT

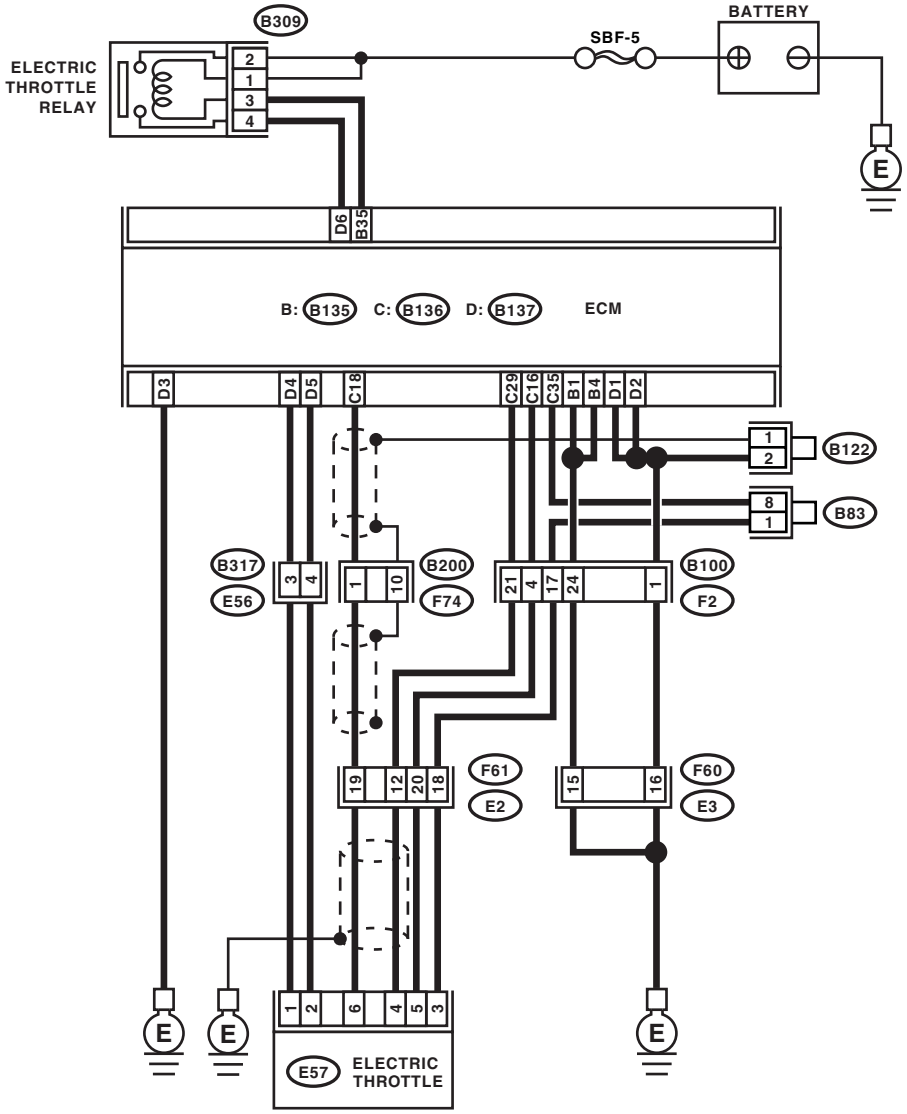
DTC DETECTING CONDITION:

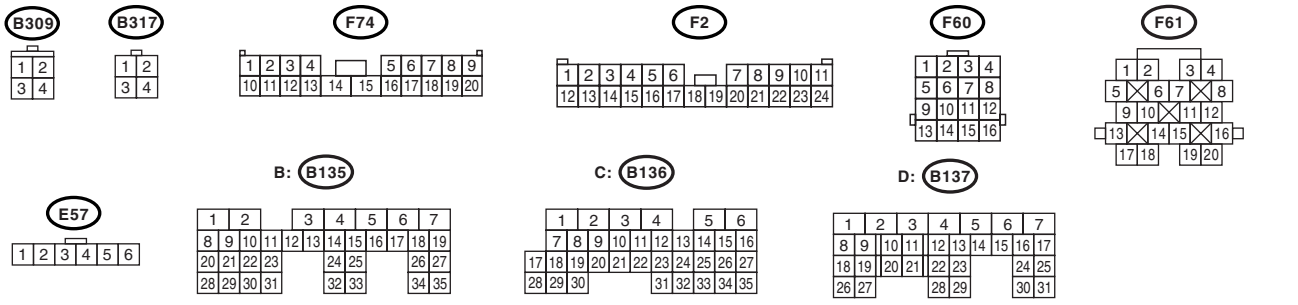
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-43, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

WIRING DIAGRAM:





EN-01825

	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 29 (+) — (B136) No. 35 (−):*** 3) Shake the ECM harness and connector, engine harness connectors and electric throttle.	Is the voltage more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle.	Is there poor contact in the connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 16 — (E57) No. 5:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair open of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 18 — Chassis ground:*** ***(B135) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the chassis short of harness.
5	**CHECK POWER SURPLY TO SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (−):*** 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>
6	**CHECK SHORT OF ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:***	Is the resistance more than 10 Ω?	Repair the poor contact in electric throttle connector. If problem persists, replace the accelerator position sensor.	Repair the poor the contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>

T: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT

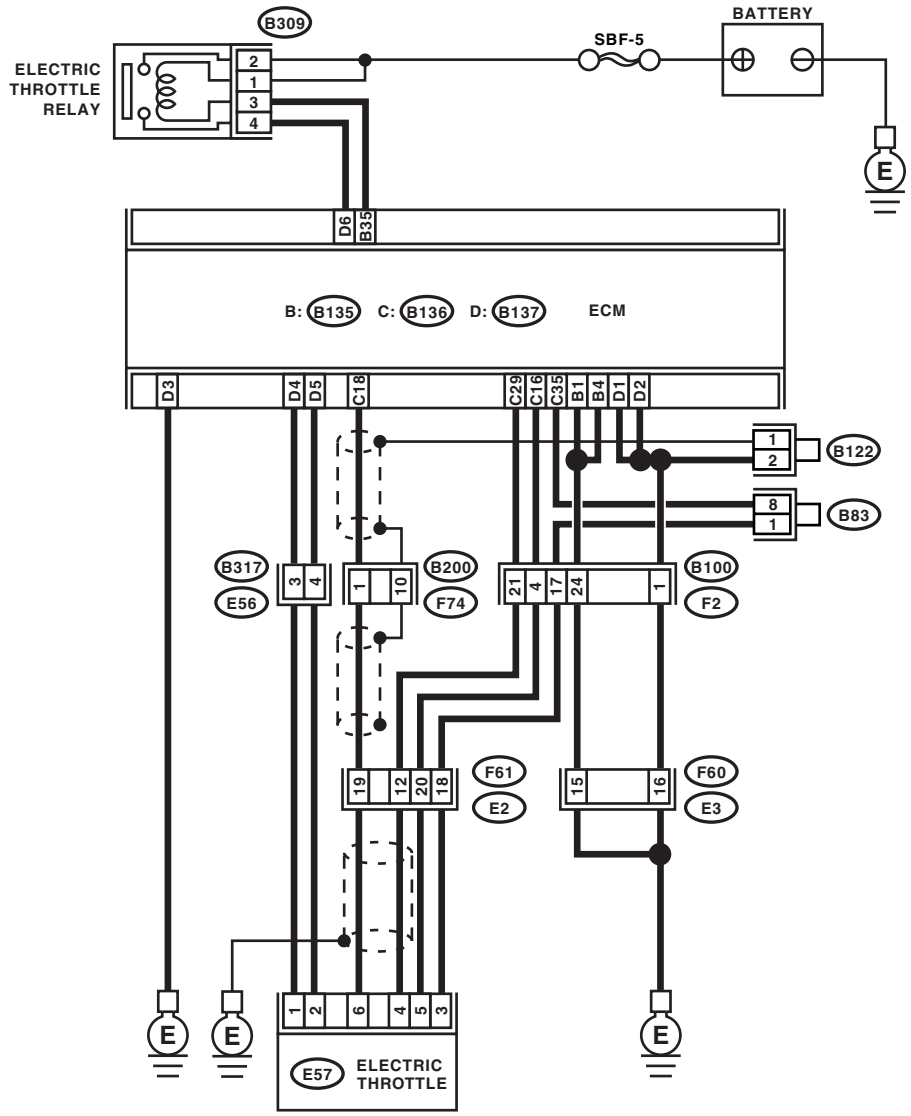
DTC DETECTING CONDITION:

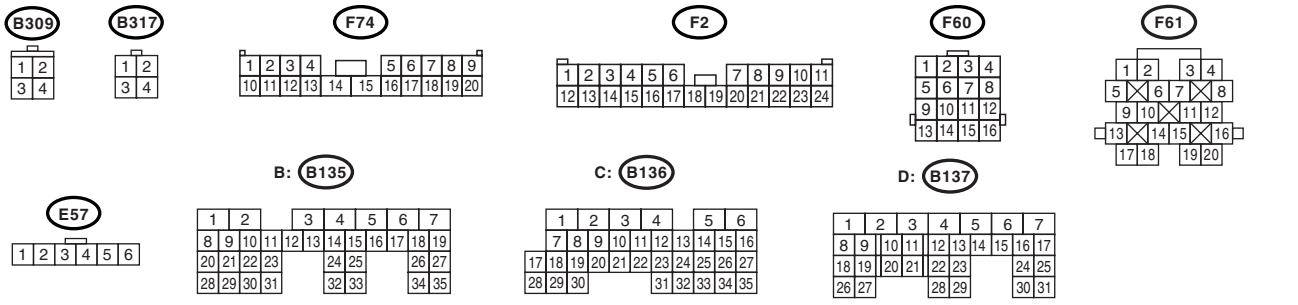
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-45, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

WIRING DIAGRAM:





EN-01825

	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Turn the ignition switch to ON. 2) Read the data of main throttle sensor signals, using the Subaru Select Monitor. 3) Shake the ECM harness and connector, engine harness connectors, electric throttle connector harness while monitoring value of voltage meter.	Is the voltage less than 4.63 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle.	Is there poor contact in the connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 18 — (E57) No. 6:*** ***(B136) No. 35 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Connect the ECM connector. 2) Measure the resistance between the electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the poor contact in ECM connector. If the problem persists, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>
5	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (−):*** 3) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage more than 10 V?	Go to step **6.**	Repair the battery short of harness between ECM connector and electric throttle connector.
6	**CHECK POWER SUPPLY TO SENSOR.** 1) Measure the voltage between the electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (−):*** 2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage less than 10 V?	Go to step **7.**	Repair the short of harness between ECM connector and electric throttle connector.

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 18 — (B136) No. 16:***	Is the resistance more than 1 MΩ?	Repair the poor contact in harness. Replace the electric throttle.	Repair the short of harness of power supply to sensor.

U: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-47, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

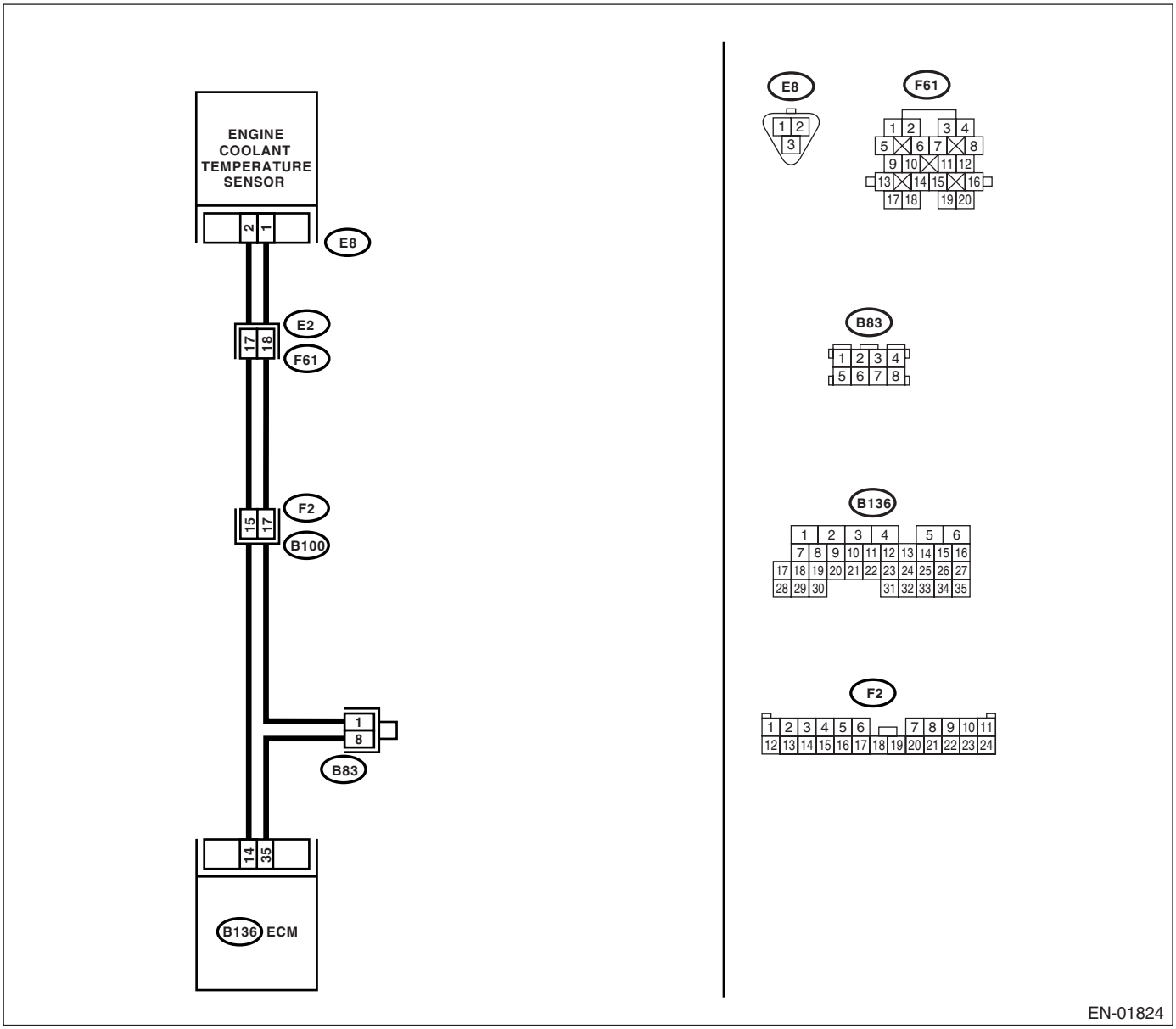
TROUBLE SYMPTOM:

Engine will not return to idling.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step **2.**
2	**CHECK ENGINE COOLING SYSTEM.** NOTE: Check the following items. • Thermostat open stuck • Coolant level • Coolant freeze • Tire diameter	Is there a fault in engine cooling system?	Replace the thermostat. <Ref. to CO(H4SO)-17, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(STi)-25, Engine Coolant Temperature Sensor.>

V: DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-49, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Thermostat remains open.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK VEHICLE CONDITION.**	Was the vehicle driven or idled with the engine partially submerged under water?	In this case, it is not necessary to inspect DTC P0128.	Go to step **2.**
2	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Codes (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK ENGINE COOLANT.**	Are coolant level and mixture ratio of cooling water to antifreeze solution correct?	Go to step **4.**	Replace the engine coolant. <Ref. to CO(H4SO)-12, REPLACEMENT, Engine Coolant.>
4	**CHECK RADIATOR FAN.** 1) Start the engine. 2) Check radiator fan operation.	Does the radiator fan continuously rotate for more than 3 minutes during idling?	Repair radiator fan circuit. <Ref. to CO(H4SO)-22, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-23, Radiator Sub Fan and Fan Motor.> .	Replace the thermostat. <Ref. to CO(H4SO)-17, Thermostat.>

W: DTC P0129 ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-51, DTC P0129 BAROMETRIC PRESSURE TOO LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 **CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is built into ECM.	NOTE: It is not necessary to inspect DTC P0129.

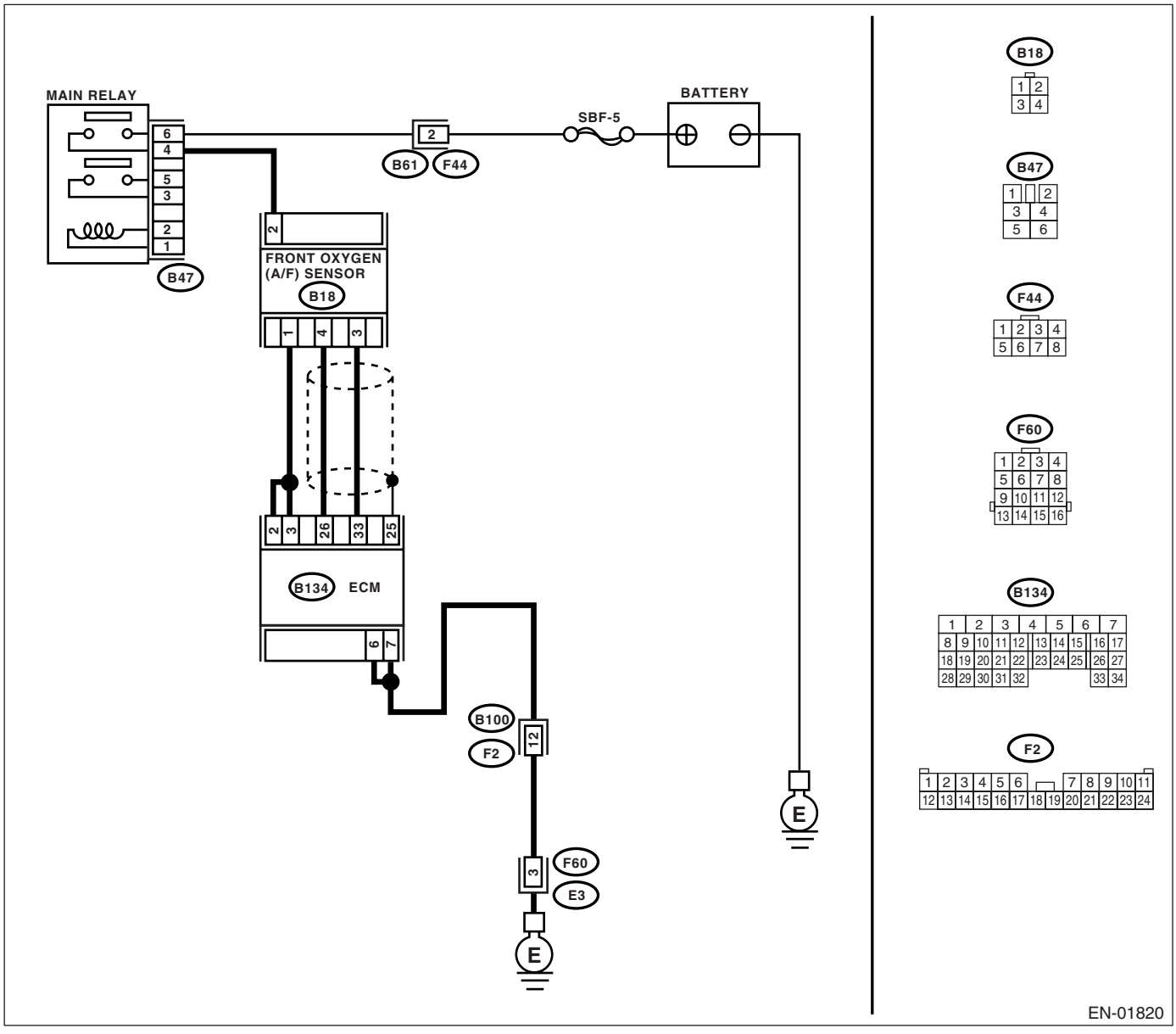
X: DTC P0131 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-52, DTC P0131 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 26 — Chassis ground:*** ***(B134) No. 33 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the front oxygen (A/F) sensor. <Ref. to FU(STi)-36, Front Oxygen (A/F) Sensor.>	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.

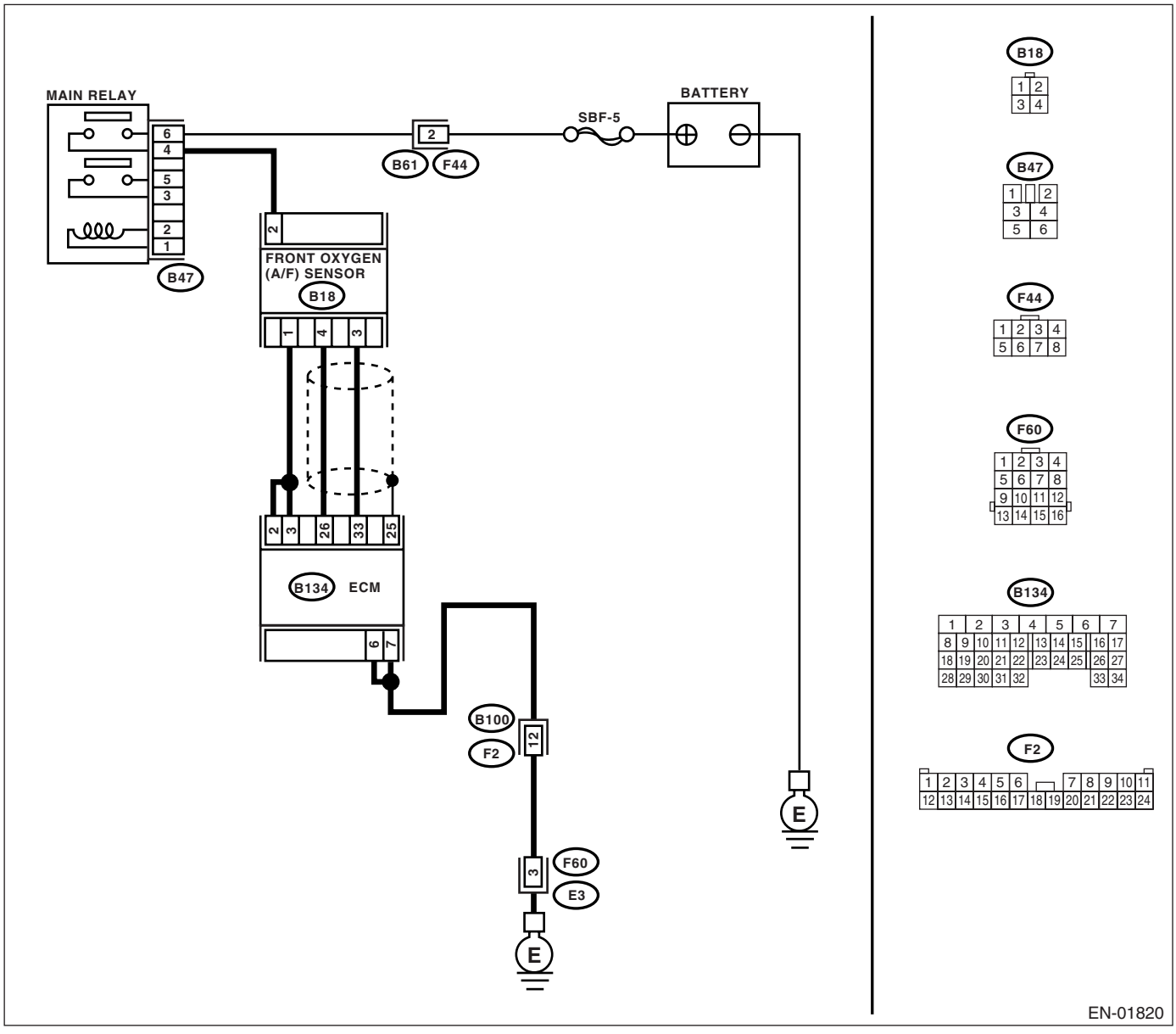
Y: DTC P0132 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-54, DTC P0132 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from front oxygen (A/F) sensor. 3) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 (+) — Chassis ground (−):*** ***(B134) No. 33 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Replace the front oxygen (A/F) sensor. <Ref. to FU(STi)-36, Front Oxygen (A/F) Sensor.>	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.

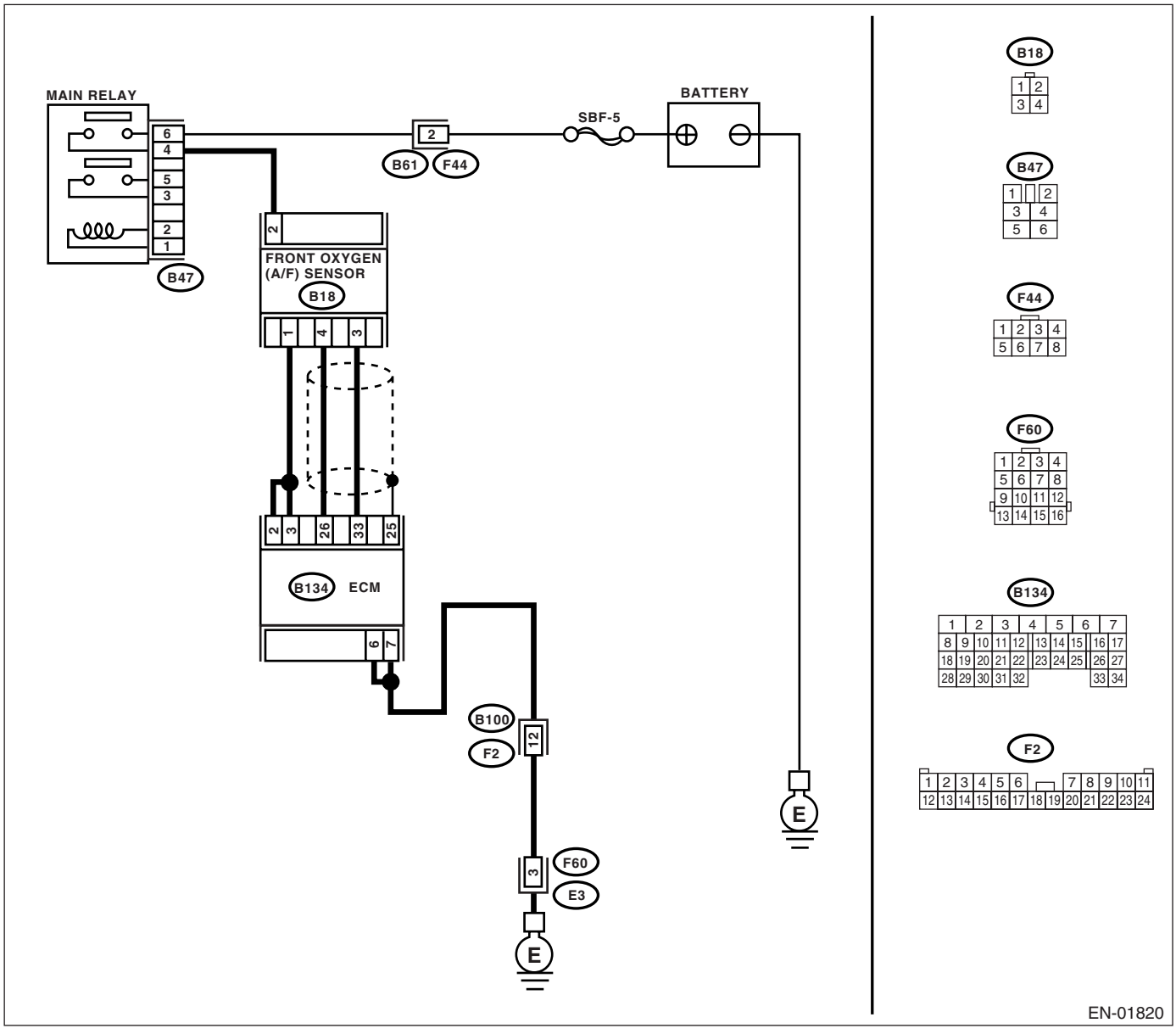
Z: DTC P0133 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-56, DTC P0133 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** NOTE: Check the following items. • Loose installation of front portion of exhaust pipe onto cylinder heads • Loose connection between front exhaust pipe and front catalytic converter • Damage of exhaust pipe resulting in a hole	Is there a fault in exhaust system?	Repair the exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(STi)-36, Front Oxygen (A/F) Sensor.>

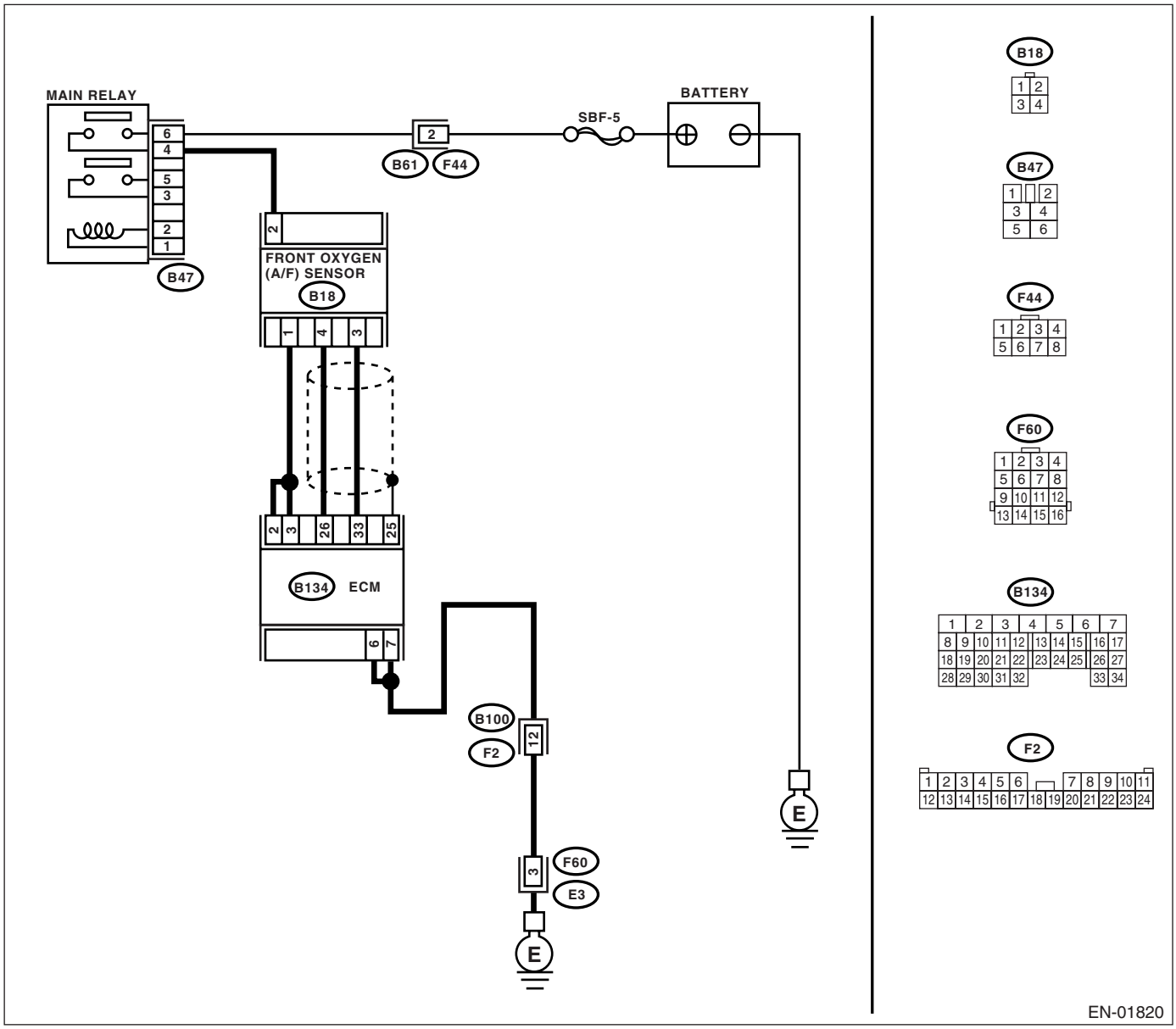
AA:DTC P0134 O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-59, DTC P0134 O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 26 — (B18) No. 4:*** ***(B134) No. 33 — (B18) No. 3:***	Is the resistance less than 1 Ω?	Replace the front oxygen (A/F) sensor. <Ref. to FU(STi)-36, Front Oxygen (A/F) Sensor.>	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.

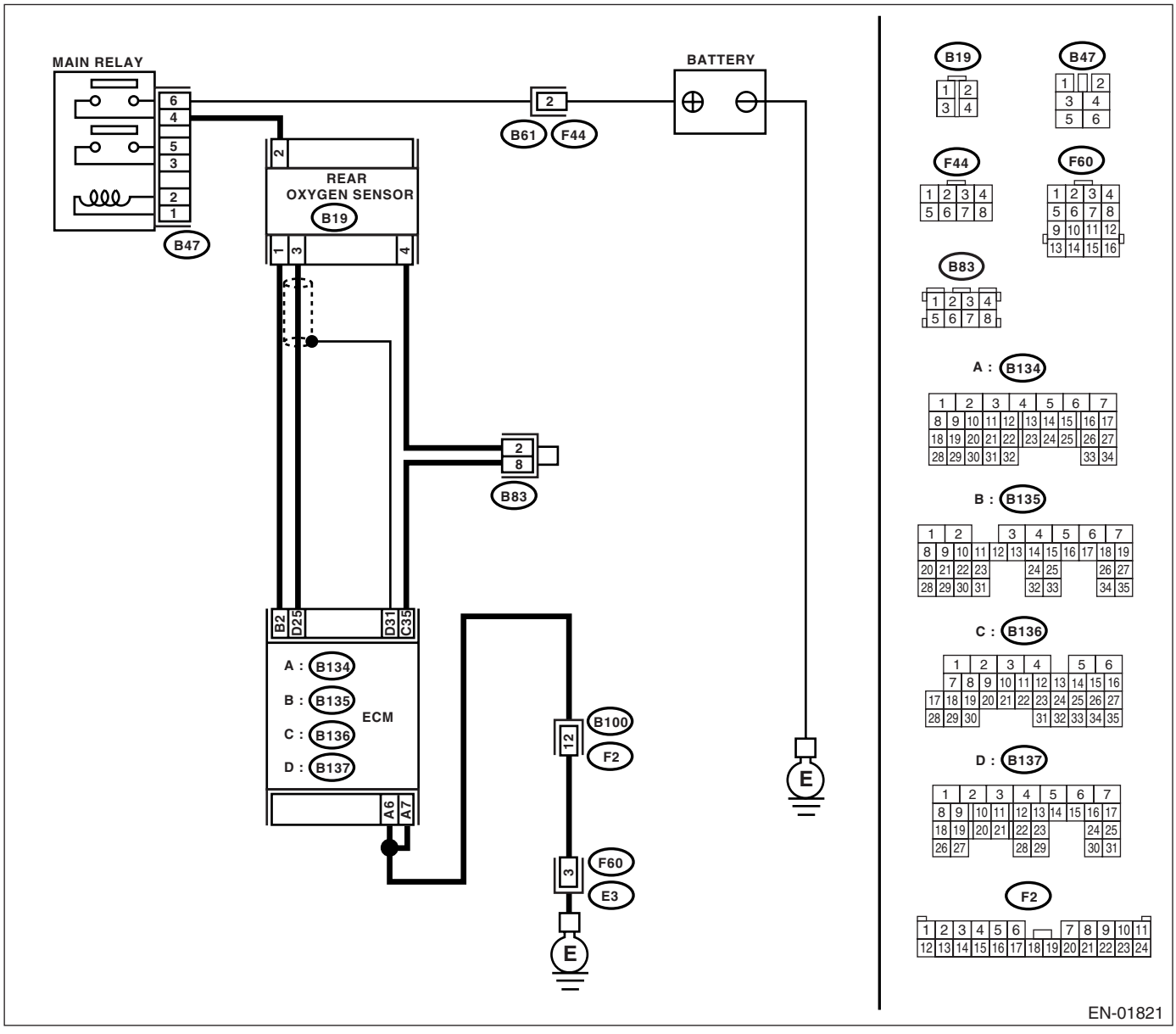
AB:DTC P0137 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-61, DTC P0137 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for 2 minutes. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Does the value fluctuate?	Go to step **6.**	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool.	Is the voltage 0.2 — 0.4 V?	Go to step **4.**	Replace the rear oxygen sensor. <Ref. to FU(STi)-38, Rear Oxygen Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B137) No. 25 — (B19) No. 3:***	Is the resistance more than 3 Ω?	Repair the open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(B19) No. 3 (+) — Engine ground (−):***	Is the voltage more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(STi)-38, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

Step		Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(STi)-38, Rear Oxygen Sensor.>

AC:DTC P0138 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

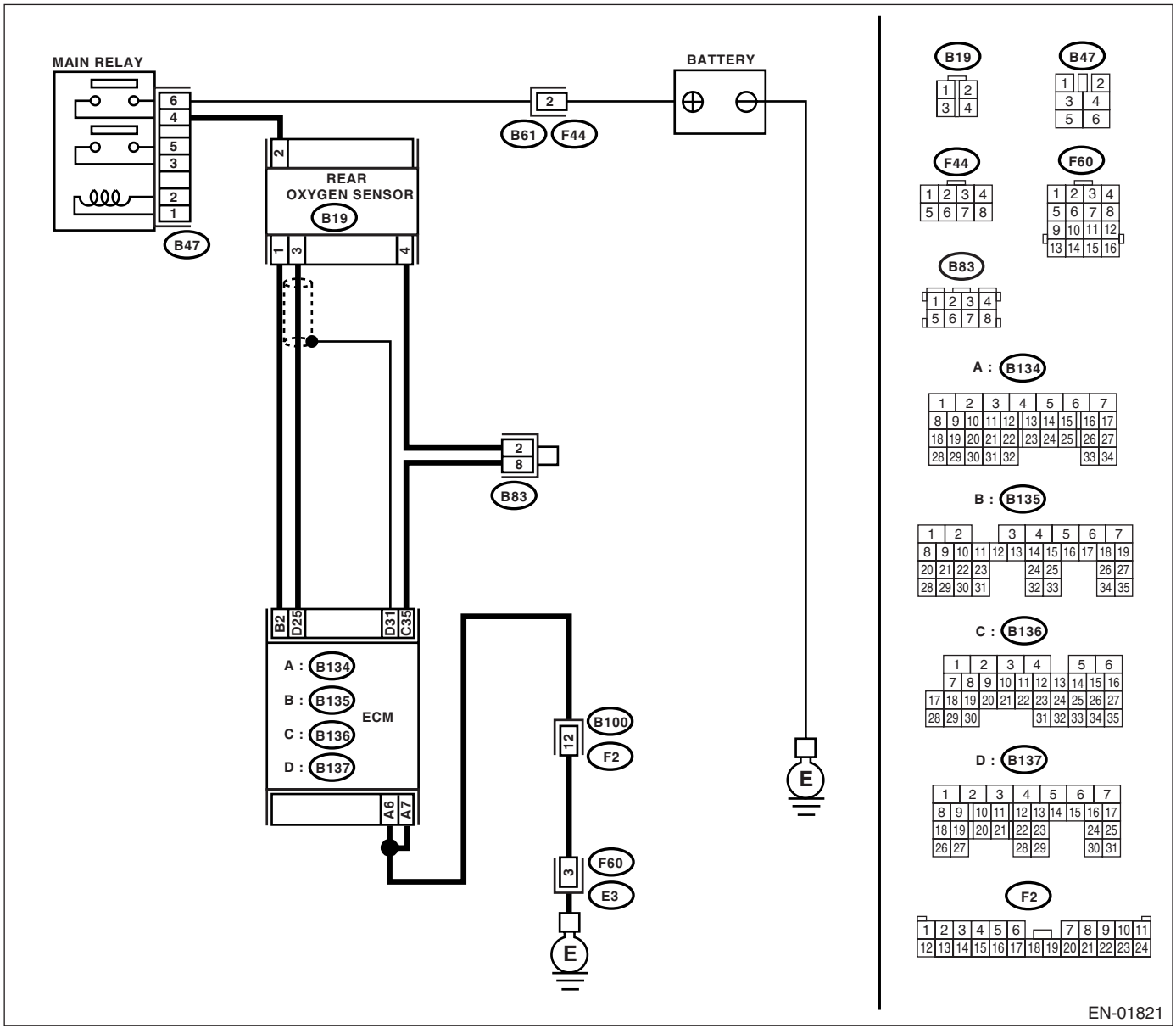
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-63, DTC P0138 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for 2 minutes. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Does the value fluctuate?	Go to step **6.**	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool.	Is the voltage 0.2 — 0.4 V?	Go to step **4.**	Replace the rear oxygen sensor. <Ref. to FU(STi)-38, Rear Oxygen Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B137) No. 25 — (B19) No. 3:***	Is the resistance more than 3 Ω?	Repair the open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(B19) No. 3 (+) — Engine ground (−):***	Is the voltage more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(STi)-38, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

	Step	Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(STi)-38, Rear Oxygen Sensor.>

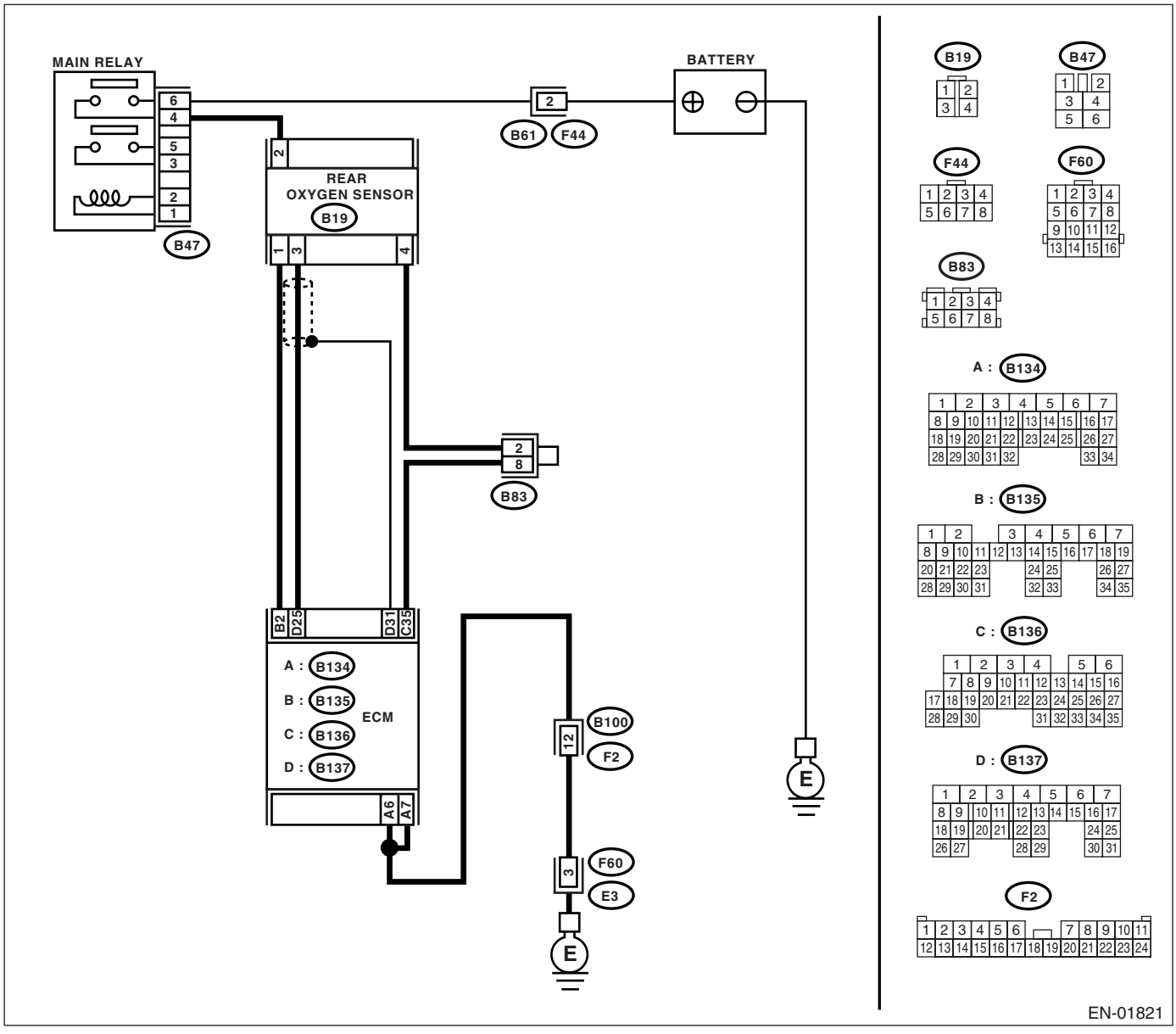
AD:DTC P0139 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-65, DTC P0139 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Replace the rear oxygen sensor. <Ref. to FU(STi)-38, Rear Oxygen Sensor.>

AE:DTC P0171 SYSTEM TOO LEAN (BANK 1)

NOTE:
For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(STi)(diag)-138, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AF:DTC P0172 SYSTEM TOO RICH (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-68, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(STi)-71, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **3.**
3	**CHECK FUEL PRESSURE.** **Warning:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel on the floor.** 1) Release the fuel pressure. (1)Disconnect the connector from fuel pump relay. (2)Start the engine and run it until it stalls. (3)After the engine stalls, crank it for 5 more seconds. (4)Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install the fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)?	Go to step **4.**	Repair the following items. Fuel pressure too high: • Clogged fuel return line or bent hose Fuel pressure too low: • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
4	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: • If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.	Is the measured value 206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)?	Go to step **5.**	Repair the following items. Fuel pressure too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
5	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature more than 60°C (140°F)?	Go to step **6.**	Replace the engine coolant temperature sensor. <Ref. to FU(STi)-25, Engine Coolant Temperature Sensor.>
6	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within the followings? Ignition ON: 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) Idling: 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)	Go to step **7.**	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(STi)-29, Mass Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
7	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Subtract ambient temperature from intake air temperature. Is the obtained value −10°C — 50°C (14°F — 122°F)?	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(STi)-29, Mass Air Flow and Intake Air Temperature Sensor.>

AG:DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE

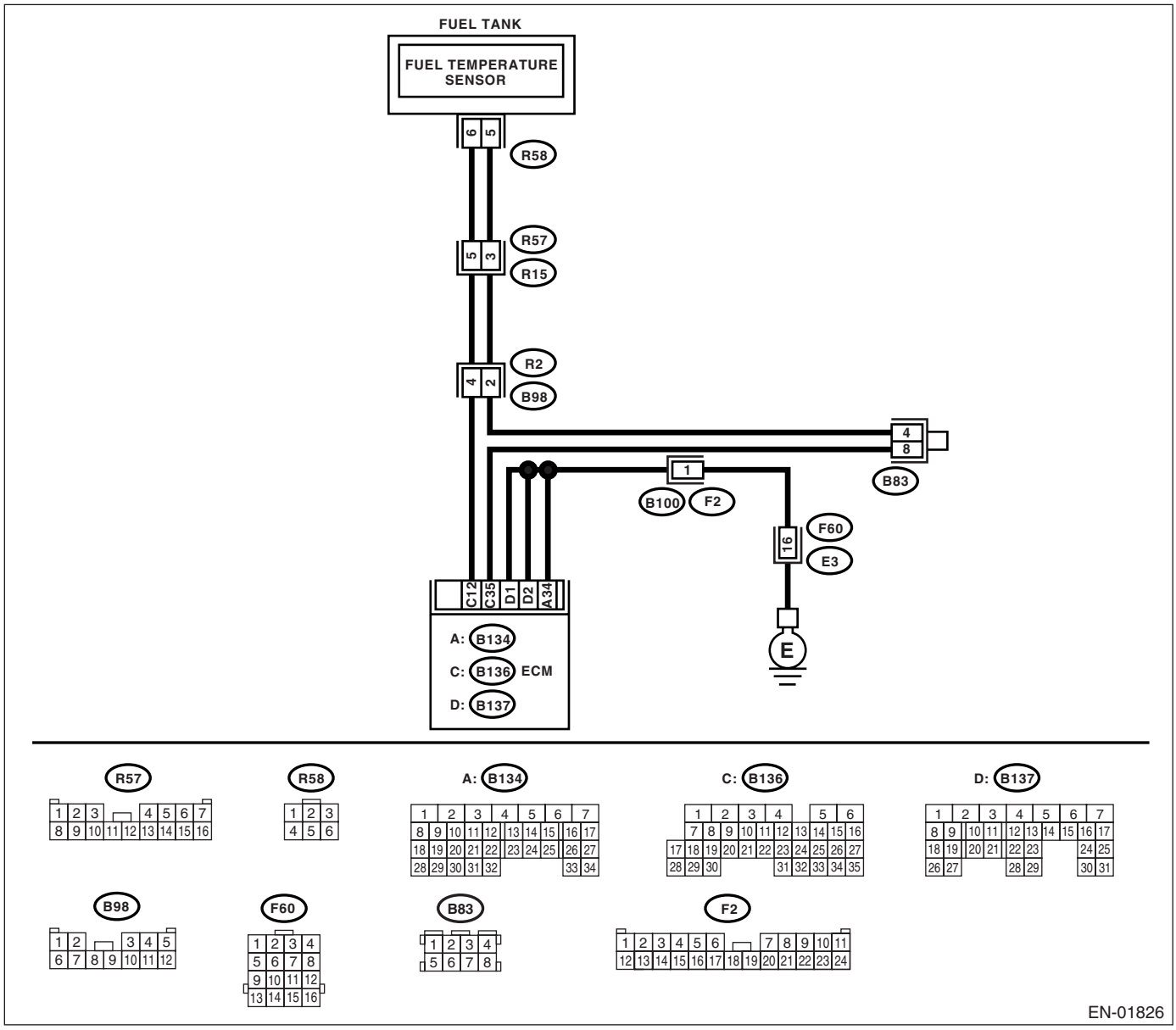
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-74, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	CHECK FOR OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Codes (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0181.	Replace the fuel temperature sensor. <Ref. to EC(STi)-8, Fuel Temperature Sensor.>

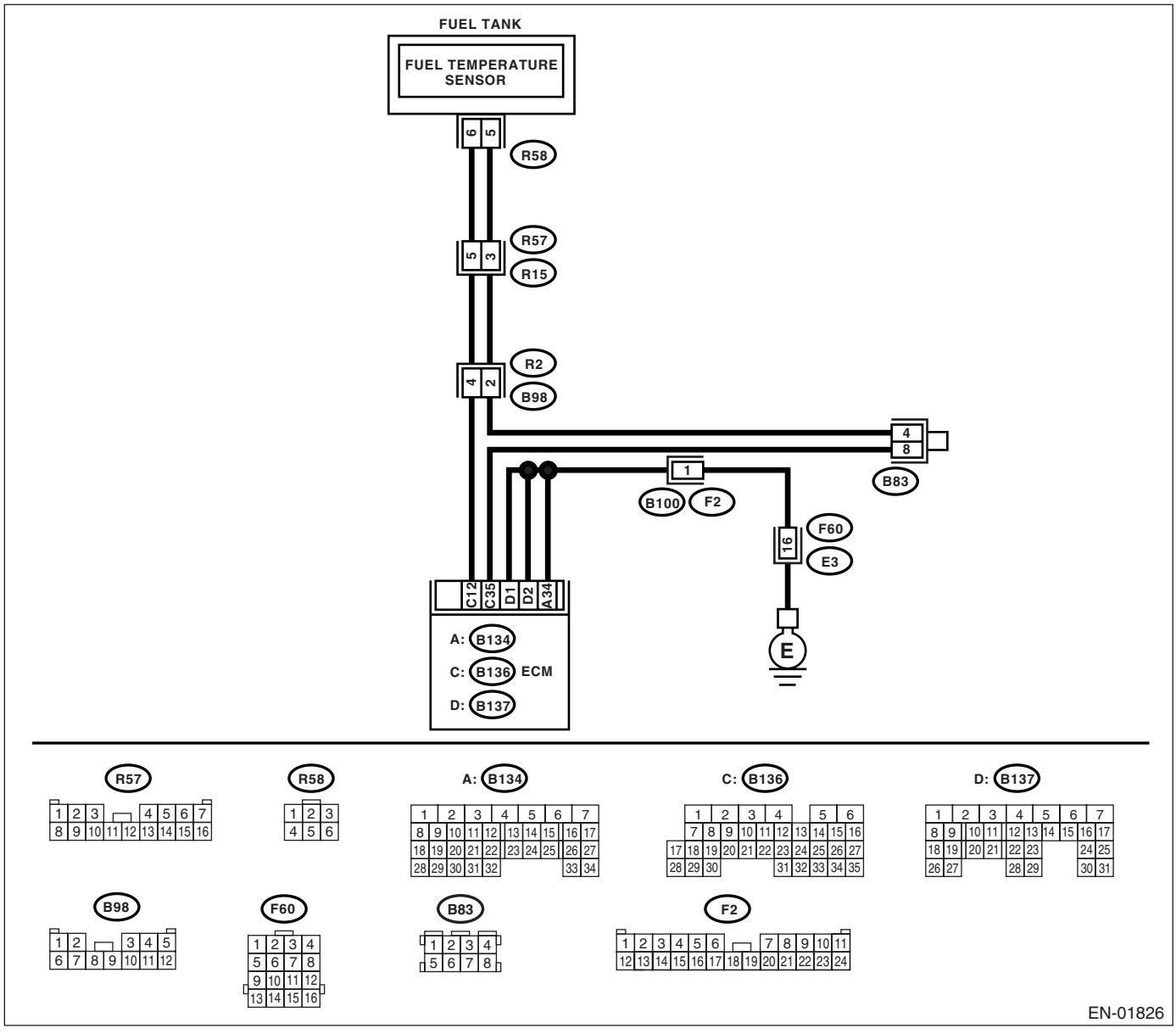
AH:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-77, DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature more than 150°C (302°F)?	Go to step **2.**	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.
2	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove the access hole lid. 3) Disconnect the connector from fuel pump. 4) Turn ignition switch to ON. 5) Read the data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature less than −40°C (−40°F)?	Replace the fuel temperature sensor. <Ref. to EC(STi)-8, Fuel Temperature Sensor.>	Repair short circuit to ground in harness between fuel pump and ECM connector.

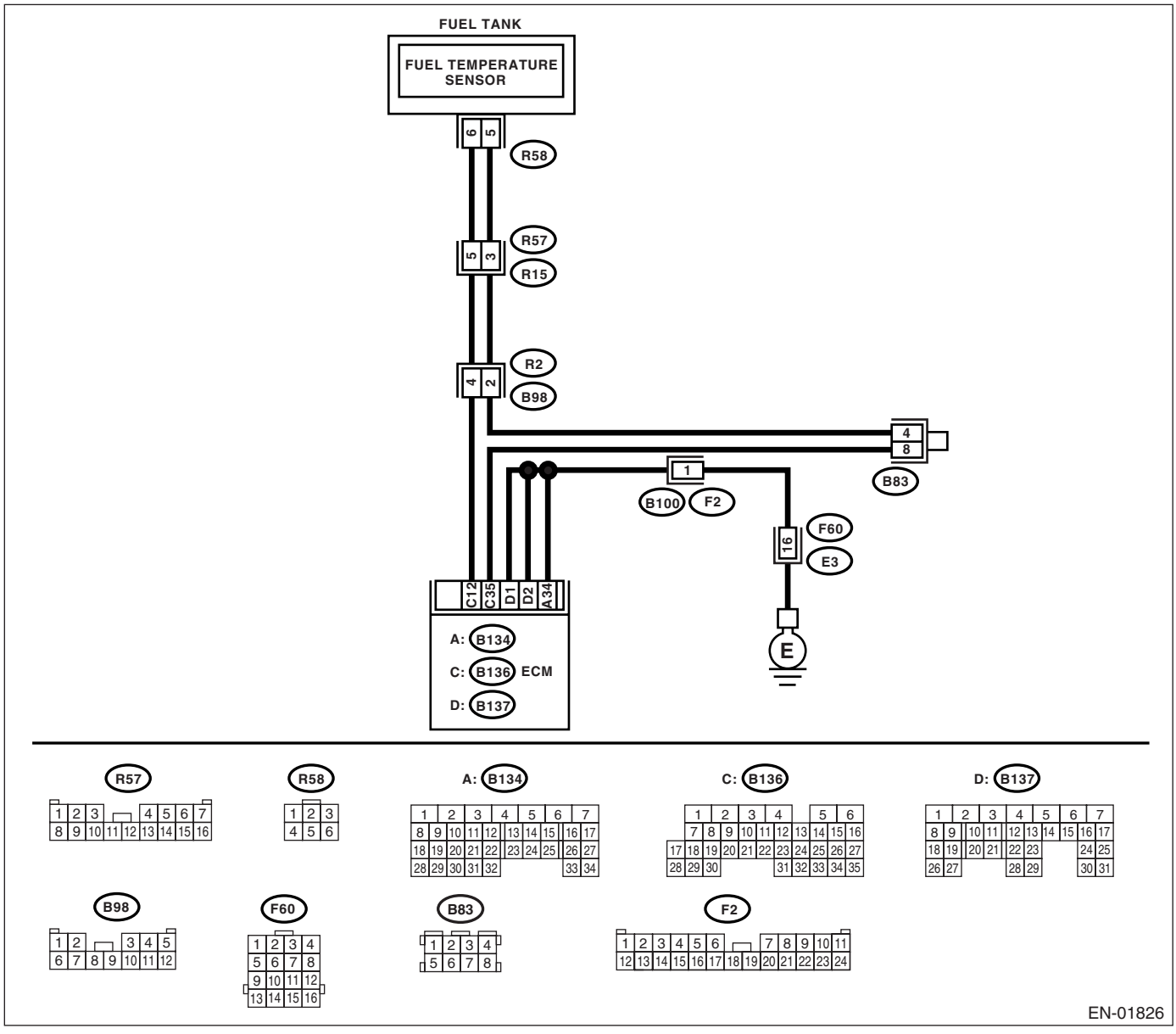
AI: DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-79, DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of fuel temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature less than –40°C (–40°F)?	Go to step **2.**	Repair poor contact. NOTE: In this case, repair the following: • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Remove the access hole lid. 3) Disconnect the connector from fuel pump. 4) Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and fuel pump connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to ON. 2) Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and fuel pump connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 4 V?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between fuel pump connector and ECM. ***Connector & terminal*** ***(R58) No. 5 — (B136) No. 35:***	Is the resistance less than 1 Ω?	Replace the fuel temperature sensor. <Ref. to EC(STi)-8, Fuel Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

AJ:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “b” CIRCUIT LOW INPUT

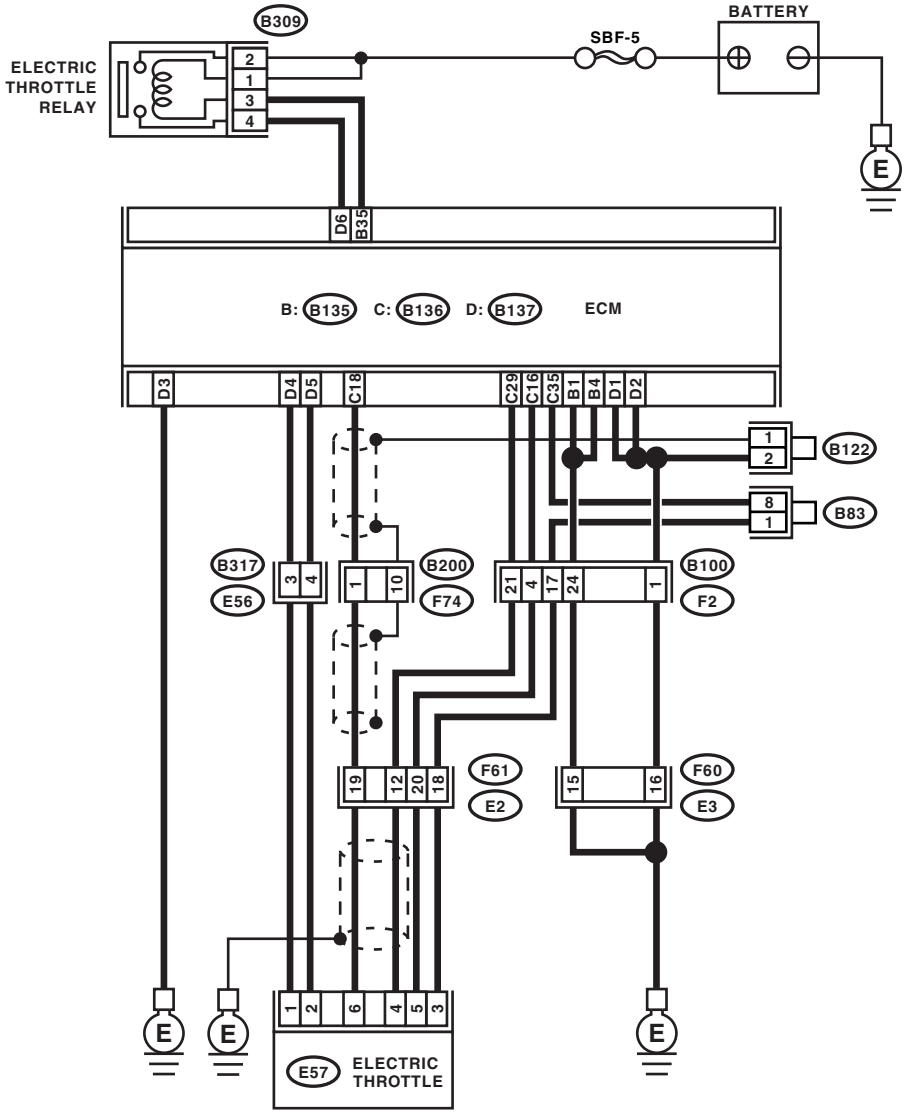
DTC DETECTING CONDITION:

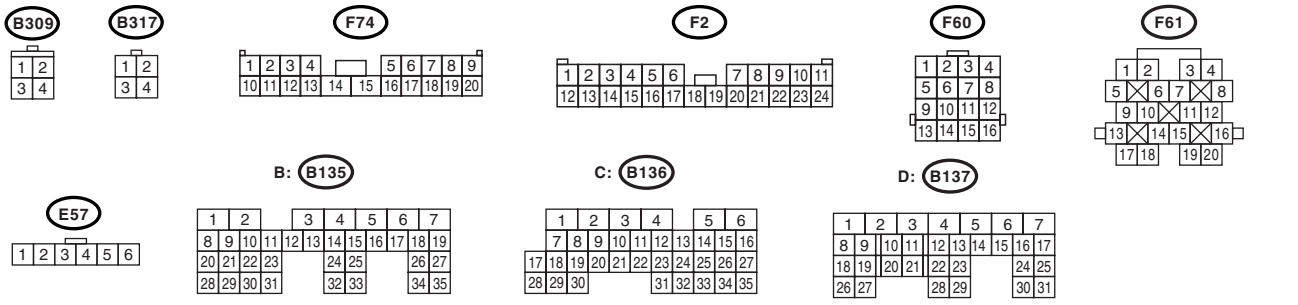
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-81, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 29 (+) — (B136) No. 35 (–):*** 3) Shake the ECM harness and connector, engine harness connectors (E84, E22), electric throttle connector harness while monitoring value of voltage meter.	Is the voltage more than 0.8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in the connectors between the ECM and electric throttle.	Is there poor contact in the connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electric throttle. 4) Measure the resistance between the ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 16 — (E57) No. 5:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** Check the resistance between the ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 29 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the chassis short of harness.
5	**CHECK POWER SURPLY TO SENSOR.** 1) Connect the ECM connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):*** 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>
6	**CHECK SHORT OF ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 — Engine ground:***	Is the resistance more than 10 Ω?	Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle.	Repair the poor contact in ECM connectors. If problem persists, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>

AK:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “b” CIRCUIT HIGH INPUT

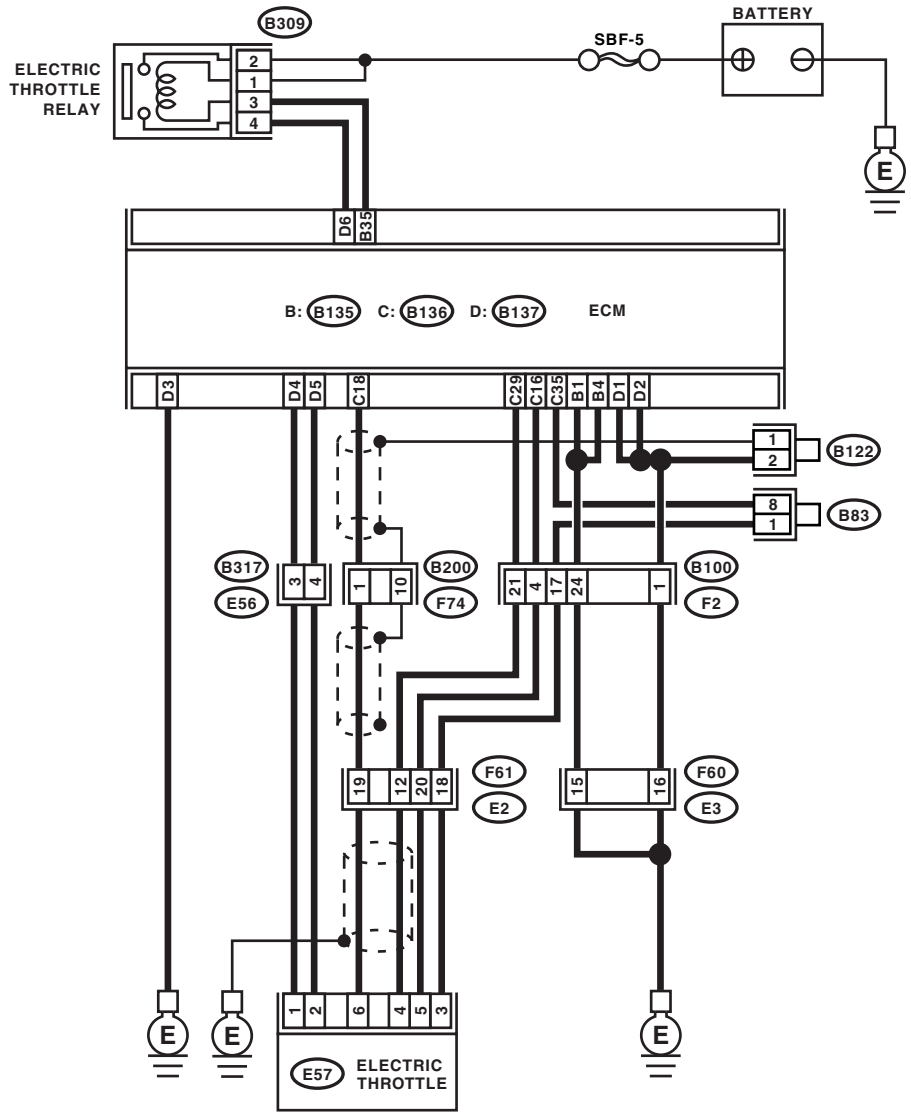
DTC DETECTING CONDITION:

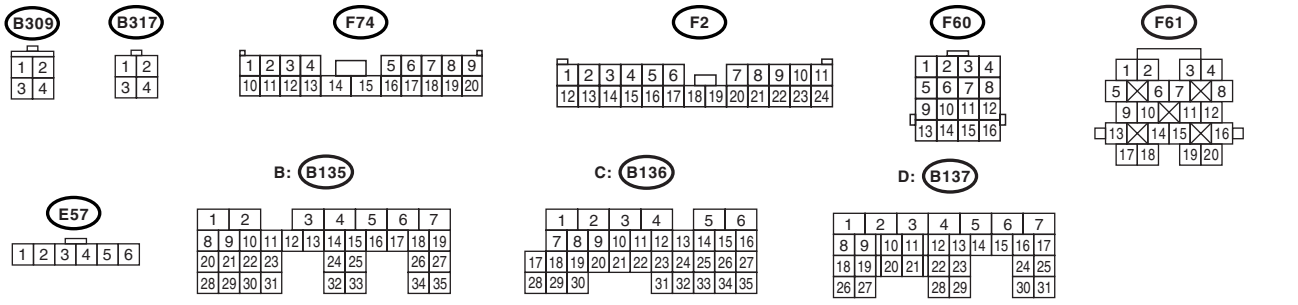
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-83, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Turn the ignition switch to ON. 2) Read the data of sub throttle sensor signals, using the Subaru Select Monitor. 3) Shake the ECM harness and connector, engine harness connectors (E84, E22), electric throttle connector harness while monitoring value of voltage meter.	Is the voltage less than 4.73 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle.	Is there poor contact in the connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 35 — (E57) No. 3:*** ***(B136) No. 29 — (E57) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Connect the ECM connector. 2) Measure the resistance between the electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the poor contact in ECM connector. If the problem persists, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>
5	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 — Engine ground:*** 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage more than 10 V?	Go to step **6.**	Repair the battery short of harness between ECM connector and electric throttle connector.
6	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Measure the voltage between the electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 (+) — Engine ground (−):*** 2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage less than 10 V?	Go to step **7.**	Repair the short of harness between ECM connector and electric throttle connector.

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the voltage between connectors. ***Connector & terminal*** ***(B136) No. 29 — (B136) No. 16:***	Is the resistance more than 1 MΩ?	Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle.	Short circuit of sensor power supply may be the cause.

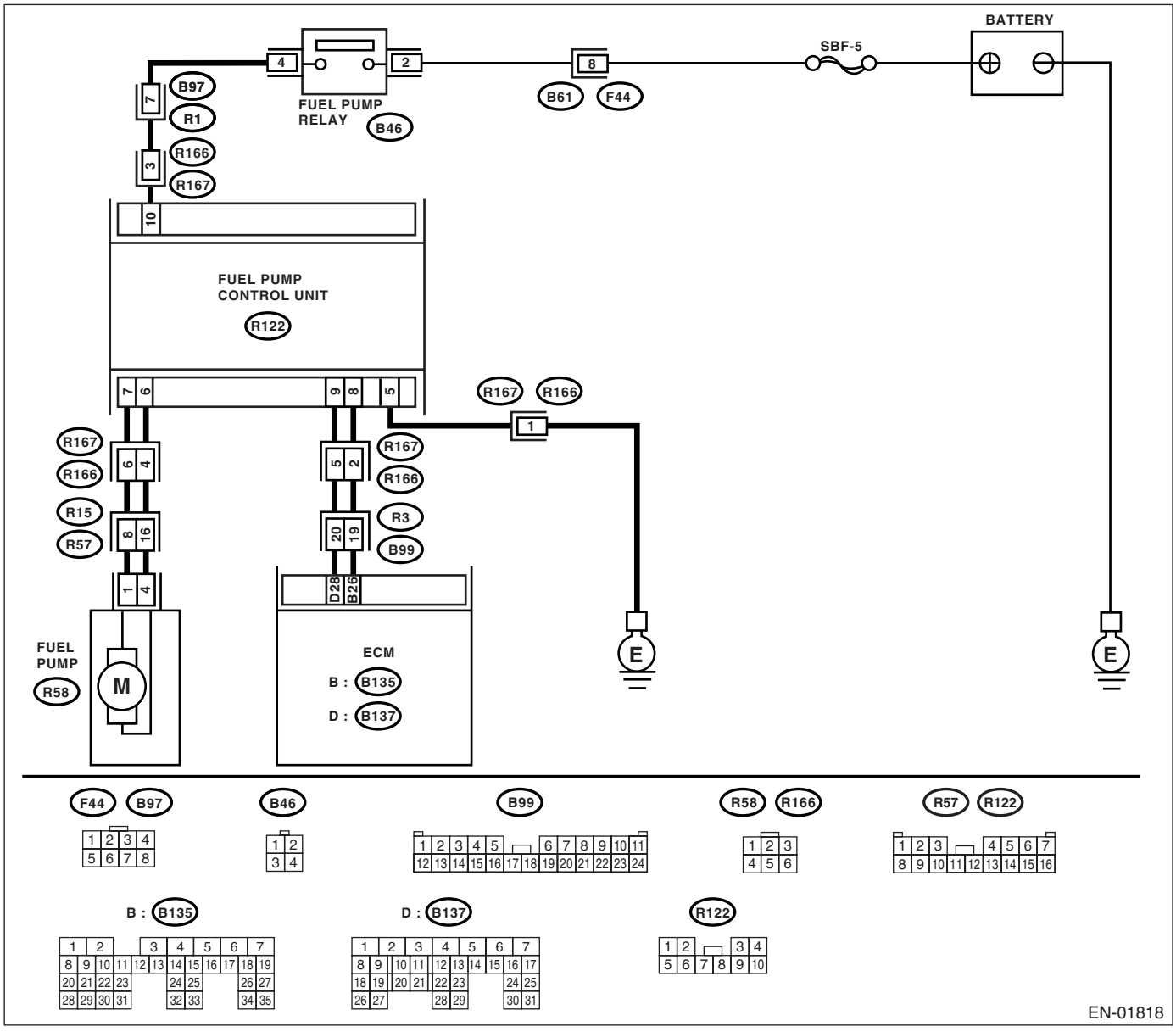
AL:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-85, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel pump control unit. 3) Turn the ignition switch to ON. 4) Measure the voltage between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Repair the power supply circuit. NOTE: In this case repair the following: • Open or ground short circuit in harness between fuel pump relay and fuel pump control unit • Poor contact in fuel pump control unit connector • Poor contact in fuel pump relay connector
2	**CHECK GROUND CIRCUIT OF FUEL PUMP CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit between fuel pump control unit and chassis ground • Poor contact in fuel pump control unit connector
3	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.** 1) Disconnect the connector from fuel pump. 2) Measure the resistance of harness between fuel pump control unit and fuel pump connector. ***Connector & terminal*** ***(R122) No. 7 — (R58) No. 1:*** ***(R122) No. 6 — (R58) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit between fuel pump control unit and fuel pump.
4	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.** Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 7 — Chassis ground:*** ***(R122) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit between fuel pump control unit and fuel pump.

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between fuel pump control unit and ECM connector. ***Connector & terminal*** ***(R122) No. 9 — (B137) No. 28:*** ***(R122) No. 8 — (B135) No. 26:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit between fuel pump control unit and ECM • Poor contact in fuel pump control unit and ECM connector
6	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.** Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 9 — Chassis ground:*** ***(R122) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit between fuel pump control unit and ECM.
7	**CHECK POOR CONTACT.** Check poor contact in ECM and fuel pump control unit connector.	Is there poor contact in ECM and fuel pump control unit connector?	Repair the poor contact in ECM and fuel pump control unit.	Go to step **8.**
8	**CHECK EXPERIENCE OF OUT OF GAS.**	Have the vehicle been out of gas before?	Complete the diagnosis. NOTE: DTC may be recorded due to the idle running of fuel pump at out of gas.	Replace the fuel pump control unit. <Ref. to FU(STi)-43, Fuel Pump Control Unit.>

AM:DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-87, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

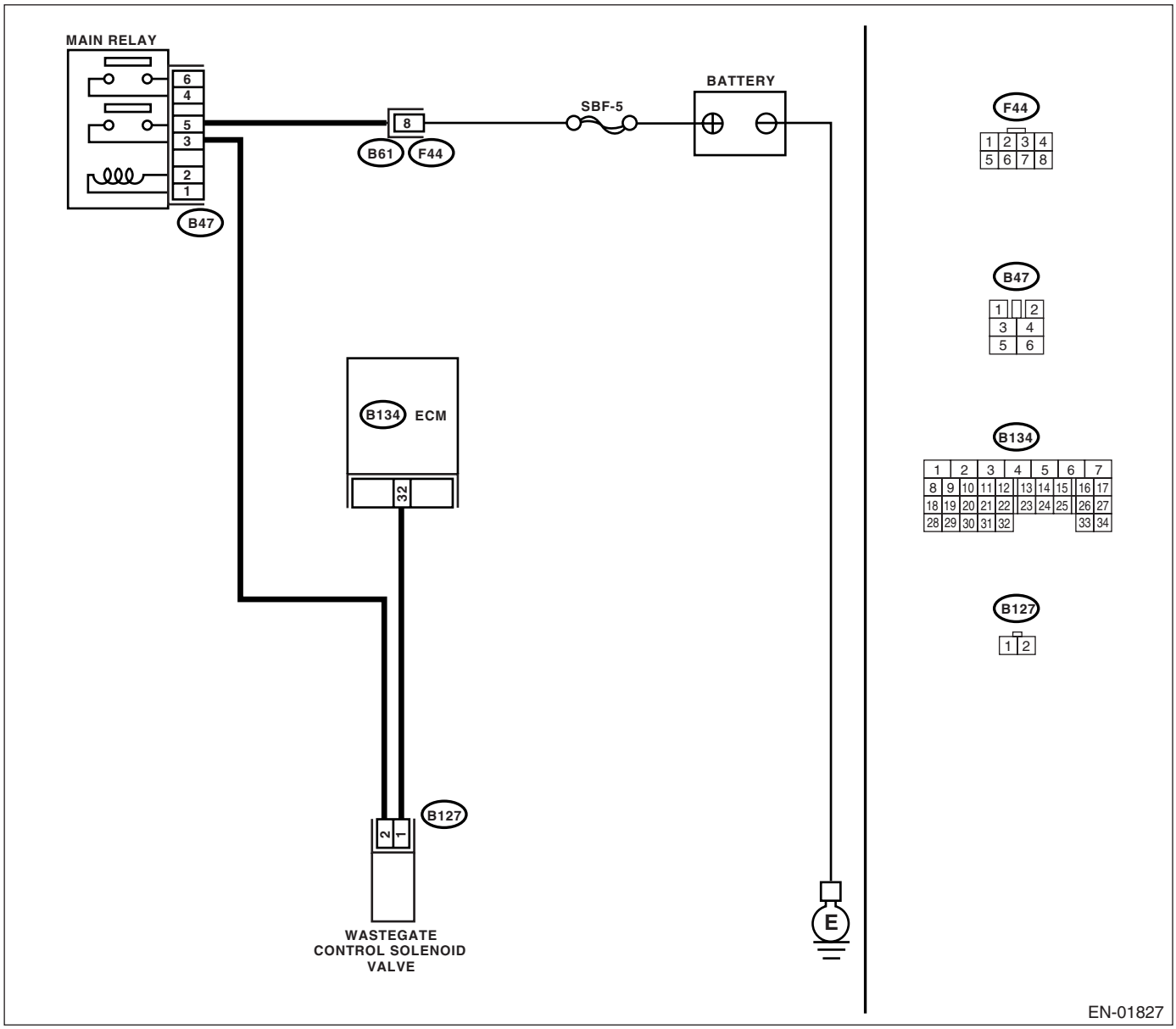
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0244.	Replace the wastegate control solenoid valve. <Ref. to FU(STi)-35, Wastegate Control Solenoid Valve.>

AN:DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-89, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

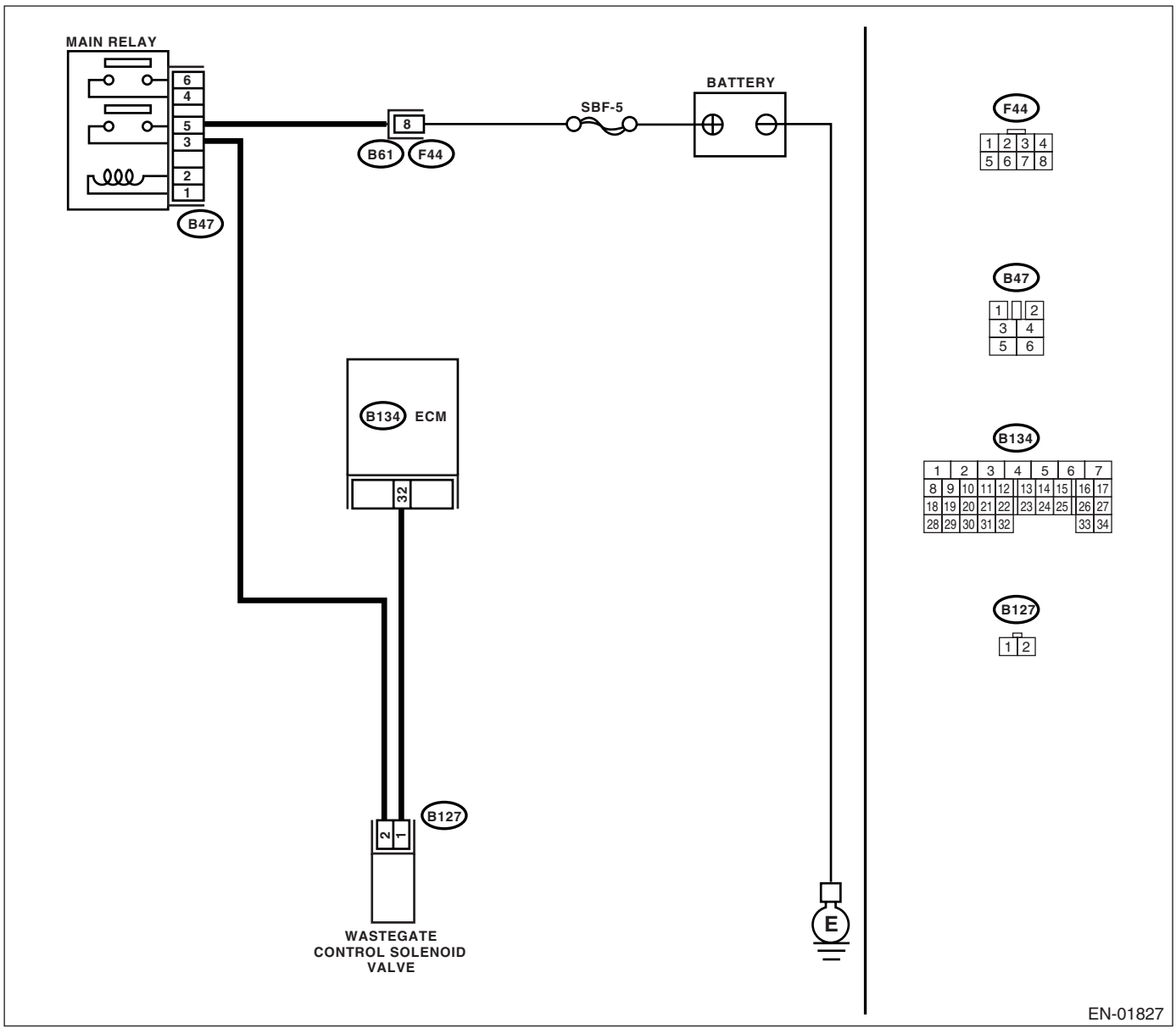
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 32 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.	Go to step **2.**
2	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from wastegate control solenoid valve and ECM. 3) Measure the resistance of harness between wastegate control solenoid valve connector and engine ground. ***Connector & terminal*** ***(B127) No. 1 — Engine ground:***	Is the resistance less than 10 Ω?	Repair the ground short circuit in harness between ECM and wastegate control solenoid valve connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and wastegate control solenoid valve of harness connector. ***Connector & terminal*** ***(B134) No. 32 — (B127) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between ECM and wastegate control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and wastegate control solenoid valve connector
4	**CHECK WASTEGATE CONTROL SOLENOID VALVE.** 1) Remove the wastegate control solenoid valve. 2) Measure the resistance between wastegate control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 30 — 40 Ω?	Go to step **5.**	Replace the wastegate control solenoid valve. <Ref. to FU(STi)-35, Wastegate Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO WASTEGATE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between wastegate control solenoid valve and engine ground. ***Connector & terminal*** ***(B127) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Repair the open circuit in harness between main relay and wastegate control solenoid valve connector.
6	**CHECK POOR CONTACT.** Check poor contact in wastegate control solenoid valve connector.	Is there poor contact in wastegate control solenoid valve connector?	Repair the poor contact in wastegate control solenoid valve connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AO:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-91, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

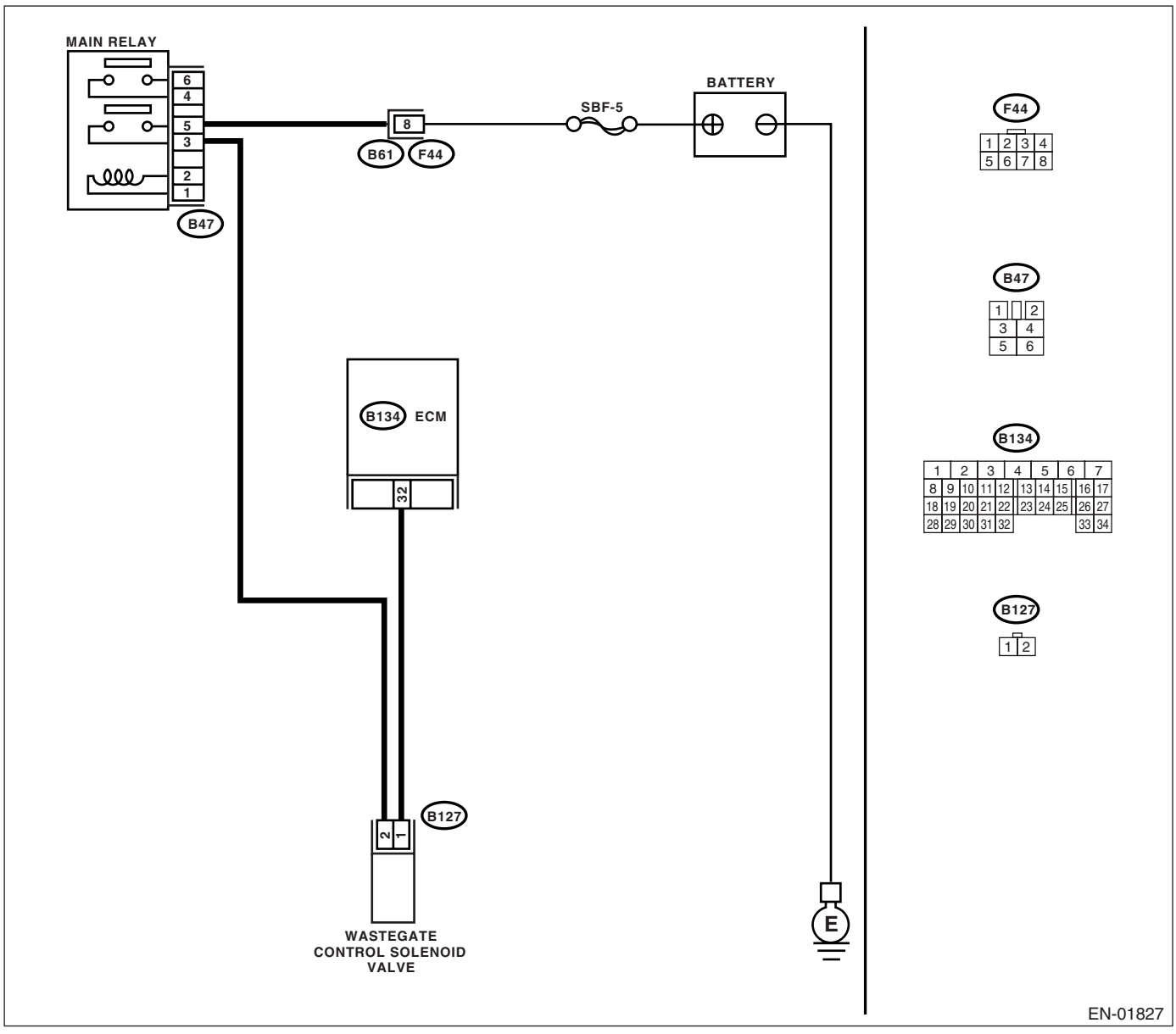
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 32 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>
3	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from wastegate control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 32 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and wastegate control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>	Go to step **4.**
4	**CHECK WASTEGATE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between wastegate control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the wastegate control solenoid valve <Ref. to FU(STi)-35, Wastegate Control Solenoid Valve.> and ECM <Ref. to FU(STi)-40, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>

AP:DTC P0301 CYLINDER 1 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(STi)(diag)-163, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AQ:DTC P0302 CYLINDER 2 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(STi)(diag)-163, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AR:DTC P0303 CYLINDER 3 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(STi)(diag)-163, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AS:DTC P0304 CYLINDER 4 MISFIRE DETECTED

DTC DETECTING CONDITION:

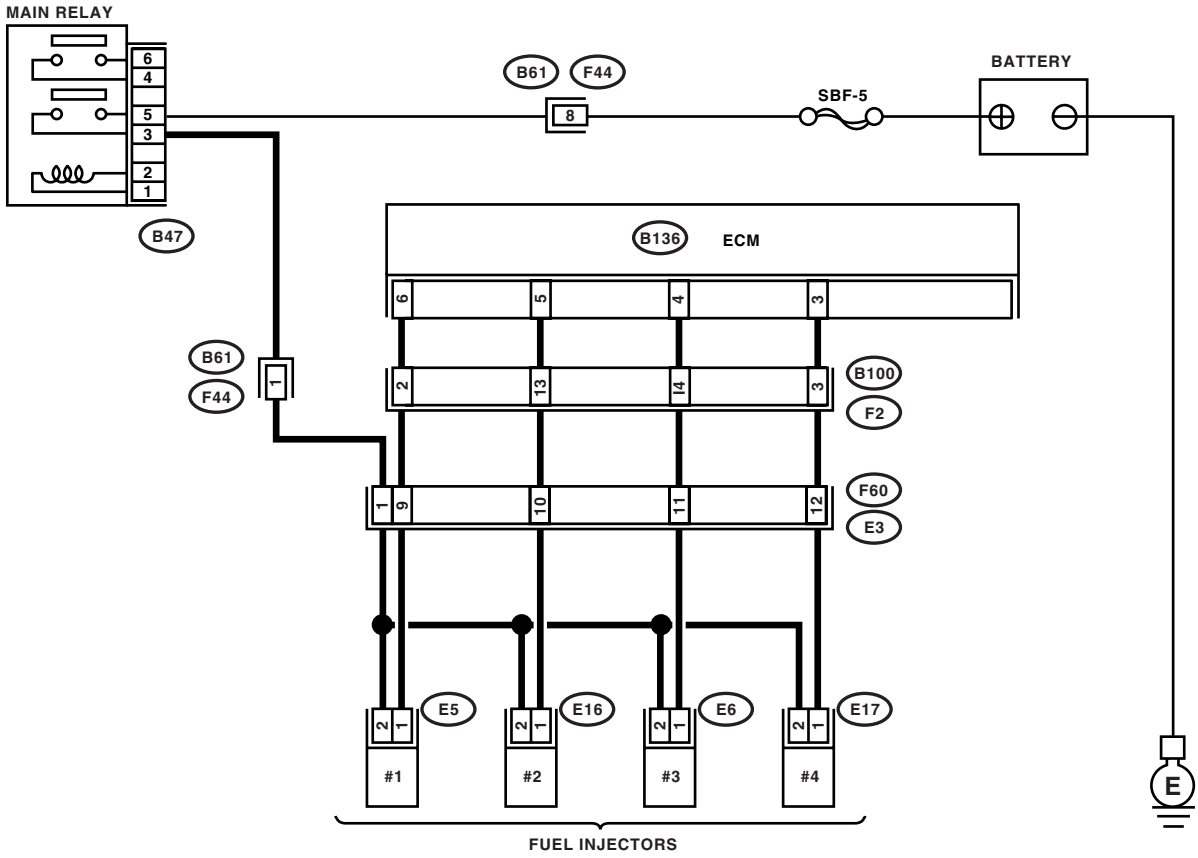
- Two consecutive driving cycles with fault
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- GENERAL DESCRIPTION <Ref. to GD(STi)-93, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

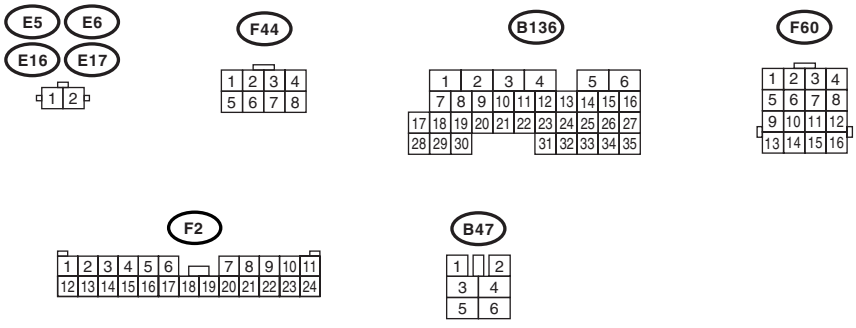
TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling
- Rough driving

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B136) No. 6 (+) — Chassis ground (−):*** ***#2 (B136) No. 5 (+) — Chassis ground (−):*** ***#3 (B136) No. 4 (+) — Chassis ground (−):*** ***#4 (B136) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **7.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Disconnect the connector from ECM. 4) Measure the resistance between ECM connector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 1 — Engine ground:*** ***#2 (E16) No. 1 — Engine ground:*** ***#3 (E6) No. 1 — Engine ground:*** ***#4 (E17) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the ground short circuit in harness between fuel injector and ECM connector.
4	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders. ***Connector & terminal*** ***#1 (B136) No. 6 — (E5) No. 1:*** ***#2 (B136) No. 5 — (E16) No. 1:*** ***#3 (B136) No. 4 — (E6) No. 1:*** ***#4 (B136) No. 3 — (E17) No. 1:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
5	**CHECK FUEL INJECTOR.** Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **6.**	Replace the faulty fuel injector. <Ref. to FU(STi)-31, Fuel Injector.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY LINE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel injector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (−):*** ***#2 (E16) No. 2 (+) — Engine ground (−):*** ***#3 (E6) No. 2 (+) — Engine ground (−):*** ***#4 (E17) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the poor contact in all connectors in fuel injector circuit.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel injector connector on faulty cylinders • Poor contact in coupling connector • Poor contact in main relay connector • Poor contact in fuel injector connector on faulty cylinders
7	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinder. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B136) No. 6 (+) — Chassis ground (−):*** ***#2 (B136) No. 5 (+) — Chassis ground (−):*** ***#3 (B136) No. 4 (+) — Chassis ground (−):*** ***#4 (B136) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and fuel injector. After repair, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>	Go to step **8.**
8	**CHECK FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the faulty fuel injector <Ref. to FU(STi)-31, Fuel Injector.> and ECM <Ref. to FU(STi)-40, Engine Control Module (ECM).>	Go to step **9.**
9	**CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.**	Is the camshaft position sensor or crankshaft position sensor loosely installed?	Tighten the camshaft position sensor or crankshaft position sensor.	Go to step **10.**
10	**CHECK CRANKSHAFT SPROCKET.** Remove the timing belt cover.	Is the crankshaft sprocket rusted or does it have broken teeth?	Replace the crankshaft sprocket. <Ref. to ME(STi)-55, Crankshaft Sprocket.>	Go to step **11.**
11	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block.	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(STi)-46, Timing Belt Assembly.>	Go to step **12.**

	Step	Check	Yes	No
12	**CHECK FUEL LEVEL.**	Is the fuel meter indication higher than the “Lower” level?	Go to step **13.**	Replenish the fuel so fuel meter indication is higher than the “Lower” level. After replenishing fuel; Go to step **13.**
13	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Clear the memory using Subaru Select Monitor. <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> 2) Start the engine, and drive the vehicle more than 10 minutes.	Is the malfunction indicator light coming on or blinking?	Go to step **15.**	Go to step **14.**
14	**CHECK CAUSE OF MISFIRE DIAGNOSED.**	Was the cause of misfire diagnosed when the engine is running?	Finish the diagnostics operation, if the engine has no abnormality.	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in ignition coil connector • Poor contact in fuel injector connector on faulty cylinders • Poor contact in ECM connector • Poor contact in coupling connector
15	**CHECK AIR INTAKE SYSTEM.**	Is there a fault in air intake system?	Repair the air intake system. NOTE: Check the following items: • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses?	Go to step **16.**
16	**CHECK CYLINDER.**	Is there a fault in that cylinder?	Repair or replace the faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression pressure	Go to DTC P0171 and P0172. <Ref. to EN(STi)(diag)-137, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AT:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-99, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

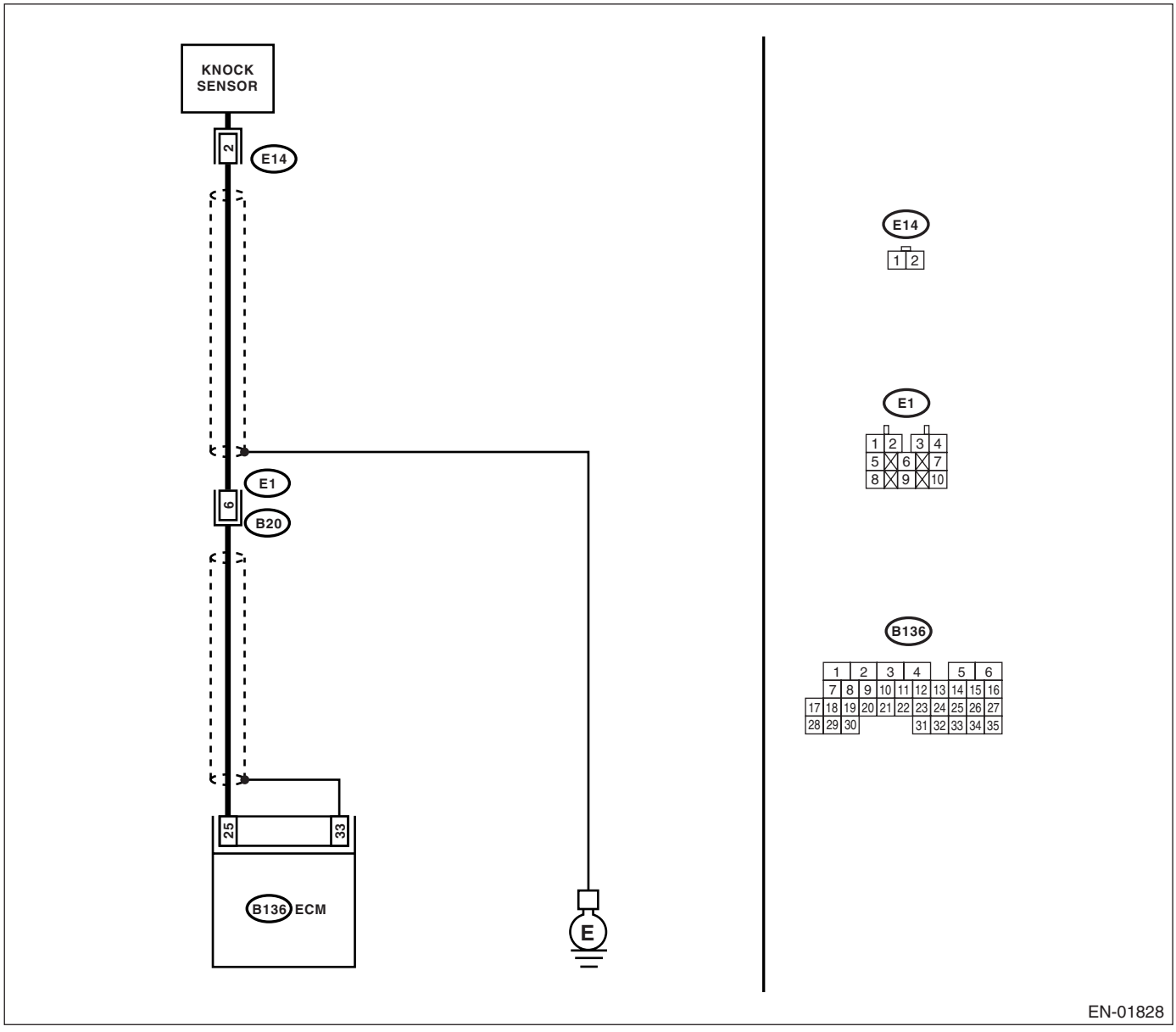
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM harness connector and chassis ground. ***Connector & terminal*** ***(B136) No. 25 — Chassis ground:***	Is the resistance more than 700 kΩ?	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. ***Terminals*** ***No. 2 — Engine ground:***	Is the resistance more than 700 kΩ?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Poor contact in knock sensor connector • Poor contact in coupling connector
3	**CHECK CONDITION OF KNOCK SENSOR INSTALLATION.**	Is the knock sensor installation bolt tightened securely?	Replace the knock sensor. <Ref. to FU(STi)-28, Knock Sensor.>	Tighten the knock sensor installation bolt securely.

AU:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-101, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

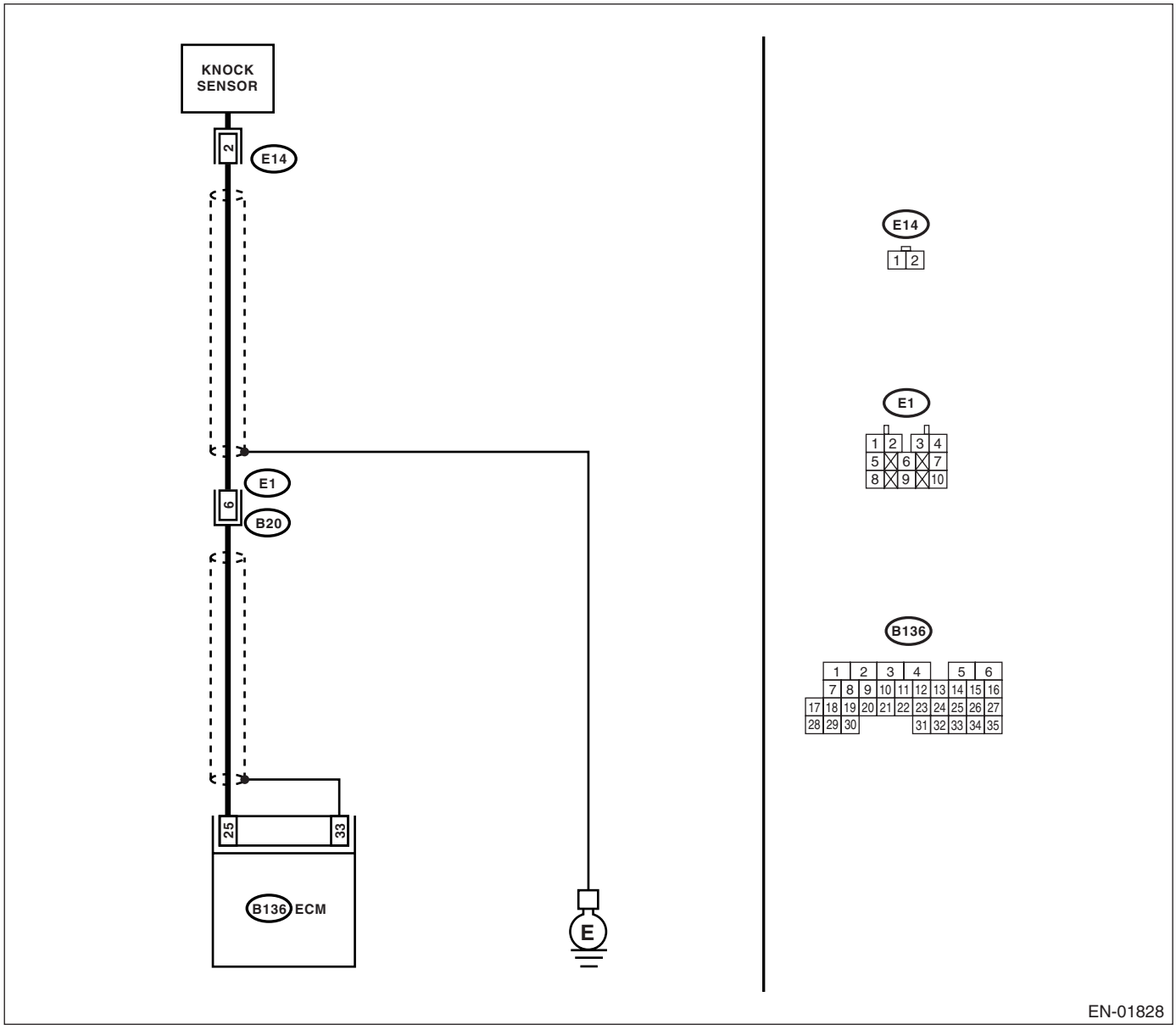
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 25 — Chassis ground:***	Is the resistance less than 400 kΩ?	Go to step **2.**	Go to step **3.**
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. ***Terminals*** ***No. 2 — Engine ground:***	Is the resistance less than 400 kΩ?	Replace the knock sensor. <Ref. to FU(STi)-28, Knock Sensor.>	Repair the ground short circuit in harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors is shielded. Repair the short circuit of harness together with shield.
3	**CHECK INPUT SIGNAL FOR ECM.** 1) Connect the connectors to ECM and knock sensor. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 25 (+) — Chassis ground (−):***	Is the voltage more than 2 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in knock sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Repair the poor contact in ECM connector.

AV:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-103, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

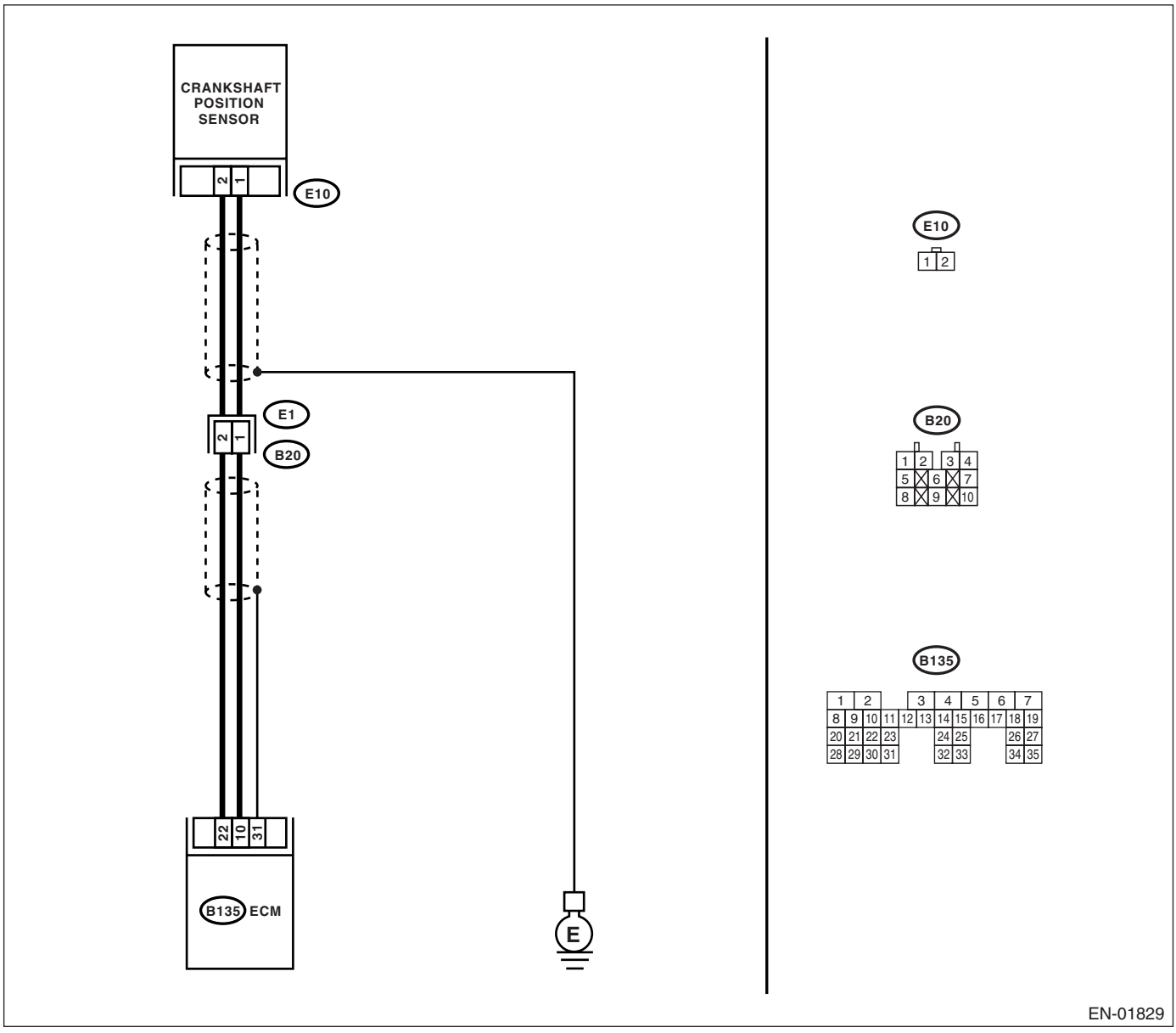
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from crankshaft position sensor. 3) Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the resistance more than 100 kΩ?	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **2.**
2	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the ground short circuit in harness between crankshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.
3	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
4	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.**	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **5.**	Tighten the crankshaft position sensor installation bolt securely.
5	**CHECK CRANKSHAFT POSITION SENSOR.** 1) Remove the crankshaft position sensor. 2) Measure the resistance between connector terminals of crankshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 — 4 kΩ?	Repair the poor contact in crankshaft position sensor connector.	Replace the crankshaft position sensor. <Ref. to FU(STi)-26, Crankshaft Position Sensor.>

AW:DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

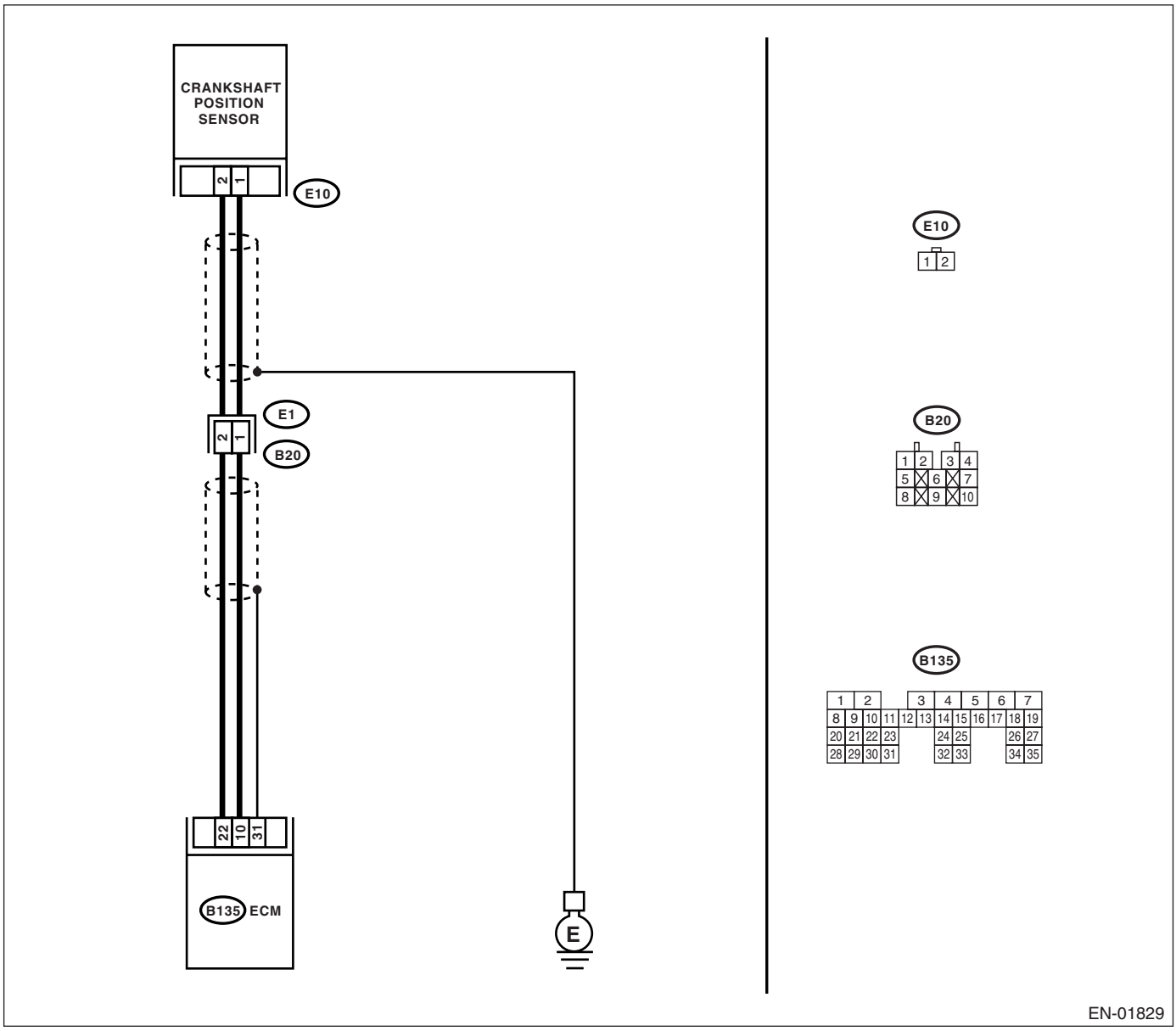
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-105, DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Turn the ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **3.**	Tighten the crankshaft position sensor installation bolt securely.
3	**CHECK CRANKSHAFT SPROCKET.** Remove the front belt cover.	Are the crankshaft sprocket teeth cracked or damaged?	Replace the crankshaft sprocket. <Ref. to FU(STi)-26, Crankshaft Position Sensor.>	Go to step **4.**
4	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block.	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(STi)-46, Timing Belt Assembly.>	Replace the crankshaft position sensor. <Ref. to FU(STi)-26, Crankshaft Position Sensor.>

AX:DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-107, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

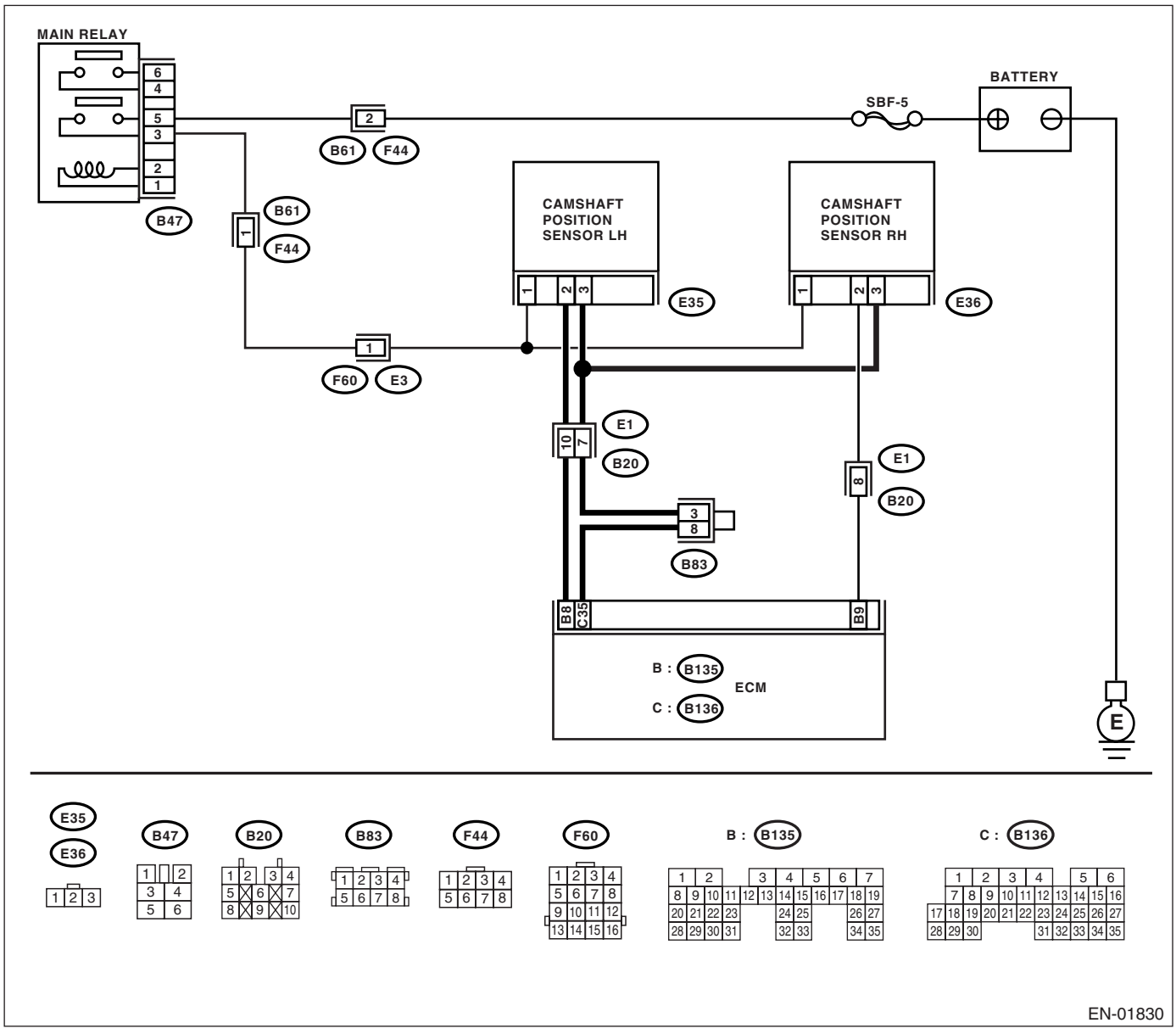
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the voltage between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E36) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the ground short circuit between main relay connector and camshaft position sensor connector.	Go to step **2.**
2	**CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E36) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Repair the open or ground short circuit between main relay connector and camshaft position sensor connector.
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between camshaft position sensor and ECM. ***Connector & terminal*** ***(E36) No. 2 — (E135) No. 9:*** ***(E36) No. 3 — (E136) No. 35:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit between camshaft position sensor and ECM.
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.** Measure the resistance between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E36) No. 2 — Engine ground:*** ***(E36) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit between camshaft position sensor and ECM.
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **6.**	Tighten the camshaft position sensor installation bolt securely.
6	**CHECK CAMSHAFT POSITION SENSOR.** Check the camshaft position sensor wave form. <Ref. to EN(STi)(diag)-18, Engine Control Module (ECM) I/O Signal.>	Is any abnormality found in waveform?	Replace the camshaft position sensor. <Ref. to FU(STi)-27, Camshaft Position Sensor.>	Go to step **7.**
7	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>

AY:DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-108, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

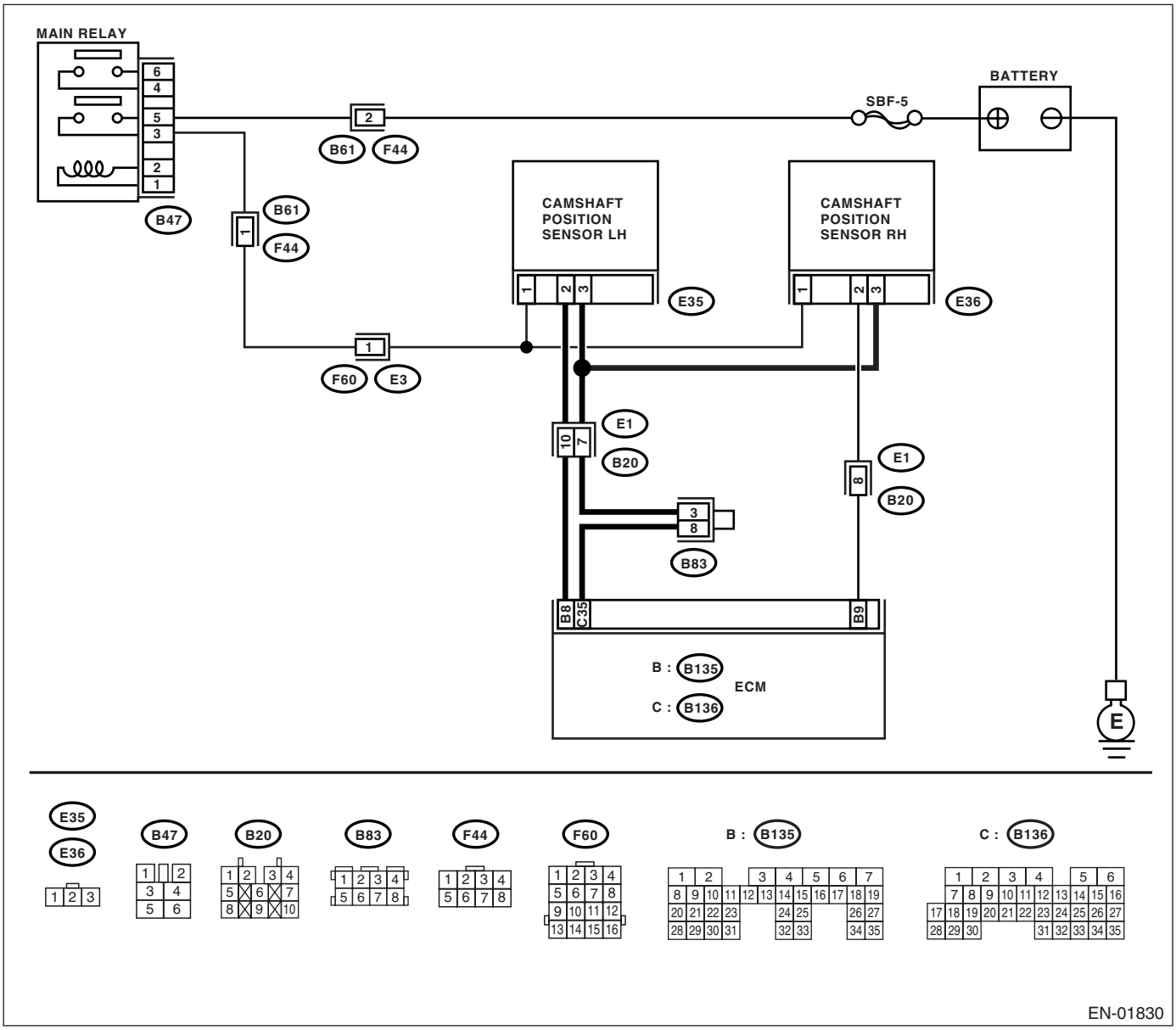
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the voltage between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E35) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit between main relay connector and camshaft position sensor connector.	Go to step **2.**
2	**CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E35) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Repair the open or ground short circuit between main relay connector and camshaft position sensor connector.
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between camshaft position sensor and ECM. ***Connector & terminal*** ***(E35) No. 2 — (B135) No. 8:*** ***(E35) No. 3 — (B136) No. 35:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit between camshaft position sensor and ECM.
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.** Measure the resistance between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E35) No. 2 — Engine ground:*** ***(E35) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit between camshaft position sensor and ECM.
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **6.**	Tighten the camshaft position sensor installation bolt securely.
6	**CHECK CAMSHAFT POSITION SENSOR.** Check the camshaft position sensor wave form. <Ref. to EN(STi)(diag)-18, Engine Control Module (ECM) I/O Signal.>	Is any abnormality found in waveform?	Replace the camshaft position sensor. <Ref. to FU(STi)-27, Camshaft Position Sensor.>	Go to step **7.**
7	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>

AZ:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-109, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

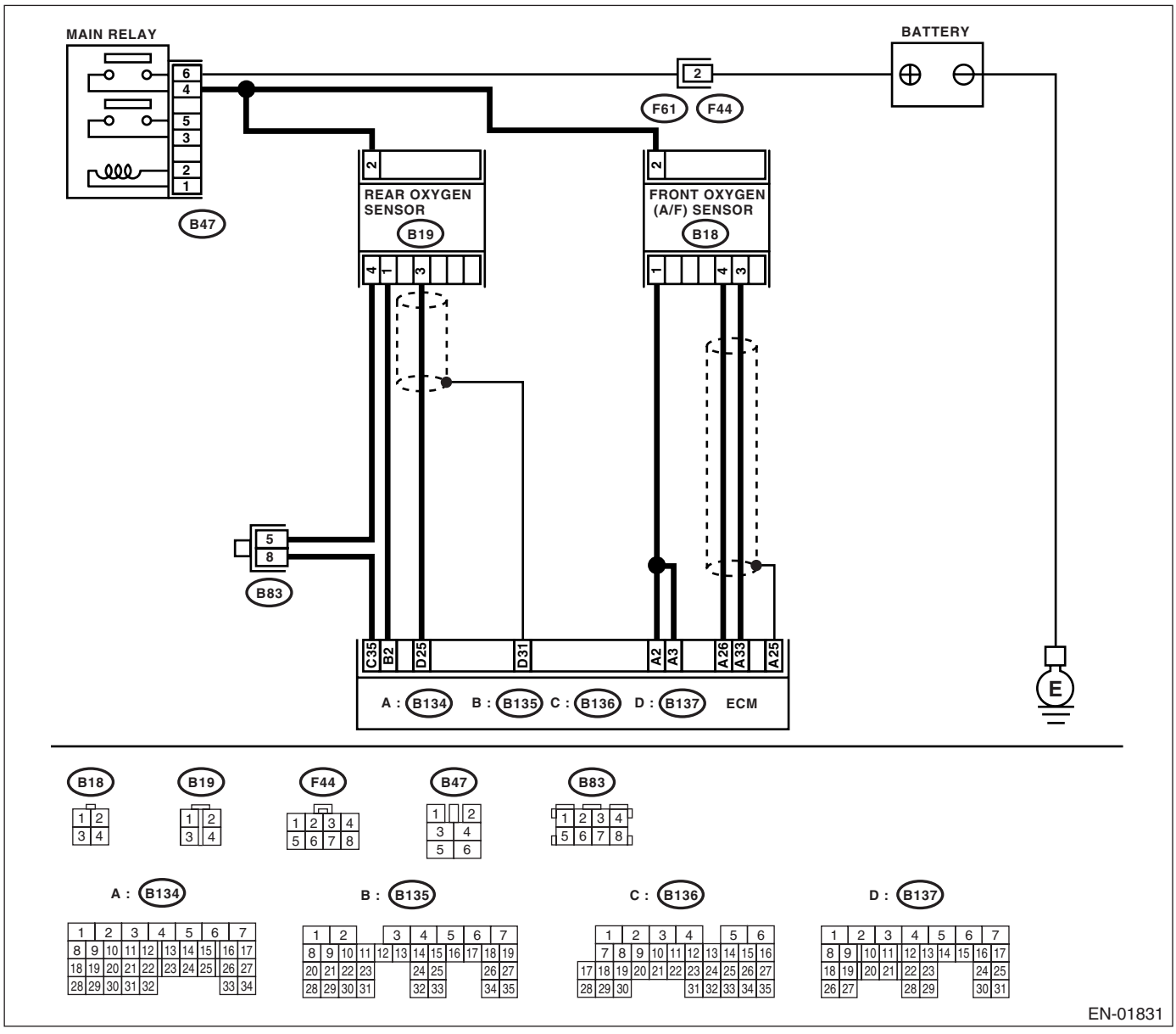
TROUBLE SYMPTOM:

- Engine stalls.
- Idle mixture is out of specifications.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. NOTE: Check the following positions. • Between cylinder head and front exhaust pipe • Between front exhaust pipe and front catalytic converter • Between front catalytic converter and rear catalytic converter	Is there a fault in exhaust system?	Repair or replace the exhaust system. <Ref. to EX(H4DOTC)-2, General Description.>	Go to step **3.**
3	**CHECK REAR CATALYTIC CONVERTER.** Separate the rear catalytic converter from rear exhaust pipe.	Is there damage at rear face of rear catalyst?	Replace the front catalytic converter. <Ref. to EC(STi)-3, Front Catalytic Converter.> and rear catalytic converter <Ref. to EC(STi)-4, Rear Catalytic Converter.>	Go to step **4.**
4	**CHECK FRONT CATALYTIC CONVERTER.** Remove the front catalytic converter.	Is there damage at rear face or front face of front catalyst?	Replace the front catalytic converter. <Ref. to EC(STi)-3, Front Catalytic Converter.>	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BA:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

DTC DETECTING CONDITION:

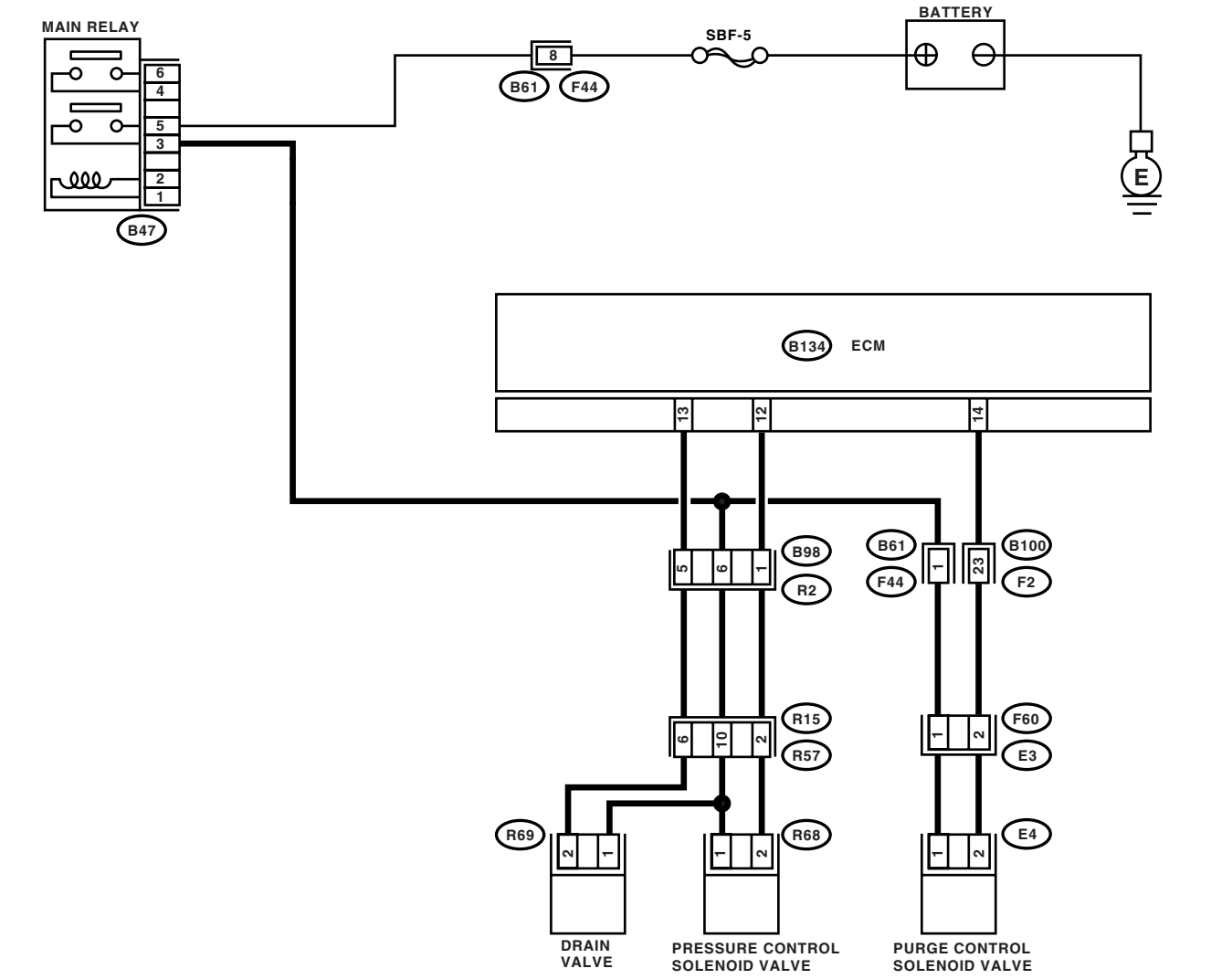
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-112, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

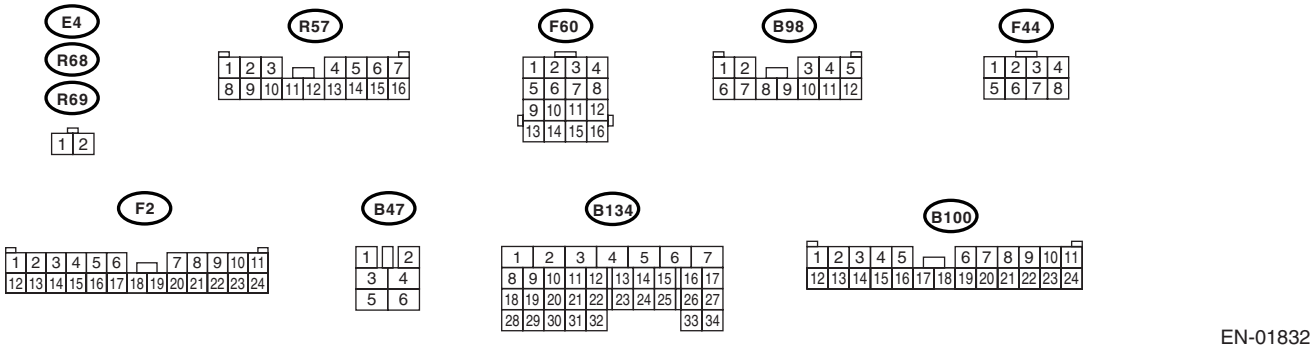
TROUBLE SYMPTOM:

- Fuel odor
- There is a hole of more than 1.0 mm (0.04 in) dia. in evaporation system or fuel tank.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-01832

	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap SUBARU genuine?	Go to step **4.**	Replace with a SUBARU genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(STi)-48, Fuel Filler Pipe.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STi)(diag)-42, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **6.**	Replace the drain valve. <Ref. to EC(STi)-18, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STi)(diag)-42, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **7.**	Replace the purge control solenoid valve. <Ref. to EC(STi)-6, Purge Control Solenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STi)(diag)-42, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **8.**	Replace the pressure control solenoid valve. <Ref. to EC(STi)-12, Pressure Control Solenoid Valve.>

	Step	Check	Yes	No
8	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn ignition switch to OFF.	Is there a hole of more than 1.0 mm (0.04 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(STi)-60, Fuel Delivery, Return and Evaporation Lines.>	Go to step **9.**
9	**CHECK CANISTER.**	Is the canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the canister. <Ref. to EC(STi)-5, Canister.>	Go to step **10.**
10	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(STi)-45, Fuel Tank.>	Is the fuel tank damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(STi)-45, Fuel Tank.>	Go to step **11.**
11	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 1.0 mm (0.04 in) dia., cracks, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

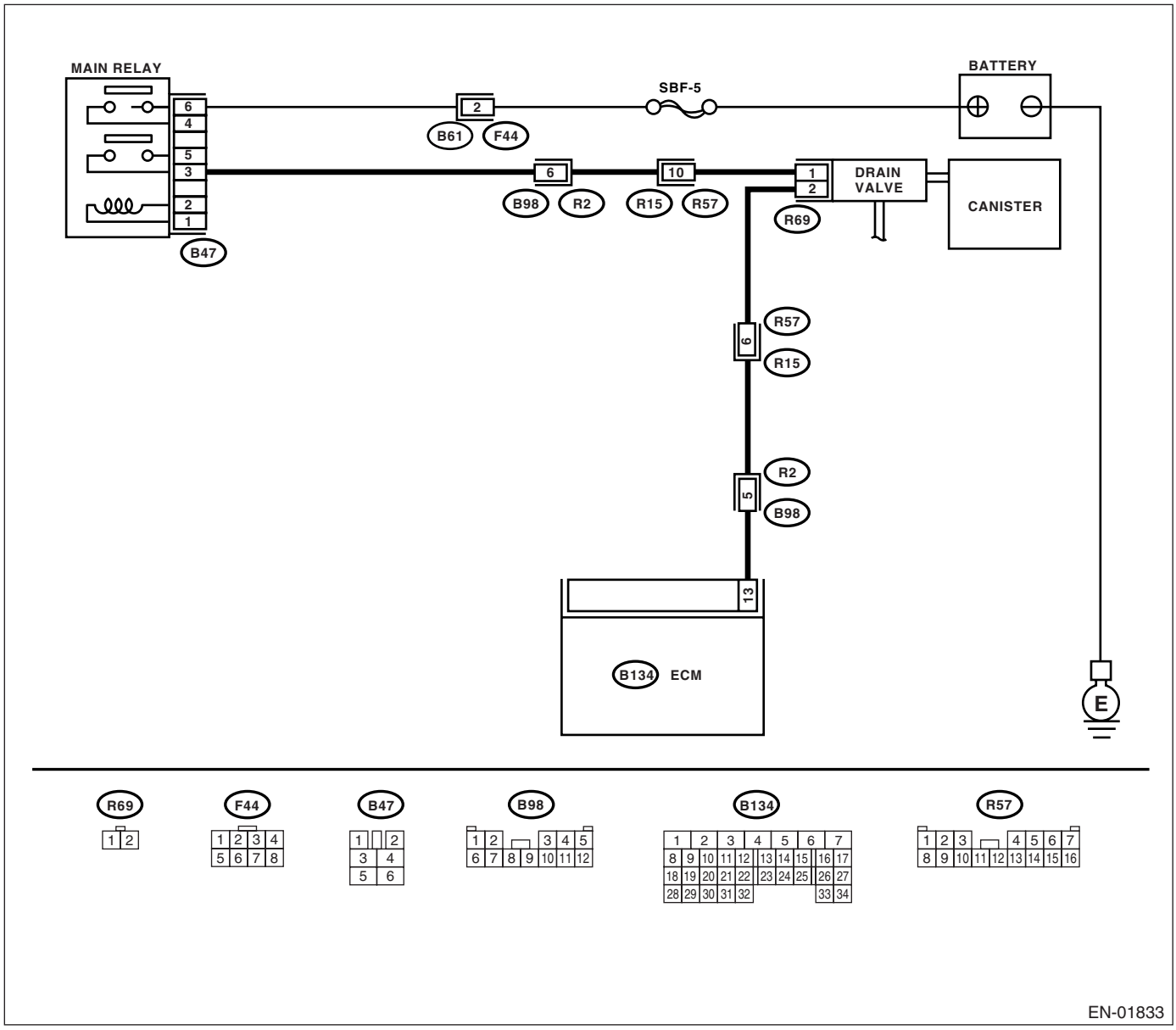
BB:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-137, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 13 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in drain valve connector • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connectors from drain valve and ECM. 3) Measure the resistance of harness between drain valve connector and chassis ground. ***Connector & terminal*** ***(R69) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair short circuit to ground in harness between ECM and drain valve connector.
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and drain valve connector. ***Connector & terminal*** ***(B134) No. 13 — (R69) No. 2:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and drain valve connector • Poor contact in coupling connector
5	**CHECK DRAIN VALVE.** Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Go to step **6.**	Replace the drain valve. <Ref. to EC(STi)-18, Drain Valve.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO DRAIN VALVE.** 1) Turn ignition switch to ON. 2) Measure the voltage between drain valve and chassis ground. ***Connector & terminal*** ***(R69) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and drain valve • Poor contact in coupling connector • Poor contact in main relay connector
7	**CHECK FOR POOR CONTACT.** Check for poor contact in drain valve connector.	Is there poor contact in drain valve connector?	Repair poor contact in drain valve connector.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BC:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

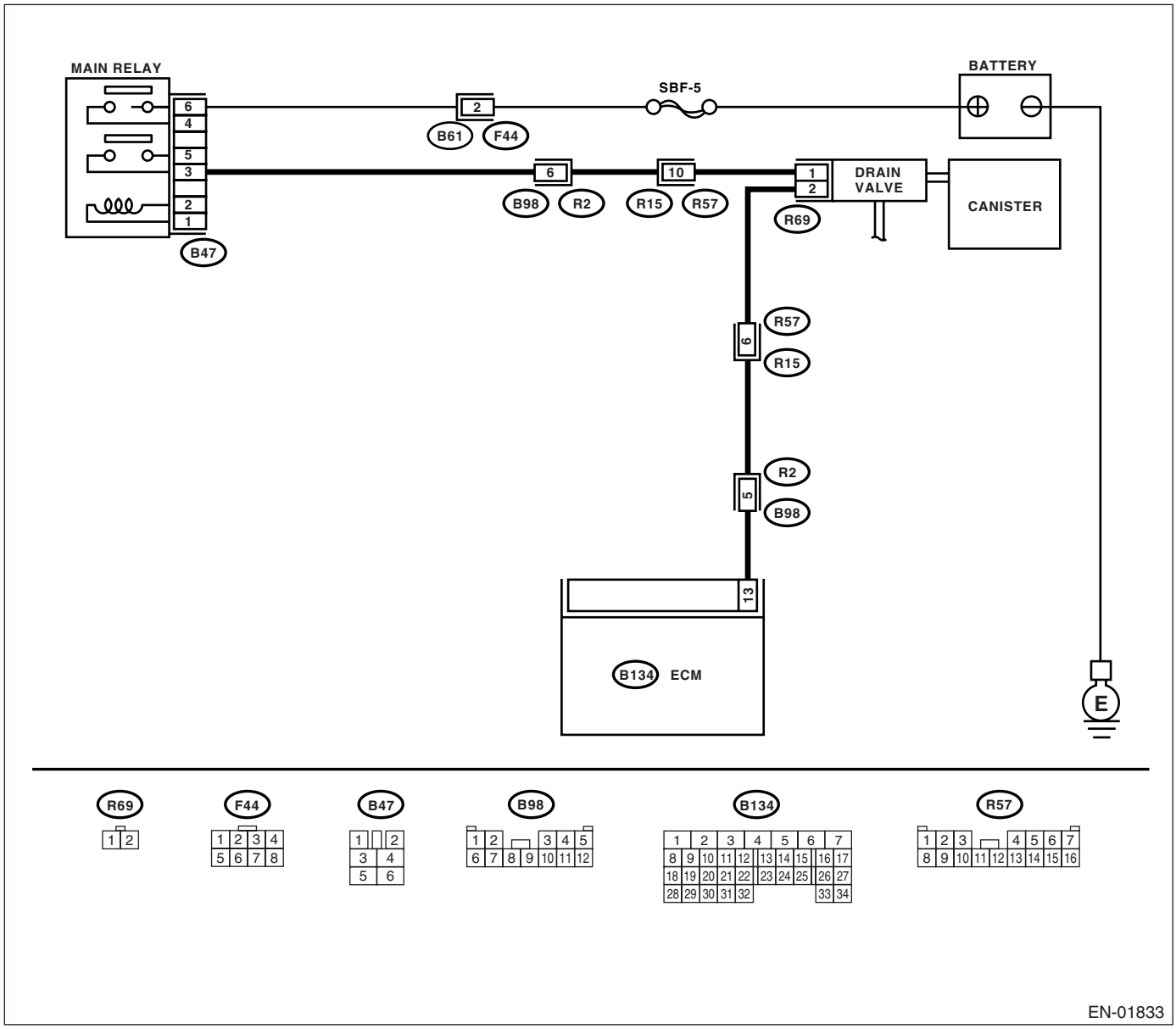
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-139, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) While operating the drain valve, measure voltage between ECM and chassis ground. NOTE: Drain valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STi)(diag)-42, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 13 (+) — Chassis ground (–):***	Does the resistance change within 0 — 10 V?	Go to step **2.**	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. In this case, repair poor contact in ECM connector.
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 13 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from drain valve. 3) Turn ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 13 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and drain valve connector. After repair, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Turn ignition switch to OFF. 2) Measure the resistance between drain valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the drain valve <Ref. to EC(STi)-18, Drain Valve.> and ECM <Ref. to FU(STi)-40, Engine Control Module (ECM).>.	Go to step **6.**
6	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>

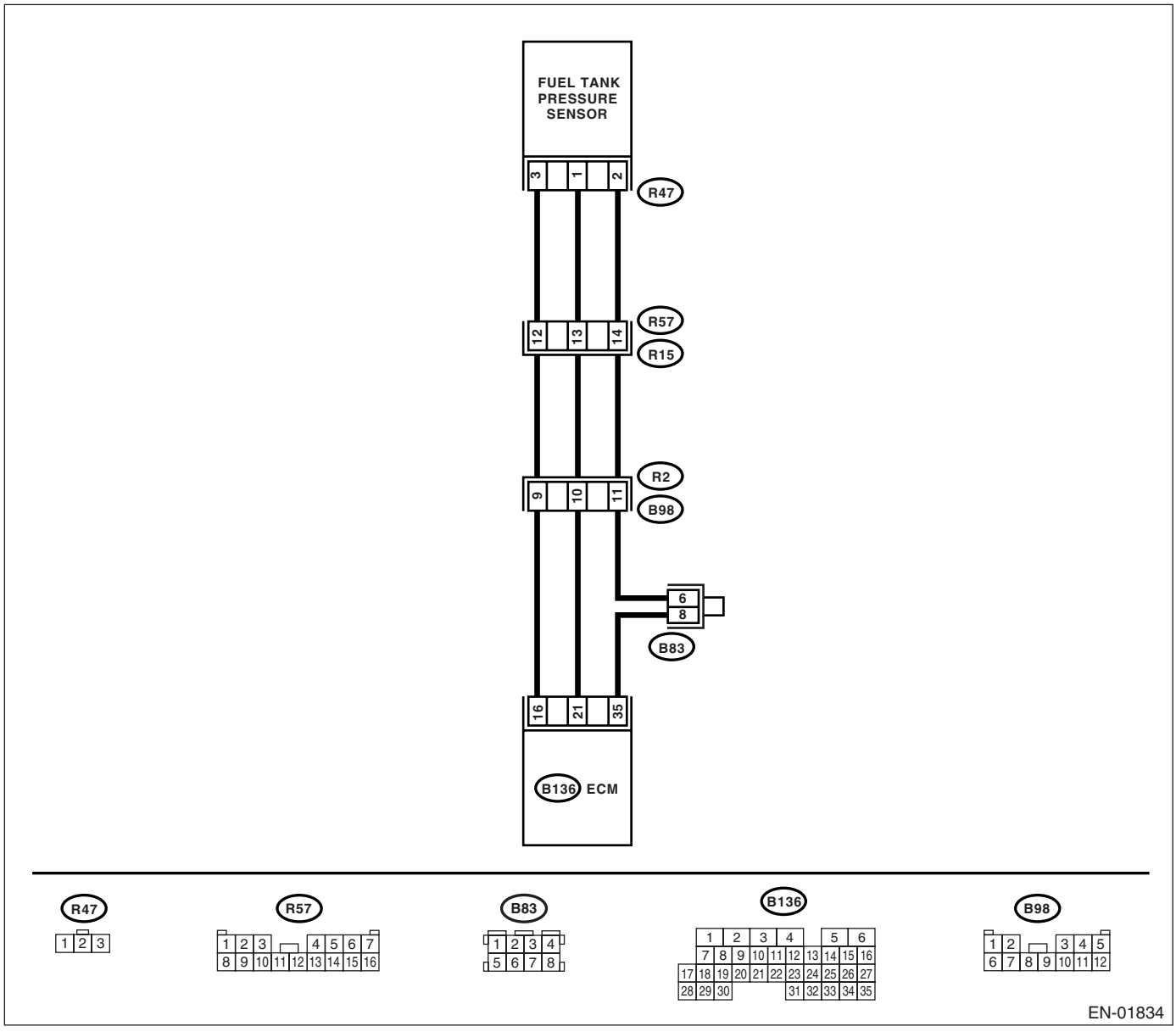
BD:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-141, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK PRESSURE/VACUUM LINE.** NOTE: Check the following items. • Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank • Disconnection, leakage and clogging of air ventilation hoses and pipes between fuel filler pipe and fuel tank	Is there a fault in pressure/vacuum line?	Repair or replace the hoses and pipes.	Replace the fuel tank pressure sensor. <Ref. to EC(STi)-10, Fuel Tank Pressure Sensor.>

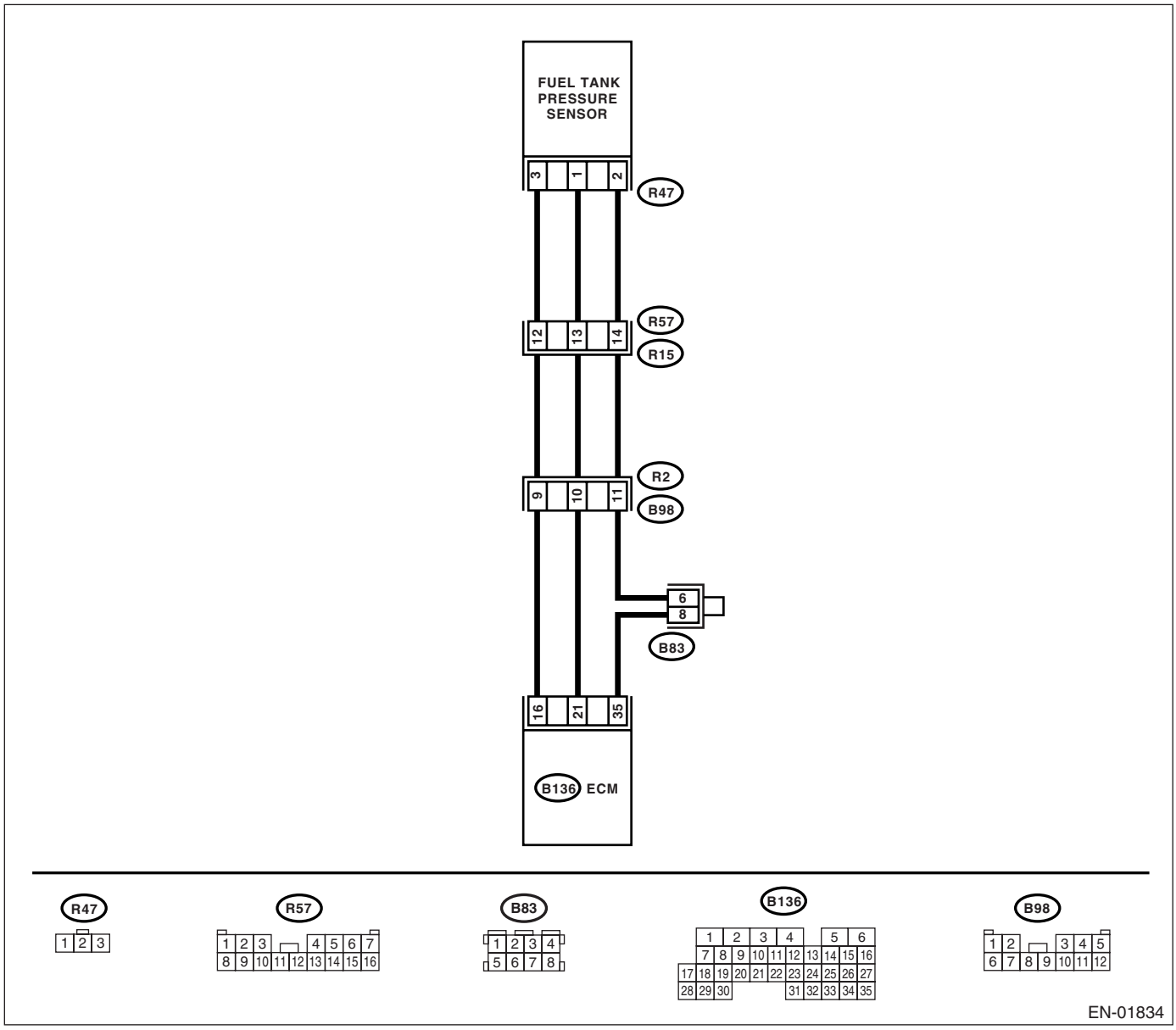
BE:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-143, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove the fuel filler cap. 3) Install the fuel filler cap. 4) Turn ignition switch to ON. 5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured valve less than −2.8 kPa (−21.0 mmHg, −0.827 inHg)?	Go to step **2.**	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.
2	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Repair poor contact in ECM connector.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (−):***	Is the voltage less than 0.2 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read the data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.>	Does the measured value exceed the specified value by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Remove the rear seat cushion. 3) Separate rear wiring harness and fuel tank cord. 4) Turn ignition switch to ON. 5) Measure the voltage between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R15) No. 12 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B136) No. 35 — (R15) No. 14:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector • Poor contact in joint connector
8	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** Measure the resistance of harness between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R15) No. 14 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair short circuit to ground in harness between ECM and rear wiring harness connector.
9	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel tank pressure sensor. 2) Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 12 — (R47) No. 3:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair open circuit in fuel tank cord.
10	**CHECK FUEL TANK CORD.** Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 14 — (R47) No. 2:***	Is the resistance less than 1 Ω?	Go to step **11.**	Repair open circuit in fuel tank cord.
11	**CHECK FUEL TANK CORD.** Measure the resistance of harness between fuel tank pressure sensor connector and engine ground. ***Connector & terminal*** ***(R47) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **12.**	Repair short circuit to ground in fuel tank cord.
12	**CHECK FOR POOR CONTACT.** Check for poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(STi)-10, Fuel Tank Pressure Sensor.>

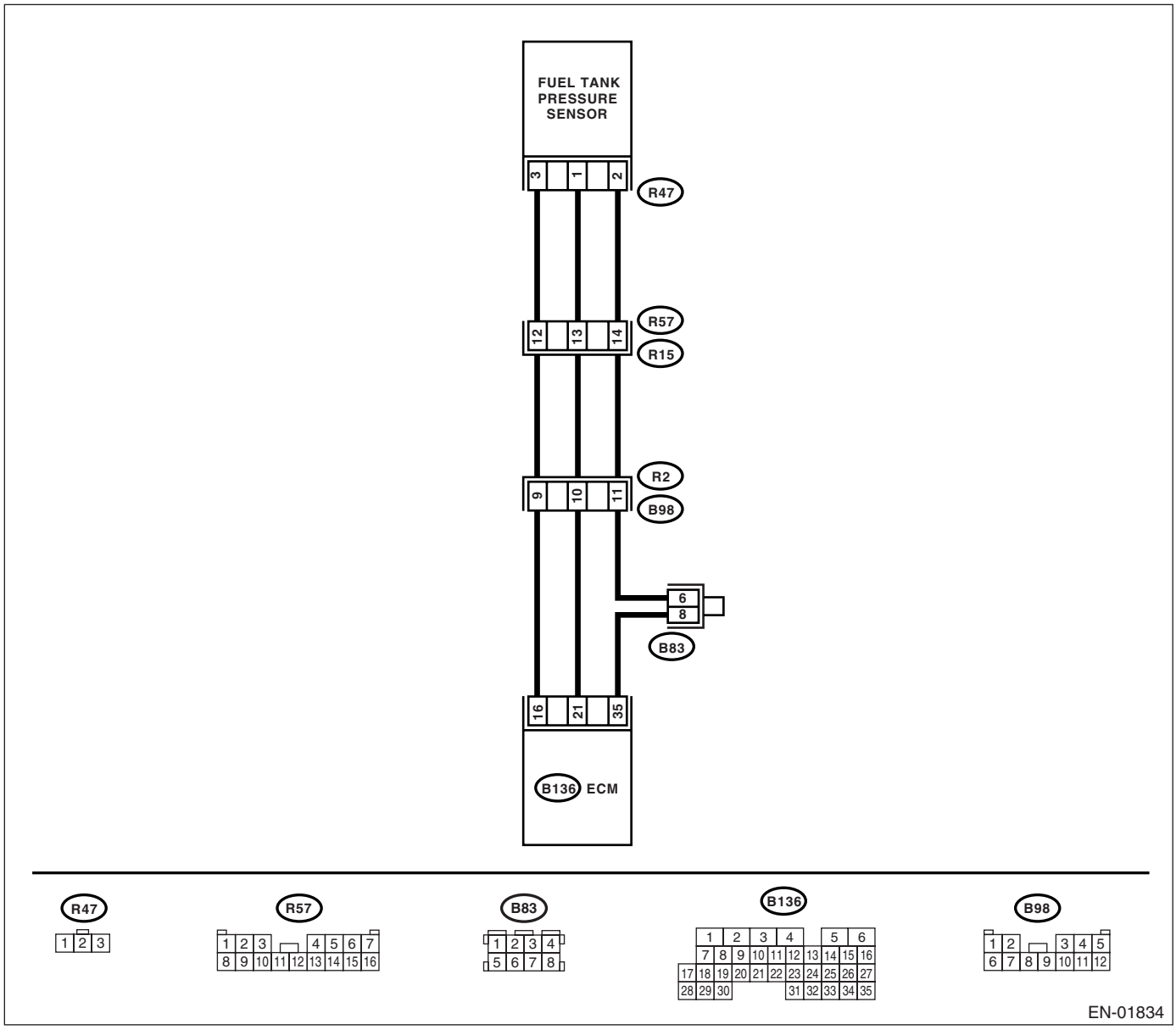
BF:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-145, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn ignition switch to OFF. 2) Remove the fuel filler cap. 3) Install the fuel filler cap. 4) Turn ignition switch to ON. 5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)	Go to step **11.**	Go to step **2.**
2	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Does the measured value exceed the specified value by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (−):***	Is the voltage less than 0.2 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.)** Read the data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.>	Does the measured value exceed −2.8 kPa (−21.0 mmHg, −0.827 inHg) by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Remove the rear seat cushion. 3) Separate rear wiring harness and fuel tank cord. 4) Turn ignition switch to ON. 5) Measure the voltage between rear wiring harness connector and chassis ground. ***Connector & terminal*** ***(R15) No. 12 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and rear wiring harness connector. ***Connector & terminal*** ***(B136) No. 21 — (R15) No. 13:*** ***(B136) No. 35 — (R15) No. 14:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector
8	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel tank pressure sensor. 2) Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 13 — (R47) No. 1:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair open circuit in fuel tank cord.
9	**CHECK FUEL TANK CORD.** Measure the resistance of fuel tank cord. ***Connector & terminal*** ***(R57) No. 14 — (R47) No. 2:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair open circuit in fuel tank cord.
10	**CHECK FOR POOR CONTACT.** Check for poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(STi)-10, Fuel Tank Pressure Sensor.>
11	**CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from fuel tank pressure sensor. 3) Turn ignition switch to ON. 4) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)?	Repair short circuit to battery in harness between ECM and fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(STi)-10, Fuel Tank Pressure Sensor.>

BG:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

DTC DETECTING CONDITION:

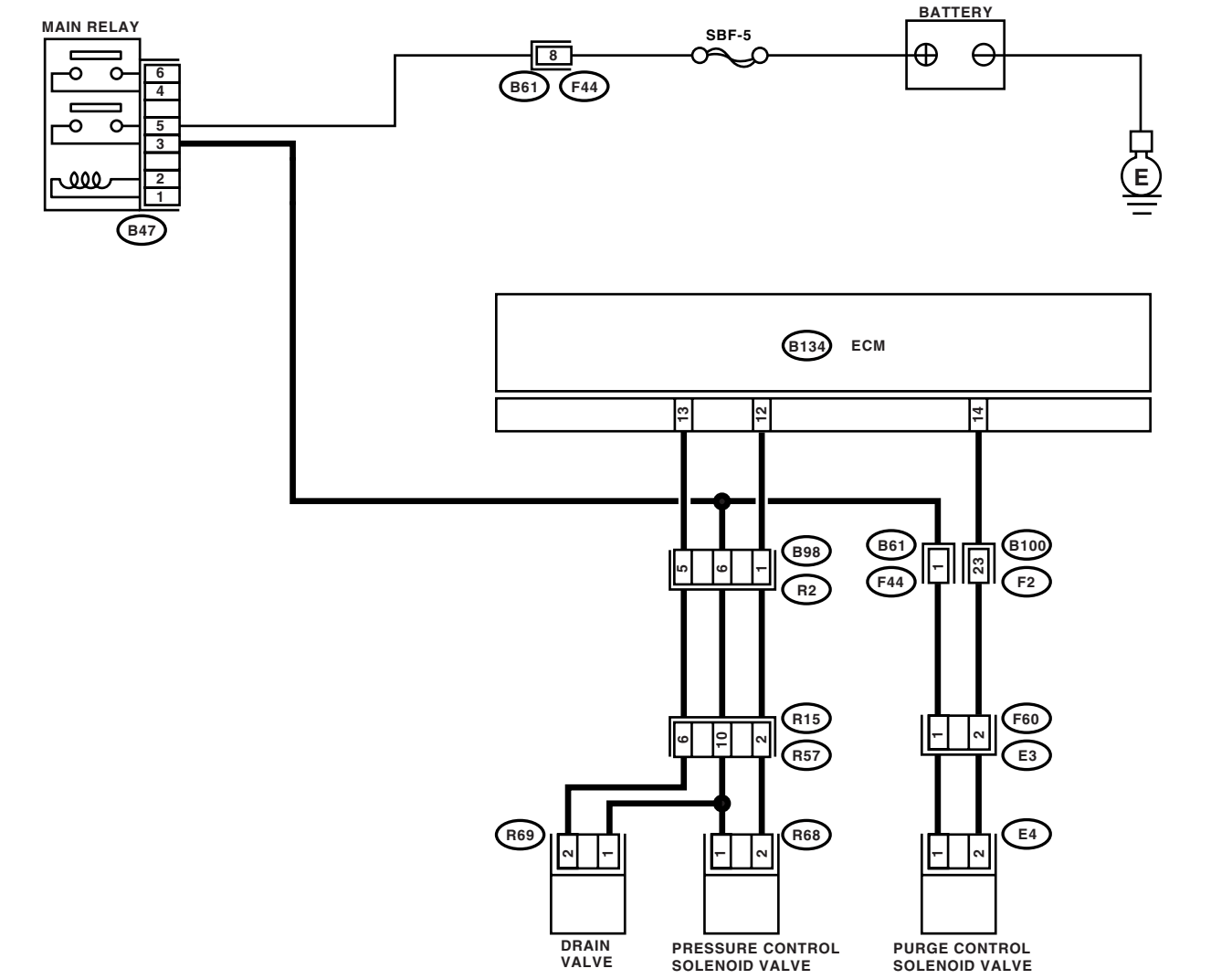
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-146, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

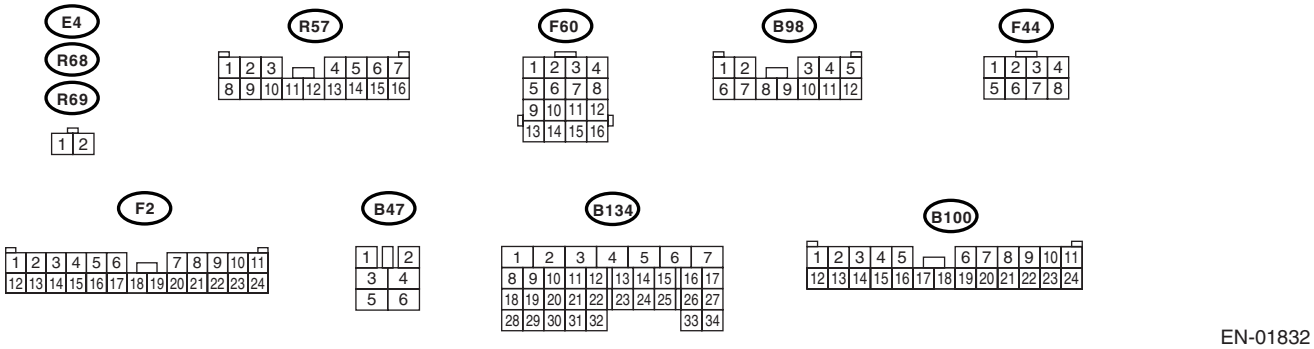
TROUBLE SYMPTOM:

- Fuel odor
- There is a hole of more than 0.5 mm (0.020 in) dia. in evaporation system or fuel tank.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-01832

	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap SUBARU genuine?	Go to step **4.**	Replace with a SUBARU genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(STi)-48, Fuel Filler Pipe.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STi)(diag)-42, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **6.**	Replace the drain valve. <Ref. to EC(STi)-18, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STi)(diag)-42, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step **7.**	Replace the purge control solenoid valve. <Ref. to EC(STi)-6, Purge Control Solenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STi)(diag)-42, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **8.**	Replace the pressure control solenoid valve. <Ref. to EC(STi)-6, Purge Control Solenoid Valve.>

	Step	Check	Yes	No
8	**CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE.** Turn ignition switch to OFF.	Is there a hole of more than 0.5 mm (0.020 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(STi)-60, Fuel Delivery, Return and Evaporation Lines.>	Go to step **9.**
9	**CHECK CANISTER.**	Is the canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the canister. <Ref. to EC(STi)-5, Canister.>	Go to step **10.**
10	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(H4DOTC)-53, Fuel Tank.>	Is the fuel tank damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(STi)-45, Fuel Tank.>	Go to step **11.**
11	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BH:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)

DTC DETECTING CONDITION:

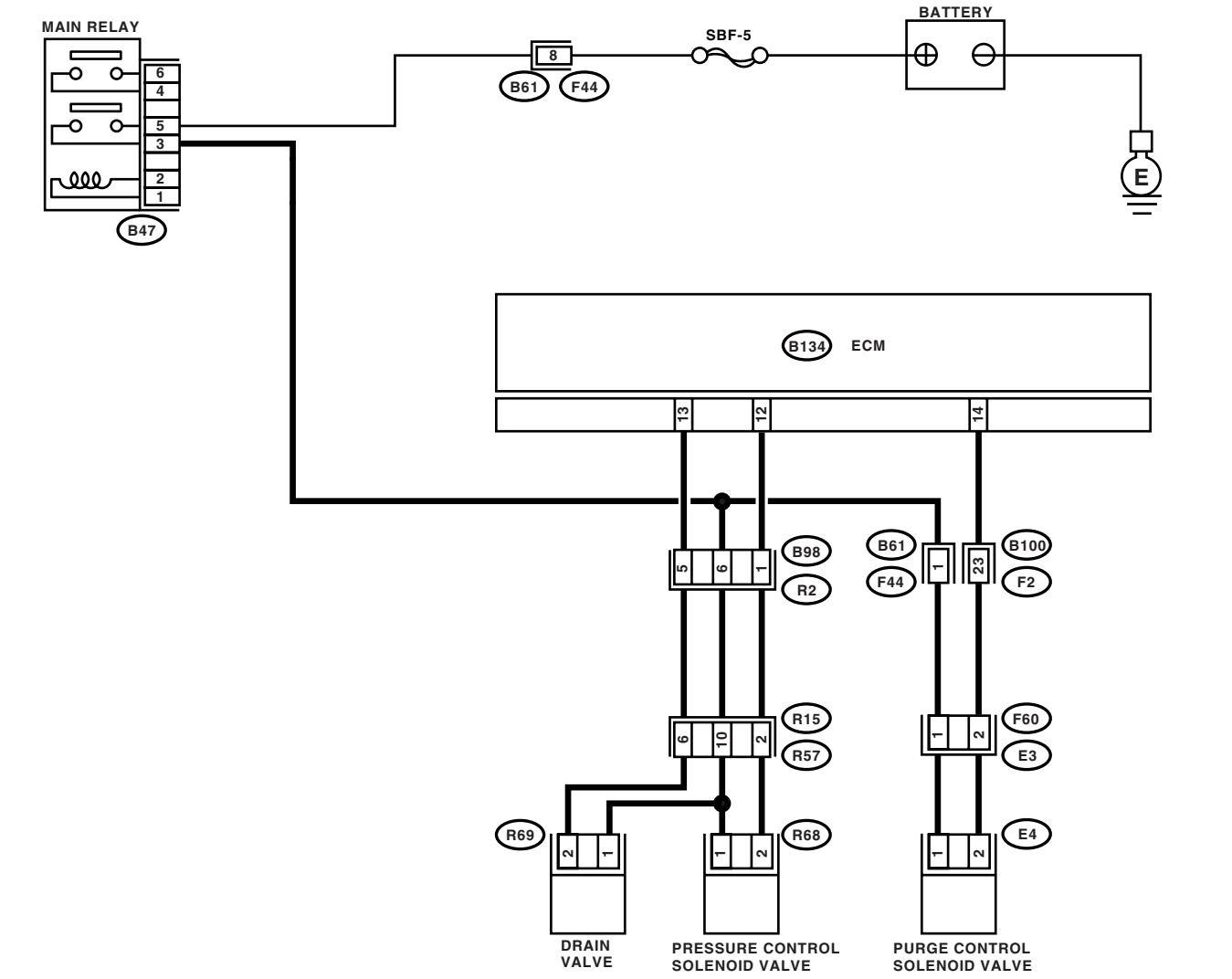
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-146, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>

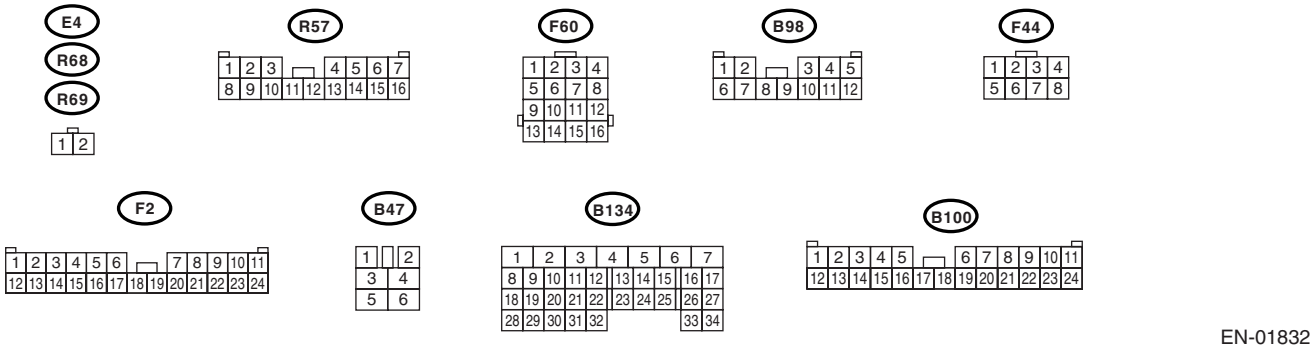
TROUBLE SYMPTOM:

- Fuel odor
- Fuel filler cap is loose or not installed.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-01832

	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK FUEL FILLER CAP.**	Is the fuel filler cap SUBARU genuine?	Go to step **4.**	Replace with a SUBARU genuine fuel filler cap.
4	**CHECK FUEL FILLER PIPE PACKING.**	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(STi)-48, Fuel Filler Pipe.>	Go to step **5.**
5	**CHECK DRAIN VALVE.** 1) Connect the test mode connector. 2) Turn ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STi)(diag)-42, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step **6.**	Replace the drain valve. <Ref. to EC(STi)-18, Drain Valve.>
6	**CHECK PURGE CONTROL SOLENOID VALVE.** Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Does the purge control solenoid valve operate?	Go to step **7.**	Replace the purge control solenoid valve. <Ref. to EC(STi)-6, Purge Control Solenoid Valve.>
7	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STi)(diag)-42, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step **8.**	Replace the pressure control solenoid valve. <Ref. to EC(STi)-6, Purge Control Solenoid Valve.>
8	**CHECK CANISTER.**	Is the canister damaged?	Repair or replace the canister. <Ref. to EC(STi)-5, Canister.>	Go to step **9.**

	Step	Check	Yes	No
9	**CHECK FUEL TANK.** Remove the fuel tank. <Ref. to FU(STi)-45, Fuel Tank.>	Is the fuel tank damaged?	Repair or replace the fuel tank. <Ref. to FU(STi)-45, Fuel Tank.>	Go to step **10.**
10	**CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.**	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging, or disconnections, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BI: DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-147, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

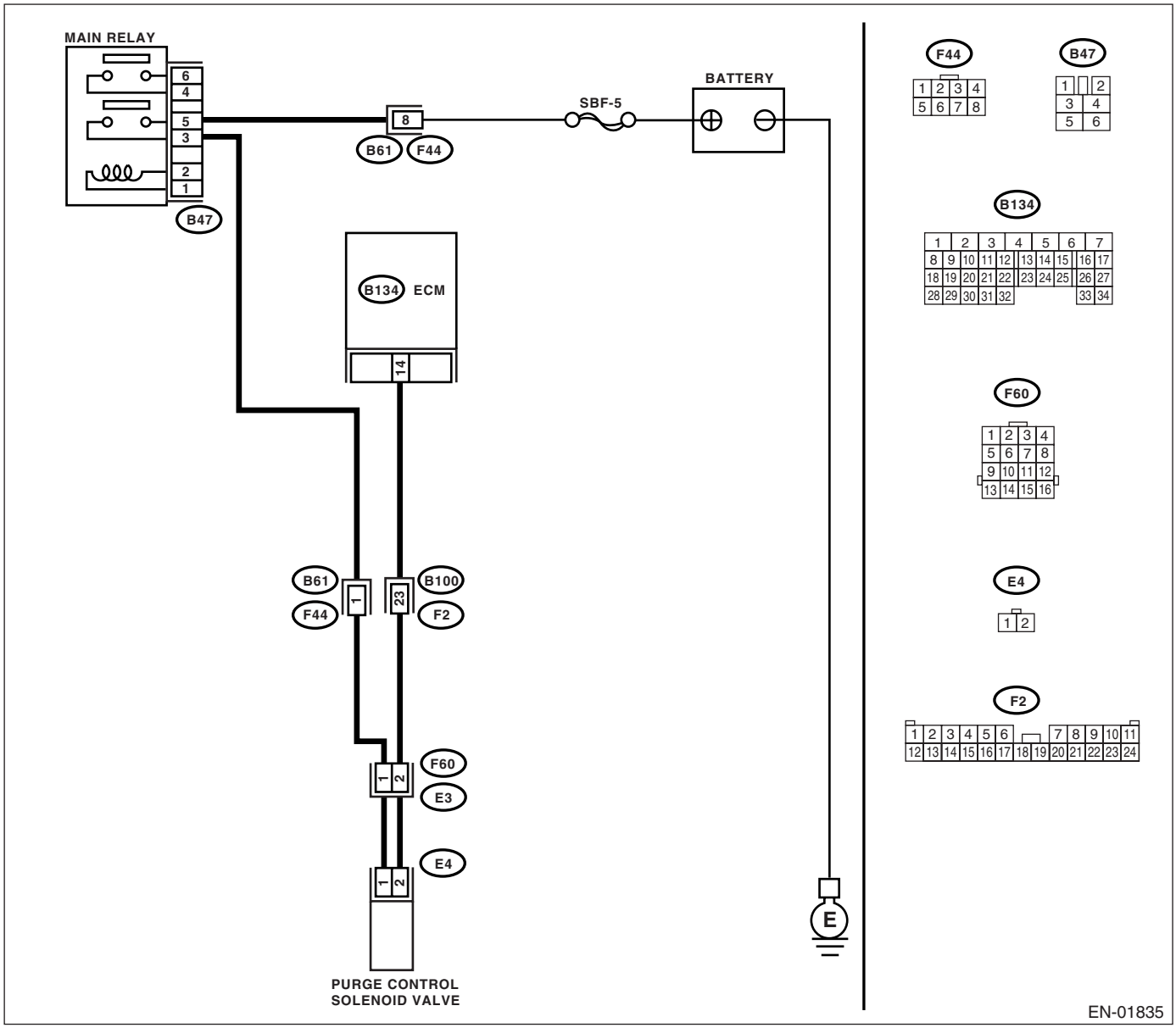
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.	Go to step **2.**
2	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from purge control solenoid valve and ECM. 3) Measure the resistance of harness between purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the ground short circuit in harness between ECM and purge control solenoid valve connector.
3	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and purge control solenoid valve of harness connector. ***Connector & terminal*** ***(B134) No. 14 — (E4) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between ECM and purge control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector
4	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Remove the purge control solenoid valve. 2) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Go to step **5.**	Replace the purge control solenoid valve. <Ref. to EC(STi)-6, Purge Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve and engine ground. ***Connector & terminal*** ***(E4) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Repair the open circuit in harness between main relay and purge control solenoid valve connector.
6	**CHECK POOR CONTACT.** Check poor contact in purge control solenoid valve connector.	Is there poor contact in purge control solenoid valve connector?	Repair the poor contact in purge control solenoid valve connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BJ:DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-149, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

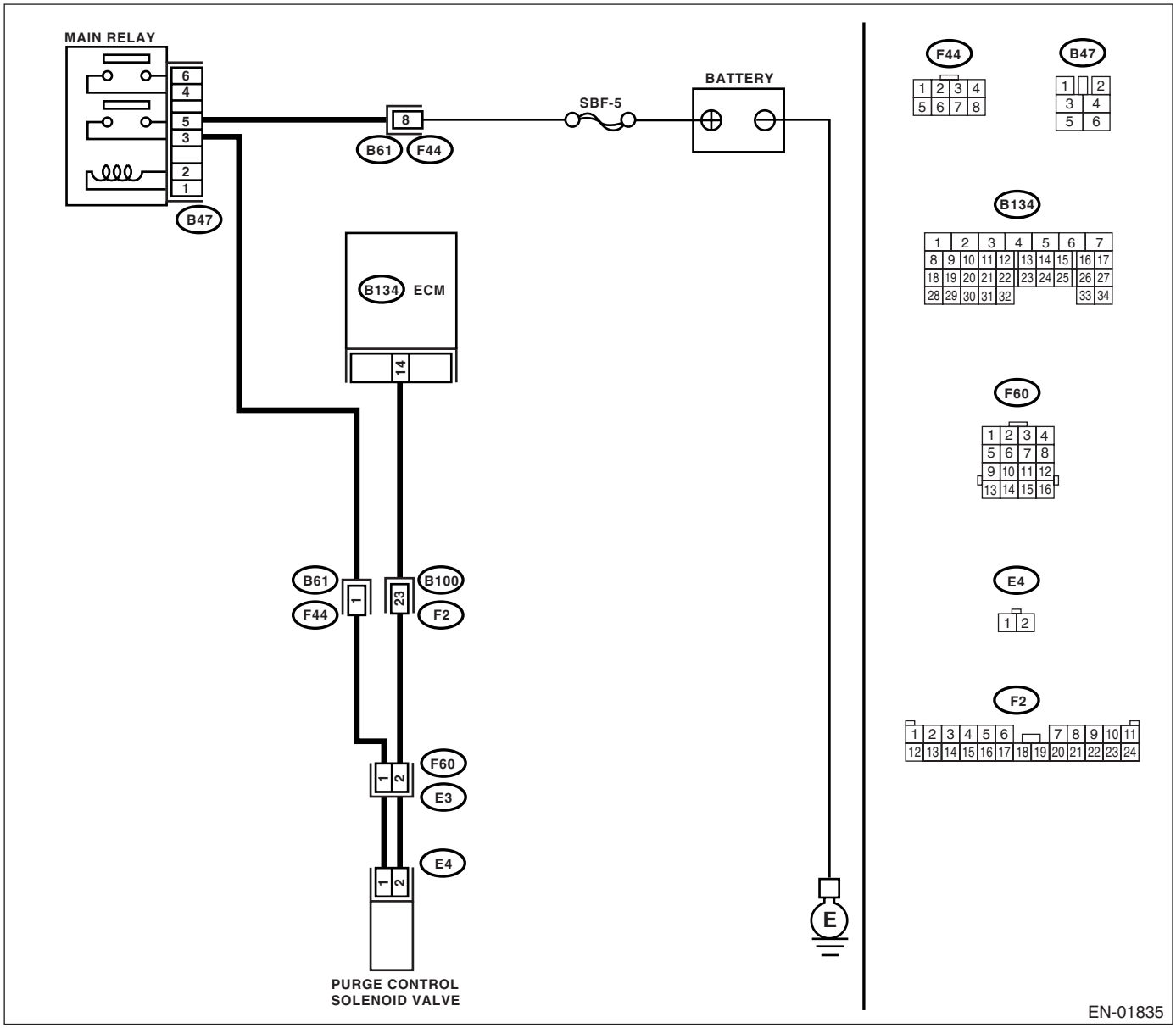
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) While operating the purge control solenoid valve, measure the voltage between ECM and chassis ground. NOTE: Purge control solenoid valve operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STi)(diag)-42, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (–):***	Is the voltage 0 — 13 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POOR CONTACT.** Check the poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the purge control solenoid valve <Ref. to EC(STi)-6, Purge Control Solenoid Valve.> and ECM <Ref. to FU(STi)-40, Engine Control Module (ECM).>	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>

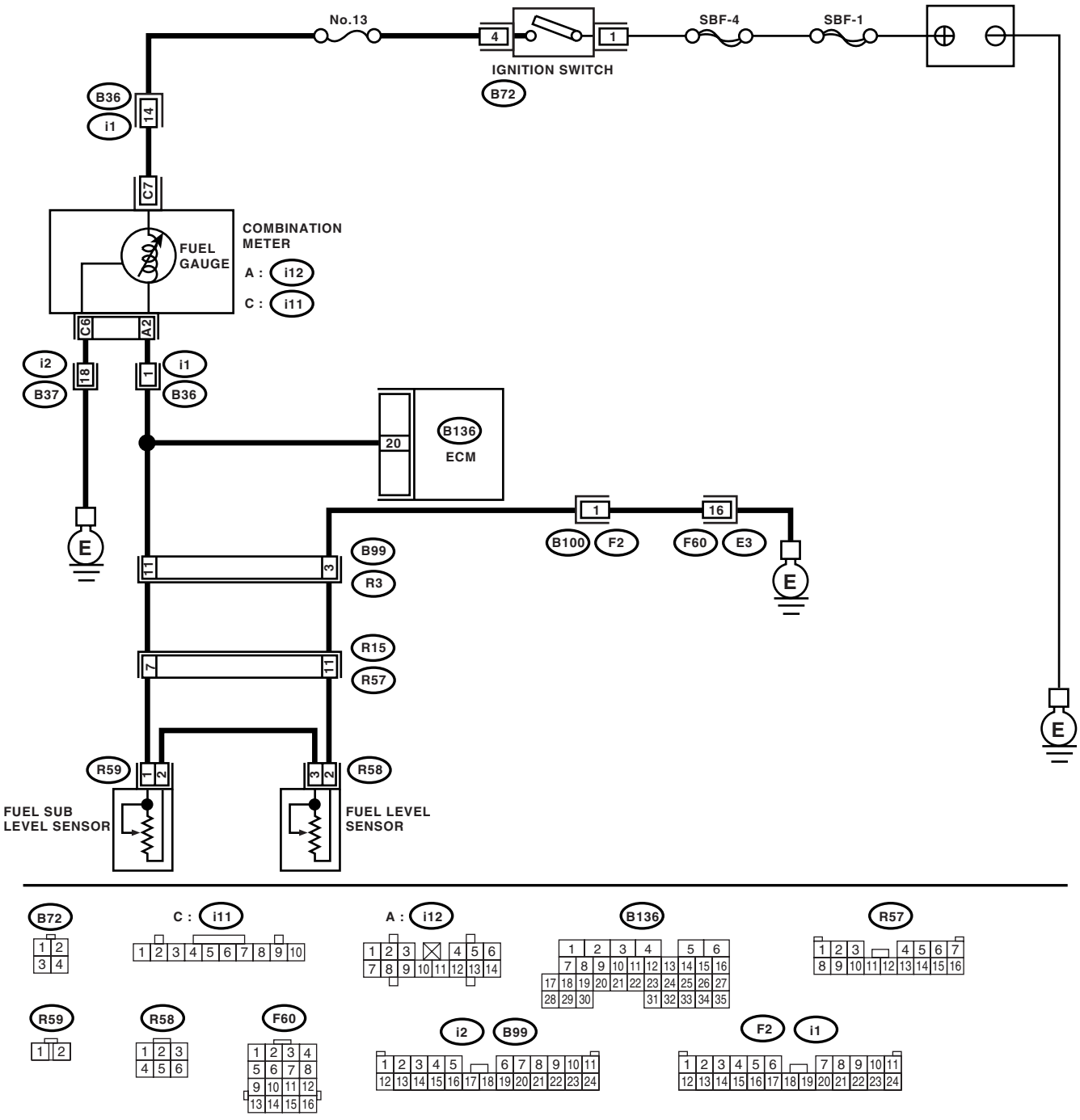
BK:DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-151, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01836

Step		Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0461.	Replace the fuel level sensor. <Ref. to FU(STi)-54, Fuel Level Sensor.> and fuel sub level sensor <Ref. to FU(STi)-55, Fuel Sub Level Sensor.>

BL:DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT

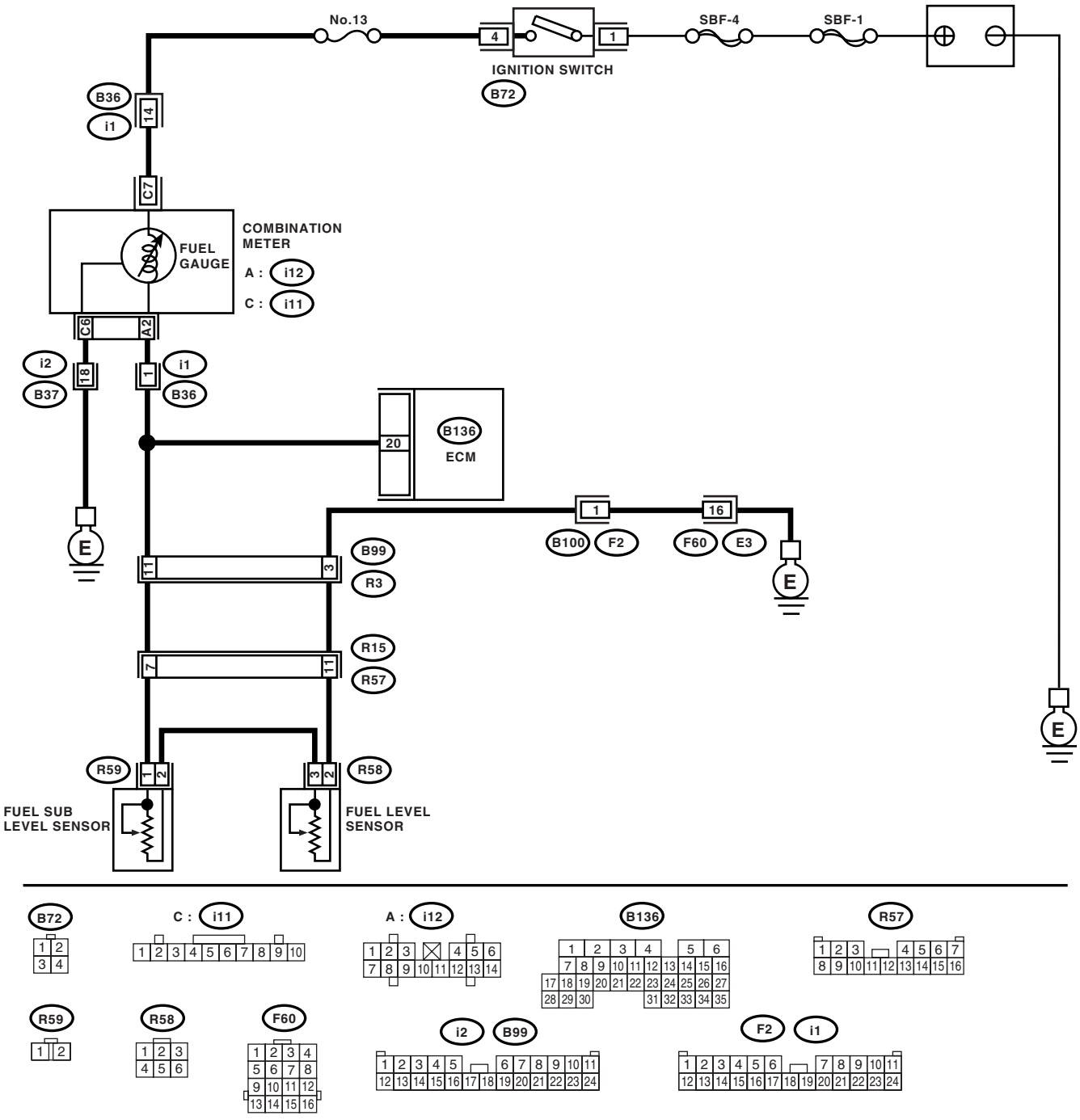
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-153, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01836

	Step	Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does the speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 20 (+) — Chassis ground (−):***	Is the voltage less than 0.12 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)** Read the data of fuel level sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.>	Does the voltage change, while shaking the ECM harness and connector?	Repair the poor contact in ECM connector.	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in combination meter connector • Poor contact in ECM connector • Poor contact in coupling connectors
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Separate the fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 20 (+) — Chassis ground (−):***	Is the voltage more than 0.12 V?	Go to step **5.**	Go to step **6.**
5	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from connector (i11), (i12) and ECM connector. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 20 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit in harness between ECM and combination meter connector.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** Measure the resistance between ECM and combination meter connector. ***Connector & terminal*** ***(B136) No. 20 — (i12) No. 2:***	Is the resistance less than 10 Ω?	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>	Repair the open circuit between ECM and combination meter connector. NOTE: In this case, repair the following: Poor contact in coupling connector
7	**CHECK FUEL TANK CORD.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel sub level sensor. 3) Measure the resistance between fuel sub level sensor and chassis ground. ***Connector & terminal*** ***(R59) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the ground short circuit in fuel tank cord.
8	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel pump assembly. 2) Measure the resistance between fuel pump assembly and chassis ground. ***Connector & terminal*** ***(R59) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the ground short circuit in fuel tank cord.
9	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(STi)-52, Fuel Pump.> 2) Measure the resistance between fuel level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 2 — No. 3:***	Is the resistance 0.5 — 2.5 Ω?	Go to step **10.**	Replace the fuel level sensor.
10	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(STi)-55, Fuel Sub Level Sensor.> 2) Measure the resistance between fuel sub level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 0.5 — 2.5 Ω?	Repair the poor contact in harness between ECM and combination meter connector.	Replace the fuel sub level sensor.

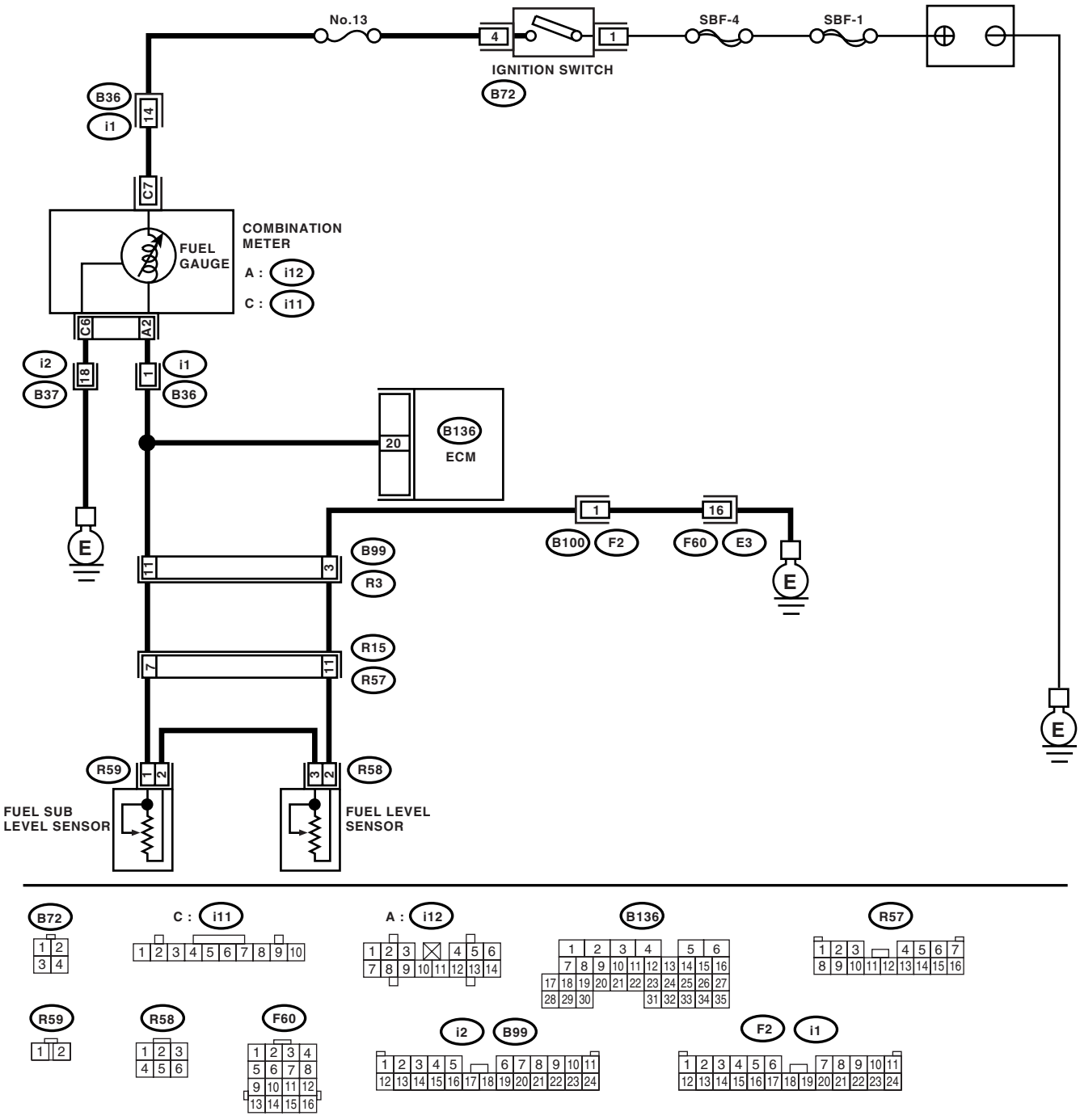
BM:DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-155, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01836

	Step	Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does the speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 20 (+) — Chassis ground (−):***	Is the voltage more than 4.75 V?	Go to step **3.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in fuel pump connector • Poor contact in coupling connector
3	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter connector (i11) and ECM connector. 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 20 (+) — Chassis ground (−):***	Is the voltage more than 4.75 V?	Go to step **4.**	Repair the battery short circuit between ECM and combination meter connector.
4	**CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD.** 1) Turn the ignition switch to OFF. 2) Separate the fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Measure the resistance between ECM and fuel tank cord. ***Connector & terminal*** ***(B136) No. 20 — (R15) No. 7:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the open circuit between ECM and fuel tank cord.
5	**CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND.** Measure the resistance between fuel tank cord and chassis ground. ***Connector & terminal*** ***(R15) No. 11 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **6.**	Repair the open circuit between fuel tank cord and chassis ground. NOTE: In this case, repair the following: Poor contact in coupling connectors
6	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel level sensor. 2) Measure the resistance between fuel level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 11 — (R58) No. 2:***	Is the resistance less than 10 Ω?	Go to step **7.**	Repair the open circuit between coupling connector and fuel level sensor.

	Step	Check	Yes	No
7	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel sub level sensor. 2) Measure the resistance between fuel level sensor and fuel sub level sensor. ***Connector & terminal*** ***(R58) No. 7 — (R59) No. 2:***	Is the resistance less than 10 Ω?	Go to step **8.**	Repair the open circuit between fuel level sensor and fuel sub level sensor.
8	**CHECK FUEL TANK CORD.** Measure the resistance between fuel sub level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 2 — (R59) No. 1:***	Is the resistance less than 10 Ω?	Go to step **9.**	Repair the open circuit between coupling connector and fuel sub level sensor.
9	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(STi)-52, Fuel Pump.> 2) While moving the fuel level sensor float up and down, measure the resistance between fuel level sensor terminals. ***Terminals*** ***No. 2 — No. 3:***	Is the resistance more than 53 Ω?	Replace the fuel level sensor. <Ref. to FU(STi)-54, Fuel Level Sensor.>	Go to step **10.**
10	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(STi)-55, Fuel Sub Level Sensor.> 2) While moving the fuel sub level sensor float up and down, measure the resistance between fuel sub level sensor terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance more than 45 Ω?	Replace the fuel sub level sensor. <Ref. to FU(STi)-55, Fuel Sub Level Sensor.>	Replace the combination meter. <Ref. to IDI-10, Combination Meter Assembly.>

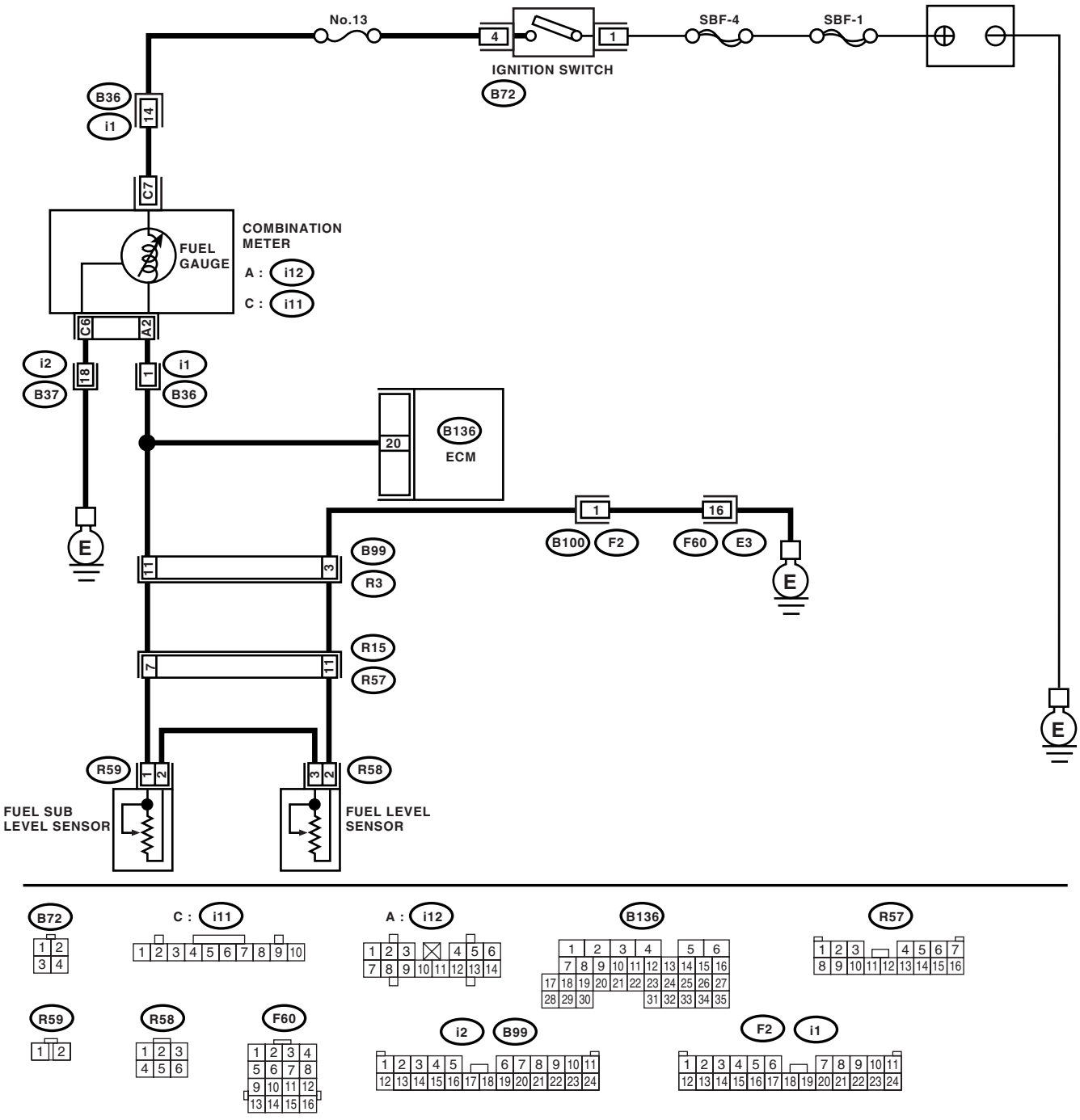
BN:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-157, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01836

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(STi)-52, Fuel Pump.> 2) While moving the fuel level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 3 — No. 2:***	Does the resistance change smoothly?	Go to step **3.**	Replace the fuel level sensor. <Ref. to FU(STi)-54, Fuel Level Sensor.>
3	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(STi)-55, Fuel Sub Level Sensor.> 2) While moving the fuel sub level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 1 — No. 2:***	Does the resistance change smoothly?	Repair the poor contact in ECM, combination meter and coupling connectors.	Replace the fuel sub level sensor. <Ref. to FU(STi)-55, Fuel Sub Level Sensor.>

BO:DTC P0483 COOLING FAN RATIONALITY CHECK

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-160, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

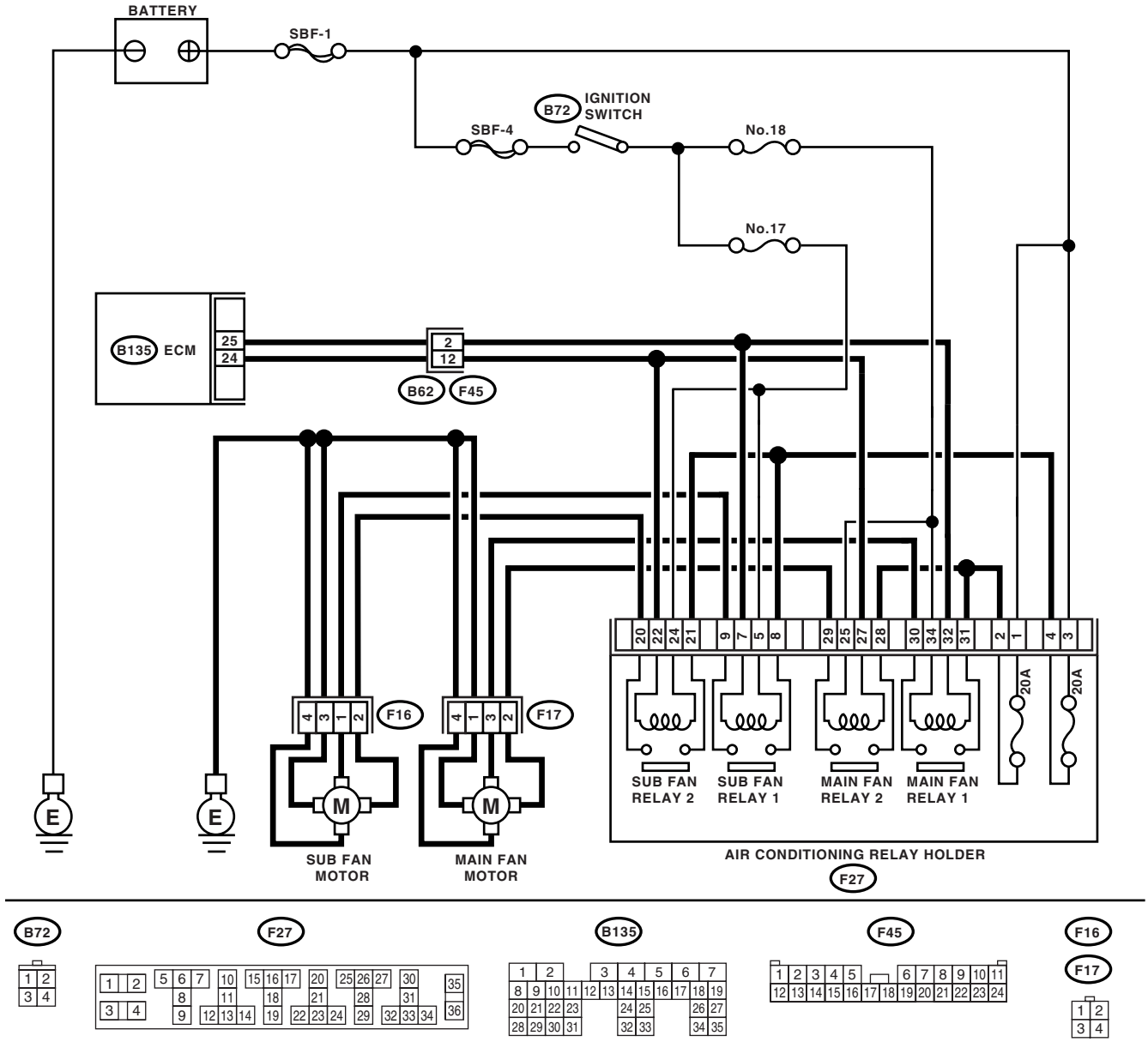
- Occurrence of noise
- Overheating

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

NOTE:
If the vehicle, with the engine idling, is placed very close to a wall or another vehicle, preventing normal cooling function, the OBD system may detect malfunction.

WIRING DIAGRAM:



EN-01837

Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Check the radiator fan, fan motor and thermostat. <Ref. to CO(H4SO)-22, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-23, Radiator Sub Fan and Fan Motor.> If thermostat is stuck, replace thermostat.

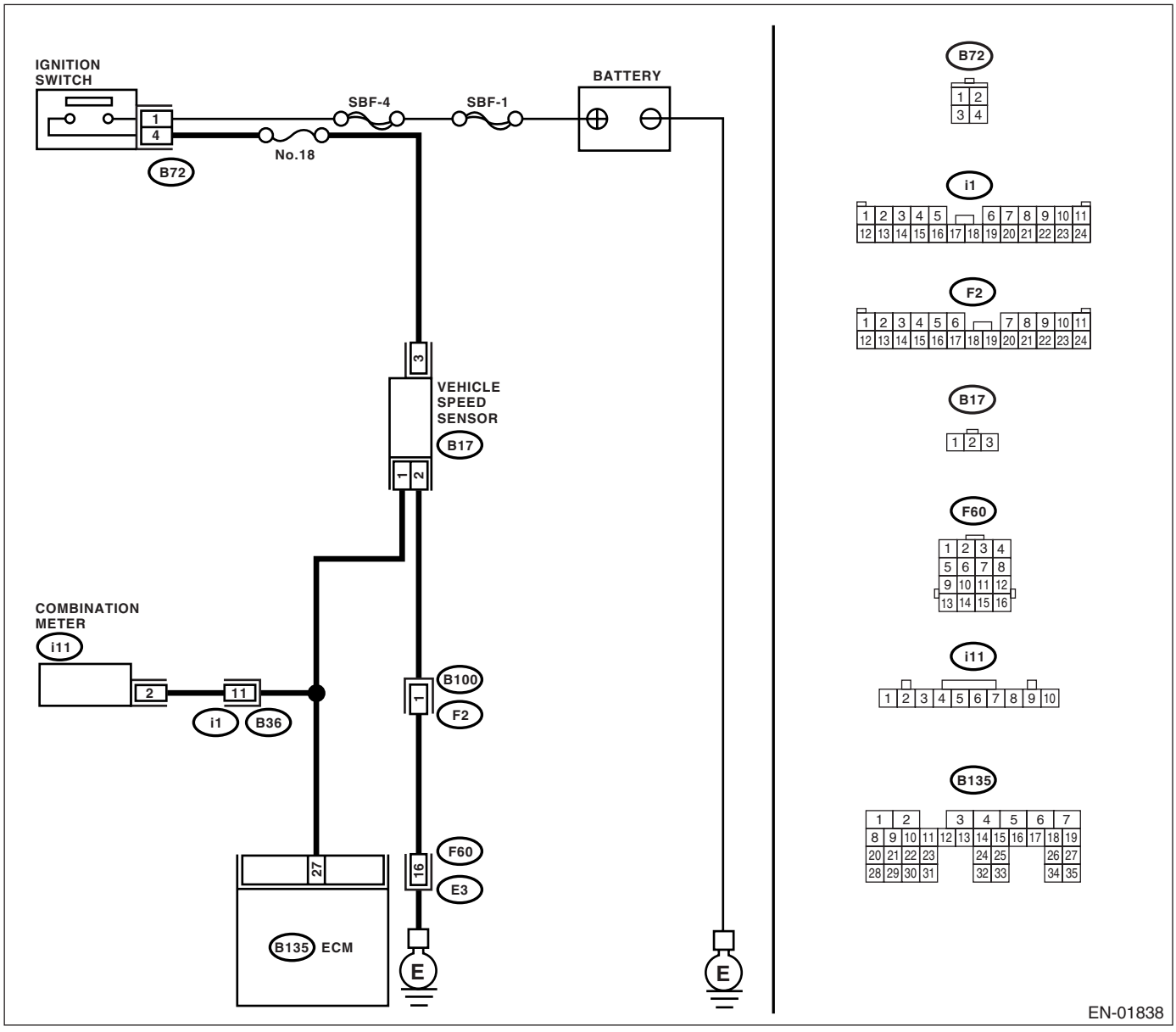
BP:DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-162, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARENESS BETWEEN VEHICLE SPEED SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from vehicle speed sensor and ECM. 3) Measure the resistance of harness between vehicle speed sensor connector and chassis ground. ***Connector & terminal*** ***(B17) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Repair the ground short circuit in harness between vehicle speed sensor and ECM connector.
2	**CHECK POOR CONTACT.** Check poor contact in the vehicle speed sensor connector.	Is there poor contact in the vehicle speed sensor connector?	Repair poor contact in the vehicle speed sensor connector.	Replace the vehicle speed sensor. <Ref. to 5MT-38, Vehicle Speed Sensor.>

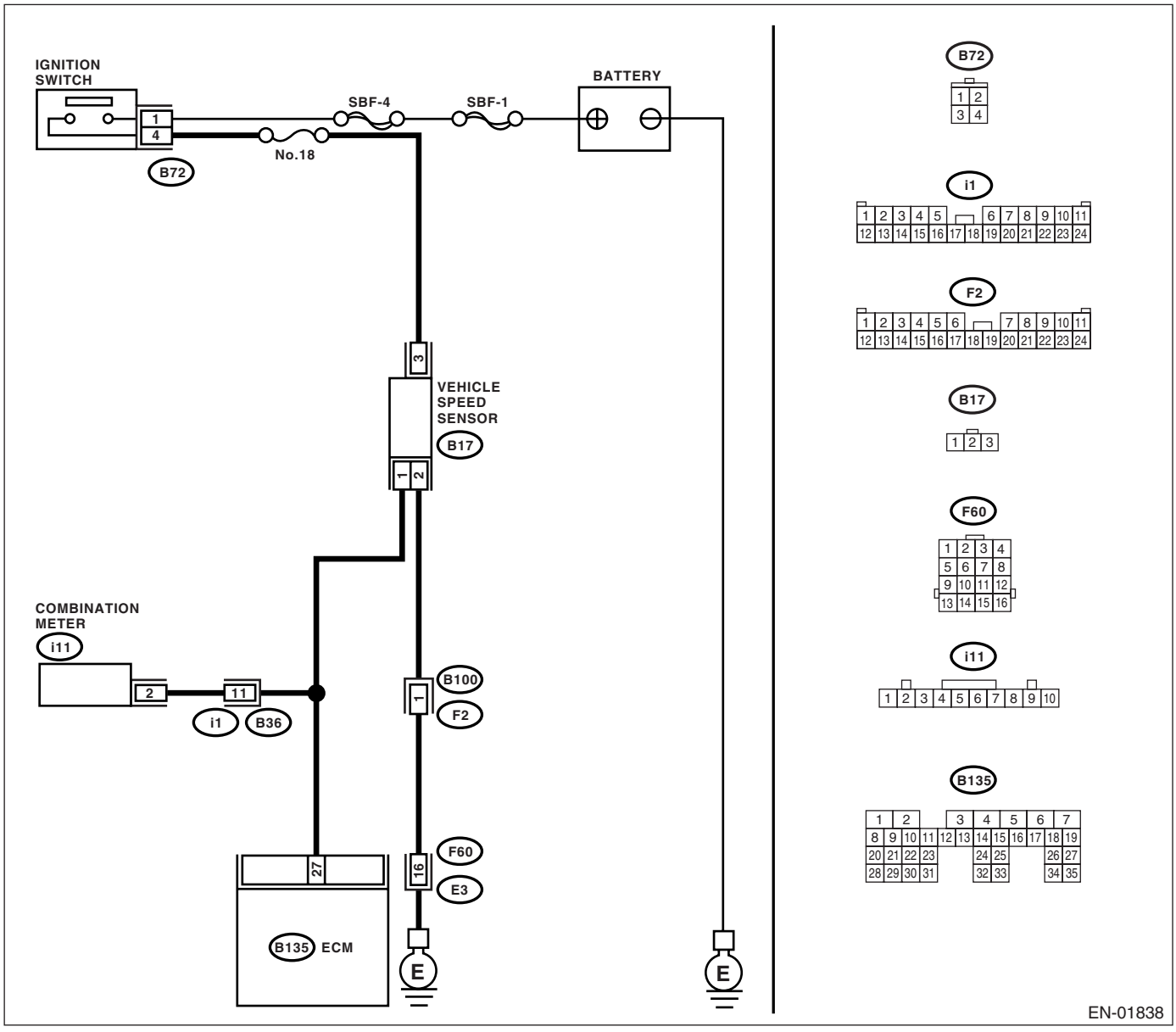
BQ:DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-164, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SPEEDOMETER OPERATION IN COMBINATION METER.**	Does the speedometer operate normally?	Go to step **2.**	Check the speedometer. <Ref. to IDI-14, Speedometer.>
2	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from combination meter. 3) Measure the resistance between ECM and combination meter. ***Connector & terminal*** ***(B135) No. 27 — (i11) No. 2:***	Is the resistance less than 10 Ω?	Repair the poor contact in ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in ECM connector • Poor contact in combination meter connector • Poor contact in coupling connector

BR:DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED

DTC DETECTING CONDITION:

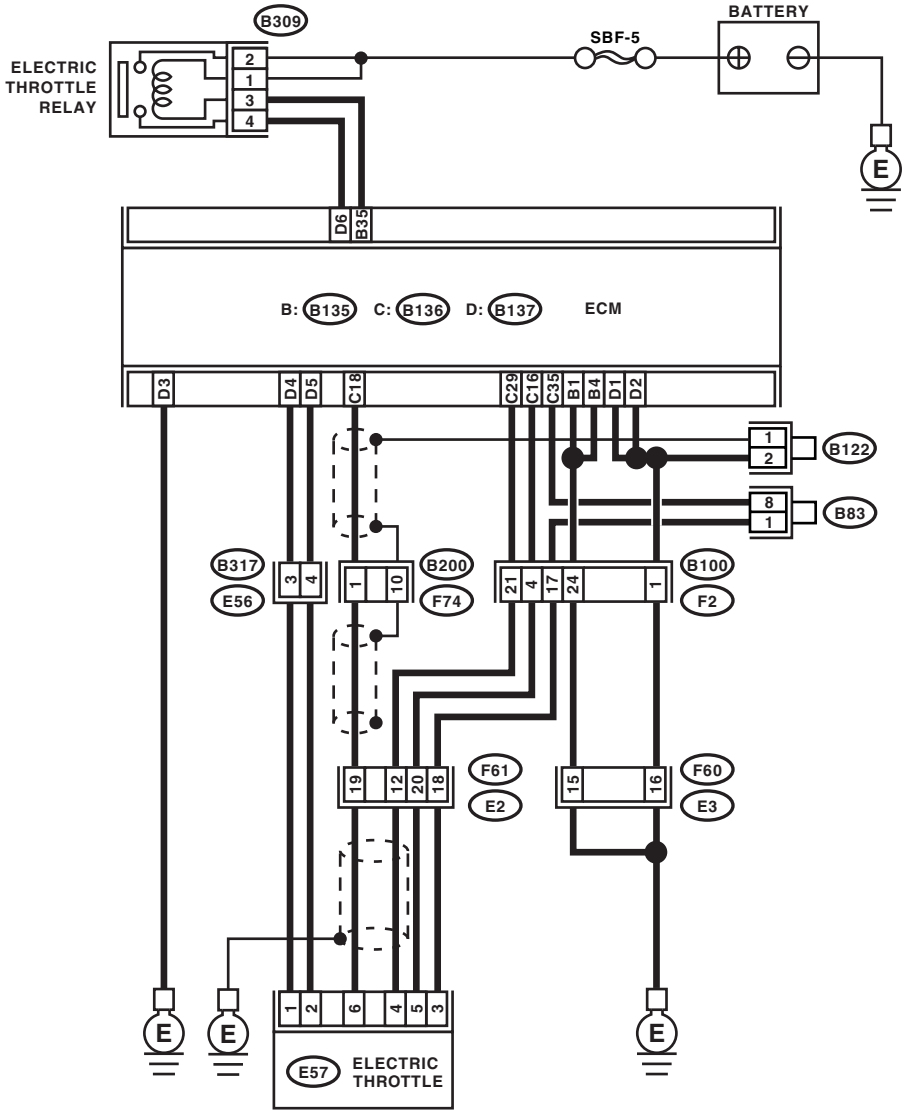
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-166, DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

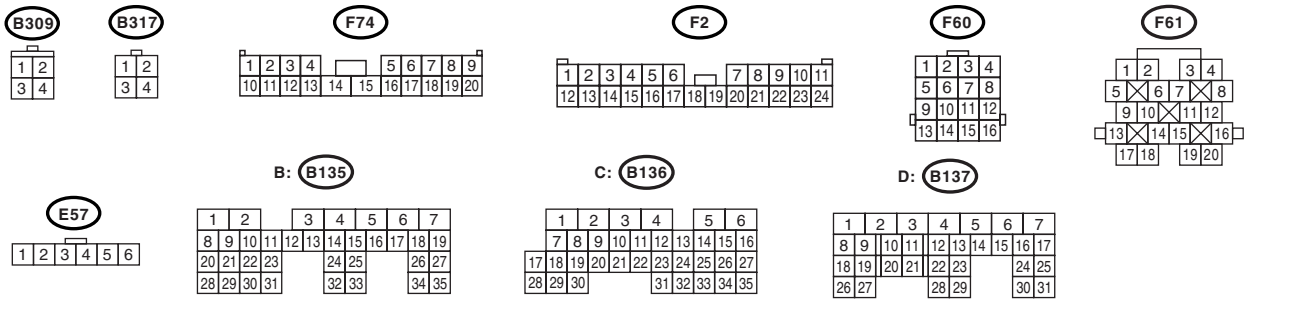
TROUBLE SYMPTOM:

- Engine is difficult to start.
- Engine does not start.
- Erroneous idling
- Engine stalls.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-01825

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	Go to step **2.**
2	**CHECK AIR CLEANER ELEMENT.** 1) Turn the ignition switch to OFF. 2) Check air cleaner element.	Is there excessive clogging on air cleaner element.	Replace the air cleaner element. <Ref. to IN(STi)-7, Air Cleaner.>	Go to step **3.**
3	**CHECK ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Remove the electric throttle. 3) Check the electric throttle.	Are there foreign particles in electric throttle?	Remove the foreign particles from electric throttle.	Perform the diagnosis of DTC P2101.

BS:DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-168, DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

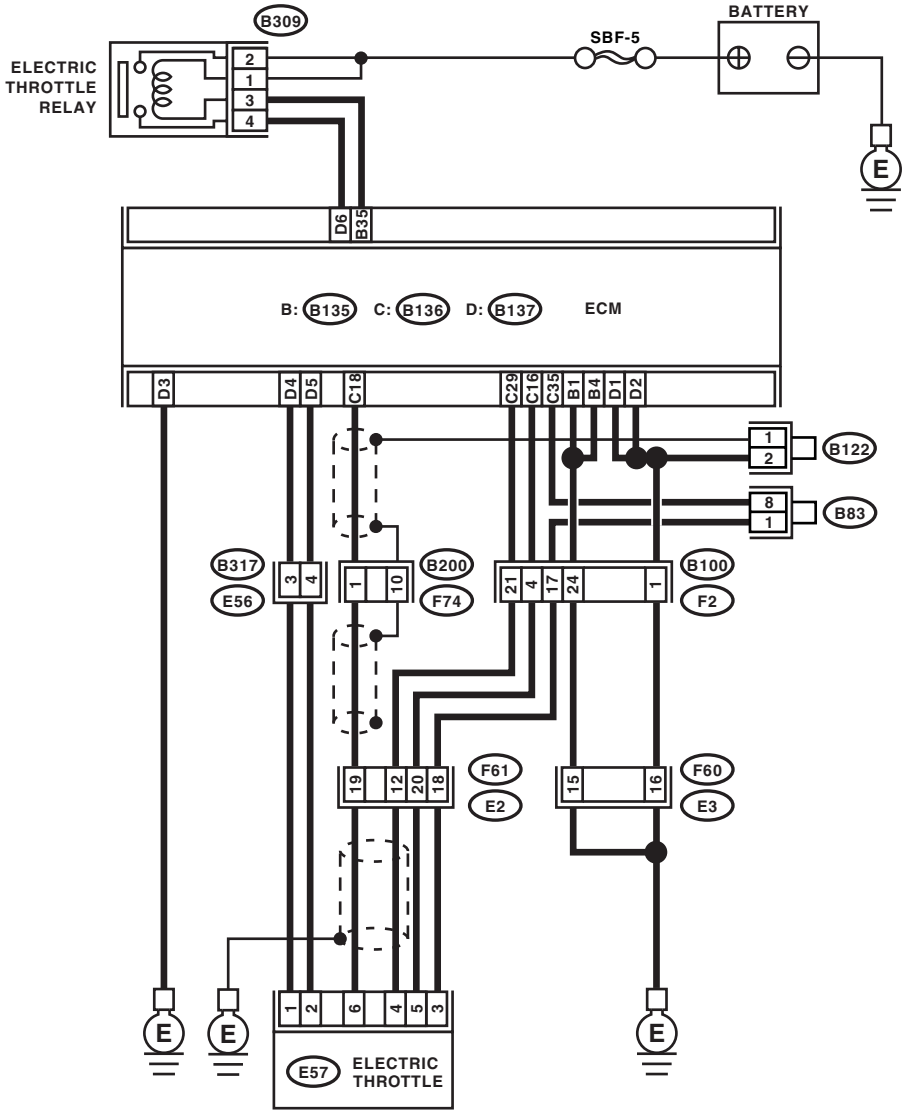
TROUBLE SYMPTOM:

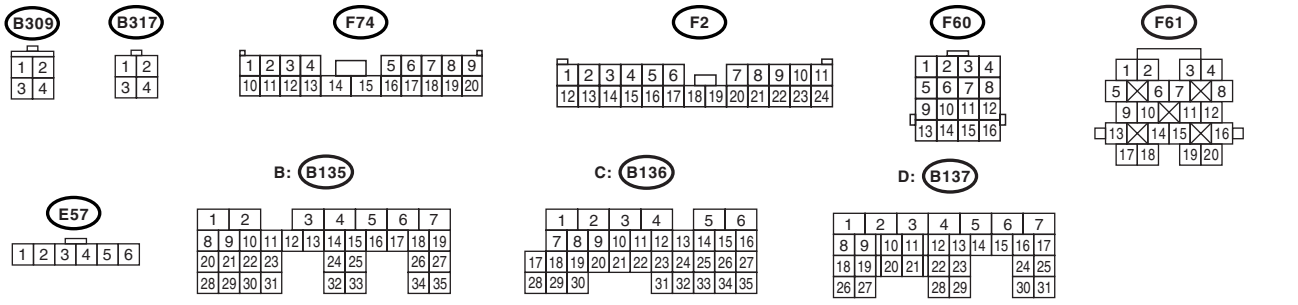
Engine keeps running at higher revolution than specified idling revolution.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-01825

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1) Turn the ignition switch to ON. 2) Start the engine, and idle it. 3) Check the following items. • Loose installation of intake manifold and throttle body • Cracks of intake manifold gasket and throttle body gasket • Disconnections of vacuum hoses	Is there a fault in air intake system?	Repair the air suction and leaks.	Go to step **3.**
3	**CHECK ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Remove the electric throttle. 3) Check the electric throttle.	Are there foreign particles in electric throttle?	Remove the foreign particles from electric throttle.	Perform the diagnosis of DTC P2102.

BT:DTC P0512 STARTER REQUEST CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-170, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

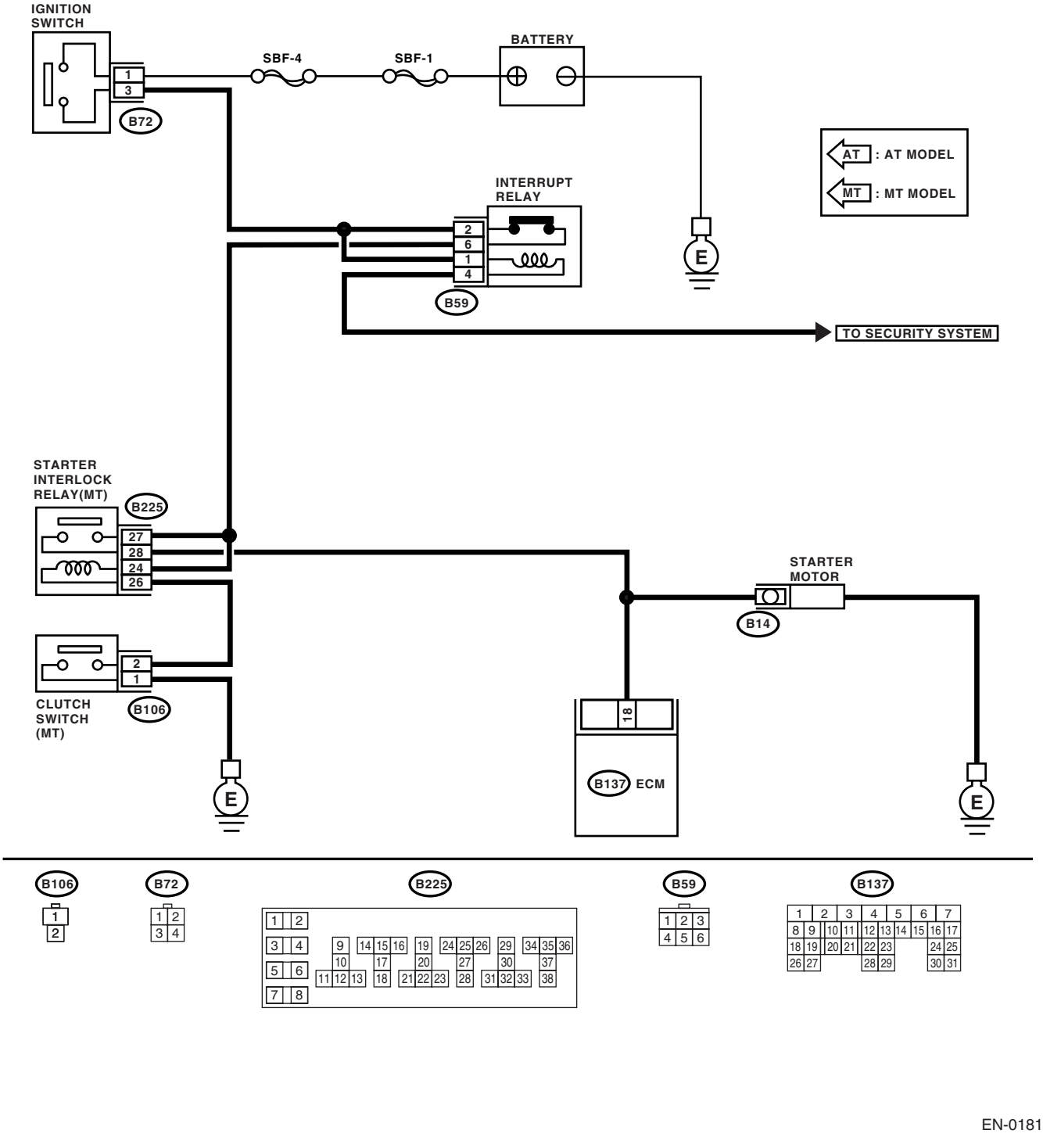
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01815

Step		Check	Yes	No
1	CHECK OPERATION OF STARTER MOTOR.	Does the starter motor operate when ignition switch is turned to ON?	Repair the battery short circuit in starter motor circuit. After repair, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>	Check the starter motor circuit. <Ref. to EN(STi)(diag)-54, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

BU:DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-171, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

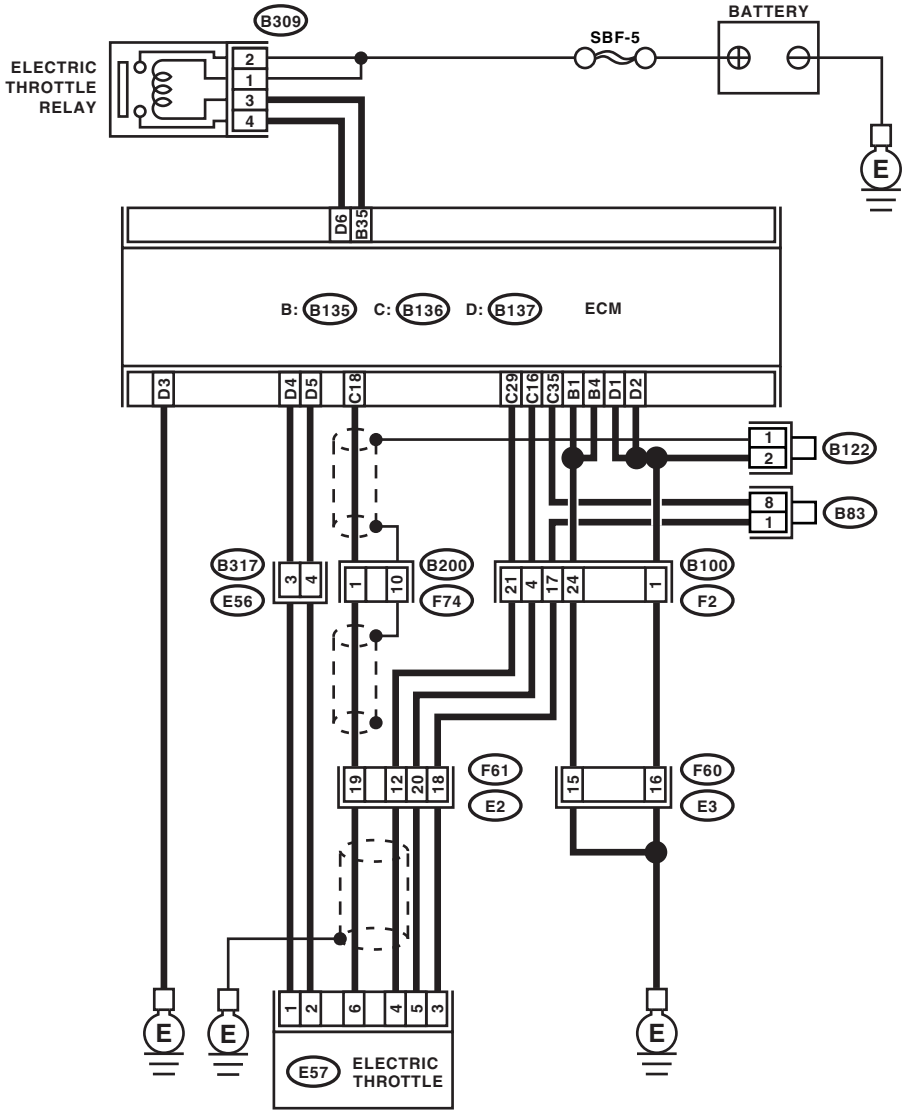
TROUBLE SYMPTOM:

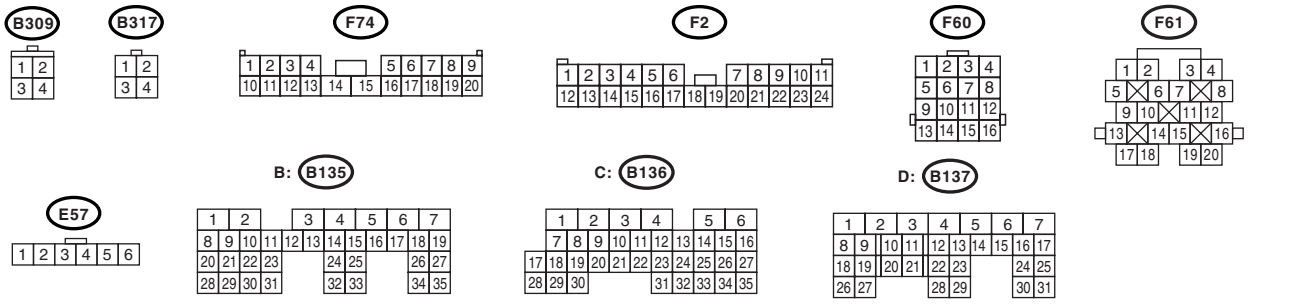
- Engine keeps running at higher revolution than specified idling revolution.
- Fuel is cut according to fail-safe function.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-01825

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0519.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1) Turn the ignition switch to ON. 2) Start the engine, and idle it. 3) Check the following items. • Loose installation of intake manifold and throttle body • Cracks of intake manifold gasket and throttle body gasket • Disconnections of vacuum hoses	Is there a fault in air intake system?	Repair the air suction and leaks.	Go to step **3.**
3	**CHECK ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Remove the electric throttle. 3) Check the electric throttle.	Are there foreign particles in electric throttle?	Remove the foreign particles from electric throttle.	Perform the diagnosis of DTC P2102.

BV:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-173, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

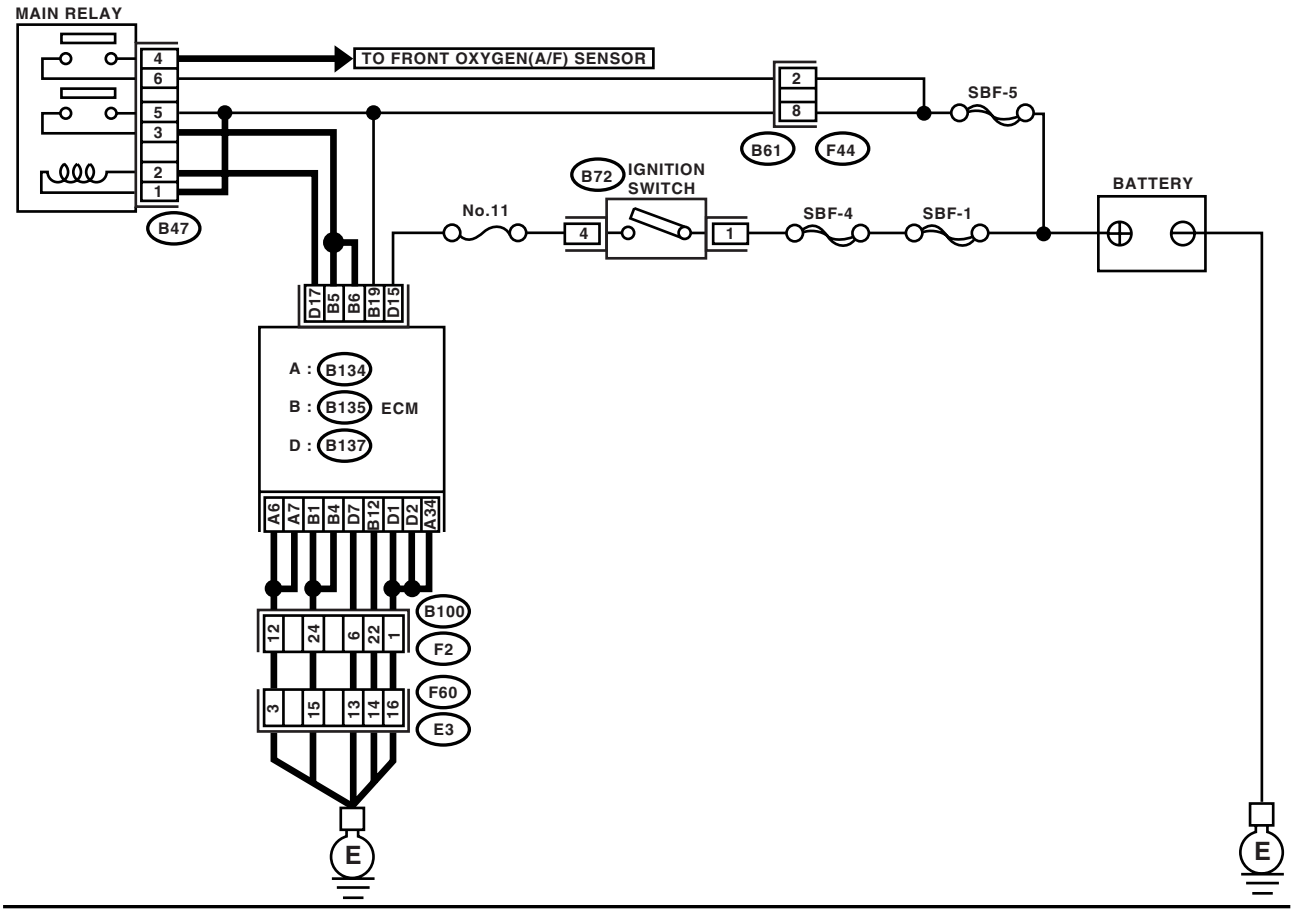
TROUBLE SYMPTOM:

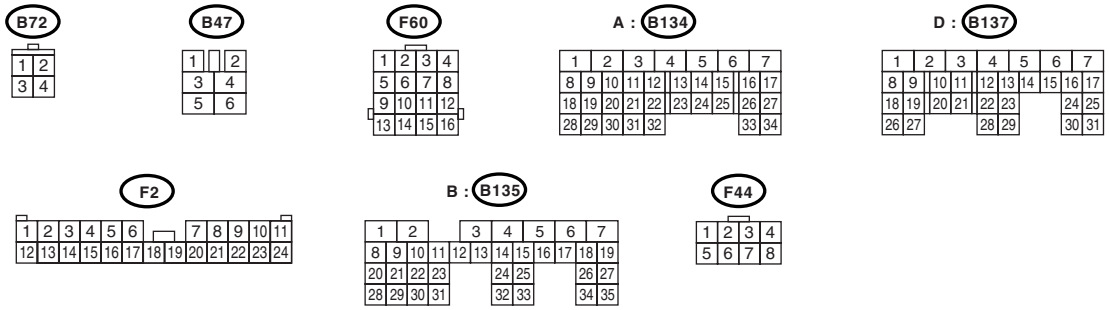
- Engine does not start.
- Engine stalls.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-01816

Step		Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0604?	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>	A temporary poor contact.

BW:DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

NOTE:
For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(STi)(diag)-237, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BX:DTC P0607 CONTROL MODULE PERFORMANCE

DTC DETECTING CONDITION:

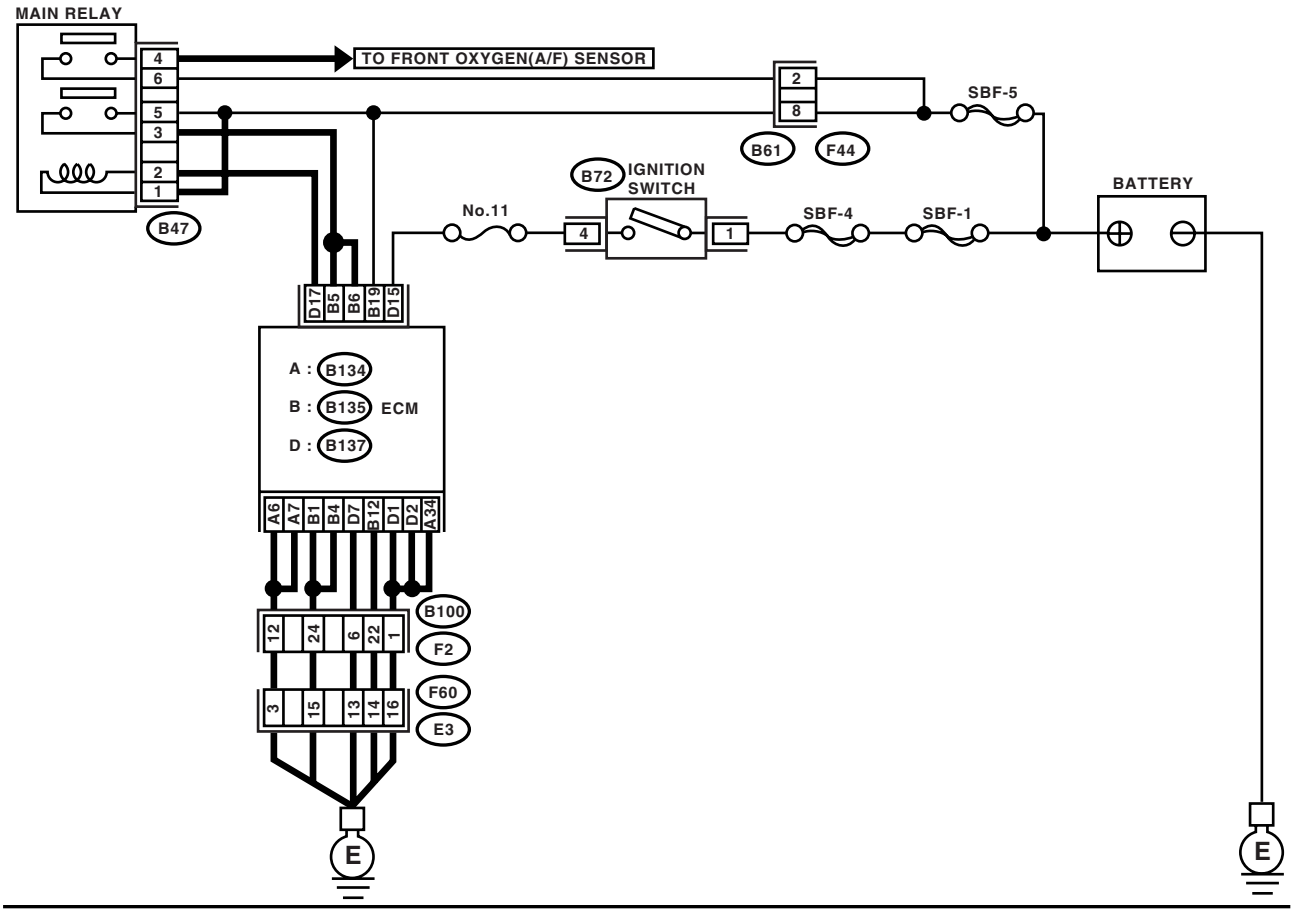
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-175, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(STi)-176, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

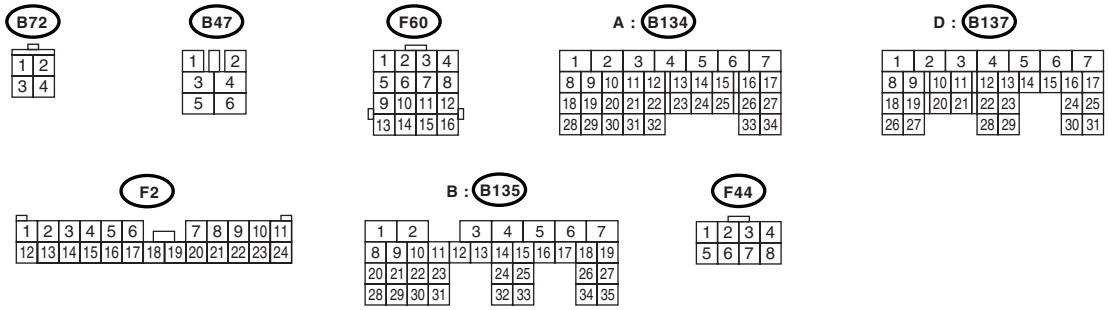
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-01816

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ECM** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (−):*** ***(B135) No. 6 (+) — Chassis ground (−):***	Is the voltage 10 — 13 V?	Go to step **2.**	Repair the open circuit or ground short of power supply circuit.
2	**CHECK INPUT VOLTAGE OF ECM** 1) Start the engine. 2) Measure the voltage between ECM connector and ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (−):*** ***(B135) No. 6 (+) — Chassis ground (−):***	Is the voltage 13 — 15 V?	Go to step **3.**	Repair the open circuit or ground short of power supply circuit.
3	**CHECK GROUND HARNESS OF ECM** Measure the voltage between ECM connector and ground. ***Connector & terminal*** ***(B137) No. 1 (+) — Chassis ground (−):*** ***(B137) No. 2 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Repair poor contact of ECM connector. If poor contact occur, replace the ECM.	Retighten the engine ground terminal.

BY:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(STi)(diag)-309, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BZ:DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW

DTC DETECTING CONDITION:

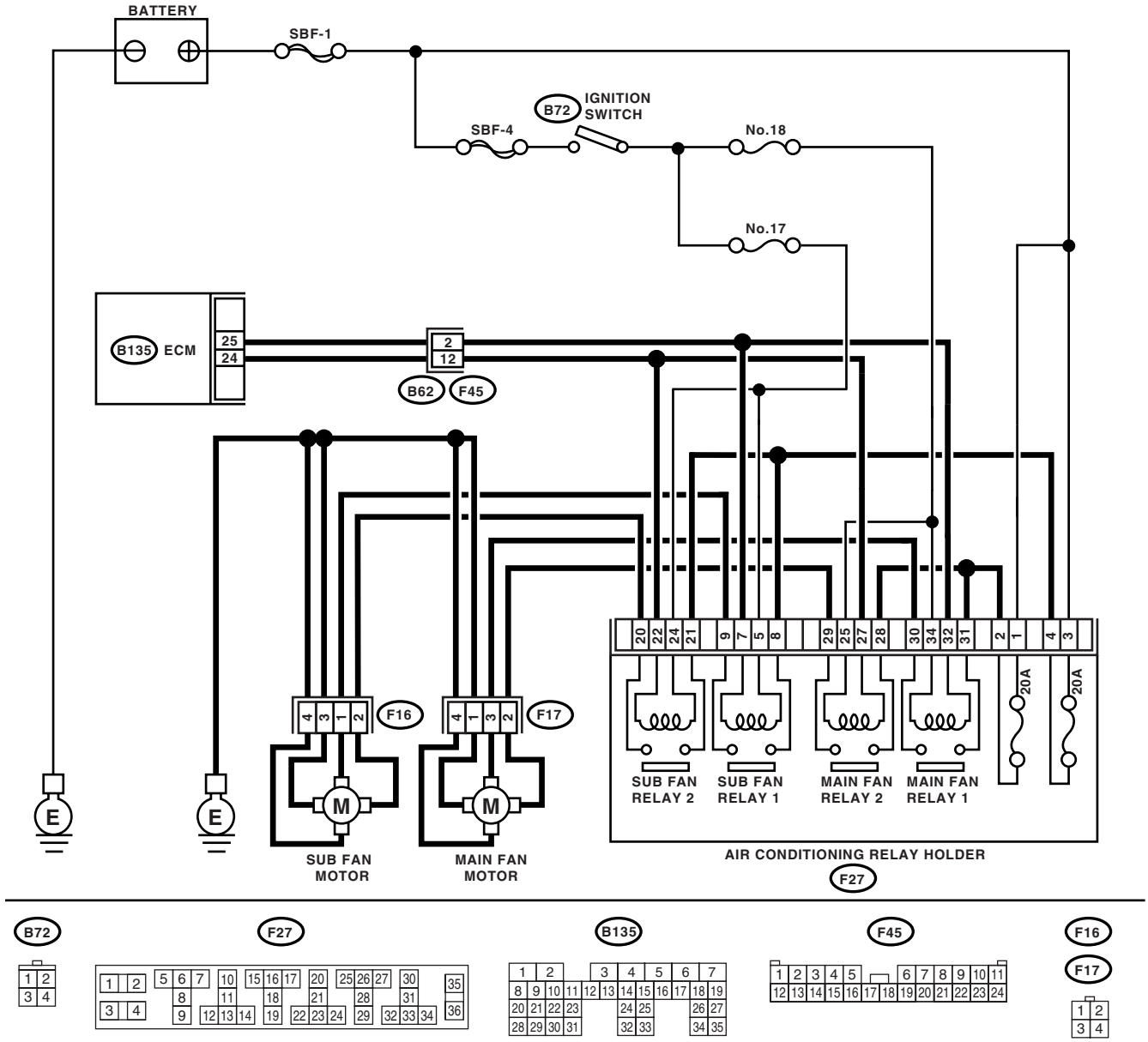
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-182, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01837

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector. 3) Turn the ignition switch to ON. 4) While operating the radiator fan relay, measure voltage between ECM terminal and ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (−):*** ***(B135) No. 24 (+) — Chassis ground (−):***	Does the voltage change 0 — 10 V?	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK GROUND SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 — Chassis ground:*** ***(B135) No. 24 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in radiator fan relay control circuit.
3	**CHECK POWER SUPPLY FOR RELAY.** 1) Remove the main fan relay 1 and main fan relay 2 from A/C relay holder. 2) Turn the ignition switch to ON. 3) Measure the voltage between fuse and relay box (F/B) connector and chassis ground. ***Connector & terminal*** ***(F27) No. 27 (+) — Chassis ground (−):*** ***(F27) No. 32 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.
4	**CHECK MAIN FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between main fan relay terminals. ***Terminals*** ***No. 32 — No. 34: (Main fan relay 1)*** ***No. 25 — No. 27: (Main fan relay 2)***	Is the resistance 87 — 107 Ω?	Go to step **5.**	Replace the main fan relay.
5	**CHECK OPEN CIRCUIT IN MAIN FAN RELAY CONTROL CIRCUIT.** Measure the resistance of harness between ECM and fan relay connector. ***Connector & terminal*** ***(B135) No. 25 — (F27) No. 32:*** ***(B135) No. 24 — (F27) No. 27:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fan relay connector • Poor contact in coupling connector
6	**CHECK POOR CONTACT.** Check poor contact in ECM or fan relay connector.	Is there poor contact in ECM or fan relay connector?	Repair poor contact in ECM or fan relay connector.	Contact your SOA Service Center.

CA:DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-183, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

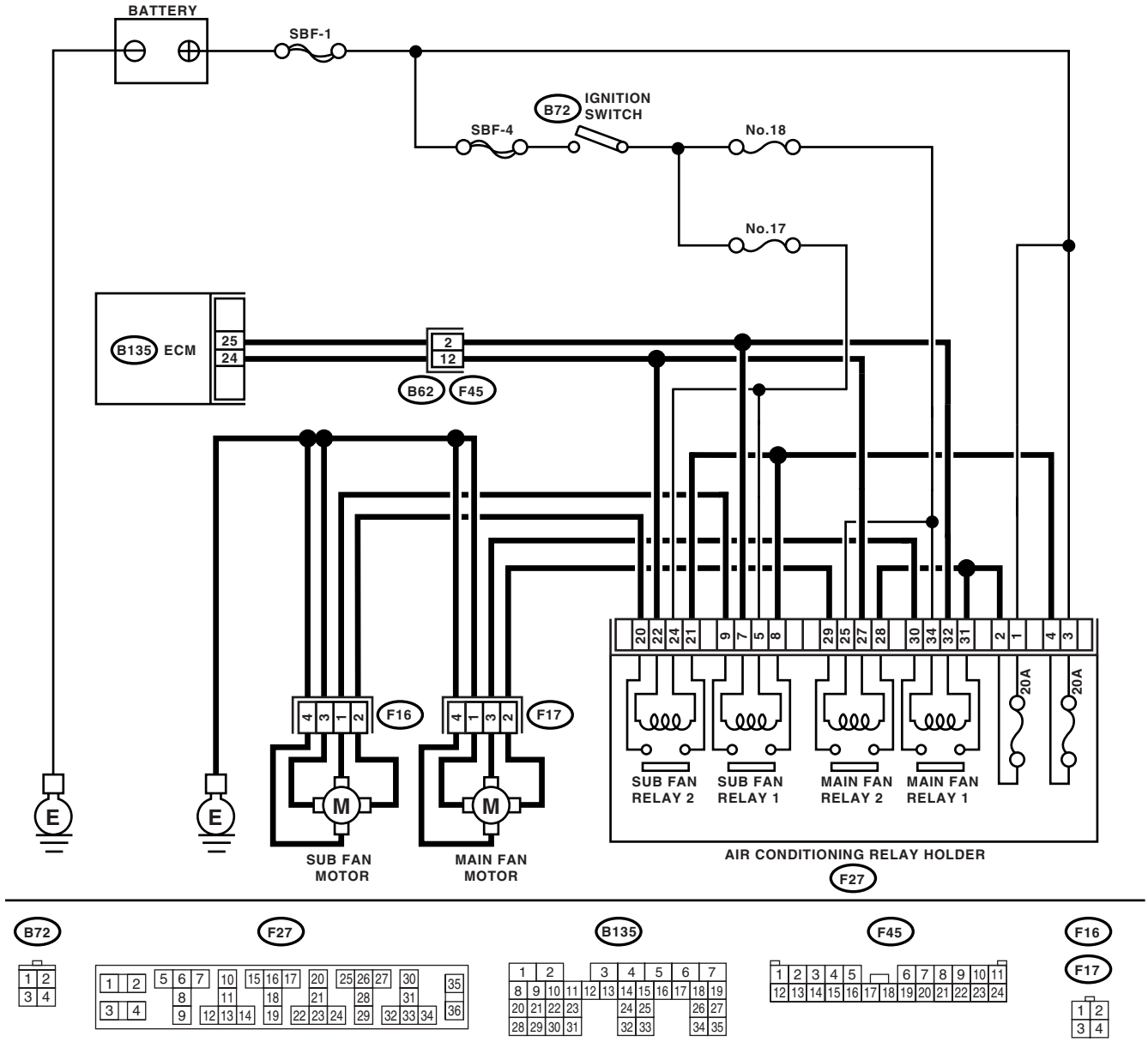
TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01837

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector. 3) Turn the ignition switch to ON. 4) While operating the radiator fan relay, measure the voltage between ECM and chassis ground. NOTE: Radiator fan relay operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STi)(diag)-42, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (−):*** ***(B135) No. 24 (+) — Chassis ground (−):***	Does the voltage change 0 — 10 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.	Go to step **2.**
2	**CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Remove the fan relay 1, fan relay 2 and fan mode relay. 3) Disconnect the test mode connector. 4) Turn the ignition switch to ON. 5) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (−):*** ***(B135) No. 24 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in radiator fan relay control circuit. After repair, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>	Go to step **3.**
3	**CHECK MAIN FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay. 3) Measure the resistance between main fan relay terminals. ***Terminals*** ***No. 30 — No. 31: (Main fan relay 1)*** ***No. 28 — No. 29: (Main fan relay 2)***	Is the resistance less than 1 Ω?	Replace the main fan relay and ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>	Go to step **4.**
4	**CHECK SUB FAN RELAY.** 1) Remove the sub fan relay. 2) Measure the resistance between sub fan relay terminals. ***Terminals*** ***No. 8 — No. 9: (Sub fan relay 1)*** ***No. 20 — No. 21: (Sub fan relay 2)***	Is the resistance less than 1 Ω?	Replace the sub fan relay and ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>

CB:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-184, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

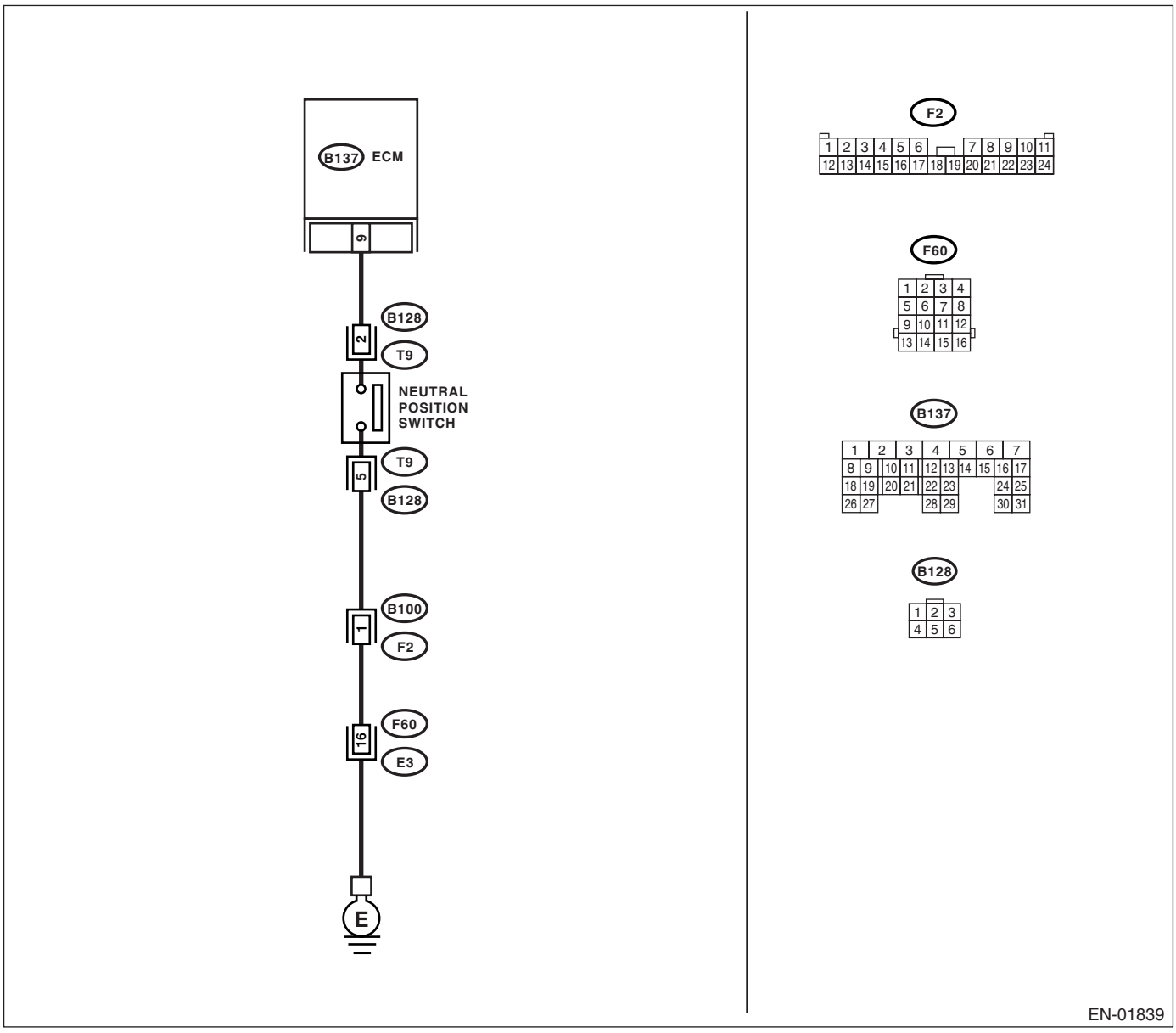
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. 2) Place the shift lever in neutral. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Place the shift lever in a position except for neutral. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact your SOA Service Center.
4	**CHECK NEUTRAL POSITION SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission harness. 3) Place the shift lever in neutral. 4) Measure the resistance between transmission harness and connector terminals. ***Connector & terminal*** ***(T9) No. 2 — No. 5:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair short circuit in transmission harness or replace neutral position switch.
5	**CHECK NEUTRAL POSITION SWITCH.** 1) Place the shift lever in a position except for neutral. 2) Measure the resistance between transmission harness connector terminals.	Is the resistance less than 1 Ω?	Go to step **6.**	Repair short circuit in transmission harness or replace neutral position switch.
6	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair ground short circuit in harness between ECM and transmission harness connector.
7	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and transmission harness connector. ***Connector & terminal*** ***(B137) No. 9 — (B128) No. 2:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between ECM and transmission harness connector.
8	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(B128) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **9.**	Repair open circuit between transmission harness connector and engine ground terminal.
9	**CHECK POOR CONTACT.** Check poor contact in transmission harness connector.	Is there poor contact in transmission harness connector?	Repair poor contact in transmission harness connector.	Contact your SOA Service Center.

CC:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-185, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

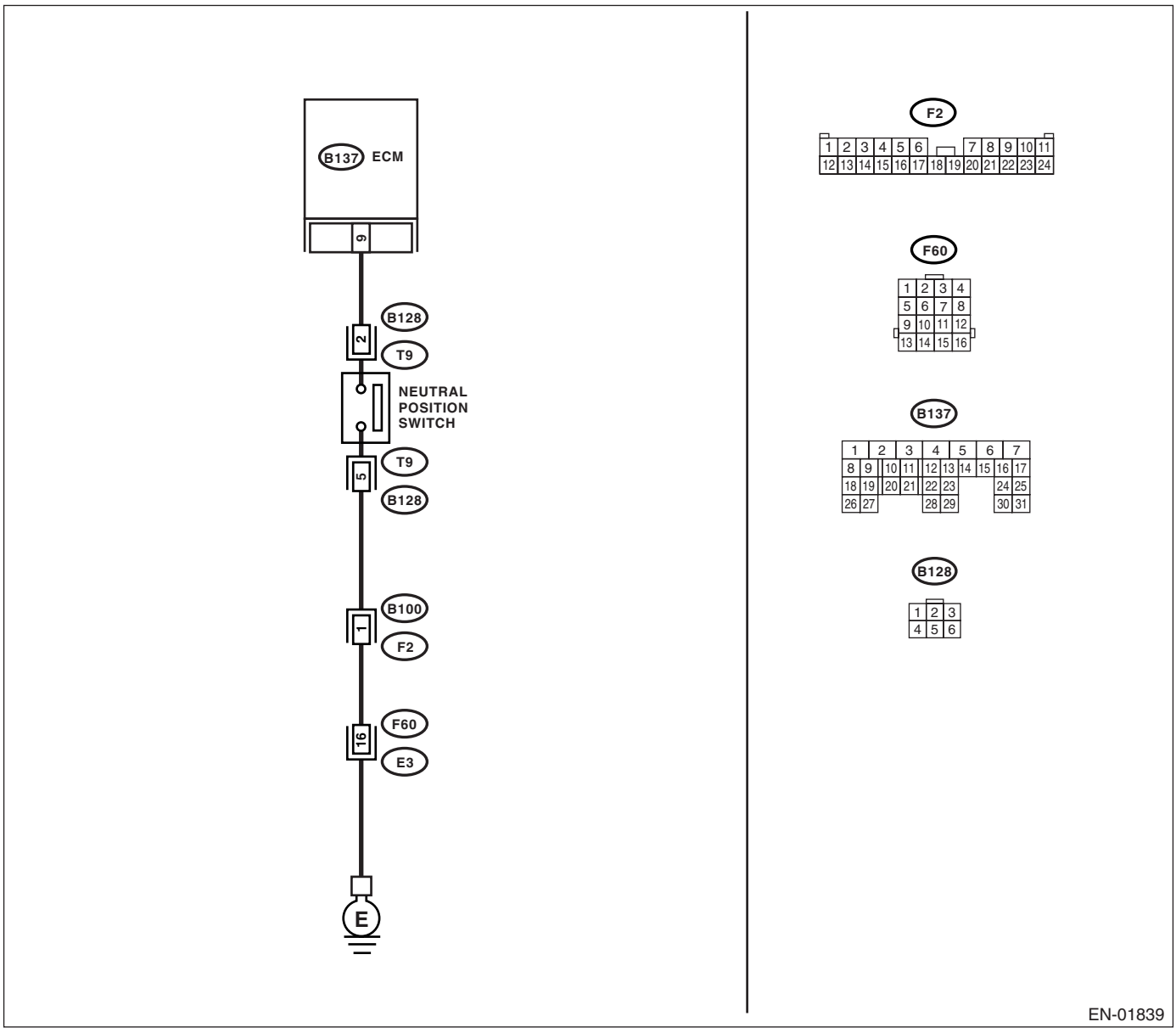
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to ON. 2) Set the shift lever to except neutral position. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Set the shift lever to neutral position. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Contact your SOA Service Center.
4	**CHECK INPUT SIGNAL FOR ECM.** 1) Disconnect ECM connector from ECM. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and transmission connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T9). 3) Measure the resistance of harness between ECM and neutral switch connector. ***Connector & terminal*** ***(B137) No. 9 — (B128) No. 2:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and transmission harness • Poor contact in transmission harness connector • Poor contact in ECM connector
6	**CHECK NEUTRAL POSITION SWITCH GROUND LINE.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(B128) No. 5 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **7.**	Repair the open circuit in harness of neutral position switch ground line.
7	**CHECK NEUTRAL POSITION SWITCH.** 1) Set the shift lever to except neutral position. 2) Measure the resistance between transmission harness connector receptacle's terminals. ***Terminals*** ***No. 2 — No. 5:***	Is the resistance less than 1 Ω?	Go to step **8.**	Replace the neutral position switch.
8	**CHECK POOR CONTACT.** Check poor contact in the transmission harness connector.	Is there poor contact in the transmission harness connector?	Repair poor contact in transmission harness connector.	Contact your SOA Service Center.

CD: DTC P1086 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-186, DTC P1086 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

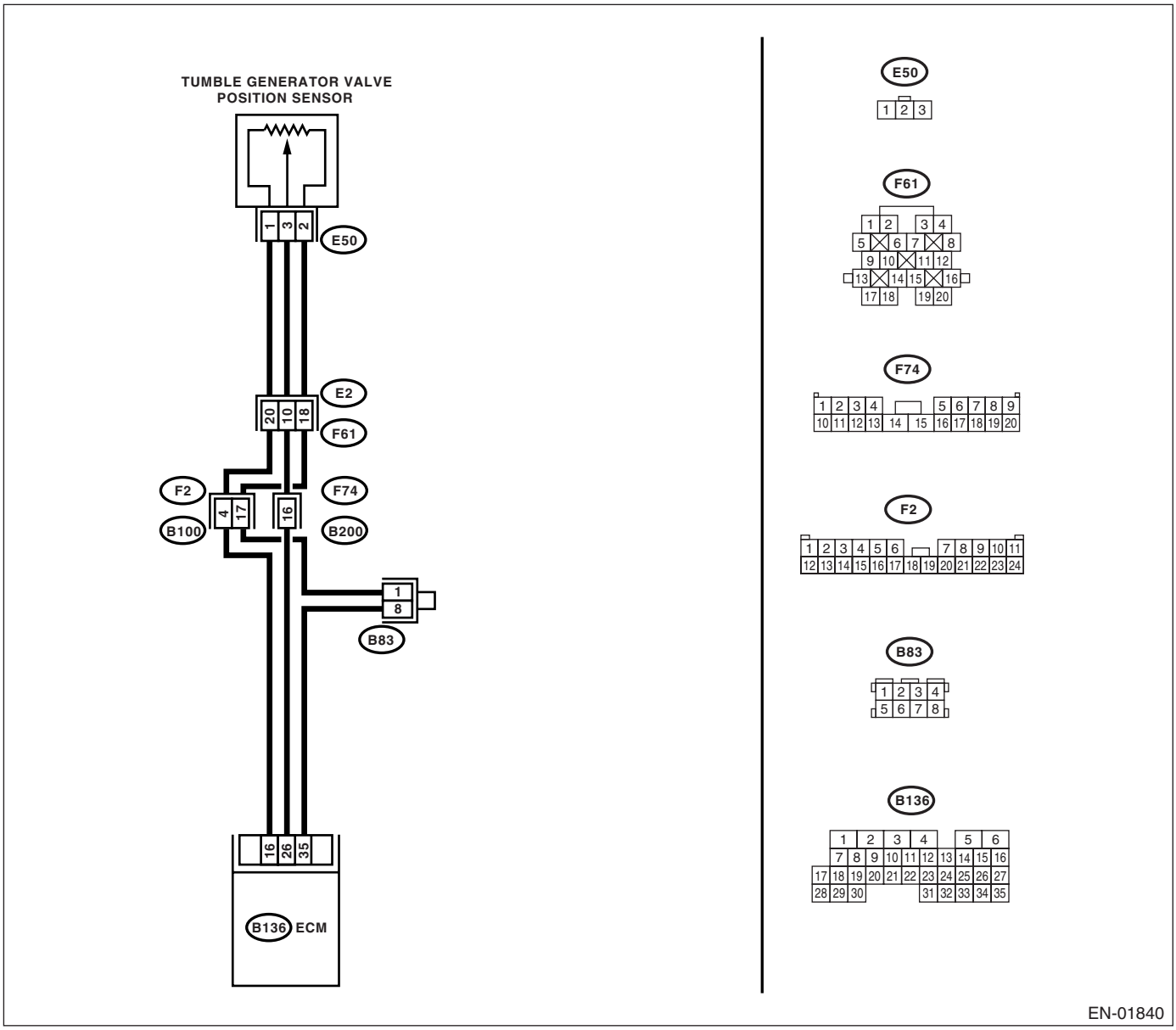
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage less than 0.1 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 26 (+) — Chassis ground (–):***	Is the voltage less than 0.1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)** Measure the voltage between ECM connector and chassis ground.	Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change?	Repair the poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from tumble generator valve position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 1 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector. ***Connector & terminal*** ***(B136) No. 26 — (E50) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the ground short circuit in harness between tumble generator valve position sensor and ECM connector.
9	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve position sensor connector.	Is there poor contact in tumble generator valve position sensor connector?	Repair the poor contact in tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(STi)-33, Tumble Generator Valve Position Sensor.>

CE:DTC P1087 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-188, DTC P1087 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

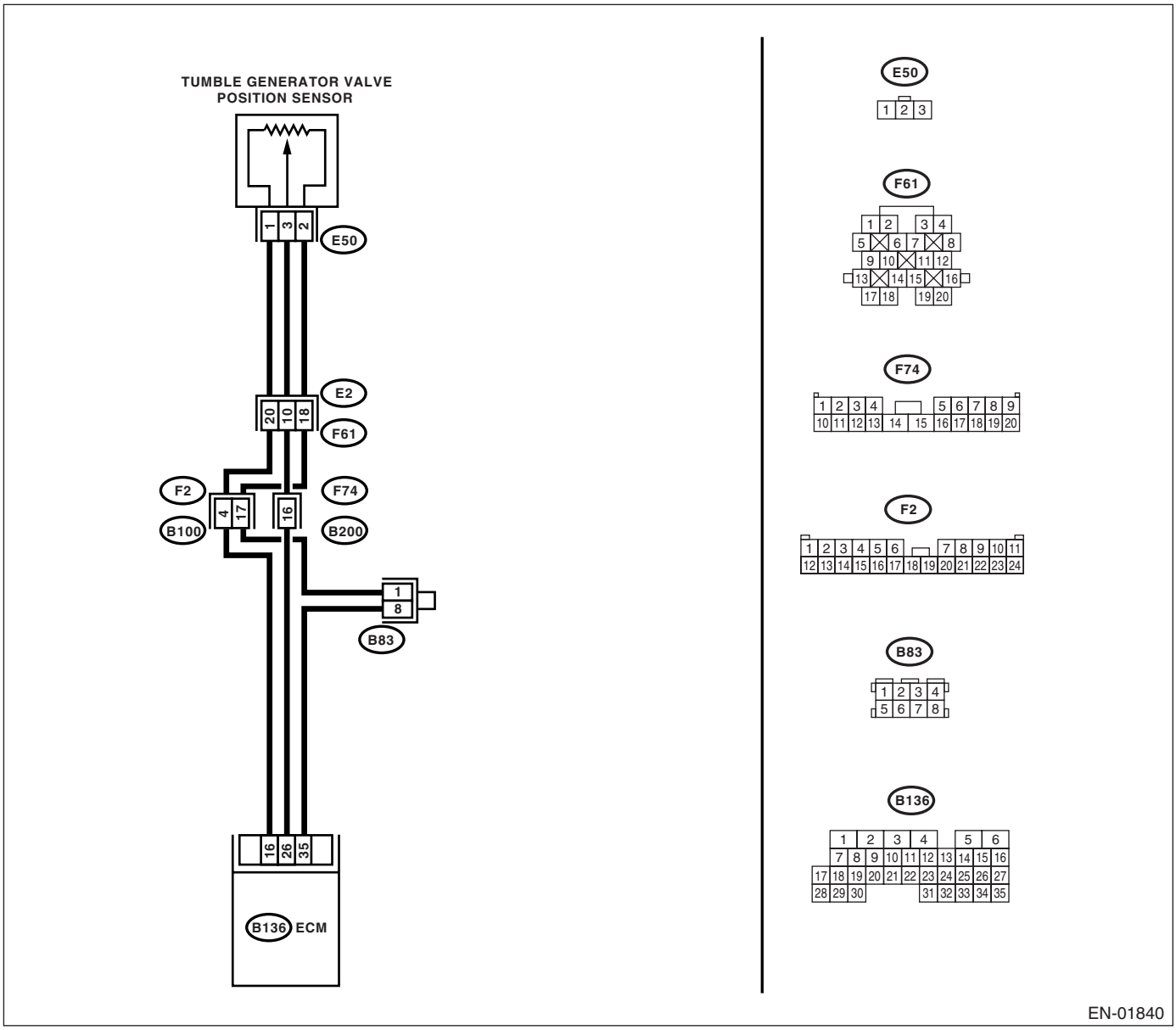
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage more than 4.9 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.9 V?	Repair the battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>	Replace the tumble generator valve position sensor. <Ref. to FU(STi)-33, Tumble Generator Valve Position Sensor.>

CF: DTC P1088 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-190, DTC P1088 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

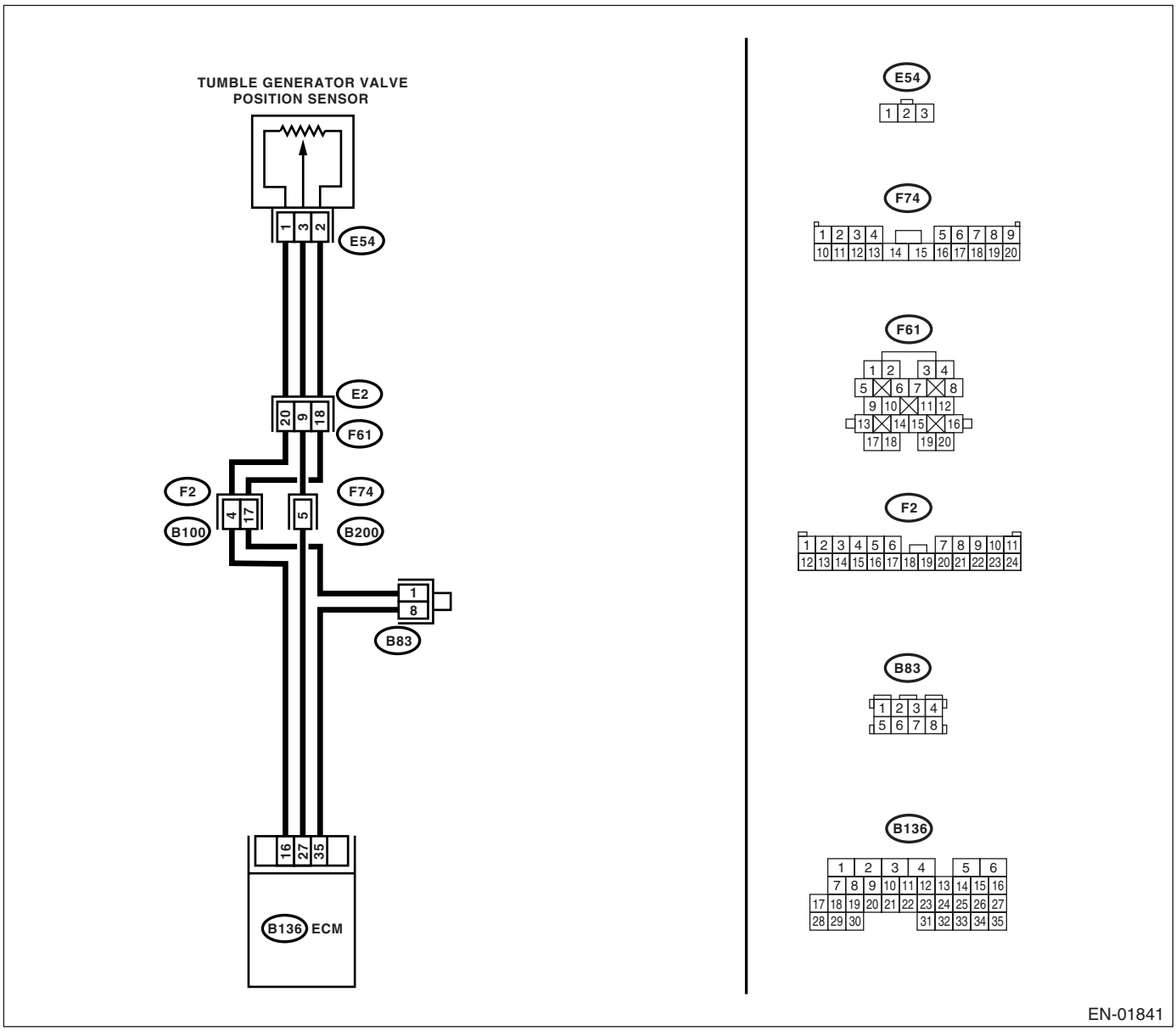
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage less than 0.1 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 27 (+) — Chassis ground (–):***	Is the voltage less than 0.1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)** Measure the voltage between ECM connector and chassis ground.	Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change?	Repair the poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from tumble generator valve position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 1 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector. ***Connector & terminal*** ***(B136) No. 27 — (E54) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the ground short circuit in harness between tumble generator valve position sensor and ECM connector.
9	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve position sensor connector.	Is there poor contact in tumble generator valve position sensor connector?	Repair the poor contact in tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(STi)-33, Tumble Generator Valve Position Sensor.>

CG:DTC P1089 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-192, DTC P1089 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

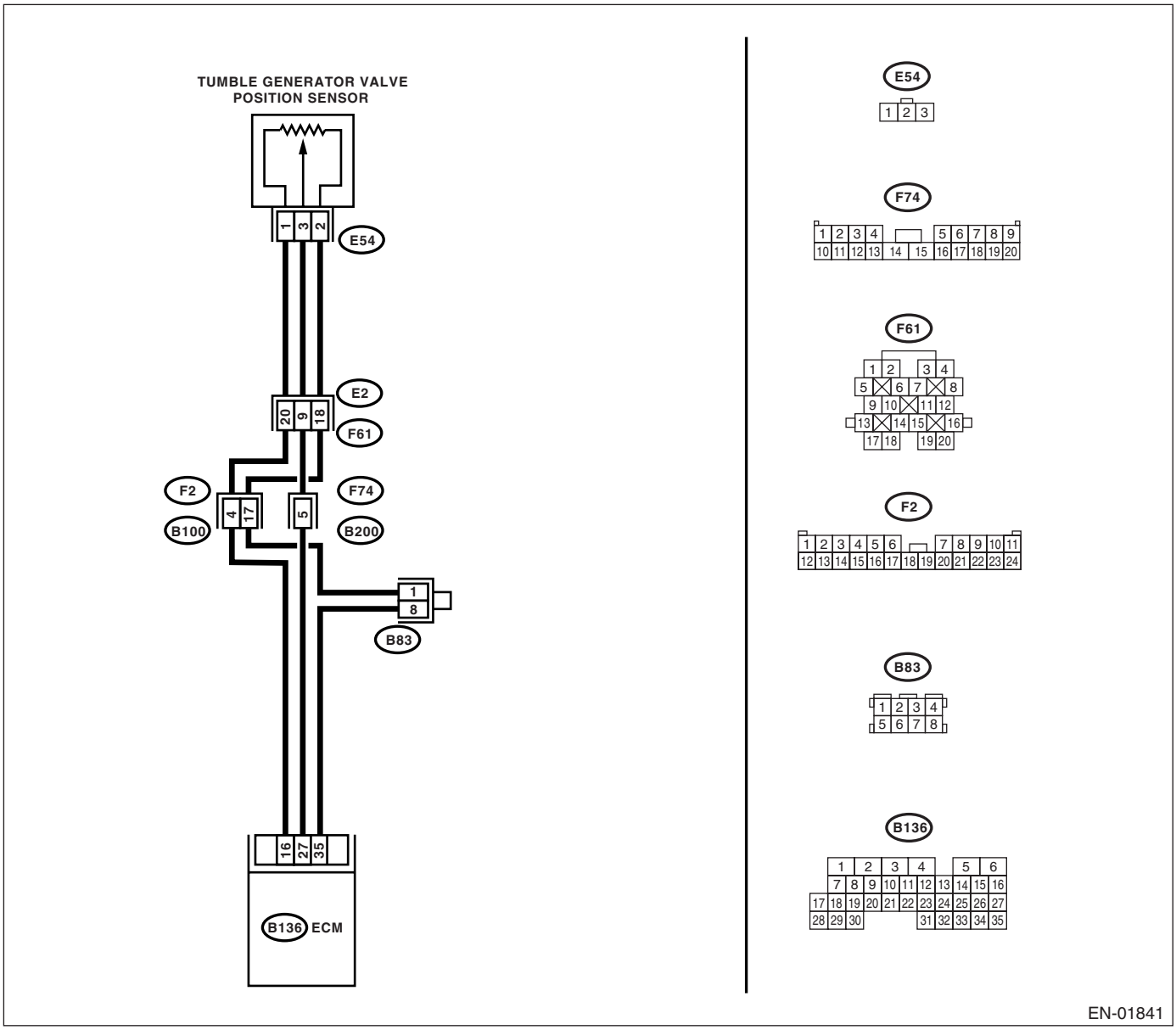
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01841

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage more than 4.9 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.9 V?	Repair the battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>	Replace the tumble generator valve position sensor. <Ref. to FU(STi)-33, Tumble Generator Valve Position Sensor.>

CH:DTC P1090 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-194, DTC P1090 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE RH.** 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(STi)-32, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

CI: DTC P1091 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-195, DTC P1091 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)" <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE RH.** 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(STi)-32, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

CJ:DTC P1092 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-196, DTC P1092 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE LH.** 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(STi)-32, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

CK:DTC P1093 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-197, DTC P1093 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE LH.** 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(STi)-32, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

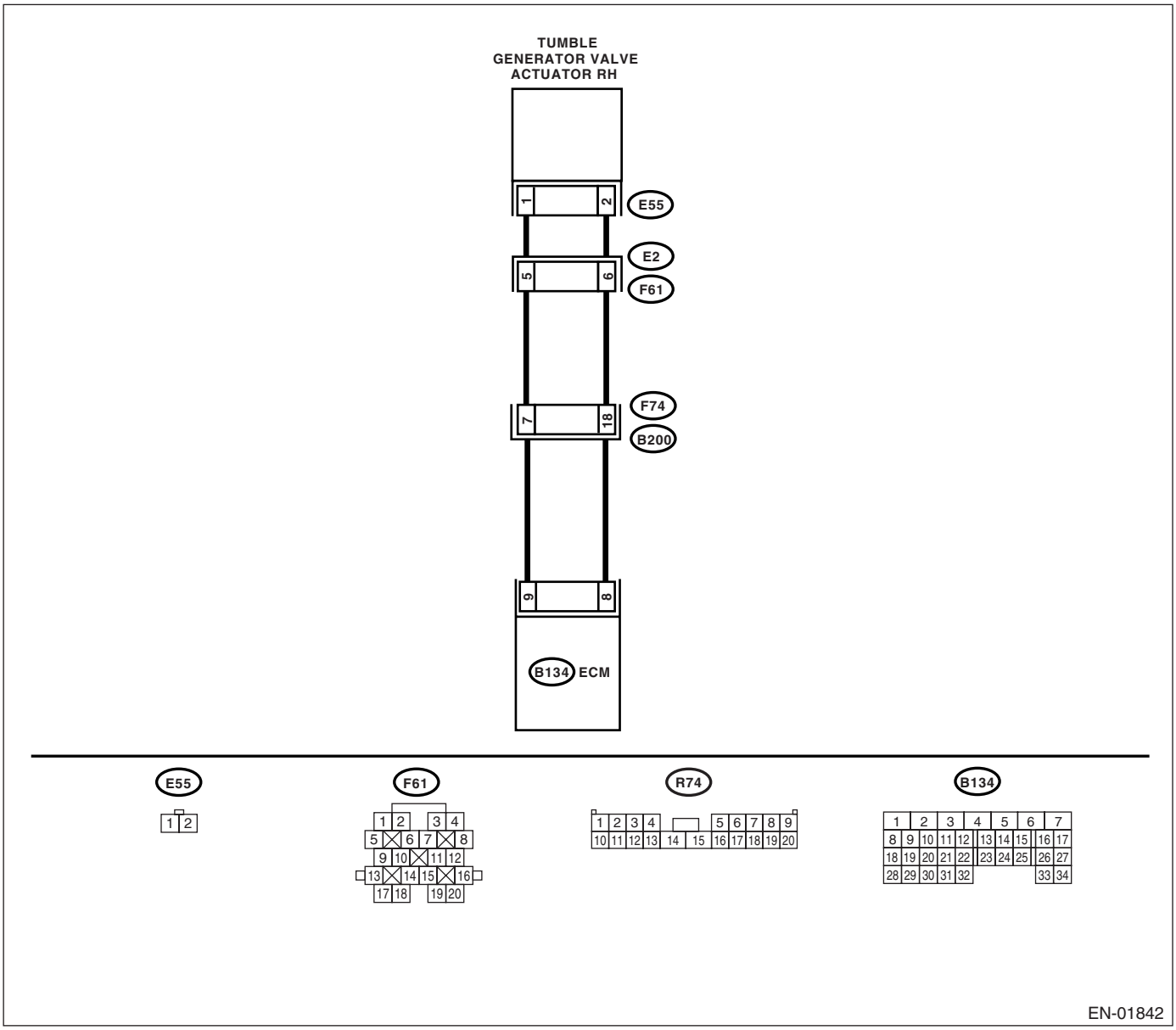
CL:DTC P1094 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-198, DTC P1094 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector. ***Connector & terminal*** ***(E55) No. 1 — (B134) No. 9:*** ***(E55) No. 2 — (B134) No. 8:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit between ECM and tumble generator valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and tumble generator valve actuator connector. • Poor contact in coupling connector.
2	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve actuator connector.	Is there poor contact in tumble generator valve actuator connector?	Repair the poor contact in tumble generator valve actuator connector.	Replace the tumble generator valve actuator. <Ref. to FU(STi)-34, Tumble Generator Valve Actuator.>

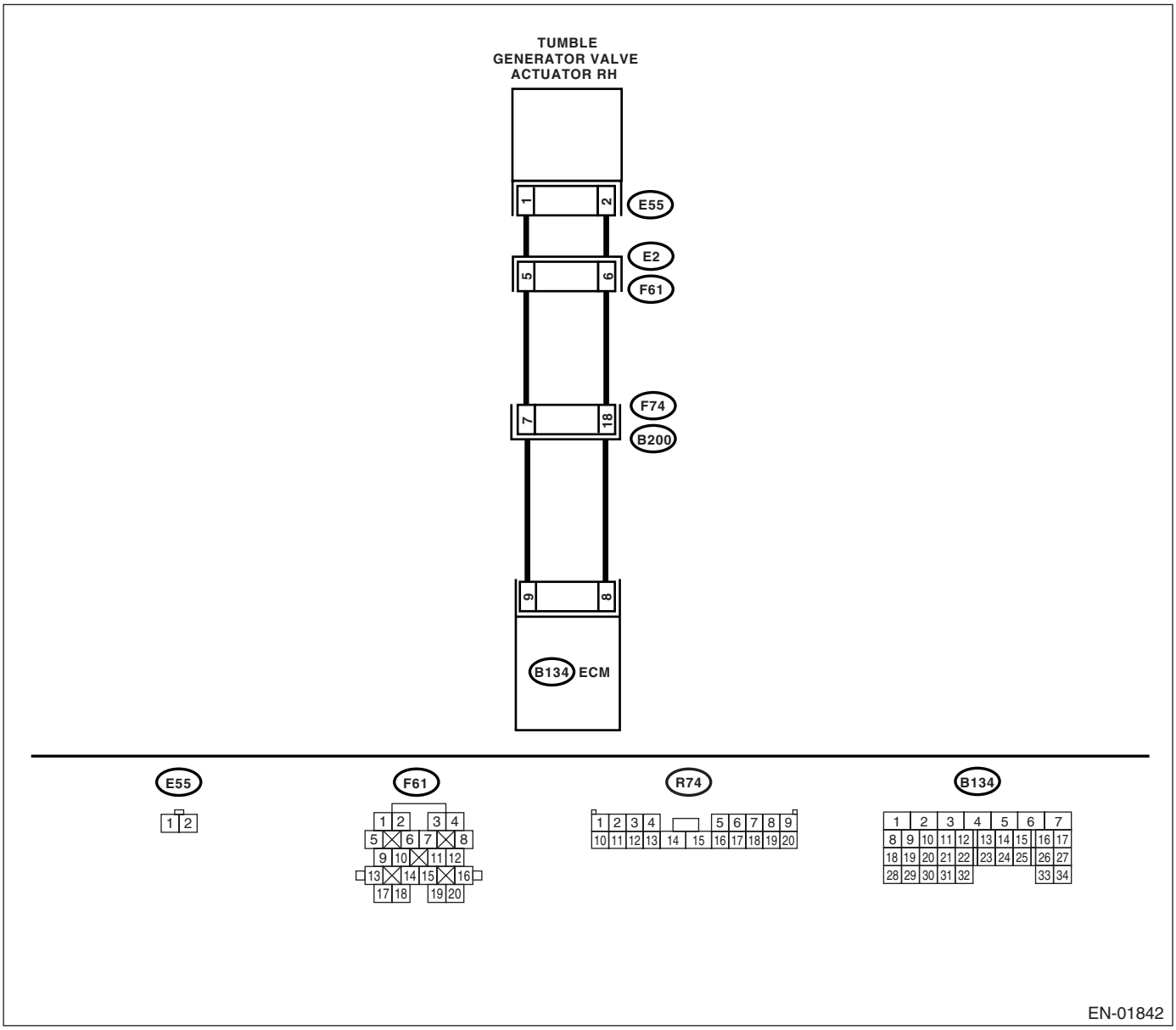
CM:DTC P1095 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-200, DTC P1095 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve connector. 3) Measure the voltage between tumble generator valve actuator and chassis ground. ***Connector & terminal*** ***(E55) No. 1 (+) — Chassis ground (−):*** ***(E55) No. 2 (+) — Chassis ground (−):***	Is the voltage less than 5 V?	Replace the tumble generator valve actuator. <Ref. to FU(STi)-34, Tumble Generator Valve Actuator.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

CN:DTC P1096 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN)

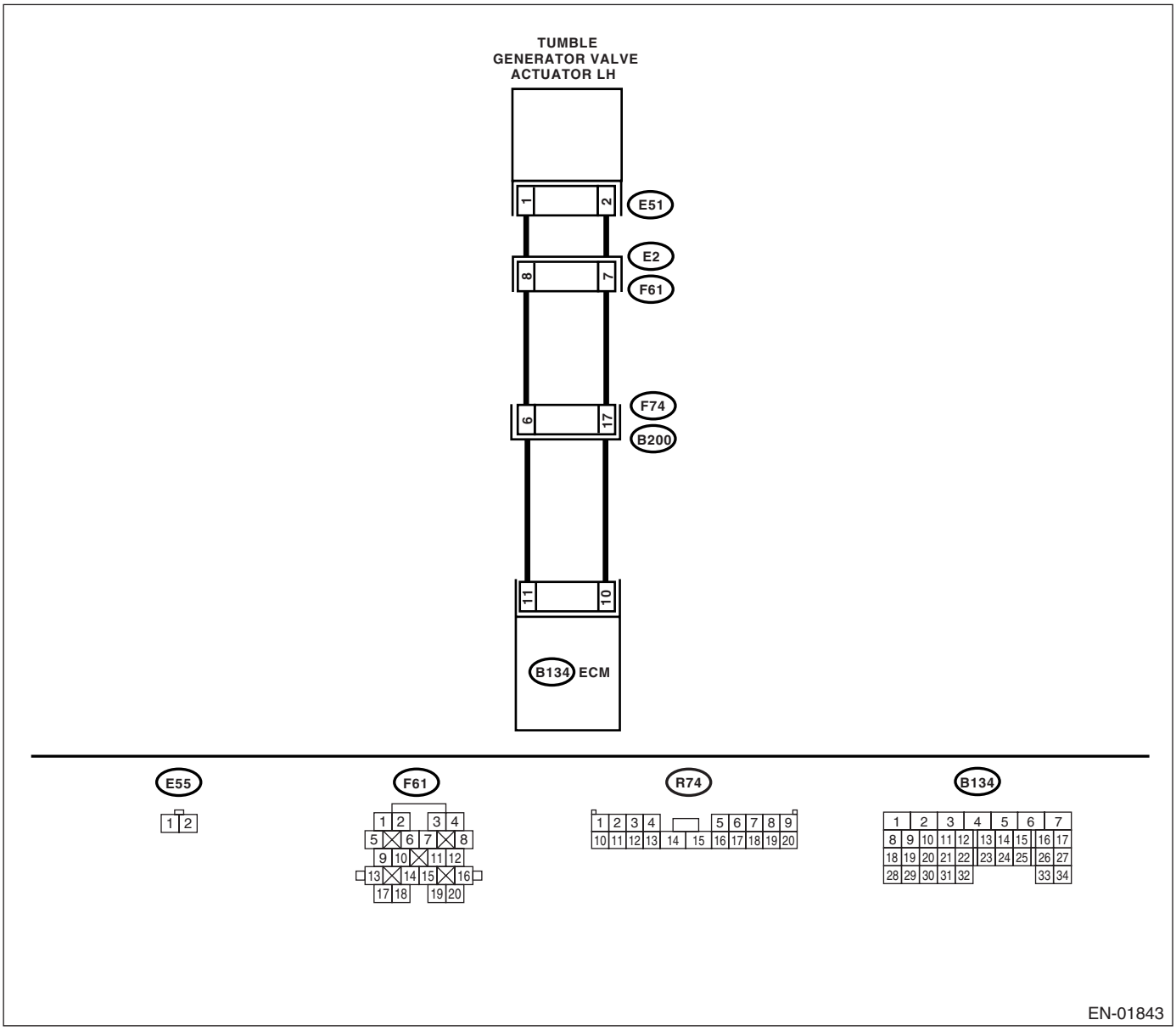
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-202, DTC P1096 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector. ***Connector & terminal*** ***(E51) No. 1 — (B134) No. 11:*** ***(E51) No. 2 — (B134) No. 10:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit between ECM and tumble generator valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and tumble generator valve actuator connector. • Poor contact in coupling connector.
2	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve actuator connector.	Is there poor contact in tumble generator valve actuator connector?	Repair the poor contact in tumble generator valve actuator connector.	Replace the tumble generator valve actuator. <Ref. to FU(STi)-34, Tumble Generator Valve Actuator.>

CO:DTC P1097 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT)

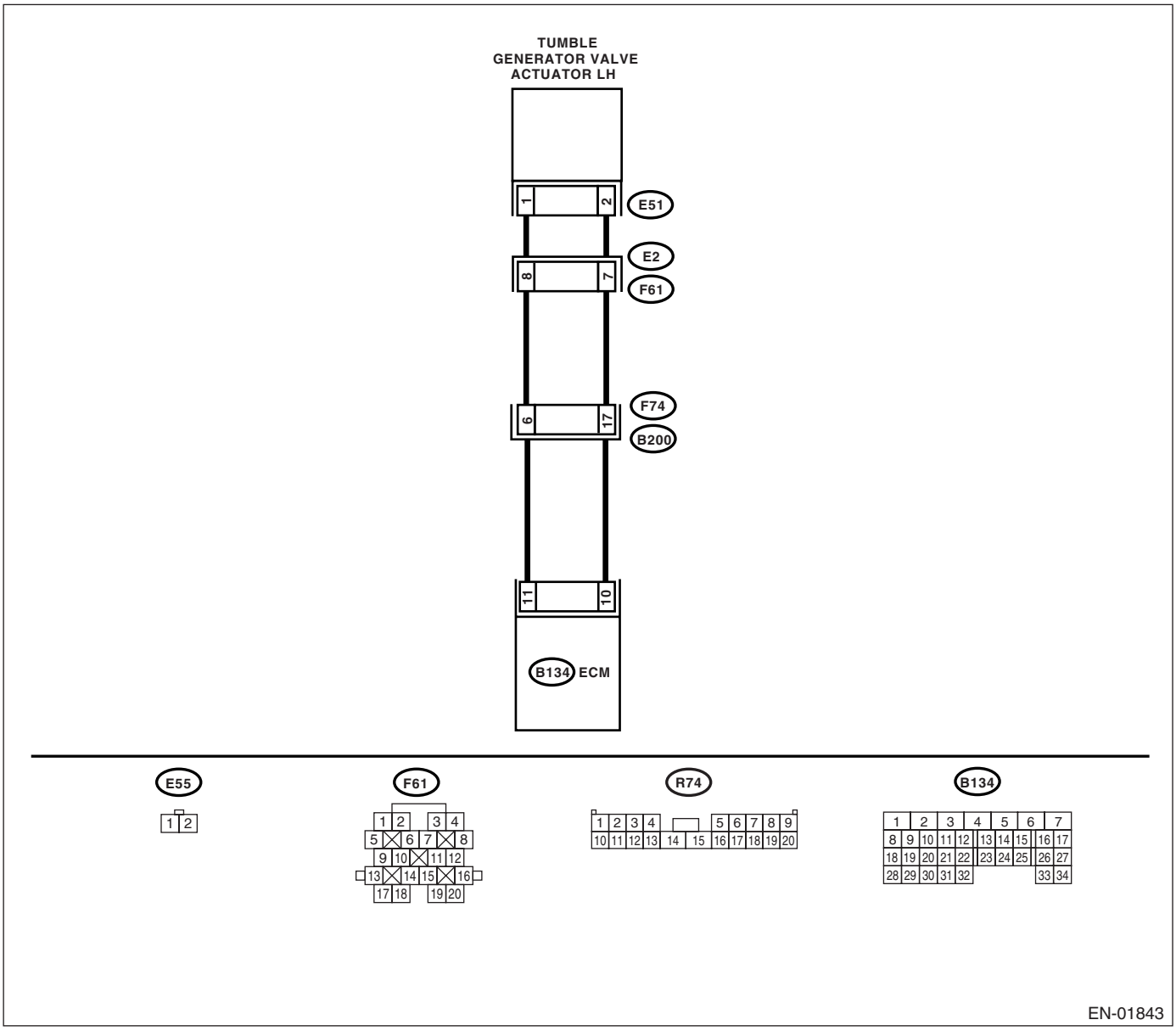
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-204, DTC P1097 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve connector. 3) Measure the voltage between tumble generator valve actuator and chassis ground. ***Connector & terminal*** ***(E51) No. 1 (+) — Chassis ground (−):*** ***(E51) No. 2 (+) — Chassis ground (−):***	Is the voltage less than 5 V?	Replace the tumble generator valve actuator. <Ref. to FU(STi)-34, Tumble Generator Valve Actuator.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

CP:DTC P1110 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-206, DTC P1110 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1110?	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is built into ECM.	A temporary poor contact.

CQ:DTC P1111 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-207, DTC P1111 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool i ndicate DTC P1111?	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is built into ECM.	A temporary poor contact.

CR:DTC P1152 O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1)

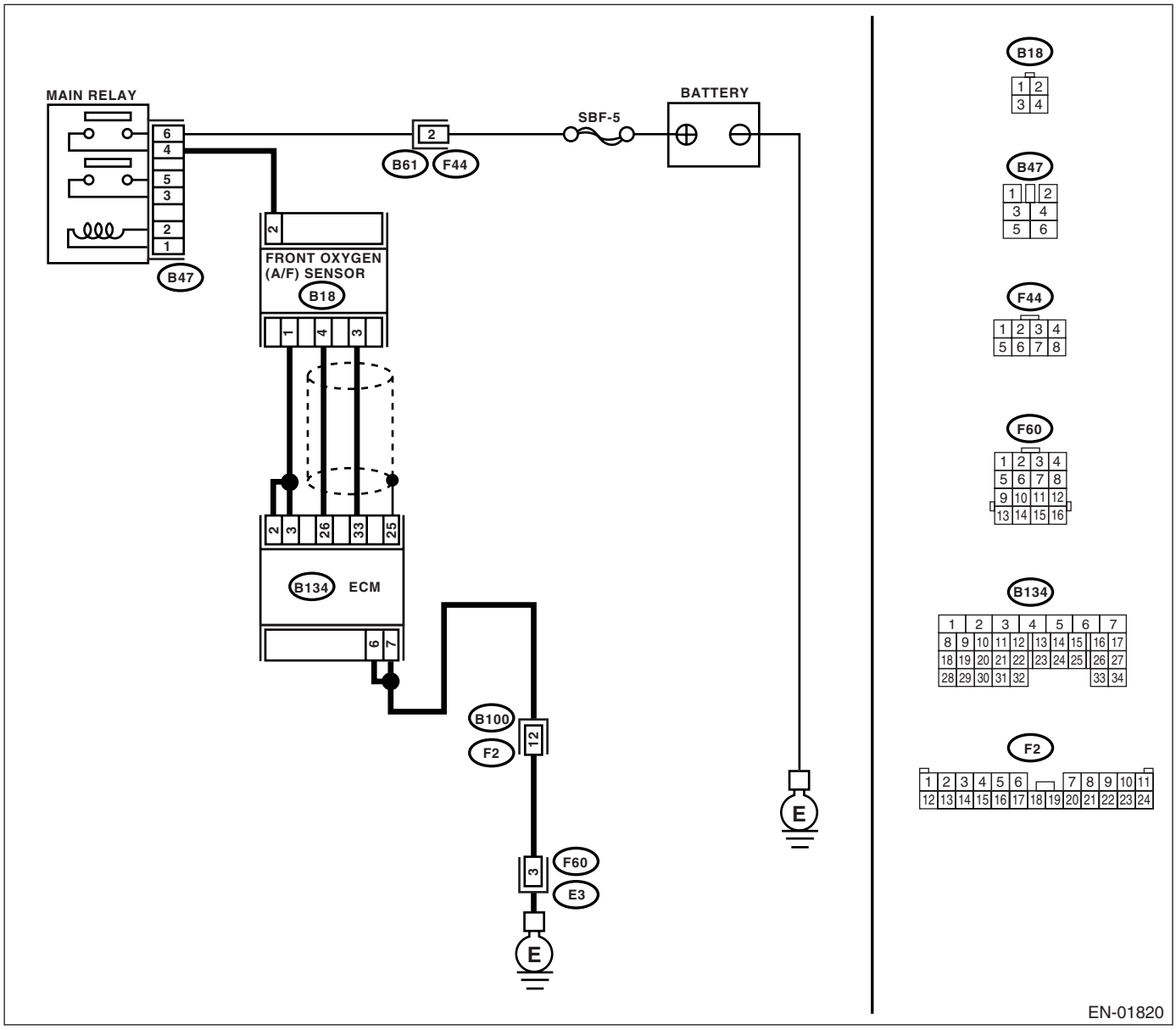
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-208, DTC P1152 O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 33 — (B18) No. 3:*** ***(B134) No. 26 — (B18) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
2	**CHECK POOR CONTACT.** Check poor contact in front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair the poor contact in front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(STi)-36, Front Oxygen (A/F) Sensor.>

CS:DTC P1153 O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

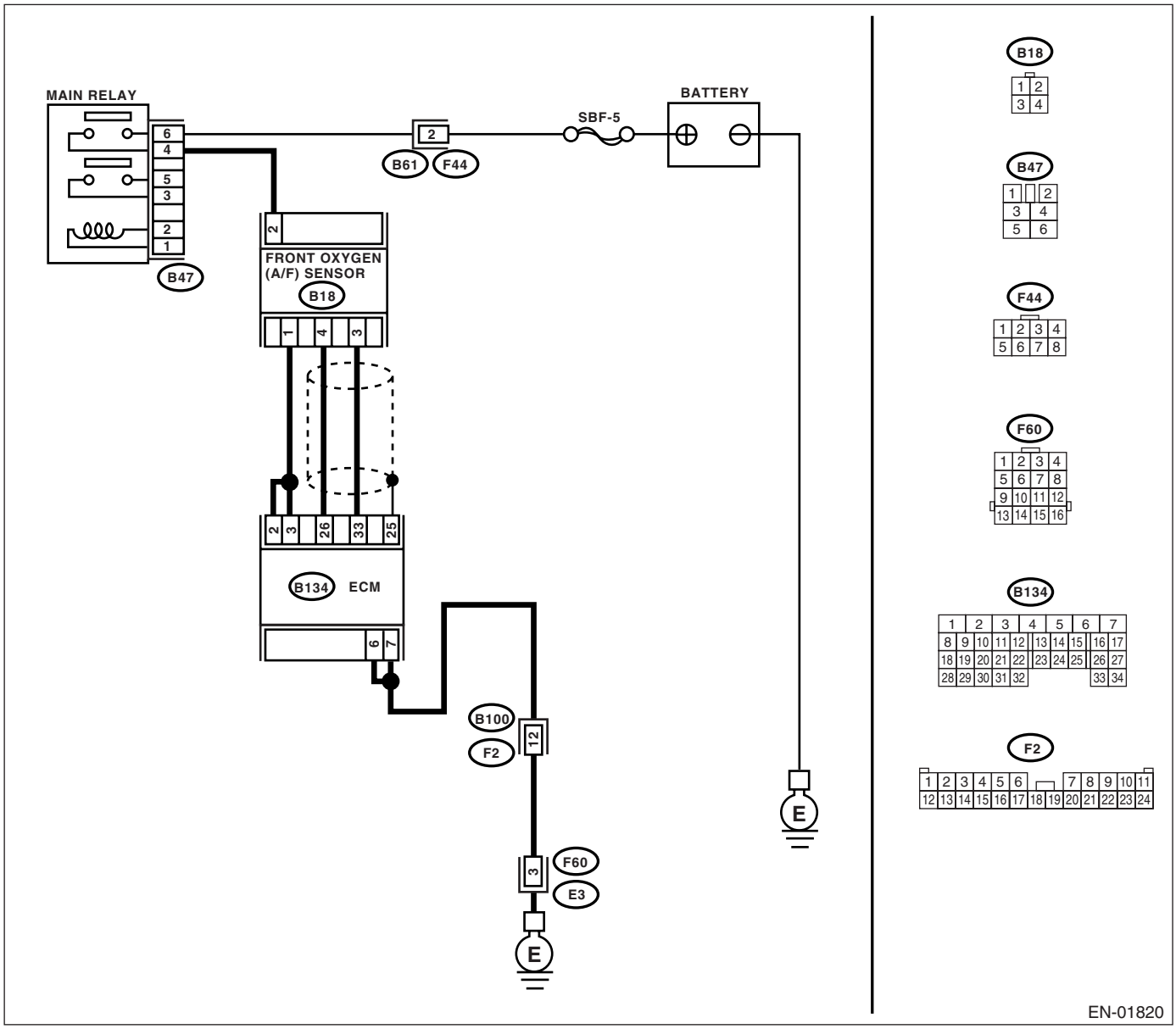
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-211, DTC P1153 O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 — Chassis ground:***	Is the resistance more than 1 MΩ?	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 33 — Chassis ground:***	Is the resistance more than 1 MΩ?	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FOR ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **5.**
4	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>	Repair the poor contact in ECM connector.
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 33 (+) — Chassis ground (−):***	Is the voltage more than 4.95 V?	Go to step **6.**	Replace the front oxygen (A/F) sensor. <Ref. to FU(STi)-36, Front Oxygen (A/F) Sensor.>
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 33 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>	Repair the poor contact in ECM connector.

CT:DTC P1160 RETURN SPRING FAILURE

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(STi)(diag)-309, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CU:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

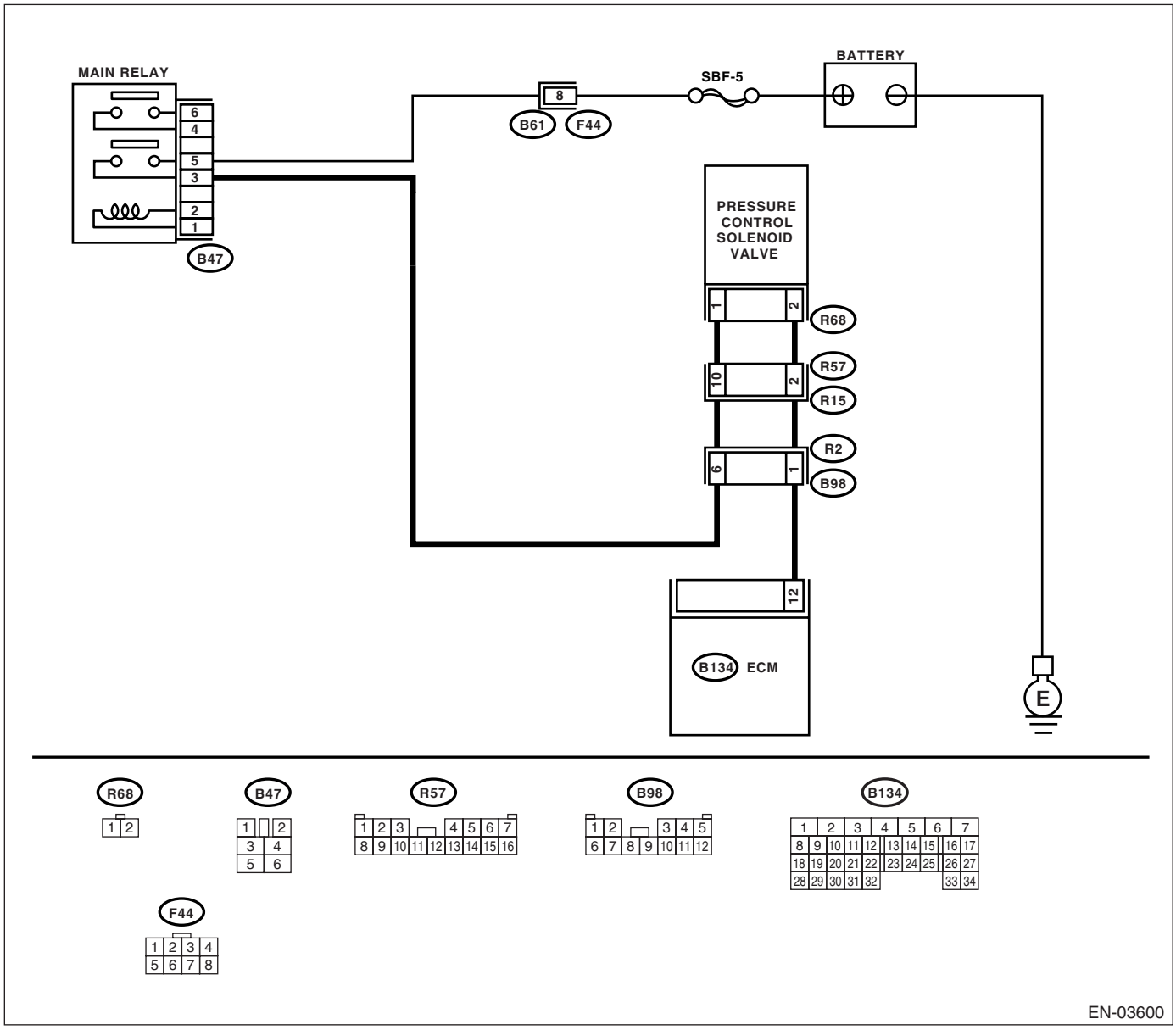
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-216, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 12 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
3	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connectors from pressure control solenoid valve and ECM. 3) Measure the resistance of harness between pressure control solenoid valve connector and chassis ground. ***Connector & terminal*** ***(R68) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair short circuit to ground in harness between ECM and pressure control solenoid valve connector.
4	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and pressure control solenoid valve connector. ***Connector & terminal*** ***(B134) No. 12 — (R68) No. 2:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and pressure control solenoid valve connector • Poor contact in coupling connector
5	**CHECK PRESSURE CONTROL SOLENOID VALVE.** Measure the resistance between pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Go to step **6.**	Replace the pressure control solenoid valve. <Ref. to EC(STi)-12, Pressure Control Solenoid Valve.>
6	**CHECK POWER SUPPLY TO PRESSURE CONTROL SOLENOID VALVE.** 1) Turn ignition switch to ON. 2) Measure the voltage between pressure control solenoid valve and chassis ground. ***Connector & terminal*** ***(R68) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and pressure control solenoid valve connector • Poor contact in coupling connector • Poor contact in main relay connector

	Step	Check	Yes	No
7	**CHECK FOR POOR CONTACT.** Check for poor contact in pressure control solenoid valve connector.	Is there poor contact in pressure control solenoid valve connector?	Repair poor contact in pressure control solenoid valve connector.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

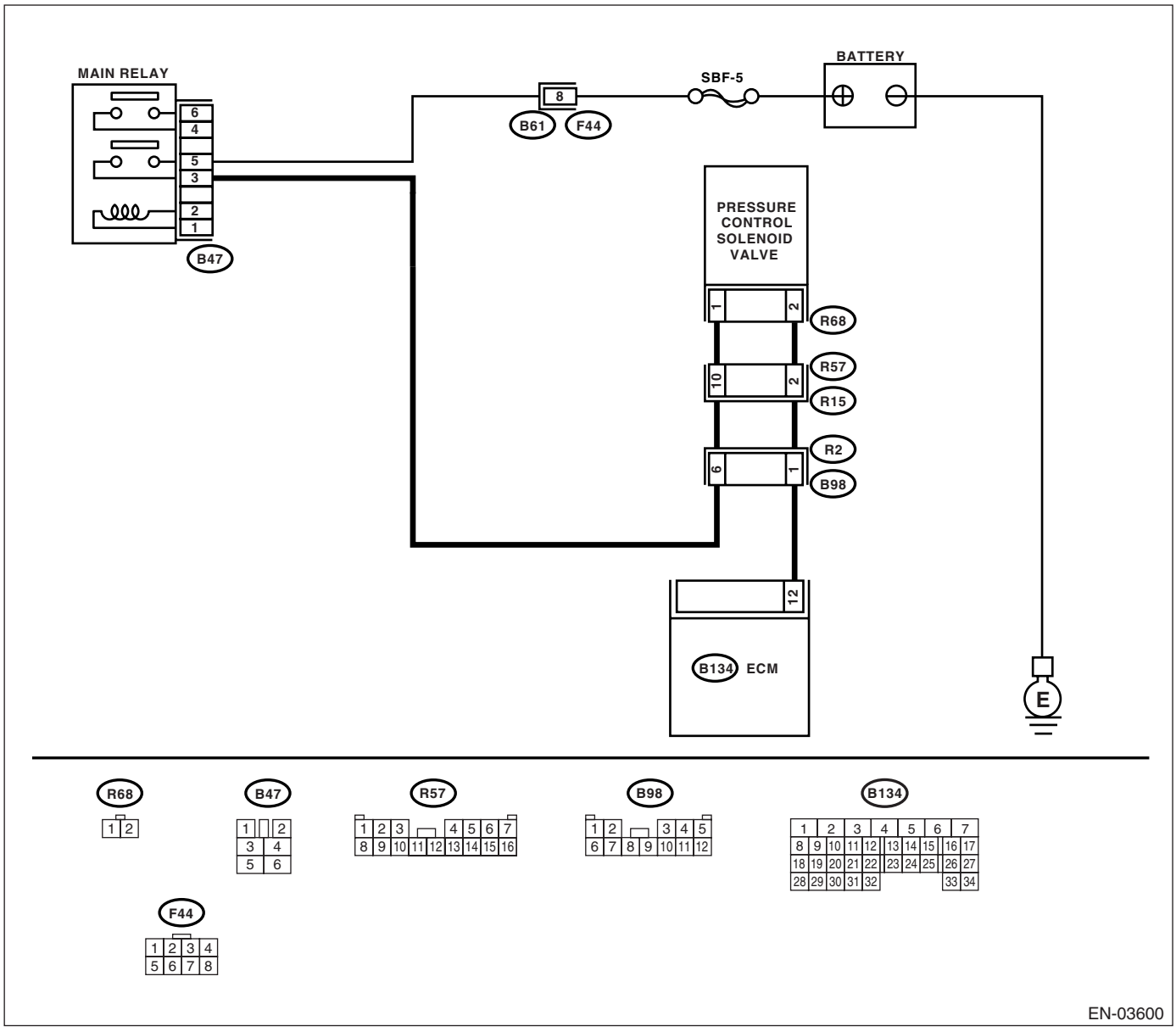
CV:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-218, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) While operating the pressure control solenoid valve, measure voltage between ECM and chassis ground. NOTE: Pressure control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STi)(diag)-42, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 12 (+) — Chassis ground (−):***	Does the voltage value change 0 — 10 V?	Go to step **2.**	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. In this case, repair poor contact in ECM connector.
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 12 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from pressure control solenoid valve. 3) Turn ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 12 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and pressure control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK PRESSURE CONTROL SOLENOID VALVE.** 1) Turn ignition switch to OFF. 2) Measure the resistance between pressure control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the pressure control solenoid valve <Ref. to EC(STi)-12, Pressure Control Solenoid Valve.> and the ECM <Ref. to FU(STi)-40, Engine Control Module (ECM).>.	Go to step **6.**
6	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>

CW:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-219, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

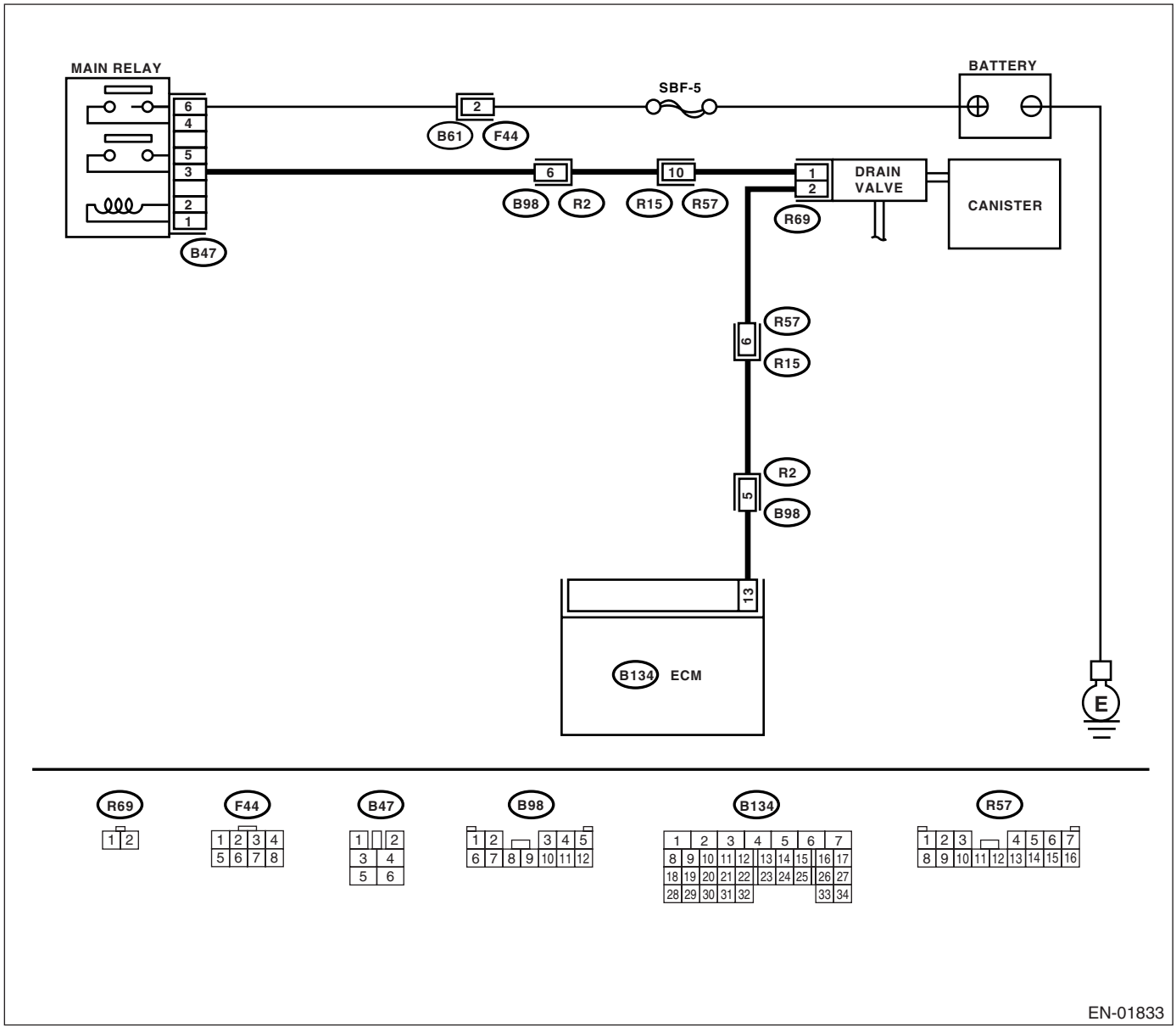
TROUBLE SYMPTOM:

Improper fuel supply

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK VENT LINE HOSES.** Check the following items. • Clogging of vent hoses between canister and drain valve • Clogging of vent hose between drain valve and air filter • Clogging of drain filter	Is there a fault in vent line?	Repair or replace faulty parts.	Go to step **3.**
3	**CHECK DRAIN VALVE OPERATION.** 1) Turn ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(STi)(diag)-42, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Replace the drain valve. <Ref. to EC(STi)-18, Drain Valve.>

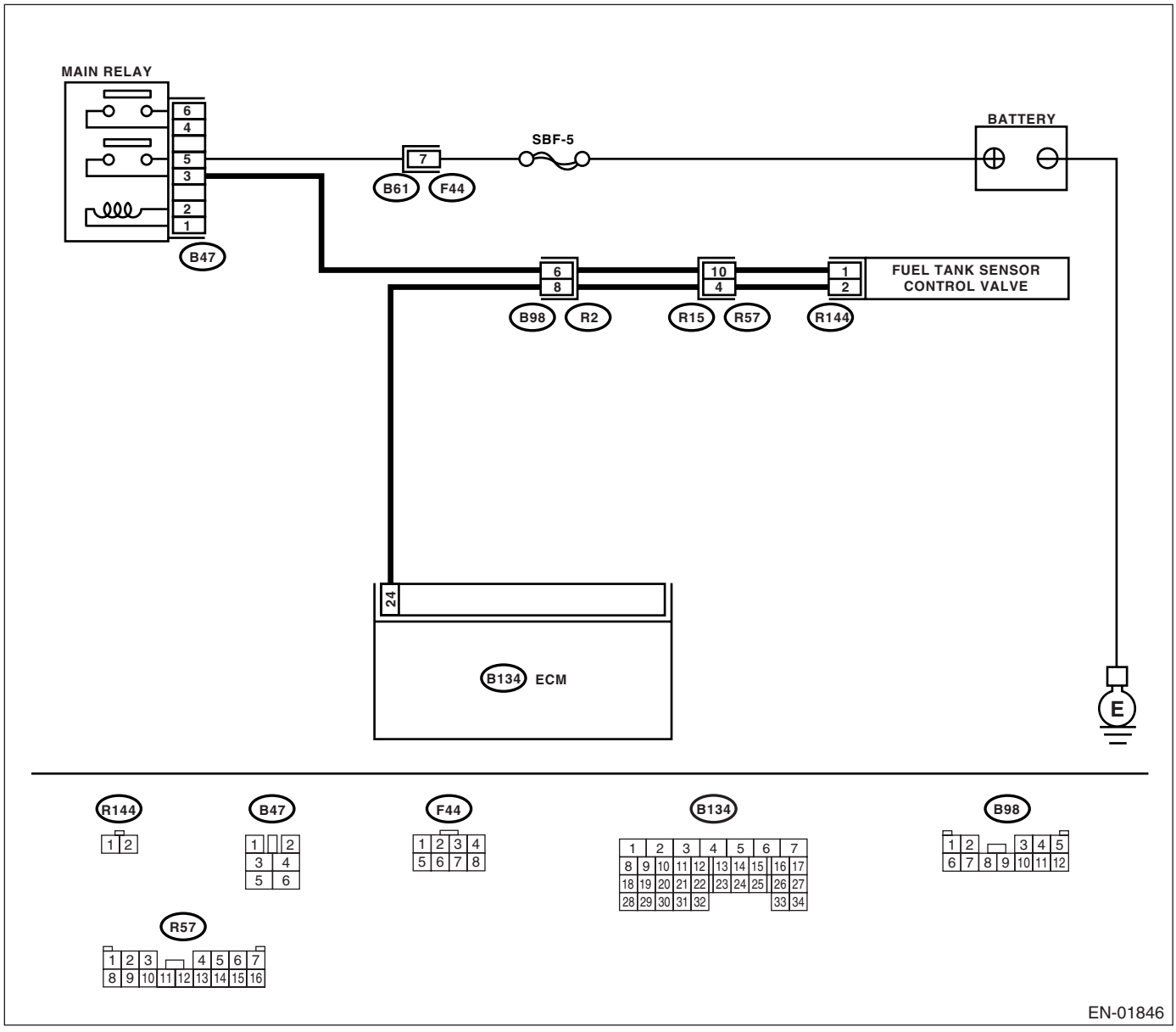
CX:DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-220, DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 24 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **3.**
2	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. (However, the possibility of poor contact still remains.)j NOTE: In this case, repair the following: • Poor contact in fuel tank sensor control valve connector • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connectors from fuel tank sensor control valve and ECM. 3) Measure the resistance of harness between fuel tank sensor control valve connector and chassis ground. ***Connector & terminal*** ***(R144) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair short circuit to ground in harness between ECM and fuel tank sensor control valve connector.
4	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and fuel tank sensor control valve connector. ***Connector & terminal*** ***(B134) No. 24 — (R144) No. 2:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel tank sensor control valve connector • Poor contact in coupling connector
5	**CHECK FUEL TANK SENSOR CONTROL VALVE.** Measure the resistance between fuel tank sensor control valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Go to step **6.**	Replace the fuel tank sensor control valve. <Ref. to EC(STi)-18, Drain Valve.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO FUEL TANK SENSOR CONTROL VALVE.** 1) Turn ignition switch to ON. 2) Measure the voltage between fuel tank sensor control valve and chassis ground. ***Connector & terminal*** ***(R144) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and fuel tank sensor control valve • Poor contact in coupling connector • Poor contact in main relay connector
7	**CHECK FOR POOR CONTACT.** Check for poor contact in fuel tank sensor control valve connector.	Is there poor contact in fuel tank sensor control valve connector?	Repair poor contact in fuel tank sensor control valve connector.	Contact with SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

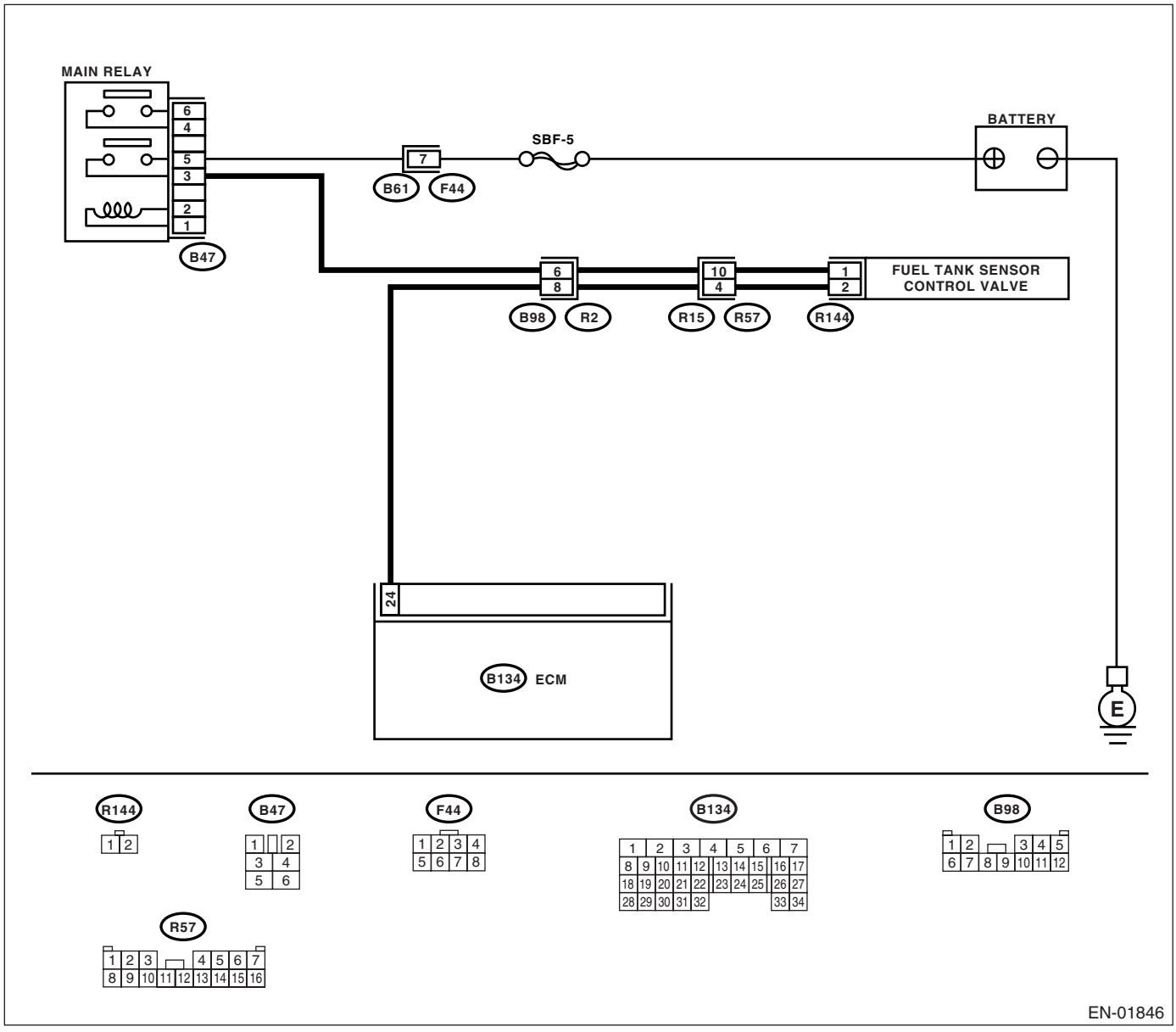
CY:DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-222, DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 24 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Go to step **2.**
2	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>
3	**CHECK HARNESS BETWEEN FUEL TANK SENSOR CONTROL VALVE AND ECM CONNECTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from fuel tank sensor control valve. 3) Turn ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 24 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and fuel tank sensor control valve connector. After repair, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>	Go to step **4.**
4	**CHECK FUEL TANK SENSOR CONTROL VALVE.** 1) Turn ignition switch to OFF. 2) Measure the resistance between fuel tank sensor control valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the fuel tank sensor control valve <Ref. to EC(STi)-11, Fuel Tank Sensor Control Valve.> and the ECM <Ref. to FU(STi)-40, Engine Control Module (ECM).>.	Go to step **5.**
5	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>

CZ:DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE/PERFORMANCE

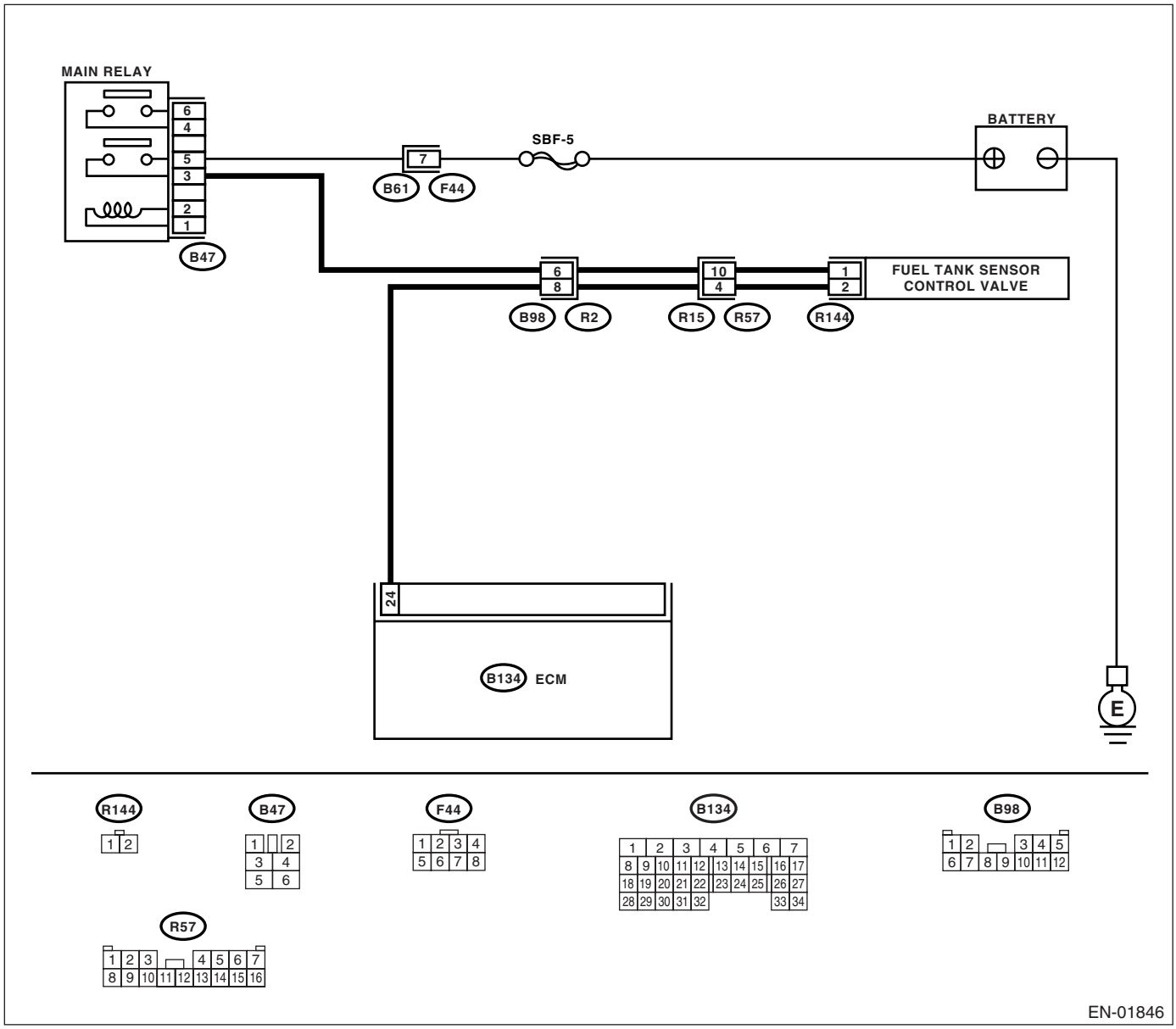
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-224, DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FOR OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using the “List of Diagnostic Trouble Codes (DTC)”. <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL FILLER CAP.** 1) Turn ignition switch to OFF. 2) Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step **3.**	Tighten fuel filler cap securely.
3	**CHECK EVAPORATIVE EMISSION LINE.** NOTE: Check the following items. • Disconnection, leakage and clogging of hoses between fuel tank pressure sensor and fuel tank. • Disconnection, leakage and clogging of hoses and pipes between fuel filler pipe and fuel tank.	Is there any trouble in evaporative emission line?	Repair the hoses and pipes.	Replace the fuel tank pressure sensor.

DA:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-227, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

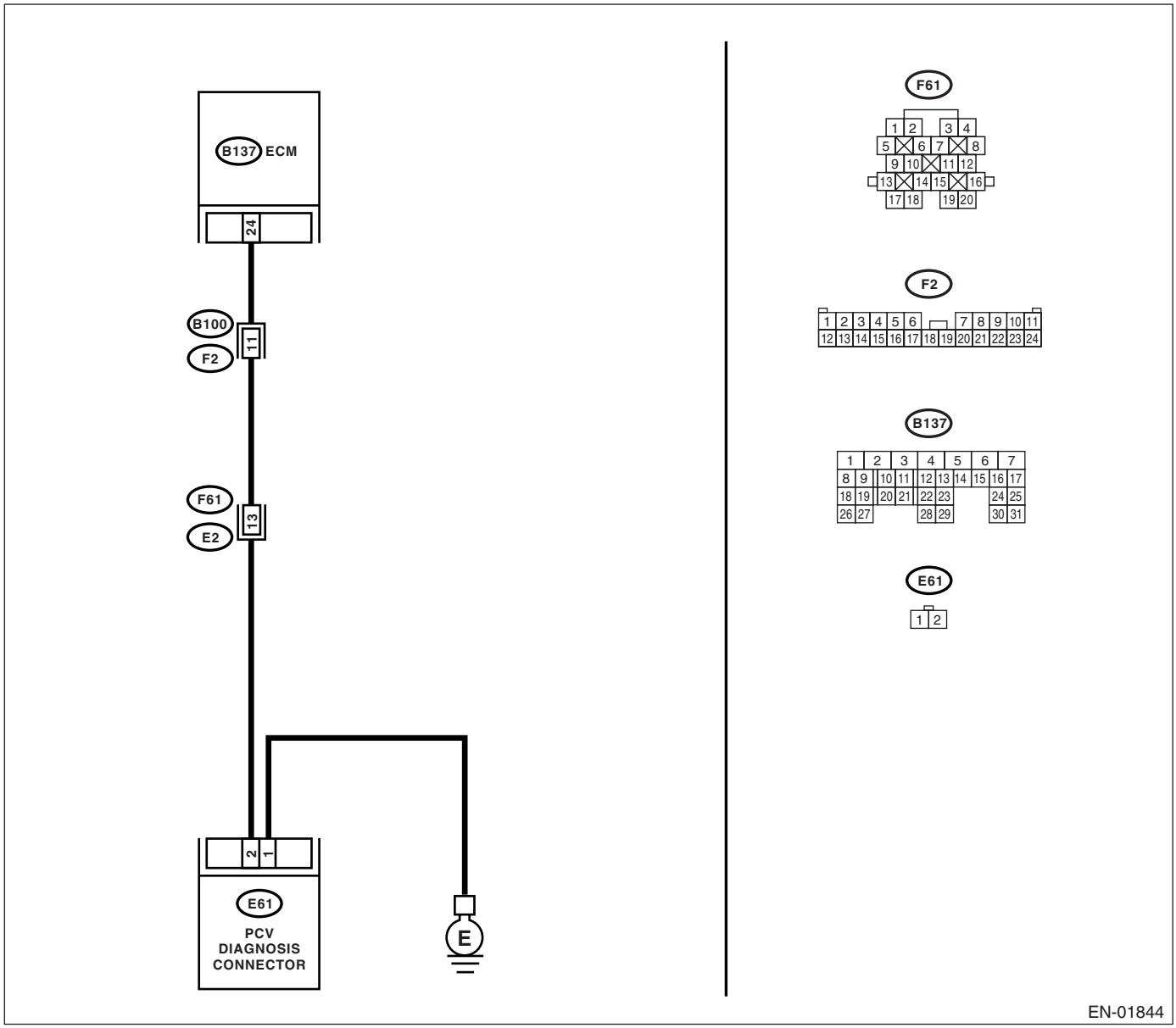
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK BLOW-BY HOSE.** Check the blow-by hose.	Is there disconnection or crack in blow-by hose?	Replace or repair blow-by hose.	Go to step **2.**
2	**INSPECT HARNESS BETWEEN PCV DIAGNOSIS CONNECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from PCV diagnosis connector and ECM. 3) Measure the resistance of harness between PCV diagnosis connector and ECM connector. ***Connector & terminal*** ***(B137) No. 24 — (E61) No. 2:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair open circuit in harness between PCV diagnosis connector and ECM.
3	**INSPECT HARNESS BETWEEN PCV DIAGNOSIS CONNECTOR AND ECM CONNECTOR.** Measure the resistance of harness between PCV diagnosis connector and chassis ground. ***Connector & terminal*** ***(B137) No. 24 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair short circuit to chassis ground in harness between PCV diagnosis connector and ECM.
4	**INSPECT PCV DIAGNOSIS CONNECTOR GROUND CIRCUIT.** Measure the resistance between PCV diagnosis connector and engine ground. ***Connector & terminal*** ***(B61) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair PCV diagnosis connector ground circuit.
5	**INSPECT PCV DIAGNOSIS CONNECTOR.** Measure the resistance between PCV diagnosis connector and terminal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Repair poor contact in ECM and PCV diagnosis connector.	Replace PCV diagnosis connector.

DB:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-229, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

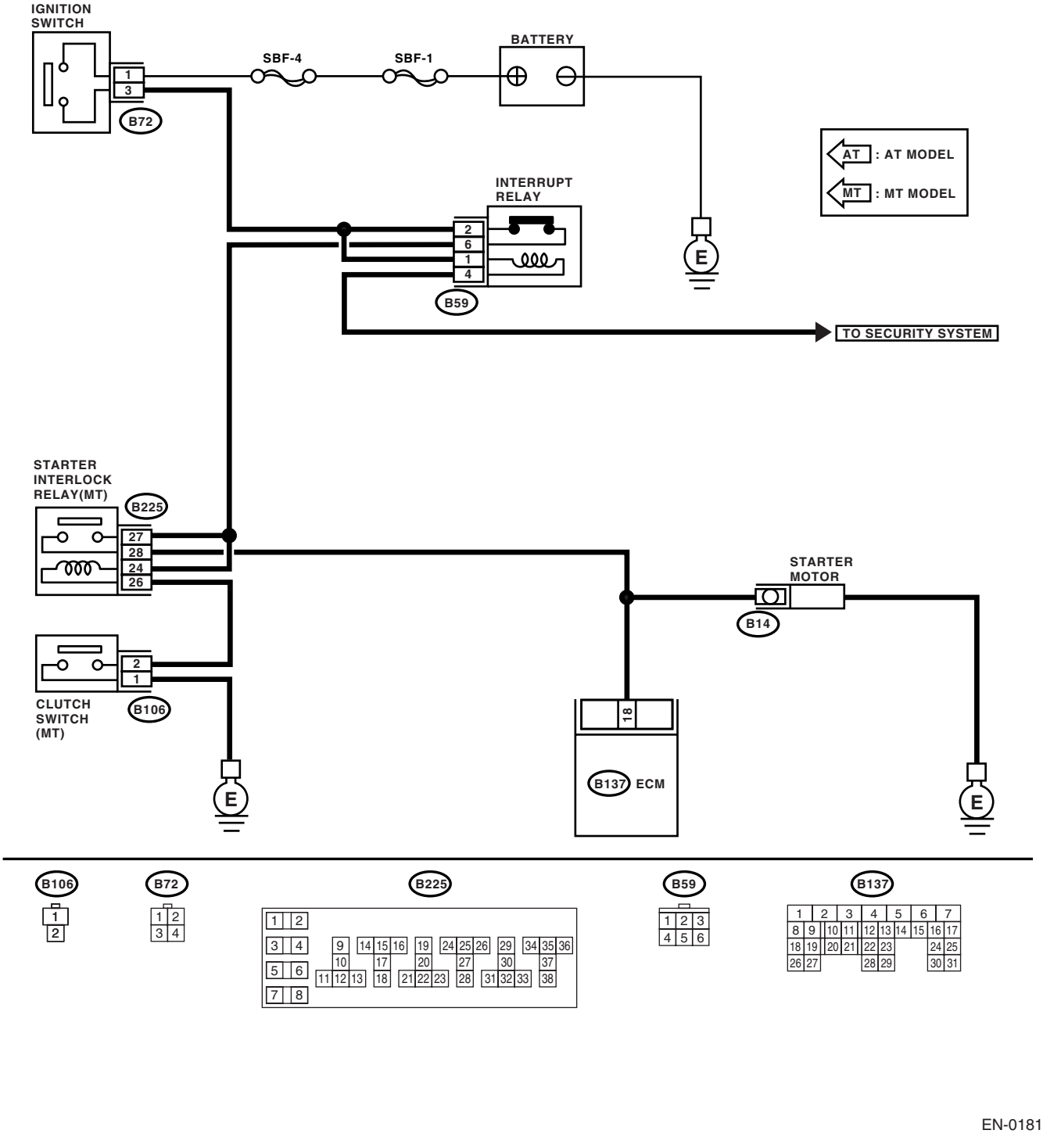
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-01815

Step	Check	Yes	No
1 CHECK OPERATION OF STARTER MOTOR.	Does the starter motor operate when ignition switch is turned to START?	Repair the harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between ECM and starter motor connector • Poor contact in ECM connector	Check the starter motor circuit. <Ref. to EN(STi)(diag)-54, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DC:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

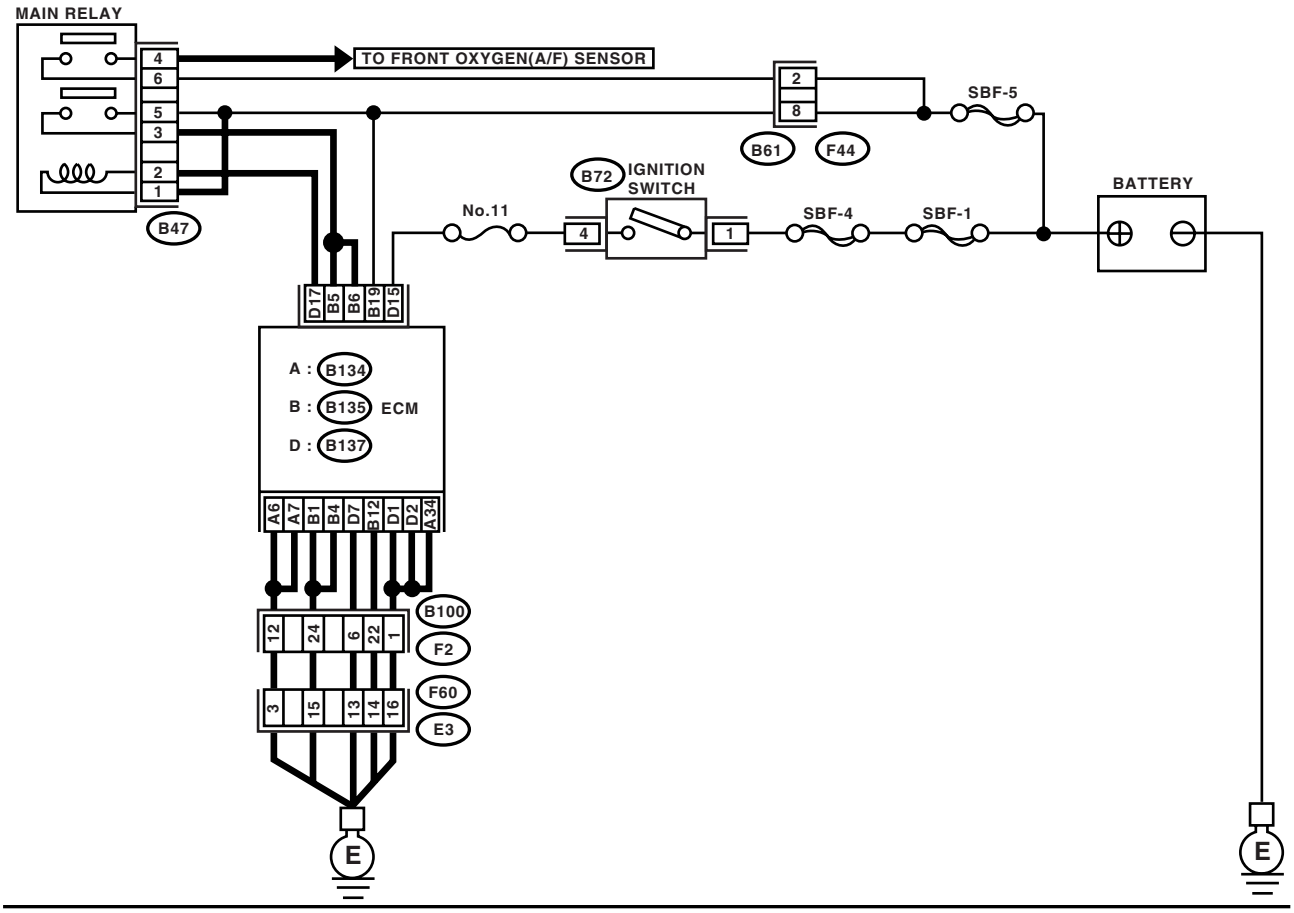
DTC DETECTING CONDITION:

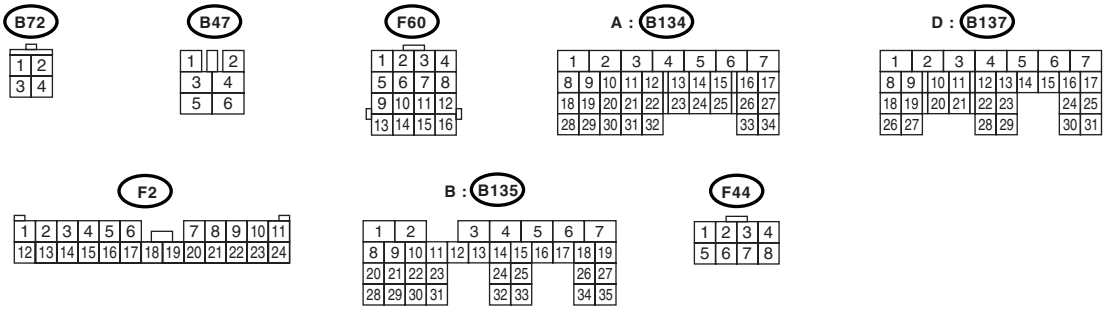
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-230, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-01816

	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair the ground short circuit in harness between ECM connector and battery terminal.	Go to step **3.**
3	**CHECK FUSE SBF-5.**	Is the fuse blown?	Replace the fuse.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and battery • Poor contact in ECM connector • Poor contact in battery terminal

DD:DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-231, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

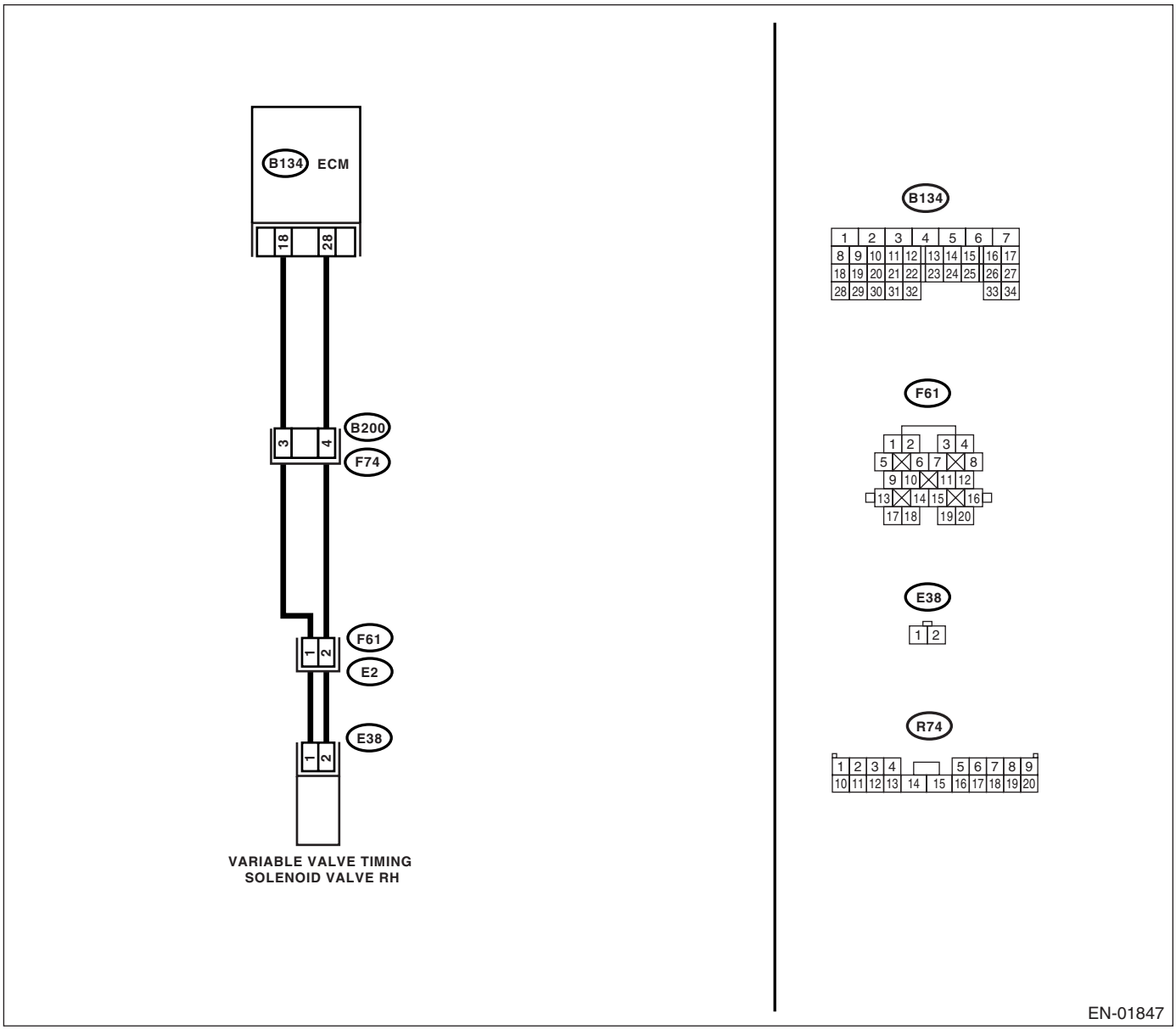
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE TIMING SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and variable valve timing solenoid valve. 3) Measure the resistance between ECM and variable valve timing solenoid valve. ***Connector & terminal*** ***(B134) No. 18 — (E38) No. 1:*** ***(B134) No. 28 — (E38) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between ECM and variable valve timing solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and variable valve timing solenoid valve connector • Poor contact in coupling connector.
2	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE TIMING SOLENOID VALVE.** Measure the resistance between ECM and variable valve timing solenoid valve. ***Connector & terminal*** ***(E38) No. 1 — Engine ground:*** ***(E38) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit between ECM and variable valve timing solenoid valve connector.
3	**CHECK VARIABLE VALVE TIMING SOLENOID VALVE.** 1) Remove the variable valve timing solenoid valve. 2) Measure the resistance between variable valve timing solenoid valve terminal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact in ECM and variable valve timing solenoid valve.	Replace the variable valve timing solenoid valve. <Ref. to ME(STi)-56, Camshaft.>

DE:DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-233, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

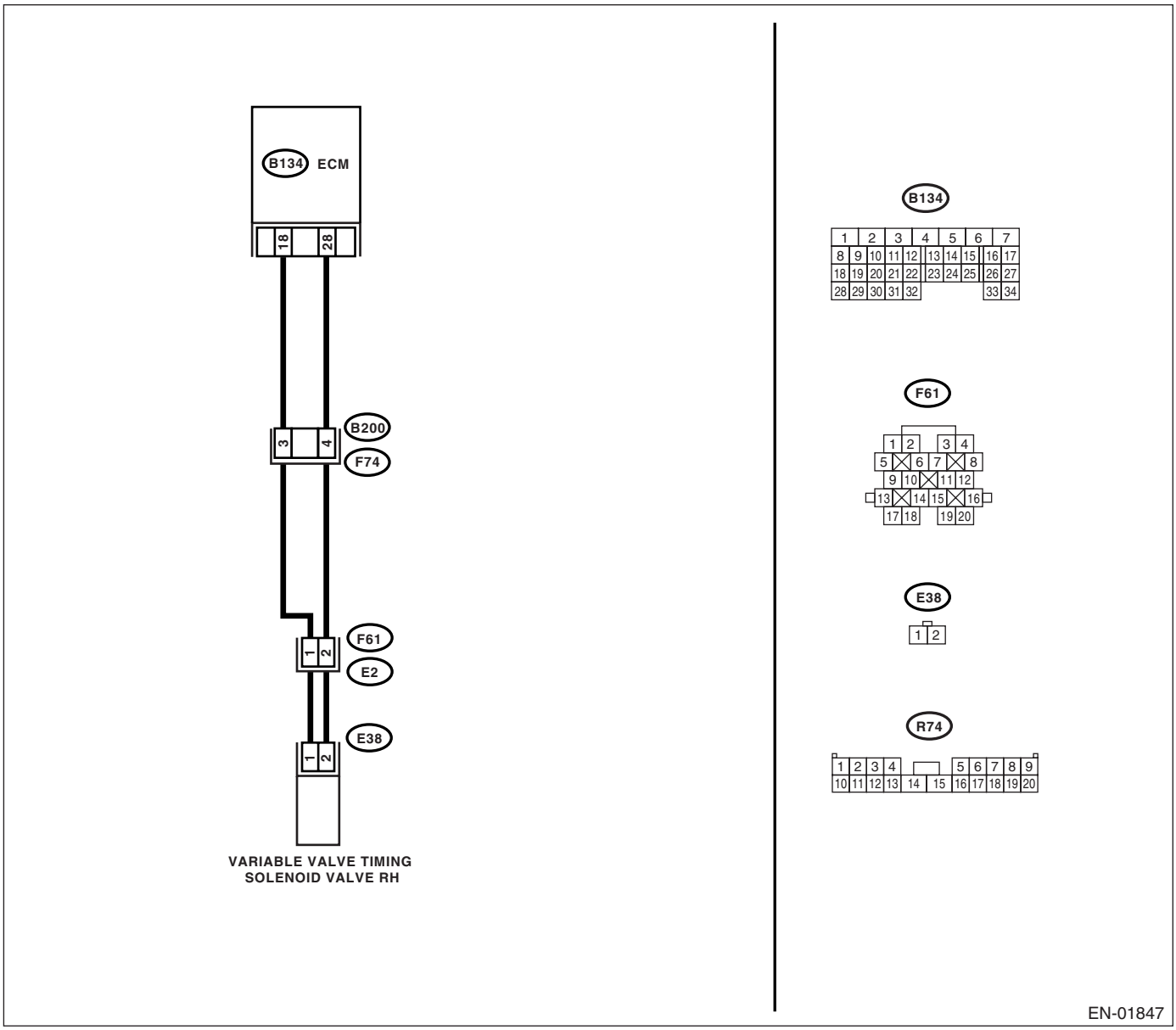
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE TIMING SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and variable valve timing solenoid valve. 3) Measure the resistance between ECM and variable valve timing solenoid valve. ***Connector & terminal*** ***(B134) No. 18 — (E38) No. 1:*** ***(B134) No. 28 — (E38) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between ECM and variable valve timing solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and variable valve timing solenoid valve connector • Poor contact in coupling connector.
2	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE TIMING SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and variable valve timing solenoid valve. 3) Measure the resistance between ECM and variable valve timing solenoid valve. ***Connector & terminal*** ***(E38) No. 1 — Engine ground:*** ***(E38) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit between ECM and variable valve timing solenoid valve connector.
3	**CHECK VARIABLE VALVE TIMING SOLENOID VALVE.** 1) Remove the variable valve timing solenoid valve. 2) Measure the resistance between variable valve timing solenoid valve terminal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact in ECM and variable valve timing solenoid valve.	Replace the variable valve timing solenoid valve. <Ref. to ME(STi)-56, Camshaft.>

DF:DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-235, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

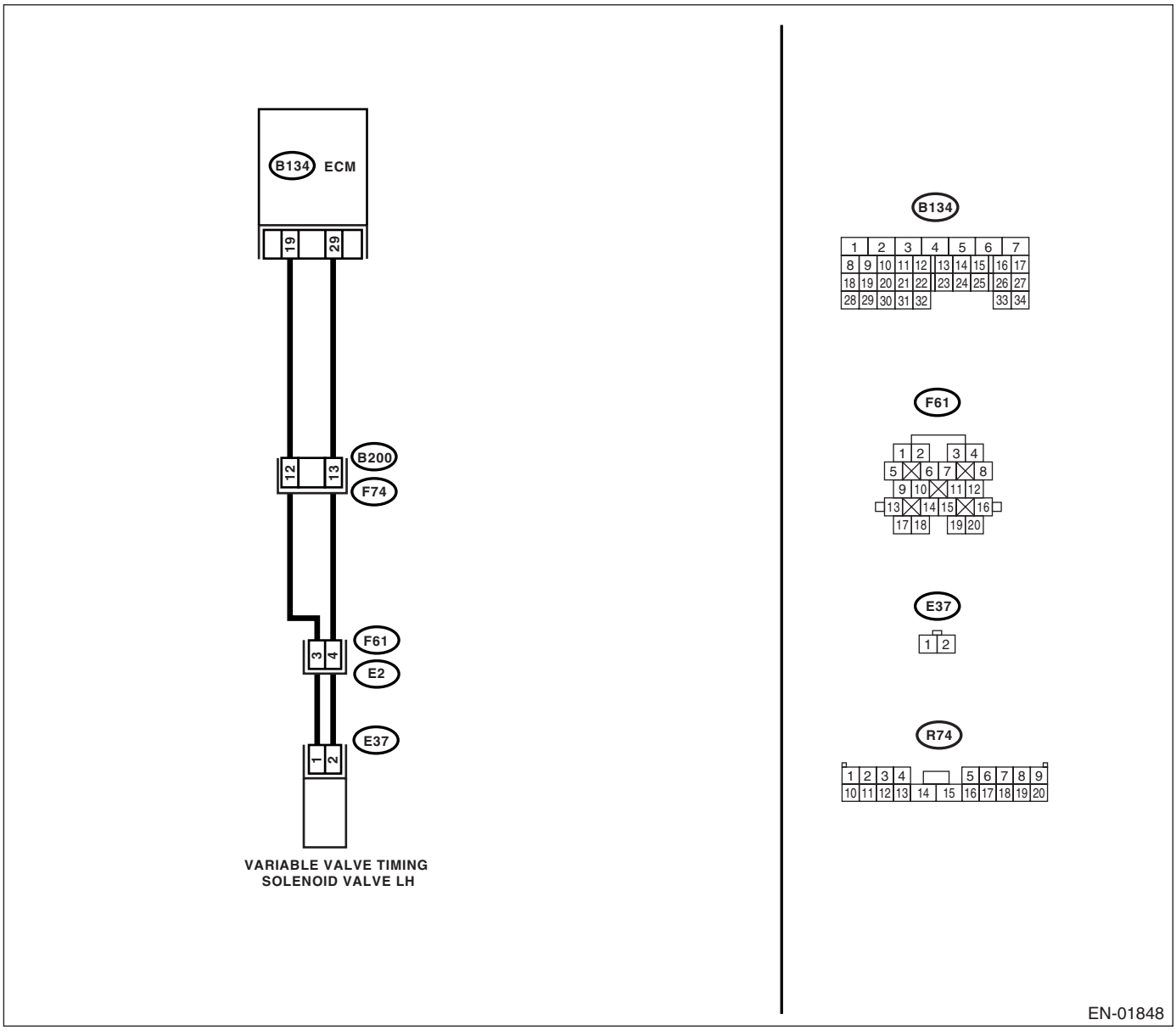
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE TIMING SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and variable valve timing solenoid valve. 3) Measure the resistance between ECM and variable valve timing solenoid valve. ***Connector & terminal*** ***(B134) No. 19 — (E37) No. 1:*** ***(B134) No. 29 — (E37) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between ECM and variable valve timing solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and variable valve timing solenoid valve connector • Poor contact in coupling connector.
2	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE TIMING SOLENOID VALVE.** Measure the resistance between ECM and variable valve timing solenoid valve. ***Connector & terminal*** ***(E37) No. 1 — Engine ground:*** ***(E37) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit between ECM and variable valve timing solenoid valve connector.
3	**CHECK VARIABLE VALVE TIMING SOLENOID VALVE.** 1) Remove the variable valve timing solenoid valve. 2) Measure the resistance between variable valve timing solenoid valve terminal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact in ECM and variable valve timing solenoid valve.	Replace the variable valve timing solenoid valve. <Ref. to ME(STi)-56, Camshaft.>

DG:DTC P2093 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-237, DTC P2093 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

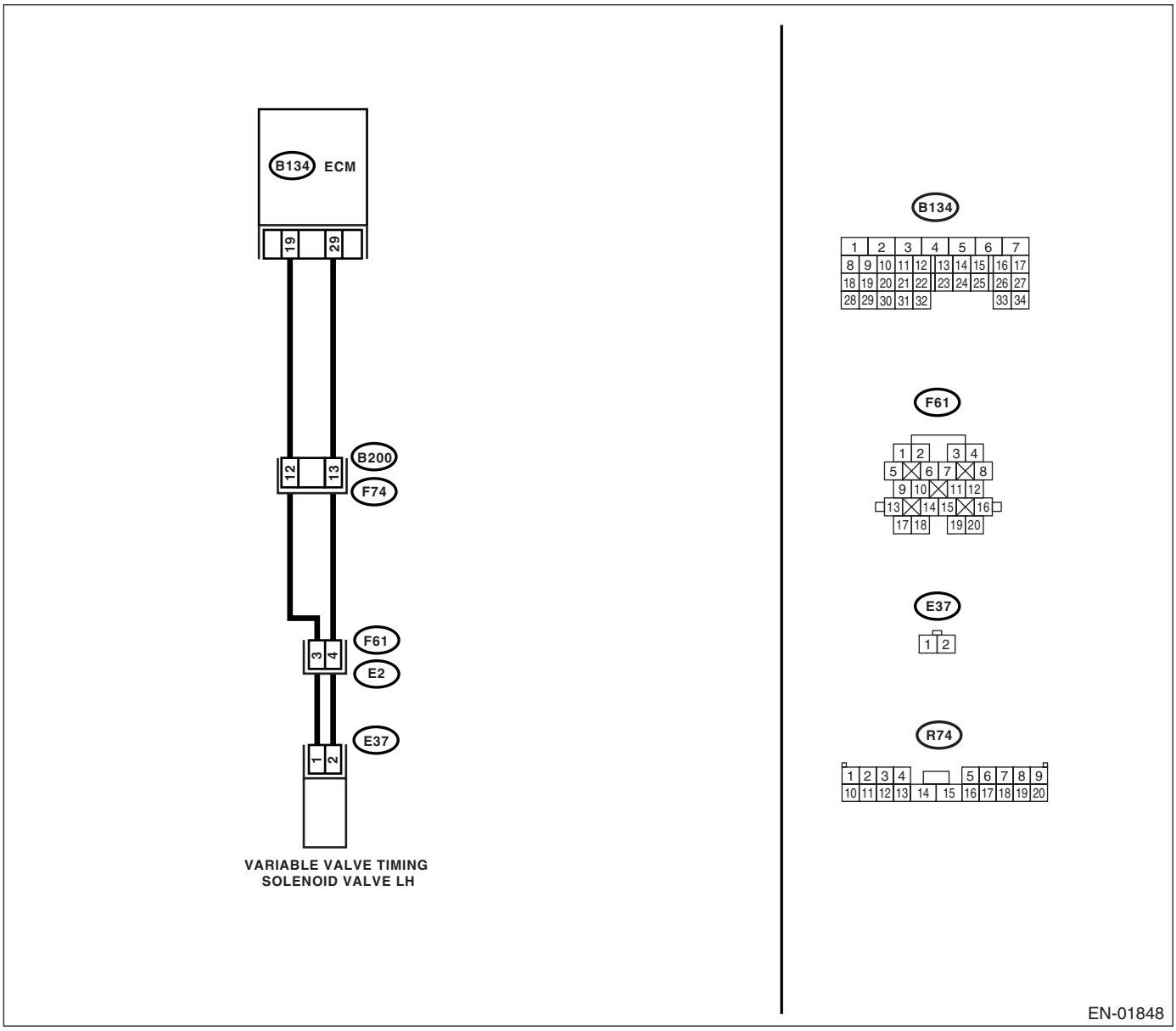
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE TIMING SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and variable valve timing solenoid valve. 3) Measure the resistance between ECM and variable valve timing solenoid valve. ***Connector & terminal*** ***(B134) No. 19 — (E37) No. 1:*** ***(B134) No. 29 — (E37) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between ECM and variable valve timing solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and variable valve timing solenoid valve connector • Poor contact in coupling connector.
2	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE TIMING SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and variable valve timing solenoid valve. 3) Measure the resistance between ECM and variable valve timing solenoid valve. ***Connector & terminal*** ***(E37) No. 1 — Engine ground:*** ***(E37) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit between ECM and variable valve timing solenoid valve connector.
3	**CHECK VARIABLE VALVE TIMING SOLENOID VALVE.** 1) Remove the variable valve timing solenoid valve. 2) Measure the resistance between variable valve timing solenoid valve terminal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact in ECM and variable valve timing solenoid valve.	Replace the variable valve timing solenoid valve. <Ref. to ME(STi)-56, Camshaft.>

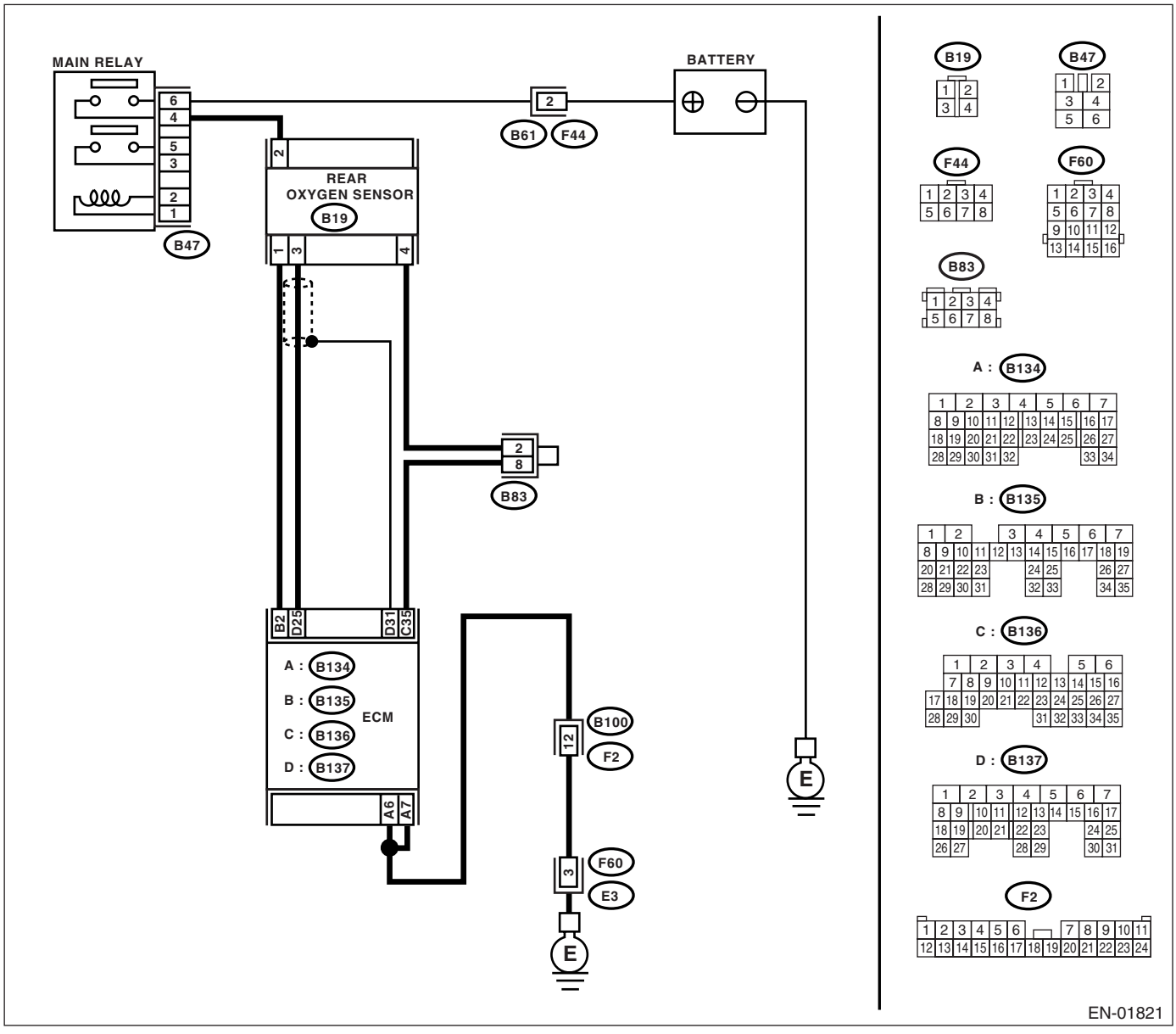
DH:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-239, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for 2 minutes. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Does the value fluctuate?	Go to step **6.**	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool.	Is the voltage 0.2 — 0.4 V?	Go to step **4.**	Replace the rear oxygen sensor. <Ref. to FU(STi)-38, Rear Oxygen Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B137) No. 25 — (B19) No. 3:***	Is the resistance more than 3 Ω?	Repair the open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(B19) No. 3 (+) — Engine ground (−):***	Is the voltage more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(STi)-38, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

	Step	Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty parts.	Go to step **7.**
7	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **8.**
8	**CHECK FUEL PRESSURE.** **Warning:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel on the floor.** 1) Release the fuel pressure. (1)Disconnect the connector from fuel pump relay. (2)Start the engine and run it until it stalls. (3)After the engine stalls, crank it for 5 more seconds. (4)Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install the fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)?	Go to step **9.**	Repair the following items. Fuel pressure too high: • Clogged fuel return line or bent hose Fuel pressure too low: • Improper fuel pump discharge • Clogged fuel supply line
9	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: • If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.	Is the measured value 206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)?	Go to step **10.**	Repair the following items. Fuel pressure too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
10	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature more than 60°C (140°F)?	Go to step **11.**	Replace the engine coolant temperature sensor. <Ref. to FU(STi)-25, Engine Coolant Temperature Sensor.>
11	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within the followings? Ignition ON: 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) Idling: 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)	Go to step **12.**	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(STi)-29, Mass Air Flow and Intake Air Temperature Sensor.>
12	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Subtract ambient temperature from intake air temperature. Is the obtained value −10°C — 50°C (14°F — 122°F)?	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(STi)-29, Mass Air Flow and Intake Air Temperature Sensor.>

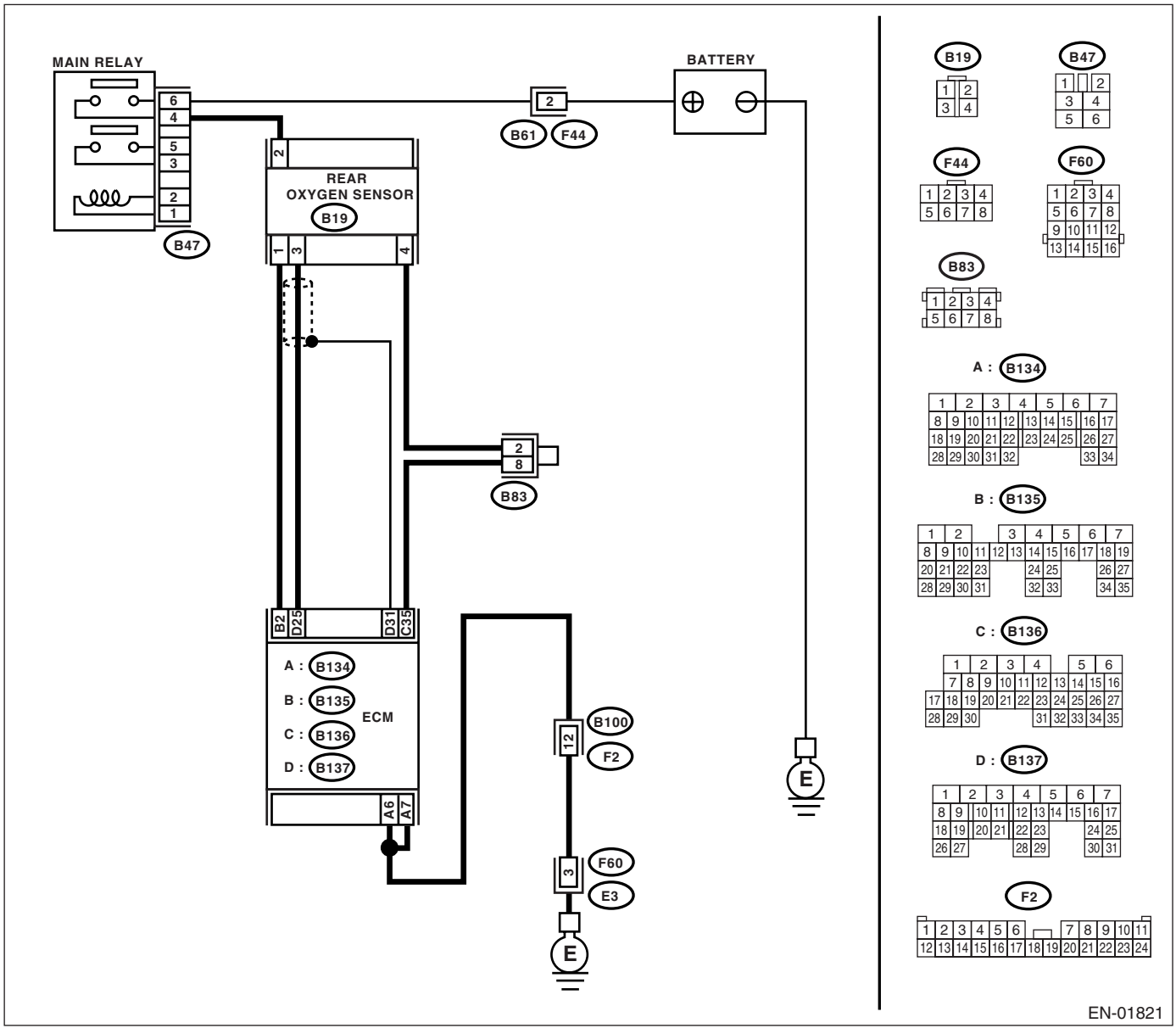
DI: DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(STi)-241, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(STi)(diag)-65, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for 2 minutes. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Does the value fluctuate?	Go to step **6.**	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool.	Is the voltage 0.2 — 0.4 V?	Go to step **4.**	Replace the rear oxygen sensor. <Ref. to FU(STi)-38, Rear Oxygen Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B137) No. 25 — (B19) No. 3:***	Is the resistance more than 3 Ω?	Repair the open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(B19) No. 3 (+) — Engine ground (−):***	Is the voltage more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(STi)-38, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

	Step	Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty parts.	Go to step **7.**
7	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **8.**
8	**CHECK FUEL PRESSURE.** **Warning:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel on the floor.** 1) Release the fuel pressure. (1)Disconnect the connector from fuel pump relay. (2)Start the engine and run it until it stalls. (3)After the engine stalls, crank it for 5 more seconds. (4)Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4) Install the fuel filler cap. 5) Start the engine and idle while gear position is neutral. 6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)?	Go to step **9.**	Repair the following items. Fuel pressure too high: • Clogged fuel return line or bent hose Fuel pressure too low: • Improper fuel pump discharge • Clogged fuel supply line
9	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: • If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.	Is the measured value 206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)?	Go to step **10.**	Repair the following items. Fuel pressure too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
10	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature more than 60°C (140°F)?	Go to step **11.**	Replace the engine coolant temperature sensor. <Ref. to FU(STi)-25, Engine Coolant Temperature Sensor.>
11	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within the followings? Ignition ON: 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) Idling: 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)	Go to step **12.**	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(STi)-29, Mass Air Flow and Intake Air Temperature Sensor.>
12	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(STi)(diag)-27, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Subtract ambient temperature from intake air temperature. Is the obtained value −10°C — 50°C (14°F — 122°F)?	Contact your SOA Service Center. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(STi)-29, Mass Air Flow and Intake Air Temperature Sensor.>

DJ:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

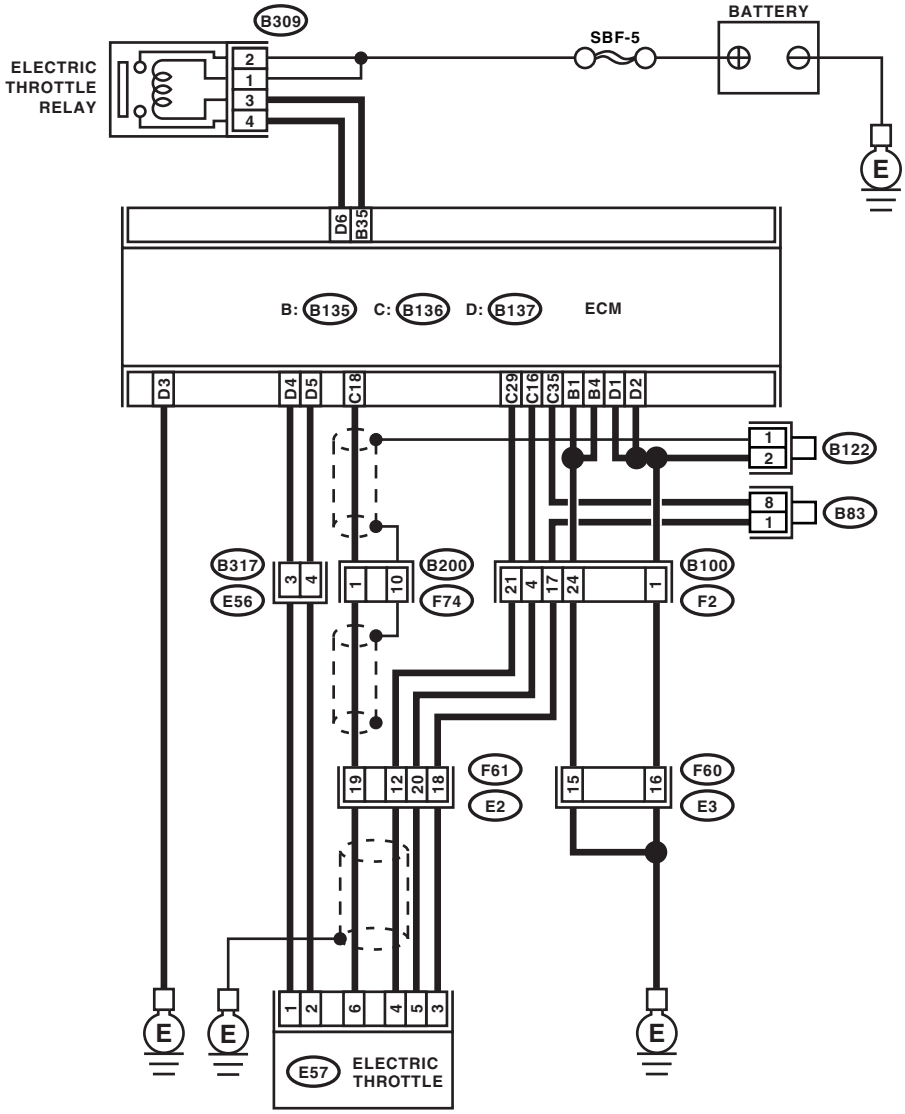
DTC DETECTING CONDITION:

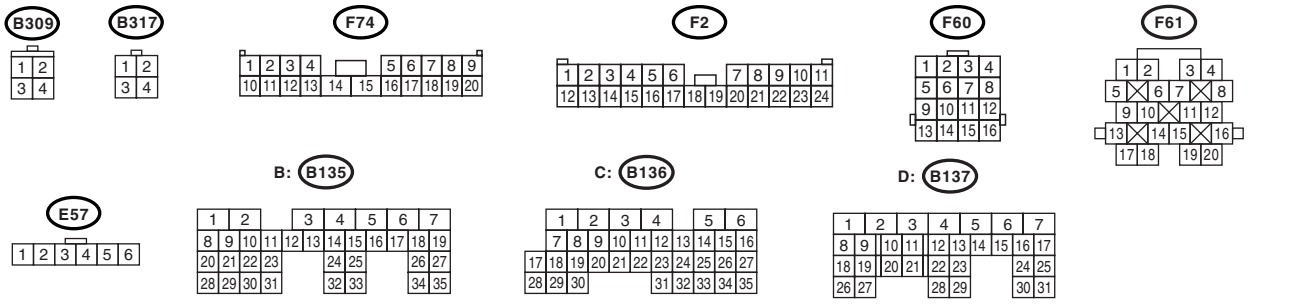
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-179, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>, <Ref. to GD(STi)-214, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(STi)-243, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

WIRING DIAGRAM:





EN-01825

	Step	Check	Yes	No
1	**CHECK ELECTRIC THROTTLE RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electric throttle relay. 3) Connect the battery to electric throttle relay terminal No. 1 and No. 3. 4) Measure the resistance between electric throttle relay terminals. ***Terminals*** ***No. 2 — No. 4:***	Is the resistance less than 1 Ω?	Go to step **2.**	Replace the electric throttle relay.
2	**CHECK POWER SUPPLY TO ELECTRIC THROTTLE RELAY.** Measure the voltage between electric throttle relay connector and engine ground. ***Connector & terminal*** ***(B309) No. 1 (+) — Engine ground (−):*** ***(B309) No. 2 (+) — Engine ground (−):***	Is the voltage more than 5 V?	Go to step **3.**	Repair the open power supply circuit or ground short.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Disconnect the connector from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle relay connector and engine ground. ***Connector & terminal*** ***(B309) No. 3 (+) — Engine ground (−):***	Is the voltage less than 5 V?	Go to step **4.**	Repair short of the power supply circuit between ECM and electric throttle.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electric throttle relay connector and chassis ground. ***Connector & terminal*** ***(B309) No. 3 — Engine ground:*** ***(B309) No. 4 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short of harness between ECM and electric throttle relay.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electric throttle connector and electric throttle relay connector. ***Connector & terminal*** ***(B135) No. 35 — (B309) No. 3:*** ***(B137) No. 6 — (B309) No. 4:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit of harness between ECM and electric throttle relay.
6	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 18 (+) — (B136) No. 35 (−):*** 4) Shake the ECM harness and connector, engine harness connectors (B136, F61), electric throttle connector harness while monitoring value of voltage meter.	Is the voltage more than 0.4 V?	Go to step **7.**	Go to step **9.**

	Step	Check	Yes	No
7	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 29 (+) — (B136) No. 35 (−):*** 4) Shake the ECM harness and connector, engine harness connectors, electric throttle connector harness while monitoring value of voltage meter.	Is the voltage more than 0.8 V?	Go to step **8.**	Go to step **9.**
8	**CHECK POOR CONTACT.** Check poor contact between ECM connector and electric throttle connector.	Is there poor contact between ECM connector and electric throttle connector?	Repair the poor contact.	Go to step **13.**
9	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 16 — (E57) No. 5:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair the open harness connector.
10	**CHECK THE HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 — Chassis ground:*** ***(B136) No. 18 — Chassis ground:*** ***(B136) No. 29 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **11.**	Repair the ground short of harness.
11	**CHECK POWER SUPPLY TO SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (−):*** 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step **12.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>
12	**CHECK SHORT OF ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:*** ***(E57) No. 4 — Engine ground:***	Is the resistance more than 10 Ω?	Go to step **13.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM.
13	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal, using the Subaru Select Monitor. 4) Shake the ECM harness and connector, engine harness connectors, electric throttle connector harness while monitoring value of voltage meter.	Is the voltage 4.63 V?	Go to step **14.**	Go to step **16.**

	Step	Check	Yes	No
14	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Read the data of sub throttle sensor signal, using the Subaru Select Monitor. 2) Shake the ECM harness and connector, engine harness connectors, electric throttle connector harness while monitoring value of voltage meter.	Is the voltage 4.73 V?	Go to step **15.**	Go to step **16.**
15	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle?	Is there poor contact in connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Go to step **21.**
16	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 35 — (E57) No. 3:*** ***(B136) No. 18 — (E57) No. 6:*** ***(B136) No. 29 — (E57) No. 4:***	Is the resistance less than 1 Ω?	Go to step **17.**	Repair the open harness connector.
17	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Connect the ECM connector. 2) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **18.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM.
18	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (−):*** 3) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage less than 10 V?	Go to step **19.**	Repair the battery short of harness between ECM connector and electric throttle connector.
19	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (−):*** ***(E57) No. 4 (+) — Engine ground (−):*** 2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage less than 10 V?	Go to step **20.**	Repair the short of harness between ECM connector and electric throttle connector.
20	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Remove the ECM. 3) Measure the voltage between ECM connectors. ***Connector & terminal*** ***(B136) No. 18 — (B136) No. 35:*** ***(B136) No. 29 — (B136) No. 35:***	Is the resistance more than 1 MΩ?	Go to step **21.**	Repair the short of sensor power supply.

	Step	Check	Yes	No
21	**CHECK OUTPUT VOLTAGE OF SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors except electric throttle replay. 3) Turn the ignition switch to ON. 4) Read the data of main throttle sensor signals, using Subaru Select Monitor.	Is the voltage 0.81 — 0.87 V?	Go to step **22.**	Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle.
22	**CHECK OUTPUT VOLTAGE OF SENSOR.** Read the data of sub throttle sensor signals, using Subaru Select Monitor.	Is the voltage 1.64 — 1.70 V?	Go to step **23.**	Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle.
23	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B137) No. 5 — (E57) No. 2:*** ***(B137) No. 4 — (E57) No. 1:***	Is the resistance less than 1 Ω?	Go to step **24.**	Repair the open harness connector.
24	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE MOTOR.** 1) Connect the connectors to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 2 (+) — Engine ground (−):*** ***(E57) No. 1 (+) — Engine ground (−):***	Is the voltage less than 5 V?	Go to step **25.**	Repair the short of harness to power supply circuit between ECM and electric throttle.
25	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 2 — Engine ground:*** ***(E57) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **26.**	Repair the short of harness.
26	**CHECK ELECTRIC THROTTLE MOTOR HARNESS.** Measure the resistance between electric throttle connector terminals. ***Connector & terminal*** ***(E57) No. 2 — (E57) No. 1:***	Is the resistance more than 1 MΩ?	Go to step **27.**	Repair the short of harness.
27	**CHECK ELECTRIC THROTTLE GROUND CIRCUIT.** Measure the resistance between ECM connector and engine ground. ***Connector & terminal*** ***(B137) No. 3 — Engine ground:***	Is the resistance less than 10 Ω?	Go to step **28.**	Repair the open circuit harness.
28	**CHECK ELECTRIC THROTTLE.** Measure the resistance between electric throttle terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 5 Ω?	Go to step **29.**	Replace the electric throttle.

	Step	Check	Yes	No
29	**CHECK ELECTRIC THROTTLE.** Open and close the throttle valve to its full width with finger.	Does it return to specified position (3 mm (0.12 in) open from fully closed position.) when finger is released?	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>	Replace the electric throttle.

DK:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

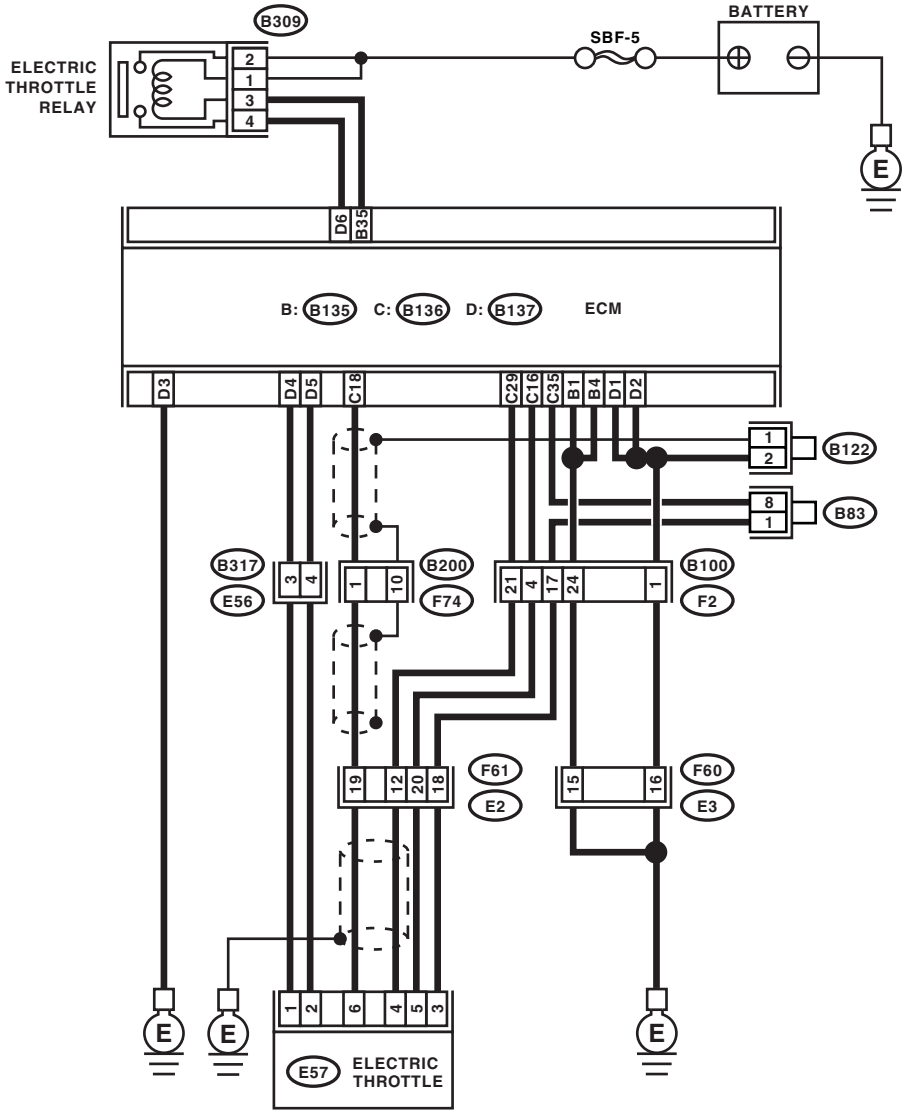
DTC DETECTING CONDITION:

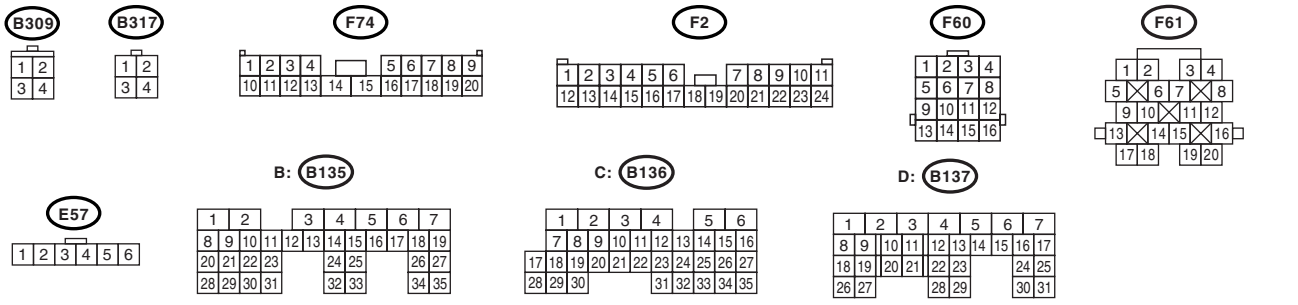
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-245, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

WIRING DIAGRAM:





EN-01825

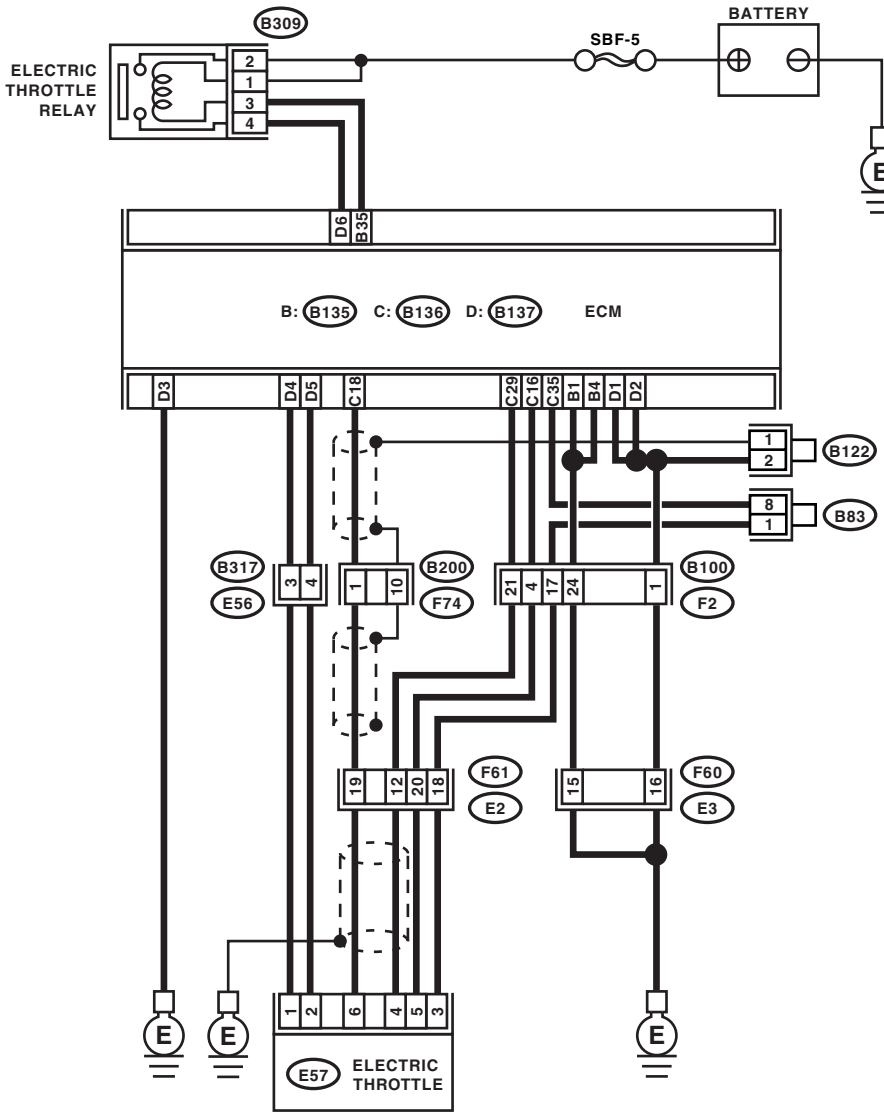
	Step	Check	Yes	No
1	**CHECK ELECTRIC THROTTLE RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electric throttle relay. 3) Connect the battery to electric throttle relay terminal No. 1 and No. 3. 4) Measure the resistance between electric throttle terminals. ***Connector & terminal*** ***(B309) No. 2 — (B309) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2.**	Replace the electric throttle relay.
2	**CHECK POWER TO ELECTRIC THROTTLE RELAY** Measure the voltage between electric throttle relay connector and engine ground. ***Connector & terminal*** ***(B309) No. 1 (+) — Engine ground (−):*** ***(B309) No. 2 (+) — Engine ground (−):***	Is the voltage more than 5 V?	Go to step **3.**	Repair the open power supply circuit or ground short.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Disconnect the connector from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle relay connector and engine ground. ***Connector & terminal*** ***(B309) No. 3 (+) — Engine ground (−):***	Is the voltage less than 5 V?	Go to step **4.**	Repair the short of power supply circuit between ECM and electric throttle.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electric throttle relay connector and chassis ground. ***Connector & terminal*** ***(B309) No. 3 — Engine ground:*** ***(B309) No. 4 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short of harness between ECM and electric throttle relay.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE RELAY.** Measure the resistance between ECM connector and electric throttle relay connector. ***Connector & terminal*** ***(B135) No. 35 — (B309) No. 3:*** ***(B137) No. 6 — (B309) No. 4:***	Is the resistance less than 1 Ω?	Repair the poor contact in ECM connector. If problem persists, replace the ECM.	Repair the open harness between ECM and electric throttle relay.

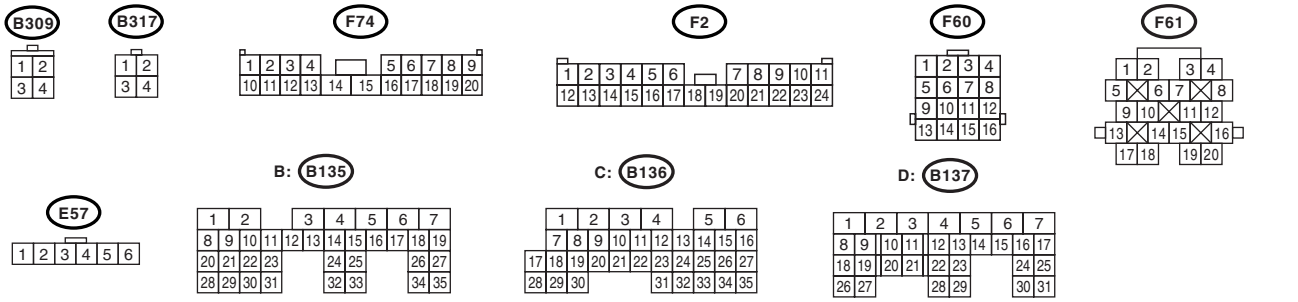
DL:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-247, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

WIRING DIAGRAM:





EN-01825

	Step	Check	Yes	No
1	**CHECK ELECTRIC THROTTLE RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electric throttle relay. 3) Measure the resistance between electric throttle relay terminals. ***Terminals*** ***No. 2 — No. 4:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Replace the electric throttle relay.
2	**CHECK SHORT OF ELECTRIC THROTTLE RELAY POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electric throttle relay connector and engine ground. ***Connector & terminal*** ***(B309) No. 4 (+) — Engine ground (−):***	Is the voltage more than 5 V?	Go to step **3.**	Repair the short of power supply to harness between ECM and electric throttle relay.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connector and engine ground. ***Connector & terminal*** ***(B135) No. 35 — Engine ground:***	Is the resistance more than 1 MΩ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM.	Repair the ground short of harness between ECM and electric throttle relay.

DM:DTC P2109 THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE

NOTE:
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(STi)(diag)-309, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DN:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT

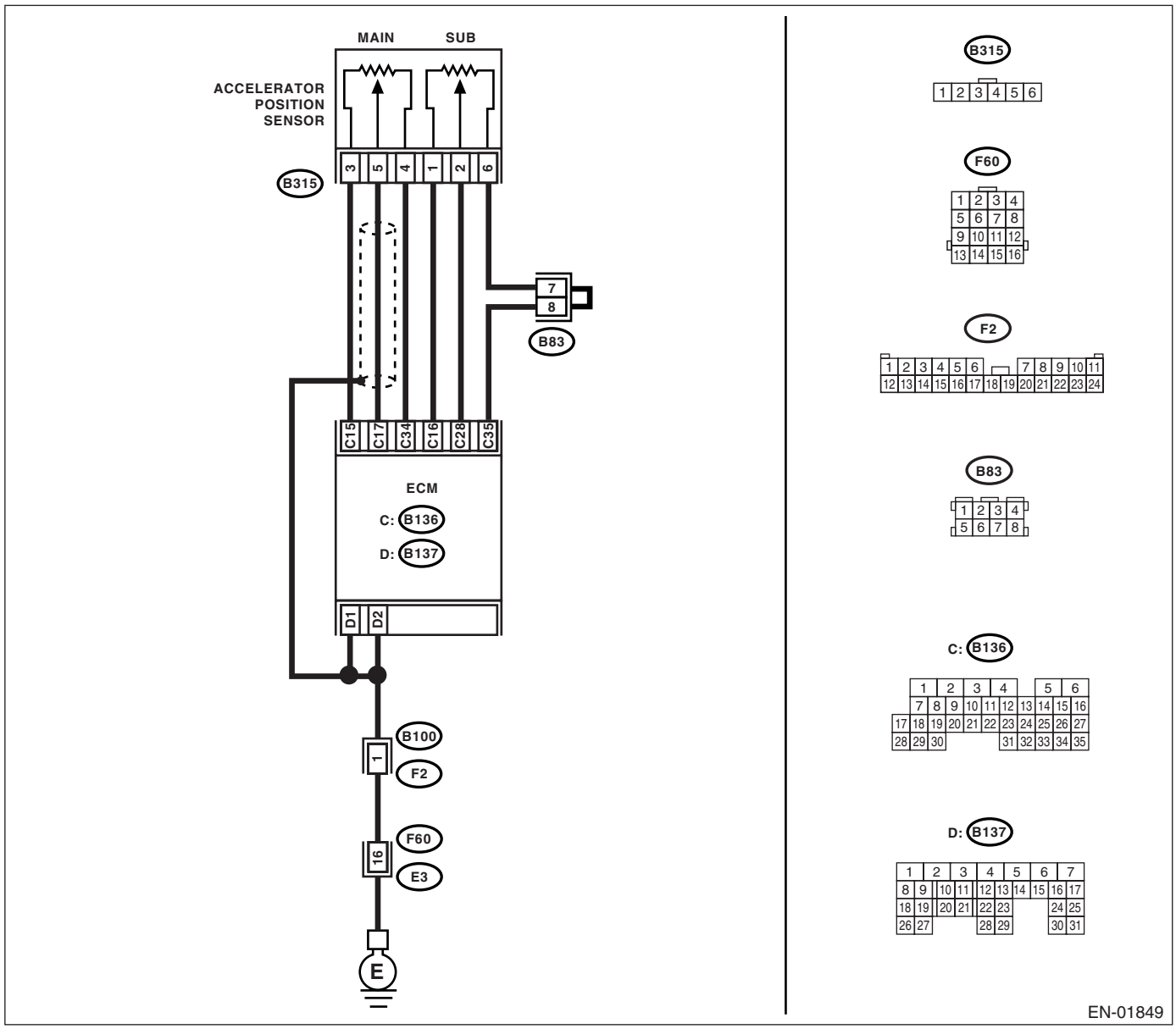
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-251, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 17 (+) — (B136) No. 34 (–):*** 3) Shake the ECM harness and connector, accelerator position sensor.	Is the voltage more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and accelerator position sensor.	Is there poor contact in connectors between ECM and accelerator position sensor?	Repair the poor contact in connectors.	Connector has returned to its normal condition at this time. A temporary poor contact of the connector may be the cause.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator position sensor. 4) Measure the resistance between ECM connector and accelerator position sensor. ***Connector & terminal*** ***(B136) No. 17 — (B315) No. 5:*** ***(B136) No. 15 — (B315) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 17 — Chassis ground:*** ***(B136) No. 15 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the open harness connector.
5	**CHECK ACCELERATOR POSITION SENSOR POWER SUPPLY** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Engine ground (–):*** 4) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>
6	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance 1.2 — 4.8 kΩ?	Go to step **7.**	Replace the accelerator position sensor.
7	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when accelerator pedal is released. ***Terminals*** ***No. 5 — No. 4:***	Is the resistance 0.2 — 1.0 kΩ?	Go to step **8.**	Replace the accelerator position sensor.

	Step	Check	Yes	No
8	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when acceleration pedal is being depressed. ***Terminals*** ***No. 5 — No. 4:***	Is the resistance 0.5 — 2.5 kΩ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM.	Replace the accelerator position sensor.

DO:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT

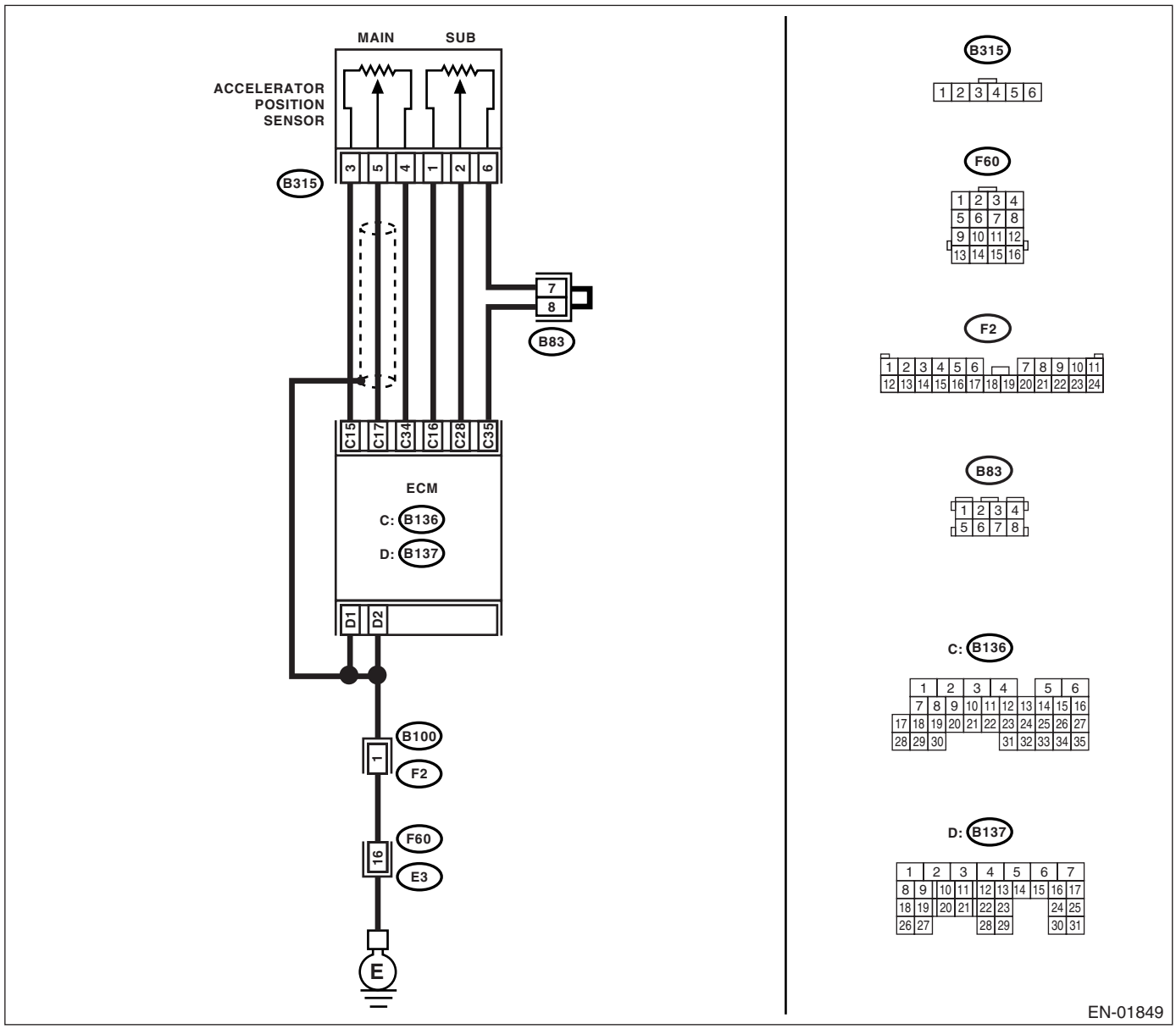
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-253, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/ SWITCH “D” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Read the data of main accelerator position sensor signals, using Subaru Select Monitor. 3) Shake the ECM harness and connector, engine harness connector, accelerator position sensor connector harness while monitoring value of voltage meter.	Is the voltage less than 4.8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and accelerator position sensor.	Is there any poor contact in connectors between ECM and accelerator position sensor?	Repair the poor contact in connectors.	Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator position sensor. 4) Measure the resistance between ECM connector and accelerator position sensor. ***Connector & terminal*** ***(B136) No. 34 — (B315) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator position sensor and engine ground. ***Connector & terminal*** ***(B315) No. 4 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>
5	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Engine ground (−):*** 4) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the voltage more than 6 V?	Go to step **6.**	Repair the battery short of harness between ECM connector and accelerator position sensor.
6	**CHECK POWER SUPPLY TO ACCELERATOR POSITION SENSOR.** 1) Measure the voltage between accelerator position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 5 (+) — Engine ground (−):*** 2) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the voltage less than 4.8 V?	Go to step **7.**	Repair the short of harness between ECM connector and accelerator position sensor connector.

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the accelerator position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 17 (+) — Chassis ground (−):***	Is the voltage 4.8 V?	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>	Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle.

DP:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT

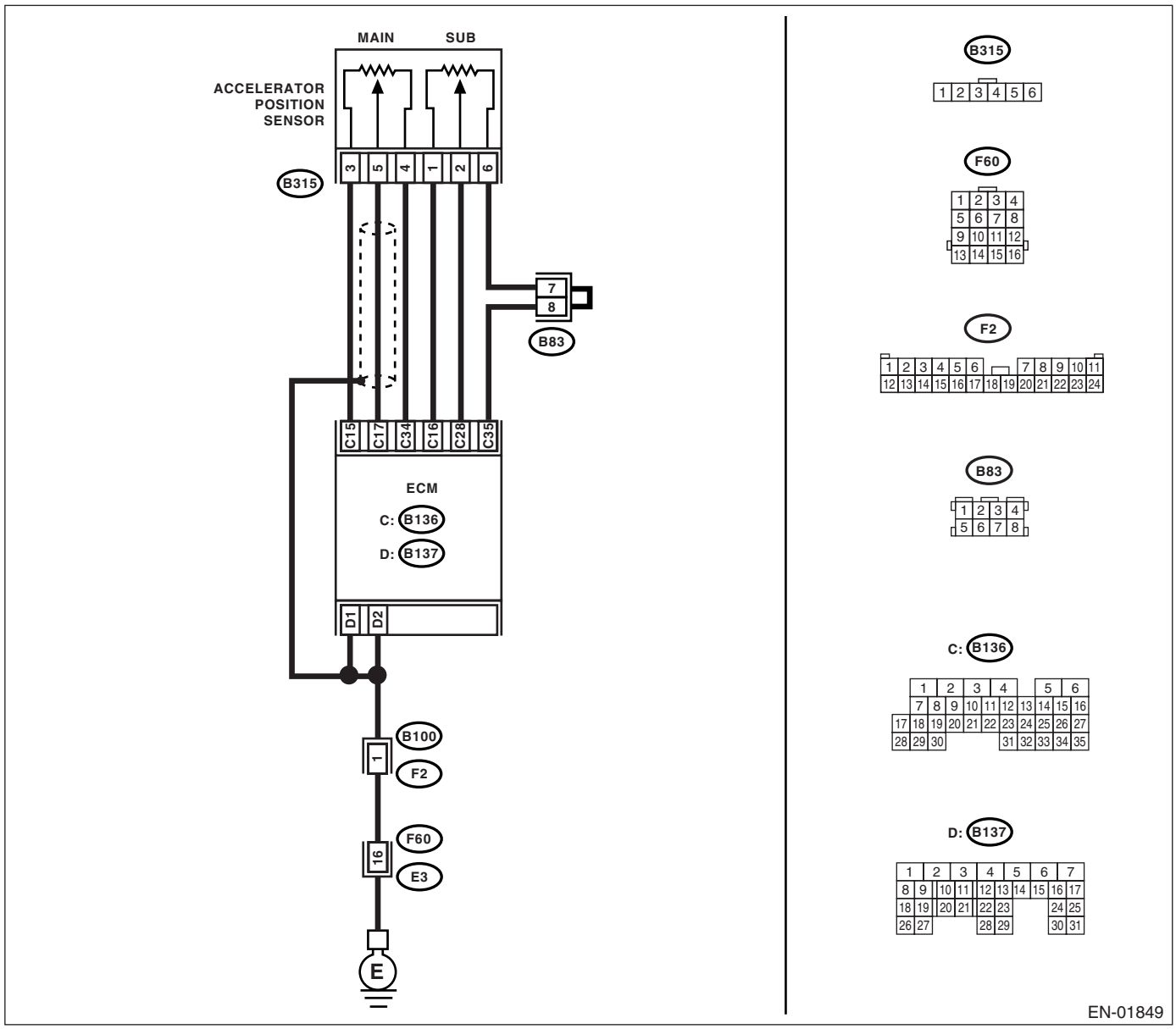
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-255, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/ SWITCH “E” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 28 (+) — (B136) No. 35 (–):*** 3) Shake the ECM harness and connector, accelerator position sensor.	Is the voltage more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and accelerator position sensor.	Is there any poor contact in connectors between ECM and accelerator position sensor?	Repair the poor contact in connectors.	Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator position sensor. 4) Measure the resistance between ECM connector and accelerator position sensor. ***Connector & terminal*** ***(B136) No. 28 — (B315) No. 2:*** ***(B136) No. 1 — (B315) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 28 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short of harness.
5	**CHECK POWER SUPPLY TO ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 1 (+) — Engine ground (–):*** 4) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>
6	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor. ***Terminals*** ***No. 1 — No. 6:***	Is the resistance 0.75 — 3.15 kΩ?	Go to step **7.**	Replace the accelerator position sensor.
7	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when accelerator pedal is released. ***Terminals*** ***No. 2 — No. 6:***	Is the resistance 0.15 — 0.63 kΩ?	Go to step **8.**	Replace the accelerator position sensor.

	Step	Check	Yes	No
8	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when acceleration pedal is being depressed. ***Terminals*** ***No. 2 — No. 6:***	Is the resistance 0.28 — 1.68 kΩ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM.	Replace the accelerator position sensor.

DQ:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGHT INPUT

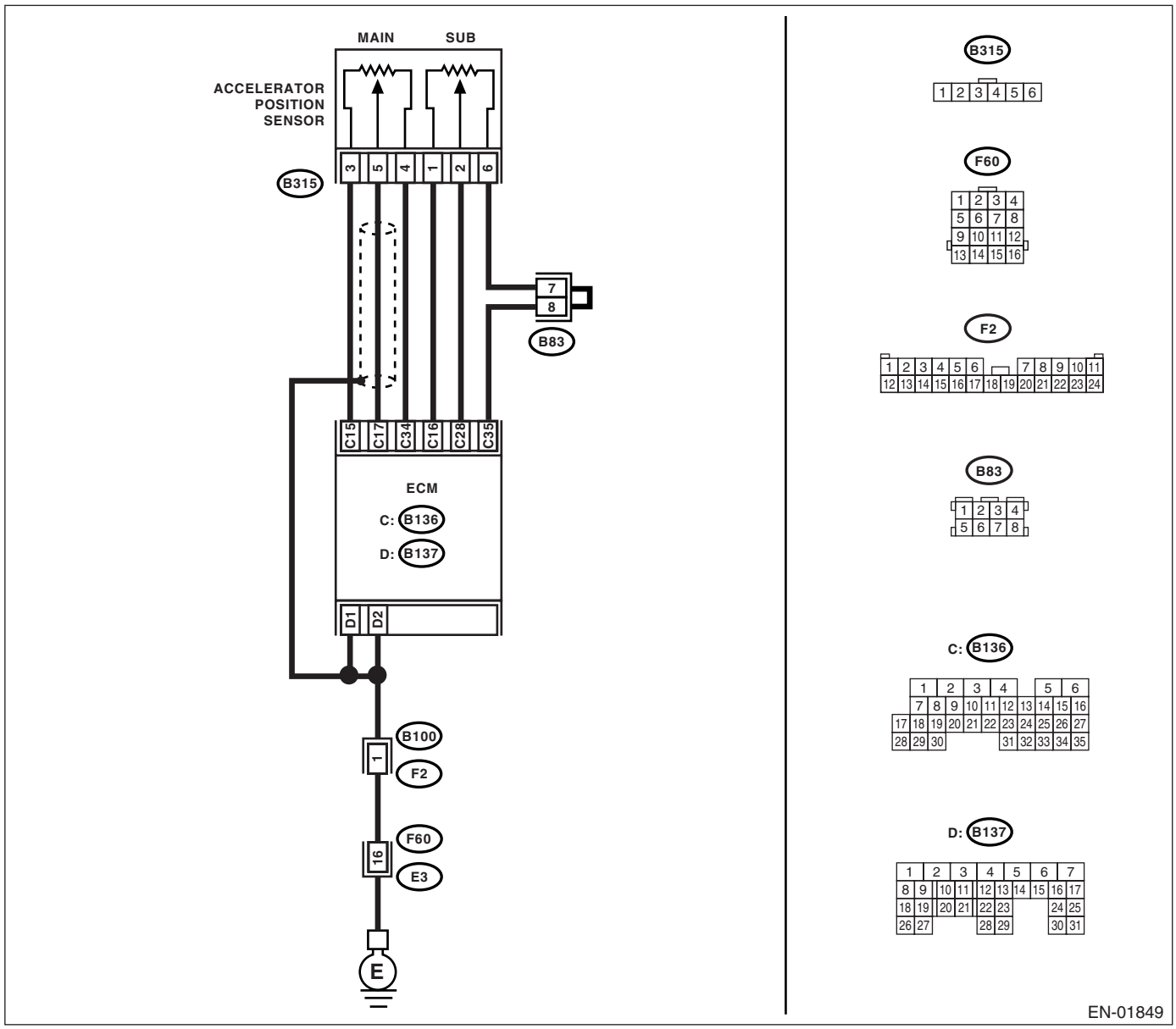
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-257, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/ SWITCH “E” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Read the data of sub accelerator position sensor signals, using Subaru Select Monitor. 3) Shake the ECM harness and connector, engine harness connector, accelerator position sensor connector harness while monitoring value of voltage meter.	Is the voltage less than 4.8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and accelerator position sensor.	Is there any poor contact in connectors between ECM and accelerator position sensor?	Repair the poor contact in connectors.	Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator position sensor. 4) Measure the resistance between ECM connector and accelerator position sensor. ***Connector & terminal*** ***(B136) No. 35 — (B315) No. 6:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 6 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM.
5	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 1 (+) — Engine ground (−):*** 4) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the voltage less than 6 V?	Go to step **6.**	Repair the battery short of harness between ECM connector and accelerator position sensor connector.
6	**CHECK POWER SUPPLY TO ACCELERATOR POSITION SENSOR.** 1) Measure the voltage between accelerator position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 2 (+) — Engine ground (−):*** 2) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the voltage less than 4.8 V?	Go to step **7.**	Repair the short of harness between ECM connector and accelerator position sensor connector.

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the accelerator position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Is the voltage 4.8 V?	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>	Repair the poor contact in electric throttle connector. If problem persists, replace the electric throttle.

DR:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE RATIONALITY

DTC DETECTING CONDITION:

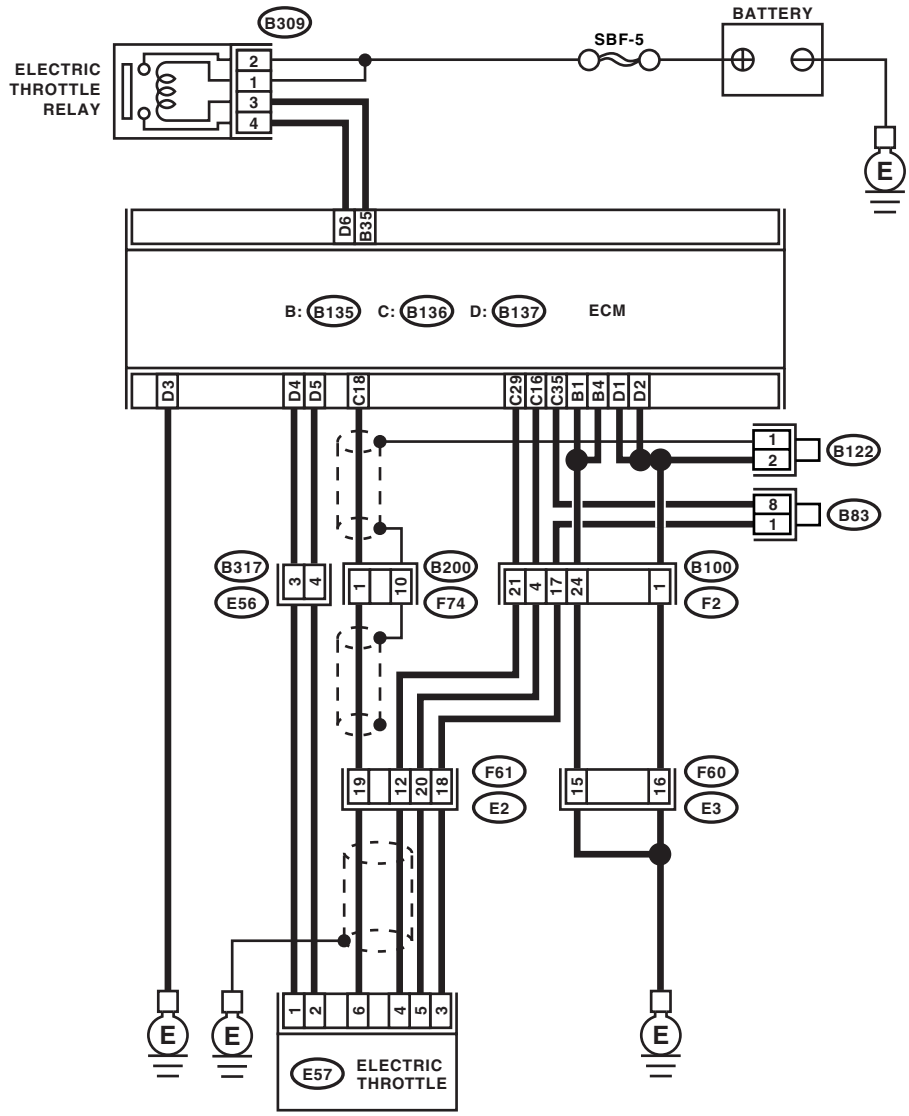
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-259, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” / “B” VOLTAGE RATIONALITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

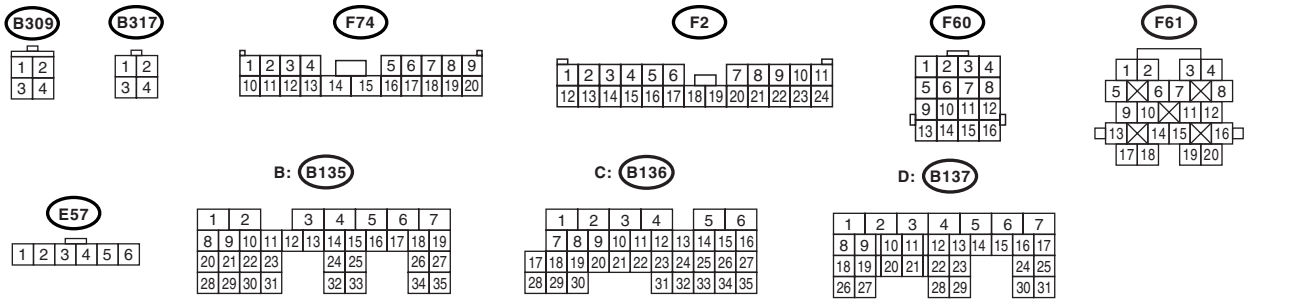
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(STi)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(STi)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-01825

	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 18 (+) — (B136) No. 35 (–):*** 3) Shake the ECM harness and connector, engine harness connectors, electric throttle connector harness while monitoring value of voltage meter.	Is the voltage more than 0.4 V?	Go to step **2.**	Go to step **4.**
2	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 29 (+) — (B136) No. 35 (–):*** 2) Shake the ECM harness and connector, engine harness connectors, electric throttle connector harness while monitoring value of voltage meter.	Is the voltage more than 0.8 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle.	Is there any poor contact in connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Go to step **14.**
4	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 16 — (E57) No. 5:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open harness connector.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 18 — Chassis ground:*** ***(B136) No. 29 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the ground short of harness.
6	**CHECK POWER SUPPLY TO SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):*** 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step **7.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM.

	Step	Check	Yes	No
7	**CHECK SHORT OF ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:*** ***(E57) No. 4 — Engine ground:***	Is the resistance more than 10 Ω?	Go to step **8.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(STi)-40, Engine Control Module (ECM).>
8	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signals, using Subaru Select Monitors. 4) Shake the ECM harness and connector, engine harness connector, electric throttle connector harness while monitoring value of voltage meter.	Is the voltage less than 4.63 V?	Go to step **9.**	Go to step **11.**
9	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Read the data of sub throttle sensor signals, using Subaru Select Monitors. 2) Shake the ECM harness and connector, engine harness connector, electric throttle connector harness while monitoring value of voltage meter.	Is the voltage less than 4.73 V?	Go to step **10.**	Go to step **11.**
10	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle.	Is there any poor contact in connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact in the connector might have been the cause.
11	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electric throttle. 4) Measure the resistance between ECM connector and electric throttle connector. ***Connector & terminal*** ***(B136) No. 35 — (E57) No. 3:*** ***(B136) No. 18 — (E57) No. 6:*** ***(B136) No. 29 — (E57) No. 4:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair the open harness connector.
12	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Connect the ECM connector. 2) Measure the resistance between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **13.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM.

	Step	Check	Yes	No
13	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (−):*** 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage less than 10 V?	Go to step **14.**	Repair the battery short of harness between ECM connector and electric throttle connector.
14	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Measure the voltage between electric throttle connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (−):*** ***(E57) No. 4 (+) — Engine ground (−):*** 2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage less than 10 V?	Go to step **15.**	Repair the short of harness between ECM connector and electric throttle connector.
15	**CHECK HARNESS BETWEEN ECM AND ELECTRIC THROTTLE.** 1) Turn the ignition switch to OFF. 2) Disconnect the electric throttle connector. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 18 (+) — (B136) No. 35 (−):*** ***(B136) No. 29 (+) — (B136) No. 35 (−):***	Is the resistance more than 1 MΩ?	Go to step **16.**	Repair the short of power supply sensor.
16	**CHECK ELECTRIC THROTTLE HARNESS.** 1) Disconnect the connector from ECM. 2) Disconnect the connector from electric throttle. 3) Measure the resistance between electric throttle connector terminals. ***Connector & terminal*** ***(E57) No. 6 — (E57) No. 4:***	Is the resistance more than 1 MΩ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM.	Repair the short of harness.

DS:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE RATIONALITY

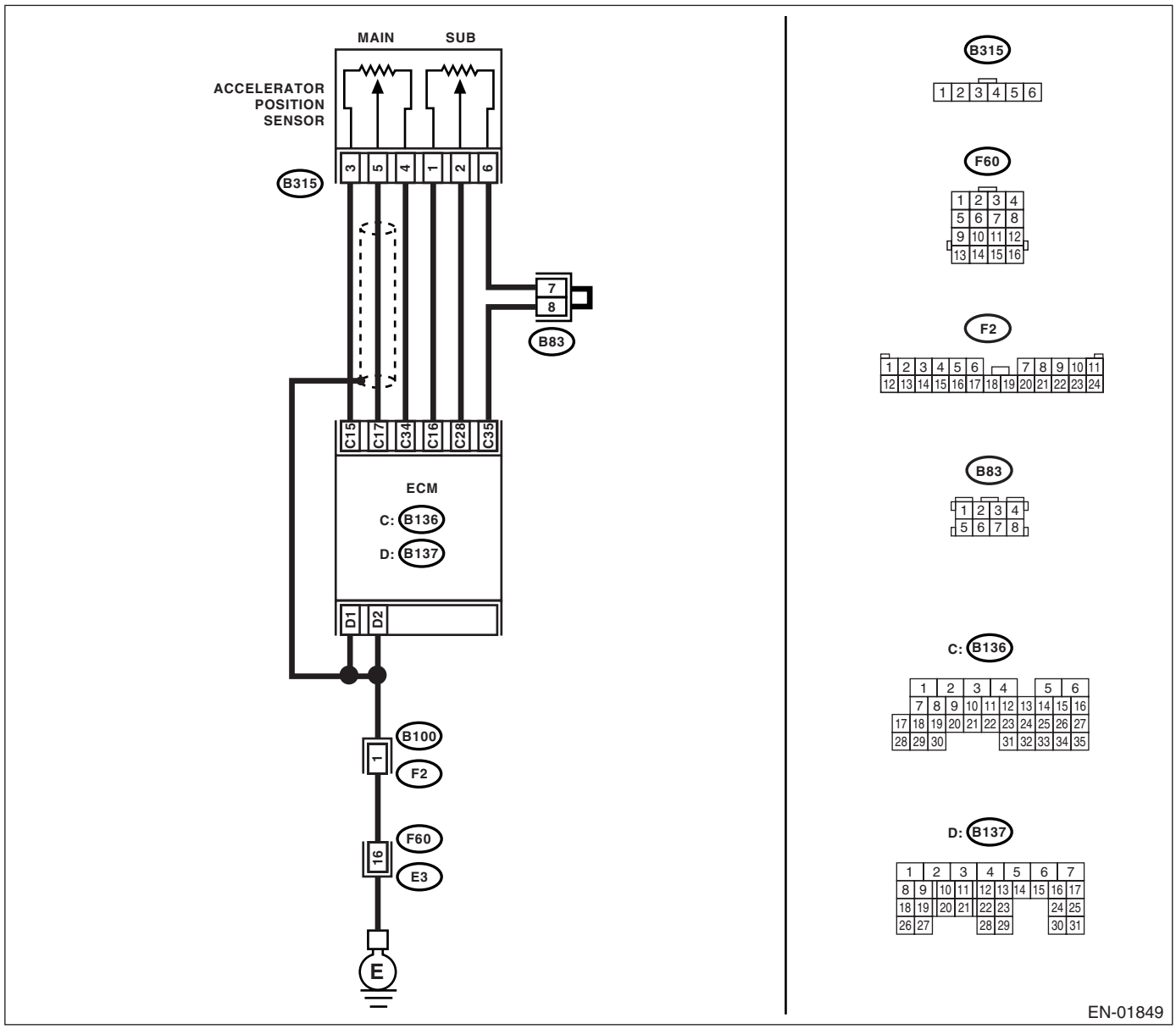
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(STi)-261, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE RATIONALITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 17 (+) — (B136) No. 34 (–):*** ***(B136) No. 28 (+) — (B136) No. 35 (–):*** 3) Shake the ECM harness and connector, accelerator position sensor connector and harness.	Is the voltage more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle.	Is there any poor contact in connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Go to step **9.**
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator position sensor. 4) Measure the resistance between ECM connector and accelerator position sensor connector. ***Connector & terminal*** ***(B136) No. 17 — (B315) No. 5:*** ***(B136) No. 15 — (B315) No. 3:*** ***(B136) No. 28 — (B315) No. 2:*** ***(B136) No. 16 — (B315) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 17 — Chassis ground:*** ***(B136) No. 15 — Chassis ground:*** ***(B136) No. 28 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short of harness.
5	**CHECK POWER SUPPLY TO ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Engine ground (–):*** ***(B315) No. 1 (+) — Engine ground (–):*** 4) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM.
6	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance 1.2 — 4.8 kΩ?	Go to step **7.**	Replace the accelerator position sensor.

	Step	Check	Yes	No
7	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor. ***Terminals*** ***No. 1 — No. 6:***	Is the resistance 0.75 — 3.15 kΩ?	Go to step **8.**	Replace the accelerator position sensor.
8	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when the acceleration pedal is released. ***Terminals*** ***No. 5 — No. 4:***	Is the resistance 0.2 — 0.8 kΩ?	Go to step **9.**	Replace the accelerator position sensor.
9	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when the acceleration pedal is released. ***Connector & terminal*** ***No. 2 — No. 6:***	Is the resistance 0.15 — 0.63 kΩ?	Go to step **10.**	Replace the accelerator position sensor.
10	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when the acceleration pedal is being depressed. ***Terminals*** ***No. 5 — No. 4:***	Is the resistance 0.5 — 2.5 kΩ?	Go to step **11.**	Replace the accelerator position sensor.
11	**CHECK ACCELERATOR POSITION SENSOR.** Measure the resistance of accelerator position sensor when the acceleration pedal is being depressed. ***Terminals*** ***No. 2 — No. 6: (Sub)***	Is the resistance 0.28 — 1.68 kΩ?	Go to step **12.**	Replace the accelerator position sensor.
12	**CHECK OUTPUT VOLTAGE OF ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Turn the ignition switch to ON. 4) Read the data of main accelerator position sensor signals and sub accelerator position sensor signals, using Subaru Select Monitor. 5) Shake the ECM harness and connector, engine harness connector, accelerator position sensor connector harness while monitoring value of voltage meter.	Is the voltage less than 4.8 V?	Go to step **13.**	Go to step **14.**
13	**CHECK POOR CONTACT IN CONNECTORS.** Check poor contact in connectors between ECM and electric throttle.	Is there any poor contact in connectors between ECM and electric throttle?	Repair the poor contact in connectors.	Go to step **19.**

	Step	Check	Yes	No
14	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator position sensor. 4) Measure the resistance between ECM connector and accelerator position sensor connector. ***Connector & terminal*** ***(B136) No. 34 — (B315) No. 4:*** ***(B136) No. 35 — (B315) No. 6:***	Is the resistance less than 1 Ω?	Go to step **15.**	Repair the open harness connector.
15	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator position sensor and engine ground. ***Connector & terminal*** ***(B315) No. 4 — Engine ground:*** ***(B315) No. 6 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **16.**	Repair the poor contact in ECM connector. If problem persists, replace the ECM.
16	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator position sensor and engine ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Engine ground (−):*** ***(B315) No. 1 (+) — Engine ground (−):*** 4) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the voltage less than 6 V?	Go to step **17.**	Repair the battery short of harness between ECM connector and accelerator position sensor.
17	**CHECK POWER SUPPLY TO ACCELERATOR POSITION SENSOR.** 1) Measure the voltage between accelerator position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 5 (+) — Engine ground (−):*** ***(B315) No. 2 (+) — Engine ground (−):*** 2) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the voltage less than 4.8 V?	Go to step **18.**	Repair the short of harness between ECM connector and accelerator position sensor connector.
18	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the accelerator position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 17 (+) — Chassis ground (−):*** ***(B136) No. 28 (+) — Chassis ground (−):***	Is the voltage less than 4.8 V?	Go to step **19.**	Repair the poor contact in accelerator position sensor connector. If problem persists, replace the accelerator position sensor.

	Step	Check	Yes	No
19	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator position sensor. 4) Measure the resistance between terminals of accelerator position sensor connector. ***Connector & terminal*** ***(B315) No. 5 — (B315) No. 2:***	Is the resistance less than 1 MΩ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM.	Repair the short of harness between accelerator position sensor connector and accelerator position sensor connector.

19.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(STi)-93, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Electric throttle 2) Manifold absolute pressure sensor 3) Mass air flow and intake temperature sensor 4) Ignition parts (*1) 5) Engine coolant temperature sensor (*2) 6) Crankshaft position sensor (*3) 7) Camshaft position sensor (*3) 8) Fuel injection parts (*4)
2. Rough idling	1) Electric throttle 2) Manifold absolute pressure sensor 3) Mass air flow and intake temperature sensor 4) Engine coolant temperature sensor (*2) 5) Ignition parts (*1) 6) Air intake system (*5) 7) Fuel injection parts (*4) 8) Crankshaft position sensor (*3) 9) Camshaft position sensor (*3) 10) Oxygen sensor 11) Fuel pump and fuel pump relay
3. Engine does not return to idle.	1) Electric throttle 2) Engine coolant temperature sensor 3) Manifold absolute pressure sensor 4) Mass air flow sensor
4. Poor acceleration	1) Manifold absolute pressure sensor 2) Mass air flow and intake temperature sensor 3) Electric throttle 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) A/C switch and A/C cut relay 10) Engine torque control signal circuit 11) Ignition parts (*1)
5. Engine stalls or engine sags or hesitates at acceleration.	1) Manifold absolute pressure sensor 2) Mass air flow and intake temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Purge control solenoid valve 7) Fuel injection parts (*4) 8) Fuel pump and fuel pump relay
6. Surge	1) Manifold absolute pressure sensor 2) Mass air flow and intake temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Fuel injection parts (*4) 7) Throttle position sensor 8) Fuel pump and fuel pump relay

Symptom	Problem parts
7. Spark knock	1) Manifold absolute pressure sensor 2) Mass air flow and intake temperature sensor 3) Engine coolant temperature sensor 4) Knock sensor 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay
8. After-burning in exhaust system	1) Manifold absolute pressure sensor 2) Mass air flow and intake temperature sensor 3) Engine coolant temperature sensor (*2) 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay

*1: Check ignition coil & ignitor ASSY and spark plug.
*2: Indicate the symptom occurring only in cold temperatures.
*3: Ensure the secure installation.
*4: Check fuel injector, fuel pressure regulator and fuel filter.
*5: Inspect air leak in air intake system.

GENERAL DESCRIPTION

GD(STi)

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1. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Index
P0011	A Camshaft Position-Timing Over-Advanced or System Performance (Bank 1)	<Ref. to GD(STi)-8, DTC P0011 “A” CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0021	A Camshaft Position-Timing Over-Advanced or System Performance (Bank 2)	<Ref. to GD(STi)-9, DTC P0021 “A” CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to GD(STi)-10, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to GD(STi)-12, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to GD(STi)-14, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to GD(STi)-16, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to GD(STi)-18, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	<Ref. to GD(STi)-20, DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to GD(STi)-22, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to GD(STi)-25, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to GD(STi)-27, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to GD(STi)-29, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to GD(STi)-31, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0111	Intake Air Temperature Circuit Range/Performance	<Ref. to GD(STi)-33, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to GD(STi)-35, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0113	Intake Air Temperature Circuit High Input	<Ref. to GD(STi)-37, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to GD(STi)-39, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to GD(STi)-41, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0122	Throttle/Pedal Position Sensor/Switch “A” Circuit Low Input	<Ref. to GD(STi)-43, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0123	Throttle/Pedal Position Sensor/Switch “A” Circuit High Input	<Ref. to GD(STi)-45, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to GD(STi)-47, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to GD(STi)-49, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0129	Atmospheric Pressure Sensor Circuit Range/Performance	<Ref. to GD(STi)-51, DTC P0129 BAROMETRIC PRESSURE TOO LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0131	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to GD(STi)-52, DTC P0131 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0132	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to GD(STi)-54, DTC P0132 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to GD(STi)-56, DTC P0133 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to GD(STi)-59, DTC P0134 O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to GD(STi)-61, DTC P0137 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to GD(STi)-63, DTC P0138 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to GD(STi)-65, DTC P0139 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System too Lean (Bank 1)	<Ref. to GD(STi)-68, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System too Rich (Bank 1)	<Ref. to GD(STi)-71, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0181	Fuel Temperature Sensor “A” Circuit Range/Performance	<Ref. to GD(STi)-74, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0182	Fuel Temperature Sensor “A” Circuit Low Input	<Ref. to GD(STi)-77, DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0183	Fuel Temperature Sensor “A” Circuit High Input	<Ref. to GD(STi)-79, DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0222	Throttle/Pedal Position Sensor/ Switch “B” Circuit Low Input	<Ref. to GD(STi)-81, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/ SWITCH “B” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0223	Throttle/Pedal Position Sensor/ Switch “B” Circuit High Input	<Ref. to GD(STi)-83, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/ SWITCH “B” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0230	Fuel Pump Primary Circuit	<Ref. to GD(STi)-85, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0244	Turbo/Super Charger Wastegate Solenoid “A” Range/Performance	<Ref. to GD(STi)-87, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0245	Turbo/Super Charger Wastegate Solenoid “A” Low	<Ref. to GD(STi)-89, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0246	Turbo/Super Charger Wastegate Solenoid “A” High	<Ref. to GD(STi)-91, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 misfire detected	<Ref. to GD(STi)-93, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P0302	Cylinder 2 misfire detected	<Ref. to GD(STi)-98, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 misfire detected	<Ref. to GD(STi)-98, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 misfire detected	<Ref. to GD(STi)-98, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to GD(STi)-99, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to GD(STi)-101, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to GD(STi)-103, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to GD(STi)-105, DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to GD(STi)-107, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0345	Camshaft Position Sensor “A” Circuit (Bank 2)	<Ref. to GD(STi)-108, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to GD(STi)-109, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0442	Evaporative Emission Control System Leak Detected (small leak)	<Ref. to GD(STi)-112, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to GD(STi)-137, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to GD(STi)-139, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	<Ref. to GD(STi)-141, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to GD(STi)-143, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to GD(STi)-145, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0456	Evaporative Emission Control System Leak Detected (very small leak)	<Ref. to GD(STi)-146, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0457	Evaporative Emission Control System Leak Detected (fuel cap loose/off)	<Ref. to GD(STi)-146, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to GD(STi)-147, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to GD(STi)-149, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0461	Fuel Level Sensor Circuit Range/Performance	<Ref. to GD(STi)-151, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0462	Fuel Level Sensor Circuit Low Input	<Ref. to GD(STi)-153, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0463	Fuel Level Sensor Circuit High Input	<Ref. to GD(STi)-155, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(STi)-157, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0483	Cooling Fan Rationality Check	<Ref. to GD(STi)-160, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to GD(STi)-162, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0503	Vehicle Speed Sensor Intermittent/ Erratic/High	<Ref. to GD(STi)-164, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0506	Idle Control System RPM Lower Than Expected	<Ref. to GD(STi)-166, DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0507	Idle Control System RPM Higher Than Expected	<Ref. to GD(STi)-168, DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(STi)-170, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to GD(STi)-171, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(STi)-173, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0605	Internal Control Module Read Only Memory (ROM) Error	<Ref. to GD(STi)-175, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0607	Control Module Performance	<Ref. to GD(STi)-176, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to GD(STi)-179, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to GD(STi)-182, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0692	Cooling Fan 1 Control Circuit High	<Ref. to GD(STi)-183, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Neutral Switch Input Circuit Low	<Ref. to GD(STi)-184, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Neutral Switch Input Circuit High	<Ref. to GD(STi)-185, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1086	Tumble Generated Valve Position Sensor 2 Circuit Low	<Ref. to GD(STi)-186, DTC P1086 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1087	Tumble Generated Valve Position Sensor 2 Circuit High	<Ref. to GD(STi)-188, DTC P1087 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1088	Tumble Generated Valve Position Sensor 1 Circuit Low	<Ref. to GD(STi)-190, DTC P1088 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1089	Tumble Generated Valve Position Sensor 1 Circuit High	<Ref. to GD(STi)-192, DTC P1089 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1090	Tumble Generated Valve System 1 (Valve Open)	<Ref. to GD(STi)-194, DTC P1090 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P1091	Tumble Generated Valve System 1 (Valve Close)	<Ref. to GD(STi)-195, DTC P1091 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1092	Tumble Generated Valve System 2 (Valve Open)	<Ref. to GD(STi)-196, DTC P1092 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1093	Tumble Generated Valve System 2 (Valve Close)	<Ref. to GD(STi)-197, DTC P1093 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1094	Tumble Generated Valve Signal 1 Circuit Malfunction (Open)	<Ref. to GD(STi)-198, DTC P1094 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1095	Tumble Generated Valve Signal 1 Circuit Malfunction (Short)	<Ref. to GD(STi)-200, DTC P1095 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1096	Tumble Generated Valve Signal 2 Circuit Malfunction (Open)	<Ref. to GD(STi)-202, DTC P1096 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1097	Tumble Generated Valve Signal 2 Circuit Malfunction (Short)	<Ref. to GD(STi)-204, DTC P1097 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1110	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)	<Ref. to GD(STi)-206, DTC P1110 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1111	Atmospheric Pressure Sensor Circuit Malfunction (High Input)	<Ref. to GD(STi)-207, DTC P1111 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1152	O_2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to GD(STi)-208, DTC P1152 O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1153	O_2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to GD(STi)-211, DTC P1153 O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1160	Return Spring Failure	<Ref. to GD(STi)-214, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to GD(STi)-216, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to GD(STi)-218, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to GD(STi)-219, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1446	Fuel Tank Sensor Control Valve Circuit Low	<Ref. to GD(STi)-220, DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1447	Fuel Tank Sensor Control Valve Circuit High	<Ref. to GD(STi)-222, DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1448	Fuel Tank Sensor Control Valve Range/Performance	<Ref. to GD(STi)-224, DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	<Ref. to GD(STi)-227, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1518	Starter Switch Circuit Low Input	<Ref. to GD(STi)-229, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to GD(STi)-230, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2088	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	<Ref. to GD(STi)-231, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DTC	Item	Index
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	<Ref. to GD(STi)-233, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	<Ref. to GD(STi)-235, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2093	OCV Solenoid Valve Signal A Circuit Short (Bank 2)	<Ref. to GD(STi)-237, DTC P2093 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to GD(STi)-239, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to GD(STi)-241, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to GD(STi)-243, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to GD(STi)-245, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to GD(STi)-247, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2109	Throttle/Pedal Position Sensor A Minimum Stop Performance	<Ref. to GD(STi)-249, DTC P2109 THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2122	Throttle/Pedal Position Sensor/ Switch “D” Circuit Low Input	<Ref. to GD(STi)-251, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2123	Throttle/Pedal Position Sensor/ Switch “D” Circuit High Input	<Ref. to GD(STi)-253, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2127	Throttle/Pedal Position Sensor/ Switch “E” Circuit Low Input	<Ref. to GD(STi)-255, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2128	Throttle/Pedal Position Sensor/ Switch “E” Circuit High Input	<Ref. to GD(STi)-257, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2135	Throttle/Pedal Position Sensor/ Switch “A”/“B” Voltage Rationality	<Ref. to GD(STi)-259, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” / “B” VOLTAGE RATIONALITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2138	Throttle/Pedal Position Sensor/ Switch “D”/“E” Voltage Rationality	<Ref. to GD(STi)-261, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE RATIONALITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

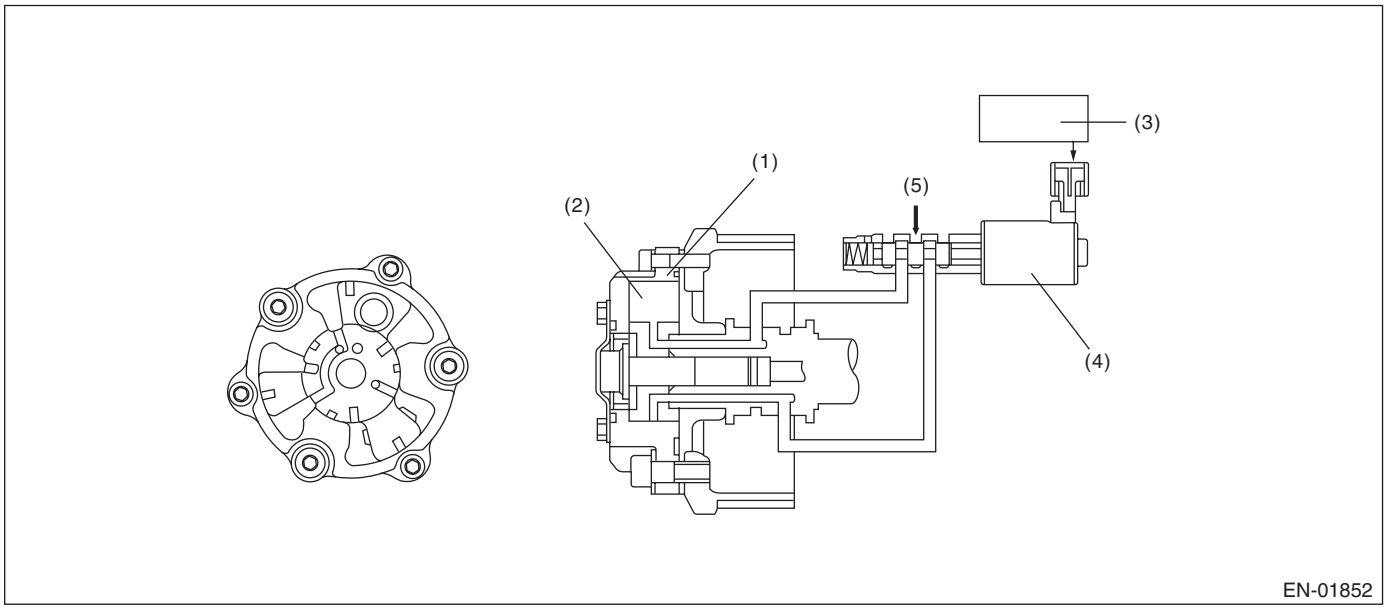
2. Diagnostic Trouble Code (DTC) Detecting Criteria

A: DTC P0011 “A” CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of AVCS system.
Judge NG when the amount of AVCS actual timing advance does not approach to the amount of AVCS target timing advance.

2. COMPONENT DESCRIPTION



(1) AVCS timing controller
(2) Vane
(3) Engine control module (ECM)
(4) Oil flow control valve
(5) Oil pressure

3. ENABLE CONDITION (FOR ABNORMALITY JUDGMENT ONLY)

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine speed	≥ 600 rpm
Coolant temperature	≥ 60°C
Amount of AVCS target timing advance	= 0°CA

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after idling when the amount of AVCS target timing advance is equal to 0.

5. DIAGNOSTIC METHOD

Judge NG when the difference of the amount of AVCS target timing advance and the amount of AVCS actual timing advance becomes large, and judge OK when the difference becomes small.

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
AVCS target position – AVCS actual position	≥ 20°

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
AVCS control	During feedback
Amount of AVCS target timing advance	5 — 30°CA
AVCS target position – AVCS actual position	< 10°

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Ignition timing whole learning compensation:
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control: Most timing retard learning is not complete or most timing retard learning completion is not experienced.
- ISC feedback compensation: Do not perform the AVCS actual timing advance compensation. Make the OCV driving Duty to be the given value (9.36%).

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

B: DTC P0021 “A” CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

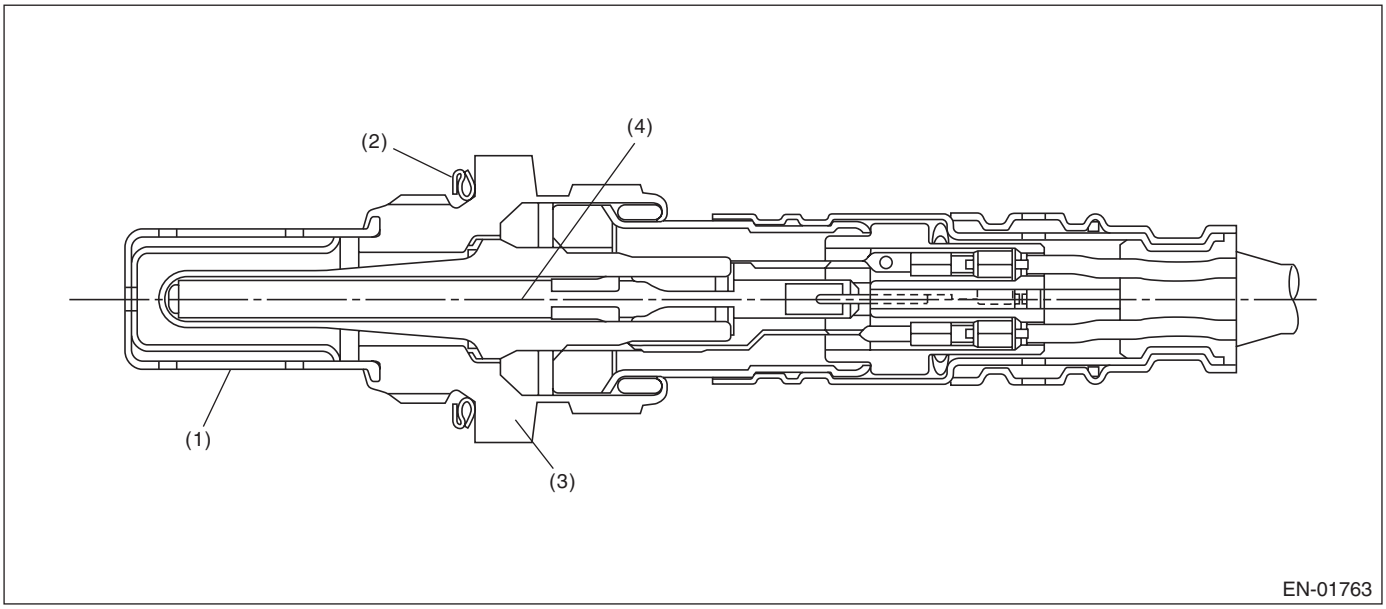
NOTE:
For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(STi)-8, DTC P0011 “A” CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

C: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of front oxygen (A/F) sensor heater.
Judge NG when impedance of front oxygen (A/F) sensor is larger than the standard value by referring to the engine condition such as fuel shut-off in deceleration, etc.

2. COMPONENT DESCRIPTION



(1) Protection tube
(2) Gasket
(3) Sensor housing
(4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	60 seconds or more
Battery voltage	> 10.9 V
After fuel shut-off	20 seconds or more
Front oxygen (A/F) sensor heater control duty ≥ 70%	Experienced

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously in 60 seconds after starting engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the continuous time of not completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Impedance of front oxygen (A/F) sensor	> 50 Ω

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

9. ECM OPERATING AT DTC SETTING

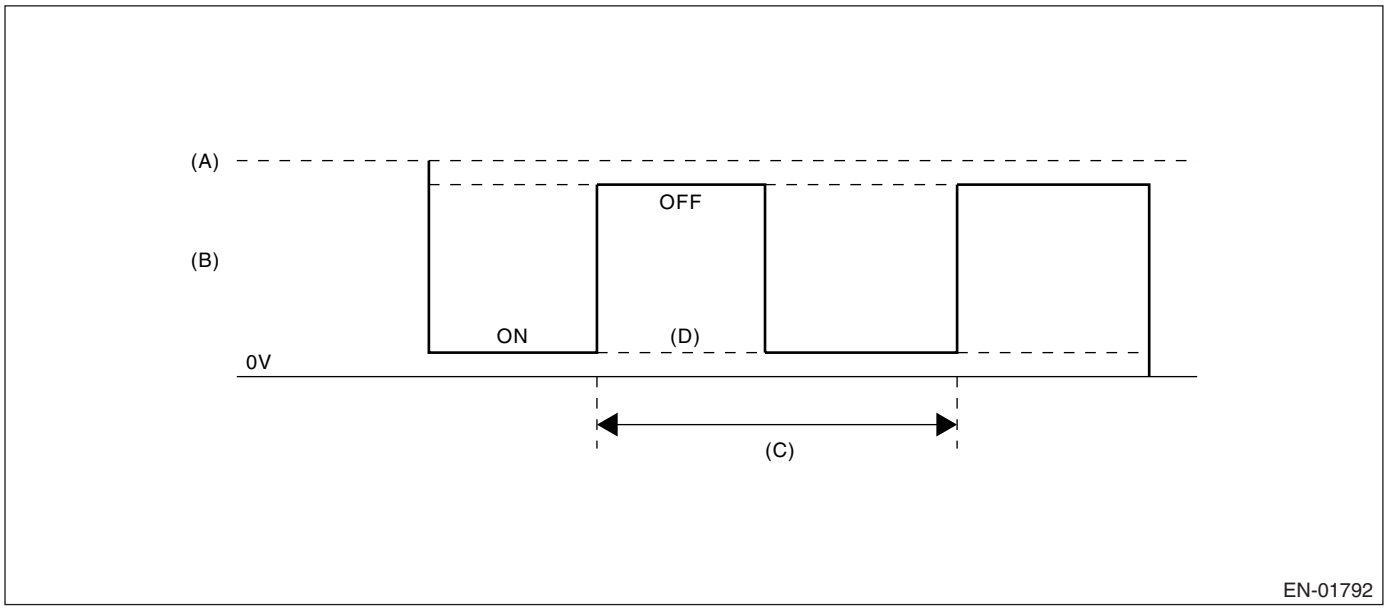
Memorize the freeze frame data. (For test mode $02)

D: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.
The heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.
Judge NG when the terminal voltage remains to be Low.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Front oxygen (A/F) sensor heater output voltage
(C) 128 milliseconds
(D) Low abnormality

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second (8 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Front oxygen (A/F) sensor heater control duty	< 87.5%

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

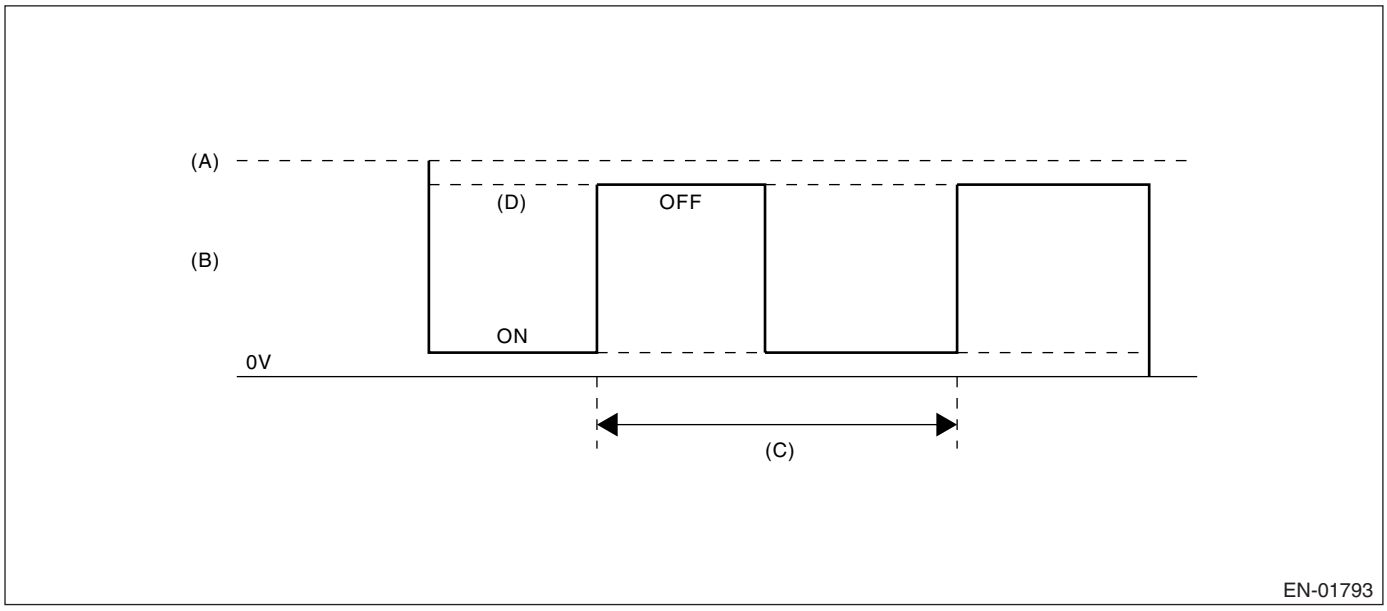
Memorize the freeze frame data. (For test mode $02)

E: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.
The heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.
Judge NG when the terminal voltage remains to be High.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Front oxygen (A/F) sensor heater output voltage
(C) 128 milliseconds
(D) High abnormality

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes 1 second (8 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Front oxygen (A/F) sensor heater control duty	≥ 12.5%

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

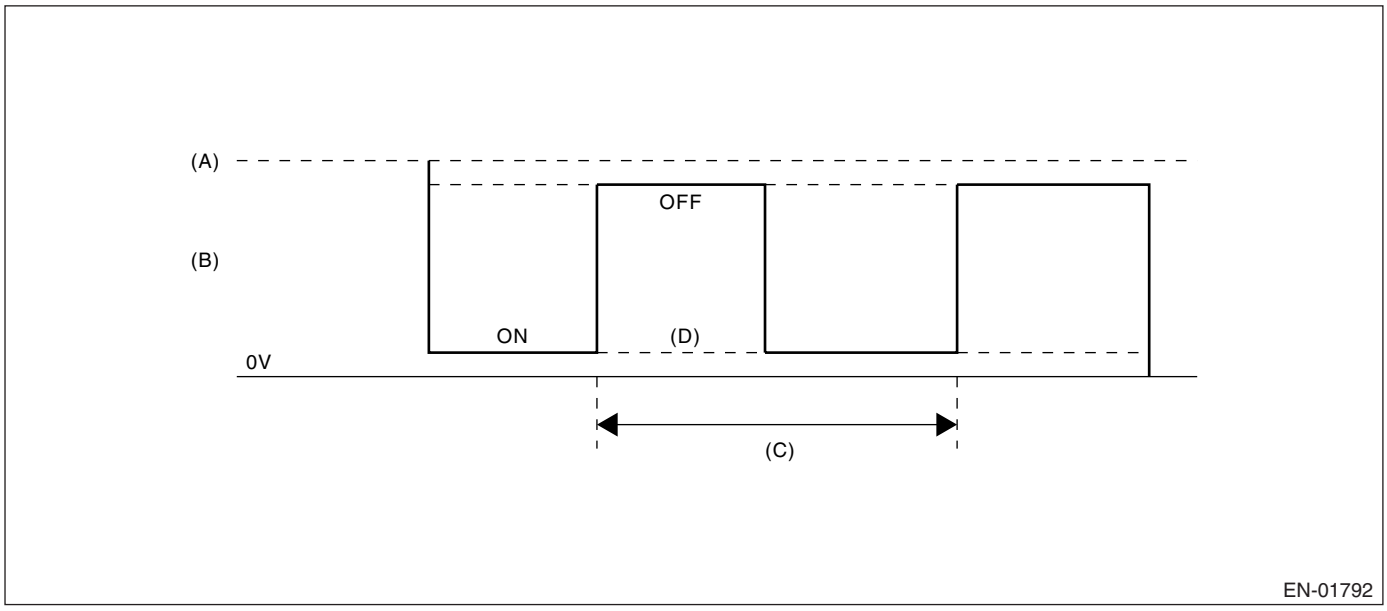
Memorize the freeze frame data. (For test mode $02)

F: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of rear oxygen sensor heater.
Rear oxygen sensor heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.
Judge NG when the terminal voltage remains to be Low.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Rear oxygen sensor heater output voltage
(C) 256 milliseconds (cycles)
(D) Low malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Elapsed time after engine starting	≥ 1 second

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 1 second after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2,560 millisecond (10 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Rear oxygen sensor heater control duty	< 75%

Time Needed for Diagnosis: 2.56 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

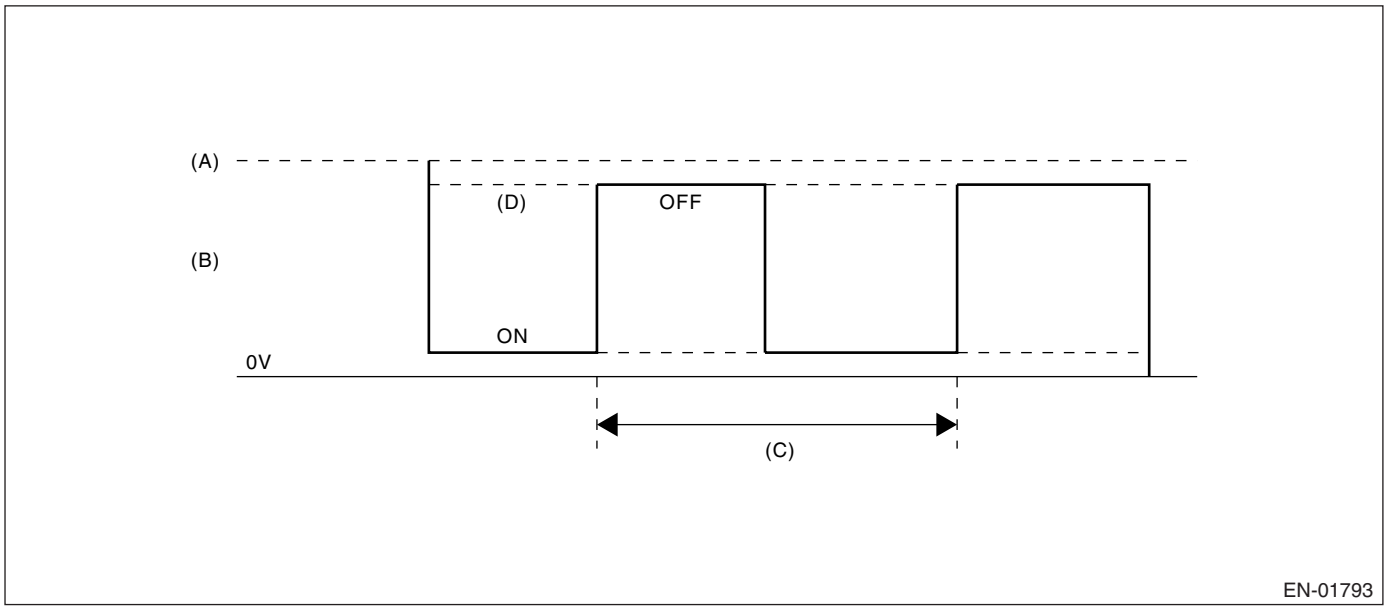
Memorize the freeze frame data. (For test mode $02)

G: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of rear oxygen heater.
Rear oxygen heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.
Judge NG when the terminal voltage remains to be High.

2. COMPONENT DESCRIPTION



(A) Battery voltage
(B) Rear oxygen sensor heater output voltage
(C) 256 milliseconds (cycle)
(D) High malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Elapsed time after engine starting	≥ 21 second

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 1 second after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2,560 milliseconds (10 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Rear oxygen sensor heater control duty	≥ 25%

Time Needed for Diagnosis: 2.56 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

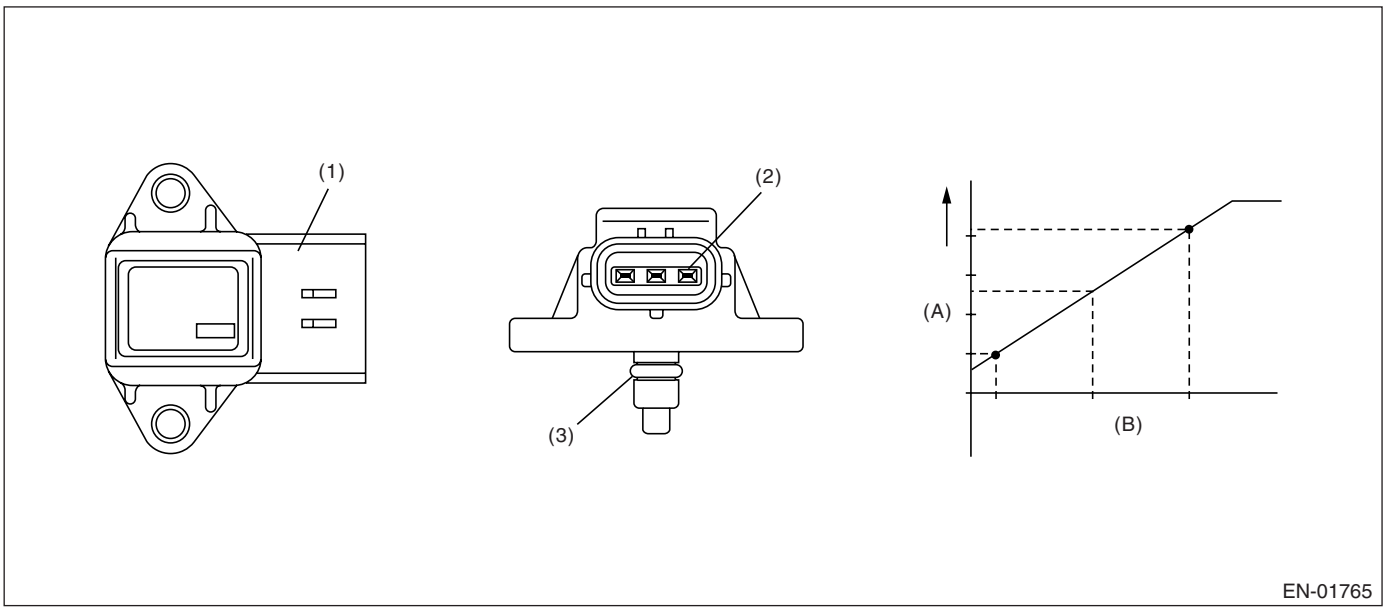
Memorize the freeze frame data. (For test mode $02)

H: DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake manifold pressure sensor output property. Judge NG when the intake air pressure AD value is Low whereas it seemed to be High from the viewpoint of engine condition, or when it is High whereas it seemed to be Low from the engine condition.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when either Low side or High side becomes NG. Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2,500 rpm
Throttle position	≥ 10°
Output voltage	< 1.0 V
High side	
Engine speed	600 ←→ 900 rpm
Throttle position	< 1.3°
Output voltage	≥ 2.6 V

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when both Low side and High side become OK. Judge OK when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2,500 rpm
Throttle position	≥ 10°
Output voltage	≥ 1.0 V
High side	
Engine speed	600 ←→ 900 rpm
Throttle position	< 1.3°
Output voltage	< 2.6 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATING AT DTC SETTING

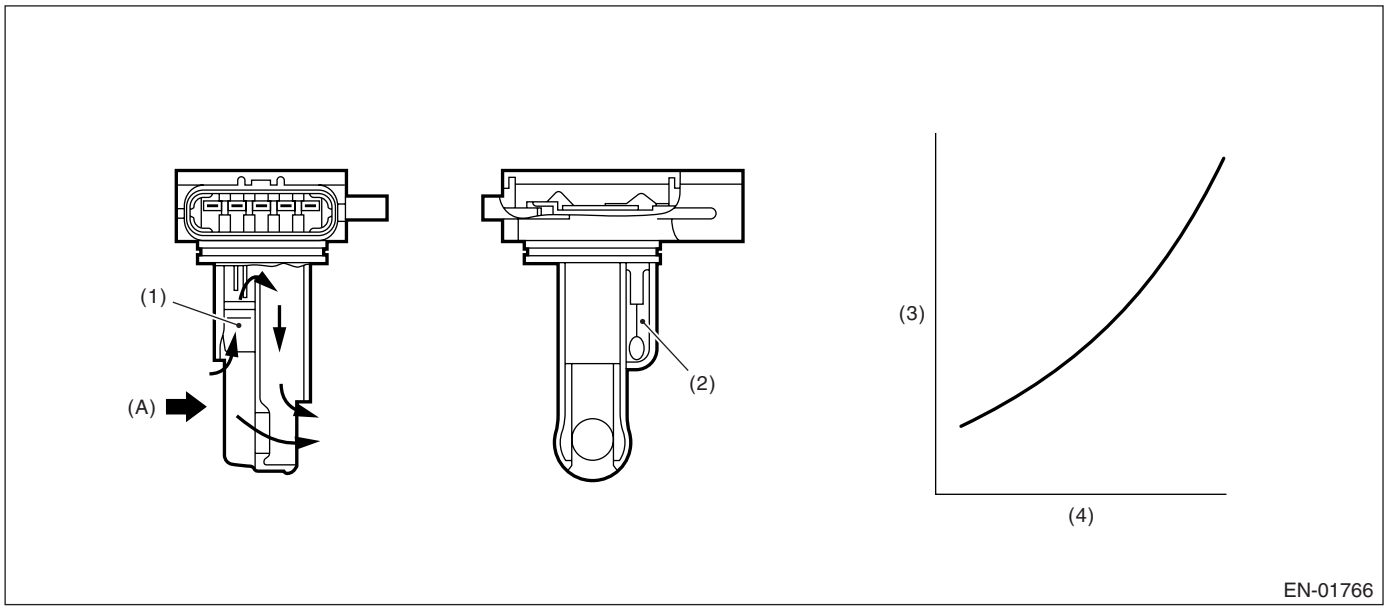
Memorize the freeze frame data. (For test mode $02)

I: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output property. Judge Low side NG when the air flow voltage indicates low value in spite of the driving condition that the air flow voltage might be high; otherwise, judge High side NG when the air flow voltage indicates high value in spite of the driving condition that the air flow voltage might be low. Judge air flow sensor property NG when the Low side or High side becomes NG.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Intake air volume (kg/s)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more then the time needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Low side NG	
Output voltage	< 1.5 V
Engine speed	≥ 2,500 rpm
Throttle angle	≥ 15°
Intake manifold pressure	≥ 53.3 kPa (400 mmHg, 15.7 inHg)
High side NG	
Output voltage	≥ 2.5 V
Engine speed	550 ←→ 900 rpm
Throttle angle	< 1.92°
Intake manifold pressure	< 46.7 kPa (350 mmHg, 13.8 inHg)

Time Needed for Diagnosis:

Low side	3 seconds
High side	10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK the when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Low side NG	
Output voltage	≥ 1.5 V
Engine speed	≥ 2,500 rpm
Throttle angle	≥ 15°
Intake manifold pressure	≥ 53.3 kPa (400 mmHg, 15.7 inHg)
High side NG	
Output voltage	< 2.5 V
Engine speed	550 ←→ 900 rpm
Throttle angle	< 1.92°
Intake manifold pressure	< 46.7 kPa (350 mmHg, 13.8 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

• Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
• EVAP conc. learning (fuel): Not allowed to learn.
• Knock compensation:
  – Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  – At normal: knock compensation = 0°CA is fixed.
  – At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
  – Not allowed to update the whole learning compensation factor.
  – Not allowed to calculate the partial learning zone compensation value.
• ISC control: Make the open loop compensation to be the given value (1 g/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
• Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

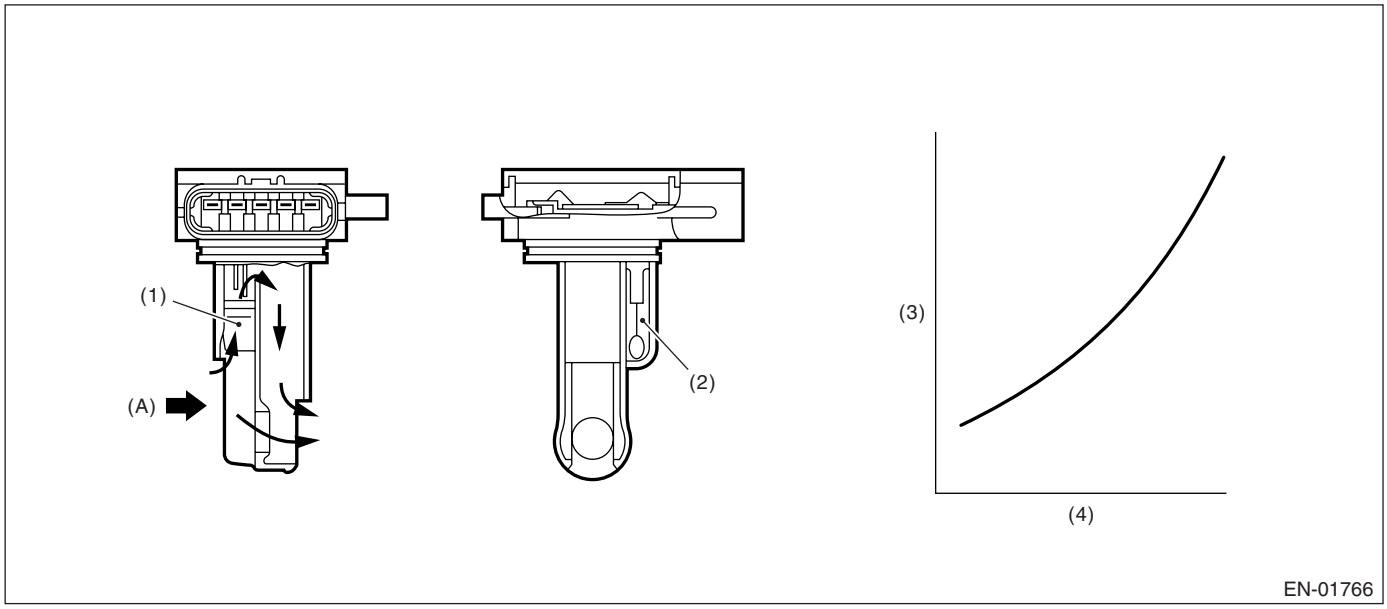
Memorize the freeze frame data. (For test mode $02)

J: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Intake air volume (kg/s)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.2 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

• Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
• EVAP conc. learning (fuel): Not allowed to learn.
• Knock compensation:
  – Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  – At normal: knock compensation = 0°CA is fixed.
  – At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
  – Not allowed to update the whole learning compensation factor.
  – Not allowed to calculate the partial learning zone compensation value.
• ISC control: Make the open loop compensation to be the given value (1 g/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
• Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

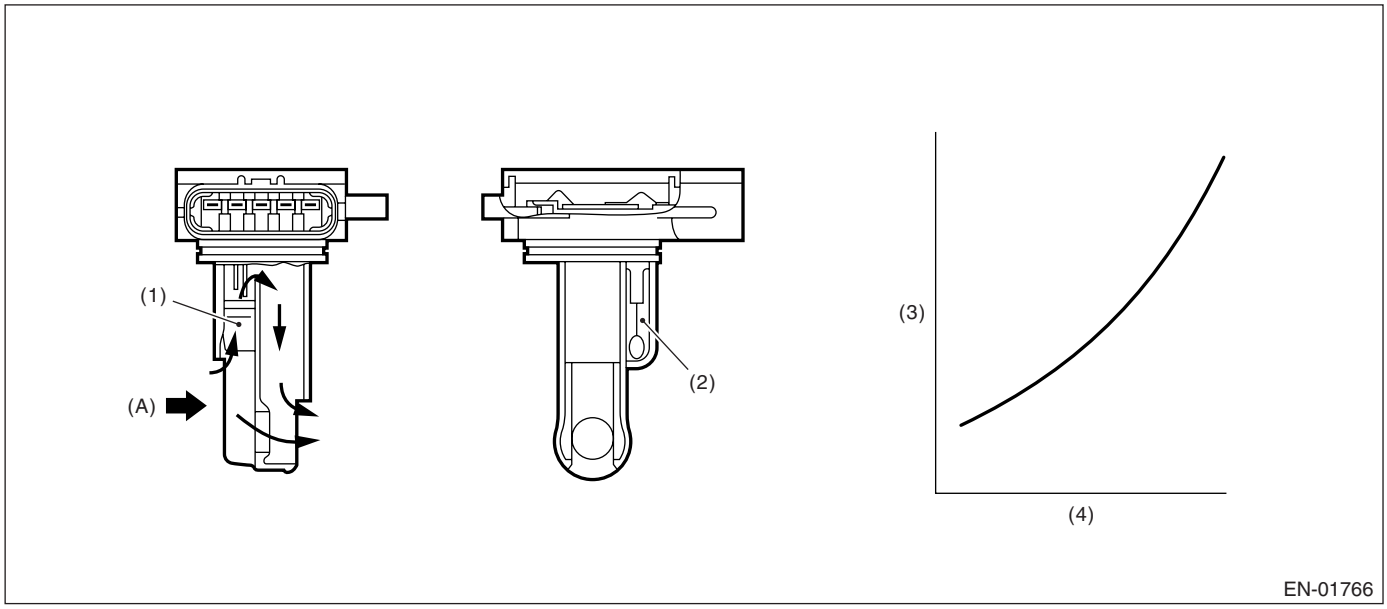
Memorize the freeze frame data. (For test mode $02)

K: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Voltage (V)
(4) Intake air volume (kg/s)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.985 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

• Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
• EVAP conc. learning (fuel): Not allowed to learn.
• Knock compensation:
  – Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
  – At normal: knock compensation = 0°CA is fixed.
  – At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
  – Not allowed to update the whole learning compensation factor.
  – Not allowed to calculate the partial learning zone compensation value.
• ISC control: Make the open loop compensation to be the given value (1 g/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
• Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

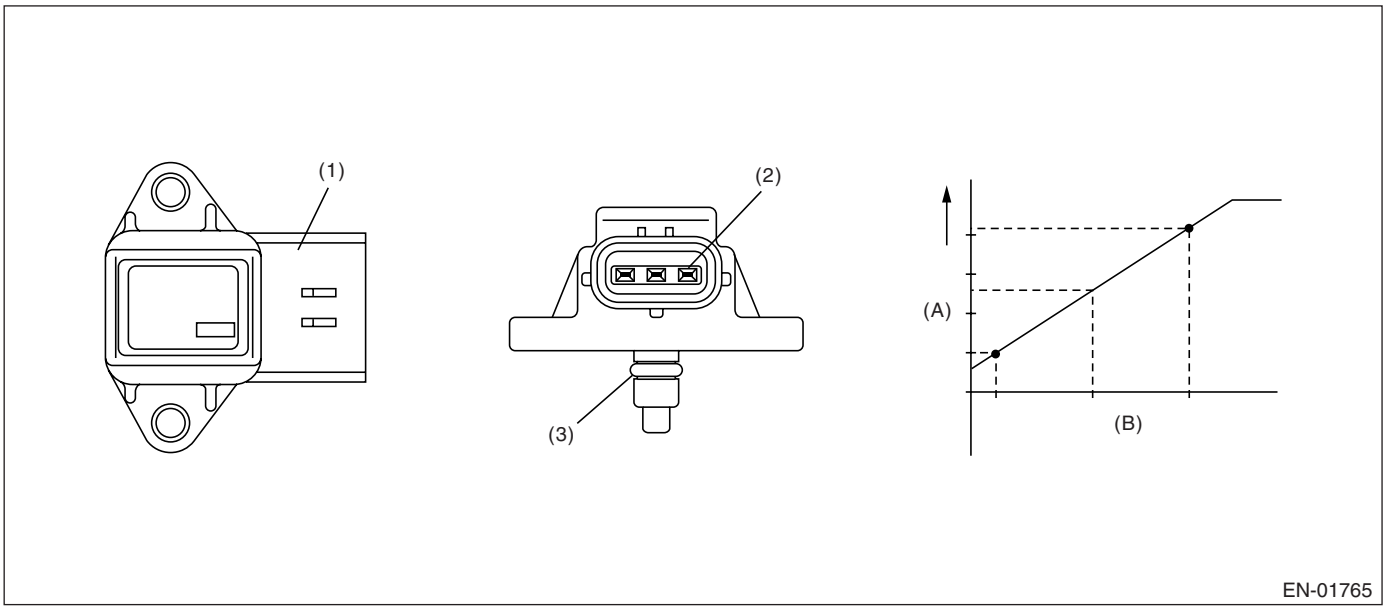
Memorize the freeze frame data. (For test mode $02)

L: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.568 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATING AT DTC SETTING

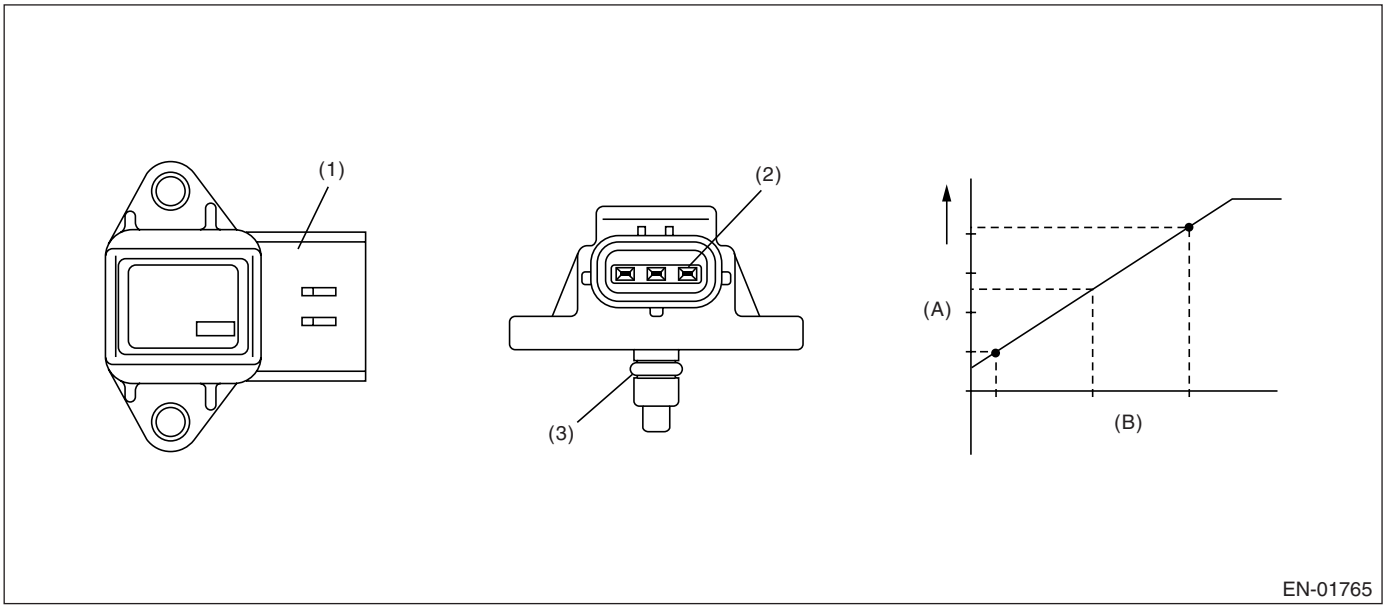
Memorize the freeze frame data. (For test mode $02)

M: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(3) O-ring
(A) Output voltage
(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.921 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATING AT DTC SETTING

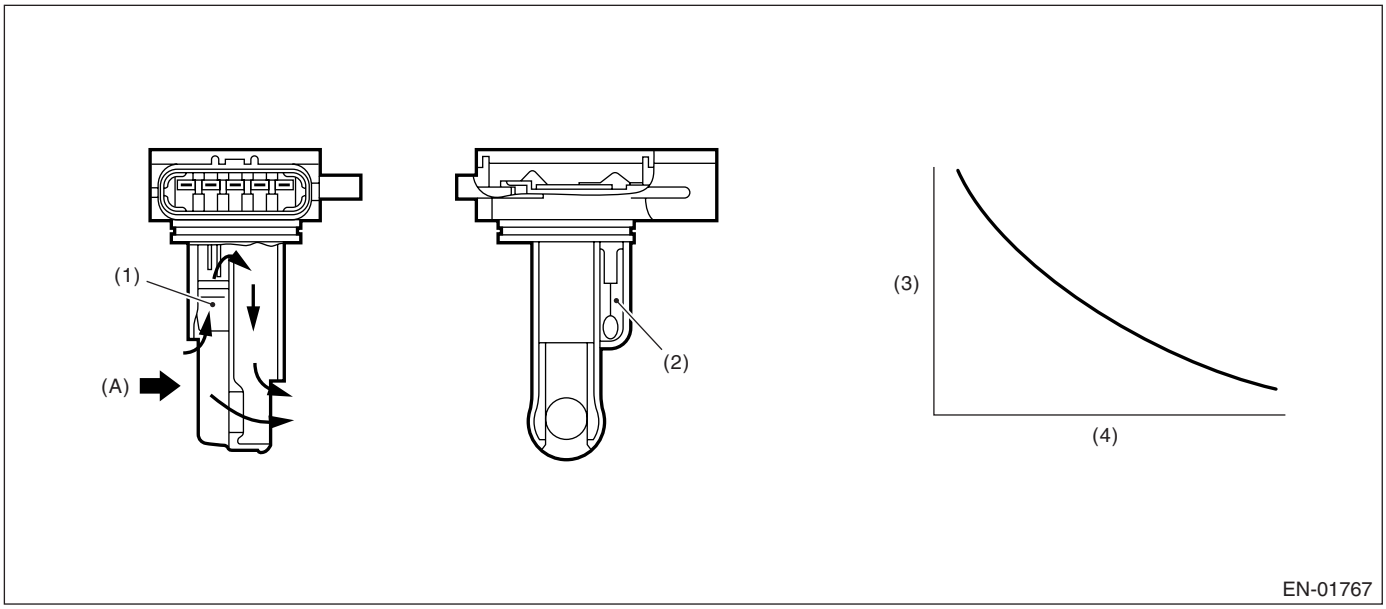
Memorize the freeze frame data. (For test mode $02)

N: DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property. Judge NG when the intake air temperature is not varied whereas it seemed to be varied from the viewpoint of engine condition.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance (Ω)
(4) Intake air temperature °C (°F)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Coolant temp. before engine start	< 30°C (86°F)
Coolant temperature	> 75°C (167°F)
Battery voltage	≥ 10.9 V
Continuous time when the vehicle speed is less than 50 km/h (31 MPH)	600 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is completed after idling from starting the cooled engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	< 20 mV (It is equal to approx. 0.5°C (33°F) around 25°.)
Exhaust temperature above 500°C (932°F)	60 seconds or more

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	≥ 20 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATING AT DTC SETTING

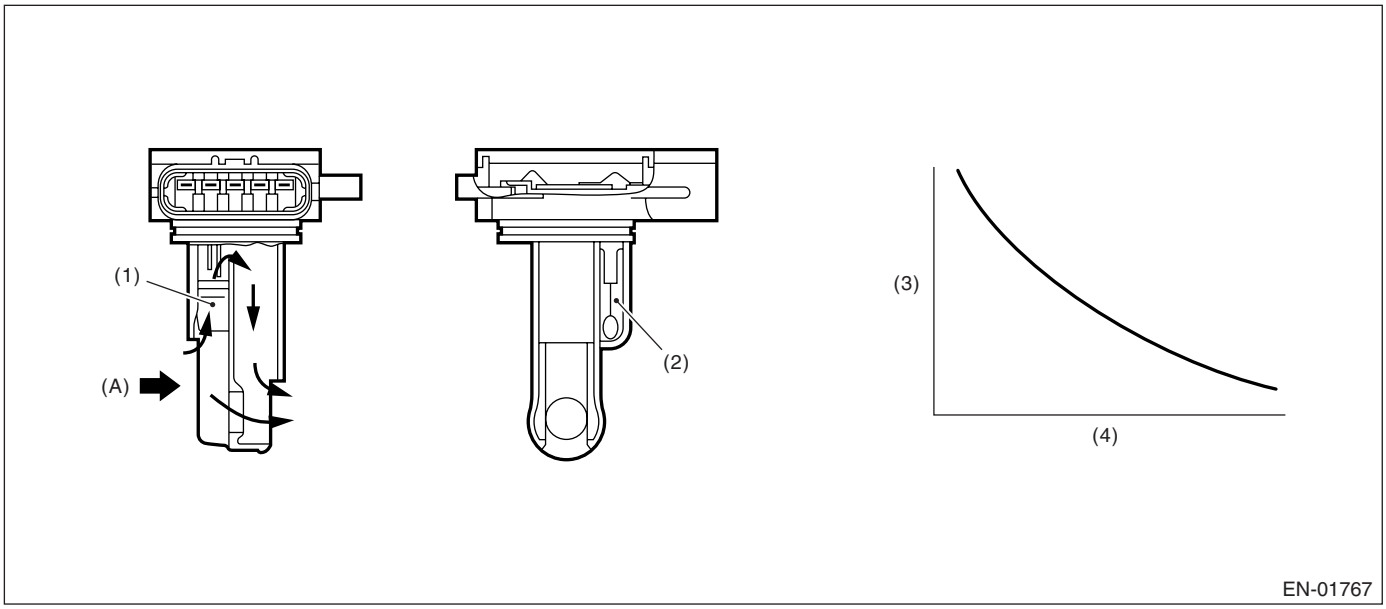
Memorize the freeze frame data. (For test mode $02)

O: DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance (Ω)
(4) Intake air temperature °C (°F)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.165 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATING AT DTC SETTING

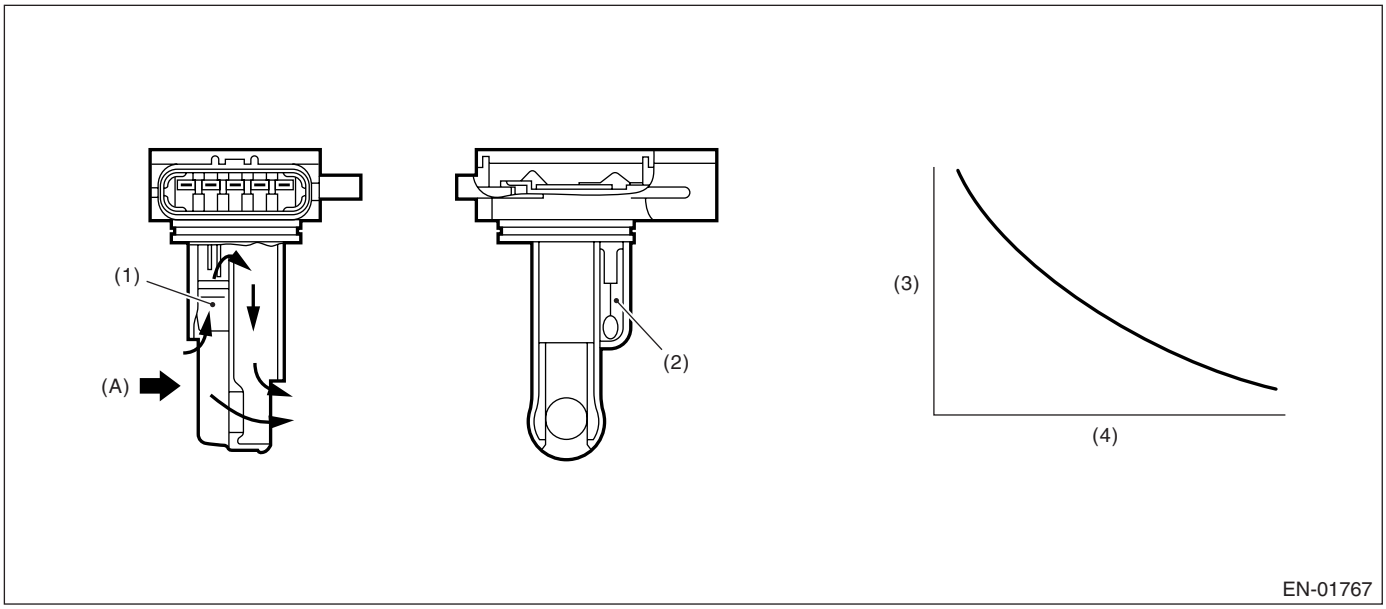
Memorize the freeze frame data. (For test mode $02)

P: DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Air flow sensor
(2) Intake air temperature sensor
(3) Resistance (Ω)
(4) Intake air temperature °C (°F)
(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.23 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATING AT DTC SETTING

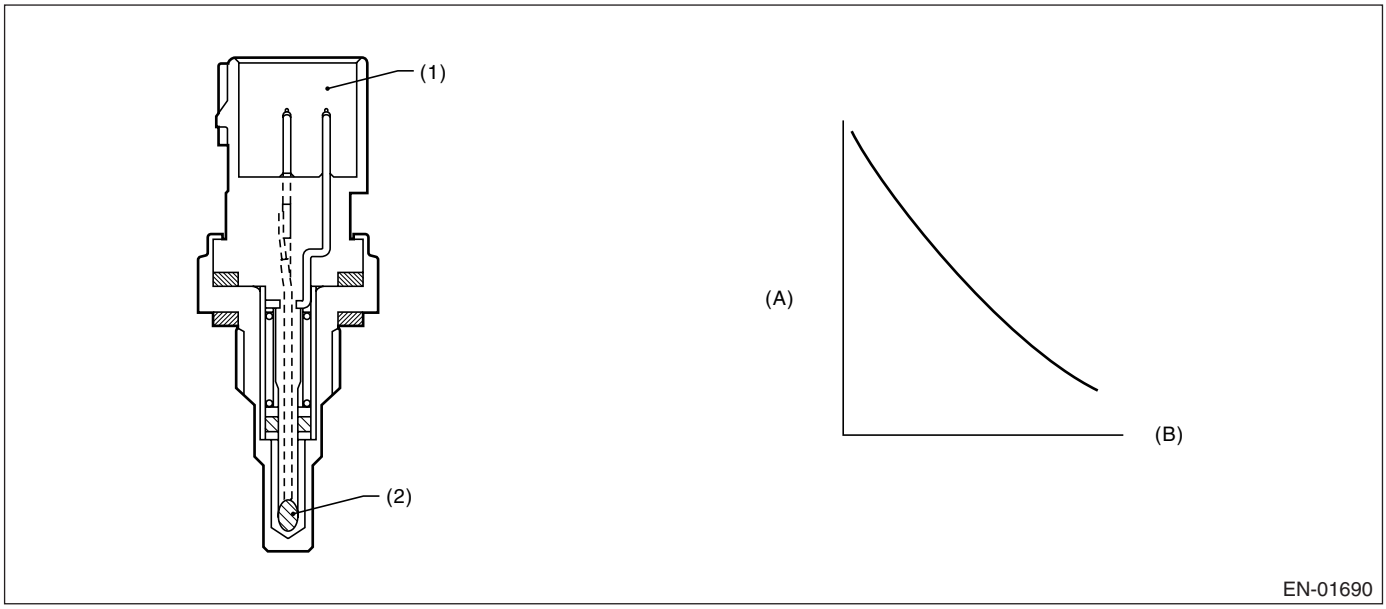
Memorize the freeze frame data. (For test mode $02)

Q: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATING AT DTC SETTING

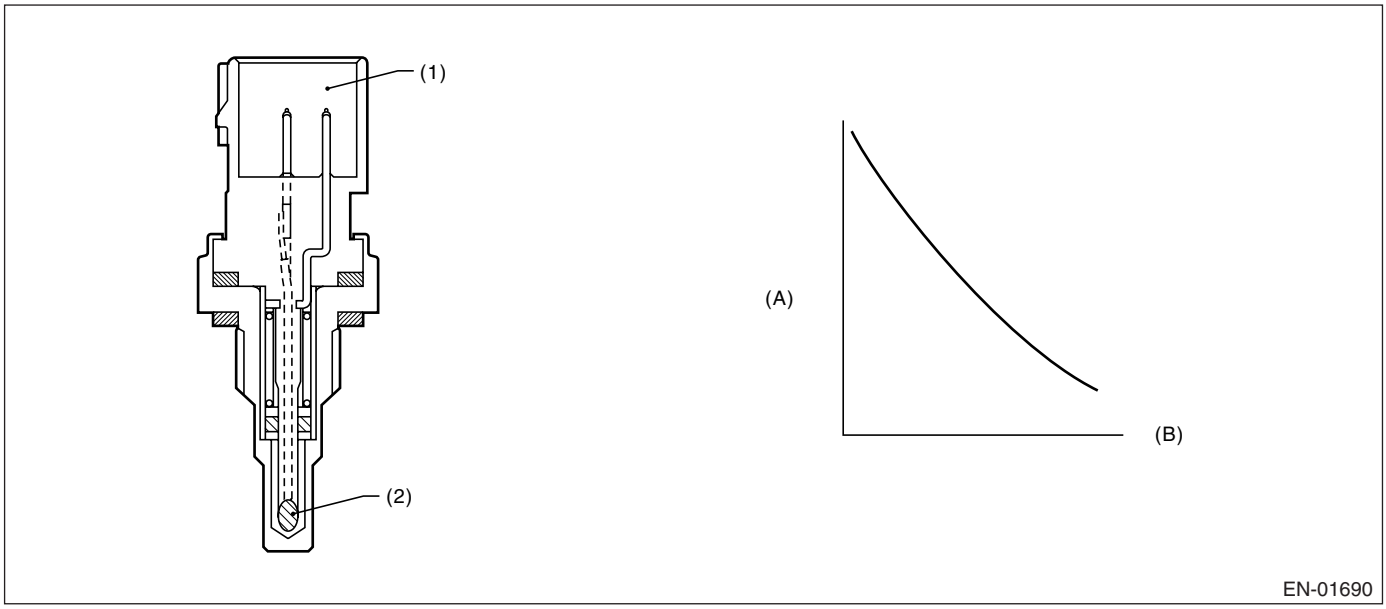
Memorize the freeze frame data. (For test mode $02)

R: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.716 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATING AT DTC SETTING

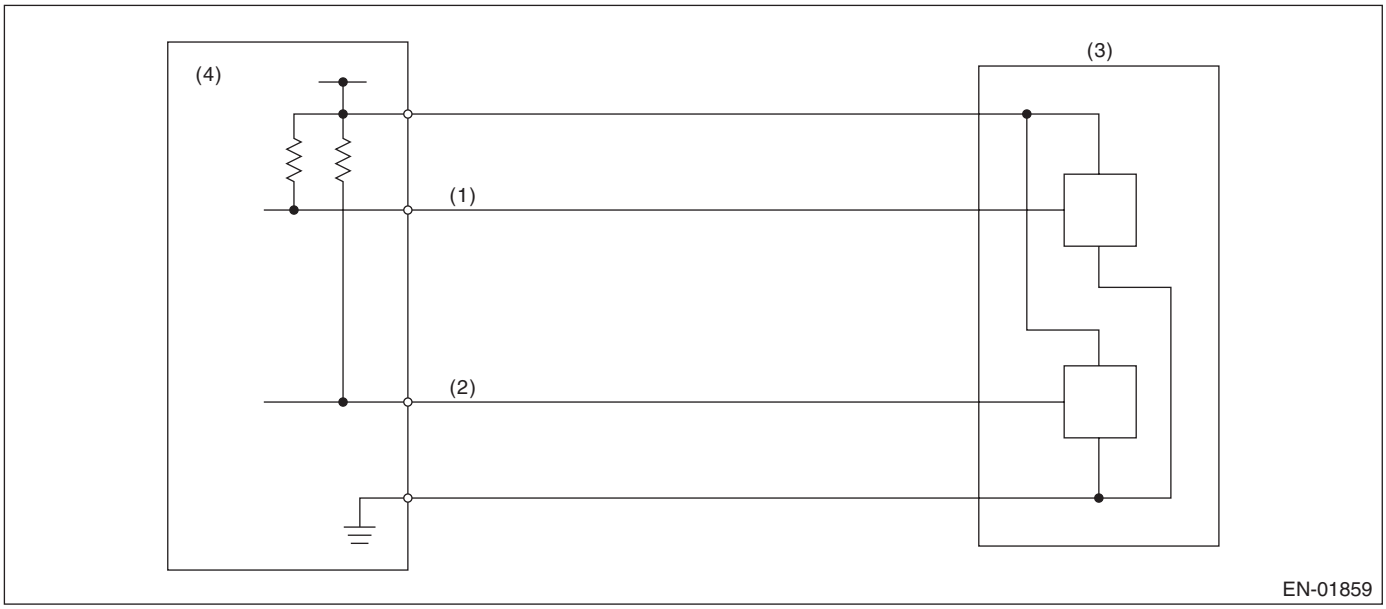
Memorize the freeze frame data. (For test mode $02)

S: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 0.309 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

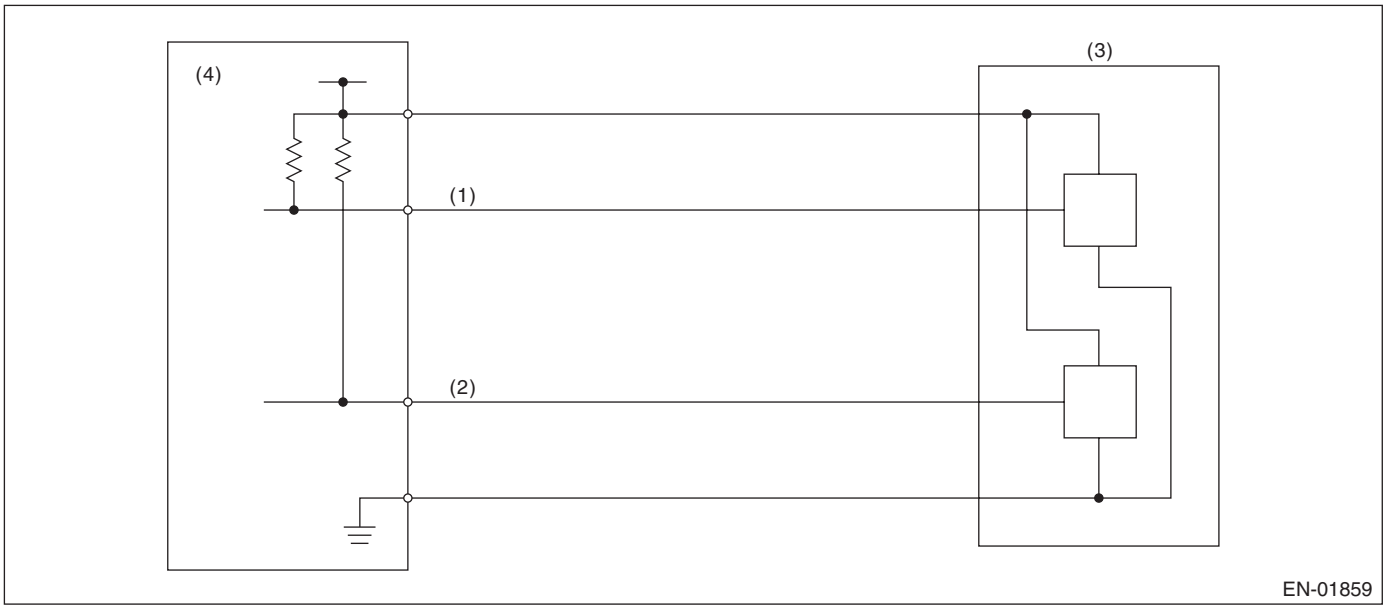
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

T: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 4.646 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

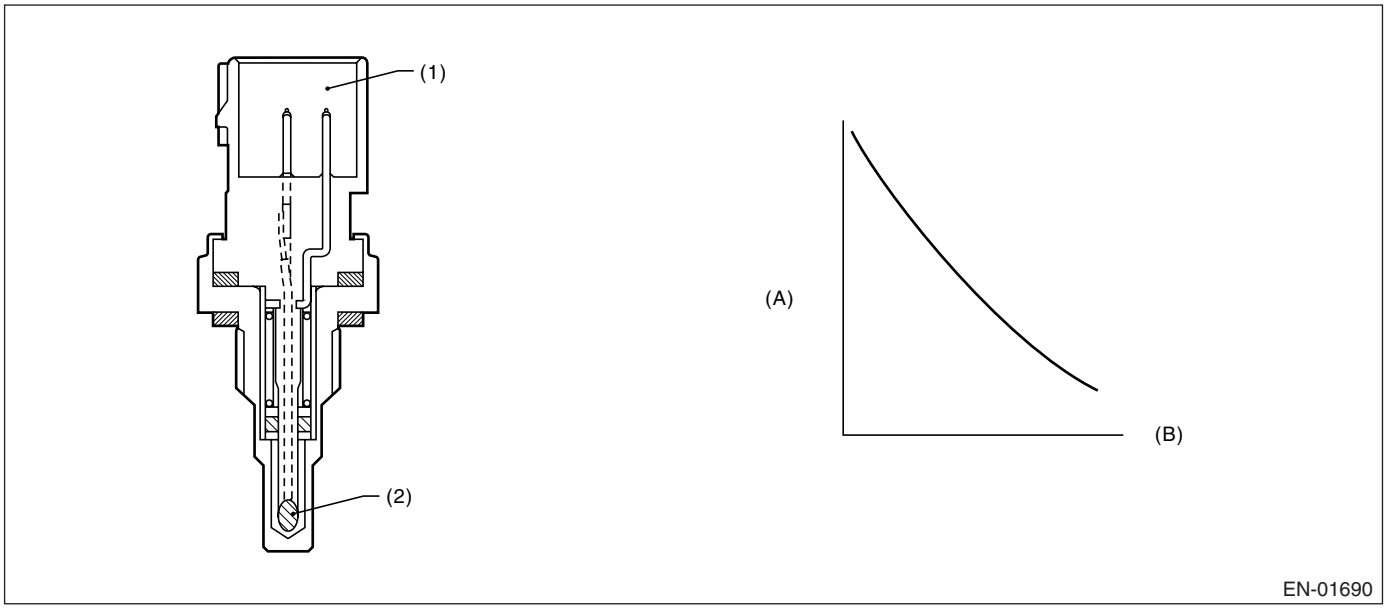
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

U: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature output property. Judge NG when the engine coolant temperature does not rise whereas it seemed to rise from the viewpoint of the engine condition.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Thermistor element
(A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Diagnosis of engine coolant temperature sensor property	Not finished
Engine speed	≥ 500 rpm
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 20°C (68°F)
Timer for diagnosis after engine starting	≥ Timer judgment value after engine starting

Timer for diagnosis after engine starting
a) Timer stop at fuel cut mode.
b) During the driving conditions except a) above, timer count up by 64 milliseconds + TWCNT milliseconds at every 64 milliseconds.

Where, TWCNT is determined as follows,
TWCNT = 0 at idle switch ON,
TWCNT show on the following table at idle switch OFF.

Temperature °C (°F)	Vehicle speed km/h (MPH)							
	0 (0)	8 (4.97)	16 (9.94)	24 (14.9)	32 (19.9)	40 (24.9)	48 (29.8)	56 (34.8)
−20 (−4)	0 ms	37.14 ms	74.27 ms	111.41 ms	126.66 ms	141.91 ms	163.59 ms	185.26 ms
−10 (14)	0 ms	27.39 ms	54.78 ms	82.17 ms	99.65 ms	117.13 ms	135.96 ms	154.80 ms
0 (32)	0 ms	17.65 ms	35.29 ms	52.94 ms	72.64 ms	92.34 ms	108.34 ms	124.33 ms
10 (50)	0 ms	7.90 ms	15.80 ms	23.70 ms	45.63 ms	67.56 ms	80.71 ms	93.87 ms
20 (68)	0 ms	7.90 ms	15.80 ms	23.70 ms	45.63 ms	67.56 ms	80.71 ms	93.87 ms

Judgment value of timer after engine starting
$t = 451.1 - 25.9 \times Ti$
Ti is the lowest coolant temperature after starting the engine.
Time Needed for Diagnosis: To be determined. (It is varied by the Min. engine coolant temperature and engine conditions such as vehicle speed and engine coolant temperature.)
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 20°C (68°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATING AT DTC SETTING

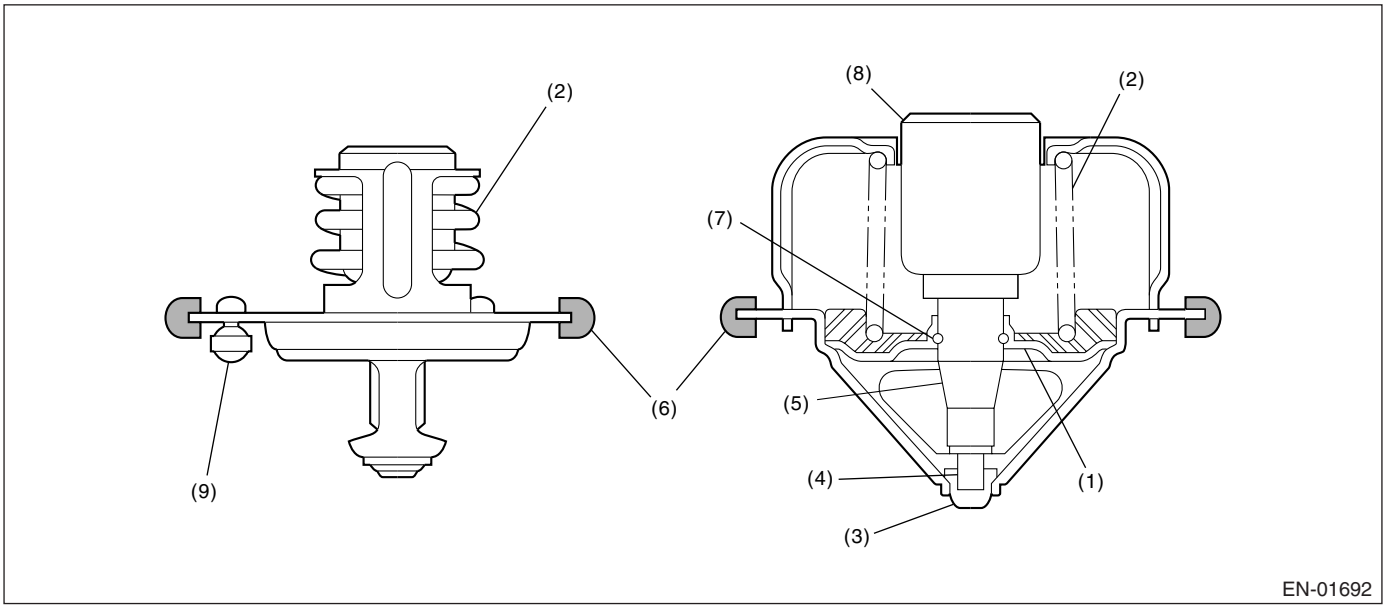
Memorize the freeze frame data. (For test mode $02)

V: DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of thermostat function. Judge NG when the engine coolant temperature is lower than the estimated engine coolant temperature and the difference between them is large. Judge OK when the engine coolant temperature becomes 75°C (167°F) and the difference is small before judging NG.

2. COMPONENT DESCRIPTION



(1) Valve
(2) Spring
(3) Stopper
(4) Piston
(5) Guide
(6) Rubber packing
(7) Stop ring
(8) Wax element
(9) Jiggle valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 30 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Estimated ambient air temperature	≥ −7°C (19.4°F)
Thermostat malfunction diagnosis	Not finished
Engine coolant temperature at engine starting	< 55°C (131°F)
Estimated coolant temperature	≥ 75°C (167°F)
Engine coolant temperature	< 75°C (167°F)
(Estimated − measured) coolant temperature	> 20°C (68°F)

Time Needed for Diagnosis: 30 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Estimated ambient air temperature	≥ −7°C (19.4°F)
Thermostat malfunction diagnosis	Not finished
Engine coolant temperature at engine starting	< 55°C (131°F)
Engine coolant temperature	≥ 75°C (167°F)
(Estimated − measured) coolant temperature	≤ 30°C (86°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

W: DTC P0129 BAROMETRIC PRESSURE TOO LOW

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of atmospheric pressure sensor output property. Judge NG when the atmospheric pressure sensor output is largely different from the intake manifold pressure at engine starting.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed at engine starting	< 300 rpm
Vehicle speed	< 1 km/h (0.62 MPH)
Diagnosis for atmospheric pressure sensor property	Not finished

4. GENERAL DRIVING CYCLE

Perform the diagnosis once turning the ignition switch to ON.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.33 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
|Atmospheric – manifold absolute pressure|	≥ 26.7 kPa (200 mmHg, 7.88 inHg)
|Intake manifold pressure at engine starting – manifold absolute pressure|	< 1.33 kPa (10 mmHg, 2.95 inHg)

Time Needed for Diagnosis: 0.3 seconds
Malfunction Indicator Light Illumination: Detect when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 0.26 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric – manifold absolute pressure	< 26.7 kPa (200 mmHg, 7.88 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101 kPa (760 mmHg, 29.8 inHg).

9. ECM OPERATING AT DTC SETTING

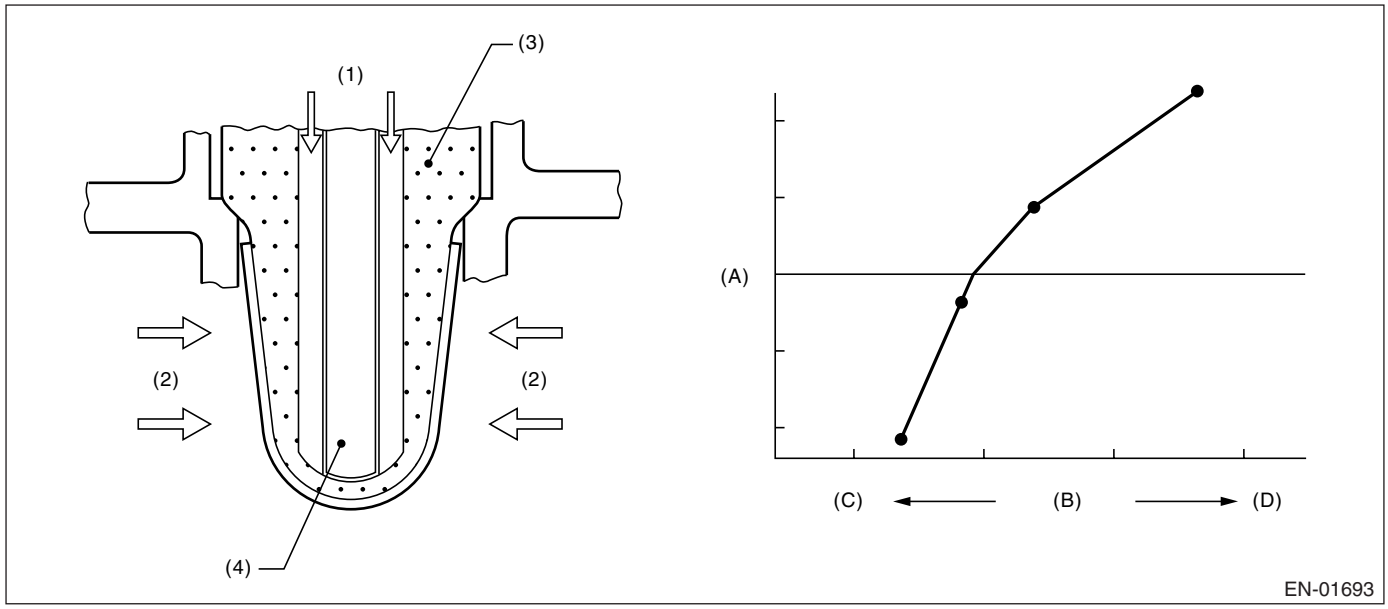
Memorize the freeze frame data. (For test mode $02)

X: DTC P0131 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.
Judge NG when the element impressed voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	< 1.8 V
Input current	< −0.01 A

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

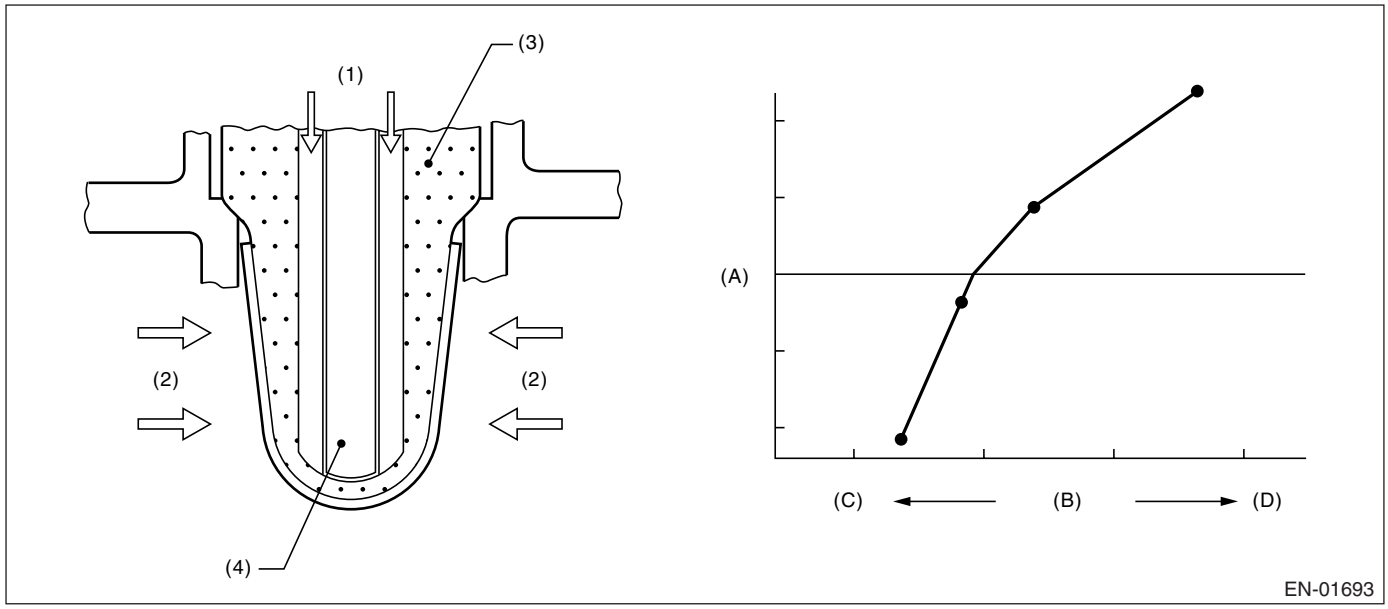
Memorize the freeze frame data. (For test mode $02)

Y: DTC P0132 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.
Judge NG when the element impressed voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	≥ 3.8 V
Input current	≥ 0.01 A

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

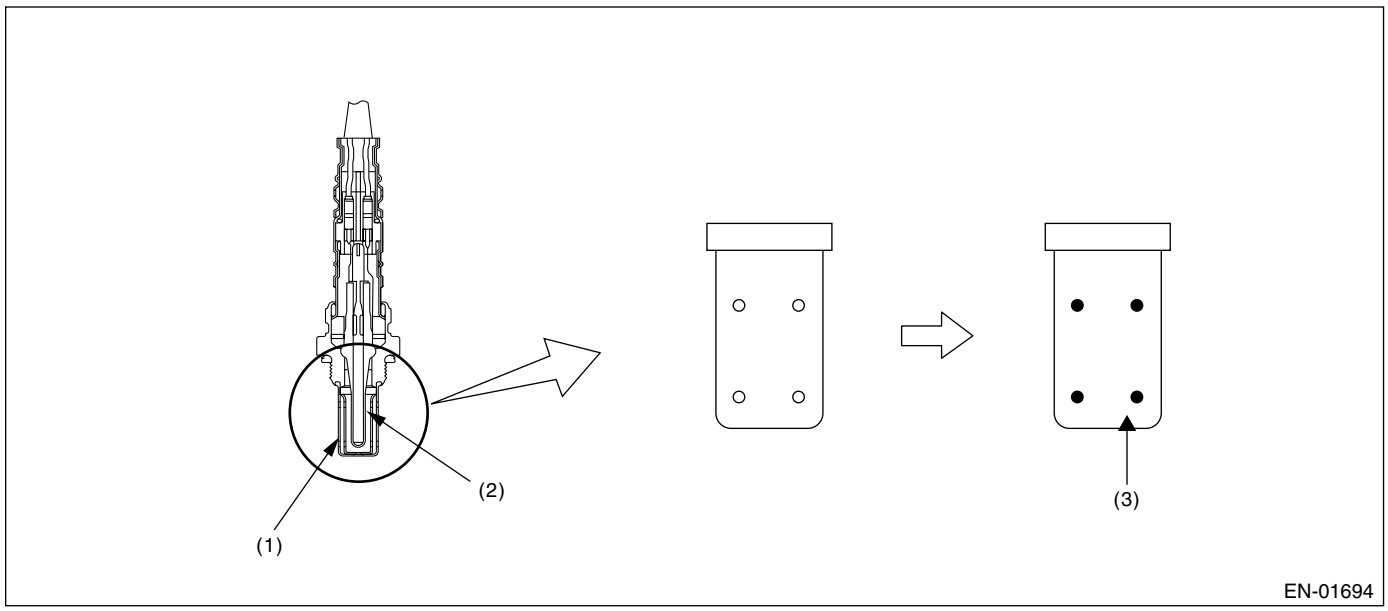
9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

Z: DTC P0133 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

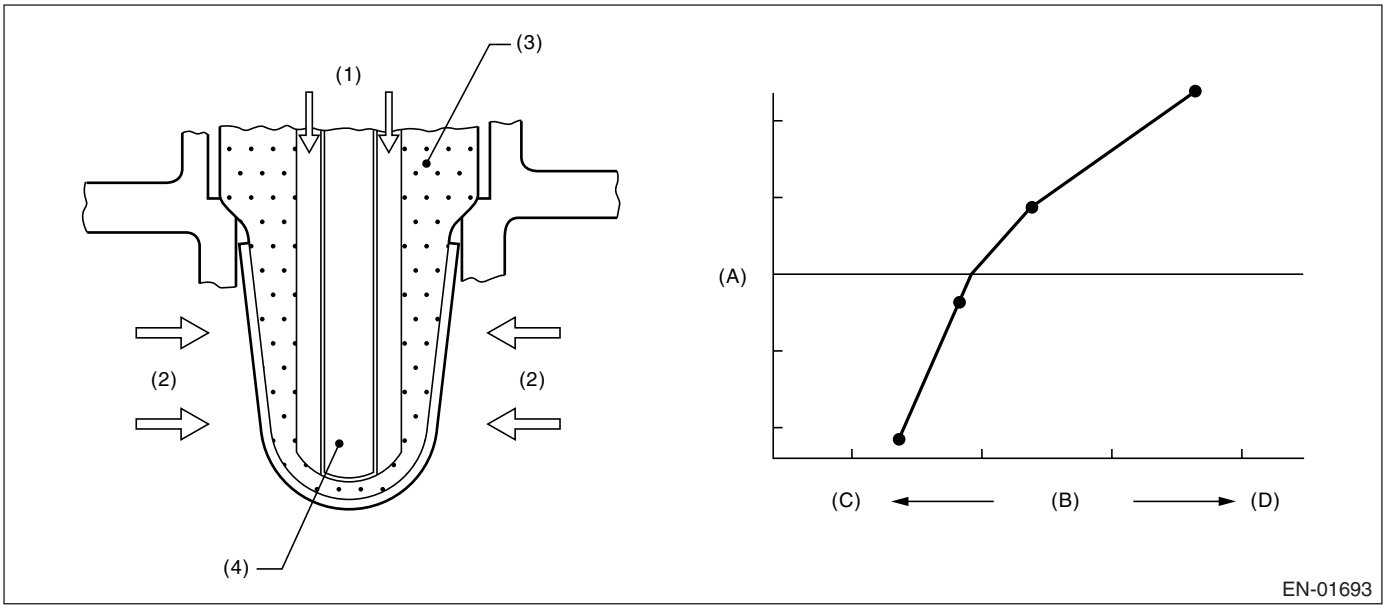
1. OUTLINE OF DIAGNOSIS

Detect time-lag of front oxygen (A/F) sensor response. Front oxygen (A/F) sensor cover has some ventilation holes for exhaust gas. Clogged ventilation holes are diagnosed. When the holes are clogged, the A/F output variation becomes slow comparing with the actual A/F variation because oxygen which reaches the zirconia layer is insufficient. Therefore, if the cover has clogged holes, the rich to lean judgment in ECM is delayed when the change from rich to lean is caused.



(1) Cover
(2) Zirconia
(3) Clogging

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameter enable conditions	more than 1 second
Diagnosis of A/F response	Not done
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback	operating
Impedance of front oxygen (A/F) sensor	0 ←→ 50 Ω
After engine starting	120 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Engine speed	1,000 ←→ 3,200 rpm
Vehicle speed	10 ←→ 120 km/h (6.21 ←→ 74.6 MPH)
Amount of intake air	10 ←→ 31 g/s
Engine load change during 0.5 engine rev.	≤ 0.01 g/rev
All conditions for EVAP canister purge	to be in enable
Learning value of EVAP conc. during purge	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis only once at a constant speed of 10 to 120 km/h (6.21 to 74.6 MPH) in 120 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Integrate the difference of faf in every 128 milliseconds and difference of λ value.
After integrate 1,640 times (210 seconds), calculate the diagnosis value.
Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
parafca = td2faf/td2lmd where, td2faf (N) = td2faf (n−1) + |d2faf (n)| td2lmd (N) = td2lmd (n−1) + |d2lmd (n)| add up for a total of 210 seconds d2faf (n) = (faf (n) − faf (n−1)) − (faf (n−1) − faf (n−2)) d2lmd (n) = (lmd (n) − lmd (n−1)) − (lmd (n−1) − lmd (n−2)) faf = main feedback compensation coefficient every 128 milliseconds lmd = output lambda every 128 milliseconds	≥ 0.30

Time Needed for Diagnosis: 210 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

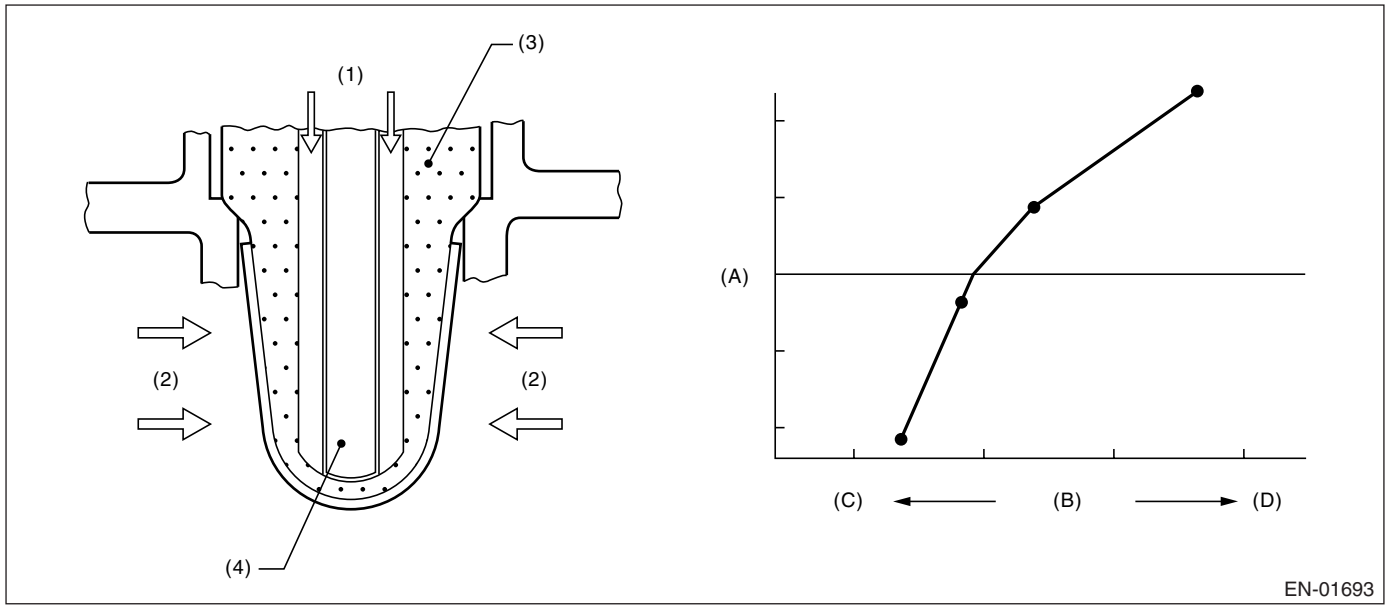
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AA:DTC P0134 O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open circuit of sensor.
Judge NG when the element impedance is large.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage	≥ 10.9 V
Time after engine starting	≥ 50 seconds
Variable amount of Front O_2 (A/F) sensor heater control duty every 128 milliseconds	≥ 28,000%
Front lambda sensor impedance	≥ 500 Ω

Time Needed for Diagnosis: 2 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

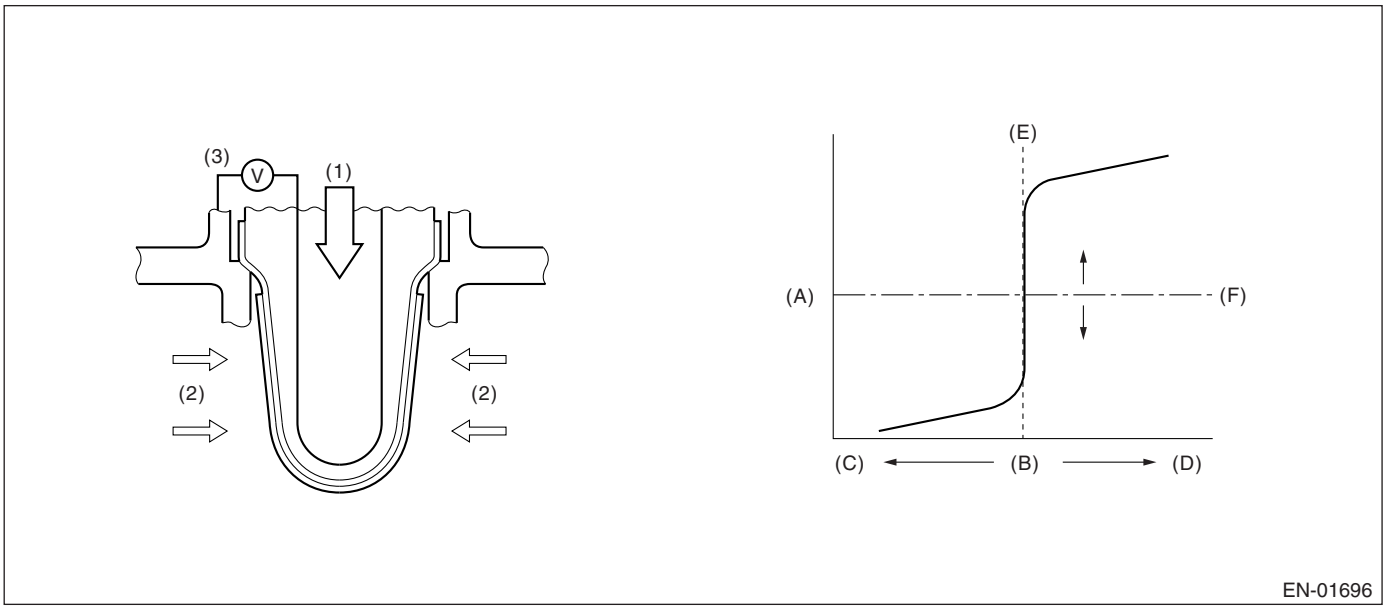
Memorize the freeze frame data. (For test mode $02)

AB:DTC P0137 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of rear oxygen sensor open or short circuit. Judge NG when the rear oxygen sensor voltage may be abnormal from rear oxygen sensor voltage value with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Low side diagnosis of rear oxygen sensor voltage with main feedback control	Incomplete
Closed loop control with main feedback control	In operation
Target output voltage of rear oxygen sensor with main feedback control	≥ 0.54 V
Amount of intake air with main feedback control	≥ 10 g/s
Engine coolant temperature with main feedback control	≥ 75°C (167°F)
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor with main feedback control	Not in limit value
Battery voltage with main feedback control	> 10.9 V
Cumulative time for completing the conditions with main feedback control	≥ 200 seconds
5 seconds or more fuel shut-off in decel.	Experienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Max. output voltage	< 490 mV

Time Needed for Diagnosis: 200 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Low side diagnosis of rear oxygen sensor voltage	Incomplete
Max. output voltage	≥ 490 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

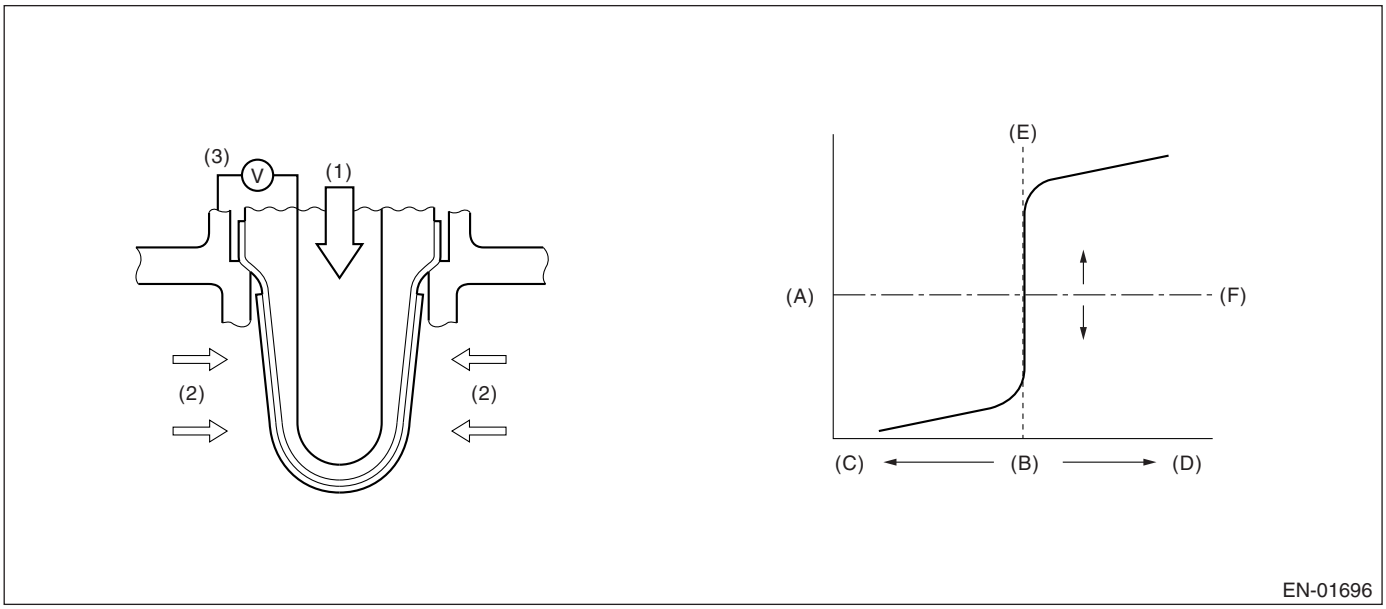
Memorize the freeze frame data. (For test mode $02)

AC:DTC P0138 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of rear oxygen sensor open or short circuit. Judge NG when the rear oxygen sensor voltage may be abnormal with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
High side diagnosis of rear oxygen sensor voltage with main feedback control	Incomplete
Closed loop control with main feedback control	In operation
Target output voltage of rear oxygen sensor with main feedback control	≥ 0.54 V
Amount of intake air with main feedback control	≥ 10 g/s
Engine coolant temperature with main feedback control	≥ 75°C (167°F)
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor with main feedback control	Not in limit value
Battery voltage with main feedback control	> 10.9 V
Cumulative time for completing the conditions with main feedback control	≥ 200 seconds
5 seconds or more fuel shut-off in decel.	Experienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Min. output voltage	> 250 mV

Time Needed for Diagnosis: 200 seconds
Malfunction Indicator Light Illumination: Detect when malfunction occurs in 2 continuous driving cycles.
• Normality Judgment

Judge OK when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
High side diagnosis of rear oxygen sensor voltage	Incomplete
Min. output voltage	≤ 250 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AD:DTC P0139 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

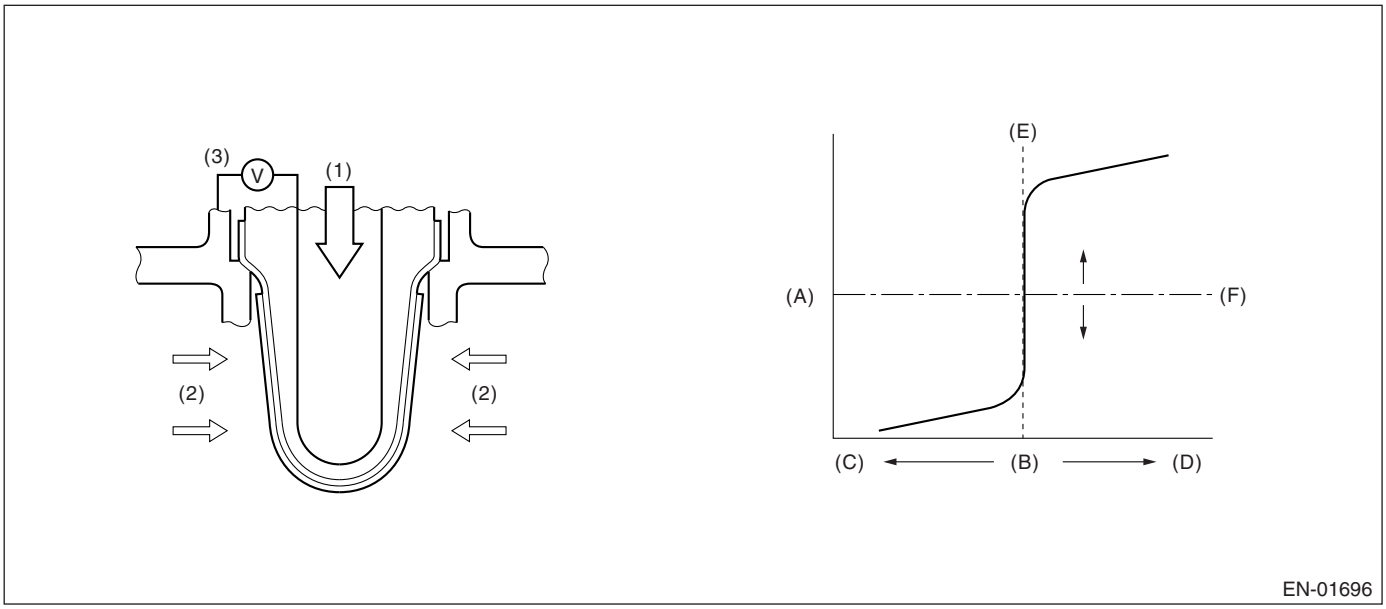
1. OUTLINE OF DIAGNOSIS

Detect the slow response of rear oxygen sensor.

• Diagnostic Method

Measure the response time of the output change of the rear oxygen sensor when the A/F ratio changes from rich to lean. And Judge NG when the measured response time is larger than the threshold value.

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) Electromotive force

(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

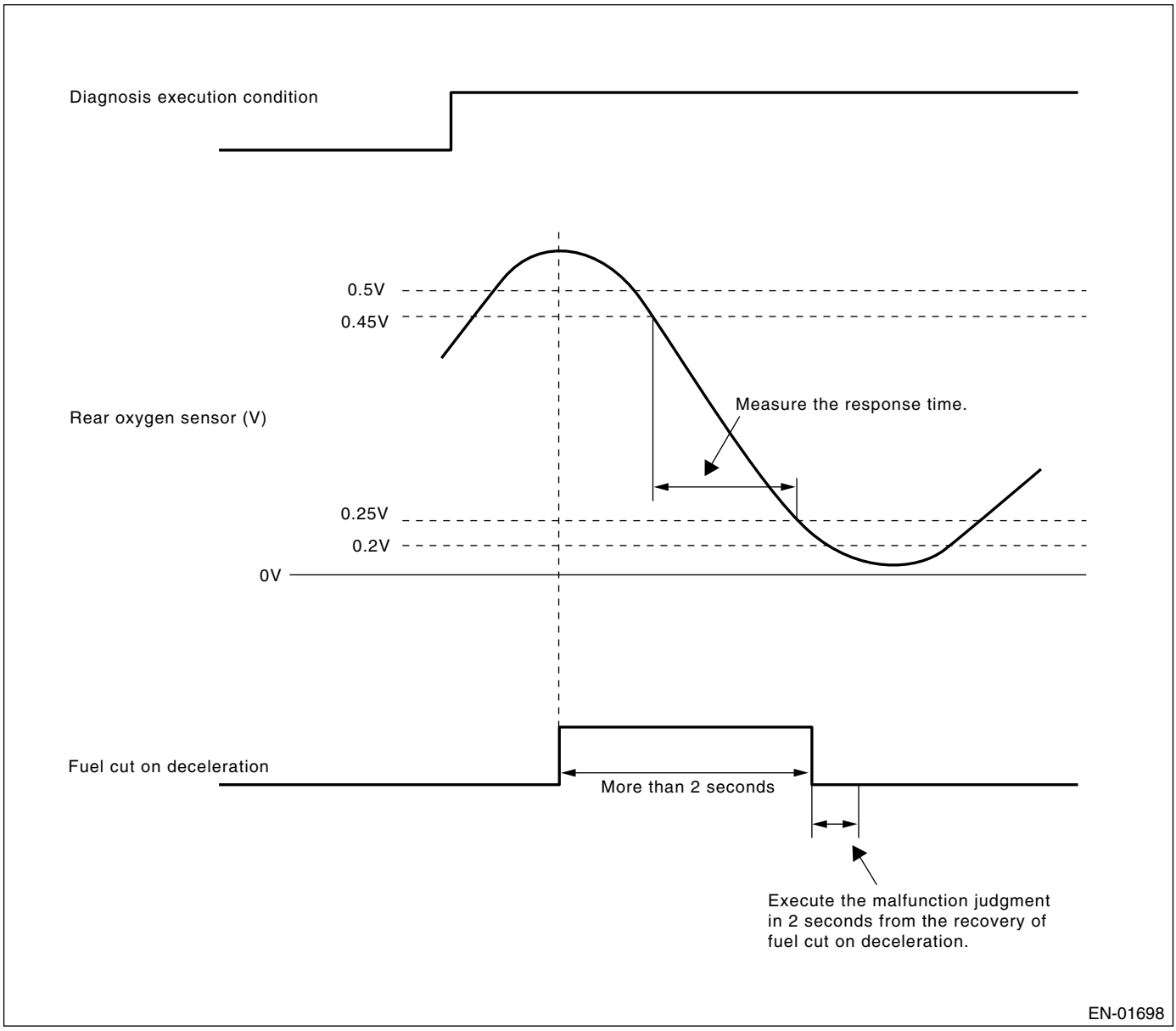
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F main feedback control condition	Completed
Deterioration diagnosis for rear oxygen sensor response	Not completed

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration in order to calculate the diagnostic value. (Pay attention to oxygen sensor voltage for the timing of deceleration.)

5. DIAGNOSTIC METHOD

When the rear oxygen sensor output voltage changes from 0.5 V (rich) to 0.2 V (lean), calculate the Min. value of response time regarded as judgment value while the output varies from 0.45 V to 0.25 V.



• Abnormality Judgment

Judge NG when the judgment value is larger than the threshold value after fuel shut-off in deceleration.
Response time (Diagnosis value) > Threshold value → Abnormal
Judge NG when the malfunction criteria below are completed in 2 seconds after the recovery of fuel shut-off in deceleration which requires 5 seconds or more. Judge OK when the malfunction criteria below are not completed regardless of the fuel shut-off in deceleration.

NOTE:
Variation time of rear oxygen sensor output voltage is short during fuel shut-off in deceleration. Carry out the NG judgment only after the fuel shut-off in deceleration. As for OK judgment, without the condition of fuel shut-off in deceleration, judge OK if the value is below the threshold value.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from rich (450 mV O_2 output) to lean (250 mV) if voltage reduces from 500 mV to 200 mV.	≥ 327 milliseconds

Time Needed for Diagnosis: 5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

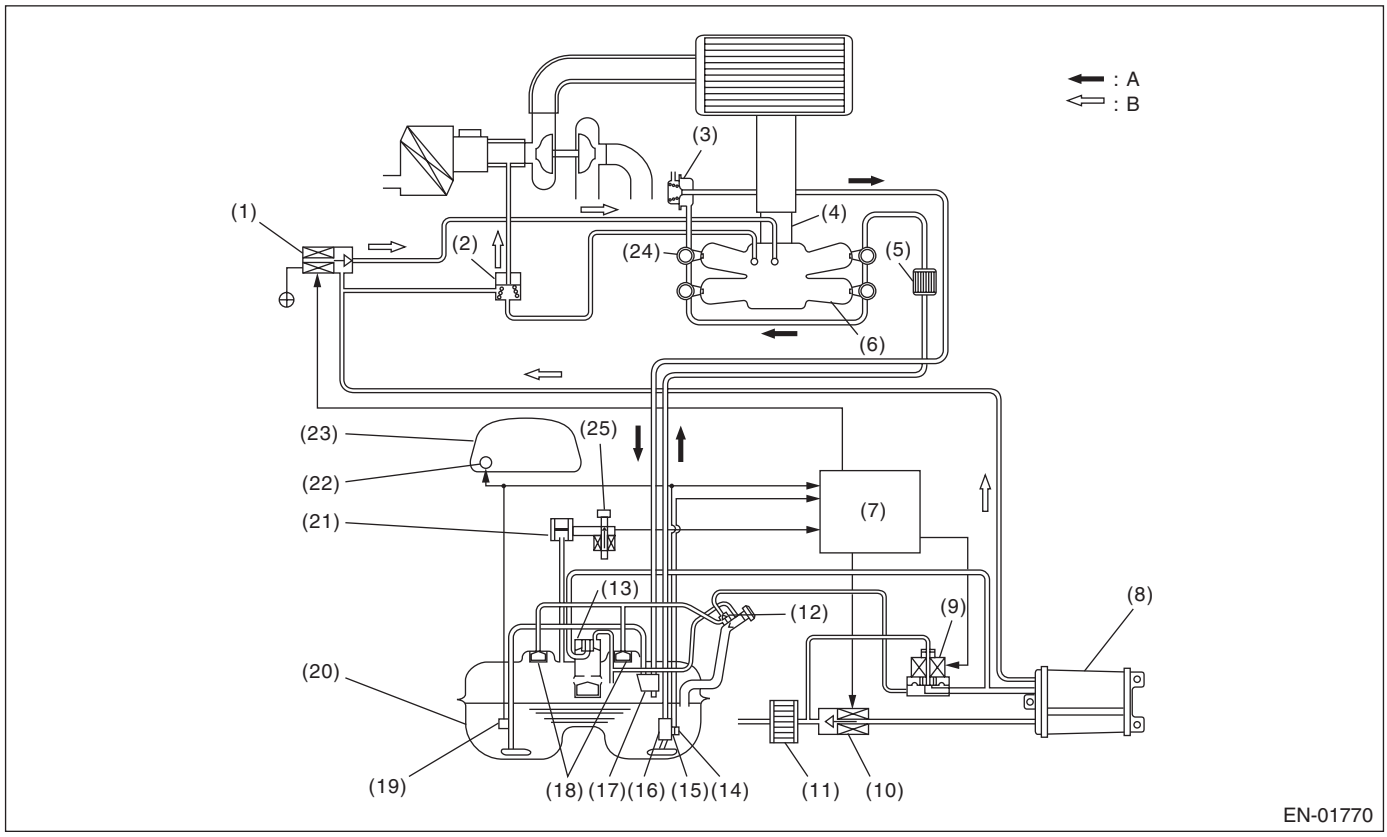
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AE:DTC P0171 SYSTEM TOO LEAN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

• Fuel System Diagnosis



(1) Purge control solenoid valve
(2) Purge valve
(3) Pressure regulator
(4) Throttle body
(5) Fuel filter
(6) Intake manifold
(7) Engine control module (ECM)
(8) Canister
(9) Pressure control solenoid valve
(10) Drain valve
(11) Drain filter
(12) Shut-off valve
(13) Vent valve
(14) Fuel temperature sensor
(15) Fuel level sensor
(16) Fuel pump
(17) Jet pump
(18) Fuel cut valve
(19) Fuel sub level sensor
(20) Fuel tank
(21) Fuel tank pressure sensor
(22) Fuel meter
(23) Combination meter
(24) Fuel injector
(25) Tank pressure switching solenoid valve

• Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	75 ←→ 119°C (167 ←→ 246°F)
Engine load	≥ Map 5
Intake air change during 0.5 engine rev.	≤ 0.02 g/rev
Learning value of EVAP conc. during purge	≤ 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	30 seconds or more

Map 5

Engine speed (rpm)	idle	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400
Measured value (g/rev)	NA	0.237	0.224	0.221	0.238	0.255	0.267	0.242	0.243	0.258	0.263

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 60 km/h (37.3 MPH).

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd − tglmda) + faf + flaf	≥ fsobdL1
where,	See Map 4
sglmd = measured lambda	
tglmda = target lambda	fsobdL1 = lean side threshold value of fsobd
faf = main feedback compensation coefficient every 64 milliseconds	
flaf = main feedback learning compensation coefficient	

Map 4 Threshold value for fuel system malfunction criteria

Amount of air (g/s)	0	2.4	4.7	7	9.4	11.7	
fsobdL1 (%)	40	40	36.9	32.0	27.0	26.5	

Time Needed for Diagnosis: 10 seconds × 3 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd − tglmda) + faf + flaf	< 19%

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 driving cycles.
- When “Clear Memory” was performed

7. FAIL SAFE

Rich side malfunction
- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

8. ECM OPERATING AT DTC SETTING

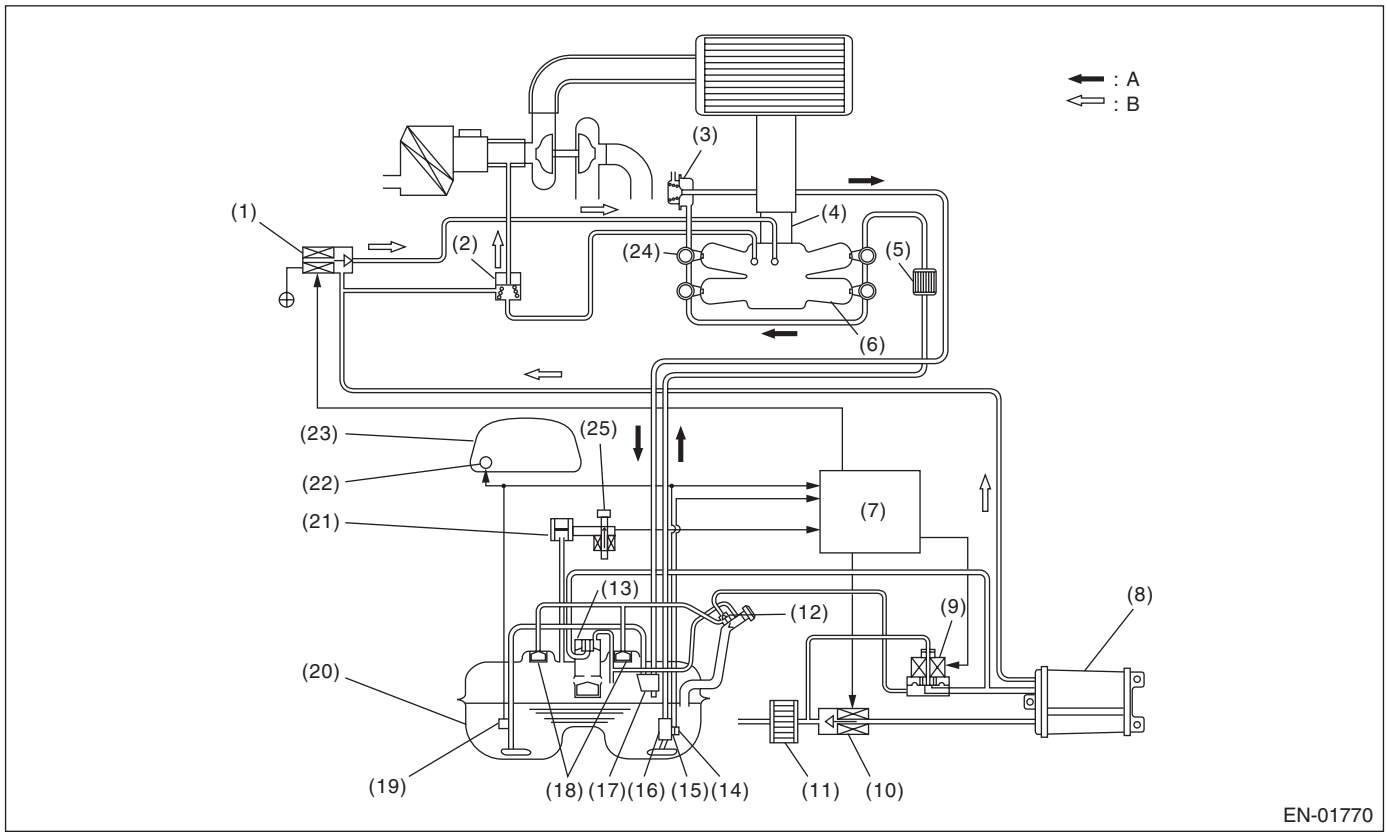
Memorize the freeze frame data. (For test mode $02)

AF:DTC P0172 SYSTEM TOO RICH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

• Fuel System Diagnosis



(1) Purge control solenoid valve
(2) Purge valve
(3) Pressure regulator
(4) Throttle body
(5) Fuel filter
(6) Intake manifold
(7) Engine control module (ECM)
(8) Canister
(9) Pressure control solenoid valve
(10) Drain valve
(11) Drain filter
(12) Shut-off valve
(13) Vent valve
(14) Fuel temperature sensor
(15) Fuel level sensor
(16) Fuel pump
(17) Jet pump
(18) Fuel cut valve
(19) Fuel sub level sensor
(20) Fuel tank
(21) Fuel tank pressure sensor
(22) Fuel meter
(23) Combination meter
(24) Fuel injector
(25) Tank pressure switching solenoid valve

• Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	75 ←→ 119°C (167 ←→ 246°F)
Engine load	≥ Map 5
Intake air change during 0.5 engine rev.	≤ 0.02 g/rev
Learning value of EVAP conc. during purge	≤ 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	30 seconds or more

Map 5

Engine speed (rpm)	idle	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400
Measured value (g/rev)	NA	0.237	0.224	0.221	0.238	0.255	0.267	0.242	0.243	0.258	0.263

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 60 km/h (37.3 MPH).

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd − tglmda) + faf + flaf	≤ fsobdR1
where,	See Map 4
sglmd = measured lambda	fsobdR1 = rich side threshold value of fsobd
tglmda = target lambda	
faf = main feedback compensation coefficient every 64 milliseconds	
flaf = main feedback learning compensation coefficient	

Map 4 Threshold value for fuel system malfunction criteria for System E

Amount of air (g/s)	0	2.4	4.7	7	9.4	11.7	
fsobdR1 (%)	−40	−40	−36.9	−32.0	−27.0	−27.0	

Time Needed for Diagnosis: 10 seconds × 3 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
fsobd = (sglmd − tglmda) + faf + flaf	≥ −20%

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When “Clear Memory” was performed

7. FAIL SAFE

Rich side malfunction
- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

8. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AG:DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE

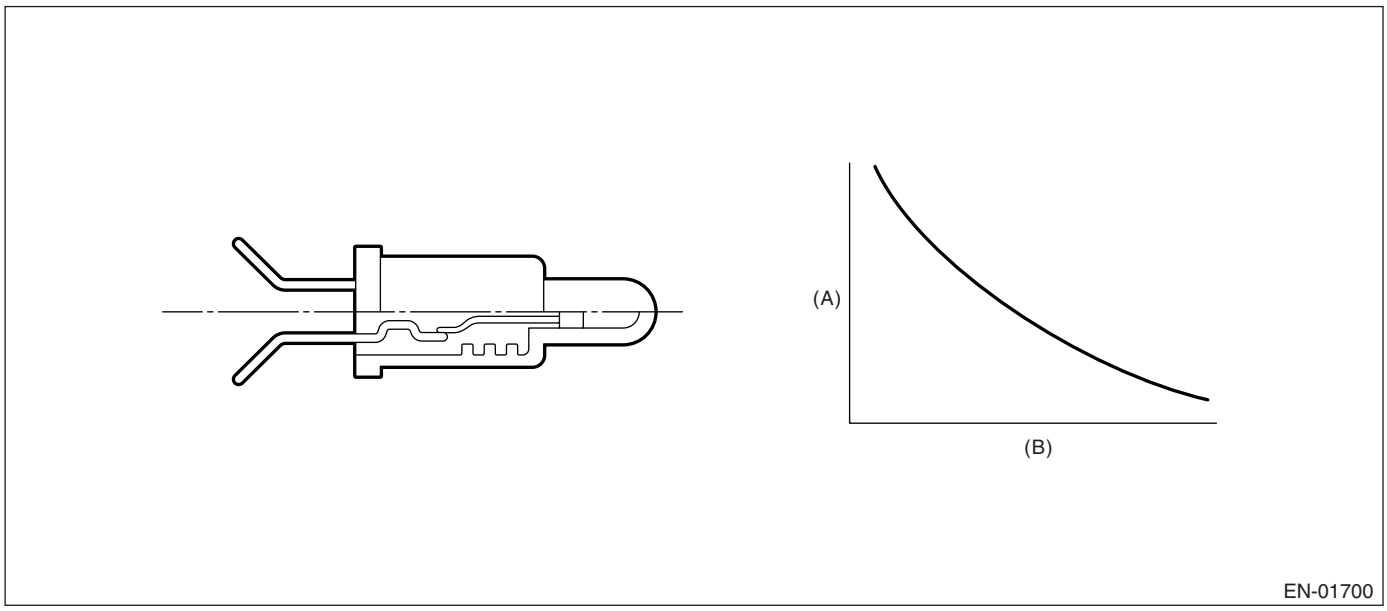
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel temperature sensor output property. Perform the diagnosis in two methods; namely, drift diagnosis and stuck diagnosis. Judge NG when either of them results in NG, and judge OK when both of them result in OK.

• Drift Diagnosis

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and make an NG judgment.

2. COMPONENT DESCRIPTION



(A) Resistance (Ω)
(B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 120 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	≥ 10 ℓ (2.64 US gal, 2.20 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature – engine coolant temperature at engine starting	> 10°C (50°F)
Fuel temperature – engine coolant temperature	≥ 10°C (50°F)
Battery voltage	> 10.9 V

Time Needed for Diagnosis: 120 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	≥ 10 ℓ (2.64 US gal, 2.20 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature – engine coolant temperature at engine starting	> 10°C (50°F)
Fuel temperature – engine coolant temperature	< 10°C (50°F)
Battery voltage	> 10.9 V

• Stuck Diagnosis

If the fuel temperature which might rise along with the engine idling (the cumulative amount of intake air after engine starting is large) does not increase, the engine is considered to be stuck and make an NG judgment.

6. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	20 seconds or more
Battery voltage	> 10.9 V

7. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 20 seconds or more after starting the engine.

8. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 550 kg (1,212.5 lb)
Fuel temperature difference between Max. and Min.	< 3°C (37.4°F)

Time Needed for Diagnosis: To be determined.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 550 kg (1,212.5 lb)
Fuel temperature difference between Max. and Min.	≥ 3°C (37.4°F)

9. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

10.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

11.FAIL SAFE

None

12.ECM OPERATING AT DTC SETTING

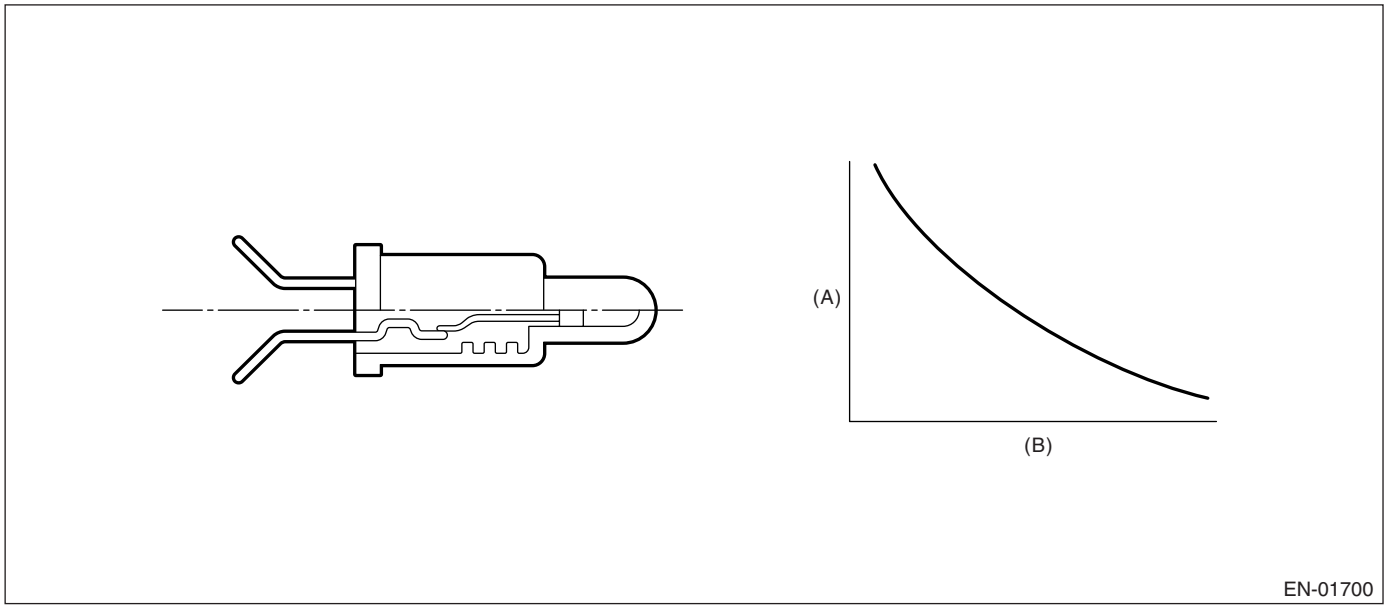
Memorize the freeze frame data. (For test mode $02)

AH:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(A) Resistance (Ω)
(B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.1646 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.1646 V
Battery voltage	≥ 10.9 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

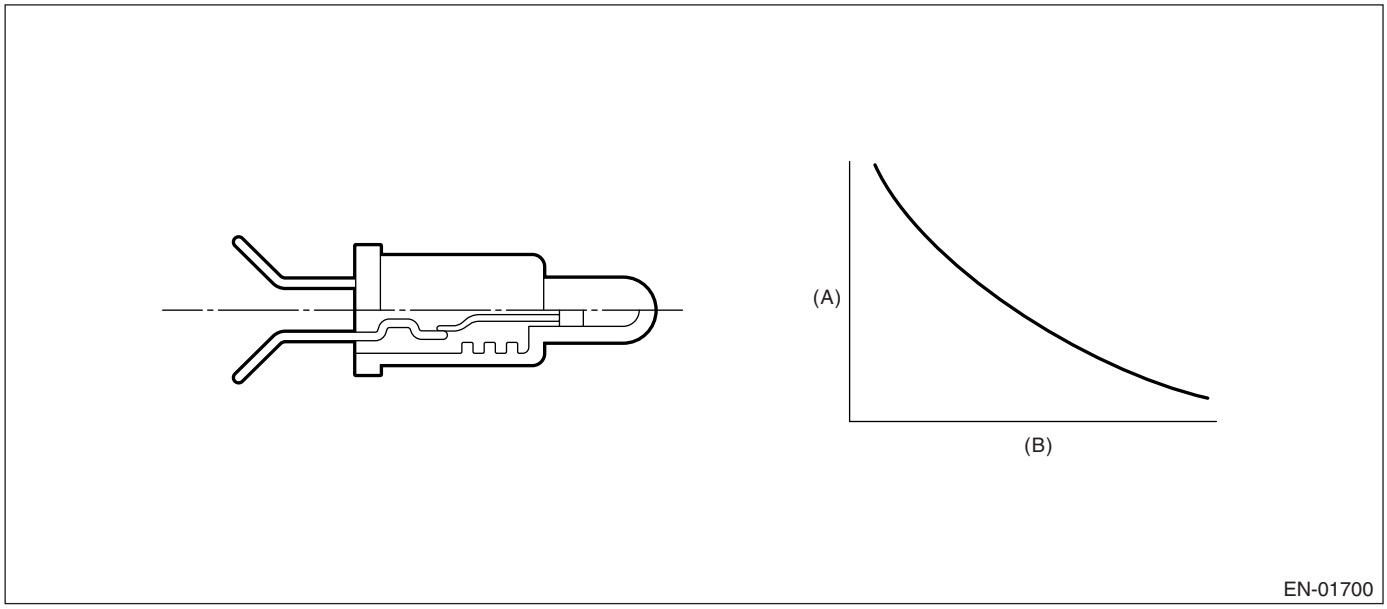
Memorize the freeze frame data. (For test mode $02)

AI: DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(A) Resistance (Ω)
(B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.72 V
Battery voltage	≥ 10.9 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

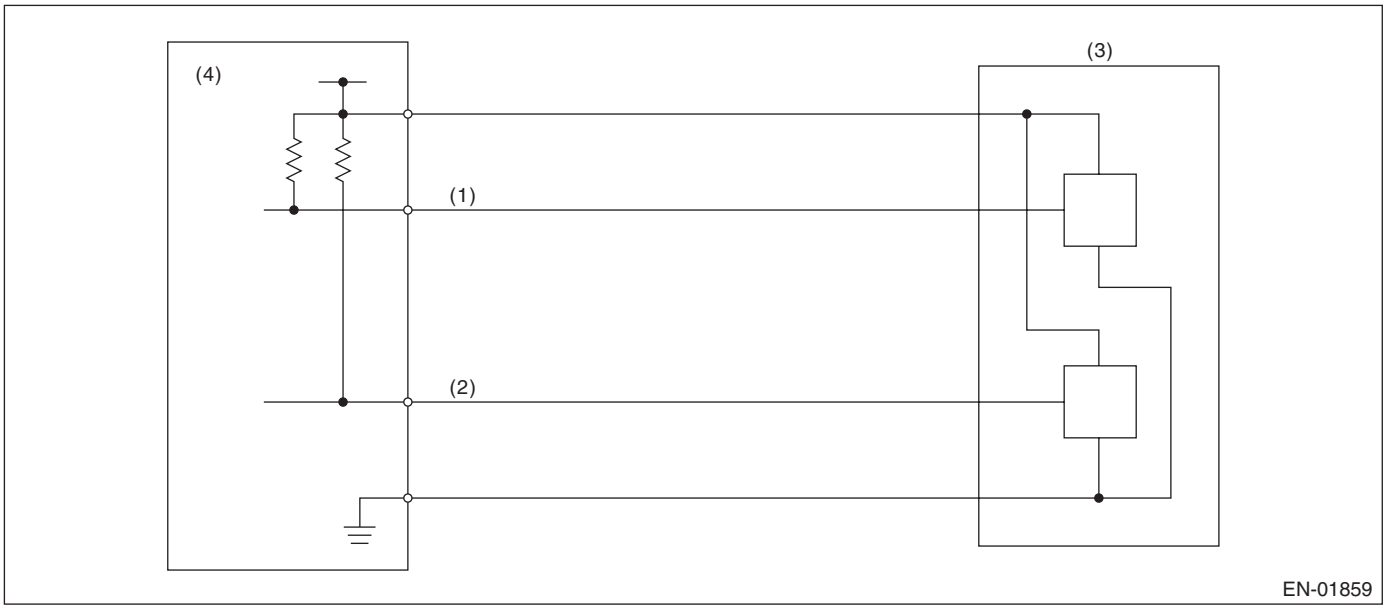
Memorize the freeze frame data. (For test mode $02)

AJ:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 0.749 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

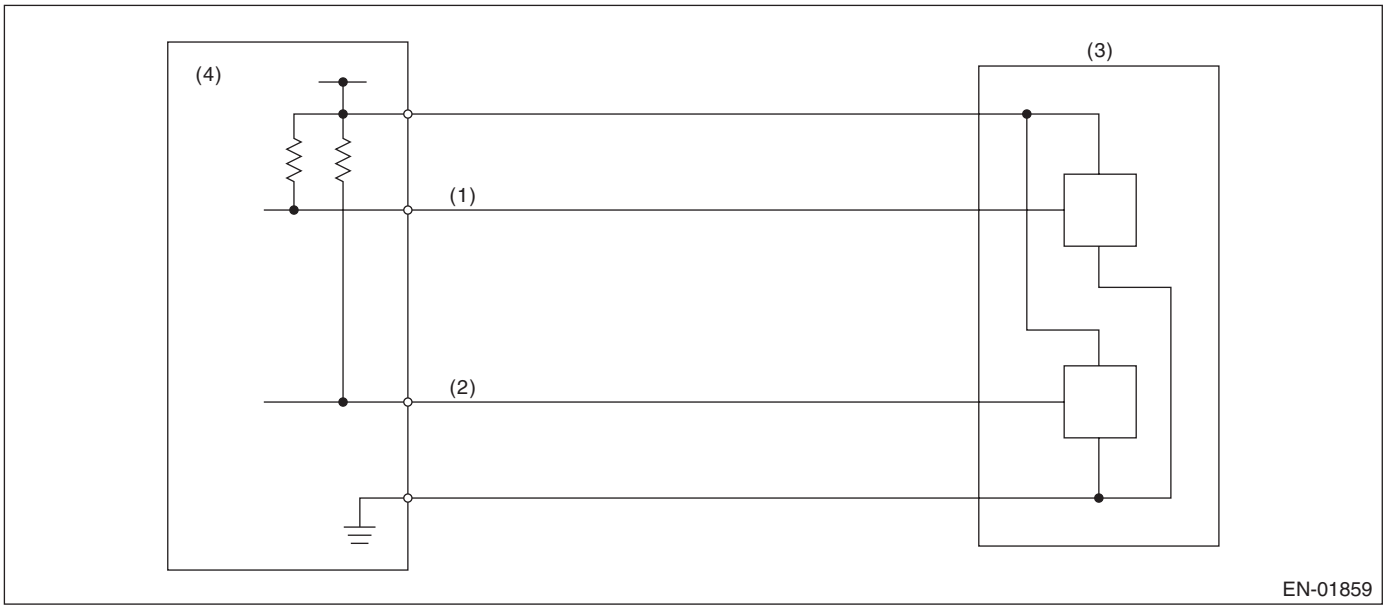
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AK:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal
(2) Throttle position sensor 2 signal
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 4.747 V

Time Needed for Diagnosis: 24 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

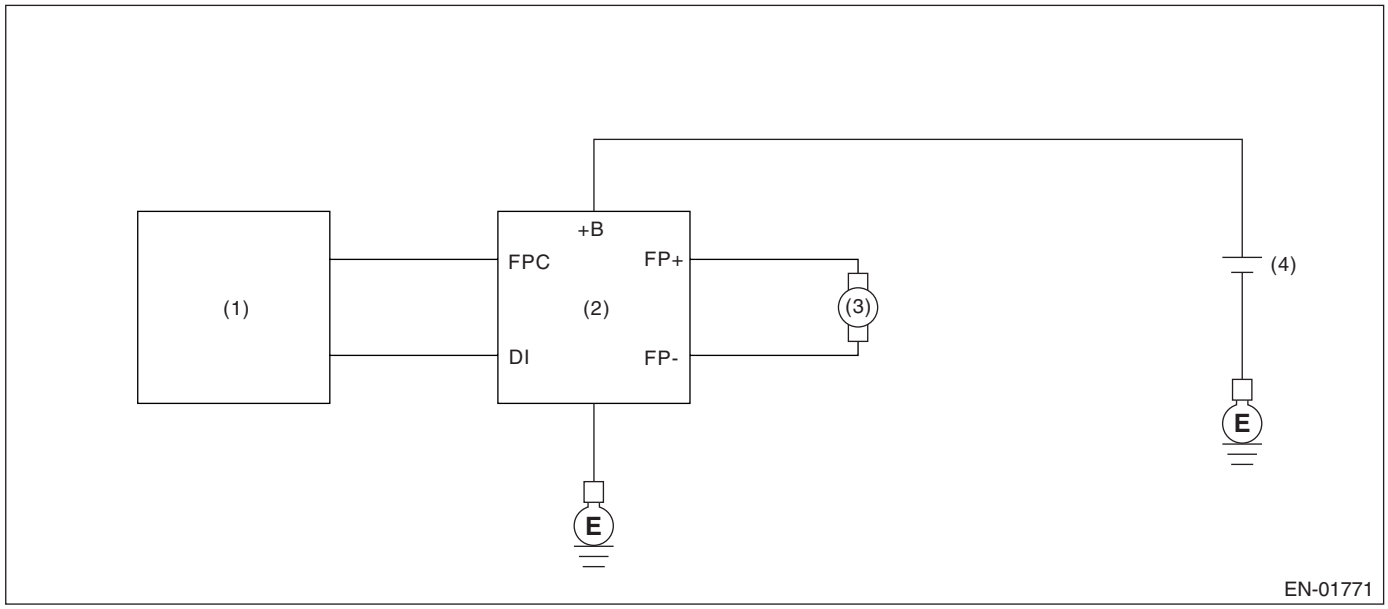
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

AL:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel pump control unit. Judge NG when the NG signal is sent through a diagnostic line coming from the fuel pump control unit. Fuel pump control unit detects the open or short circuit malfunction for each line, and then sends NG signals if one of them is found NG.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel pump control unit
(3) Fuel pump
(4) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
After engine starting	30 seconds or more
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
After engine starting	30 seconds or more
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

OFF setting may be needed depending on the NG portion.

9. ECM OPERATING AT DTC SETTING

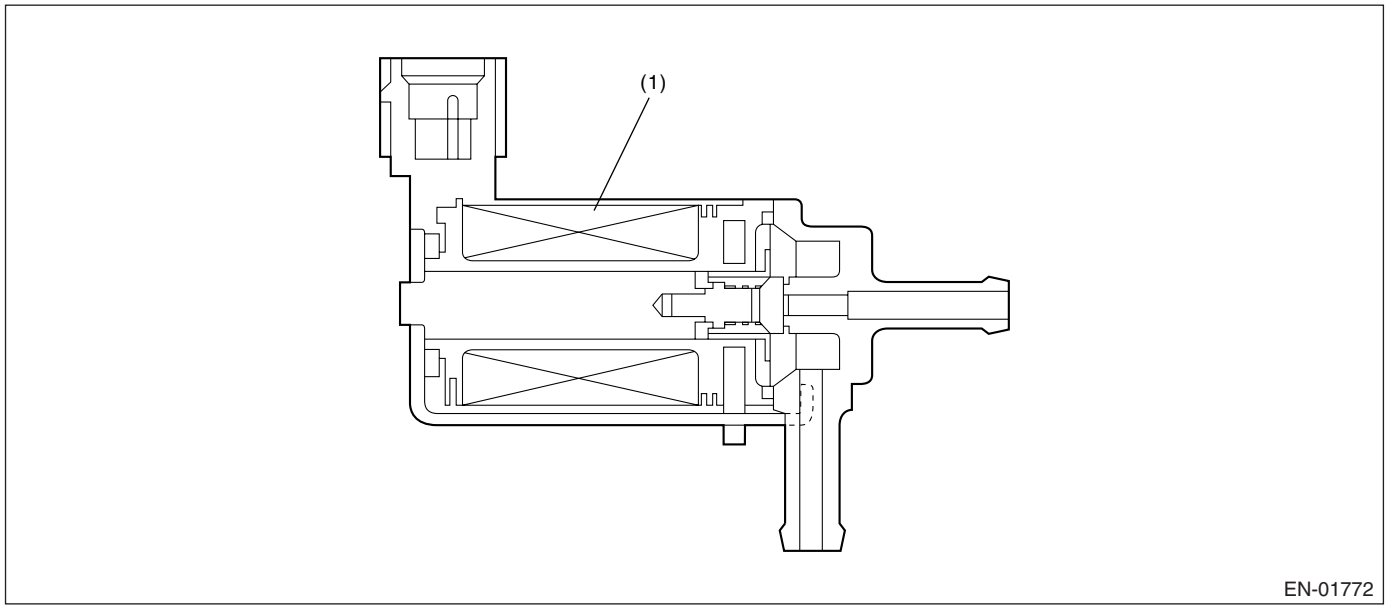
Memorize the freeze frame data. (For test mode $02)

AM:DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of wastegate control solenoid valve function. Judge NG when becoming high wastegate pressure.

2. COMPONENT DESCRIPTION



(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Intake manifold pressure	≥ Map 10

Map 10

Pa (kPa (mmHg, inHg))	56.7 (440,17.3)	67.2 (504, 19.8)	75.7 (568, 22.4)	84.3 (632, 24.9)	92.8 (696, 27.4)	101.3 (760, 29.9)
Abnormal threshold (kPa (mmHg, inHg))	170.0 (1,275, 50.2)	184.4 (1,383, 54.4)	199.1 (1,493, 58.8)	213.3 (1,600, 63.0)	228.0 (1,710, 67.3)	228.0 (1,710, 67.3)
Normal threshold (kPa (mmHg, inHg))	147.6 (1,107, 43.6)	162.0 (1,215, 47.8)	176.7 (1,325, 52.2)	190.9 (1,432, 56.4)	205.6 (1,542, 60.7)	205.6 (1,542, 60.7)

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Intake manifold pressure	< Map 10

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

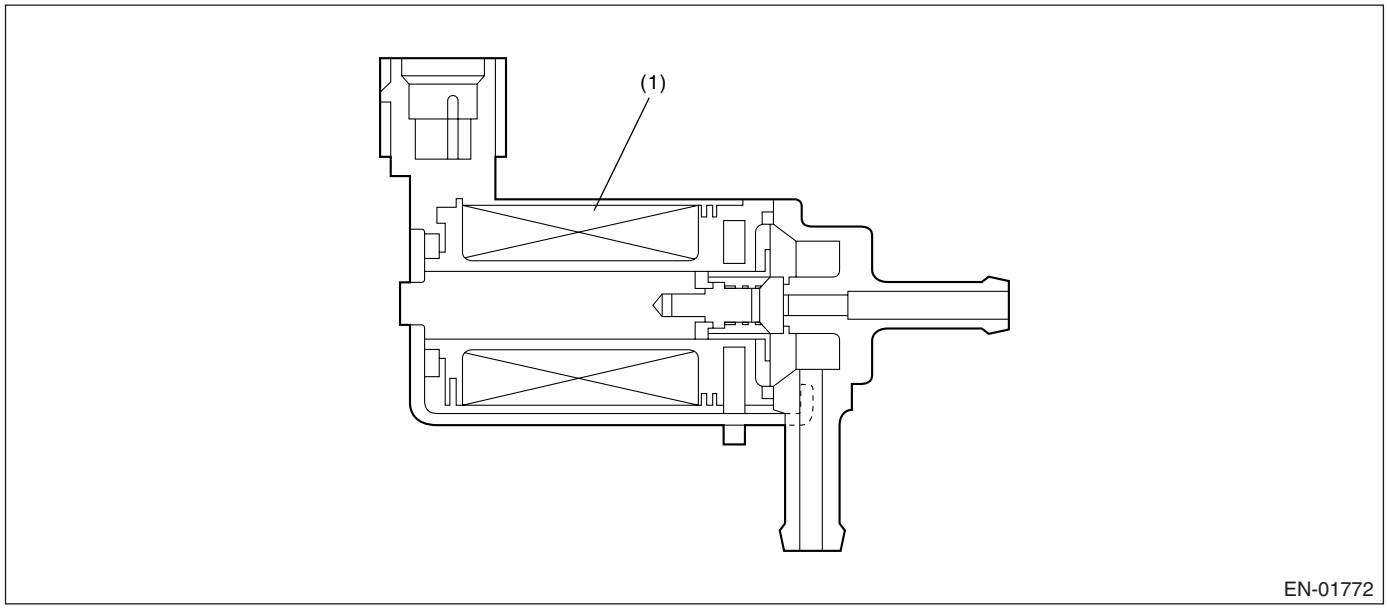
Memorize the freeze frame data. (For test mode $02)

AN:DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of wastegate control solenoid valve. Judge NG when the terminal output voltage remains Low during outputting the duty signal.

2. COMPONENT DESCRIPTION



(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starts.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio for turbocharged pressure control when terminal output voltage is Low	< 75%

Time Needed for Diagnosis: 655 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

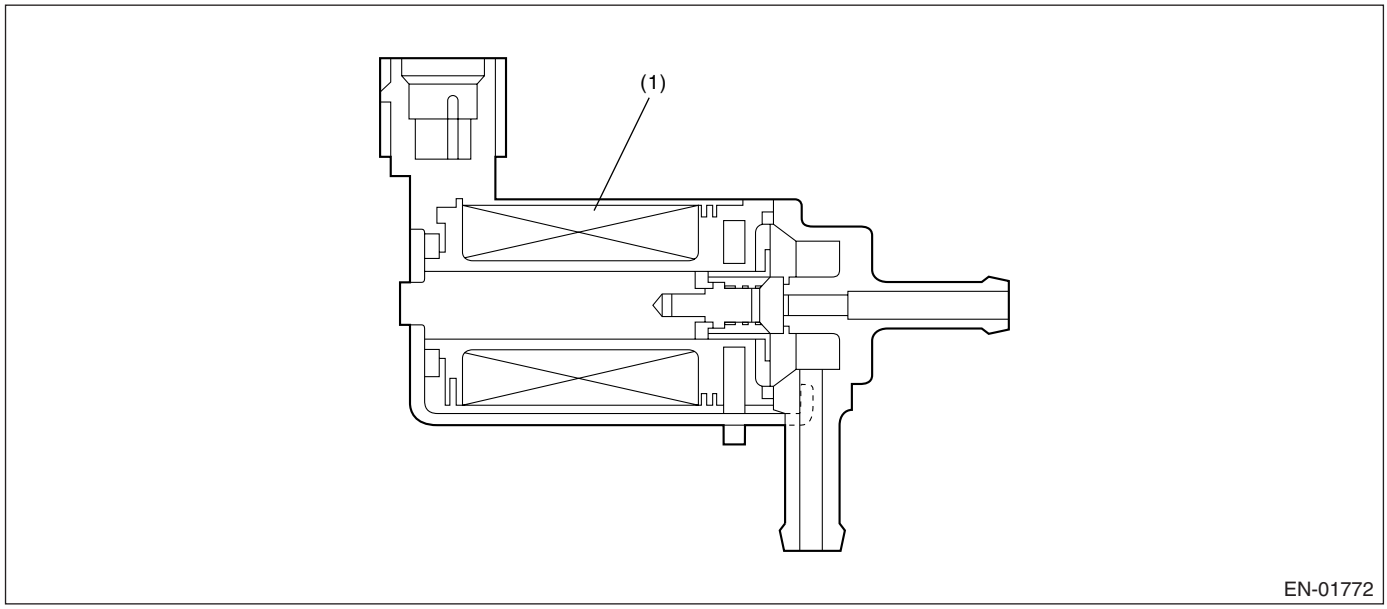
Memorize the freeze frame data. (For test mode $02)

AO:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of wastegate control solenoid valve. Judge NG when the terminal output voltage remains Low or High during outputting the duty signal.

2. COMPONENT DESCRIPTION



(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starts.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio for turbocharged pressure control when output terminal voltage is High	> 25%

Time Needed for Diagnosis: 655 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AP:DTC P0301 CYLINDER 1 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

Detect whether the misfire occurred or not. (Revolution fluctuation method) Monitoring the misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has three patterns below.

- Intermittent misfire (The same cylinder misfires in random, or different cylinders misfire in random.): FTP 1.5 times misfire
- Every time misfire (The same cylinder misfires every time.): FTP 1.5 times misfire, Catalyst damage misfire

The following detecting methods are adopted for these detection.

1) Intermittent misfire: FTP 1.5 times misfire
- 180° Interval Difference Method (MT: 1,800 rpm or less; AT: None)
- 360° Interval Difference Method (whole range)
- 720° Interval Difference Method (3,000 rpm or less)

2) Every time misfire: FTP 1.5 times misfire, Catalyst damage misfire
- 360° Interval Difference Method

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Intake manifold pressure change during 0.5 engine rev.	< 16.0 kPa (120 mmHg, 4.72 inHg)
Engine speed change	< 500 rpm/32 milliseconds
Throttle position change during 16 milliseconds	< 10°
Fuel shut-off function	Not operating
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
Air condition	No switching ON ←→ OFF
Radiator fan	No switching ON ←→ OFF
Power steering switch	No switching ON ←→ OFF
Starter	ON, or OFF, or change from ON to OFF
Evaporative system leak check	Not in operation
Engine speed	500 — 7,000 rpm
Intake manifold pressure	> Map 3 or more
Battery voltage	≥ 8 V

Map3

Vehicle Speed < 64.4 km/h (40 MPH)

rpm	700	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	6,700
kPa (mmHg, inHg)	25.1 (188, 7.40)	24.8 (186, 7.32)	25.6 (192, 7.56)	23.3 (175, 6.89)	26.3 (197, 7.76)	25.9 (194, 7.64)	28.9 (216.5, 8.52)	30.0 (225, 8.86)	31.7 (237.5, 9.35)	33.0 (248, 9.76)	37.1 (278.5, 11.0)	41.9 (314, 12.4)	47.0 (352.5, 13.9)	51.1 (383, 15.1)

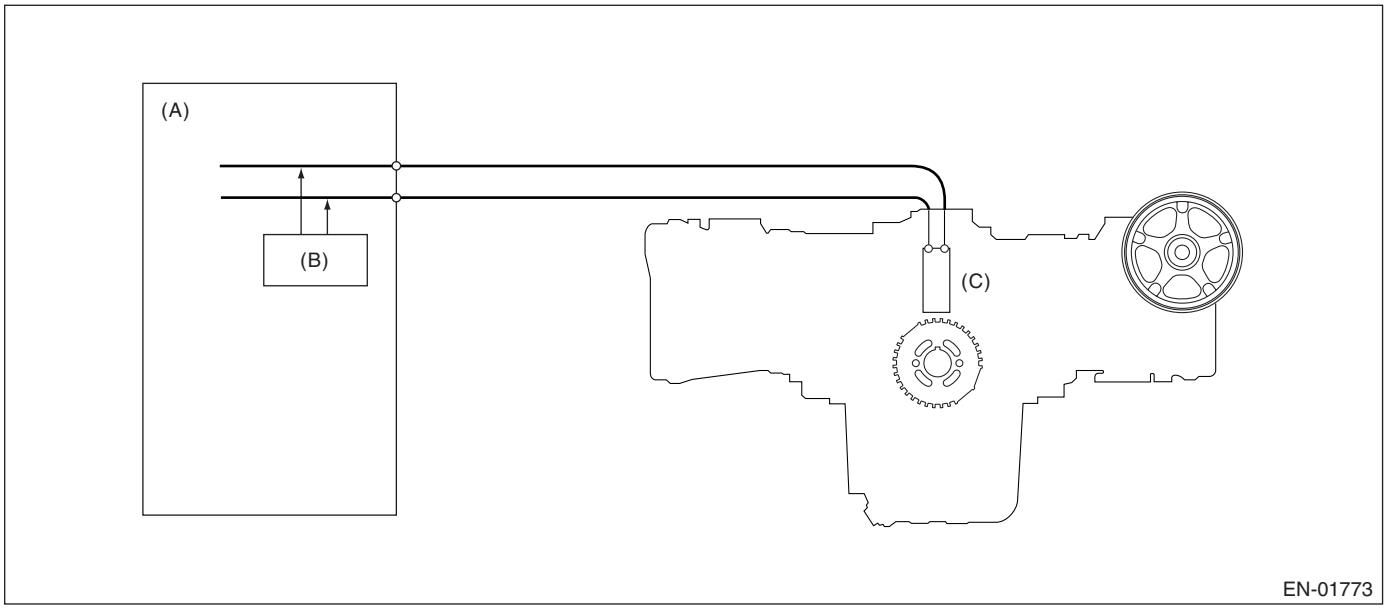
Vehicle Speed ≥ 64.4 km/h (40 MPH)

rpm	700	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000	5,500	6,000	6,500	6,700
kPa (mmHg, inHg)	25.5 (191, 7.52)	25.1 (188, 7.40)	30.4 (227.7, 8.96)	35.6 (267.4, 10.5)	38.5 (288.9, 11.4)	40.4 (302.9, 11.9)	41.1 (308.6, 12.1)	40.8 (306, 12.0)	44.8 (335.8, 13.2)	47.3 (354.5, 14.0)	49.1 (368.2, 14.5)	50.9 (381.9, 15.0)	52.8 (396, 15.6)	52.8 (396, 15.6)

3. GENERAL DRIVING CYCLE

• Detecting misfire is able to be carried out in the condition between idling and high revolution; however, idling condition is better for detecting misfire from the viewpoint of engine load and damage.
• Perform the diagnosis continuously.

4. DIAGNOSTIC METHOD



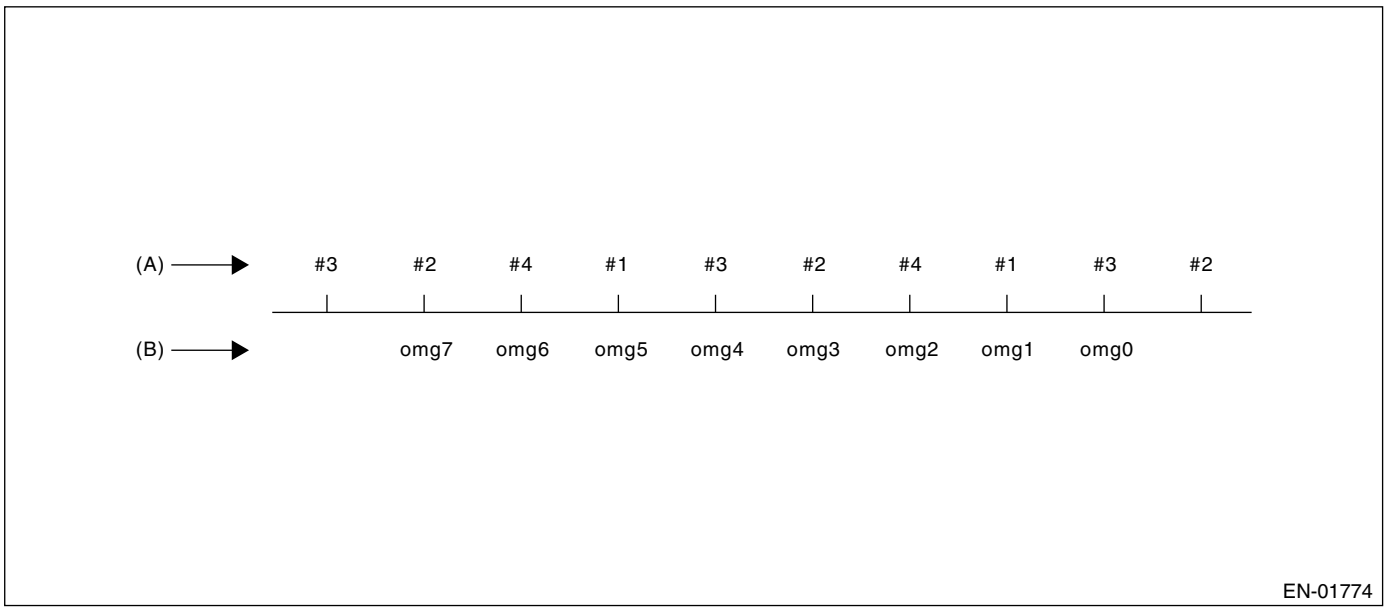
(A) Engine control module (ECM)
(B) Diagnosis circuit
(C) Crankshaft position sensor

When the misfire occurred, the engine speed is decreased and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed by the following formula, and judge whether the misfire occurs or not comparing the calculated result with judgment value. Counting the number of misfire up, and if the misfire ratio is higher during 1,000 rev. or 200 rev., judge NG for the corresponding cylinder.

Calculate the diagnostic value (from crankshaft position speed) → Misfire detection every single ignition (Compare diagnostic value with judgment value)
- 180° Interval Difference Method
- 360° Interval Difference Method
- 720° Interval Difference Method

→ NG judgment (Judge misfire occurrence required by the law) (Compare number of misfire with judgment)
- FTP1.5 times misfire NG judgment
- Catalyst damage misfire NG judgment

As the following figure, pick out a random cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, and the following is the same.



(A) Ignition order
(B) Crankshaft position speed

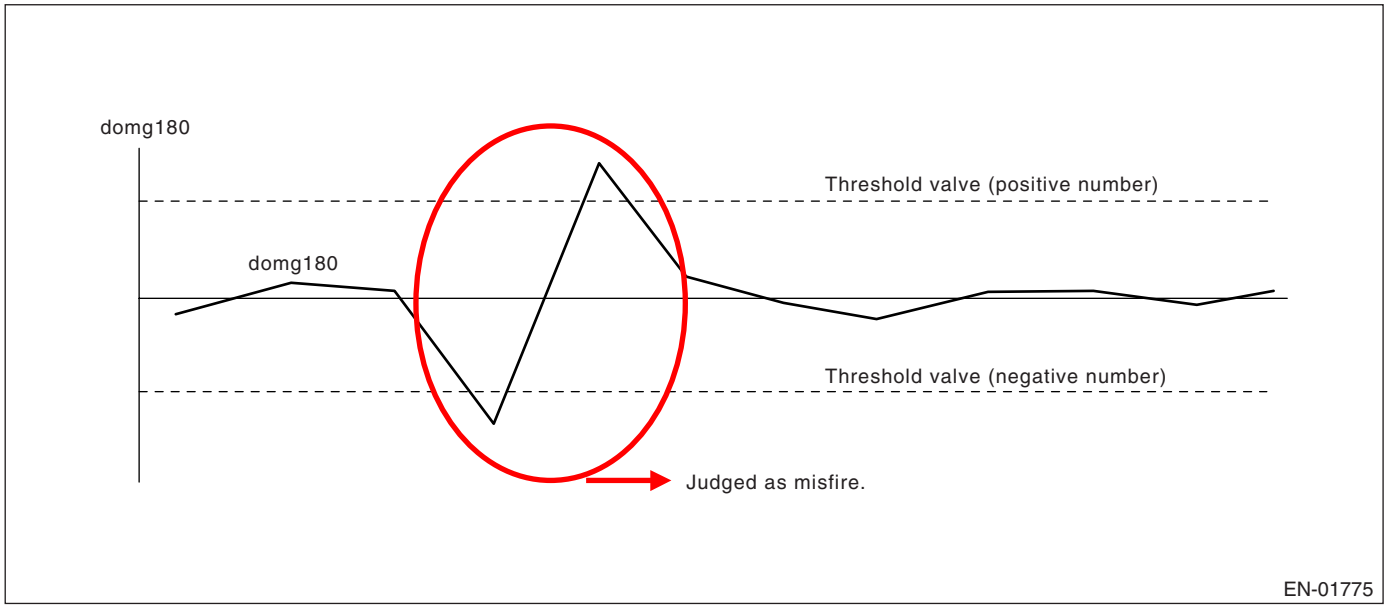
• 180° Interval Difference Method

Diagnosis value domg 180 = (omg –1 omg 0) – (omg 7 – omg 1)/ 6

Judge misfire occurs in the following cases.

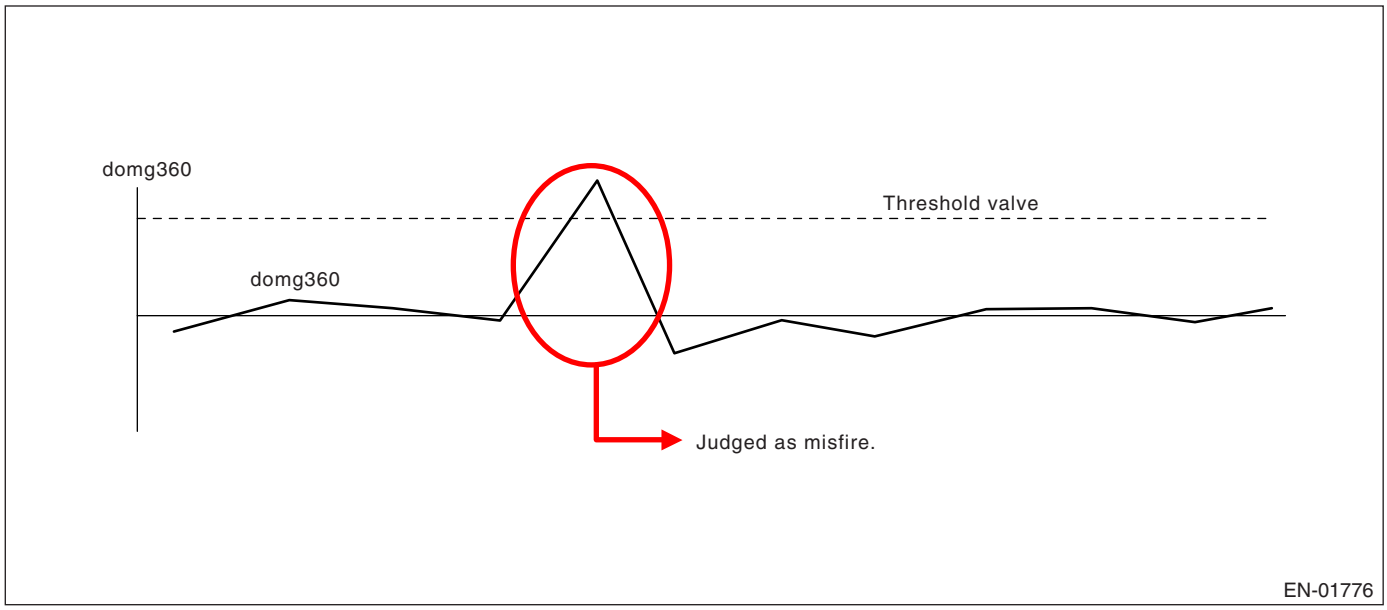
- domg 180 > judgment value of positive side
- domg 180 ≤ judgment value of negative side

(judgment value before 180°CA)



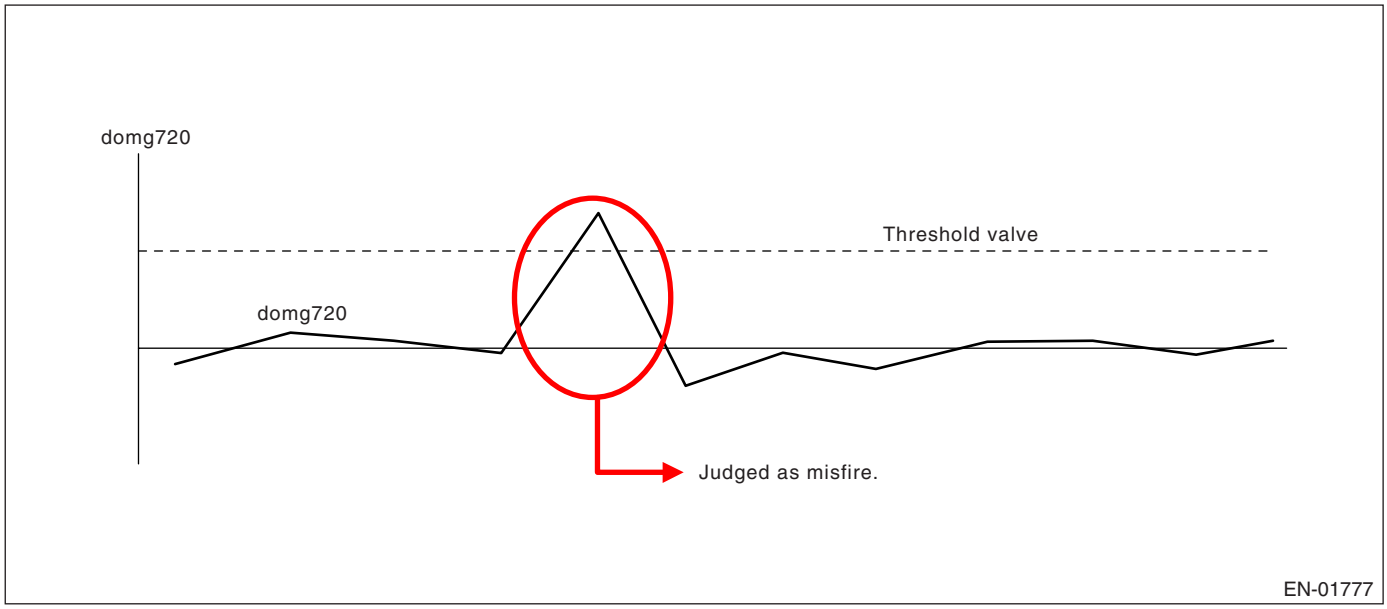
• 360° Interval Difference Method

Diagnosis value	domg 360 = (omg 1 – omg 0) – (omg 4 – omg 3)		
Misfire judgment	domg 360 > judgment value	→	Misfire occurs



• 720° Interval Difference Method

Diagnosis value	domg 720 = (omg 1 – omg 0) – (omg 7 – omg 6)		
Misfire judgment	domg 720 > judgment value	→	Misfire occurs



• FTP 1.5 times misfire (Misfire occurrence level affecting exhaust gas)

Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 1,000 engine revs.)

Malfunction Criteria	Threshold Value
FTP emission judgment value	> 1.0% in 1,000 revs.

Time Needed for Diagnosis: 1,000 engine revs.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Catalyst damage misfire (Misfire occurrence level damaging catalyst)

Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 200 engine revs. (400 ignitions))

Malfunction Criteria	Threshold Value
Catalyst damage misfire judgment value	See Map 1

Map 1 Fault criteria threshold for misfire which would result in catalyst damage

Percentage		Intake air (g/gev.)														
		0.2	0.3	0.4	0.6	0.8	1.0	1.2	1.3	1.4	1.6	1.8	1.9	2.0	2.2	2.4
Engine speed (rpm)	700	45.80	45.80	45.80	41.70	36.15	30.60	27.80	26.40	25.00						
	1000	45.80	45.80	45.80	37.50	33.30	25.00	23.75	25.00							
	1500	43.74	41.13	38.53	31.25	27.28	21.25	20.13	20.50							
	2000	41.67	36.46	31.25	25.00	21.25	17.50	16.50	16.00	15.50	14.30					
	2500	38.55	33.02	27.50	21.25	17.78	14.31	12.43	11.49	10.55	9.65					
	3000	35.42	29.59	23.75	17.50	14.31	11.11	8.36	6.98	5.60	5.00	4.40	6.70			
	3500		24.99	22.53	14.30	12.20	10.11	8.38	7.51	6.65	6.20	5.75	6.18			
	4000		20.40	21.30	11.10	10.10	9.10	8.40	8.05	7.70	7.40	7.10	5.65	4.20	2.50	0.80
	4500		19.35	19.00	12.25	10.90	9.55	9.20	9.03	8.85	7.68	6.50	5.58	4.65		
	5000		18.30	16.70	13.40	11.70	10.00	10.00	10.00	10.00	7.95	5.90	5.50	5.10		
	5500			16.10	12.00	10.58	9.15	8.75	8.55	8.35	6.30	4.25				
	6000			15.50	10.60	9.45	8.30	7.50	7.10	6.70	4.65	2.60				
	6500			15.50	10.00											

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These figures mean the misfire ratio (%) in 400 ignitions; for example, 22.5 (%) means 400 (ignition) × 22.5 (%) = 90 (ignition) or more, so this case is judged misfire.
Time Needed for Diagnosis: 200 engine revs.
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AQ:DTC P0302 CYLINDER 2 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(STi)-93, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AR:DTC P0303 CYLINDER 3 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(STi)-93, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AS:DTC P0304 CYLINDER 4 MISFIRE DETECTED

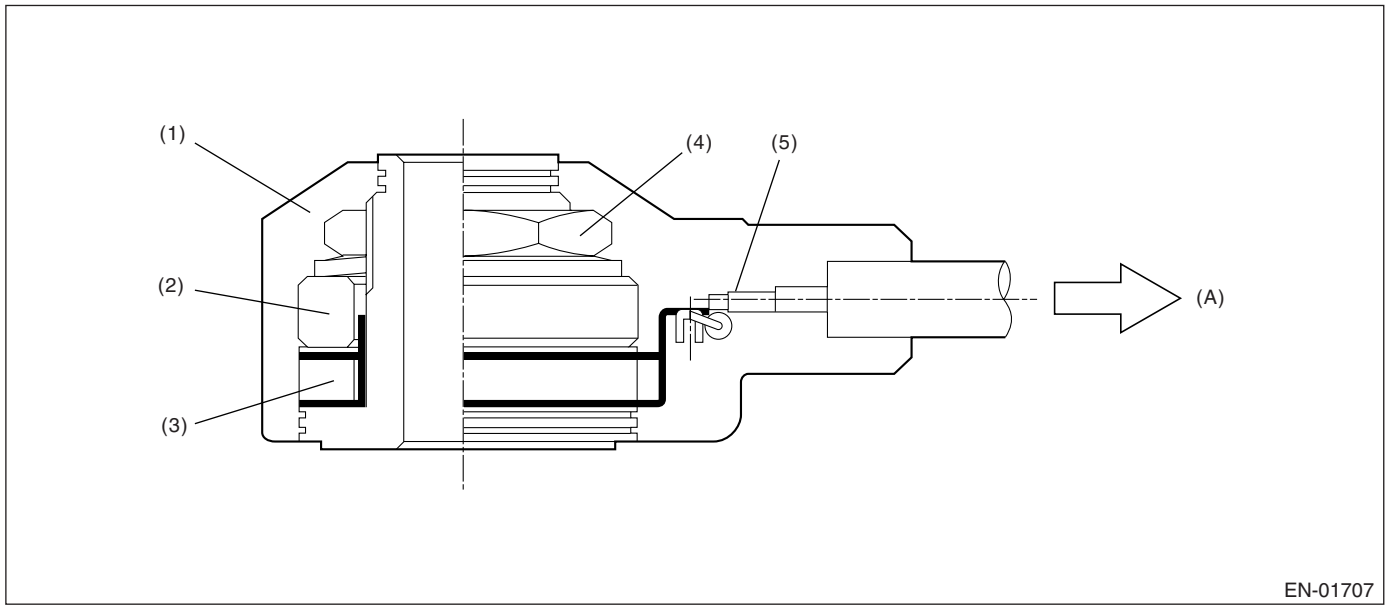
NOTE:
For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(STi)-93, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AT:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance
(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.238 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.238 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Knock compensation:
• Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
- At normal: knock compensation = 0°CA is fixed.
- At trouble: knock compensation = −5°CA. (Retard 5°CA.)
- Not allowed to update the whole learning compensation factor.
- Not allowed to calculate the partial learning zone compensation value.

9. ECM OPERATING AT DTC SETTING

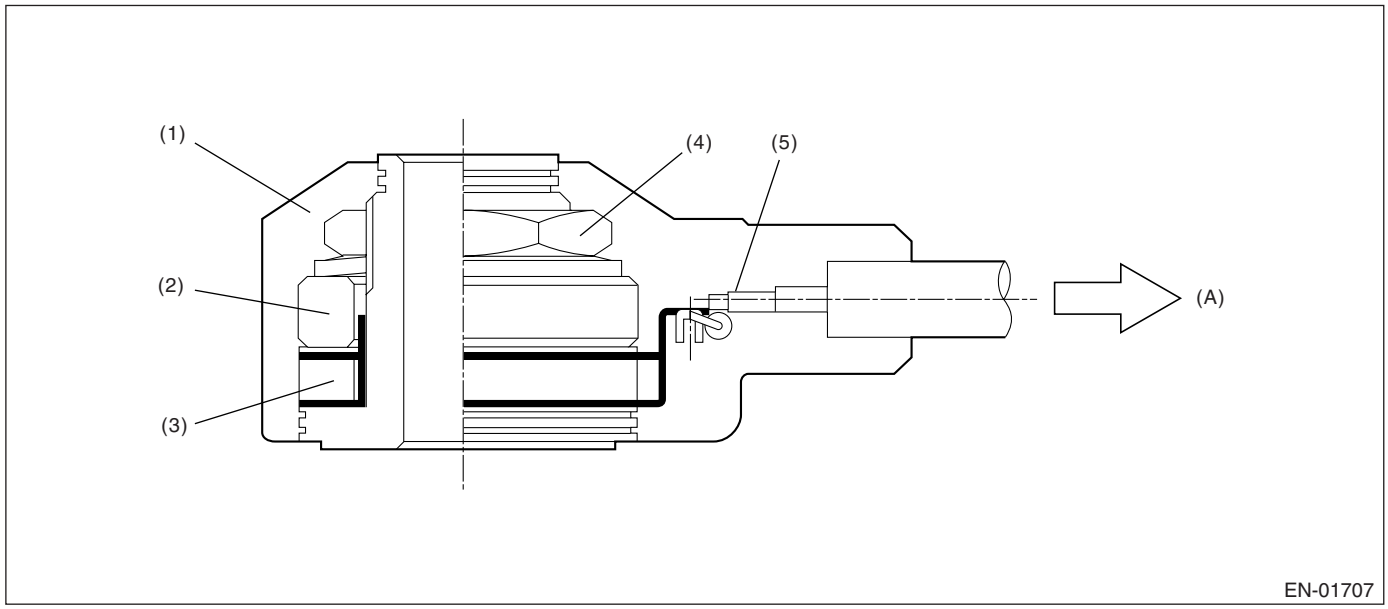
Memorize the freeze frame data. (For test mode $02)

AU:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Case
(2) Weight
(3) Piezoelectric element
(4) Nut
(5) Resistance
(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.714 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.714 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Knock compensation:
• Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
- At normal: knock compensation = 0°CA is fixed.
- At trouble: knock compensation = −5°CA. (Retard 5°CA.)
- Not allowed to update the whole learning compensation factor.
- Not allowed to calculate the partial learning zone compensation value.

9. ECM OPERATING AT DTC SETTING

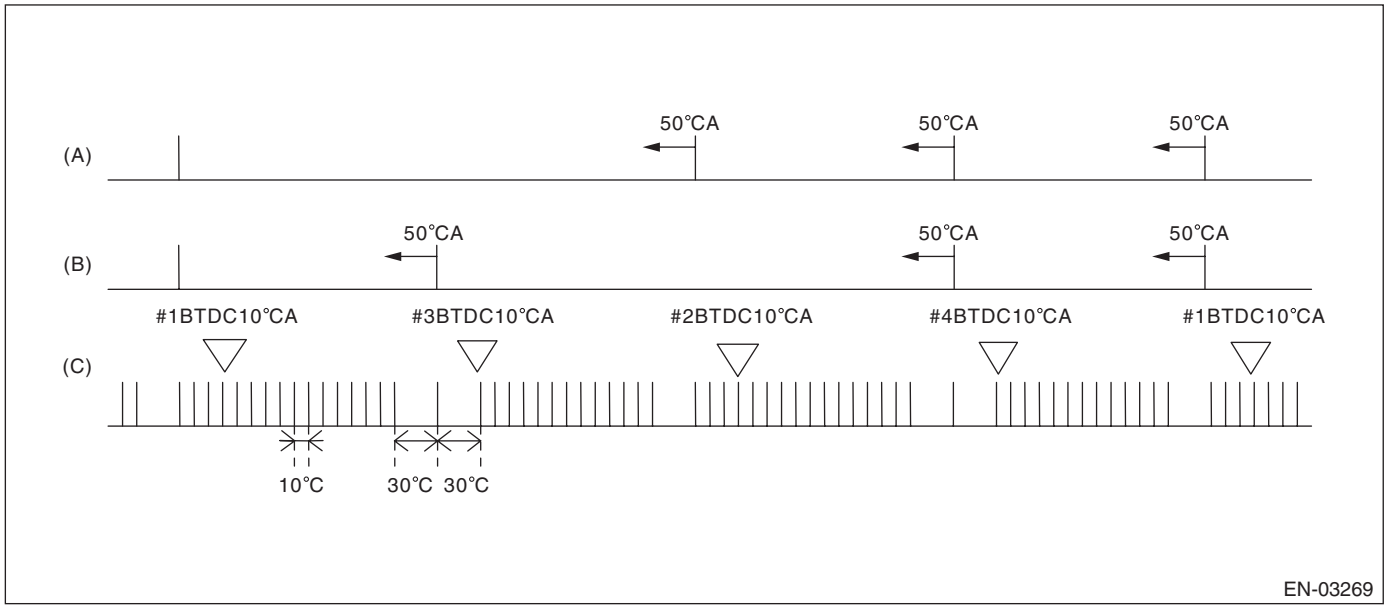
Memorize the freeze frame data. (For test mode $02)

AV:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

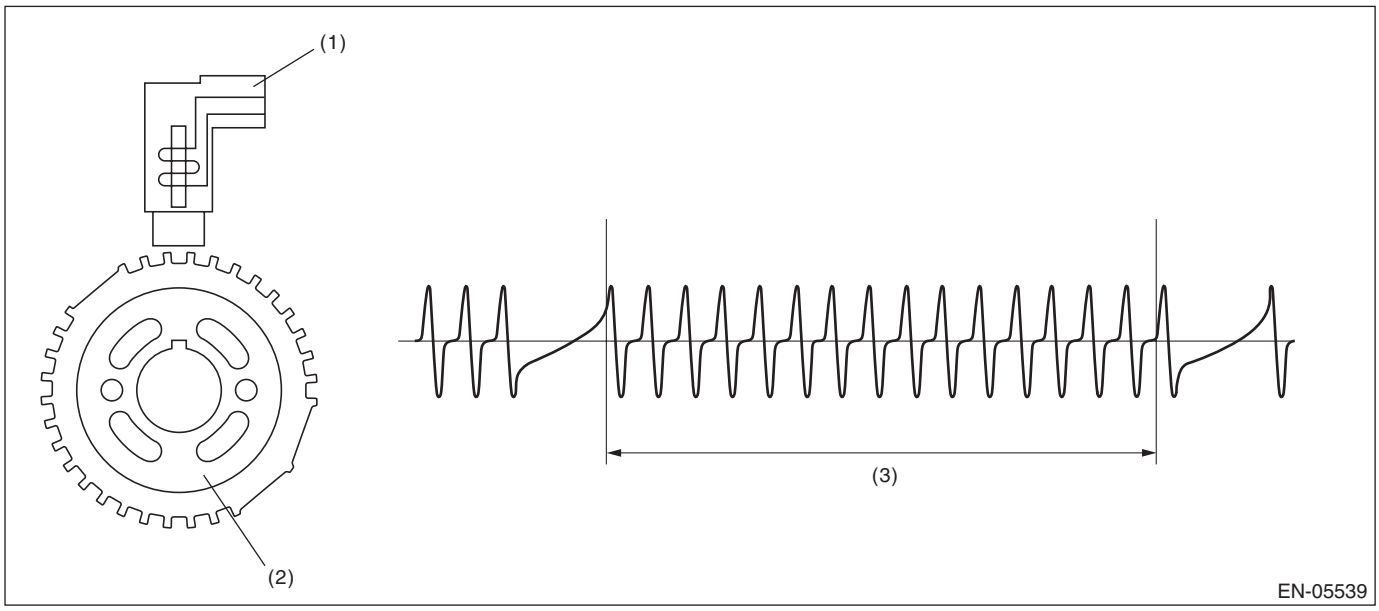
1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of crankshaft position sensor. Judge NG when the crankshaft signal does not input regardless of turning the starter.

2. COMPONENT DESCRIPTION



(A) Camshaft signal (RH)
(B) Camshaft signal (LH)
(C) Crankshaft signal



(1) Crankshaft position sensor
(2) Crankshaft sprocket
(3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Crankshaft position sensor signal	Not detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	Input exists
Battery voltage	≥ 8 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

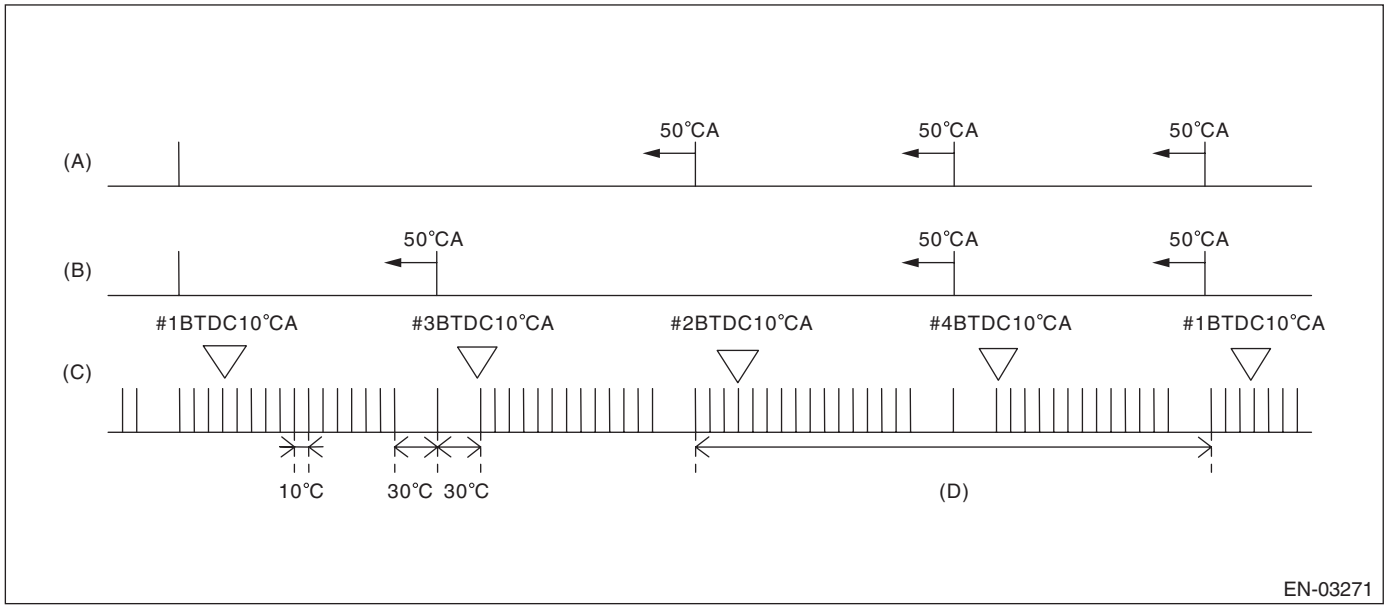
Memorize the freeze frame data. (For test mode $02)

AW:DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE

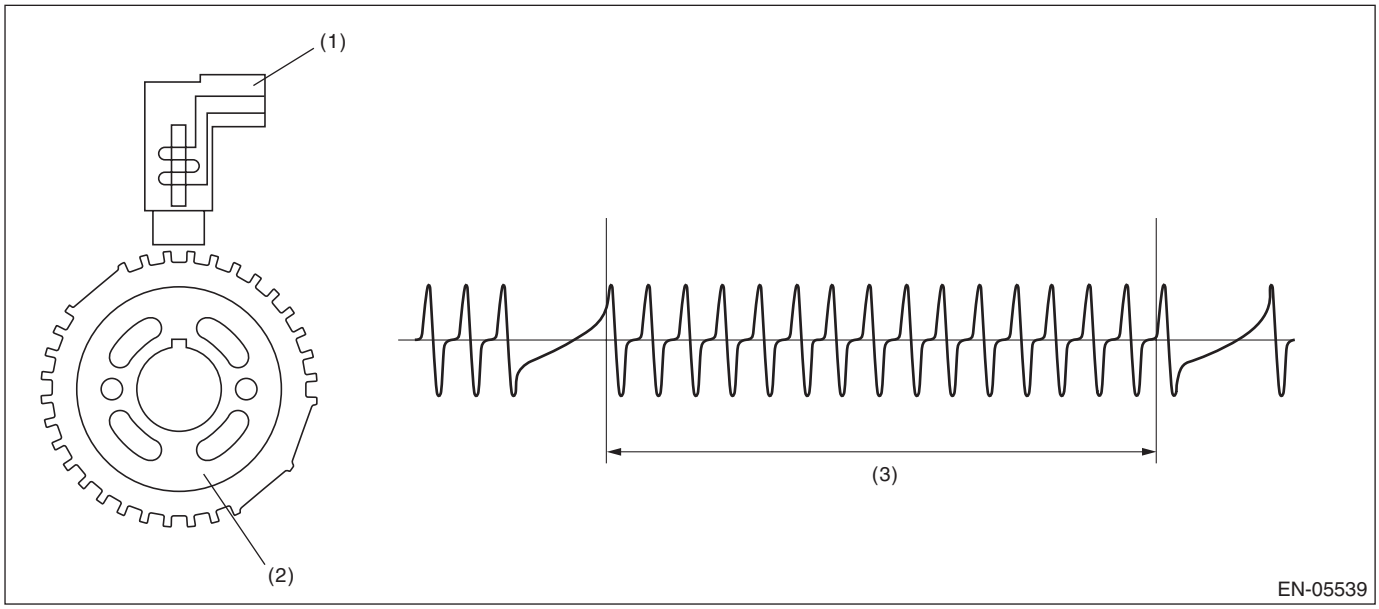
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of crankshaft position sensor output property. Judge NG when the number of crankshaft signal every 1 revolution becomes abnormal.

2. COMPONENT DESCRIPTION



(A) Camshaft signal (RH)
(B) Camshaft signal (LH)
(C) Crankshaft signal
(D) Number of crankshaft signal = 30 is normal.



(1) Crankshaft position sensor
(2) Crankshaft sprocket
(3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8 V
Engine speed	< 3,000 rpm

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3,000 rpm engine speed.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when all the malfunction criteria below are completed more than 10 times in a row.
Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number distinction	Completed
Amount of crank sensor signal during 1 rev.	Not = 30

Time Needed for Diagnosis: 10 engine revs.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number distinction	Completed
Amount of crank sensor signal during 1 rev.	= 30

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

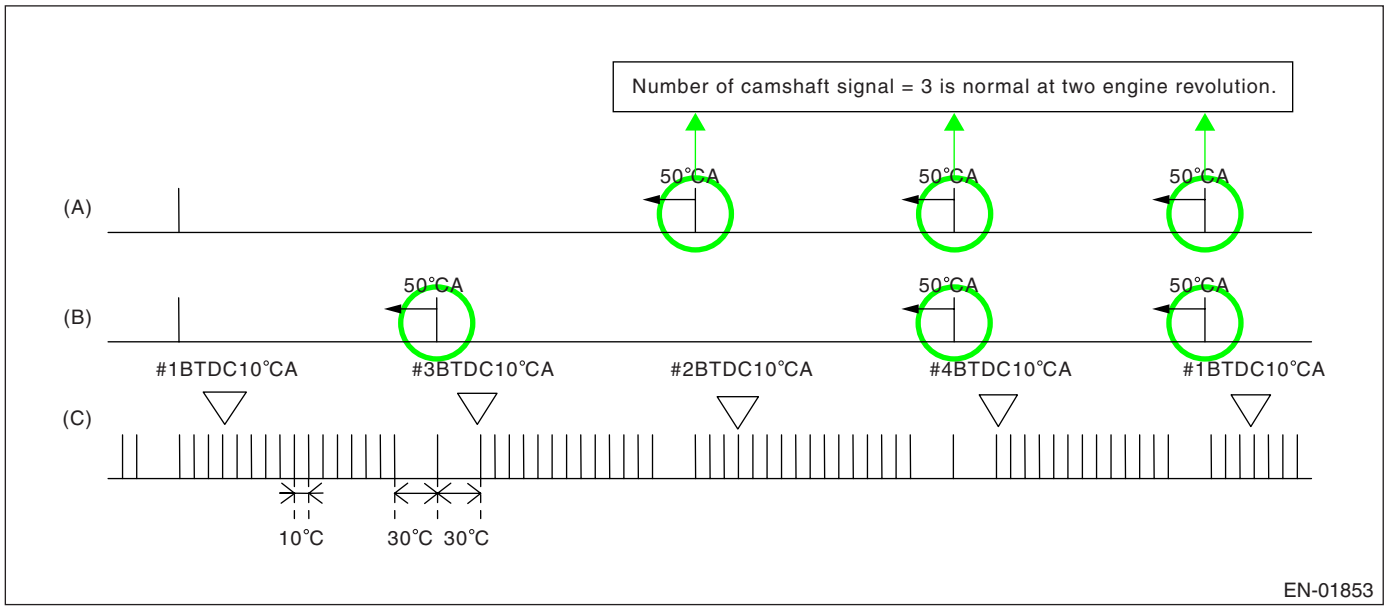
Memorize the freeze frame data. (For test mode $02)

AX:DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of camshaft position sensor. Judge NG when the number of camshaft signal remains to be abnormal.

2. COMPONENT DESCRIPTION



(A) Camshaft signal RH
(B) Camshaft signal LH
(C) Crankshaft signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 8 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment 1

The camshaft signal normally enters three times by two rev. of engine speed; however, judge NG when the camshaft signal does not enter three times continuously.
Judge NG when the malfunction criteria below are completed more than 100 rev. of engine speed. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Number of camshaft sensor signal during 2 rev.	Except 3

Time Needed for Diagnosis: 100 rev.
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Abnormality Judgment 2

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Camshaft angle signal	None

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Camshaft angle signal	Exists

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Ignition timing whole learning compensation:
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control: Most timing retard learning is not complete or most timing retard learning completion is not experienced.
- ISC feedback compensation: Do not perform the AVCS actual timing advance compensation. Make the OCV driving Duty to be the given value (9.36%).

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

AY:DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2)

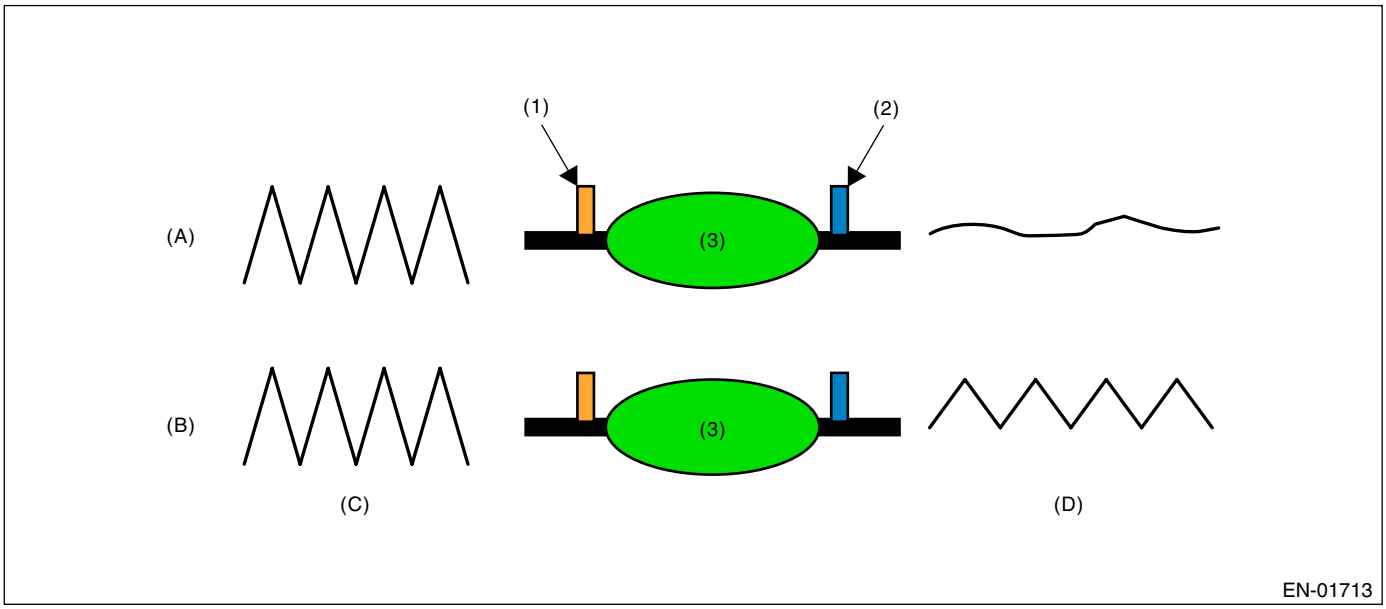
NOTE:
For diagnostic procedure, refer to DTC P0340. <Ref. to GD(STi)-107, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AZ:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the deterioration of catalyst function.
Though the rear oxygen sensor output would change slowly with a new catalyst, the sensor output with a deteriorated catalyst becomes high and the inversion time is shortened. For this reason, the catalyst diagnosis is carried out by monitoring the rear oxygen sensor output and comparing it with the front A/F sensor output.

2. COMPONENT DESCRIPTION



(1) Front oxygen (A/F) sensor
(2) Rear oxygen sensor
(3) Catalyst

(A) Normal
(B) Deterioration
(C) Front oxygen (A/F) sensor waveform
(D) Rear oxygen sensor waveform

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time for keep completing all secondary parameters	1.2 seconds or more
Catalyst deterioration diagnosis	Not finished
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 65°C (149°F)
Catalyst warm-up counter on Map 2	≥ 7,600
Misfire detection during 200 engine revs.	< 5 times
Learning value of evaporation gas density	< 0.20
Sub feedback	Operating
Evaporative system diagnostic	Not in operation
Difference between actual and target time lambda < 0.10	1,000 milliseconds or more
Vehicle speed	≥ 75 km/h (46.6 MPH)
Amount of intake air	10 ←→ 40 g/s
Engine load change every 0.5 engine revs.	< 0.03 g/rev
Rear O_2 output change from below 600 mV to over	Experienced after fuel cut
After engine starting	≥ 150 seconds

• Map 2

Add the following value every 512 milliseconds.

Catalyst warm-up counter ≤ 8,000

Amount of intake air (g/s)	0	5	10	15	20	25	30	35	40	45	50	55
Integrated value for warm-up counter	–20	–8	15	36	57	79	100	121	127	127	127	127

Catalyst warm-up counter > 8,000

Amount of intake air (g/s)	0	5	10	15	20	25	30	35	40	45	50	55
Integrated value for warm-up counter	–2	–1	5	7	8	9	11	12	13	13	13	13

4. GENERAL DRIVING CYCLE

Perform the diagnosis once at the constant vehicle speed from 80 to 100 km/h (49.7 to 62.1 MPH).

5. DIAGNOSTIC METHOD

After the malfunction criteria are completed, calculate the output fluctuation value of front oxygen (A/F) sensor and output fluctuation value of rear oxygen sensor.
Calculate the diagnosis value when the front oxygen (A/F) sensor output fluctuation value more than specified value.
Regard the A/F response properties and diagnosis value as parameters for judgment value.
Judge NG when the malfunction criteria below are completed, and judge OK when they are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated variation of output voltage of rear oxygen sensor per 32 milliseconds × 4 divided by accumulated variation of lambda of front oxygen (A/F) sensor per 32 milliseconds × 4	≥ Map 3

Map 3

Diagnosis value	0.1	0.162	0.214	0.266	0.318
Judgment value	4.51	4.51	10.45	16.39	22.34

Time Needed for Diagnosis: 55 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

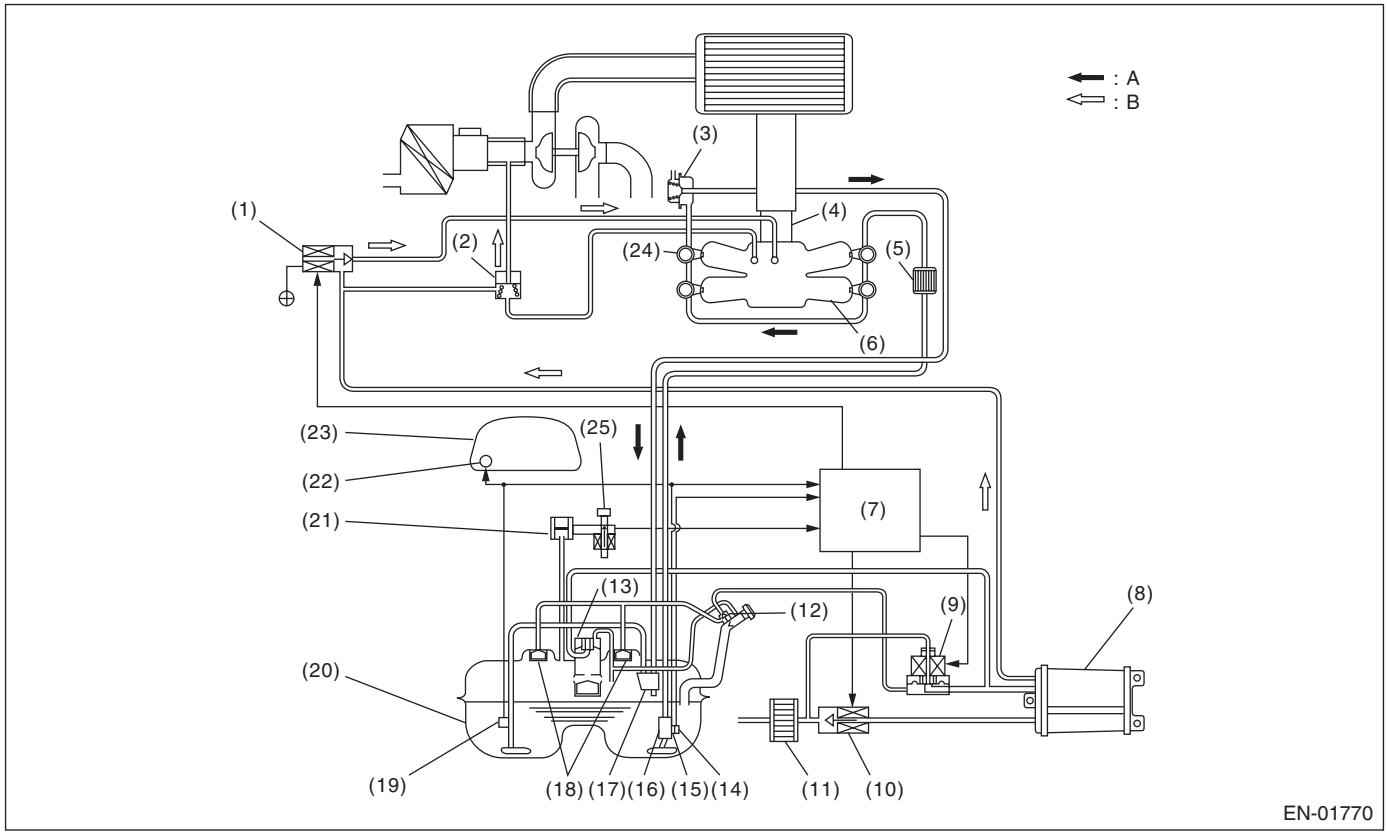
9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

BA:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

1. OUTLINE OF DIAGNOSIS

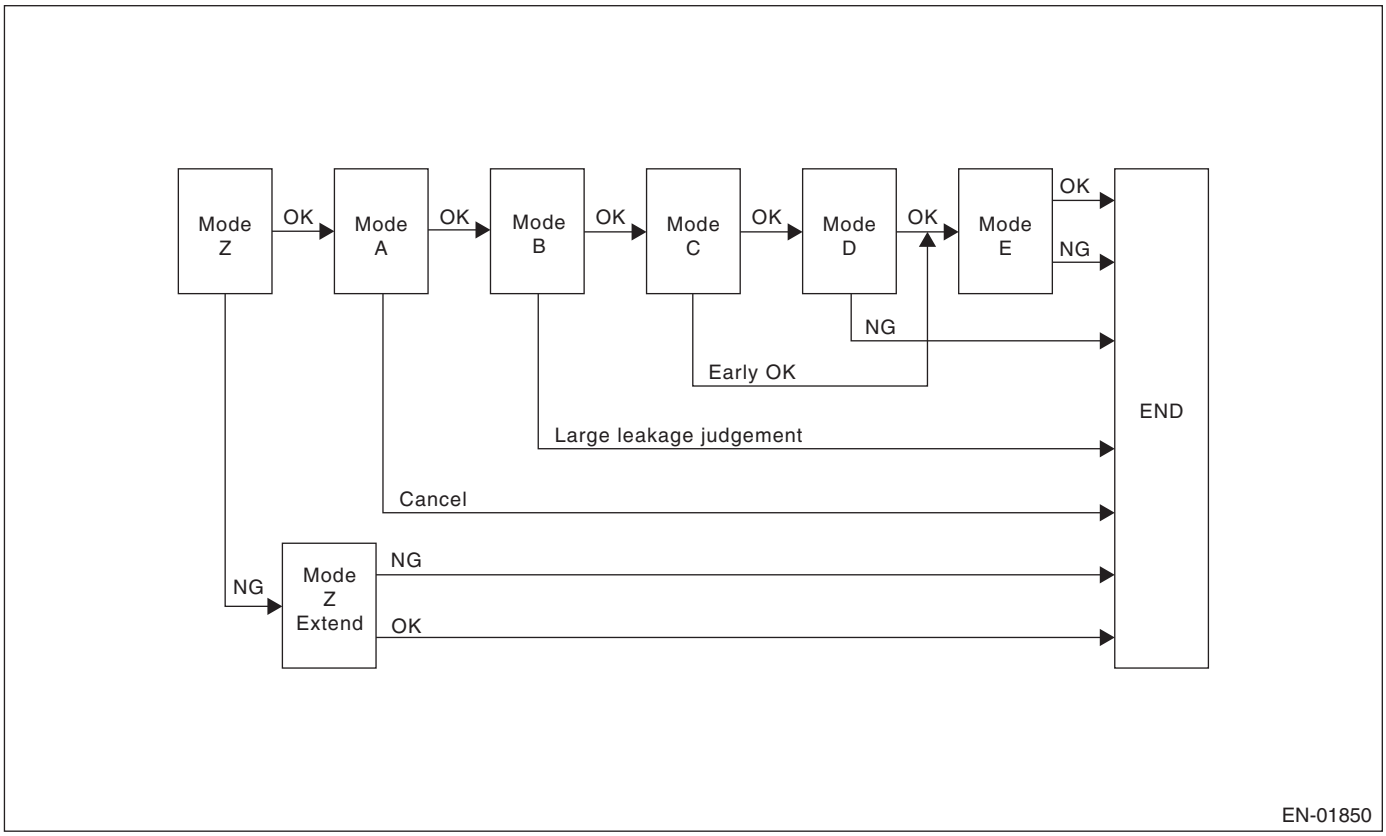
Perform the diagnosis of leakage of fuels system and valve functions.



(1) Purge control solenoid valve
(2) Purge valve
(3) Pressure regulator
(4) Throttle body
(5) Fuel filter
(6) Intake manifold
(7) Engine control module (ECM)
(8) Canister
(9) Pressure control solenoid valve
(10) Drain valve
(11) Drain filter
(12) Shut-off valve
(13) Vent valve
(14) Fuel temperature sensor
(15) Fuel level sensor
(16) Fuel pump
(17) Jet pump
(18) Fuel cut valve
(19) Fuel sub level sensor
(20) Fuel tank
(21) Fuel tank pressure sensor
(22) Fuel meter
(23) Combination meter
(24) Fuel injector
(25) Tank pressure switching solenoid valve

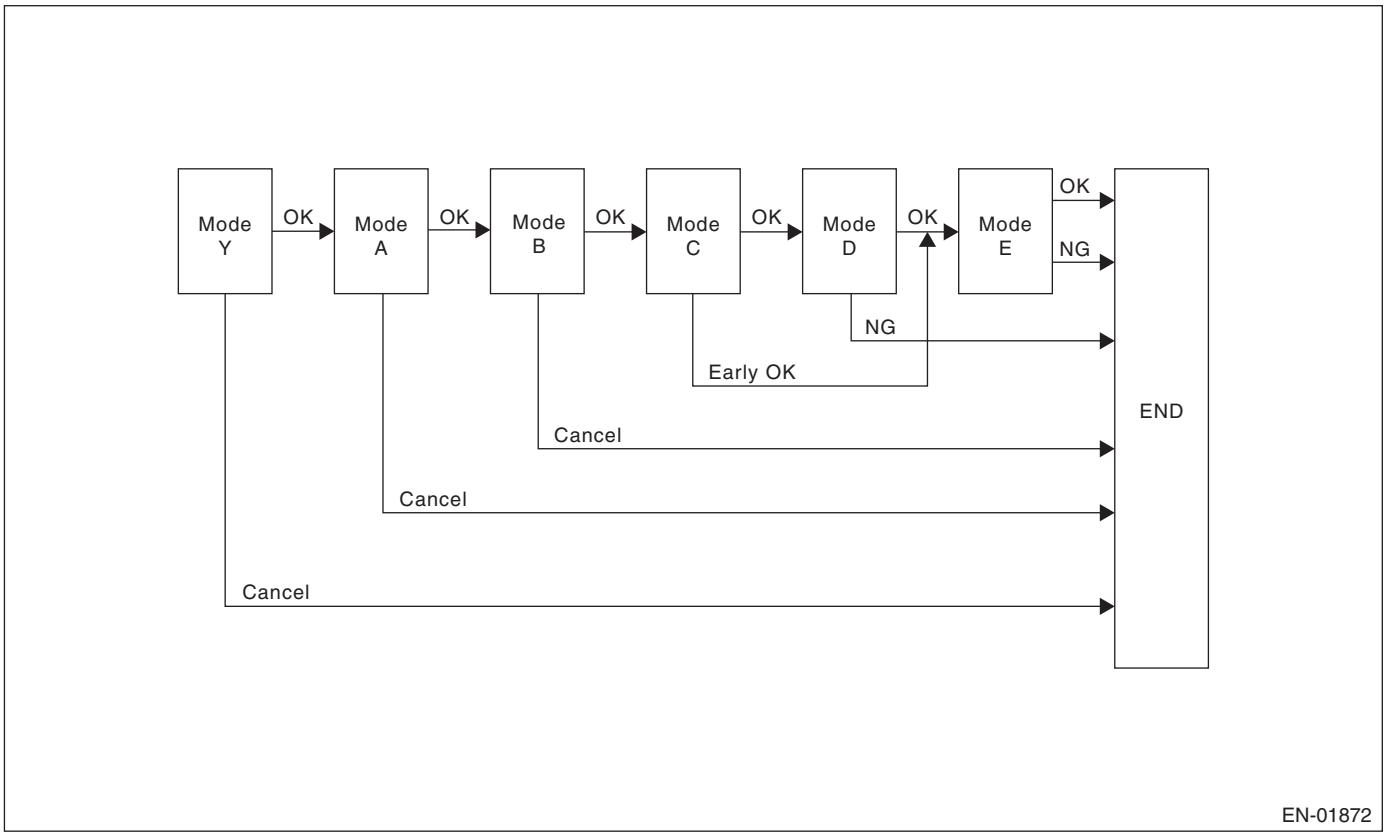
In this system diagnosis, checking for leakage and valve function is conducted by changing the fuel tank pressure and monitoring the pressure change using the fuel tank pressure sensor. 0.04 inch diagnosis is performed in the order of mode Z, mode A, mode B, mode C, mode D and mode E, and 0.02 inch diagnosis is performed in the order of mode Y, mode A, mode B, mode C, mode D and mode E.

• 0.04-inch Diagnosis



Mode	Mode Description	Diagnosis Period
Mode Z (CPC abnormal open diagnosis, CCV abnormal close diagnosis)	Carry out CPC open trouble and CCV close trouble diagnosis according to tank pressure change amount after diagnosis started.	3 — 16 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	16 seconds
Mode B (Sealed negative pressure, large leakage judgment)	Introduce the intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value. If the tank pressure cannot be reduced, it is diagnosed as large leak.	4 — 35 seconds
Mode C (Pressure increase check advanced OK judgment)	Wait until the tank pressure becomes the desired value. If the tank pressure does not become the value, make advanced OK judgment.	4 — 15 seconds
Mode D (Negative pressure variation measurement evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode 1. Perform the evaporation leakage diagnosis using the diagnostic value.	12 — 16 seconds
Mode E (CCV property abnormal diagnosis)	Perform the CCV property abnormal diagnosis according to the tank pressure change amount after the leakage diagnosis completed.	4 seconds

• 0.02-inch Diagnosis



Mode	Mode Description	Diagnosis Period
Mode Y (Tank pressure stabilization)	Return the tank pressure to atmosphere.	15 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	29 seconds
Mode B (Negative pressure sealed)	Introduce the intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value.	10 — 20 seconds
Mode C (Pressure increase check advanced OK judgment)	Wait until the tank pressure becomes the desired value. If the tank pressure does not become the value, make advanced OK judgment.	5 — 20 seconds
Mode D (Negative pressure variation measurement evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode 1. Perform the evaporation leakage diagnosis using the diagnostic value.	20 — 25 seconds
Mode E (CCV property abnormal diagnosis)	Perform the CCV property abnormal diagnosis according to the tank pressure change amount after the leakage diagnosis completed.	4 seconds

• Mode Table for Evaporative Emission Control System Diagnosis

0.04-inch Diagnosis

Mode	Behavior of tank internal pressure under normal conditions	Diagnostic item	DTC
Mode Z	Nearly same as atmospheric pressure (equivalent pressure of 0 kPa (0 mmHg, 0 inHg))	CCV is judged to be stuck closed.	P1443
		CPC is judged to be stuck open.	P0457
Mode A	Pressure is in proportion to amount of evaporative emission.	—	—
Mode B	Negative pressure is formed due to intake manifold negative pressure	Large leakage	P0457
Mode C	Target pressure is reached.	—	—
Mode D	Pressure change is small.	EVAP system is judged to have large leak [1.0 mm (0.04 in)].	P0442
		P2 measurement of small leak in system. EVAP. system is judged to have small leak [0.5 mm (0.02 in.)].	P0456
Mode E	Return to atmosphere	CCV property	P1443

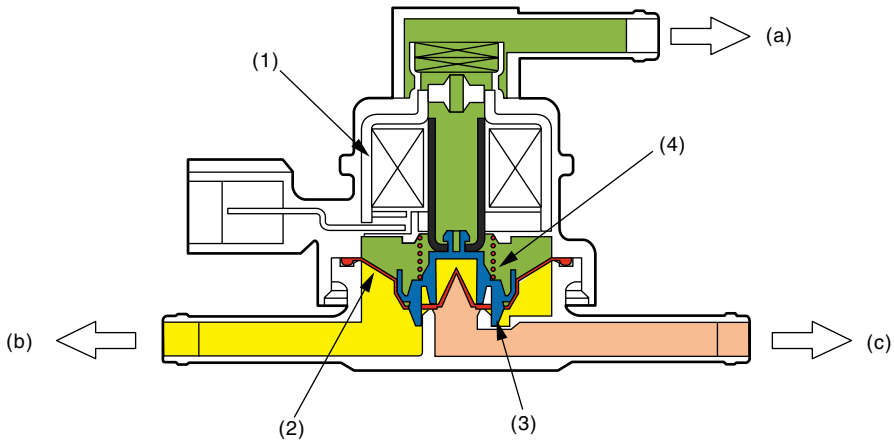
0.02-inch Diagnosis

Mode	Behavior of tank internal pressure under normal conditions	Diagnostic item	DTC
Mode Y	Return to atmosphere	—	—
Mode A	Pressure is in proportion to amount of evaporation gas occurrence.	—	—
Mode B	Negative pressure is formed due to intake manifold negative pressure	—	—
Mode C	Target pressure is reached.	—	—
Mode D	Pressure change is small.	P2 measurement of small leak in system. Evaporation system is judged to have small leak [0.5 mm (0.02 in.)].	P0456
Mode E	Return to atmosphere	CCV property judgment	P1443

2. COMPONENT DESCRIPTION

• Pressure Control Solenoid Valve

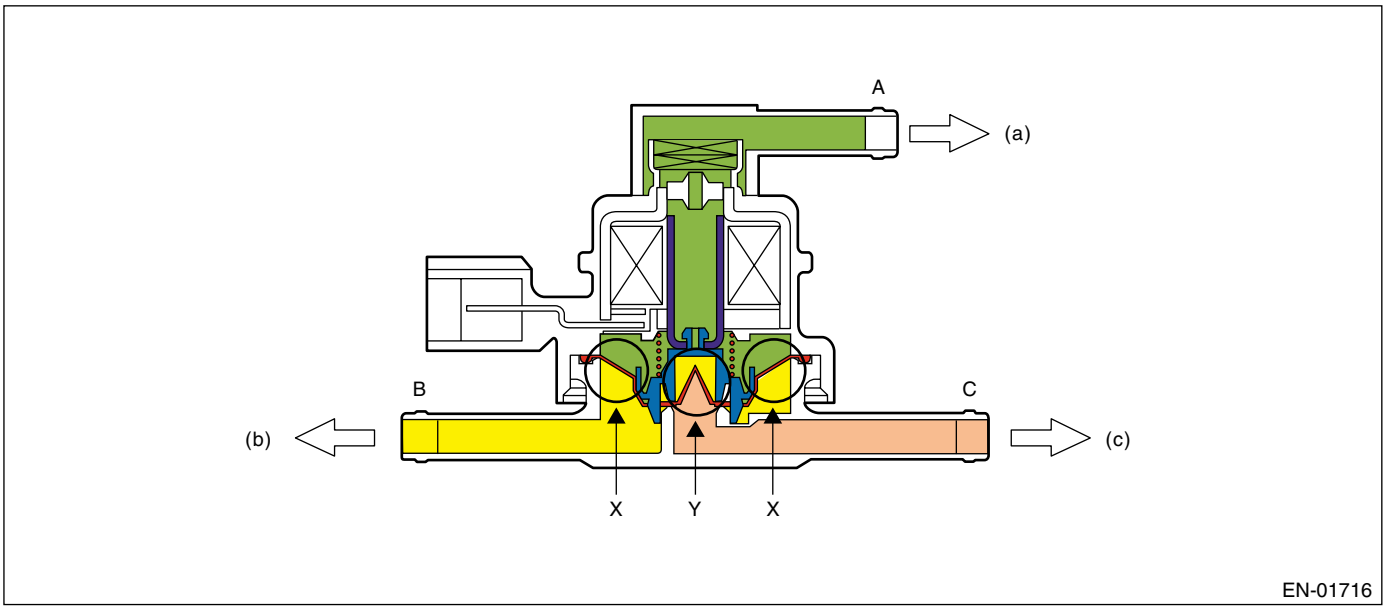
PCV controls the fuel tank pressure to be equal to the atmospheric air pressure.
Normally, the solenoid is set to OFF. And the valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.
The solenoid which is set to ON forces to open the valve.



(1) Solenoid
(2) Diaphragm
(3) Valve
(4) Spring
(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

• Valve Operation and Air Flow

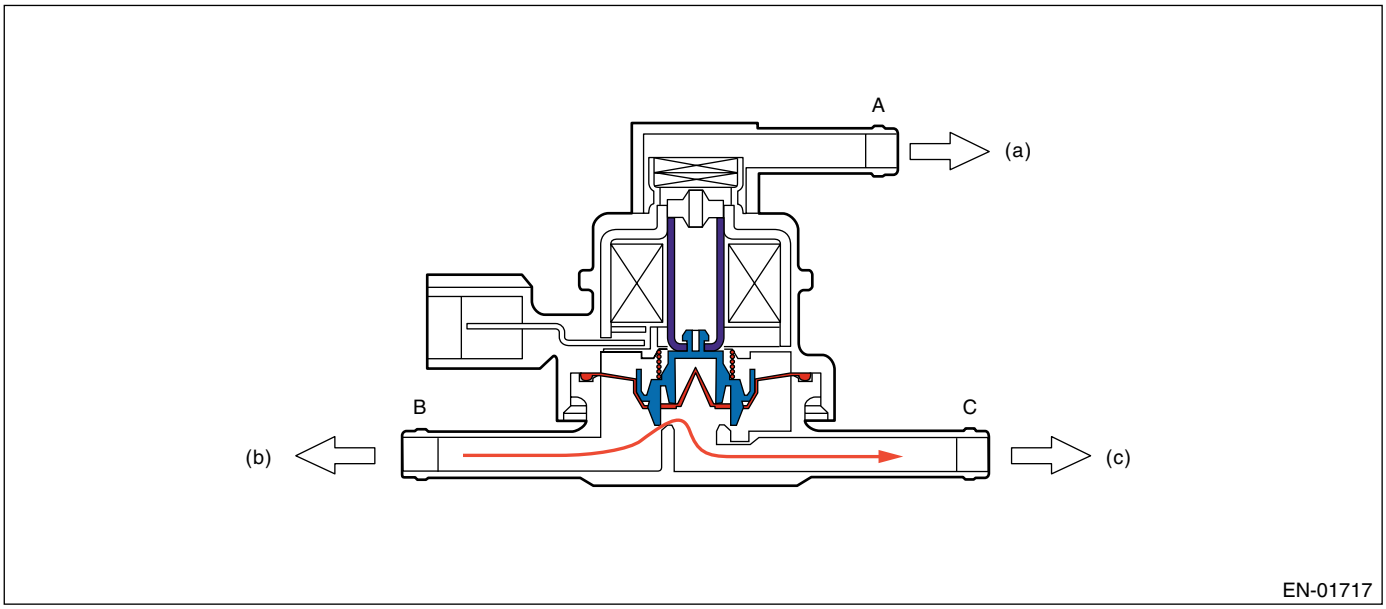
In the figure below, divided by the diaphragm, the part above X is charged with atmospheric air pressure, and the part below X is charged with tank pressure. Also, the part above Y is charged with tank pressure, and the part below Y is charged with canister pressure.
If the atmospheric air pressure port is A, tank pressure port is B, and canister pressure port is C, the air flows according to pressure difference from each port as shown in the table below.



(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

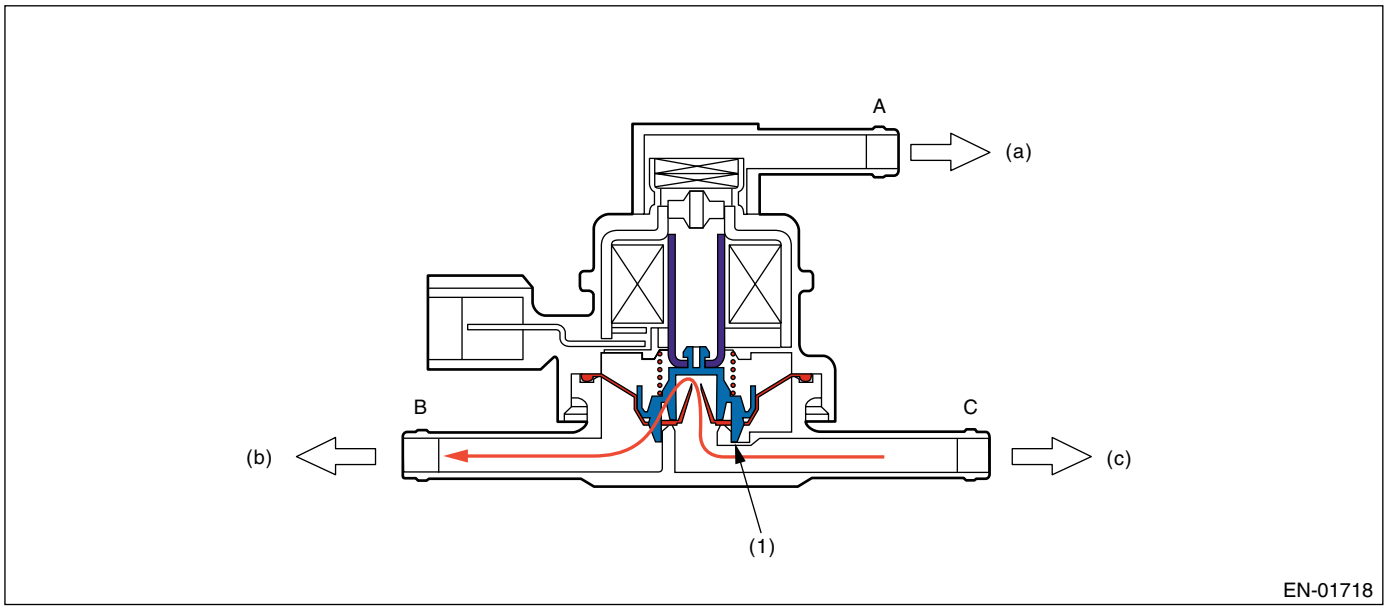
Condition of pressure	Flow
A < B (solenoid OFF)	B → C
B < C (solenoid OFF)	C → B
Solenoid ON	B ←→ C

• When A < B (Solenoid OFF)



(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

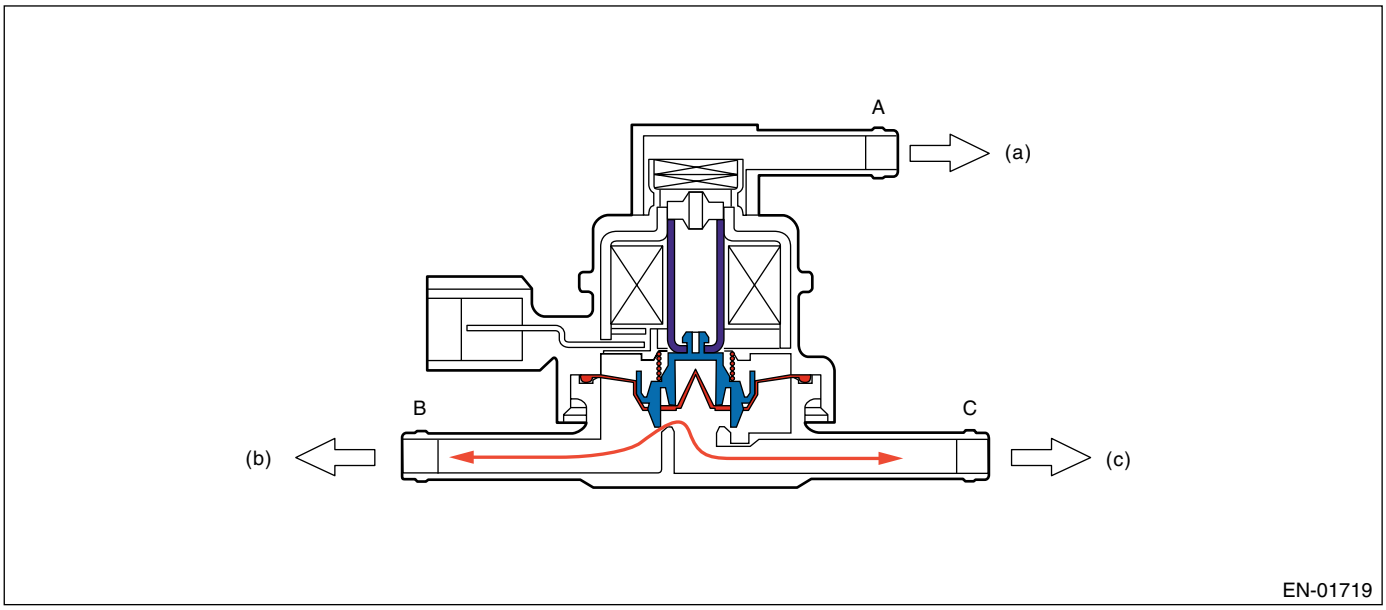
• When B < C (Solenoid OFF)



(1) Valve

(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

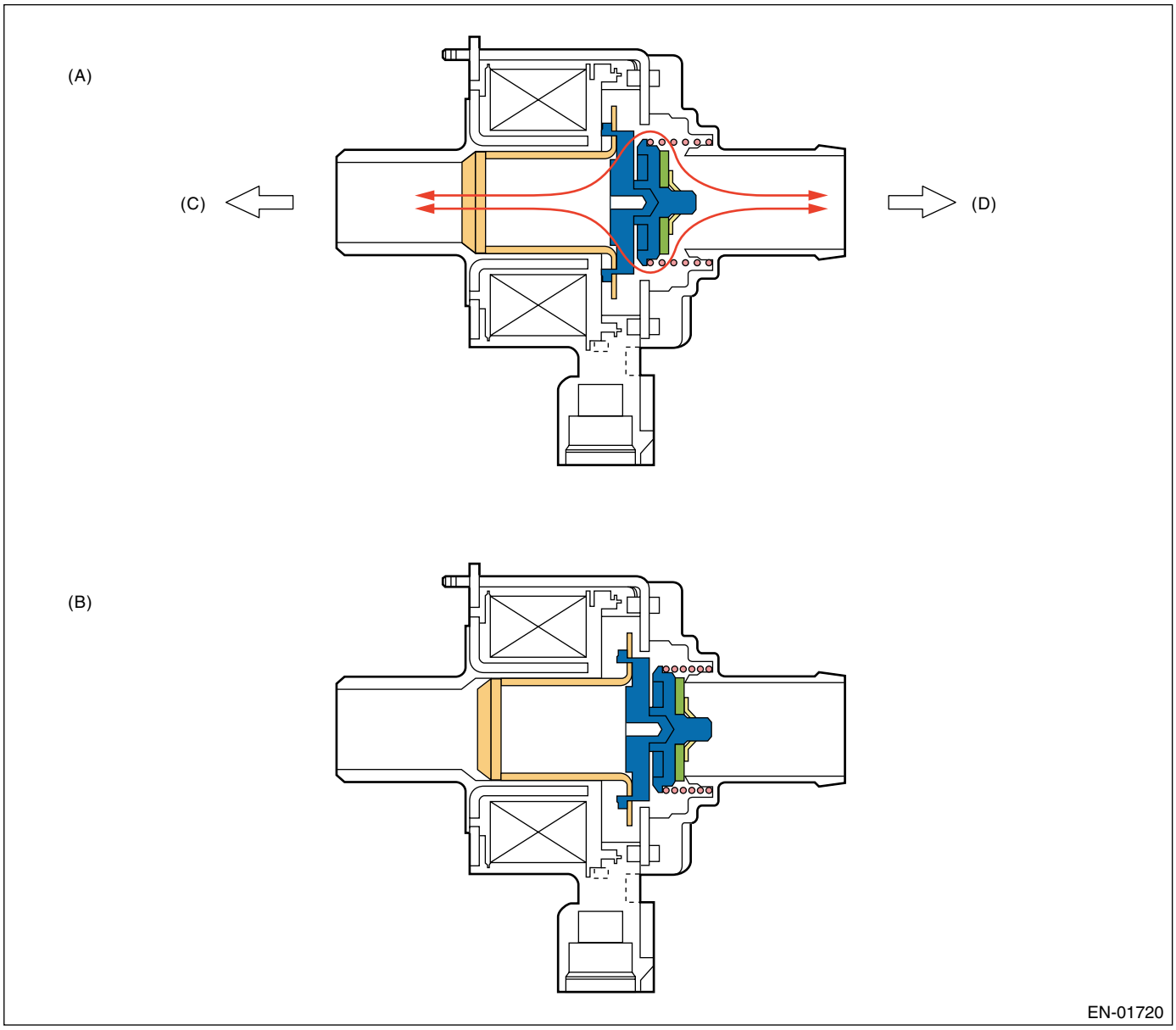
• When Solenoid is ON



(a) Atmospheric pressure
(b) Fuel tank
(c) Canister

• CCV

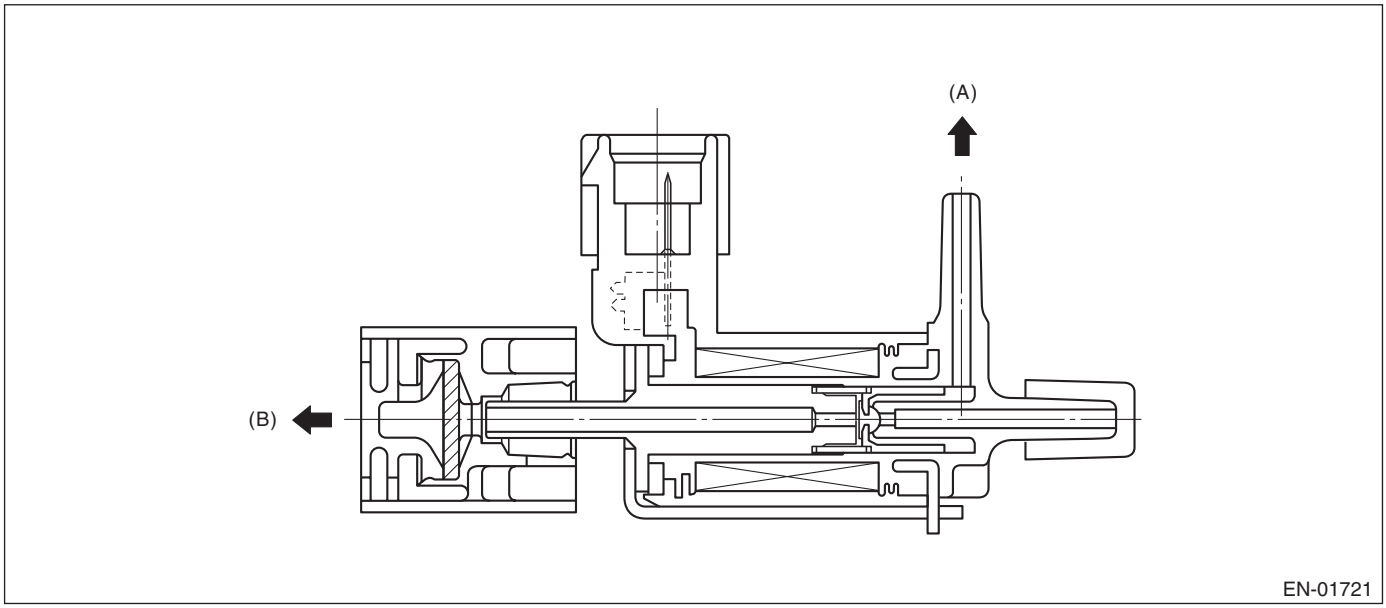
CCV controls the ambient air to be introduced to the canister.



(A) Open (Solenoid OFF)
(B) Close (Solenoid ON)
(C) Filter
(D) Canister

• Tank Pressure Switching Solenoid

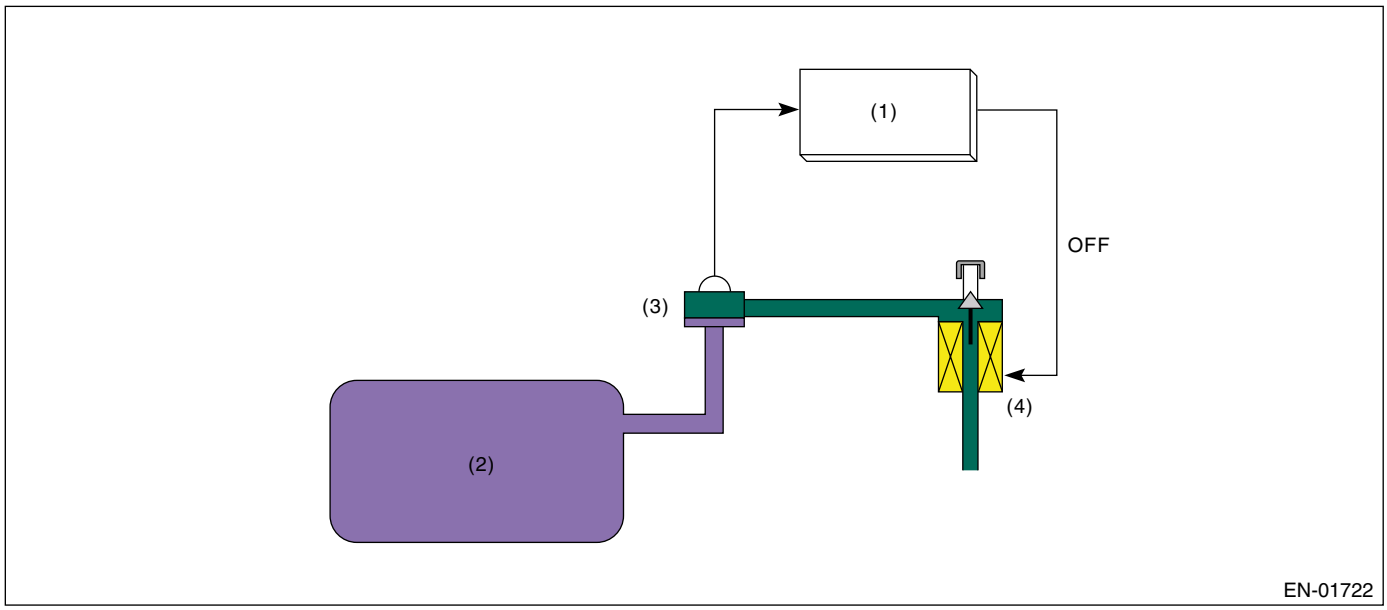
One of the atmospheric pressure switching solenoid valves is connected to fuel tank pressure sensor and the other is released to atmosphere. The passage to fuel tank pressure sensor is usually released to atmosphere because the solenoid is set to OFF, but the solenoid which is set to ON closes the passage open to atmosphere.



(A) Fuel tank pressure sensor
(B) Atmosphere

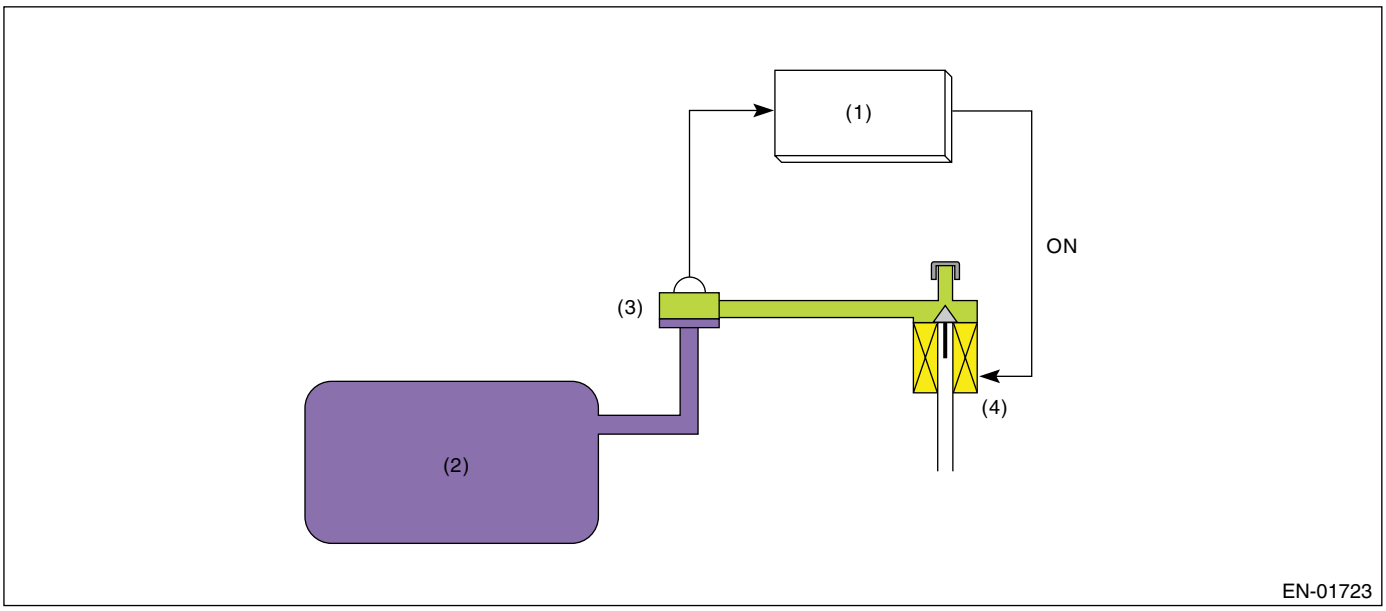
• Purpose of this solenoid

Fuel tank pressure sensor detects the difference between the atmospheric air pressure and the tank pressure and the ECM monitors the pressure difference.
Even if the tank pressure is constant, the atmospheric air pressure varies depending on the driving height, and the pressure signal transmitted to ECM will change.



(1) Engine control module (ECM)
(2) Fuel tank
(3) Fuel tank pressure sensor
(4) Atmospheric pressure switching solenoid

Especially, in the small leakage [0.5 mm (0.02 in)], minute change in the tank pressure has to be detected. This diagnosis period is long (approx. 29 seconds). And if the driving height changes during the diagnosis, the atmospheric air pressure changes. In this case, it becomes difficult to precisely detect the tank pressure variation, causing erroneous diagnosis. Therefore, using the atmospheric pressure switching solenoid, atmospheric air is sealed between the fuel tank pressure sensor and atmospheric pressure switching solenoid, maintaining the air pressure constant and enabling the detection of minute variation of tank pressure.



(1) Engine control module (ECM)
(2) Fuel tank
(3) Fuel tank pressure sensor
(4) Atmospheric pressure switching solenoid

NOTE:
ECM also has the atmospheric air pressure sensor, and always monitors atmospheric air. However, as the monitoring range is large, that is, 53 to 107 kPa (400 to 800 mmHg, 16 to 32 inHg) it is not suitable for detection of minute pressure variation.
In the case of small leakage diagnosis, the tank pressure variation is very small, that is, 0.13 to 0.27 kPa (1 to 2 mmHg, 0.04 to 0.08 inHg) and the fuel tank pressure sensor is equipped.

3. ENABLE CONDITION

0.04-inch Diagnosis

Secondary Parameters	Enable Conditions
Evaporation diagnosis	Incomplete
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Total time of canister purge operation	120 seconds or more
After engine starting	856 seconds or more
Learning value of evaporation gas density	≤ 0.04
Engine speed	1,050 ←→ 6,500 rpm
Fuel tank pressure	−4.0 — 1.03 kPa (−30 — 7.72 mmHg, −1.2 — 0.30 inHg)
Intake manifold vacuum (relative pressure)	< −13.3 kPa (−100 mmHg, −3.92 inHg)
Vehicle speed	≥ 32 km/h (20 MPH)
Fuel level	9 ←→ 51 ℓ (2.38 ←→ 13.5 US gal, 1.98 ←→ 11.2 Imp gal)
Closed air/fuel ratio control	In operation
Fuel temperature	−10 ←→ 45°C (14 ←→ 113°F)
Intake air temperature	≥ −10°C (14°F)
Pressure change per second	< 0.13 kPa (0.95 mmHg, 0.04 inHg)
Min. pressure change per second − Max. pressure change per second	< 0.23 kPa (1.75 mmHg, 0.07 inHg)
Fuel level change	< 2.5 ℓ (0.66 US gal, 0.55 Imp gal)/128 milliseconds
Air fuel ratio	0.76 — 1.25

0.02-inch Diagnosis

Secondary Parameters	Enable Conditions
(At starting a diagnosis)	
EVAP. diagnosis	Incomplete
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Since last incomplete diagnosis event of 0.02-inch leakage	≥ 120 seconds
Total time of canister purge operation	120 second or more
After engine starting	335 second or more
Fuel temperature	−10 ←→ 35°C (14 ←→ 95°F) < 2,400 seconds
Or engine coolant temperature at engine start	< 45°C (113°F)
And time after engine start	< 2,400 seconds
Fuel level	9 ←→ 51 ℓ (2.38 ←→ 13.5 US gal, 1.98 ←→ 11.2 Imp gal)
(Ambient − fuel) temperature	< 1°C (1.8°F)
Fuel tank pressure below −3.01 kPa (−22.8 mmHg, −0.88 inHg) (during same driving cycle)	Up to 2 times
Intake manifold vacuum (relative pressure)	< −13.3 kPa (−100 mmHg, −3.92 inHg)
Fuel tank pressure	−0.13 — 0.91 kPa (−1 — 6.8 mmHg, −0.04 — 0.27 inHg)
Vehicle speed	≥ 68 km/h (42 MPH)
Closed air/fuel ratio control	In operation
Engine speed	1,500 ←→ 3,000 rpm
(During diagnosis)	
P1	−0.13 ←→ 0.13 kPa (−1 ←→ 1 mmHg, −0.04 ←→ 0.04 inHg)
Pressure change per second	< 0.13 kPa (0.96 mmHg, 0.04 inHg)
Fuel level change	1 ←→ 3 ℓ (0.3 ←→ 0.8 US gal, 0.2 ←→ 0.7 Imp gal)
Tank pressure	< 1.03 kPa (7.72 mmHg, 0.30 inHg)
Min. tank pressure change per second − Max. tank pressure change per second	< 0.23 kPa (1.75 mmHg, 0.07 inHg)
Change of atmospheric pressure during P1 calculation	−0.04 ←→ 0.13 kPa (−0.3 ←→ 1 mmHg, −0.01 ←→ 0.04 inHg)
Change of atmospheric pressure during P2 calculation	0 ←→ 0.12 kPa (0 ←→ 0.9 mmHg, 0 ←→ 0.04 inHg)

4. GENERAL DRIVING CYCLE

• 0.04-inch Diagnosis

• Perform the diagnosis only once in more than 856 seconds after the engine start at the constant driving speed of 32 km/h (20 MPH) or more.

• Pay attention to the fuel temperature and fuel level.

• 0.02-inch Diagnosis

• Perform diagnosis in more than 335 seconds after engine start at the constant speed of 68 km/h (42 MPH) or more, and then terminate the diagnosis when judged OK or NG.
• If not judged OK or NG, repeat the diagnosis until judged OK or NG.
• Pay attention to the fuel temperature and fuel level.

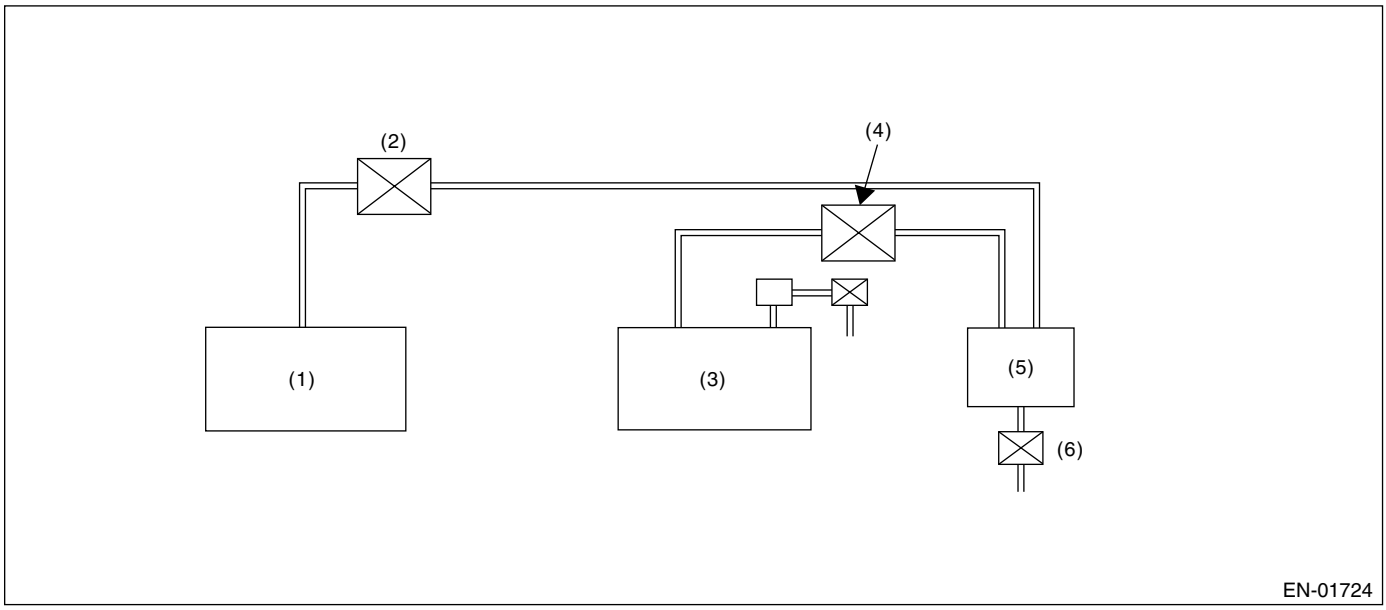
5. DIAGNOSTIC METHOD

• MODE Z (Purge control solenoid valve open malfunction diagnosis, CPC close malfunction diagnosis)

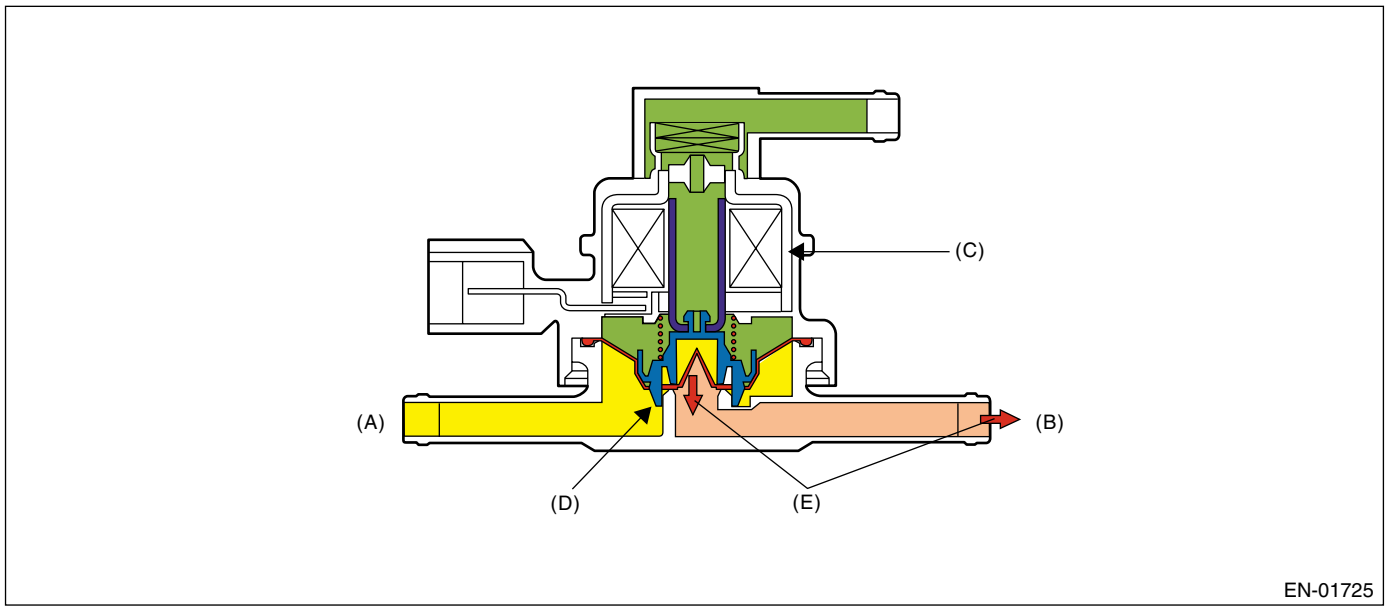
DTC P0457
DTC P1443

• Purpose of Mode Z

When performing the leakage diagnosis of EVAP system, CCV and CPC have to operate normally. Therefore, mode Z is used to diagnose the CCV close fixation and CPC open fixation.
If the CCV closed fixation trouble or CPC open fixation trouble is detected, the EVAP system leakage diagnosis is cancelled.
If the CCV closed fixation trouble occurred, negative pressure is generated from the engine to pressure control solenoid valve when pressure control solenoid valve is closed and CPC is opened. In this status, the pressure control solenoid valve solenoid, which is set to ON, does not open the valve for its structure when the negative pressure is larger than electromagnetic force.



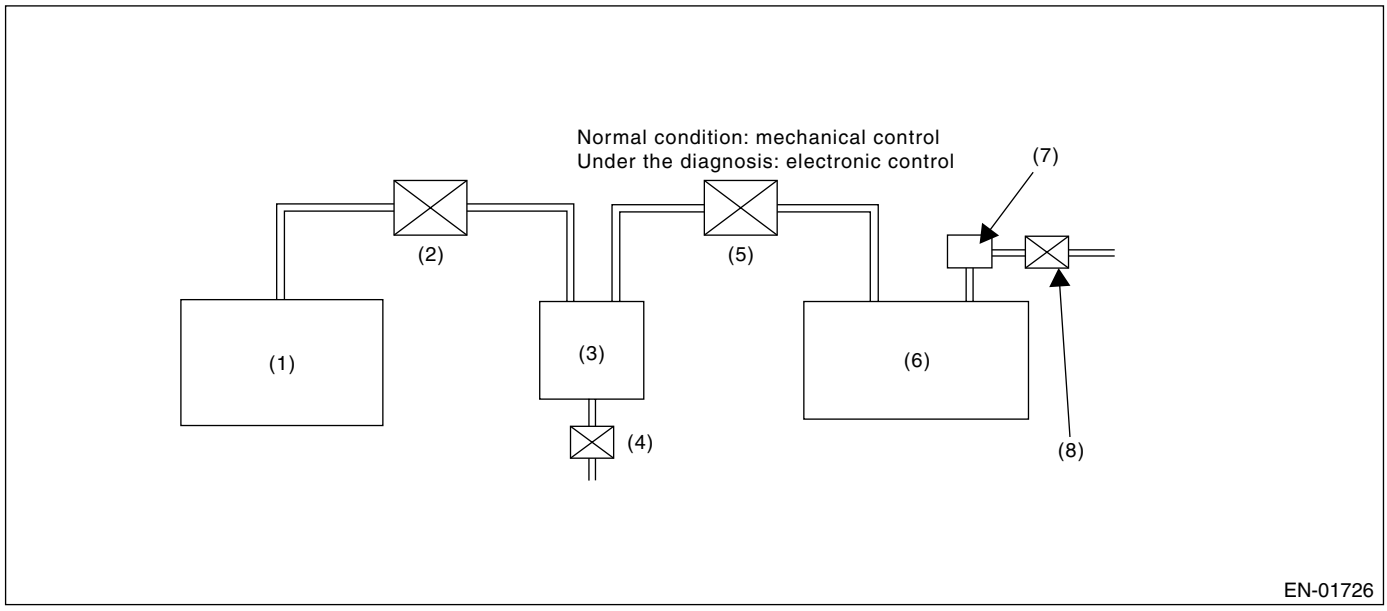
(1) Engine
(2) Purge control solenoid valve open
(3) Fuel tank
(4) Pressure control solenoid valve close
(5) Canister
(6) CCV stuck close



(A) To fuel tank
(B) To canister (Negative pressure)
(C) Solenoid ON
(D) Valve cannot be open.
(E) Negative pressure

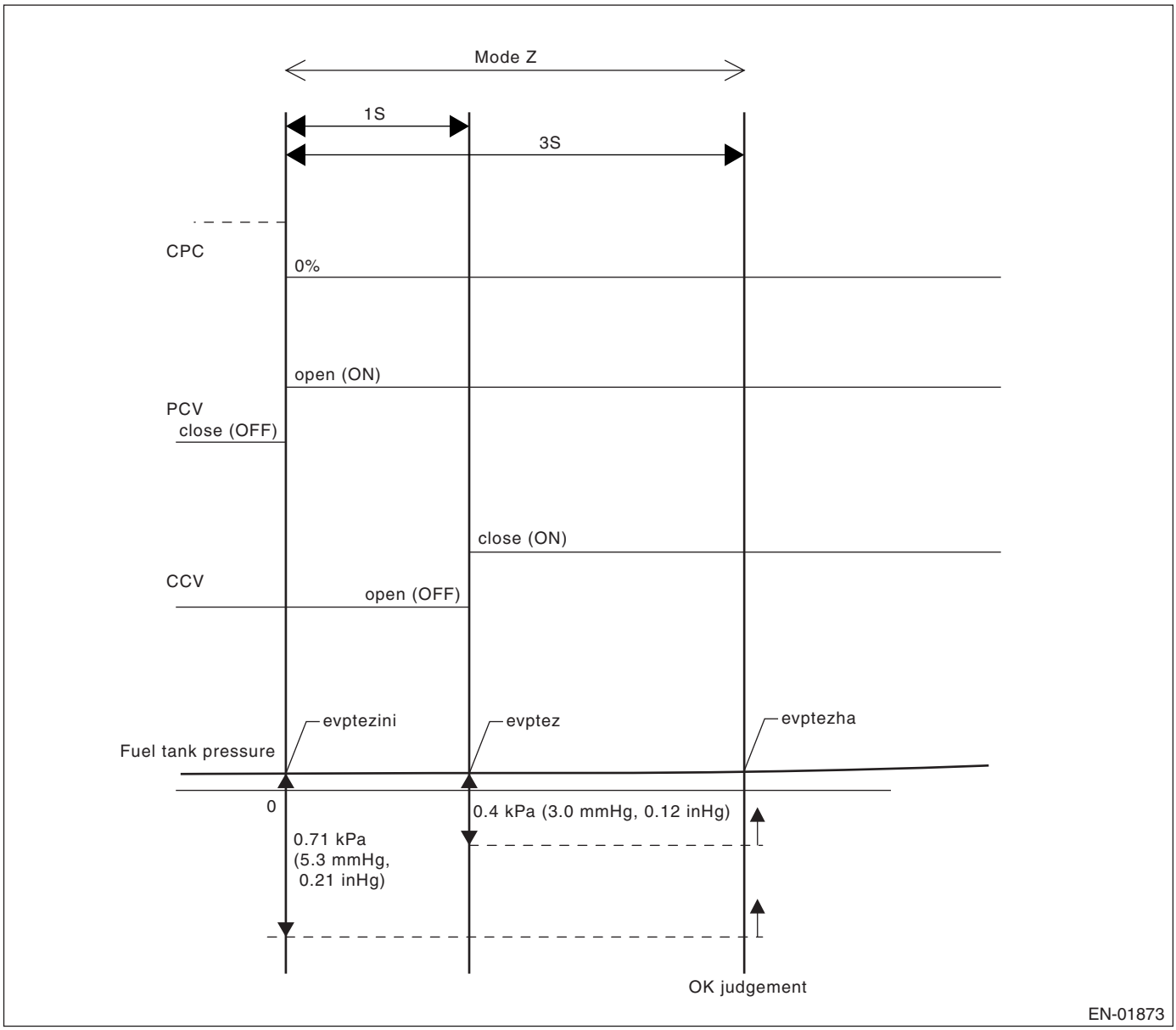
• Diagnostic method

CCV closed fixation diagnosis and CPC open fixation diagnosis are performed in mode Z as shown in the figure below.



(1) Engine
(2) Purge control solenoid valve
(3) Canister
(4) Drain valve
(5) Pressure control solenoid valve
(6) Fuel tank
(7) Fuel tank pressure sensor
(8) Tank pressure switching solenoid valve

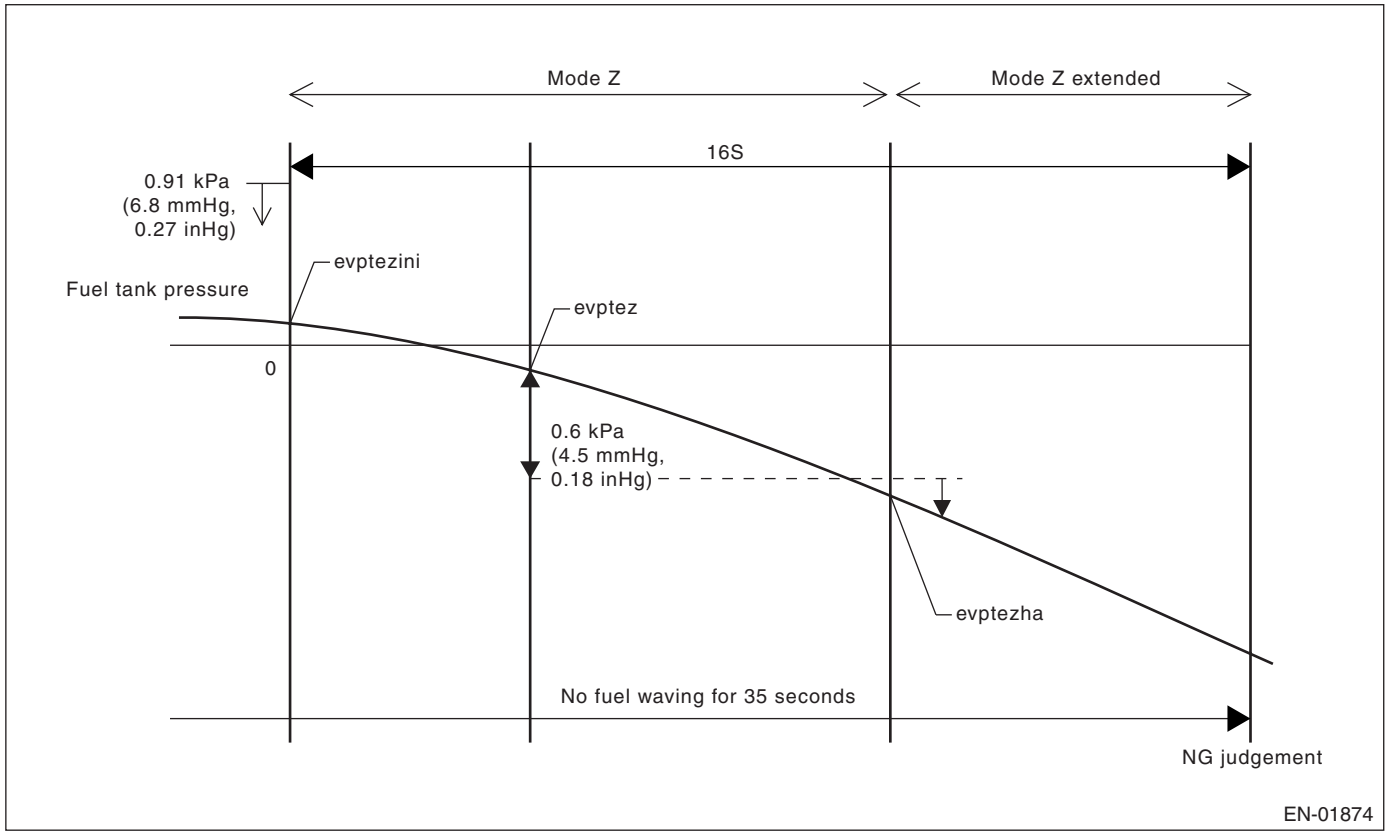
• Normal Operation



- evptez − evptezha ≤ 0.4 kPa (3.0 mmHg, 0.12 inHg)
- evptezini − evptezha ≤ 0.71 kPa (5.3 mmHg, 0.21 inHg)

Judge normal when these calculations are completed.

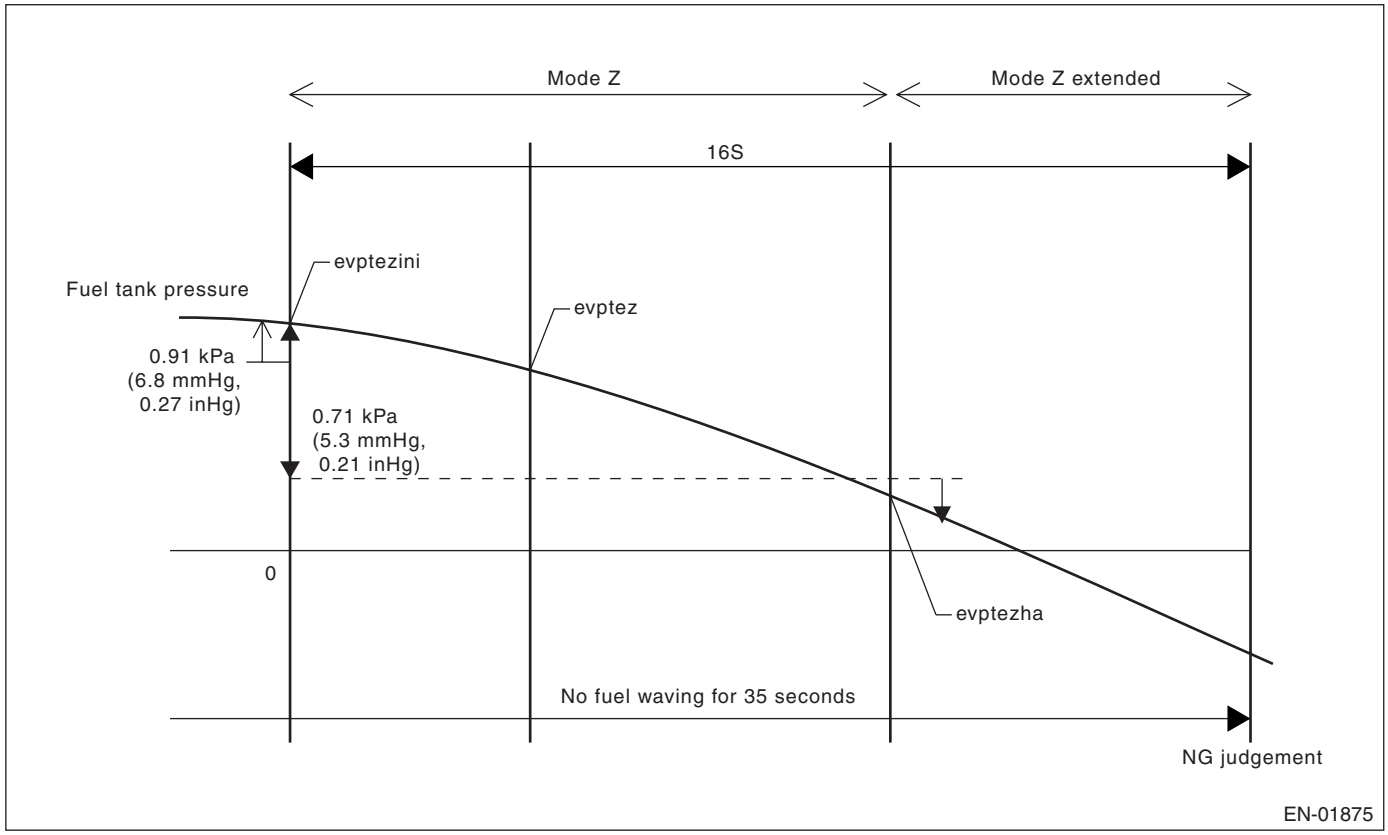
• Purge Control Solenoid Valve Open Fixation



- evptez − evptezha > 0.6 kPa (4.5 mmHg, 0.18 inHg)
- evptezini ≤ 0.91 kPa (6.8 mmHg, 0.27 inHg)
- No fuel rolling of above 32(0.79 US gal, 0.67 Imp gal) for more than 35 seconds.

Judge normal when these calculations are completed.

• Drain Valve close fixation



- evptezini – evptezha > 0.71 kPa (5.3 mmHg, 0.21 inHg)
- evptezini > 0.91 kPa (6.8 mmHg, 0.27 inHg)
- No fuel rolling of above 32(0.79 US gal, 0.67 Imp gal) for more than 35 seconds

Judge normal when these calculations are completed.

• Diagnosing Function of CCV [P1443]

CCV functional diagnosis is performed by monitoring the tank pressure variation in Mode Z.

Normality Judgment

Judge OK and change to Mode A when the criteria below are completed in 3 seconds after Mode Z started.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure in 1 second after Mode Z started) – (Tank pressure when Mode Z finished)	≤ 0.4 kPa (3.0 mmHg, 0.12 inHg)	P1443
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	≤ 0.7 kPa (5.3 mmHg, 0.21 inHg)	P0457

Abnormality Judgment

If OK judgment cannot be made, extend Mode Z 16 seconds more, and judge NG when all the criteria below are completed in 16 seconds.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Tank pressure when Mode Z started	> 0.91 kPa (6.8 mmHg, 0.27 inHg)	P1443
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	> 0.7 kPa (5.3 mmHg, 0.21 inHg)	
No fuel locking time	≥ 35 seconds	

Time Needed for Diagnosis: 16 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
Finish the Evap. diagnosis when making NG judgment for drain valve close fixation.
Cancel the Evap. diagnosis when the OK/NG judgment for drain valve close fixation and purge control solenoid valve open fixation cannot be made in Mode Z.

• Diagnosing function of CPC [P0457]

CPC functional diagnosis is performed by monitoring the tank pressure in Mode Z.

Normality Judgment

Make OK judgment in 3 seconds after Mode Z started, and change to Mode A if OK.
Both diagnostic method and judgment value are the same as PCV normality judgment.

Abnormality Judgment

If OK judgment cannot be made, extend Mode Z 16 seconds more, and judge NG when all the criteria below are completed in 16 seconds.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure in 1 second after Mode Z started) − (Tank pressure when Mode Z finished)	> 0.6 kPa (4.5 mmHg, 0.18 inHg)	P0457
Tank pressure when Mode Z started	≤ 0.91 kPa (6.8 mmHg, 0.27 inHg)	
No fuel locking time	≥ 35 seconds	

Time Needed for Diagnosis: 16 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.
Finish the Evap. diagnosis when making NG judgment for purge control solenoid valve open fixation.
Cancel the Evap. diagnosis when the OK/NG judgment for drain valve close fixation and purge control solenoid valve open fixation cannot be made in Mode Z.

• Leak Diagnosis

DTC P0442
DTC P0456
DTC P0457

• Diagnostic method

• The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.
• The diagnosis is divided into the following five phases.

Mode A; (Estimation of evaporation gas yield)

Calculate the tank pressure variation amount (P1). After calculating P1, change to Mode B.

Mode B; (Seal negative pressure)

Introduce the negative pressure in the intake manifold to the tank.
Approx. 0 → −1.4 kPa (0 → −10.5 mmHg, 0 → −0.41 inHg) (0.04-in diagnosis)
Approx. 0 → −3.05 kPa (0 → −22.9 mmHg, 0 → −0.9 inHg) (0.02-in diagnosis)
When the pressure above (desired negative pressure) is reached, Mode C is entered.
In this case, if the tank pressure does not become the desired negative pressure, judge that there is a large leakage in the system.
Judge NG when the malfunction criteria below is completed.
Finish the Evap. diagnosis when judging large leak (10 seconds or 25 seconds) in 0.04-inch diagnosis. Cancel the diagnosis (10 to 20 seconds) in 0.02-inch diagnosis.

Abnormality Judgment

Judge NG (large leak) when the criteria below are completed in the specified time.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(0.04-inch diagnosis) Time for reaching desired negative pressure Or time for Mode B (Min. value of tank pressure during Mode B) − (Tank pressure when Mode B started)	 ≥ 25 seconds ≥ 10 seconds < −0.5 kPa (−4 mmHg, −0.16 inHg)	P0457

Mode C; (Check increasing pressure)

Stop the introduction of negative pressure. (Wait until returning target pressure.)
When returning to target pressure, move to Mode D.
Judge immediate OK and change to Mode E when it does not return in spite of spending the specified time.

	Target pressure	Time for immediate OK judgment
0.04-inch diagnosis	−1.3 kPa (−9.75 mmHg, −0.38 inHg)	15 seconds
0.02-inch diagnosis	−3 kPa (−22.5 mmHg, −0.89 inHg)	20 seconds

Mode D; (Measurement of negative pressure changes)

Monitor the tank pressure variation in Mode D. In this case, the tank pressure increases, that is, the pressure becomes as high as the atmospheric air pressure, because evaporator is generated. However, if any leakage exists, the pressure increases additionally in proportion to this leakage. The pressure variation of this tank is P2.
After calculating P2, perform small leak diagnosis and change to Mode E if normal. Complete Evap. diagnosis if abnormal.

• After Mode D

Assigning P1 and P2, which are tank variations measured in Mode A and Mode B, to the formula below, judge the small leakage of the system. If the measured judgment value exceeds the threshold value, it is judged to be malfunction.

• 0.04-inch Diagnosis

Abnormality Judgment

Judge NG when the criteria below are completed and judge OK when not completed.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 − 1.5 × P1 P2: Change of tank pressure within 16 seconds on Mode D P1: Change of tank pressure within 16 seconds on Mode A	> Value on map 7. *Threshold value: Figure (Fuel level vs Tank temperature)	P0442

***1.5:** Compensation value of the amount of evaporator occurrence. (Because evaporator increases more when becoming negative pressure.)

Map 7 Limit of malfunction criteria for 0.04-inch leak as Evap. diagnosis.

Fuel temperature & Fuel level	5°C (41°F)	15°C (59°F)	25°C (77°F)	35°C (95°F)	45°C (113°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.49 kPa (3.68 mmHg, 0.14 inHg)	0.49 kPa (3.68 mmHg, 0.14 inHg)	0.53 kPa (3.95 mmHg, 0.16 inHg)	0.54 kPa (4.07 mmHg, 0.16 inHg)	0.56 kPa (4.17 mmHg, 0.16 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.50 kPa (3.77 mmHg, 0.15 inHg)	0.51 kPa (3.79 mmHg, 0.15 inHg)	0.53 kPa (4.01 mmHg, 0.16 inHg)	0.56 kPa (4.17 mmHg, 0.16 inHg)	0.57 kPa (4.27 mmHg, 0.17 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.51 kPa (3.85 mmHg, 0.15 inHg)	0.52 kPa (3.90 mmHg, 0.15 inHg)	0.54 kPa (4.06 mmHg, 0.16 inHg)	0.57 kPa (4.27 mmHg, 0.17 inHg)	0.60 kPa (4.48 mmHg, 0.18 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.65 kPa (4.88 mmHg, 0.19 inHg)	0.65 kPa (4.90 mmHg, 0.19 inHg)	0.66 kPa (4.98 mmHg, 0.20 inHg)	0.71 kPa (5.32 mmHg, 0.21 inHg)	0.76 kPa (5.73 mmHg, 0.23 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.79 kPa (5.96 mmHg, 0.23 inHg)	0.79 kPa (5.96 mmHg, 0.23 inHg)	0.79 kPa (5.96 mmHg, 0.23 inHg)	0.85 kPa (6.38 mmHg, 0.25 inHg)	0.88 kPa (6.60 mmHg, 0.26 inHg)

• 0.02-inch Diagnosis

Abnormality Judgment

Judge NG when the criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 − 1.5 × P1 P2: Change of tank pressure within 16 seconds on Mode D P1: Change of tank pressure within 16 seconds on Mode A	> Value on map 8. *Threshold value: Figure (Fuel level vs Tank temperature)	P0456

Map 8 Limit of malfunction criteria for 0.02-inch leak as Evap. diagnosis.

Fuel temperature & Fuel level	15°C (59°F)	25°C (77°F)	35°C (95°F)	40°C (104°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.56 kPa (4.19 mmHg, 0.16 inHg)	0.59 kPa (4.40 mmHg, 0.18 inHg)	0.62 kPa (4.66 mmHg, 0.18 inHg)	0.66 kPa (4.92 mmHg, 0.19 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.63 kPa (4.70 mmHg, 0.19 inHg)	0.65 kPa (4.88 mmHg, 0.19 inHg)	0.70 kPa (5.27 mmHg, 0.21 inHg)	0.79 kPa (5.89 mmHg, 0.23 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.69 kPa (5.20 mmHg, 0.20 inHg)	0.71 kPa (5.35 mmHg, 0.21 inHg)	0.78 kPa (5.87 mmHg, 0.23 inHg)	0.83 kPa (6.20 mmHg, 0.24 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.75 kPa (5.65 mmHg, 0.22 inHg)	0.78 kPa (5.83 mmHg, 0.23 inHg)	0.85 kPa (6.39 mmHg, 0.25 inHg)	0.88 kPa (6.58 mmHg, 0.26 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.81 kPa (6.10 mmHg, 0.24 inHg)	0.84 kPa (6.30 mmHg, 0.25 inHg)	0.92 kPa (6.90 mmHg, 0.27 inHg)	0.95 kPa (7.10 mmHg, 0.28 inHg)

Normality Judgment

Judge OK when the criteria below are completed.

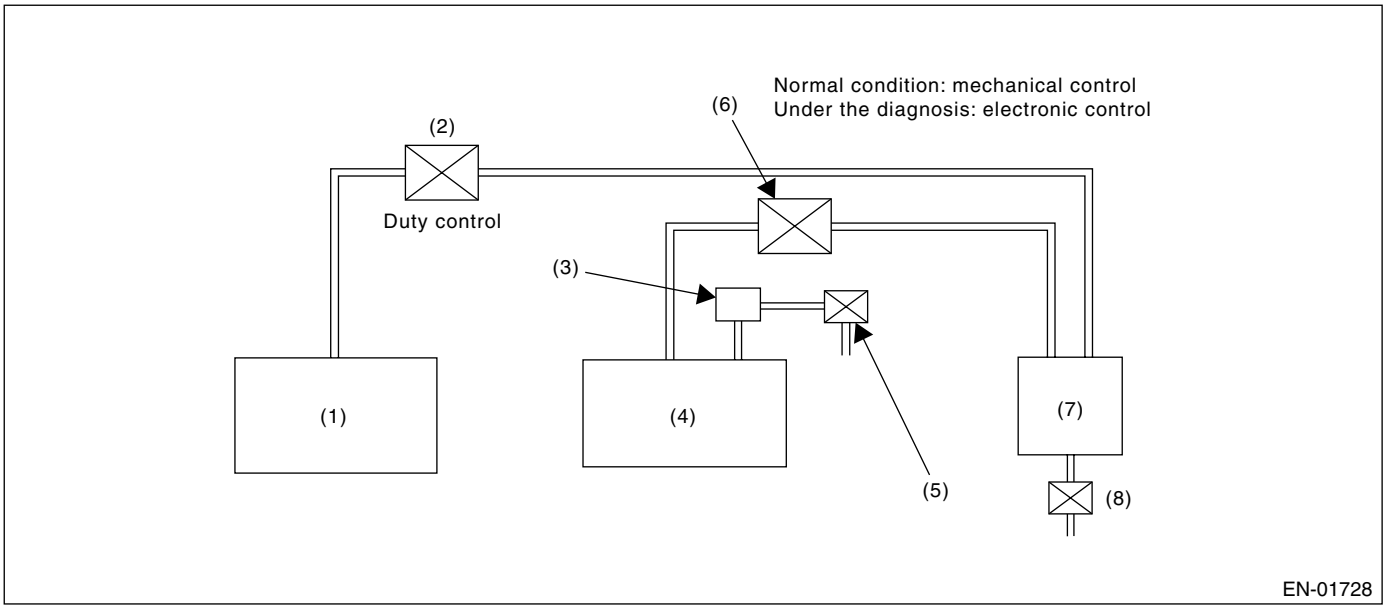
Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 − 1.5 × P1	< Valve on map 9.	P0456

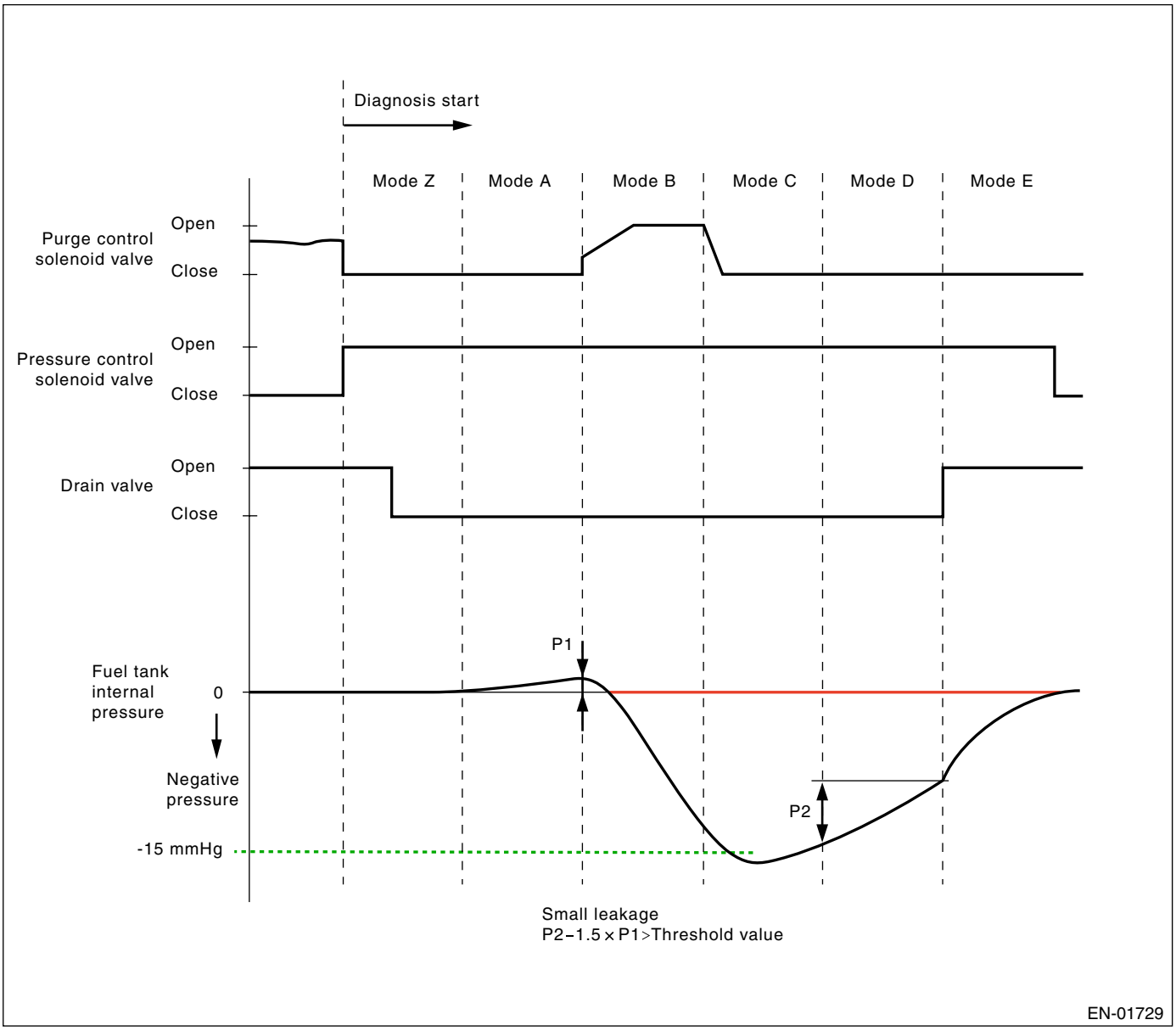
Map 9.

Fuel temperature & Fuel level	15°C (59°F)	25°C (77°F)	35°C (95°F)	40°C (104°F)
10 L (2.6 US gal, 2.2 Imp gal)	2.00 kPa (15.0 mmHg, 0.59 inHg)	3.33 kPa (25.0 mmHg, 0.98 inHg)	4.66 kPa (35.0 mmHg, 1.38 inHg)	5.33 kPa (40.0 mmHg, 1.57 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.36 kPa (2.69 mmHg, 0.11 inHg)	0.39 kPa (2.90 mmHg, 0.11 inHg)	0.42 kPa (3.16 mmHg, 0.12 inHg)	0.46 kPa (3.42 mmHg, 0.13 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.43 kPa (3.20 mmHg, 0.12 inHg)	0.45 kPa (3.38 mmHg, 0.13 inHg)	0.50 kPa (3.77 mmHg, 0.15 inHg)	0.59 kPa (4.39 mmHg, 0.17 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.49 kPa (3.70 mmHg, 0.15 inHg)	0.51 kPa (3.85 mmHg, 0.15 inHg)	0.58 kPa (4.37 mmHg, 0.17 inHg)	0.63 kPa (4.70 mmHg, 0.19 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.61 kPa (4.60 mmHg, 0.18 inHg)	0.64 kPa (4.80 mmHg, 0.19 inHg)	0.72 kPa (5.40 mmHg, 0.21 inHg)	0.75 kPa (5.60 mmHg, 0.22 inHg)

If not judged OK or NG, repeat the diagnosis until judged OK or NG.



(1) Engine
(2) Purge control solenoid valve
(3) Fuel tank pressure sensor
(4) Fuel tank
(5) Atmospheric pressure switching solenoid
(6) Pressure control solenoid valve
(7) Canister
(8) Drain valve



• CCV Property Diagnosis [P1443]

Mode E;

The tank pressure must become again as high as the atmospheric air pressure after the evaporation diagnosis (normal judgment on Mode C or after Mode D). If the tank pressure does not become as high as the atmospheric air pressure, judge that CCV is blocked.
Judge NG when the criteria below are completed.

Malfunction Criteria	Threshold Value	DTC
Fuel tank pressure difference from the end of EVAP sys. diagnosis to 4 seconds later	< 0.36 kPa (2.72 mmHg, 0.11 inHg)	P1443

Time Needed for Diagnosis:

0.04-inch:	50 — 70 seconds
0.02-inch:	90 — 105 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric purge solenoid function malfunction; Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

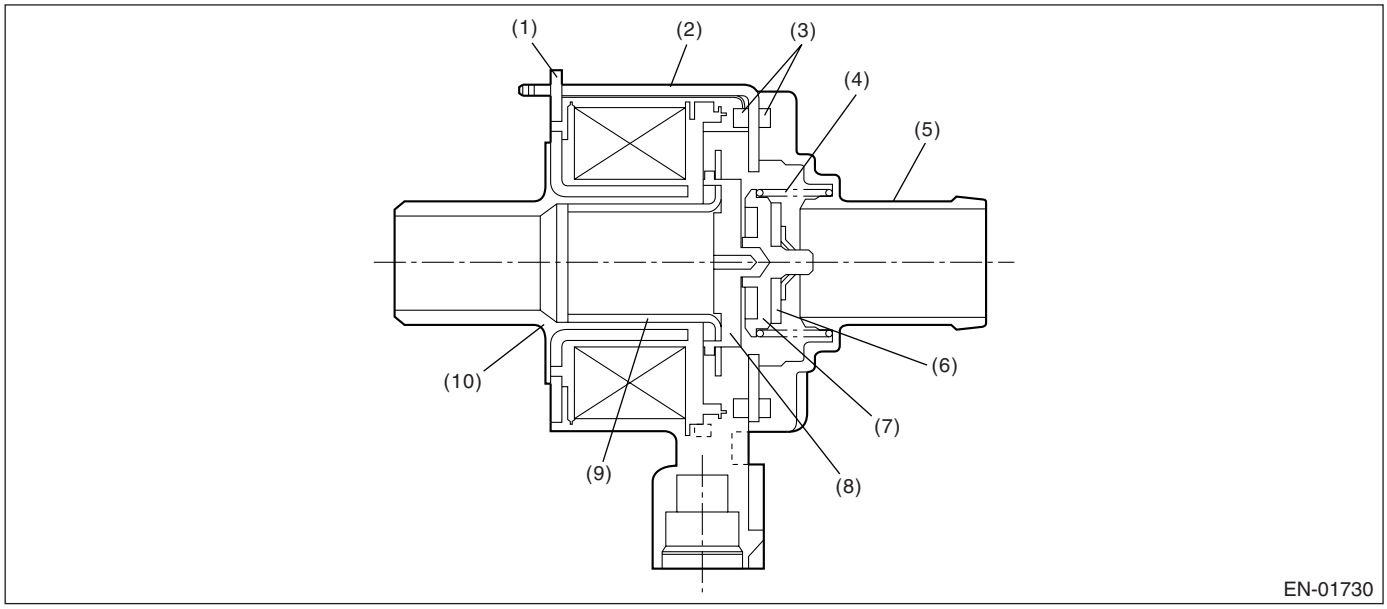
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

BB:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.
Judge NG when the ECM output level is different from the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Magnetic plate
(2) Yoke
(3) Packing
(4) Spring
(5) Valve seat
(6) Valve
(7) Plate
(8) Retainer
(9) Movable core
(10) Bobbin

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends OFF signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

PCV control: Open the PCV solenoid.

9. ECM OPERATION AT DTC SETTING

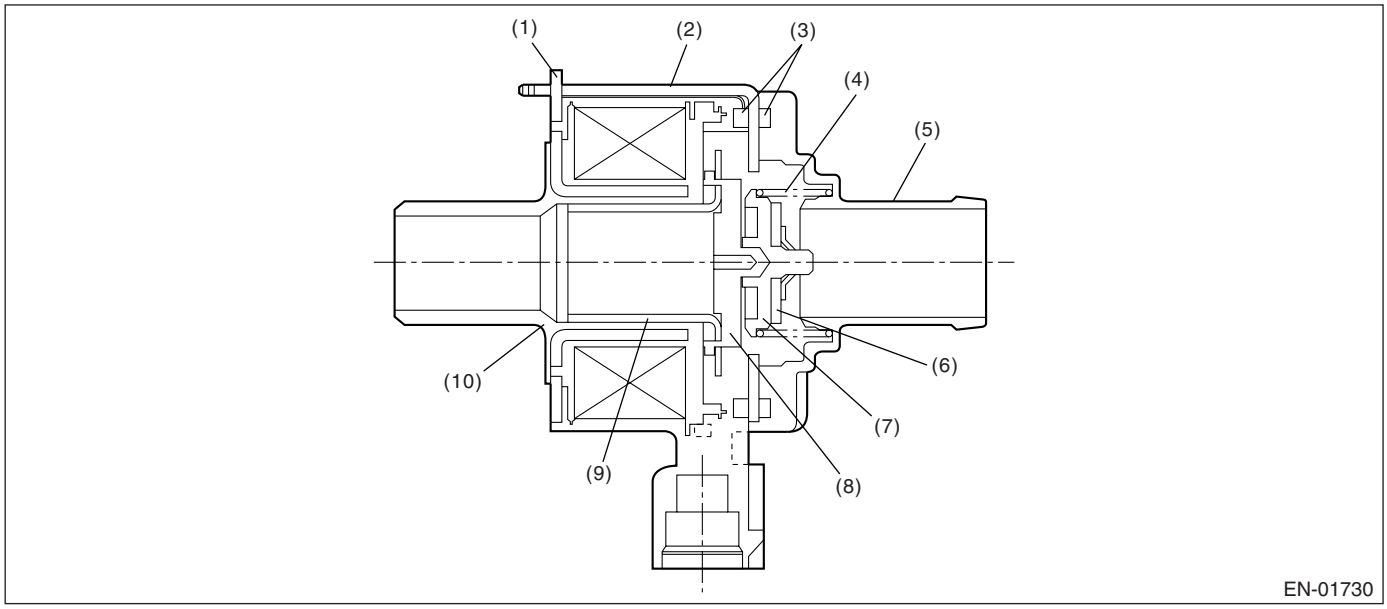
Memorize the freeze frame data. (For test mode $02)

BC:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.
Judge NG when the ECM output level is different from the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Magnetic plate
(2) Yoke
(3) Packing
(4) Spring
(5) Valve seat
(6) Valve
(7) Plate
(8) Retainer
(9) Movable core
(10) Bobbin

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends ON signal	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends ON signal	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

PCV control: Open the PCV solenoid.

9. ECM OPERATION AT DTC SETTING

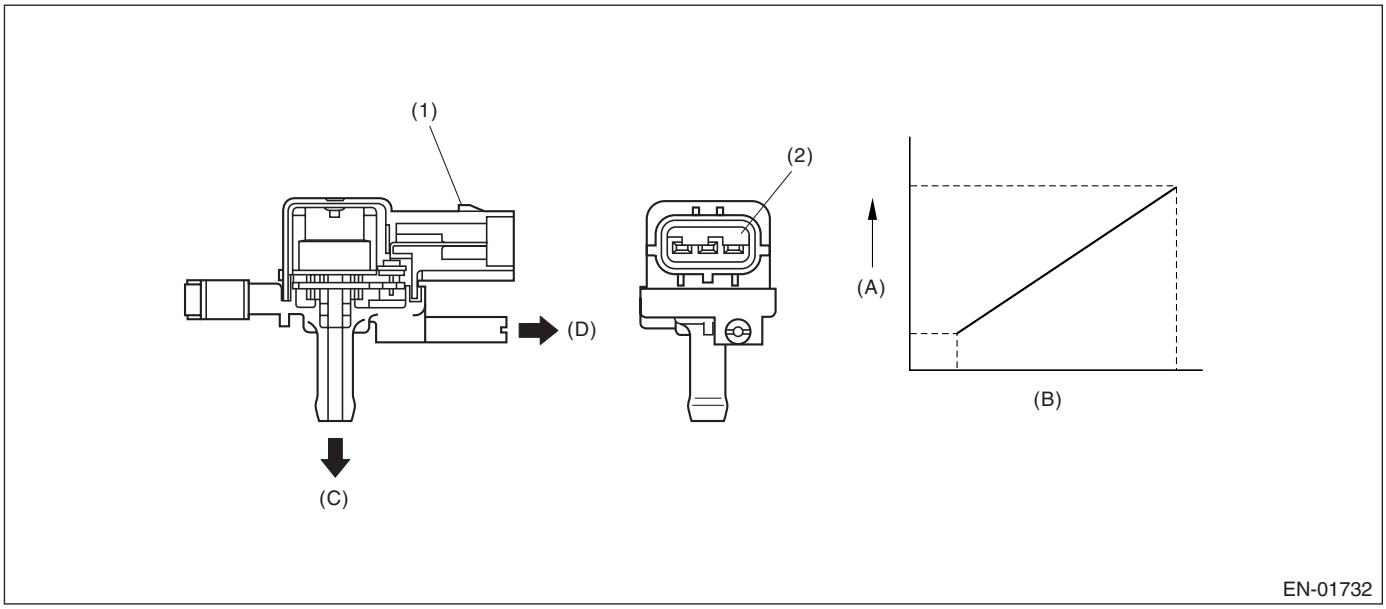
Memorize the freeze frame data. (For test mode $02)

BD:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.
Judge NG when there is no pressure variation, which should exist in the tank, considering the engine status.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After starting the engine	60 second or more
Fuel level	≥ 18 ℓ (4.76 US gal, 3.96 Imp gal)
Fuel temperature	< 35°C (95°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Engine speed	< 6,500 rpm

4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously in 60 seconds or more after starting the engine.
- Be sure to check the fuel level and fuel temperature.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below is completed.
Judgment Value

Malfunction Criteria	Threshold Value
Number of times when the difference between the Max. fuel level and the Min., fuel level every 60 seconds is 2 ℓ (0.53 US gal, 0.44Imp gal) or more (with enable condition completed)	≥ 16 times
Max. − Min. tank pressure (with enable condition completed)	< 0.05 kPa (0.375 mmHg, 0.02 inHg)
Max. − Min. fuel temperature (with enable condition completed)	≥ 7°C (44.6 °F)

If the fuel level (Max. − Min.) in every 60 seconds is less than 2 ℓ , extend 60 seconds more and make judgment with the Max. and Min. fuel level in 120 seconds.
If the difference did not appear though the time extended, extend the time (180, 240, 300 seconds) and continue the judgment.
Diagnosis counter will count up when the difference of fuel level (Max. − Min.) is more than 2 ℓ .
Time Needed for Diagnosis: 1 second × 16 times or more
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.
Judgment Value

Malfunction Criteria	Threshold Value
Max. − Min. tank pressure	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

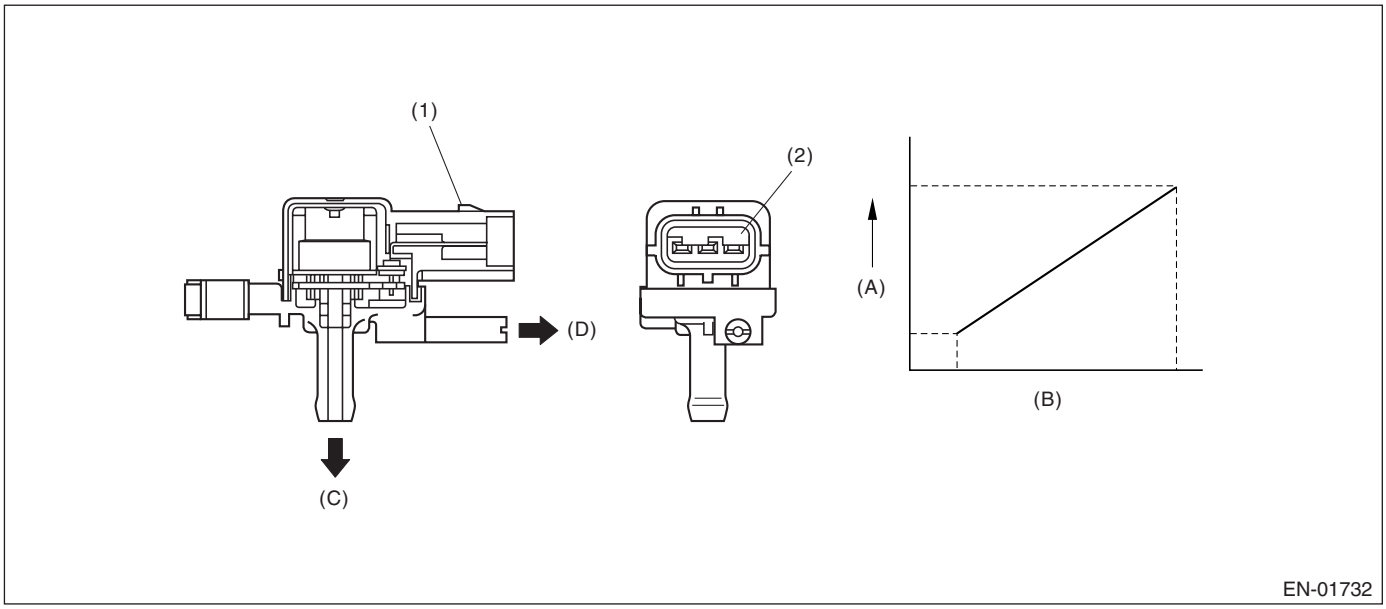
Memorize the freeze frame data. (For test mode $02)

BE:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION (USED WITH HIGH SIDE NORMAL/ABNORMAL JUDGMENT)

Secondary Parameters	Enable Conditions
Continuous time of completing all condition	≥ 5 seconds
Vehicle speed	≥ 2 km/h (1 MPH)
All conditions of EVAP canister purge	Possible
Learning value of EVAP conc. during purge	≤ 0.08
Feedback lambda coefficient	≥ 0.9
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 15 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< –7.45 kPa (–55.85 mmHg, –2.20 inHg)
Feedback lambda coefficient	≥ 0.9

Time Needed for Diagnosis: 15 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ –7.33 kPa (–55 mmHg, –2.17 inHg)
Feedback lambda coefficient	≥ 0.9

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

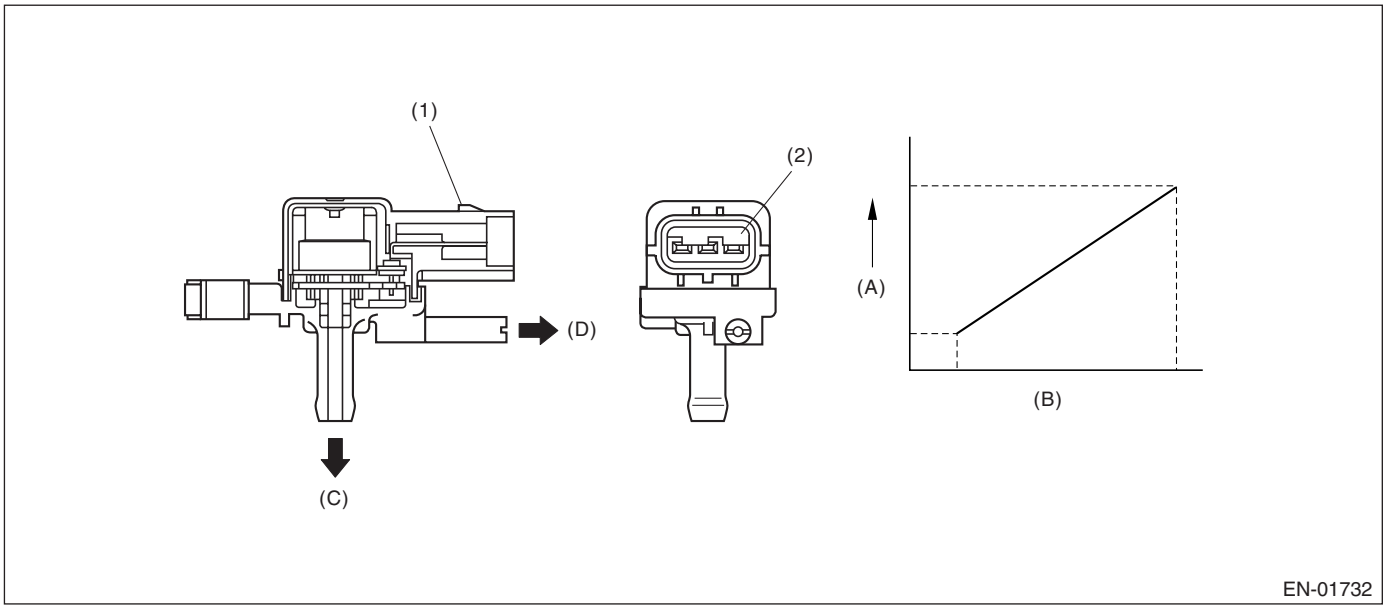
Memorize the freeze frame data. (For test mode $02)

BF:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the breaking/shortage of the fuel tank pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Connector
(2) Terminal
(A) Output voltage
(B) Input voltage
(C) To fuel tank
(D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time when all conditions are completed.	≥ 5 seconds
Vehicle speed	≥ 2 km/h (1.24 MPH)
All conditions of EVAP canister purge	Complete
Evaporation gas density learning value	≤ 0.08
Main feedback compensation coefficient	≥ 0.9
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis when purging.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 15 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.98 kPa (59.85 mmHg, 2.36 inHg)
Fuel temperature	< 35°C (95°F)
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)

Time Needed for Diagnosis: 15 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.33 kPa (55 mmHg, 2.17 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BG:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(STi)-112, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BH:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)

1. OUTLINE OF DIAGNOSIS

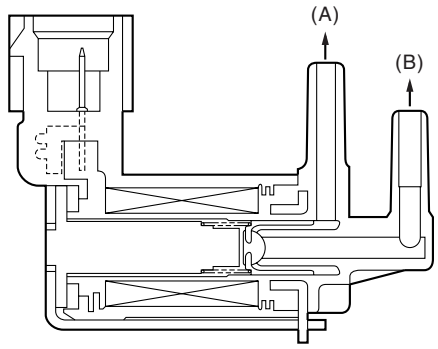
For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(STi)-112, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BI: DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



EN-01733

(A) To canister
(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of completing criteria below.	≥ 2.5 seconds
Duty ratio of 'ON'	< 75%
Terminal output voltage	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.
Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

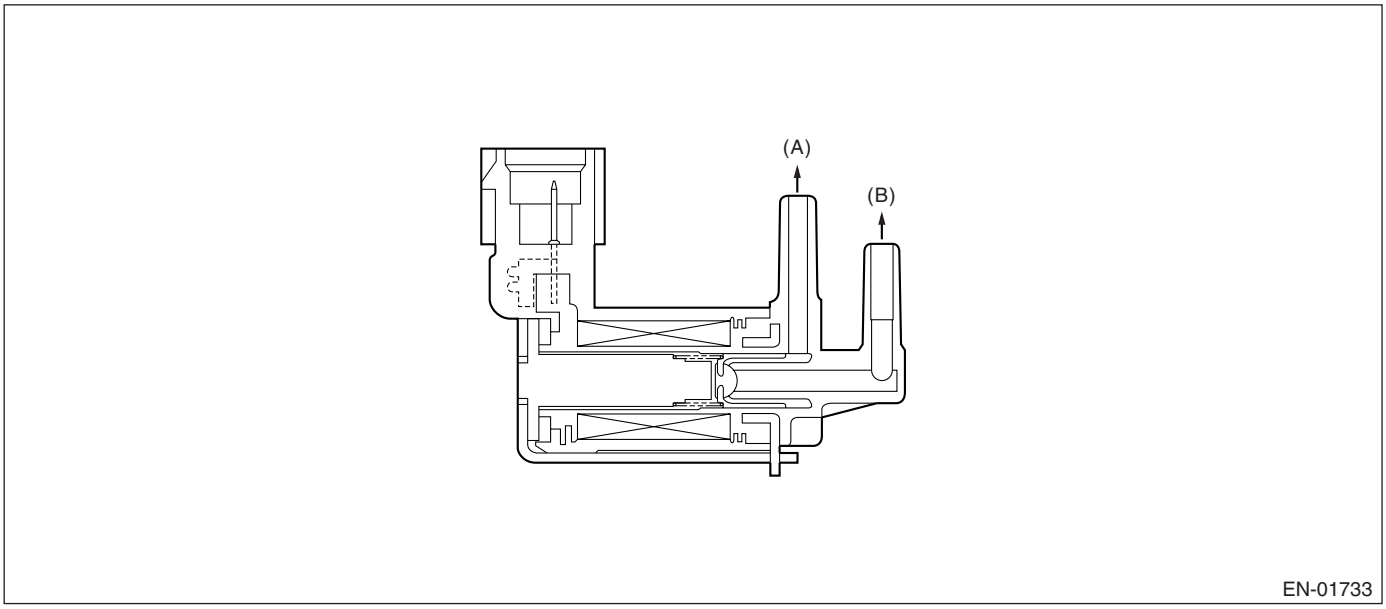
Memorize the freeze frame data. (For test mode $02)

BJ:DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) To canister
(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of completing criteria below.	≥ 2.5 seconds
Duty ratio of 'ON'	≥ 25%
Terminal output voltage	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.
Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

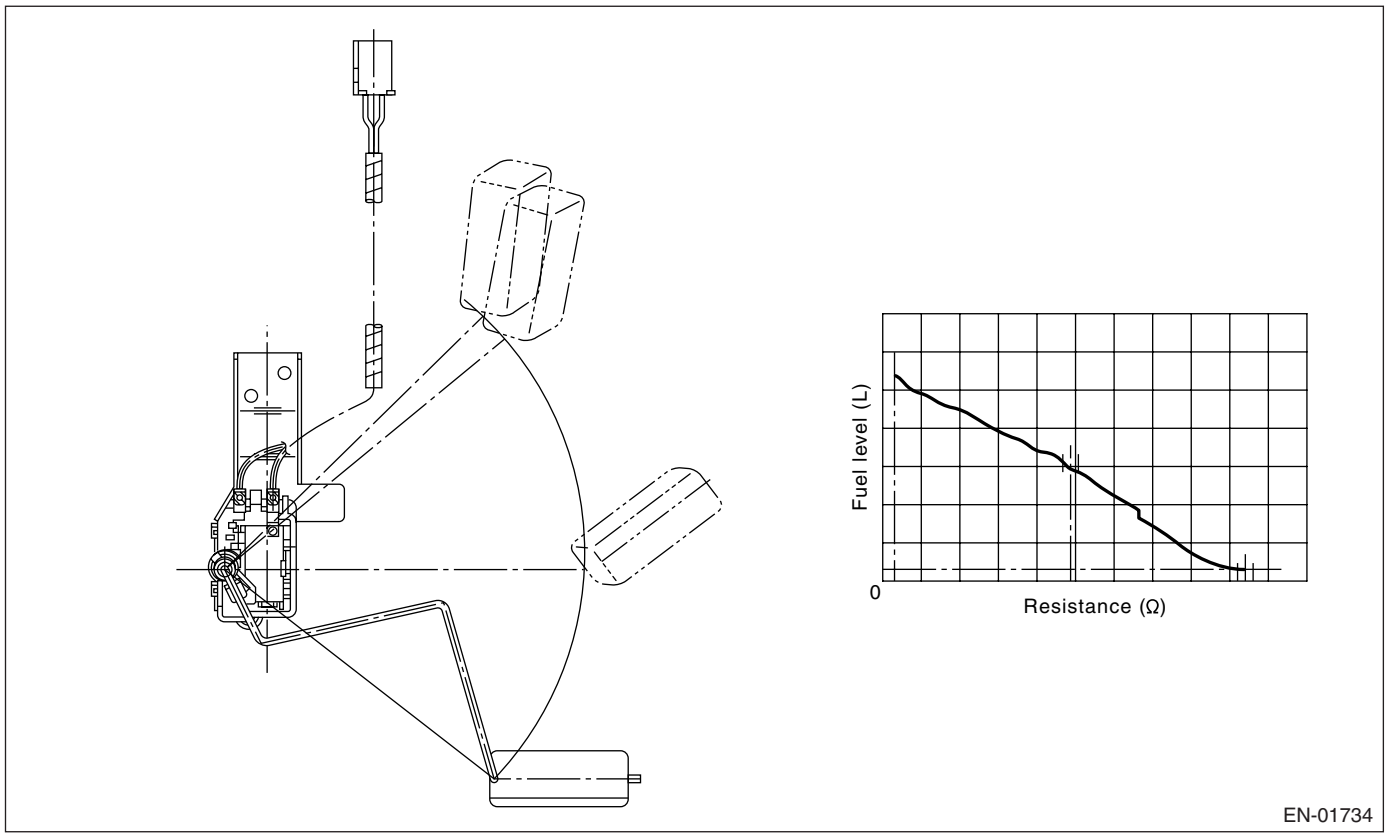
Memorize the freeze frame data. (For test mode $02)

BK:DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel level sensor output property.
Judge NG when the fuel level does not vary whereas it seemed to vary be in a usual driving speed.

2. COMPONENT DESCRIPTION



3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max.– Min. fuel level output	< 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
Engine speed	< 6,500 rpm
After engine start	More than 5 seconds

Time Needed for Diagnosis: To be determined.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max.– Min. fuel level output	≥ 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
Engine speed	< 6,500 rpm
After engine start	More than 5 seconds

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

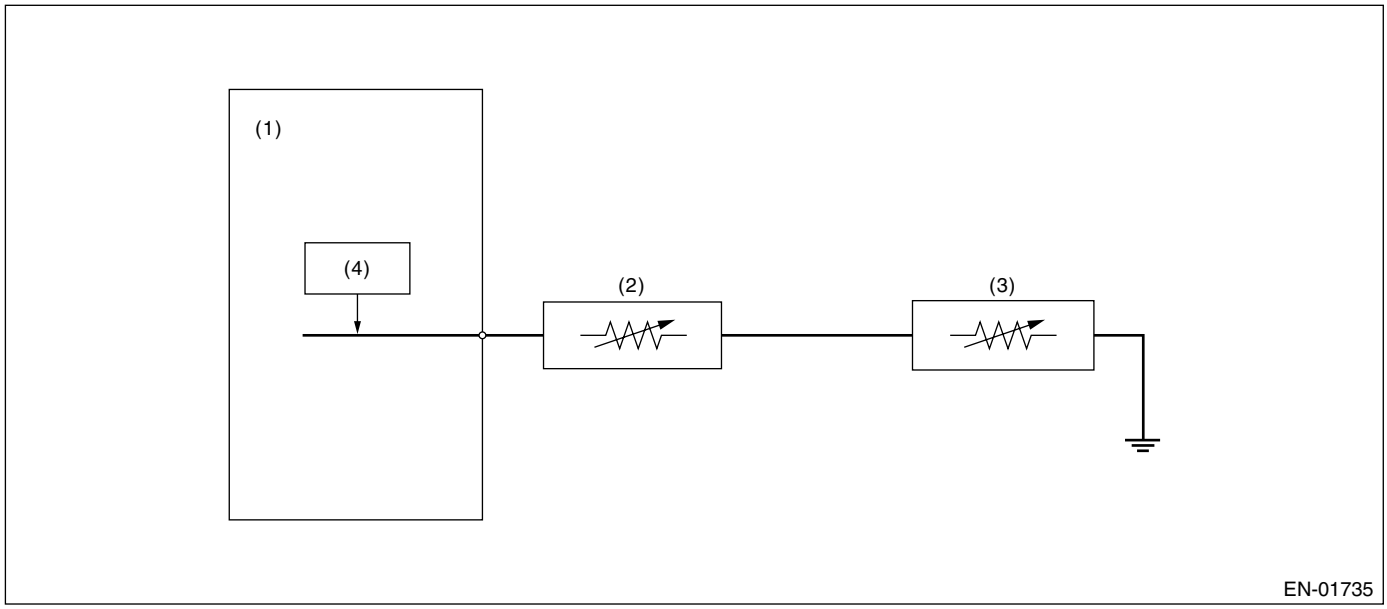
Memorize the freeze frame data. (For test mode $02)

BL:DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	< 0.015 V

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	≥ 0.015 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

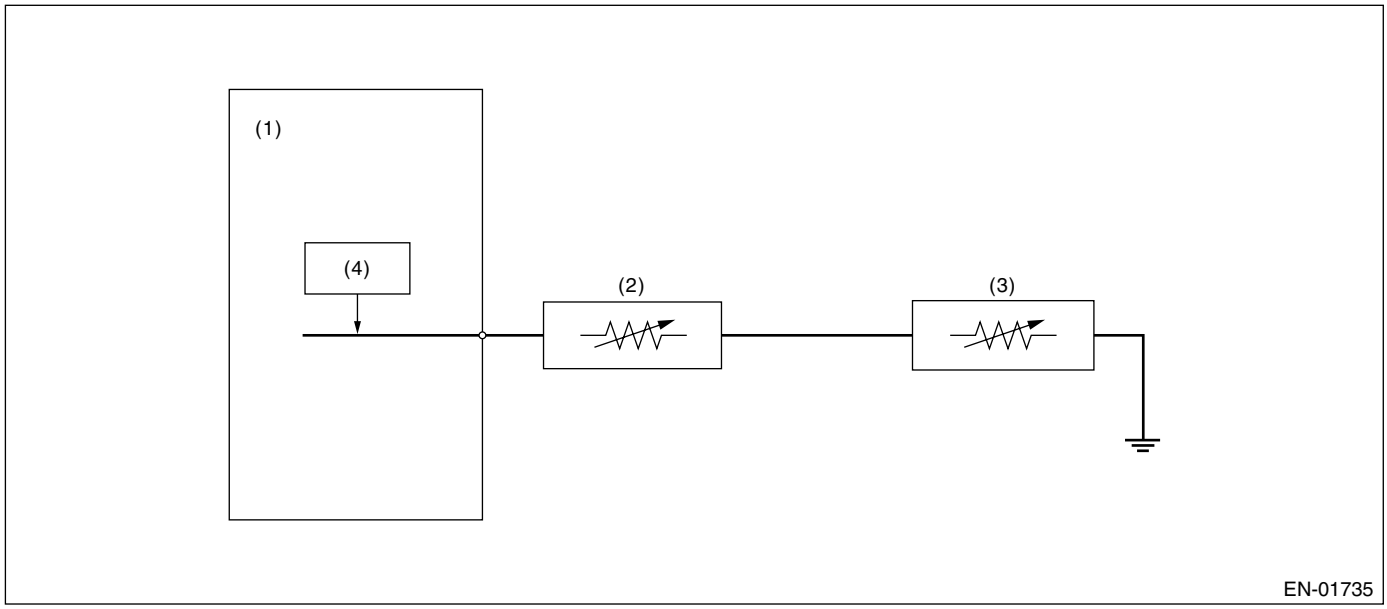
Memorize the freeze frame data. (For test mode $02)

BM:DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Fuel level sensor
(3) Fuel sub level sensor
(4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (one second).

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	≥ 4.958 V

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	< 4.958 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BN:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of unstable output from fuel level sensor caused by noise.
Judge NG when the max. value and cumulative value of output voltage variation of fuel level sensor is larger than the threshold value.

2. ENABLE CONDITION

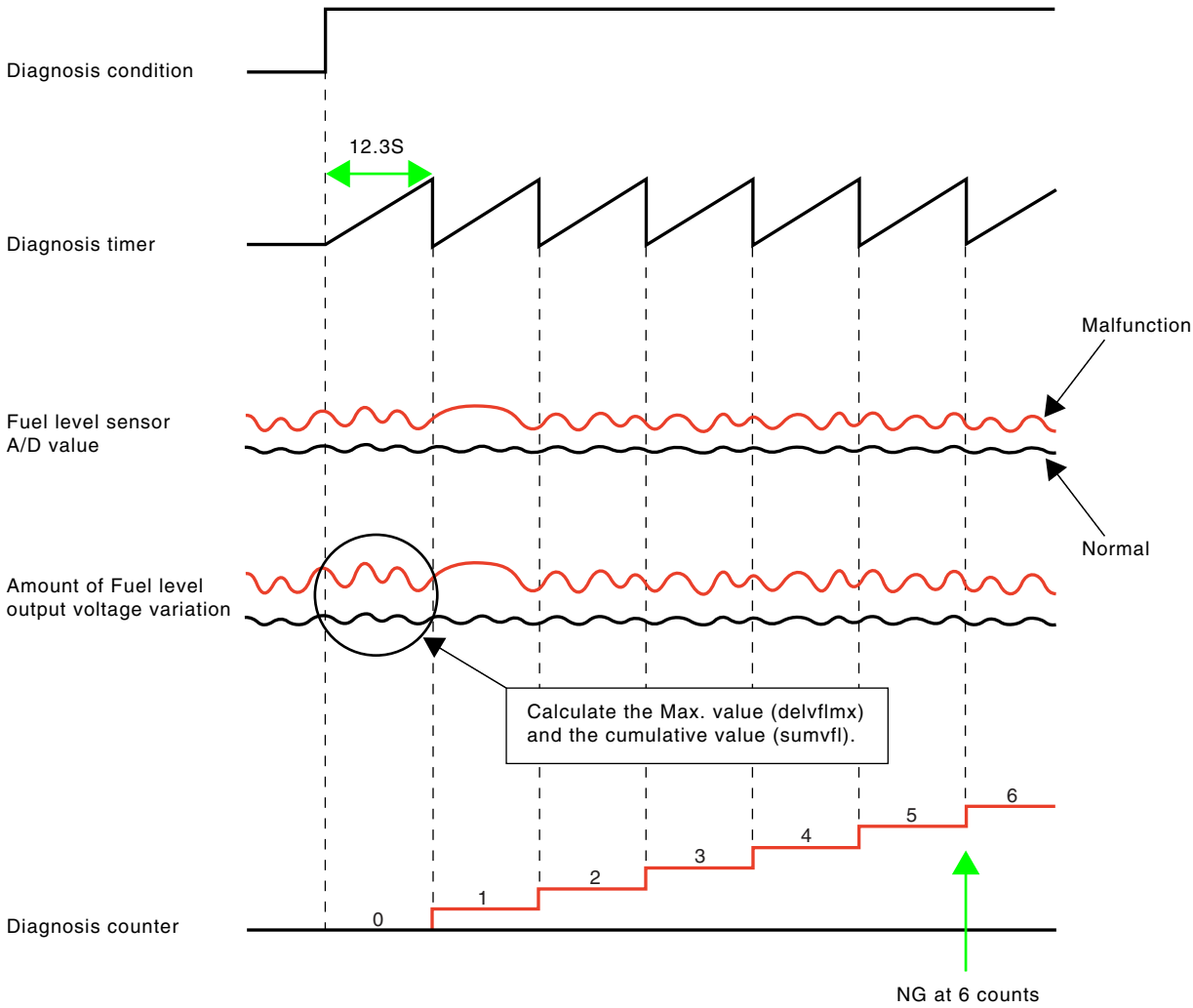
Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
After engine starting	1 second or more
Ignition switch	ON
Battery voltage	> 10.9 V
Idle switch	ON
Fuel level	9 ←→ 51 ℓ (2.4 ←→ 13.4 US gal, 1.98 ←→ 11.2 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	10 seconds or more

3. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously in idling condition.
- Pay attention to the fuel level.

4. DIAGNOSTIC METHOD

Calculate the Max. value (delflmax) and cumulative value (sumfl) of output voltage variation of fuel level sensor during 12.3 seconds. Judge it normal when both max. and cumulative values are not over the threshold value. Otherwise, when either of them is over the threshold value, count the diagnosis counter up. And judge NG if the counter indicated 6 counts.



• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Integrated times of the condition reaching follows, DELFLMAX ≥ 0.2 V or SUMFL ≥ 15 V where, DELFLMAX is Max. deviation of sensor output during 12.3 seconds. SUMFL is integrated value of sensor output deviation during 12.3 seconds.	≥ 4 times

Do not count the diagnosis counter up when the following conditions are completed during 12.3 seconds.

Max – Min of tank pressure during 12.3 seconds	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)
Max – Min of battery voltage during 12.3 seconds	≥ 0.4 V

Time Needed for Diagnosis: 12.3 seconds × 4 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
DELFLMAX	< 0.2 V
SUMFL Where, DELFLMAX is Max. deviation of sensor output during 12.3 seconds. SUMFL is integrated value of sensor output deviation during 12.3 seconds.	< 15 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BO:DTC P0483 COOLING FAN RATIONALITY CHECK

1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the radiator fan.
Judge NG when the engine coolant temperature slowly decreases even when the radiator fan is rotating.

2. ENABLE CONDITION

Diagnostic enable condition is completed if the radiator fan changes from OFF to ON when all of the conditions below are completed. When one of the conditions below is not completed, the diagnostic enable condition is not completed.

Secondary Parameters	Enable Conditions
Engine Speed	600 — 900 rpm
Idle switch	ON
Vehicle speed	< 2 km/h (1.2 MPH)
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the radiator fan changes from OFF to ON when idling.

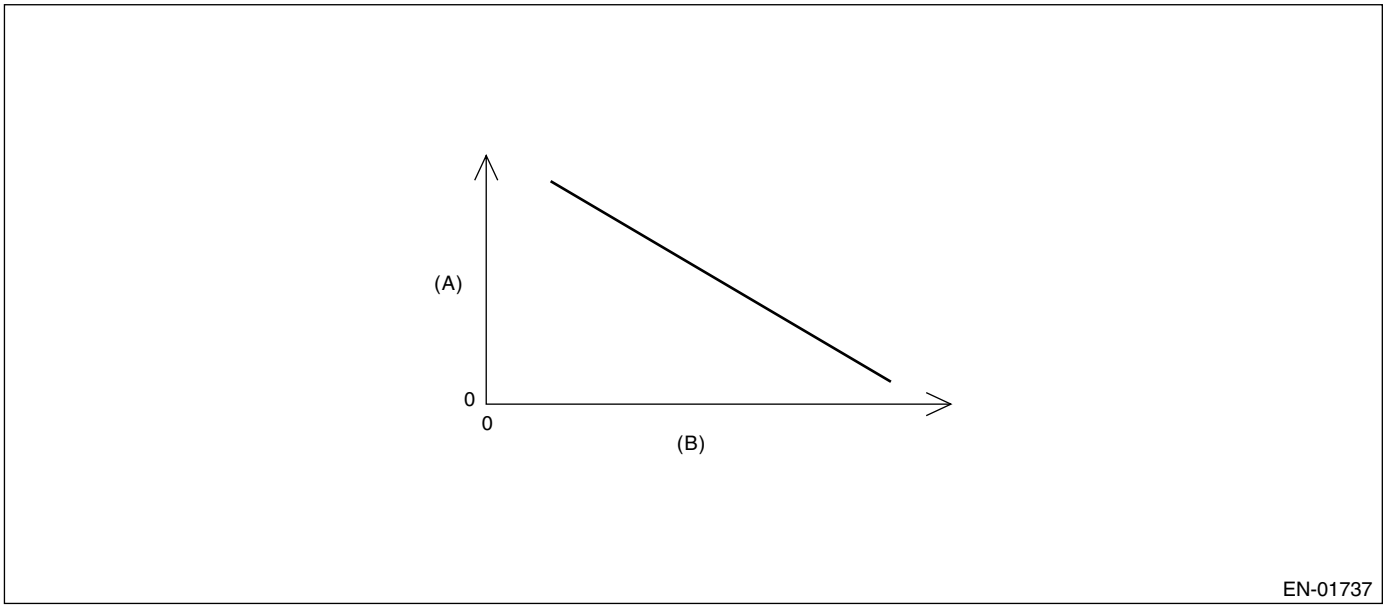
4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 minutes.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 96°C (204.8°F)
Engine coolant temperature sensor A/D value − Engine coolant temperature sensor A/D value Min. value (Min. value with radiator fan OFF → ON)	< 15 mV (Approx. 1°C (1.8°F))



(A) Engine coolant temperature °C (°F)
(B) A/D value (V)

Time Needed for Diagnosis: 5 minutes

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature sensor A/D value − Engine coolant temperature sensor A/D value Min. value (Min. value with radiator fan OFF → ON)	≥ 15 mV (Approx. 1°C (1.8°F))

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BP:DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.
Judge NG when low vehicle speed (0 km/h (0 MPH)) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4,000 rpm
Fuel cut in decel.	Operating
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 4 seconds.
Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1

Time Needed for Diagnosis: 4 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.
• Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 1
Starter switch	OFF
Time after starter switch ON → OFF	≥ 3 seconds

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

- Accelerator sensor signal process: Not allowed all closed points learning.
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on “and” of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Set the open loop compensation to specified value (1 g/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Hi drive both main/sub.
- Judge gear ratio: Control as gear fixed on 6th.
- Tumble generator valve control: Open the tumble generator valve.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BQ:DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.
Judge NG when high vehicle speed (240 km/h (149.1 MPH) or more) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4,000 rpm
Fuel cut in decel.	Operating
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 4 seconds.
Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 240

Time Needed for Diagnosis: 4 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.
• Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 300
Starter switch	OFF
Time after starter switch ON → OFF	≥ 3 seconds

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

- Accelerator sensor signal process: Not allowed all closed points learning.
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on “and” of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Set the open loop compensation to specified value (1 g/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Hi drive both main/sub.
- Judge gear ratio: Control as gear fixed on 6th.
- Tumble generator valve control: Open the tumble generator valve.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BR:DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling.
Judge NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
After engine starting	10 seconds or more
Feedback in ISC	In operation
Measured lambda	0.90 ←→ 1.1
After air condition switching ON-OFF, OFF-ON	5 seconds or more
After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg)	> 5 seconds
After neutral switch ON-OFF event	> 5 seconds
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Always perform diagnosis during idling after engine warmed.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds × 3 times).

Judgment Value

Malfunction Criteria	Threshold Value
Actual − target engine speed	< −100 rpm
Feedback correction for idle air control solenoid valve	Max.

Time Needed for Diagnosis: 10 seconds × 3 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Actual − target engine speed	≥ −100 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel.
Knock compensation:

- Knock compensation final retard/advance value: Knock compensation value + Total learning compensation value + Partial learning compensation value
- AT normal: Knock compensation value = Fixed on 0°CA
- AT abnormal: Knock compensation value ≠ Fixed on 0°CA (Maximum 12°CA retard on knocking)
- Not allowed to refresh learning compensation coefficient
- Not allowed to calculate partial learning zone compensation value

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BS:DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling.
Judge NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
After engine starting	10 seconds or more
Feedback in ISC	In operation
Lambda	0.90 ←→ 1.1
After air condition switching ON-OFF, OFF-ON	5 seconds or more
After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg)	> 5 seconds
After neutral switch ON-OFF event	> 5 seconds
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Always perform diagnosis during idling after engine warmed.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds × 3 times).

Judgment Value

Malfunction Criteria	Threshold Value
Actual – target eng. speed	≥ 200 rpm
Feedback correction for idle air control solenoid valve	Min.

Time Needed for Diagnosis: 10 seconds × 3 times
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Actual – target eng. speed	< 200 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel.
Knock compensation:

- Knock compensation final retard/advance value: Knock compensation value + Total learning compensation value + Partial learning compensation value
- AT normal: Knock compensation value = Fixed on 0°CA
- AT abnormal: Knock compensation value ≠ Fixed on 0°CA (Maximum 12°CA retard on knocking)
- Not allowed to refresh learning compensation coefficient
- Not allowed to calculate partial learning zone compensation value

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BT:DTC P0512 STARTER REQUEST CIRCUIT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.
Judge ON NG when the starter SW signal remains to be on.
Judge OFF NG when the engine starts without starter experience.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 minutes.

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	> 500 rpm
Starter SW	ON
Battery voltage	> 8 V

Time Needed for Diagnosis: 180 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge ON OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Starter SW	OFF
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BU:DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that engine speed increases more than that in normal condition during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Feedback in ISC	In operation
Vehicle speed	< 4 km/h (2.49 MPH)
After engine starting	1 seconds or more

3. GENERAL DRIVING CYCLE

Always perform diagnosis at less than 4 km/h (2.49 MPH) of vehicle speed.

4. DIAGNOSTIC METHOD

• Abnormality Judgment 1

Judge NG when the continuous time until completing the all malfunction criteria below becomes more than the time needed for diagnosis (2 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	≥ 1,000 rpm
Feedback value for ISC	≤ 0
Engine speed change every 180 degree engine rev.	≥ –5 rpm

• Abnormality Judgment 2

Judge NG when the continuous time until completing the all malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	≥ 1,000 rpm
Feedback value for ISC	≤ 0

Time Needed for Diagnosis: 2 seconds or 5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	< 200 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Fuel shut-off: Shut-off fuel for only #1 and #2 cylinder, or for all cylinder in accordance with vehicle speed, engine speed, throttle position

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BV:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the micro-computer (RAM).
Judge NG when either the main CPU normal RAM or sub CPU normal RAM is abnormal. Judge OK when both of them are normal.
At initial routine, write the data to all area of RAM. Judge OK when same data can be read out, and judge NG when same data cannot be read out.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

Perform the diagnosis in the initial routine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis immediately after IG key SW is turned ON.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Main CPU normal RAM abnormality	
Write 5AA5A55A, and read out. (All area of RAM)	Cannot be read out 5AA5A55A.
Or write A55A5AA5, and read out. (All area of RAM)	Cannot be read out A55A5AA5.
Sub CPU normal RAM abnormality.	
Write 5AA5, and read out. (All area of RAM)	Cannot be read out 5AA5.
Or write A55A, and read out. (All area of RAM)	Cannot be read out A55A.

Time Needed for Diagnosis: 100 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Main CPU normal RAM abnormality	
Write 5AA5A55A, and read out. (All area of RAM)	Cannot be read out 5AA5A55A.
Or write A55A5AA5, and read out. (All area of RAM)	Cannot be read out A55A5AA5.
Sub CPU normal RAM abnormality.	
Write 5AA5, and read out. (All area of RAM)	Cannot be read out 5AA5.
Or write A55A, and read out. (All area of RAM)	Cannot be read out A55A.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

BW:DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

1. OUTLINE OF DIAGNOSIS

Judge NG when SUM value of ROM is out of the standard value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
SUM value of ROM	Standard value

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only at engine stop)

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Stop the current to electric control throttle motor. (Fix the throttle opening angle to 6°.)

8. ECM OPERATION AT DTC SETTING

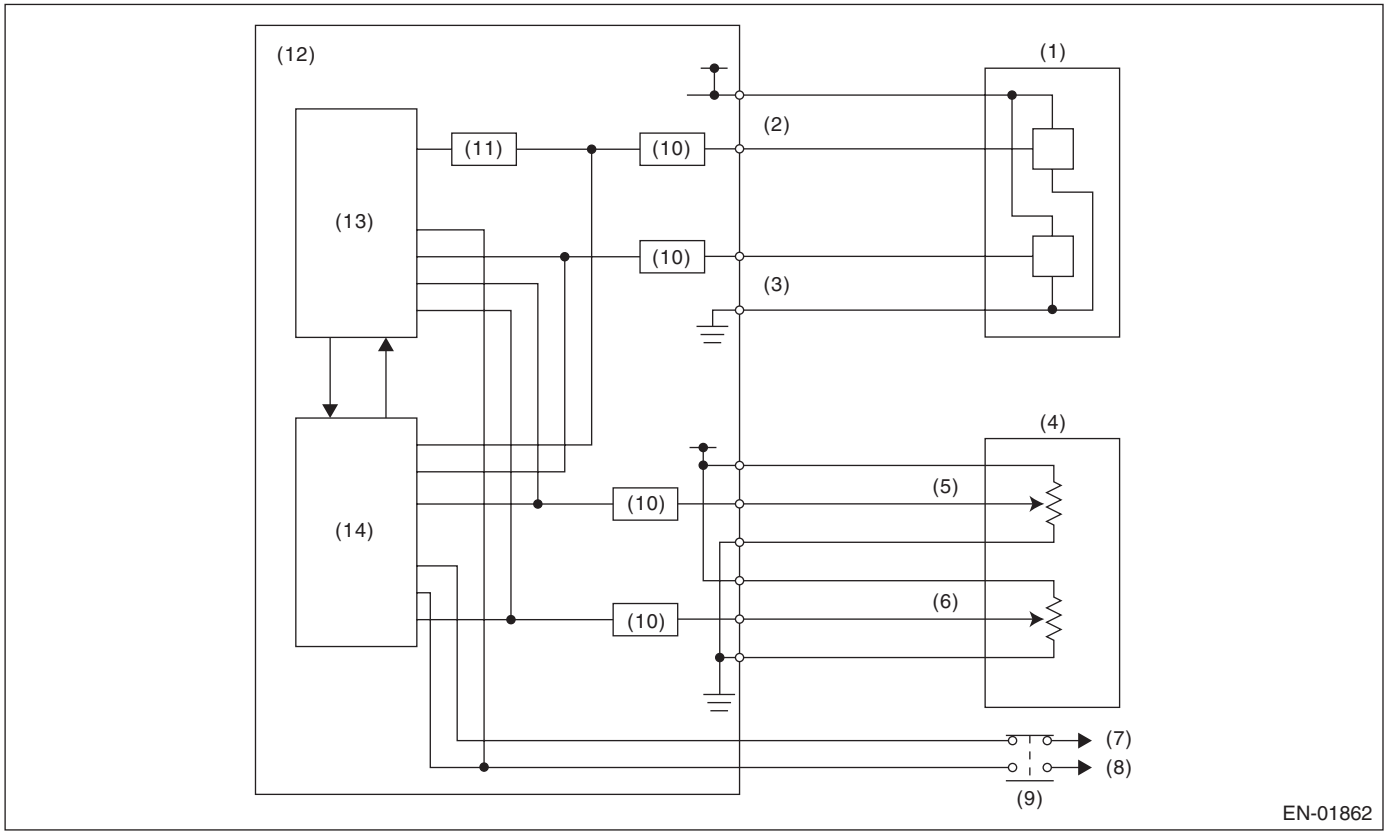
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnosis value and malfunction criteria value. (For test mode $06)

BX:DTC P0607 CONTROL MODULE PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge NG when either the following is completed.
- When the read value of throttle position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the read value of accelerator position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the sub CPU operates abnormally.
- When the communication between main CPU and sub CPU is abnormal.
- When the input amplifier circuit of throttle position sensor 1 is abnormal.
- When the cruise control cannot be canceled correctly.
- When the signal of brake SW1 and 2 is mismatched.
- When the directed angle from main CPU is abnormal.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor
(2) Throttle position sensor 1
(3) Throttle position sensor 2
(4) Accelerator pedal position sensor
(5) Accelerator pedal position sensor 1
(6) Accelerator pedal position sensor 2
(7) Battery
(8) Stop light
(9) Brake switch
(10) I/F circuit
(11) Amplifier circuit
(12) Engine control module (ECM)
(13) Sub CPU
(14) Main CPU

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Ignition switch	ON
None	—
None	—
Throttle opening angle	
Brake SW (with cruise control)	ON
None	—
Cruise control	OFF

4. GENERAL DRIVING CYCLE

(1) — (4): Always perform the diagnosis continuously.
(5): Always perform the diagnosis continuously on idling.
(6): Perform the diagnosis when the brake pedal is depressed.
(7): Always perform the diagnosis continuously.
(8): Always perform the diagnosis continuously when the cruise control pedal is not operating.

5. DIAGNOSTIC METHOD

Judge OK and clear NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
(1) Difference of CPU on reading value of throttle position sensor signal	Within 0.12 V
(2) Difference of CPU on reading value of accelerator position sensor signal	Within 0.07 V
(3) WD pulse from sub CPU	WD pulse occur
(4) Communication between CPU	Possible to communicate
(5) Difference of signal on connection of amplifier	Within × 4±0.6 V
(6) Cruise control cancel signal at brake ON	Cruise control cancel signal ON
(7) Brake switch 1, 2 signal	SW 1 and 2 are matched
(8) Throttle opening angle directing value	Within the opening angle +3.4° which calculated from accelerator opening angle coefficient.

Time Needed for Diagnosis:
(1) 250 milliseconds
(2) 250 milliseconds
(3) 200 milliseconds
(4) 200 milliseconds
(5) 24 milliseconds
(6) 250 milliseconds
(7) 200 milliseconds
(8) 250 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Stop the current to electric control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

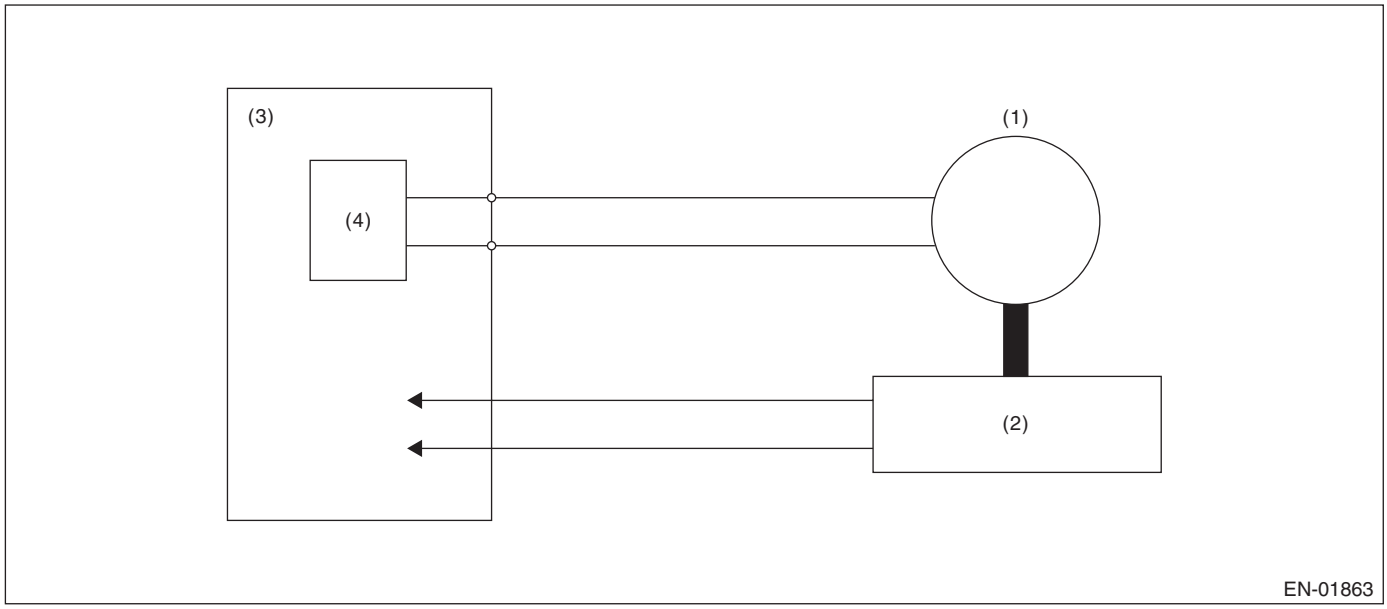
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnosis value and malfunction criteria value. (For test mode $06)

BY:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

1. OUTLINE OF DIAGNOSIS

Judge NG when the target opening angle and actual opening angle is mismatched or the current to motor is more than specified duty for specified time continuously.

2. COMPONENT DESCRIPTION



(1) Motor
(2) Throttle position sensor
(3) Engine control module (ECM)
(4) Drive circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Normal operation of electric control throttle	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when the electric control throttle is operating.

5. DIAGNOSTIC METHOD

Judge OK and clear NG when the malfunction criteria below are completed.

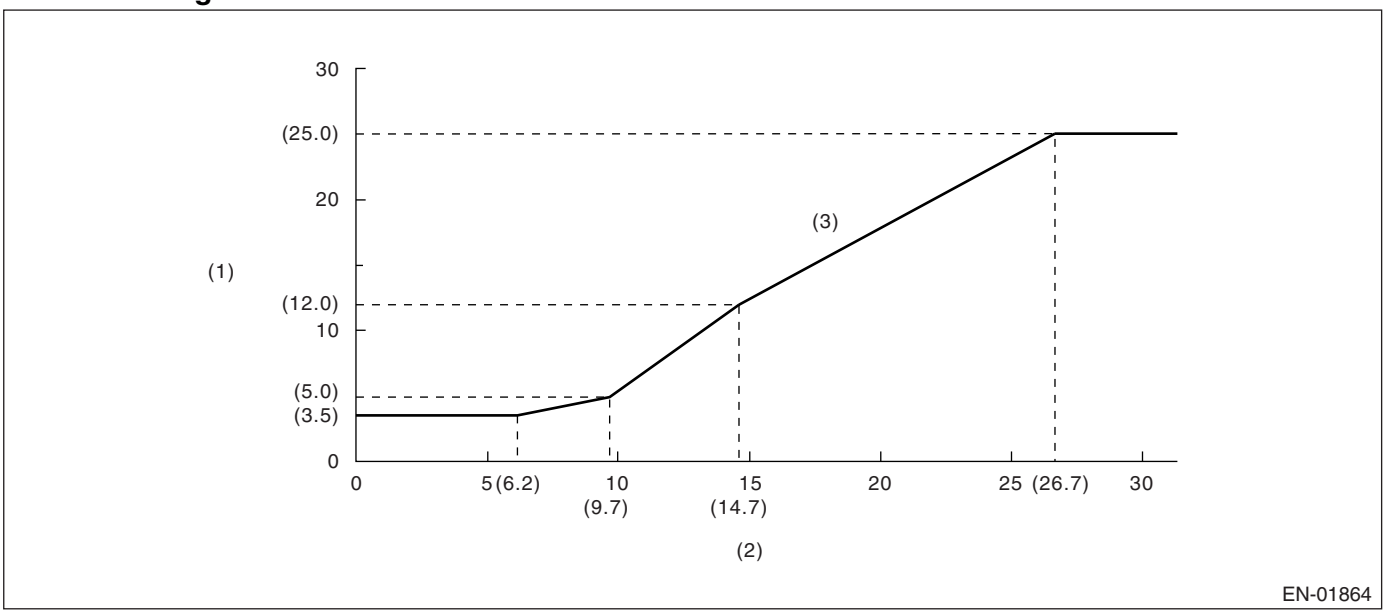
Judgment Value

Malfunction Criteria	Threshold Value
Difference between target opening angle and actual opening angle	Less than 3.5°
Output duty to drive circuit	Less than 95%

Time Needed for Diagnosis:

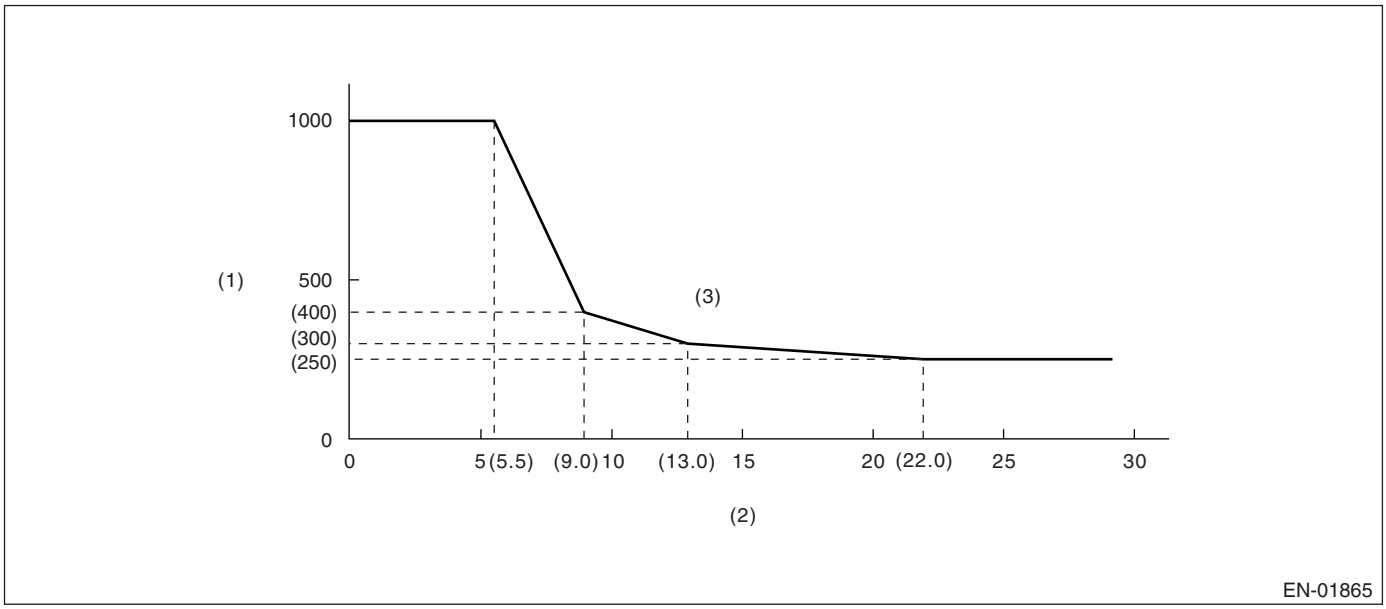
Target opening angle and actual opening angle: 250 milliseconds (For NG) 2,000 milliseconds (For OK)
Output duty to drive circuit: 2,000 milliseconds

Details of Judgment



(1) Difference between target opening angle and actual opening angle (°)
(2) Target throttle opening angle (°)
(3) NG area

Details of Judgment (Always 1,000 milliseconds when the actual opening angle ≤ target opening angle)



(1) Judgment time (milliseconds)
(2) Throttle position sensor 1 opening angle
(3) NG area

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stopped)

8. FAIL SAFE

Stop the current to electric control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnosis value and malfunction criteria value. (For test mode $06)

BZ:DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.
Judge NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits OFF signal	High level

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CA:DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.
Judge NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits ON signal	High level

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits ON signal	Low level

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CB:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.
Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting the engine	2 seconds or more
Starter switch	OFF
Engine speed	≥ 500 rpm

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	ON continues
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm	
b) Vehicle speed = 64 km/h (40 MPH) & engine speed 1,600 — 2,550 rpm	

Time Needed for Diagnosis: 3 monitoring
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Cruise control command: Not allowed to command cruise control

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CC:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.
Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting the engine	2 seconds or more
Starter switch	OFF
Engine speed	≥ 500 rpm

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	OFF continues
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm	
b) Vehicle speed = 64 km/h (40 MPH) & engine speed 1,600 — 2,550 rpm	

Time Needed for Diagnosis: 3 monitoring
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

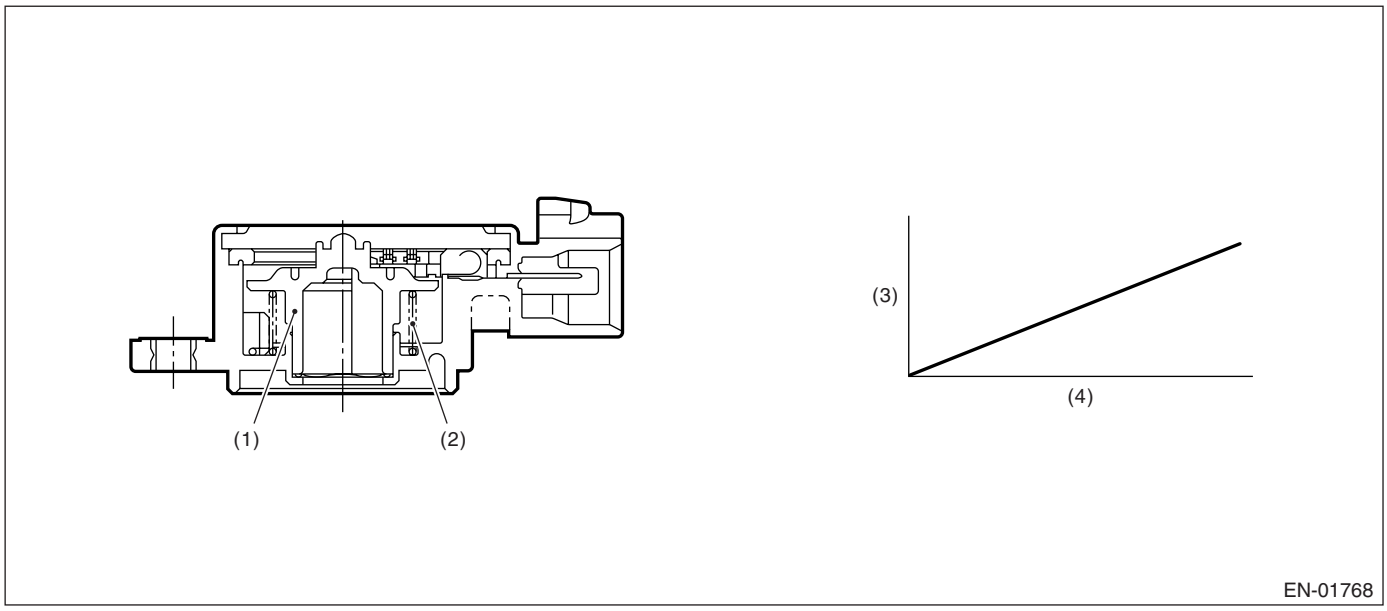
Memorize the freeze frame data. (For test mode $02)

CD:DTC P1086 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generated valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.167 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve position
- Learning of tumble generated valve position fully closed and date renewed to close side.
- Learning of tumble generated valve position fully opened and date renewed to open side.

9. ECM OPERATION AT DTC SETTING

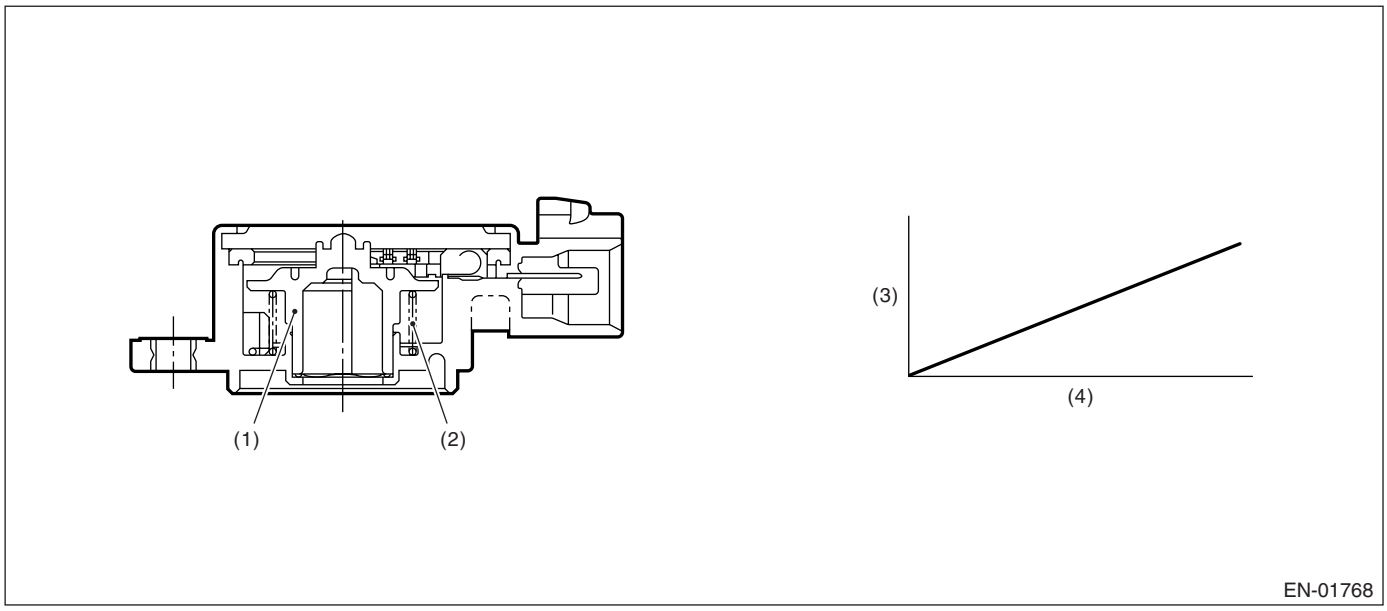
Memorize the freeze frame data. (For test mode $02)

CE:DTC P1087 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generated valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.843 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve position
- Learning of tumble generated valve position fully closed and date renewed to close side.
- Learning of tumble generated valve position fully opened and date renewed to open side.

9. ECM OPERATION AT DTC SETTING

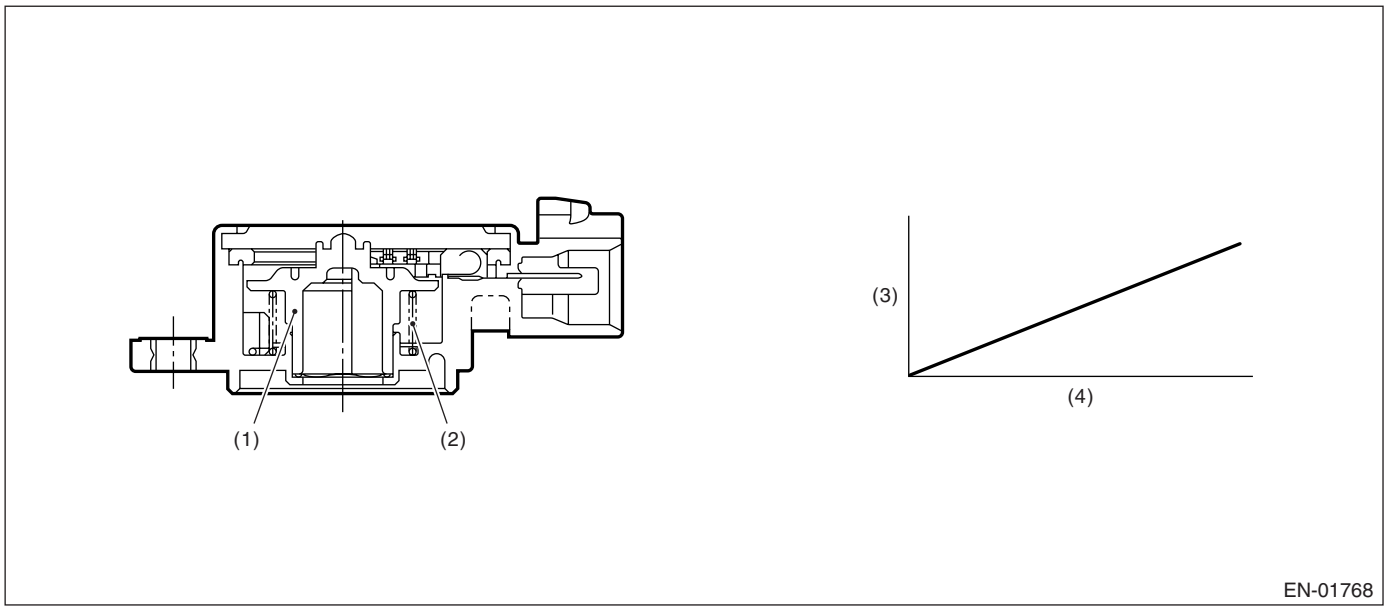
Memorize the freeze frame data. (For test mode $02)

CF:DTC P1088 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generated valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.167 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve position
- Learning of tumble generated valve position fully closed and date renewed to close side.
- Learning of tumble generated valve position fully opened and date renewed to open side.

9. ECM OPERATION AT DTC SETTING

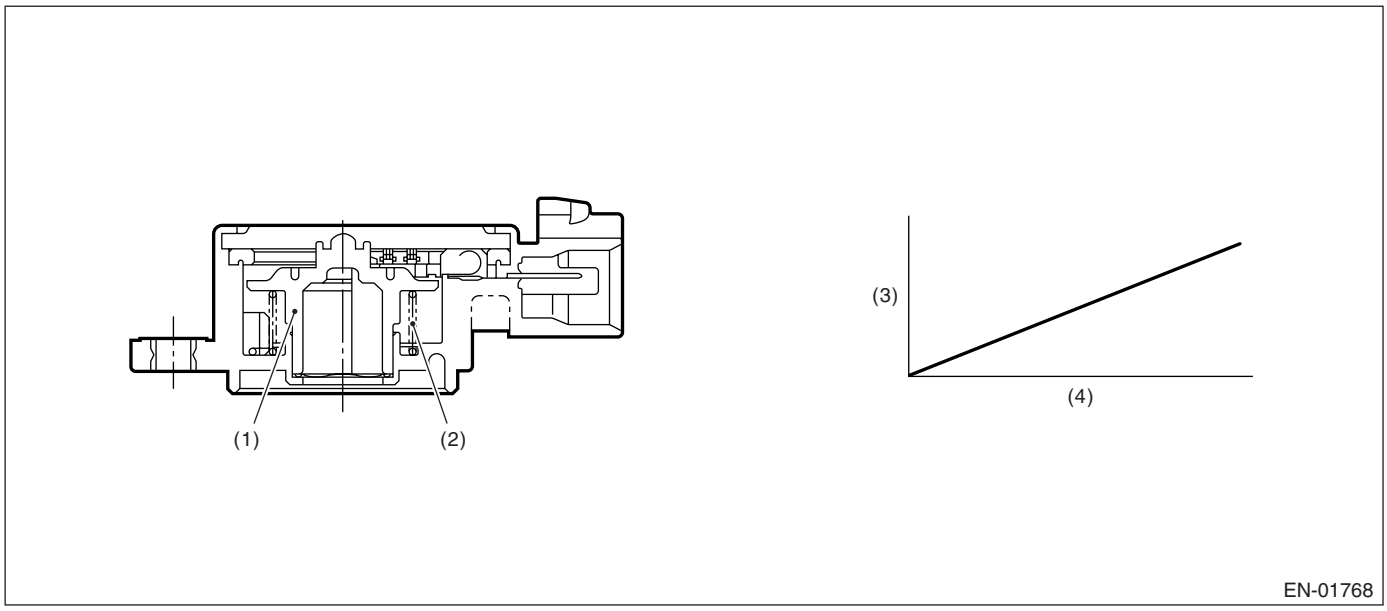
Memorize the freeze frame data. (For test mode $02)

CG:DTC P1089 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



(1) Rotor
(2) Return spring
(3) Voltage (V)
(4) Tumble generated valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.843 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve position
- Learning of tumble generated valve position fully closed and date renewed to close side.
- Learning of tumble generated valve position fully opened and date renewed to open side.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CH:DTC P1090 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.
Judge open fixing malfunction when the opening degree is large even after finishing the tumble generated valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)
Ambient temperature	≥ 0°C (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.
Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	≥ 67.4°
Tumble generated valve “close” signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.
• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	< 67.4°
Tumble generated valve “close” signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to the closing side.
- For tumble generated valve all opening points learning, not allowed to update to the opening side.

Tumble generated valve control
- Output the open signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CI: DTC P1091 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.
Judge close fixing malfunction when the opening degree is small even after finishing the tumble generated valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	< 67.4°
Tumble generated valve “open” signal output	1.4 seconds or more

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	≥ 67.4°
Tumble generated valve “open” signal output	1.4 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to the closing side.
- For tumble generated valve all opening points learning, not allowed to update to the opening side.

Tumble generated valve control
- Output the close signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CJ:DTC P1092 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.
Judge open fixing malfunction when the opening degree is large even after finishing the tumble generated valve closing driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.
Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	≥ 67.4°
Tumble generated valve “close” signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.
• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	< 67.4°
Tumble generated valve “close” signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to the closing side.
- For tumble generated valve all opening points learning, not allowed to update to the opening side.

Tumble generated valve control
- Output the open signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CK:DTC P1093 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.
Judge close fixing malfunction when the opening degree is small even after finishing the tumble generated valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	≥ 0°C (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	< 67.4°
Tumble generated valve “open” signal output	1.4 seconds or more

Time Needed for Diagnosis: 3 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	≥ 67.4°
Tumble generated valve “open” signal output	1.4 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Tumble generated valve opening
- For tumble generated valve all closing points learning, not allowed to update to the closing side.
- For tumble generated valve all opening points learning, not allowed to update to the opening side.

Tumble generated valve control
- Output the close signal.

8. ECM OPERATION AT DTC SETTING

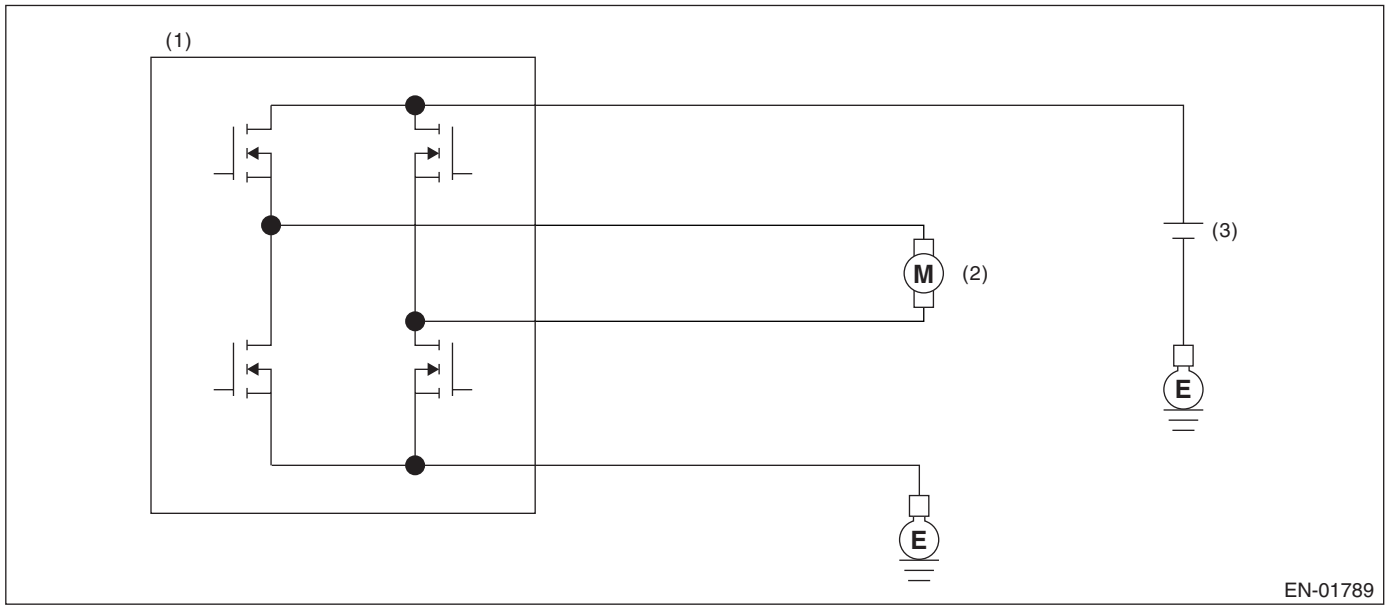
Memorize the freeze frame data. (For test mode $02)

CL:DTC P1094 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.
Judge NG when the open signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Tumble generated valve
(3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generated valve driving IC, and then NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generated valve output is set to ON and OFF, and judge open NG when the open NG signal is sent 20 times in a row. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Current	< 5 mA

Time Needed for Diagnosis: 2 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve control: Not allowed to move tumble generated valve.

9. ECM OPERATION AT DTC SETTING

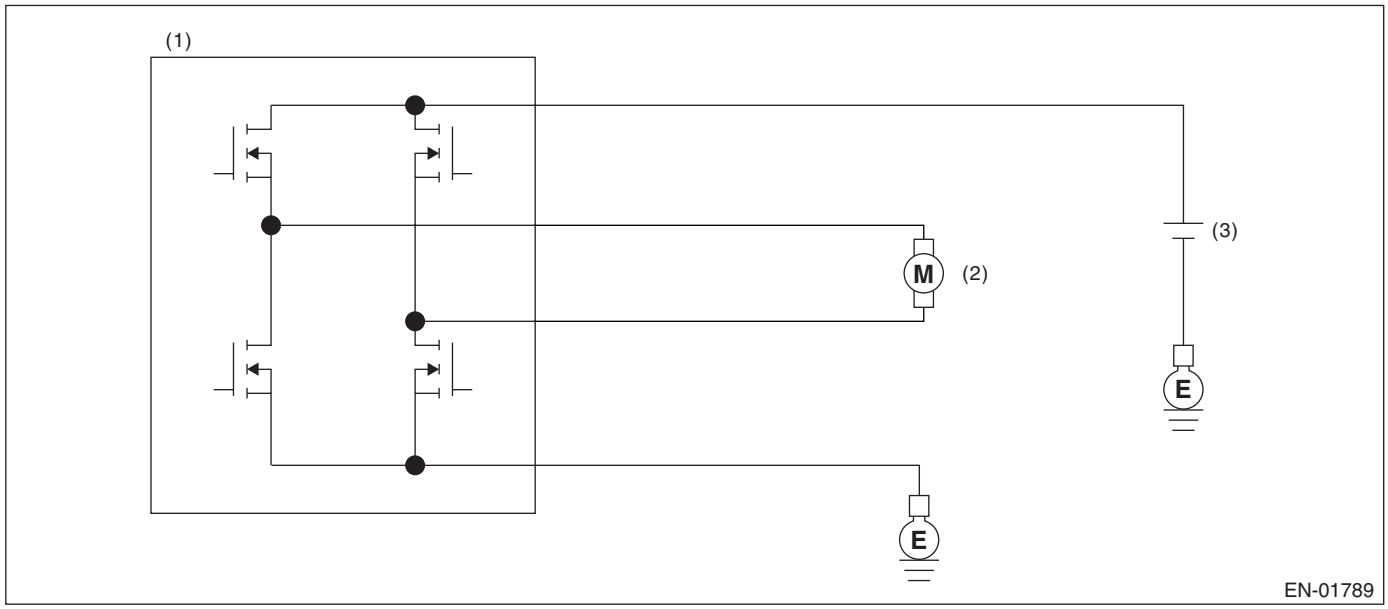
Memorize the freeze frame data. (For test mode $02)

CM:DTC P1095 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.
Judge NG when the overcurrent signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Tumble generated valve
(3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generated valve driving IC, and then NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generated valve output is set to ON and OFF, and judge overcurrent NG when the overcurrent NG signal is sent 10 times in a row. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Current	> 3 A

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve control: Not allowed to move tumble generated valve.

9. ECM OPERATION AT DTC SETTING

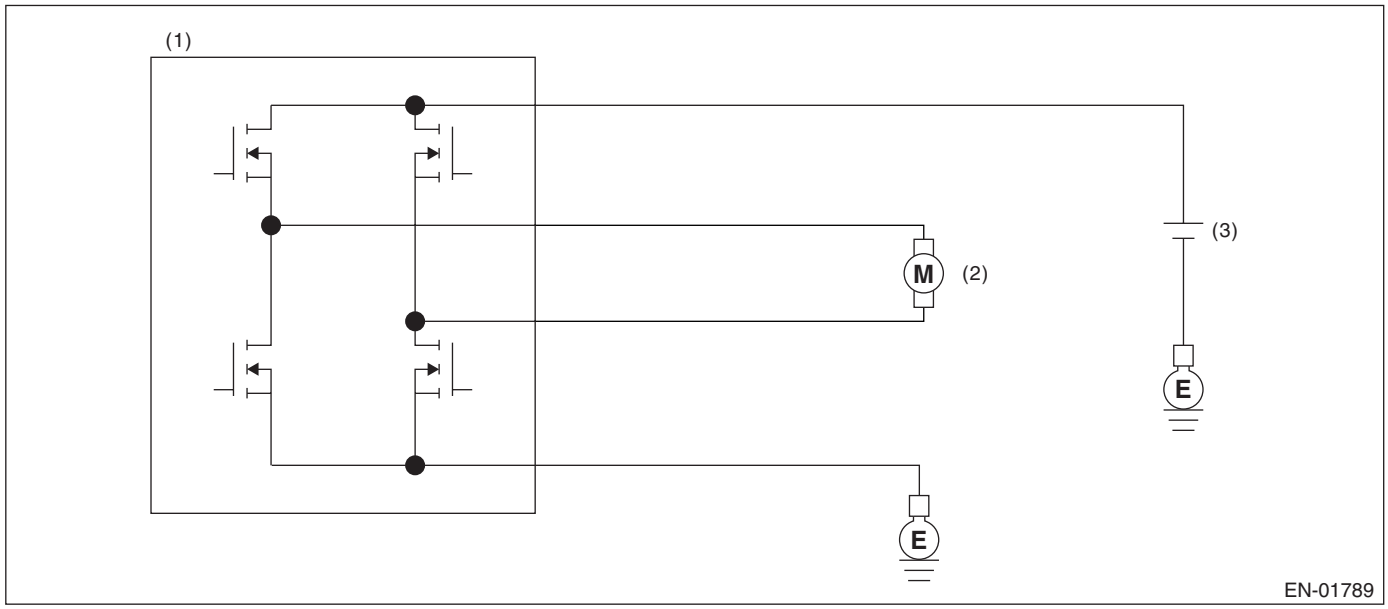
Memorize the freeze frame data. (For test mode $02)

CN:DTC P1096 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.
Judge NG when the open signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Tumble generated valve
(3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generated valve driving IC, and then NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generated valve output is set to ON and OFF, and judge open NG when the open NG signal is sent 20 times in a row. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Current	< 5 mA

Time Needed for Diagnosis: 2 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve control: Not allowed to move tumble generated valve.

9. ECM OPERATION AT DTC SETTING

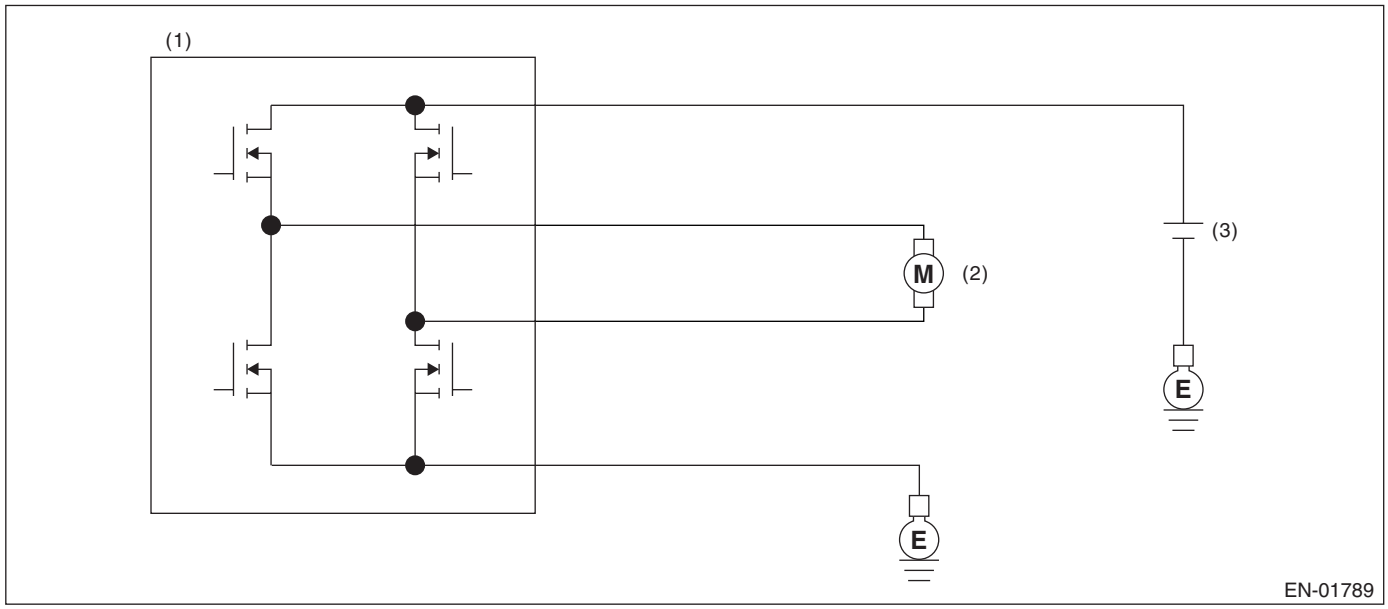
Memorize the freeze frame data. (For test mode $02)

CO:DTC P1097 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.
Judge NG when the overcurrent signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Tumble generated valve
(3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generated valve driving IC, and then NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generated valve output is set to ON and OFF, and judge overcurrent NG when the overcurrent NG signal is sent 10 times in a row.
Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Current	> 3 A

Time Needed for Diagnosis: 1 second
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generated valve control: Not allowed to move tumble generated valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CP:DTC P1110 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 0.118 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 0.118 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CQ:DTC P1111 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 4.936 V

Time Needed for Diagnosis: 0.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 4.936 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

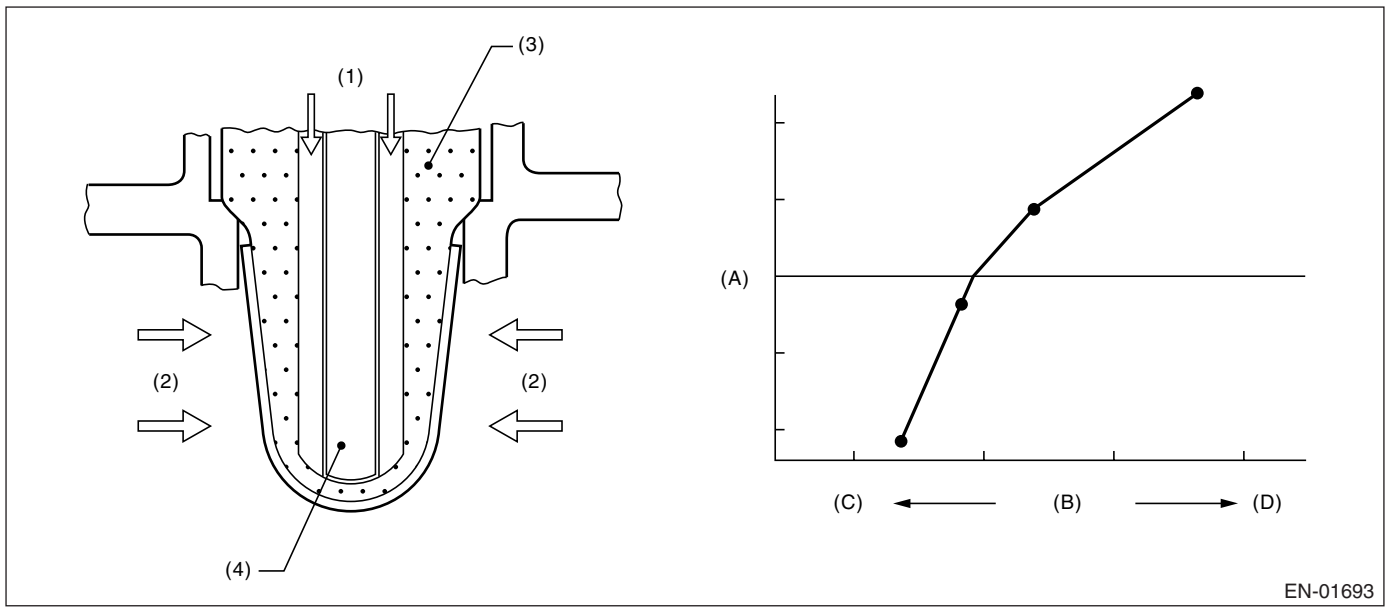
Memorize the freeze frame data. (For test mode $02)

CR:DTC P1152 O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1)

1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains Low.
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.
Lambda value = Actual air fuel ratio/Theoretical air fuel ratio
Lambda > 1: Lean
Lambda < 1: Rich

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters to be in enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Operating
Rear oxygen sensor output voltage – feedback target voltage	–0.2 V ←→ 0.1 V
or rear oxygen sensor sub feedback compensation coefficient	On Min.
or rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 6 g/s
Load change during 0.5 engine rev.	≤ 0.01 g/rev
Impedance of front oxygen (A/F) sensor	0 ←→ 50 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output lambda when rear oxygen sensor sub feedback compensation coefficient being at not high limit	≤ 0.85

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

9. ECM OPERATION AT DTC SETTING

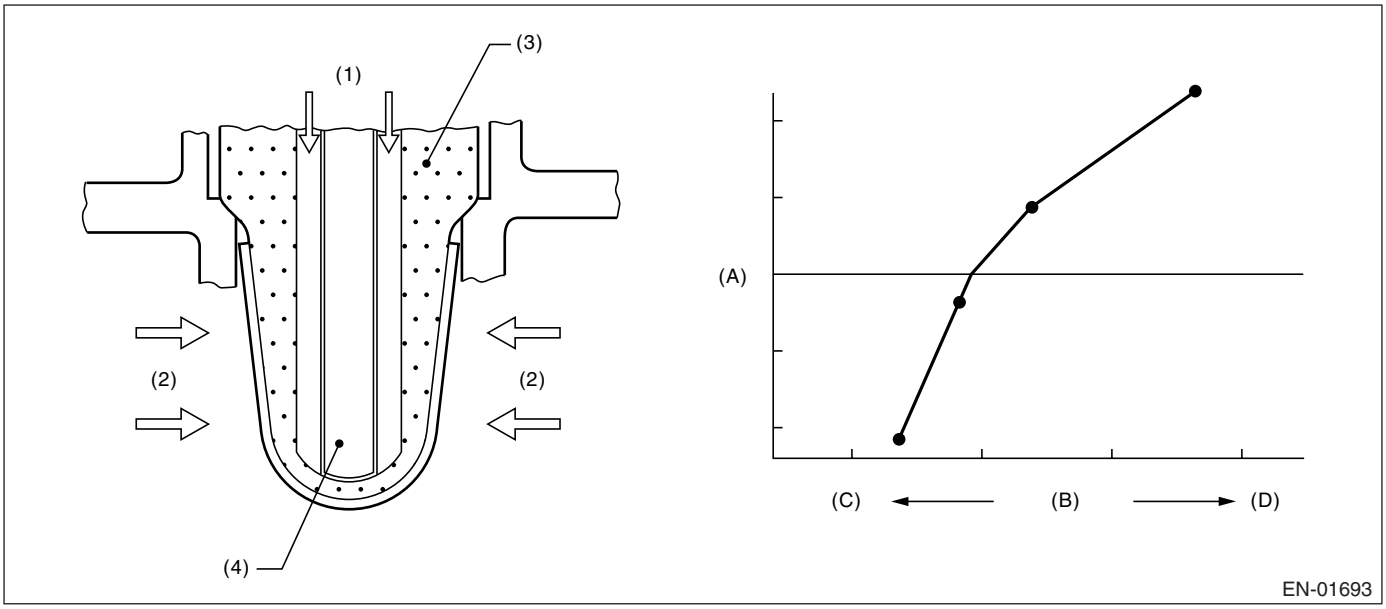
Memorize the freeze frame data. (For test mode $02)

CS:DTC P1153 O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains High.
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.
Lambda value = Actual air fuel ratio/Theoretical air fuel ratio
Lambda > 1: Lean
Lambda < 1: Rich

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust
(3) ZrO_2
(4) Ceramic heater
(A) Electromotive force
(B) Air fuel ratio
(C) Lean
(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters to be in enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Operating
Rear oxygen sensor output voltage – feedback target voltage	–0.2 V ←→ 0.1 V
or rear oxygen sensor sub feedback compensation coefficient	On Min.
or rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 6 g/s
Load change during 0.5 engine rev.	≤ 0.01 g/rev
Impedance of front oxygen (A/F) sensor	0 ←→ 50 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output lambda when rear O_2 sensor sub feedback compensation coefficient value being at not low limit	≥ 1.15

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

9. ECM OPERATION AT DTC SETTING

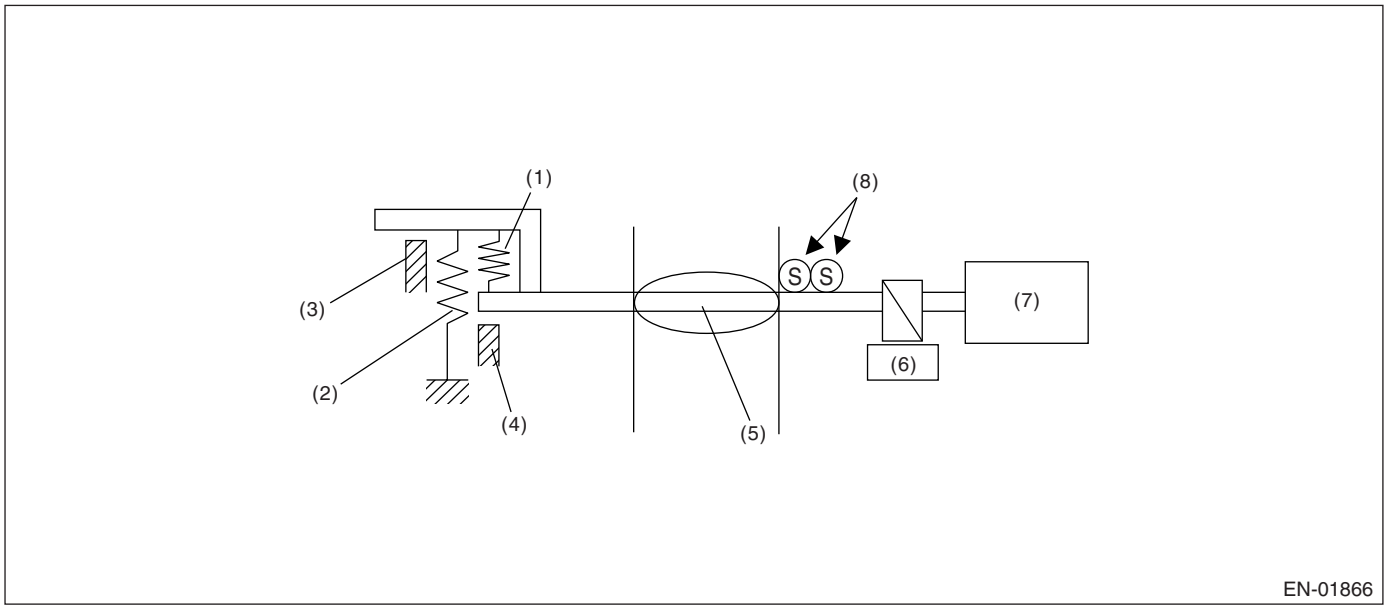
Memorize the freeze frame data. (For test mode $02)

CT:DTC P1160 RETURN SPRING FAILURE

1. OUTLINE OF DIAGNOSIS

Judge NG when the valve does not move to the close direction with the motor power stopped and the valve open more than the default opening.

2. COMPONENT DESCRIPTION



(1) Opener spring
(2) Return spring
(3) Intermediate stopper
(4) Full closed stopper
(5) Throttle valve
(6) Gear
(7) DC motor
(8) Main and sub throttle sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle opening	OFF
Motor continuity	OFF

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Opening variation after continuity is set to OFF	≥ 2°

Time Needed for Diagnosis: 600 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Fix the throttle opening to 6°.

9. ECM OPERATION AT DTC SETTING

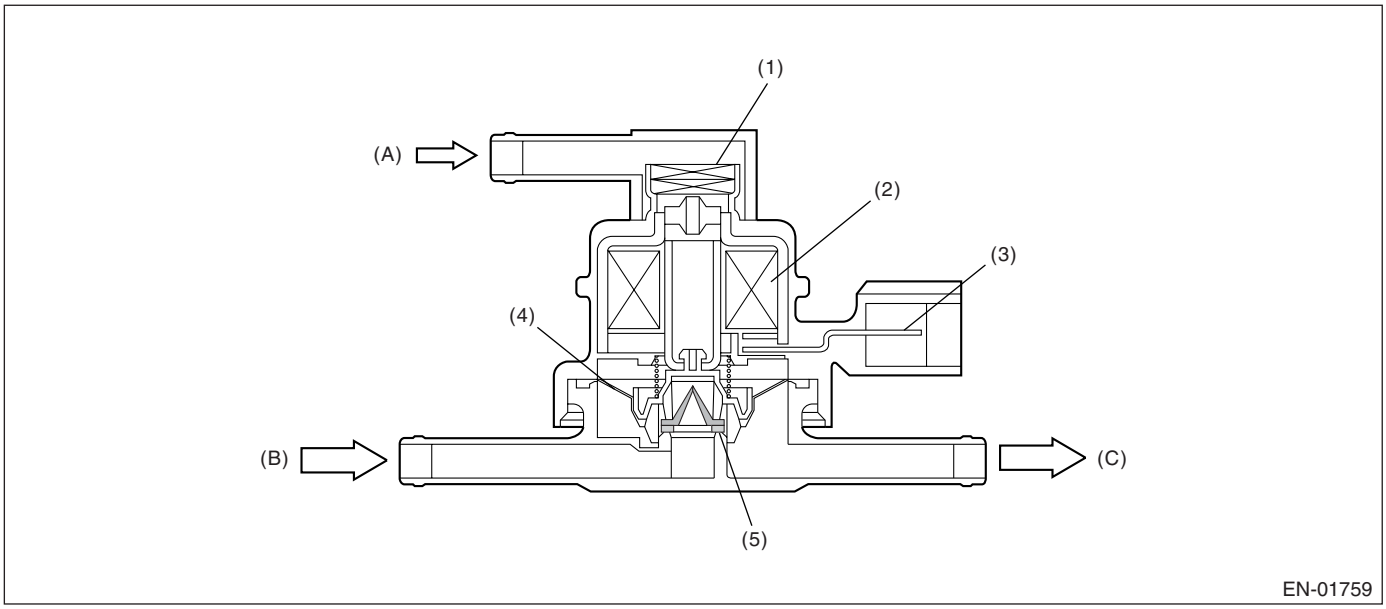
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

CU:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve. Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve

(A) Atmospheric pressure
(B) Shut off valve
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs off signal	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

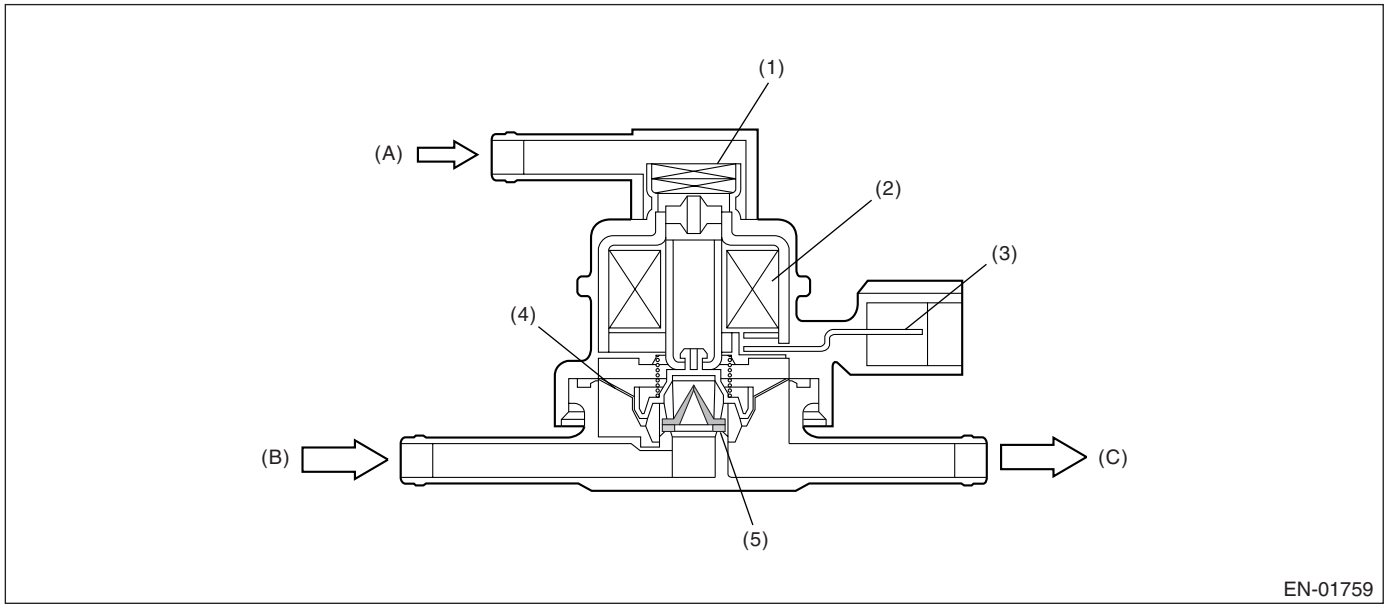
Memorize the freeze frame data. (For test mode $02)

CV:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Filter
(2) Coil
(3) Connector terminal
(4) Diaphragm
(5) Valve
(A) Atmospheric pressure
(B) Shut off valve
(C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs off signal	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

CW:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

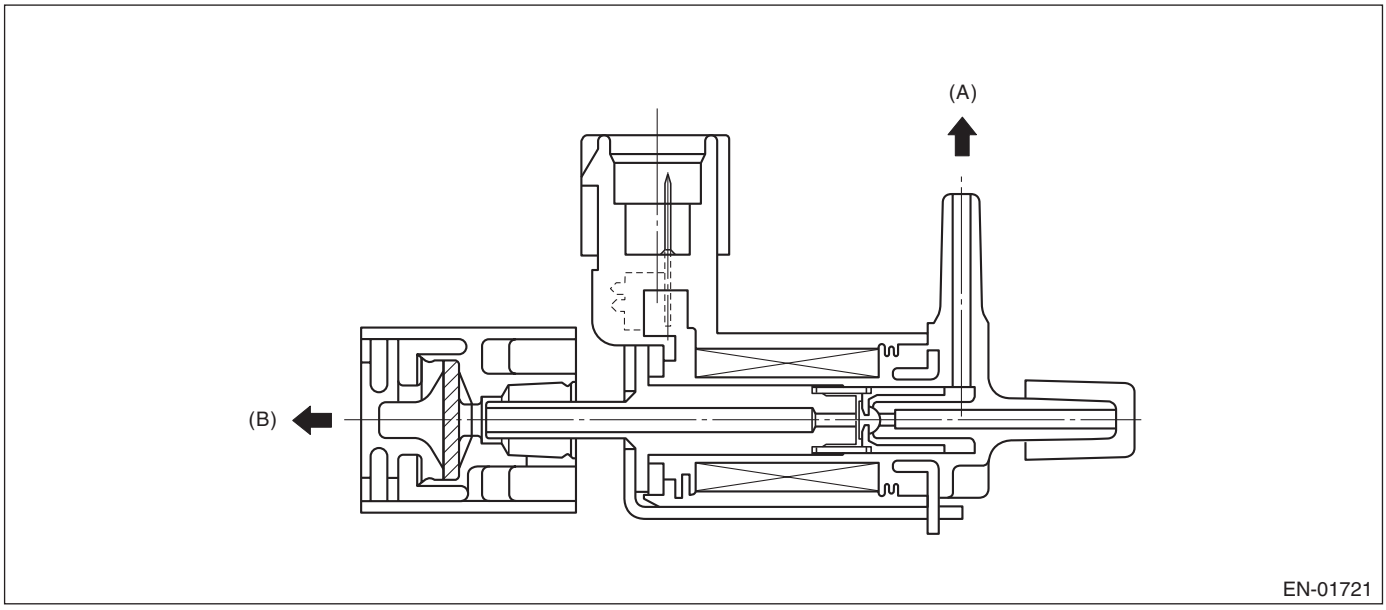
For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(STi)-112, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CX:DTC P1446 FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure switching solenoid.
Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) Fuel tank pressure sensor
(B) Ambient air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	Low

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

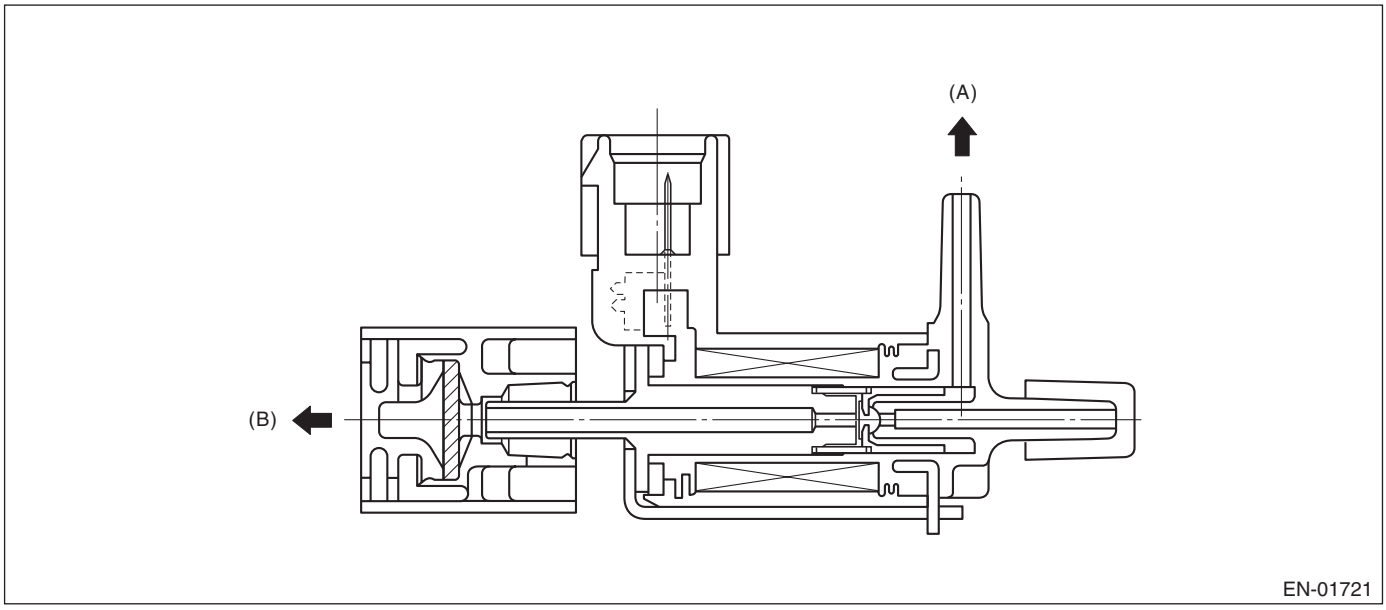
Memorize the freeze frame data. (For test mode $02)

CY:DTC P1447 FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure switching solenoid.
Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) Fuel tank pressure sensor
(B) Ambient air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sent ON signals	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

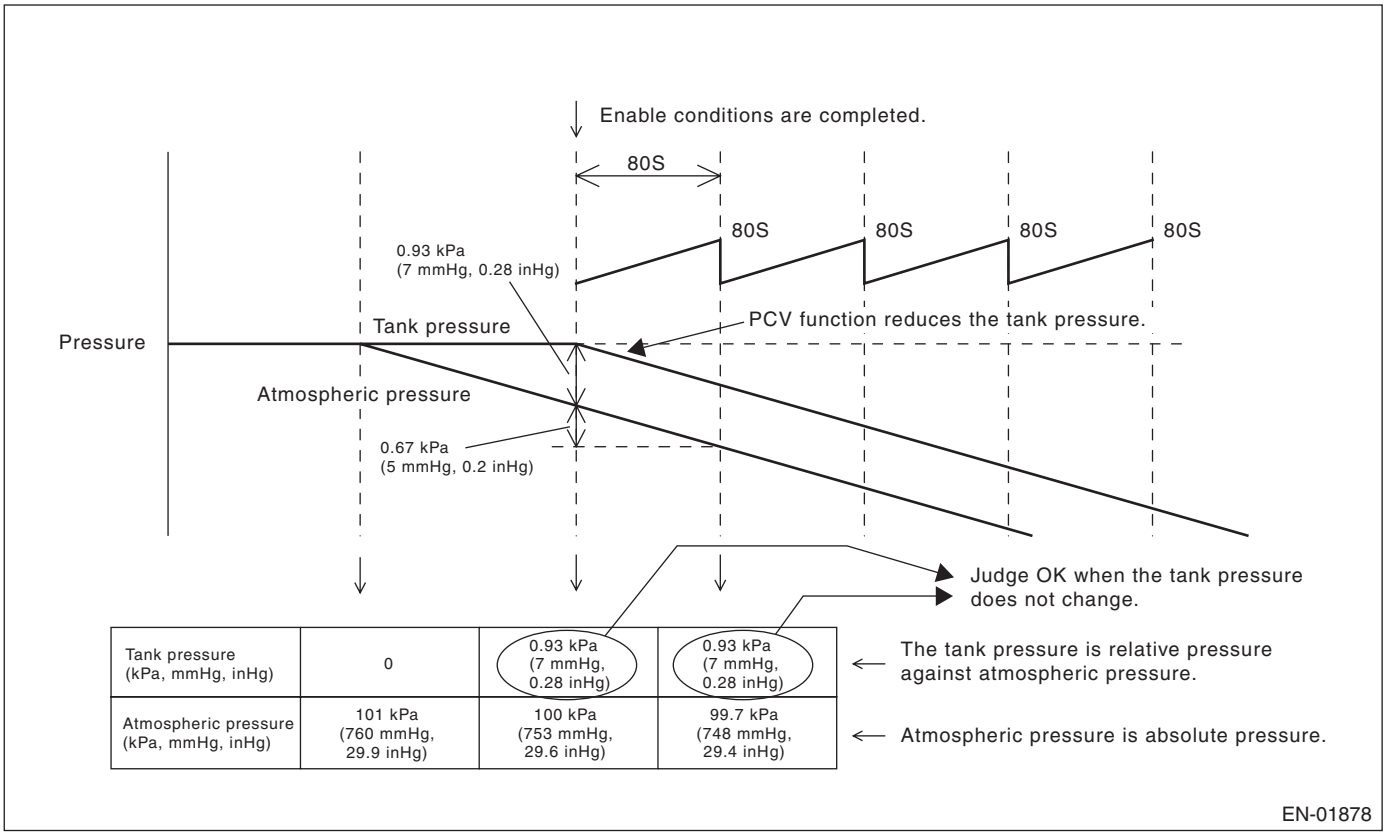
CZ:DTC P1448 FUEL TANK SENSOR CONTROL VALVE RANGE PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure switching solenoid function abnormality.
The tank pressure sensor is a relative pressure sensor, which normally compares the pressure with the atmospheric pressure. The tank pressure switching solenoid is a solenoid, which shifts the compare space from opening to closed during the EVAP diagnosis. Detect the malfunction that the compare space remains closed. (Not judge NG after enable condition completed but assume NG before enable condition completed.)

• Normality Judgment

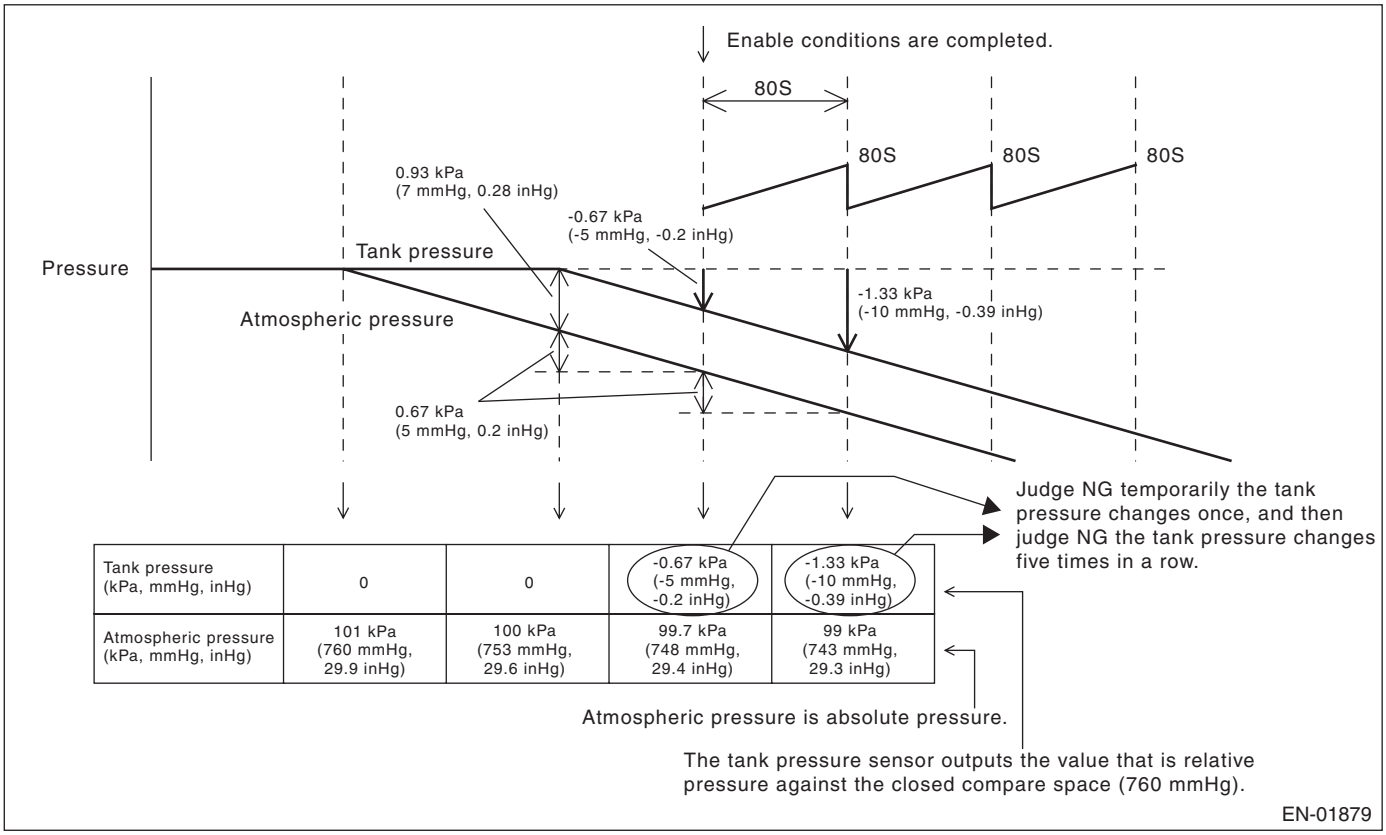
Judge OK when the fuel tank pressure does not change (or changes by less than 0.67 kPa (5 mmHg, 0.2 inHg)) at atmospheric pressure changing by 0.67 kPa (5 mmHg, 0.2 inHg) or more per 80 seconds.



Tank pressure (kPa, mmHg, inHg)	0	0.93 kPa (7 mmHg, 0.28 inHg)	0.93 kPa (7 mmHg, 0.28 inHg)	← The tank pressure is relative pressure against atmospheric pressure.
Atmospheric pressure (kPa, mmHg, inHg)	101 kPa (760 mmHg, 29.9 inHg)	100 kPa (753 mmHg, 29.6 inHg)	99.7 kPa (748 mmHg, 29.4 inHg)	← Atmospheric pressure is absolute pressure.

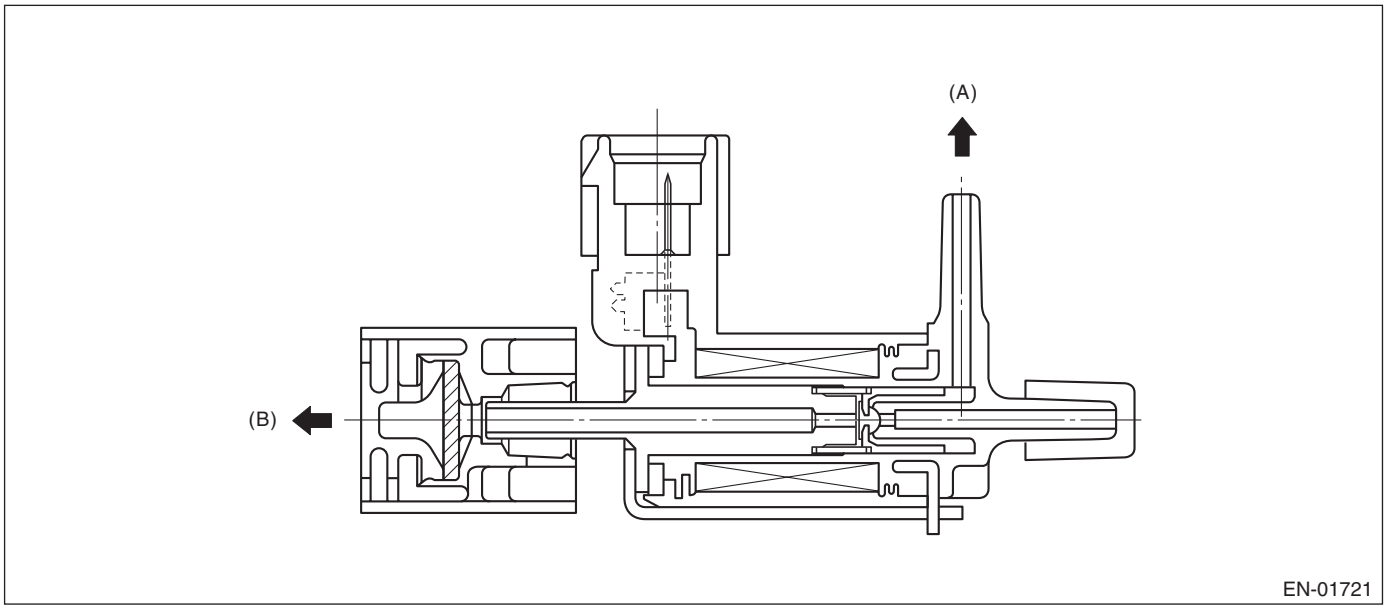
• Abnormality Judgment

Judge NG temporarily when the fuel tank pressure changes by 0.67 kPa (5 mmHg, 0.2 inHg) or more at atmospheric pressure changing by 0.67 kPa (5 mmHg, 0.2 inHg) or more per 80 seconds, and then judge NG when the previous condition is completed 5 times in a row.



Tank pressure (kPa, mmHg, inHg)	0	0	-0.67 kPa (-5 mmHg, -0.2 inHg)	-1.33 kPa (-10 mmHg, -0.39 inHg)
Atmospheric pressure (kPa, mmHg, inHg)	101 kPa (760 mmHg, 29.9 inHg)	100 kPa (753 mmHg, 29.6 inHg)	99.7 kPa (748 mmHg, 29.4 inHg)	99 kPa (743 mmHg, 29.3 inHg)

2. COMPONENT DESCRIPTION



(A) Fuel tank pressure sensor
(B) Ambient air

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V
Fuel level	9 ←→ 51 ℓ (2.38 ←→ 13.3 US gal, 1.98 ←→ 11.2 Imp gal)
Evaporation system diagnosis	Not in operation
After starting the engine	80 seconds or more
Fuel tank pressure	< −0.67 kPa (−5 mmHg, −0.2 inHg) or > −0.93 kPa (7 mmHg, 0.28 inHg)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the fuel tank pressure is large or small in 80 seconds or more after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below is completed 5 times.

Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric air change in 80 seconds	≥ 0.67 kPa (4.5 mmHg, 0.2 inHg)
Fuel tank pressure change in 80 seconds	≥ 0.67 kPa (4.5 mmHg, 0.2 inHg)
Fuel level change	< 2.25 ℓ (0.59 US gal, 0.49 Imp gal)

Time Needed for Diagnosis: 80 seconds × 5 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric air change in 80 seconds	≥ 0.60 kPa (4.5 mmHg, 0.18 inHg)
Fuel tank pressure change in 80 seconds	< 0.60 kPa (4.5 mmHg, 0.18 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

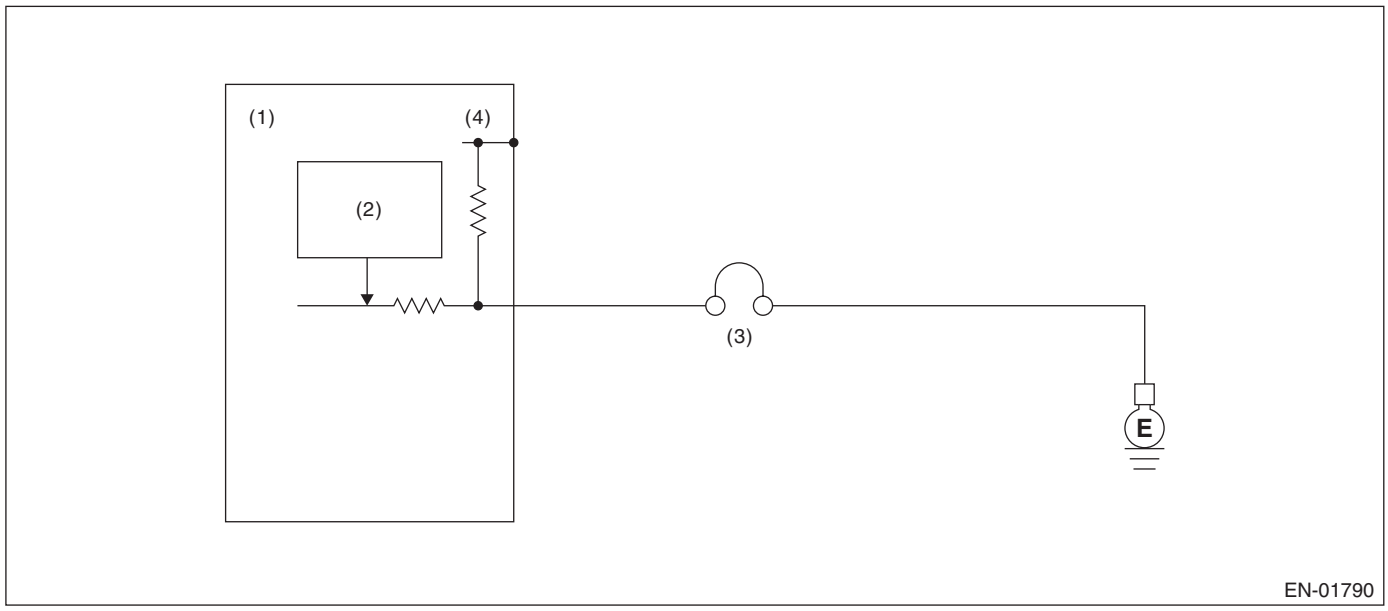
Memorize the freeze frame data. (For test mode $02)

DA:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

Detect the blow-by hose release abnormality.
Judge NG when the diagnosis terminal voltage is high.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Detecting circuit
(3) PCV diagnosis connector
(4) 5 V

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSIS METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Before and after starting the engine	After starting the engine
Positive crankcase ventilation diagnosis voltage	High

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Before and after starting the engine	After starting the engine
Positive crankcase ventilation diagnosis voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was performed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnosis value and trouble standard value. (For test mode $06)

DB:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.
Judge OFF NG when it turns to “after engine starting” while the starter has never been set to ON.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge OFF NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1 km/h (0.62 MPH)
It took more than 0.8 seconds at engine starting, and then it turned after engine starting.	
Starter ON	Not experienced
Starter ON diagnosis	Not diagnosed
Battery voltage	> 8 V

Time Needed for Diagnosis:
Not determined.
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OFF OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Starter ON	Experienced
Starter ON diagnosis	Diagnosed
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DC:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the back-up voltage circuit.
Judge NG when the back-up voltage becomes smaller than the battery voltage.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power	Low
Battery voltage	≥ 10.9 V
Before and after starting the engine	After starting the engine

Time Needed for Diagnosis: 2.5 seconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	High
Battery voltage	≥ 10.9 V
Before and after starting the engine	After starting the engine

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DD:DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.
Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
OCV control duty	≥ 99.61%
OCV control present current	< 0.309 A

Time Needed for Diagnosis: 2,000 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of OCV	≥ 0.14%
| Target current value of OCV − Control current value of OCV |	≥ 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

- Ignition timing whole learning compensation:
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  – Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  – ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  – Make the OCV driving Duty to be the given value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DE:DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.
Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
OCV control duty	< 0.39%
OCV control present current	< 0.306 A

Time Needed for Diagnosis: 2,000 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
| Target current value of OCV − Control current value of OCV |	≥ 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

- Ignition timing whole learning compensation:
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  – Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  – ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  – Make the OCV driving Duty to be the given value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DF:DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.
Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
OCV control duty	≥ 99.61%
OCV control present current	< 0.306 A

Time Needed for Diagnosis: 2,000 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of OCV	≥ 0.14%
| Target current value of OCV − Control current value of OCV |	≥ 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

- Ignition timing whole learning compensation:
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  – Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  – ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  – Make the OCV driving Duty to be the given value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode $02)

DG:DTC P2093 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oil flow control valve solenoid.
Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
OCV control duty	< 0.39%
OCV control present current	≥ 0.306 A

Time Needed for Diagnosis: 2,000 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
| Target current value of OCV − Control current value of OCV |	< 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

- Ignition timing whole learning compensation:
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
  – Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
  – Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
  – Most timing retard learning is not complete or most timing retard learning completion is not experienced.
  – ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
  – Make the OCV driving Duty to be the given value (9.36%).

8. ECM OPERATION AT DTC SETTING

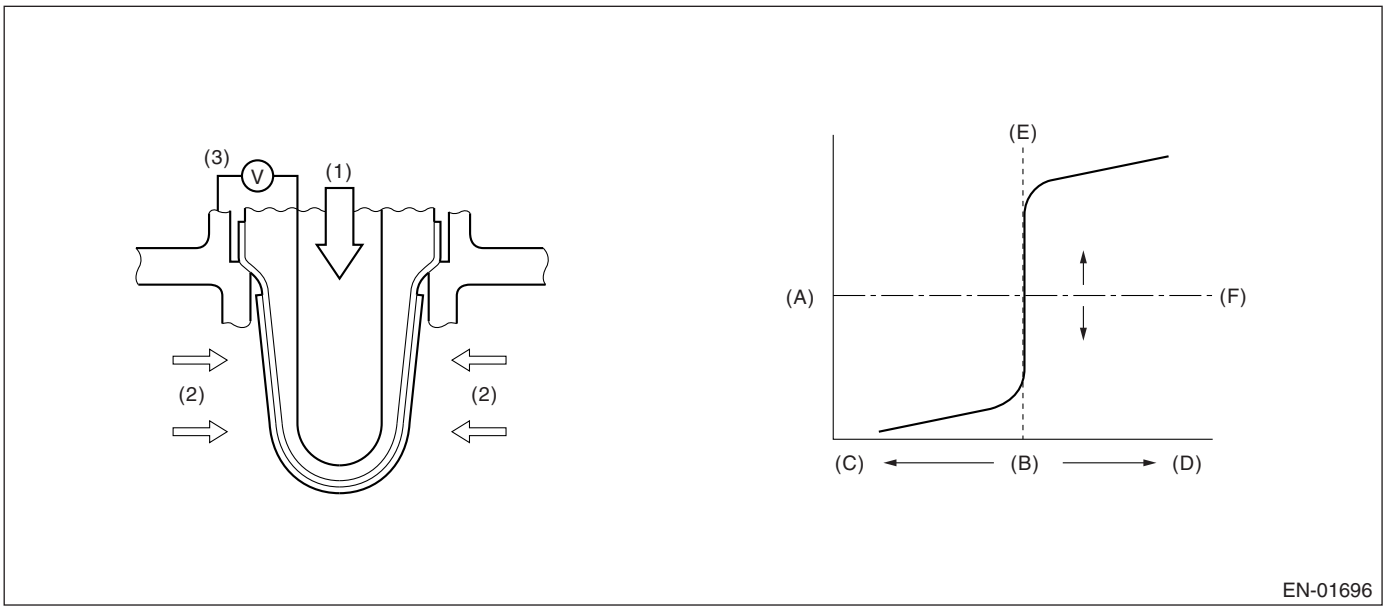
Memorize the freeze frame data. (For test mode $02)

DH:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.
Sub feedback control amount sticks to lean sides during sub feedback control.
Judge NG when the rear oxygen sensor output does not come close to target voltage (slice level).

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Main feedback	In operation
Sub feedback	In operation
Amount of intake air	≥ 15 g/sec
Sub feedback	Sticks to the limit value (lean side)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 80 km/h (50 MPH).

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Calculate the continuous time from the sticking of sub feedback control amount to lean side and cumulative deviation (sumdelo 2) of rear oxygen sensor voltage and target voltage.
Judge NG when the malfunction criteria below are completed after 300 seconds have passed continuously.
Judgment Value

Malfunction Criteria	Threshold Value
sumdelo2 = sumdelo2 + (rvo2 − rsl) where: rvo2 = sensing voltage of O_2 sensor rsl = target voltage of O_2 sensor	> −1,700 V

Time Needed for Diagnosis: 300 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the rear oxygen output is reversed, and during 4 seconds after that, the sub feedback control amount does not stick to rich or lean sides.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

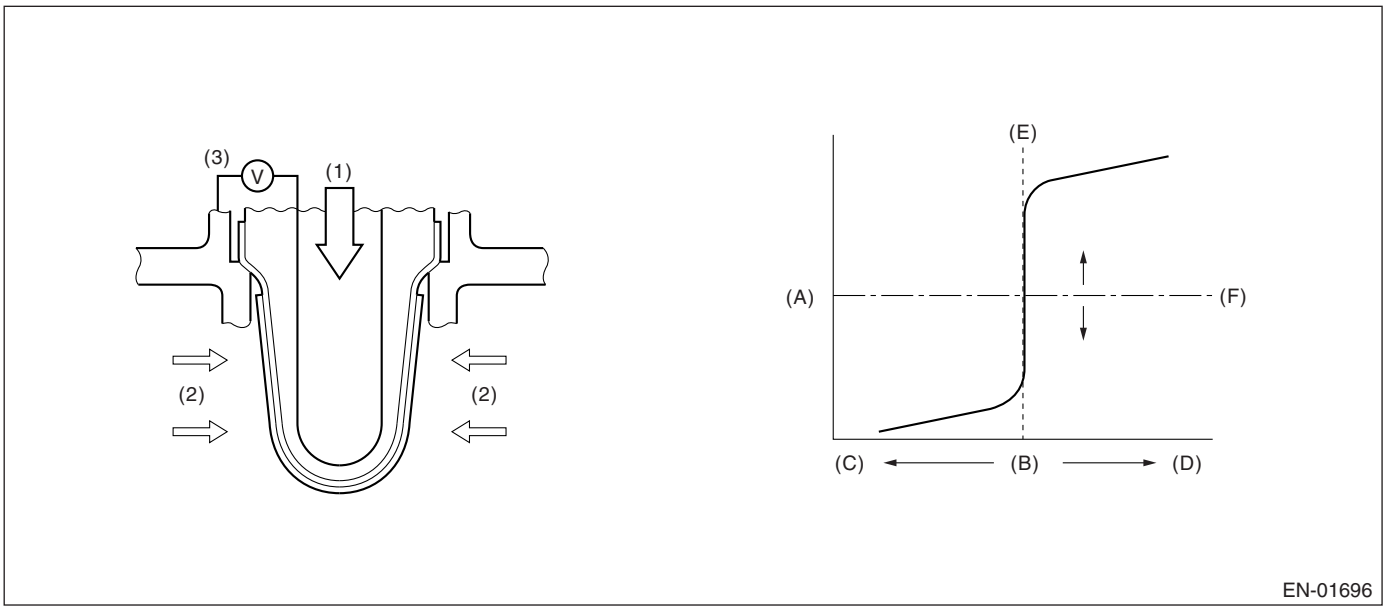
Memorize the freeze frame data. (For test mode $02)

DI: DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.
Sub feedback control amount sticks to rich sides during sub feedback control.
Judge NG when the rear oxygen sensor output does not come close to target voltage (slice level).

2. COMPONENT DESCRIPTION



(1) Atmosphere
(2) Exhaust gas
(3) Electromotive force
(A) Electromotive force
(B) Air fuel ratio
(C) Rich
(D) Lean
(E) Theoretical air fuel ratio
(F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Main feedback	In operation
Sub feedback	In operation
Amount of intake air	≥ 15 g/sec
Sub feedback	Sticks to the limit value (rich side)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant 80 km/h (50 MPH).

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Calculate the continuous time from the sticking of sub feedback control amount to rich side and cumulative deviation (sumdelo 2) of rear oxygen sensor voltage and target voltage.
Judge NG when the malfunction criteria below are completed after 300 seconds have passed continuously.
Judgment Value

Malfunction Criteria	Threshold Value
sumdelo2 = sumdelo2 + (rvo2 − rsl) where: rvo2 = sensing voltage of O_2 sensor rsl = target voltage of O_2 sensor	> 1,500 V

Time Needed for Diagnosis: 300 seconds
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous drive cycles.

• Normality Judgment

Judge OK and clear the NG when the rear oxygen output is reversed, and during 4 seconds after that, the sub feedback control amount does not stick to rich or lean sides.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

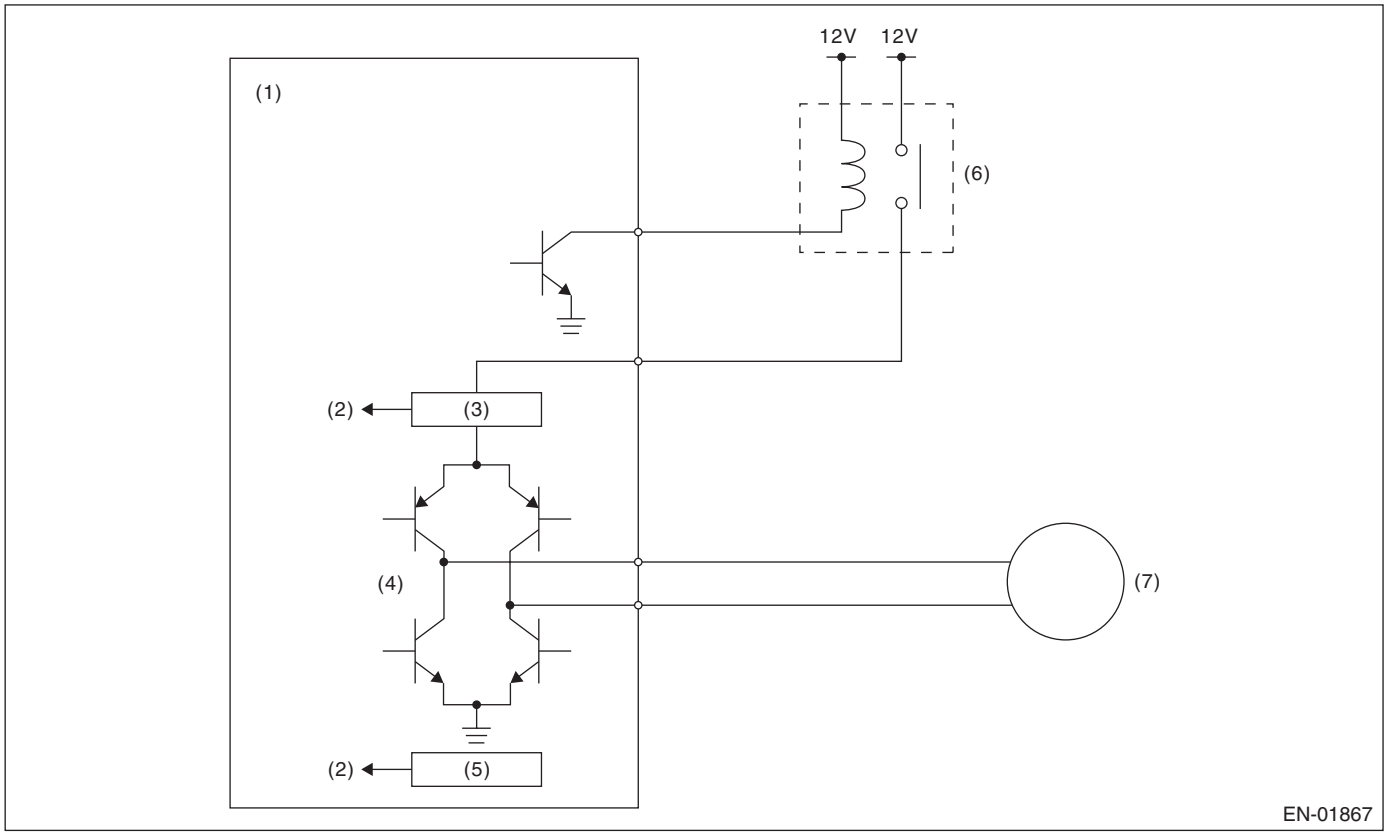
Memorize the freeze frame data. (For test mode $02)

DJ:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge NG when the motor current becomes large or drive circuit is heated.

2. COMPONENT DESCRIPTION



(1) Engine control unit (ECM)
(2) Detection circuit
(3) Overcurrent detection circuit
(4) Drive circuit
(5) Temperature detection circuit
(6) Electronic control throttle relay
(7) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Under control of electronic control throttle	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Motor current	≤ 8 A
Drive circuit inner temperature	≤ 175°C (347°F)

Time Needed for Diagnosis:
- 500 milliseconds (NG judgment)
- 2,000 milliseconds (OK judgment)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

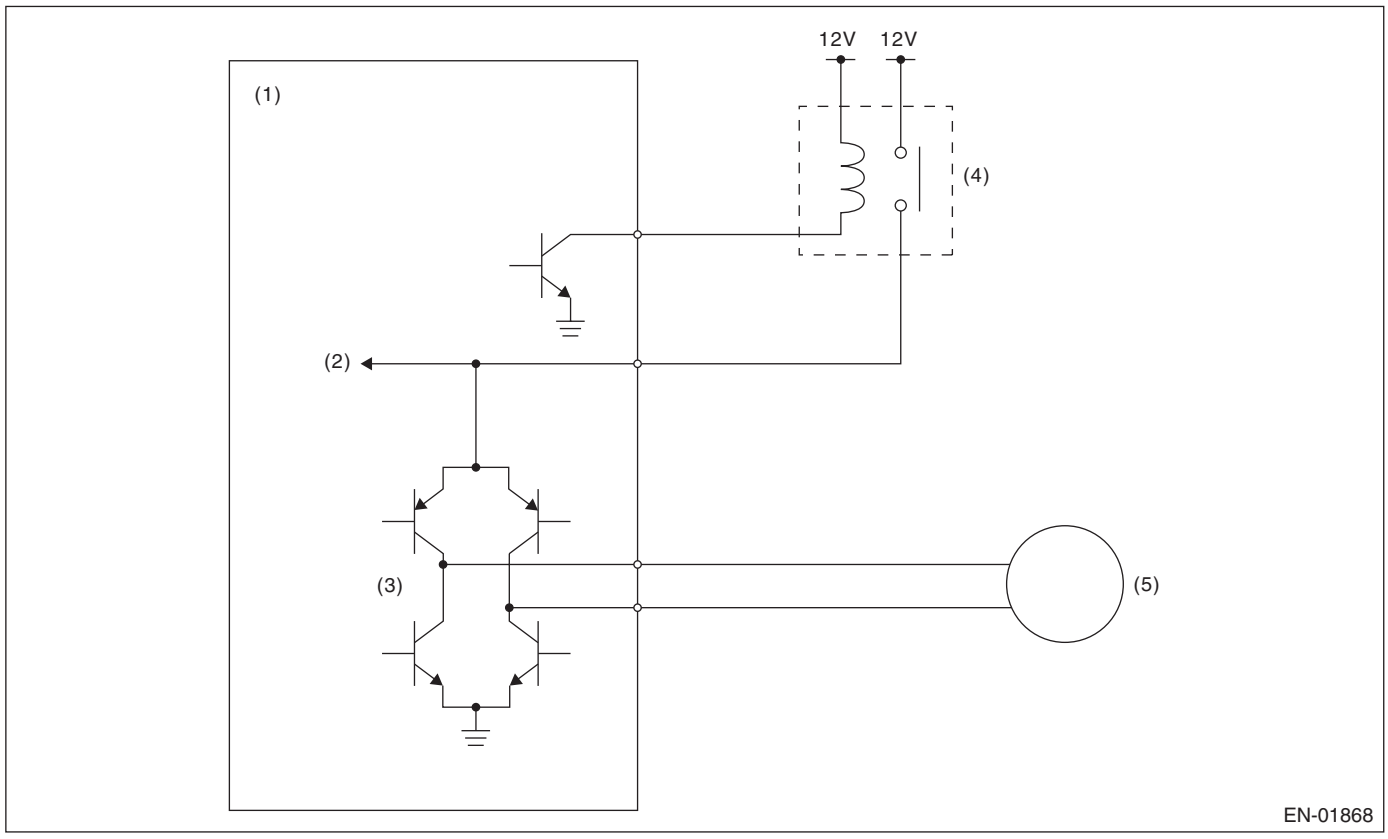
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

DK:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Judge NG when the electronic control throttle power is not supplied even when ECM sets the electric control throttle relay to ON.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Voltage detection circuit
(3) Drive circuit
(4) Electronic control throttle relay
(5) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Electronic control throttle relay output	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	≥ 5 V

Time Needed for Diagnosis:
- 400 milliseconds (For NG)
- 2,000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

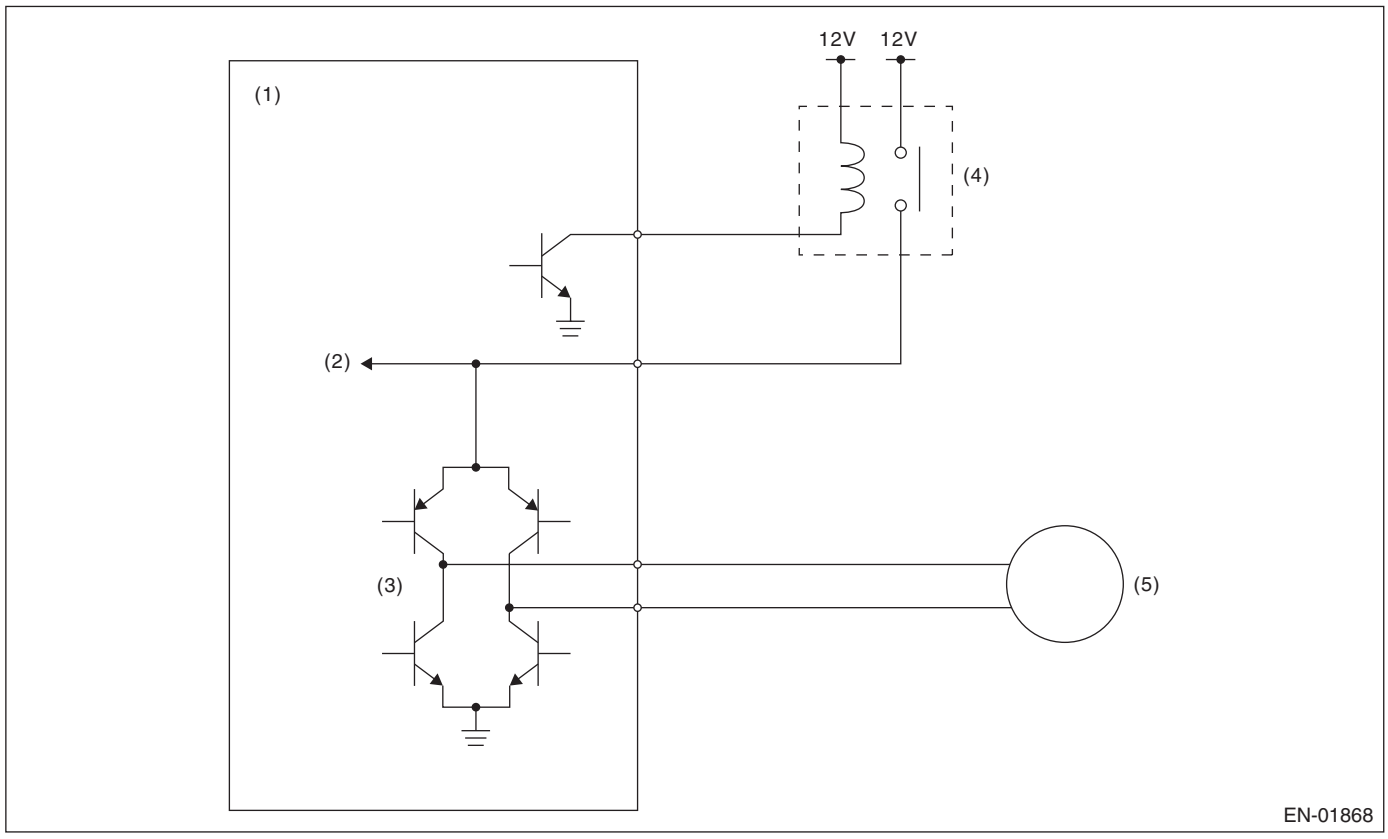
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

DL:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Judge NG when the electronic control throttle power is not supplied even when ECM sets the electric control throttle relay to OFF.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Voltage detection circuit
(3) Drive circuit
(4) Electronic control throttle relay
(5) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Electronic control throttle relay output	OFF

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	≤ 5 V

Time Needed for Diagnosis:

- 600 milliseconds (For NG)
- 400 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

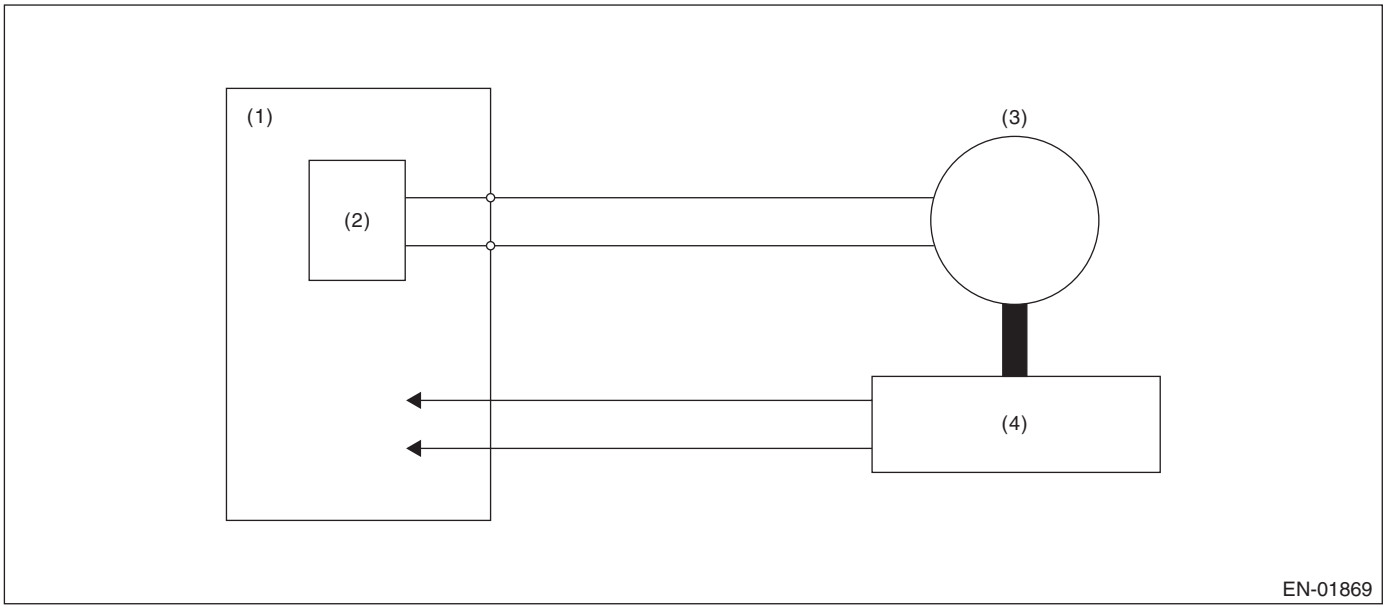
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

DM:DTC P2109 THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge NG when all close point learning cannot conducted or abnormal value is detected.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Drive circuit
(3) Motor
(4) Throttle position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON → OFF
Ignition switch (after clear memory only)	OFF → ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis at all close point learning.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Throttle sensor voltage at all close point learning	0.41 — 0.79 V
Time for all close point learning completion	Within 80 milliseconds

Time Needed for Diagnosis: None

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

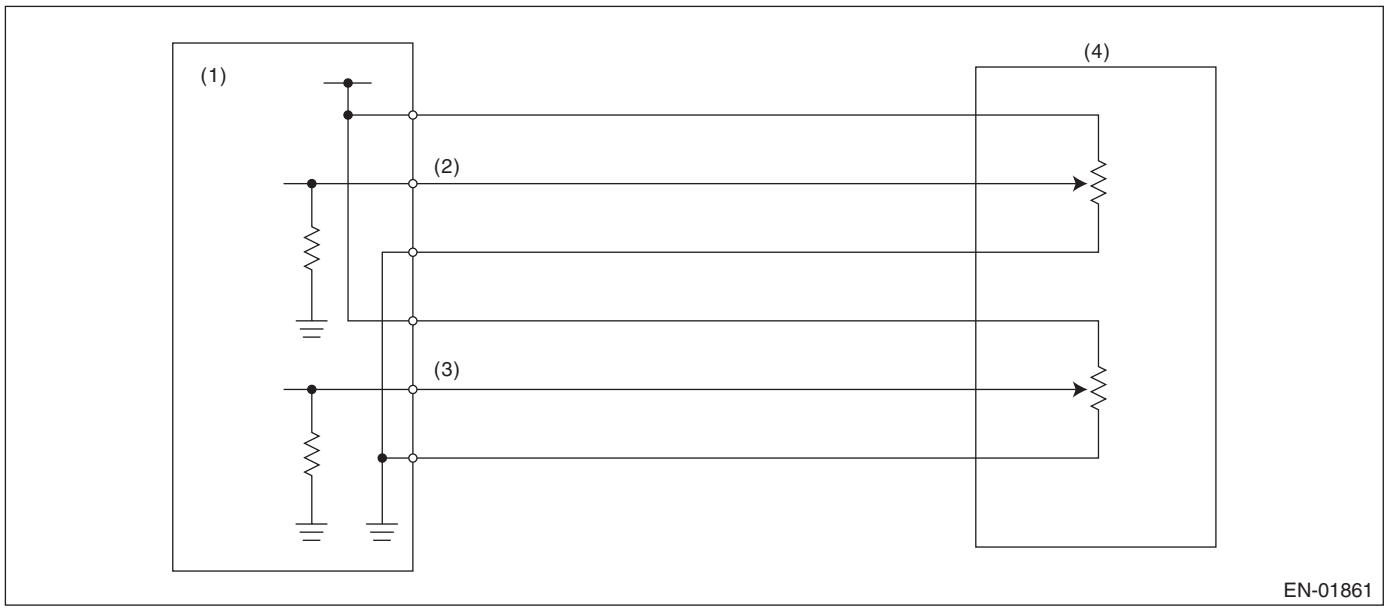
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

DN:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal.
(3) Accelerator pedal position sensor 2 signal.
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.308 V

Time Needed for Diagnosis: 100 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

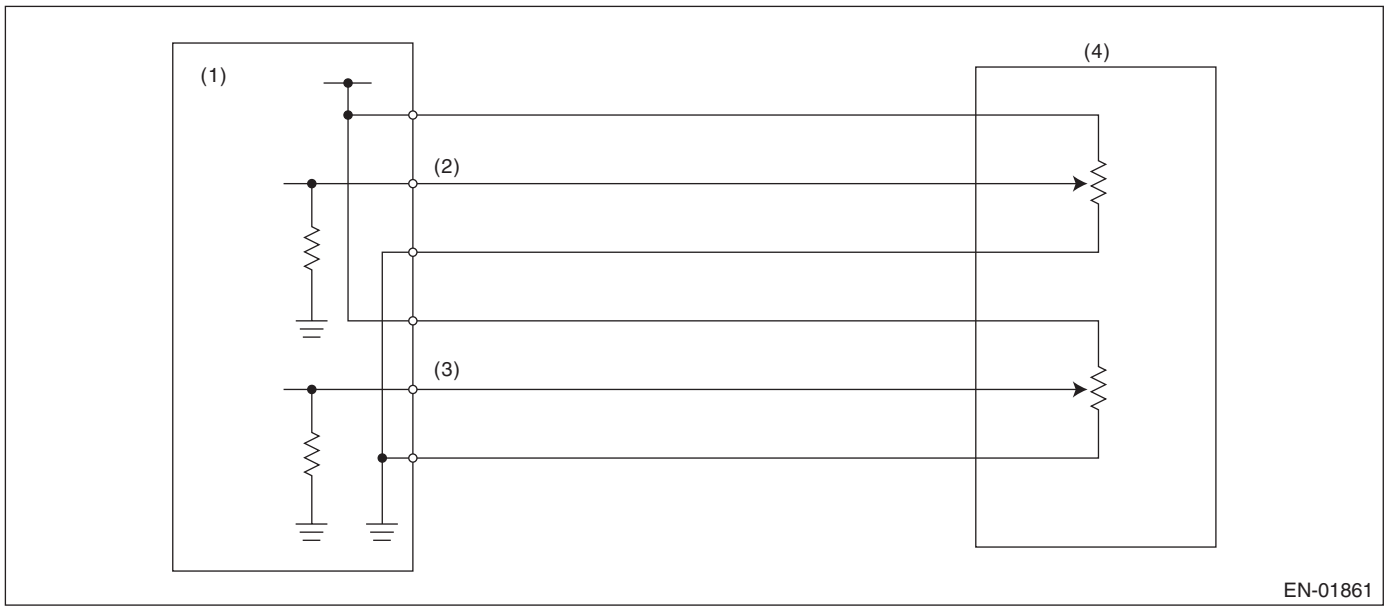
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

DO:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal.
(3) Accelerator pedal position sensor 2 signal.
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 4.856 V

Time Needed for Diagnosis: 100 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

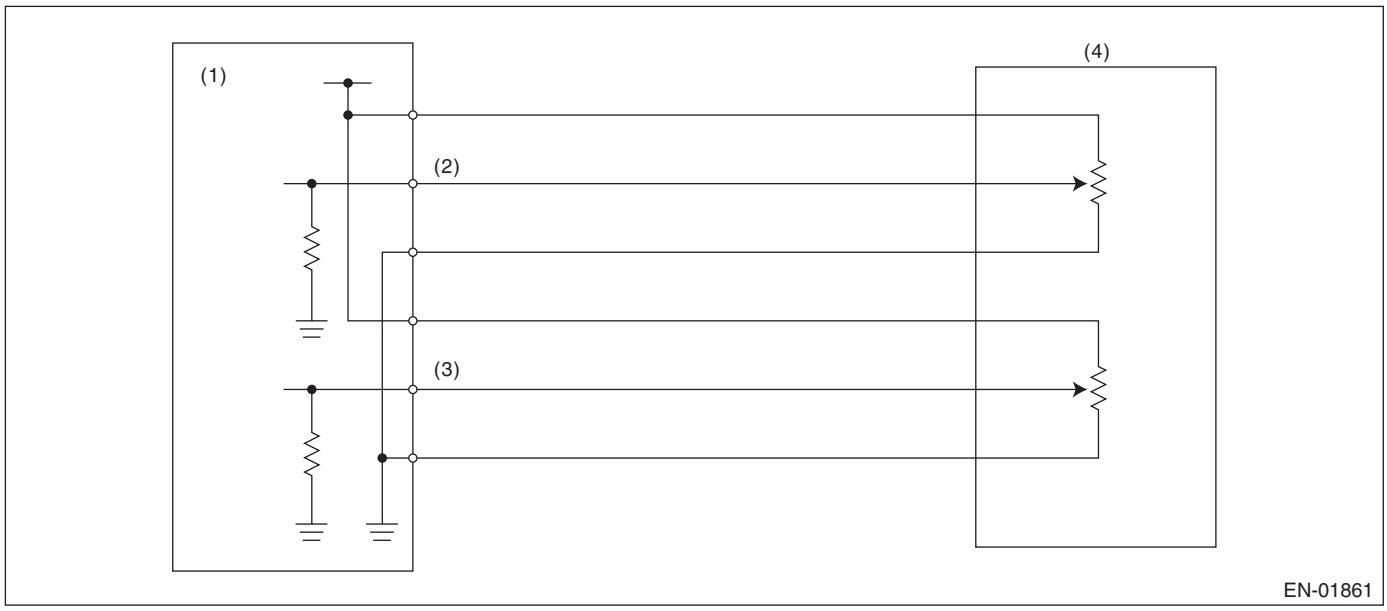
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

DP:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal.
(3) Accelerator pedal position sensor 2 signal.
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.308 V

Time Needed for Diagnosis: 100 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

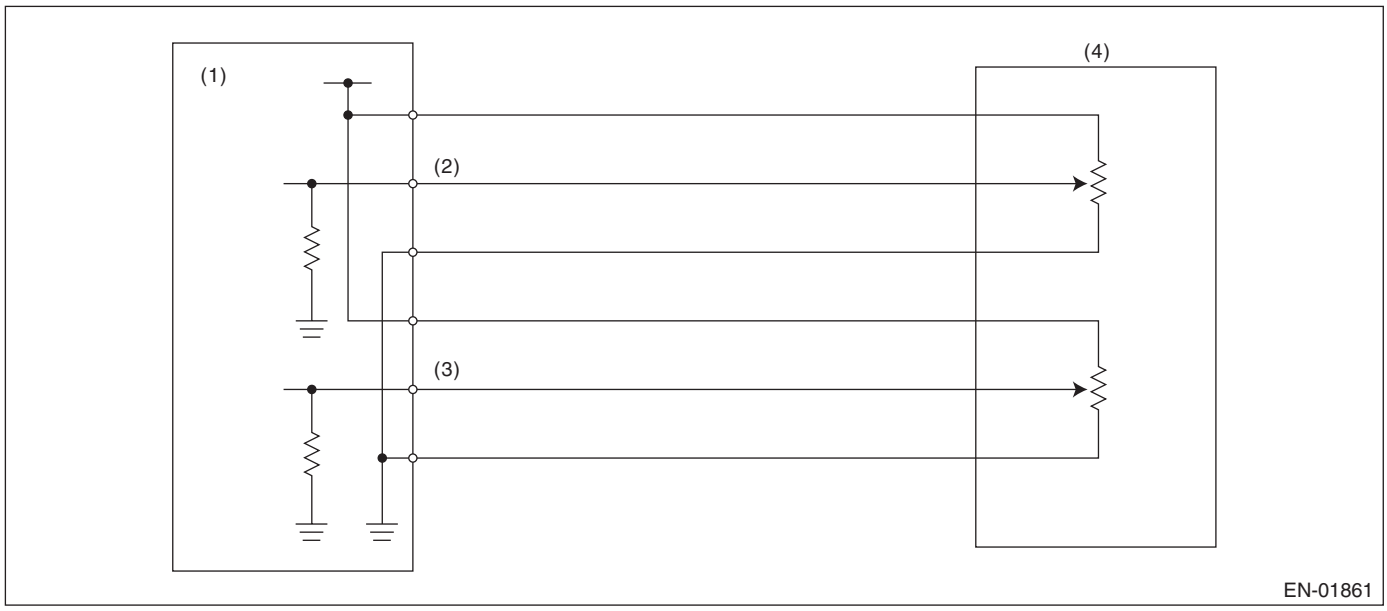
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

DQ:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal.
(3) Accelerator pedal position sensor 2 signal.
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.
Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.308 V

Time Needed for Diagnosis: 100 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

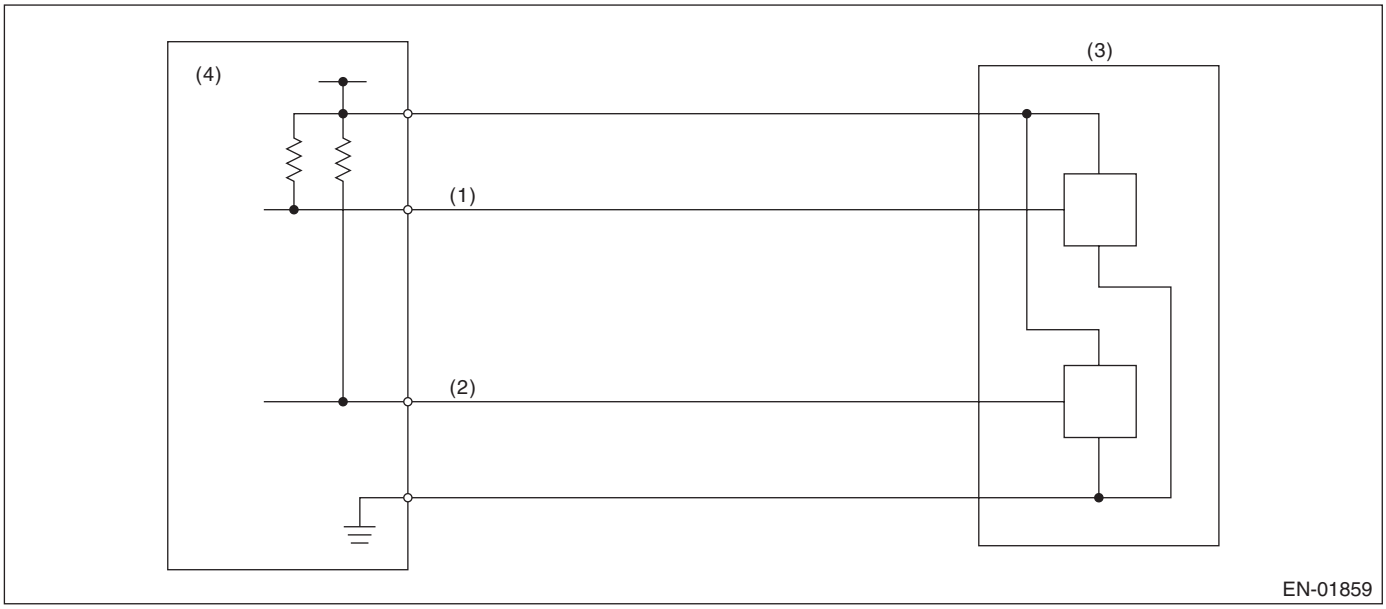
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

DR:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" / "B" VOLTAGE RATIONALITY

1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal.
(2) Throttle position sensor 2 signal.
(3) Throttle position sensor
(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

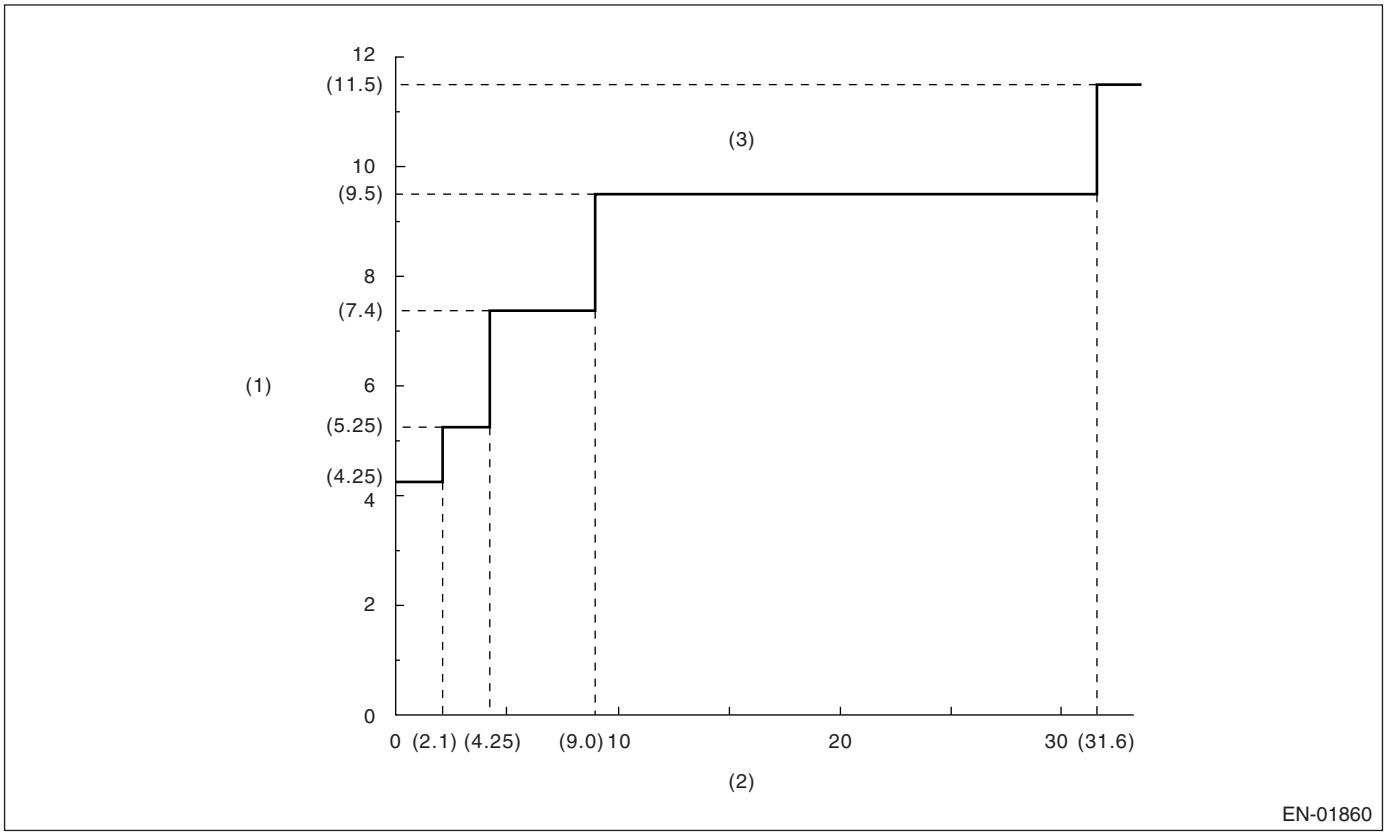
5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	≤ 4.25

Details of Judgment Value



(1) Sensor output difference (°)
(2) Throttle position sensor 1 opening angle (°)
(3) NG area

Time Needed for Diagnosis: 212 milliseconds
Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to ETC motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

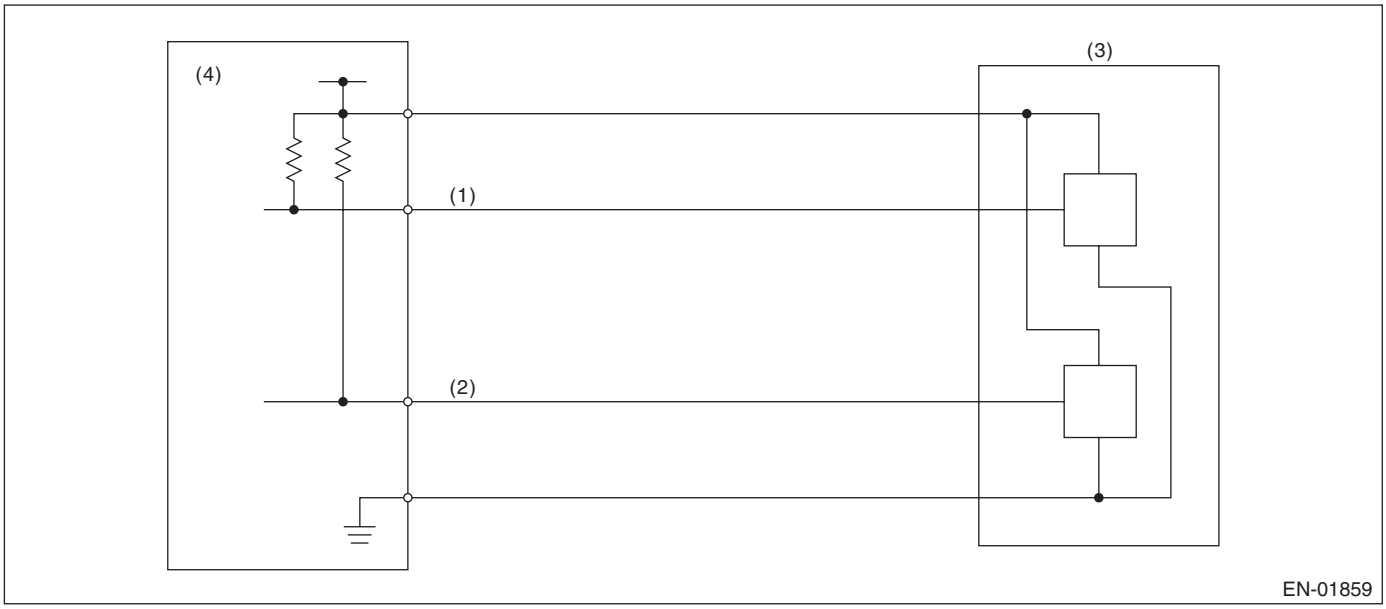
- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

DS:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE RATIONALITY

1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)
(2) Accelerator pedal position sensor 1 signal.
(3) Accelerator pedal position sensor 2 signal.
(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

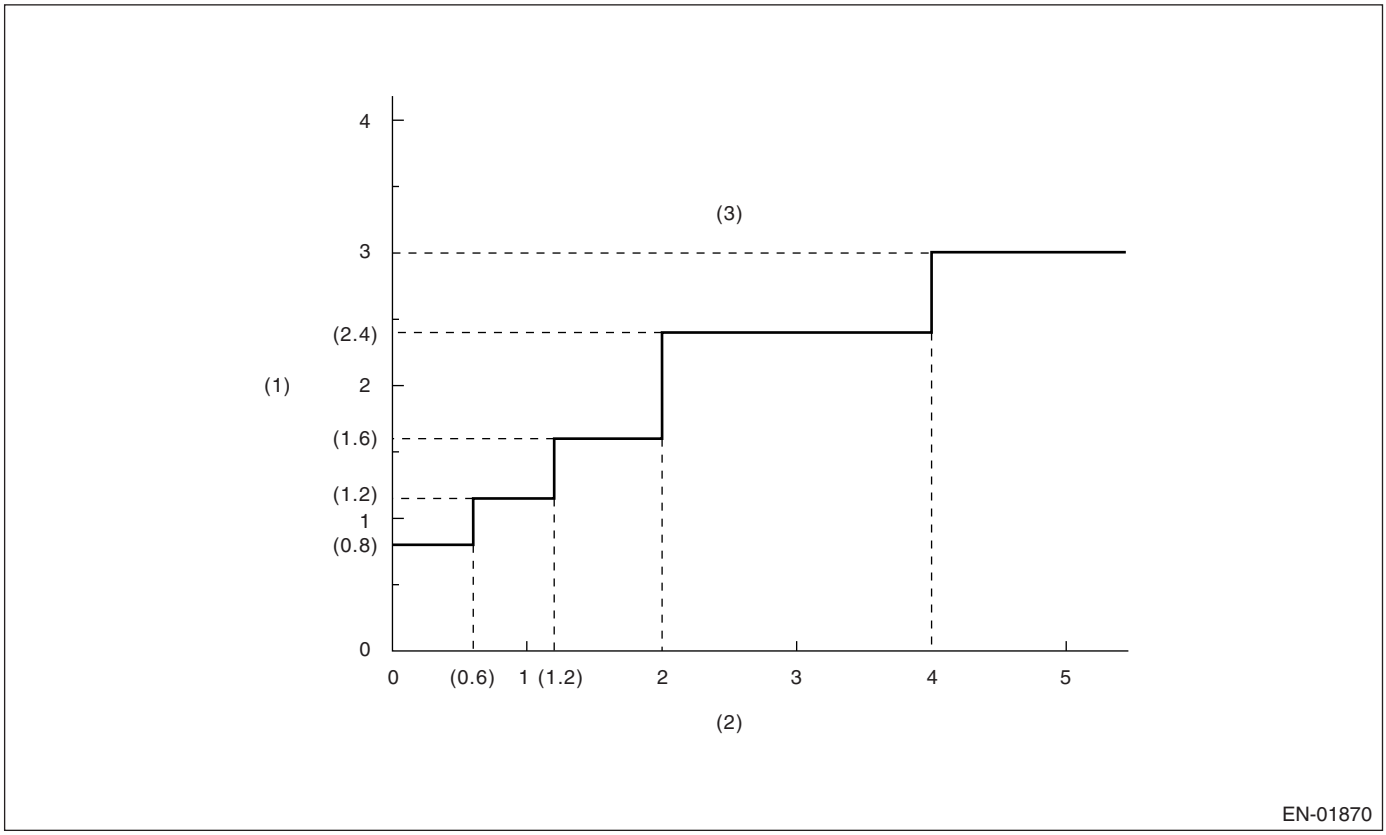
5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	≤ 0.8°

Details of Judgment Value



(1) Sensor output difference (°)
(2) Accelerator pedal position sensor 2 opening angle (°)
(3) NG area

Time Needed for Diagnosis:
- 116 milliseconds (For NG)
- 1,000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode $02)
- Memorize the diagnostic value and trouble standard value. (For test mode $06)

TRANSMISSION SECTION

CONTROL SYSTEMS	CS
AUTOMATIC TRANSMISSION	4AT
AUTOMATIC TRANSMISSION (DIAGNOSTICS)	4AT(diag)
MANUAL TRANSMISSION AND DIFFERENTIAL	5MT
MANUAL TRANSMISSION AND DIFFERENTIAL	6MT
MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)	6MT(diag)
CLUTCH SYSTEM	CL

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

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

FUJI HEAVY INDUSTRIES LTD.

G1870BE5

CONTROL SYSTEMS

CS

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2. AT Shift Lock System 7
3. Select Lever 22
4. Select Cable 25
5. AT Shift Lock Solenoid and “P” Range Switch 28
6. Body Integrated Unit 30
7. MT Gear Shift Lever 31
8. Reverse Check Cable 44
9. General Diagnostic Table 48

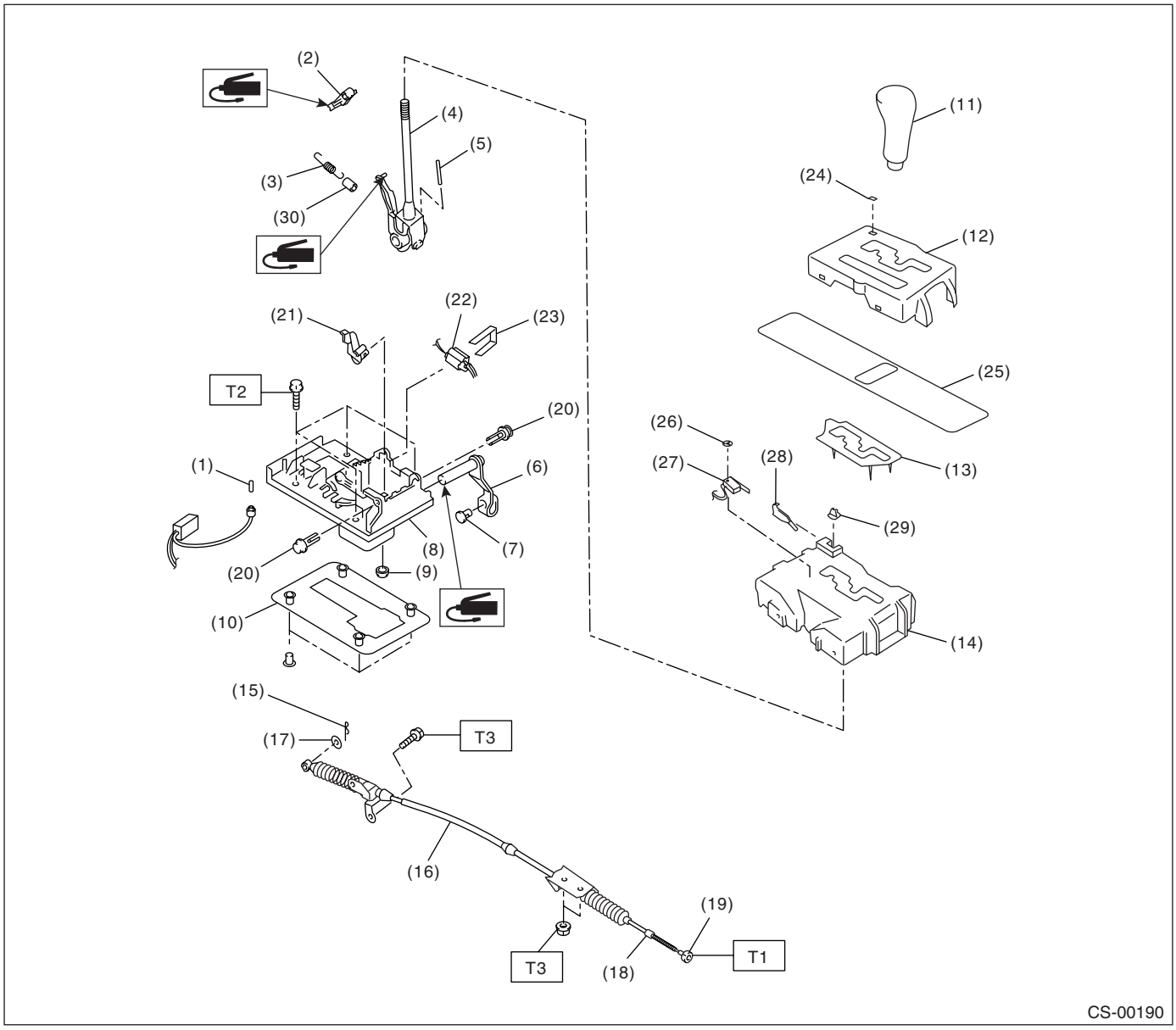
1. General Description

A: SPECIFICATIONS

Item	Specification
Swing torque of rod against lever N (kgf, lb)	3.7 (0.38, 0.84) or less

B: COMPONENT

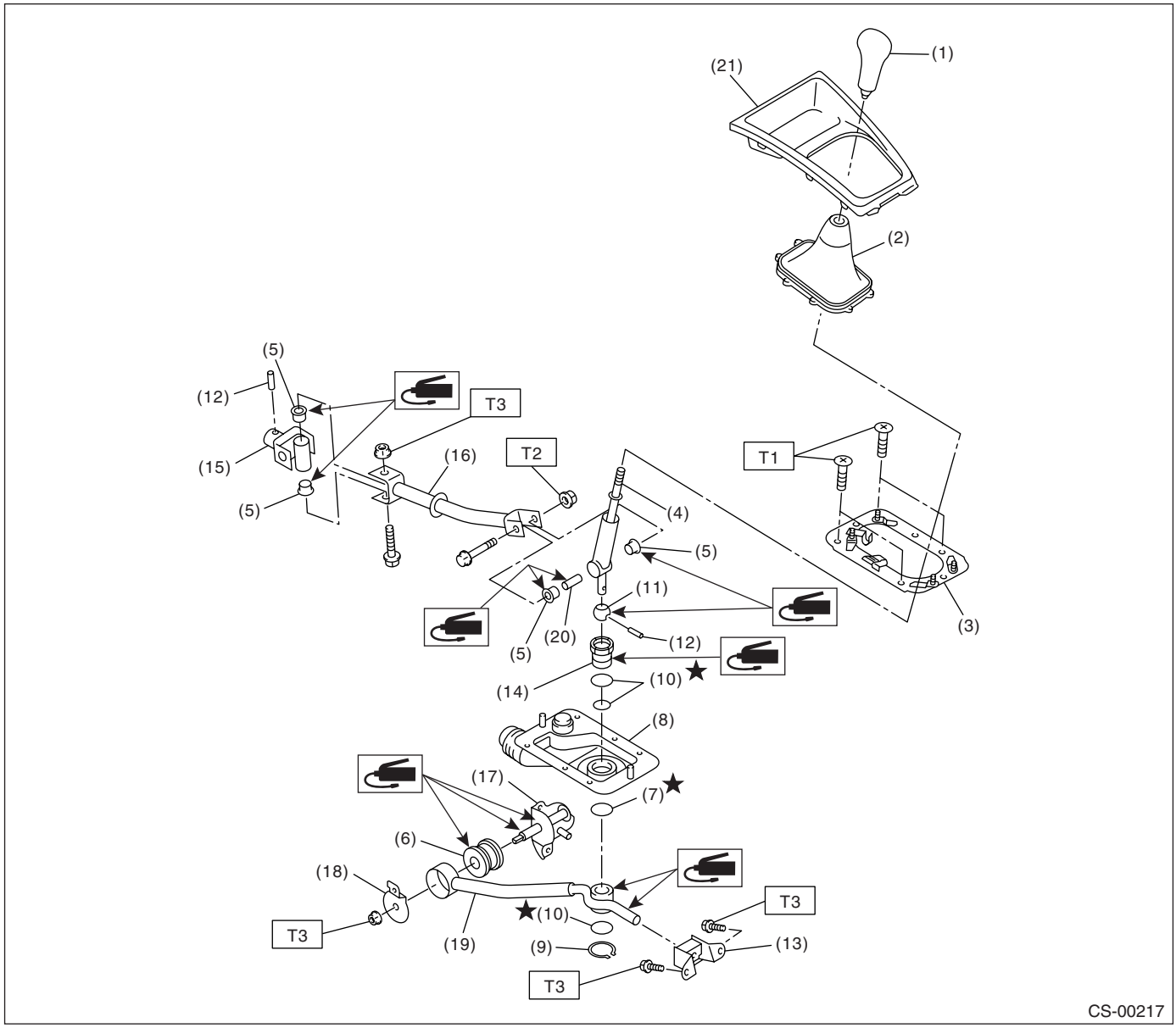
1. AT SELECT LEVER



(1) Indicator bulb
(2) Detent arm
(3) Detent spring
(4) Select lever ASSY
(5) Spring pin
(6) Arm
(7) Bush
(8) Plate
(9) Grommet
(10) Packing
(11) Grip
(12) Indicator cover
(13) Cushion plate
(14) Guide plate
(15) Snap pin
(16) Select cable
(17) Washer
(18) Nut B
(19) Nut A
(20) Clamp
(21) Lock plate
(22) Shift lock solenoid
(23) Clamp
(24) Cover
(25) Blind
(26) Clamp
(27) Parking switch
(28) Spring
(29) Button
(30) Tube

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 13 (1.3, 9.4)
T3: 18 (1.8, 13.0)

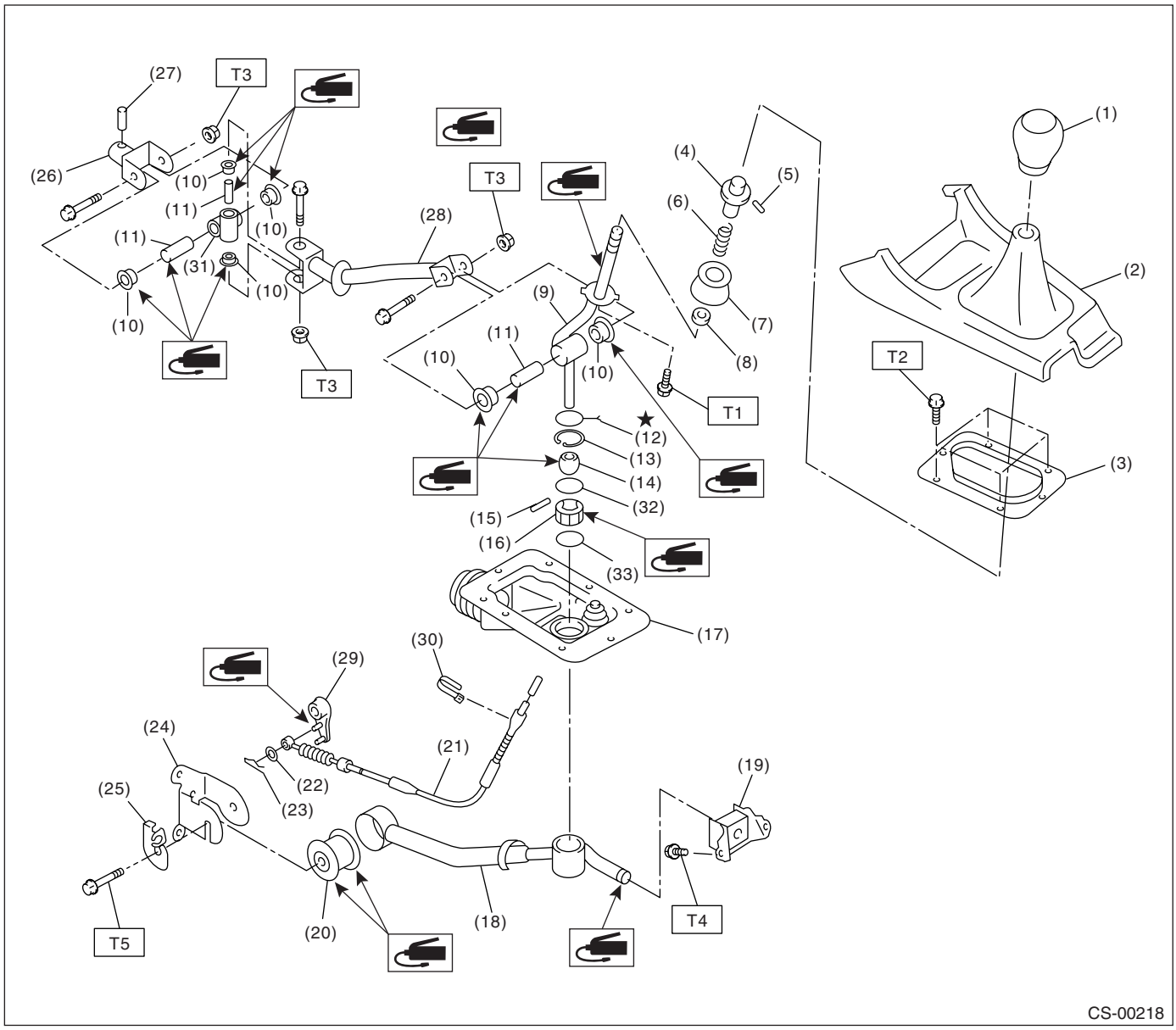
2. 5MT GEAR SHIFT LEVER



(1) Gear shift knob
(2) Console boot
(3) Plate ASSY
(4) Lever
(5) Bushing
(6) Bushing
(7) Lock wire
(8) Boot
(9) Snap ring
(10) O-ring
(11) Bushing A
(12) Spring pin
(13) Cushion rubber
(14) Bushing B
(15) Joint
(16) Rod
(17) Bracket
(18) Washer
(19) Stay
(20) Spacer
(21) Front cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 12 (1.2, 8.7)
T3: 18 (1.8, 13.0)

3. 6MT GEAR SHIFT LEVER



(1) Gear shift knob
(2) Console box front
(3) Plate
(4) Slider
(5) Spring pin
(6) Spring
(7) Holder
(8) Seat cushion
(9) Lever
(10) Bush
(11) Spacer
(12) Lock wire
(13) Snap ring
(14) Bush
(15) Spring pin
(16) Bush
(17) Boot
(18) Stay
(19) Cushion rubber
(20) Bush
(21) Reverse check cable
(22) Washer
(23) Snap pin
(24) Bracket
(25) Cable plate
(26) Joint
(27) Spring pin
(28) Rod
(29) Reverse check lever
(30) Band clip
(31) Boss
(32) O-ring
(33) O-ring

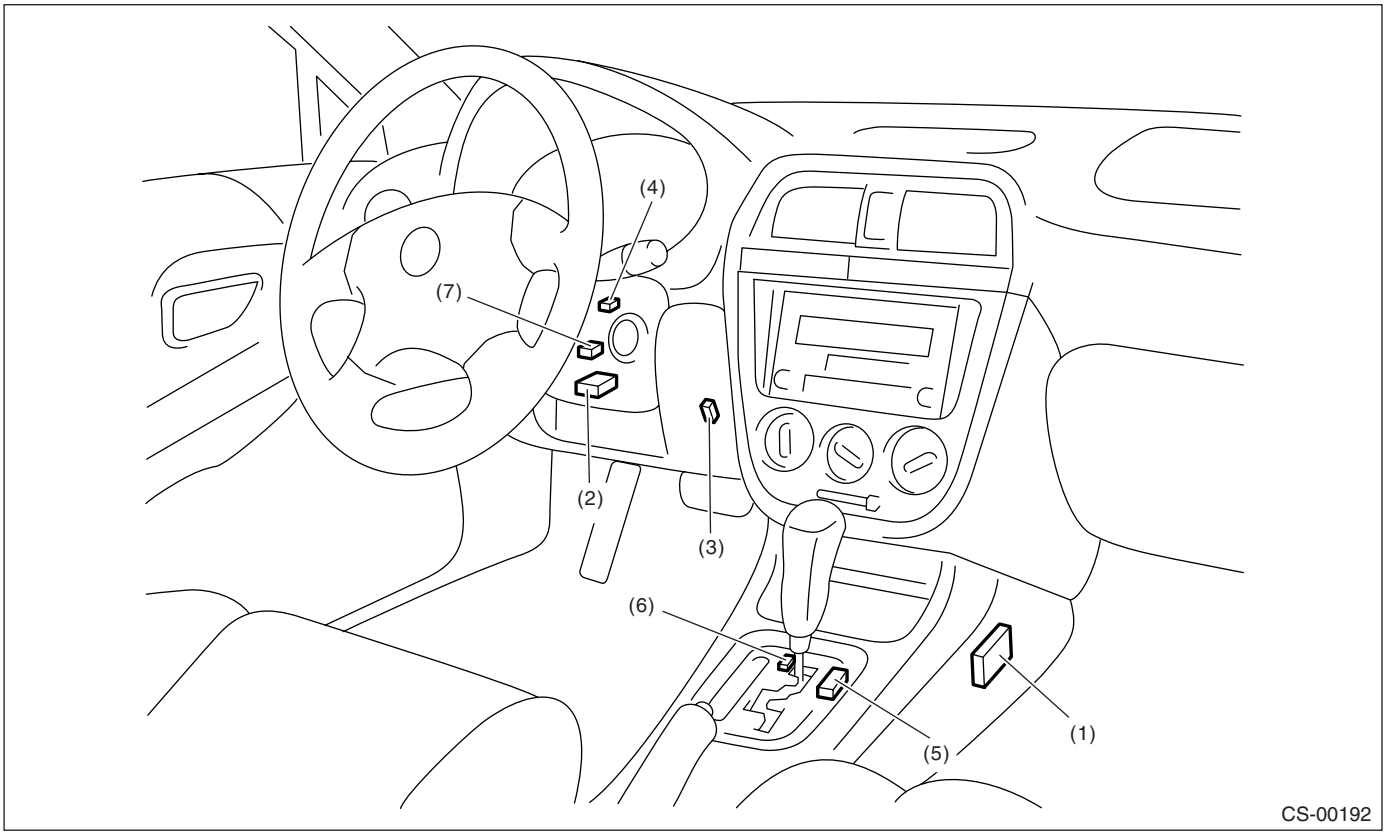
Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.3 (0.13, 0.96)
T2: 7.5 (0.76, 5.5)
T3: 11.8 (1.2, 8.7)
T4: 18 (1.8, 13.0)
T5: 32 (3.3, 23.6)

C: CAUTION

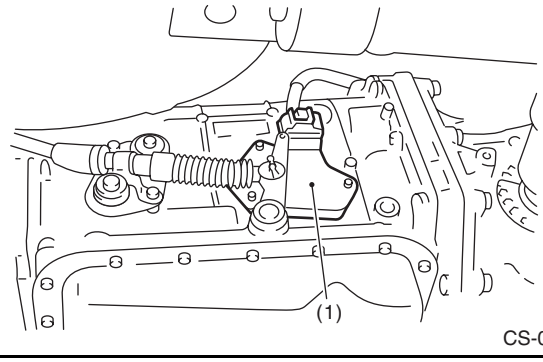
• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply grease onto sliding or revolution surfaces before installation.
• Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Before disconnecting electrical connectors, be sure to disconnect the ground cable from battery.

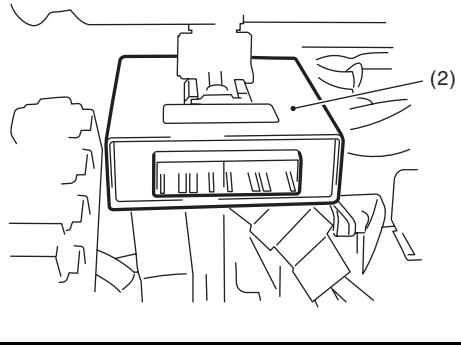
2. AT Shift Lock System

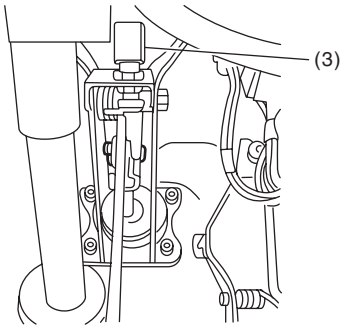
A: LOCATION



(1) Inhibitor switch
(2) Body integrated unit
(3) Stop light switch
(4) Key warning switch
(5) Shift lock solenoid
(6) “P” range switch
(7) Key lock solenoid







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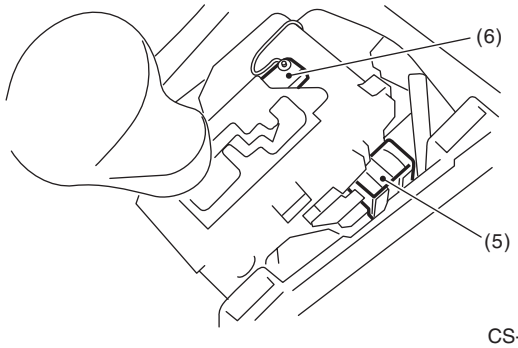

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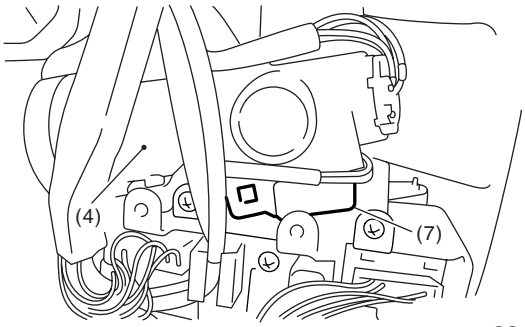
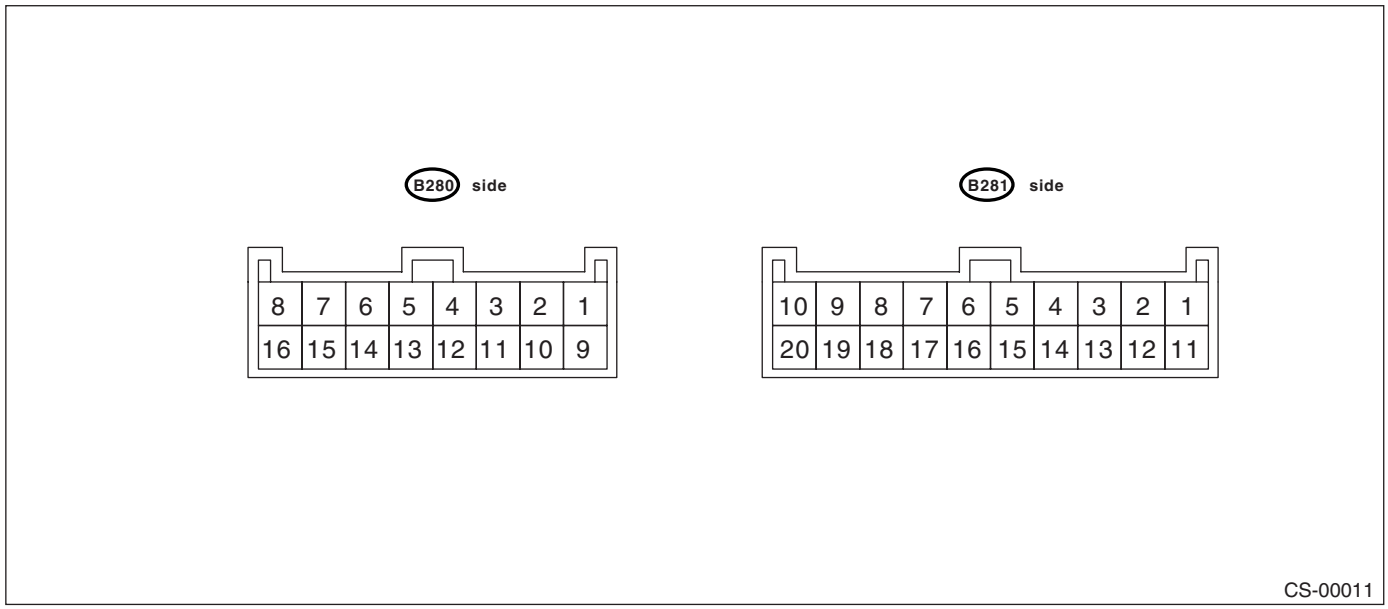


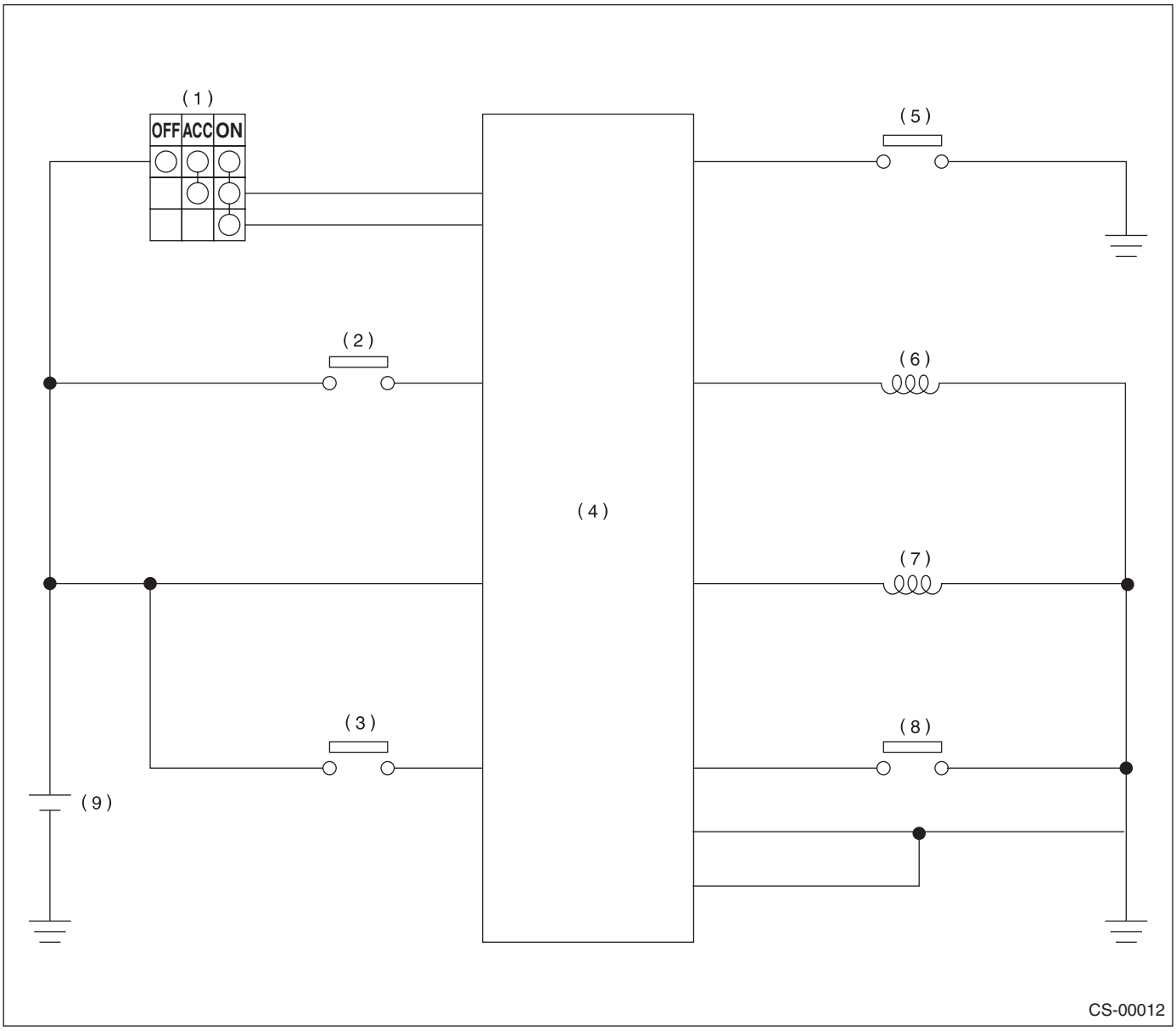
CS-00008

B: ELECTRICAL SPECIFICATION



Contents	To Connector No.	Terminal No.	Input/Output signal Measured value and measuring conditions
Battery power supply	B280	2	9 — 16 V
Ignition power supply	B281	19	10 — 15 V when ignition switch is at ON or START.
Ignition power supply	B281	10	10 — 15 V when ignition switch is at ACC.
Inhibitor Switch (“P” range)	B281	5	0 V when select lever is in “P” range. 9 — 16 V when select lever is in other ranges than “P” range.
Stop light switch	B281	9	9 — 16 V when stop light switch is ON. 0 V when stop light switch is OFF.
“P” range switch	B281	6	0 V when select lever is in “P” range. 9 — 16 V when select lever is in other ranges than “P” range.
Shift lock solenoid signal	B280	9	8.5 — 16 V when shift lock is released. 0 V when shift lock is operating.
Key warning switch signal	B281	20	9 — 16 V when key is inserted. 0 V when key is removed.
Key lock solenoid signal	B280	3	7.5 — 16 V when turning ignition switch to ON, select lever is in “P” range and brake switch is ON. 0 V at other conditions than above.
Ground	B280	4	—
Ground	B280	13	—

C: WIRING DIAGRAM



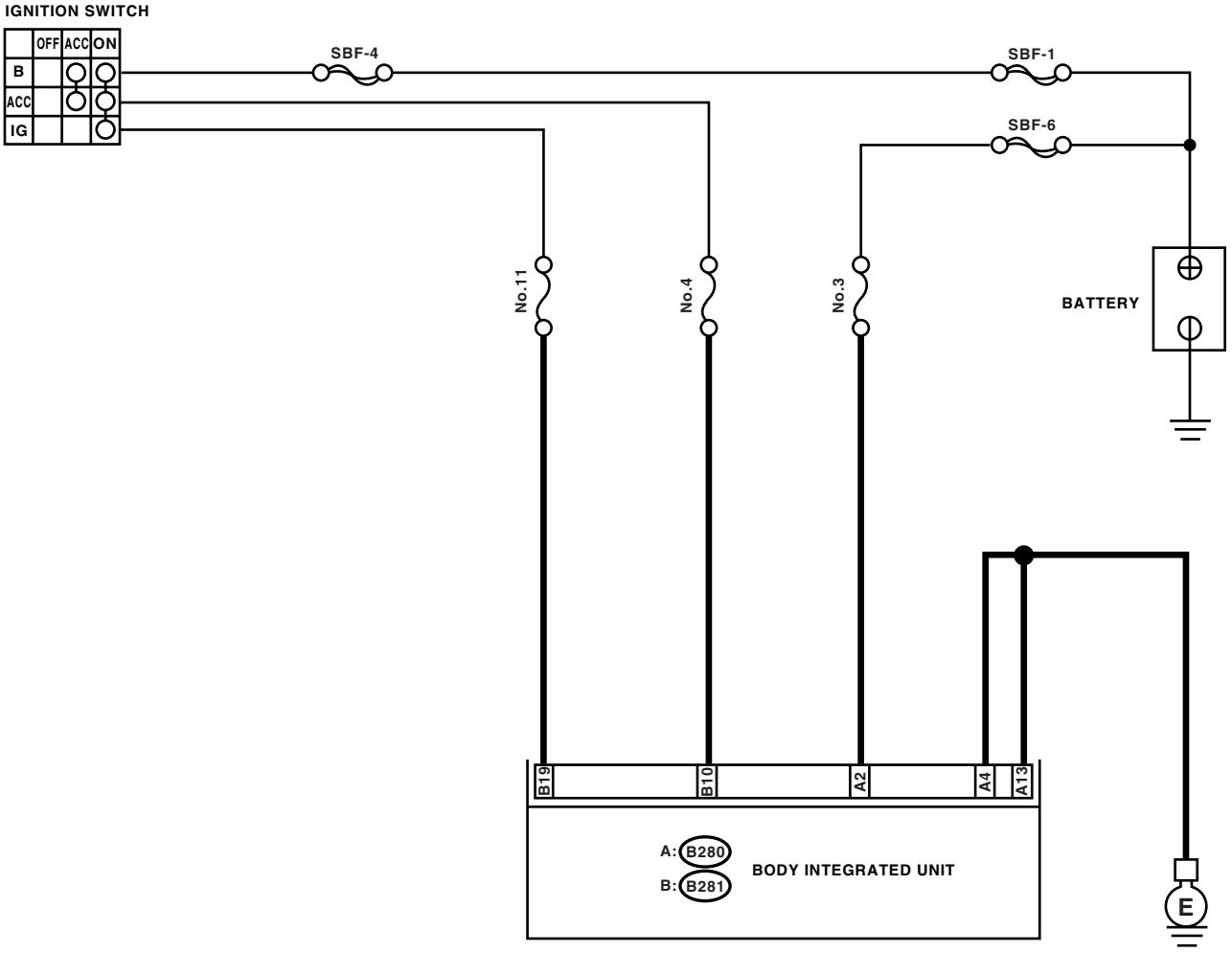
(1) Ignition switch
(2) Stop light switch
(3) Key warning switch
(4) Body integrated unit
(5) Inhibitor switch
(6) Key lock solenoid
(7) Shift lock solenoid
(8) “P” range switch
(9) Battery

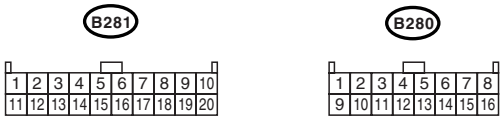
D: INSPECTION

1. SHIFT LOCK OPERATION

	Step	Check	Yes	No
1	**CHECK SHIFT LOCK.** 1) Turn the ignition switch ON. 2) Move the select lever to “P” range.	While the brake pedal is not depressed, can select lever move from “P” range to other ranges?	Inspect “SELECT LEVER CANNOT BE SHIFT LOCKED”. <Ref. to CS-14, SELECT LEVER CANNOT BE SHIFT LOCKED, INSPECTION, AT Shift Lock System.>	Go to step **2.**
2	**CHECK SHIFT LOCK.**	While the brake pedal is depressed, can select lever move from “P” range to other ranges?	Go to step **3.**	Inspect “SELECT LEVER SHIFT LOCK CANNOT BE RELEASED”. <Ref. to CS-16, SELECT LEVER SHIFT LOCK CANNOT BE RELEASED, INSPECTION, AT Shift Lock System.>
3	**CHECK KEY INTERLOCK.**	When the select lever is in other than “P” range, does ignition switch turn to “LOCK” position?	Inspect “KEY INTERLOCK DOES NOT BE LOCKED OR RELEASED. <Ref. to CS-19, KEY INTERLOCK DOES NOT LOCK OR RELEASE, INSPECTION, AT Shift Lock System.>	Go to step **4.**
4	**CHECK KEY INTERLOCK.**	When the select lever is in “P” range, does ignition switch turn to “LOCK” position?	AT shift lock system is normal.	Inspect “KEY INTERLOCK DOES NOT BE LOCKED OR RELEASED. <Ref. to CS-19, KEY INTERLOCK DOES NOT LOCK OR RELEASE, INSPECTION, AT Shift Lock System.>

2. BODY INTEGRATED UNIT POWER SUPPLY AND GROUND LINE

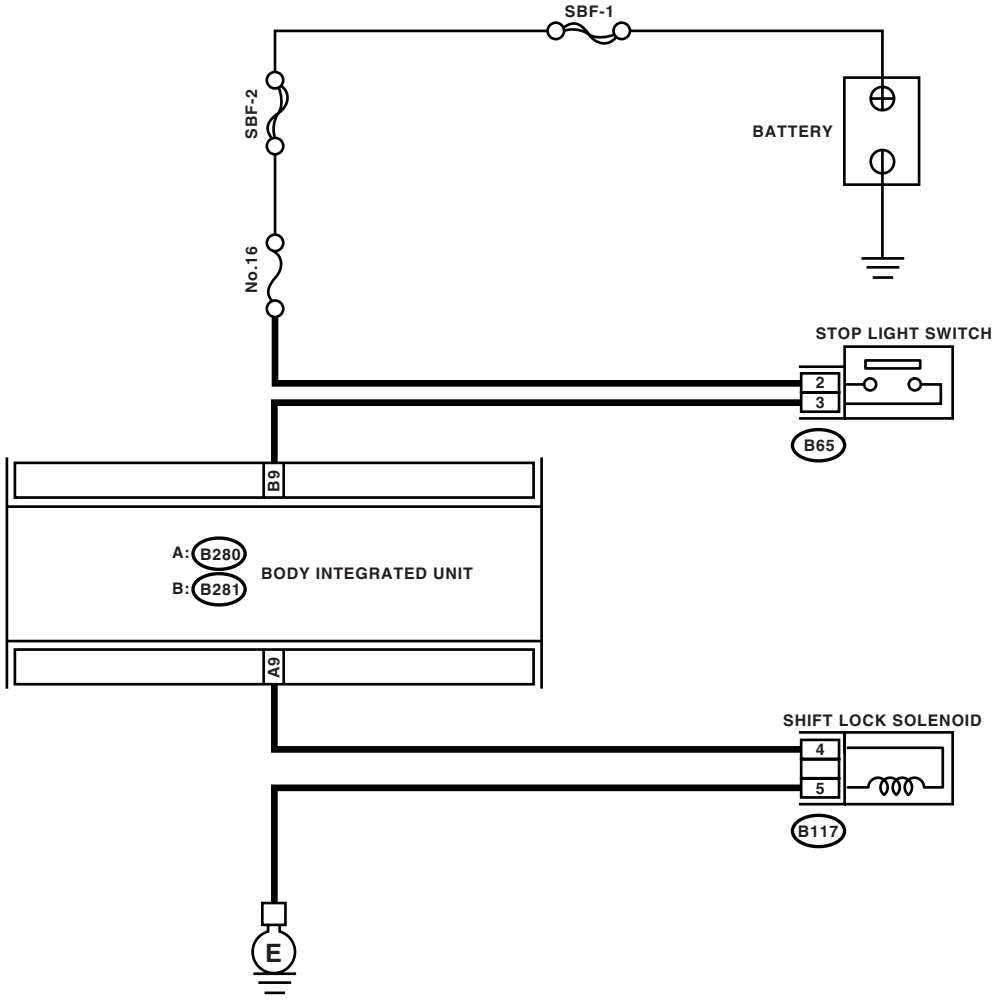


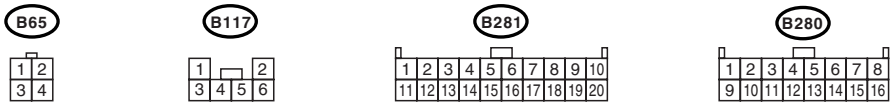


CS-00258

	Step	Check	Yes	No
1	**CHECK FUSE.** Remove the fuse (No. 3, 4 and 11).	Is the fuse (No. 3, 4 or 11) blown out?	Replace the fuse (No. 3, 4 or 11). If the replaced fuse (No. 3, 4 or 11) has blown out easily, repair short circuit in harness between fuse and body integrated unit.	Go to step **2.**
2	**CHECK HARNESS CONNECTOR BETWEEN BODY INTEGRATED UNIT AND BODY GROUND.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between body integrated unit and chassis ground. ***Connector & terminal*** ***(B280) No. 4 — Chassis ground:*** ***(B280) No. 13 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between body integrated unit and body ground.
3	**CHECK BATTERY POWER SUPPLY.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the voltages between body integrated unit and chassis ground. ***Connector & terminal*** ***(B280) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 9 V?	Go to step **4.**	Repair the open circuit harness between battery and body integrated unit, and poor contact in coupling connector.
4	**CHECK IGNITION POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ACC. 2) Measure the voltage between body integrated unit and chassis ground. ***Connector & terminal*** ***(B281) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 9 V?	Go to step **5.**	Repair the open circuit harness between battery and body integrated unit, and poor contact in coupling connector.
5	**CHECK IGNITION POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the voltage between body integrated unit and chassis ground. ***Connector & terminal*** ***(B281) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 9 V?	Go to step **6.**	Repair the open circuit harness between battery and body integrated unit, and poor contact in coupling connector.
6	**CHECK POOR CONTACT.**	Is there poor contact in connector?	Repair the poor contact.	Replace the body integrated unit.

3. SELECT LEVER CANNOT BE SHIFT LOCKED

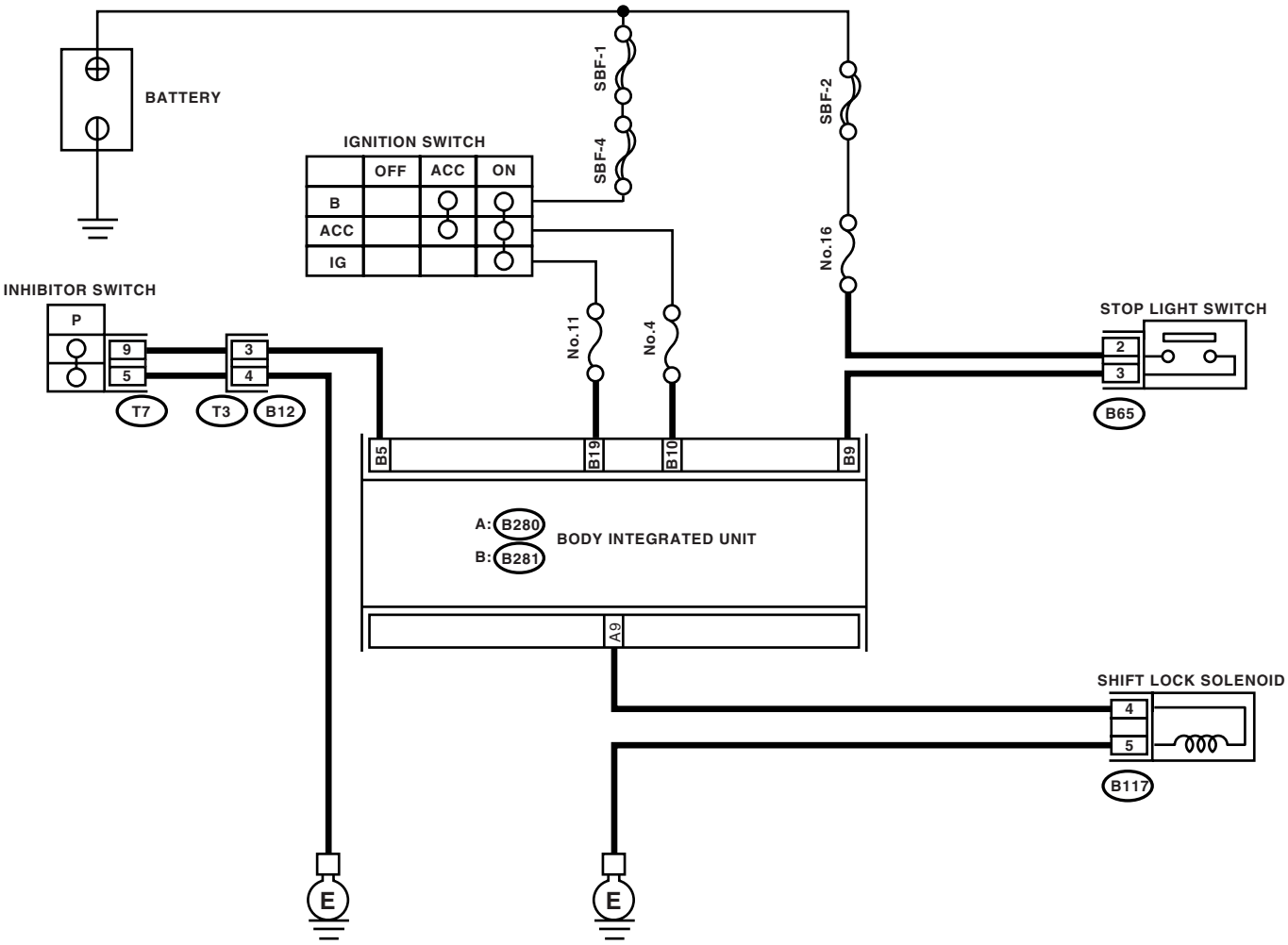


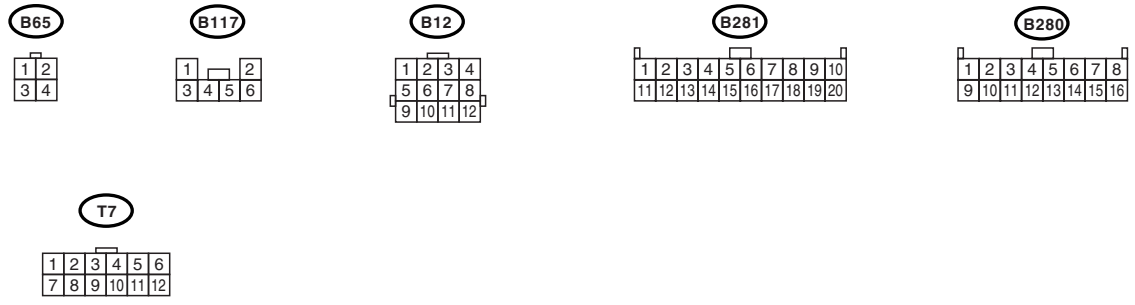


CS-00259

	Step	Check	Yes	No
1	**CHECK STOP LIGHT SWITCH.** Depress the brake pedal.	Does the stop light turn on?	Go to step **2.**	Inspect the stop light system.
2	**CHECK HARNESS BETWEEN STOP LIGHT SWITCH AND BODY INTEGRATED UNIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the body integrated unit and stoplight switch connector. 3) Measure the resistance of harness between stop light switch and body integrated unit. ***Connector & terminal*** ***(B65) No. 3 — (B281) No. 9:***	Is the resistance more than 1 MΩ?	Repair the open circuit in harness between body integrated unit and stop light switch.	Go to step **3.**
3	**CHECK HARNESS BETWEEN STOP LIGHT SWITCH AND BODY INTEGRATED UNIT.** Measure the resistance of harness between stop light switch and chassis ground. ***Connector & terminal*** ***(B65) No. 3 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair the short circuit in harness between body integrated unit and stop light switch.	Go to step **4.**
4	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND SHIFT LOCK SOLENOID.** 1) Disconnect the shift lock solenoid connector. 2) Measure the resistance of harness between body integrated unit and shift lock solenoid. ***Connector & terminal*** ***(B117) No. 4 — (B280) No. 9:***	Is the resistance more than 1 MΩ?	Repair the open circuit in harness between body integrated unit and shift lock solenoid.	Go to step **5.**
5	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND SHIFT LOCK SOLENOID.** Measure the resistance of harness between shift lock solenoid and chassis ground. ***Connector & terminal*** ***(B117) No. 4 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair the short circuit in harness between body integrated unit and shift lock solenoid.	Go to step **6.**
6	**CHECK HARNESS BETWEEN SHIFT LOCK SOLENOID AND CHASSIS GROUND.** Measure the resistance of harness between shift lock solenoid and chassis ground. ***Connector & terminal*** ***(B117) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Repair the open circuit in harness between shift lock solenoid and body ground.	Go to step **7.**
7	**CHECK SHIFT LOCK SOLENOID.** Measure the resistance of shift lock solenoid connector terminals. ***Terminals*** ***No. 4 — No. 5:***	Is the resistance 20 — 40 Ω?	Go to step **8.**	Replace the shift lock solenoid.
8	**CHECK SHIFT LOCK SOLENOID.** Connect the battery with shift lock solenoid connector terminal and operate solenoid. ***Terminals*** ***No. 4 (+) — No. 5 (−):***	Does the shift lock solenoid operate properly?	Go to step **9.**	Replace the shift lock solenoid.
9	**CHECK POOR CONTACT.**	Is there poor contact in connector?	Repair the poor contact.	Replace the body integrated unit.

4. SELECT LEVER SHIFT LOCK CANNOT BE RELEASED



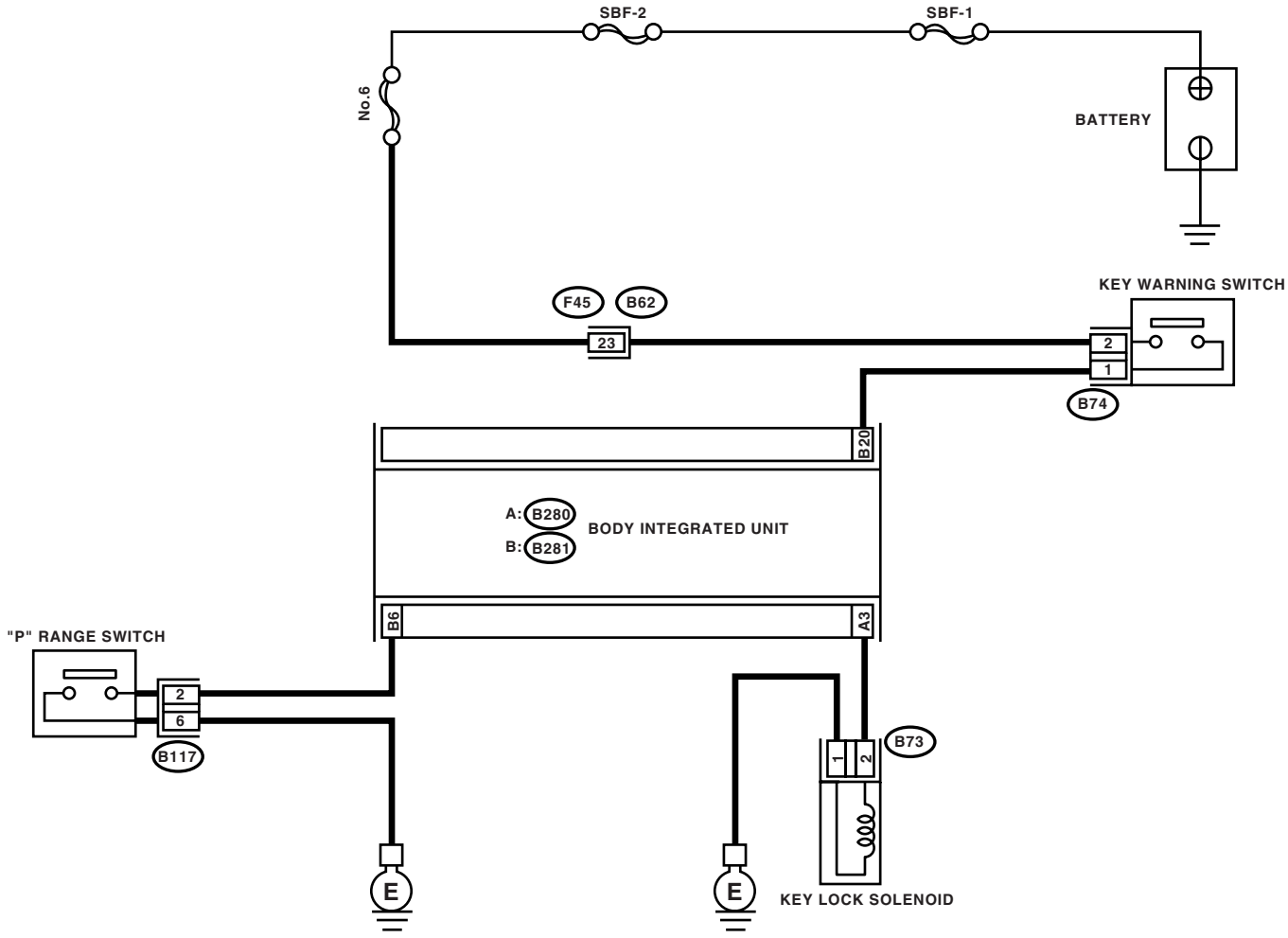


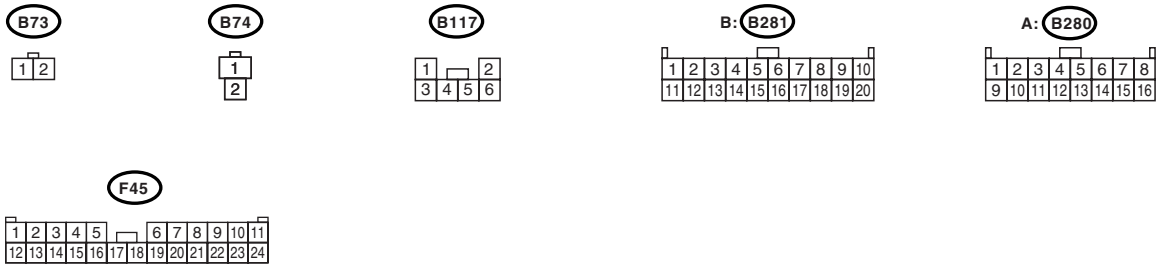
CS-00260

	Step	Check	Yes	No
1	**CHECK INHIBITOR SWITCH.** 1) Turn the ignition switch to ON (engine OFF). 2) Move the select lever from “P” to “1” range.	Are combination meter indicator light and select lever “P”, “R”, “N”, “3”, “2” and “1” correctly matched?	Go to step **2.**	Adjust the inhibitor switch and select cable.
2	**CHECK HARNESS BETWEEN INHIBITOR SWITCH AND BODY INTEGRATED UNIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector of transmission harness and body integrated unit. 3) Measure the resistance of harness between body integrated unit and chassis ground. ***Connector & terminal*** ***(B281) No. 5 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair the short circuit in harness between body integrated unit and transmission connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN INHIBITOR SWITCH AND BODY INTEGRATED UNIT.** Measure the resistance of harness between body integrated unit and inhibitor switch. ***Connector & terminal*** ***(B12) No. 3 — (B281) No. 5:***	Is the resistance more than 1 MΩ?	Repair the open circuit in harness between body integrated unit and transmission connector	Go to step **4.**
4	**CHECK HARNESS BETWEEN INHIBITOR SWITCH AND CHASSIS GROUND.** Measure the resistance of harness between body integrated unit and chassis ground. ***Connector & terminal*** ***(B12) No. 4 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit in harness between body integrated unit and chassis ground.
5	**CHECK INHIBITOR SWITCH.** 1) Move the select lever to “P” range. 2) Measure the resistance of transmission harness connector terminals . ***Connector & terminal*** ***(T3) No. 3 — No. 4:***	Is the resistance more than 1 MΩ?	Repair or replace the inhibitor switch.	Go to step **6.**
6	**CHECK OUTPUT SIGNAL FOR BODY INTEGRATED UNIT.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between body integrated unit and chassis ground. ***Connector & terminal*** ***(B281) No. 5 (+) — Chassis ground (−):***	Is the voltage 9 — 16 V?	Go to step **7.**	Go to step **15.**
7	**CHECK STOP LIGHT SWITCH.** Depress the brake pedal.	Does the stop light turn on?	Go to step **8.**	Inspect the stop light system.
8	**CHECK HARNESS BETWEEN STOP LIGHT SWITCH AND AT SHIFT LOCK CONTROL MODULE.** 1) Depress the brake pedal. 2) Measure the voltage between body integrated unit and chassis ground. ***Connector & terminal*** ***(B281) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 9 V?	Go to step **9.**	Repair the open or short circuit in harness between body integrated unit and stop light switch.

	Step	Check	Yes	No
9	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND SHIFT LOCK SOLENOID.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from shift lock solenoid and body integrated unit. 3) Measure the resistance of harness between body integrated unit and shift lock solenoid. ***Connector & terminal*** ***(B280) No. 9 — (B117) No. 4:***	Is the resistance more than 1 MΩ?	Repair the open circuit in harness between body integrated unit and shift lock solenoid.	Go to step **10.**
10	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND SHIFT LOCK SOLENOID.** Measure the resistance of harness between shift lock solenoid and chassis ground. ***Connector & terminal*** ***(B280) No. 9 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **11.**	Repair the short circuit in harness between body integrated unit and shift lock solenoid.
11	**CHECK HARNESS BETWEEN SHIFT LOCK SOLENOID AND CHASSIS GROUND.** Measure the resistance of harness between shift lock solenoid and chassis ground. ***Connector & terminal*** ***(B117) No. 5 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair the open circuit in harness between shift lock solenoid and chassis ground.
12	**CHECK SHIFT LOCK SOLENOID.** Measure the resistance of shift lock solenoid connector terminals. ***Terminals*** ***No. 4 — No. 5:***	Is the resistance 20 — 40 Ω?	Go to step **13.**	Replace the shift lock solenoid.
13	**CHECK SHIFT LOCK SOLENOID.** Connect the battery with shift lock solenoid connector terminal and operate solenoid. ***Terminals*** ***No. 4 (+) — No. 5 (−):***	Is the shift lock solenoid operating properly?	Go to step **14.**	Replace the shift lock solenoid.
14	**CHECK OUTPUT SIGNAL FOR AT SHIFT LOCK CONTROL MODULE.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the voltage between body integrated unit and chassis ground. ***Connector & terminal*** ***(B280) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 8.5 V?	Go to step **15.**	Replace the body integrated unit.
15	**CHECK POOR CONTACT.**	Is there poor contact in connector?	Repair the poor contact.	Replace the body integrated unit.

5. KEY INTERLOCK DOES NOT LOCK OR RELEASE





CS-00261

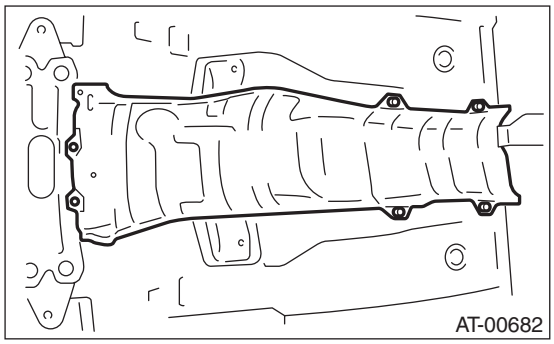
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN BATTERY AND KEY WARNING SWITCH.** 1) Disconnect the connector key warning switch. 2) Measure the voltage of harness between key warning switch and chassis ground. ***Connector & terminal*** ***(B74) No. 2 (+) — Chassis ground (−):***	Is the voltage 9 — 16 V?	Go to step **2.**	Repair the open or short circuit in harness between battery and key warning switch.
2	**CHECK KEY WARNING SWITCH.** Measure the resistance of key warning switch connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance more than 1 MΩ?	Replace the key warning switch.	Go to step **3.**
3	**CHECK KEY WARNING SWITCH.** 1) Remove the key. 2) Measure the resistance of key warning switch connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the key warning switch.
4	**CHECK HARNESS BETWEEN AT SHIFT LOCK CONTROL MODULE AND KEY WARNING SWITCH.** 1) Disconnect the body integrated unit connector. 2) Measure the voltage of harness body integrated unit and chassis ground. ***Connector & terminal*** ***(B281) No. 20 (+) — Chassis ground (−):***	Is the voltage more than 9 V?	Go to step **5.**	Repair the open circuit in harness between body integrated unit and key warning switch.
5	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND KEY LOCK SOLENOID.** 1) Disconnect the connector of key lock solenoid. 2) Measure the resistance of harness between body integrated unit and key lock solenoid. ***Connector & terminal*** ***(B73) No. 2 — (B280) No. 3:***	Is the resistance more than 1 MΩ?	Repair the open circuit in harness between body integrated unit and key lock solenoid.	Go to step **6.**
6	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND KEY LOCK SOLENOID.** Measure the resistance of harness between body integrated unit and chassis ground. ***Connector & terminal*** ***(B280) No. 3 — Chassis ground:***	Is the resistance more than 1 Ω?	Go to step **7.**	Repair the short circuit in harness between body integrated unit and key lock solenoid.
7	**CHECK HARNESS BETWEEN KEY LOCK SOLENOID AND CHASSIS GROUND.** Measure the resistance of harness between key lock solenoid and chassis ground. ***Connector & terminal*** ***(B73) No. 1 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **8.**	Repair the open circuit in harness between key lock solenoid and chassis ground.
8	**CHECK KEY LOCK SOLENOID.** Measure the resistance of key lock solenoid connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 4 — 8 Ω?	Go to step **14.**	Replace the key lock solenoid.

	Step	Check	Yes	No
9	**CHECK HARNESS BETWEEN "P" RANGE SWITCH AND CHASSIS GROUND.** Measure the resistance of harness between "P" range switch and chassis ground. ***Connector & terminal*** ***(B117) No. 2 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair the short circuit in harness between "P" range switch and body integrated unit.
10	**CHECK HARNESS BETWEEN AT SHIFT LOCK CONTROL MODULE AND "P" RANGE SWITCH.** 1) Disconnect the connector from "P" range switch. 2) Measure the resistance of harness between body integrated unit and "P" range switch. ***Connector & terminal*** ***(B117) No. 2 — (B281) No. 6:***	Is the resistance more than 1 MΩ?	Repair the open circuit in harness between body integrated unit and "P" range switch.	Go to step **11.**
11	**CHECK HARNESS BETWEEN "P" RANGE SWITCH AND CHASSIS GROUND.** Measure the resistance of harness "P" range switch and chassis ground. ***Connector & terminal*** ***(B117) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Repair the open circuit in harness between "P" range switch and chassis ground.	Go to step **12.**
12	**CHECK "P" RANGE SWITCH.** 1) Move the select lever to "P" range. 2) Measure resistance between "P" range switch connector terminals. ***Terminals*** ***No. 2 — No. 6:***	Is the resistance less than 1 Ω?	Go to step **13.**	Replace the "P" range switch.
13	**CHECK "P" RANGE SWITCH.** 1) Move the select lever to other than "P" range. 2) Measure resistance between "P" range switch connector terminals. ***Terminals*** ***No. 2 — No. 6:***	Is the resistance more than 1 MΩ?	Go to step **14.**	Replace the "P" range switch.
14	**CHECK OUTPUT SIGNAL FOR BODY INTEGRATED UNIT.** 1) Connect all connectors. 2) Turn the ignition switch to ON (engine OFF). 3) Move the select lever to "P" range. 4) Press the brake pedal. 5) Measure the voltage between body integrated unit connector and chassis ground. ***Connector & terminal*** ***(B280) No. 3 (+) — Chassis ground (−):***	Is the voltage 7.5 — 16 V?	Go to step **15.**	Replace the body integrated unit.
15	**CHECK POOR CONTACT.**	Is there poor contact in connector?	Repair the poor contact.	Replace the body integrated unit.

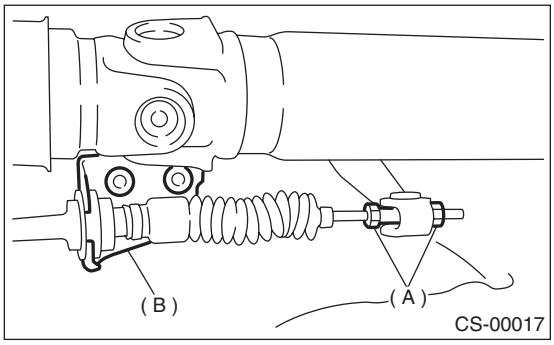
3. Select Lever

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect negative cable from battery.
3) Set the select lever to the “N” range.
4) Lift-up the vehicle.
5) Remove the rear exhaust pipe and muffler.
SOHC model
<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, REMOVAL, Muffler.>
DOHC turbo model
<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
6) Remove the heat shield cover. (If equipped)

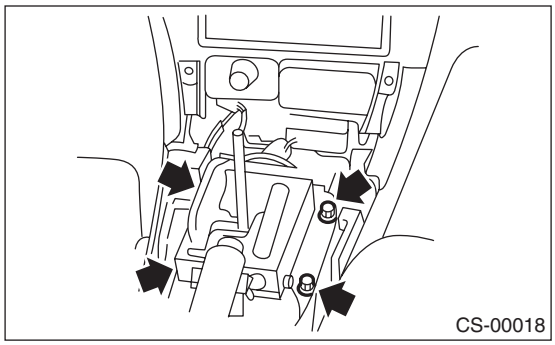


7) Disconnect the cable from select lever, and then remove the cable bracket.



(A) Adjusting nuts
(B) Cable bracket

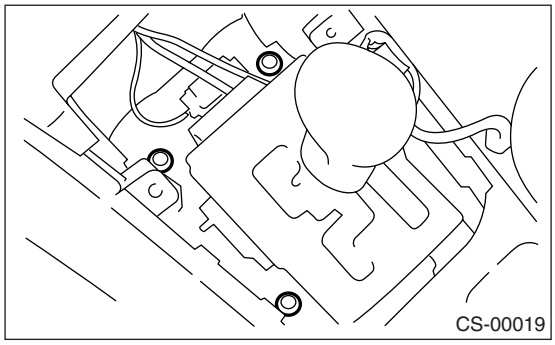
8) Lower the vehicle.
9) Remove the console box. <Ref. to EI-44, REMOVAL, Console Box.>
10) Disconnect the connectors, then remove the four bolts to take out the select lever assembly from the body.



B: INSTALLATION

1) Mount the select lever onto the vehicle body.
2) Tighten the four bolts to install the select lever to the vehicle body, then connect connector.

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



3) Install the console box. <Ref. to EI-44, INSTALLATION, Console Box.>
4) Set location of the select lever at “N” range.
5) Lift-up the vehicle.
6) Set location of the range select lever to “N” range.
7) Insert the thread portion of the other inner cable and into the connector hole of the select lever, and fix the other outer cable end to the bracket.

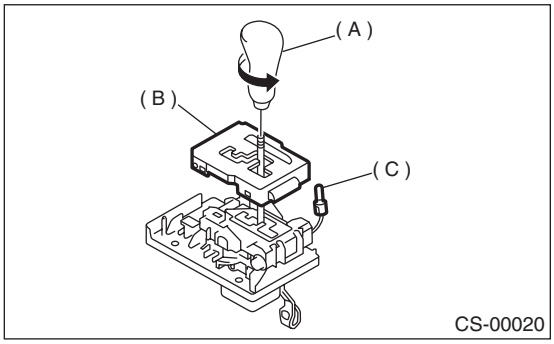
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

8) Adjust the select cable position. <Ref. to CS-26, ADJUSTMENT, Select Cable.>
9) After completion of fitting, make sure that the select lever operates smoothly all across the operating range.
10) Install the heat shield cover. (If equipped)
11) Install the rear exhaust pipe and muffler.
SOHC model
<Ref. to EX(H4SO)-8, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, INSTALLATION, Muffler.>

DOHC turbo model
<Ref. to EX(H4DOTC)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-14, INSTALLATION, Muffler.>
12) Inspect the following items. If the following inspection reveals problems, adjust the select cable and inhibitor switch. <Ref. to CS-26, ADJUSTMENT, Select Cable.> and <Ref. to 4AT-46, ADJUSTMENT.>
(1) The engine starts operating when select lever is in range “P” and “N”, but not in other ranges.
(2) The back-up light is lit when the select lever is in range “R”, but not in other ranges.
(3) Select lever and indicator ranges are matched.

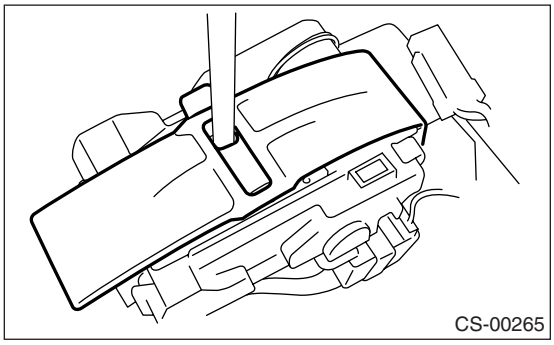
C: DISASSEMBLY

1) Remove the packing.
2) Remove the grip.
3) Remove the indicator bulb from indicator cover.
4) Remove the indicator cover.

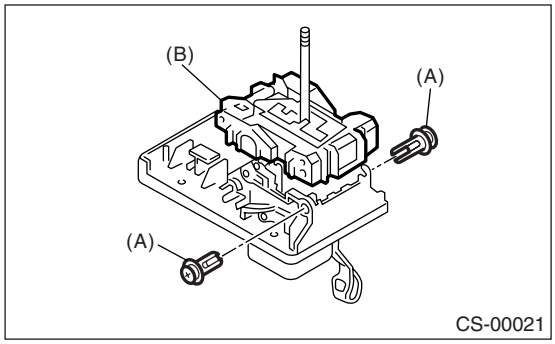


(A) Grip
(B) Indicator cover
(C) Indicator bulb

5) Remove the blind.

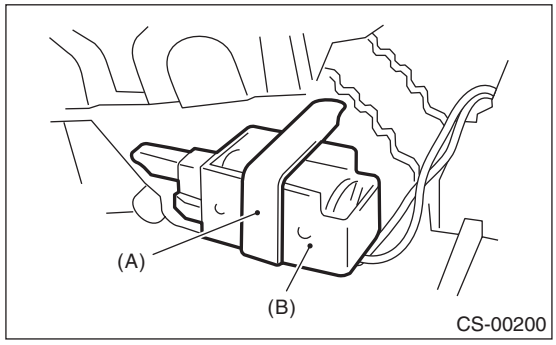


6) Remove the clip, and then remove the guide plate.



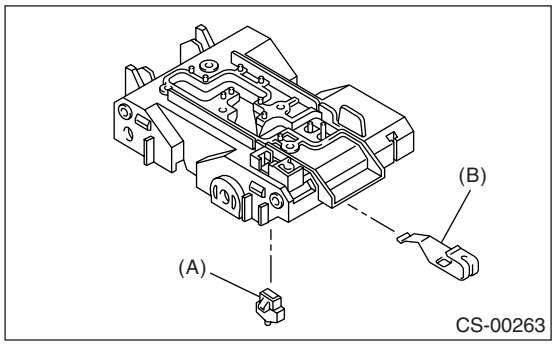
(A) Clip
(B) Guide plate

7) Remove the clamp, and then remove the shift lock solenoid.



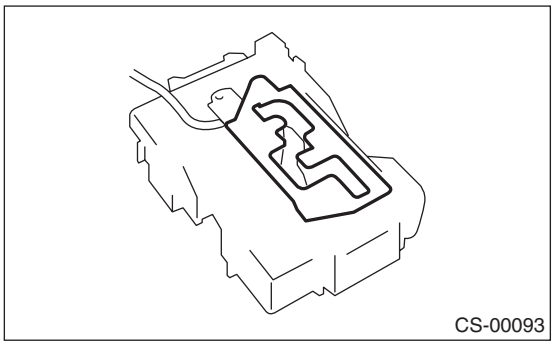
(A) Clamp
(B) Shift lock solenoid

8) Remove the spring, and button.

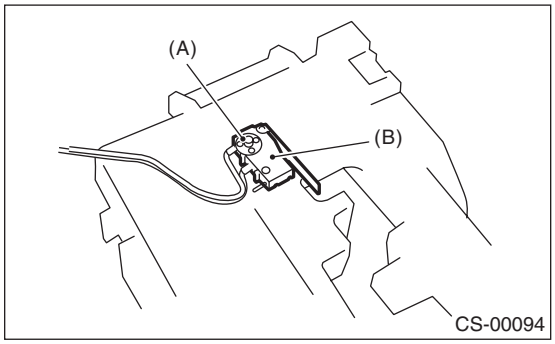


(A) Button
(B) Spring

9) Remove the cushion plate.

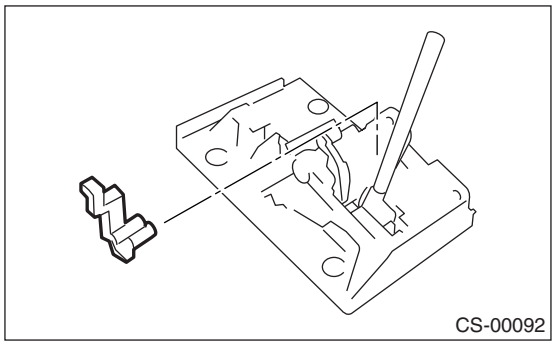


10) Remove the clip, and then remove the “P” range switch.

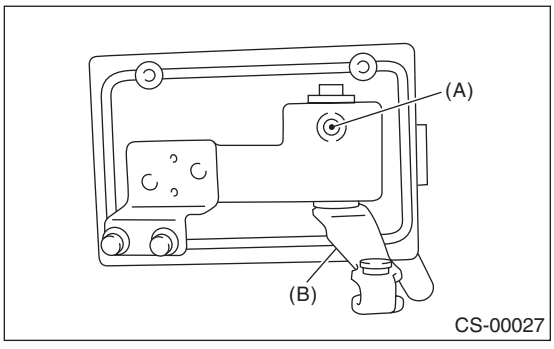


(A) Clip
(B) “P” range switch

11) Remove the lock plate.

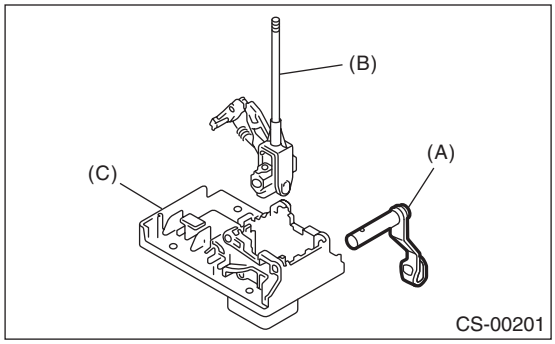


12) Remove the grommet, and then remove the spring pin.



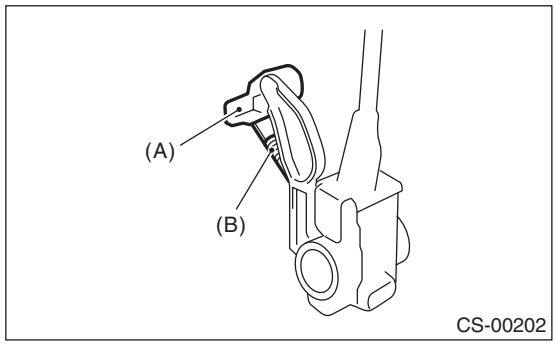
(A) Spring pin
(B) Select lever lower

13) Remove the arm, and then remove the select lever assembly from guide plate.



(A) Arm
(B) Select lever ASSY
(C) Plate

14) Remove the spring and detent arm.



(A) Detent arm
(B) Spring

D: ASSEMBLY

1) Clean all parts before assembly.
2) Apply grease [KOPR-KOTE (Part No. 003603001) or equivalent] to each parts. <Ref. to CS-3, AT SELECT LEVER, COMPONENT, General Description.>
3) Assembly is in the reverse order of disassembly.
4) After completion of fitting, transfer the select lever to range “P” — “1”, then check whether the indicator and select lever agree, whether the pointer and position mark agree and what the operating force is.

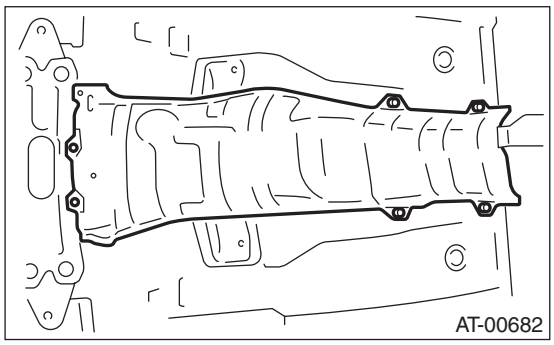
E: INSPECTION

1) Inspect the removed parts by comparing with new ones for deformation, damage and wear. Correct or replace if defective.
2) Confirm the following parts for operating condition before assembly. Moving condition of the select lever assembly, it should move smoothly.

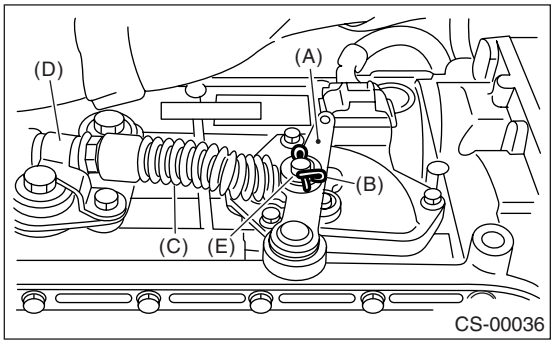
4. Select Cable

A: REMOVAL

1) Set the vehicle on a lift.
2) Set the select lever to “N” range.
3) Disconnect negative cable from battery.
4) Lift-up the vehicle.
5) Remove front, center, rear exhaust pipe and muffler. (SOHC model)
<Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-7, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, REMOVAL, Muffler.>
6) Remove the center and rear exhaust pipes and muffler. (DOHC turbo model)
<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
7) Remove the heat shield cover. (If equipped)

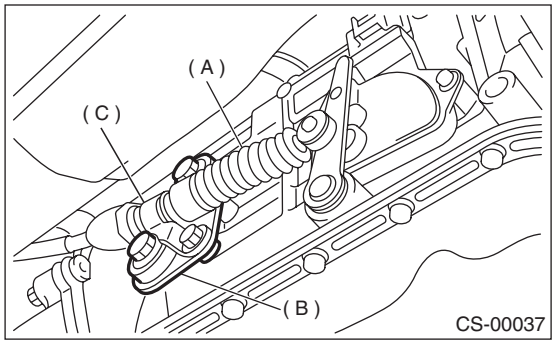


8) Remove the snap pin and washer from range select lever.



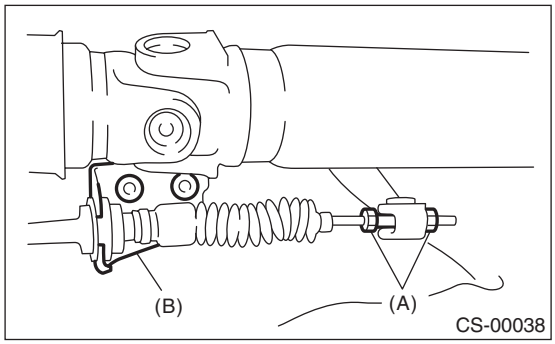
(A) Range select lever
(B) Snap pin
(C) Select cable
(D) Clamp
(E) Washer

9) Remove the plate assembly from transmission case.



(A) Select cable
(B) Plate ASSY
(C) Clamp

10) Disconnect the cable from select lever, and then remove the cable bracket.



(A) Adjusting nuts
(B) Cable bracket

11) Remove the select cable from plate assembly.

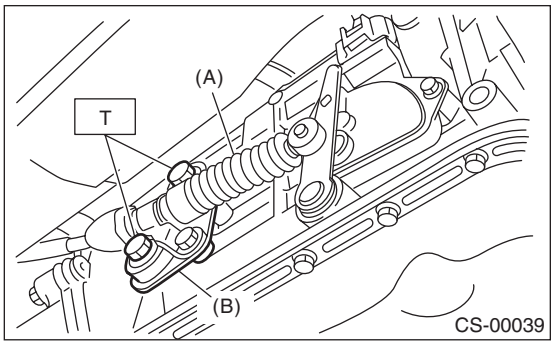
B: INSTALLATION

1) Install the select cable to plate assembly.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

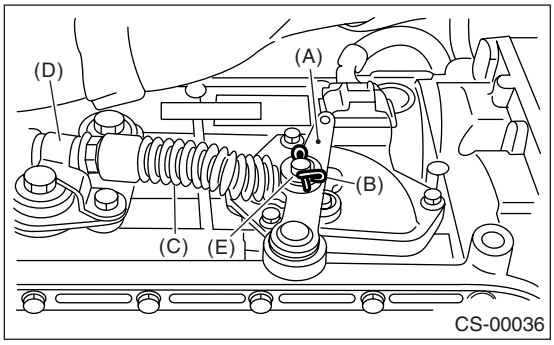
2) Install the select cable to range select lever.
3) Install the plate assembly to transmission.

Tightening torque:
T: 24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Select cable
(B) Plate ASSY

4) Install the washer and snap pin to range select lever.

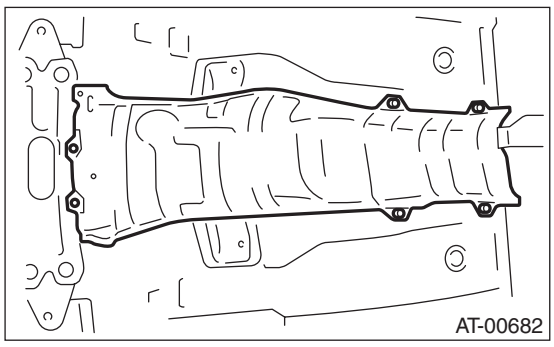


(A) Range select lever
(B) Snap pin
(C) Select cable
(D) Clamp
(E) Washer

5) Insert the thread portion of other inner cable and into connector hole of select lever, and fix the other outer cable end to the bracket.

Tightening torque:
18 N·m (1.8 kgf-m, 13 ft-lb)

6) Move the select lever to “N” range, and then adjust the select cable position. <Ref. to CS-26, ADJUSTMENT, Select Cable.>
7) Install the heat shield cover.



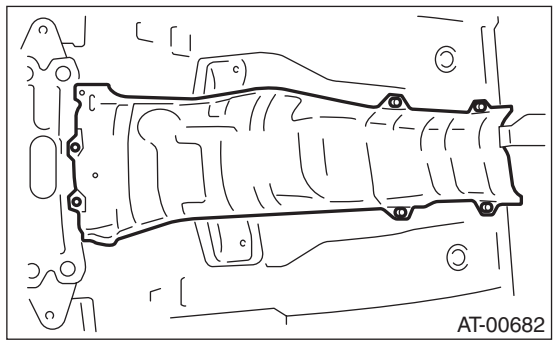
8) Install the front, center, rear exhaust pipe and muffler. (SOHC model)
<Ref. to EX(H4SO)-5, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-7, INSTALLATION, Center Exhaust Pipe.>, <Ref. to EX(H4SO)-8, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, INSTALLATION, Muffler.>
9) Install center and rear exhaust pipes and muffler. (DOHC turbo model)
<Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>, <Ref. to EX(H4DOTC)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-14, INSTALLATION, Muffler.>

C: INSPECTION

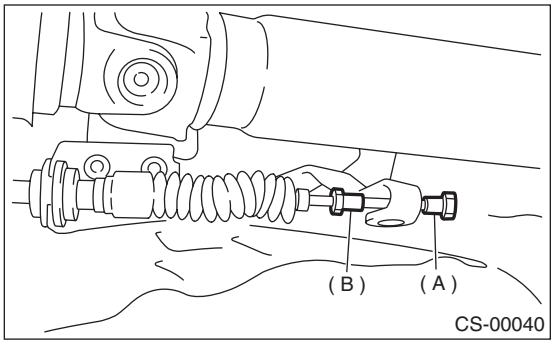
Check the removed cable and replace if damaged, rusty, or malfunctioning.
1) Check for smooth operation of the cable.
2) Check the inner cable for damage and rust.
3) Check the outer cable for damage, bends, and cracks.
4) Check the boot for damage, cracks, and deterioration.
5) Move the select lever from “P” range to “1” range. You should be able to feel the detents in each range. If the detents cannot be felt or the range pointer is improperly aligned, adjust the cable.

D: ADJUSTMENT

1) Set the select lever to “N” range.
2) Remove the rear exhaust pipe and muffler.
SOHC model
<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, REMOVAL, Muffler.>
DOHC turbo model
<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
3) Remove the heat shield cover. (If equipped)

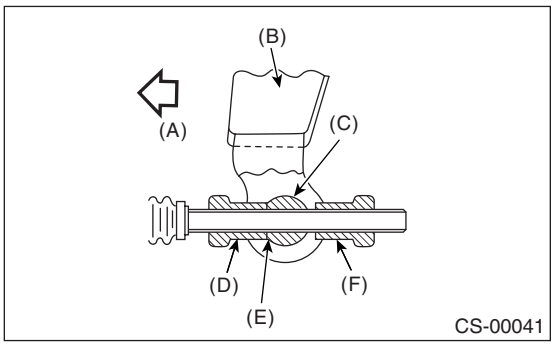


4) Loosen the adjusting nut on each side.



(A) Adjusting nut A
(B) Adjusting nut B

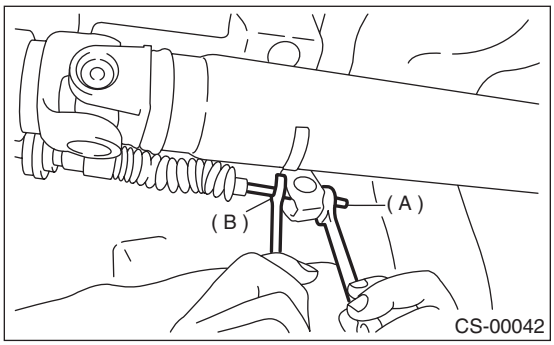
5) Turn the adjusting nut B until it lightly touches the connector.



(A) Front side
(B) Select lever
(C) Connector
(D) Adjusting nut B
(E) Contact point
(F) Adjusting nut A

6) While preventing the adjusting nut B from moving with a wrench, tighten the adjusting nut A.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



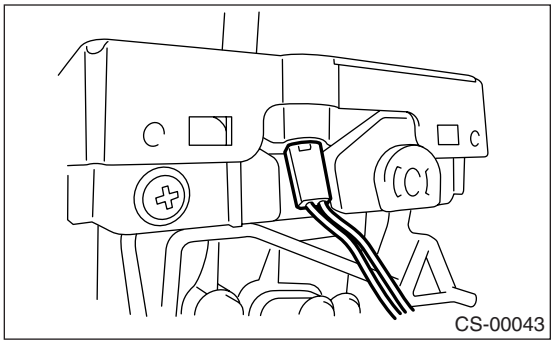
(A) Adjusting nut A
(B) Adjusting nut B

7) After completion of fitting, make sure that the select lever operates smoothly all across the operating range.
8) Install in the reverse order of removal.

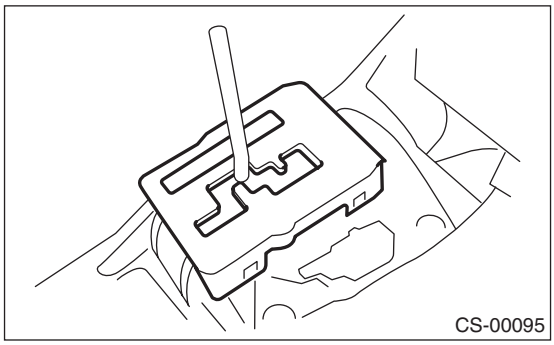
5. AT Shift Lock Solenoid and “P” Range Switch

A: REMOVAL

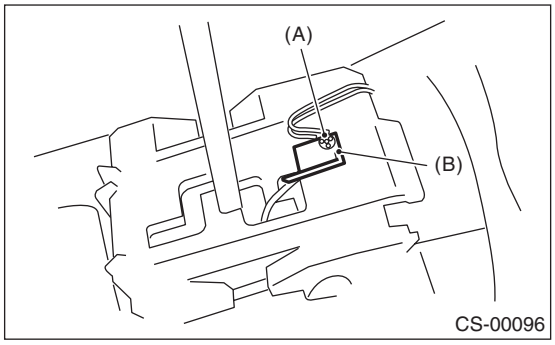
1) Disconnect the ground cable from battery.
2) Remove the console box. <Ref. to EI-44, REMOVAL, Console Box.>
3) Disconnect the connector.
4) Remove the grip.
5) Remove the indicator bulb from indicator cover.



6) Remove the indicator cover.

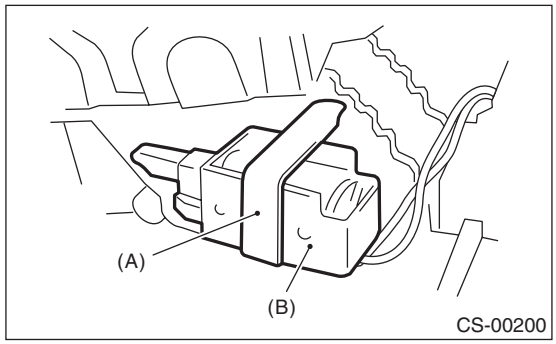


7) Remove the blind.
8) Remove the cushion.
9) Remove the clip, and then remove the “P” range switch.



(A) Clip
(B) “P” range switch

10) Remove the clamp, and then remove the shift lock solenoid.



(A) Clamp
(B) Shift lock solenoid

B: INSTALLATION

Install in the reverse order of removal.

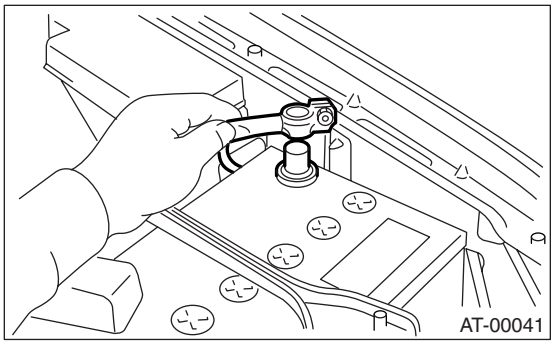
C: INSPECTION

	Step	Check	Yes	No
1	**CHECK SHIFT LOCK SOLENOID.** Measure the resistance of shift lock solenoid connector terminals. ***Terminals*** ***No. 4 — No. 5:***	Is the resistance between 20 and 40 Ω?	Go to step **2.**	Replace the shift lock solenoid and “P” range switch assembly.
2	**CHECK SHIFT LOCK SOLENOID.** Connect the battery with shift lock solenoid connector terminal, operate solenoid. ***Terminals*** ***N o. 4 (+) — No. 5 (–):***	Is the shift lock solenoid operating properly?	Go to step **3.**	Replace the shift lock solenoid and “P” range switch assembly.
3	**CHECK “P” RANGE SWITCH.** 1) Move the select lever to “P” range. 2) Measure the resistance between “P” range switch connector terminals.	Is the resistance less than 1 Ω?	Go to step **4.**	Replace the “P” range switch.
4	**CHECK “P” RANGE SWITCH.** 1) Move the select lever to other than “P” range. 2) Measure the resistance between “P” range switch connector terminals.	Is the resistance more than 1 MΩ?	Normal	Replace the “P” range switch.

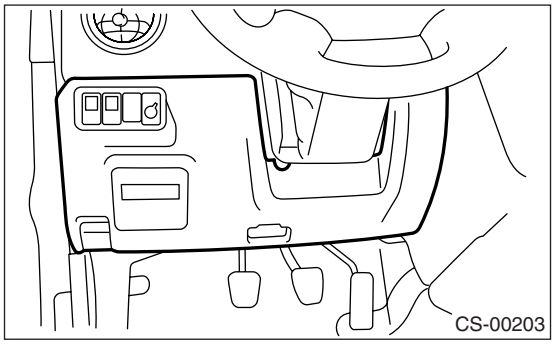
6. Body Integrated Unit

A: REMOVAL

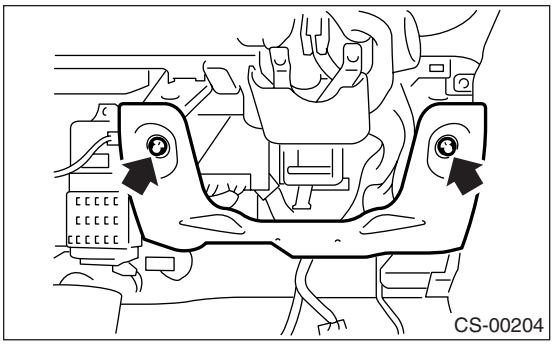
1) Disconnect the ground cable from battery.



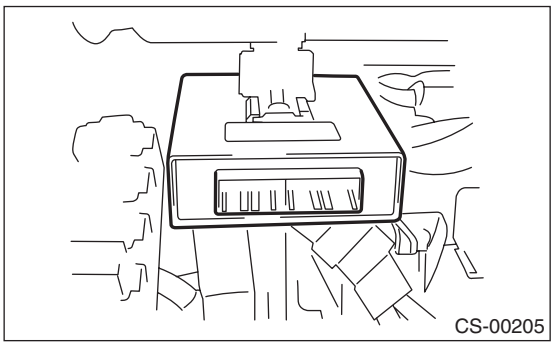
2) Remove the lower cover.



3) Remove the knee bolster.



4) Disconnect the connector from body integrated unit.
5) Remove the body integrated unit.



B: INSTALLATION

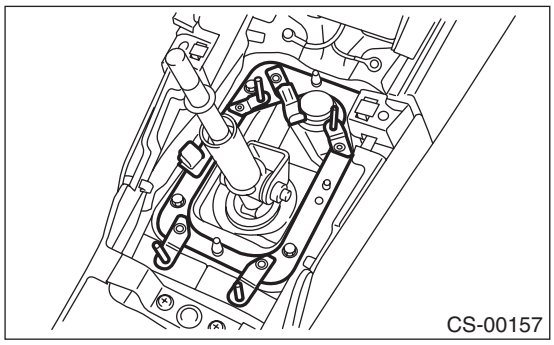
Install in the reverse order of removal.

7. MT Gear Shift Lever

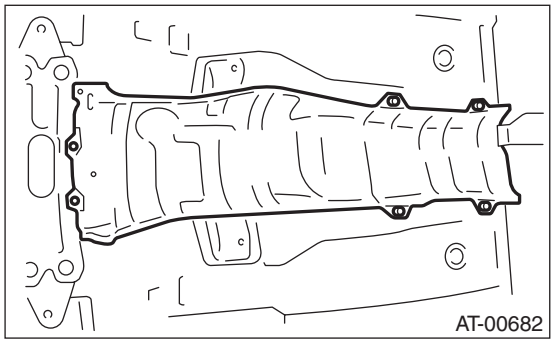
A: REMOVAL

1. 5MT

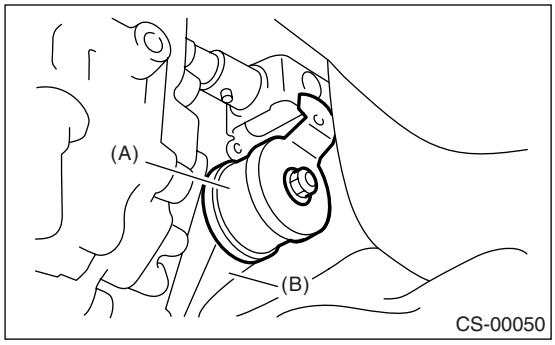
1) Set the vehicle on a lift.
2) Disconnect the negative cable from battery.
3) Remove the gear shift knob.
4) Remove the console box. <Ref. to EI-44, REMOVAL, Console Box.>
5) Remove the plate assembly from body.



6) Lift-up the vehicle.
7) Remove the rear exhaust pipe and muffler.
SOHC model
<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, REMOVAL, Muffler.>
DOHC turbo model
<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
8) Remove the heat shield cover. (If equipped)

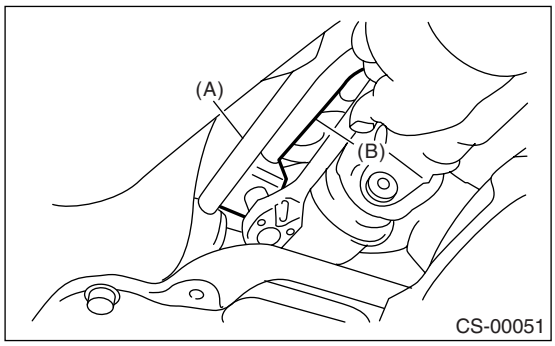


9) Remove the stay from transmission bracket.



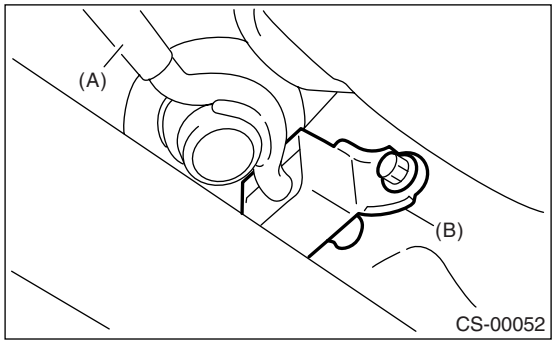
(A) Stay
(B) Transmission bracket

10) Remove the rod from joint.



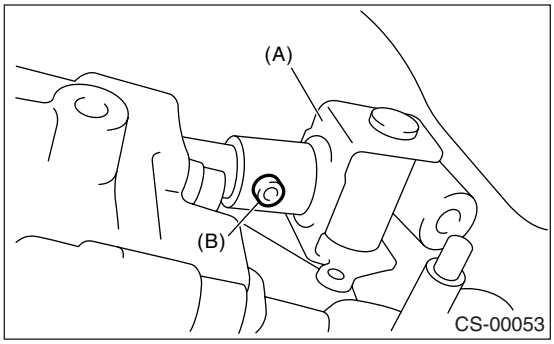
(A) Stay
(B) Rod

11) Remove the cushion rubber from body.



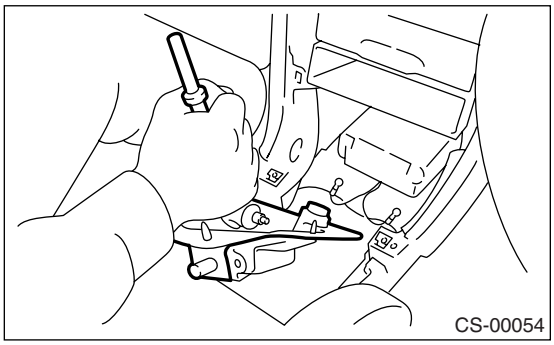
(A) Stay
(B) Cushion rubber

12) Extract the spring pin, and then remove the joint.



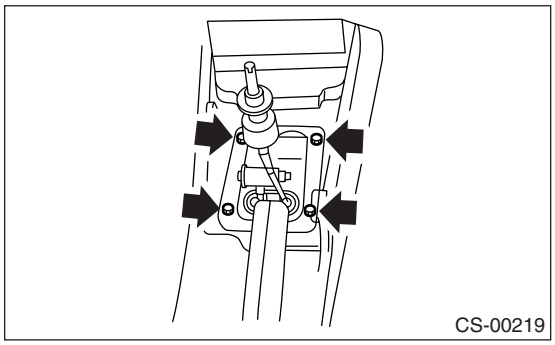
(A) Joint
(B) Spring pin

13) Lower the vehicle.
14) Remove the gear shift lever.

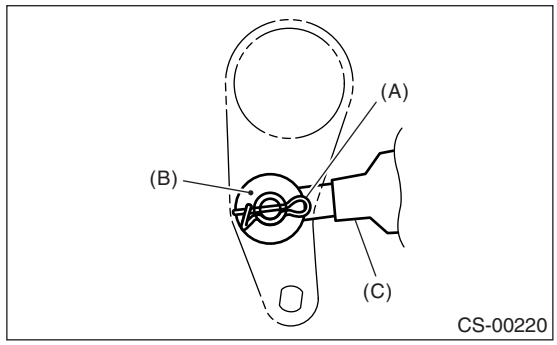


2. 6MT

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Remove the gear shift knob.
4) Remove the console box front. <Ref. to EI-44, REMOVAL, Console Box.>
5) Remove the boot plate from body.



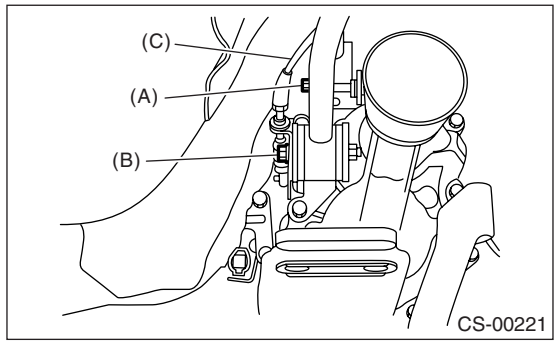
6) Lift-up the vehicle.
7) Remove the under cover.
8) Remove the rear exhaust pipe and muffler. <Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> , <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
9) Remove the crossmember. <Ref. to 6MT-33, REMOVAL, Transmission Mounting System.>
10) Remove the snap pin and washer, and then remove the reverse check cable from reverse check lever.



(A) Snap pin
(B) Washer
(C) Reverse check cable

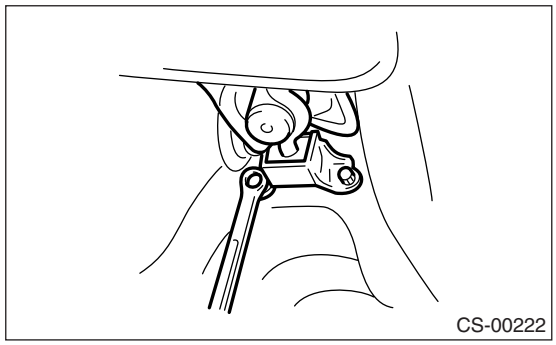
11) Move the transmission to right side, and then remove the joint COMPL, stay bolt and reverse check cable.

NOTE:
If the transmission is not moved, the joint COMPL and stay bolt will contact body and damage may occur.



(A) Joint COMPL bolt
(B) Stay bolt
(C) Reverse check cable

12) Remove the cushion rubber from body.



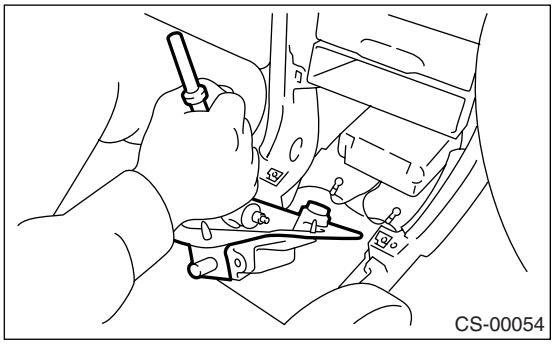
13) Lower the vehicle.
14) Remove the gear shift lever.

B: INSTALLATION

1. 5MT

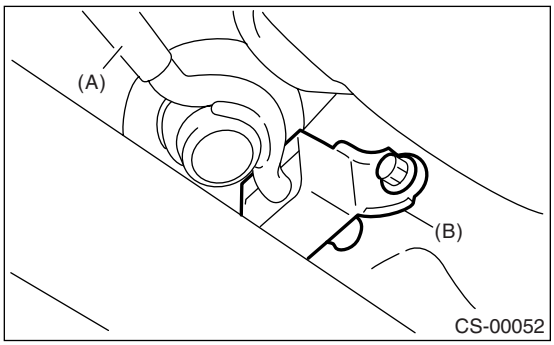
1) Install the joint to the transmission and secure with the spring pin.
2) Insert gear shift lever from room side.

NOTE:
After inserting rod and stay, temporarily put them onto transmission mount.



3) Lift-up the vehicle.
4) Mount the cushion rubber on body.

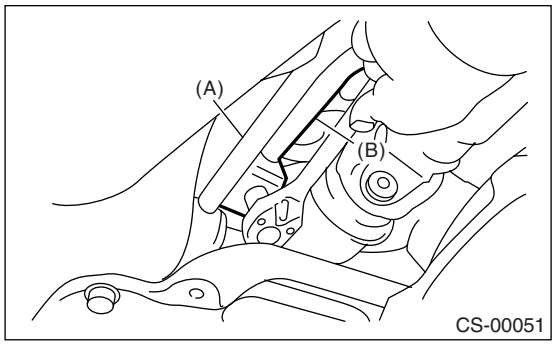
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



(A) Stay
(B) Cushion rubber

5) Connect the rod to the joint.

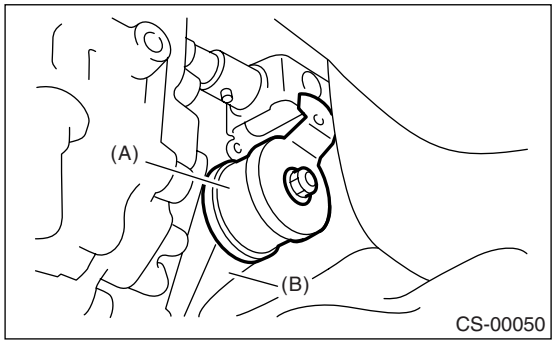
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



(A) Stay
(B) Rod

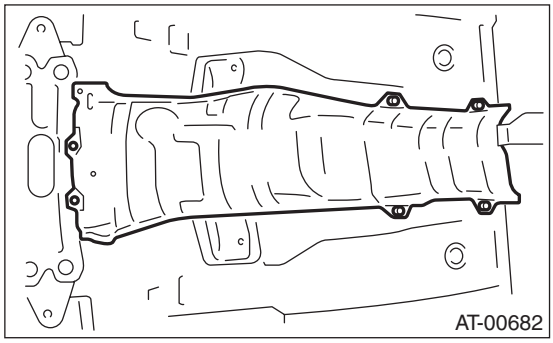
6) Connect the stay to transmission bracket.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



(A) Stay
(B) Transmission bracket

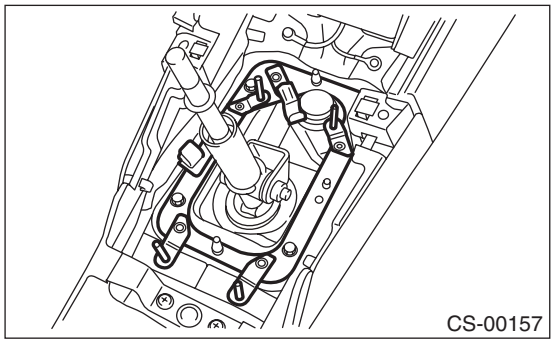
7) Install the heat shield cover. (If equipped)



8) Install the rear exhaust pipe and muffler.
SOHC model
<Ref. to EX(H4SO)-8, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, INSTALLATION, Muffler.>
DOHC turbo model
<Ref. to EX(H4DOTC)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-14, INSTALLATION, Muffler.>

9) Install the plate assembly to body.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



10) Install console box. <Ref. to EI-44, INSTALLATION, Console Box.>

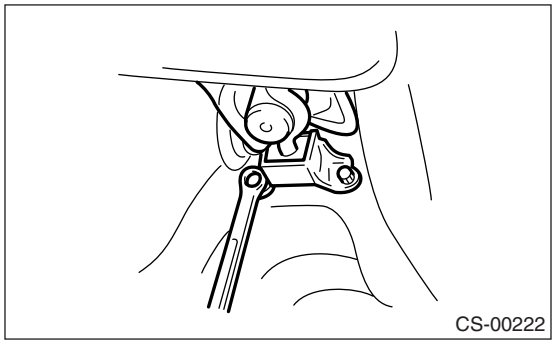
2. 6MT

1) Insert the gear shift lever from room side.

NOTE:
After inserting the rod and stay, temporarily put them onto transmission mount.

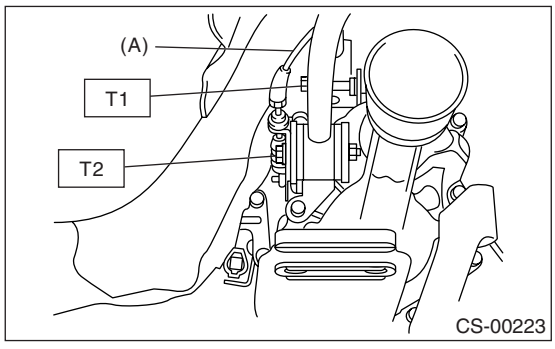
2) Mount the cushion rubber on body.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



3) Move the transmission to right side, and then install the joint COMPL and stay.

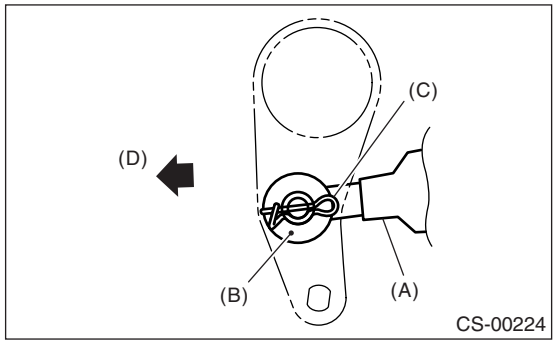
Tightening torque:
T1: 11.8 N·m (1.2 kgf-m, 8.7 ft-lb)
T2: 32 N·m (3.3 kgf-m, 23.6 ft-lb)



(A) Reverse check cable

4) Install the crossmember. <Ref. to 6MT-33, INSTALLATION, Transmission Mounting System.>
5) Install the reverse check cable end, washer and snap pin to reverse check lever.

NOTE:
• Take care to install the snap pin in proper direction.
• Conduct the adjustment of reverse check cable before installation. <Ref. to CS-46, ADJUSTMENT, Reverse Check Cable.>

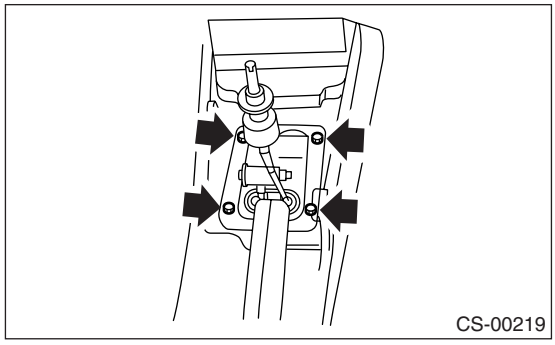


(A) Reverse check cable
(B) Washer
(C) Snap pin
(D) Front side

6) Install the rear exhaust pipe and muffler. <Ref. to EX(H4DOTC)-13, INSTALLATION, Rear Exhaust Pipe.> , <Ref. to EX(H4DOTC)-14, INSTALLATION, Muffler.>
7) Install the under cover.
8) Install the boot plate.

NOTE:
Install the inner boot without any twist.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

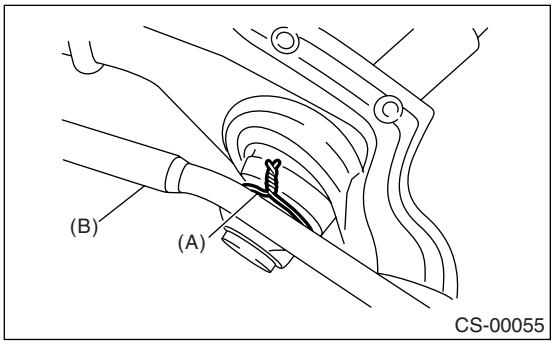


9) Install the console box. <Ref. to EI-44, INSTALLATION, Console Box.>
10) Check that the gear shift is correctly shifted to each gear.

C: DISASSEMBLY

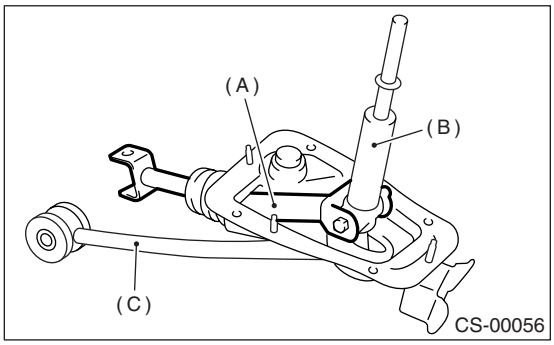
1. 5MT

1) Disassemble the lock wire.



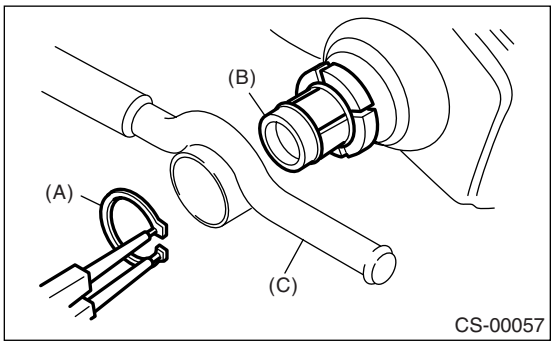
(A) Lock wire
(B) Stay

2) Remove the rod from lever.



(A) Rod
(B) Lever
(C) Stay

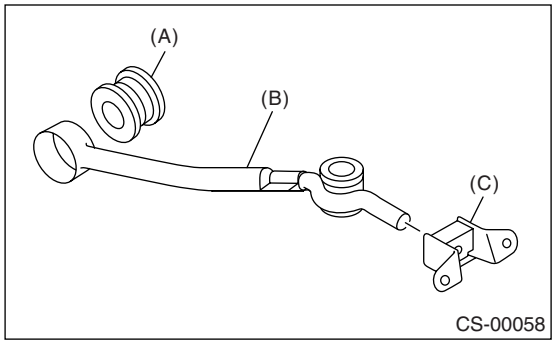
3) Remove the snap ring from bushing B, and then disconnect the stay.



(A) Snap ring
(B) Bushing B
(C) Stay

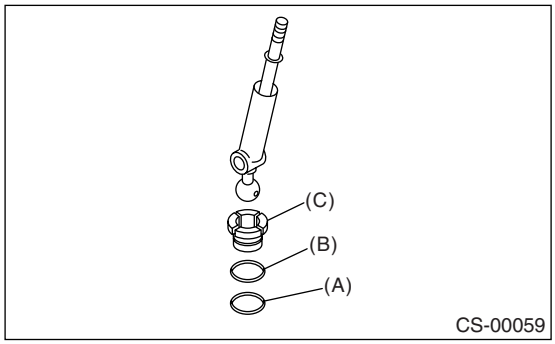
4) Remove the boot from gear shift lever.

5) Remove the bushing and cushion rubber from stay.



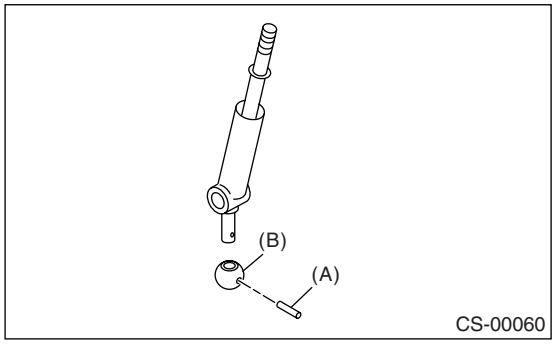
(A) Bushing
(B) Stay
(C) Cushion rubber

6) Remove O-ring, and then disconnect the bushing B.



(A) O-ring
(B) O-ring
(C) Bushing B

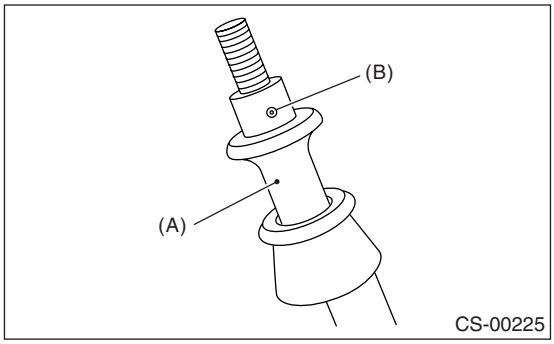
7) Draw out the spring pin, and then remove the bushing A from gear shift lever.



(A) Spring pin
(B) Bushing A

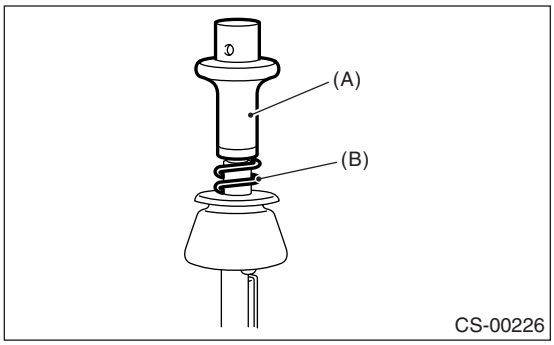
2. 6MT

1) Remove the spring pin from slider.



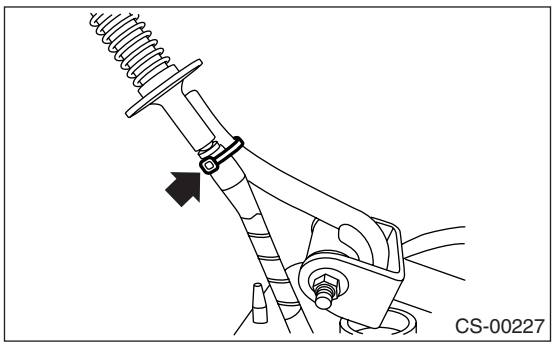
(A) Slider
(B) Spring pin

2) Remove the slider and spring.

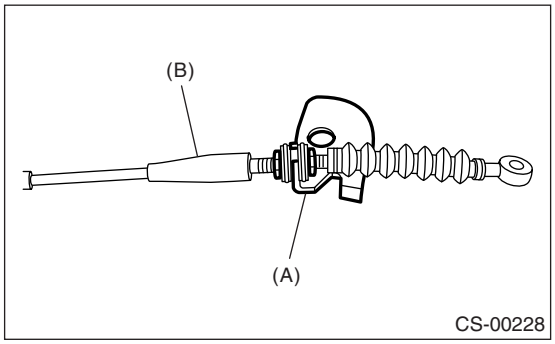


(A) Slider
(B) Spring

3) Cut the band clip.

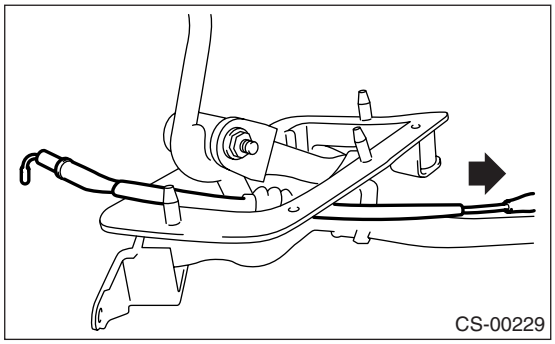


4) Remove the reverse check cable from cable plate.

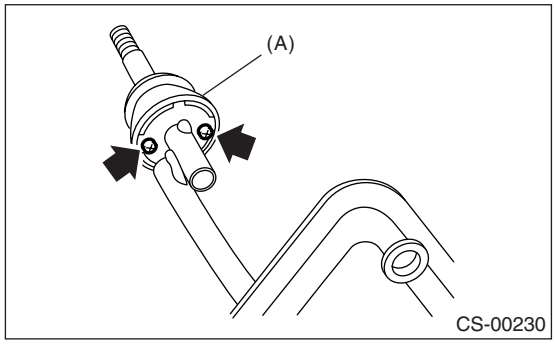


(A) Cable plate
(B) Reverse check cable

5) Remove the reverse check cable from gear shift assembly.



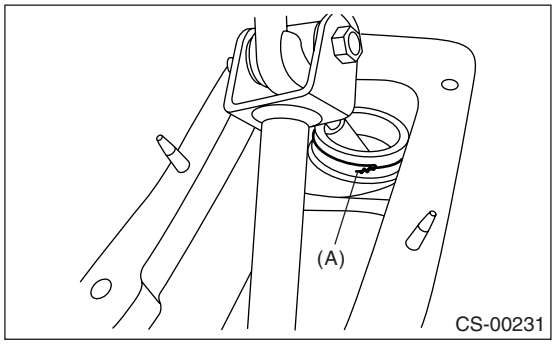
6) Remove the holder and spring seat.



(A) Holder

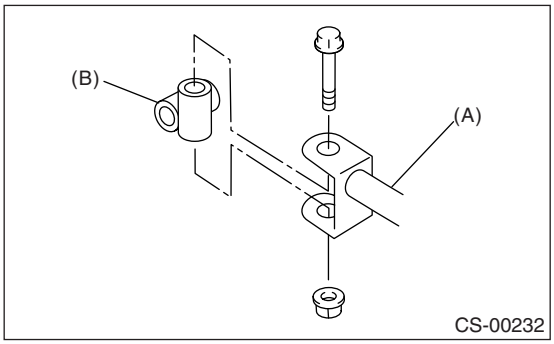
7) Disassemble the lock wire.

NOTE:
Do not reuse the lock wire.



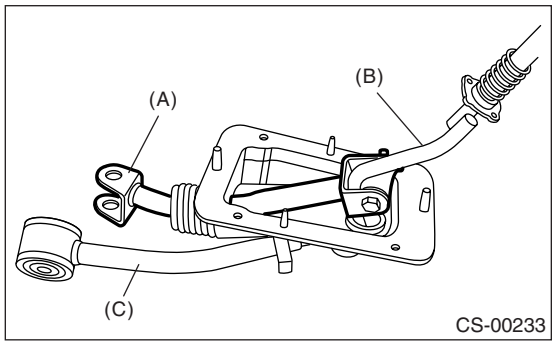
(A) Lock wire

8) Remove the boss from rod.



(A) Rod
(B) Boss

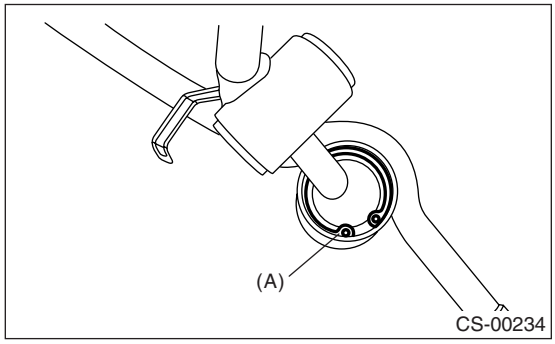
9) Remove the rod from lever.



(A) Rod
(B) Lever
(C) Stay

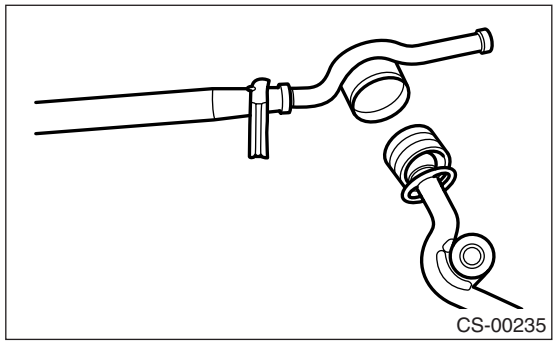
10) Separate the rod and inner boot.

11) Remove the snap ring from stay.

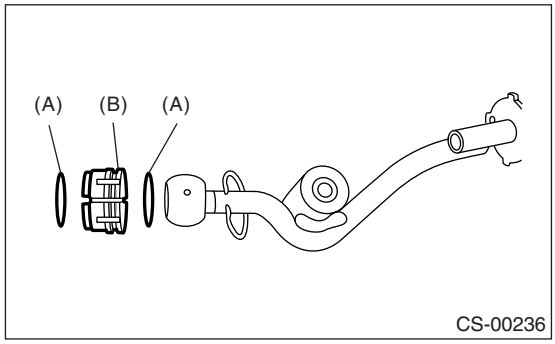


(A) Snap ring

12) Separate the gear shift lever and stay.

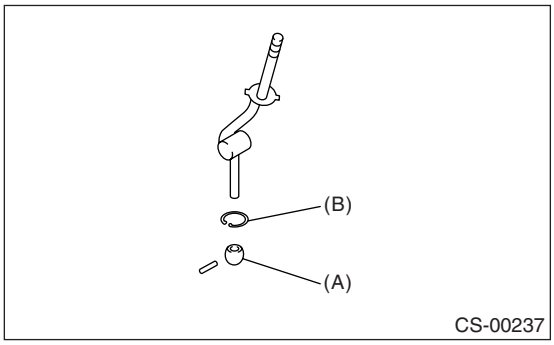


13) Remove the boot and bush from gear shift lever.



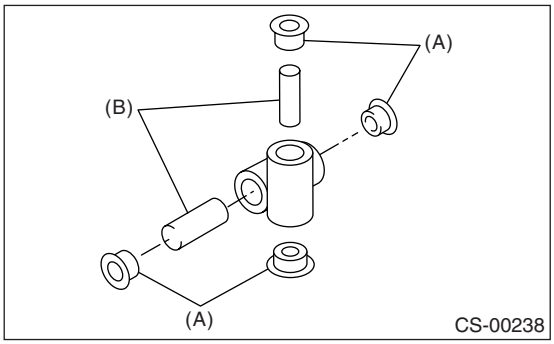
(A) O-ring
(B) Bush

14) Remove the spring pin, and then remove the bush and snap ring.



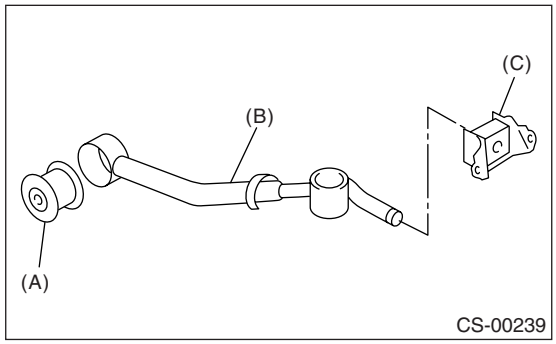
(A) Bush
(B) Snap ring

15) Remove the bush and spacer from boss.



(A) Bush
(B) Spacer

16) Remove the bush and cushion rubber from stay.

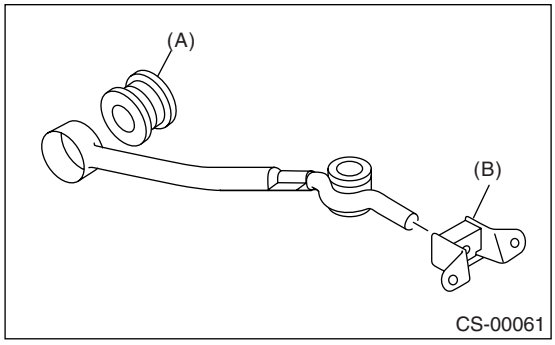


(A) Bush
(B) Stay
(C) Cushion rubber

D: ASSEMBLY

1. 5MT

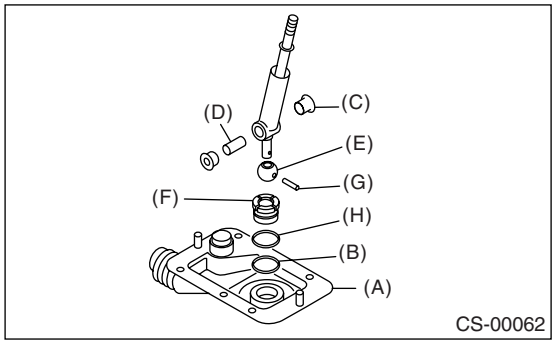
1) Clean all parts before assembly.
2) Mount the bushing and cushion rubber on the stay.



(A) Bushing
(B) Cushion rubber

3) Mount each part; boot, O-ring, bushing A, spacer, bushing B, bushing and spring pin on the gear shift lever.

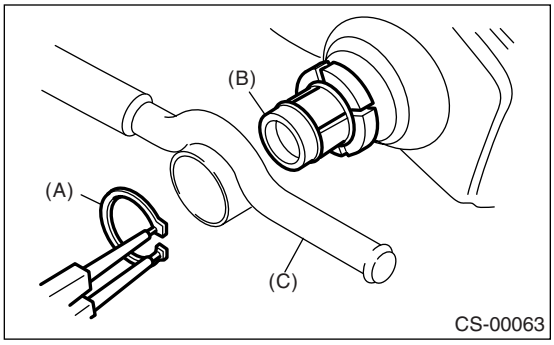
NOTE:
• Always use new O-rings.
• Apply grease [KOPR-KOTE (Part No. 003603001) or equivalent] to the inner and side surfaces of the bushing when installing the spacer.



(A) Boot
(B) O-ring
(C) Bushing
(D) Spacer
(E) Bushing A
(F) Bushing B
(G) Spring pin
(H) O-ring

4) Insert the gear shift lever into the boot hole.

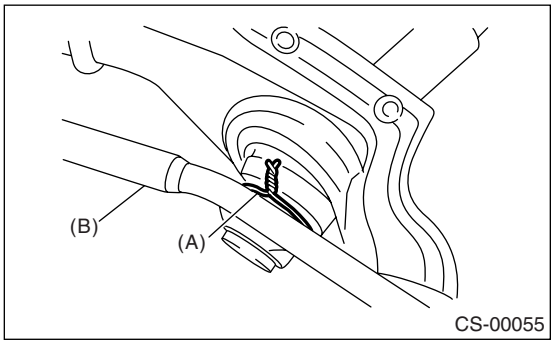
5) Install the snap ring and stay to bushing B.



(A) Snap ring
(B) Bushing B
(C) Stay

6) Tighten with lock wire to the extent that the boot will not come off.

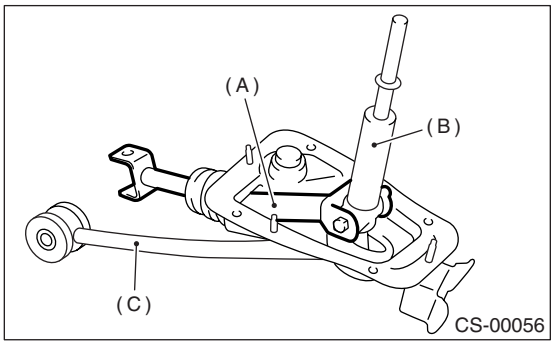
NOTE:
Always use new lock wire.



(A) Lock wire
(B) Stay

7) Insert the rod into the boot hole.
8) Connect rod to lever.

Tightening torque:
11.8 N·m (1.2 kgf-m, 8.7 ft-lb)



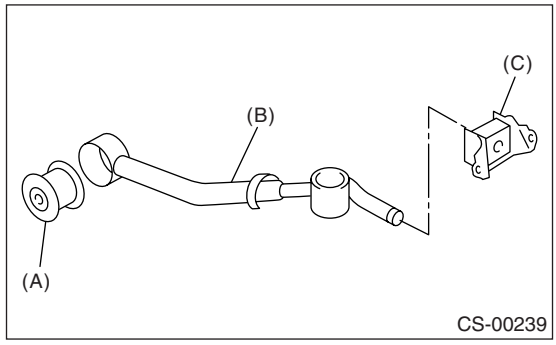
(A) Rod
(B) Lever
(C) Stay

9) Check the swing torque of rod in relation to the gear shift lever.
10) Check that there is no excessive play and that parts move smoothly.

2. 6MT

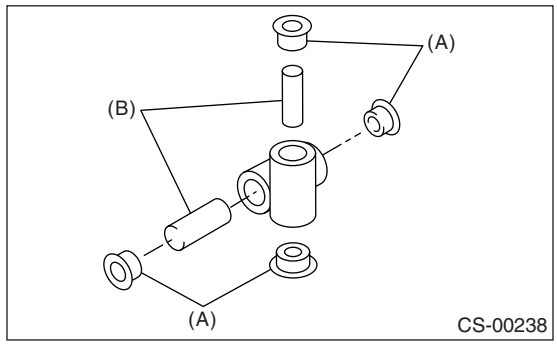
NOTE:
- Clean all parts before assembly.
- Apply NIGTIGHT LYW No. 2 grease or equivalent to each parts.

1) Mount the bush and cushion rubber on the stay.



(A) Bush
(B) Stay
(C) Cushion rubber

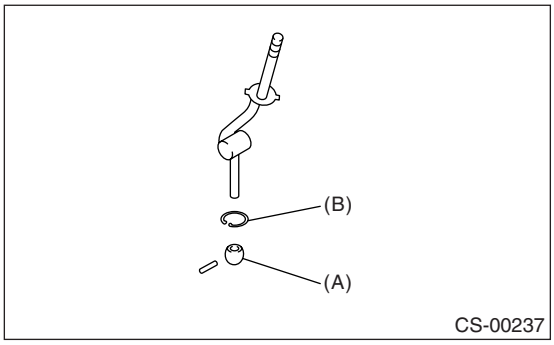
2) Install the bush and spacer to boss.



(A) Bush
(B) Spacer

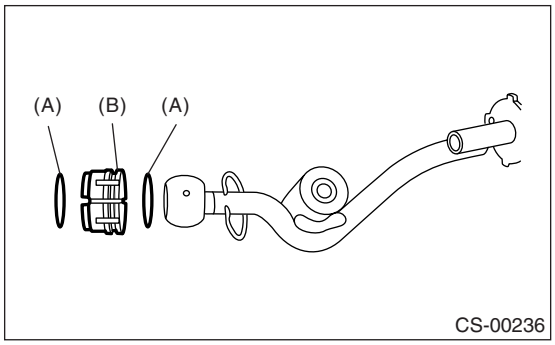
3) Install the snap ring to gear shift lever, and then install the bush.

NOTE:
Apply grease to the bush.



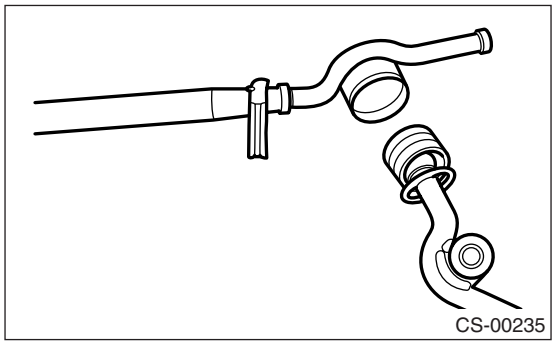
(A) Bush
(B) Snap ring

4) Apply grease to the bush and O-ring, and then install to the gear shift lever.

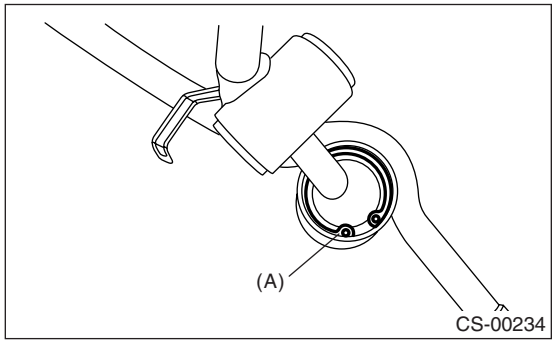


(A) O-ring
(B) Bush

5) Apply sufficient grease into the boss, and then install the gear shift lever to stay.



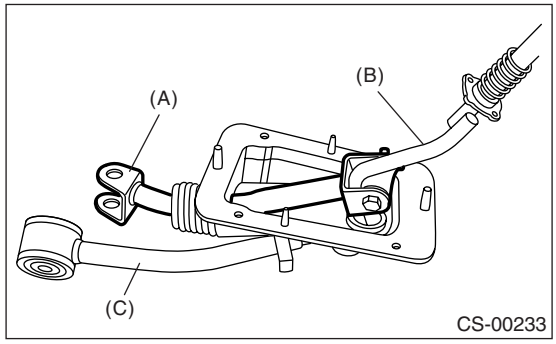
6) Install the washer and snap ring.



(A) Snap ring

7) Insert the gear shift lever and rod into boot hole.
8) Install the rod.

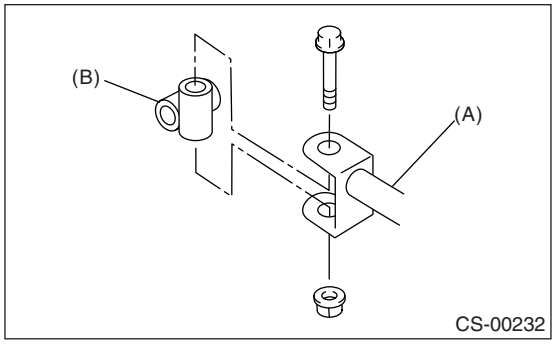
Tightening torque:
11.8 N·m (1.2 kgf-m, 8.7 ft-lb)



(A) Rod
(B) Lever
(C) Stay

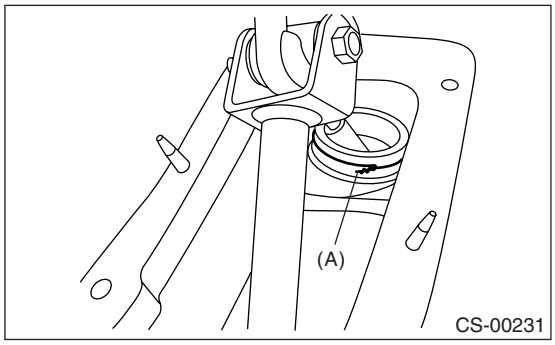
9) Install the boss to rod.

Tightening torque:
11.8 N·m (1.2 kgf-m, 8.7 ft-lb)



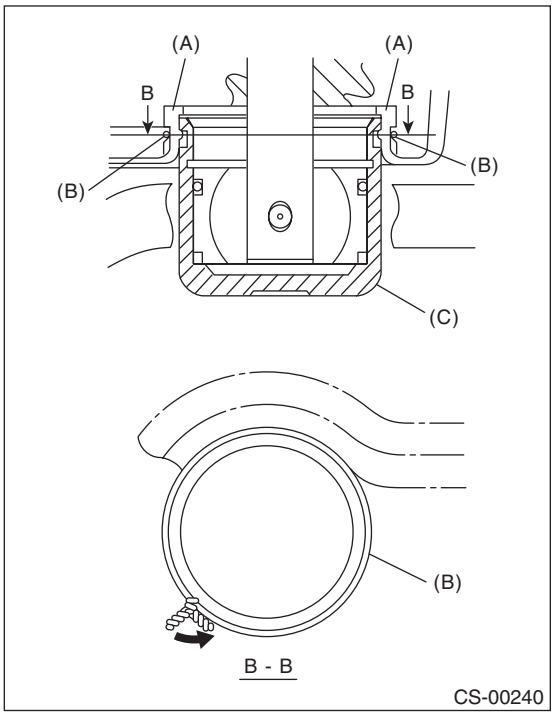
(A) Rod
(B) Boss

10) Install a new lock wire.



(A) Lock wire

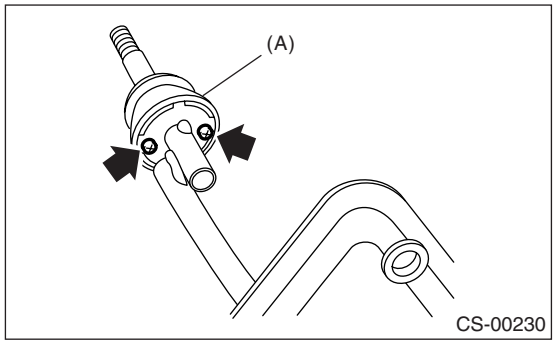
NOTE:
- Install the lock wire to the stay groove.
- Bend the extra wire to same direction of lock wire winding.



(A) Inner boot
(B) Lock wire
(C) Stay

11) Install the holder.

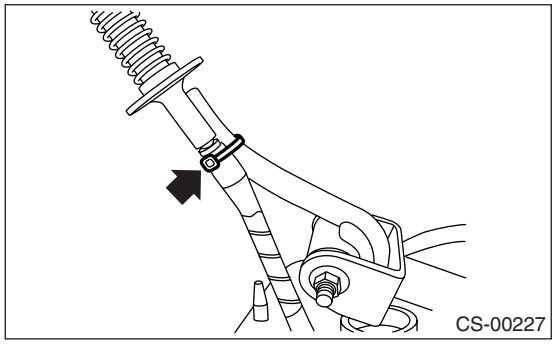
Tightening torque:
1.3 N·m (0.13 kgf-m, 0.96 ft-lb)



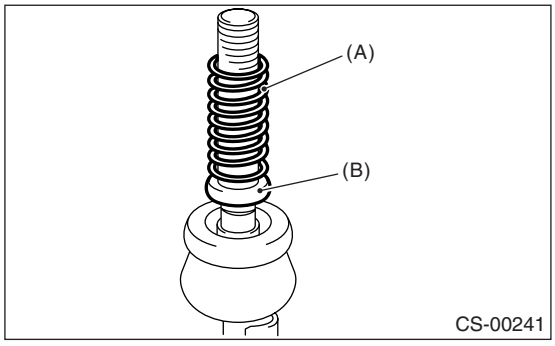
(A) Holder

12) Insert the reverse check cable into boot hole.
13) Insert the reverse check cable into gear shift assembly, and fix with band clip.

NOTE:
- Cut off the extra band clip.
- Make sure that the reverse check cable is inserted into gear shift lever assembly without any clearance.



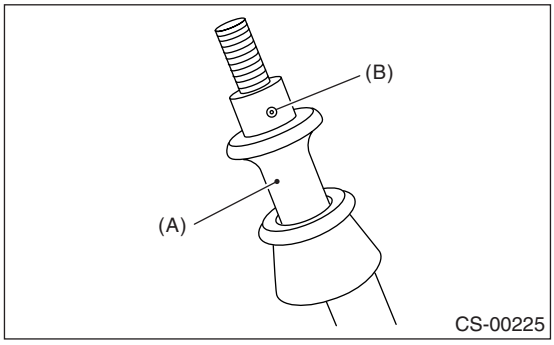
14) Install the seat cushion and spring.



(A) Spring
(B) Seat cushion

15) Fix the slider and reverse check cable end with spring pin.

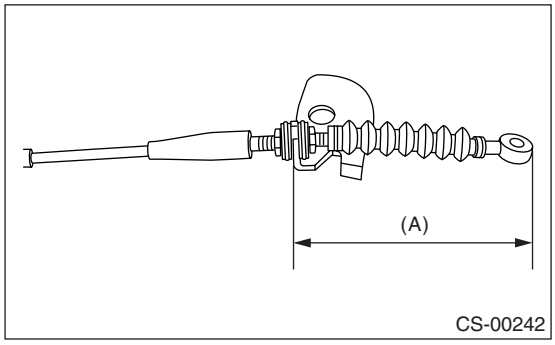
NOTE:
Apply grease to the sliding part of slider.



(A) Slider
(B) Spring pin

16) Adjust the length between end of cable plate and reverse check cable to 84 mm (3.31 in) with cable pulled (with slider lowered), and then tighten the lock nut.

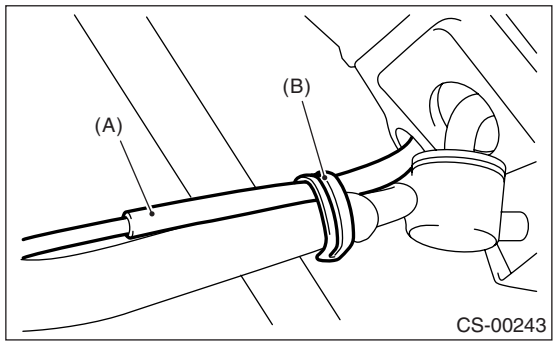
Tightening torque:
6 N·m (0.6 kgf-m, 4.4 ft-lb)



(A) 84 mm (3.31 in)

17) Fix the reverse check cable to clip of stay.

NOTE:
Install the reverse check cable to upper side of stay.

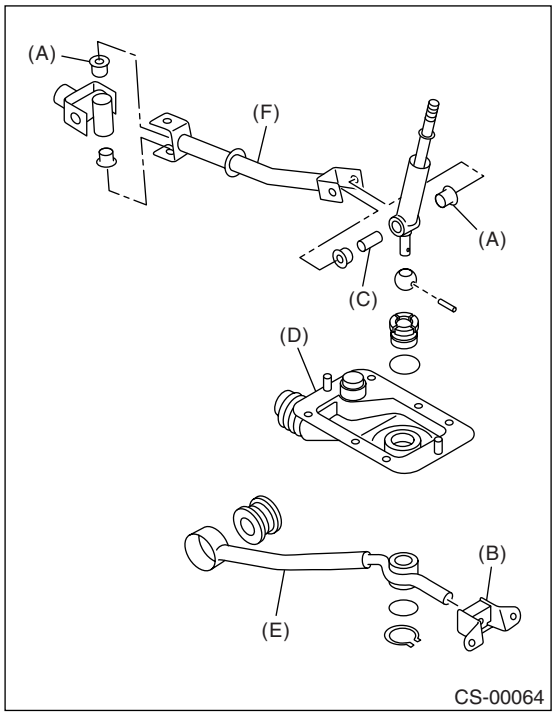


(A) Reverse check cable
(B) Clip

E: INSPECTION

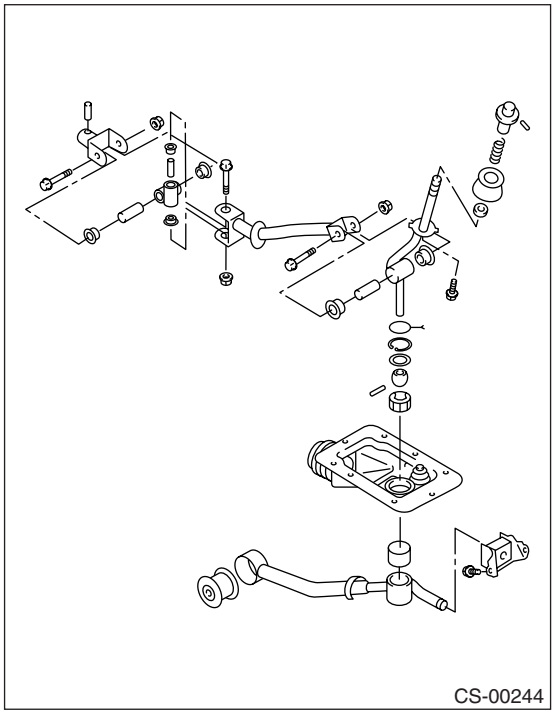
1) Check each part (bushing, cushion rubber, spacer, boot, stay and rod, etc.) for deformation, damage and wear. Repair or replace any defective part. Determine defective parts by comparing with new parts.

- 5MT



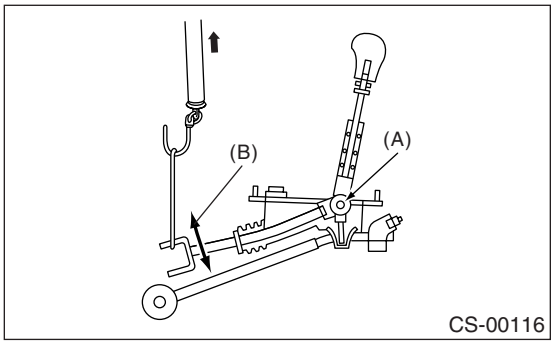
(A) Bushing
(B) Cushion rubber
(C) Spacer
(D) Boot
(E) Stay
(F) Rod

- 6MT



2) Check the swing torque of the rod in relation of the gear shift lever.
If the torque exceeds the specification, replace the bushing or retighten the nuts.

Swing torque:
3.7 N (0.38 kgf, 0.84 lb) or less

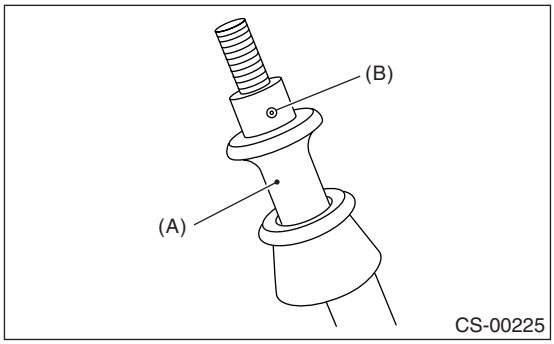


(A) Center of rotation
(B) Swing torque

8. Reverse Check Cable

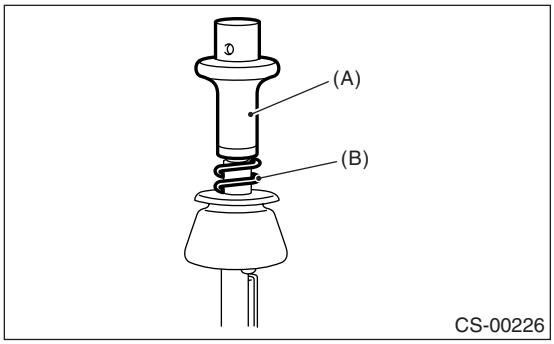
A: REMOVAL

1) Set the vehicle on a lift.
2) Remove the gear shift knob.
3) Remove the console box front. <Ref. to EI-44, REMOVAL, Console Box.>
4) Remove the spring pin from slider.



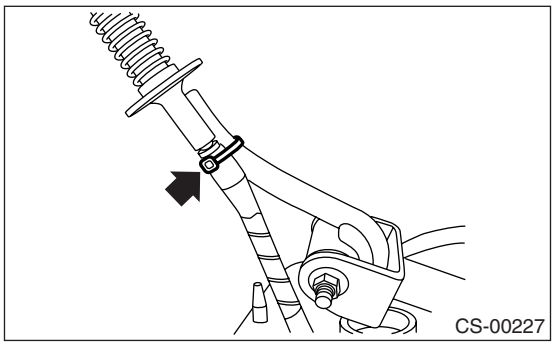
(A) Slider
(B) Spring pin

5) Remove the slider and spring.

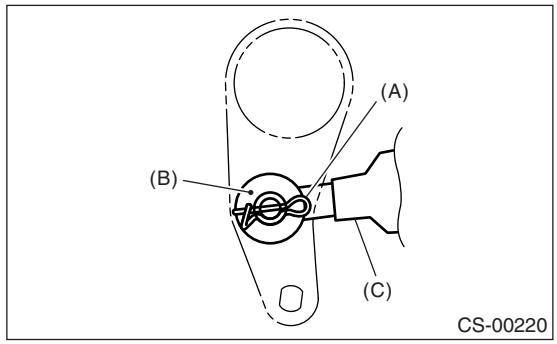


(A) Slider
(B) Spring

6) Cut the band clip, and then separate the reverse check cable from gear shift lever.



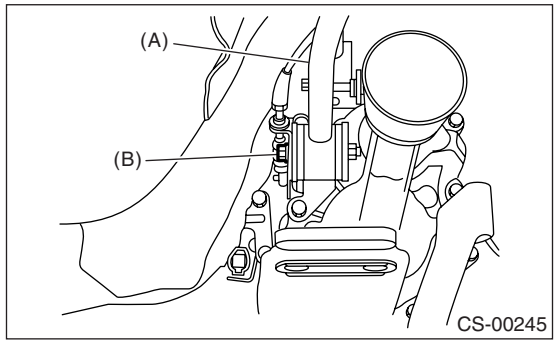
7) Lift-up the vehicle.
8) Remove the under cover.
9) Remove the rear exhaust pipe and muffler. <Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> , <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
10) Remove the crossmember. <Ref. to 6MT-33, REMOVAL, Transmission Mounting System.>
11) Remove the snap pin and washer, and then separate the reverse check cable from reverse check lever.



(A) Snap pin
(B) Washer
(C) Reverse check cable

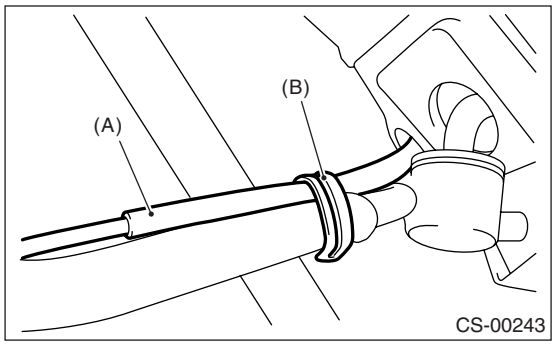
12) Move the transmission to right side, and then remove the stay bolt and reverse check cable.

NOTE:
If the transmission is not moved, the stay bolt will contact body and damage may occur.



(A) Stay
(B) Stay bolt

13) Raise the clip of stay, and then separate the stay and reverse check cable.

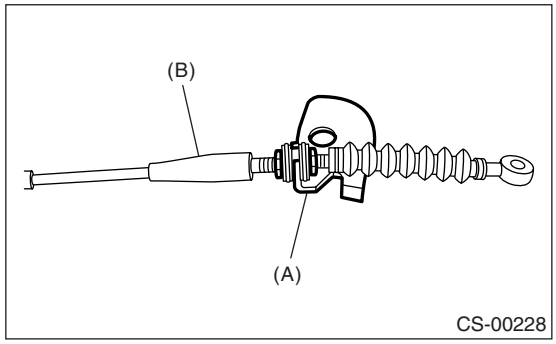


(A) Reverse check cable
(B) Clip

14) Remove the reverse check cable by pulling from underneath the vehicle.

NOTE:
Take care not to damage the inner boot.

15) Loosen the lock nut, then remove the reverse check cable from cable plate.

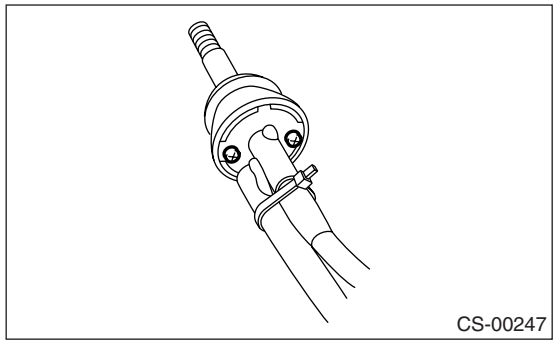


(A) Cable plate
(B) Reverse check cable

B: INSTALLATION

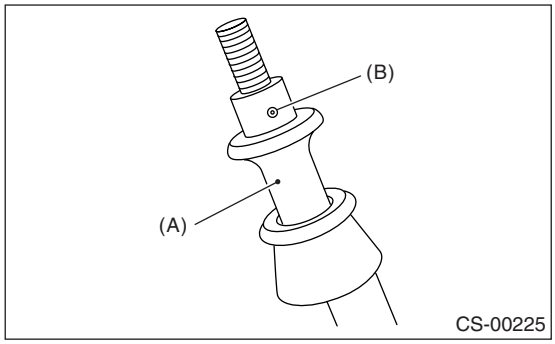
1) Insert the reverse check cable to the hole of inner boots from underneath the vehicle.
2) Insert the reverse check cable to the gear shift lever assembly, then fix with the band clip.

NOTE:
- Cut off the extra band clip.
- Make sure that the reverse check cable is inserted into gear shift lever assembly without any clearance.



3) Fix the slider and reverse check cable end with spring pin.

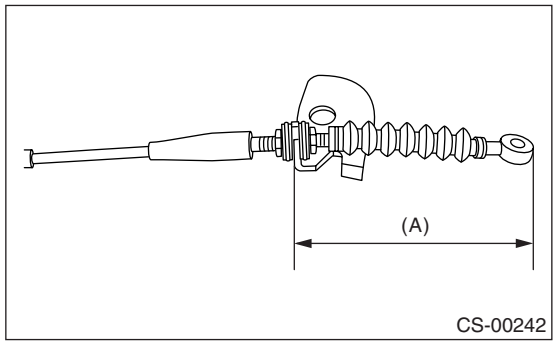
NOTE:
Apply grease to the sliding part of slider.



(A) Slider
(B) Spring pin

4) Lift-up the vehicle.
5) Adjust the length between end of cable plate and reverse check cable to 84 mm (3.31 in) with cable pulled (with slider lowered), and then tighten the lock nut.

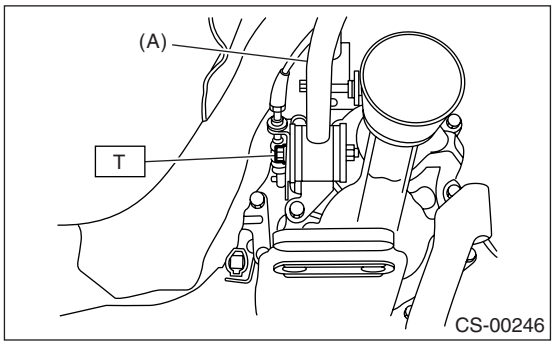
Tightening torque:
6 N·m (0.6 kgf-m, 4.4 ft-lb)



(A) 84 mm (3.31 in)

6) Move the transmission to right side, and then install the stay.

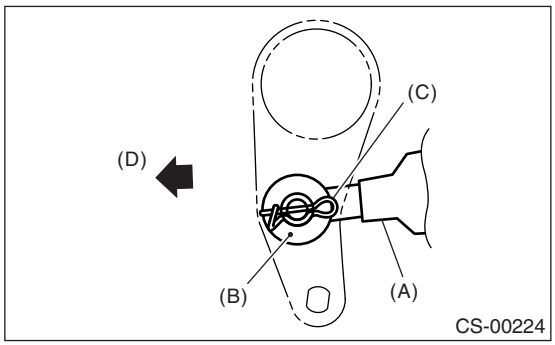
Tightening torque:
T: 32 N·m (3.3 kgf-m, 23.6 ft-lb)



(A) Stay

7) Install the reverse check cable end, washer and snap pin to reverse check lever.

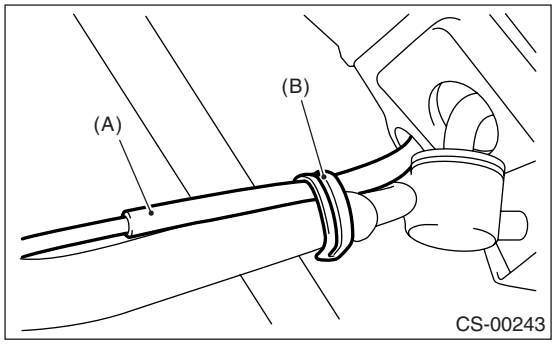
NOTE:
Take care to install the snap pin in proper direction.



(A) Reverse check cable
(B) Washer
(C) Snap pin
(D) Front side

8) Fix the reverse check cable to clip of stay.

NOTE:
Install the reverse check cable to upper side of stay.



(A) Reverse check cable
(B) Clip

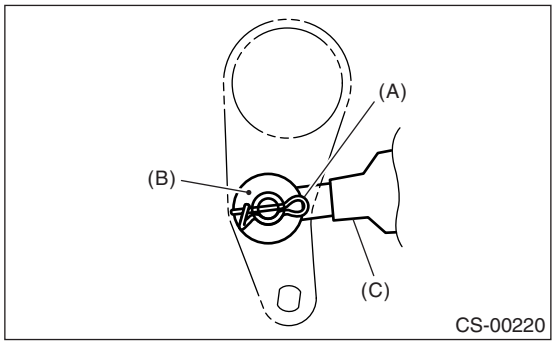
9) Install the rear exhaust pipe and muffler. <Ref. to EX(H4DOTC)-13, INSTALLATION, Rear Exhaust Pipe.> , <Ref. to EX(H4DOTC)-14, INSTALLATION, Muffler.>
10) Lower the vehicle.
11) Install the console box. <Ref. to EI-44, INSTALLATION, Console Box.>

C: INSPECTION

1) Verify whether the slider moves smoothly. If not, adjust the reverse check cable or check damage of slider. <Ref. to CS-46, ADJUSTMENT, Reverse Check Cable.>
2) Check that the gear can be shift to reverse, when the slider is pulled up. If the gear can not be shift to reverse, adjust the reverse check cable. <Ref. to CS-46, ADJUSTMENT, Reverse Check Cable.>
3) Check that the gear can not be shift to reverse, when the slider is not pulled up. If the gear can be shift to reverse, adjust or replace the reverse check cable. <Ref. to CS-46, ADJUSTMENT, Reverse Check Cable.>

D: ADJUSTMENT

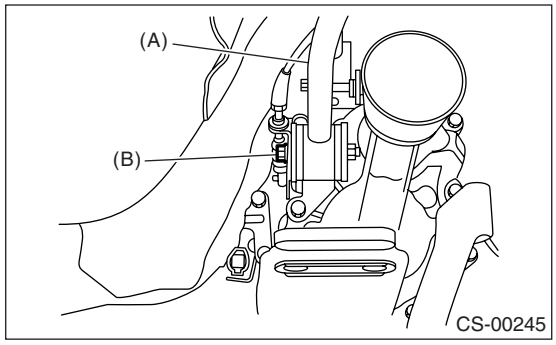
1) Set the vehicle on a lift.
2) Remove the under cover.
3) Remove the rear exhaust pipe and muffler. <Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> , <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
4) Remove the crossmember. <Ref. to 6MT-33, REMOVAL, Transmission Mounting System.>
5) Remove the snap pin and washer, and then separate the reverse check cable from reverse check lever.



(A) Snap pin
(B) Washer
(C) Reverse check cable

6) Move the transmission to right side, and then remove the stay bolt and reverse check cable.

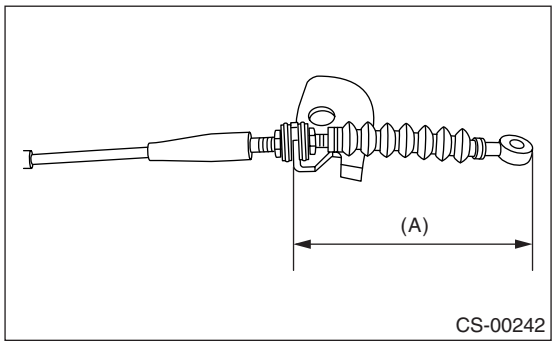
NOTE:
If the transmission is not moved, the stay bolt will contact body and damage may occur.



(A) Stay
(B) Stay bolt

7) Adjust the length between end of cable plate and reverse check cable to 84 mm (3.31 in) with cable pulled (with slider lowered), and then tighten the lock nut.

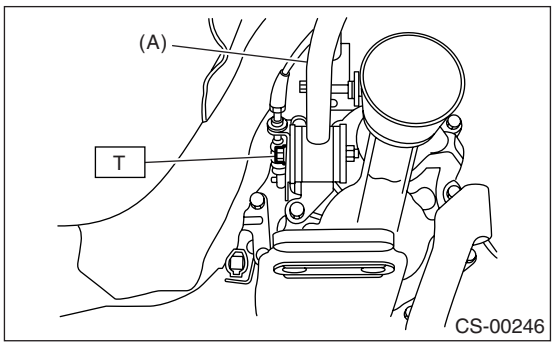
Tightening torque:
6 N·m (0.6 kgf-m, 4.4 ft-lb)



(A) 84 mm (3.31 in)

8) Move the transmission to right side, and then install the stay.

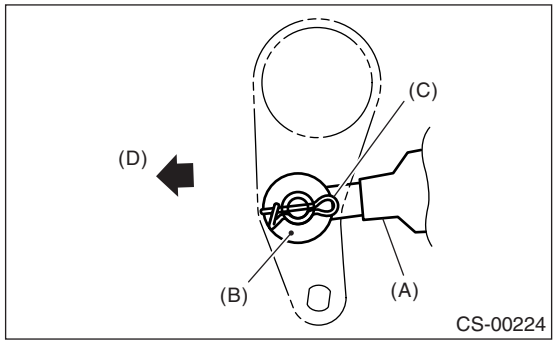
Tightening torque:
T: 32 N·m (3.3 kgf-m, 23.6 ft-lb)



(A) Stay

9) Install the crossmember. <Ref. to 6MT-33, INSTALLATION, Transmission Mounting System.>
10) Install the rear exhaust pipe and muffler. <Ref. to EX(H4DOTC)-13, INSTALLATION, Rear Exhaust Pipe.> , <Ref. to EX(H4DOTC)-14, INSTALLATION, Muffler.>
11) Install the reverse check cable end, washer and snap pin to reverse check lever.

NOTE:
Take care to install the snap pin in proper direction.



(A) Reverse check cable
(B) Washer
(C) Snap pin
(D) Front side

12) Install the under cover.

9. General Diagnostic Table

A: INSPECTION

Symptom	Possible cause	Remedy
1. Select lever	Starter does not run.	Adjust select cable and inhibitor switch, or inspect circuit.
	Back-up light does not light up.	Adjust select cable and inhibitor switch, or inspect circuit.
	AT shift lock system does not operate normally.	Adjust select cable and inhibitor switch, or inspect circuit.
2. MT gear shift lever (6MT)	Shift into reverse is impossible.	Adjust reverse check cable.
	Shift into reverse is possible without pulling up slider.	Adjust or replace reverse check cable.
	Slider cannot be pulled up. Or slider is pulled up being sticked.	• Inspect reverse check system of transmission. • Adjust or replace reverse check cable.

AUTOMATIC TRANSMISSION

4AT

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1. General Description

A: SPECIFICATIONS

1. TORQUE CONVERTER CLUTCH

Model	Non-turbo	Turbo
Type	Symmetric, 3 element, single stage, 2 phase torque converter	
Stall torque ratio	1.85 — 2.15	2.05 — 2.35
Nominal diameter	246 mm (9.69 in)	
Stall speed (at sea level)	2,100 — 2,600 rpm	2,600 — 3,400 rpm
One-way clutch	Sprague type one-way clutch	

2. OIL PUMP

Type	Paracoid constant-displacement pump	
Driving method	Driven by engine	
Number of teeth	Inner rotor	9
	Outer rotor	10

3. TRANSMISSION CONTROL ELEMENT

Type	4-forward, 1-reverse, double-row planetary gears
Multi-plate clutch	3 sets
Multi-plate brake	2 sets
One-way clutch (sprague type)	1 sets

4. TRANSMISSION GEAR RATIO

Model	Sedan (Non-turbo)	Except sedan (Non-turbo)
1st	3.027	2.785
2nd	1.619	1.545
3rd	1.000	
4th	0.694	
Rev	2.272	

5. PLANETARY GEAR AND PLATE

Model	Non-turbo		Turbo
	Sedan	Wagon	
Tooth number of front sun gear	33		
Tooth number of front pinion	21		
Tooth number of front internal gear	75		
Tooth number of rear sun gear	37	42	
Tooth number of rear pinion	19	17	
Tooth number of rear internal gear	75		
Drive plate number of high clutch	4		5
Drive plate number of low clutch	6		7
Drive plate number of reverse clutch	2		
Drive plate number of 2-4 brake	3		4
Drive plate number of low & reverse brake	6		7

6. SELECTOR POSITION

P (Park)	Transmission in neutral, output member immovable, and engine start possible
R (Reverse)	Transmission in reverse for backing
N (Neutral)	Transmission in neutral and engine start possible
D (Drive)	Automatic gear change 1st $\leftarrow\rightarrow$ 2nd $\leftarrow\rightarrow$ 3rd $\leftarrow\rightarrow$ 4th
3 (3rd)	Automatic gear change 1st $\leftarrow\rightarrow$ 2nd $\leftarrow\rightarrow$ 3rd $\leftarrow$ 4th
2 (2nd)	2nd gear locked (Deceleration possible 2nd $\leftarrow$ 3rd $\leftarrow$ 4th)
1 (1st)	1st gear locked (Deceleration possible 1st $\leftarrow$ 2nd $\leftarrow$ 3rd $\leftarrow$ 4th)
Control method	Hydraulic remote control

7. HYDRAULIC CONTROL AND LUBRICATION

Type	Electronic/hydraulic control [Four forward speed changes by electrical signals of vehicle speed and accelerator (throttle) opening]
Fluid	Dexron III type
Fluid capacity	9.3 — 9.6 ℓ (9.8 — 10.1 US qt, 8.2 — 8.4 Imp qt)
Lubrication system	Forced feed lubrication with oil pump
Oil	Automatic transmission fluid (above mentioned)

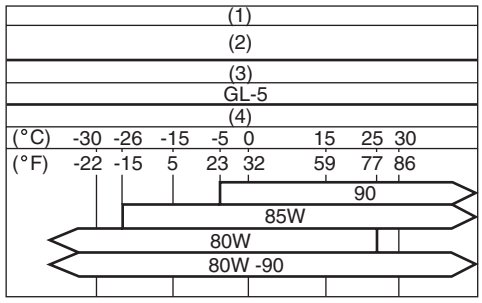
8. COOLING AND HARNESS

Cooling system	Liquid-cooled cooler incorporated in radiator
Inhibitor switch	12 poles
Transmission harness	20 poles

9. TRANSFER

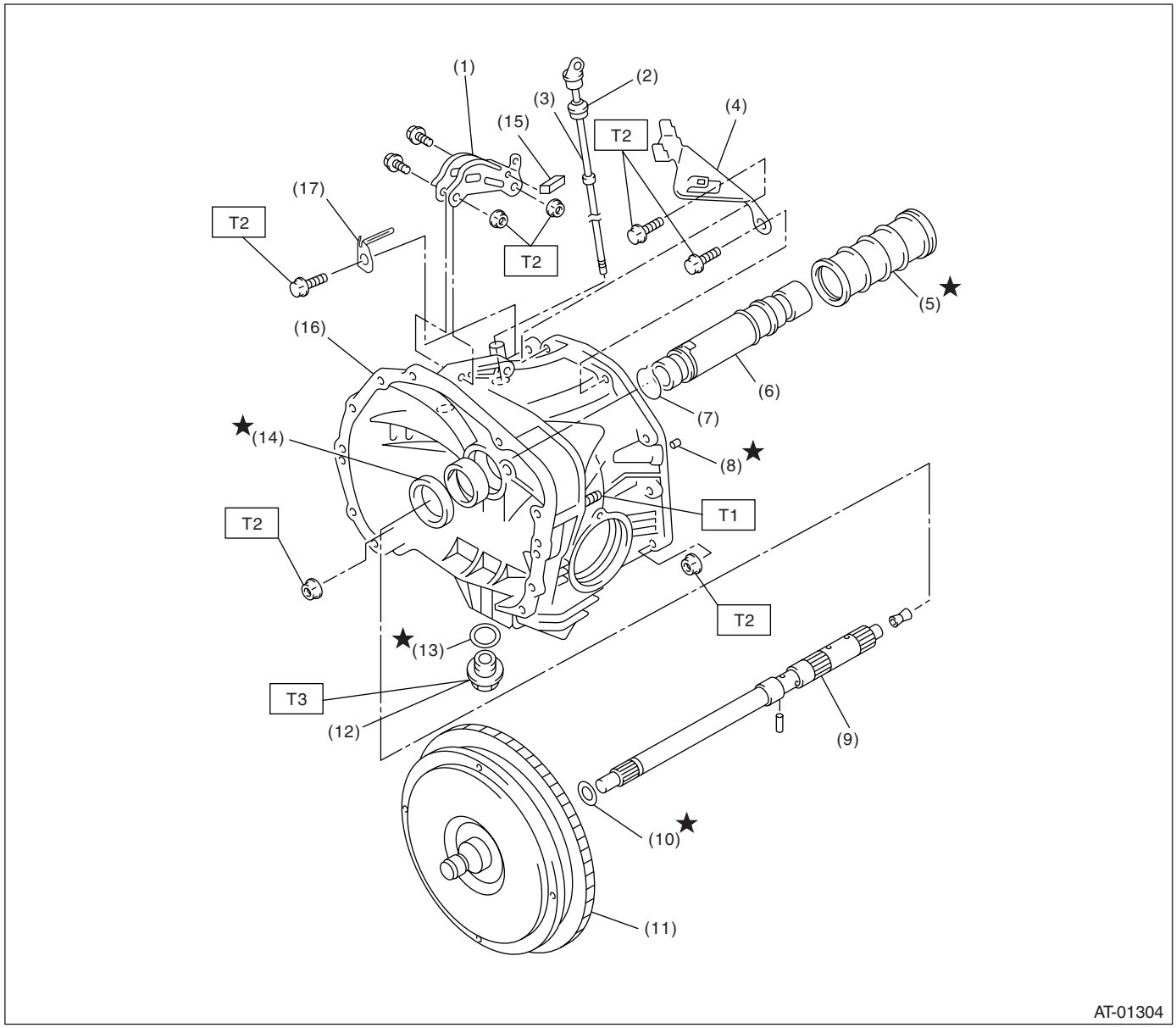
Model	Non-turbo	Turbo
Transfer type	Multi-plate transfer (MPT)	Variable torque distribution (VTD)
Drive & driven plate number of transfer clutch	5	3
Control method	Electronic, hydraulic type	
Lubricant	The same Automatic transmission fluid used in automatic transmission	
1st reduction gear ratio	1.000 (53/53)	

10.FINAL REDUCTION

Model	Except Sedan (Non-turbo)	Sedan (Non-turbo)
Front final gear ratio	4.111 (37/9)	4.444 (40/9)
Lubrication oil	 AT-00001 (1) Item (2) Front differential gear oil (3) API classification (4) SAE viscosity No. and applicable temperature	
Front differential oil capacity	1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)	

B: COMPONENT

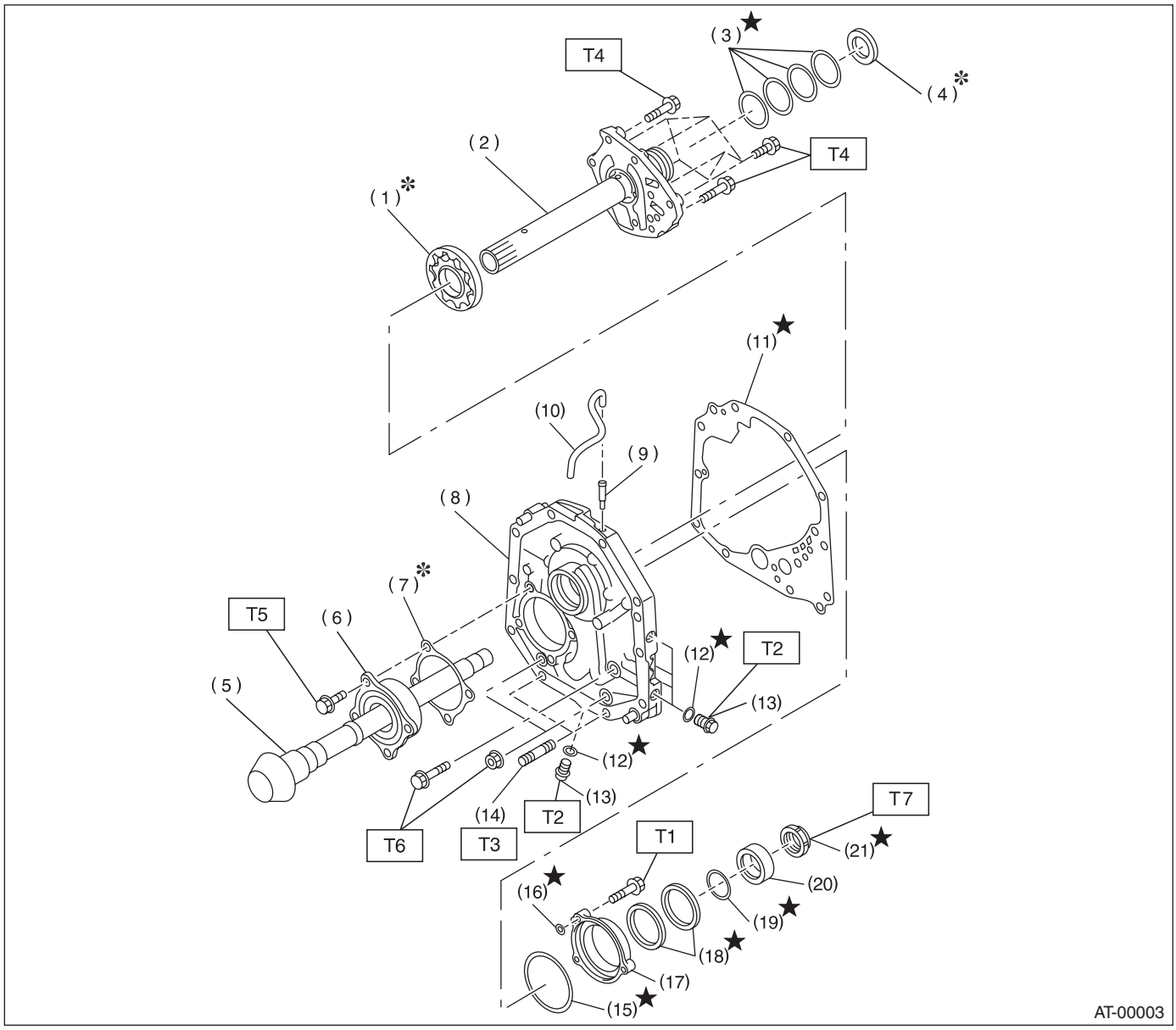
1. TORQUE CONVERTER CLUTCH AND CASE



(1) Pitching stopper bracket
(2) O-ring
(3) Differential oil level gauge
(4) Stay
(5) Seal pipe
(6) Oil pump shaft
(7) Clip
(8) Oil drain pipe
(9) Input shaft
(10) O-ring
(11) Torque converter clutch ASSY
(12) Drain plug
(13) Gasket
(14) Oil seal
(15) Clip (Turbo model)
(16) Torque converter clutch case
(17) Harness stay (Non-turbo model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 18 (1.8, 13.0)
T2: 41 (4.2, 30.4)
T3: 44 (4.5, 32.5)

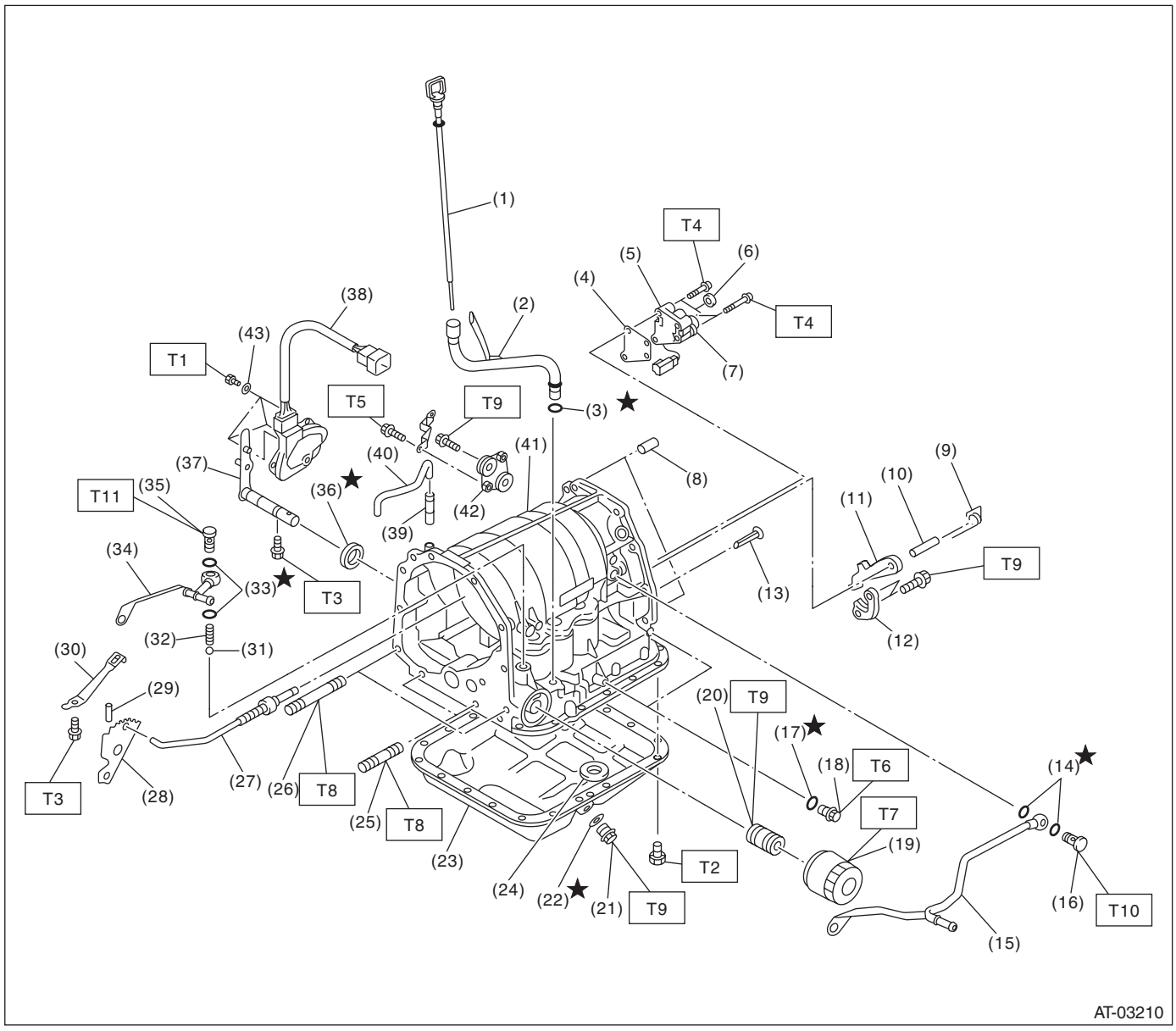
2. OIL PUMP



(1) Oil pump rotor
(2) Oil pump cover
(3) Seal ring
(4) Thrust needle bearing
(5) Drive pinion shaft
(6) Roller bearing
(7) Shim
(8) Oil pump housing
(9) Nipple
(10) Air breather hose
(11) Gasket
(12) O-ring
(13) Test plug
(14) Stud bolt
(15) O-ring
(16) O-ring
(17) Oil seal retainer
(18) Oil seal
(19) O-ring
(20) Drive pinion collar
(21) Lock nut

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7 (0.7, 5.1)
T2: 13 (1.3, 9.4)
T3: 18 (1.8, 13.0)
T4: 25 (2.5, 18.1)
T5: 40 (4.1, 30)
T6: 42 (4.3, 31)
T7: 116 (11.8, 85)

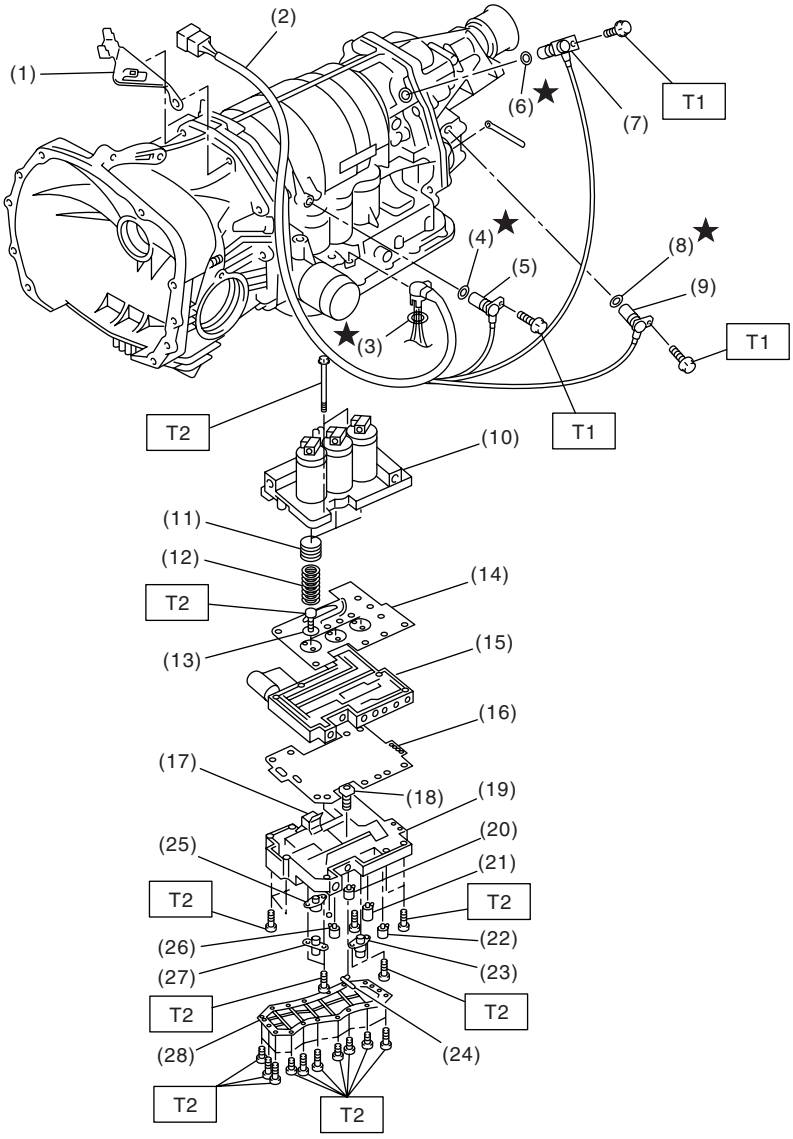
3. TRANSMISSION CASE AND CONTROL DEVICE



(1) ATF level gauge
(2) ATF charger pipe
(3) O-ring
(4) Transfer valve plate
(5) Transfer valve ASSY
(6) Transfer clutch seal
(7) Transfer duty solenoid
(8) Straight pin
(9) Return spring
(10) Shaft
(11) Parking pawl
(12) Parking support
(13) Inlet filter
(14) Gasket
(15) Inlet pipe
(16) Union screw
(17) O-ring
(18) Test plug
(19) Oil filter
(20) Oil filter stud bolt
(21) Drain plug
(22) Gasket
(23) Oil pan
(24) Magnet
(25) Stud bolt (Short)
(26) Stud bolt (Long)
(27) Parking rod
(28) Manual plate
(29) Spring pin
(30) Detention spring
(31) Ball
(32) Spring
(33) Gasket
(34) Outlet pipe
(35) Union screw
(36) Oil seal
(37) Select lever
(38) Inhibitor switch ASSY
(39) Nipple
(40) Air breather hose
(41) Transmission case
(42) Plate ASSY
(43) Washer

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	***3.5 (0.36, 2.6)***
T2:	***5 (0.5, 3.6)***
T3:	***6 (0.6, 4)***
T4:	***8 (0.8, 6)***
T5:	***12 (1.2, 8.7)***
T6:	***13 (1.3, 10)***
T7:	***14 (1.4, 10)***
T8:	***18 (1.8, 13)***
T9:	***25 (2.6, 18)***
T10:	***40 (4.1, 30)***
T11:	***44 (4.5, 32.5)***

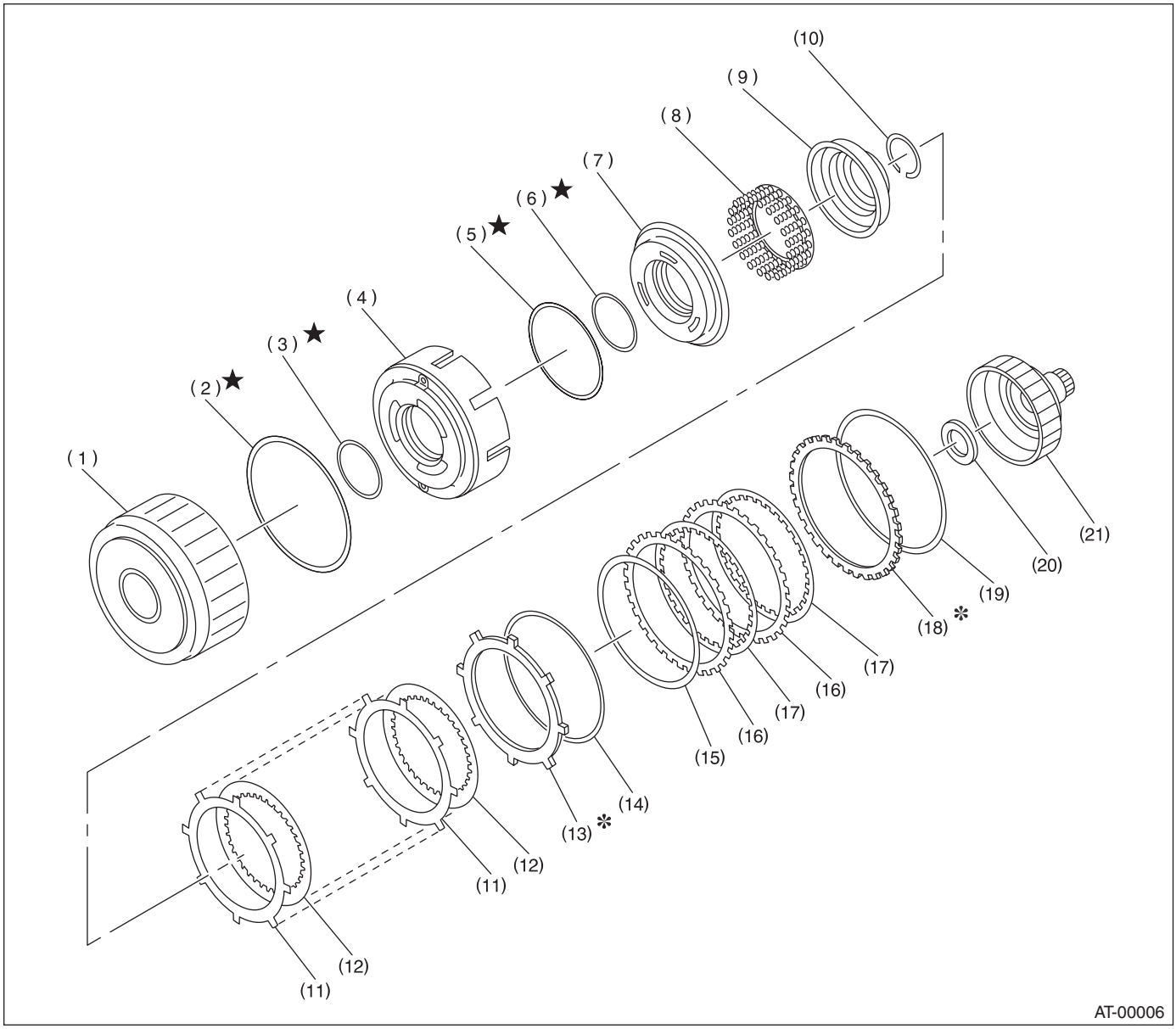
4. CONTROL VALVE AND HARNESS ROUTING



(1) Stay
(2) Transmission harness
(3) O-ring
(4) O-ring
(5) Torque converter turbine speed sensor
(6) O-ring
(7) Front vehicle speed sensor
(8) O-ring
(9) Rear vehicle speed sensor
(10) Upper valve body
(11) Accumulator piston
(12) Accumulator spring
(13) Side plate
(14) Separate plate
(15) Middle valve body
(16) Separate plate
(17) Fluid filter
(18) Fluid filter
(19) Lower valve body
(20) Shift solenoid 2
(21) Shift solenoid 1
(22) 2-4 brake timing solenoid
(23) 2-4 brake duty solenoid
(24) ATF temperature sensor
(25) Line pressure duty solenoid
(26) Low clutch timing solenoid
(27) Lock-up duty solenoid
(28) Oil strainer

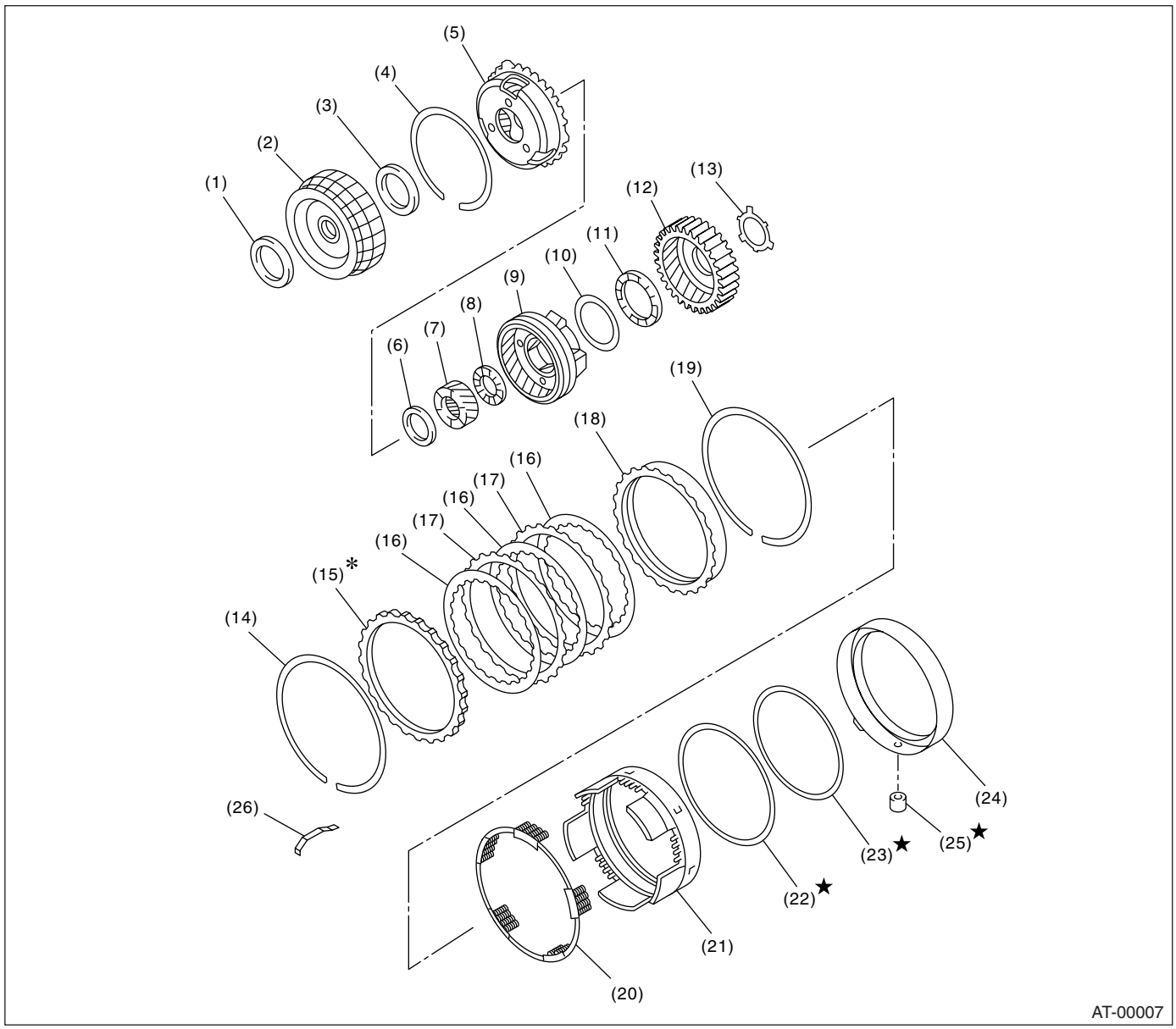
Tightening torque: N·m (kgf-m, ft-lb)
T1: 7 (0.7, 5.1)
T2: 8 (0.8, 5.8)

5. HIGH CLUTCH AND REVERSE CLUTCH



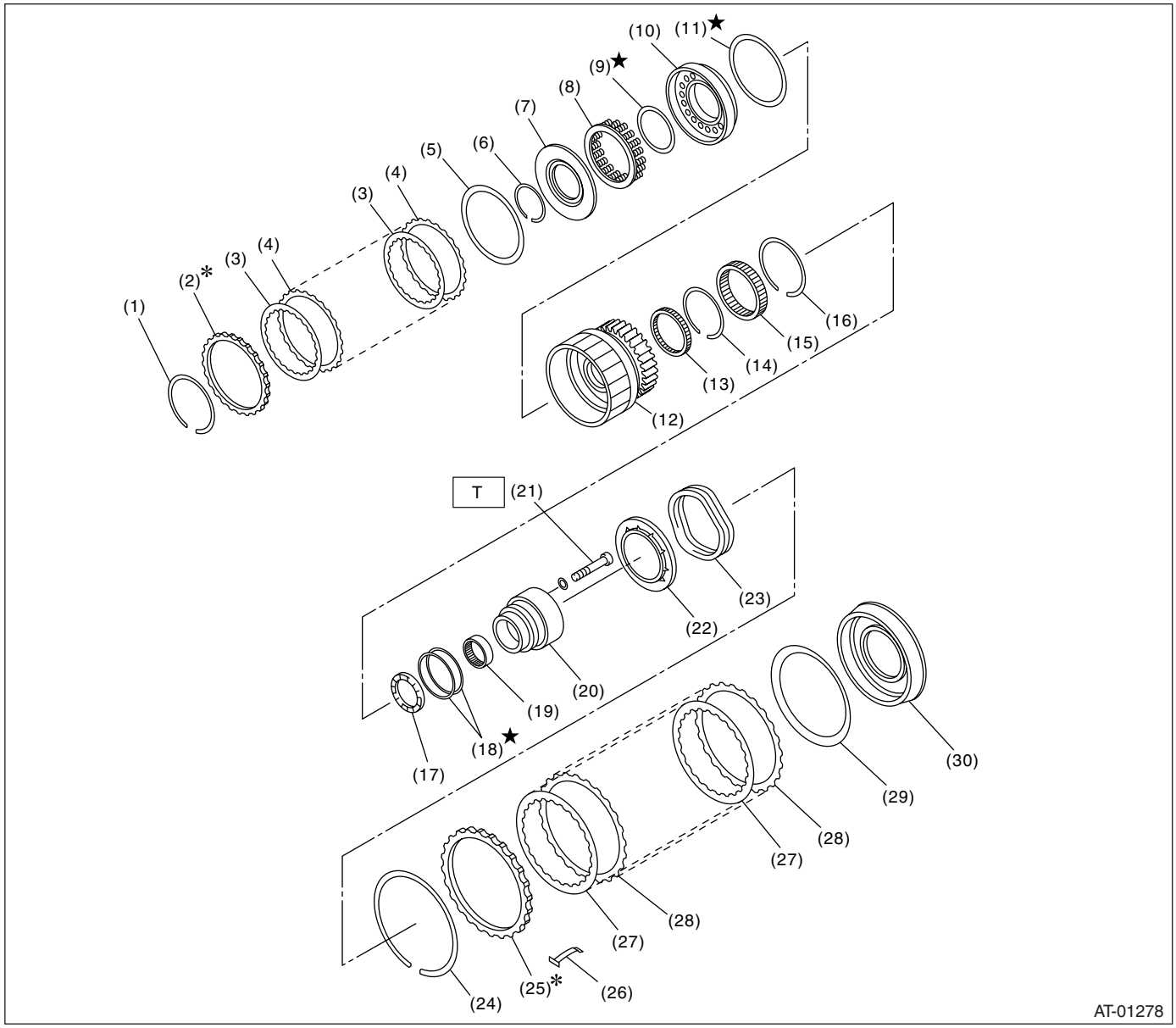
(1)	High clutch drum	(8)	Spring retainer	(15)	Dish plate
(2)	Lip seal	(9)	Cover	(16)	Driven plate
(3)	D-ring	(10)	Snap ring	(17)	Drive plate
(4)	Reverse clutch piston	(11)	Driven plate	(18)	Retaining plate
(5)	D-ring	(12)	Drive plate	(19)	Snap ring
(6)	D-ring	(13)	Retaining plate	(20)	Thrust needle bearing
(7)	High clutch piston	(14)	Snap ring	(21)	High clutch hub

6. PLANETARY GEAR AND 2-4 BRAKE



(1) Thrust needle bearing
(2) Front sun gear
(3) Thrust needle bearing
(4) Snap ring
(5) Front planetary carrier
(6) Thrust needle bearing
(7) Rear sun gear
(8) Thrust needle bearing
(9) Rear planetary carrier
(10) Washer
(11) Thrust needle bearing
(12) Rear internal gear
(13) Washer
(14) Snap ring
(15) Retaining plate
(16) Drive plate
(17) Driven plate
(18) Pressure rear plate
(19) Snap ring
(20) Spring retainer
(21) 2-4 brake piston
(22) D-ring
(23) D-ring
(24) 2-4 brake piston retainer
(25) 2-4 brake seal
(26) Leaf spring

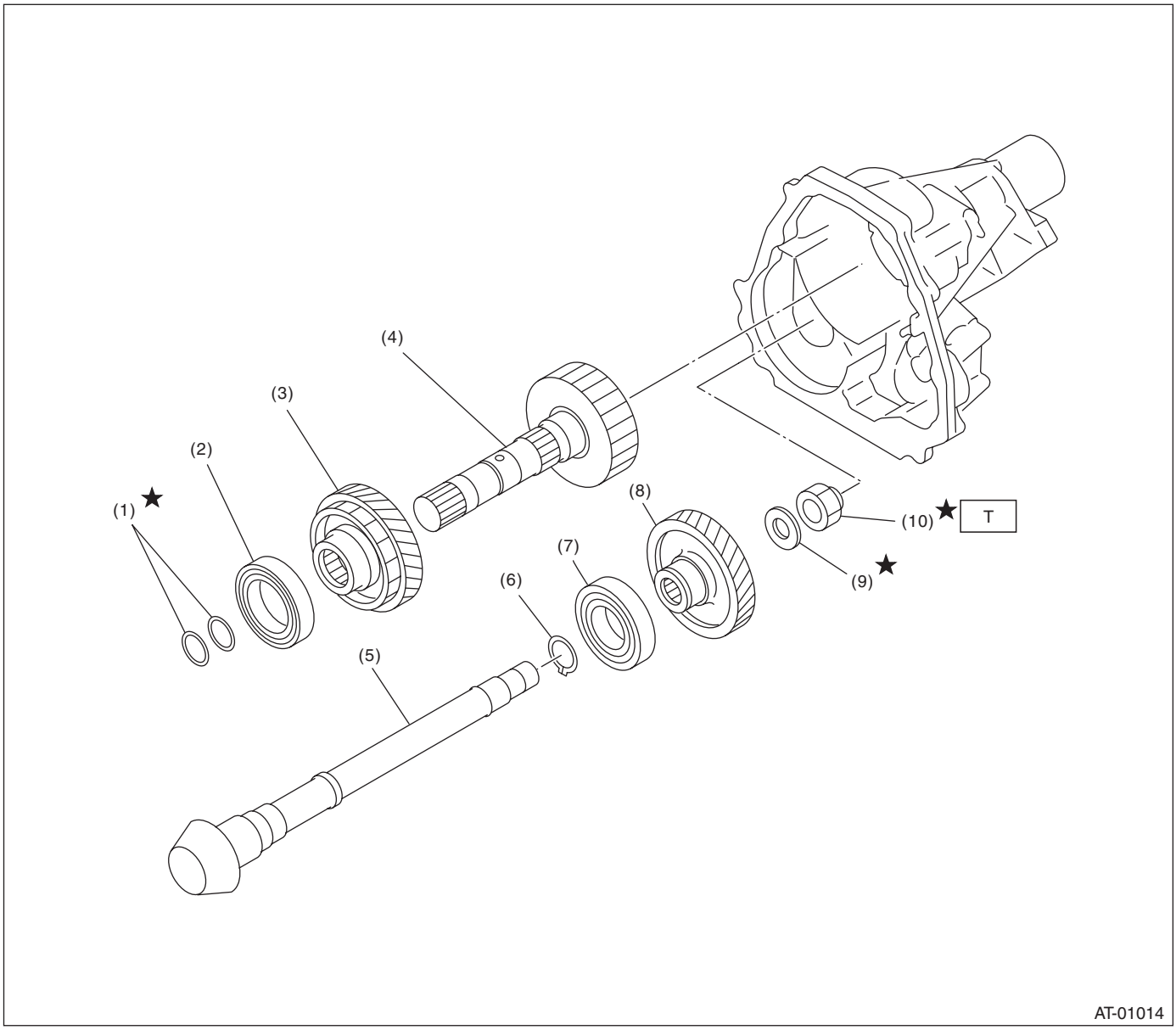
7. LOW CLUTCH AND LOW & REVERSE BRAKE



(1) Snap ring
(2) Retaining plate
(3) Drive plate
(4) Driven plate
(5) Dish plate
(6) Snap ring
(7) Cover
(8) Spring retainer
(9) D-ring
(10) Low clutch piston
(11) D-ring
(12) Low clutch drum
(13) Needle bearing
(14) Snap ring
(15) One-way clutch
(16) Snap ring
(17) Thrust needle bearing
(18) Seal ring
(19) Needle bearing
(20) One-way clutch inner race
(21) Socket bolt
(22) Spring retainer
(23) Return spring
(24) Snap ring
(25) Retaining plate
(26) Leaf spring
(27) Drive plate
(28) Driven plate
(29) Dish plate
(30) Low & reverse brake piston

Tightening torque: N·m (kgf-m, ft-lb)
T: 25 (2.5, 18.1)

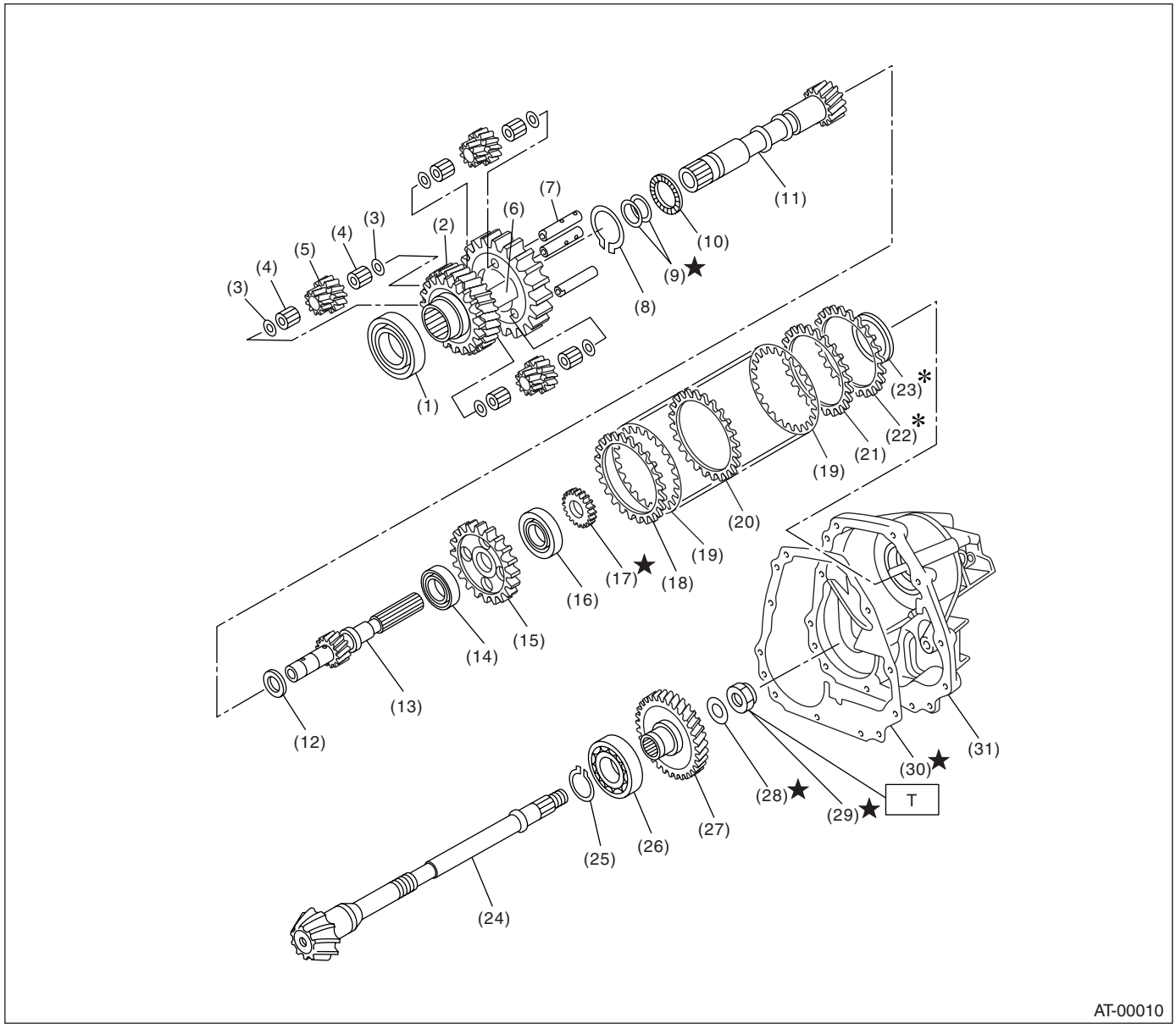
8. REDUCTION GEAR WITH MPT



(1) Seal ring
(2) Ball bearing
(3) Reduction drive gear
(4) Reduction drive shaft
(5) Drive pinion shaft
(6) Snap ring
(7) Ball bearing
(8) Reduction driven gear
(9) Washer
(10) Lock nut

Tightening torque: N·m (kgf-m, ft-lb)
T: 100 (10.2, 73.8)

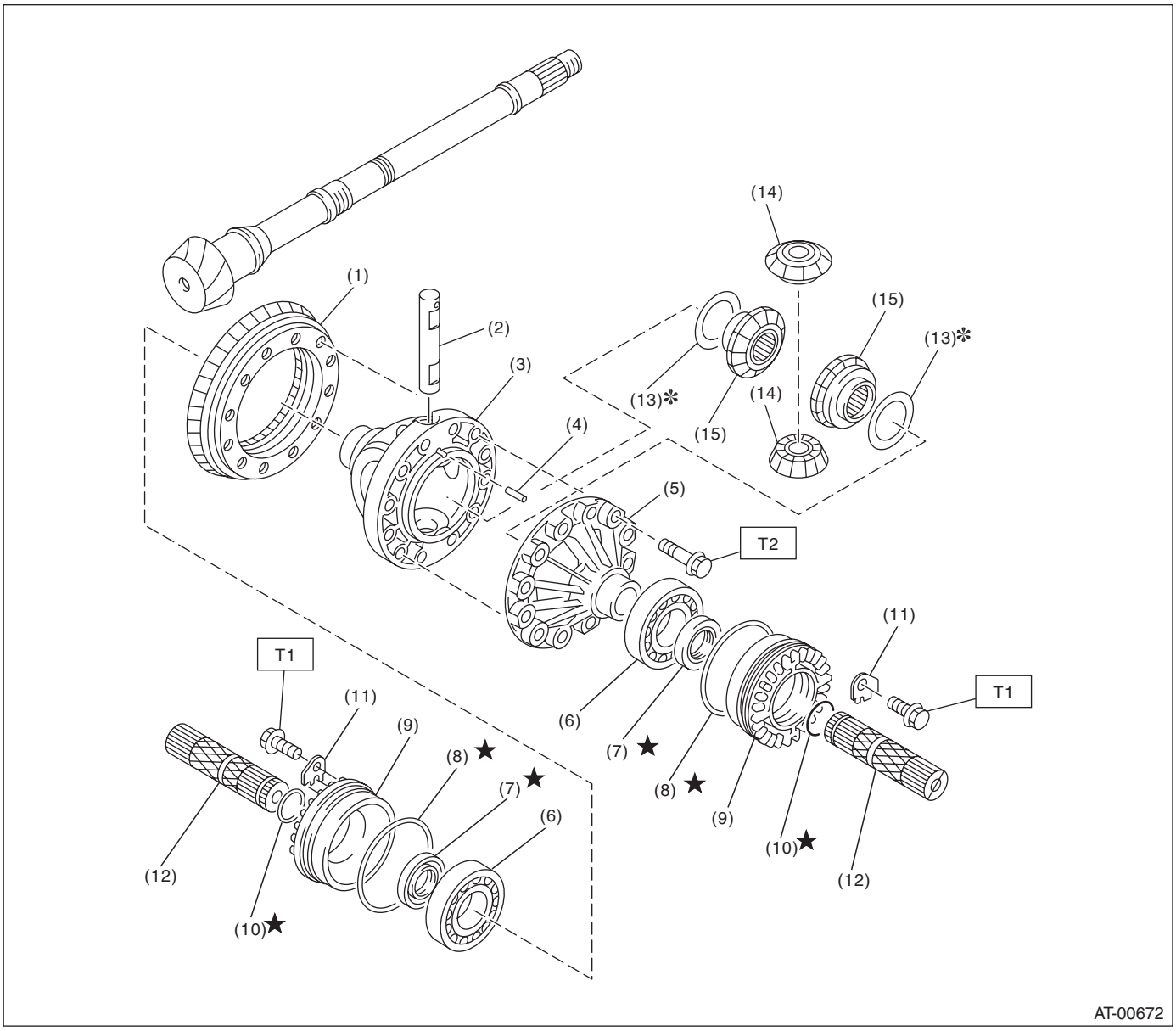
9. REDUCTION GEAR WITH VTD



(1) Ball bearing
(2) Reduction drive gear
(3) Washer
(4) Needle bearing
(5) Pinion gear
(6) Carrier
(7) Planetary pinion shaft
(8) Snap ring
(9) Seal ring
(10) Thrust needle bearing
(11) Intermediate shaft
(12) Thrust washer
(13) Rear drive shaft
(14) Ball bearing
(15) Multi-plate clutch (LSD) hub
(16) Ball bearing
(17) Revolution gear
(18) Driven plate (Thick)
(19) Driven plate
(20) Driven plate (Thin)
(21) Driven plate (Thick)
(22) Pressure plate
(23) Rear drive shaft shim
(24) Drive pinion shaft
(25) Snap ring
(26) Ball bearing
(27) Reduction driven gear
(28) Lock washer
(29) Lock nut
(30) Gasket
(31) Extension case

Tightening torque: N·m (kgf-m, ft-lb)
T: 100 (10.2, 73.8)

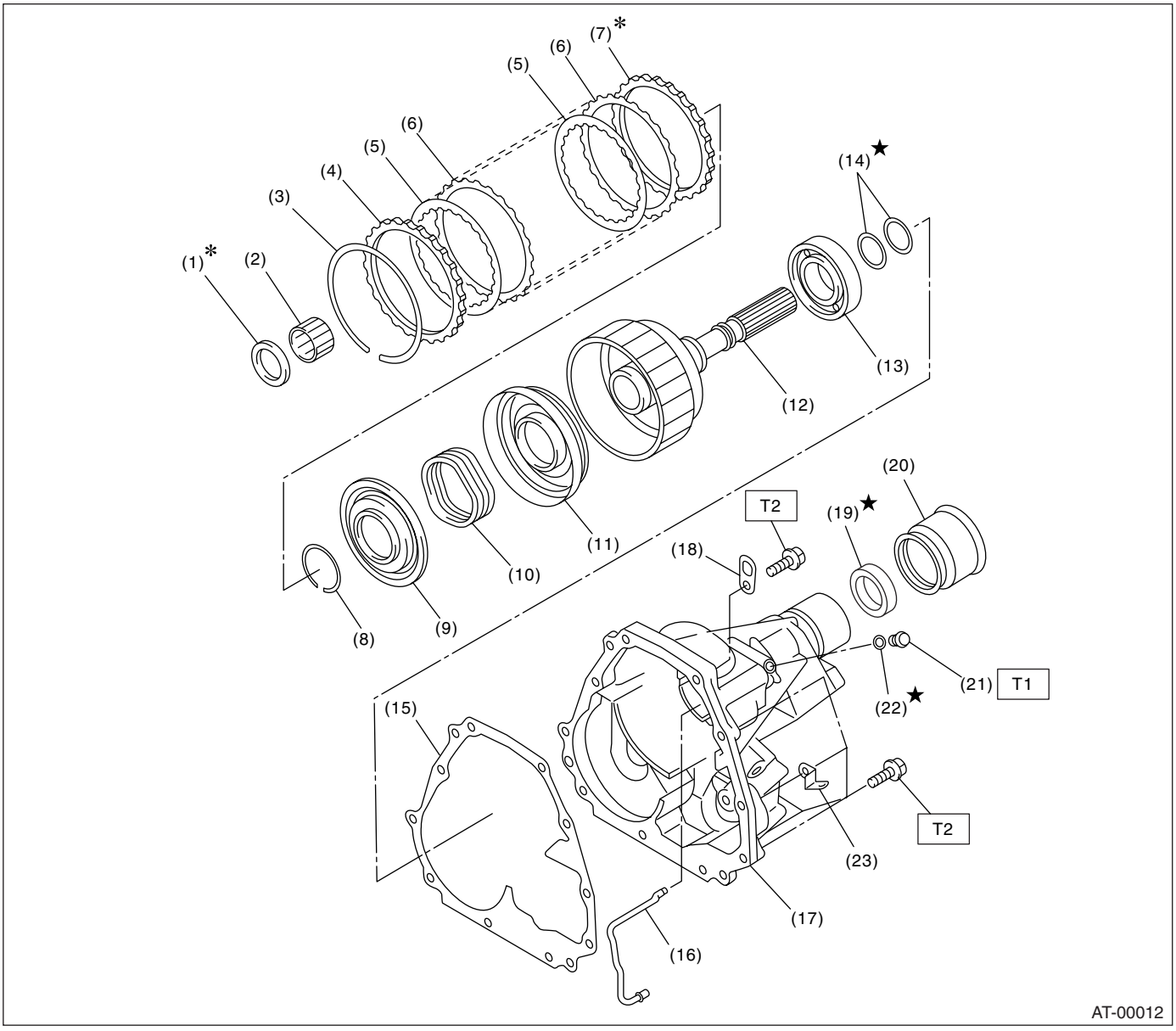
10.DIFFERENTIAL GEAR



(1) Crown gear
(2) Pinion shaft
(3) Differential case (RH)
(4) Straight pin
(5) Differential case (LH)
(6) Taper roller bearing
(7) Oil seal
(8) O-ring
(9) Differential side retainer
(10) Circlip
(11) Lock plate
(12) Axle shaft
(13) Washer
(14) Differential bevel pinion
(15) Differential bevel gear

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)
T2: 62 (6.3, 45.6)

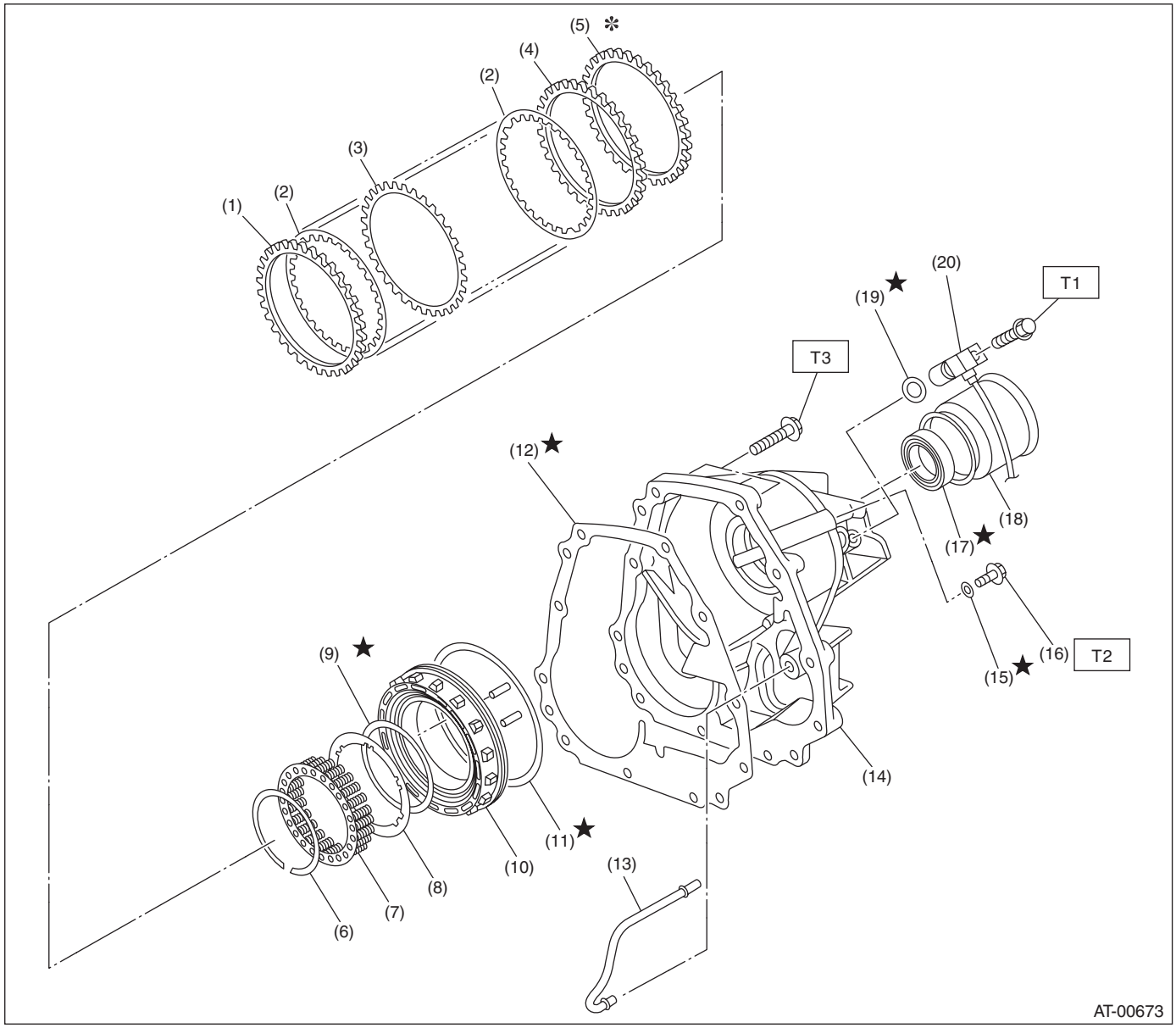
11.TRANSFER AND EXTENSION CASE WITH MPT



(1) Thrust needle bearing
(2) Needle bearing
(3) Snap ring
(4) Pressure plate
(5) Drive plate
(6) Driven plate
(7) Retaining plate
(8) Snap ring
(9) Transfer piston seal
(10) Return spring
(11) Transfer clutch piston
(12) Rear drive shaft
(13) Ball bearing
(14) Seal ring
(15) Gasket
(16) Transfer clutch pipe
(17) Extension case
(18) Transmission hanger
(19) Oil seal
(20) Dust cover
(21) Test plug
(22) O-ring
(23) Clip

Tightening torque: N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.4)
T2: 25 (2.5, 18.1)

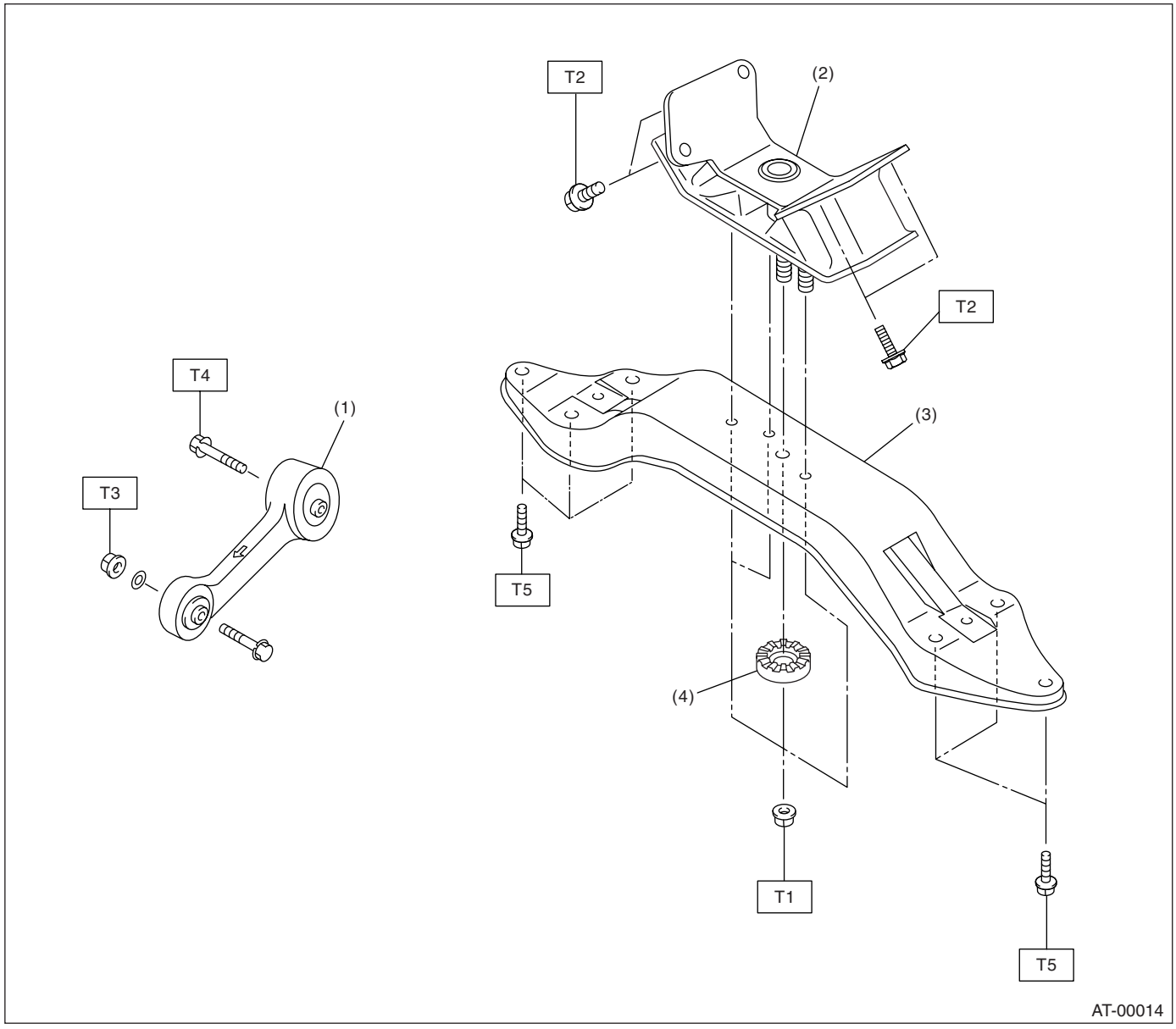
12.TRANSFER AND EXTENSION CASE WITH VTD



(1) Driven plate (Thick)
(2) Driven plate
(3) Driven plate (Thin)
(4) Driven plate (Thick)
(5) Retaining plate
(6) Snap ring
(7) Spring retainer
(8) Plate
(9) O-ring
(10) Multi-plate clutch (LSD) piston
(11) D-ring
(12) Gasket
(13) Multi-plate clutch (LSD) pipe
(14) Extension case
(15) O-ring
(16) Test plug
(17) Oil seal
(18) Dust cover
(19) O-ring
(20) Rear wheel sensor

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7 (0.7, 5.1)
T2: 13 (1.3, 9.4)
T3: 25 (2.5, 18.1)

13.TRANSMISSION MOUNTING



(1) Pitching stopper
(2) Rear cushion rubber
(3) Crossmember
(4) Stopper

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 26)
T2: 39 (4.0, 29)
T3: 50 (5.1, 37)
T4: 58 (5.9, 43)
T5: 70 (7.1, 51)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation, and disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Until the oil pan is removed, do not place with the oil pan side facing up to prevent foreign matter from entering the valve body.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• When disassembling the case and other light alloy parts, use a plastic hammer to force it apart. Do not pry it apart with a screwdriver or other tool.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply gear oil onto sliding or revolution surfaces before installation.
• Replace deformed or otherwise damaged snap rings with new ones.
• Before installing O-rings or oil seals, apply sufficient amount of ATF fluid to avoid damage and deformation.
• Be careful not to incorrectly install or fail to install O-rings, snap rings and other such parts.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Avoid damaging the mating surface of the case.
• Before applying sealant, completely remove the old seal.
• When disassembling AT, be sure to use nylon or paper towel, do not use cloth glove and cloth.

D: PREPARATION TOOL

1. SPECIAL TOOLS

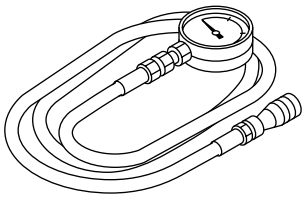
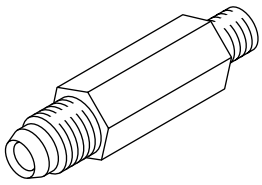
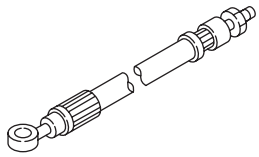
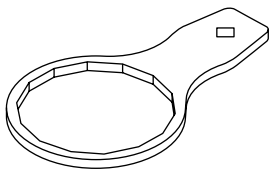
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498575400	498575400	OIL PRESSURE GAUGE ASSY	Used for measuring oil pressure.
 ST-498897200	498897200	ADAPTER	Used oil pump housing when measuring reverse clutch pressure and line pressure.
 ST-498897700	498897700	ADAPTER SET	Used for measuring transfer clutch pressure.
 ST-498545400	498545400	FILTER WRENCH	Used for removing and installing ATF filter.

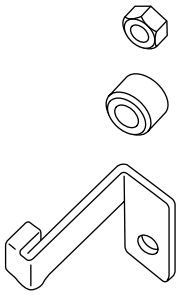
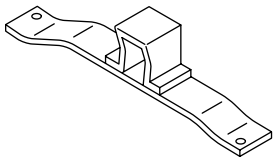
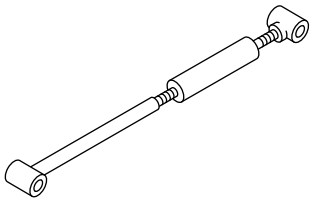
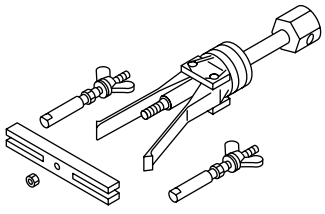
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498277200	498277200	STOPPER SET	Used for removing and installing automatic transmission assembly to engine.
 ST41099AA010	41099AA010	ENGINE SUPPORT BRACKET	• Used for supporting engine. • Used with ENGINE SUPPORT (41099AA020).
 ST41099AA020	41099AA020	ENGINE SUPPORT	• Used for supporting engine. • Used with ENGINE SUPPORT BRACKET (41099AA010).
 ST-398527700	398527700	PULLER ASSY	• Used for removing extension case roller bearing. • Used for removing extension oil seal. • Used for removing front differential side retainer bearing outer race. • Used for removing front differential side retainer bearing outer ball race.

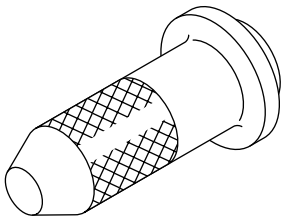
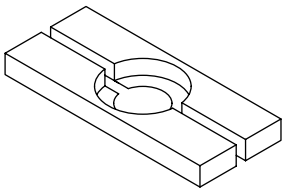
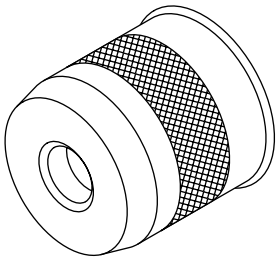
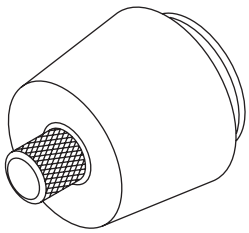
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498057300	498057300	INSTALLER	Used for installing extension oil seal.
 ST-498077000	498077000	REMOVER	Used for removing differential taper roller bearing.
 ST-499247400	499247400	INSTALLER	• Used for installing transfer outer snap ring. • Used with GUIDE (499257300).
 ST-499257300	499257300	SNAP RING OUTER GUIDE	• Used for installing transfer outer snap ring. • Used with INSTALLER (499247400).

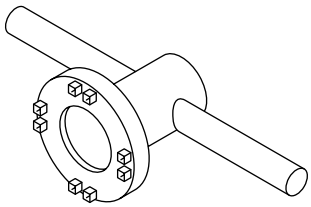
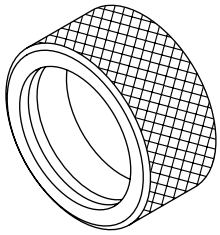
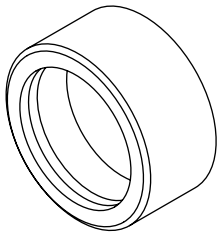
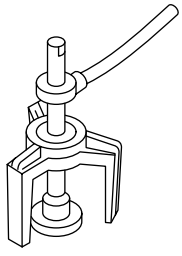
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499787000	499787000	WRENCH ASSY	Used for removing and installing differential side retainer.
 ST-398437700	398437700	DRIFT	Used for installing converter case oil seal.
 ST-398487700	398487700	INSTALLER	Used for installing taper roller bearing of front differential.
 ST-398673600	398673600	COMPRESSOR	Used for removing and installing clutch spring.

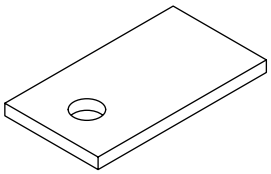
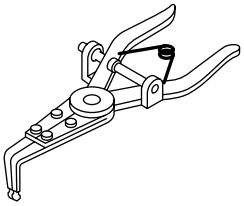
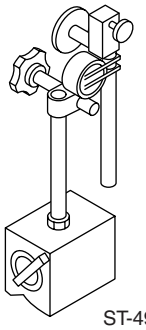
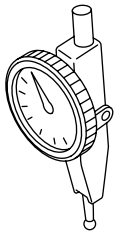
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498255400	498255400	PLATE	Used for measuring backlash of hypoid gear.
 ST-399893600	399893600	PLIERS	Used for removing and installing clutch spring.
 ST-498247001	498247001	MAGNET BASE	• Used for measuring gear backlash. • Used with DIAL GAUGE (498247100).
 ST-498247100	498247100	DIAL GAUGE	• Used for measuring gear backlash. • Used with MAGNET BASE (498247001).

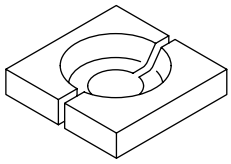
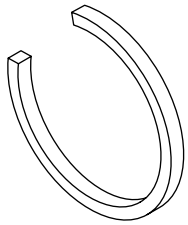
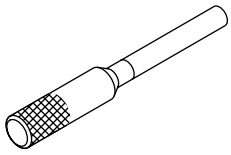
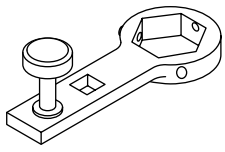
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498517000	498517000	REPLACER	Used for removing front roller bearing.
 ST-398623600	398623600	SEAT	Used for removing spring of transfer clutch piston.
 ST-499267300	499267300	STOPPER PIN	Used for installing inhibitor switch.
 ST-499787700	499787700	WRENCH	Used for removing and installing drive pinion lock nut.

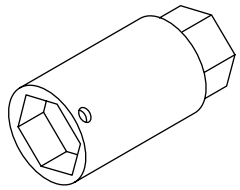
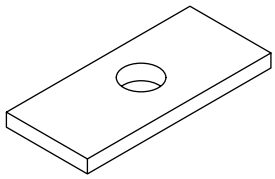
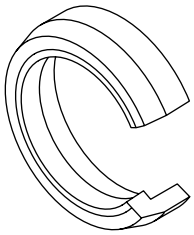
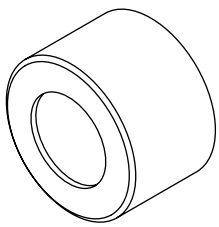
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499787500	499787500	ADAPTER	Used for removing and installing drive pinion lock nut.
 ST-398643600	398643600	GAUGE	Used for measuring total end play, extension end play and drive pinion height.
 ST-498627100	498627100	SEAT	Used for holding low clutch piston retainer spring when installing snap ring.
 ST-499577000	499577000	GAUGE	• Used for measuring the transmission case mating surface to the reduction gear end surface. • For MPT model.

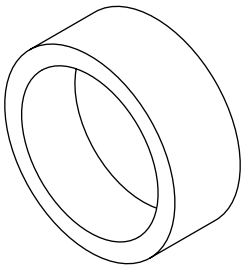
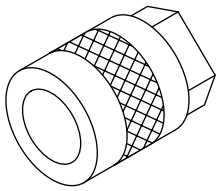
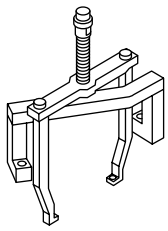
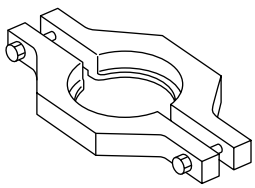
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398744300	398744300	GAUGE	• Use for measuring contact face between multi-plate clutch end and transmission. • For VTD model.
 ST-499737000	499737000	PULLER	Used for removing reduction driven gear assembly.
 ST-499737100	499737100	PULLER SET	Used for removing reduction drive gear assembly.
 ST-498077600	498077600	REMOVER	Used for removing ball bearing.

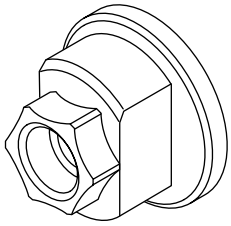
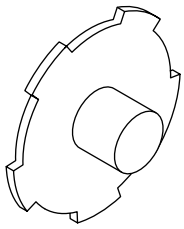
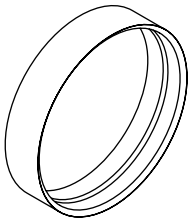
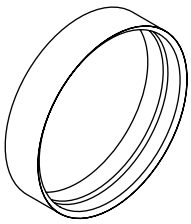
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498937110	498937110	HOLDER	Used for removing and installing drive pinion lock nut.
 ST-498677100	498677100	COMPRESSOR	Used for installing 2-4 brake snap ring.
 ST-498437000	498437000	HIGH CLUTCH PISTON GUIDE	Used for installing high clutch piston.
 ST-498437100	498437100	LOW CLUTCH PISTON GUIDE	Used for installing low clutch piston.

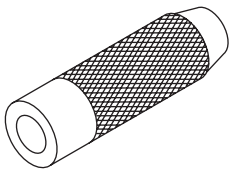
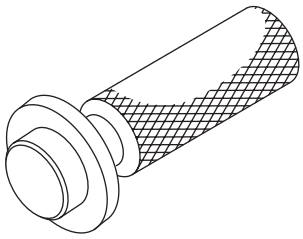
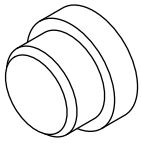
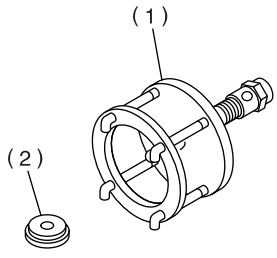
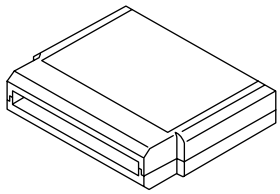
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899580100	899580100	INSTALLER	Used for press-fitting the ball bearing for transfer clutch.
 ST-499797000	499797000	INSTALLER	Used for installing differential side retainer oil seal.
 ST-398497701	398497701	SEAT	Used for installing needle bearing.
 ST-899524100	899524100	PULLER SET	• Using the bolt only. (1) Bolt • Used with PULLER SET (499737100). • Used with PULLER (499737000). (1) Puller (2) Cap

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230 (Newly adapted tool)	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

2. GENERAL PURPOSE TOOLS

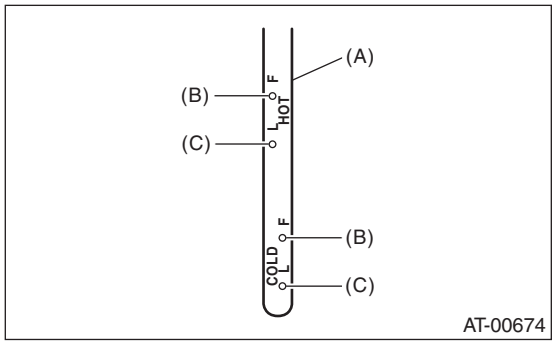
TOOL NAME	REMARKS
Depth gauge	Used for measuring transmission end play.
Thickness gauge	Used for measuring clearances of clutch, brake and oil pump.
Micro meter	Used for measuring thickness of drive pinion.
Spring balance	Used for measuring starting torque of drive pinion.
Circuit tester	Used for measuring resistance and voltage.
TORX® T70	Used for removing and installing differential gear oil drain plug.

2. Automatic Transmission Fluid

A: INSPECTION

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

1) Raise the ATF temperature by driving a distance of 5 to 10 km (3 to 6 miles). Otherwise, idle the engine to raise ATF temperature to 70 — 80°C (158 — 176°F) on SUBARU Select Monitor. <Ref. to 4AT(diag)-22, READ CURRENT DATA, OPERATION, Subaru Select Monitor.>
2) Make sure the vehicle is level.
3) After selecting all positions (P, R, N, D, 3, 2, 1), set the select lever in "P" range. Measure the ATF level with the engine idling for one or two minutes.



(A) ATF level gauge
(B) Upper level
(C) Lower level

4) Make sure that ATF level is above the center of upper and lower marks at HOT side.

NOTE:
When the transmission is hot, the level should be above the center of upper and lower marks, and when it is cold, the level should be found below the center of these two marks.

5) If the ATF level is below the center between upper and lower marks, add the recommended ATF until the ATF level is found above the center between upper and lower marks.

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

6) Check ATF level after raising ATF temperature to 70 — 80°C (158 — 176°F) by running the vehicle or by idling the engine again.
7) Check the ATF for leaks.
Check for leaks in the transmission. If there are leaks, it is necessary to repair or replace gasket, oil seals, plugs or other parts.

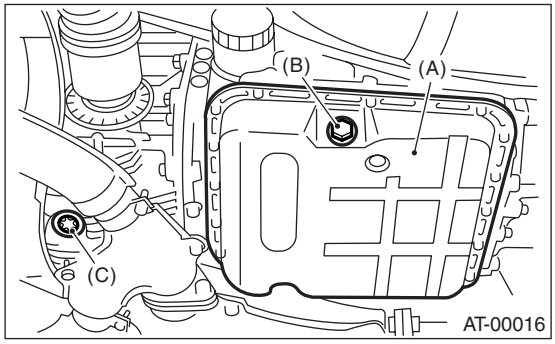
B: REPLACEMENT

1) Lift-up the vehicle.
2) Drain the ATF completely.

CAUTION:
Directly after the vehicle has been running or the engine has been idling for long time, the ATF is hot. Be careful not to burn yourself.

3) Replace with a new gasket, and then tighten the ATF drain plug.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Oil pan
(B) Drain plug (ATF)
(C) Differential oil drain plug

4) Lower the vehicle.
5) Pour ATF into the oil charge pipe.

Recommended fluid:
Dexron III type automatic transmission fluid

Capacity:
Fill the same amount of ATF drained from drain plug hole.

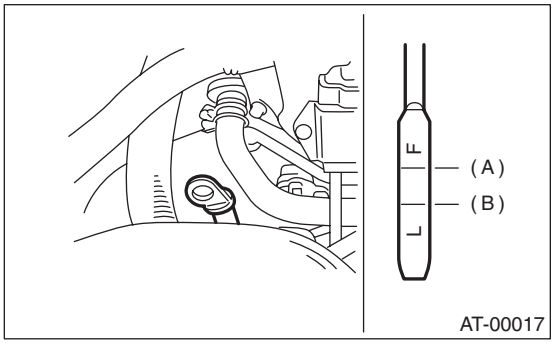
Capacity when transmission is overhauled:
9.3 — 9.6 ℓ (9.8 — 10.1 US qt, 8.2 — 8.4 Imp qt)

6) Check the level and leaks of ATF.
<Ref. to 4AT-30, INSPECTION, Automatic Transmission Fluid.>

3. Differential Gear Oil

A: INSPECTION

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe it clean.
3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
4) Remove it again and note the reading. If the differential gear oil level is below the “L” line, add oil to bring the level up to the “F” line.
5) To prevent overfilling the differential gear oil, do not add oil above the “F” line.



(A) Upper level
(B) Lower level

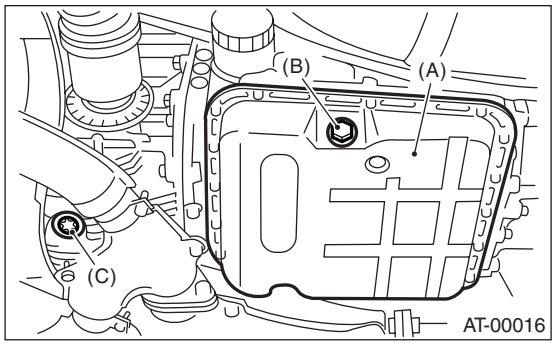
B: REPLACEMENT

1) Lift-up the vehicle.
2) Remove the differential gear oil drain plug using TORX® T70, and then drain the differential gear oil completely.

CAUTION:
• Directly after the vehicle has been running or the engine has been long idling running, the differential gear oil is hot. Be careful not to burn yourself.
• Be careful not to spill the differential gear oil on exhaust pipe to prevent it from emitting smoke or fire. When the differential gear oil is spilled on exhaust pipe, wipe it away completely.

3) Replace the gasket with a new one, and then tighten the differential gear oil drain plug using TORX® T70.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)



(A) Oil pan
(B) Drain plug
(C) Differential oil drain plug

4) Lower the vehicle.
5) Pour gear oil into the gauge hole.

Recommended fluid:
Use GL-5 (SAE: 80W — 90) or equivalent.

Gear oil capacity:
1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)

6) Check the level of differential gear oil.
<Ref. to 4AT-31, INSPECTION, Differential Gear Oil.>

4. Road Test

A: INSPECTION

1. GENERAL PRECAUTION

Road tests should be conducted to properly diagnose the condition of the automatic transmission.

NOTE:
When performing the test, do not exceed posted speed limit.

2. D RANGE SHIFT FUNCTION

Check shifting between 1st ←→ 2nd ←→ 3rd ←→ 4th while driving on normal city streets.

3. D RANGE SHIFT SHOCK

Check the shock level when shifting up during normal driving.

4. KICK-DOWN FUNCTION

Check kick-down for each gear. Also check the kick-down shock level.

5. ENGINE BRAKE OPERATION

- Check the 3rd gear engine brake when shifting between D ←→ 3rd range while driving in 4th gear of D range [50 to 60 km/h (31 to 37 MPH)].
- Check the 2nd gear engine brake when shifting between 3 ←→ 2 range while driving in the 3 range 3rd gear [40 to 50 km/h (25 to 31 MPH)].
- Check the 1st gear engine brake when shifting between 2 ←→1 range while driving in the 2 range 2nd gear [20 to 30 km/h (12 to 19 MPH)].

6. LOCK-UP FUNCTION

Check that engine speed does not change sharply when the acclelerator pedal is lightly depressed when driving on flat roads at normal speed in the lock-up range.

7. P RANGE OPERATION

Stop the vehicle on an uphill grade of 5% or more and shift to “P” range. Check that the vehicle does not move when the parking brake is released.

8. UNUSUAL SOUNDS AND VIBRATION

Check for unusual sounds and vibration while driving and during shifting.

9. CLIMBING CONTROL FUNCTION

- Check that the gear remains in 3rd when going up a grade.
- Check that the gear remains in 3rd when applying the brakes while going down a grade.

10.TRANSFER CLUTCH

Check if the tight corner braking occurs when the vehicle is started with steering wheel held at fully turned position. (MPT model)

11.OIL LEAKS

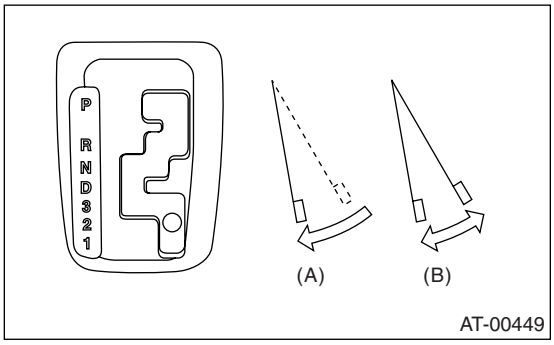
After the driving test, inspect for oil leaks.

5. Stall Test

A: INSPECTION

NOTE:
The stall test is of extreme importance in diagnosing the condition of the automatic transmission and the engine. It should be conducted to measure the engine stall speeds in “R” and “2” ranges.

Purposes of the stall test:
• To check the operation of the automatic transmission clutch.
• To check the operation of the torque converter clutch.
• To check engine performance.
1) Check that throttle valve opens fully.
2) Check that engine oil level is correct.
3) Check that coolant level is correct.
4) Check that ATF level is correct.
5) Check that differential gear oil level is correct.
6) Increase ATF temperature to 70 to 80°C (158 to 176°F) by idling the engine for approx. 30 minutes (with select lever set to “N” or “P”).
7) Place the wheel chocks at the front and rear of all wheels and engage the parking brake.
8) Move the manual linkage to ensure it operates properly, and shift the select lever to the “2” range.
9) While forcibly depressing the foot brake pedal, gradually depress the accelerator pedal until the engine operates at full throttle.



(A) Brake pedal
(B) Accelerator pedal

10) When the engine speed is stabilized, record that speed quickly and release the accelerator pedal.
11) Shift the select lever to “N” range, and cool down the engine by idling it for more than one minute.
12) If the stall speed in “2” range is higher than specifications, low clutch slipping and 2-4 brake slipping may occur. To identify it, conduct the same test as above in “R” range.
13) Perform the stall tests with the select lever in “D” range.

NOTE:
• Do not continue the stall test for MORE THAN 5 SECONDS at a time (from closed throttle, fully open throttle to stall speed reading). Failure to follow this instruction causes the engine oil and ATF to deteriorate and the clutch and brake to be adversely affected.
• Be sure to cool down the engine for at least 1 minute after each stall test with the select lever set in the “P” or “N” range and with the idle speed lower than 1,200 rpm.
• If the stall speed is higher than the specified range, attempt to finish the stall test in as short a time as possible, in order to prevent the automatic transmission from sustaining damage.

Stall speed (at sea level):
2.0 L Turbo model: 2,600 — 3,400 rpm
2.5 L Non-turbo model: 2,100 — 2,600 rpm

Stall speed (at sea level)	Position	Cause
Less than specifications	2, R	• Throttle valve not fully open • Erroneous engine operation • Torque converter clutch’s one-way clutch slipping
Greater than specifications	D	• Line pressure too low • Low clutch slipping • One-way clutch malfunction
	R	• Line pressure too low • Reverse clutch slipping • Low & reverse brake slipping
	2	• Line pressure too low • Low clutch slipping • 2-4 brake slipping

6. Time Lag Test

A: INSPECTION

NOTE:
If the select lever is shifted while the engine is idling, there will be a certain time elapse or lag before the shock can be felt. This is used for checking the condition of the low clutch, reverse clutch, low & reverse brake and one-way clutch.

- Perform the test at normal operating fluid temperature 70 to 80°C (158 to 176°F).
- Be sure to allow a 1 minute interval between tests.
- Make three measurements and take the average value.

1) Fully apply the parking brake.
2) Start the engine.
Check the idling speed (A/C OFF).
3) Shift the select lever from “N” to “D” range.
Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.
Time lag: Less than 1.2 seconds
If “N” → “D” time lag is longer than specified:

- Line pressure too low
- Low clutch worn
- One-way clutch not operating properly
- D-ring worn

4) In the same manner, measure the time lag for “N” → “R”.
Time lag: Less than 1.5 seconds
If “N” → “R” time lag is longer than specified:

- Line pressure too low
- Reverse clutch worn
- Low & reverse brake worn
- D-ring worn

7. Line Pressure Test

A: MEASUREMENT

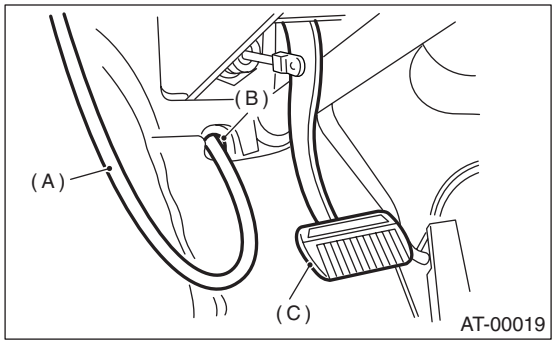
NOTE:
If the clutch or the brake shows a sign of slippage or shifting sensation is not correct, the line pressure should be checked.

• Excessive shocks during upshifting or shifting takes place at a higher point than under normal circumstances, may be due to the line pressure being too high.

• Slippage or inability to operate the vehicle may, in most cases, be due to loss of oil pressure for the operation of the clutch, brake or control valve.

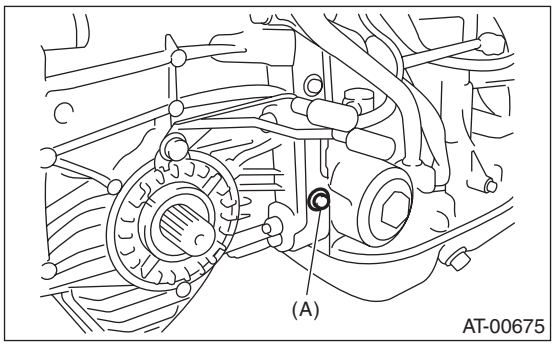
1) Line pressure measurement (under no load)
   (1) Before measuring the line pressure, jack-up all wheels.
   (2) Maintain the temperature of ATF at approx. 70 — 80°C (158 — 176°F) during measurement. (ATF will reach the above temperature after idling the engine for approx. 30 minutes with select lever in “N” or “P”.)
2) Line pressure measurement (under heavy load)
   (1) Before measuring the line pressure, apply both foot and parking brakes with all wheels chocked (Same as for “stall” test conditions).
   (2) Measure the line pressure when select lever is in “R”, “2” with engine under stall conditions.
   (3) Measure the line pressure within 5 seconds after shifting the select lever to each position. (If line pressure needs to be measured again, allow the engine to idle, and then stop it to cool down for at least one minute.)
   (4) Maintain the temperature of ATF at approx. 70 — 80°C (158 — 176°F) during measurement (ATF will reach the above temperature after idling the engine for approx. 30 minutes with the select lever in “N” or “P”.)
3) Temporarily attach the ST to a suitable place in the driver’s compartment, remove the blind plug located in front of the toe board and pass the hose of the ST to engine compartment.

ST 498575400 OIL PRESSURE GAUGE ASSY



(A) Pressure gauge hose
(B) Hole in toe board (blank cap hole)
(C) Brake pedal

4) Remove the test plug and install the ST instead.
ST 498897200 OIL PRESSURE GAUGE ADAPTER



(A) Test plug

5) Connect the ST1 with ST2.
ST1 498897200 OIL PRESSURE GAUGE ADAPTER
ST2 498575400 OIL PRESSURE GAUGE ASSY

6) Check for duty ratio changes by opening and closing the throttle valve using SUBARU Select Monitor.

Standard line pressure			
Range position	Line pressure duty ratio (%)	Throttle position	Line pressure kPa (kg/cm^2, psi)
2	5	Full open	1,128 — 1,304 (11.5 — 13.3, 164 — 189)
R	5	Full open	1,520 — 1,716 (15.5 — 17.5, 220 — 249)
D	95	Full closed	304 — 412 (3.1 — 4.2, 44 — 60)

8. Transfer Clutch Pressure Test

A: INSPECTION

• MPT MODEL

Check the transfer clutch pressure in accordance with the following chart in the same manner as with line pressure. <Ref. to 4AT-35, Line Pressure Test.>

ST 498897700 OIL PRESSURE ADAPTER SET

ST 498575400 OIL PRESSURE GAUGE ASSY

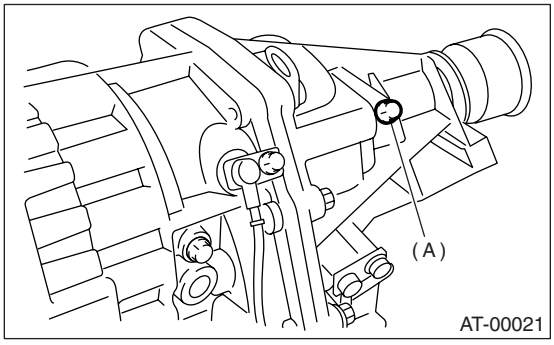
AWD mode: “D” range

FWD mode: “P” range, engine speed 2,000 rpm

If oil pressure is not produced or if it does not change in the AWD mode, the transfer duty solenoid or transfer valve assembly may be malfunctioning. If oil pressure is produced in the FWD mode, the problem is similar to that in the AWD mode.

NOTE:

Before setting in FWD mode, install the spare fuse on FWD mode switch.



(A) Test plug

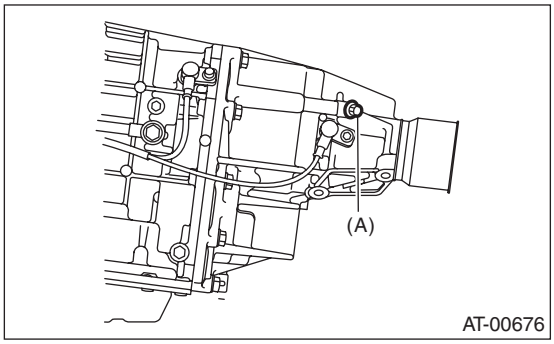
Standard transfer clutch pressure kPa (kg/cm^2, psi)			
ON Duty ratio (%)	Throttle position	AWD mode	FWD mode
5	Full open	932 — 1,089 (9.5 — 11.1, 135 — 158)	—
60	2/3 throttle	216 — 294 (2.2 — 3.0, 31 — 43)	—
95	Full closed	—	0 (0, 0)

• VTD MODEL

Check transfer clutch pressure using the following chart. <Ref. to 4AT-35, Line Pressure Test.>

ST 498897700 OIL PRESSURE ADAPTER SET

ST 498575400 OIL PRESSURE GAUGE ASSY



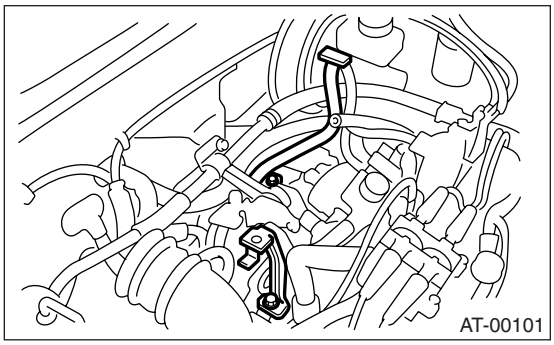
(A) Test plug

Duty ratio (%)	Throttle opening angle	Standard of transfer clutch pressure kPa (kg/cm^2, psi)
95	Fully open	932 — 1,089 (9.5 — 11.1, 135 — 158)
60	2/3 open	216 — 294 (2.2 — 3.0, 33 — 43)

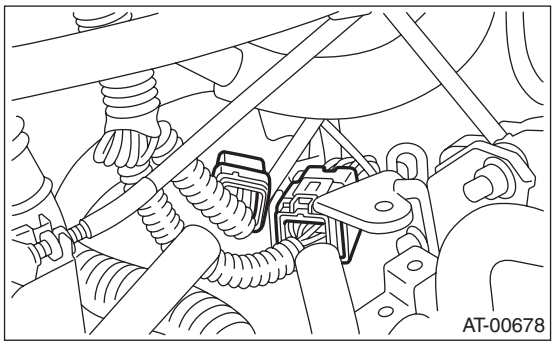
9. Automatic Transmission Assembly

A: REMOVAL

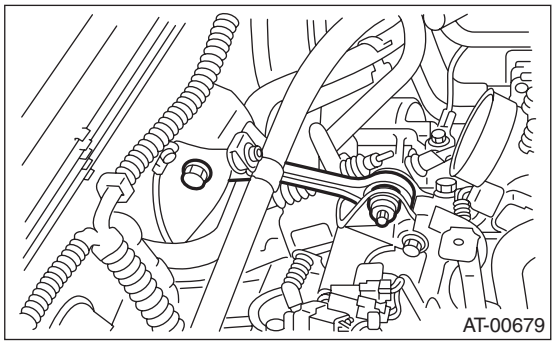
1) Set the vehicle on a lift.
2) Open the front hood fully, and support it with stay.
3) Disconnect the battery ground cable.
4) Remove the air intake duct. (Non-turbo model)
<Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
5) Remove the air cleaner case or air intake chamber. (Non-turbo model)
<Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
6) Remove the intercooler. (Turbo model)
<Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
7) Remove the air cleaner case stay. (Non-turbo model)



8) Disconnect the following connectors.
(1) Transmission harness connector

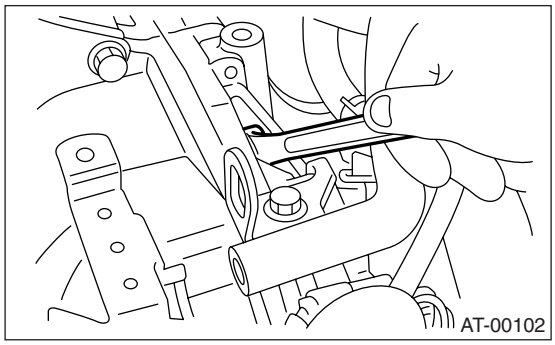


(2) Transmission ground terminal
9) Remove the starter.
<Ref. to SC(H4SO)-7, REMOVAL, Starter.>
10) Remove the pitching stopper.

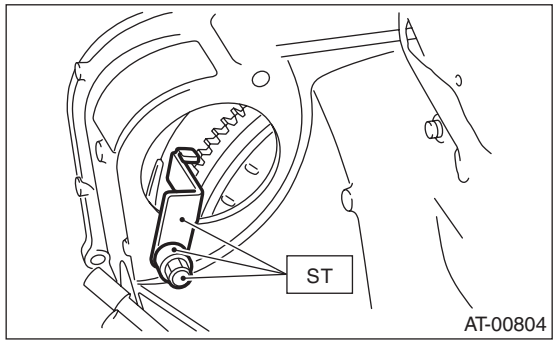


11) Separate the torque converter clutch from drive plate.
(1) Remove the service hole plug.
(2) Remove the bolts which hold torque converter clutch to drive plate.
(3) Remove the V-belt cover.
(4) Insert the wrench in the crankshaft pulley bolts, and remove all the bolts by slowly rotating the crankshaft pulley.

CAUTION:
Be careful not to drop the bolts into torque converter clutch housing.

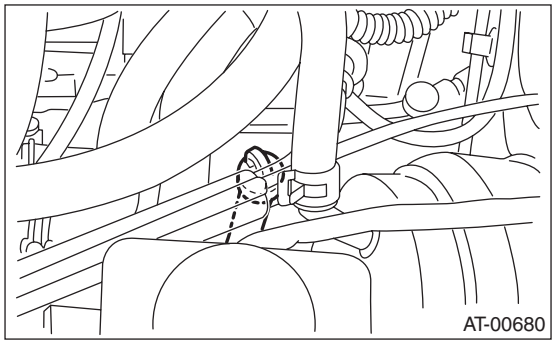


12) Install the ST to torque converter clutch case.
ST 498277200 STOPPER SET



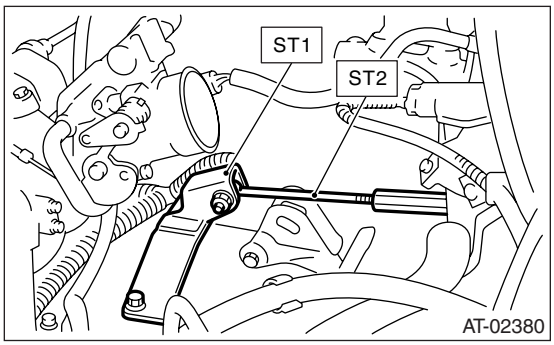
13) Remove the ATF level gauge.

NOTE:
Plug the opening to prevent an entry of foreign particles into transmission fluid.

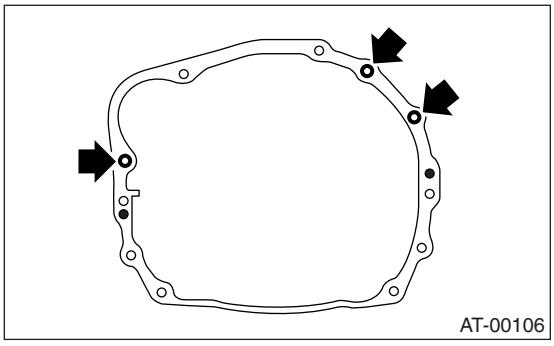


14) Set the ST.

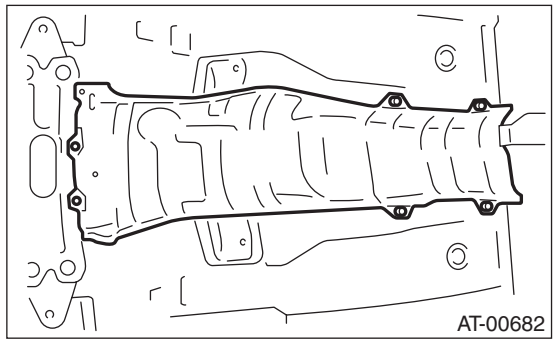
ST1 41099AA010 ENGINE SUPPORT BRACKET
ST2 41099AA020 ENGINE SUPPORT



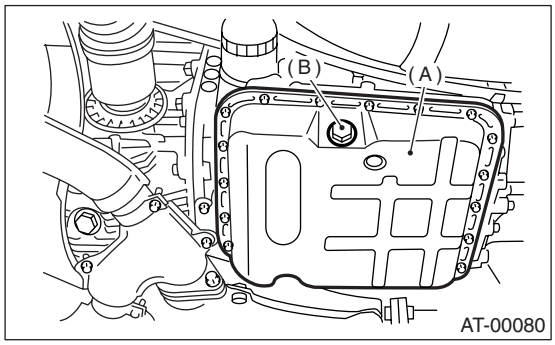
15) Remove the bolts which hold the right upper side of transmission to engine.



16) Lift-up the vehicle.
17) Remove the under cover.
18) Remove the front, center and rear exhaust pipe, and muffler. (Non-turbo model)
<Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, REMOVAL, Muffler.>
19) Remove the center and rear exhaust pipes, and muffler. (Turbo model)
<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
20) Remove the heat shield cover. (If equipped)

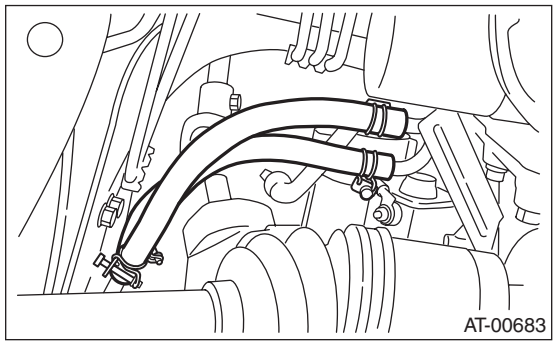


21) Drain ATF to remove the ATF drain plug.



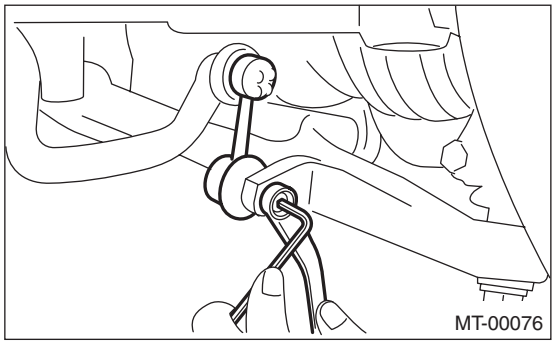
(A) Oil pan
(B) Drain plug

22) Disconnect the ATF cooler hoses from pipes of transmission side, and remove the ATF level gauge guide.

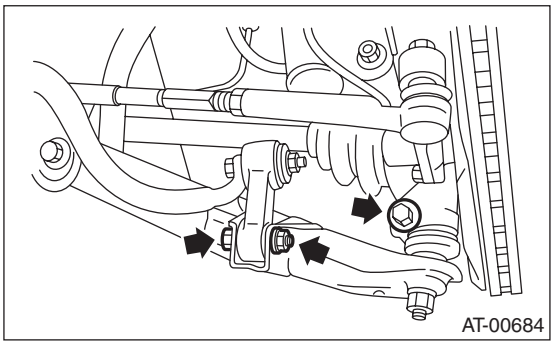


23) Remove the propeller shaft.
<Ref. to DS-14, REMOVAL, Propeller Shaft.>
24) Remove the shift select cable. <Ref. to CS-25, REMOVAL, Select Cable.>
25) Disconnect the stabilizer link from transverse link.
26) Remove the bolt securing ball joint of transverse link to housing.

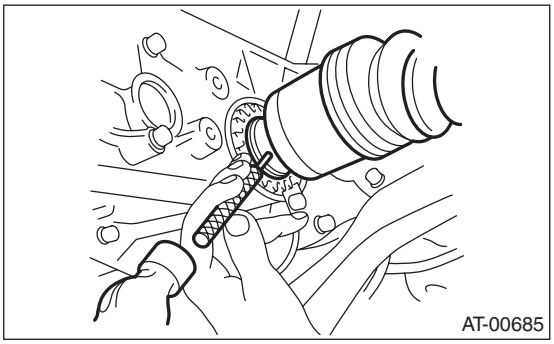
- SEDAN MODEL



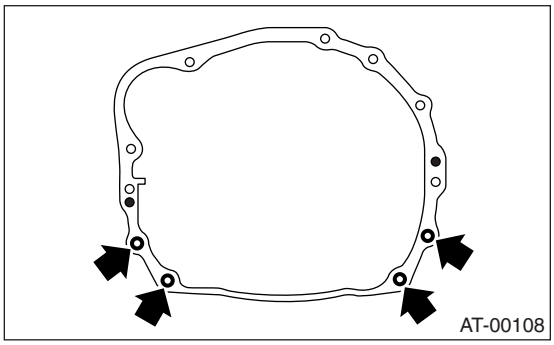
- WAGON MODEL



27) Remove the spring pins and separate the front drive shafts from each side of transmission.



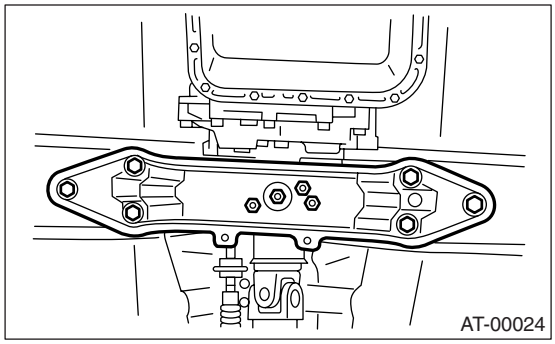
28) Remove the nuts which hold the lower side of transmission to engine.



29) Place the transmission jack under transmission.

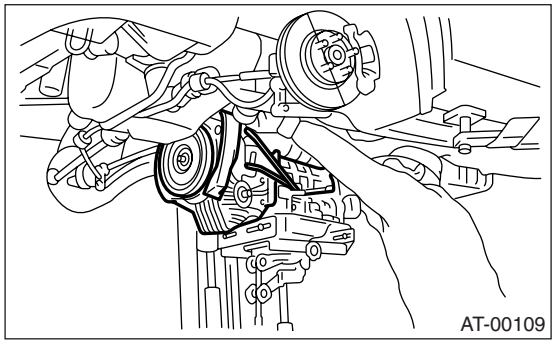
NOTE:
Make sure that the support plates of transmission jack don't touch the oil pan.

30) Remove the transmission rear crossmember from vehicle.



31) Remove the transmission.

CAUTION:
Move the transmission and torque converter as a unit away from engine.



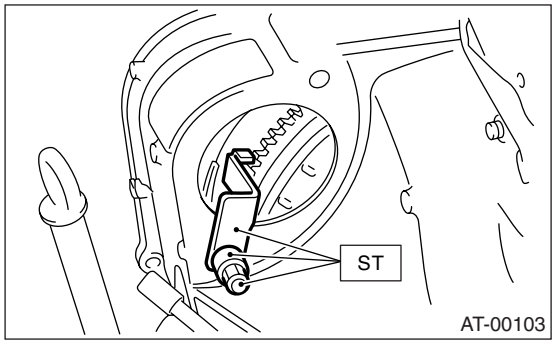
32) Separate the transmission assembly and rear cushion rubber.

B: INSTALLATION

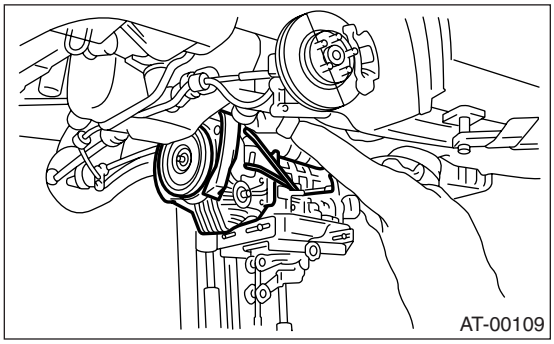
1) Install the rear cushion rubber to transmission assembly.

Tightening torque:
39 N·m (4.0 kgf-m, 29 ft-lb)

2) Install the ST to torque converter clutch case.
ST 498277200 STOPPER SET

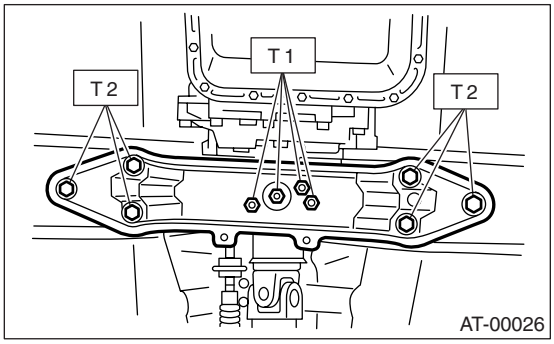


3) Install the transmission onto engine.
(1) Gradually raise the transmission with transmission jack.



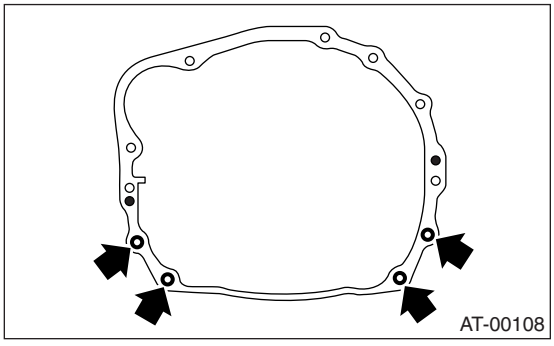
(2) Engage them at splines.
4) Install the transmission rear crossmember.

Tightening torque:
T1: 35 N·m (3.6 kgf-m, 26 ft-lb)
T2: 70 N·m (7.1 kgf-m, 51 ft-lb)



5) Take off the transmission jack.
6) Tighten the nuts and bolts which hold the lower side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

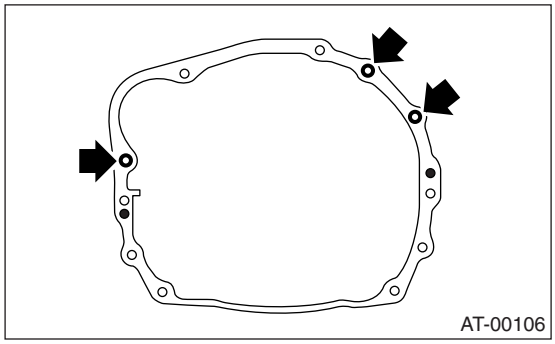


7) Lower the vehicle.
8) Connect the engine and transmission.
(1) Remove the ST from torque converter clutch case.

NOTE:
Be careful not to drop the ST into torque converter clutch case when removing ST.
ST 498277200 STOPPER SET

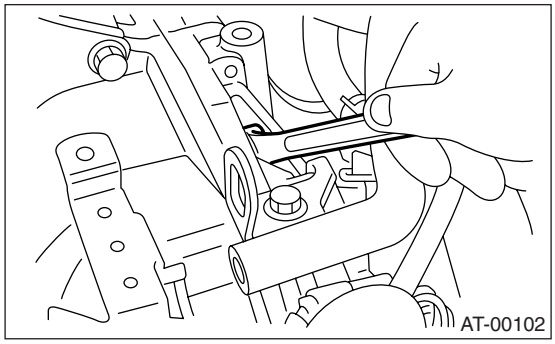
(2) Install the starter.
<Ref. to SC(H4SO)-7, INSTALLATION, Starter.>
(3) Tighten the bolts which hold the right upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

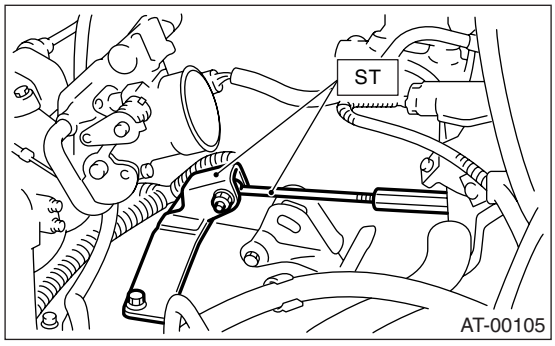


9) Install the torque converter clutch to drive plate.
(1) Tighten the bolts which hold the torque converter clutch to drive plate.
(2) Insert the wrench in the crankshaft pulley bolts, and tighten all the bolts by slowly rotating the crankshaft pulley.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

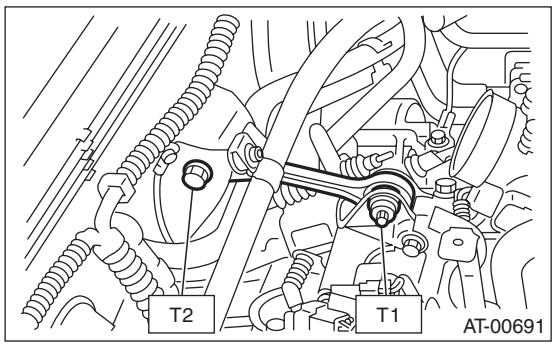


(3) Clog the plug onto service hole.
(4) Install the V-belt cover.
10) Remove the ST.

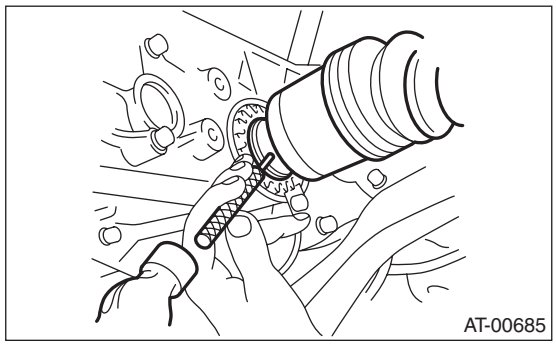


11) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



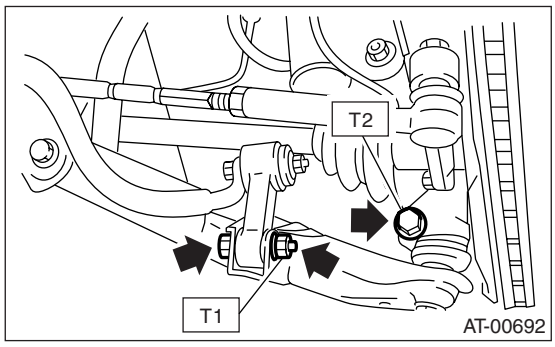
12) Lift-up the vehicle.
13) Install the front drive shaft into transmission.
(1) Lift-up the vehicle.
(2) Install the front drive shaft into transmission.
(3) Drive a new spring pin into chamfered hole of drive shaft.



14) Install the ball joint into housing.
15) Connect the stabilizer link to transverse link, and tighten the bolts. (Wagon model)

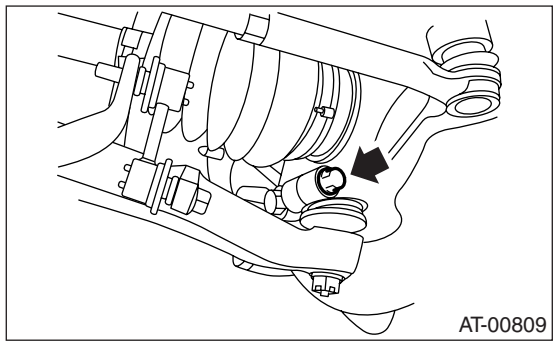
NOTE:
Discard the loosened self-locking nut and replace with a new one.

Tightening torque:
T1: 30 N·m (3.1 kgf-m, 22.4 ft-lb)
T2: 50 N·m (5.1 kgf-m, 37 ft-lb)



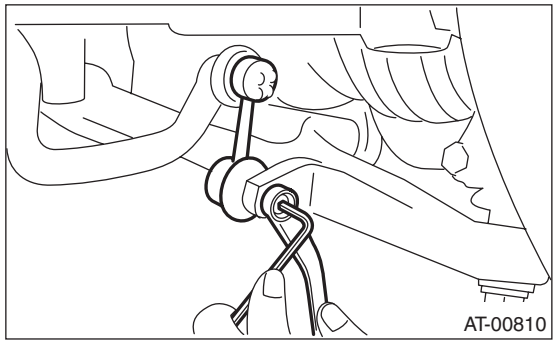
16) Tighten the installing bolts. (Wagon model)

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

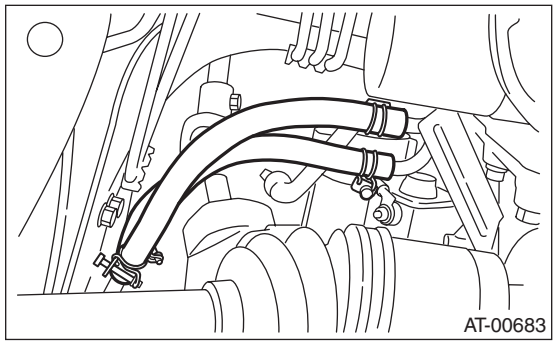


17) Install the stabilizer link to transverse link. (Sedan model)

Tightening torque:
45 N·m (4.6 kgf-m, 33.2 ft-lb)

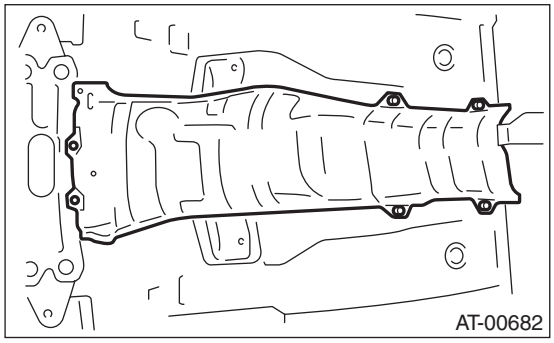


18) Install the shift select cable onto select lever.
<Ref. to CS-25, INSTALLATION, Select Cable.>
19) Install the ATF level gauge guide, and connect the ATF cooler hoses to pipe.

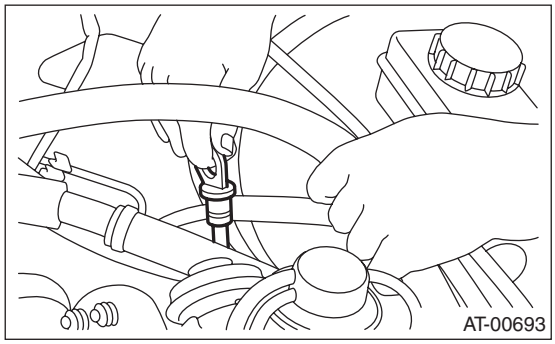


20) Install the propeller shaft.
<Ref. to DS-15, INSTALLATION, Propeller Shaft.>

21) Install the heat shield cover. (If equipped)



22) Install the rear exhaust pipe and muffler assembly.
Non-turbo model
<Ref. to EX(H4SO)-8, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, INSTALLATION, Muffler.>
Turbo model
<Ref. to EX(H4DOTC)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-14, INSTALLATION, Muffler.>
23) Install the front and center exhaust pipe. (Non-turbo model)
<Ref. to EX(H4SO)-5, INSTALLATION, Front Exhaust Pipe.>
24) Install the center exhaust pipe. (Turbo model)
<Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>
25) Install the under cover.
26) Lower the vehicle.
27) Install the ATF level gauge.



28) Connect the following connectors.
(1) Transmission harness connectors
(2) Transmission ground terminal
29) Connect the cruise control cable.
30) Install the air cleaner case stay.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)

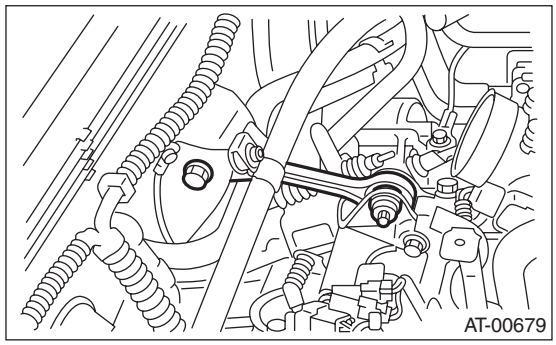
31) Install the air cleaner case or air intake chamber. (Non-turbo model)
<Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>
32) Install the air intake duct. (Non-turbo model)
<Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Duct.>
33) Install the intercooler. (Turbo model)
<Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>
34) Connect the battery ground cable.
35) Fill ATF up to the middle of the “COLD” side on level gauge by using the gauge hole. <Ref. to 4AT-30, Automatic Transmission Fluid.>
36) Take off the vehicle from lift arms.
37) Check select lever operation.
<Ref. to 4AT-46, INSPECTION, Inhibitor Switch.>
38) Check the ATF level. <Ref. to 4AT-30, Automatic Transmission Fluid.>
39) Check the road test.
<Ref. to 4AT-32, Road Test.>

10. Transmission Mounting System

A: REMOVAL

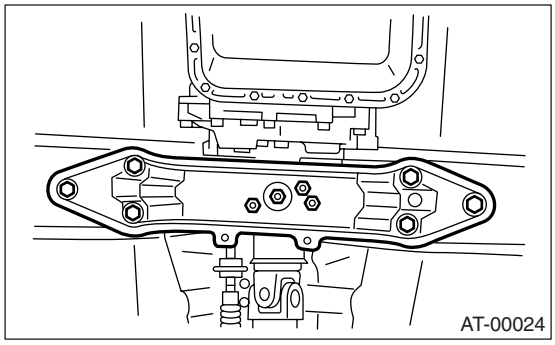
1. PITCHING STOPPER

1) Disconnect the ground cable from battery.
2) Remove the air cleaner case. (Non-turbo model) <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
3) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
4) Remove the pitching stopper.



2. TRANSMISSION REAR CROSSMEMBER AND REAR CUSHION RUBBER

1) Disconnect the ground cable from battery.
2) Jack-up the vehicle and support it with sturdy racks.
3) Remove the front, center, rear exhaust pipes and muffler. (Non-turbo model) <Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, REMOVAL, Muffler.>
4) Remove the center and rear exhaust pipes, and muffler. (Turbo model) <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
5) Remove the heat shield cover. (If equipped)
6) Set the transmission jack under the transmission. Make sure that the support plates of transmission jack don't touch the oil pan.
7) Remove the transmission rear crossmember.



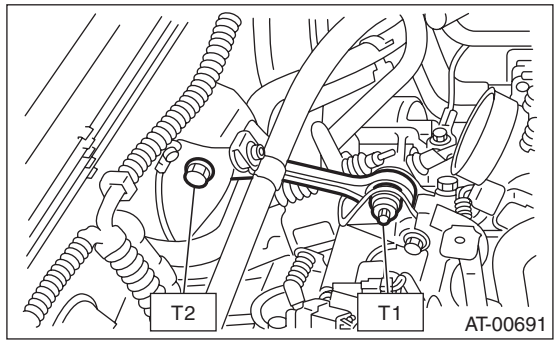
8) Remove the rear cushion rubber.

B: INSTALLATION

1. PITCHING STOPPER

1) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



2) Install the air cleaner case. (Non-turbo model) <Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>
3) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>

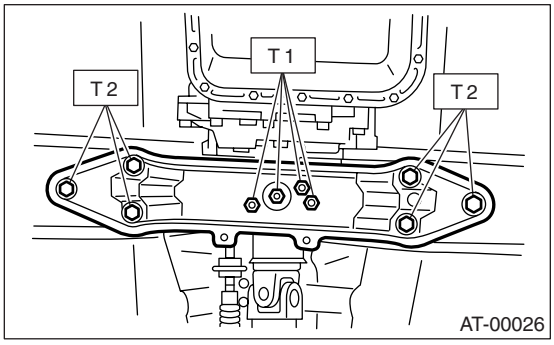
2. TRANSMISSION REAR CROSSMEMBER AND REAR CUSHION RUBBER

1) Install the rear cushion rubber.

Tightening torque:
39 N·m (4.0 kgf-m, 29 ft-lb)

2) Install the crossmember.

Tightening torque:
T1: 35 N·m (3.6 kgf-m, 26 ft-lb)
T2: 70 N·m (7.1 kgf-m, 51 ft-lb)



3) Remove the transmission jack.
4) Install the heat shield cover. (If equipped)
5) Install the front, center, rear exhaust pipes and the muffler. (Non-turbo model)
<Ref. to EX(H4SO)-5, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-8, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, INSTALLATION, Muffler.>
6) Install center and rear exhaust pipes, and muffler. (Turbo model)
<Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>, <Ref. to EX(H4DOTC)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-14, INSTALLATION, Muffler.>

C: INSPECTION

Repair or replace parts if the results of the inspection below are not satisfactory.

1. PITCHING STOPPER

Make sure that the pitching stopper is not bent or damaged. Make sure that the rubber is not stiff, cracked, or otherwise damaged.

2. TRANSMISSION REAR CROSSMEMBER AND REAR CUSHION RUBBER

Make sure that the crossmember is not bent or damaged. Make sure that the cushion rubber is not stiff, cracked, or otherwise damaged.

11.Extension Case Oil Seal

A: INSPECTION

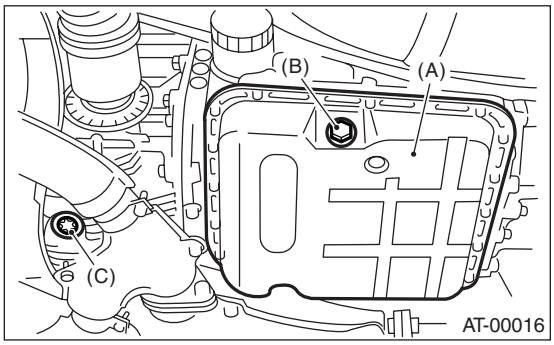
Make sure the ATF does not leak from the joint of transmission and propeller shaft. If so, replace the oil seal. <Ref. to 4AT-45, REPLACEMENT, Extension Case Oil Seal.>

B: REPLACEMENT

1) Clean the transmission exterior.
2) Drain the ATF completely.

NOTE:
Tighten the ATF drain plug after draining the ATF.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Oil pan
(B) Drain plug
(C) Differential oil drain plug

3) Remove the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
4) Remove the heat shield cover. (If equipped)
5) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
6) Using the ST, remove the oil seal.
ST 398527700 PULLER ASSY
7) Using the ST, install the oil seal.
ST 498057300 INSTALLER
8) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>
9) Install the heat shield cover. (If equipped)
10) Install the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(H4SO)-8, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, INSTALLATION, Muffler.>
Turbo model
<Ref. to EX(H4DOTC)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-14, INSTALLATION, Muffler.>
11) Pour ATF and check the ATF level. <Ref. to 4AT-30, Automatic Transmission Fluid.>

12.Inhibitor Switch

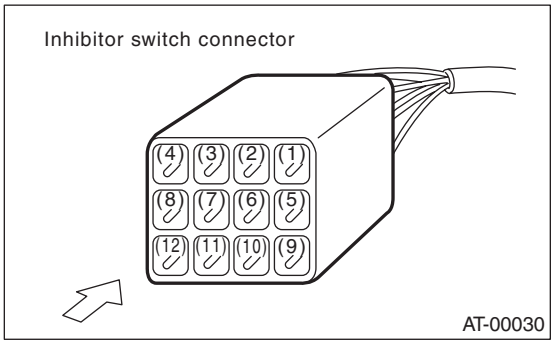
A: INSPECTION

When the driving condition or starter motor operation is erroneous, first check the shift linkage for improper operation. If the shift linkage is functioning properly, check the inhibitor switch.

1) Disconnect the inhibitor switch connector.
2) Check continuity in inhibitor switch circuits with the select lever moved to each position.

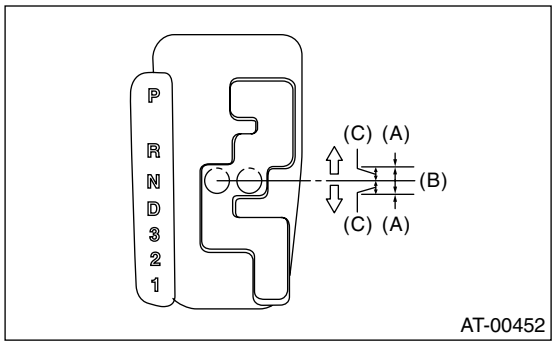
NOTE:
• Also check that continuity in ignition circuit does not exist when the select lever is in “R”, “D”, “3”, “2” and “1” ranges.
• If the inhibitor switch is inoperative, check for poor contact of connector on transmission side.

	Position	Pin No.
Signal sent to TCM	P	4 — 3
	R	4 — 2
	N	4 — 1
	D	4 — 8
	3	4 — 7
	2	4 — 6
	1	4 — 5
Ignition circuit	P/N	12 — 11
Back-up light circuit	R	10 — 9



3) Check if there is continuity at equal points when the select lever is turned 1.5° in both directions from “N” range.

If there is continuity in one direction and the continuity in the other or if there is continuity at unequal points, adjust the inhibitor switch. <Ref. to 4AT-46, ADJUSTMENT, Inhibitor Switch.>

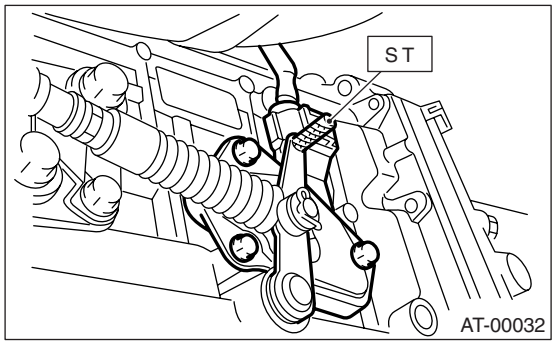


(A) Continuity does not exist.
(B) Continuity exists.
(C) 1.5°

4) Repeat the above checks. If there are abnormalities, adjust the select cable. <Ref. to CS-26, ADJUSTMENT, Select Cable.>

B: ADJUSTMENT

1) Shift the select lever to “N” range.
2) Loosen the three inhibitor switch securing bolts.
3) Insert the ST as vertical as possible into the holes in inhibitor switch lever and switch body.
ST 499267300 STOPPER PIN



4) Tighten the three inhibitor switch bolts.

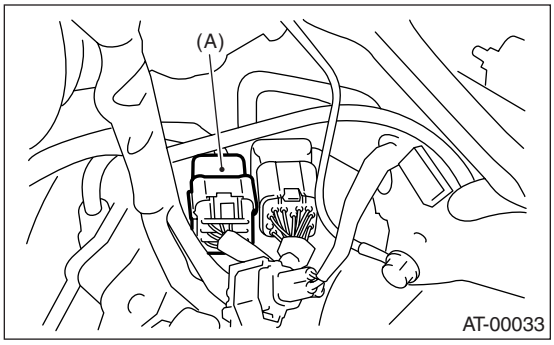
Tightening torque:
3.5 N·m (0.35 kgf-m, 2.5 ft-lb)

5) Repeat the above checks. If the inhibitor switch is determined to be “faulty”, replace it.

C: REMOVAL

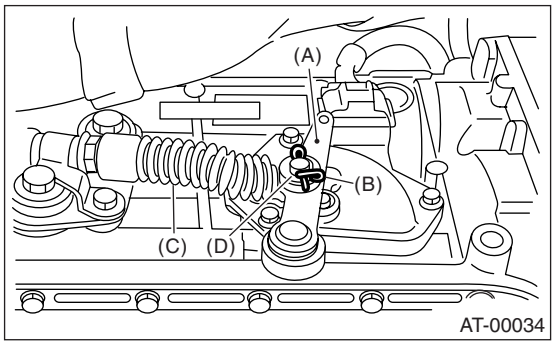
1) Set up the vehicle on a lift.
2) Move the select lever to “N” range.
3) Remove the air cleaner case. (Non-turbo model)
<Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
4) Remove the intercooler. (Turbo model)
<Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>

5) Disconnect the inhibitor switch connector.



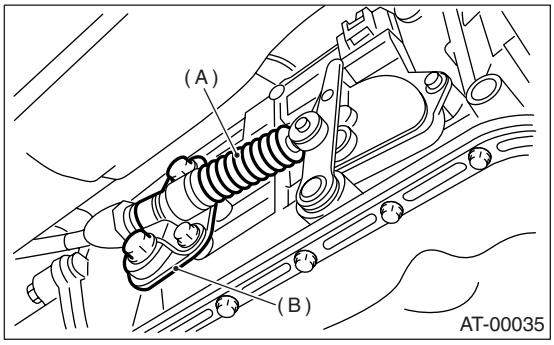
(A) Inhibitor switch connector

6) Remove the inhibitor switch connector from stay.
7) Lift-up the vehicle.
8) Remove the front and center exhaust pipes.
<Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>
9) Remove the snap pin and washer from range select lever.



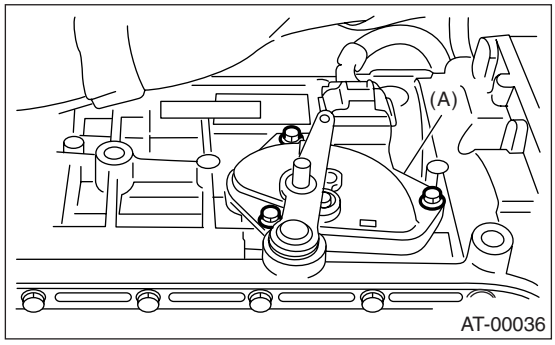
(A) Range select lever
(B) Snap pin
(C) Select cable
(D) Washer

10) Remove the plate assembly from transmission case.



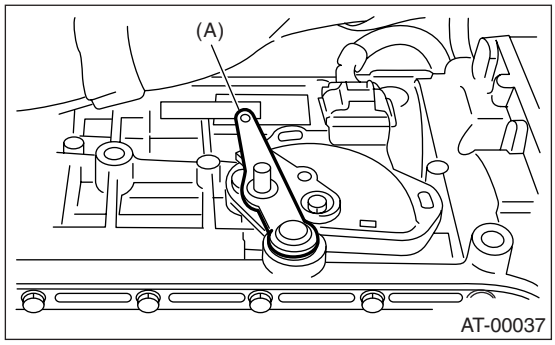
(A) Select cable
(B) Plate ASSY

11) Remove the bolts.



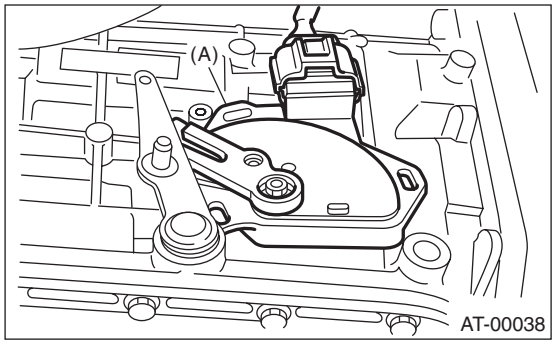
(A) Inhibitor switch

12) Move the range select lever to parking position (left side).



(A) Range select lever

13) Remove the inhibitor switch from transmission.



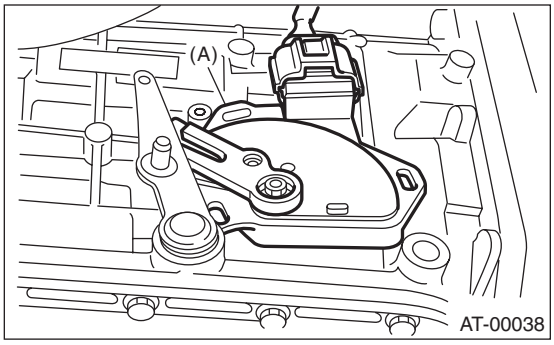
(A) Inhibitor switch

14) Disconnect the inhibitor switch harness connector from inhibitor switch.

D: INSTALLATION

1) Connect the inhibitor switch harness connector to inhibitor switch.

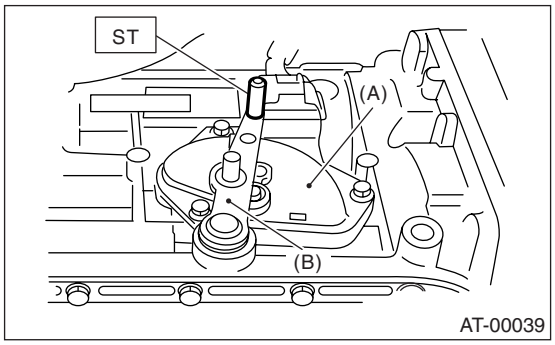
2) Install the inhibitor switch to transmission case.



(A) Inhibitor switch

3) Move the range select lever to neutral position.
4) Using the ST, tighten the bolts of inhibitor switch.
ST 499267300 STOPPER PIN

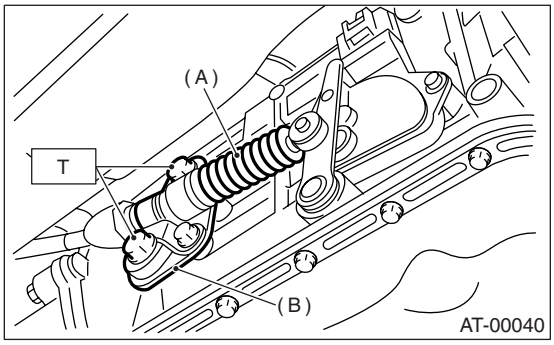
Tightening torque:
3.5 N·m (0.36 kgf-m, 2.6 ft-lb)



(A) Inhibitor switch
(B) Range select lever

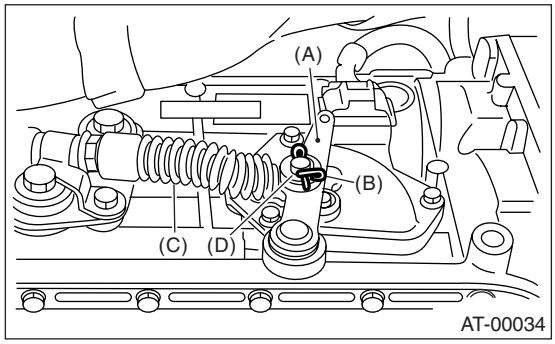
5) Install the select cable to range select lever.
6) Install the plate assembly to transmission.

Tightening torque:
T: 25 N·m (2.5 kgf-m, 18.1 ft-lb)



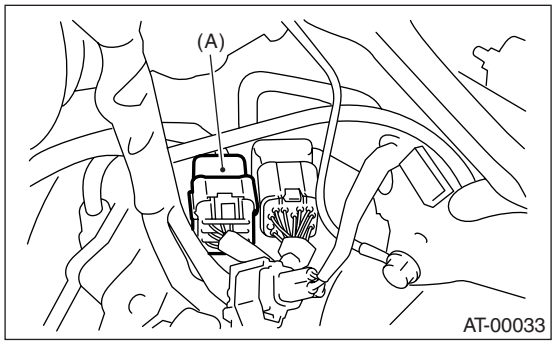
(A) Select cable
(B) Plate ASSY

7) Install the washer and snap pin to range select lever.



(A) Range select lever
(B) Snap pin
(C) Select cable
(D) Washer

8) Install the front and center exhaust pipes. (Non-turbo model)
<Ref. to EX(H4SO)-5, INSTALLATION, Front Exhaust Pipe.>
9) Install the center exhaust pipe. (Turbo model)
<Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>
10) Lower the vehicle.
11) Install the inhibitor switch connector from stay.
12) Connect the inhibitor switch connector.



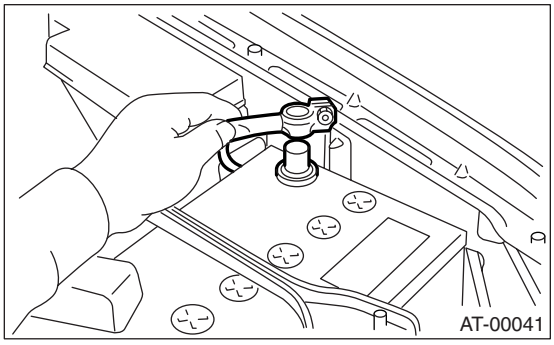
(A) Inhibitor switch connector

13) Install the air cleaner case. (Non-turbo model)
<Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>
14) Install the intercooler. (Turbo model)
<Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>
15) Inspect the inhibitor switch. <Ref. to 4AT-46, INSPECTION, Inhibitor Switch.>

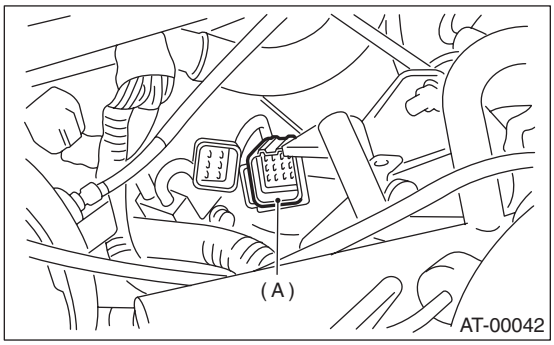
13.Front Vehicle Speed Sensor

A: REMOVAL

1) Set up the vehicle on a lift.
2) Disconnect the ground cable from battery.



3) Remove the air cleaner case. (Non-turbo model) <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
4) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
5) Disconnect the transmission connector.

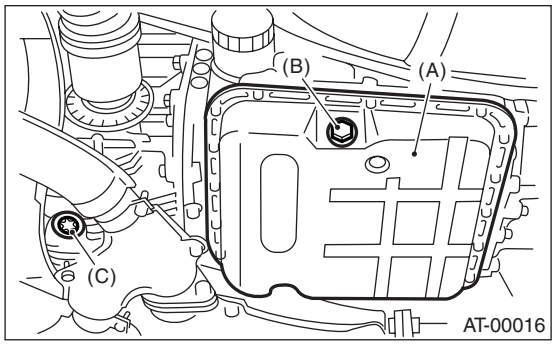


(A) Transmission connector

6) Remove the pitching stopper. <Ref. to 4AT-43, REMOVAL, Transmission Mounting System.>
7) Remove the transmission connector from stay.
8) Lift-up the vehicle.
9) Clean the transmission exterior.
10) Drain the ATF completely.

NOTE:
Tighten the ATF drain plug after draining the ATF.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

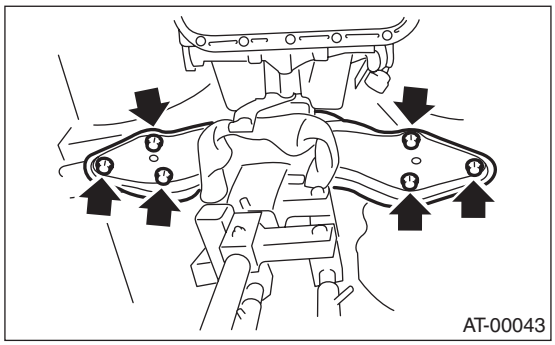


(A) Oil pan
(B) Drain plug
(C) Differential oil drain plug

11) Remove the front, center, exhaust pipes and muffler. (Non-turbo model)
<Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, REMOVAL, Muffler.>
12) Remove the center, rear exhaust pipe and muffler. (Turbo model)
<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
13) Remove the shield cover. (If equipped)
14) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
15) Place the transmission jack under transmission.

NOTE:
Make sure that the support plates of transmission jack don't touch the crossmember.

16) Remove the transmission rear crossmember bolts.



17) Lower the AT jack.

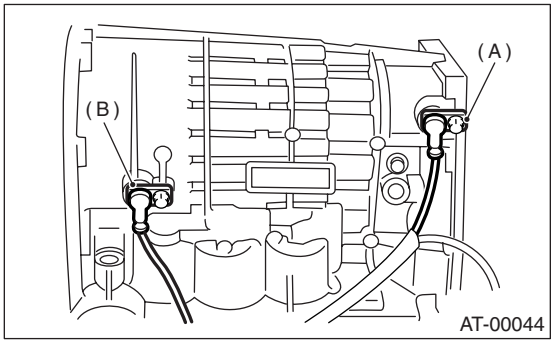
NOTE:
Do not separate the AT jack and transmission.

18) Remove the oil cooler inlet and outlet pipe.

NOTE:
When removing the outlet pipe, be careful not to lose balls and springs used with retaining screws.

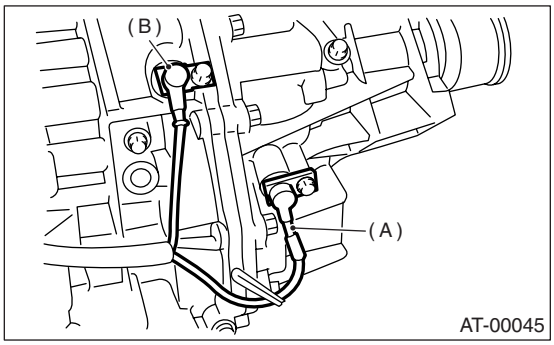
19) Remove the front and rear vehicle speed sensor and torque converter turbine speed sensor.

• Front vehicle speed sensor and torque converter turbine speed sensor



(A) Front vehicle speed sensor
(B) Torque converter turbine speed sensor

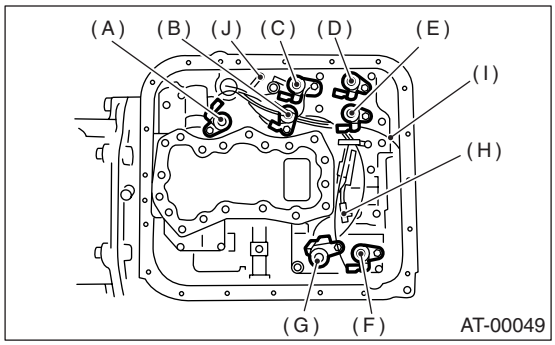
• Rear vehicle speed sensor



(A) Rear vehicle speed sensor
(B) Front vehicle speed sensor

20) Remove the oil pan.

21) Disconnect the duty solenoid connectors, and then disconnect the ATF temperature sensor from control valve body.

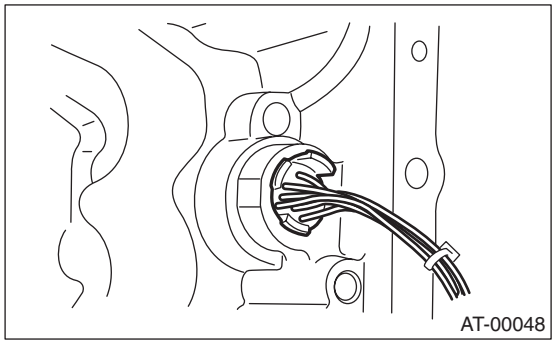


(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor
(I) Transfer duty solenoid (Brown)
(J) Transmission ground

22) Remove the harness assembly.

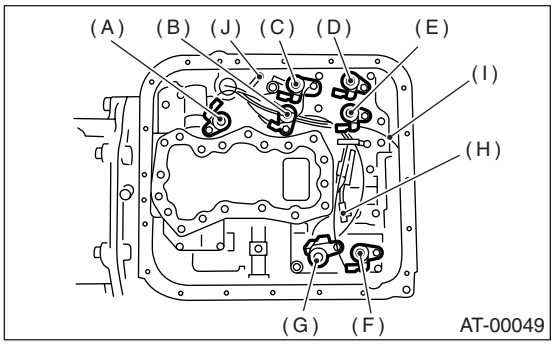
B: INSTALLATION

1) Pass the harness assembly through the hole in the transmission case.



2) Connect the harness connectors and ATF temperature sensor.
Connect the connectors of same color, and secure the harness to valve body using clips.

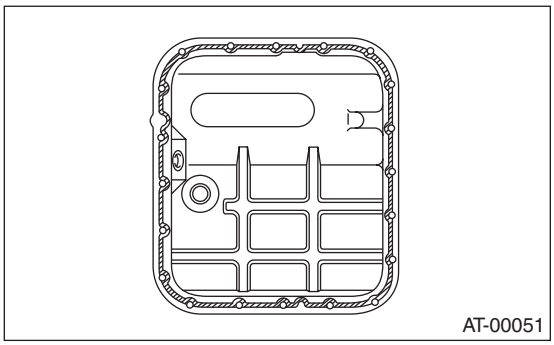
Tightening torque (Transmission ground cable ATF temperature sensor)
8 N·m (0.8 kgf-m, 5.8 ft-lb)



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor
(I) Transfer duty solenoid (Brown)
(J) Transmission ground

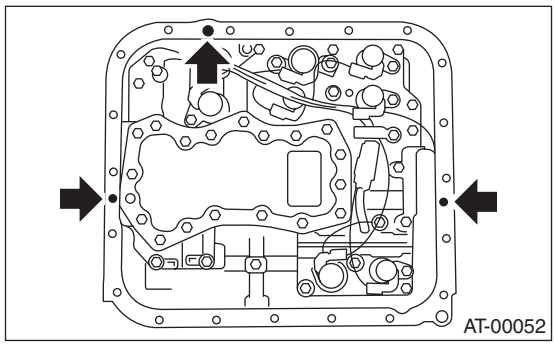
3) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Fluid packing:
THREE BOND 1217B (Part No. K0877YA020)



4) Apply liquid gasket fully to three holes other than screw holes on transmission case.

Fluid packing:
THREE BOND 1217B (Part No. K0877YA020)



5) Install the oil pan.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

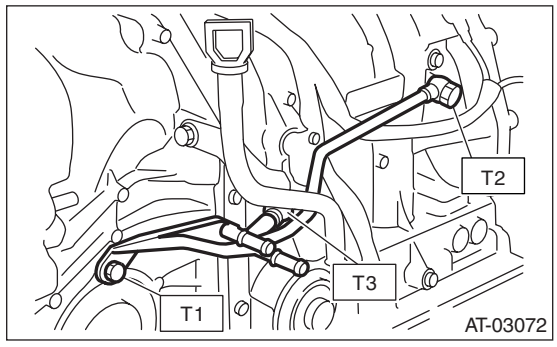
6) Install the front and rear vehicle speed sensor, and also the torque converter turbine speed sensor, and then fasten the harness.

Tightening torque:
7 N·m (0.7 kgf-m, 5.1 ft-lb)

7) Install the oil cooler pipes.

NOTE:
Be sure to use a new copper washer.

Tightening torque:
T1: 25 N·m (2.5 kgf-m, 18.1 ft-lb)
T2: 40 N·m (4.1 kgf-m, 30 ft-lb)
T3: 44 N·m (4.5 kgf-m, 32.5 ft-lb)



8) Install the transmission rear crossmember bolts.

Tightening torque:
70 N·m (7.1 kgf-m, 51 ft-lb)

9) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>
10) Install the shield cover. (If equipped)
11) Install the front, center, rear exhaust pipes and muffler. (Non-turbo model)
<Ref. to EX(H4SO)-5, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-8, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, INSTALLATION, Muffler.>

12) Install the center, rear exhaust pipes and muffler. (Turbo model)
<Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>, <Ref. to EX(H4DOTC)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-14, INSTALLATION, Muffler.>
13) Lower the vehicle.
14) Install the transmission connector to the stay.
15) Install the pitching stopper. <Ref. to 4AT-43, INSTALLATION, Transmission Mounting System.>
16) Install the air cleaner case. (Non-turbo model)
<Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>
17) Install the intercooler. (Turbo model)
<Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>

14.Rear Vehicle Speed Sensor

A: REMOVAL

When removing the rear vehicle speed sensor, refer to “Front Vehicle Speed Sensor.” <Ref. to 4AT-49, REMOVAL, Front Vehicle Speed Sensor.>

B: INSTALLATION

When installing the rear vehicle speed sensor, refer to “Front Vehicle Speed Sensor.” <Ref. to 4AT-50, INSTALLATION, Front Vehicle Speed Sensor.>

15. Torque Converter Turbine Speed Sensor

A: REMOVAL

When removing the torque converter turbine speed sensor, refer to “Front Vehicle Speed Sensor.” <Ref. to 4AT-49, REMOVAL, Front Vehicle Speed Sensor.>

B: INSTALLATION

When installing the torque converter turbine speed sensor, refer to “Front Vehicle Speed Sensor.” <Ref. to 4AT-50, INSTALLATION, Front Vehicle Speed Sensor.>

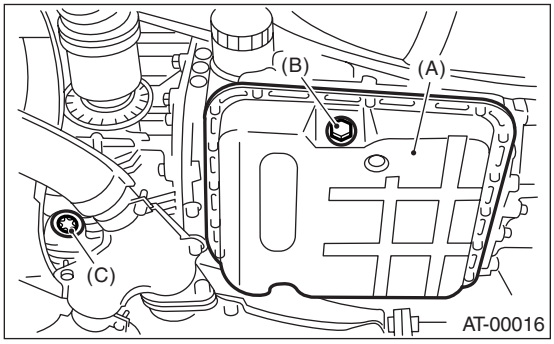
16.Control Valve Body

A: REMOVAL

1) Lift-up the vehicle.
2) Clean the transmission exterior.
3) Drain the ATF completely.

NOTE:
• Tighten the ATF drain plug after draining the ATF.
• Replace the gasket with a new one.

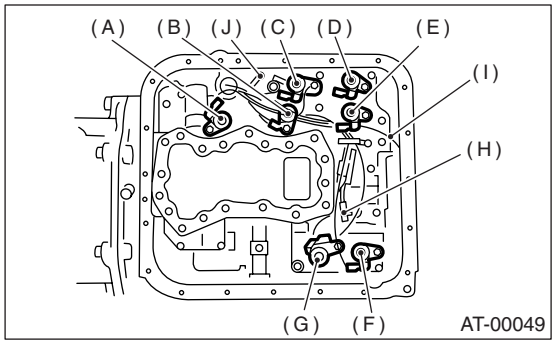
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Oil pan
(B) Drain plug
(C) Differential oil drain plug

4) Remove the oil pan.
5) Remove and clean the magnet.
6) Remove the old gasket on the oil pan and transmission case completely.

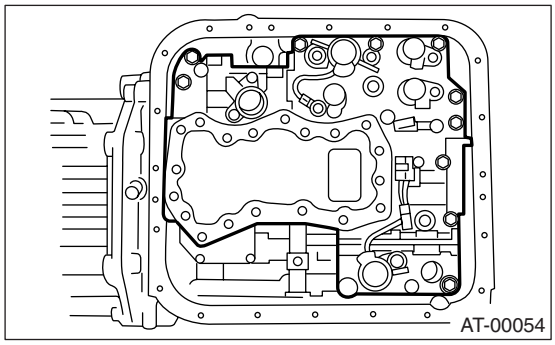
7) Disconnect each solenoid connector and remove ATF temperature sensor from control valve.



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor
(I) Transfer duty solenoid (Brown)
(J) Transmission ground

8) Remove the control valve.

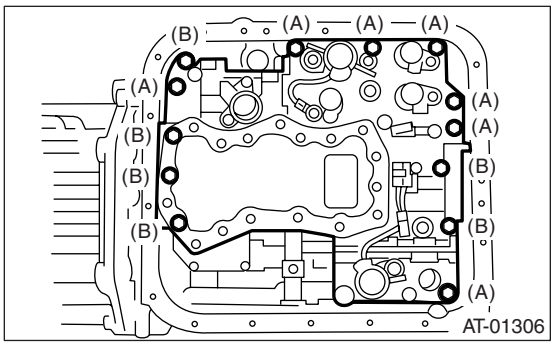
NOTE:
When removing the control valve body, be careful not to interfere with transfer duty solenoid wiring.



B: INSTALLATION

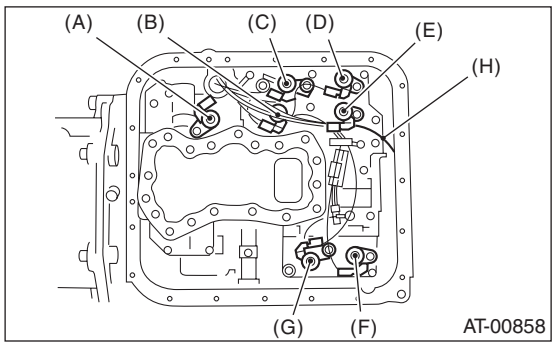
1) Set the range select lever in “N” range.
2) Install the control valve, ATF temperature sensor and ground connectors.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



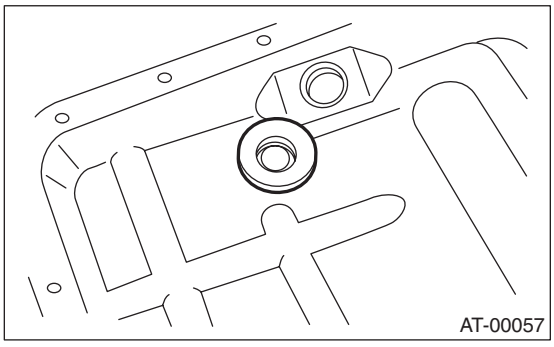
Bolt length mm (in)
(A) 30 (1.18)
(B) 55 (2.17)

3) Connect all connectors.



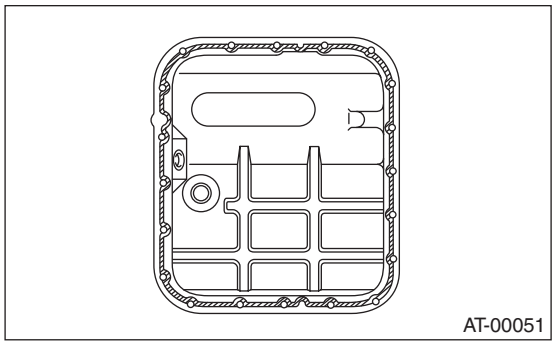
(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) Transfer duty solenoid (Brown)

4) Attach the magnet at specified position.



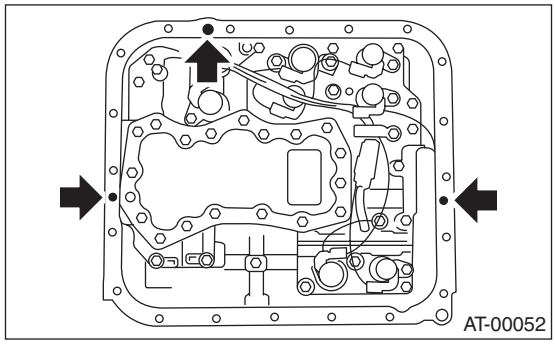
5) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Liquid gasket:
THREE BOND 1217B (Part No. K0877YA020)



6) Apply liquid gasket fully to three holes other than screw holes on transmission case.

Liquid gasket:
THREE BOND 1217B (Part No. K0877YA020)



7) Install the oil pan by equally tightening the bolts.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

8) Pour ATF from the oil charge pipe.

Recommended fluid:
Dexron III

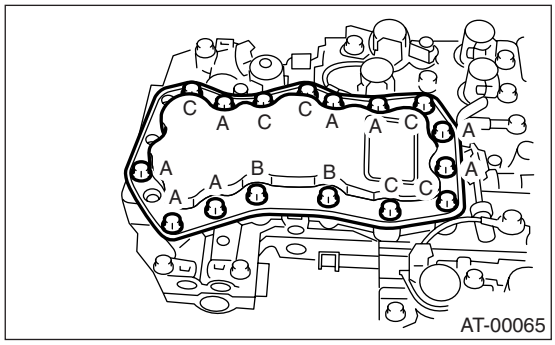
Fluid capacity:
Fill the same amount of fluid drained from drain plug hole.

9) Check the level of ATF.
<Ref. to 4AT-30, Automatic Transmission Fluid.>

C: DISASSEMBLY

1) Remove oil strainer from lower control valve body.

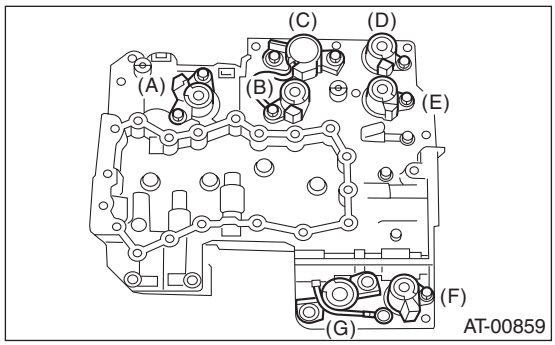
NOTE:
Arrange the removed bolts in good order to assemble in the same place as disassembly, because the bolt lengths are different.



(A) Short bolt
(B) Middle bolt
(C) Long bolt

2) Remove the duty solenoids, solenoids and sensor from the lower valve body.

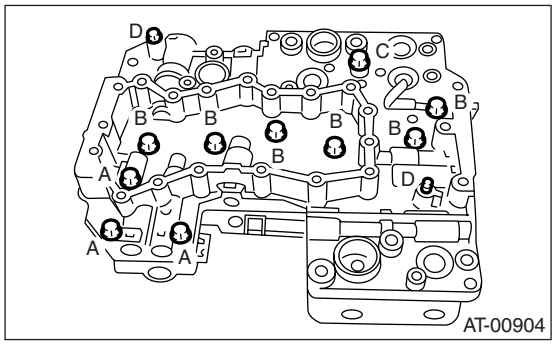
NOTE:
Arrange the removed bolts in good order to assemble in the same place as disassembly, because the bolt lengths are different.



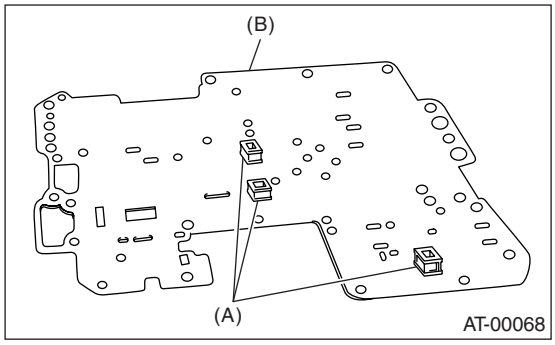
(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 1 (Yellow)
(E) Shift solenoid 2 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)

3) Remove the upper-lower valve body tightening bolts.

NOTE:
Arrange the removed bolts in good order to assemble in the same place as disassembly, because the bolt lengths are different.

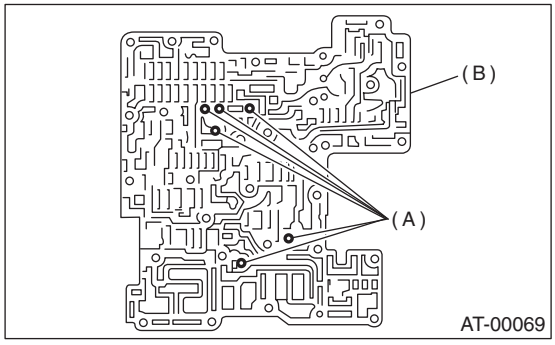


4) Remove the lower valve body.
5) Remove the oil filter and plate.



(A) Oil filter
(B) Plate

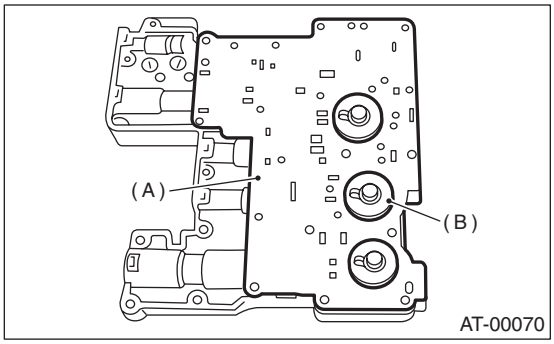
6) Remove six steel balls from middle valve body.



(A) Steel ball
(B) Middle valve body

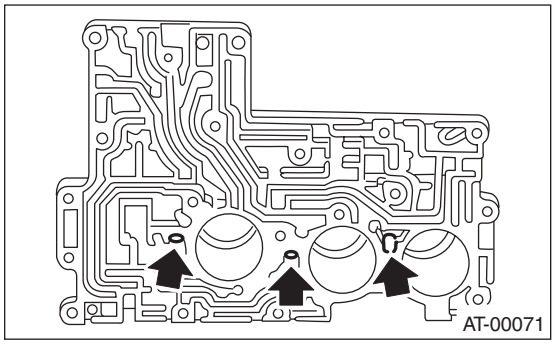
7) Remove the middle valve body.

8) Remove upper separator plate from middle valve body.

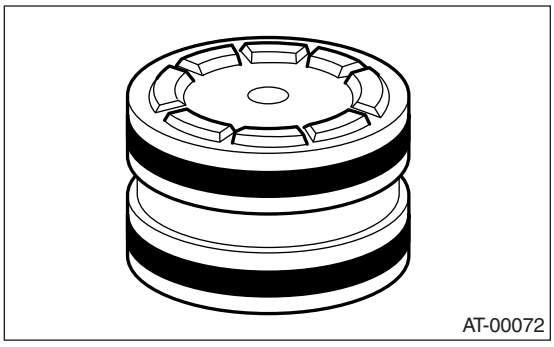


(A) Upper separator plate
(B) Side plate

9) Remove valve springs and four steel balls from upper valve body.
10) Place a shop cloth to the piston removal hole.
11) Using an air compressor, apply air slowly to each piston hole and remove the pistons.

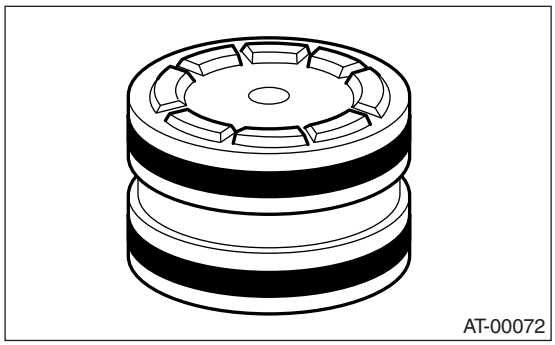


12) Remove the seal ring from piston.

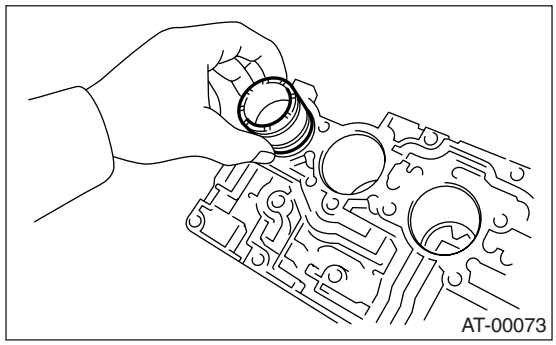


D: ASSEMBLY

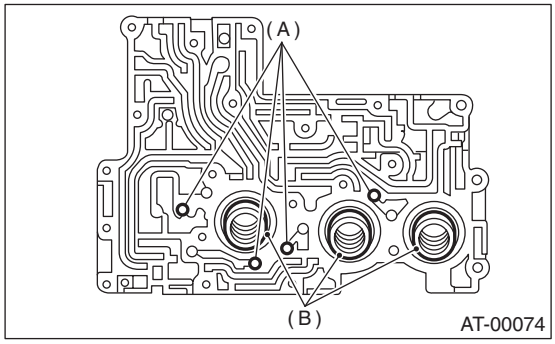
1) Install a new seal ring to piston.



2) Apply ATF to the seal ring.
3) Insert the piston fully into upper valve body.



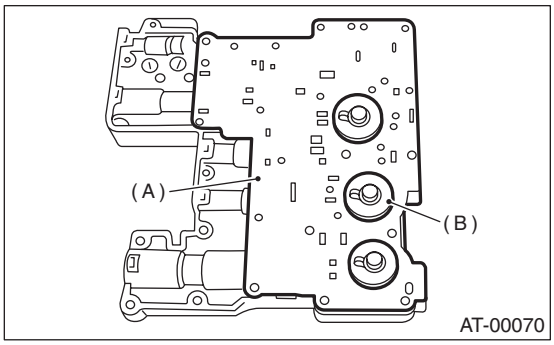
4) Install the spring and four steel balls to specified positions of upper valve body.



(A) Steel ball
(B) Spring

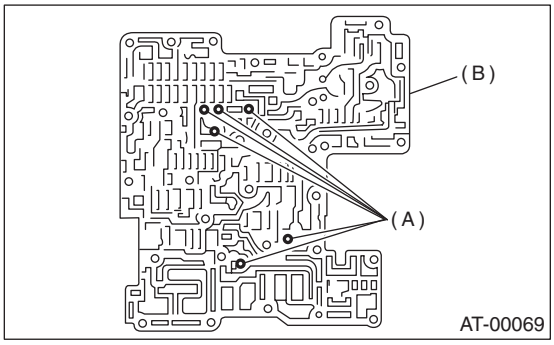
5) Align the hole in side plate with the hole in separator plate, and then install support plate and upper separator plate to middle valve body.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



(A) Upper separator plate
(B) Side plate

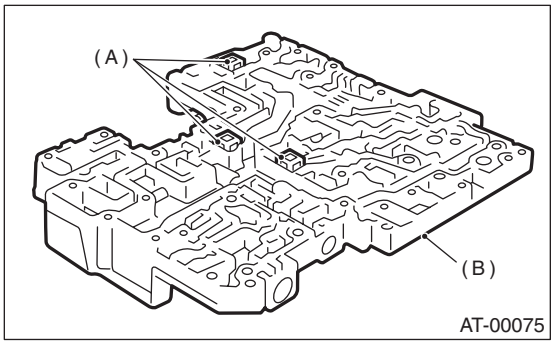
6) Insert six steel balls in their proper positions to middle valve body.



(A) Steel ball
(B) Middle valve body

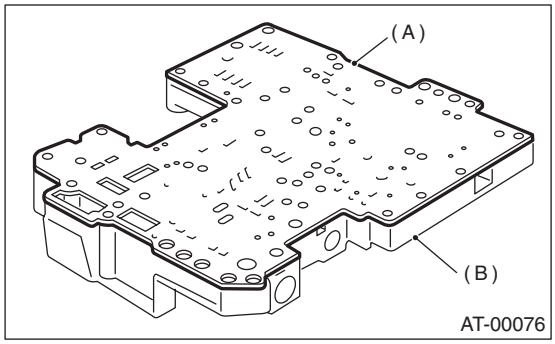
7) Install three filters to lower valve body.

NOTE:
Pay attention to the location of filters.



(A) Strainer
(B) Lower valve body

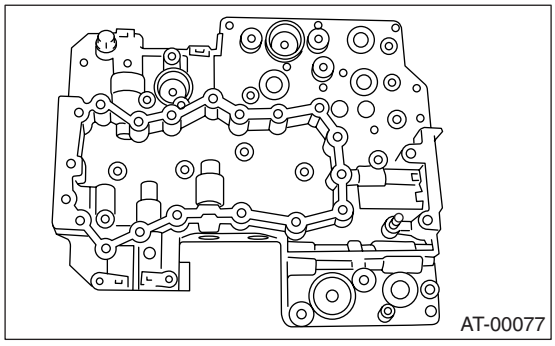
8) Install the lower separate plate to lower valve body.



(A) Lower separator plate
(B) Lower valve body

9) Temporarily assemble the valve body.

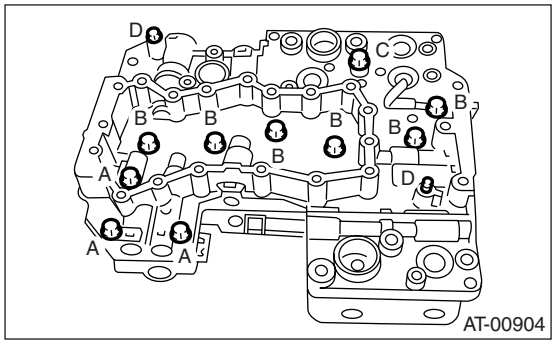
NOTE:
Be careful not to drop the middle valve body and upper body interior steel ball, or the lower body filter.



10) Tighten the bolts and nuts.

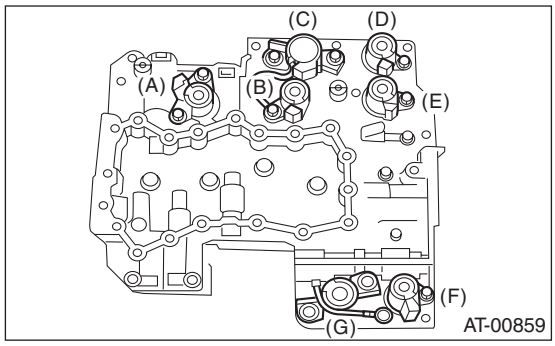
NOTE:
Install the bolts (D) from upper valve body side.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



Bolt length mm (in)
(A) 40 (1.57)
(B) 62 (2.44)
(C) 73 (2.87)
(D) 79 (3.11)

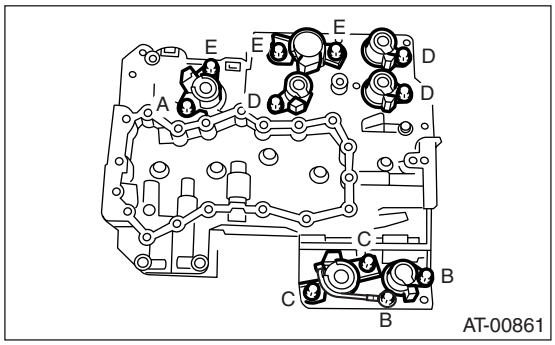
11) Install the sensor, solenoids and duty solenoids to specified positions.



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 1 (Yellow)
(E) Shift solenoid 2 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)

12) Tighten the bolts.

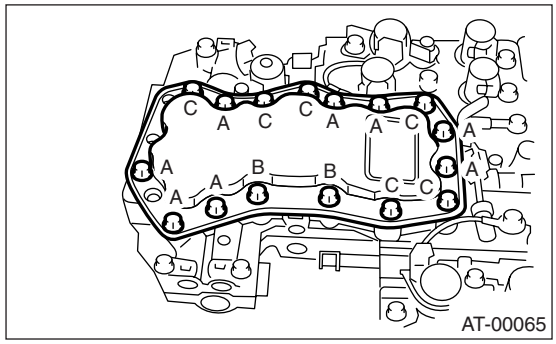
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



Bolt length mm (in)
(A) 12 (0.47)
(B) 40 (1.57)
(C) 45 (1.77)
(D) 62 (2.44)
(E) 73 (2.87)

13) Install oil strainer to lower valve body.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



Bolt length mm (in)
(A) 12 (0.47)
(B) 62 (2.44)
(C) 81 (3.19)

E: INSPECTION

Make sure that each component is free of harmful gouges, cuts, or dust.

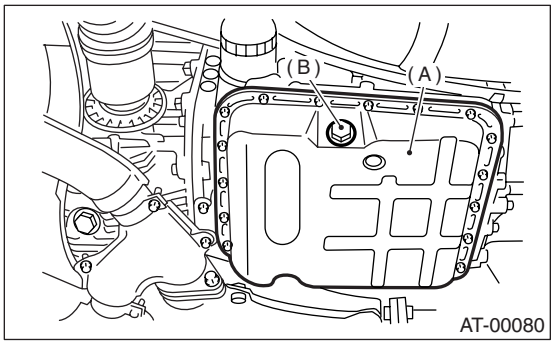
17.Shift Solenoids, Duty Solenoids and ATF Temperature Sensor

A: REMOVAL

1. SHIFT SOLENOIDS AND DUTY SOLENOIDS

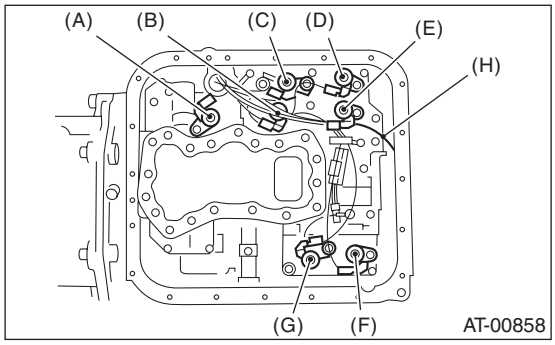
1) Lift-up the vehicle.
2) Clean the transmission exterior.
3) Replace the gasket with a new one, and tighten the drain plug.
4) Drain the ATF completely.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



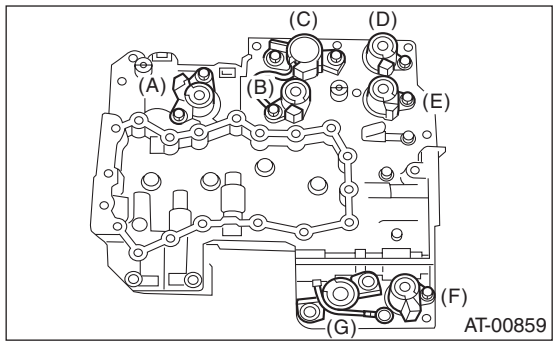
(A) Oil pan
(B) Drain plug

5) Remove the oil pan.
6) Disconnect the solenoid and duty solenoid connectors.



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) Transfer duty solenoid (Brown)

7) Remove the solenoids and duty solenoids.



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)

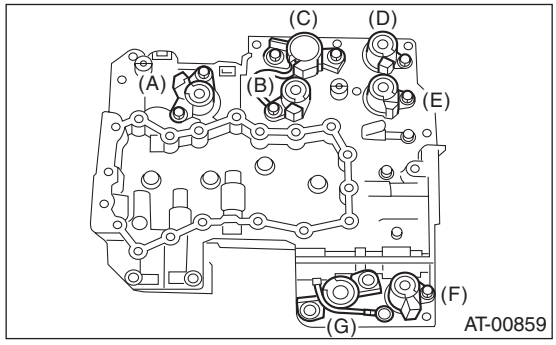
2. ATF TEMPERATURE SENSOR

For removal of ATF temperature sensor, refer to “Front Vehicle Speed Sensor.” <Ref. to 4AT-49, REMOVAL, Front Vehicle Speed Sensor.>

B: INSTALLATION

1. SHIFT SOLENOIDS AND DUTY SOLENOIDS

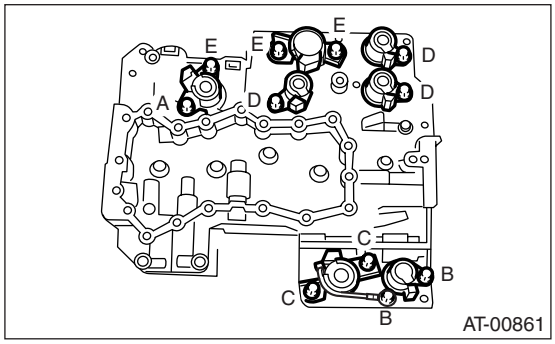
1) Insert solenoid and duty solenoid to specified position.



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)

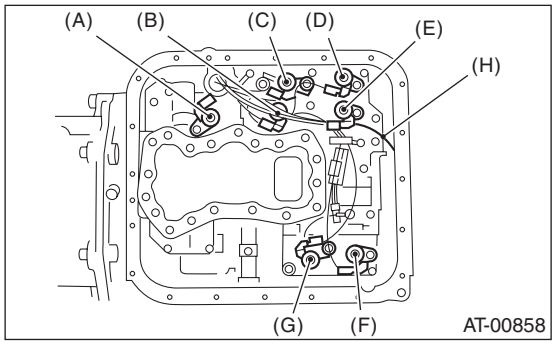
2) Tighten the bolts and nuts.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



Bolt length mm (in)
(A) 12 (0.47)
(B) 40 (1.57)
(C) 45 (1.77)
(D) 62 (2.44)
(E) 73 (2.87)

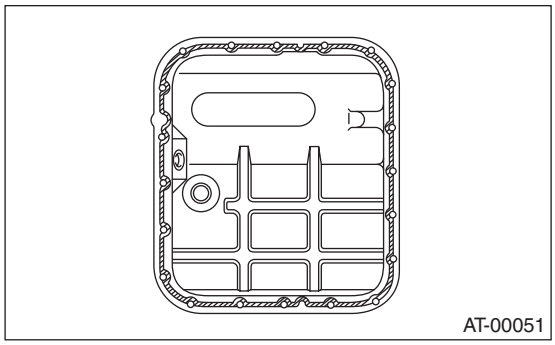
3) Connect the harness connectors.
Connect the connectors of same color, and secure the harness to valve body using clips.



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) Transfer duty solenoid (Brown)

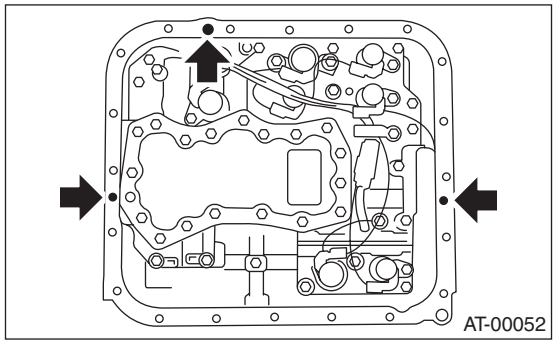
4) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Fluid packing:
THREE BOND 1217B (Part No. K0877YA020)



5) Apply liquid gasket fully to three holes other than screw holes on transmission case.

Fluid packing:
THREE BOND 1217B (Part No. K0877YA020)



6) Install the oil pan.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

7) Fill ATF up to the middle of the “COLD” side on level gauge by using the gauge hole. <Ref. to 4AT-30, Automatic Transmission Fluid.>
8) Check the ATF level. <Ref. to 4AT-30, Automatic Transmission Fluid.>

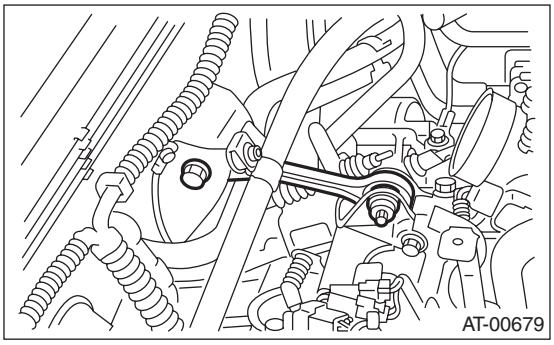
2. ATF TEMPERATURE SENSOR

For installation of ATF temperature sensor, refer to “Front Vehicle Speed Sensor.” <Ref. to 4AT-50, INSTALLATION, Front Vehicle Speed Sensor.>

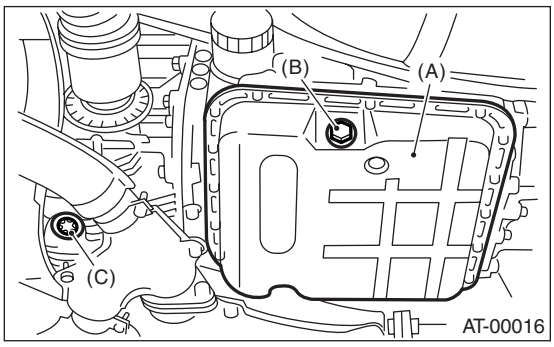
18. Transfer Duty Solenoid and Valve Body

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Remove the air cleaner case. (Non-turbo model) <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
4) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
5) Remove the pitching stopper.

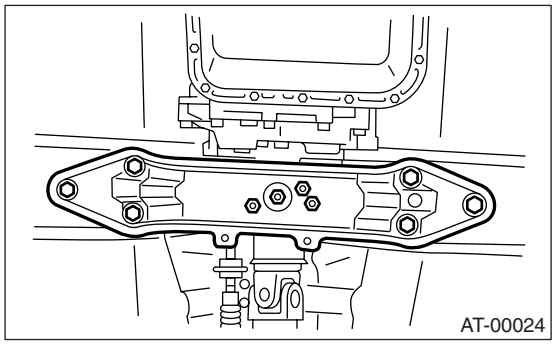


6) Remove the front exhaust pipe with center exhaust pipe. (Non-turbo model) <Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>
7) Remove the center exhaust pipe. (Turbo model) <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
8) Remove the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
9) Raise the vehicle and drain the ATF.

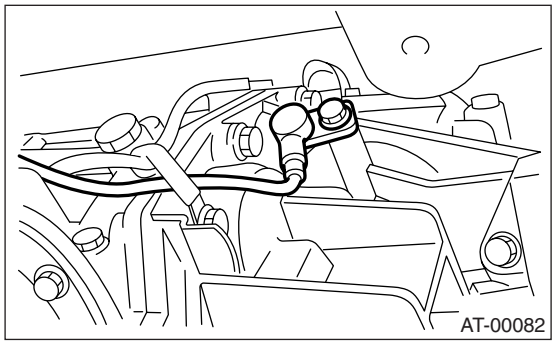


(A) Oil pan
(B) Drain plug
(C) Deferential oil drain plug

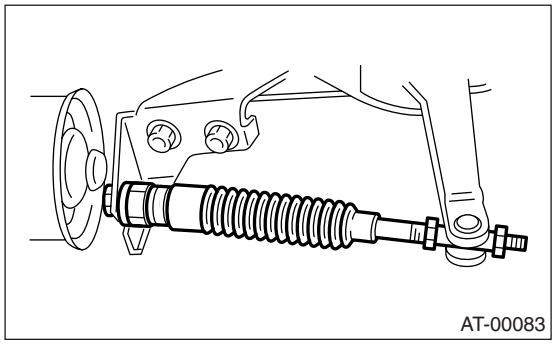
10) Remove the heat shield cover. (If equipped)
11) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
12) Remove the transmission rear crossmember.
(1) Support the transmission using a transmission jack and raise it slightly.
(2) Remove the bolts and nuts as shown in the figure.



13) Remove the rear vehicle speed sensor.



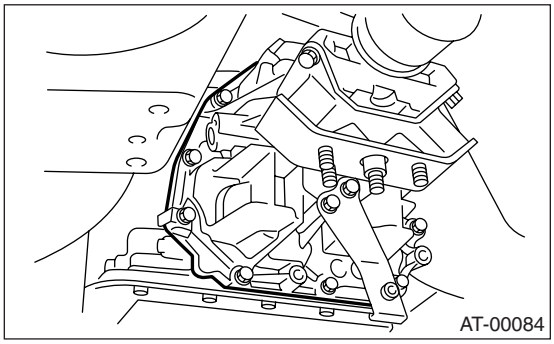
14) Remove the select cable nut.



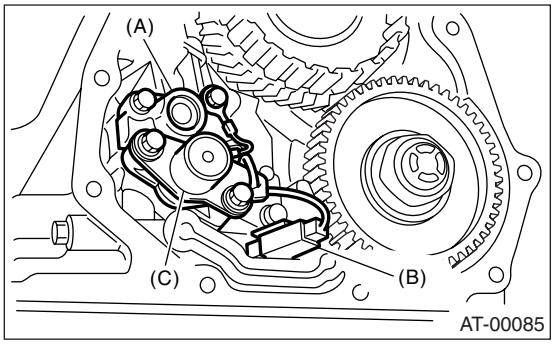
15) Move the gear select cable so that extension bolts can be removed.
16) Remove the bolts.

17) Remove the extension case.

NOTE:
Use a container to catch oil flowing from extension.



18) Disconnect the transfer duty solenoid connector.
19) Remove the transfer duty solenoid and transfer valve body.



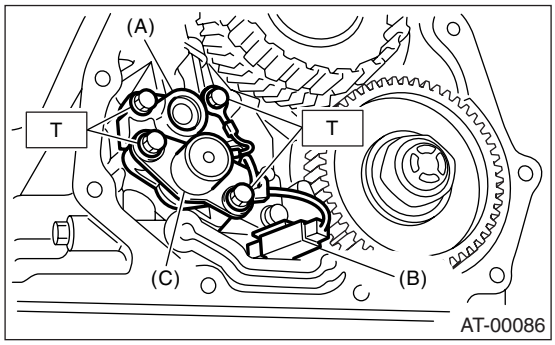
(A) Transfer valve body
(B) Transfer duty solenoid connector
(C) Transfer duty solenoid

B: INSTALLATION

1) Install the transfer duty solenoid and transfer valve body.
(1) Install the transfer duty solenoid and transfer valve body.

Tightening torque:
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)

(2) Connect the transfer duty solenoid connector.



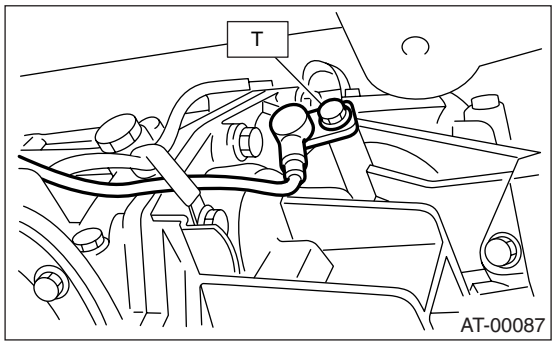
(A) Transfer valve body
(B) Transfer duty solenoid connector
(C) Transfer duty solenoid

2) Install a new gasket and the extension case to transmission case.
(1) Tighten eleven bolts.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

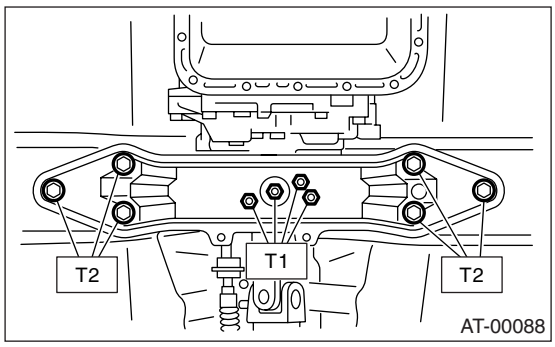
(2) Adjust the select cable. <Ref. to CS-26, ADJUSTMENT, Select Cable.>
3) Install the rear vehicle speed sensor.

Tightening torque:
T: 7 N·m (0.7 kgf-m, 5.1 ft-lb)



4) Install the transmission rear crossmember.
(1) Tighten the bolts.

Tightening torque:
T1: 35 N·m (3.6 kgf-m, 26 ft-lb)
T2: 70 N·m (7.1 kgf-m, 51 ft-lb)



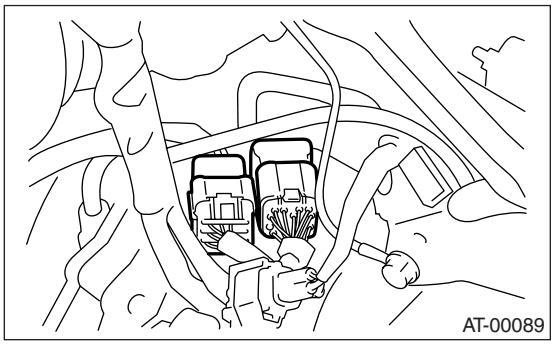
(2) Remove the transmission jack.

5) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>

6) Install the front, center rear exhaust pipe and muffler. (Non-turbo model)
<Ref. to EX(H4SO)-5, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(H4SO)-8, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, INSTALLATION, Muffler.>

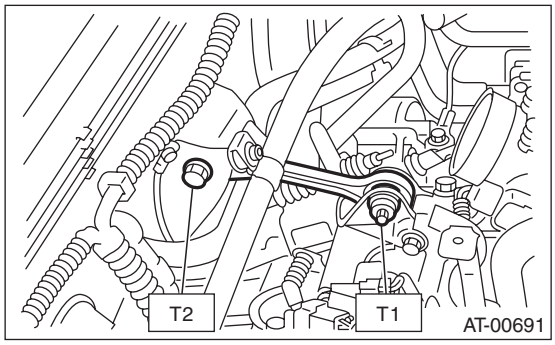
7) Install center and rear exhaust pipes, and muffler. (Turbo model)
<Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>, <Ref. to EX(H4DOTC)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-14, INSTALLATION, Muffler.>

8) Connect the transmission harness connector.



9) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



10) Install the air cleaner case. (Non-turbo model)
<Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>

11) Install intercooler. (Turbo model)
<Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>

12) Fill ATF up to the middle of the “COLD” side on level gauge by using the gauge hole. <Ref. to 4AT-30, Automatic Transmission Fluid.>

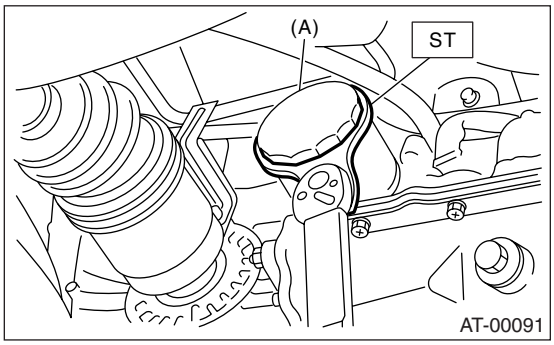
13) Check the ATF level. <Ref. to 4AT-30, Automatic Transmission Fluid.>

19.ATF Filter

A: REMOVAL

NOTE:
ATF filter is maintenance free.

1) Lift-up the vehicle.
2) Using ST, remove the ATF filter.
ST 498545400 OIL FILTER WRENCH



(A) ATF filter

B: INSTALLATION

1) Get a new ATF filter and apply a thin coat of ATF to the oil seal.
2) Install the ATF filter. Turn it by hand, being careful not to damage the oil seal.
3) Using ST, tighten the ATF filter.
Calculate ATF filter torque specifications using the following formula.
$T2 = L2/(L1 + L2) \times T1$
T1: 14 N·m (1.4 kgf-m, 10.1 ft-lb)
[Required torque setting]
T2: Tightening torque
L1: ST length 0.078 m (3.07 in)
L2: Torque wrench length
Example:

Torque wrench length mm (in)	Tightening torque N·m (kgf-m, ft-lb)
100 (3.94)	7.7 (0.79, 5.7)
150 (5.91)	9.0 (0.92, 6.7)
200 (7.87)	10 (1.0, 7.2)

NOTE:
Align the ST with torque wrench while tightening the ATF filter.

ST 498545400 OIL FILTER WRENCH

4) Add ATF.
5) Inspect the level of ATF. <Ref. to 4AT-30, Automatic Transmission Fluid.>

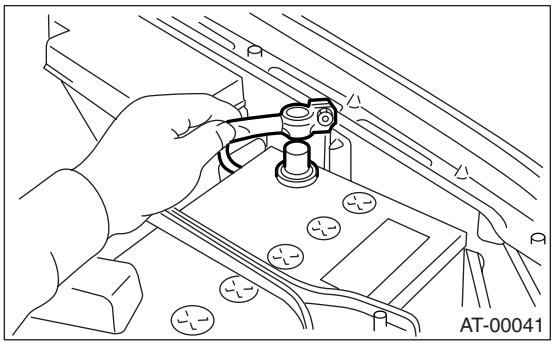
C: INSPECTION

Replace the part if any defect is found from the inspection.
Check for rust, hole, ATF leaks, and other damage.

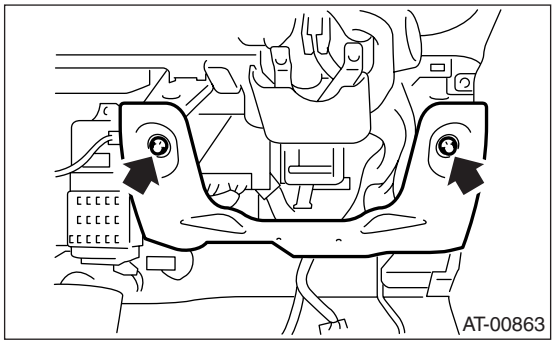
20.Transmission Control Module (TCM)

A: REMOVAL

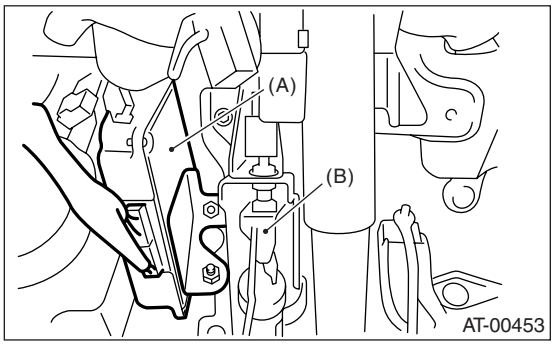
1) Disconnect the ground cable from battery.



2) Remove the lower cover and then disconnect the connector.
3) Remove the knee bolster.



4) Disconnect the connectors from TCM.



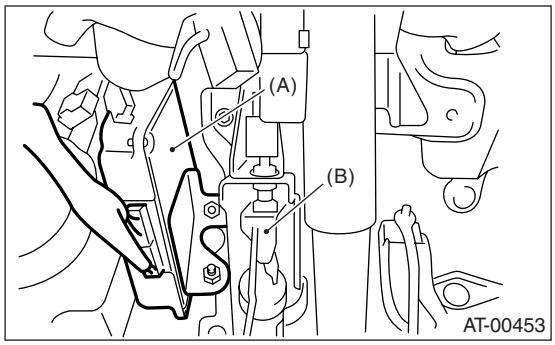
(A) Transmission control module (TCM)
(B) Brake pedal

5) Remove the TCM.

B: INSTALLATION

1) Install the TCM.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



(A) Transmission control module (TCM)
(B) Brake pedal

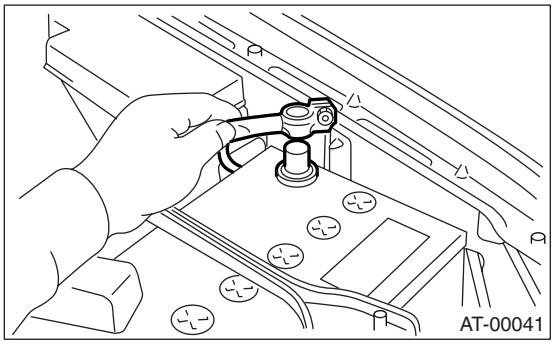
2) Connect the connectors to TCM.
3) Install in the reverse order of removal.

21.Dropping Resistor

A: REMOVAL

NOTE:
Dropping resistor is installed on non-turbo models only.

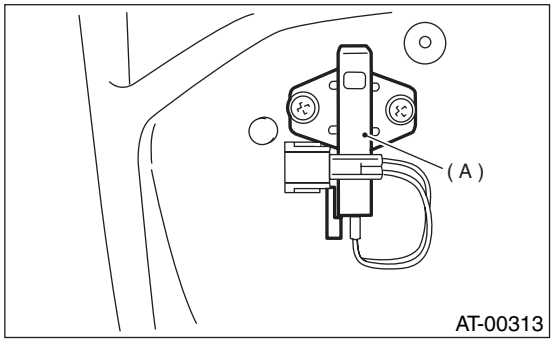
1) Disconnect the ground cable from battery.



2) Remove the air intake duct. <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>

3) Disconnect the connector from dropping resistor.

4) Remove the dropping resistor.

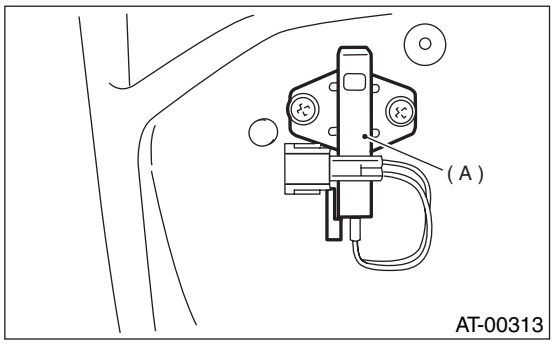


(A) Dropping resistor

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



(A) Dropping resistor

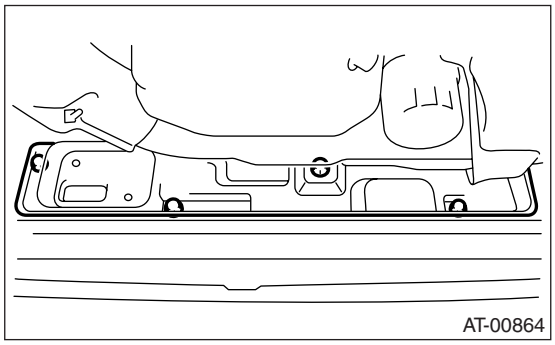
C: INSPECTION

Step		Check	Yes	No
1	**CHECK RESISTOR.** 1) Turn ignition switch to OFF. 2) Disconnect the connector from dropping resistor. 3) Measure the resistance between dropping resistor terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 9 — 15 Ω?	Go to step **2.**	Replace the dropping resistor. <Ref. to 4AT-68, Dropping Resistor.>
2	**CHECK RESISTOR.** Measure the resistance between dropping resistor terminals. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance 9 — 15 Ω?	Dropping resistor is normal.	Replace the dropping resistor. <Ref. to 4AT-68, Dropping Resistor.>

22.ATF Cooler Pipe and Hose

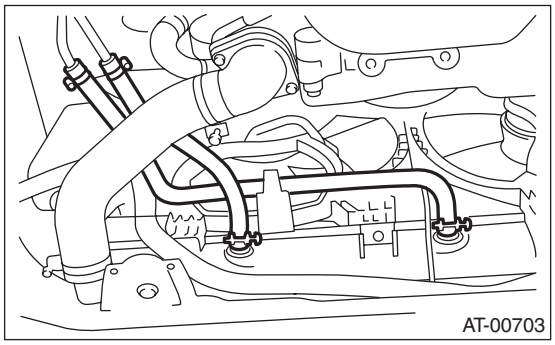
A: REMOVAL

1) Set the vehicle on a lift.
2) Remove battery and washer tank.
3) Lift-up the vehicle.
4) Remove the under cover.
5) Remove the radiator under cover. (Turbo model)



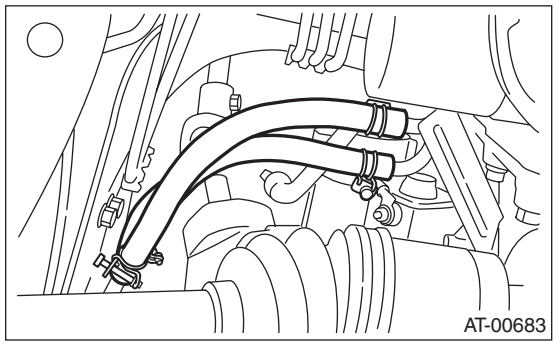
6) Disconnect the ATF cooler hoses from radiator.

NOTE:
• Do not remove them with a screwdriver or other pointed tools.
• When the hose is difficult to remove, wrap the hose around with a shop cloth to protect. Turn it with pliers, and then pull it directly out with your hand.

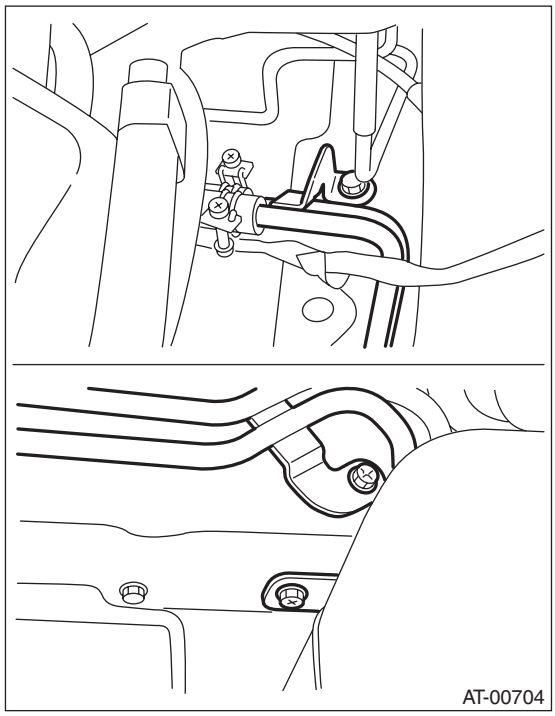


7) Disconnect the ATF cooler hoses from pipes.

NOTE:
• Do not remove them with a screwdriver or other pointed tools.
• When the hose is difficult to remove, wrap the hose around with a shop cloth to protect. Turn the hose with pliers, and then pull it directly out with your hand.

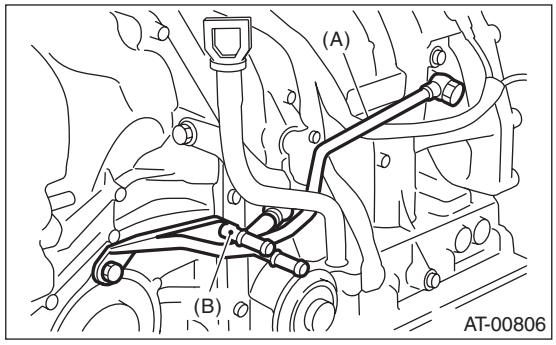


8) Remove the ATF cooler pipes from frame.



9) Remove the oil cooler inlet and outlet pipes.

NOTE:
When removing the outlet pipe, be careful not to lose the ball and spring used with retaining screw.

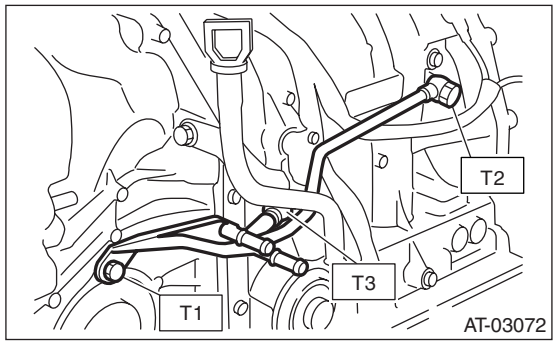


(A) Inlet pipe
(B) Outlet pipe

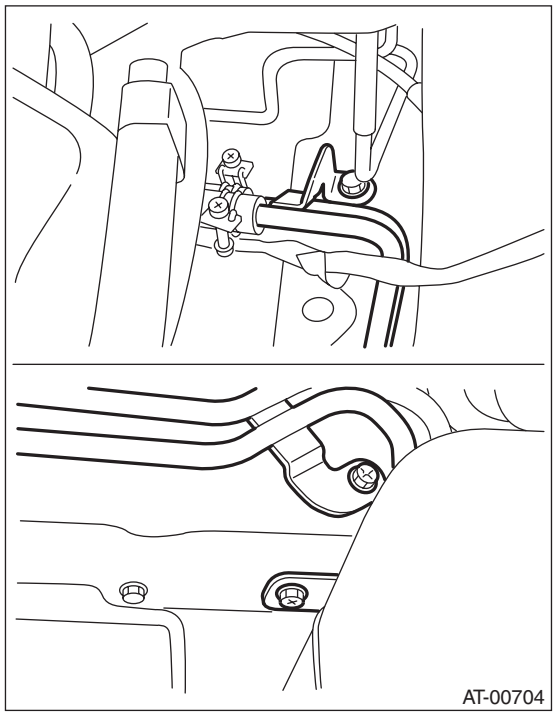
B: INSTALLATION

1) Install the oil cooler outlet and inlet pipes using new aluminum washers.

Tightening torque:
T1: 25 N·m (2.5 kgf-m, 18.1 ft-lb)
T2: 40 N·m (4.1 kgf-m, 30 ft-lb)
T3: 44 N·m (4.5 kgf-m, 32.5 ft-lb)

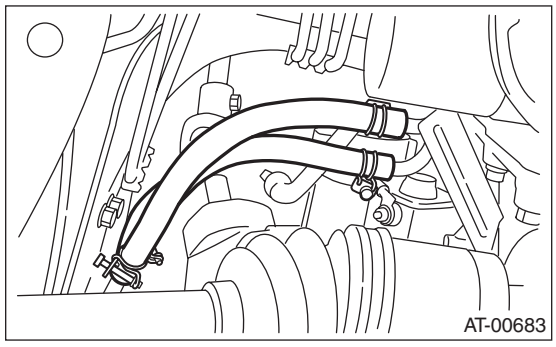


2) Install the ATF cooler pipes to frame.



3) Connect the ATF cooler hoses to pipe transmission side.

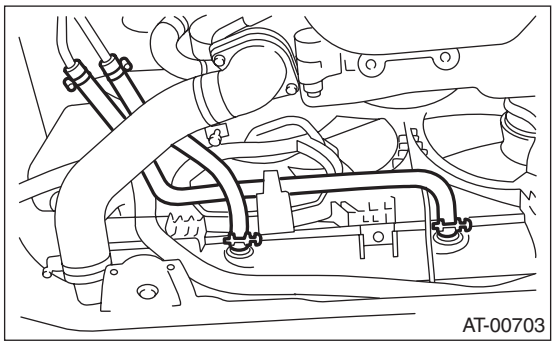
NOTE:
• Install the hoses so that they are not folded over, excessively bent, or twisted.
• Be careful to insert the hoses to the specified position.



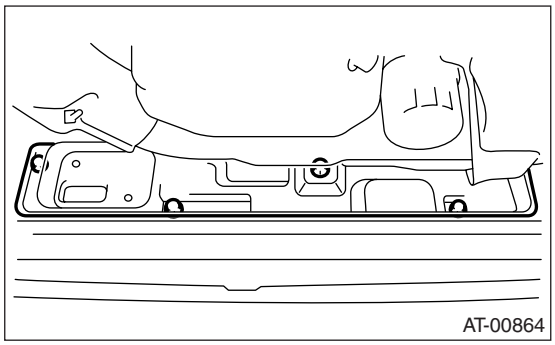
4) Connect the ATF cooler hoses to pipes of radiator side.

NOTE:
• Install the hoses so that they are not folded over, excessively bent, or twisted.

• Be careful to insert the hoses to the specified position.



5) Install the radiator under cover. (Turbo model)
Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)



6) Install the under cover.
7) Install the battery and washer tank.
8) Fill ATF. <Ref. to 4AT-30, Automatic Transmission Fluid.>

NOTE:
Make sure there are no ATF leaks in joints between the transmission, radiator, pipes, and hoses.

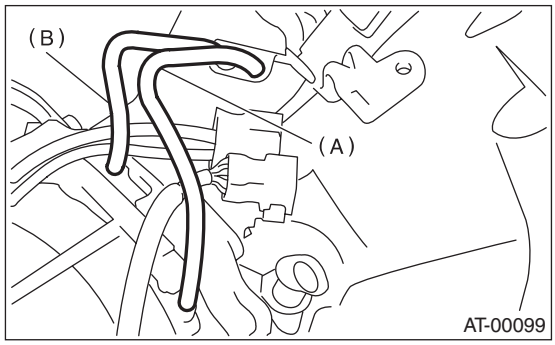
C: INSPECTION

Repair or replace any defective hoses, pipes, clamps, and washers found from the inspection below.
1) Check for ATF leaks in joints between the transmission, radiator, pipes, and hoses.
2) Check for deformed clamps.
3) Lightly bend the hose and check for cracks in the surface and other damage.
4) Pinch the hose with your fingers and check for poor elasticity. Also check for poor elasticity in the parts where the clamp was by pressing with your fingernail.
5) Check for peeling, cracks, and deformation at the tip of the hose.

23.Air Breather Hose

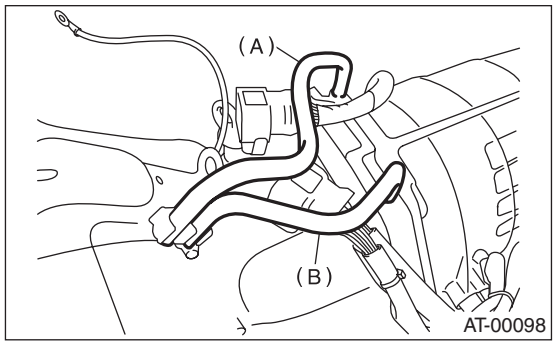
A: REMOVAL

1) Remove the air cleaner case. (Non-turbo model) <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
2) Remove intercooler. (Turbo model) <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
3) Disconnect the air breather hoses.
• NON-TURBO MODEL



(A) Air breather hose (Transmission case)
(B) Air breather hose (Oil pump housing)

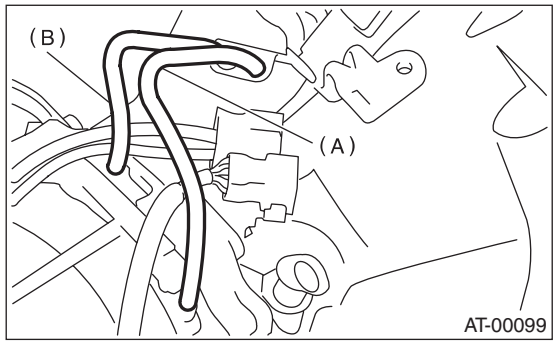
• TURBO MODEL



(A) Air breather hose (Transmission case)
(B) Air breather hose (Oil pump housing)

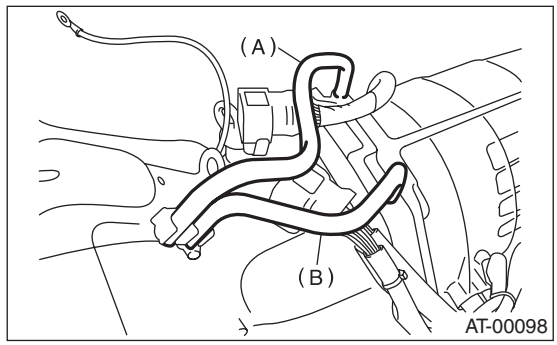
B: INSTALLATION

1) Install air breather hoses.
• NON-TURBO MODEL



(A) Air breather hose (Transmission case)
(B) Air breather hose (Oil pump housing)

• TURBO MODEL



(A) Air breather hose (Transmission case)
(B) Air breather hose (Oil pump housing)

2) Install the air cleaner case. (Non-turbo model) <Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>
3) Install intercooler. (Turbo model) <Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>

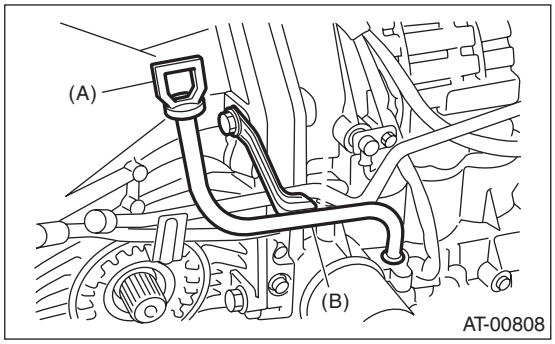
C: INSPECTION

Make sure the hose is not cracked or clogged.

24.Oil Charger Pipe

A: REMOVAL

1) Remove the air cleaner case. (Non-turbo model) <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
2) Remove intercooler. (Turbo model) <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
3) Remove the oil charger pipe, and remove the O-ring from the flange face.

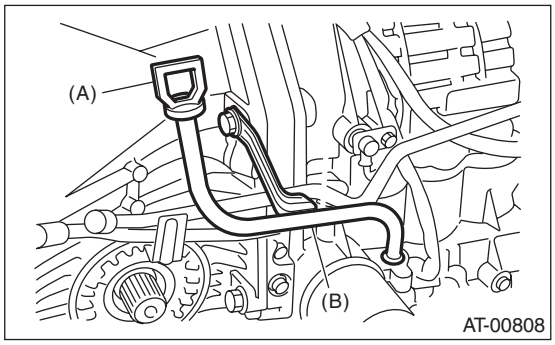


(A) Oil level gauge
(B) Oil charger pipe

B: INSTALLATION

1) Install the oil charger pipe with new O-ring.

Tightening torque:
41 N·m (4.2 kgf-m, 30.4 ft-lb)



(A) Oil level gauge
(B) Oil charger pipe

2) Install the air cleaner case. (Non-turbo model) <Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.>
3) Install intercooler. (Turbo model) <Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>

C: INSPECTION

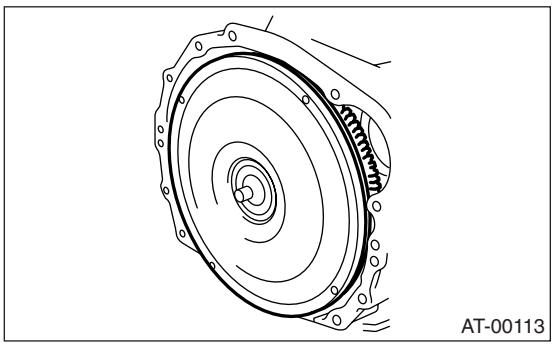
Make sure the oil charger pipe is not deformed or otherwise damaged.

25. Torque Converter Clutch Assembly

A: REMOVAL

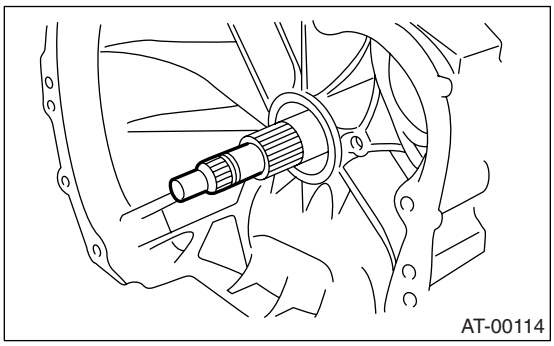
1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
2) Extract the torque converter clutch and oil pump shaft horizontally.

NOTE:
Be careful not to scratch the bushing inside the oil pump shaft.



3) Remove the input shaft.

NOTE:
When the torque converter clutch assembly is removed, the input shaft will come out.

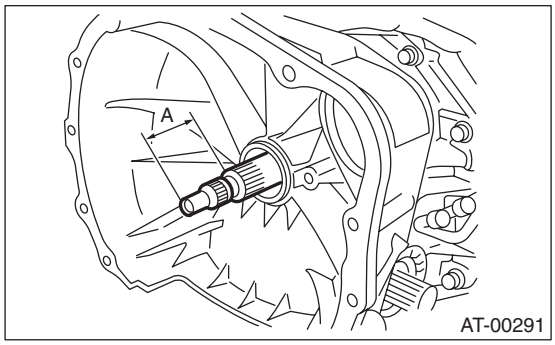


4) Remove the oil pump shaft from torque converter clutch as necessary.

B: INSTALLATION

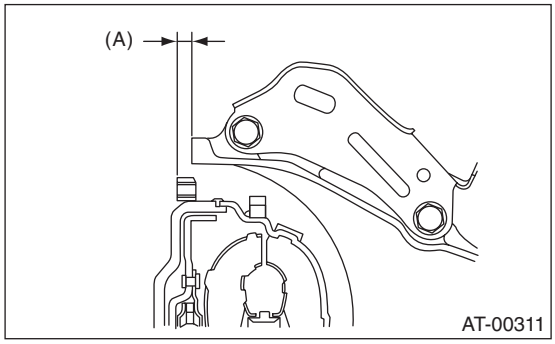
1) Install the oil pump shaft to torque converter clutch if it is removed.
2) Install the oil pump shaft to the torque converter clutch, and then check the clip fits securely in its groove.
3) Insert the input shaft while turning lightly by hand.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



4) Holding the torque converter clutch assembly by hand, carefully install it to the torque converter clutch case. Be careful not to damage the bushing. Also avoid undue contact between the oil pump shaft bushing and stator shaft portion of the oil pump cover.
5) Rotate the shaft lightly by hand to engage the splines securely.

Dimension A:
2.7 — 2.9 mm (0.106 — 0.114 in)



(A) Dimension A

6) Install the transmission assembly to vehicle. <Ref. to 4AT-39, INSTALLATION, Automatic Transmission Assembly.>

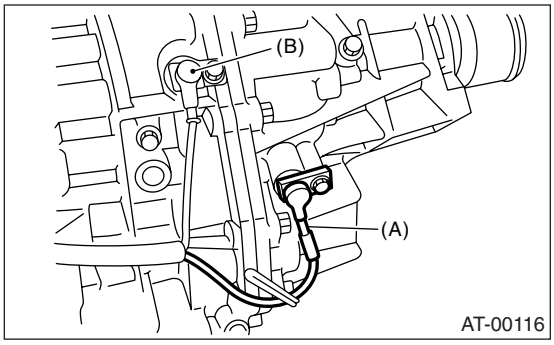
C: INSPECTION

Make sure the ring gear is not damaged and that the protrusion on the edge of the torque converter clutch is not deformed or otherwise damaged.

26.Extension Case

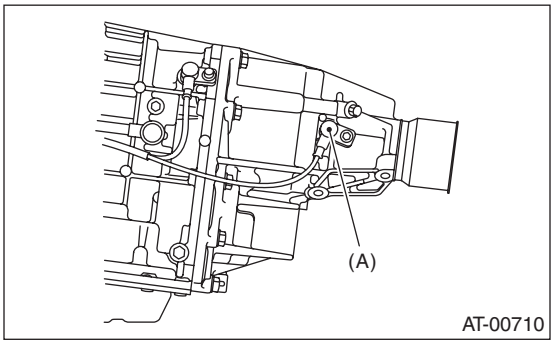
A: REMOVAL

1) Remove the transmission assembly. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
2) Remove rear vehicle speed sensor.
• MPT MODEL



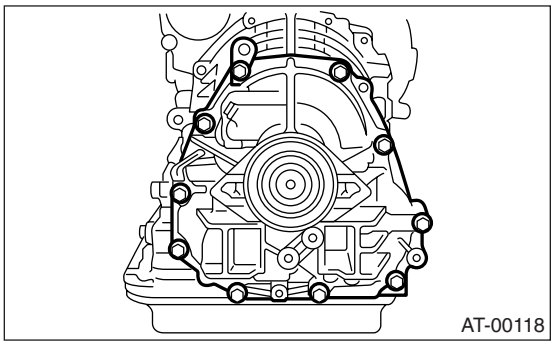
(A) Rear vehicle speed sensor
(B) Front vehicle speed sensor

• VTD MODEL



(A) Rear vehicle speed sensor

3) Separate transmission case and extension case sections.



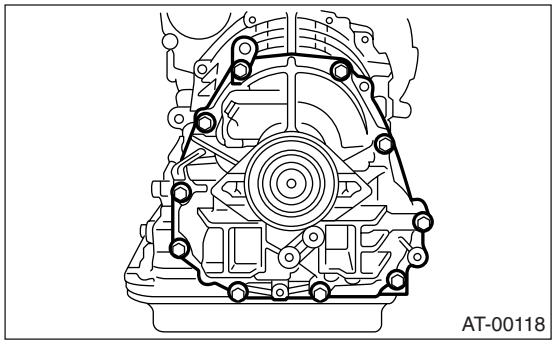
B: INSTALLATION

1) Attach the selected thrust needle bearing to the end surface of reduction drive gear with vaseline.

NOTE:
Install thrust needle bearing in the correct direction.

2) Install new gasket.
3) Install the extension case to the transmission case.
4) Tighten bolts to secure the case.

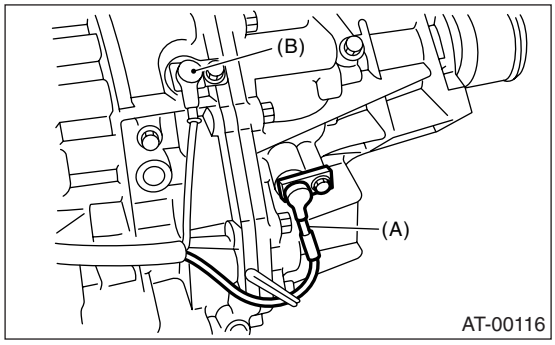
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



5) Install the rear vehicle speed sensor.

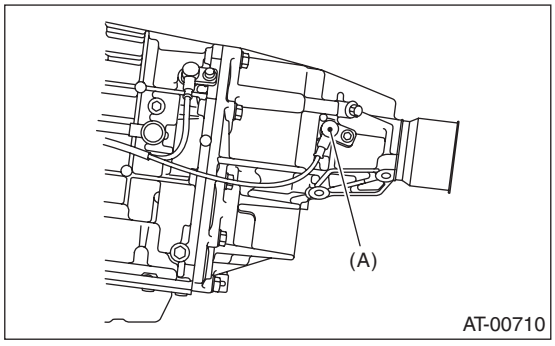
Tightening torque:
7 N·m (0.7 kgf-m, 5.1 ft-lb)

• MPT MODEL



(A) Rear vehicle speed sensor
(B) Front vehicle speed sensor

• VTD MODEL



(A) Rear vehicle speed sensor

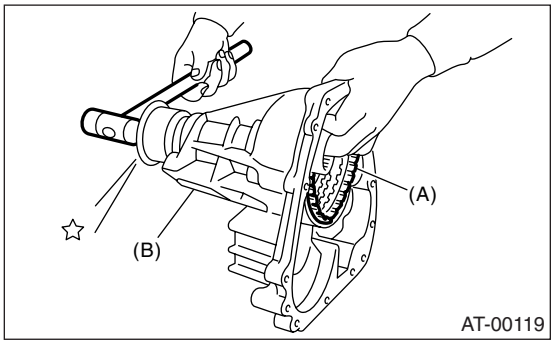
6) Install the transmission assembly. <Ref. to 4AT-39, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

1. MPT MODEL

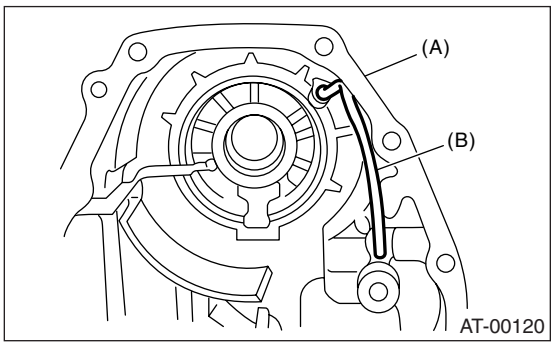
1) Take out the transfer clutch by lightly tapping the end of the rear drive shaft.

NOTE:
Be careful not to damage the oil seal in the extension.



(A) Extension case
(B) Transfer clutch

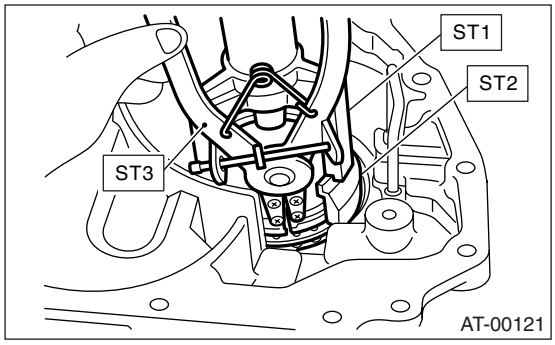
2) Remove the transmission clutch pipe without bending pipe.



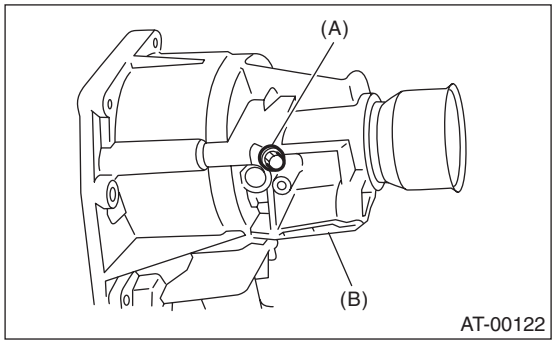
(A) Extension case
(B) Transfer clutch pipe

2. VTD MODEL

1) Remove snap ring using ST1, ST2, ST3 and a press.
ST1 398673600 COMPRESSOR
ST2 498627100 SHEAT
ST3 398663600 PLIERS

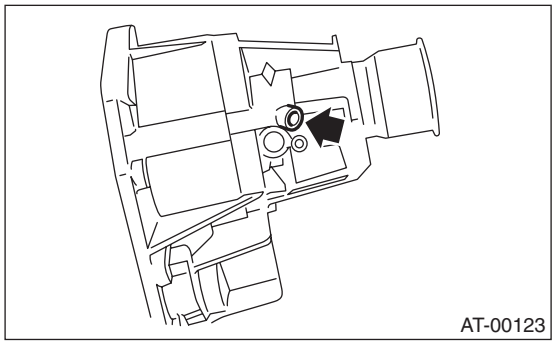


2) Remove test plug.

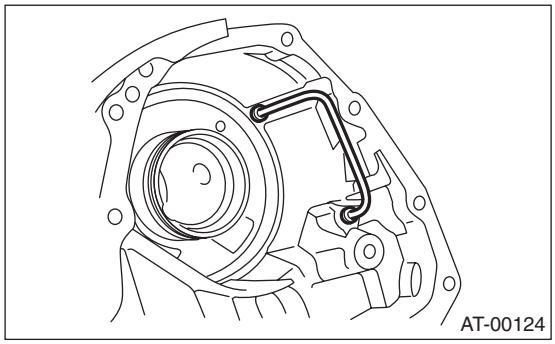


(A) Extension case
(B) Test plug

3) Remove clutch piston using compressed air.



4) Pay attention, not to bend pipe, and remove transfer clutch pipe.

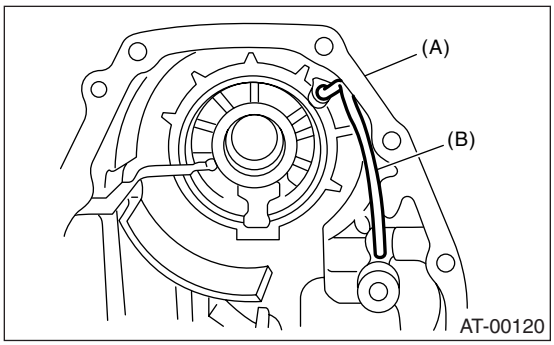


5) Remove the dust cover from the extension case.
6) Remove the oil seal from the extension case.

D: ASSEMBLY

1. MPT MODEL

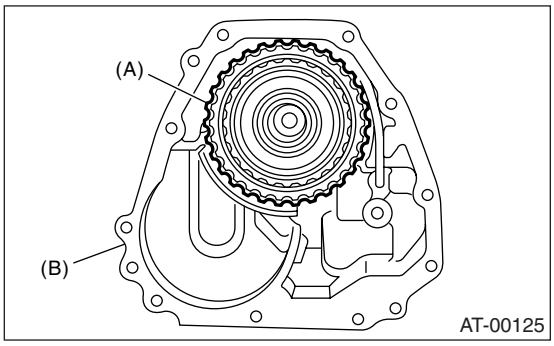
1) Using the ST and a press, press in a new oil seal.
ST 498057300 INSTALLER
2) Press in the dust cover.
3) Install the transfer clutch pipe to extension case without bending pipe.



(A) Extension case
(B) Transfer clutch pipe

4) Install the transfer clutch assembly to the case.

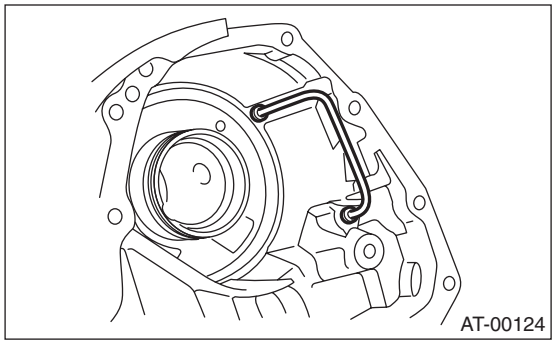
NOTE:
- Be careful not to damage the seal rings.
- Insert the clutch assembly fully into position until the bearing shoulder bottoms.



(A) Transfer clutch
(B) Extension case

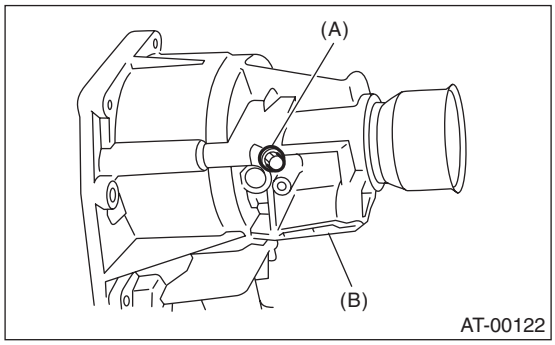
2. VTD MODEL

1) Press new oil seal using ST and a press.
ST 498057300 INSTALLER
2) Press dust cover.
3) Install the transfer clutch pipe onto the extension case, taking care not to bend the pipe.



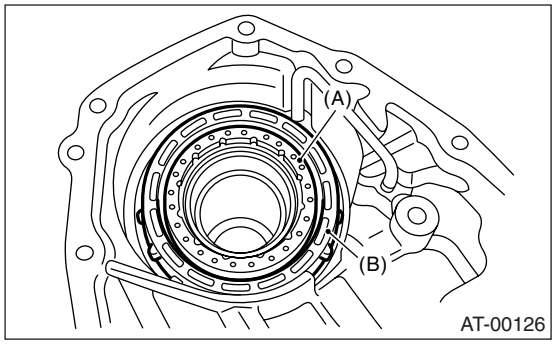
4) Install the test plug.

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



(A) Test plug
(B) Extension case

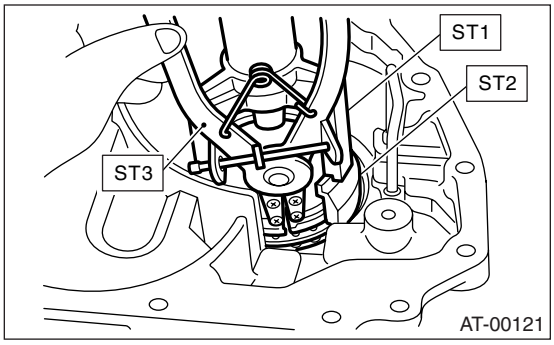
5) Insert the multi-plate clutch, drive plates, driven plates, and spring retainer.



(A) Spring retainer
(B) Multi-plate clutch (LSD) piston assembly

6) Install the snap ring using special tools 1, 2, and 3.
ST1 398673600 COMPRESSOR
ST2 498627100 SEAT

ST3 398663600 PLIERS



E: INSPECTION

- Use forced air to make sure the transfer pipe and extension case routes are not clogged and do not leak.
- Measure the extension end play and adjust it to within specifications.

MPT model
<Ref. to 4AT-82, MPT MODEL, ADJUSTMENT, Transfer Clutch.>
VTD model
<Ref. to 4AT-83, VTD MODEL, ADJUSTMENT, Transfer Clutch.>

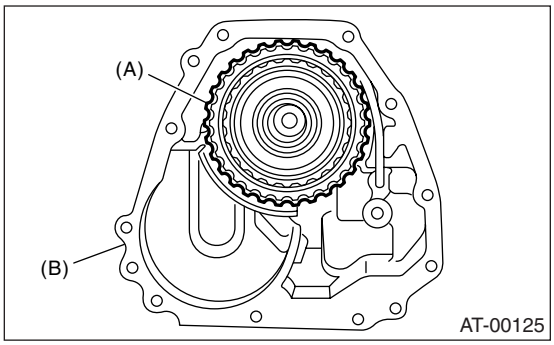
27.Transfer Clutch

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
2) Remove the extension case and remove the transfer clutch. <Ref. to 4AT-75, REMOVAL, Extension Case.> and <Ref. to 4AT-76, DISASSEMBLY, Extension Case.>

B: INSTALLATION

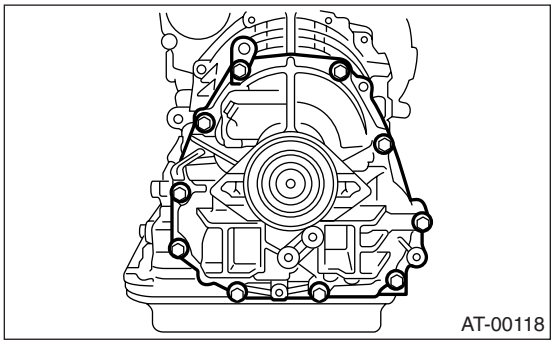
1) Select the thrust needle bearing. <Ref. to 4AT-82, ADJUSTMENT, Transfer Clutch.>
2) Install the transfer clutch assembly to the case.



(A) Transfer clutch
(B) Extension case

3) Tighten bolts to secure the case.

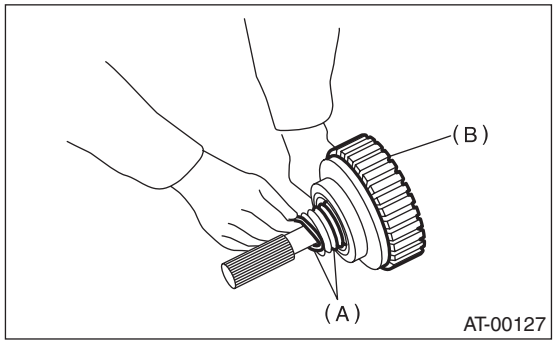
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



4) Install the transmission assembly to vehicle. <Ref. to 4AT-39, INSTALLATION, Automatic Transmission Assembly.>

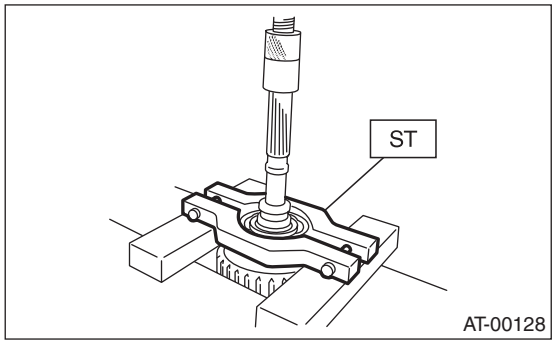
C: DISASSEMBLY

1) Remove the seal ring.

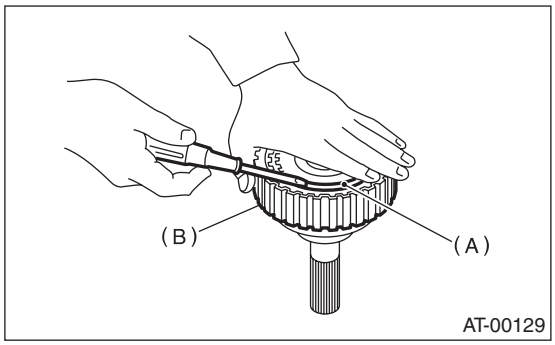


(A) Seal ring
(B) Transfer clutch

2) Using a press and ST, remove the ball bearing.
ST 498077600 REMOVER



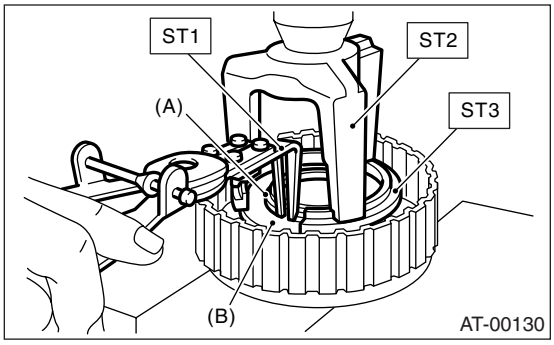
3) Remove the snap ring, and take out the pressure plate, drive plates, and driven plates.



(A) Snap ring
(B) Transfer clutch

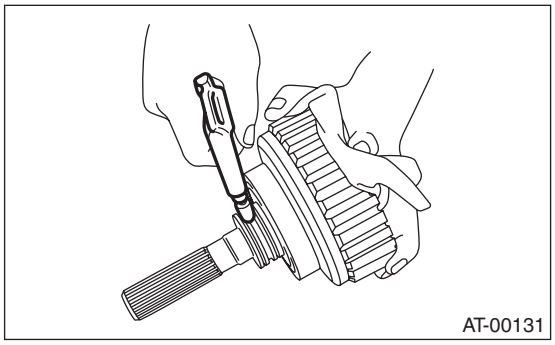
4) Remove the snap ring with ST1, ST2 and ST3, and take out the return spring and transfer clutch piston seal.
ST1 399893600 PLIERS
ST2 398673600 COMPRESSOR

ST3 398623600 SEAT



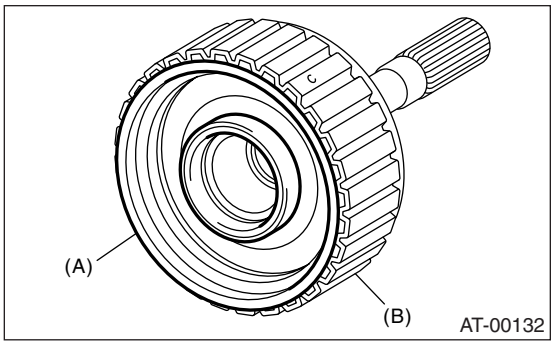
(A) Snap ring
(B) Transfer piston seal

5) Apply compressed air to the rear drive shaft to remove the piston.



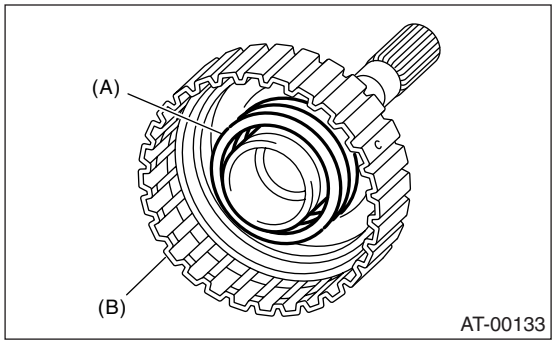
D: ASSEMBLY

1) Install the transfer clutch piston.



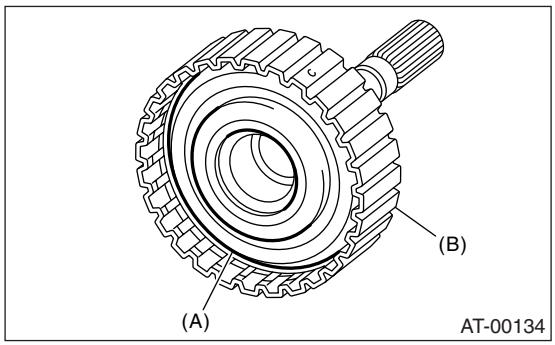
(A) Transfer clutch piston
(B) Rear drive shaft

2) Install return spring to transfer piston.



(A) Return spring
(B) Rear drive shaft

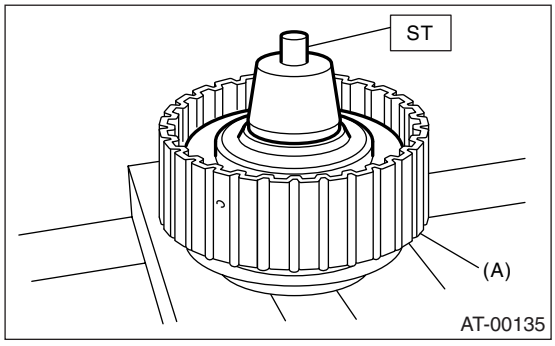
3) Install transfer clutch piston seal.



(A) Transfer clutch piston seal
(B) Rear drive shaft

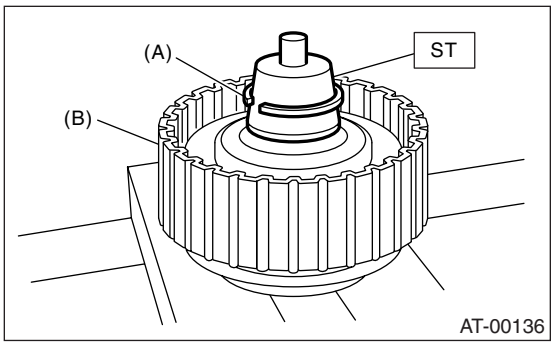
4) Install ST to rear drive shaft.

ST 499257300 SNAP RING OUTER GUIDE



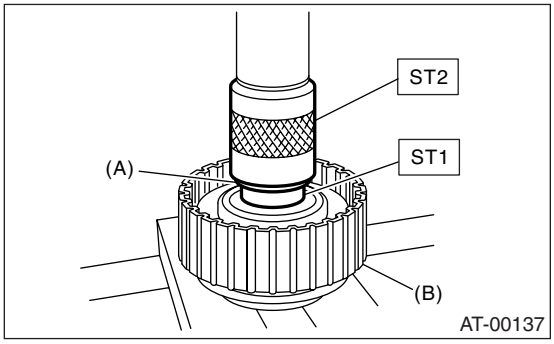
(A) Transfer clutch

5) Install snap ring to ST.
ST 499257300 SNAP RING OUTER GUIDE



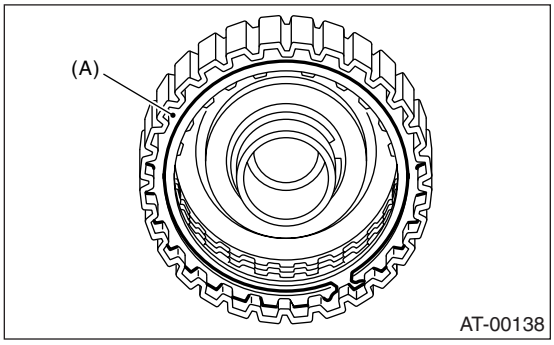
(A) Snap ring
(B) Transfer clutch

6) Using ST1 and ST2, install snap ring to rear drive shaft.
ST1 499257300 SNAP RING OUTER GUIDE
ST2 499247400 INSTALLER



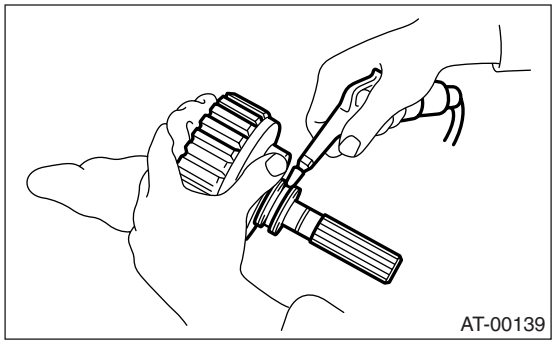
(A) Snap ring
(B) Transfer clutch

7) Install the driven plates, drive plates, pressure plate and snap ring.

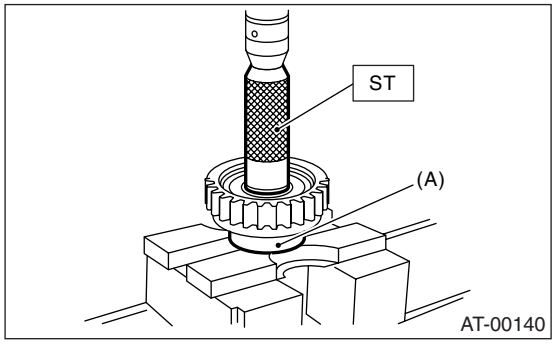


(A) Snap ring

8) Apply compressed air to see if the assembled parts move smoothly.



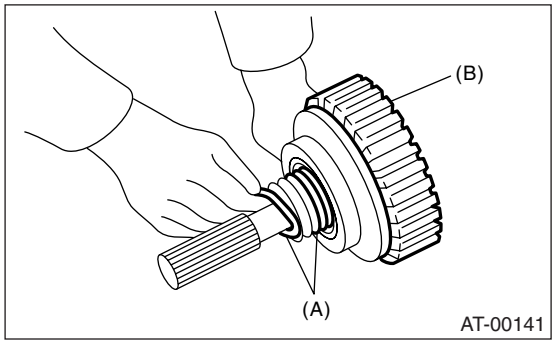
9) Check clearance between snap ring and pressure plate. <Ref. to 4AT-82, INSPECTION, Transfer Clutch.>
10) Press-fit a new ball bearing with ST.
ST 899580100 INSTALLER



(A) Ball bearing

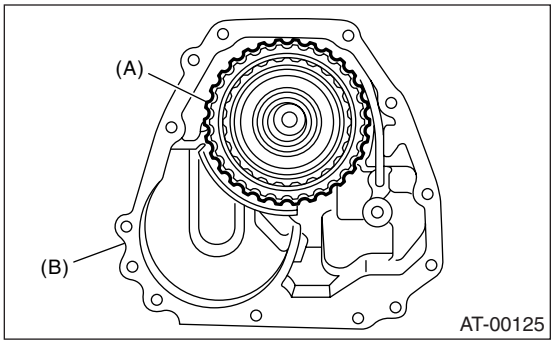
11) Coat a new seal ring with vaseline, and install it in the seal ring groove of the shaft.

NOTE:
Do not expand the seal ring excessively when installing.



(A) Snap ring
(B) Transfer clutch

12) Install the transfer clutch assembly without damaging seal ring.



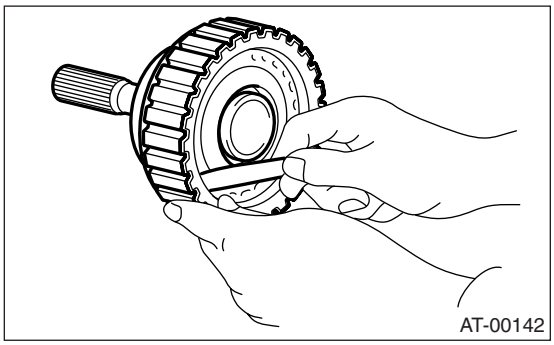
(A) Transfer clutch
(B) Extension case

E: INSPECTION

• Check the drive plate facing for wear and damage.
• Check the snap ring for wear, return spring for permanent set and breakage, and return spring for deformation.
• Check the lathe cut seal ring for damage.
• Measure the extension end play and adjust it to within specifications.
<Ref. to 4AT-82, ADJUSTMENT, Transfer Clutch.>
1) Inspect clearance between snap ring and pressure plate.
2) Before measuring clearance, place the same thickness of shim on both sides to prevent pressure plate from tilting.
3) If the clearance is not within specification, adjust it by selecting a suitable pressure plate on the transfer clutch piston side.

Standard value:
0.7 — 1.1 mm (0.028 — 0.043 in)

Allowable limit:
1.6 mm (0.063 in)



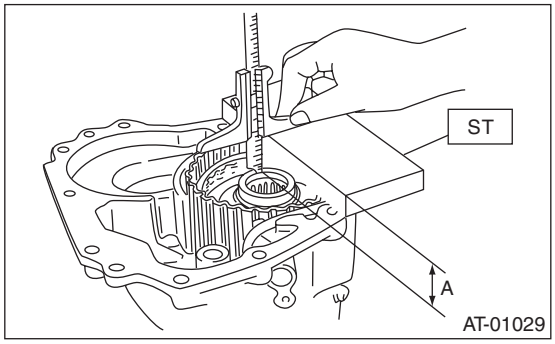
Pressure plates	
Part No.	Thickness mm (in)
31593AA151	3.3 (0.130)
31593AA161	3.7 (0.146)
31593AA171	4.1 (0.161)
31593AA181	4.5 (0.177)

4) Check if the tight corner braking does not occur when the vehicle is started with steering wheel held at fully turned position. If tight corner braking occurs, perform the following procedures.
(1) With the steering wheel held at fully turned position, drive the vehicle in “D” range and with vehicle speed at approx. 5 km/h (3 MPH) in both clockwise and counterclockwise directions for approx. ten times each, while repeating acceleration and braking intermittently.
(2) If the tight corner braking still persists, drive the vehicle again in a circle for several laps.

F: ADJUSTMENT

1. MPT MODEL

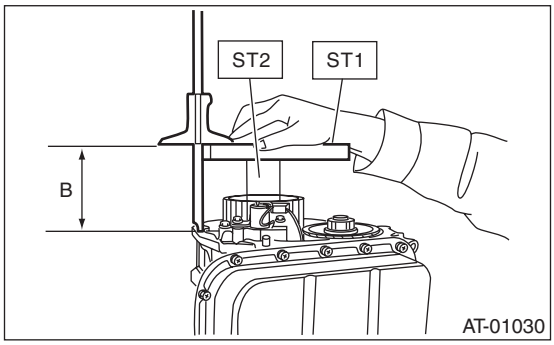
1) Using the ST, measure the distance “A” from the end surface of ST to the end surface of rear drive shaft.
ST 398643600 GAUGE



A: Measured value

2) Using the ST1 and ST2, measure the distance “B” from the transmission case mating surface to the end surface of ST.
ST1 398643600 GAUGE

ST2 499577000 GAUGE



B: Measured value

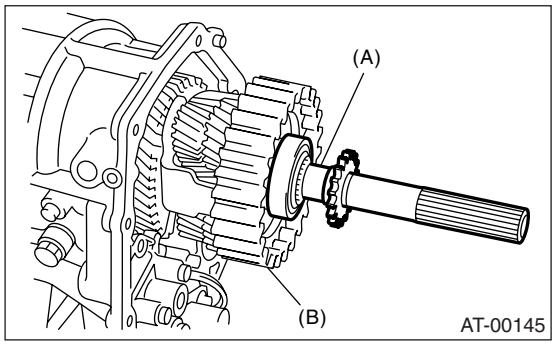
3) Calculation formula:

NOTE:
• Calculate “T”:
T = A − B + 35.4 mm
[T = A − B + 1.3937 in]
T: Thrust needle bearing thickness
A: Distance from the end surface of ST to the end surface of rear drive shaft
B: Distance from the mating surface of transmission case to end of the end surface of ST
Example:
When, A = 33.6 mm (1.3228 in), B = 65.05 mm (2.5610 in)
T = 33.6 − 65.05 + 35.4 = 3.95
[T = 1.3228 − 2.5610 + 1.3937 = 0.1555]
After calculation, the value of “H” becomes 3.95, therefore select bearing thickness of 3.8.
• Calculation formula for “T” is applied when measuring using ST (398643600 GUAGE, 499577000 GUAGE). When not using ST, apply
T = (A − α + 0.45 mm) − (B − β) − H
[T = (A − α + 0.0177 in) − (B − β) − H].
T: Thrust needle bearing thickness
A: Distance from the end surface of collar as substitute for ST to the end surface of reduction drive shaft
B: Distance from the mating surface of transmission case to the end surface of collar as substitute for ST
α: Collar thickness used when measuring “A”
β: Collar thickness used when measuring “B”
0.45: Gasket thickness (mm)
H: Shim clearance

Thrust needle bearing	
Part No.	Thickness mm (in)
806536020	3.8 (0.150)
806535030	4.0 (0.157)
806535040	4.2 (0.165)
806535050	4.4 (0.173)
806535060	4.6 (0.181)
806535070	4.8 (0.189)
806535090	5.0 (0.197)

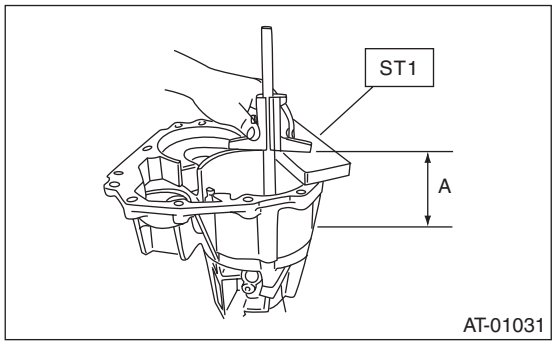
2. VTD MODEL

1) Insert the rear drive shaft into the reduction drive gear and center differential assembly.



(A) Rear drive shaft
(B) Center differential carrier

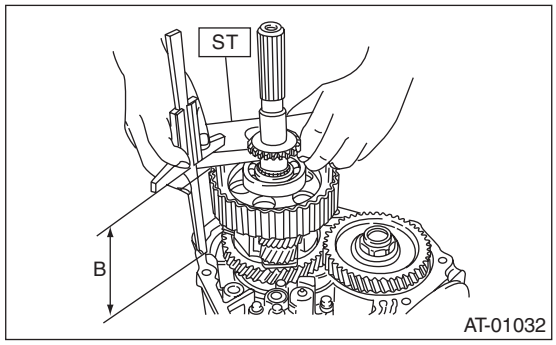
2) Using the ST, measure the distance “A” from the end surface of ST to the ball bearing outer ring contact surface of rear drive shaft.
ST 398643600 GAUGE



A: Measured value

3) Using the ST, measure the distance “B” from the mating surface of transmission case to the end surface of ST.

ST 398643600 GAUGE



B: Measured value

4) Formula:

NOTE:
• Calculation of “T”:
When clearances are 0.05 mm (0.0020 in), select up to four adjusting shims from the table, suitable for clearance value.
When clearances are 0.05 mm (0.0020 in)
T = A − B + 0.40 mm
[T = A − B + 0.0157 in]
When clearances are 0.25 mm (0.0098 in)
T = A − B + 0.20 mm
[T = A − B + 0.0079 in]
T: Shim clearance
A: Distance from the end surface of ST to the ball bearing outer ring contact surface of rear drive shaft
B: Distance from the mating surface of transmission case to the end surface of ST
T: Shim thickness
0.05 — 0.25 mm (0.0020 — 0.0098 in)
Example:
When, A = 90.50 mm (3.5630 in), B = 90.35 mm (3.5571 in)
Calculation for 0.05 mm (0.0020 in) of clearance
T = 90.50 − 90.35 + 0.4 = 0.55
[T = 3.5630 − 3.5571 + 0.0157 = 0.0216]
Calculation when clearance is 0.25 mm (0.0098 in)
T = 90.50 − 90.35 + 0.2 = 0.35
[T = 3.5630 − 3.5571 + 0.0079 = 0.0138]
• Calculation formula for “T” is applied when measuring using ST (398643600 GUAGE). When not using ST, apply
T = (A − α + 0.45 mm) − (B − β) − H
[T = (A − α + 0.0177 in) − (B − β) − H].
T: Thrust needle bearing thickness
A: Distance from the end surface of collar as substitute for ST to the rear drive shaft ball bearing outer ring contact surface
B: Distance from the mating surface of transmission case to the end surface of collar as substitute for ST
α: Collar thickness used when measuring “A”
β: Collar thickness used when measuring “B”
0.45: Gasket thickness (mm)
H: Shim clearance
After calculation, the value of “T” becomes between 0.35 mm (0.0138 in) and 0.55 mm (0.0216 in), therefore select two shims with thickness of 0.2 mm (0.010 in) or one shim with thickness of 0.5 mm (0.020 in).

Adjusting shim	
Part No.	Thickness mm (in)
33281AA001	0.2 (0.008)
33281AA011	0.5 (0.020)

28.Multi-plate Clutch

A: REMOVAL

Remove multi-plate clutch following the same instructions as for the extension case. <Ref. to 4AT-75, REMOVAL, Extension Case.>

B: INSTALLATION

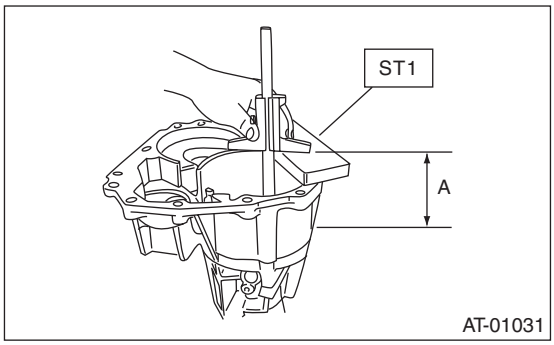
Install multi-plate clutch following the same instructions as for the extension case. <Ref. to 4AT-75, INSTALLATION, Extension Case.>

C: INSPECTION

- Inspect drive plate facing for wear and damage.
- Make sure snap ring is not worn and return spring has no permanent distortion, damage, or deformation.
- Inspect lathe cut seal ring for damage.
- Measure multi-plate clutch clearance and adjust it to within the specification range. <Ref. to 4AT-85, ADJUSTMENT, Multi-plate Clutch.>

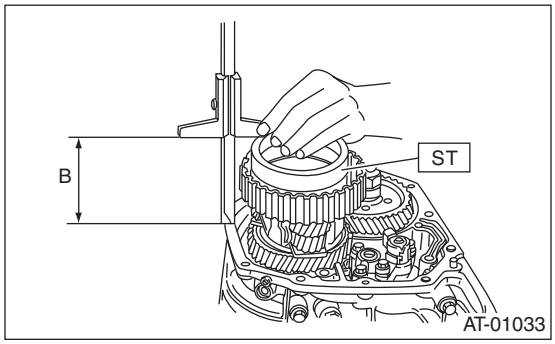
D: ADJUSTMENT

1) Install the drive plate and driven plate to center differential carrier.
2) Using the ST, measure the distance “A” from the end surface of ST to multi-plate clutch piston.
ST 398643600 GAUGE



A: Measured value

3) Using the ST, measure the height “B” from the mating surface of transmission case to the end surface of ST.
ST 398744300 GAUGE



B: Measured value

4) Calculation formula
$T = A - B + 0.45$ mm
[$T = A - B + 0.0177$ in]

NOTE:
- Calculation formula for “T” is applied when measuring using ST (398643600 GUAGE, 398744300 GAUGE). When not using ST, apply
$T = (A - \alpha + 0.45\text{ mm}) - (B - \beta)$
[$T = (A - \alpha + 0.0177\text{ in}) - (B - \beta)$].

T: Thrust needle bearing thickness
A: Distance from the end surface of collar as substitute for ST to multi-plate clutch piston
B: Distance from the mating surface of transmission case to the end surface of collar as substitute for ST
α: Collar thickness used when measuring “A”
β: Collar thickness used when measuring “B”
0.45: Gasket thickness (mm)
- Measure multi-plate clutch driven and drive plate thickness to find the clearance between measurement value and “T”.

Standard value:
0.2 — 0.6 mm (0.008 — 0.024 in)

Limit value:
1.6 mm (0.063 in)

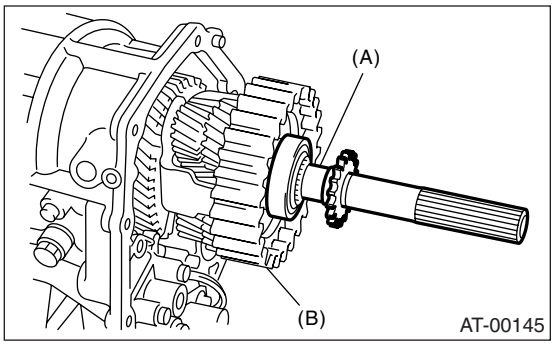
If outside the standard value, replace the plate set (drive and driven plate). Select a multi-plate clutch piston side adjustment plate that will bring clearance within the standard value.

Obtainable driven plates	
Part No.	Thickness mm (in)
31589AA041	1.6 (0.063)
31589AA050	2.0 (0.079)
31589AA060	2.4 (0.094)
31589AA070	2.8 (0.110)

29.Rear Drive Shaft

A: REMOVAL

1) Remove transmission assembly. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
2) Remove rear wheel speed sensor and separate extension case from transmission case. <Ref. to 4AT-75, REMOVAL, Extension Case.>
3) Pull out the rear drive shaft from the center differential assembly.



(A) Rear drive shaft
(B) Center differential carrier

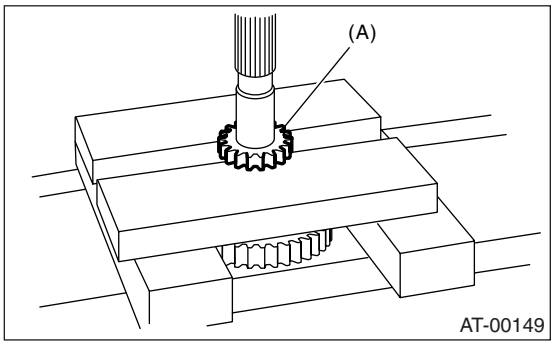
4) Remove drive plate and driven plate.

B: INSTALLATION

1) Select the appropriate shim. <Ref. to 4AT-83, VTD MODEL, ADJUSTMENT, Transfer Clutch.>
2) Install drive plate and driven plate.
3) Insert rear drive shaft into the center differential assembly.
4) Join transmission case and extension case. Install rear wheel speed sensor. <Ref. to 4AT-75, INSTALLATION, Extension Case.>
5) Install transmission assembly. <Ref. to 4AT-39, INSTALLATION, Automatic Transmission Assembly.>

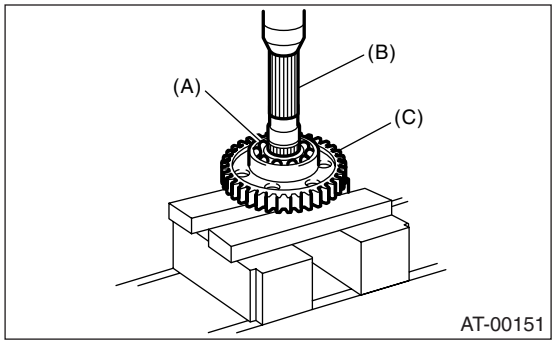
C: DISASSEMBLY

1) Using a press, remove revolution gear.



(A) Revolution gear

2) Using a press, remove the front and rear side ball bearings and clutch hub.

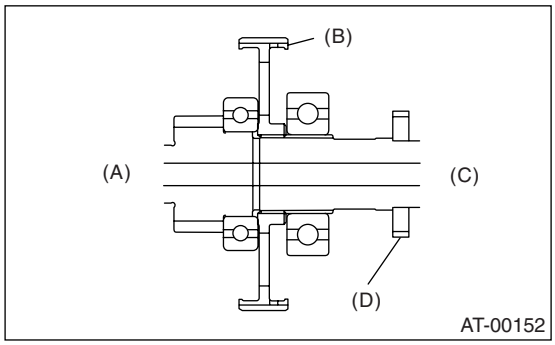


(A) Rear ball bearing
(B) Rear drive shaft
(C) Clutch hub

D: ASSEMBLY

Assemble in the reverse order of disassembly.

NOTE:
• Use a new revolution gear and ball bearings.
• Make sure the clutch hub is oriented in the correct direction.



(A) Front side
(B) Clutch hub
(C) Rear side
(D) Revolution gear

E: INSPECTION

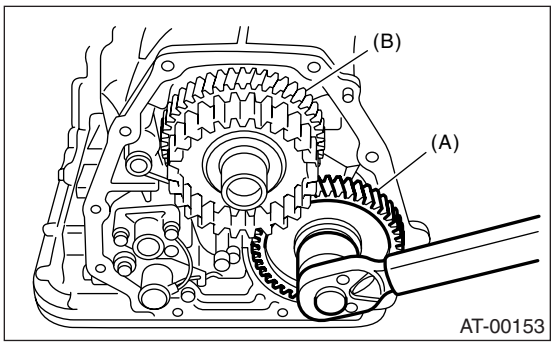
• Inspect parts to make sure there are no holes, cuts, and that they are not dusty.
• Inspect extension end play and adjust it to within the standard value. <Ref. to 4AT-83, VTD MODEL, ADJUSTMENT, Transfer Clutch.>

30.Reduction Driven Gear

A: REMOVAL

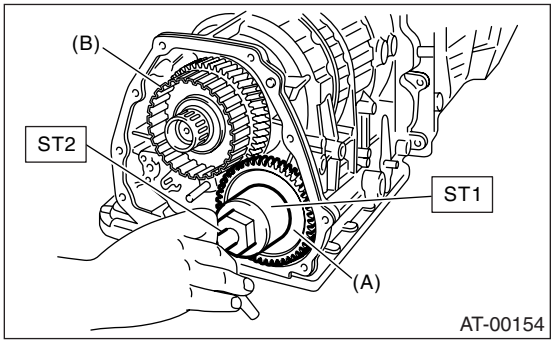
1. MPT MODEL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
2) Remove rear vehicle speed sensor, and separate the transmission case and extension case. <Ref. to 4AT-75, REMOVAL, Extension Case.>
3) Set the range select lever to “P”.
4) Straighten the staked portion, and remove the lock nut.



(A) Reduction driven gear
(B) Reduction drive gear

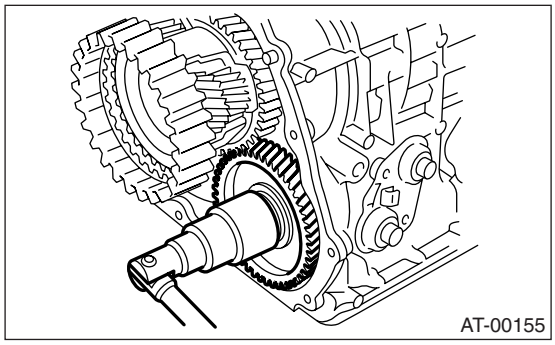
5) Using the ST1 and ST2, extract the reduction driven gear.
ST1 499737000 PULLER
ST2 899524100 PULLER SET



(A) Reduction driven gear
(B) Reduction drive gear

2. VTD MODEL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
2) Remove rear vehicle speed sensor, and separate the transmission case and extension case. <Ref. to 4AT-75, REMOVAL, Extension Case.>
3) Remove the rear drive shaft. <Ref. to 4AT-86, REMOVAL, Rear Drive Shaft.>
4) Set the range select lever to “P”.
5) Straighten the staked portion, and remove the lock nut.



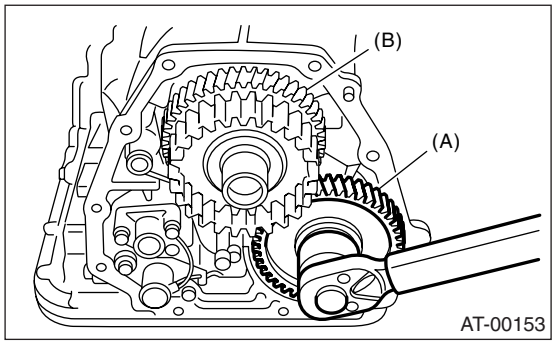
6) Using the ST1 and ST2, extract the reduction driven gear.
ST1 499737000 PULLER
ST2 899524100 PULLER SET
7) Pull out the center differential assembly. <Ref. to 4AT-91, REMOVAL, Center Differential Carrier.>

B: INSTALLATION

1. MPT MODEL

1) Set the select lever to “P” range.
2) Using a plastic hammer, install reduction driven gear assembly and new washer, and tighten new drive pinion lock nut.

Tightening torque:
100 N·m (10.2 kgf-m, 73.8 ft-lb)



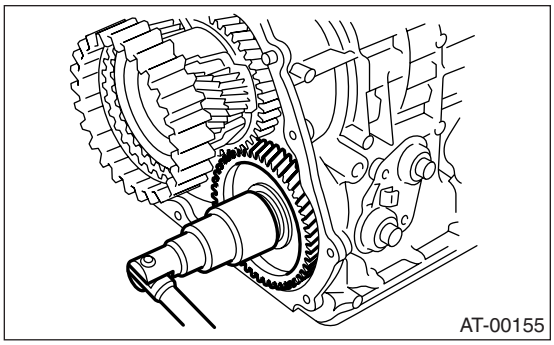
(A) Reduction driven gear
(B) Reduction drive gear

3) After tightening, stake the lock nut securely.
4) Combine the transmission case with the extension case, and install rear vehicle speed sensor. <Ref. to 4AT-75, INSTALLATION, Extension Case.>
5) Install the transmission assembly to vehicle. <Ref. to 4AT-39, INSTALLATION, Automatic Transmission Assembly.>

2. VTD MODEL

1) Set the select lever to “P” range.
2) Using a plastic hammer, install reduction driven gear assembly.
3) Using a plastic hammer, install the center differential assembly.
4) Install a new self-lock nut and a washer.

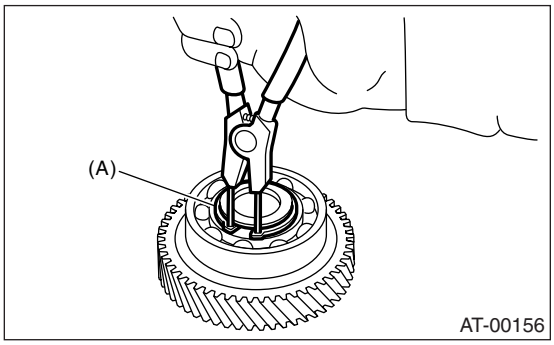
Tightening torque:
100 N·m (10.2 kgf-m, 73.8 ft-lb)



5) After tightening, stake the lock nut securely.
6) Insert the rear drive shaft assembly. <Ref. to 4AT-86, INSTALLATION, Rear Drive Shaft.>
7) Combine the transmission case with the extension case, and install rear vehicle speed sensor. <Ref. to 4AT-75, INSTALLATION, Extension Case.>
8) Install the transmission assembly to vehicle. <Ref. to 4AT-39, INSTALLATION, Automatic Transmission Assembly.>

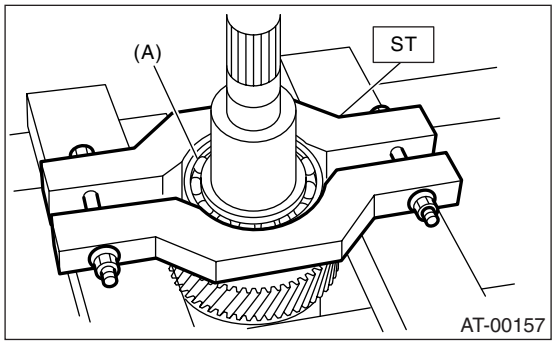
C: DISASSEMBLY

1) Remove snap ring from reduction driven gear.



(A) Snap ring

2) Using ST, remove ball bearing from reduction driven gear.
ST 498077600 REMOVER

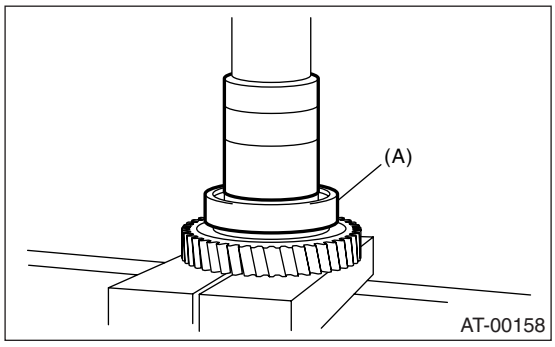


(A) Ball bearing

3) Remove snap ring reduction driven gear.

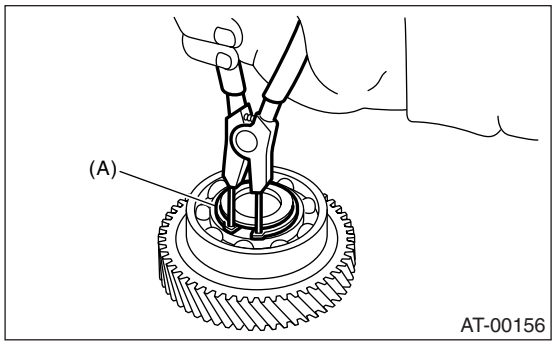
D: ASSEMBLY

1) Install snap ring to reduction driven gear.
2) Using a press, install a new ball bearing to reduction driven gear.



(A) Ball bearing

3) Install snap ring to reduction driven gear.



(A) Snap ring

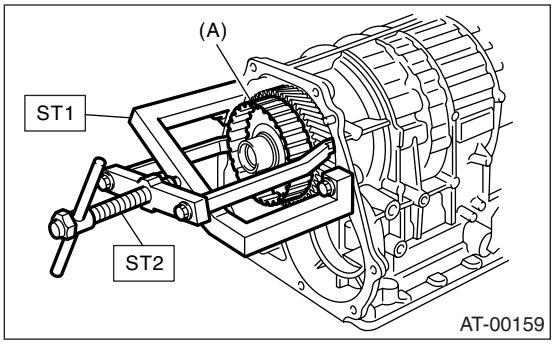
E: INSPECTION

Check ball bearing and gear for dents or damage.

31.Reduction Drive Gear

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
2) Remove rear vehicle speed sensor, and separate the transmission case and extension case. <Ref. to 4AT-75, REMOVAL, Extension Case.>
3) Remove the reduction driven gear. <Ref. to 4AT-87, REMOVAL, Reduction Driven Gear.>
4) Using ST, extract the reduction drive gear.
ST1 499737000 PULLER
ST2 899524100 PULLER SET

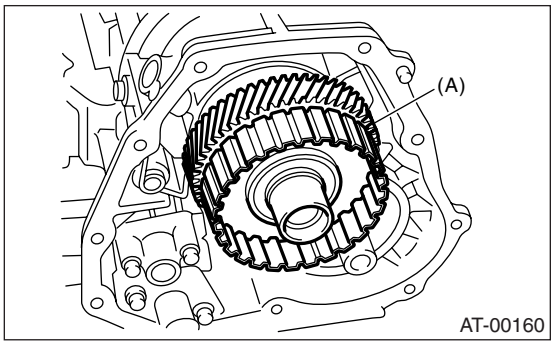


(A) Reduction drive gear

B: INSTALLATION

1) Install the reduction drive gear assembly.

NOTE:
Insert it fully into position until the bearing shoulder bottoms.

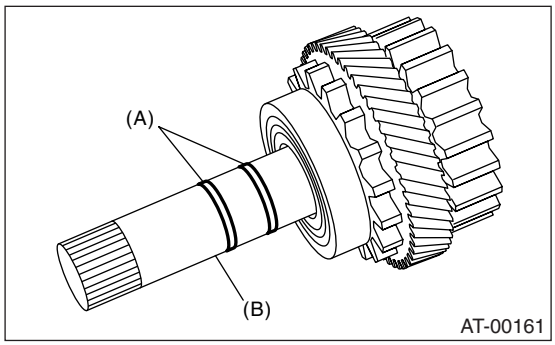


(A) Reduction drive gear

2) Install the reduction driven gear. <Ref. to 4AT-87, INSTALLATION, Reduction Driven Gear.>
3) Combine the transmission case with the extension case, and install rear vehicle speed sensor. <Ref. to 4AT-75, INSTALLATION, Extension Case.>
4) Install the transmission assembly to the vehicle. <Ref. to 4AT-39, INSTALLATION, Automatic Transmission Assembly.>

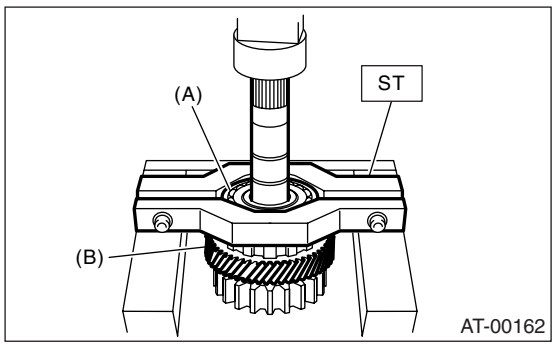
C: DISASSEMBLY

1) Take out the seal rings.



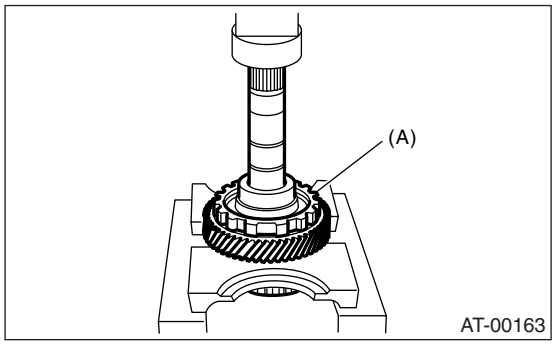
(A) Seal rings
(B) Reduction drive shaft

2) Using ST, remove the ball bearing.
ST 498077600 REMOVER



(A) Ball bearing
(B) Reduction drive gear

3) Using a press, remove the reduction drive gear.

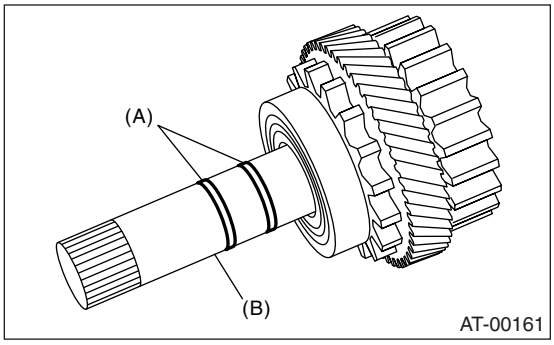


(A) Reduction drive gear

D: ASSEMBLY

1) Press-fit the reduction drive gear to the shaft.
2) Press-fit a new ball bearing to the reduction drive gear.
3) Apply vaseline to the outer surface of seal ring and shaft groove.

4) Attach a new seal rings.



(A) Seal rings
(B) Reduction drive shaft

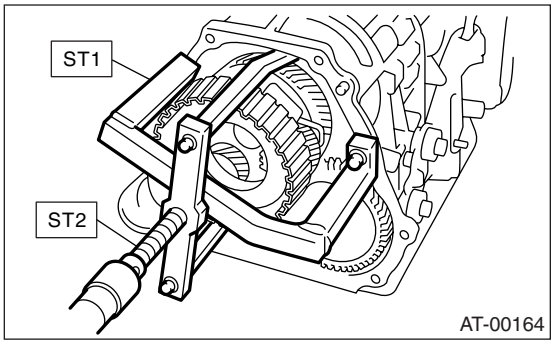
E: INSPECTION

- Rotate the bearing by hand, make sure it rotates smoothly.
- Make sure that each component is free of harmful gouges, cuts, or dust.
- Measure the extension end play and adjust it to within specifications.<Ref. to 4AT-82, ADJUSTMENT, Transfer Clutch.>

32.Center Differential Carrier

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
2) Remove the rear wheel speed sensor, and separate the extension case from the transmission case. <Ref. to 4AT-75, REMOVAL, Extension Case.>
3) Pull out the rear drive shaft. <Ref. to 4AT-86, REMOVAL, Rear Drive Shaft.>
4) Using the special tools, pull out the center differential carrier assembly.
ST1 499737000 PULLER
ST2 899524100 PULLER SET

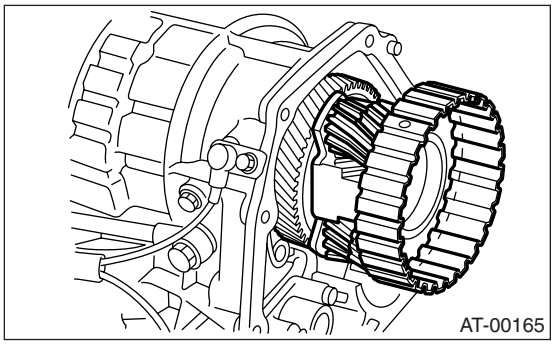


5) Pull out the shim(s) from transmission case.

B: INSTALLATION

1) Install the center differential assembly with the shim(s).

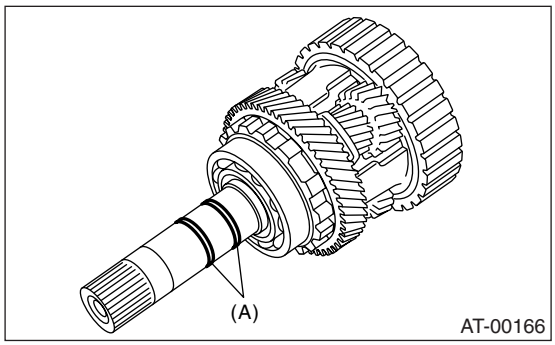
NOTE:
Insert the center differential assembly and shim(s) completely into the bearing shoulder bottom.



2) Insert the rear drive shaft. <Ref. to 4AT-86, INSTALLATION, Rear Drive Shaft.>
3) Connect the transmission case and extension case, and install the rear wheel speed sensor. <Ref. to 4AT-75, INSTALLATION, Extension Case.>
4) Install the transmission assembly onto vehicle. <Ref. to 4AT-39, INSTALLATION, Automatic Transmission Assembly.>

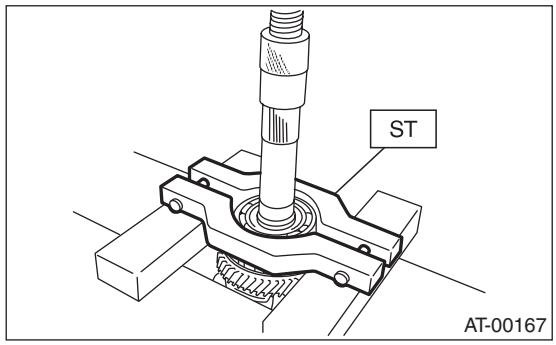
C: DISASSEMBLY

1) Remove the seal rings.

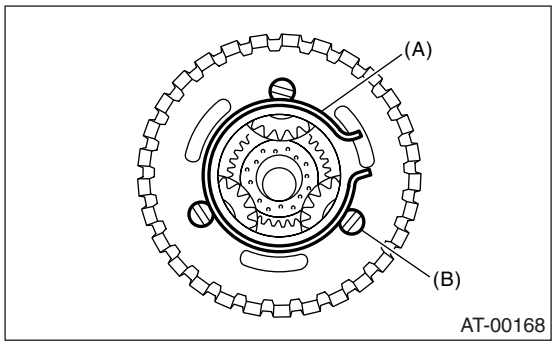


(A) Seal ring

2) Using a press and the ST, remove the ball bearing.
ST 498077600 REMOVER

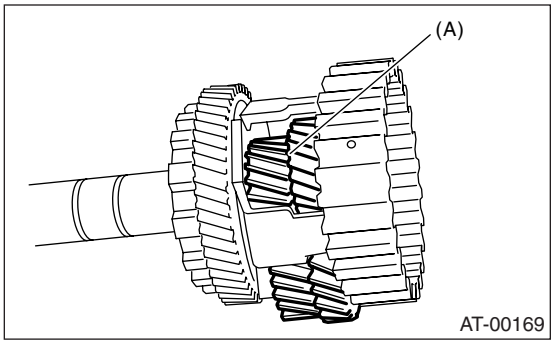


3) Remove the snap ring, and pull out the shaft from the center differential assembly.



(A) Snap ring
(B) Shaft

4) Remove the thrust washers, pinion gears, and washers from the center differential assembly.

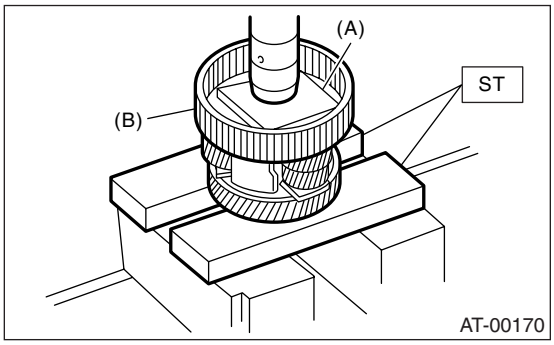


(A) Pinion gear

5) Pull out the intermediate shaft and thrust bearing.

D: ASSEMBLY

1) Install the thrust washer onto the intermediate shaft.
2) Install thrust bearing onto the intermediate shaft.
3) Install the pinion gears and washers.
4) Insert the shaft into the center differential assembly.
5) Install the snap ring.
6) Using a press, install a new ball bearing into the center differential assembly.
ST 498077000 REMOVER



(A) Plate
(B) Center differential carrier

7) Apply Vaseline onto the seal ring outer surface and shaft grooves.
8) Install new seal rings.

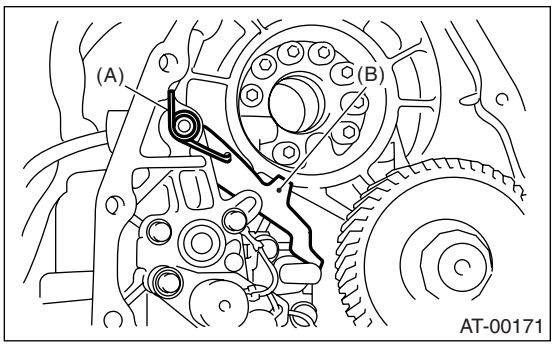
E: INSPECTION

- Check all parts for hole, score, or dirt.
- Check the play of the extension end, and if necessary, adjust it. <Ref. to 4AT-83, VTD MODEL, ADJUSTMENT, Transfer Clutch.>

33.Parking Pawl

A: REMOVAL

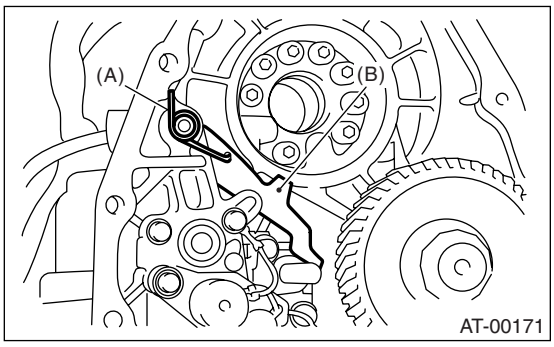
1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
2) Remove rear vehicle speed sensor and separate transmission case and extension case sections. <Ref. to 4AT-75, REMOVAL, Extension Case.>
3) Remove the reduction drive gear. (MPT model) <Ref. to 4AT-89, REMOVAL, Reduction Drive Gear.>
4) Remove the center differential carrier. (VTD model) <Ref. to 4AT-91, REMOVAL, Center Differential Carrier.>
5) Remove the parking pawl, return spring and shaft.



(A) Return spring
(B) Parking pawl

B: INSTALLATION

1) Install the parking pawl, shaft and return spring.



(A) Return spring
(B) Parking pawl

2) Install the reduction drive gear. <Ref. to 4AT-89, INSTALLATION, Reduction Drive Gear.>
3) Install the center differential carrier. (VTD model) <Ref. to 4AT-91, INSTALLATION, Center Differential Carrier.>
4) Install the rear vehicle speed sensor and extension case. <Ref. to 4AT-75, INSTALLATION, Extension Case.>
5) Install the transmission assembly to the vehicle. <Ref. to 4AT-39, INSTALLATION, Automatic Transmission Assembly.>

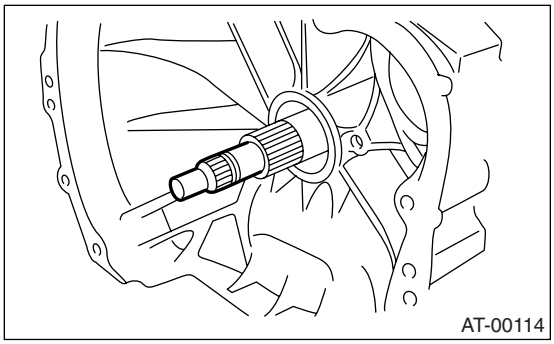
C: INSPECTION

Make sure that the tab of the packing pole on the reduction gear is not worn or otherwise damaged.

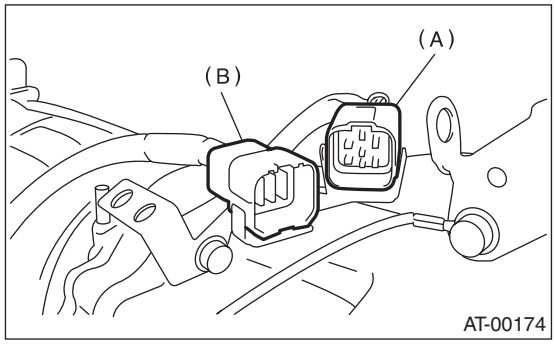
34. Torque Converter Clutch Case

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
2) Extract the torque converter clutch assembly. <Ref. to 4AT-74, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.



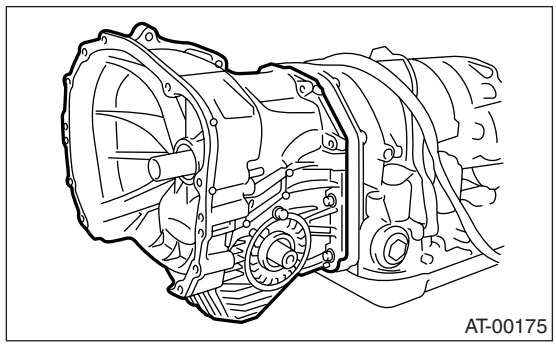
4) Lift-up lever behind the connector and disconnect it from stay.
5) Disconnect inhibitor switch connector from stay.



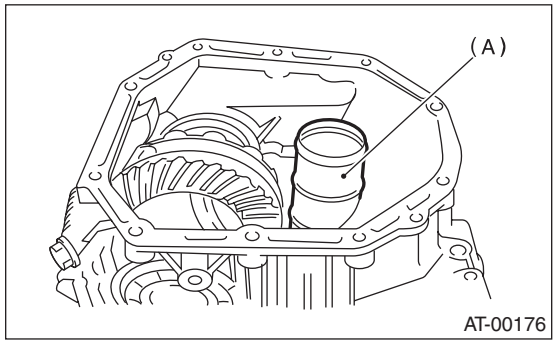
(A) Transmission harness
(B) Inhibitor switch harness

6) Remove the oil charger pipe. <Ref. to 4AT-73, REMOVAL, Oil Charger Pipe.>
7) Remove the oil cooler inlet and outlet pipes. <Ref. to 4AT-69, REMOVAL, ATF Cooler Pipe and Hose.>
8) Lightly tapping the torque converter clutch case with plastic hammer, separate the transmission case and torque converter clutch case.

NOTE:
• Be careful not to damage the oil seal and bushing inside the torque converter clutch case by the oil pump cover.
• Be careful not to lose the rubber seal.



9) Remove the seal pipe if it is attached. (Reusing is not allowed.)

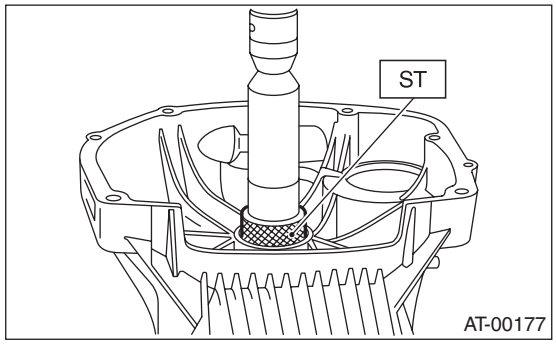


(A) Seal pipe

10) Remove the differential assembly. <Ref. to 4AT-107, REMOVAL, Front Differential.>
11) Remove the oil seal from torque converter clutch case.

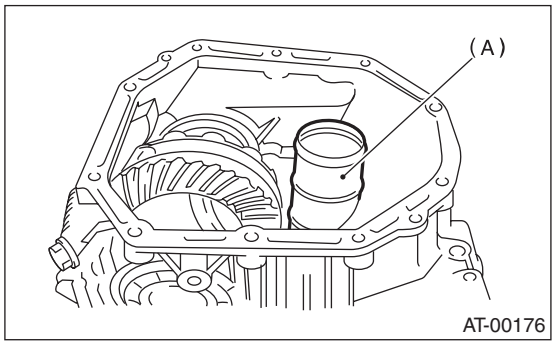
B: INSTALLATION

1) Check the appearance of each component and clean.
2) Force-fit the oil seal to the torque converter clutch case with ST.
ST 398437700 DRIFT



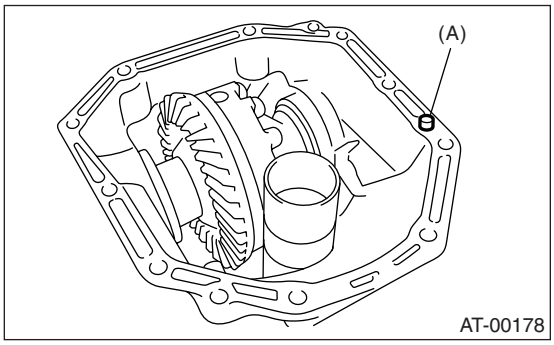
3) Install the differential assembly to the case. <Ref. to 4AT-107, INSTALLATION, Front Differential.>
4) Install the left and right side retainers. <Ref. to 4AT-111, ADJUSTMENT, Front Differential.>

5) Install the new seal pipe to the torque converter clutch case.



(A) Seal pipe

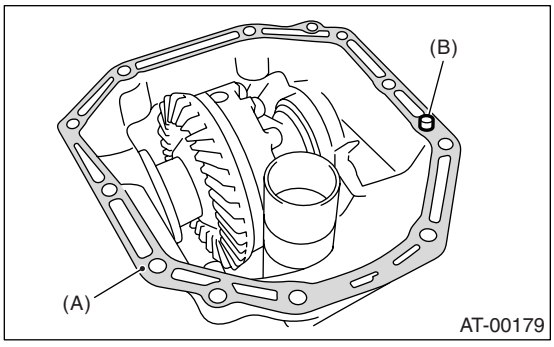
6) Install the rubber seal to the torque converter clutch case.



(A) Rubber seal

7) Apply proper amount of liquid gasket to the entire torque converter clutch case mating surface.

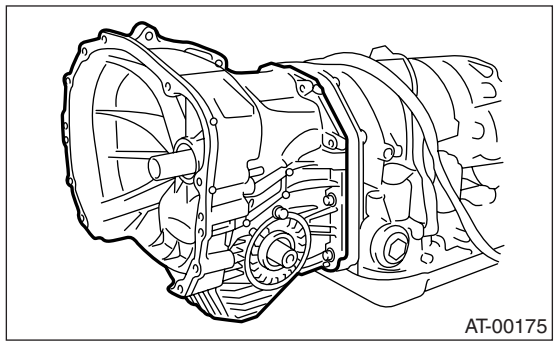
Liquid gasket:
THREE BOND 1215 (Part No. 004403007)



(A) THREE BOND 1215
(B) Rubber seal

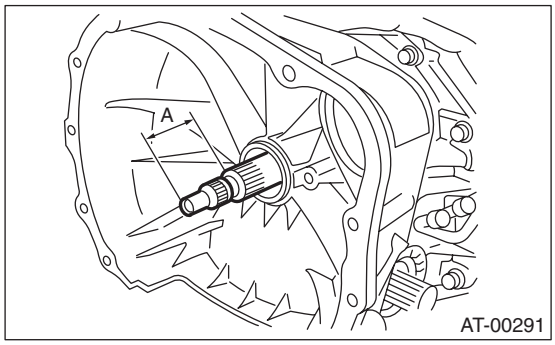
8) Install the torque converter clutch case assembly without damaging bush and oil seal and secure with six bolts and four nuts.

Tightening torque:
41 N·m (4.2 kgf-m, 30.4 ft-lb)



9) Insert inhibitor switch and transmission connector into stay.
10) Install air breather hose. <Ref. to 4AT-72, INSTALLATION, Air Breather Hose.>
11) Install the oil cooler pipes. <Ref. to 4AT-70, INSTALLATION, ATF Cooler Pipe and Hose.>
12) Install the oil charger pipe with O-ring. <Ref. to 4AT-73, INSTALLATION, Oil Charger Pipe.>
13) Insert the input shaft while turning lightly by hand and verify the protrusion amount.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



14) Install the torque converter clutch assembly. <Ref. to 4AT-74, INSTALLATION, Torque Converter Clutch Assembly.>
15) Install the transmission assembly to the vehicle. <Ref. to 4AT-39, INSTALLATION, Automatic Transmission Assembly.>

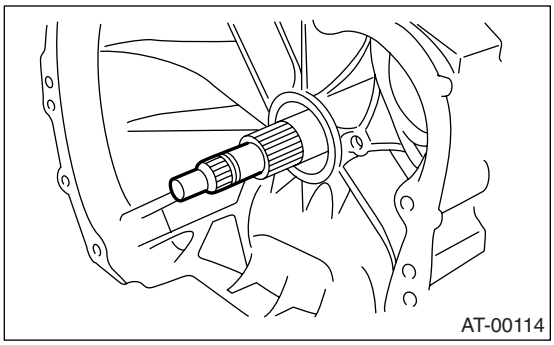
C: INSPECTION

Measure the backlash and adjust to within specifications. <Ref. to 4AT-104, ADJUSTMENT, Drive Pinion Shaft.>

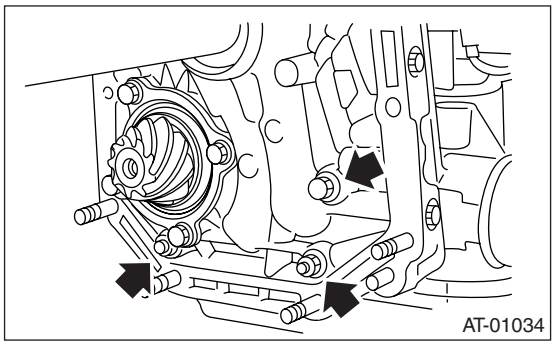
35.Oil Pump Housing

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
2) Extract the torque converter clutch assembly. <Ref. to 4AT-74, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.

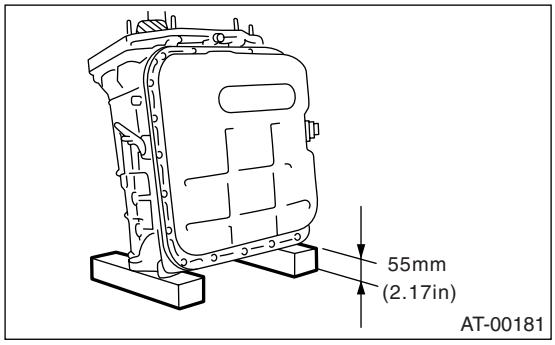


4) Lift-up the lever behind the transmission harness connector and disconnect it from stay.
5) Disconnect the inhibitor switch connector from stay.
6) Remove the oil charger pipe. <Ref. to 4AT-73, REMOVAL, Oil Charger Pipe.>
7) Remove the oil cooler inlet and outlet pipes. <Ref. to 4AT-69, REMOVAL, ATF Cooler Pipe and Hose.>
8) Separate the torque converter clutch case and transmission case sections. <Ref. to 4AT-94, REMOVAL, Torque Converter Clutch Case.>
9) Separate the transmission case and extension case sections. <Ref. to 4AT-75, REMOVAL, Extension Case.>
10) Remove the reduction drive gear. (MPT model) <Ref. to 4AT-89, REMOVAL, Reduction Drive Gear.>
11) Remove the center differential carrier. (VTD model) <Ref. to 4AT-91, REMOVAL, Center Differential Carrier.>
12) Remove the reduction driven gear. <Ref. to 4AT-87, REMOVAL, Reduction Driven Gear.>
13) Loosen the oil pump housing mounting bolts.

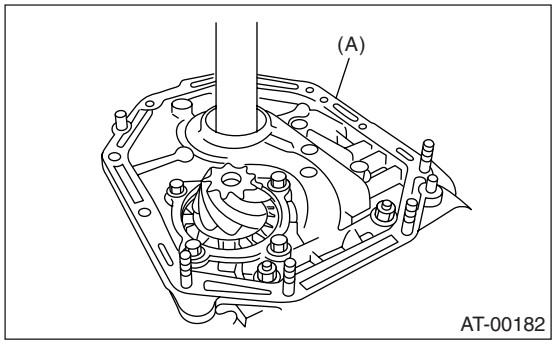


14) Place two wooden blocks on the workbench, and stand the transmission case with its rear end facing down.

NOTE:
• Be careful not to scratch the rear mating surface of the transmission case.
• Note that the parking rod and drive pinion protrude from the mating surface.



15) Remove the oil pump housing and adjusting thrust washer.

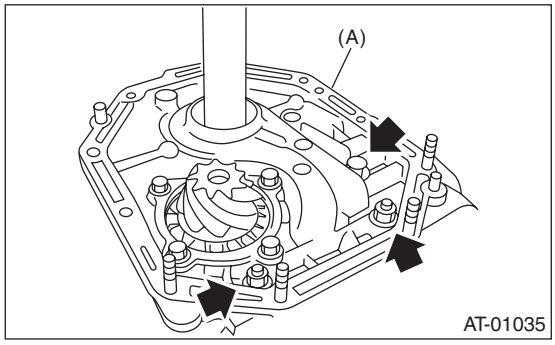


(A) Oil pump housing

B: INSTALLATION

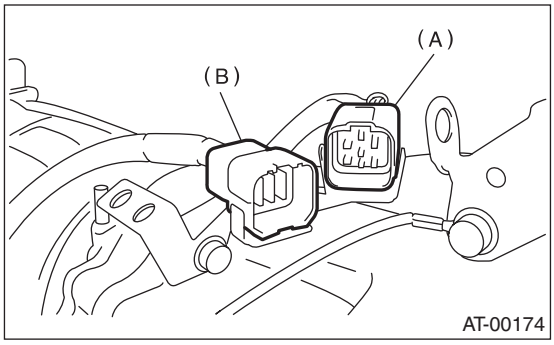
1) Secure the oil pump housing with two nuts and the bolt.

Tightening torque:
42 N·m (4.3 kgf-m, 31 ft-lb)



(A) Oil pump housing

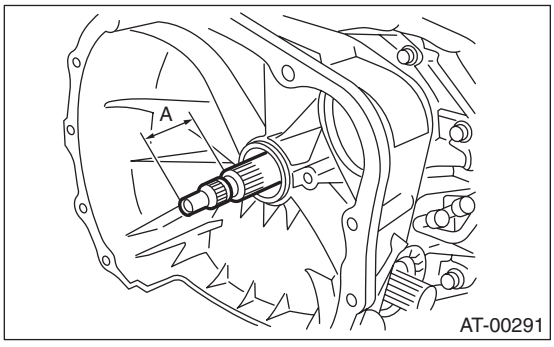
2) Install the torque converter clutch case assembly to the transmission case assembly. <Ref. to 4AT-74, INSTALLATION, Torque Converter Clutch Assembly.>
3) Install reduction driven gear. <Ref. to 4AT-87, INSTALLATION, Reduction Driven Gear.>
4) Install the reduction drive gear. (MPT model) <Ref. to 4AT-89, INSTALLATION, Reduction Drive Gear.>
5) Install the center differential carrier. (VTD model) <Ref. to 4AT-91, INSTALLATION, Center Differential Carrier.>
6) Combine the extension case with the transmission case, and install vehicle speed sensor 1 (rear). <Ref. to 4AT-75, INSTALLATION, Extension Case.>
7) Insert inhibitor switch and transmission connector into stay.



(A) Transmission harness
(B) Inhibitor switch harness

8) Install the oil cooler pipe. <Ref. to 4AT-70, INSTALLATION, ATF Cooler Pipe and Hose.>
9) Install the oil charger pipe with O-ring. <Ref. to 4AT-73, INSTALLATION, Oil Charger Pipe.>
10) Insert the input shaft while turning lightly by hand and verify the protrusion amount.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)

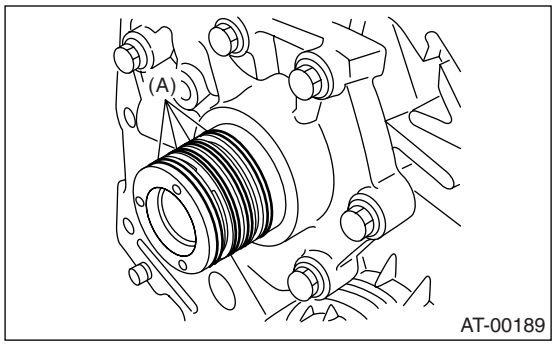


11) Install the torque converter clutch assembly. <Ref. to 4AT-74, INSTALLATION, Torque Converter Clutch Assembly.>
12) Install the transmission assembly to the vehicle. <Ref. to 4AT-39, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

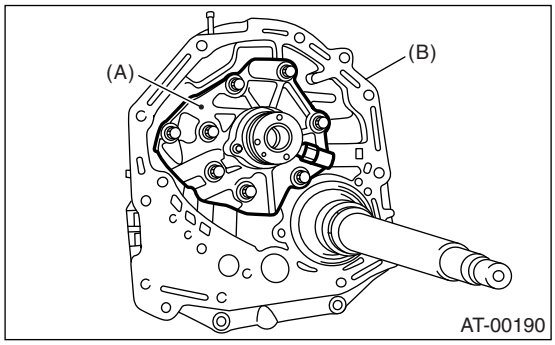
1. OIL PUMP COVER

1) Remove four seal rings.



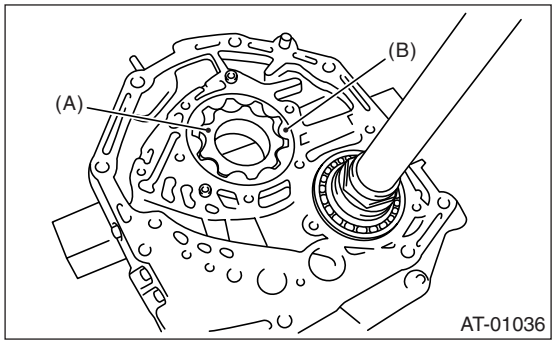
(A) Seal rings

2) Lightly tap the end of the stator shaft to remove the cover.



(A) Oil pump cover
(B) Oil pump housing

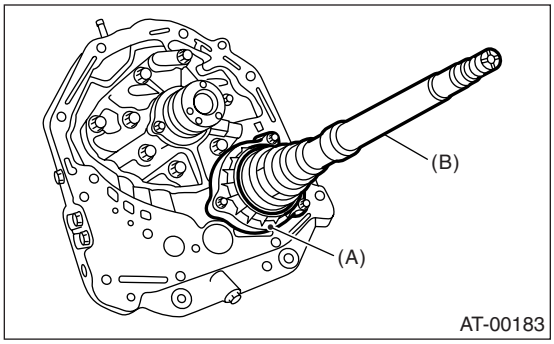
3) Remove the inner and outer rotor.



(A) Inner rotor
(B) Outer rotor

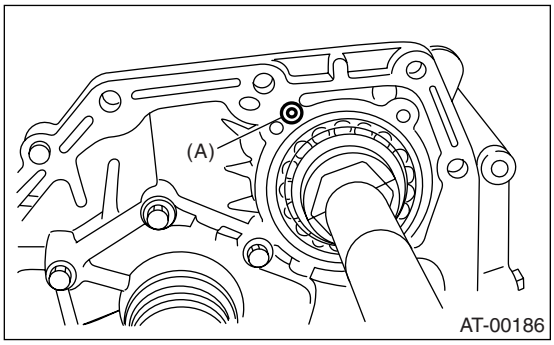
2. OIL SEAL RETAINER

1) Remove the oil seal retainer.



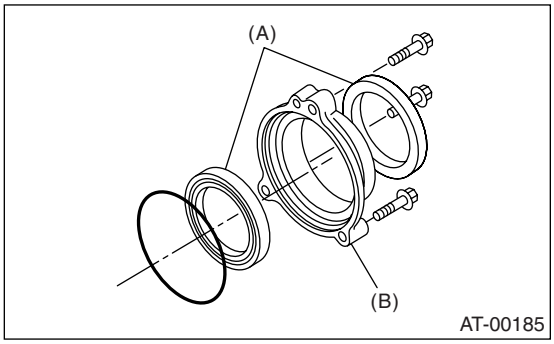
(A) Oil seal retainer
(B) Drive pinion shaft

2) Remove the O-ring.



(A) O-ring

3) Remove the oil seal from oil seal retainer.

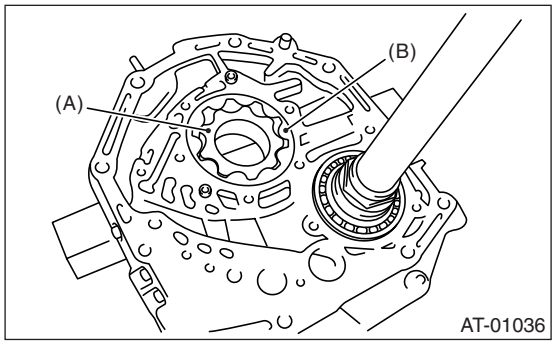


(A) Oil seal
(B) Oil seal retainer

D: ASSEMBLY

1. OIL PUMP COVER

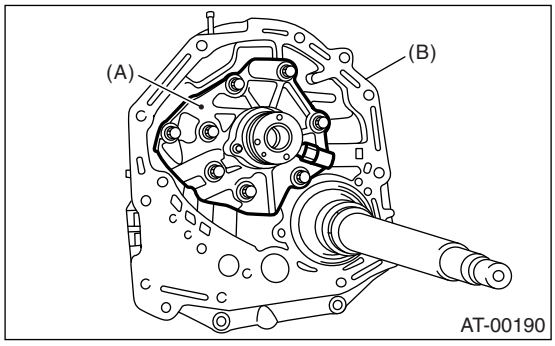
1) Install oil pump rotor assembly to oil pump housing.



(A) Inner rotor
(B) Outer rotor

2) Align both pivots with the pivot holes of the cover, and install the oil pump cover being careful not to apply undue force to the pivots.

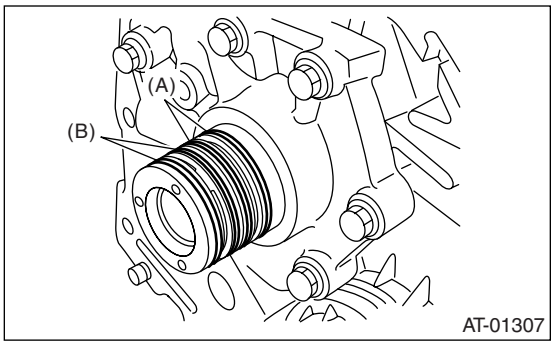
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Oil pump cover
(B) Oil pump housing

3) After assembling, turn the oil pump shaft to check for smooth rotation of the rotor.

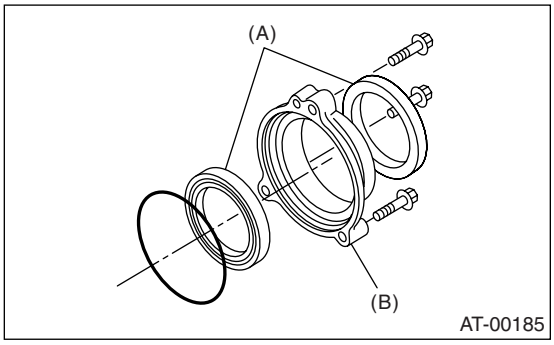
4) Install the oil seal retainer and new seal rings. After adjusting the drive pinion backlash and tooth contact. <Ref. to 4AT-100, ADJUSTMENT, Oil Pump Housing.>



(A) Seal rings (Black)
(B) Seal rings (Brown)

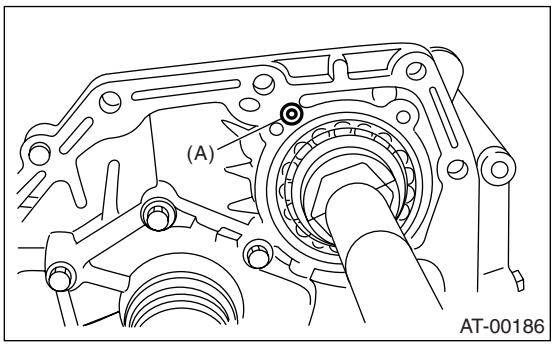
2. OIL SEAL RETAINER

1) Install two new oil seals to the oil seal retainer in proper position using ST.



(A) Oil seal
(B) Oil seal retainer

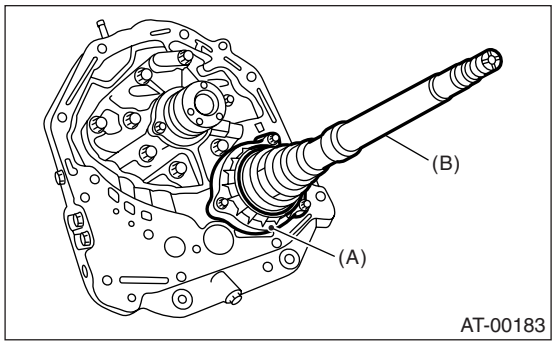
2) Install a new O-ring to the oil seal retainer using vaseline. Install the seal to oil pump housing bore.



(A) O-ring

3) Install the oil seal and secure it using three bolts being careful not to damage oil seal lip.

Tightening torque:
7 N·m (0.7 kgf-m, 5.1 ft-lb)

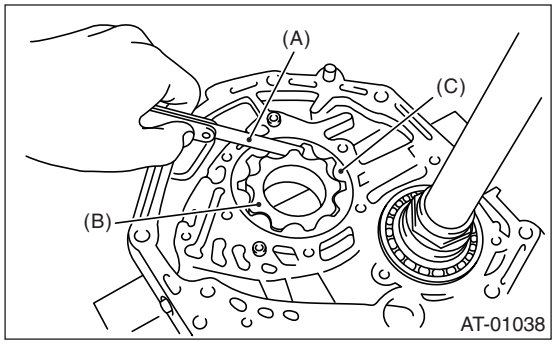


(A) Oil seal retainer
(B) Drive pinion shaft

E: INSPECTION

1) Check seal ring and O-ring oil seal for breaks or damage.
2) Check other parts for dents or abnormalities.
3) Selection of oil pump rotor assembly
(1) Tip clearance
Install inner rotor and outer rotor to oil pump. With rotor gears facing each other, measure crest-to-crest clearance.

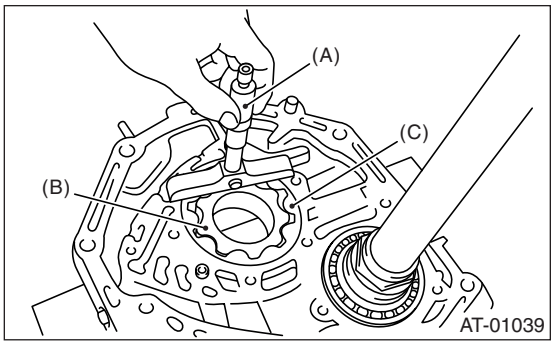
Tip clearance:
0.02 — 0.15 mm (0.0008 — 0.0059 in)



(A) Thickness gauge
(B) Inner rotor
(C) Outer rotor

(2) Side clearance
Set a depth gauge to oil pump housing, then measure oil pump housing-to-rotor clearances.

Side clearance:
0.02 — 0.04 mm (0.0008 — 0.0016 in)



(A) Depth gauge
(B) Inner rotor
(C) Outer rotor

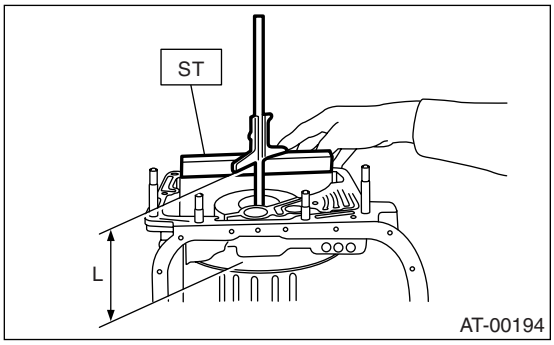
(3) If depth and/or side clearances are outside specifications, replace rotor assembly.

Oil pump rotor assembly	
Part No.	Thickness mm (in)
15008AA060	11.37 — 11.38 (0.4476 — 0.4480)
15008AA070	11.38 — 11.39 (0.4480 — 0.4484)
15008AA080	11.39 — 11.40 (0.4484 — 0.4488)

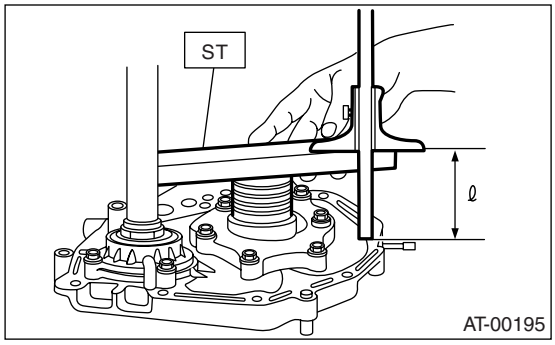
Measure the total end play and adjust to within specifications. <Ref. to 4AT-100, ADJUSTMENT, Oil Pump Housing.>

F: ADJUSTMENT

1) Using the ST, measure the distance from the end surface of ST to the recessed portion “L” of the high clutch drum.
ST 398643600 GAUGE

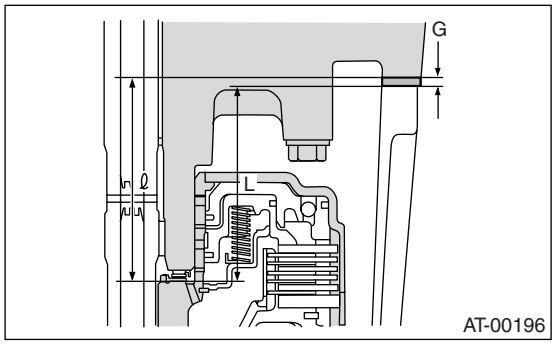


2) Using the ST, measure the distance from the oil pump housing mating surface to the end surface of ST.
ST 398643600 GAUGE



3) Calculation of total end play
Select suitable bearing race from among those listed in this table so that clearance C is in the 0.25 to 0.55 mm (0.0098 to 0.0217 in) range.
$C = (L + G) - \ell$

C	Clearance between concave portion of high clutch and end of clutch drum support
L	Length from case mating surface to concave portion of high clutch
G	Gasket thickness [0.28 mm (0.0110 in)]
ℓ	Height from housing mating surface to upper surface of clutch drum support



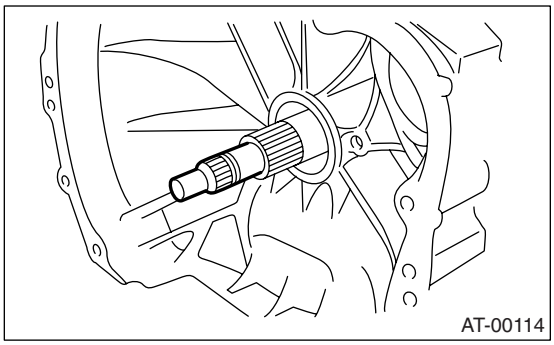
Thrust needle bearing	
Part No.	Thickness mm (in)
806528050	4.1 (0.161)
806528060	4.3 (0.169)
806528070	4.5 (0.177)
806528080	4.7 (0.185)
806528090	4.9 (0.193)
806528100	5.1 (0.201)

4) After completing end play adjustment, insert the bearing race in the recess of the high clutch. Attach the thrust needle bearing to the oil pump cover with vaseline.
5) After correctly installing the new gasket to the case mating surface, carefully install the oil pump housing assembly. Be careful to avoid hitting the drive pinion against the inside of the case.
6) Install both parts with dowel pins aligned. Make sure no clearance exists at the mating surface.

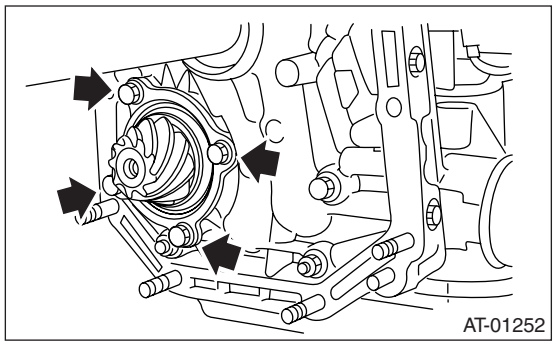
36.Drive Pinion Shaft

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
2) Extract the torque converter clutch assembly. <Ref. to 4AT-74, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.



4) Lift-up the lever behind the transmission harness connector and disconnect it from stay.
5) Disconnect the inhibitor switch connector from stay.
6) Disconnect the air breather hose. <Ref. to 4AT-72, REMOVAL, Air Breather Hose.>
7) Remove the oil charger pipe. <Ref. to 4AT-73, REMOVAL, Oil Charger Pipe.>
8) Remove the oil cooler inlet and outlet pipes. <Ref. to 4AT-69, REMOVAL, ATF Cooler Pipe and Hose.>
9) Separate the torque converter clutch case and transmission case sections. <Ref. to 4AT-94, REMOVAL, Torque Converter Clutch Case.>
10) Separate the transmission case and extension case sections. <Ref. to 4AT-75, REMOVAL, Extension Case.>
11) Remove the reduction drive gear. (MPT model) <Ref. to 4AT-89, REMOVAL, Reduction Drive Gear.>
12) Remove the center differential carrier. (VTD model) <Ref. to 4AT-91, REMOVAL, Center Differential Carrier.>
13) Remove the reduction driven gear.
<Ref. to 4AT-87, REMOVAL, Reduction Driven Gear.>
14) Remove the drive pinion shaft mounting bolt and remove the drive shaft assembly from oil pump housing.

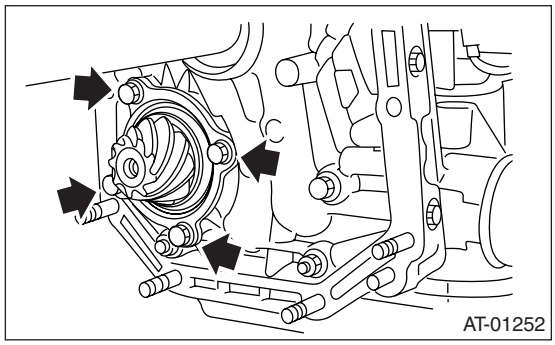


B: INSTALLATION

1) Assemble the drive pinion assembly to the oil pump housing.

NOTE:
- Pay attention not to bend the shim.
- Pay attention not to press the pinion into housing bore.

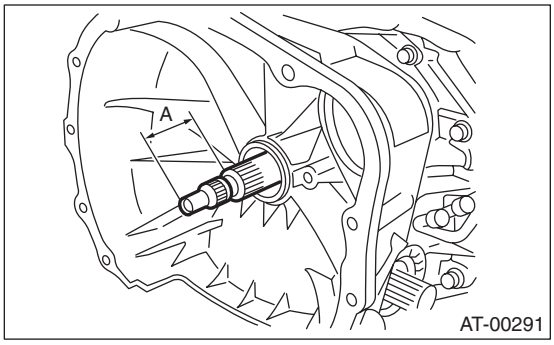
Tightening torque:
40 N·m (4.0 kgf-m, 30 ft-lb)



2) Combine the torque converter case with the transmission case. <Ref. to 4AT-94, INSTALLATION, Torque Converter Clutch Case.>
3) Install the reduction driven gear.
<Ref. to 4AT-87, INSTALLATION, Reduction Driven Gear.>
4) Install the reduction drive gear. (MPT model) <Ref. to 4AT-89, INSTALLATION, Reduction Drive Gear.>
5) Install the center differential carrier. (VTD model) <Ref. to 4AT-91, INSTALLATION, Center Differential Carrier.>
6) Combine the extension case with the transmission case, and install vehicle speed sensor 1 (rear). <Ref. to 4AT-75, INSTALLATION, Extension Case.>
7) Insert inhibitor switch and transmission connector into stay.
8) Install the oil cooler inlet and outlet pipes. <Ref. to 4AT-70, INSTALLATION, ATF Cooler Pipe and Hose.>

9) Install the oil charger pipe with O-ring.
10) Insert the input shaft while turning lightly by hand and verify the protrusion amount.

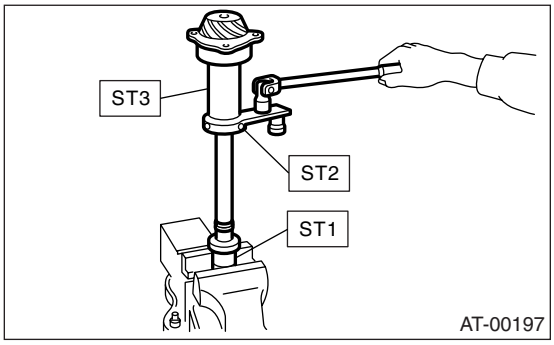
Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



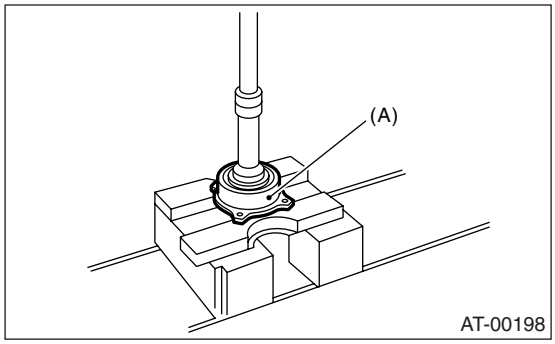
11) Install the torque converter clutch assembly. <Ref. to 4AT-74, INSTALLATION, Torque Converter Clutch Assembly.>
12) Install the transmission assembly to vehicle. <Ref. to 4AT-39, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

1) Straighten the staked portion of the lock nut, and remove the lock nut while locking the rear spline portion of the shaft with ST1 and ST2. Then pull off the drive pinion collar.
ST1 498937110 HOLDER
ST2 499787700 WRENCH
ST3 499787500 ADAPTER

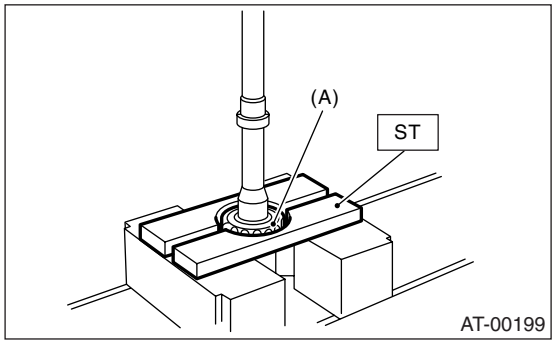


2) Remove the O-ring.
3) Using a press, separate the rear roller bearing and outer race from the shaft.



(A) Outer race

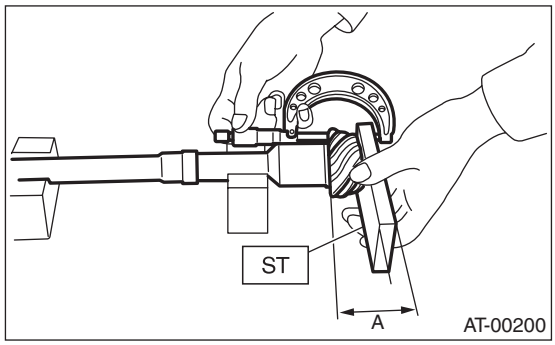
4) Using a press and ST, separate the front roller bearing from the shaft.
ST 498517000 REPLACER



(A) Front roller bearing

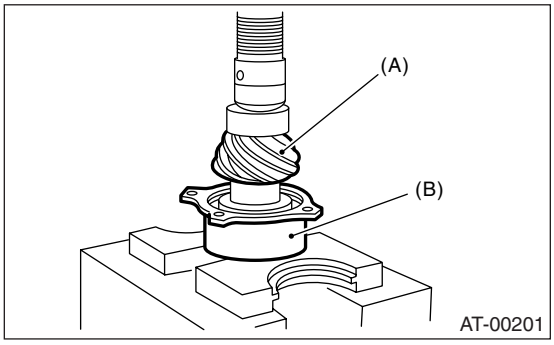
D: ASSEMBLY

1) Measure dimension “A” of the drive pinion shaft.
ST 398643600 GAUGE



2) Using a press, force-fit a new roller bearing in position.

NOTE:
If too much pressure is applied, the roller bearing will not turn easily.



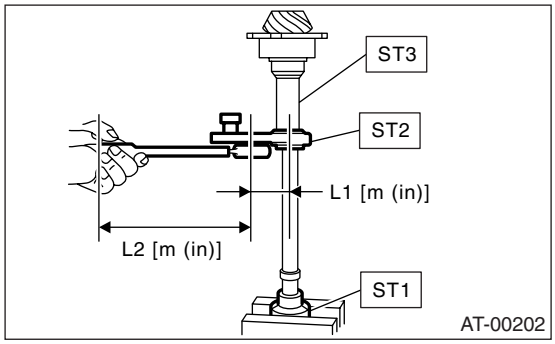
(A) Drive pinion shaft
(B) Roller bearing

3) After fitting a new O-ring to the shaft, attach the drive pinion collar to the shaft.
4) Install the lock washer to drive pinion shaft in proper direction.
5) Tighten a new lock nut with ST1, ST2 and ST3.
Calculate lock washer and lock nut specifications using the following formula.
T2 = L2/(L1 + L2) × T1
T1: 116 N·m (11.8 kgf-m, 85.3 ft-lb)
[Required torque setting]
T2: Tightening torque
L1: ST2 length 0.072 m (2.83 in)
L2: Torque wrench length
Example:

Torque wrench length m (in)	Tightening torque 2 (kgf-m, ft-lb)
0.4 (15.75)	98 (10.0, 72)
0.45 (17.72)	100 (10.2, 73.8)
0.5 (19.69)	101 (10.3, 74.5)
0.55 (21.65)	102 (10.4, 75)

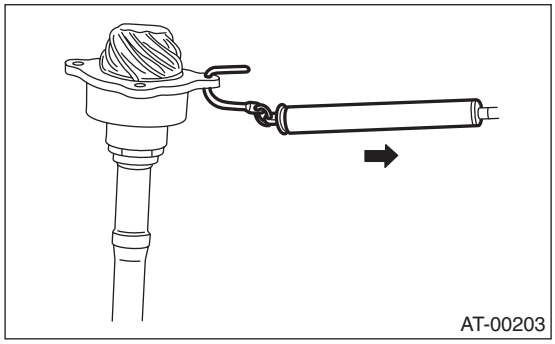
ST1 498937110 HOLDER
ST2 499787700 WRENCH
ST3 499787500 ADAPTER

NOTE:
Install ST2 to torque wrench as straight as possible.

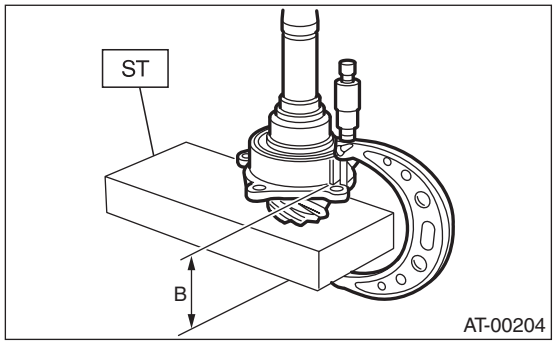


6) Measure the starting torque of the bearing. Make sure the starting torque is within the specified range. If out of the allowable range, replace the roller bearing.

Starting torque:
7.6 — 38.1 N (0.776 — 3.88 kgf, 1.7 — 8.6 lb)



7) Stake the lock nut securely at two places.
8) Measure dimension “B” of the drive pinion shaft.
ST 398643600 GAUGE



9) The thickness “t” (mm) of the drive pinion shim.
t = 6.5±0.0625 − (B − A)

10) Select three or less shims from following table.

Available drive pinion shims	
Part No.	Thickness mm (in)
31451AA050	0.150 (0.0059)
31451AA060	0.175 (0.0069)
31451AA070	0.200 (0.0079)
31451AA080	0.225 (0.0089)
31451AA090	0.250 (0.0098)
31451AA100	0.275 (0.0108)

E: INSPECTION

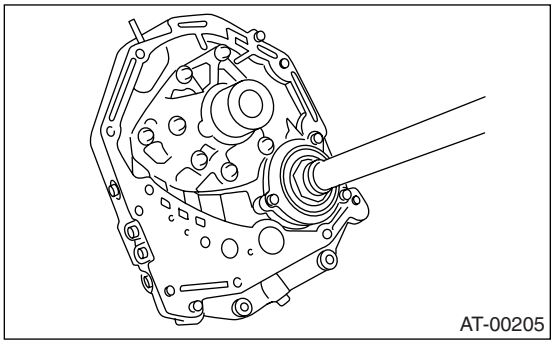
• Make sure that all component parts are free of harmful cuts, gouges, and other faults.
• Adjust the teeth alignment. <Ref. to 4AT-104, ADJUSTMENT, Drive Pinion Shaft.>

F: ADJUSTMENT

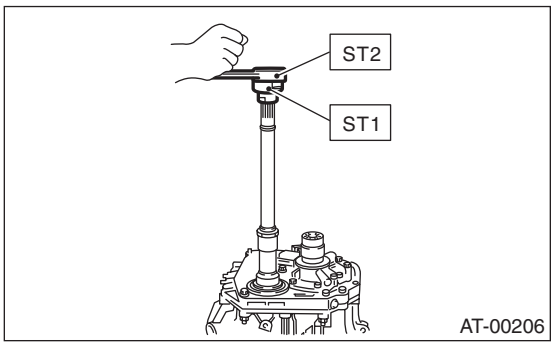
1) Thoroughly remove the liquid gasket from the case mating surface beforehand.
2) Install the oil pump housing assembly to the torque converter clutch case, and secure evenly by tightening four bolts.

NOTE:
Use an old gasket or an aluminum washer so as not to damage the mating surface of the housing.

Tightening torque:
41 N·m (4.2 kgf-m, 30.4 ft-lb)

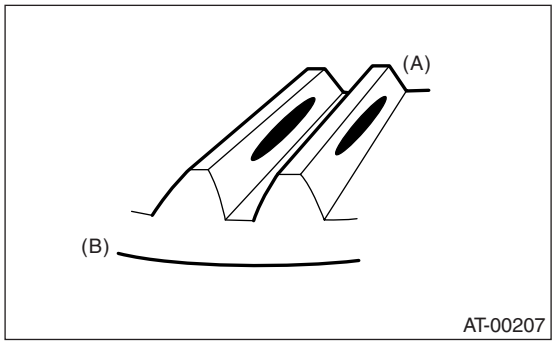

AT-00205

3) Rotate the drive pinion several times with ST1 and ST2.
ST1 498937110 HOLDER
ST2 499787700 WRENCH



AT-00206

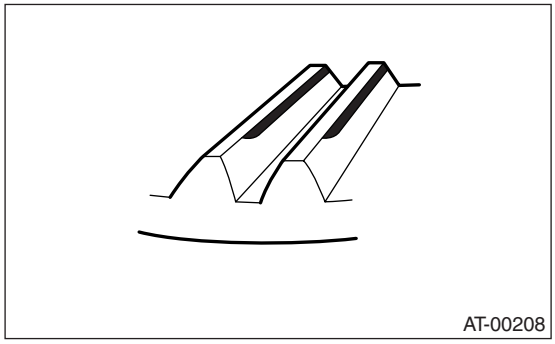
4) Adjust the backlash between drive pinion and crown gear. <Ref. to 4AT-111, ADJUSTMENT, Front Differential.>
5) Apply red lead evenly to the surfaces of three or four teeth of the crown gear. Rotate the drive pinion in the forward and reverse directions several times. Then remove the oil pump housing, and check the tooth contact pattern.
If tooth contact is improper, readjust the backlash or shim thickness.<Ref. to 4AT-111, ADJUSTMENT, Front Differential.>
• Tooth contact
Checking item:Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. [When loaded, contact pattern moves toward heel.]



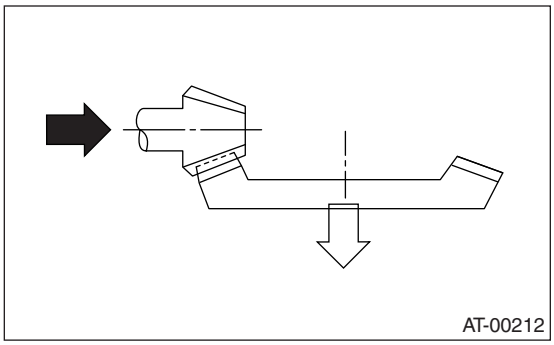
AT-00207

(A) Toe side
(B) Heel side

• Face contact
Checking item: Backlash is too large.
Contact pattern

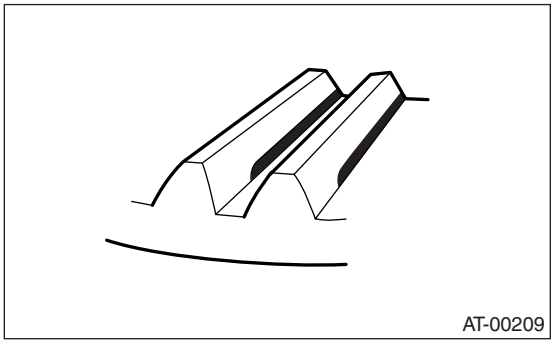

AT-00208

Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.

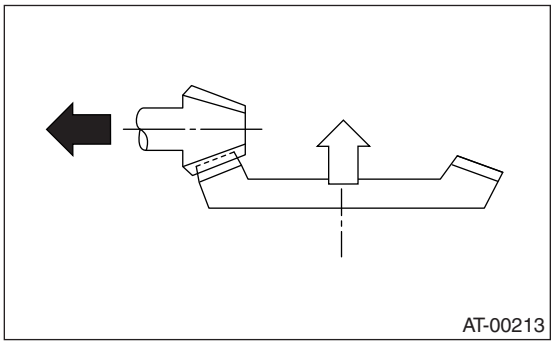


- Flank contact

Checking item: Backlash is too small.
Contact pattern

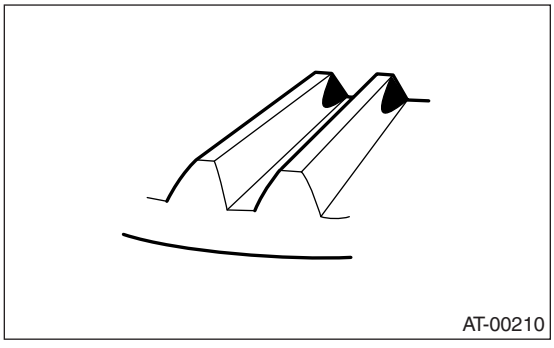


Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.

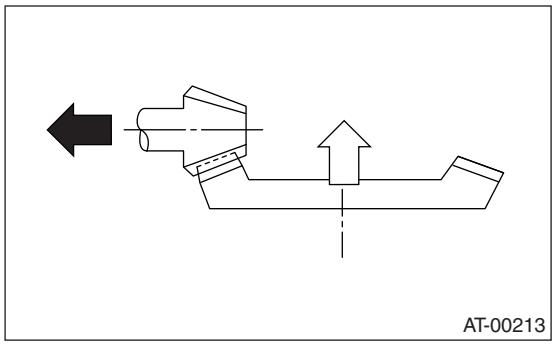


- Toe contact (Inside end contact)

Checking item: Contact areas is small.
Contact pattern

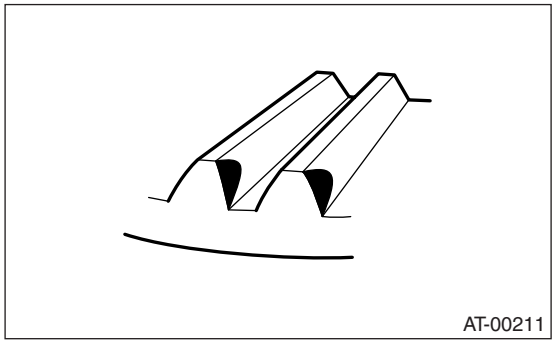


Corrective action: Decrease thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.

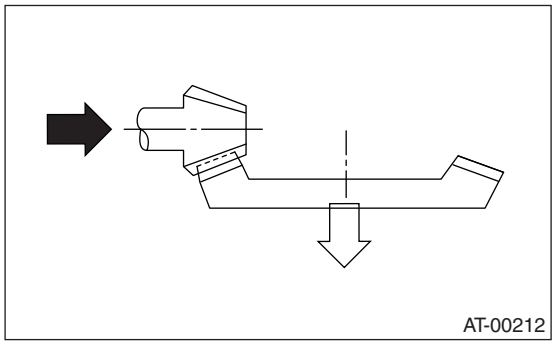


- Heel contact (Outside end contact)

Checking item: Contact areas is small.
Contact pattern

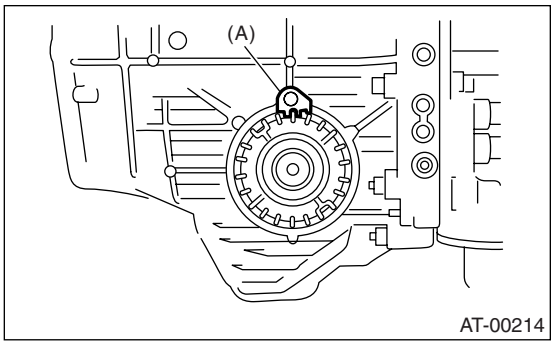


Corrective action: Increase thickness of drive pinion height adjusting shim in order to move drive pinion close to crown gear.



6) If tooth contact is correct, mark the retainer position and loosen it. After fitting a new O-ring and oil seal, screw in the retainer to the marked position. Then tighten the lock plate to the specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

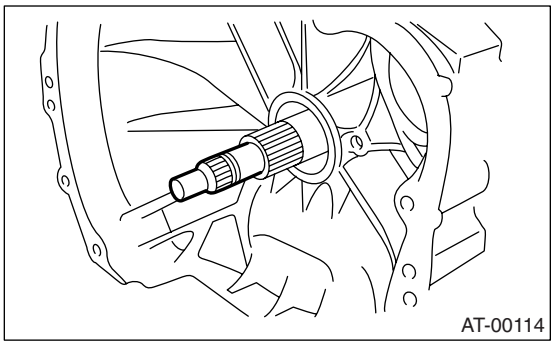


(A) Lock plate

37.Front Differential

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
2) Extract the torque converter clutch assembly. <Ref. to 4AT-74, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.



4) Lift-up the lever behind the transmission harness connector and disconnect it from stay.
5) Disconnect the inhibitor switch from stay.
6) Remove the oil charger pipe. <Ref. to 4AT-73, REMOVAL, Oil Charger Pipe.>
7) Remove the oil cooler inlet and outlet pipes. <Ref. to 4AT-69, REMOVAL, ATF Cooler Pipe and Hose.>
8) Separate the torque converter clutch case and transmission case.<Ref. to 4AT-94, REMOVAL, Torque Converter Clutch Case.>
9) Remove the seal pipe.
10) Remove the differential side retainer with ST.

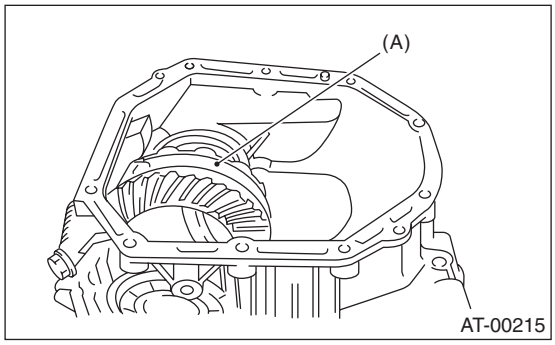
NOTE:
Hold the differential case assembly by hand to avoid damaging retainer mounting hole of the torque converter clutch case.

ST 499787000 WRENCH ASSY

11) Remove the differential assembly without damaging installation part of retainer.

B: INSTALLATION

1) Install the differential assembly to the case, paying special attention not to damage the inside of the case (particularly, the differential side retainer contact surface).



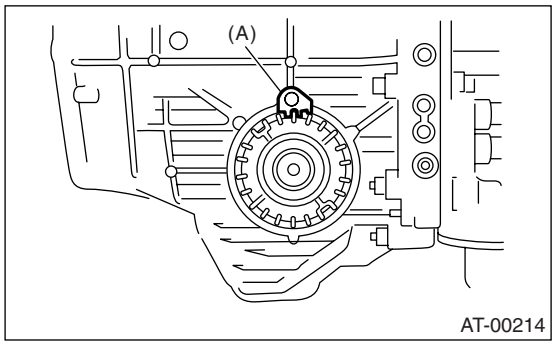
(A) Differential assembly

2) Install the O-rings from left and right side retainer.
3) Using ST, install the side retainers. <Ref. to 4AT-107, REMOVAL, Front Differential.>

ST 499787000 WRENCH ASSY

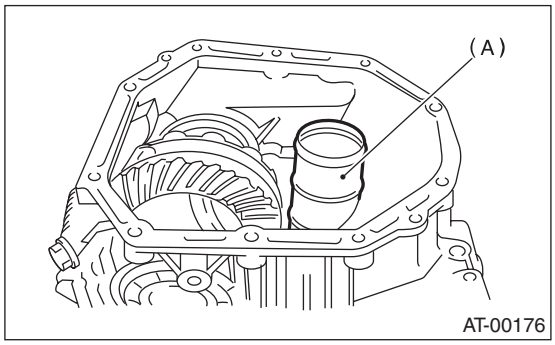
4) Adjust the front differential backlash. <Ref. to 4AT-111, ADJUSTMENT, Front Differential.>
5) Install the lock plate.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



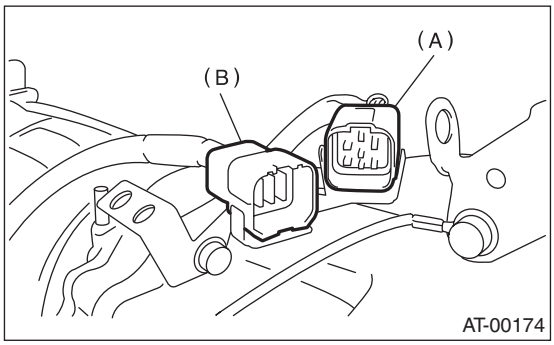
(A) Lock plate

6) Install a new seal pipe to the torque converter clutch case.



(A) Seal pipe

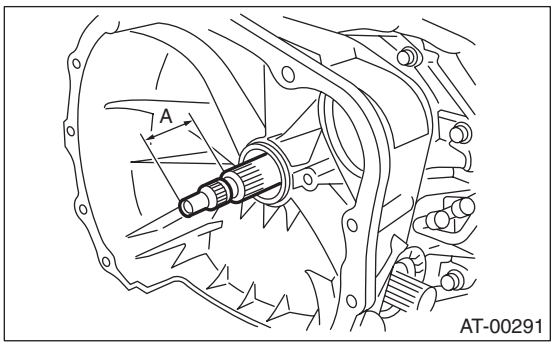
7) Install the torque converter clutch case to transmission case. <Ref. to 4AT-94, INSTALLATION, Torque Converter Clutch Case.>
8) Insert the inhibitor switch and transmission connector into stay.



(A) Transmission harness
(B) Inhibitor switch harness

9) Install the oil cooler pipes. <Ref. to 4AT-70, INSTALLATION, ATF Cooler Pipe and Hose.>
10) Install the oil charger pipe with O-ring <Ref. to 4AT-73, INSTALLATION, Oil Charger Pipe.>
11) Insert the input shaft while turning it lightly by hand and verify the protrusion amount.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)

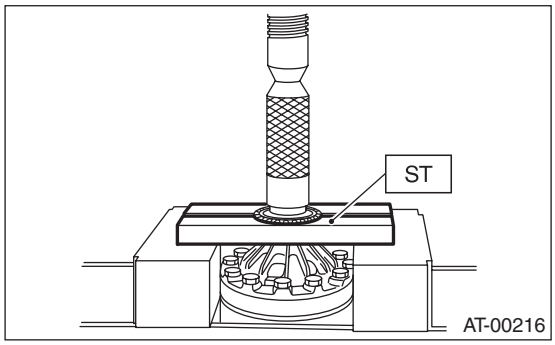


12) Install the torque converter clutch assembly. <Ref. to 4AT-74, INSTALLATION, Torque Converter Clutch Assembly.>
13) Install the transmission assembly to the vehicle. <Ref. to 4AT-39, INSTALLATION, Automatic Transmission Assembly.>

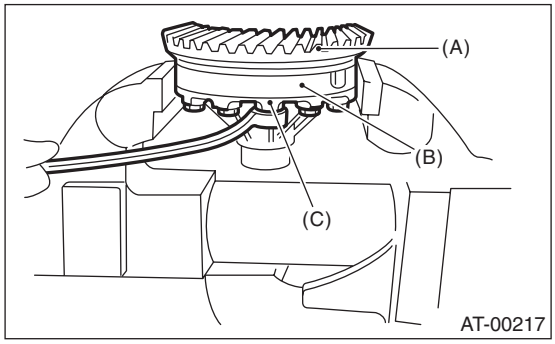
C: DISASSEMBLY

1. DIFFERENTIAL CASE ASSEMBLY

1) Using a press and ST, remove the taper roller bearing.
ST 498077000 REMOVER

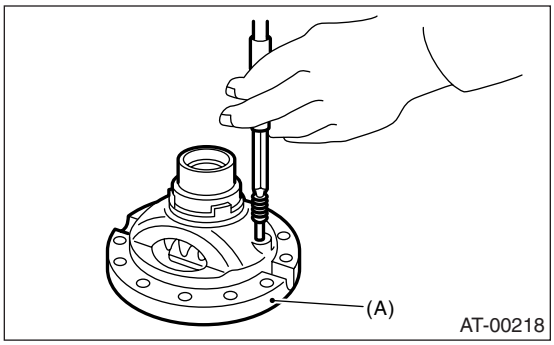


2) Secure the case in a vise and remove the crown gear tightening bolts, then separate the crown gear, case (RH) and case (LH).



(A) Crown gear
(B) Differential case (RH)
(C) Differential case (LH)

3) Pull out the straight pin and shaft, and remove the differential bevel gear, washer, and differential bevel pinion.

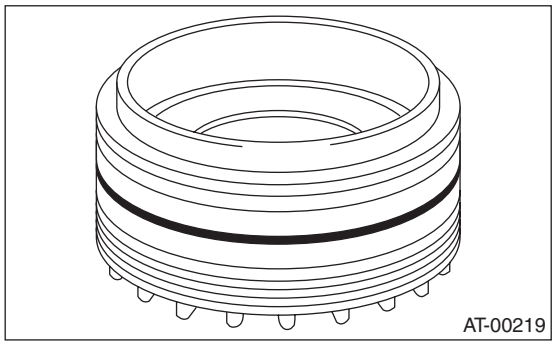


(A) Differential case (RH)

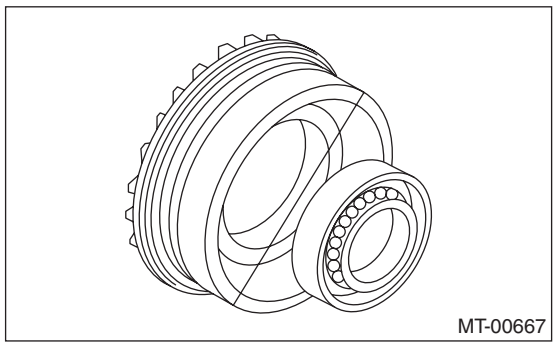
2. SIDE RETAINER

NOTE:
After adjusting the drive pinion backlash and tooth contact, remove and install the oil seal and O-ring.

1) Remove O-ring.

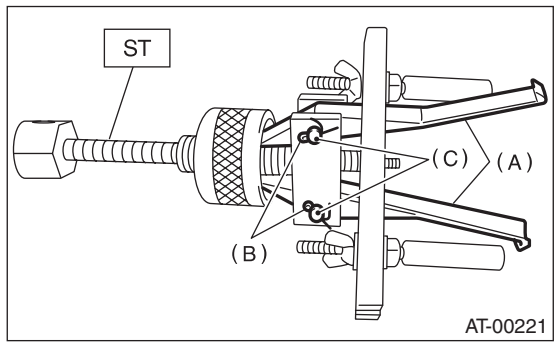


2) Remove oil seal.



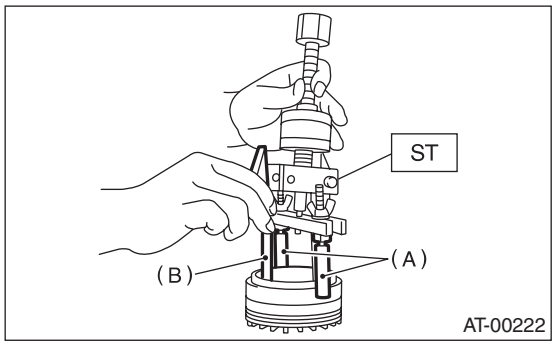
3) Take out either split pin, remove claw.

ST 398527700 PULLER ASSY



(A) Claw
(B) Split pin
(C) Pin

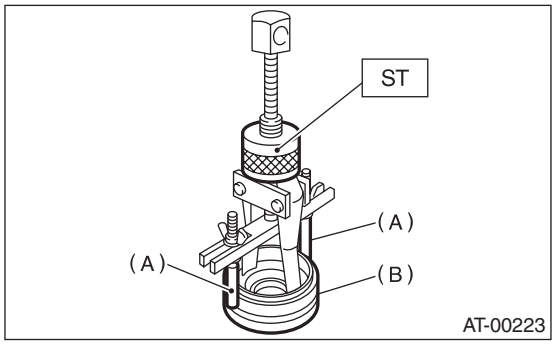
4) Securely attach two claws to outer race, set ST to side retainer.
ST 398527700 PULLER ASSY



(A) Shaft
(B) Claw

5) Return removed claw to the original position, and install pin and split pin.
6) Hold the shaft of ST to avoid removing from side retainer, and then remove the bearing outer race.
ST 398527700 PULLER ASSY

NOTE:
Replace bearing inner and outer races as a single unit.

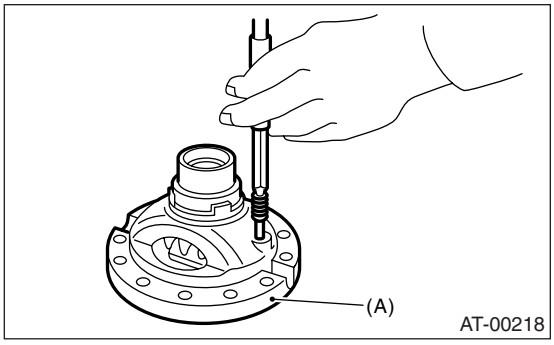


(A) Shaft
(B) Side retainer

D: ASSEMBLY

1. DIFFERENTIAL CASE ASSEMBLY

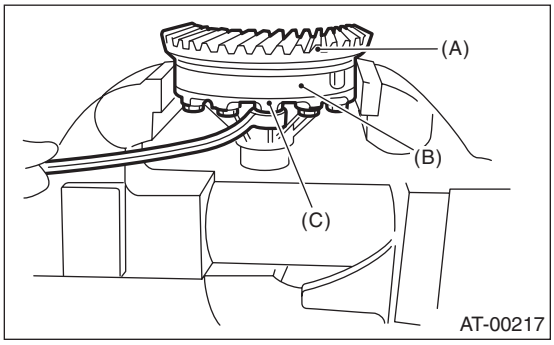
1) Install the washer, differential bevel gear and differential bevel pinion in the differential case (RH). Insert the pinion shaft.
2) Install straight pin from reverse direction.



(A) Differential case (RH)

3) Install the washer and differential bevel gear to the differential case (LH). Then put the case over the differential case (RH), and connect both cases.
4) Install the crown gear and secure by tightening the bolt.

Standard tightening torque:
62 N·m (6.3 kgf-m, 45.6 ft-lb)



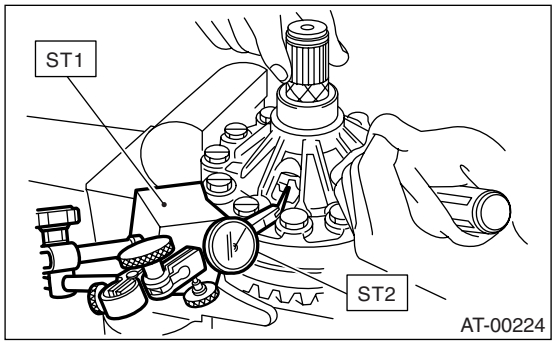
(A) Crown gear
(B) Differential case (RH)
(C) Differential case (LH)

5) Measurement of backlash (Selection of washer)
(1) Measure the gear backlash with ST1 and ST2, and insert ST2 through the access window of the case.

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

NOTE:
• Measure the backlash by applying a pinion tooth between two bevel gear teeth.
• Fix bevel pinion gear in place with a screwdriver or similar tool when measuring.

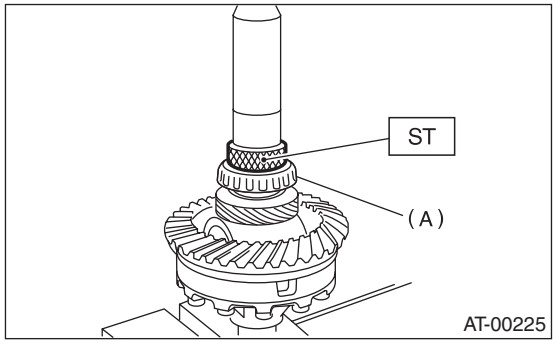
Standard value:
0.13 — 0.18 mm (0.0051 — 0.0071 in)



(2) If backlash is not as specified, select a washer from the table below.

Washer	
Part No.	Thickness mm (in)
803038021	0.95 (0.037)
803038022	1.00 (0.039)
803038023	1.05 (0.041)

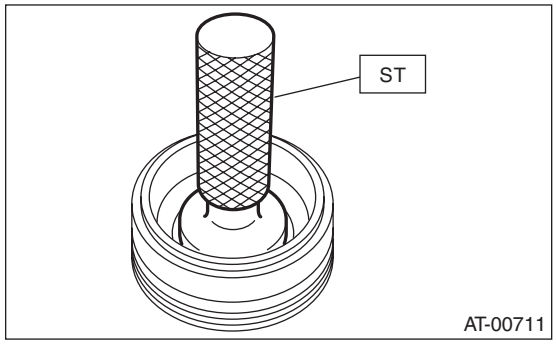
6) Using ST, install taper roller bearing.
ST 398437700 DRIFT



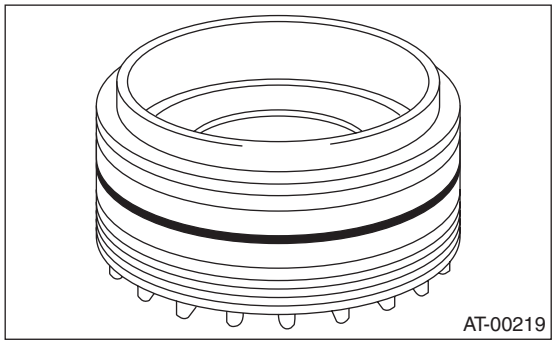
(A) Taper roller bearing

2. SIDE RETAINER

1) Install bearing outer race to side retainer.
2) Install a new oil seal using the ST and hammer.
ST 499797000 INSTALLER



3) Install new O-ring.



E: INSPECTION

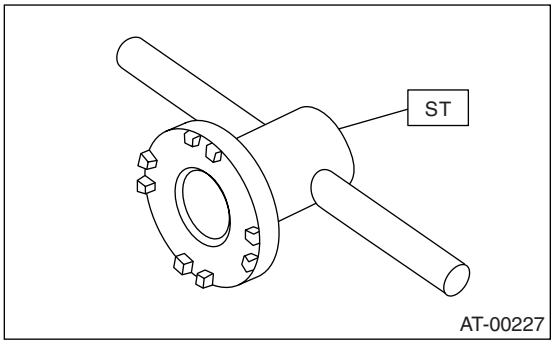
• Check each component for harmful cuts, damage and other faults.
• Measure the backlash and adjust to within specifications.
<Ref. to 4AT-111, ADJUSTMENT, Front Differential.>

F: ADJUSTMENT

1) Using ST, screw in the retainer until light contact is felt.

NOTE:
Screw in the RH side slightly deeper than the LH side.

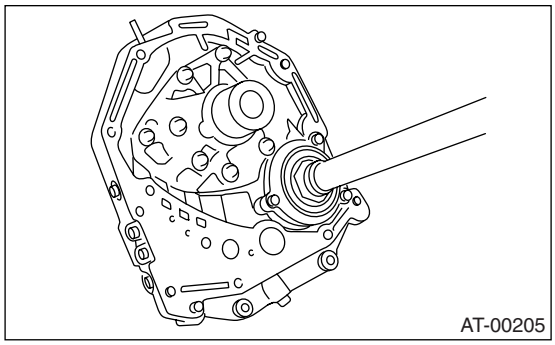
ST 499787000 WRENCH ASSY



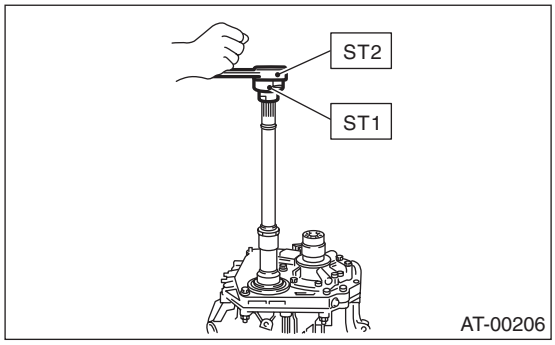
2) Remove the oil pump housing.
3) Thoroughly remove the liquid gasket from the case mating surface beforehand.
4) Install the oil pump housing assembly to the torque converter clutch case, and secure evenly by tightening four bolts.

NOTE:
Use an old gasket or an aluminum washer so as not to damage the mating surface of the housing.

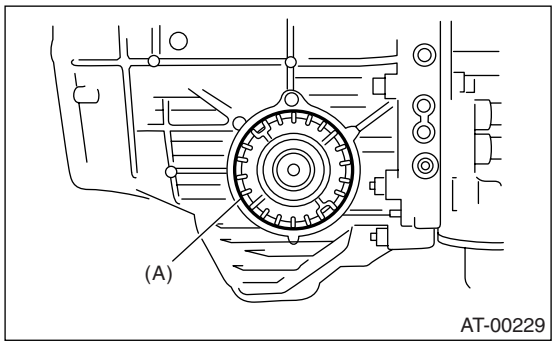
Tightening torque:
41 N·m (4.2 kgf-m, 30.4 ft-lb)



5) Rotate the drive pinion several times with ST1 and ST2.
ST1 498937110 HOLDER
ST2 499787700 WRENCH

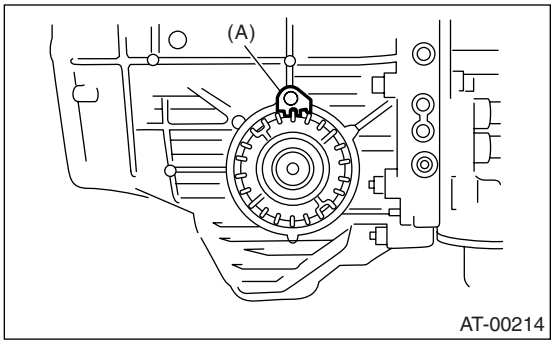


6) Tighten the LH retainer until contact is felt while rotating the shaft. Then loosen the RH retainer. Keep tightening the LH retainer and loosening the RH retainer until the pinion shaft can no longer be turned. This is the “zero” state.



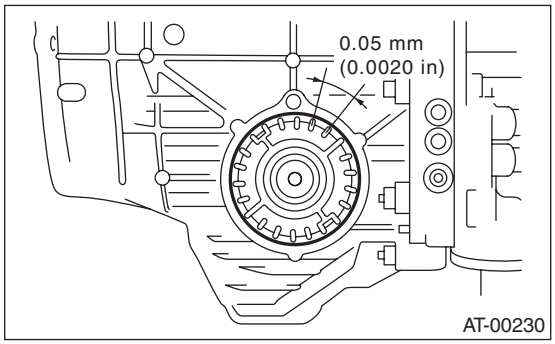
(A) Retainer

7) After the “zero” state is established, back off the LH retainer 3 notches and secure it with the lock plate. Then back off the RH retainer and retighten until it stops. Rotate drive pinion a few times. Tighten the RH retainer 1-3/4 notches further. This sets the preload. Finally, secure the retainer with its lock plate.



(A) Lock plate

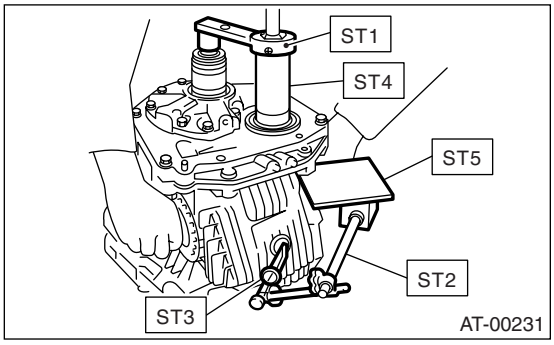
NOTE:
Turning the retainer by one tooth changes the backlash about 0.05 mm (0.0020 in).



8) Turn the drive pinion several rotations with ST1 and check to see if the backlash is within the standard value with ST2, ST3, ST4 and ST5.

ST1	499787700	WRENCH
ST2	498247001	MAGNET BASE
ST3	498247100	DIAL GAUGE
ST4	499787500	ADAPTER
ST5	498255400	PLATE

Backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)

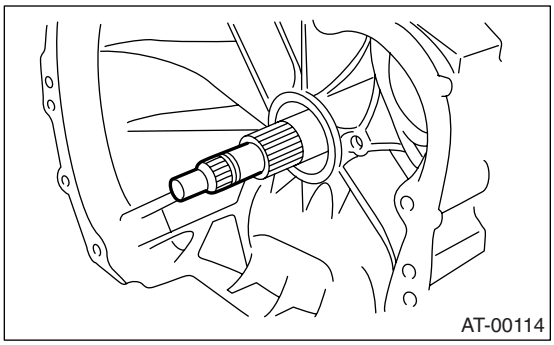


9) Adjust the tooth contact between front differential and drive shaft. <Ref. to 4AT-104, ADJUSTMENT, Drive Pinion Shaft.>

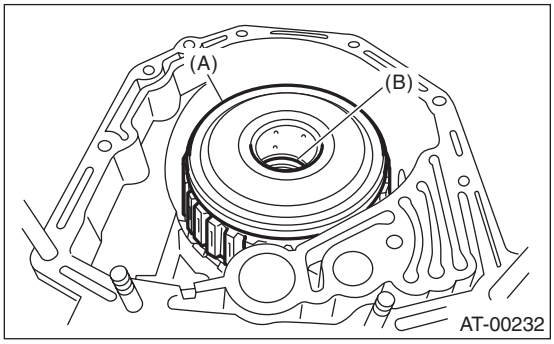
38.AT Main Case

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
2) Extract the torque converter clutch assembly. <Ref. to 4AT-74, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.

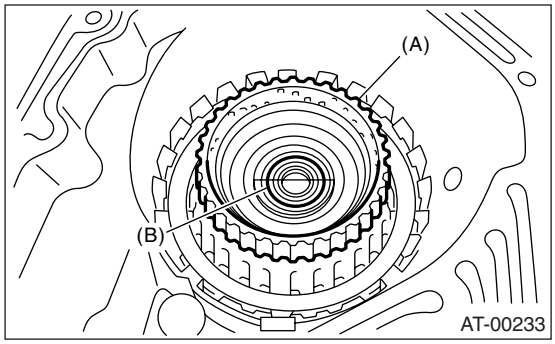


4) Lift-up the lever behind the transmission harness connector and disconnect it from stay.
5) Disconnect the inhibitor switch connector from stay.
6) Disconnect the air breather hose.
7) Remove the oil charger pipe. <Ref. to 4AT-73, REMOVAL, Oil Charger Pipe.>
8) Remove the oil cooler inlet and outlet pipes. <Ref. to 4AT-69, REMOVAL, ATF Cooler Pipe and Hose.>
9) Separate the torque converter clutch case and transmission case.<Ref. to 4AT-94, REMOVAL, Torque Converter Clutch Case.>
10) Remove the oil pump housing.
<Ref. to 4AT-96, REMOVAL, Oil Pump Housing.>
11) Take out the high clutch, thrust needle bearing and reverse clutch assembly.



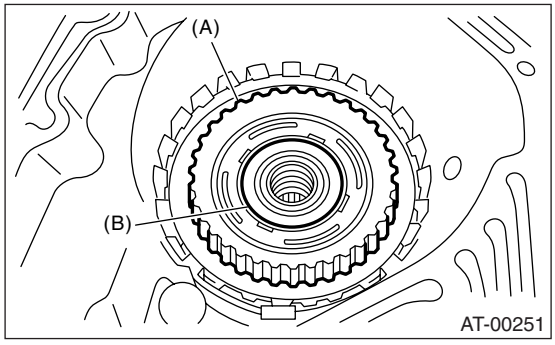
(A) High clutch and reverse clutch assembly
(B) Thrust needle bearing

12) Take out the high clutch hub and the thrust bearing.



(A) High clutch hub
(B) Thrust needle bearing

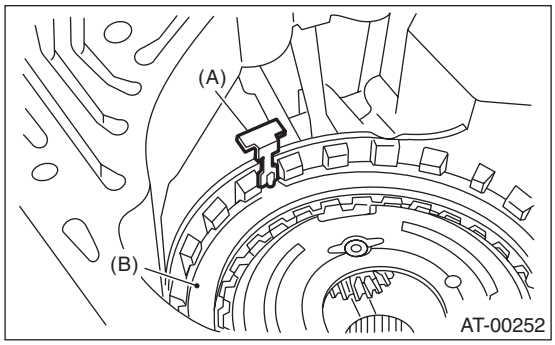
13) Take out the front sun gear and the thrust bearing.



(A) Front sun gear
(B) Thrust needle bearing

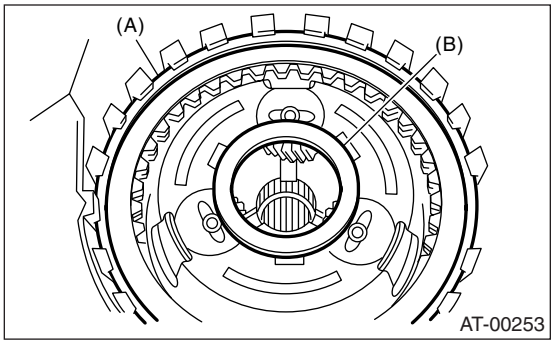
14) Pull out the leaf spring without folding.

NOTE:
Remove it while pressing the lower leaf spring down.



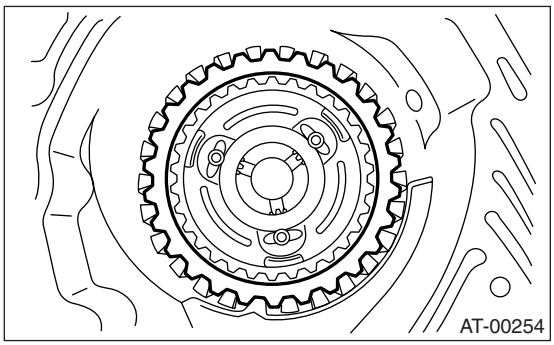
(A) Leaf spring
(B) Retaining plate

15) Remove the snap ring and thrust needle bearing.

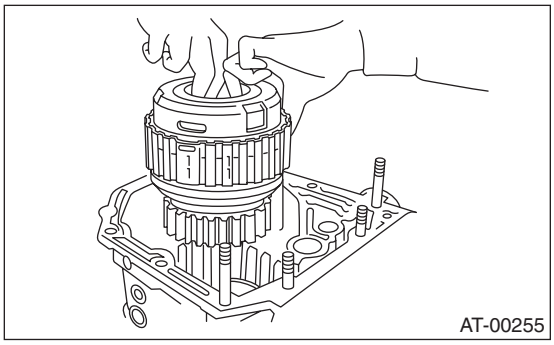


(A) Snap ring
(B) Thrust needle bearing

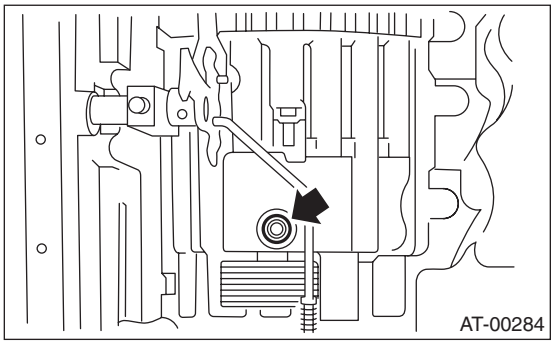
16) Take out the retaining plate, drive plate and driven plate of 2-4 brake.



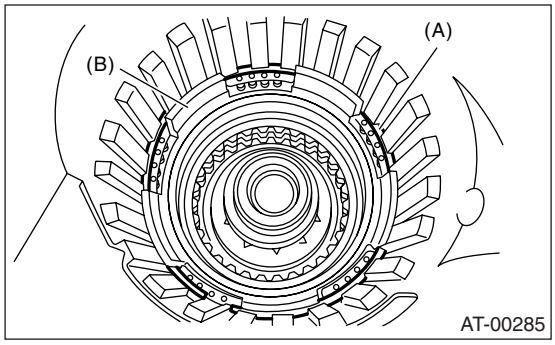
17) Take out the thrust needle bearing, planetary gear assembly and the low clutch assembly.



18) Remove the 2-4 brake seal.

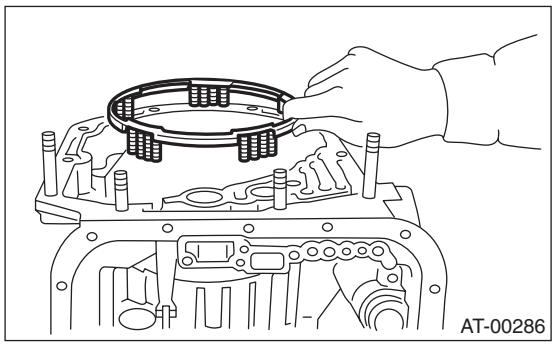


19) Remove the snap ring.

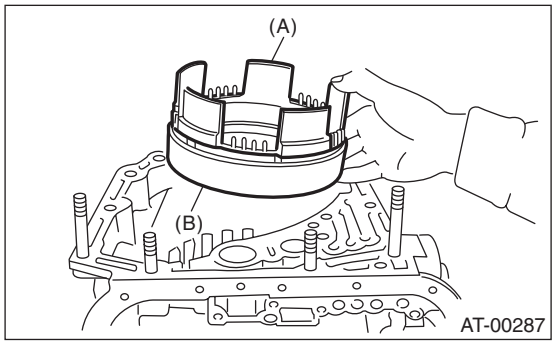


(A) Snap ring
(B) 2-4 brake piston

20) Take out the 2-4 brake return spring.

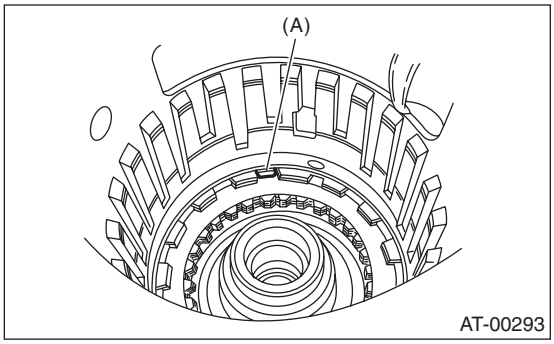


21) Remove the 2-4 brake piston and piston retainer without damaging.



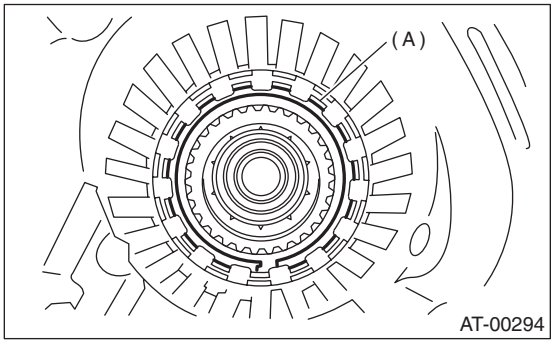
(A) 2-4 brake piston
(B) 2-4 brake piston retainer

22) Pull out the leaf spring without folding.



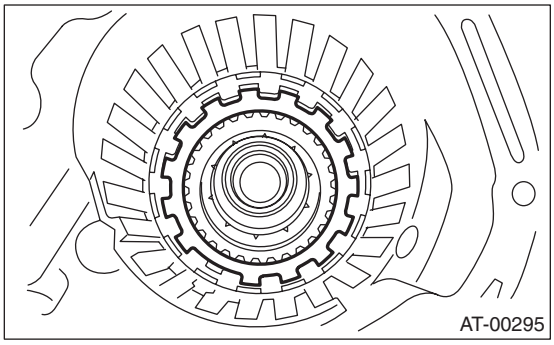
(A) Leaf spring

23) Remove the snap ring.

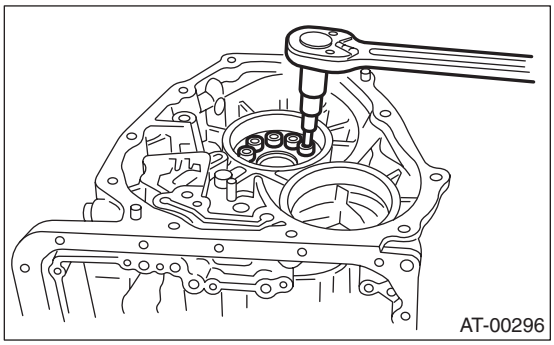


(A) Snap ring

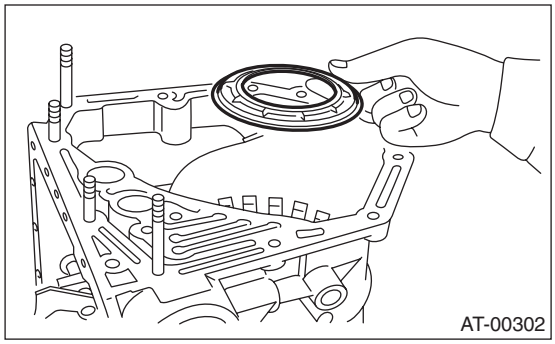
24) Take out the retaining plate, drive plate, driven plate and dish plate.



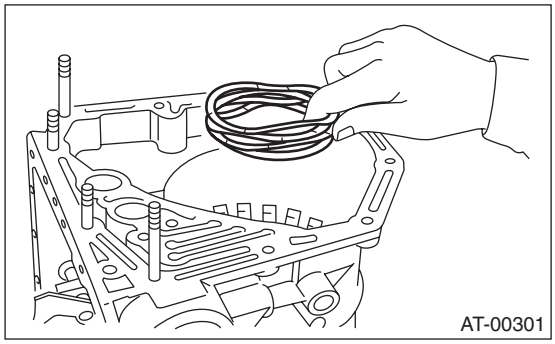
25) Turn the transmission case upside down, and then take out the socket bolts while holding the one-way clutch inner race with hand.



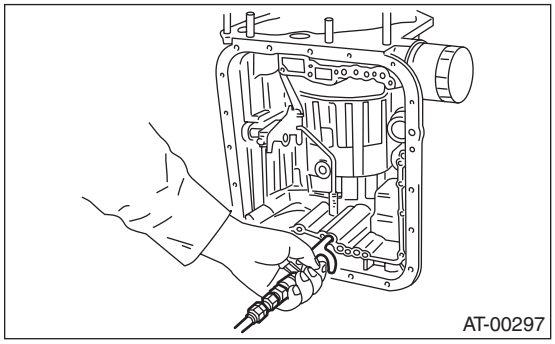
26) Take out the spring retainer.



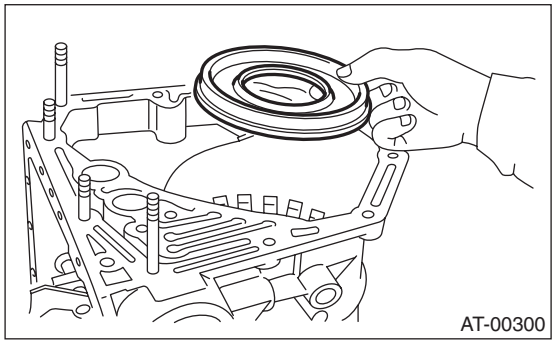
27) Take out the return spring.



28) Apply compressed air.



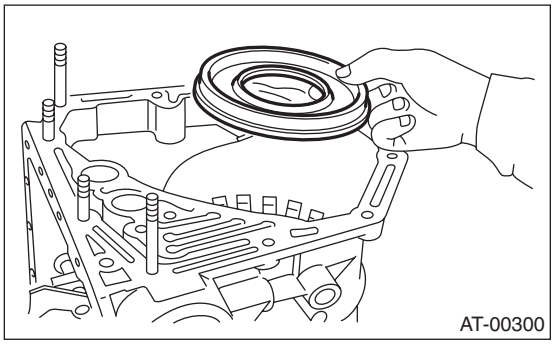
29) Take out the low & reverse piston.



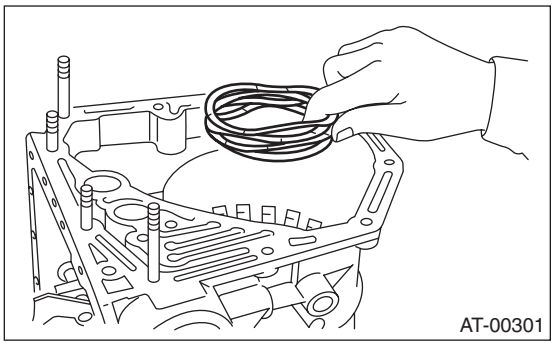
B: INSTALLATION

1) Install the low and reverse piston without tilting.

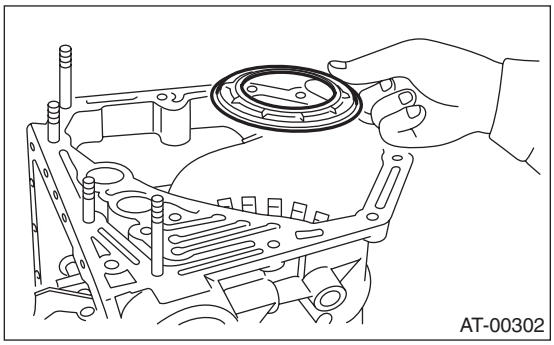
NOTE:
Be careful not to damage the lip seal.



2) Install the return spring.



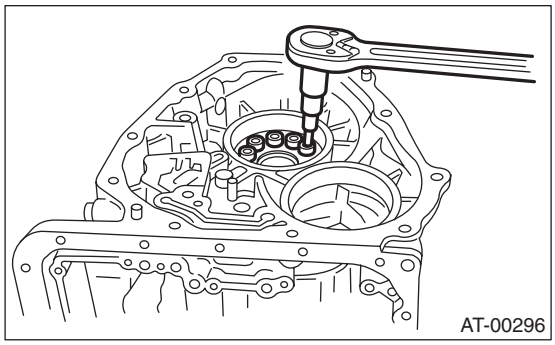
3) Install the spring retainer.



4) Install the one-way clutch inner race, spring retainer and return spring.

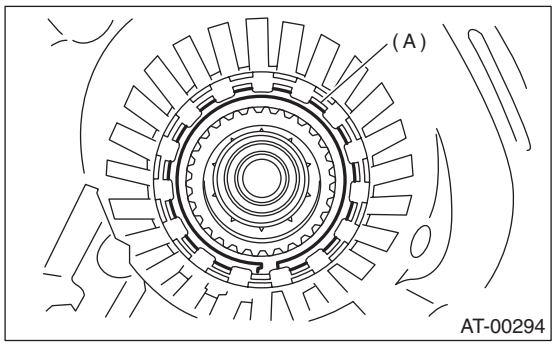
5) Tighten the socket head bolts evenly from the rear side of transmission case.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



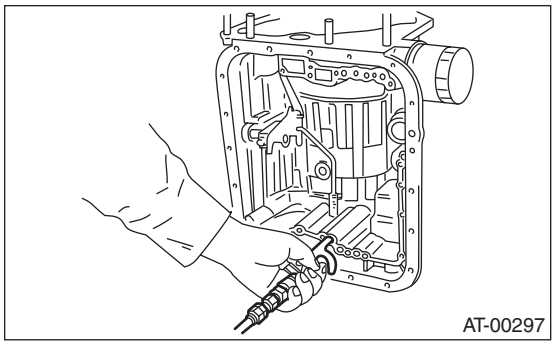
6) Place the front side of transmission body upward.
7) Install thrust needle bearing.
8) Installation of the low & reverse brake:
Install dish plate, driven plates, drive plates, and a retaining plate, and secure with a snap ring.

NOTE:
Pay attention to the orientation of the dish plate.



(A) Snap ring

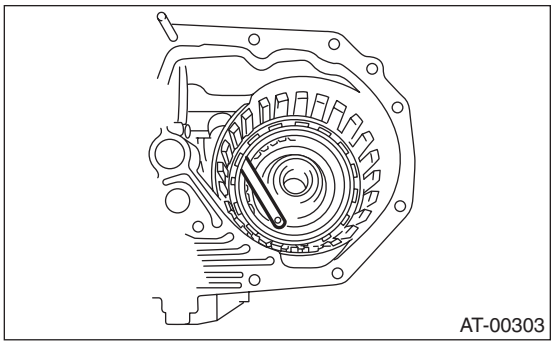
9) Apply compressed air intermittently to check for operation.



10) Check the clearance and select the retaining plate. Place the same thickness of shim on both sides to prevent the retaining plate from tilting.

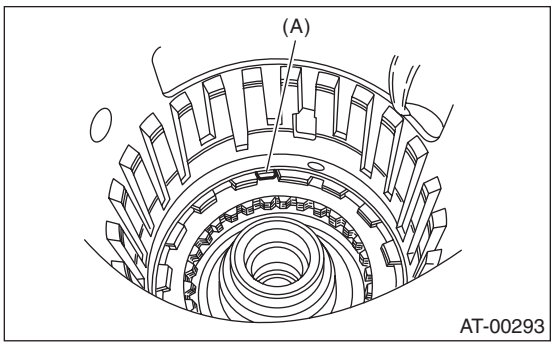
Standard value:
0.7 — 1.2 mm (0.028 — 0.047 in)

Allowable limit:
2.2 mm (0.087 in)


AT-00303

Retaining plates	
Part No.	Thickness mm (in)
31667AA320	4.1 (0.161)
31667AA330	4.4 (0.173)
31667AA340	4.7 (0.185)
31667AA350	5.0 (0.197)
31667AA360	5.3 (0.209)
31667AA370	5.6 (0.220)
31667AA380	5.9 (0.232)

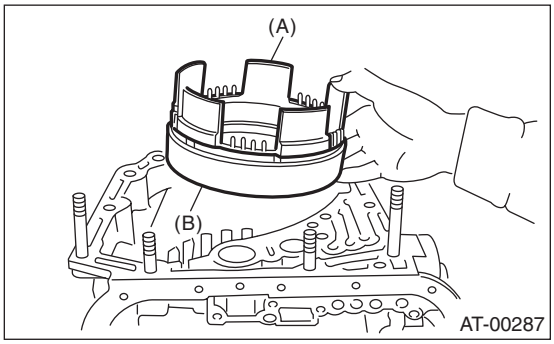
11) Install the low & reverse brake leaf spring.



AT-00293

(A) Leaf spring

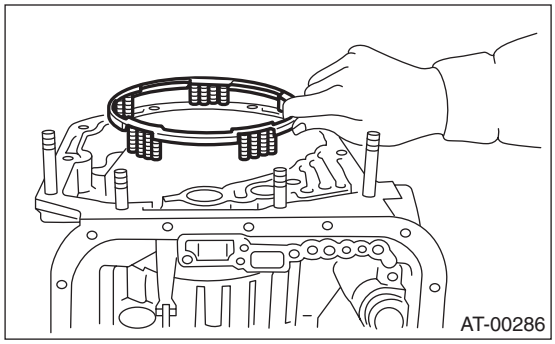
12) Install the 2-4 brake piston and 2-4 brake retainer by aligning the hole of 2-4 brake retainer and the hole of transmission case.



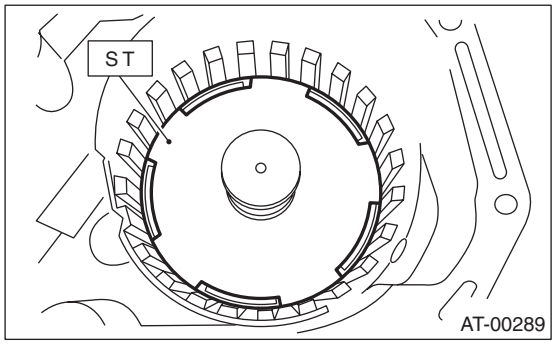
AT-00287

(A) 2-4 brake piston
(B) 2-4 brake piston retainer

13) Install the 2-4 brake piston return spring to transmission case.

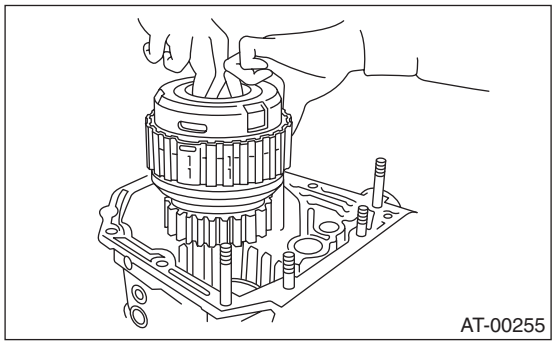

AT-00286

14) Position the snap ring in transmission. Using ST, press the snap ring into place.
ST 498677100 COMPRESSOR

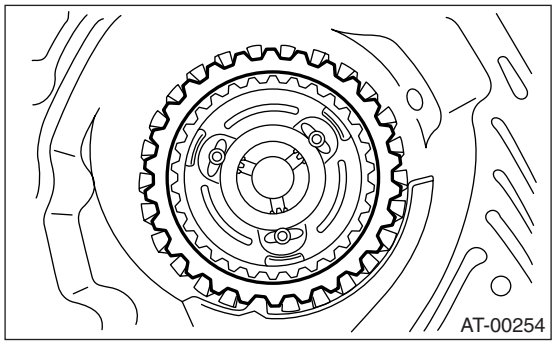


AT-00289

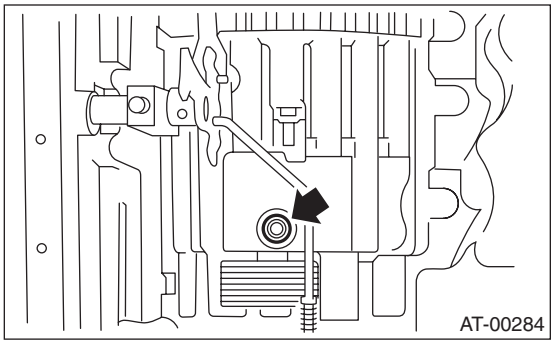
15) Install the planetary gear and low clutch assembly to transmission case.
Install carefully while rotating the low clutch and planetary gear assembly slowly paying special attention not to damage the seal ring.


AT-00255

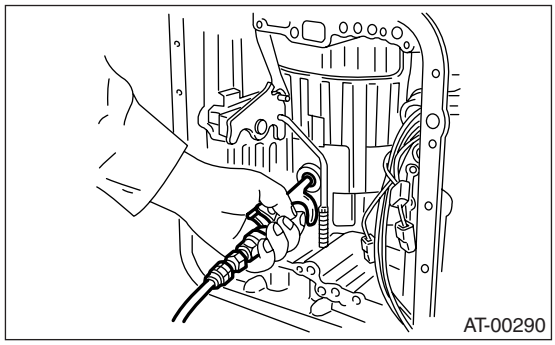
16) Install pressure plate, drive plate, driven plate, retaining plate and snap ring.


AT-00254

17) Install a new 2-4 brake oil seal to transmission case.



18) After all 2-4 brake component parts have been installed, blow in air intermittently and confirm the operation of the brake.

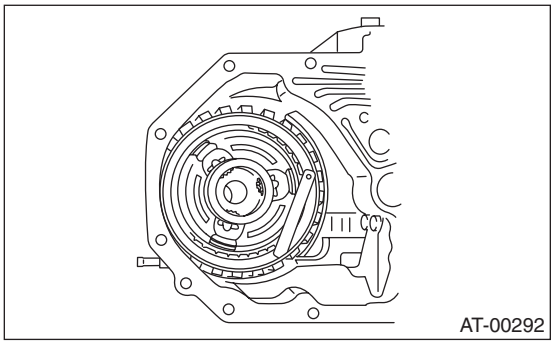


19) Check the clearance between the retaining plate and the snap ring.

NOTE:
Select a retaining plate with a suitable value from the following table, so that the clearance becomes the standard value.

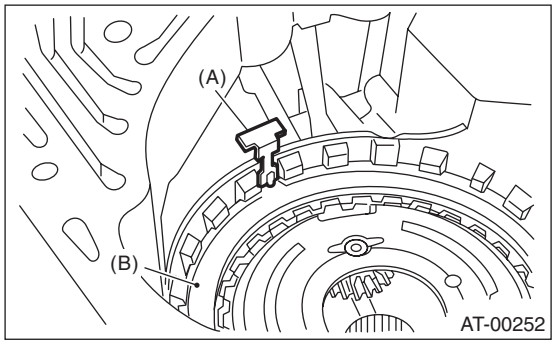
Standard value:
0.8 — 1.2 mm (0.031 — 0.047 in)

Allowable limit:
1.5 mm (0.059 in)



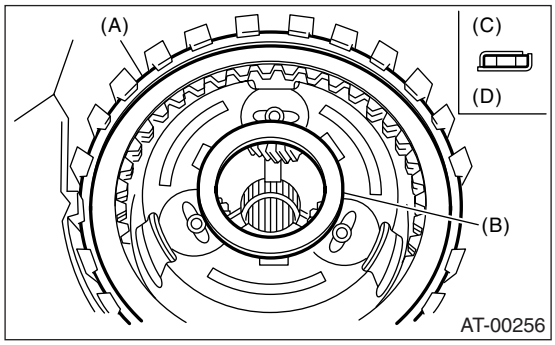
Retaining plates	
Part No.	Thickness mm (in)
31567AA612	5.6 (0.220)
31567AA622	5.8 (0.228)
31567AA632	6.0 (0.236)
31567AA642	6.2 (0.244)
31567AA652	6.4 (0.252)
31567AA662	6.6 (0.260)

20) Be careful not to mistake the location of the leaf spring to be inserted.



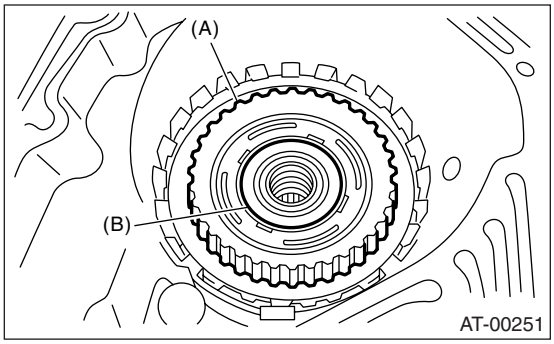
(A) Leaf spring
(B) Retaining plate

21) Install thrust needle bearing in the correct direction.



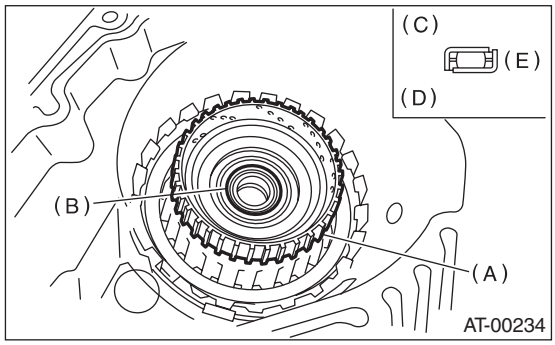
(A) Snap ring
(B) Thrust needle bearing
(C) Upside
(D) Downside

22) Install front sun gear and thrust needle bearing.



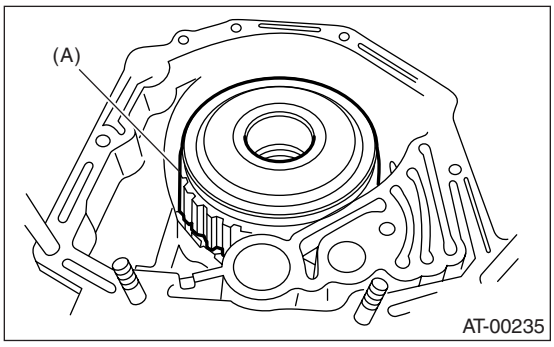
(A) Front sun gear
(B) Thrust needle bearing

23) Install the high clutch hub.
Attach the thrust needle bearing to the hub with vaseline and install the hub by correctly engaging the splines of the front planetary carrier.
24) Install the thrust needle bearing in proper direction.



(A) High clutch hub
(B) Thrust needle bearing
(C) Upside
(D) Downside
(E) Outside

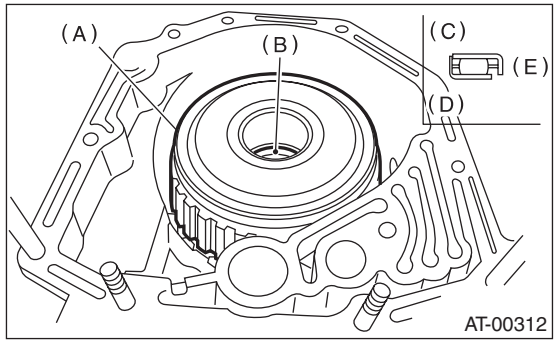
25) Install the high clutch assembly.



(A) High clutch and reverse clutch assembly

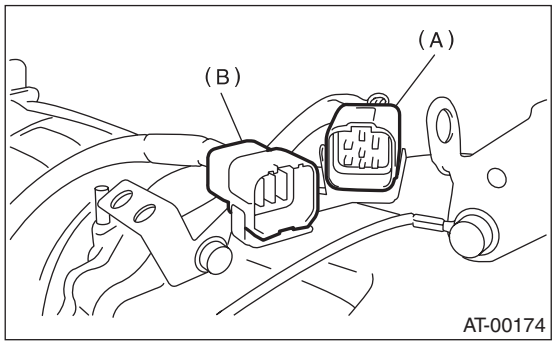
26) Adjust total end play. <Ref. to 4AT-100, ADJUSTMENT, Oil Pump Housing.>

27) Install the thrust needle bearing in proper direction.



(A) High clutch and reverse clutch ASSY
(B) Thrust needle bearing
(C) Upside
(D) Downside
(E) Outside

28) Install the oil pump housing assembly.
29) Install the torque converter clutch case assembly to the transmission case assembly. <Ref. to 4AT-94, INSTALLATION, Torque Converter Clutch Case.>
30) Insert inhibitor switch and transmission connector into stay.
31) Install air breather hose. <Ref. to 4AT-72, INSTALLATION, Air Breather Hose.>

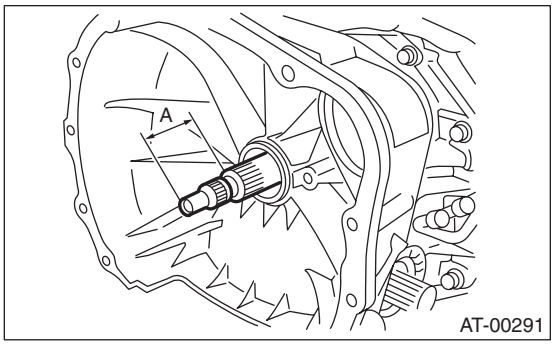


(A) Transmission harness
(B) Inhibitor switch harness

32) Install oil cooler pipes. <Ref. to 4AT-70, INSTALLATION, ATF Cooler Pipe and Hose.>
33) Install the oil charger pipe with O-ring. <Ref. to 4AT-73, INSTALLATION, Oil Charger Pipe.>

34) Insert the input shaft while turning lightly by hand. At this time, not to damage the bushing.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)

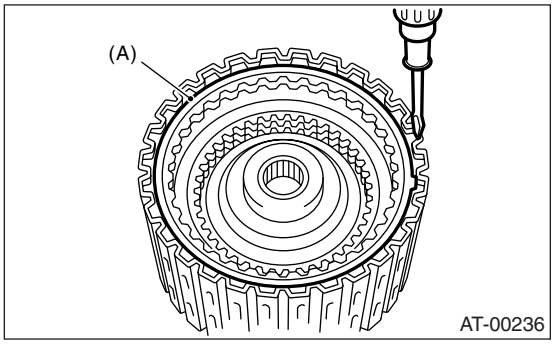


35) Install the torque converter clutch assembly. <Ref. to 4AT-74, INSTALLATION, Torque Converter Clutch Assembly.>
36) Install the transmission assembly to the vehicle. <Ref. to 4AT-39, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

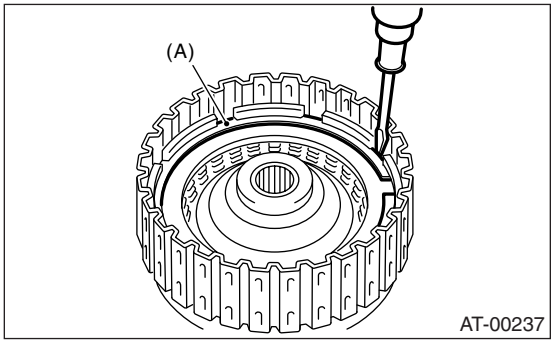
1. HIGH CLUTCH, REVERSE CLUTCH

1) Remove the snap ring, and take out the retaining plate, drive plates, driven plates.



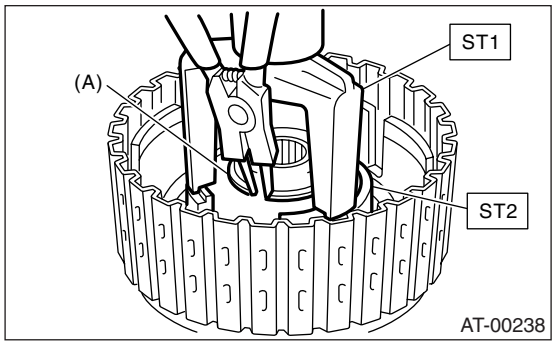
(A) Snap ring

2) Remove snap ring, and take out the retaining plate, drive plates and driven plates.



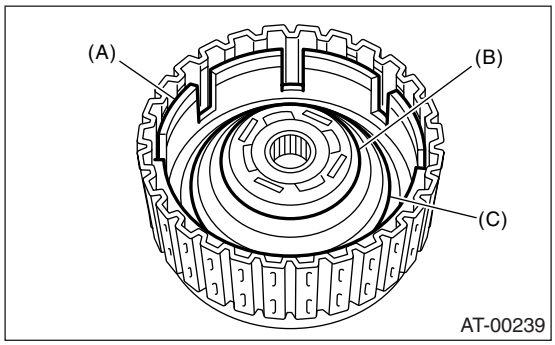
(A) Snap ring

3) Using ST1 and ST2, remove snap ring.
ST1 398673600 COMPRESSOR
ST2 498627100 SEAT



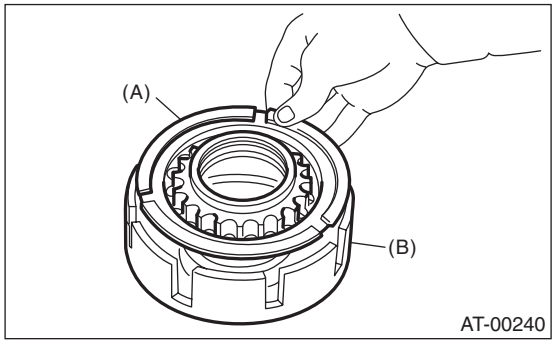
(A) Snap ring

4) Take out clutch cover, spring retainer, high clutch piston and reverse clutch piston.



(A) Reverse clutch piston
(B) Cover
(C) Return spring

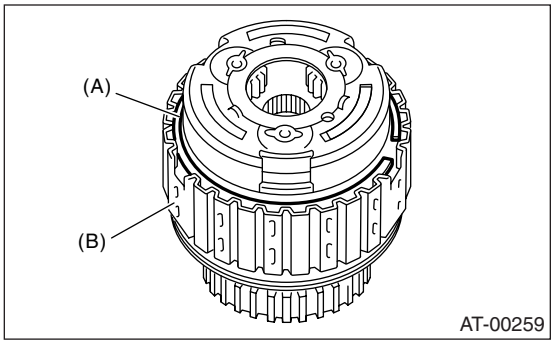
5) Remove seal rings and lip seal from high clutch piston and reverse clutch piston.



(A) High clutch piston
(B) Reverse clutch piston

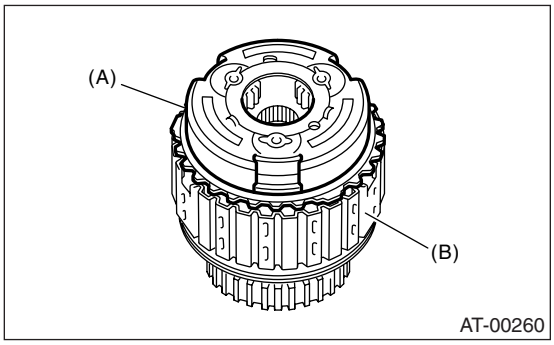
2. PLANETARY GEAR, LOW CLUTCH

1) Remove snap ring from the low clutch drum.



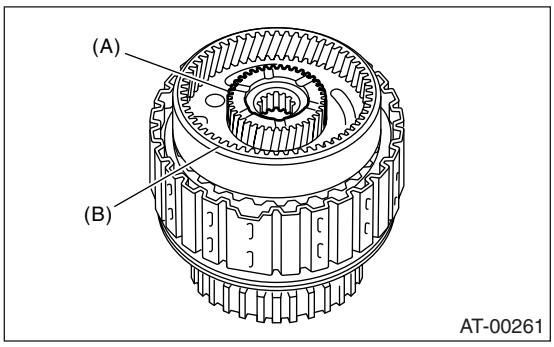
(A) Snap ring
(B) Low clutch drum

2) Take out front planetary carrier.



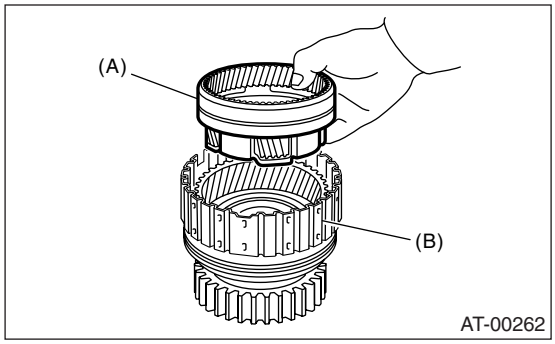
(A) Front planetary carrier
(B) Low clutch drum

3) Take out rear sun gear.



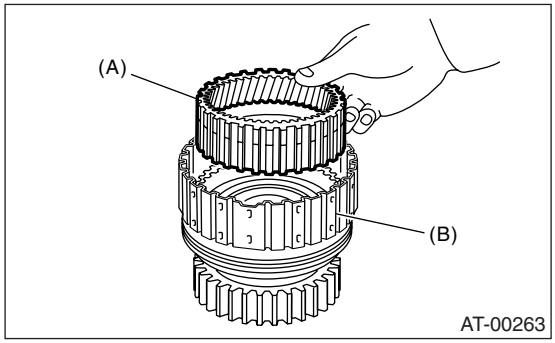
(A) Rear sun gear
(B) Rear planetary carrier

4) Take out rear planetary carrier, washer and thrust needle bearing.



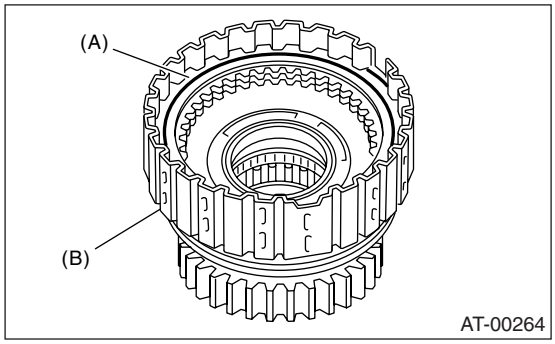
(A) Rear planetary carrier
(B) Low clutch drum

5) Take out rear internal gear.



(A) Rear internal gear
(B) Low clutch drum

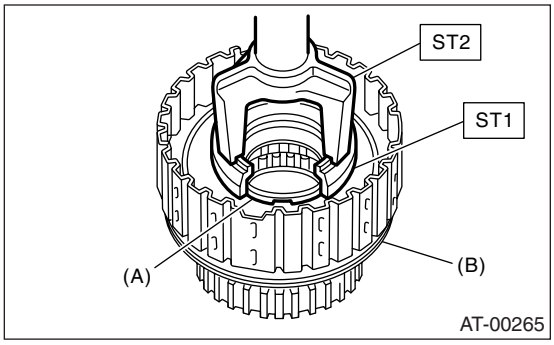
6) Remove the snap ring from the low clutch drum.



(A) Snap ring
(B) Low clutch drum

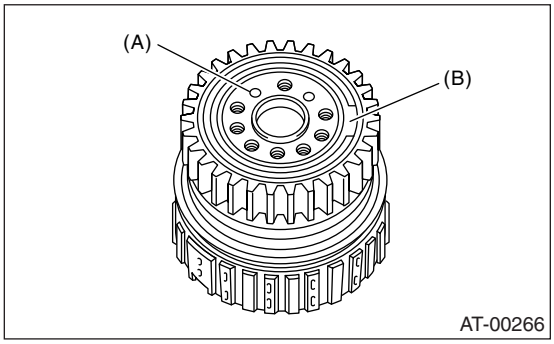
7) Compress the spring retainer, and remove the snap ring from the low clutch drum, by using ST1 and ST2.
ST1 498627100 SEAT

ST2 398673600 COMPRESSOR



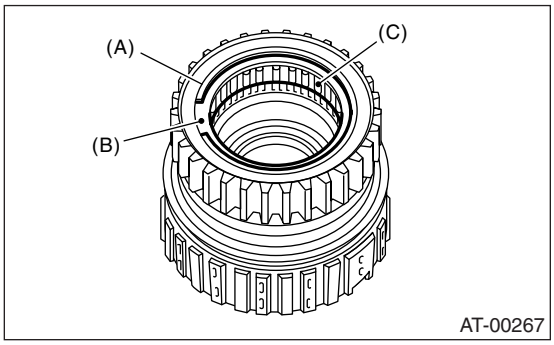
(A) Snap ring
(B) Low clutch drum

8) Remove one-way clutch. <Ref. to 4AT-113, REMOVAL, AT Main Case.>
9) Install the one-way clutch inner race to the low clutch drum, and apply compressed air to remove the low clutch piston.



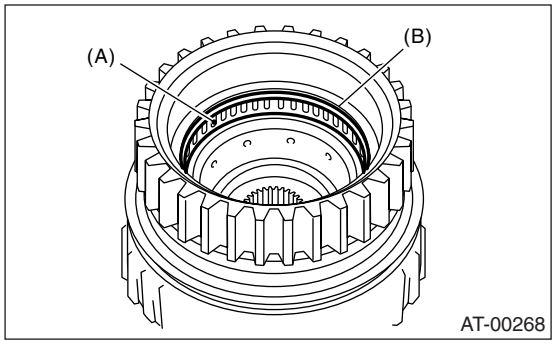
(A) Apply compressed air
(B) One-way clutch inner race

10) Remove the one-way clutch inner race.
11) Remove the one-way clutch after taking out the snap ring.



(A) Snap ring
(B) Plate
(C) One-way clutch

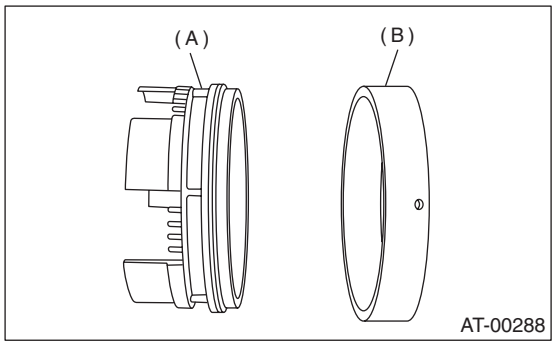
12) Remove the needle bearing after taking out the snap ring.



(A) Needle bearing
(B) Snap ring

3. 2-4 BRAKE

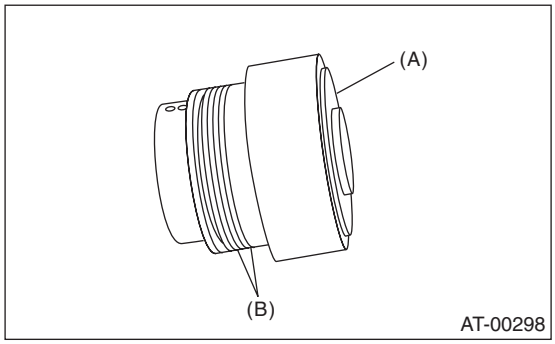
1) Separate 2-4 brake piston and piston retainer.



(A) 2-4 brake piston
(B) 2-4 brake piston retainer

4. ONE-WAY CLUTCH INNER RACE

1) Remove seal rings.

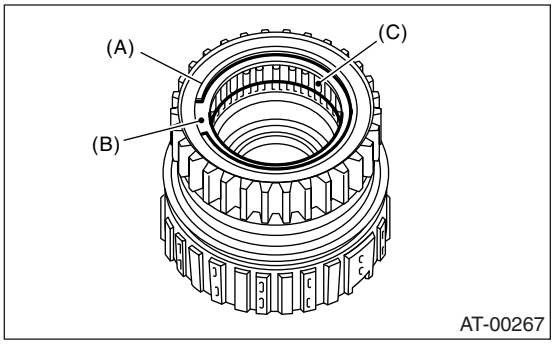


(A) One way clutch inner race
(B) Seal rings

2) Using ST, remove needle bearing.
ST 398527700 PULLER ASSY

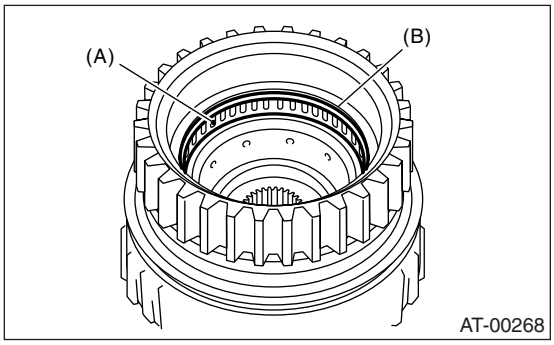
5. ONE-WAY CLUTCH OUTER RACE

1) Remove the one-way clutch after taking out the snap ring.



(A) Snap ring
(B) Plate
(C) One-way clutch

2) Remove the needle bearing after taking out the snap ring.

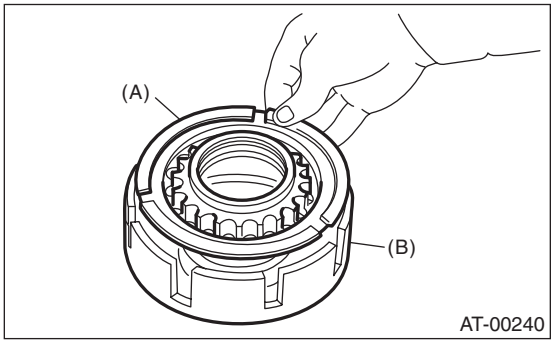


(A) Needle bearing
(B) Snap ring

D: ASSEMBLY

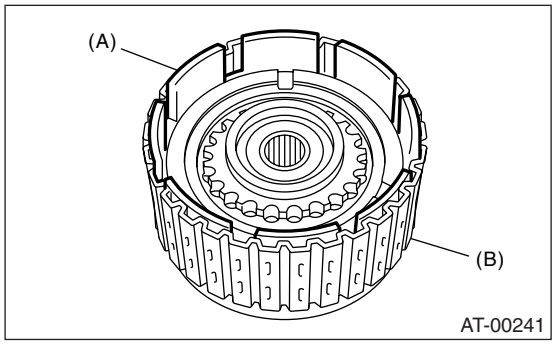
1. HIGH CLUTCH, REVERSE CLUTCH

1) Install seal rings and lip seal to high clutch piston and reverse clutch piston.
2) Install high clutch piston to reverse clutch piston.



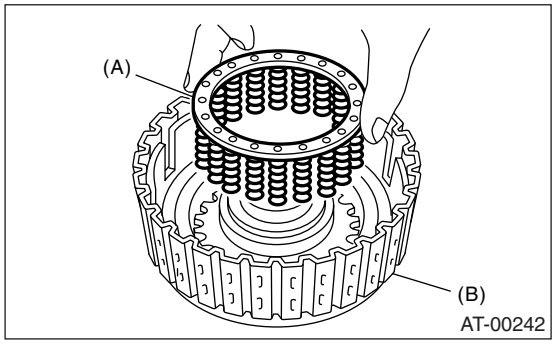
(A) High clutch piston
(B) Reverse clutch piston

3) Install reverse clutch to high clutch drum.
Align the groove on the reverse clutch piston with the groove on the high clutch drum during installation.



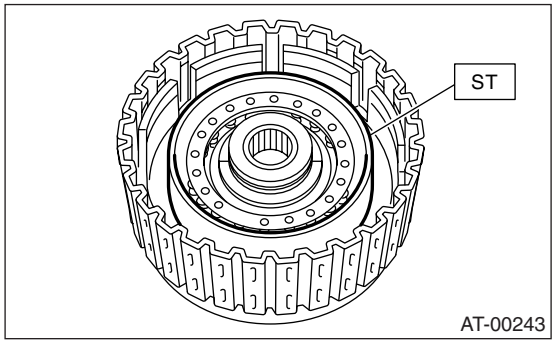
(A) Reverse clutch piston
(B) High clutch drum

4) Install spring retainer to high clutch piston.



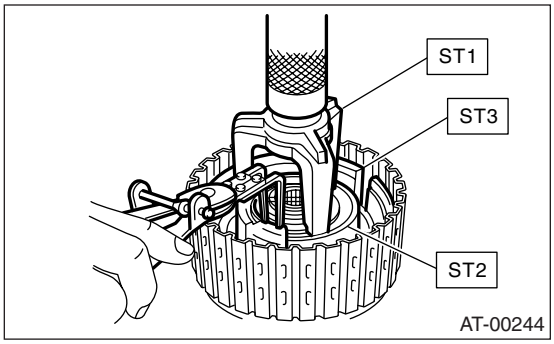
(A) Return spring
(B) High clutch drum

5) Install ST to high clutch piston.
ST 498437000 HIGH CLUTCH PISTON GUIDE

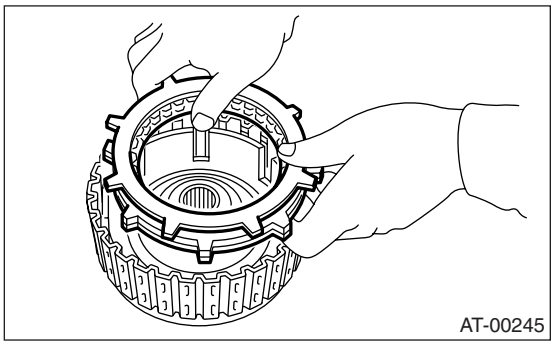


6) Avoid folding the high clutch piston seal, when installing the cover to high clutch piston.
7) Using ST1 and ST2, install snap ring.
ST1 398673600 COMPRESSOR
ST2 498627100 SEAT

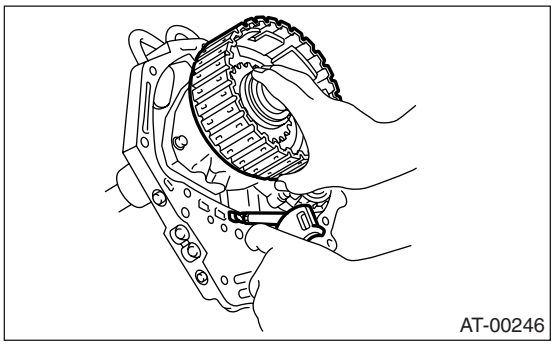
ST3 498437000 HIGH CLUTCH PISTON GUIDE



8) Install the thickest driven plate to piston side, and then install the driven plate, drive plate, retaining plate to high clutch drum.



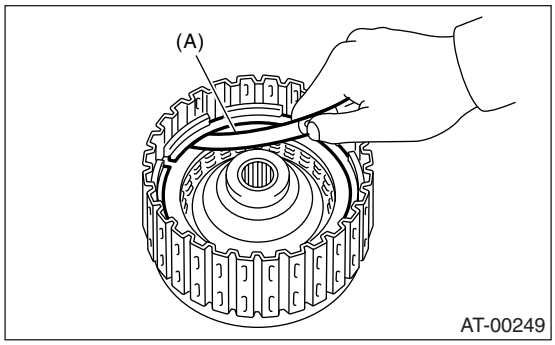
9) Install snap ring to high clutch drum.
10) Apply compressed air intermittently to check for operation.



11) Measure the clearance between the retaining plate and snap ring (High clutch). At this time, do not press down retaining plate.

Standard value:
0.8 — 1.1 mm (0.031 — 0.043 in)

Allowable limit:
1.5 mm (0.059 in)

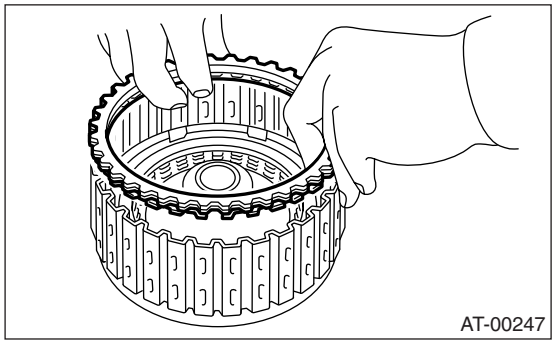


(A) Thickness gauge

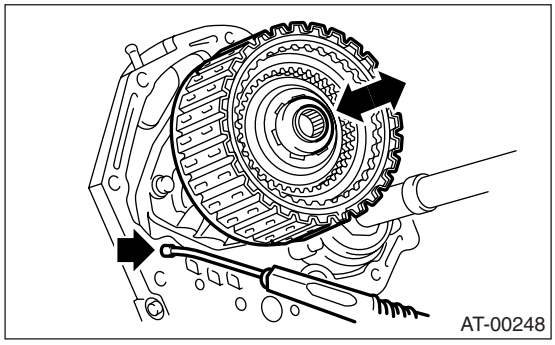
If specified tolerance limits are exceeded, select a suitable high clutch retaining plate.

High clutch retaining plate	
Part No.	Thickness mm (in)
31567AA710	4.7 (0.185)
31567AA720	4.8 (0.189)
31567AA730	4.9 (0.193)
31567AA740	5.0 (0.197)
31567AA670	5.1 (0.201)
31567AA680	5.2 (0.205)
31567AA690	5.3 (0.209)
31567AA700	5.4 (0.213)

12) Install driven plate, drive plate, retaining plate and snap ring.



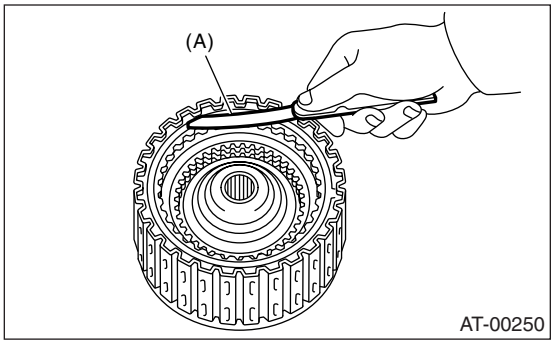
13) Apply compressed air intermittently to check for operation.



14) Measure the clearance between the retaining plate and snap ring (Reverse clutch). At this time, do not press down retaining plate.

Standard value:
0.5 — 0.8 mm (0.020 — 0.031 in)

Allowable limit:
1.2 mm (0.047 in)



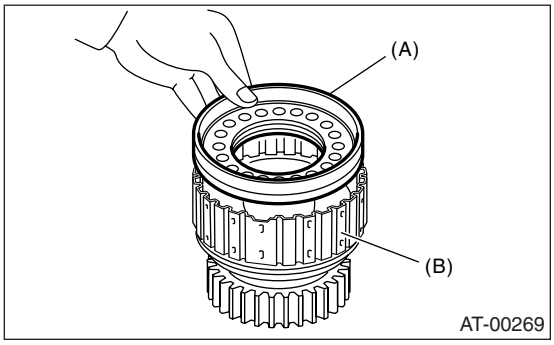
(A) Thickness gauge

If specified tolerance limits are exceeded, select a suitable high clutch retaining plate.

Reverse clutch retaining plates	
Part No.	Thickness mm (in)
31567AA910	4.0 (0.157)
31567AA920	4.2 (0.165)
31567AA930	4.4 (0.173)
31567AA940	4.6 (0.181)
31567AA950	4.8 (0.189)
31567AA960	5.0 (0.197)
31567AA970	5.2 (0.205)
31567AA980	5.4 (0.213)

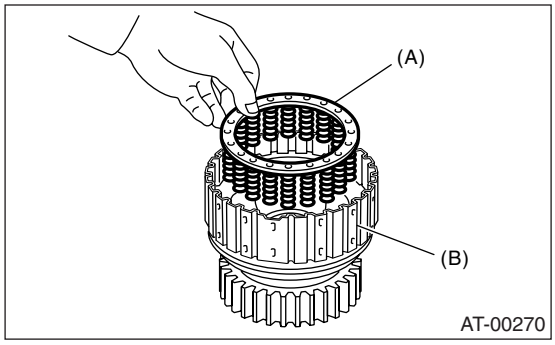
2. PLANETARY GEAR, LOW CLUTCH

1) Install lathe cut seal ring to low clutch piston.
2) Fit the low clutch piston to the low clutch drum.



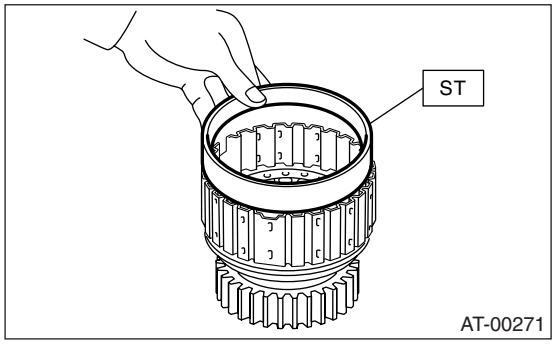
(A) Low clutch piston
(B) Low clutch drum

3) Install spring retainer to low clutch piston.

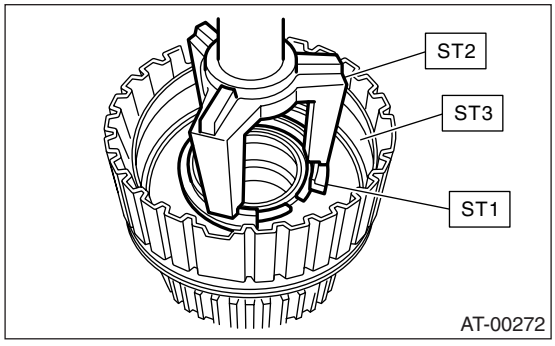


(A) Spring retainer
(B) Low clutch drum

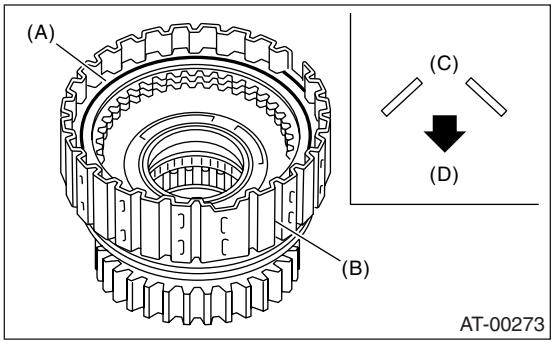
4) Install ST to low clutch drum.
ST 498437100 LOW CLUTCH PISTON GUIDE



5) Set the cover on the piston with a press using ST1 and ST2, and attach the snap ring. At this time, be careful not to fold cover seal during installation.
ST1 498627100 SEAT
ST2 398673600 COMPRESSOR
ST3 498437100 LOW CLUTCH PISTON GUIDE

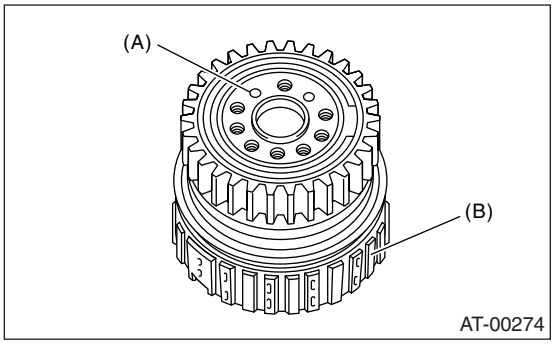


6) Install the dish plate, driven plates, drive plates, and retaining plate, and secure with the snap ring.



(A) Snap ring
(B) Low clutch drum
(C) Dish plate
(D) Low clutch piston side

7) Check the low clutch for operation.
(1) Remove one-way clutch. <Ref. to 4AT-113, REMOVAL, AT Main Case.>
(2) Set the one-way clutch inner race, and apply compressed air for checking.

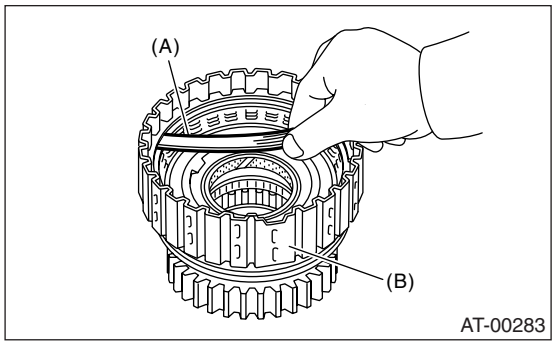


(A) Apply compressed air
(B) Low clutch drum

8) Checking low clutch clearance.
(1) Place the same thickness of shim on both sides to prevent retaining plate from tilting.
(2) Inspect clearance between retaining plate and operation of the low clutch.

Standard value:
0.7 — 1.1 mm (0.028 — 0.043 in)

Allowable limit:
1.6 mm (0.063 in)

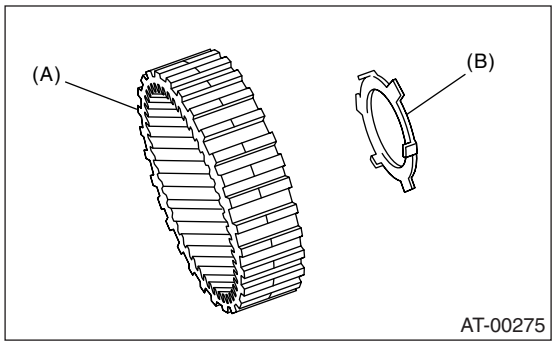


(A) Thickness gauge
(B) Low clutch drum

If the clearance is out of the specified range, select a proper retaining plate so that the standard clearance can be obtained.

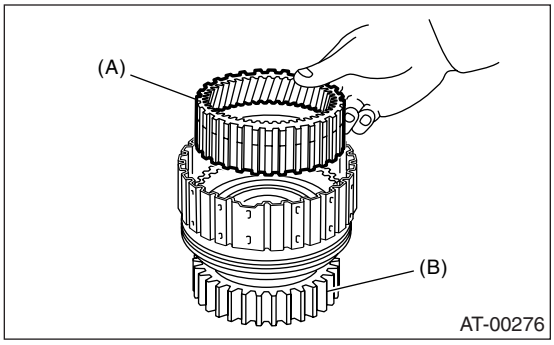
Available retaining plates	
Part No.	Thickness mm (in)
31567AA830	3.8 (0.150)
31567AA840	4.0 (0.157)
31567AA850	4.2 (0.165)
31567AA860	4.4 (0.173)
31567AA870	4.6 (0.181)

9) Install washer to rear internal gear.



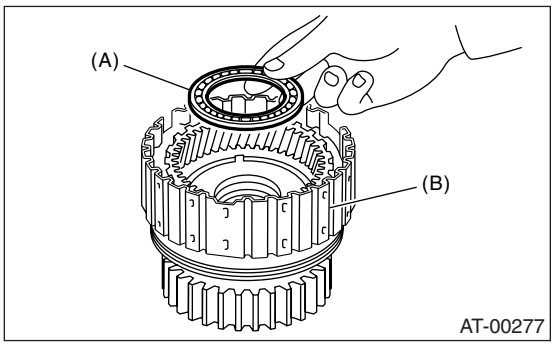
(A) Rear internal gear
(B) Washer

10) Install rear internal gear.



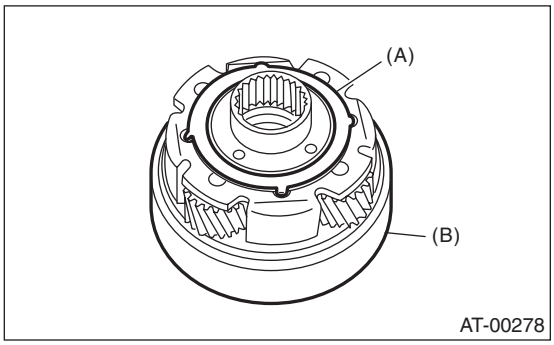
(A) Rear internal gear
(B) Low clutch drum

11) Install thrust needle bearing in the correct direction.



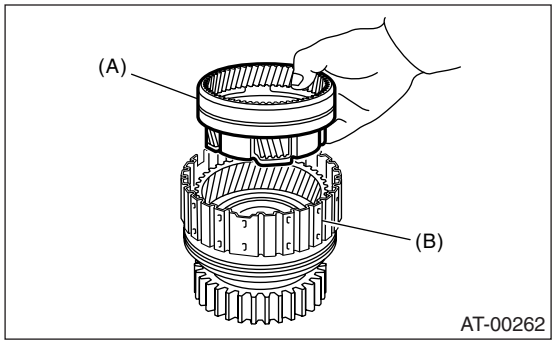
(A) Thrust needle bearing
(B) Low clutch drum

12) Install the washer by aligning protrusion of washer and hole of rear planetary carrier.



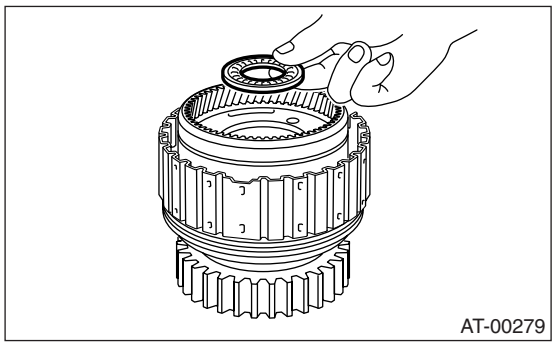
(A) Washer
(B) Rear planetary carrier

13) Install rear planetary carrier to low clutch drum.

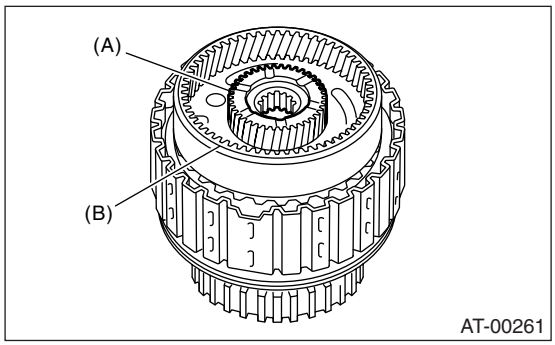


(A) Rear planetary carrier
(B) Low clutch drum

14) Install thrust needle bearing in the correct direction.

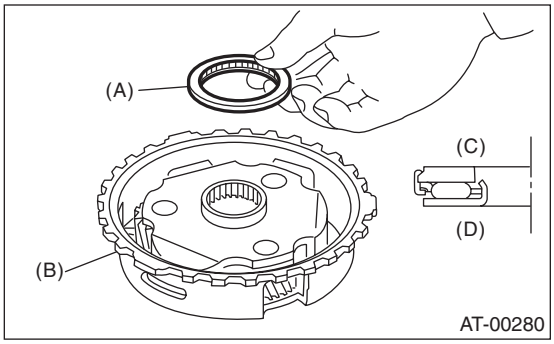


15) Install the rear sun gear in proper direction.



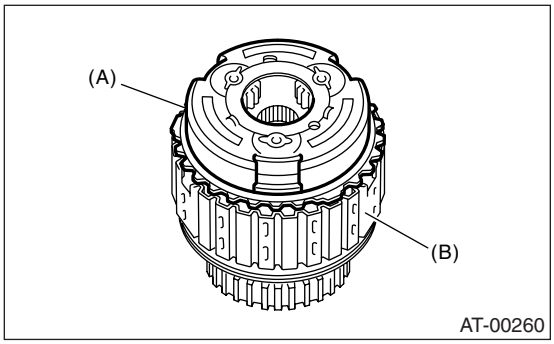
(A) Rear sun gear
(B) Rear planetary carrier

16) Install the thrust needle bearing in proper direction.



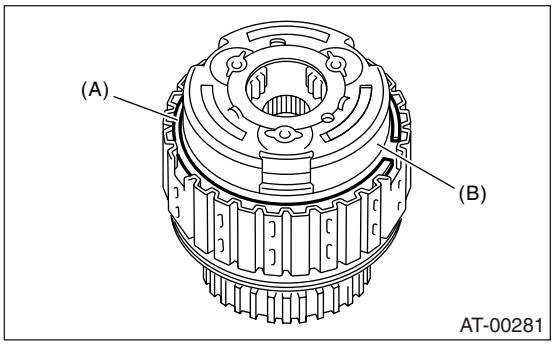
(A) Thrust needle bearing
(B) Front planetary carrier
(C) Rear sun gear side
(D) Front planetary carrier side

17) Install front planetary carrier to low clutch drum.



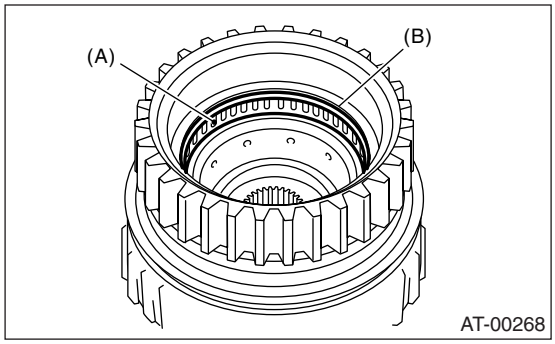
(A) Front planetary carrier
(B) Low clutch drum

18) Install snap ring to low clutch drum.



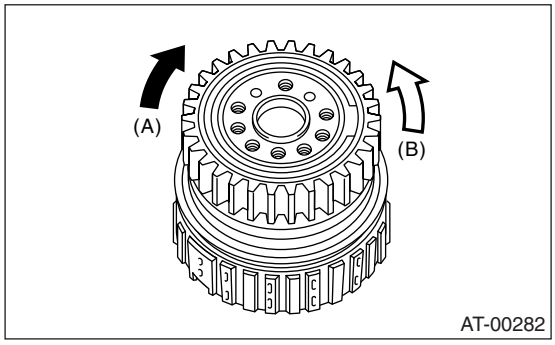
(A) Snap ring
(B) Front planetary carrier

19) Install the needle bearing, and secure with the snap ring.



(A) Needle bearing
(B) Snap ring

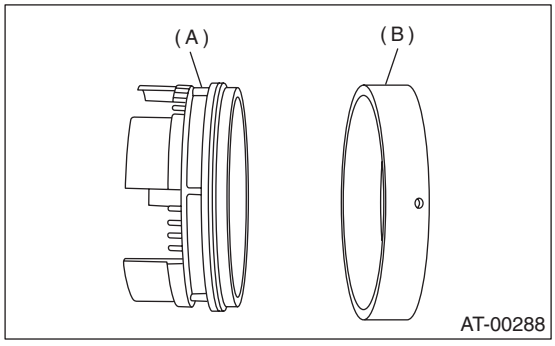
20) Install the one-way clutch, one-way clutch inner race and plate, and secure with the snap ring.
21) Set the inner race. Make sure that the forward clutch is free in the clockwise direction and locked in the counterclockwise direction, as viewed from the front of the vehicle.



(A) Locked
(B) Free

3. 2-4 BRAKE

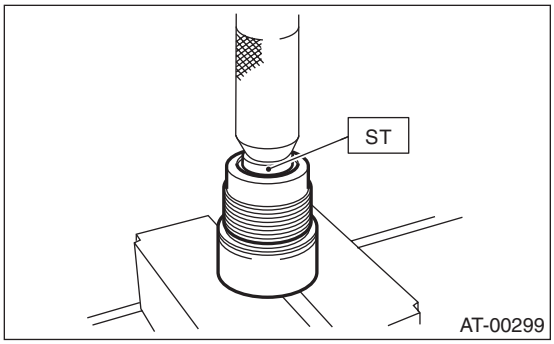
1) Install 2-4 brake piston to 2-4 brake piston retainer.



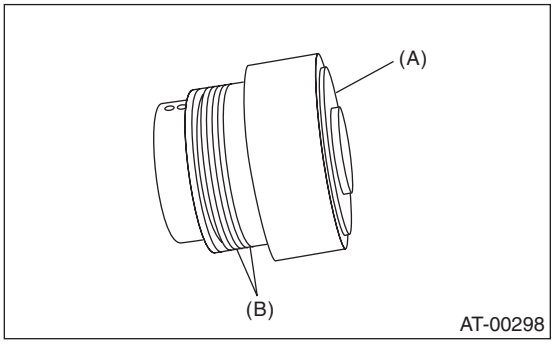
(A) 2-4 brake piston
(B) 2-4 brake piston retainer

4. ONE-WAY CLUTCH INNER RACE

1) Using a press and ST, install the needle bearing to the inner race.
ST 398497701 SEAT



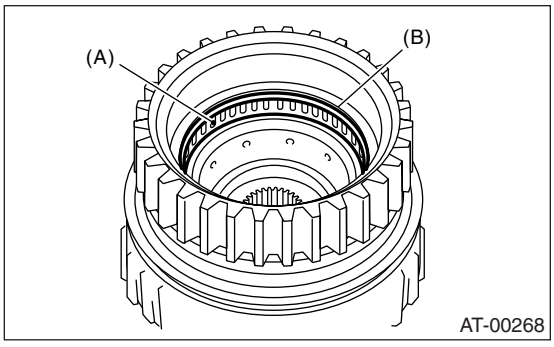
2) Apply vaseline to the groove of the inner race and to the seal ring.
3) Install two seal rings to one-way clutch inner race.



(A) One way clutch inner race
(B) Seal rings

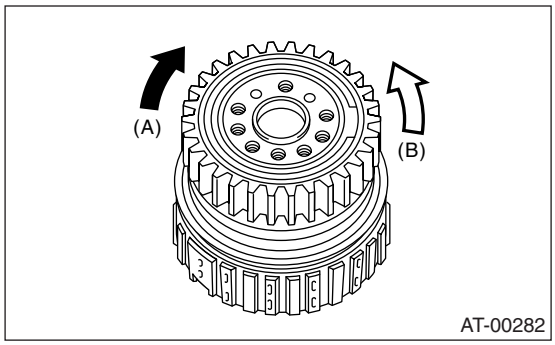
5. ONE-WAY CLUTCH OUTER RACE

1) Install the needle bearing, and secure with the snap ring.



(A) Needle bearing
(B) Snap ring

2) Install the one-way clutch, and secure with the snap ring.
3) Set the inner race. Make sure that the forward clutch is free in the clockwise direction and locked in the counterclockwise direction, as viewed from the front of the vehicle.



(A) Locked
(B) Free

E: INSPECTION

1. HIGH CLUTCH AND REVERSE CLUTCH

Inspect the following items.
- Drive plate facing for wear and damage
- Snap ring for wear, return spring for setting and breakage, and snap ring retainer for deformation
- Lip seal and lathe cut seal ring for damage
- Piston and drum check ball for operation
- Adjust total end play. <Ref. to 4AT-100, ADJUSTMENT, Oil Pump Housing.>

2. PLANETARY GEAR AND LOW CLUTCH

Inspect the following items.
- Drive plate facing for wear and damage
- Snap ring for wear, return spring for breakage or setting, and spring retainer for deformation
- Lip seal and lathe cut seal ring for damage
- Piston check ball for operation
- Measure the total end play and adjust to within specifications.

<Ref. to 4AT-100, ADJUSTMENT, Oil Pump Housing.>

3. 2-4 BRAKE

Inspect the following items.
- Drive plate facing for wear and damage
- Snap ring for wear and spring retainer for deformation
- Lip seal and lathe cut seal ring for damage
- Measure the total end play and adjust to within specifications.<Ref. to 4AT-100, ADJUSTMENT, Oil Pump Housing.>

4. ONE-WAY CLUTCH

- Make sure the snap ring is not worn and the seal rings are not damaged.
- Measure the total end play and adjust to within specifications. <Ref. to 4AT-100, ADJUSTMENT, Oil Pump Housing.>

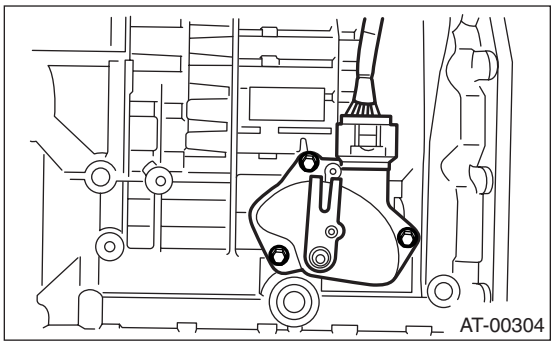
5. LOW AND REVERSE BRAKE

Check for the following.
- Drive plate facing for wear or damage
- Snap ring for wear and spring retainer for deformation

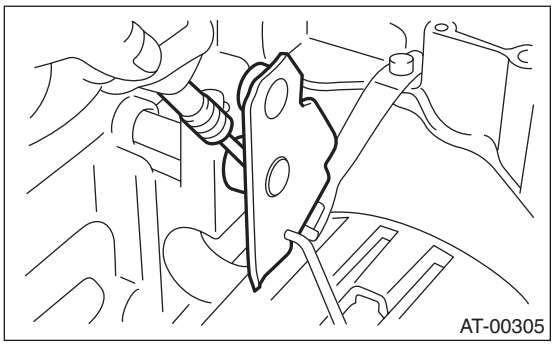
39.Transmission Control Device

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
2) Extract the torque converter clutch assembly. <Ref. to 4AT-74, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.
4) Lift-up the lever behind the transmission harness connector and disconnect it from stay.
5) Disconnect the air breather hoses. <Ref. to 4AT-72, REMOVAL, Air Breather Hose.>
6) Disconnect the inhibitor switch connector from stay.
7) Wrap the nipple attached to the air breather hose around with a vinyl tape.
8) Remove pitching stopper bracket.
9) Remove the inhibitor switch.

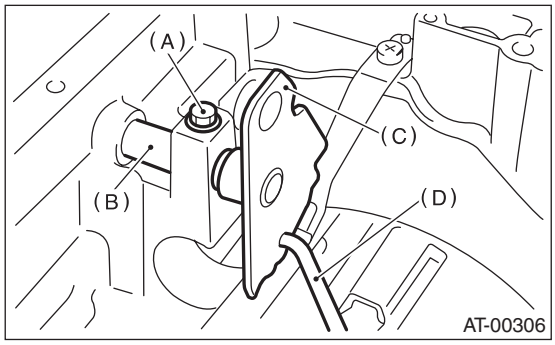

AT-00304

10) Remove the control valve body assembly. <Ref. to 4AT-55, REMOVAL, Control Valve Body.>
11) Pull off the straight pin of manual plate.


AT-00305

12) Remove the bolts securing select lever, then remove the select lever, manual plate and parking rod.

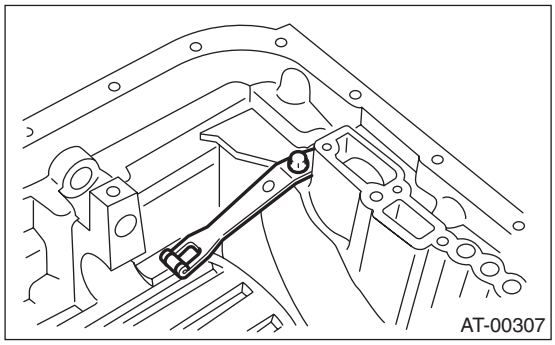
NOTE:
Be careful not to damage the lips of the press-fitted oil seal in the case.



AT-00306

(A) Bolt
(B) Range select lever
(C) Manual plate
(D) Parking rod

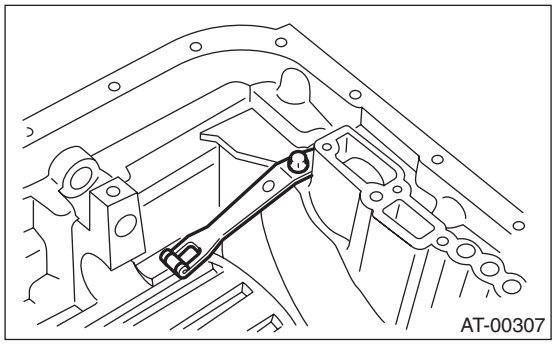
13) Remove the detention spring.


AT-00307

B: INSTALLATION

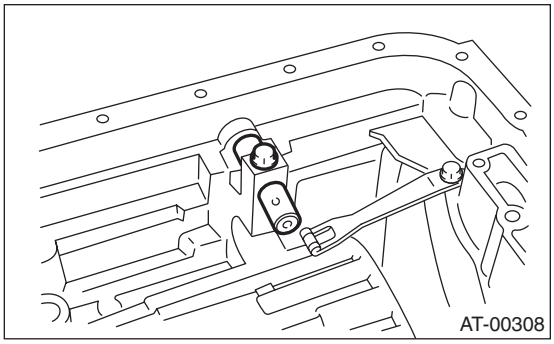
1) Install the detention spring to transmission case.

Tightening torque:
6 N·m (0.6 kgf-m, 4.3 ft-lb)

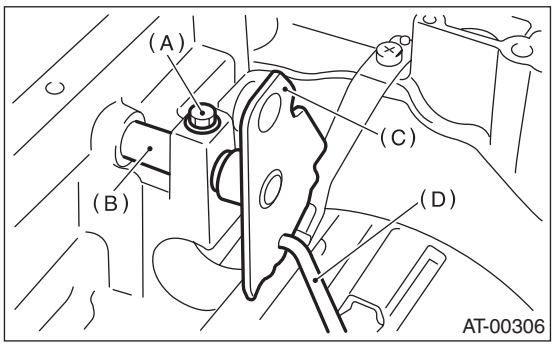

AT-00307

2) Insert the range select lever, and tighten the bolt.

Tightening torque:
6 N·m (0.6 kgf-m, 4.3 ft-lb)

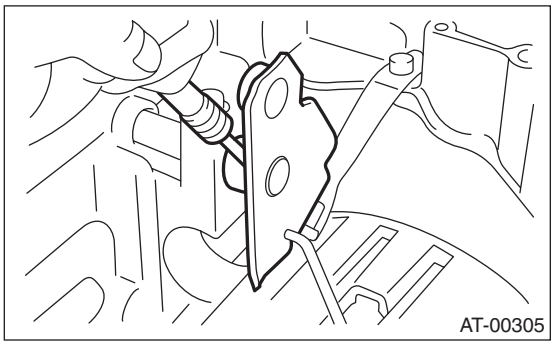


3) Insert the manual plate and parking rod.



(A) Bolt
(B) Range select lever
(C) Manual plate
(D) Parking rod

4) Insert the spring pin to manual plate.

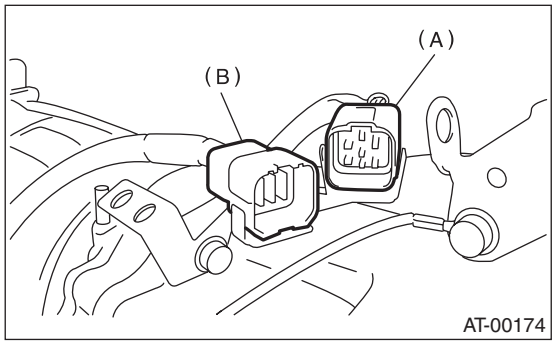


5) Install the control valve assembly and oil pan. <Ref. to 4AT-56, INSTALLATION, Control Valve Body.>
6) Turn over the transmission case to its original position.
7) Install the pitching stopper bracket.

Tightening torque:
41 N·m (4.2 kgf-m, 30.4 ft-lb)

8) Install the inhibitor switch and adjust the inhibitor switch. <Ref. to 4AT-46, Inhibitor Switch.>

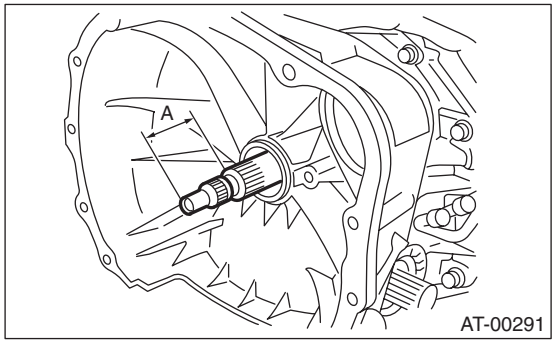
9) Insert the inhibitor switch and transmission connector into stay.



(A) Transmission harness
(B) Inhibitor switch harness

10) Install the air breather hose. <Ref. to 4AT-72, INSTALLATION, Air Breather Hose.>
11) Insert the input shaft while turning it lightly by hand and verify the protrusion amount.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



12) Install the torque converter clutch assembly. <Ref. to 4AT-74, INSTALLATION, Torque Converter Clutch Assembly.>
13) Install the transmission assembly to the vehicle. <Ref. to 4AT-39, INSTALLATION, Automatic Transmission Assembly.>

C: INSPECTION

Make sure the manual lever and detention spring are not worn or otherwise damaged.

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

4AT(diag)

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1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how trouble occurred using interview checklist. <Ref. to 4AT(diag)-4, Check List for Interview.> 2) Before performing the diagnosis, inspect following items which might influence the AT problems. • General inspection <Ref. to 4AT(diag)-5, INSPECTION, General Description.> • Oil leak • Stall speed test <Ref. to 4AT-33, Stall Test.> • Line pressure test <Ref. to 4AT-35, Line Pressure Test.> • Transfer clutch pressure test <Ref. to 4AT-36, Transfer Clutch Pressure Test.> • Time lag test <Ref. to 4AT-34, Time Lag Test.> • Road test <Ref. to 4AT-32, Road Test.> • Inhibitor switch <Ref. to 4AT-46, Inhibitor Switch.>	Is the unit that might influence AT problem normal?	Go to step **2.**	Repair or replace each item.
2	**CHECK AT OIL TEMP WARNING LIGHT.** Turn the ignition switch to ON.	Does the AT OIL TEMP warning light illuminate?	Go to step **4.**	Go to step **3.**
3	**CHECK AT OIL TEMP WARNING LIGHT.** 1) Turn the ignition switch to OFF. 2) Repair the AT OIL TEMP warning light circuit or power supply and ground line circuit. <Ref. to 4AT(diag)-30, Diagnostic Procedure for AT OIL TEMP Warning Light.> 3) Turn the ignition switch to ON.	Is the AT OIL TEMP warning light illuminate?	Go to step **4.**	Go to step **5.**
4	**CHECK INDICATION OF DTC.** Calling up the DTC. Without Subaru Select Monitor <Ref. to 4AT(diag)-24, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> With Subaru Select Monitor <Ref. to 4AT(diag)-25, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> NOTE: If the communication function of select monitor cannot be executed normally, check the communication circuit. <Ref. to 4AT(diag)-36, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostic Procedurefor Select Monitor Communication.>	Is the DTC displayed?	Go to step **6.** NOTE: Record all DTC.	Go to step **5.**

	Step	Check	Yes	No
5	**PERFORM THE GENERAL DIAGNOSTICS.** 1) Inspect using “Diagnostic Procedure without DTC”.<Ref. to 4AT(diag)-100, Diagnostic Procedure without Diagnostic Trouble Code (DTC).> 2) Inspect using “Symptom Related Diagnostic”. <Ref. to 4AT(diag)-115, Symptom Related Diagnostic.> 3) Perform the clear memory mode. Without Subaru Select Monitor <Ref. to 4AT(diag)-27, WITH SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> With Subaru Select Monitor <Ref. to 4AT(diag)-27, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 4) Perform the inspection mode. <Ref. to 4AT(diag)-26, Inspection Mode.> 5) Calling up the DTC. Without Subaru Select Monitor <Ref. to 4AT(diag)-24, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> With Subaru Select Monitor <Ref. to 4AT(diag)-25, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is the DTC displayed?	Complete the diagnosis.	Go to step **6.**
6	**PERFORM THE DIAGNOSIS.** 1) Inspect using “Diagnostics Chart with DTC”. <Ref. to 4AT(diag)-39, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: For DTC table, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to 4AT(diag)-29, List of Diagnostic Trouble Code (DTC).> 2) Repair the trouble cause. 3) Perform the clear memory mode. Without Subaru Select Monitor <Ref. to 4AT(diag)-27, WITH SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> With Subaru Select Monitor <Ref. to 4AT(diag)-27, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 4) Perform the inspection mode. <Ref. to 4AT(diag)-26, Inspection Mode.> 5) Calling up the DTC. Without Subaru Select Monitor <Ref. to 4AT(diag)-24, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> With Subaru Select Monitor <Ref. to 4AT(diag)-25, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is the DTC displayed?	Complete the diagnosis.	Inspect using “Diagnostics Procedure with Diagnostic Trouble Code (DTC)”. <Ref. to 4AT(diag)-39, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

2. Check List for Interview

A: CHECK

Check the following items when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name			
Date of purchase			
Date of repair			
Trans. model	TRANSMISSION	VIN	
Odometer reading	km/h or miles		
Frequency	❑ Continuous ❑ Intermittent (times a day)		
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others ( )		
Place	❑ High ❑ Suburbs ❑ Inner city ❑ Uphill ❑ Rough road ❑ Others ( )		
Outdoor temperature	❑ Hot ❑ Warm ❑ Cool ❑ Cold		
Vehicle speed	km/h (MPH)		
AT diagnostic indicator light (AT OIL TEMP warning light)	❑ Continuously lit	❑ Not lit	
Select lever position	❑ P ❑ R ❑ N ❑ D ❑ 3 ❑ 2 ❑ 1		
Driving condition	❑ Not affected ❑ At racing ❑ While decelerating	❑ At starting ❑ While accelerating ❑ While turning (❑ RH / ❑ LH)	❑ While idling ❑ While cruising
Symptoms	❑ No up-shift		
	❑ No down-shift		
	❑ No kick down		
	❑ Vehicle does not move (❑ Any position ❑ Particular position)		
	❑ Lock-up malfunction		
	❑ Noise or vibration		
	❑ Shift shock or slip		
	❑ Select lever does not move		
	❑ Others ( )		

3. General Description

A: CAUTION

• Supplemental Restraint System "Airbag"

The airbag system wiring harness is routed near the transmission control module (TCM).

CAUTION:

• All airbag system wiring harness and connectors are colored yellow. Do not use an electrical test equipment on these circuit.

• Be careful not to damage the airbag system wiring harness when performing diagnostics and servicing the TCM.

• Measurement

When measuring the voltage and resistance of ECM, TCM or each sensor, use a tapered pin with diameter of less than 0.64 mm (0.025 in) in order to avoid poor contact. Do not insert the pin more than 0.65 mm (0.256 in).

B: INSPECTION

1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V or more

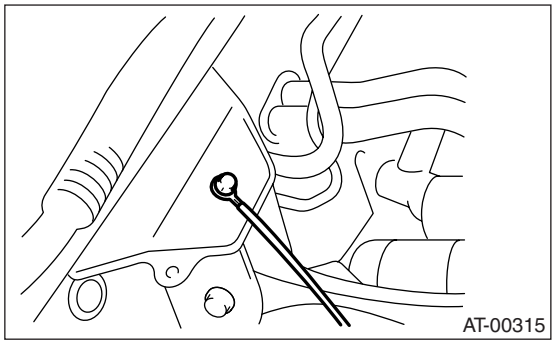
Specific gravity: Above 1.260

2. TRANSMISSION GROUND

Make sure that the ground terminal bolt is tightened securely.

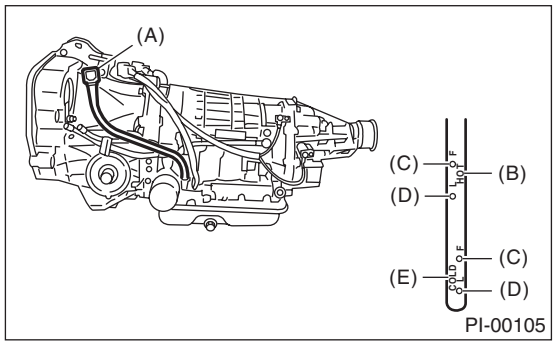
• Chassis side

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



3. ATF LEVEL

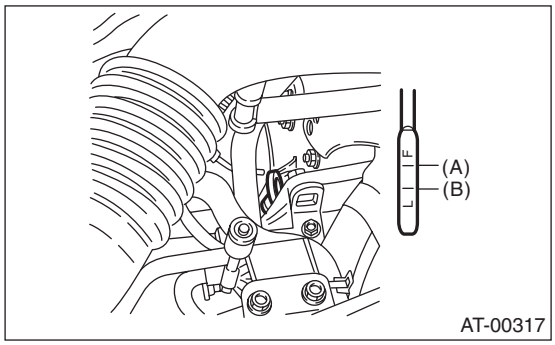
Make sure that ATF level is in the specification. <Ref. to 4AT-30, INSPECTION, Automatic Transmission Fluid.>



(A) Level gauge
(B) "HOT" side
(C) Upper level
(D) Lower level
(E) "COLD" side

4. FRONT DIFFERENTIAL OIL LEVEL

Make sure that the front differential oil level is in specification. <Ref. to 4AT-31, INSPECTION, Differential Gear Oil.>

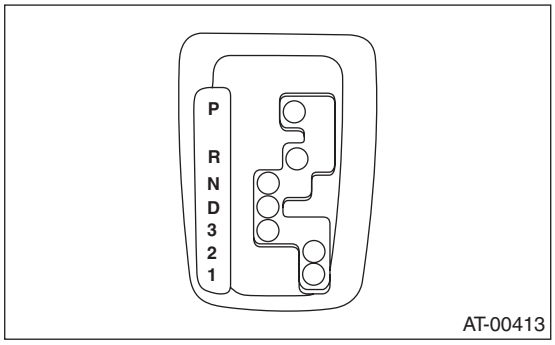


(A) Upper level
(B) Lower level

5. OPERATION OF SHIFT SELECT LEVER

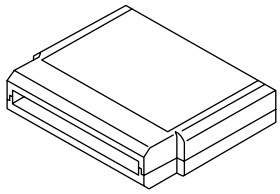
Make sure there is no abnormal noise, dragging or contact pattern in each select lever range.

WARNING:
Stop the engine while checking operation of selector lever.



C: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems.

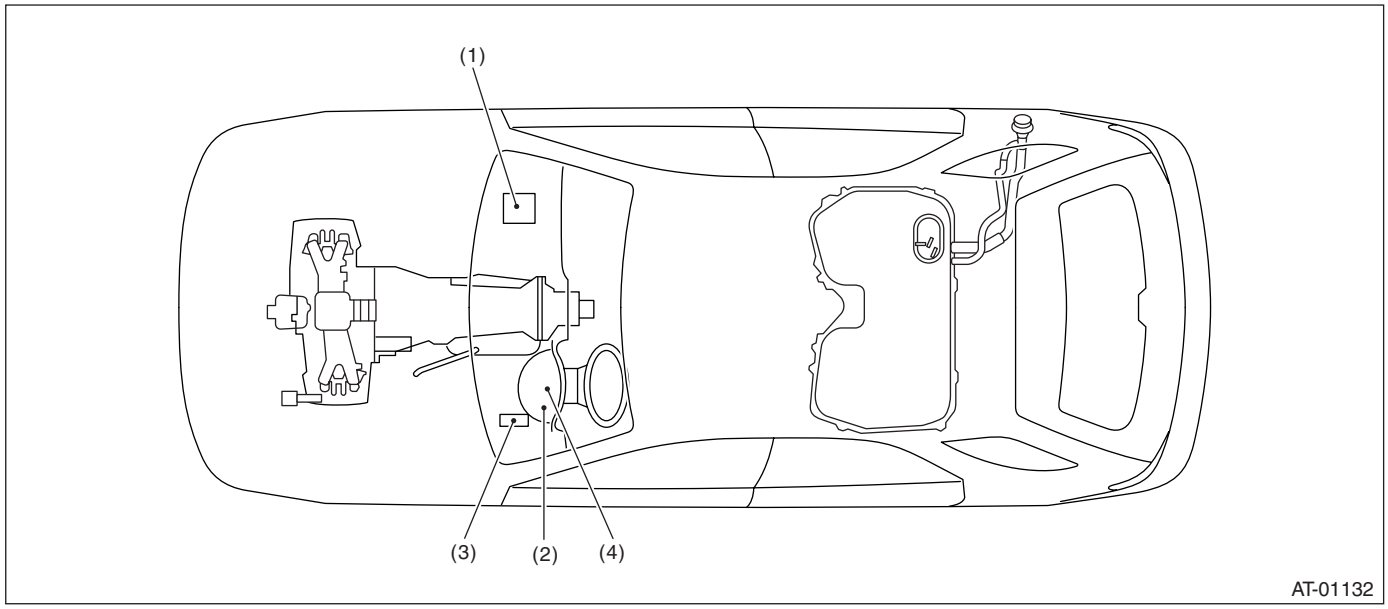
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Oscilloscope	Used for measuring sensor.

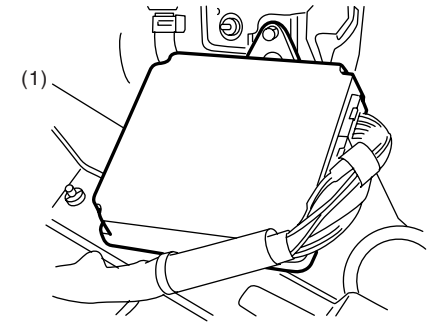
4. Electrical Components Location

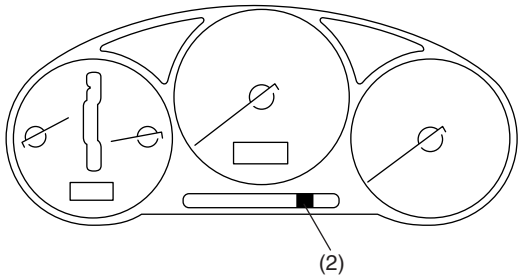
A: LOCATION

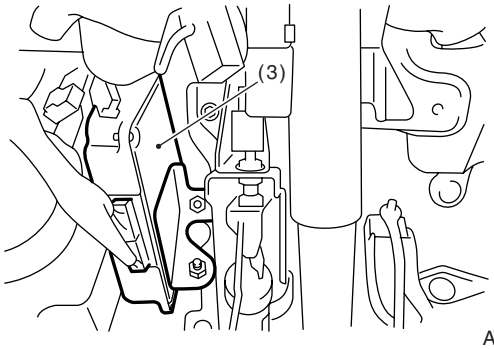
1. CONTROL MODULE

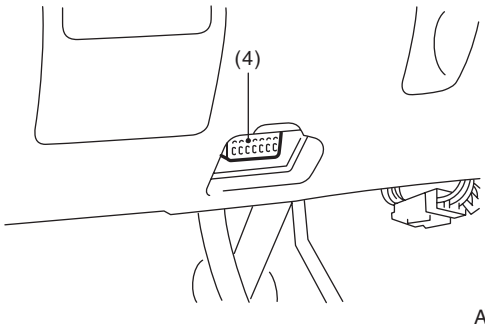


(1) Engine control module (ECM)
(2) AT OIL TEMP warning light (AT diagnostic indicator light)
(3) Transmission control module (TCM)
(4) Data link connector

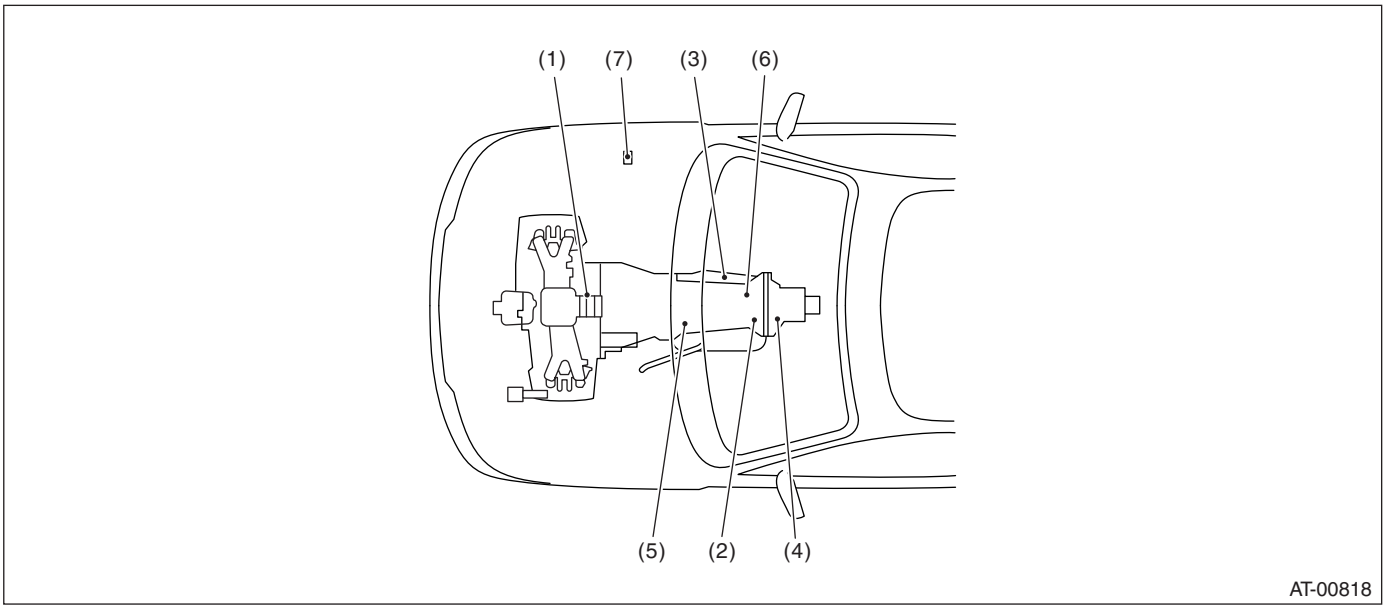




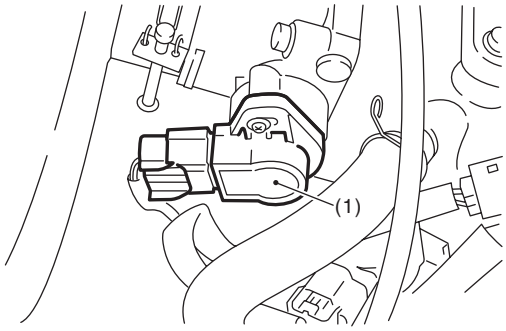




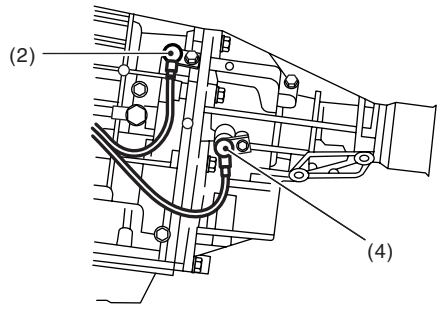
2. SENSOR



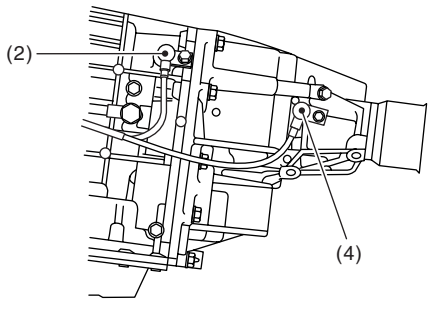
(1) Throttle position sensor
(2) Front vehicle speed sensor
(3) Inhibitor switch
(4) Rear vehicle speed sensor
(5) Torque converter turbine speed sensor
(6) ATF temperature sensor
(7) Dropping resistor (Non-TURBO MODEL)

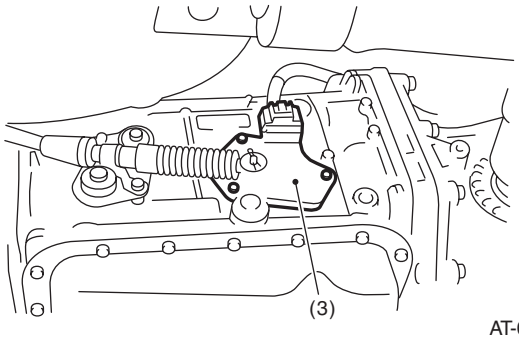


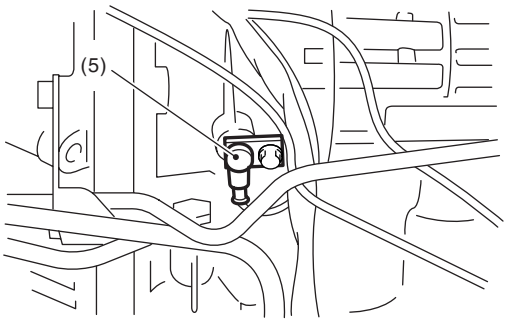
Non-turbo model



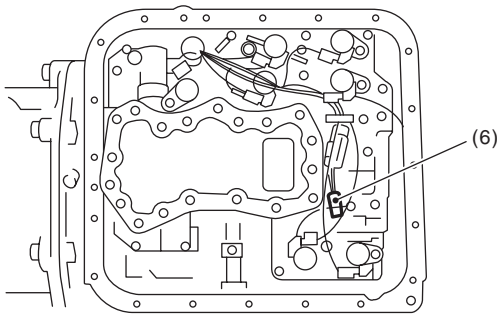
Turbo model



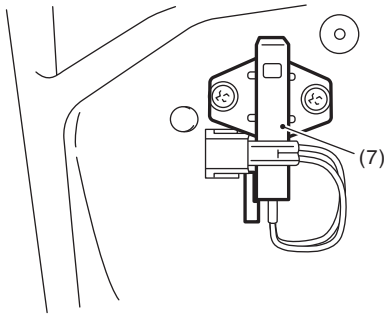




AT-00331

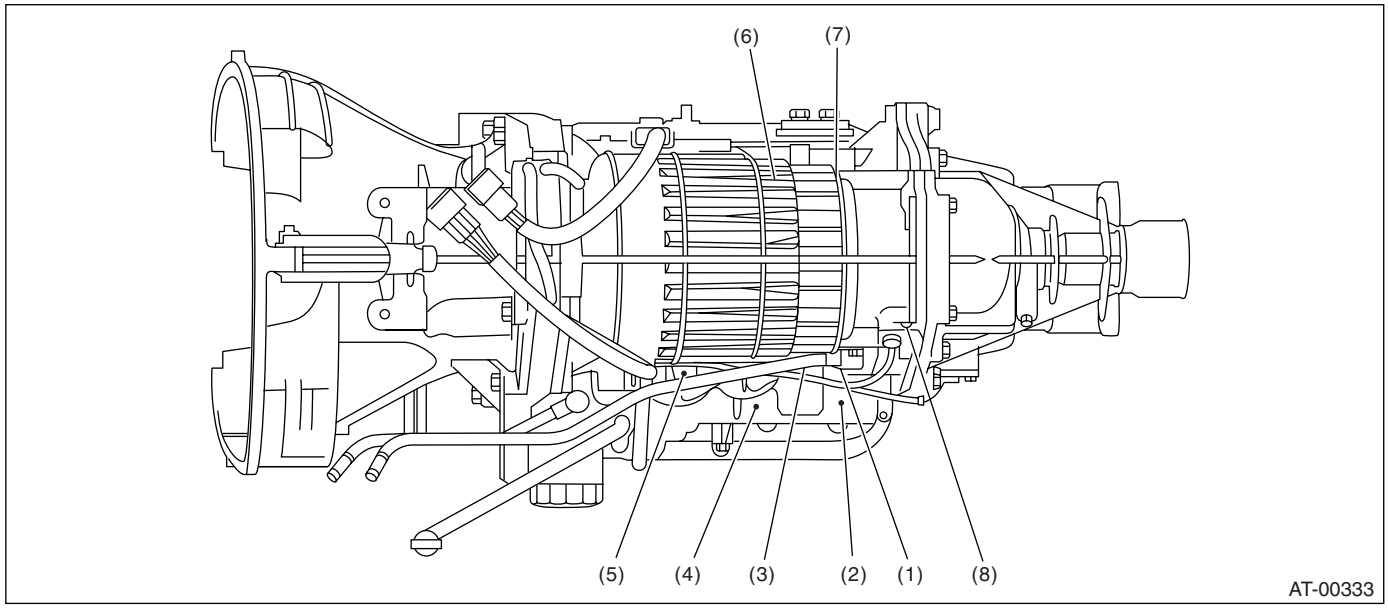


AT-00332

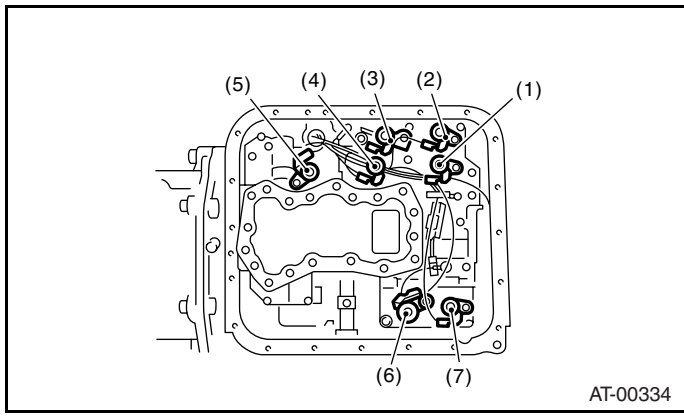


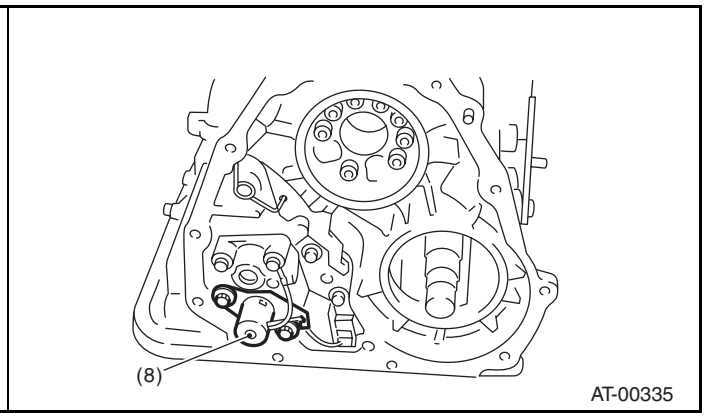
AT-00820

3. SOLENOID



(1) Solenoid 1
(2) Solenoid 2
(3) Line pressure duty solenoid
(4) Low clutch timing solenoid
(5) Lock-up duty solenoid
(6) 2-4 brake duty solenoid
(7) 2-4 brake timing solenoid
(8) Transfer duty solenoid

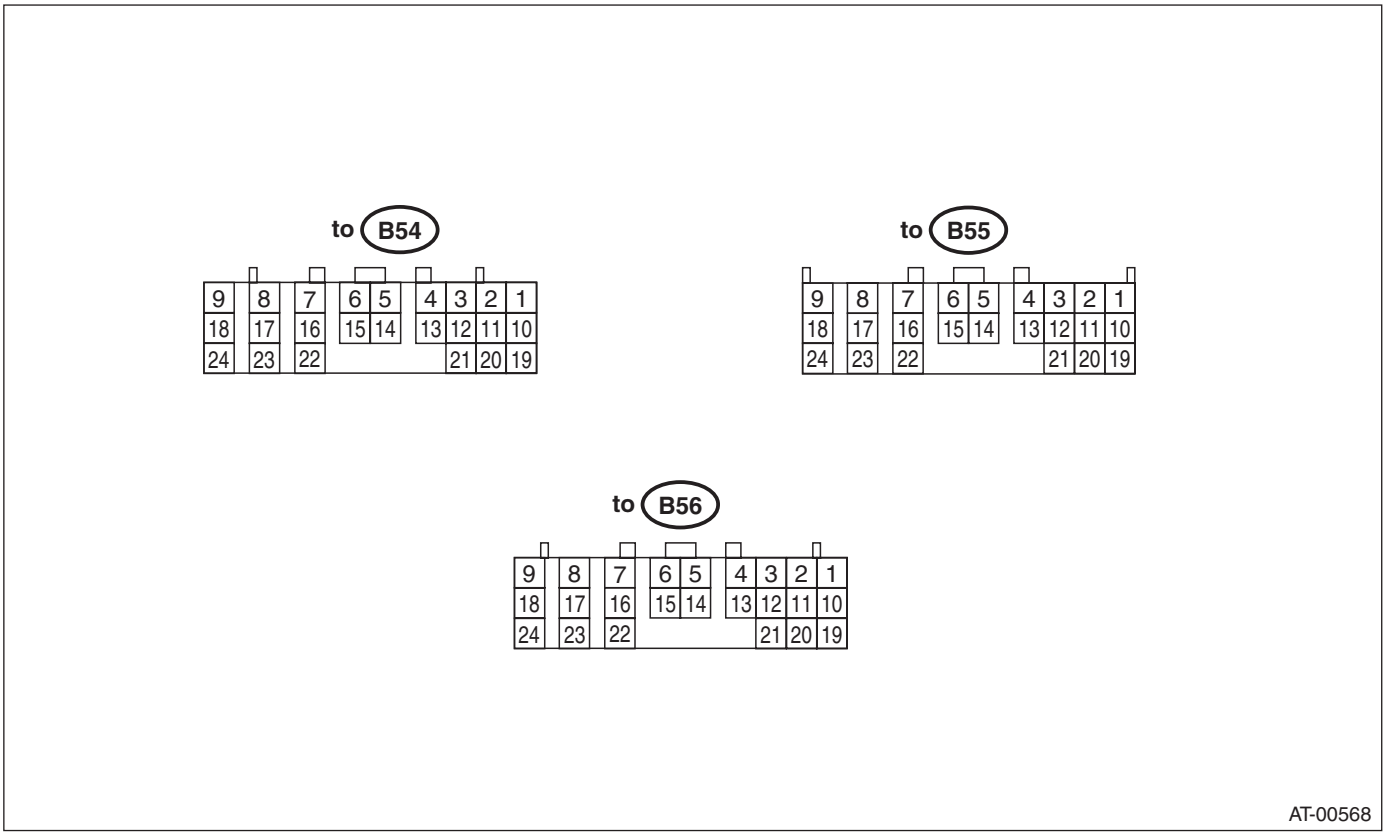




5. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION

1. TURBO MODEL

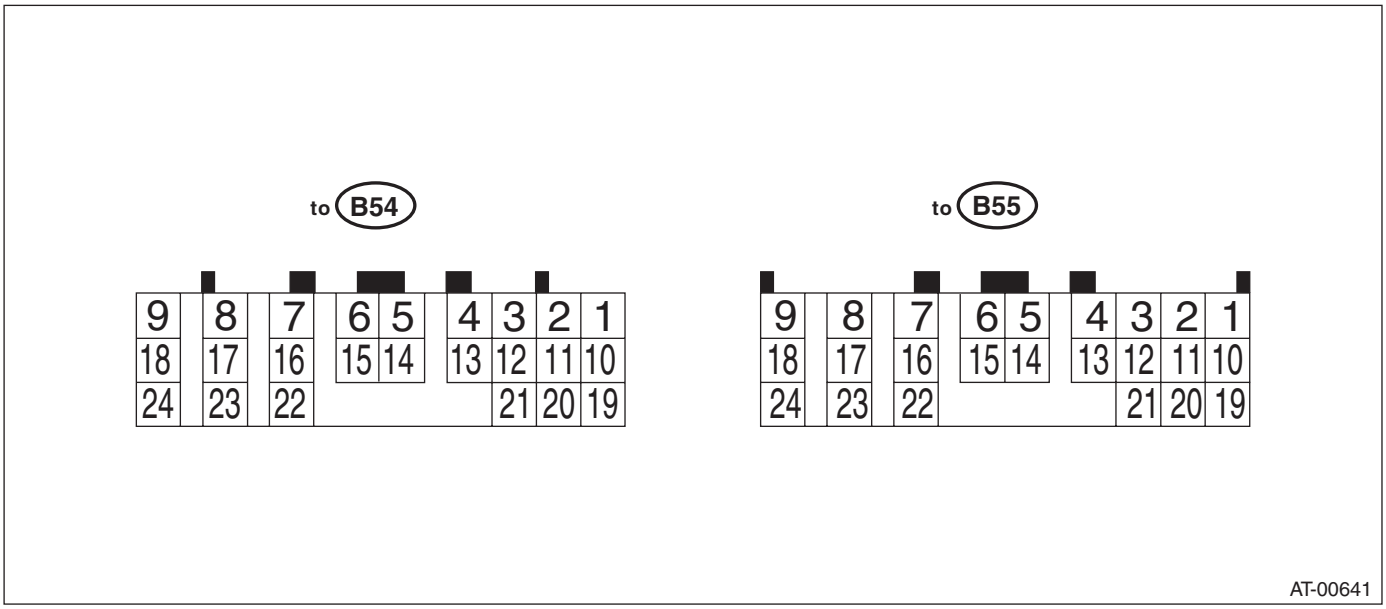


Check with ignition switch ON.						
Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Back-up power supply		B56	1	Ignition switch OFF	10 — 13	—
Ignition power supply		B54	23	Ignition switch ON (with engine OFF)	10 — 13	—
		B54	24			
Inhibitor switch	"P" range switch	B55	1	Select lever in "P" range	Less than 1	—
				Select lever in any other than "P" range (except "N" range)	More than 8	
	"N" range switch	B55	14	Select lever in "N" range	Less than 1	—
				Select lever in any other than "N" range (except "P" range)	More than 8	
	"R" range switch	B55	3	Select lever in "R" range	Less than 1	—
				Select lever in any other than "R" range	More than 8	
	"D" range switch	B55	4	Select lever in "D" range	Less than 1	—
				Select lever in any other than "D" range	More than 8	
	"3" range switch	B55	5	Select lever in "3" range	Less than 1	—
				Select lever in any other than "3" range	More than 8	

Check with ignition switch ON.						
Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Inhibitor switch	"2" range switch	B55	6	Select lever in "2" range	Less than 1	—
				Select lever in any other than "2" range	More than 8	
	"1" range switch	B55	7	Select lever in "1" range	Less than 1	—
				Select lever in any other than "1" range	More than 8	
Brake switch		B55	12	Brake pedal depressed.	More than 10.5	—
				Brake pedal released.	Less than 1	
AT OIL TEMP warning light		B56	10	Light ON	Less than 1	—
				Light OFF	More than 9	
Throttle position sensor		B54	3	Throttle fully closed.	0.2 — 1.0	—
				Throttle fully open.	4.2 — 4.7	
Throttle position sensor power supply		B54	2	Ignition switch ON (with engine OFF)	4.8 — 5.3	—
ATF temperature sensor		B54	11	ATF temperature 20°C (68°F)	1.6 — 2.0	2.1 k — 2.9 k
				ATF temperature 80°C (176°F)	0.4 — 0.9	275 — 375
Rear vehicle speed sensor		B55	24	Vehicle stopped.	0	450 — 650
				Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Front vehicle speed sensor		B55	18	Vehicle stopped.	0	450 — 650
				Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Torque converter turbine speed sensor		B55	8	Engine idling after warm-up. (D range)	0	450 — 650
				Engine idling after warm-up. (N range)	More than 1 (AC range)	
Vehicle speed output signal		B56	17	Vehicle speed at most 10 km/h (6 MPH)	Less than 1 ← → More than 4	—
Engine speed signal		B55	17	Ignition switch ON (with engine OFF)	More than 10.5	—
				Ignition switch ON (with engine ON)	8 — 11	
Cruise set signal		B55	22	When cruise control is set. (SET lamp ON)	Less than 1	—
				When cruise control is not set. (SET lamp OFF)	More than 6.5	
Torque control signal 1		B56	5	Ignition switch ON (with engine ON)	More than 4	—
Torque control signal 2		B56	14	Ignition switch ON (with engine ON)	More than 4	—
Torque control cut signal		B55	10	Ignition switch ON	8	—
Mass air flow signal		B54	1	Engine idling after warm-up.	0.9 — 1.4	—
Shift solenoid 1		B54	22	1st or 4th gear	More than 9	10 — 16
				2nd or 3rd gear	Less than 1	
Shift solenoid 2		B54	5	1st or 2nd gear	More than 9	10 — 16
				3rd or 4th gear	Less than 1	

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Line pressure duty solenoid	B54	9	Ignition switch ON (with engine OFF). Throttle fully closed after warm-up.	1.5 — 4.0	2.0 — 4.5
			Ignition switch ON (with engine OFF). Throttle fully open after warm-up.	Less than 0.5	
Lock-up duty solenoid	B54	7	When lock up occurs.	More than 8.5	10 — 17
			When lock up is released.	Less than 0.5	
Transfer duty solenoid	B54	6	Throttle fully closed.	More than 8.5	10 — 17
			Throttle fully open.	Less than 0.5	
2-4 brake duty solenoid	B54	18	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 5.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
2-4 brake timing solenoid	B54	16	1st gear	Less than 1	10 — 16
			3rd gear	More than 9	
Low clutch timing solenoid	B54	15	2nd gear	Less than 1	10 — 16
			4th gear	More than 9	
ABS signal	B55	21	ABS switch ON	Less than 1	—
			ABS switch OFF	6.5 — 15	—
Sensor ground line 1	B54	20	—	0	Less than 1
Sensor ground line 2	B55	9	—	0	Less than 1
System ground line	B56	19	—	0	Less than 1
	B54	21			
Sensor ground line 3	B54	10	—	0	Less than 1
Sensor ground line 4	B54	19	—	0	Less than 1
AT diagnosis signal	B56	21	Ignition switch ON	Less than 1 ← → More than 4	—
Data link signal (Subaru Select Monitor)	B56	15	—	—	—

2. NON-TURBO MODEL



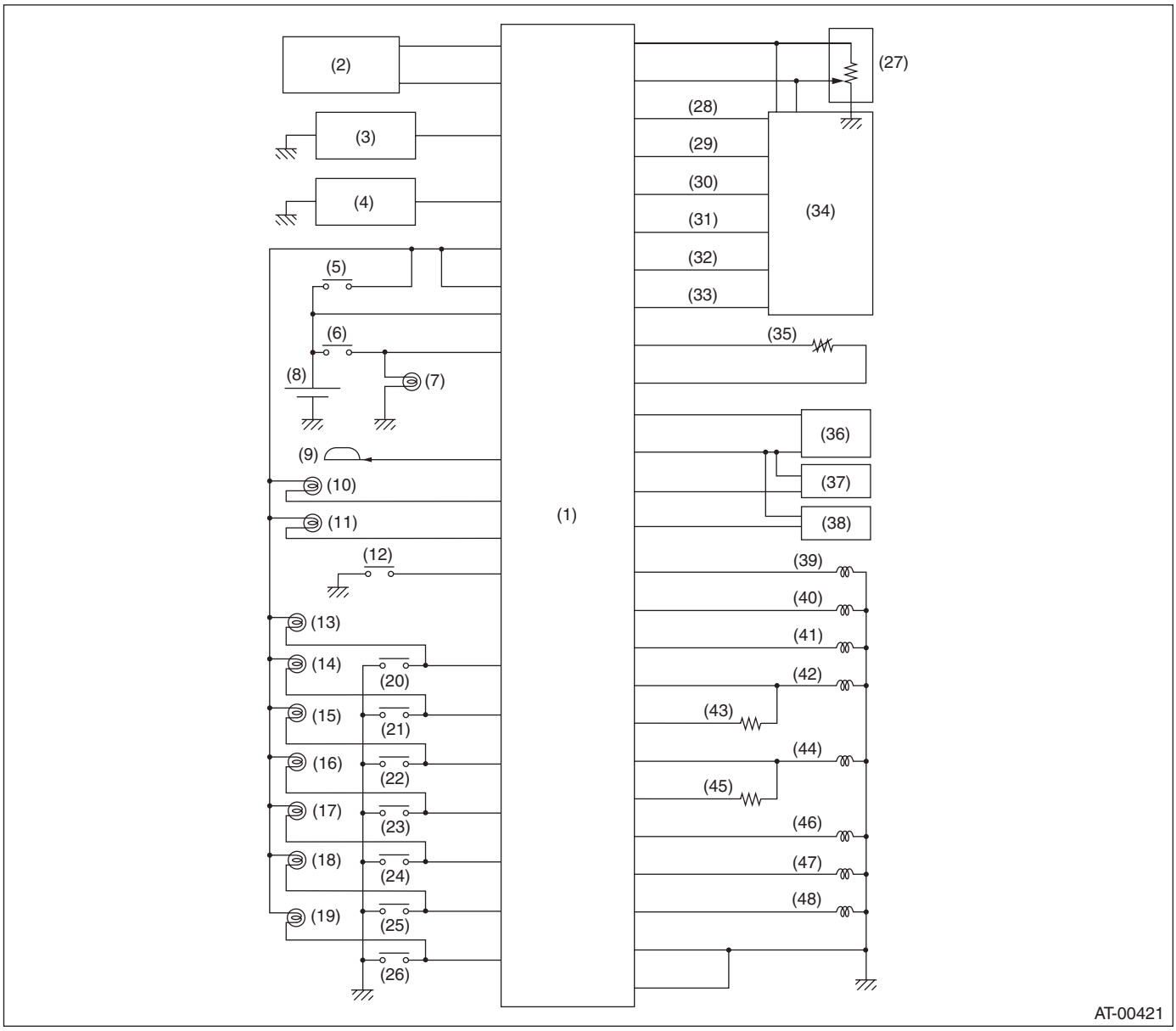
Check with ignition switch ON.						
Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Back-up power supply		B55	6	Ignition switch OFF	10 — 13	—
Ignition power supply		B54	23	Ignition switch ON (with engine OFF)	10 — 13	—
		B54	24			
Inhibitor switch	"P" range switch	B55	23	Select lever in "P" range	Less than 1	—
				Select lever in any other than "P" range (except "N" range)	More than 8	
	"N" range switch	B55	22	Select lever in "N" range	Less than 1	—
				Select lever in any other than "N" range (except "P" range)	More than 8	
	"R" range switch	B55	17	Select lever in "R" range	Less than 1	—
				Select lever in any other than "R" range	More than 8	
	"D" range switch	B55	8	Select lever in "D" range	Less than 1	—
				Select lever in any other than "D" range	More than 8	
	"3" range switch	B55	18	Select lever in "3" range	Less than 1	—
				Select lever in any other than "3" range	More than 8	
	"2" range switch	B54	10	Select lever in "2" range	Less than 1	—
				Select lever in any other than "2" range	More than 8	
	"1" range switch	B54	1	Select lever in "1" range	Less than 1	—
				Select lever in any other than "1" range	More than 8	
Brake switch		B55	24	Brake pedal depressed.	More than 10.5	—
				Brake pedal released.	Less than 1	
ABS signal		B54	19	ABS switch ON	Less than 1	—
				ABS switch OFF	More than 6.5	
AT OIL TEMP warning light		B54	3	Light ON	Less than 1	—
				Light OFF	More than 9	

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Throttle position sensor	B55	2	Throttle fully closed.	0.2 — 1.0	—
			Throttle fully open.	4.2 — 4.7	
Throttle position sensor power supply	B55	1	Ignition switch ON (With engine OFF)	4.8 — 5.3	—
ATF temperature sensor	B55	11	ATF temperature 20°C (68°F)	1.6 — 2.0	2.1 k — 2.9 k
			ATF temperature 80°C (176°F)	0.4 — 0.9	275 — 375
Rear vehicle speed sensor	B55	3	Vehicle stopped.	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Front vehicle speed sensor	B55	5	Vehicle stopped	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Torque converter turbine speed sensor	B55	12	Engine idling after warm-up (“D” range)	0	450 — 650
			Engine idling after warm-up (“N” range)	More than 1 (AC range)	
Vehicle speed output signal	B55	13	Vehicle speed at most 10 km/h (6 MPH)	Less than 1 ← → More than 4	—
Engine speed signal	B55	4	Ignition switch ON (with engine OFF)	0	—
			Ignition switch ON (with engine ON)	0 — 13 or more	
Cruise set signal	B54	11	When cruise control is set (SET light ON)	Less than 1	—
			When cruise control is not set (SET light OFF)	More than 6.5	
Torque control signal 1	B54	13	Ignition switch ON (with engine ON)	More than 4.0	—
Torque control signal 2	B54	21	Ignition switch ON (with engine ON)	More than 4.0	—
Torque control cut signal	B54	2	Ignition switch ON	8	—
Intake manifold pressure signal	B55	20	Engine idling after warm-up.	0.4 — 1.6	—
Shift solenoid 1	B54	7	1st or 4th gear	More than 9	10 — 16
			2nd or 3rd gear	Less than 1	
Shift solenoid 2	B54	6	1st or 2nd gear	More than 9	10 — 16
			3rd or 4th gear	Less than 1	
Line pressure duty solenoid	B54	9	Ignition switch ON (with engine OFF). Throttle fully closed after warm-up.	1.5 — 4.0	2.0 — 4.5
			Ignition switch ON (with engine OFF). Throttle fully open after warm-up.	Less than 1	
Dropping resistor	B54	18	Throttle fully closed (with engine OFF) after warm-up.	More than 8.5	9 — 15
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	

Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Lock-up duty solenoid	B54	16	When lock up occurs.	More than 8.5	10 — 17
			When lock up is released.	Less than 0.5	
Transfer duty solenoid	B54	15	Fuse on FWD switch	More than 8.5	10 — 17
			Fuse removed from FWD switch (with throttle fully open and with select lever in 1st gear).	Less than 0.5	
2-4 brake duty solenoid	B54	8	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 5.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
2-4 brake dropping resistor	B54	17	Throttle fully closed (with engine OFF) after warm-up.	More than 8.5	9 — 15
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
2-4 brake timing solenoid	B54	5	1st gear	Less than 1	10 — 16
			3rd gear	More than 9	
Low clutch timing solenoid	B54	14	2nd gear	Less than 1	10 — 16
			4th gear	More than 9	
Sensor ground line 1	B55	10	—	0	Less than 1
Sensor ground line 2	B55	21	—	0	Less than 1
System ground line	B55	9	—	0	Less than 1
		19			
FWD switch	B55	14	Fuse removed.	More than 9	—
			Fuse installed.	Less than 1	
FWD indicator light	B54	12	Fuse ONFWD switch	Less than 1	—
			Fuse removed from FWD switch	More than 9	
AT diagnosis signal	B54	4	Ignition switch ON	Less than 1 ← → More than 4	—
Data link signal (Subaru Select Monitor)	B55	7	—	—	—

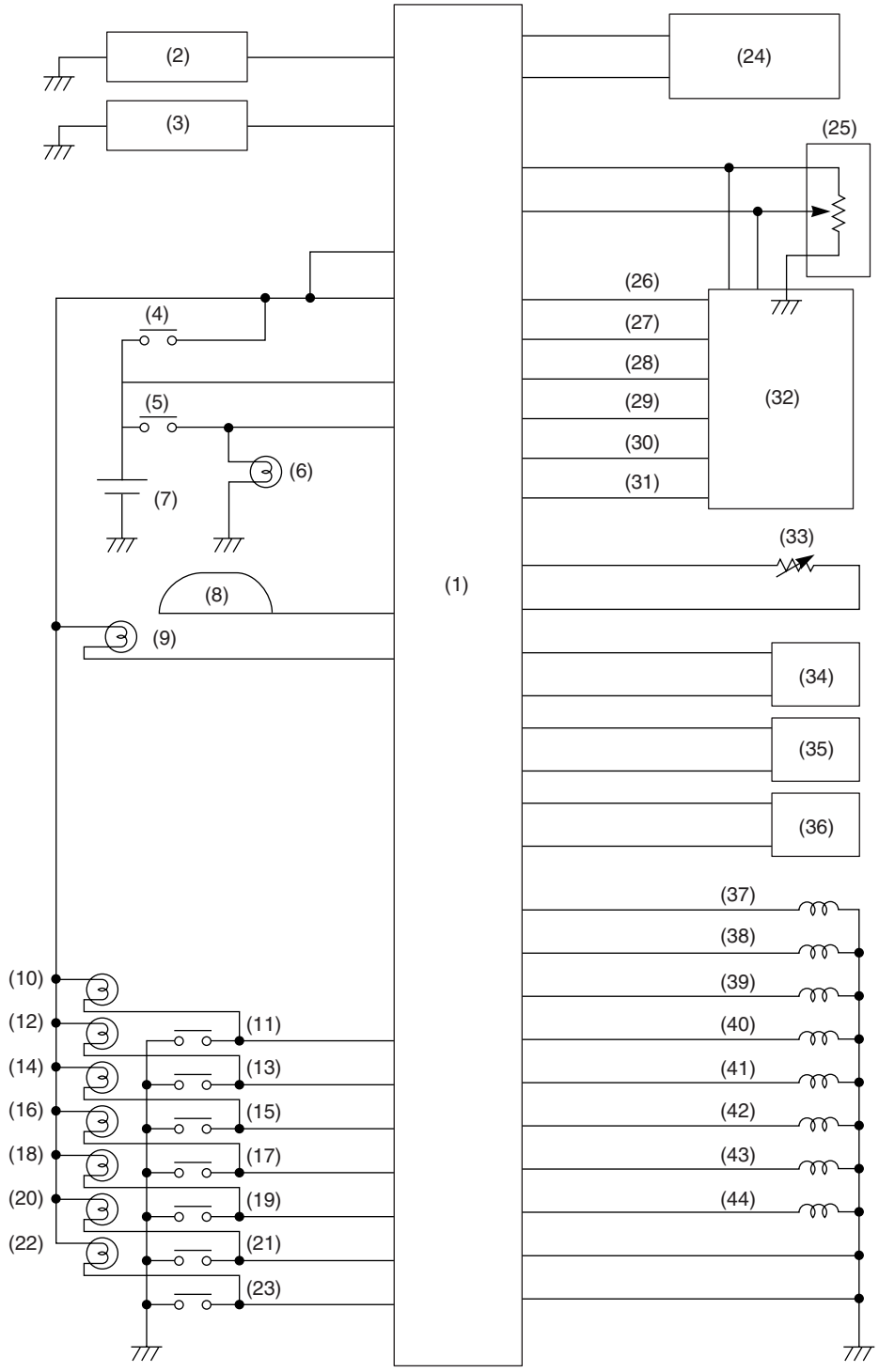
B: WIRING DIAGRAM

1. NON-TURBO MODEL



(1) Transmission control module (TCM)
(2) Data link connector
(3) Cruise control module
(4) ABS control module
(5) Ignition switch
(6) Brake switch
(7) Brake light
(8) Battery
(9) Combination meter
(10) AT OIL TEMP warning light
(11) FWD indicator light
(12) FWD switch
(13) “P” range indicator light
(14) “R” range indicator light
(15) “N” range indicator light
(16) “D” range indicator light
(17) “3” range indicator light
(18) “2” range indicator light
(19) “1” range indicator light
(20) “P” range switch
(21) “R” range switch
(22) “N” range switch
(23) “D” range switch
(24) “3” range switch
(25) “2” range switch
(26) “1” range switch
(27) Throttle position sensor
(28) Engine speed signal
(29) Torque control cut signal
(30) Torque control signal 2
(31) Torque control signal 1
(32) Intake manifold pressure signal
(33) AT diagnostics signal
(34) Engine control module (ECM)
(35) ATF temperature sensor
(36) Torque converter turbine speed sensor
(37) Front vehicle speed sensor
(38) Rear vehicle speed sensor
(39) Shift solenoid 1
(40) Shift solenoid 2
(41) 2-4 brake timing solenoid
(42) Line pressure duty solenoid
(43) Line pressure dropping resistor
(44) 2-4 brake duty solenoid
(45) 2-4 brake dropping resistor
(46) Lock-up duty solenoid
(47) Low clutch timing solenoid
(48) Transfer duty solenoid

2. TURBO MODEL



AT-00821

Transmission Control Module (TCM) I/O Signal

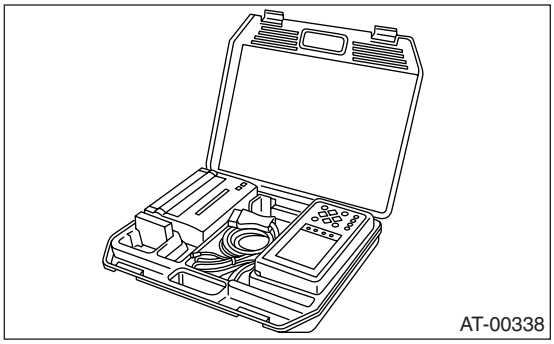
(1) Transmission control module (TCM)
(2) Cruise control module
(3) ABS control module
(4) Ignition switch
(5) Brake switch
(6) Brake light
(7) Battery
(8) Combination meter (Speedometer circuit)
(9) AT OIL TEMP warning light
(10) “P” range indicator light
(11) “P” range switch
(12) “R” range indicator light
(13) “R” range switch
(14) “N” range indicator light
(15) “N” range switch
(16) “D” range indicator light
(17) “D” range switch
(18) “3” range indicator light
(19) “3” range switch
(20) “2” range indicator light
(21) “2” range switch
(22) “1” range indicator light
(23) “1” range switch
(24) Data link connector
(25) Throttle position sensor
(26) Engine speed signal
(27) Torque control cut signal
(28) Torque control signal 2
(29) Torque control signal 1
(30) Mass air flow signal
(31) AT diagnostics signal
(32) Engine control module (ECM)
(33) ATF temperature sensor
(34) Torque converter turbine speed sensor
(35) Rear vehicle speed sensor
(36) Front vehicle speed sensor
(37) Shift solenoid 1
(38) Shift solenoid 2
(39) 2-4 brake timing solenoid
(40) Line pressure duty solenoid
(41) 2-4 brake duty solenoid
(42) Lock-up duty solenoid
(43) Low clutch timing solenoid
(44) Transfer duty solenoid

6. Subaru Select Monitor

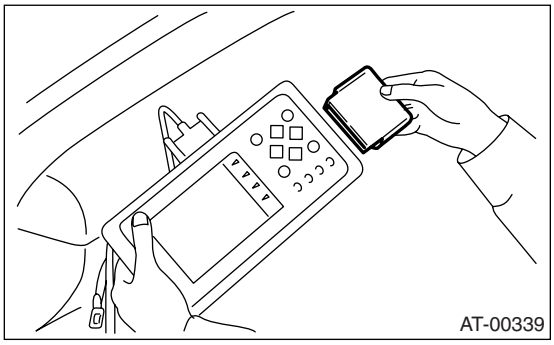
A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE (DTC)

1) Prepare the Subaru Select Monitor kit.

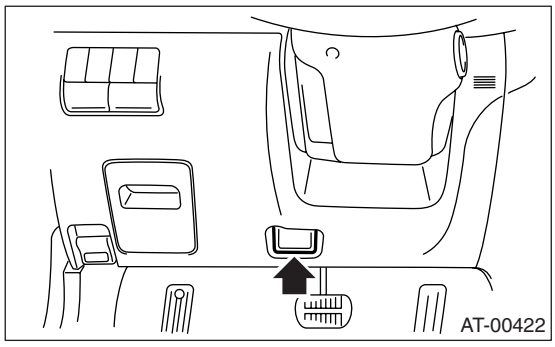


2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to 4AT(diag)-6, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

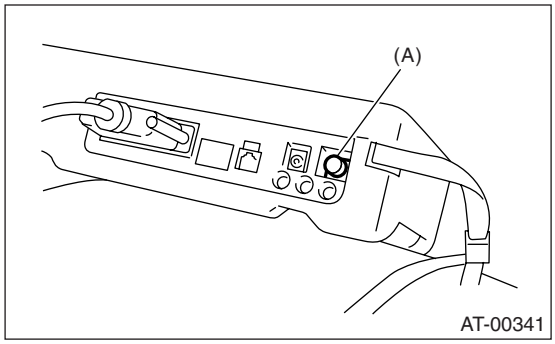
(1) Data link connector located in the lower portion of instrument panel (on driver's side).



(2) Connect the diagnosis cable to data link connector.

NOTE:
Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) POWER switch

6) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
7) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
8) Press the [YES] key after the information of transmission type is displayed.
9) On the «Transmission Diagnosis» display screen, select the {DTC Display} and press the [YES] key.
10) On the «DTC Display» display screen, select the {Memorized DTC} and press the [YES] key.

NOTE:
• For detailed operation procedure, refer to the Subaru Select Monitor OPERATION MANUAL.
• For details concerning the DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to 4AT(diag)-29, List of Diagnostic Trouble Code (DTC).>

2. READ CURRENT DATA

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
3) Press the [YES] key after the information of transmission type is displayed.
4) On the «Transmission Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Rear Wheel Speed	km/h or MPH
Front vehicle speed sensor signal	Front Wheel Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Automatic transmission fluid temperature signal	ATF Temp.	°C or °F
Throttle position signal	Throttle Sensor Voltage	V
Gear position	Gear Position	—
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch control duty ratio	Lock Up Duty Ratio	%
Transfer clutch control duty ratio (AWD model)	Transfer Duty Ratio	%
Power supply for throttle position sensor	Throttle Sensor Power	V
Torque converter turbine speed signal	Turbine Revolution Speed	rpm
2-4 brake timing pressure control duty ratio	Brake Clutch Duty Ratio	%
Mass air flow sensor signal (Turbo model)	Air Flow Sensor Voltage	V
Intake manifold pressure sensor voltage (Non-turbo model)	Mani. Pressure Voltage	V
2 wheel drive switch signal (Non-turbo model)	FWD Switch	ON or OFF
Stop light switch signal	Stop Light Switch	ON or OFF
Anti lock brake system signal	ABS Signal	ON or OFF
Cruise control system signal	Cruise Control Signal	ON or OFF
Parking range signal	P Range Signal	ON or OFF
Neutral range signal	N Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
Shift control solenoid 1	Shift Solenoid #1	ON or OFF
Shift control solenoid 2	Shift Solenoid #2	ON or OFF
Torque control output signal #1	Torque Control Signal 1	ON or OFF
Torque control output signal #2	Torque Control Signal 2	ON or OFF
Torque control cut signal	Torque Control Cut Sig.	ON or OFF
2-4 brake timing control solenoid valve	2-4 Brake Timing Sol.	ON or OFF
Low clutch timing control solenoid valve	Low Clutch Timing Sol.	ON or OFF
Automatic transmission diagnosis indicator lamp	Diagnosis Lamp	ON or OFF
Automatic transmission fluid temperature lamp	ATF Temperature Lamp	ON or OFF

NOTE:
For detailed operation procedure, refer to the Subaru Select Monitor OPERATION MANUAL.

3. CLEAR MEMORY MODE

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
3) Press the [YES] key after the information of transmission type is displayed.
4) On the «Transmission Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
5) When the “Done” and “Turn Ignition Switch OFF” are shown on display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
For detailed operation procedure, refer to the Subaru Select Monitor OPERATION MANUAL.

7. Read Diagnostic Trouble Code (DTC)

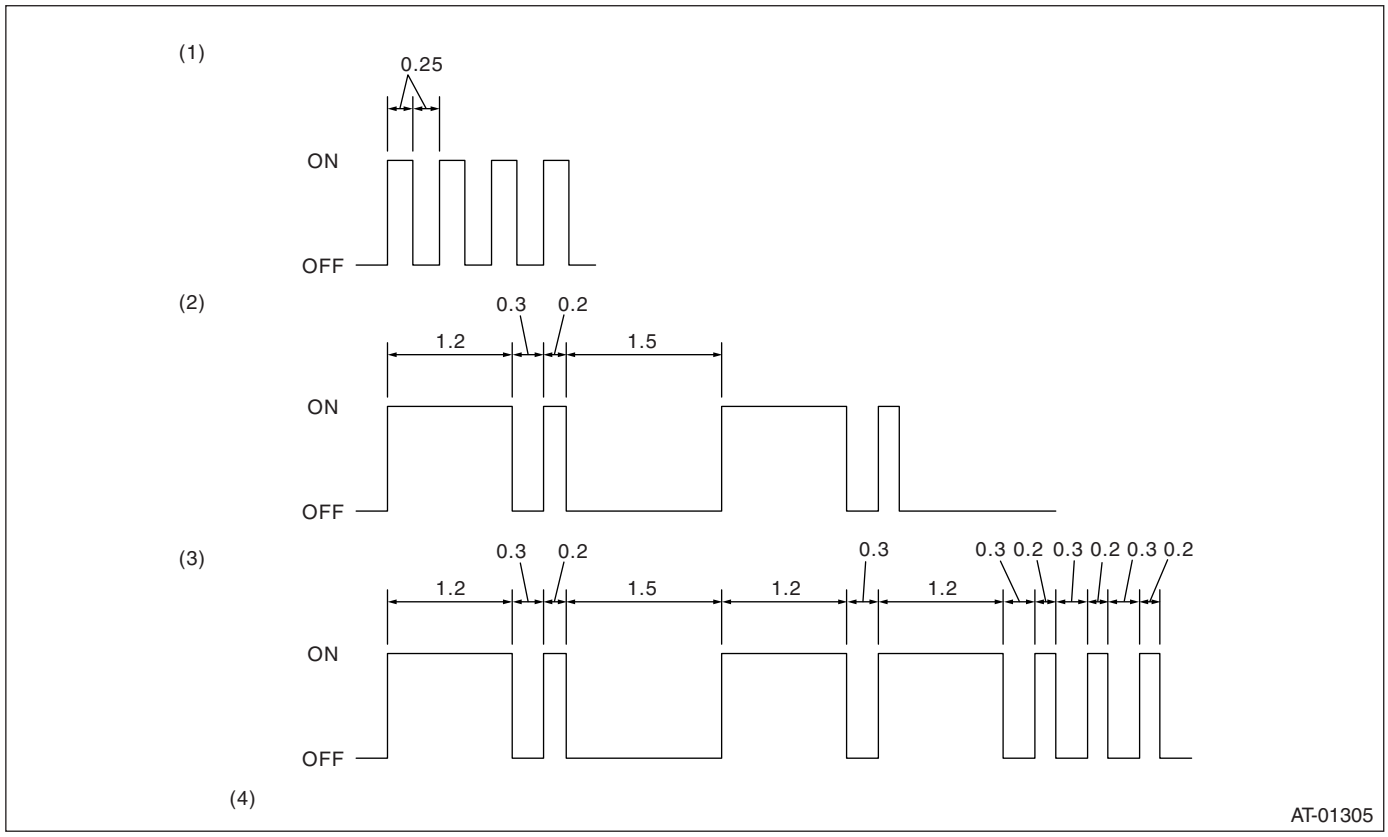
A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

Step		Check	Yes	No
1	**PERFORM READ DTC.** 1) Warm-up the engine. 2) Turn the ignition switch to OFF. 3) Turn the ignition switch to ON. 4) Start the engine. 5) Drive the vehicle at speeds greater than 20 km/h (12 MPH). 6) Stop the vehicle. 7) The brake pedal depressed and move select lever to 1 range. 8) Turn the ignition switch to OFF. 9) Turn the ignition switch to ON. 10) Move the select lever “2” range. 11) Move the select lever “1” range. 12) Move the select lever “2” range. 13) Move the select lever “3” range. 14) Move the select lever “D” range.	Does the AT OIL TEMP warning light blink at 4 Hz intervals? NOTE: Blinks every 0.125 (1/8) seconds (until the ignition switch is turned OFF).	Repair the power supply and ground circuit. <Ref. to 4AT(diag)-33, CHECK POWER SUPPLY AND GROUND LINE, Diagnostic Procedure for AT OIL TEMP Warning Light.>	Go to step **2.**
2	**CHECK AT OIL TEMP WARNING LIGHT.**	Does the AT OIL TEMP warning light blink at 2 Hz intervals? NOTE: Blinks every 0.25 (1/4) seconds (until ignition switch is turned to OFF).	The AT system is normal.	Go to step **3.**
3	**CHECK AT OIL TEMP WARNING LIGHT.**	Is the DTC outputted by the blink of AT OIL TEMP warning light?	Inspect the problem corresponding with DTC. NOTE: Record all DTCs.	Go to step **4.**
4	**CHECK AT OIL TEMP WARNING LIGHT.**	Does the AT OIL TEMP warning light remain illuminated?	Repair the AT OIL TEMP warning light circuit <Ref. to 4AT(diag)-30, Diagnostic Procedure for AT OIL TEMP Warning Light.>, or Inspect inhibitor switch, wiring, TCM, etc.	Calling up the DTC again.

• The way of reading DTC

The AT OIL TEMP warning light flashes the code corresponding to faulty part.
The long segment (1.2 sec on) indicates a “ten”, and the short segment (0.2 sec on) signifies a “one”.



(1) Normal code
(2) DTC 11
(3) DTC 11 and 23
(4) Unit: Seconds

2. WITH SUBARU SELECT MONITOR

Refer to Subaru Select Monitor for information about how to obtain and understand DTC. <Ref. to 4AT(diag)-21, OPERATION, Subaru Select Monitor.>

8. Inspection Mode

A: PROCEDURE

Shift the select lever to D range, and drive continuously for 10 seconds or more at 60 km/h (37 MPH).

WARNING:
Observe the road traffic law.

9. Clear Memory Mode

A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

Current DTC shown on display are cleared by turning the ignition switch to OFF after conducting on-board diagnostics operation. Previous DTC, however, cannot be cleared since they are stored in the TCM memory which is operating on back-up power supply. These DTC can be cleared by removing the specified TCM connector for at least two minutes.

CLEAR MEMORY:

Non-turbo model

Remove the TCM connector (B55) for at least two minutes.

Turbo model

Remove the TCM connector (B56) for at least two minutes.

- TCM connector is located in the line to memory back-up power supply of TCM. Removal of this connector clears the previous DTC stored in TCM memory.
- Be sure to remove TCM connector for at least the specified length of time. Otherwise, the DTC may not be cleared.

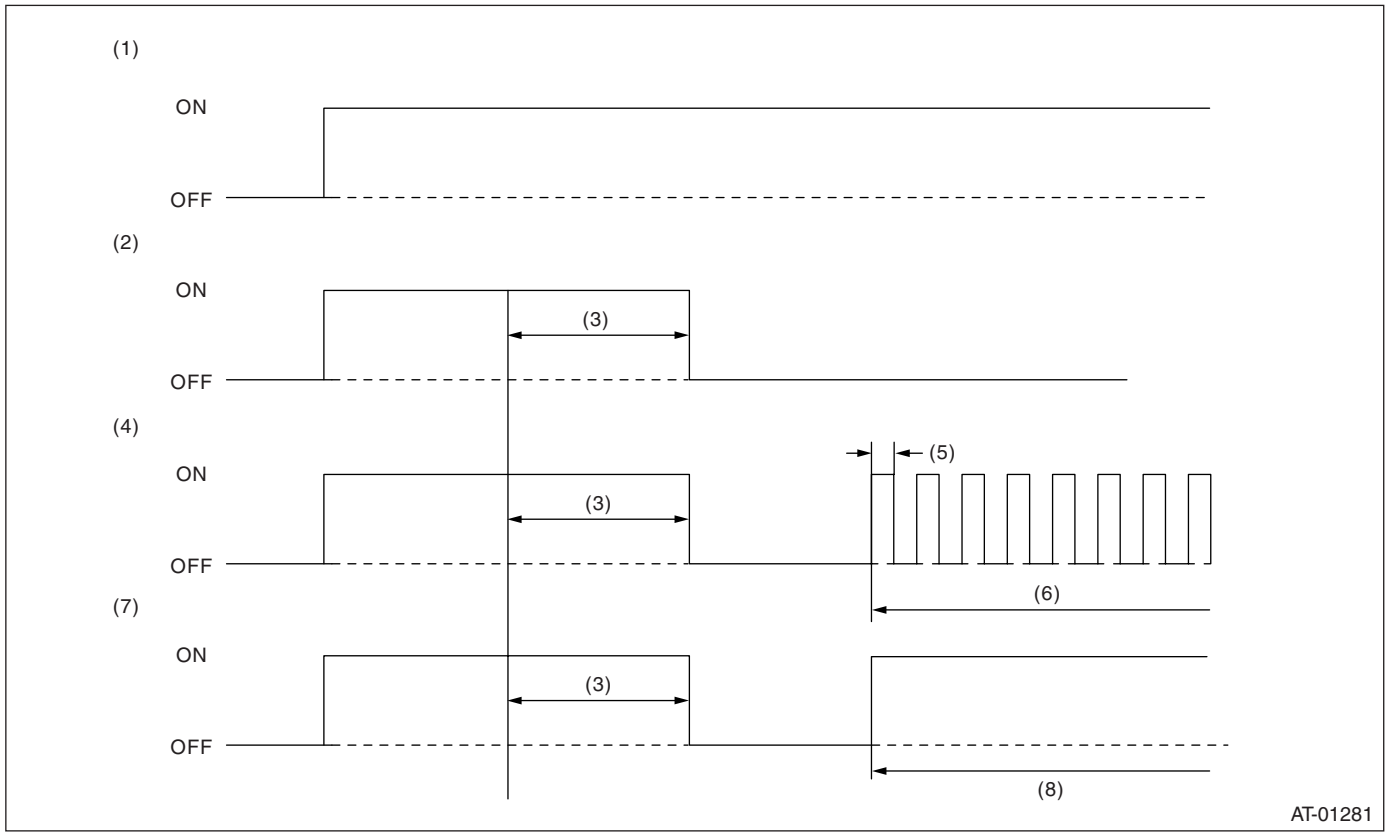
2. WITH SUBARU SELECT MONITOR

Refer to Subaru Select Monitor for information about how to clear DTC.
<Ref. to 4AT(diag)-23, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.>

10.AT OIL TEMP Warning Light Display

A: INSPECTION

When any on-board diagnostics item is malfunctioning, the display on AT OIL TEMP warning light blinks from the time malfunction is detected after starting the engine until ignition switch is turned to OFF. The malfunctioning part or unit can be determined by a DTC during on-board diagnostics operation. Problems which occurred previously can also be identified through the memory function. If the AT OIL TEMP warning light does not show a problem (although a problem is occurring), the problem can be determined by checking the performance characteristics of each sensor using select monitor. The AT OIL TEMP warning light signal is as shown in the figure.



(1) Ignition switch (engine OFF)
(2) Normal
(3) 2 secs
(4) Abnormal (Trouble occurs)
(5) 0.25 secs
(6) Blink
(7) Normal (ATF temperature is high)
(8) ATF temperature is high

11.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Content of diagnosis	Index
11	Engine speed signal	Detects open or shorted input signal circuit.	<Ref. to 4AT(diag)-39, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	Mass air flow signal (Turbo model)	Detects open or shorted input signal circuit.	<Ref. to 4AT(diag)-41, DTC 23 MASS AIR FLOW SIGNAL (TURBO MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
27	ATF temperature sensor	Detects open or shorted input signal circuit.	<Ref. to 4AT(diag)-43, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	Throttle position sensor	Detects open or shorted input signal circuit.	<Ref. to 4AT(diag)-46, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
33	Front vehicle speed sensor	Detects open or shorted input signal circuit.	<Ref. to 4AT(diag)-52, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
36	Torque converter turbine speed sensor	Detects open or shorted input signal circuit.	<Ref. to 4AT(diag)-57, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
38	Torque control signal	Detects open or shorted input signal circuit.	<Ref. to 4AT(diag)-60, DTC 38 TORQUE CONTROL SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
45	Intake manifold pressure signal (Non-turbo model)	Detects open or shorted input signal circuit.	<Ref. to 4AT(diag)-63, DTC 45 INTAKE MANIFOLD PRESSURE SIGNAL (NON-TURBO MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
71	Shift solenoid 1	Detects open or shorted output signal circuit.	<Ref. to 4AT(diag)-65, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
72	Shift solenoid 2	Detects open or shorted output signal circuit.	<Ref. to 4AT(diag)-68, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
73	Low clutch timing solenoid	Detects open or shorted output signal circuit.	<Ref. to 4AT(diag)-71, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
74	2-4 brake timing solenoid	Detects open or shorted output signal circuit.	<Ref. to 4AT(diag)-74, DTC 74 2-4 BRAKE TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
75	Line pressure duty solenoid	Detects open or shorted output signal circuit.	<Ref. to 4AT(diag)-78, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
76	2-4 brake duty solenoid	Detects open or shorted output signal circuit.	<Ref. to 4AT(diag)-83, DTC 76 2-4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
77	Lock-up duty solenoid	Detects open or shorted output signal circuit.	<Ref. to 4AT(diag)-87, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
79	Transfer duty solenoid	Detects open or shorted output signal circuit.	<Ref. to 4AT(diag)-92, DTC 79 TRANSFER DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
93	Rear vehicle speed sensor	Detects open or shorted input signal circuit.	<Ref. to 4AT(diag)-96, DTC 93 REAR VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

12.Diagnostic Procedure for AT OIL TEMP Warning Light

A: AT OIL TEMP WARNING LIGHT DOES NOT COME ON OR GO OFF

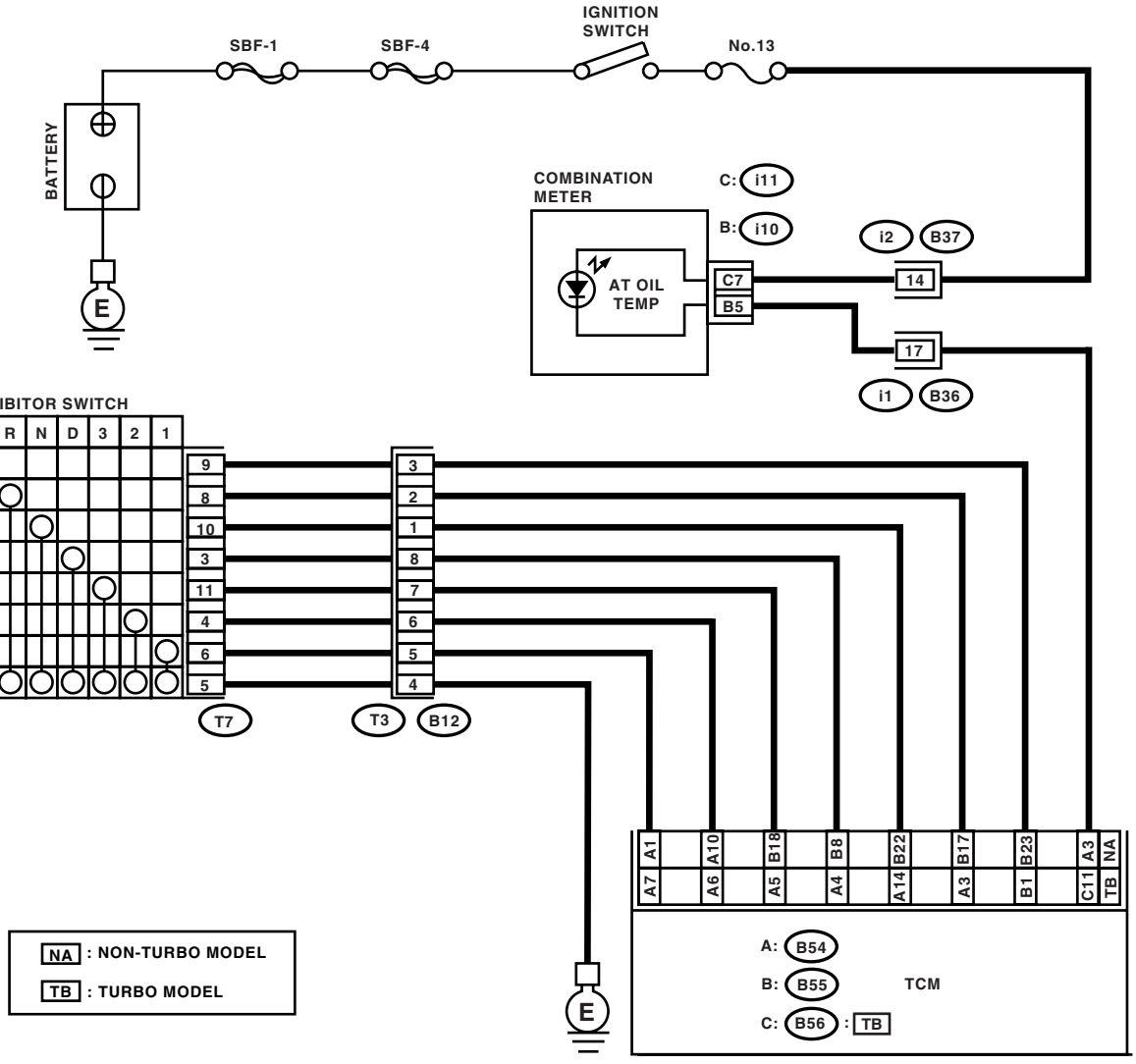
DIAGNOSIS:

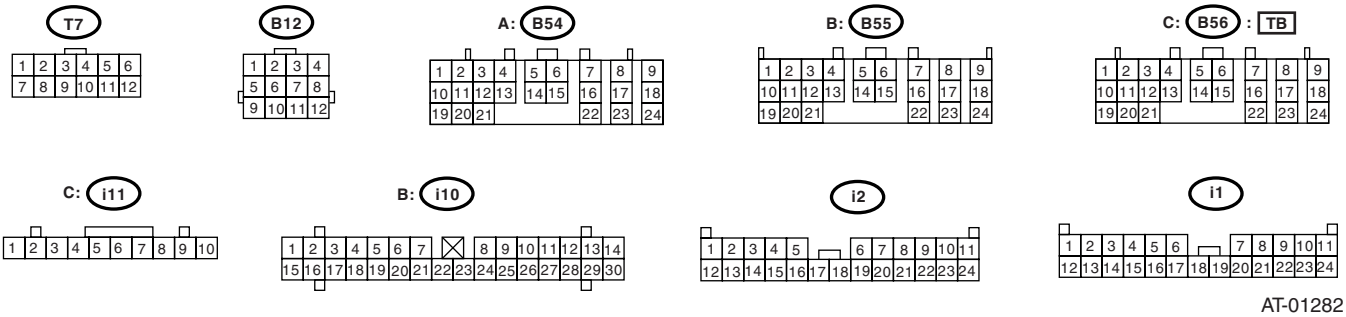
The AT OIL TEMP warning light circuit is open or shorted.

TROUBLE SYMPTOM:

- When the ignition switch is turned to ON (engine OFF), AT OIL TEMP warning light does not illuminate.
- When the on-board diagnostics is performed, AT OIL TEMP warning light remains illuminated.

WIRING DIAGRAM:





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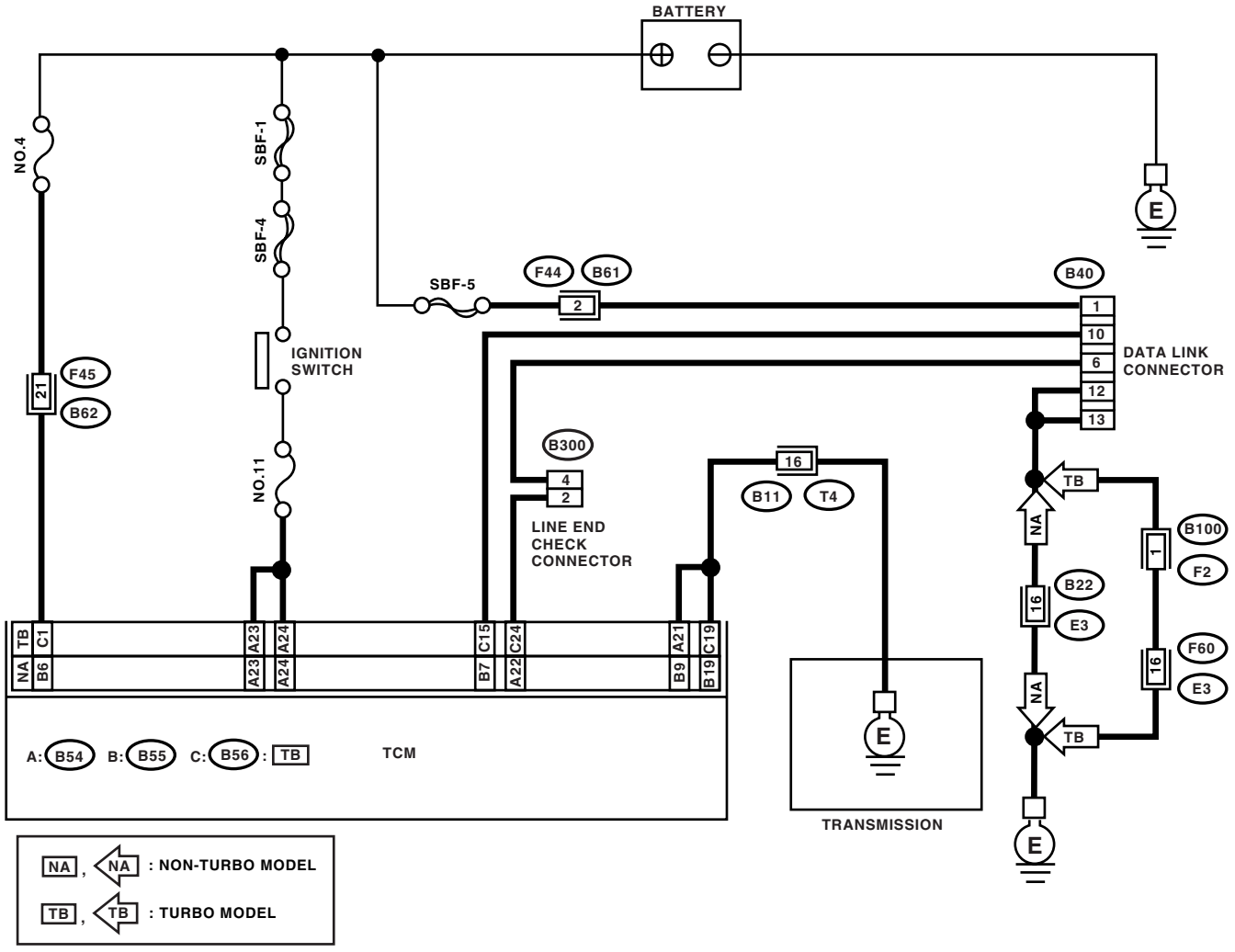
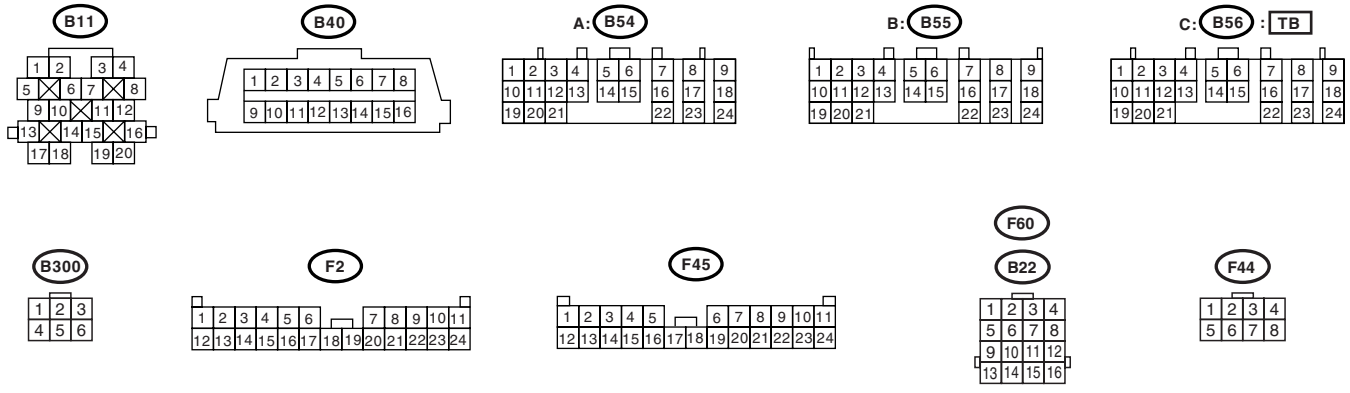
	Step	Check	Yes	No
1	**CHECK AT OIL TEMP WARNING LIGHT.** Turn the ignition switch to ON (engine OFF).	Does the AT OIL TEMP warning light illuminate?	Go to step **3.**	Go to step **2.**
2	**CHECK AT OIL TEMP WARNING LIGHT.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter.	Is the AT OIL TEMP warning light bulb OK?	Go to step **4.**	Check the combination meter.
3	**CHECK AT OIL TEMP WARNING LIGHT.** Perform "Read Diagnostic Trouble Code (DTC)". <Ref. to 4AT(diag)-24, Read Diagnostic Trouble Code (DTC).>	Does the AT OIL TEMP warning light blink?	A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM, inhibitor switch and combination meter.	Go to step **9.**
4	**CHECK FUSE (No. 13).** Remove the fuse (No. 13).	Is the fuse (No. 13) blown out?	Replace the fuse (No. 13). If replaced fuse (No. 13) is blown out easily, repair short circuit in harness between fuse (No. 13) and combination meter.	Go to step **5.**
5	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND IGNITION SWITCH.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i11) No. 7 (+) — Chassis ground (−):***	Is the voltage more than 9 V?	Go to step **6.**	Repair the open circuit in harness between combination meter and battery.
6	**CHECK COMBINATION METER.** Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 5 (+) — Chassis ground (−):***	Is the voltage less than 9 V?	Repair the combination meter. <Ref. to IDI-10, Combination Meter Assembly.>	Go to step **7.**
7	**CHECK OPEN CIRCUIT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from combination meter connector. 3) Measure the resistance of harness between combination meter. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 3 — (i10) No. 5:*** ***TURBO MODEL*** ***(B56) No. 11 — (i10) No. 5:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between TCM and combination meter, and poor contact in coupling connector.

	Step	Check	Yes	No
8	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connector to TCM and combination meter. 2) Turn the ignition switch to ON (engine OFF). 3) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 3 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B56) No. 11 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>
9	**CHECK INHIBITOR SWITCH.** 1) Connect the Subaru Select Monitor to data link connector. 2) Turn the ignition switch to ON. 3) Turn the Subaru Select Monitor to ON. 4) Read the data of range switch using Subaru Select Monitor. • Range switch is indicated in ON ←→ OFF.	When each range is selected, does the LED of Subaru Select Monitor light up?	Go to step **10.**	Check the inhibitor switch circuit. <Ref. to 4AT(diag)-104, CHECK INHIBITOR SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>
10	**CHECK SHORT CIRCUIT OF HARNESS.** 1) Disconnect the connector from TCM. 2) Remove the combination meter. 3) Disconnect the connector from combination meter. 4) Measure the resistance of harness connector between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 11 — Chassis ground:*** ***TURBO MODEL*** ***(B56) No. 11 — Chassis ground:***	Is the resistance less than 1 MΩ?	Check the TCM power supply and ground line. <Ref. to 4AT(diag)-33, CHECK POWER SUPPLY AND GROUND LINE, Diagnostic Procedure for AT OIL TEMP Warning Light.>	Repair the short circuit in harness between combination meter connector and TCM connector.

B: CHECK POWER SUPPLY AND GROUND LINE

WIRING DIAGRAM:





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Diagnostic Procedure for AT OIL TEMP Warning Light

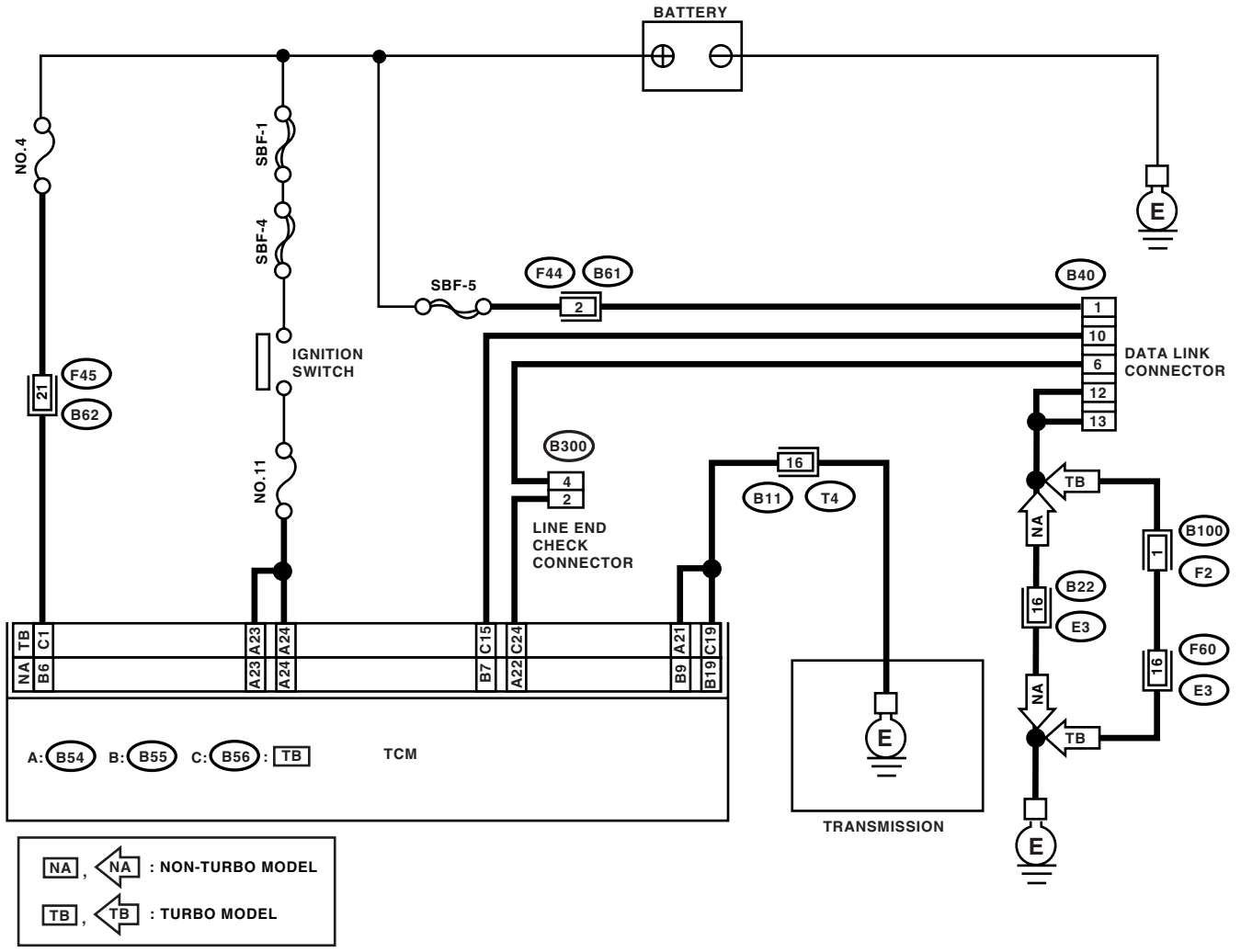
	Step	Check	Yes	No
1	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Is there poor contact at battery terminal?	Repair or tighten the battery terminal.	Go to step **2.**
2	**CHECK POWER SUPPLY OF TCM.** 1) Disconnect the connector from TCM. 2) Turn the ignition switch to ON. 3) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 6 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B56) No. 1 (+) — Chassis ground (−):***	Is the voltage 10 — 13 V?	Go to step **4.**	Go to step **3.**
3	**CHECK FUSE (No. 4).** Remove the fuse (No. 4).	Is the fuse (No. 4) blown out?	Replace the fuse (No. 4). If replaced fuse (No. 4) has blown out easily, repair short circuit in harness between fuse (No. 4) and TCM.	Repair the open circuit in harness between fuse (No. 4) and TCM, or fuse (No. 4) and battery, and poor contact in coupling connector.
4	**CHECK IGNITION POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the ignition power supply voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 23 (+) — Chassis ground (−):*** ***(B54) No. 24 (+) — Chassis ground (−):***	Is the voltage 10 — 13 V?	Go to step **6.**	Go to step **5.**
5	**CHECK FUSE (No. 11).** Remove the fuse (No. 11).	Is the fuse (No. 11) blown out?	Replace the fuse (No. 11). If replaced fuse (No. 11) has blown out easily, repair short circuit in harness between fuse (No. 11) and TCM.	Repair the open circuit in harness between fuse (No. 4) and TCM, or fuse (No. 4) and battery, and poor contact in coupling connector.
6	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 21 — (B11) No. 16:*** ***(B56) No. 19 — (B11) No. 16:*** ***TURBO MODEL*** ***(B56) No. 19 — (B11) No. 16:*** ***(B54) No. 21 — (B11) No. 16:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair the open circuit in harness between TCM, transmission harness connector, and poor contact in coupling connector.
7	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND TRANSMISSION GROUND.** Measure the resistance of harness between transmission and transmission ground. ***Connector & terminal*** ***(T4) No. 16 — Transmission ground:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between transmission and transmission ground.

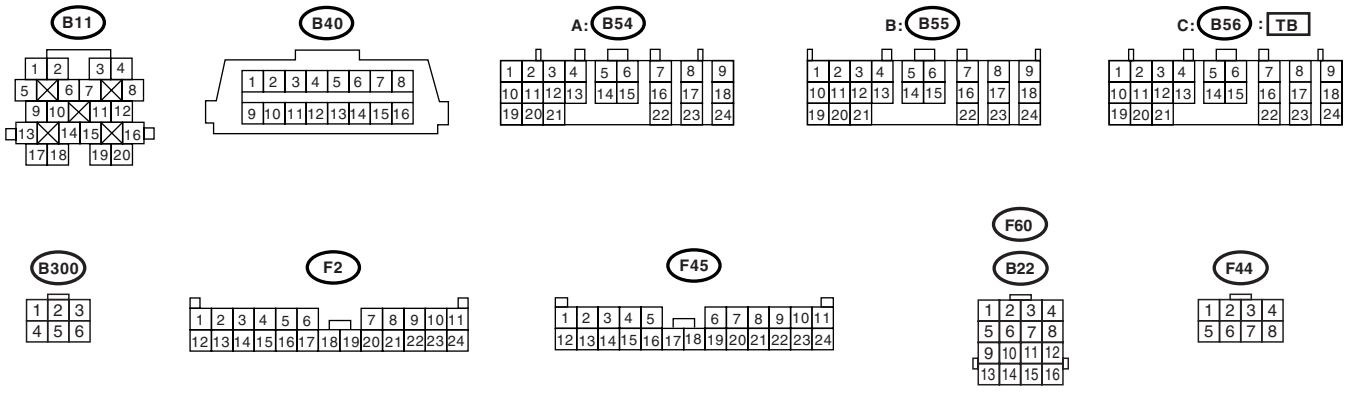
Step		Check	Yes	No
8	CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in control module power supply, ground line and data link connector?	Repair the connector.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

13.Diagnostic Procedurefor Select Monitor Communication

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DIAGNOSIS:
Faulty harness connector
TROUBLE SYMPTOM:
Select monitor communication failure
WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK SUBARU SELECT MONITOR POWER SUPPLY CIRCUIT.** Measure the voltage between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Repair the harness and connector between battery and data link connector, and poor contact in coupling connector.
2	**CHECK SUBARU SELECT MONITOR GROUND CIRCUIT.** Measure the resistance of harness between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 12 — Chassis ground:*** ***(B40) No. 13 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between data link connector and ground terminal, and poor contact in coupling connector.
3	**CHECK COMMUNICATION OF SELECT MONITOR.** 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to engine systems can be executed normally.	Are the name and year of system displayed on Subaru Select Monitor?	Go to step **8.**	Go to step **4.**
4	**CHECK COMMUNICATION OF SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM connector. 3) Check whether communication to engine systems can be executed normally.	Are the name and year of system displayed on Subaru Select Monitor?	Go to step **6.**	Go to step **5.**
5	**CHECK COMMUNICATION OF SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Connect the TCM connector. 3) Disconnect the ECM connector. 4) Check whether communication to transmission systems can be executed normally.	Are the name and year of system displayed on Subaru Select Monitor?	Inspect the ECM.	Go to step **6.**
6	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM, ECM, ABSCM&H/U, cruise control module and immobilizer control module connectors. 3) Measure the resistance between TCM connector and chassis ground. ***Connector & terminal*** ***(B40) No. 10 — Chassis ground:*** ***(B40) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the harness and connector between each control module and data link connector.
7	**CHECK OUTPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B40) No. 10 (+) — Chassis ground (–):*** ***(B40) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 1 V?	Repair the harness and connector between each control module and data link connector.	Go to step **8.**

	Step	Check	Yes	No
8	**CHECK HARNESS/CONNECTOR BETWEEN TCM AND DATA LINK CONNECTOR.** Measure the resistance between TCM connector and data link connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 7 — (B40) No. 10:*** ***TURBO MODEL*** ***(B56) No. 15 — (B40) No. 10:***	Is the resistance less than 0.5 Ω?	Go to step **9.**	Repair the harness and connector between TCM and data link connector.
9	**CHECK HARNESS/CONNECTOR BETWEEN TCM AND DATA LINK CONNECTOR.** Measure the resistance between TCM and data link connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 22 — (B40) No. 6:*** ***TURBO MODEL*** ***(B56) No. 24 — (B40) No. 6:***	Is the resistance more than 1 MΩ?	Go to step **10.**	Repair the harness and connector between TCM and data link connector.
10	**CHECK INSTALLATION OF TCM CONNECTOR.** Turn the ignition switch to OFF.	Is the TCM connector inserted into TCM?	Go to step **11.**	Insert the TCM connector into TCM.
11	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in control module and data link connector?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

14.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC 11 ENGINE SPEED SIGNAL

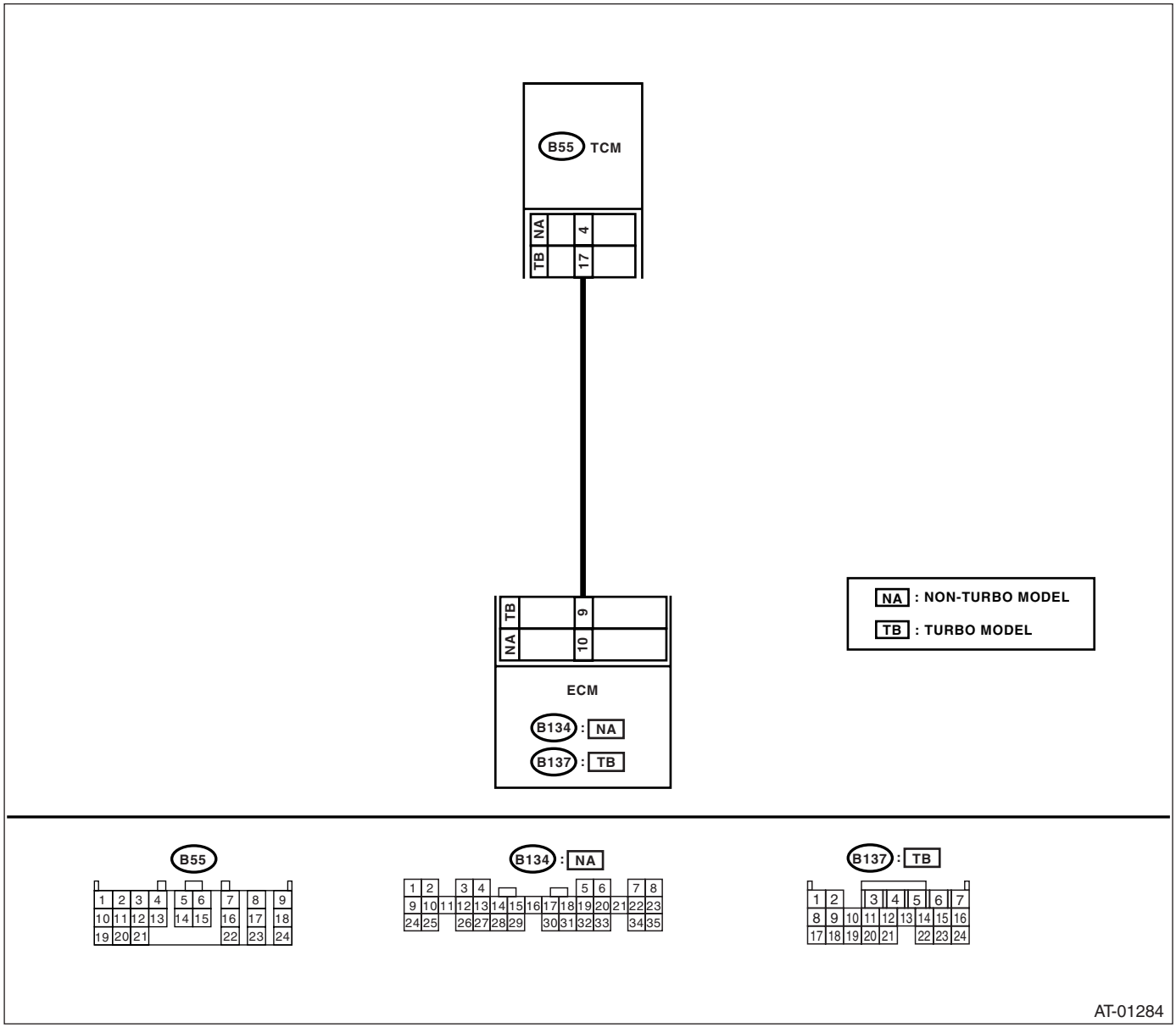
DIAGNOSIS:

The engine speed input signal circuit is open or shorted.

TROUBLE SYMPTOM:

- No lock-up (after engine warm-up).
- The AT OIL TEMP warning light remains on when vehicle speed is “0”.

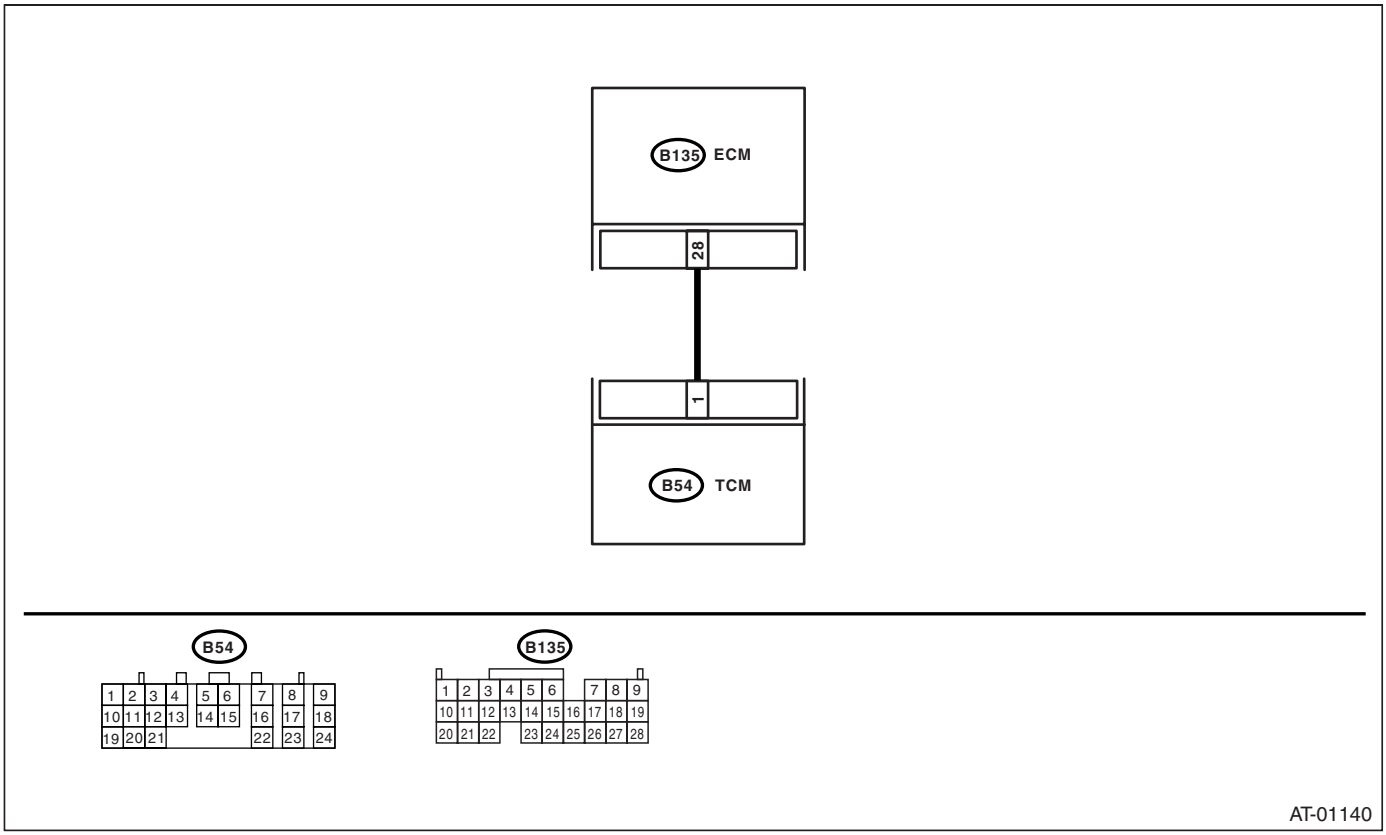
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and ECM. 3) Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 4 — (B134) No. 10:*** ***TURBO MODEL*** ***(B55) No. 17 — (B137) No. 9:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and ECM connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 4 — Chassis ground:*** ***TURBO MODEL*** ***(B55) No. 17 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and ECM connector.
3	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **5.**	Go to step **4.**
4	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and ECM. 2) Turn the ignition switch to ON (engine OFF). 3) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 4 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B55) No. 17 (+) — Chassis ground (−):***	Is the voltage more than 10.5 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **6.**
5	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and ECM. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine and turn Subaru Select Monitor switch to ON. 4) Warm-up the engine until engine coolant temperature is above 80°C (176°F). 5) Idle the engine. 6) Read the data of engine speed using Subaru Select Monitor. • Display shows the engine speed signal value sent from ECM.	Is the revolution value same as tachometer reading shown on combination meter?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **6.**
6	**CHECK POOR CONTACT.**	Is there poor contact in engine speed signal circuit?	Repair the poor contact.	Go to step **7.**
7	**CONFIRM DTC 11.**	Replace the ECM with a new one. Does the DTC appear again, after memory has been cleared?	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>	Replace the ECM.

B: DTC 23 MASS AIR FLOW SIGNAL (TURBO MODEL)

DIAGNOSIS:
The input signal circuit of TCM from ECM is open or shorted.
TROUBLE SYMPTOM:
Excessive shift shock.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ENGINE GROUND TERMINALS AND GROUND CIRCUIT OF ECM.** <Ref. to 4AT(diag)-46, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble?	Repair the ground terminal and/or ground circuit of ECM.	Go to step **2.**
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and ECM. 3) Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***(B54) No. 1 — (B135) No. 28:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and ECM connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short circuit in harness between TCM and ECM connector.
4	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **6.**	Go to step **5.**

	Step	Check	Yes	No
5	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and ECM. 2) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3) Idle the engine. 4) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 1 (+) — Chassis ground (−):***	Is the voltage 0.9 — 1.4 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM and ECM.	Go to step **7.**
6	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and ECM. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine and turn the Subaru Select Monitor switch to ON. 4) Warm-up the engine until engine coolant temperature is above 80°C (176°F). 5) Idle the engine. 6) Read the data of mass air flow sensor signal using Subaru Select Monitor. • Display shows the mass air flow sensor signal value sent from ECM.	Is the value voltage 0.9 — 1.4 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM and ECM.	Go to step **7.**
7	**CHECK POOR CONTACT.**	Is there poor contact in intake manifold pressure signal circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

C: DTC 27 ATF TEMPERATURE SENSOR

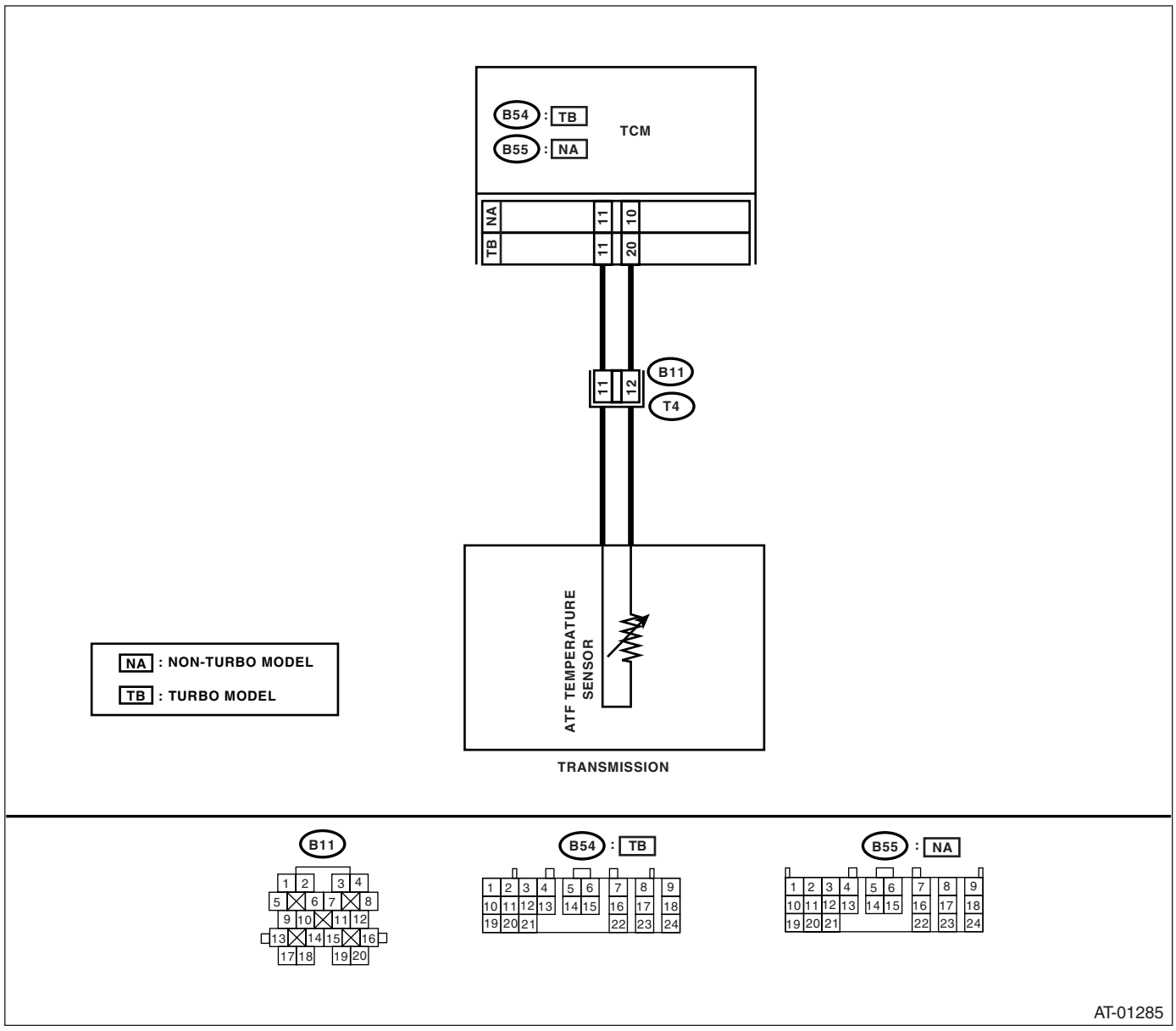
DIAGNOSIS:

The input signal circuit of TCM to ATF temperature sensor is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission and TCM. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 10 — (B11) No. 12:*** ***TURBO MODEL*** ***(B54) No. 20 — (B11) No. 12:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 11 — (B11) No. 11:*** ***TURBO MODEL*** ***(B54) No. 11 — (B11) No. 11:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 10 — Chassis ground:*** ***TURBO MODEL*** ***(B54) No. 20 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short circuit in harness between TCM and transmission connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 11 — Chassis ground:*** ***TURBO MODEL*** ***(B54) No. 11 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit in harness between TCM and transmission connector.
5	**CHECK ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the connectors to transmission and TCM. 3) Turn the ignition switch to ON and start engine. 4) Warm-up the transmission until ATF temperature reaches to 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 5) Disconnect the connector from transmission. 6) Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 11 — No. 12:***	Is the resistance 275 — 375 Ω?	Go to step **6.**	Replace the ATF temperature sensor. <Ref. to 4AT-61, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>

	Step	Check	Yes	No
6	**CHECK ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 11 — No. 12:***	Does the resistance value increase while ATF temperature decreases?	Go to step **7.**	Replace the ATF temperature sensor. <Ref. to 4AT-61, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
7	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **9.**	Go to step **8.**
8	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connector to transmission. 2) Warm-up the transmission until ATF temperature is about 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3) Measure the voltage between TCM connector terminal. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 11 (+) — No. 10 (−):*** ***TURBO MODEL*** ***(B54) No. 11 (+) — No. 20 (−):***	Is the voltage 0.4 — 0.9 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. Temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in ATF temperature sensor and transmission connector.	Go to step **10.**
9	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connector to transmission. 2) Turn the ignition switch to ON (engine OFF).	Does the ATF temperature gradually decrease?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. Temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in ATF temperature sensor and transmission connector.	Go to step **10.**
10	**CHECK POOR CONTACT.**	Is there poor contact in ATF temperature sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

D: DTC 31 THROTTLE POSITION SENSOR

DIAGNOSIS:

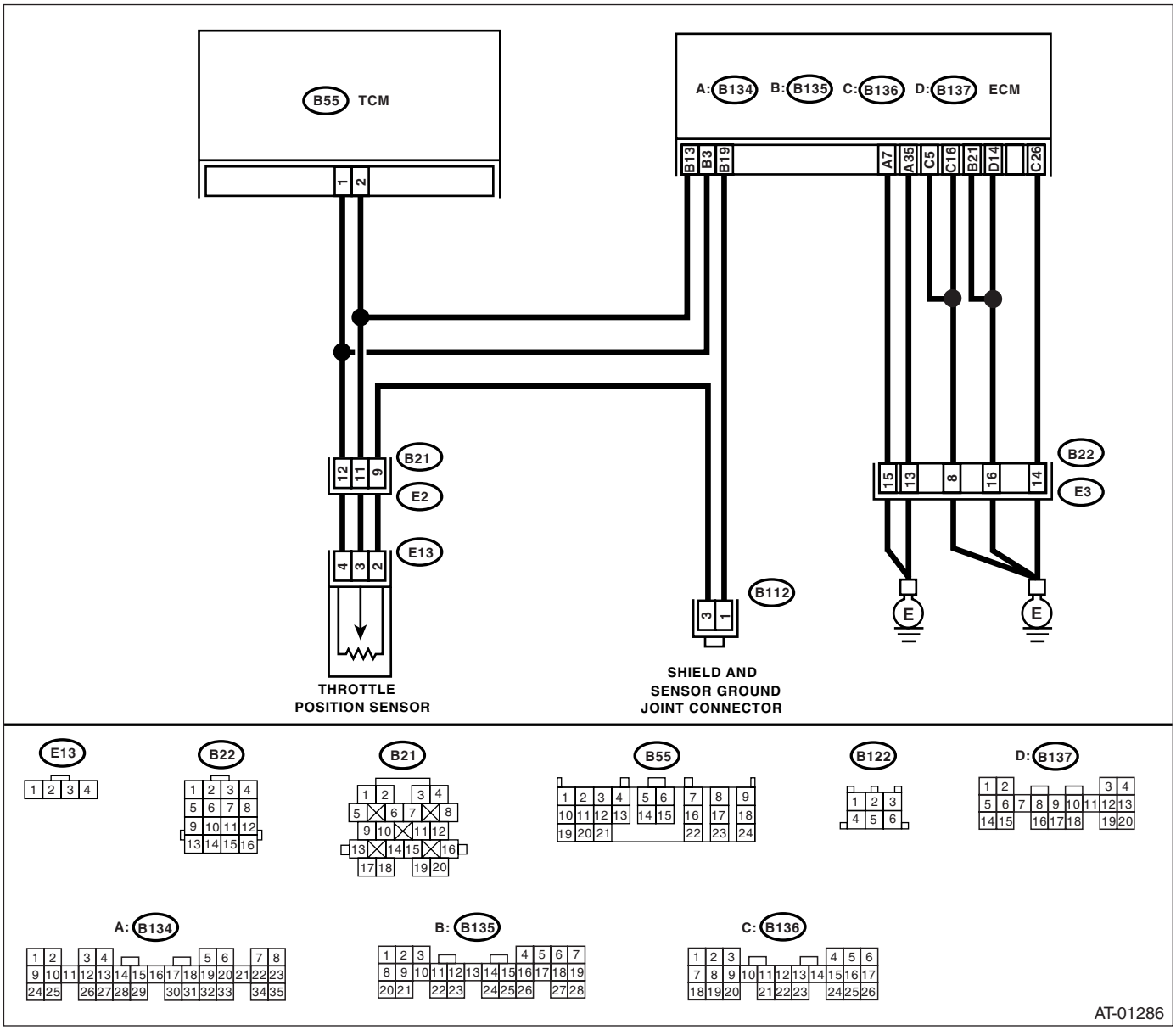
The input signal circuit of throttle position sensor is open or shorted.

TROUBLE SYMPTOM:

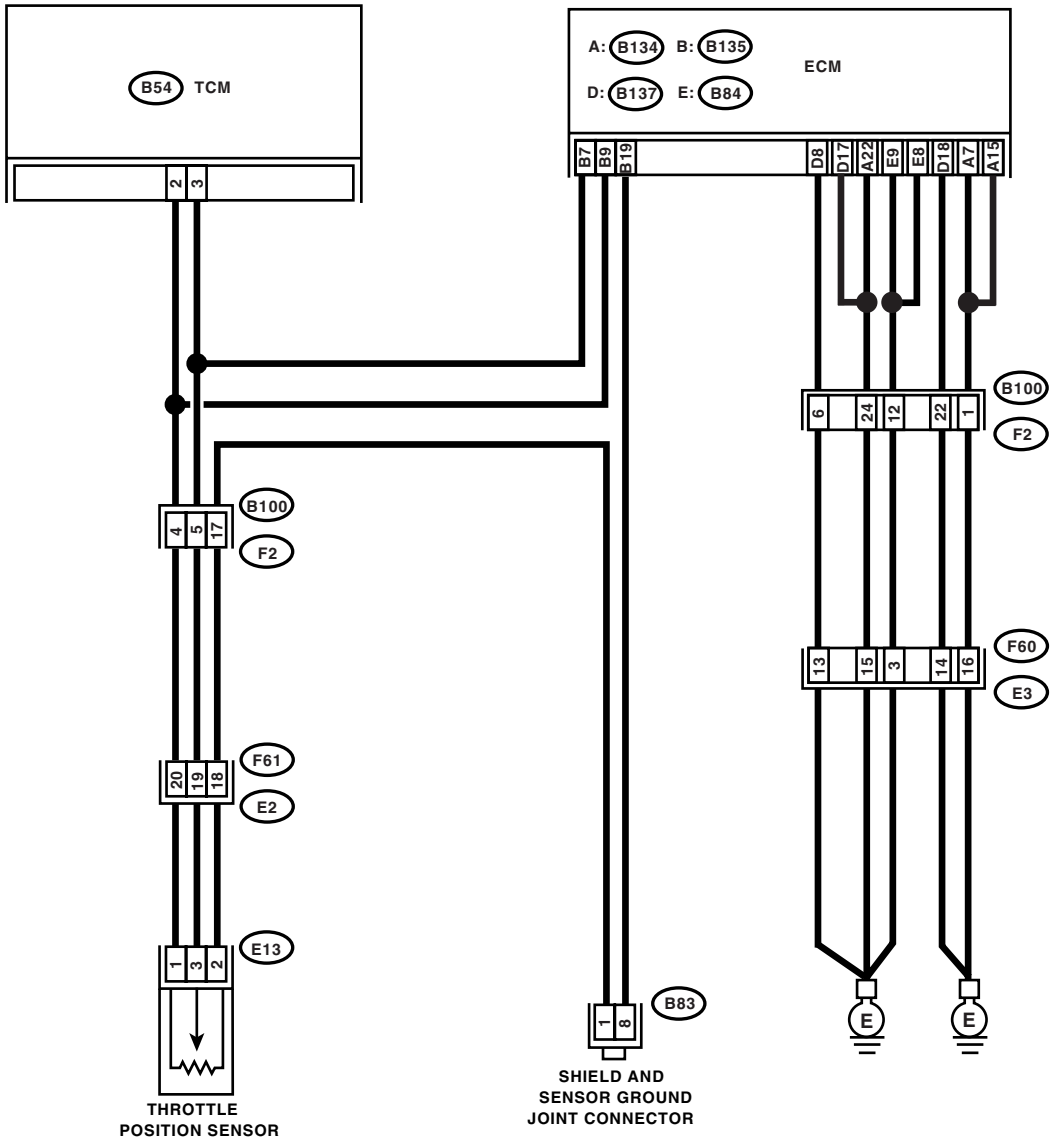
Shift point too high or too low; excessive shift shock; excessive tight corner “braking”.

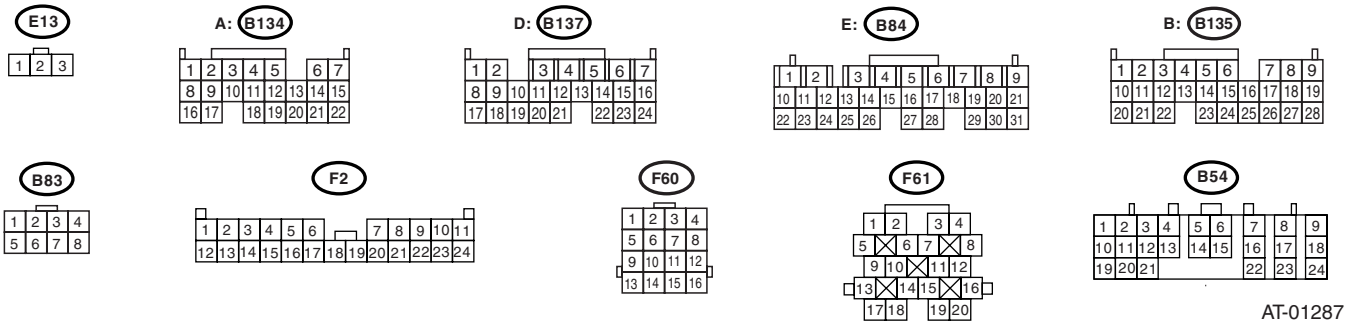
WIRING DIAGRAM:

- **NON-TURBO MODEL**



- **TURBO MODEL**





AT-01287

	Step	Check	Yes	No
1	**CHECK ENGINE GROUND TERMINALS.**	Have engine ground terminals been tightened?	Go to step **2.**	Tighten the engine ground terminals.
2	**CHECK GROUND CIRCUIT OF ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and engine ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B134) No. 35 — Engine ground:*** ***(B135) No. 21 — Engine ground:*** ***(B136) No. 5 — Engine ground:*** ***(B136) No. 16 — Engine ground:*** ***(B136) No. 26 — Engine ground:*** ***(B137) No. 14 — Engine ground:*** ***(B134) No. 7 — Engine ground:*** ***TURBO MODEL*** ***(B134) No. 7 — Engine ground:*** ***(B134) No. 15 — Engine ground:*** ***(B134) No. 22 — Engine ground:*** ***(B137) No. 8 — Engine ground:*** ***(B137) No. 17 — Engine ground:*** ***(B137) No. 18 — Engine ground:*** ***(B84) No. 8 — Engine ground:*** ***(B84) No. 9 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the open circuit in harness between ECM connector and engine grounding terminal.
3	**CHECK THROTTLE POSITION SENSOR.** 1) Disconnect the connector from throttle position sensor. 2) Measure the resistance between throttle position sensor connector receptacle's terminals. ***Terminals*** ***NON-TURBO MODEL*** ***No. 4 — No. 2:*** ***TURBO MODEL*** ***No. 1 — No. 2:***	Is the resistance 3.0 — 4.2 kΩ?	Go to step **4.**	Replace the throttle position sensor.
4	**CHECK THROTTLE POSITION SENSOR.** Measure the resistance between throttle position sensor connector receptacle's terminals. ***Terminals*** ***No. 2 — No. 3:***	Is the resistance 0.35 — 0.5 kΩ?	Go to step **5.**	Replace the throttle position sensor.
5	**CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM and throttle position sensor connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 2 — (E13) No. 3:*** ***TURBO MODEL*** ***(B54) No. 3 — (E13) No. 3:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between TCM and throttle position sensor connector, and poor contact in coupling connector.

	Step	Check	Yes	No
6	**CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.** Measure the resistance of harness between TCM and throttle position sensor connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 1 — (E13) No. 4:*** ***TURBO MODEL*** ***(B54) No. 2 — (E13) No. 1:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair the open circuit in harness between TCM and throttle position sensor connector, and poor contact in coupling connector.
7	**CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 2 — Chassis ground:*** ***TURBO MODEL*** ***(B54) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the short circuit in harness between TCM and throttle position sensor connector.
8	**CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the short circuit in harness between TCM and throttle position sensor connector.
9	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 2 — (B135) No. 13:*** ***TURBO MODEL*** ***(B54) No. 3 — (B135) No. 7:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair the open circuit in harness between TCM and ECM connector.
10	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 1 — (B135) No. 3:*** ***TURBO MODEL*** ***(B54) No. 2 — (B135) No. 9:***	Is the resistance less than 1 Ω?	Go to step **11.**	Repair the open circuit in harness between TCM and ECM connector.
11	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **14.**	Go to step **12.**
12	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM, throttle position sensor and ECM. 2) Turn the ignition switch to ON (engine OFF). 3) Close the throttle completely. 4) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 2 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B54) No. 3 (+) — Chassis ground (−):***	Is the voltage 0.2 — 1.0 V?	Go to step **13.**	Go to step **18.**

	Step	Check	Yes	No
13	**CHECK INPUT SIGNAL FOR TCM.** 1) Open the throttle completely and hold it. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 2 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B54) No. 3 (+) — Chassis ground (−):***	Is the voltage 4.2 — 4.7 V?	Go to step **16.**	Go to step **18.**
14	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM, throttle position sensor and ECM. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON (engine OFF). 4) Turn the Subaru Select Monitor switch to ON. 5) Throttle fully closed. 6) Read the data of throttle position sensor using Subaru Select Monitor. • Throttle position sensor input signal is indicated.	Is the value voltage 0.2 — 1.0 V?	Go to step **15.**	Go to step **18.**
15	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** Throttle fully open. NOTE: Must be changed correspondingly with the accelerator pedal operation (from “released” to “depressed” position).	Is the value voltage 4.2 — 4.7 V?	Go to step **18.**	Go to step **17.**
16	**CHECK INPUT SIGNAL FOR TCM (THROTTLE POSITION SENSOR POWER SUPPLY).** Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 1 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B54) No. 2 (+) — Chassis ground (−):***	Is the voltage 4.8 — 5.3 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in throttle position sensor circuit.	Go to step **18.**

	Step	Check	Yes	No
17	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR (THROTTLE POSITION SENSOR POWER SUPPLY).** Read the data of throttle position sensor power supply using Subaru Select Monitor. • Throttle position sensor power supply voltage is indicated.	Is the value voltage 4.8 — 5.3 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in throttle position sensor circuit.	Go to step **18.**
18	**CHECK POOR CONTACT.**	Is there poor contact in throttle position sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

E: DTC 33 FRONT VEHICLE SPEED SENSOR

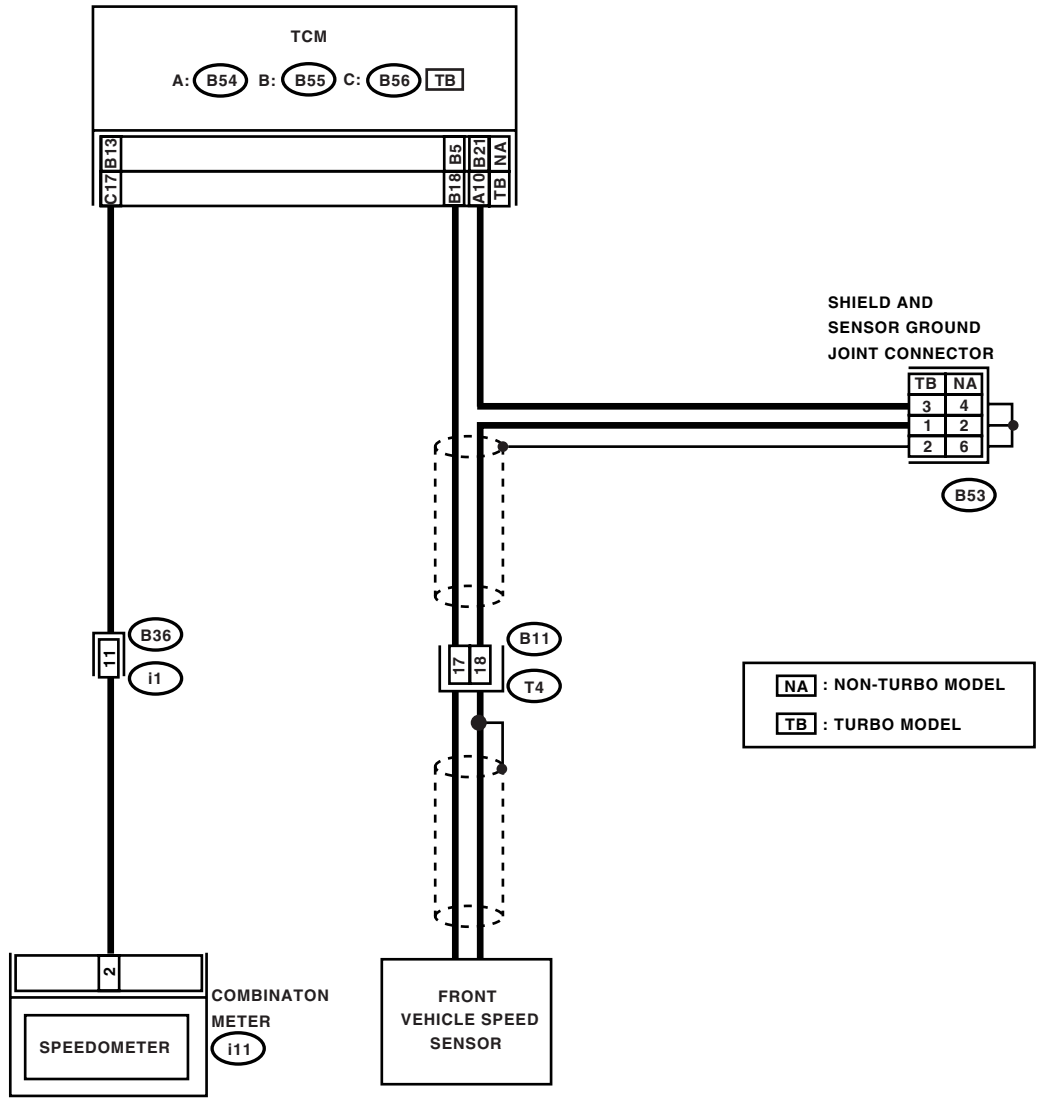
DIAGNOSIS:

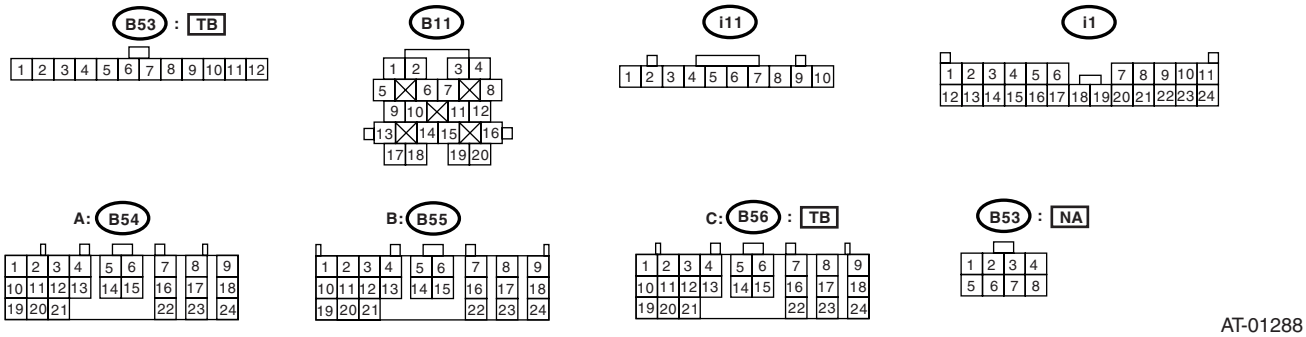
- The vehicle speed signal is abnormal.
- The circuit in combination meter is faulty.
- The harness connector between TCM and vehicle speed sensor is in short or open.

TROUBLE SYMPTOM:

- Erroneous idling.
- Engine stalls.
- Poor driving performance.

WIRING DIAGRAM:





AT-01288

	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 5 — (B11) No. 17:*** ***TURBO MODEL*** ***(B55) No. 18 — (B11) No. 17:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 21 — (B11) No. 18:*** ***TURBO MODEL*** ***(B54) No. 10 — (B11) No. 18:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 21 — Chassis ground:*** ***TURBO MODEL*** ***(B54) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short circuit in harness between TCM and transmission connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 5 — Chassis ground:*** ***TURBO MODEL*** ***(B55) No. 18 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
5	**CHECK FRONT VEHICLE SPEED SENSOR.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 17 — No. 18:***	Is the resistance 450 — 650 Ω?	Go to step **6.**	Replace the front vehicle speed sensor. <Ref. to 4AT-49, Front Vehicle Speed Sensor.>
6	**PREPARE OSCILLOSCOPE.**	Do you have an oscilloscope?	Go to step **9.**	Go to step **7.**
7	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **10.**	Go to step **8.**

	Step	Check	Yes	No
8	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect all connectors. 2) Lift-up or raise the vehicle and place safety stands. NOTE: Raise all wheels off floor. 3) Start the engine and set vehicle in 20 km/h (12 MPH) condition. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-22, Clear Memory Mode.> 4) Measure the voltage between TCM connector terminals. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 5 (+) — (B55) No. 21 (–):*** ***TURBO MODEL*** ***(B55) No. 18 (+) — (B54) No. 10 (–):***	Is the voltage more than AC 1 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact or harness may be the cause. Repair the harness or connector in the front vehicle speed sensor circuit.	Go to step **11.**
9	**CHECK FRONT VEHICLE SPEED SENSOR USING OSCILLOSCOPE.** 1) Connect all connectors. 2) Lift-up the vehicle and place safety stand. NOTE: Raise all wheels off ground. 3) Set the oscilloscope to TCM connector terminals. ***Connector & terminal*** ***NON-TURBO MODEL*** ***Positive probe; (B55) No. 5:*** ***Ground lead; (B55) No. 21:*** ***TURBO MODEL*** ***Positive probe; (B55) No. 18:*** ***Ground lead; (B54) No. 10:*** 4) Start the engine, and drive the wheels slowly. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When AT control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system. <Ref. to ABS(diag)-22, Clear Memory Mode.> 5) Measure the signal voltage indicated on oscilloscope.	Is the voltage more than AC 4 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact or harness may be the cause. Repair the harness or connector in front vehicle speed sensor circuit.	Go to step **11.**

	Step	Check	Yes	No
10	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect all connectors. 2) Connect the Subaru Select Monitor to data link connector. 3) Lift-up or raise the vehicle and place safety stands. NOTE: Raise all wheels off floor. 4) Turn the ignition switch to ON and turn Subaru Select Monitor switch to ON. 5) Start the engine. 6) Read the data of vehicle speed using Subaru Select Monitor. • Compare the speedometer with Subaru Select Monitor indications. • Vehicle speed is indicated in “km/h” or “MPH”. 7) Slowly increase the vehicle speed to 60 km/h or 37 MPH. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-22, Clear Memory Mode.>	Does the speedometer indication increase as Subaru Select Monitor data increases?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor connector or harness may be the cause. Repair the harness or connector in front vehicle speed sensor circuit.	Go to step **11.**
11	**CHECK POOR CONTACT.**	Is there poor contact in front vehicle speed sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

F: DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR

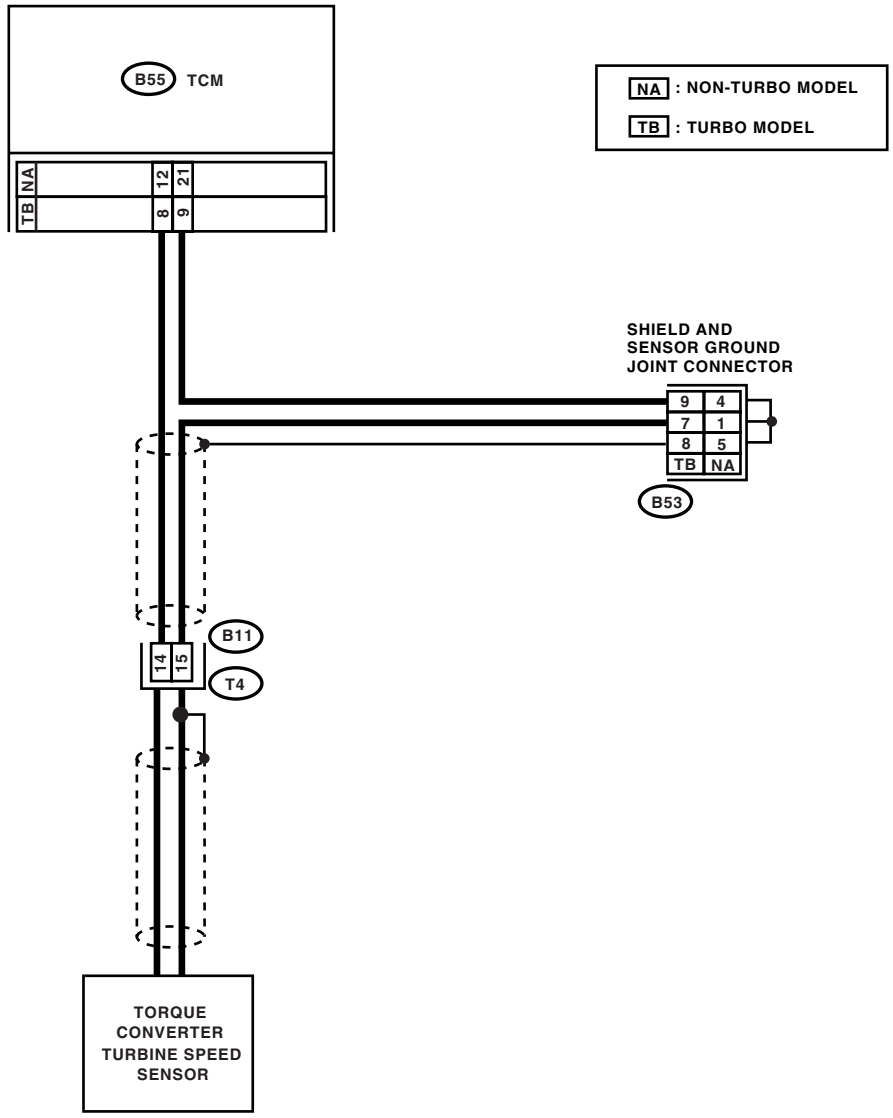
DIAGNOSIS:

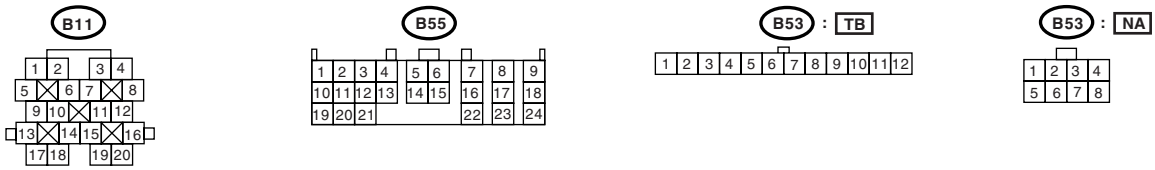
The input signal circuit of TCM is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:





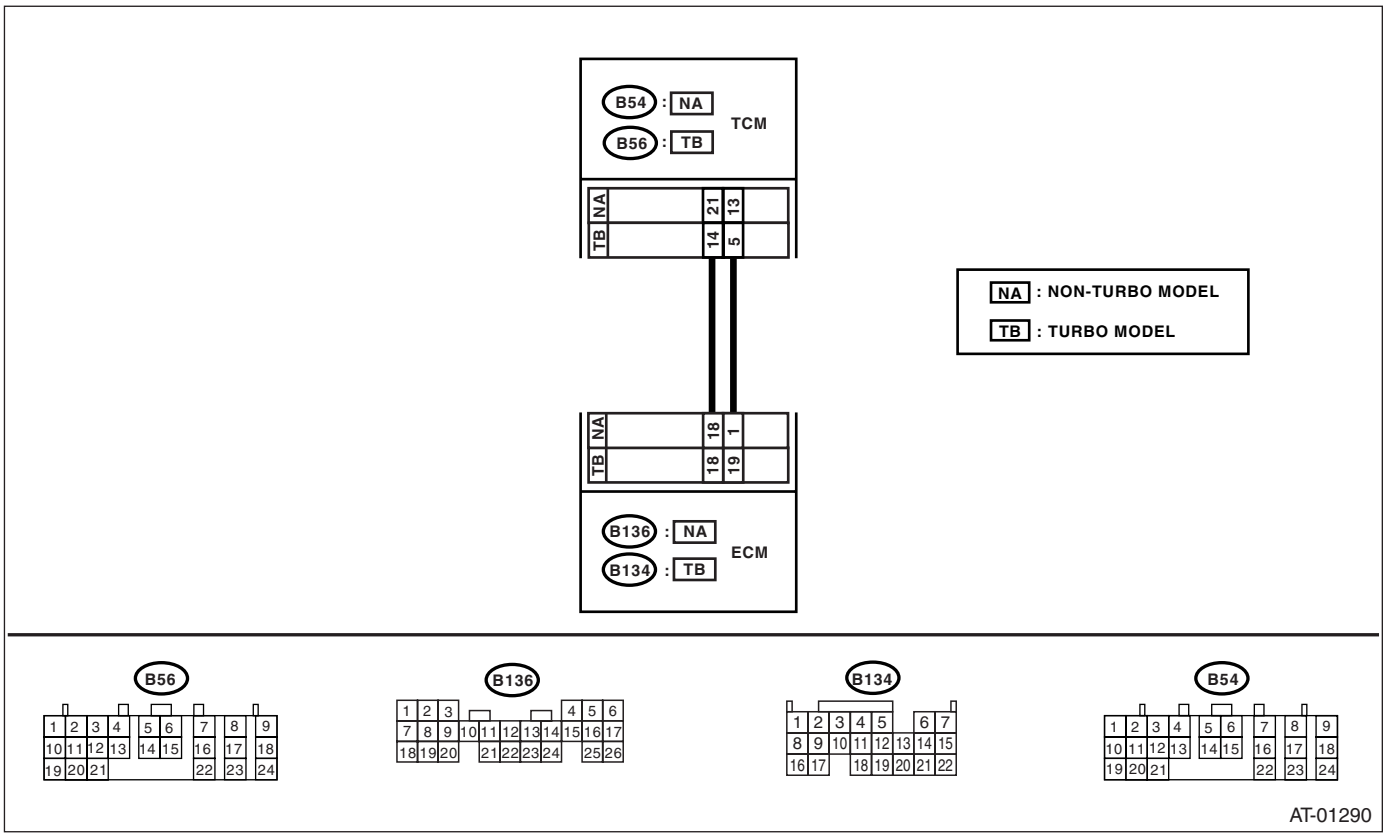
AT-01289

	Step	Check	Yes	No
1	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission. 3) Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 14 — No. 15:***	Is the resistance 450 — 650 Ω?	Go to step **2.**	Replace the turbine speed sensor. <Ref. to 4AT-54, Torque Converter Turbine Speed Sensor.>
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 12 — (B11) No. 14:*** ***TURBO MODEL*** ***(B55) No. 8 — (B11) No. 14:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 21 — (B11) No. 15:*** ***TURBO MODEL*** ***(B55) No. 9 — (B11) No. 15:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 21 — Chassis ground:*** ***TURBO MODEL*** ***(B55) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit in harness between TCM and transmission connector.
5	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 12 — Chassis ground:*** ***TURBO MODEL*** ***(B55) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the short circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
6	**PREPARE OSCILLOSCOPE.**	Do you have an oscilloscope?	Go to step **10.**	Go to step **7.**
7	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **9.**	Go to step **8.**

	Step	Check	Yes	No
8	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and transmission. 2) Start the engine and move select lever to "P" or "N" range. 3) Measure the voltage between TCM connector terminals. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 12 (+) — No. 21 (–):*** ***TURBO MODEL*** ***(B55) No. 8 (+) — No. 9 (–):***	Is the voltage more than AC 1 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**
9	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON and turn Subaru Select Monitor switch to ON. 4) Start the engine. 5) Move the select lever to "P" or "N" range. 6) Read the data of turbine speed using Subaru Select Monitor. • Compare the tachometer with Subaru Select Monitor indications.	Is the revolution value same as the tachometer reading shown on the combination meter?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**
10	**CHECK INPUT SIGNAL FOR TCM USING OSCILLOSCOPE.** 1) Connect the connectors to TCM and transmission. 2) Set the oscilloscope to TCM connector terminals. ***Connector & terminal*** ***NON-TURBO MODEL*** ***Positive probe; (B55) No. 12:*** ***Ground lead; (B55) No. 21:*** ***TURBO MODEL*** ***Positive probe; (B55) No. 8:*** ***Ground lead; (B55) No. 9:*** 3) Start the engine and move select lever to "P" or "N" range.	Is the signal voltage more than AC 1 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**
11	**CHECK POOR CONTACT.**	Is there poor contact in torque converter turbine speed sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

G: DTC 38 TORQUE CONTROL SIGNAL

DIAGNOSIS:
The signal circuit is open or shorted.
TROUBLE SYMPTOM:
Excessive shift shock.
WIRING DIAGRAM:



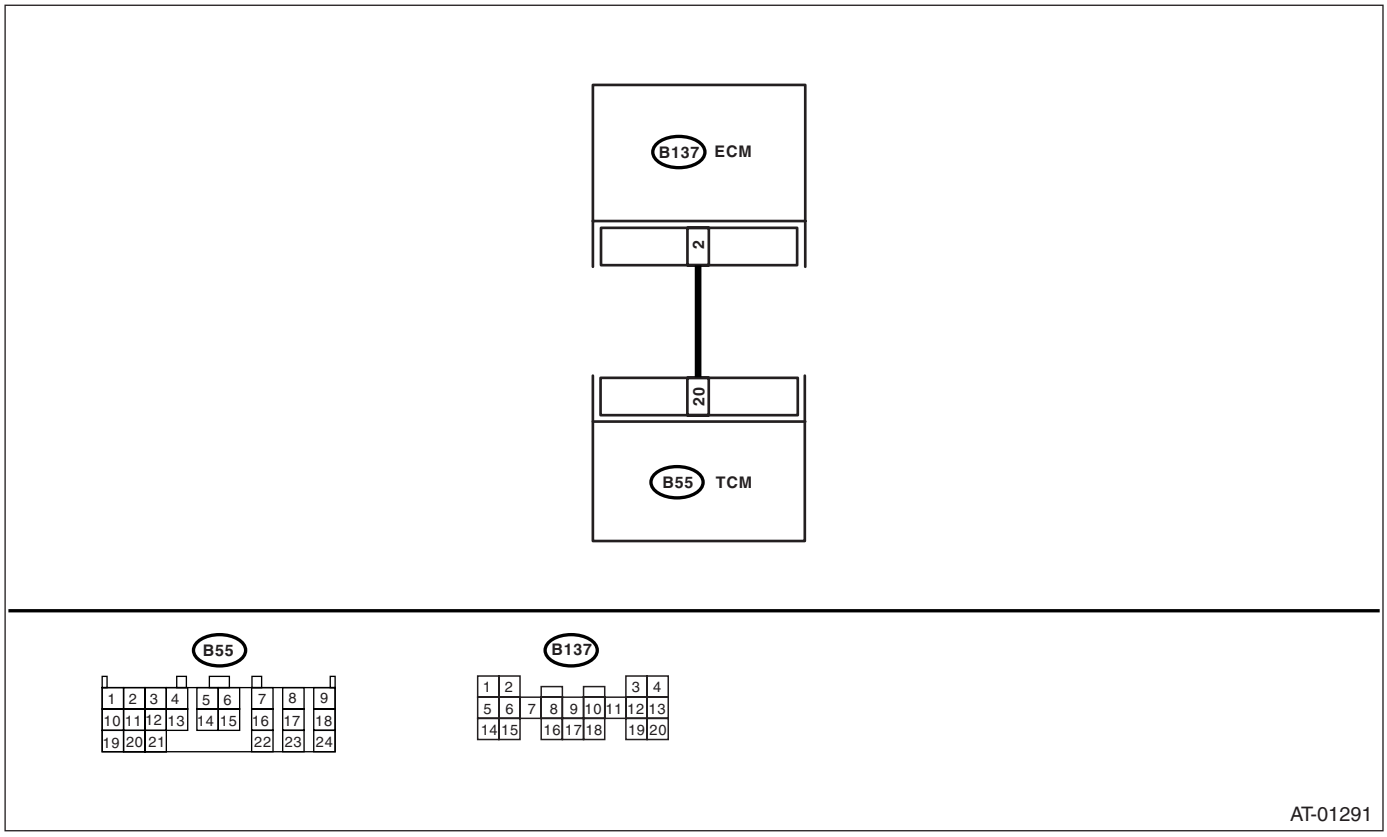
Step		Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and ECM. 3) Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 21 — (B136) No. 18:*** ***(B54) No. 13 — (B136) No. 1:*** ***TURBO MODEL*** ***(B56) No. 14 — (B134) No. 18:*** ***(B56) No. 5 — (B134) No. 19:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and ECM connector.

	Step	Check	Yes	No
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 21 — Chassis ground:*** ***(B54) No. 13 — Chassis ground:*** ***TURBO MODEL*** ***(B56) No. 14 — Chassis ground:*** ***(B56) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and ECM connector.
3	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connectors to TCM and ECM. 2) Turn the ignition switch to ON (engine OFF). 3) Measure the voltage between TCM connector terminals. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 21 (+) — Chassis ground (−):*** ***(B54) No. 13 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B56) No. 14 (+) — Chassis ground (−):*** ***(B56) No. 5 (+) — Chassis ground (−):***	Is the voltage more than 4.8 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **4.**
4	**CHECK POOR CONTACT.**	Is there poor contact in torque control signal circuit?	Repair the poor contact.	Go to step **5.**
5	**CHECK GROUND LINE BETWEEN TRANSMISSION AND BODY.** Check installing condition of the ground line in transmission and body.	Is there any dirt or rust at the ground line installing point?	Remove dirt and rust.	Go to step **6.**
6	**CHECK GROUND LINE BETWEEN TRANSMISSION AND BODY.** Check installing condition of the ground line in transmission and body. ***Tightening torque:*** ***10 — 16 N·m (1.0 — 1.6 kgf-m, 7.2 — 11.6 ft-lb)***	Is the tightening torque value within specification?	Go to step **7.**	Tighten to the specified torque.
7	**CHECK GROUND LINE INSIDE TRANSMISSION.** 1) Drain the ATF and remove oil pan. 2) Check the tightening torque value of ground line installing bolt. ***Tightening torque:*** ***7 — 9 N·m (0.7 — 0.9 kgf-m, 5.1 — 6.5 ft-lb)***	Is the tightening torque value within specification?	Go to step **9.**	Tighten to the specified torque.
8	**CHECK GROUND CIRCUIT OF ECM.** <Ref. to 4AT(diag)-46, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble?	Repair the ground terminal and/or ground circuit of ECM.	Go to step **9.**

	Step	Check	Yes	No
9	**RECHECK OUTPUT SIGNAL EMITTED FROM TCM.** Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 21 (+) — Chassis ground (−):*** ***(B54) No. 13 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B56) No. 14 (+) — Chassis ground (−):*** ***(B56) No. 5 (+) — Chassis ground (−):***	Is each voltage more than 4 V?	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>	Replace the ECM.

H: DTC 45 INTAKE MANIFOLD PRESSURE SIGNAL (NON-TURBO MODEL)

DIAGNOSIS:
The input signal circuit of TCM from ECM is open or shorted.
TROUBLE SYMPTOM:
Excessive shift shock.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ENGINE GROUND TERMINALS AND GROUND CIRCUIT OF ECM** <Ref. to 4AT(diag)-46, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble?	Repair the ground terminal and/or ground circuit of ECM.	Go to step **2.**
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and ECM. 3) Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***(B55) No. 20 — (B137) No. 2:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and ECM connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 20 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short circuit in harness between TCM and ECM connector.
4	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **6.**	Go to step **5.**

	Step	Check	Yes	No
5	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and ECM. 2) Start the engine, and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3) Idle the engine. 4) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 20 (+) — Chassis ground (−):***	Is the voltage 0.4 — 1.6 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **7.**
6	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and ECM. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine, and turn Subaru Select Monitor switch to ON. 4) Warm-up the engine until engine coolant temperature is above 80°C (176°F). 5) Idle the engine. 6) Read the data of intake manifold pressure signal using Subaru Select Monitor. • Display shows the intake manifold pressure signal value sent from ECM.	Is the value voltage 0.4 — 1.6 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **7.**
7	**CHECK POOR CONTACT.**	Is there poor contact in intake manifold pressure signal circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

I: DTC 71 SHIFT SOLENOID 1

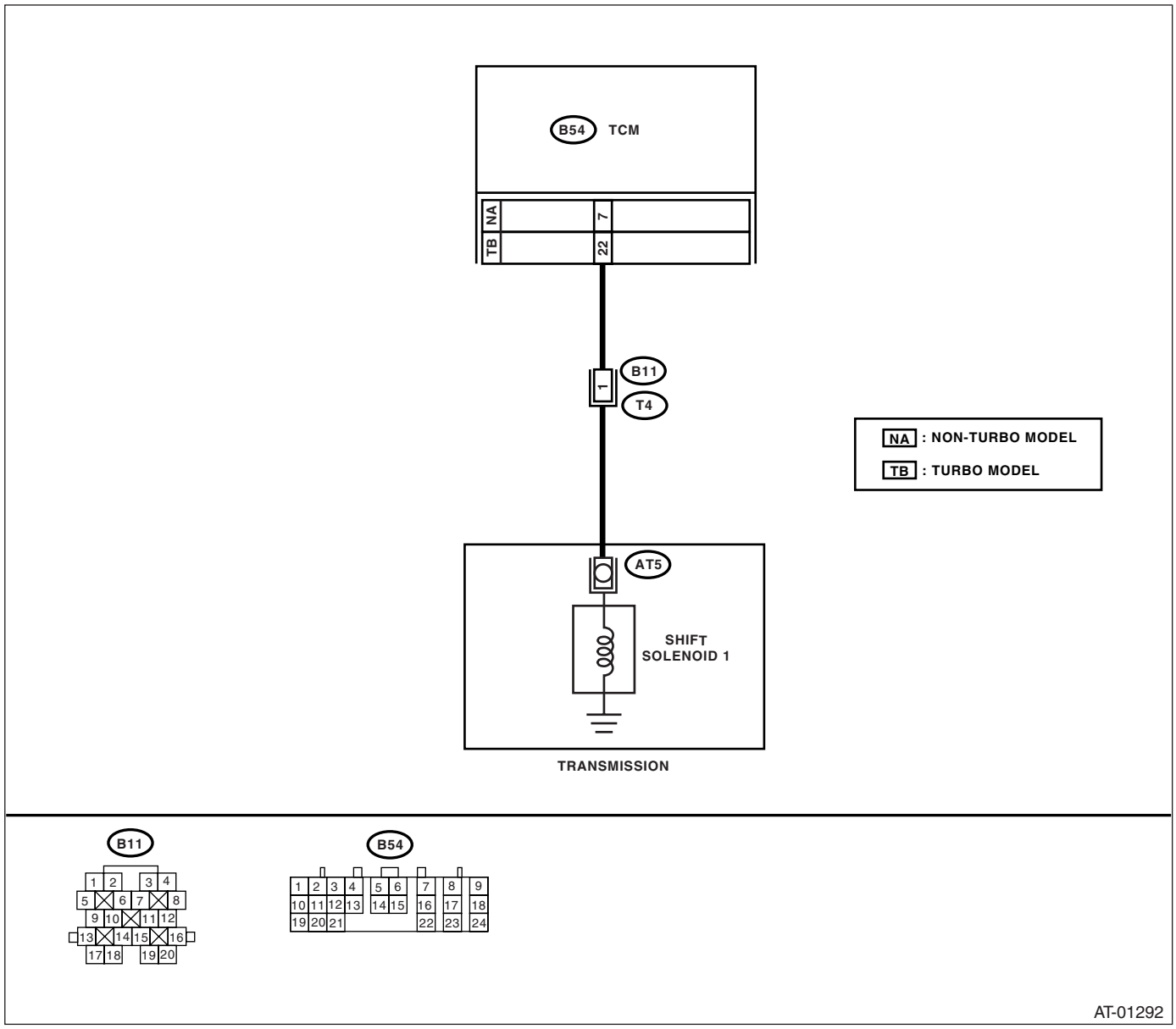
DIAGNOSIS:

The output signal circuit of shift solenoid 1 is open or shorted.

TROUBLE SYMPTOM:

Does not shift.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and shift solenoid 1 connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 7 — (B11) No. 1:*** ***TURBO MODEL*** ***(B54) No. 22 — (B11) No. 1:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 7 — Chassis ground:*** ***TURBO MODEL*** ***(B54) No. 22 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK SHIFT SOLENOID 1.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 1 — No. 16:***	Is the resistance 10 — 16 Ω?	Go to step **4.**	Go to step **7.**
4	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connectors to TCM and transmission. 2) Turn the ignition switch to ON (engine OFF). 3) Move the select lever to “D” range. 4) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 7 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B54) No. 22 (+) — Chassis ground (−):***	Is the voltage more than 9 V?	Go to step **5.**	Go to step **6.**
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Move the select lever to “2” range. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 7 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B54) No. 22 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in TCM.	Go to step **6.**
6	**CHECK POOR CONTACT.**	Is there poor contact in shift solenoid 1 circuit?	Repair poor contact.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

	Step	Check	Yes	No
7	**CHECK SHIFT SOLENOID 1 (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Lift-up or raise the vehicle and support with safety stand. NOTE: Raise all wheels off ground. 3) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 4) Remove the oil pan, and disconnect connector from shift solenoid 1. 5) Measure the resistance between shift solenoid 1 connector and transmission ground. ***Terminals*** ***No. 1 — Transmission ground:***	Is the resistance 10 — 16 Ω?	Go to step **8.**	Replace the shift solenoid 1. <Ref. to 4AT-61, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
8	**CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 1 AND TRANSMISSION.** Measure the resistance of harness between shift solenoid 1 and transmission connector. ***Connector & terminal*** ***(T4) No. 1 — (AT5) No. 1:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the open circuit in harness between shift solenoid 1 and transmission connector.
9	**CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 1 AND TRANSMISSION.** Measure the resistance of harness between shift solenoid 1 connector and transmission ground. ***Connector & terminal*** ***(T4) No. 1 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in shift solenoid 1 and transmission.	Repair the short circuit harness between shift solenoid 1 and transmission connector.

J: DTC 72 SHIFT SOLENOID 2

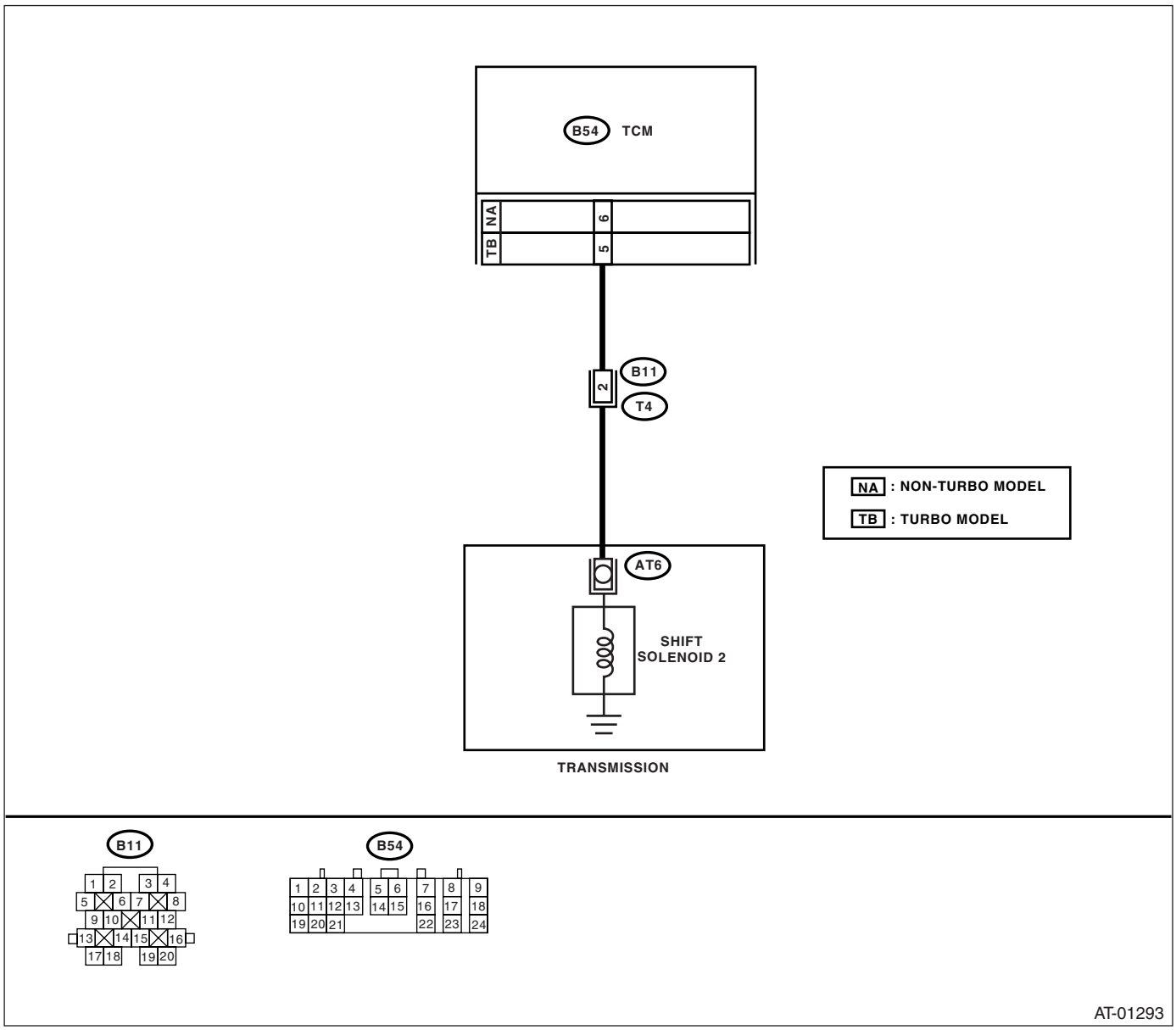
DIAGNOSIS:

The output signal circuit of shift solenoid 2 is open or shorted.

TROUBLE SYMPTOM:

Does not shift.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and shift solenoid 2 connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 6 — (B11) No. 2:*** ***TURBO MODEL*** ***(B54) No. 5 — (B11) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and transmission ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 6 — Chassis ground:*** ***TURBO MODEL*** ***(B54) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK SHIFT SOLENOID 2.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 2 — No. 16:***	Is the resistance 10 — 16 Ω?	Go to step **4.**	Go to step **6.**
4	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connectors to TCM and transmission. 2) Lift-up or raise the vehicle and support with safety stand. NOTE: Raise all wheels off ground. 3) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 4) Move the selector lever to “D” range, and slowly increase vehicle speed to 50 km/h (31 MPH). NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-22, Clear Memory Mode.> 5) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 6 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B54) No. 5 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **5.**

	Step	Check	Yes	No
5	**CHECK POOR CONTACT.**	Is there poor contact in shift solenoid 2 circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>
6	**CHECK SHIFT SOLENOID 2 (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan, and disconnect connector from shift solenoid 2. 4) Measure the resistance between shift solenoid 2 connector and transmission ground. ***Terminals*** ***No. 1 — Transmission ground:***	Is the resistance 10 — 16 Ω?	Go to step **7.**	Replace the shift solenoid 2. <Ref. to 4AT-61, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
7	**CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 2 AND TRANSMISSION.** Measure the resistance of harness between shift solenoid 2 and transmission connector. ***Connector & terminal*** ***(AT6) No. 1 — (T4) No. 2:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between shift solenoid 2 and transmission connector.
8	**CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 2 AND TRANSMISSION.** Measure the resistance of harness between shift solenoid 2 connector and transmission ground. ***Connector & terminal*** ***(T4) No. 2 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in shift solenoid 2 and transmission.	Repair the short circuit harness between shift solenoid 2 and transmission connector.

K: DTC 73 LOW CLUTCH TIMING SOLENOID

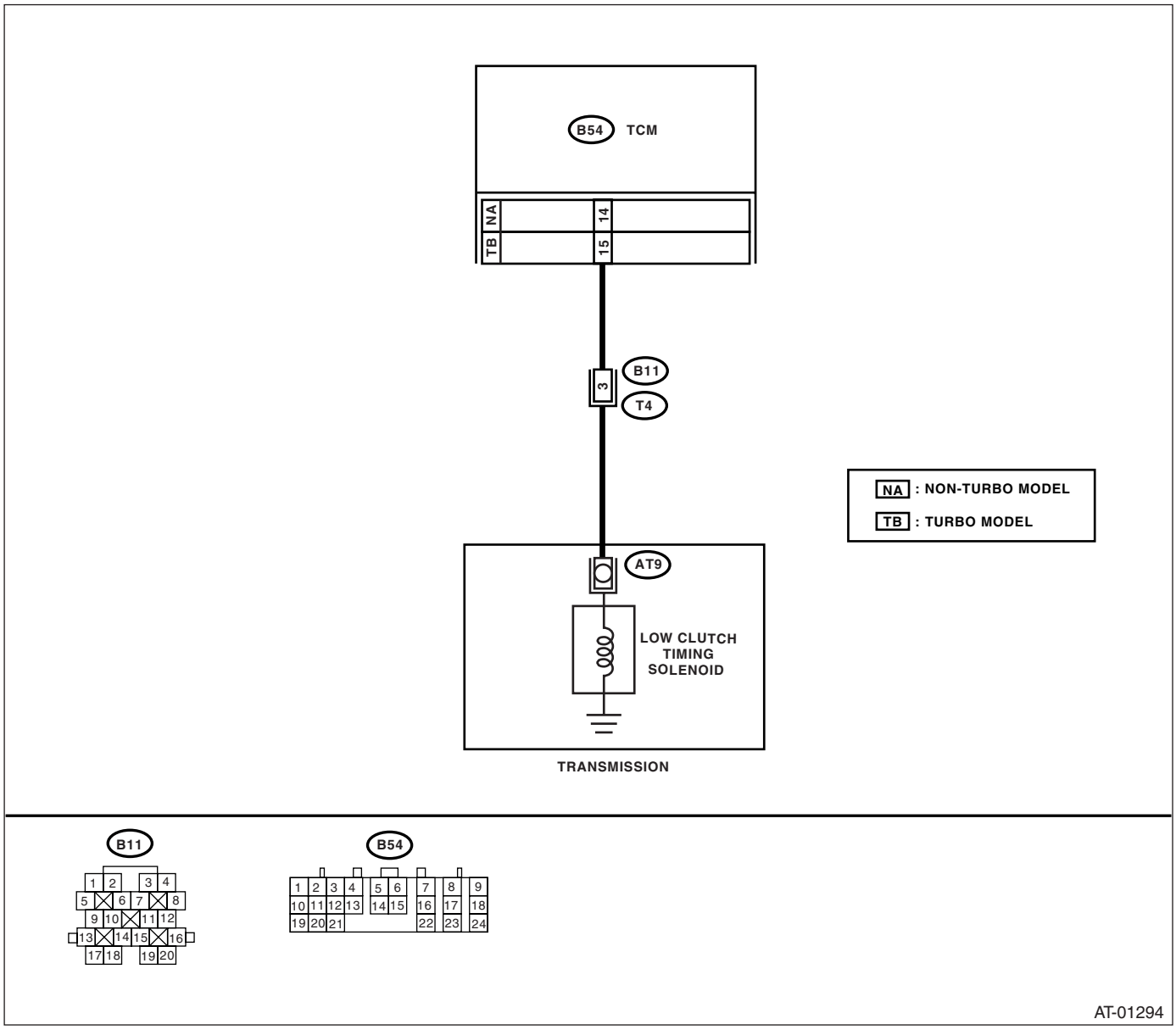
DIAGNOSIS:

The output signal circuit of low clutch timing solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 14 — (B11) No. 3:*** ***TURBO MODEL*** ***(B54) No. 15 — (B11) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and transmission ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 14 — Chassis ground:*** ***TURBO MODEL*** ***(B54) No. 15 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK LOW CLUTCH TIMING SOLENOID.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 3 — No. 16:***	Is the resistance 10 — 16 Ω?	Go to step **4.**	Go to step **7.**
4	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connectors to TCM and transmission. 2) Turn the ignition switch to ON (engine OFF). 3) Move the select lever to “D” range. 4) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 14 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B54) No. 15 (+) — Chassis ground (−):***	Is the voltage more than 9 V?	Go to step **5.**	Go to step **6.**
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Set the select lever to “2” range. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 14 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B54) No. 15 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in TCM and transmission.	Go to step **6.**
6	**CHECK POOR CONTACT.**	Is there poor contact in low clutch timing solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

	Step	Check	Yes	No
7	**CHECK LOW CLUTCH TIMING SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Lift-up or raise the vehicle and support with safety stand. NOTE: Raise all wheels off ground. 3) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 4) Remove the oil pan, and disconnect connector from low clutch timing solenoid. 5) Measure the resistance between low clutch timing solenoid connector and transmission ground. ***Terminals*** ***No. 1 — Transmission ground:***	Is the resistance 10 — 16 Ω?	Go to step **8.**	Replace the low clutch timing solenoid. <Ref. to 4AT-61, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
8	**CHECK HARNESS CONNECTOR BETWEEN LOW CLUTCH TIMING SOLENOID AND TRANSMISSION.** Measure the resistance of harness between low clutch timing solenoid and transmission connector. ***Connector & terminal*** ***(AT9) No. 1 — (T4) No. 3:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the open circuit in harness between low clutch timing solenoid and transmission connector.
9	**CHECK HARNESS CONNECTOR BETWEEN LOW CLUTCH TIMING SOLENOID AND TRANSMISSION.** Measure the resistance of harness between low clutch timing solenoid connector and transmission ground. ***Connector & terminal*** ***(T4) No. 3 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in low clutch timing solenoid and transmission.	Repair the short circuit harness between low clutch timing solenoid and transmission connector.

L: DTC 74 2-4 BRAKE TIMING SOLENOID

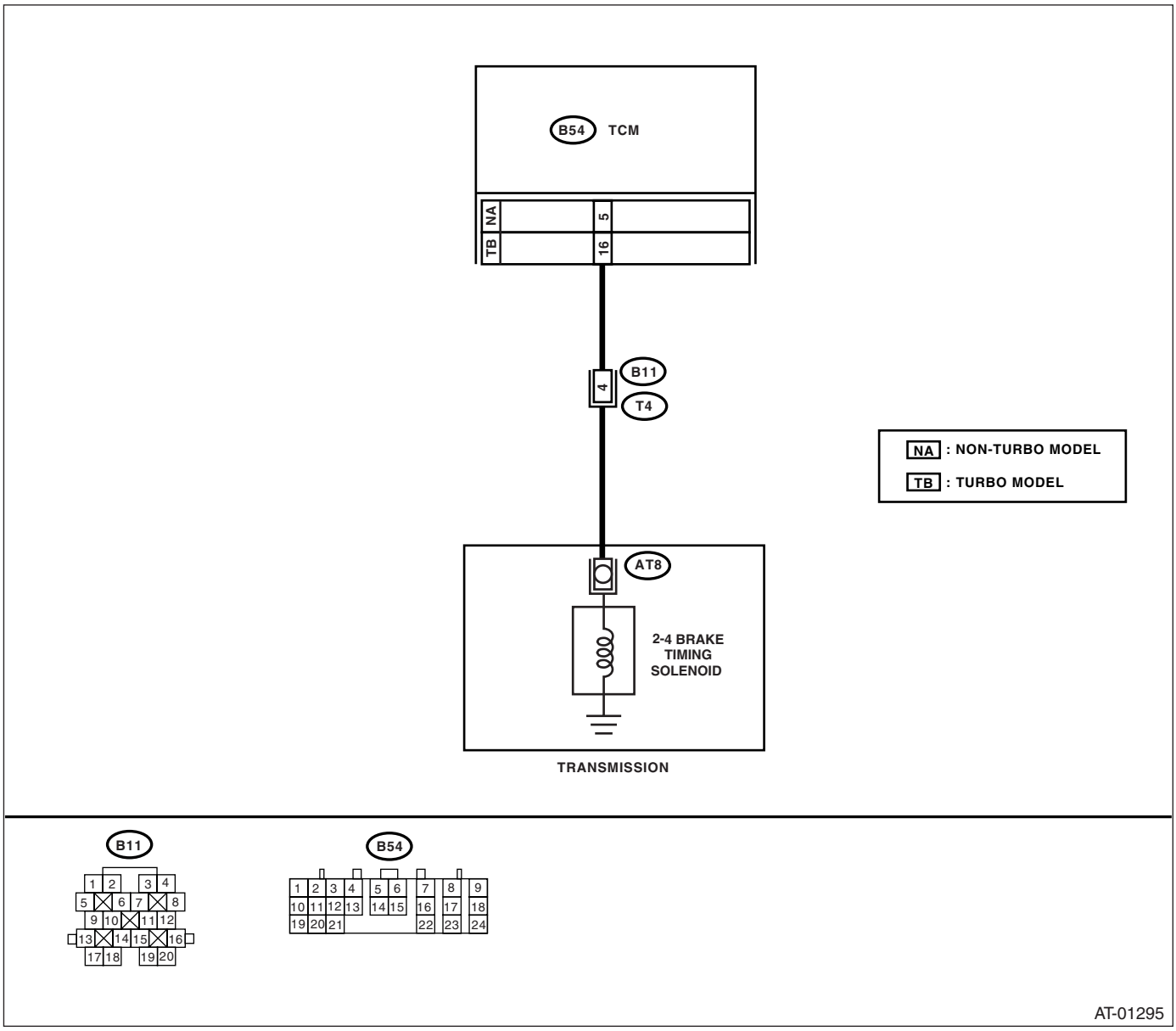
DIAGNOSIS:

The output signal circuit of 2-4 brake timing solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 5 — (B11) No. 4:*** ***TURBO MODEL*** ***(B54) No. 16 — (B11) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 5 — Chassis ground:*** ***TURBO MODEL*** ***(B54) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK 2-4 BRAKE TIMING SOLENOID.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 4 — No. 16:***	Is the resistance 10 — 16 Ω?	Go to step **4.**	Go to step **7.**
4	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connectors to TCM and transmission. 2) Lift-up or raise the vehicle and support with safety stand. NOTE: Raise all wheels off ground. 3) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 4) Move the selector lever to "1" range, and slowly increase vehicle speed to 10 km/h (6 MPH). NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-22, Clear Memory Mode.> 5) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 5 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B54) No. 16 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **5.**	Go to step **6.**

	Step	Check	Yes	No
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Move the selector lever to "D" range, and slowly increase vehicle speed to 65 km/h (40 MPH). NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-22, Clear Memory Mode.> 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 5 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B54) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 9 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in transmission.	Go to step **6.**
6	**CHECK POOR CONTACT.**	Is there poor contact in 2-4 brake timing solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>
7	**CHECK 2-4 BRAKE TIMING SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Lift-up or raise the vehicle and support with safety stand. NOTE: Raise all wheels off ground. 3) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 4) Remove the oil pan, and disconnect connector from 2-4 brake timing solenoid. 5) Measure the resistance between 2-4 brake timing solenoid connector and transmission ground. ***Terminals*** ***No. 1 — Transmission ground:***	Is the resistance 10 — 16 Ω?	Go to step **8.**	Replace the 2-4 brake timing solenoid. <Ref. to 4AT-61, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
8	**CHECK HARNESS CONNECTOR BETWEEN 2-4 BRAKE TIMING SOLENOID AND TRANSMISSION.** Measure the resistance of harness between 2-4 brake timing solenoid and transmission connector. ***Connector & terminal*** ***(AT8) No. 1 — (T4) No. 4:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the open circuit in harness between 2-4 brake timing solenoid and transmission connector.

	Step	Check	Yes	No
9	**CHECK HARNESS CONNECTOR BETWEEN 2-4 BRAKE TIMING SOLENOID AND TRANSMISSION.** Measure the resistance of harness between 2-4 brake timing solenoid connector and transmission ground. ***Connector & terminal*** ***(T4) No. 4 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in 2-4 brake timing solenoid and transmission.	Repair the short circuit harness between 2-4 brake timing solenoid and transmission connector.

M: DTC 75 LINE PRESSURE DUTY SOLENOID

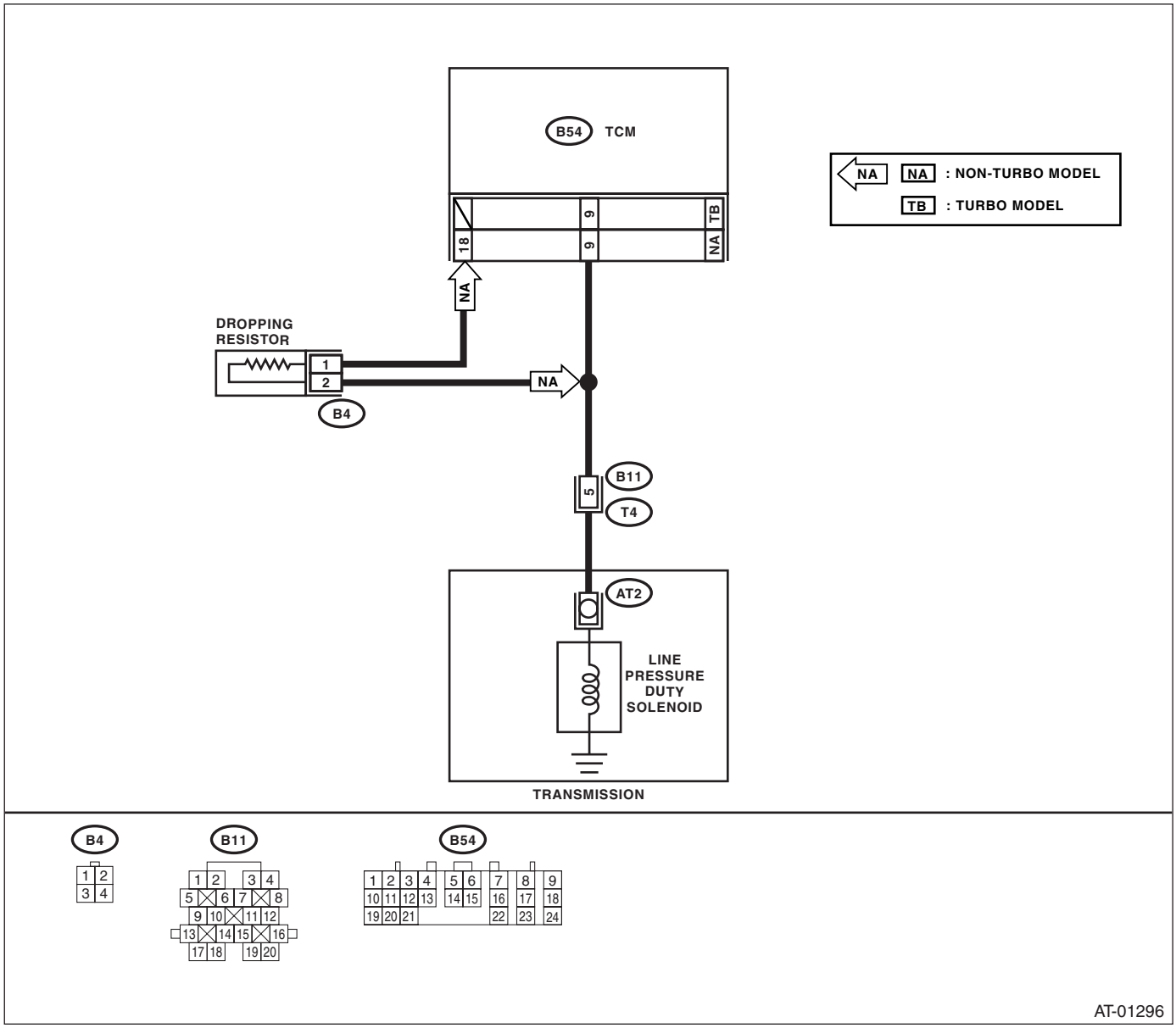
DIAGNOSIS:

Output signal circuit of line pressure duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK VEHICLE.**	Is the target non-turbo model?	Go to step **2.**	Go to step **7.**
2	**CHECK RESISTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from dropping resistor. 3) Measure the resistance between dropping resistor terminal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 9 — 15 Ω?	Go to step **3.**	Replace the dropping resistor. <Ref. to 4AT-68, Dropping Resistor.>
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND DROPPING RESISTOR.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM connector and dropping resistor connector. ***Connector & terminal*** ***(B54) No. 18 — (B4) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between TCM and dropping resistor connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND DROPPING RESISTOR.** Measure the resistance of harness between dropping resistor connector and chassis ground. ***Connector & terminal*** ***(B4) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair short circuit in harness between TCM and dropping resistor connector.
5	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND DROPPING RESISTOR.** 1) Disconnect the connector from transmission. 2) Measure the resistance of harness between transmission and dropping resistor connector. ***Connector & terminal*** ***(B4) No. 2 — (B11) No. 5:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair open circuit in harness between dropping resistor and transmission connector.
6	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND DROPPING RESISTOR.** Measure the resistance of harness between dropping resistor connector and chassis ground. ***Connector & terminal*** ***(B4) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair short circuit in harness between dropping resistor and transmission connector.
7	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission and TCM. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 9 — (B11) No. 5:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between TCM and transmission connector.
8	**CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the short circuit in harness between TCM and transmission connector.

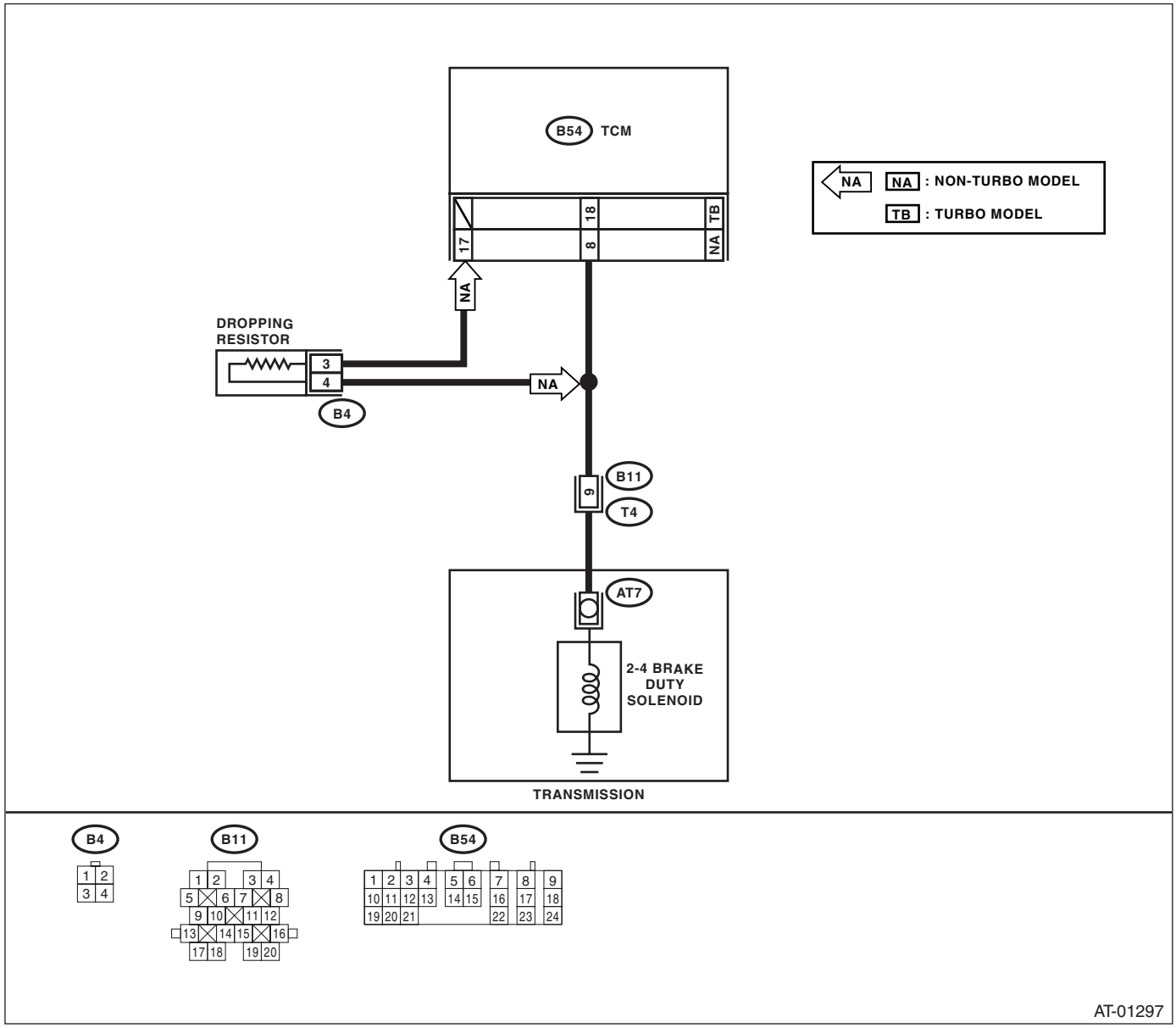
	Step	Check	Yes	No
9	**CHECK LINE PRESSURE DUTY SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Terminals*** ***(T4) No. 5 — No. 16:***	Is the resistance between 2.0 and 4.5 Ω?	Go to step **10.**	Go to step **16.**
10	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **13.**	Go to step **11.**
11	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect all connectors. 2) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3) Turn the ignition switch to ON (engine OFF). 4) Move the select lever to "N" range. 5) Throttle fully closed. 6) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 9 (+) — Chassis ground (−):***	Is the voltage 1.5 — 5.0 V?	Go to step **12.**	Go to step **15.**
12	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Throttle fully open and hold it. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 9 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in transmission.	Go to step **15.**

	Step	Check	Yes	No
13	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine and turn Subaru Select Monitor switch to ON. 4) Warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 5) Stop the engine and turn ignition switch to ON (engine OFF). 6) Move the select lever to "N" range. 7) Throttle is fully closed. • Line pressure duty solenoid is indicated in "%". 8) Read the data of line pressure duty solenoid using Subaru Select Monitor.	Is the value 100%?	Go to step **14.**	Go to step **15.**
14	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Turn the ignition switch to ON (engine OFF). 2) Throttle is fully open.	Is the value less than 25%?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in transmission.	Go to step **15.**
15	**CHECK POOR CONTACT.**	Is there poor contact in line pressure duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>
16	**CHECK LINE PRESSURE DUTY SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan, and disconnect connector from line pressure duty solenoid. 4) Measure the resistance between line pressure duty solenoid connector and transmission ground. ***Terminals*** ***No. 1 — Transmission ground:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **17.**	Replace the line pressure duty solenoid. <Ref. to 4AT-61, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>

	Step	Check	Yes	No
17	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LINE PRESSURE DUTY SOLENOID.** Measure the resistance of harness between line pressure duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 5 — (AT2) No. 1:***	Is the resistance less than 1 Ω?	Go to step **18.**	Repair the open circuit in harness between line pressure duty solenoid and transmission connector.
18	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LINE PRESSURE DUTY SOLENOID.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 5 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in line pressure duty solenoid and transmission.	Repair the short circuit in harness between line pressure duty solenoid and transmission connector.

N: DTC 76 2-4 BRAKE DUTY SOLENOID

DIAGNOSIS:
Output signal circuit of 2-4 brake duty solenoid is open or shorted.
TROUBLE SYMPTOM:
Excessive shift shock.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK VEHICLE.**	Is the target non-turbo model?	Go to step **2.**	Go to step **7.**
2	**CHECK RESISTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from dropping resistor. 3) Measure the resistance between dropping resistor terminal. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance 9 — 15 Ω?	Go to step **3.**	Replace the dropping resistor. <Ref. to 4AT-68, Dropping Resistor.>

	Step	Check	Yes	No
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND DROPPING RESISTOR.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM connector and dropping resistor connector. ***Connector & terminal*** ***(B54) No. 17 — (B4) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between TCM and dropping resistor connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND DROPPING RESISTOR.** Measure the resistance of harness between dropping resistor connector and chassis ground. ***Connector & terminal*** ***(B4) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair short circuit in harness between TCM and dropping resistor connector.
5	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND DROPPING RESISTOR.** 1) Disconnect the connector from transmission. 2) Measure the resistance of harness between transmission and dropping resistor connector. ***Connector & terminal*** ***(B4) No. 4 — (B11) No. 9:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair open circuit in harness between dropping resistor and transmission connector.
6	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND DROPPING RESISTOR.** Measure the resistance of harness between dropping resistor connector and chassis ground. ***Connector & terminal*** ***(B4) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair short circuit in harness between dropping resistor and transmission connector.
7	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission and TCM. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 8 — (B11) No. 9:*** ***TURBO MODEL*** ***(B54) No. 18 — (B11) No. 9:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between TCM and transmission connector.
8	**CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 8 — Chassis ground:*** ***TURBO MODEL*** ***(B54) No. 18 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the short circuit in harness between TCM and transmission connector.
9	**CHECK 2-4 BRAKE DUTY SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Terminals*** ***(T4) No. 16 — No. 9:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **10.**	Go to step **16.**

	Step	Check	Yes	No
10	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **13.**	Go to step **11.**
11	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect all connectors. 2) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3) Turn the ignition switch to ON (engine OFF). 4) Move the select lever to "N" range. 5) Throttle fully closed. 6) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 18 (+) — Chassis ground (−):***	Is the voltage 1.5 — 5.0 V?	Go to step **12.**	Go to step **15.**
12	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Throttle fully open and hold it. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 18 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **15.**
13	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect all connectors. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine and turn Subaru Select Monitor switch to ON. 4) Warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 5) Stop the engine and turn ignition switch to ON (engine OFF). 6) Move the select lever to "N" range. 7) Throttle is fully closed. • 2-4 brake duty solenoid is indicated in "%". 8) Read the data of 2-4 brake duty solenoid using Subaru Select Monitor.	Is the value 100%?	Go to step **14.**	Go to step **15.**

	Step	Check	Yes	No
14	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Turn the ignition switch to ON (engine OFF). 2) Throttle is fully open.	Is the value less than 25%?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **15.**
15	**CHECK POOR CONTACT.**	Is there poor contact in 2-4 brake duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>
16	**CHECK 2-4 BRAKE DUTY SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan, and disconnect connector from 2-4 brake duty solenoid. 4) Measure the resistance between 2-4 brake duty solenoid connector and transmission ground. ***Terminals*** ***No. 1 — Transmission ground:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **17.**	Replace the 2-4 brake duty solenoid. <Ref. to 4AT-61, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
17	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND 2-4 BRAKE DUTY SOLENOID.** Measure the resistance of harness between 2-4 brake duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 9 — (AT7) No. 1:***	Is the resistance less than 1 Ω?	Go to step **18.**	Repair the open circuit in harness between 2-4 brake duty solenoid and transmission connector.
18	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND 2-4 BRAKE DUTY SOLENOID.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 9 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in line pressure duty solenoid and transmission.	Repair the short circuit in harness between 2-4 brake duty solenoid and transmission connector.

O: DTC 77 LOCK-UP DUTY SOLENOID

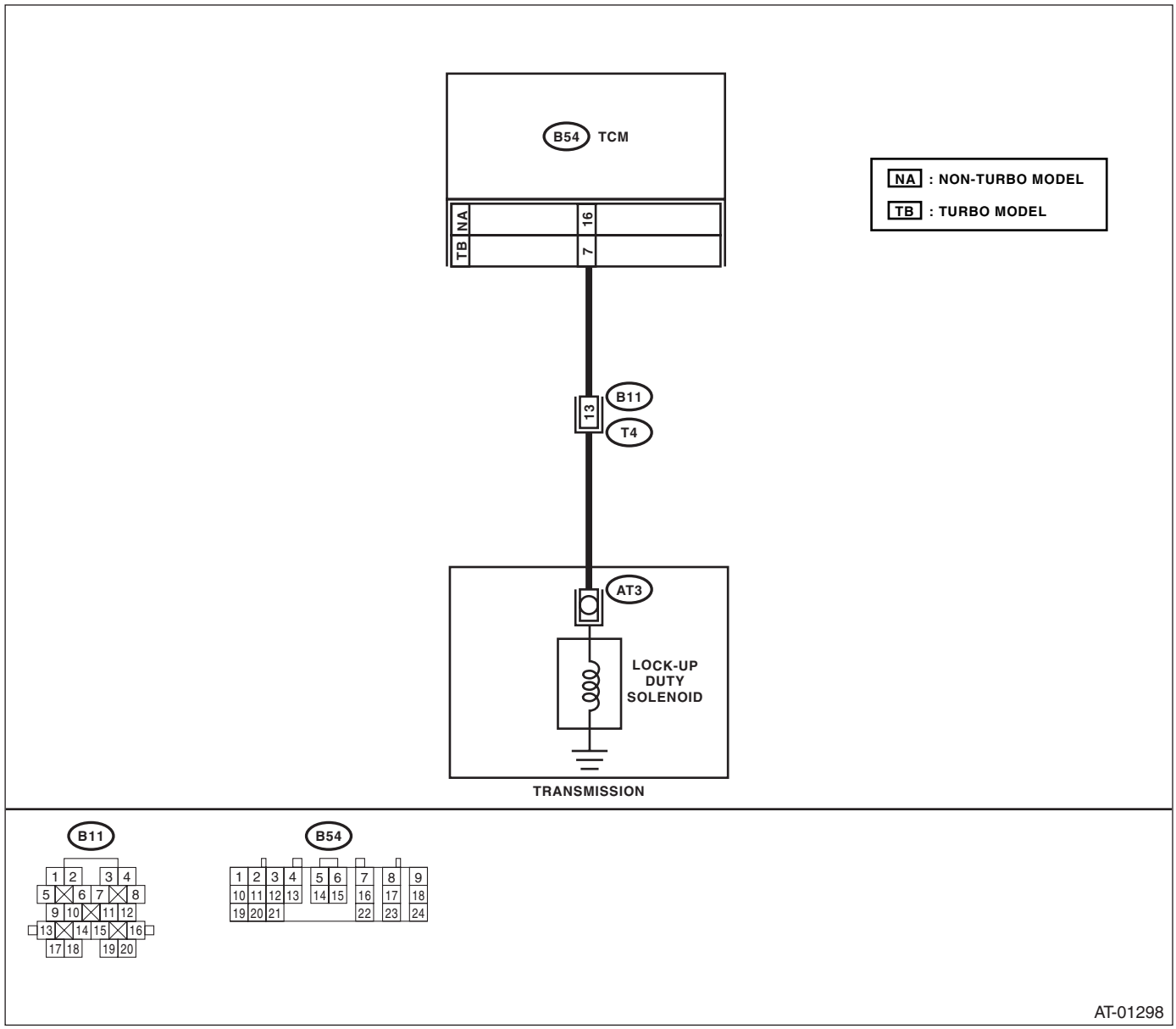
DIAGNOSIS:

The output signal circuit of lock-up duty solenoid is open or shorted.

TROUBLE SYMPTOM:

No “lock-up” (after engine warm-up).

WIRING DIAGRAM:



Step	Check	Yes	No
1 CHECK DTC.	Do multiple DTCs appear in the on-board diagnostics test mode?	Go to another DTC.	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 16 — (B11) No. 13:*** ***TURBO MODEL*** ***(B54) No. 7 — (B11) No. 13:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness connector between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 16 — Chassis ground:*** ***TURBO MODEL*** ***(B54) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short circuit in harness between TCM and transmission connector.
4	**CHECK LOCK-UP DUTY SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 13 — No. 16:***	Is the resistance 10 — 17 Ω?	Go to step **5.**	Go to step **11.**
5	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **8.**	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connectors to TCM and transmission. 2) Lift-up the vehicle and place safety stand. NOTE: Raise all wheels off ground. 3) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 4) Move the selector lever to "D" range and slowly increase vehicle speed to 75 km/h (47 MPH). Wheels will lock-up. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-22, Clear Memory Mode.> 5) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 16 (+) — Chassis ground (–):*** ***TURBO MODEL*** ***(B54) No. 7 (+) — Chassis ground (–):***	Is the voltage more than 8.5 V?	Go to step **7.**	Go to step **10.**
7	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Return the engine to idling speed and move select lever to "N" range. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 16 (+) — Chassis ground (–):*** ***TURBO MODEL*** ***(B54) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 0.5 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **10.**

	Step	Check	Yes	No
8	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Lift-up the vehicle and place safety stand. NOTE: Raise all wheels off ground. 3) Connect the Subaru Select Monitor to data link connector. 4) Start the engine and turn Subaru Select Monitor switch to ON. 5) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 6) Read the data of lock-up duty solenoid using Subaru Select Monitor. • Lock-up duty solenoid is indicated in “%”. 7) Move the selector lever to “D” range and slowly increase vehicle speed to 75 km/h (47 MPH). Wheels will lock-up. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-22, Clear Memory Mode.>	Is the value 95%?	Go to step **9.**	Go to step **10.**
9	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** Return the engine to idling speed and move selector lever to “N” range. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-22, Clear Memory Mode.>	Is the value 5%?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **10.**
10	**CHECK POOR CONTACT.**	Is there poor contact in lock-up duty solenoid circuit?	Repair poor contact.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

	Step	Check	Yes	No
11	**CHECK LOCK-UP DUTY SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan and disconnect connector from lock-up duty solenoid. 4) Measure the resistance between lock-up duty solenoid connector and transmission ground. ***Terminals*** ***No. 1 — Transmission ground:***	Is the resistance 10 — 17 Ω?	Go to step **12.**	Replace the lock-up duty solenoid. <Ref. to 4AT-61, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
12	**CHECK HARNESS CONNECTOR BETWEEN LOCK-UP DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between lock-up duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 13 — (AT3) No. 1:***	Is the resistance less than 1 Ω?	Go to step **13.**	Repair the open circuit in harness between TCM and transmission connector.
13	**CHECK HARNESS CONNECTOR BETWEEN LOCK-UP DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 13 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in lock-up duty solenoid and transmission.	Repair the short circuit in harness between lock-up duty solenoid and transmission connector.

P: DTC 79 TRANSFER DUTY SOLENOID

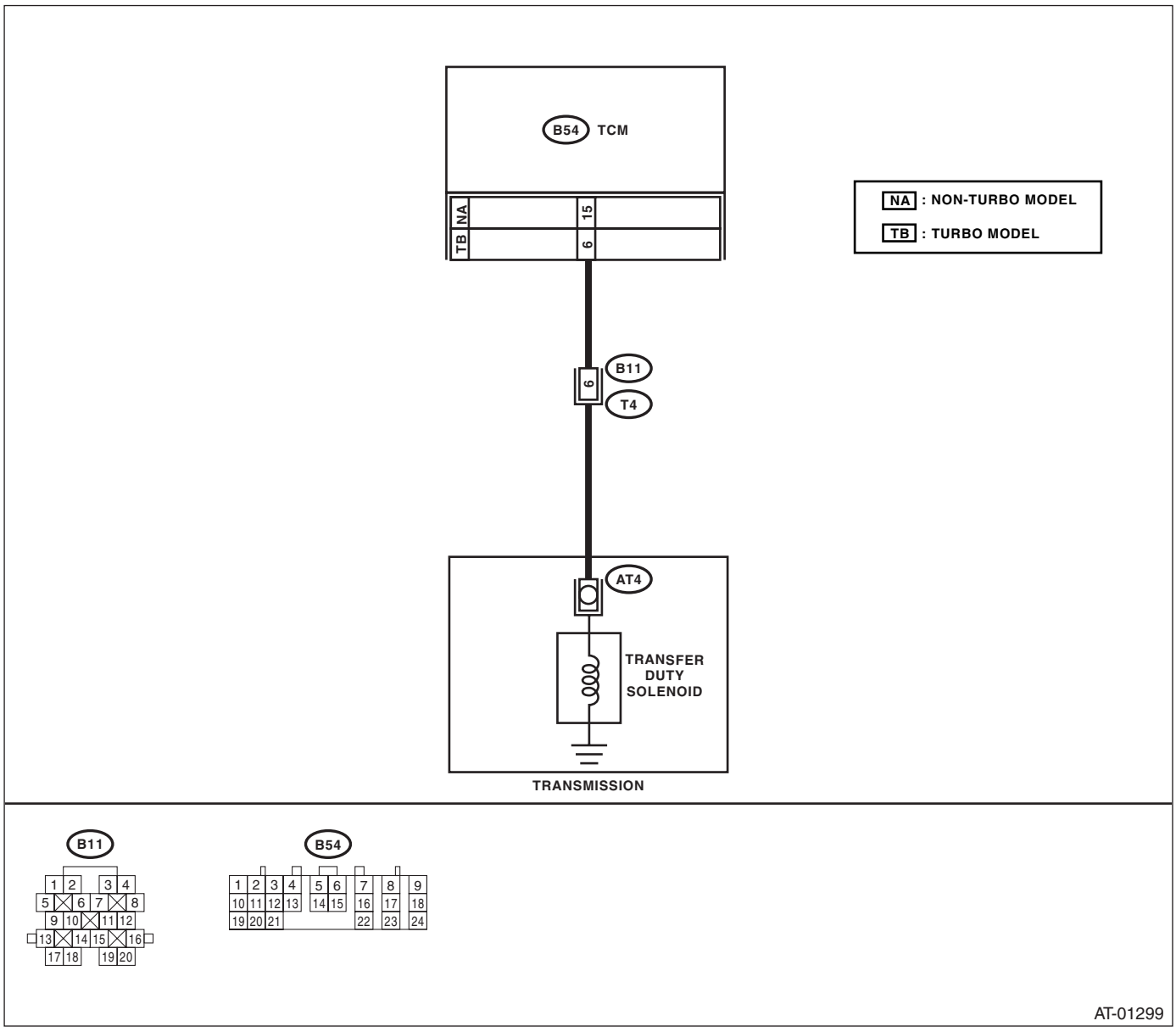
DIAGNOSIS:

The output signal circuit of transfer duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive “braking” in tight corners.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 15 — (B11) No. 6:*** ***TURBO MODEL*** ***(B54) No. 6 — (B11) No. 6:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance harness connector between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 15 — Chassis ground:*** ***TURBO MODEL*** ***(B54) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK TRANSFER DUTY SOLENOID.** Measure the resistance between transmission connector and transmission terminals. ***Connector & terminal*** ***(T4) No. 6 — No. 16:***	Is the resistance 10 — 17 Ω?	Go to step **4.**	Go to step **13.**
4	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **8.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connectors to TCM and transmission. 2) Turn the ignition switch to ON (engine OFF). 3) Throttle is fully closed. 4) Move the select lever to “P” range. 5) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 15 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B54) No. 6 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **6.**	Go to step **12.**
6	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Move the select lever to “D” range. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 15 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B54) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 8.5 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **12.**
7	**CHECK VEHICLE**	Is the target non-turbo model?	Go to step **8.**	Go to step **10.**

	Step	Check	Yes	No
8	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON (engine OFF) and turn Subaru Select Monitor switch to ON. 4) Move the select lever to “D” range with throttle fully open (vehicle speed 0 km/h or 0 MPH). 5) Read data of transfer duty solenoid using Subaru Select Monitor. • Transfer duty solenoid is indicated in “%”.	Is the value 5 — 10%?	Go to step **9.**	Go to step **12.**
9	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Move the select lever to “N” range with throttle fully closed (vehicle speed 0 km/h or 0 MPH). 2) Read the data of transfer duty solenoid using Subaru Select Monitor. • Transfer duty solenoid is indicated in “%”.	Is the value approx. 60 — 70%?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **12.**
10	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON (engine OFF) and turn Subaru Select Monitor switch to ON. 4) Move the select lever to “D” range with throttle fully open (vehicle speed 0 km/h or 0 MPH). 5) Read the data of transfer duty solenoid using Subaru Select Monitor. • Transfer duty solenoid is indicated in “%”.	Is the value 80 — 95%?	Go to step **11.**	Go to step **12.**
11	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Move the select lever to “N” range with throttle fully close (vehicle speed 0 km/h or 0 MPH). 2) Read the data of transfer duty solenoid using Subaru Select Monitor. • Transfer duty solenoid is indicated in “%”.	Is the value approx. 40%?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in transfer duty solenoid and TCM connector.	Go to step **12.**

	Step	Check	Yes	No
12	**CHECK POOR CONTACT.**	Is there poor contact in transfer duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>
13	**CHECK TRANSFER DUTY SOLENOID (IN TRANSMISSION).** 1) Lift-up the vehicle and place safety stand. NOTE: Raise all wheels off ground. 2) Drain the automatic transmission fluid. **CAUTION:** **Do not drain the automatic transmission fluid until it cools down.** 3) Remove the extension case and disconnect connector from transfer duty solenoid. 4) Measure the resistance between transfer duty solenoid connector and transmission ground. ***Connector & terminal*** ***(AT4) No. 1 — Transmission ground:***	Is the resistance 10 — 17 Ω?	Go to step **14.**	Replace the transfer duty solenoid.
14	**CHECK HARNESS CONNECTOR BETWEEN TRANSFER DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transfer duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 6 — (AT4) No. 1:***	Is the resistance less than 1 Ω?	Go to step **15.**	Repair the open circuit in harness between transfer duty solenoid and transmission connector.
15	**CHECK HARNESS CONNECTOR BETWEEN TRANSFER DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 6 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in transfer duty solenoid and transmission.	Repair the short circuit in harness between transfer duty solenoid and transmission connector.

Q: DTC 93 REAR VEHICLE SPEED SENSOR

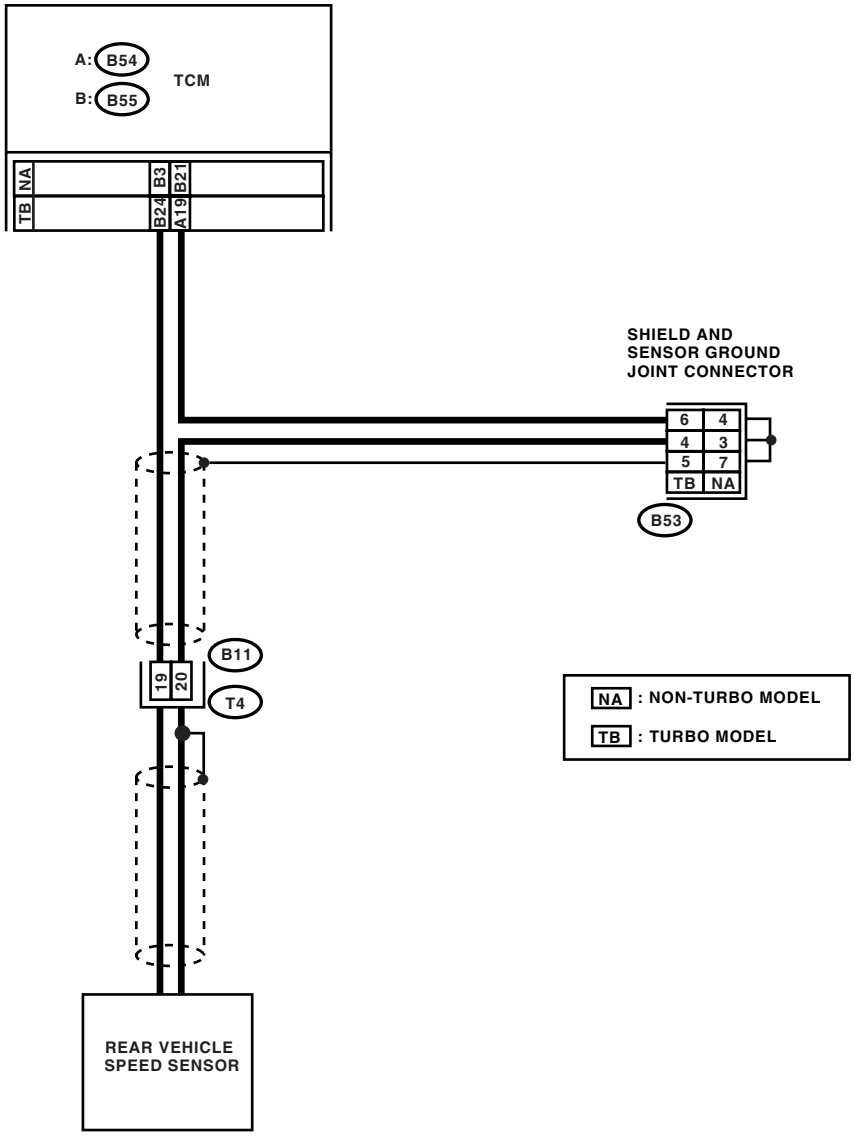
DIAGNOSIS:

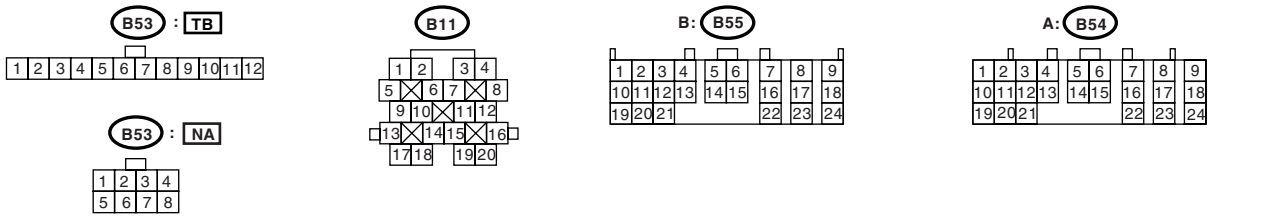
The input signal circuit of TCM is open or shorted.

TROUBLE SYMPTOM:

No lock-up or excessive tight corner “braking”.

WIRING DIAGRAM:





AT-01300

	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 3 — (B11) No. 19:*** ***TURBO MODEL*** ***(B55) No. 24 — (B11) No. 19:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 21 — (B11) No. 20:*** ***TURBO MODEL*** ***(B54) No. 19 — (B11) No. 20:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission, and poor contact in coupling connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 3 — Chassis ground:*** ***TURBO MODEL*** ***(B55) No. 24 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short circuit in harness between TCM and transmission connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 21 — Chassis ground:*** ***TURBO MODEL*** ***(B54) No. 19 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit in harness between TCM and transmission connector.
5	**CHECK REAR VEHICLE SPEED SENSOR.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 19 — No. 20:***	Is the resistance 450 — 650 Ω?	Go to step **6.**	Replace the rear vehicle speed sensor. <Ref. to 4AT-53, Rear Vehicle Speed Sensor.>
6	**PREPARE OSCILLOSCOPE.**	Do you have an oscilloscope?	Go to step **10.**	Go to step **7.**
7	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **9.**	Go to step **8.**

	Step	Check	Yes	No
8	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and transmission. 2) Lift-up or raise the vehicle and place safety stands. NOTE: Raise all wheels off floor. 3) Start the engine and set vehicle in 20 km/h (12 MPH) condition. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-22, Clear Memory Mode.> 4) Measure the voltage between TCM connector terminals. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 3 (+) — (B55) No. 21 (–):*** ***TURBO MODEL*** ***(B55) No. 24 (+) — (B54) No. 19 (–):***	Is the voltage more than AC 1 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**
9	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Lift-up or raise the vehicle and place safety stands. NOTE: Raise all wheels off floor. 4) Turn the ignition switch to ON and turn Subaru Select Monitor switch to ON. 5) Start the engine. 6) Read the data of vehicle speed using Subaru Select Monitor. • Compare the speedometer with Subaru Select Monitor indications. • Vehicle speed is indicated in “km/h” or “MPH”. 7) Slowly increase the vehicle speed to 60 km/h or 37 MPH. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-22, Clear Memory Mode.>	Does the speedometer indication increase as the Subaru Select Monitor data increases?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**

	Step	Check	Yes	No
10	**CHECK INPUT SIGNAL FOR TCM USING OSCILLOSCOPE.** 1) Connect the connectors to TCM and transmission. 2) Lift-up or raise the vehicle and place safety stands. NOTE: Raise all wheels off floor. 3) Set the oscilloscope to TCM connector terminals. ***Connector & terminal*** ***NON-TURBO MODEL*** ***Positive probe; (B55) No. 3:*** ***Ground lead; (B55) No. 21:*** ***TURBO MODEL*** ***Positive probe; (B55) No. 24:*** ***Ground lead; (B54) No. 19:*** 4) Start the engine and set vehicle in 20 km/h (12 MPH) condition. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-22, Clear Memory Mode.> 5) Measure the signal voltage indicated on oscilloscope.	Is the signal voltage more than AC 1 V?	Even if the AT OIL TEMP warning light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**
11	**CHECK POOR CONTACT.**	Is there poor contact in rear vehicle speed sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

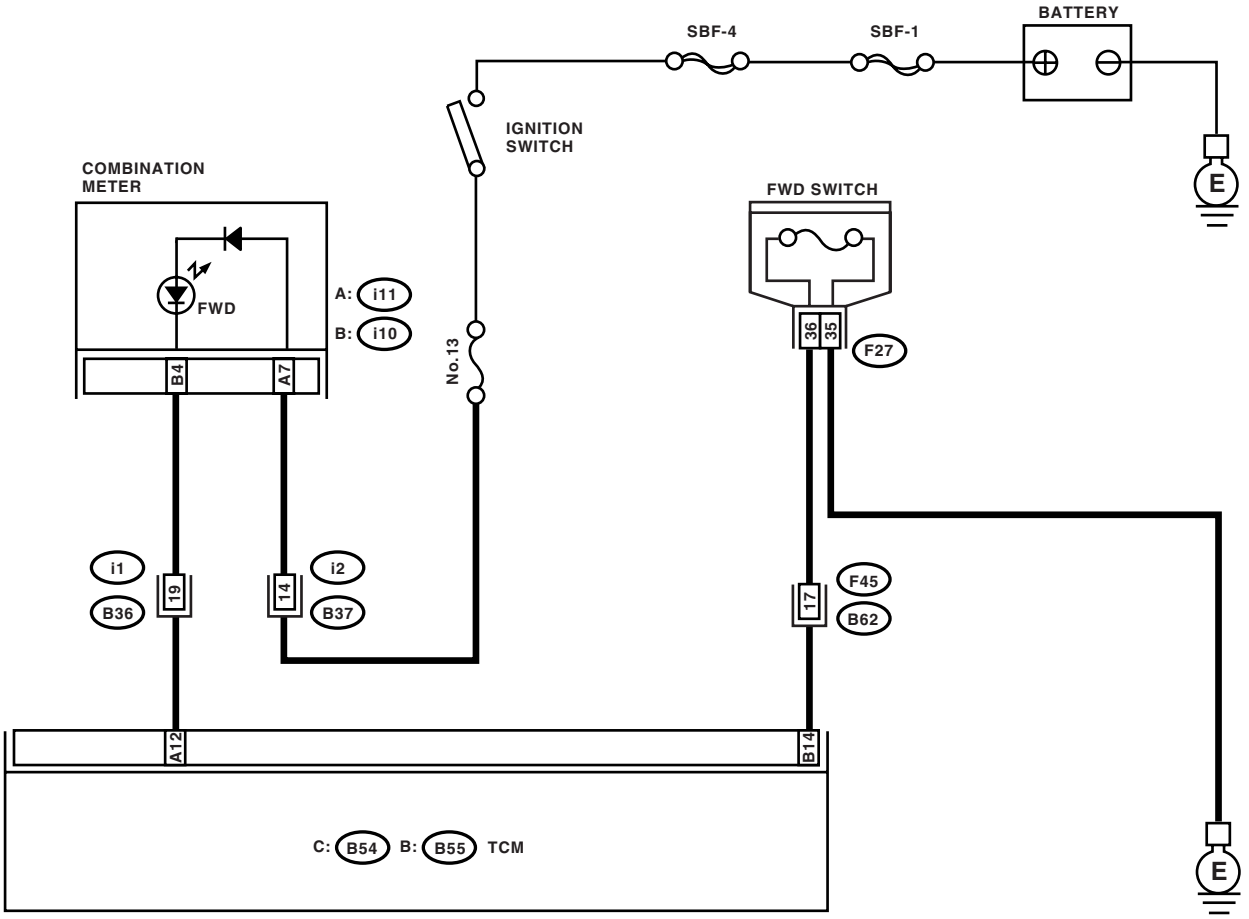
15.Diagnostic Procedure without Diagnostic Trouble Code (DTC)

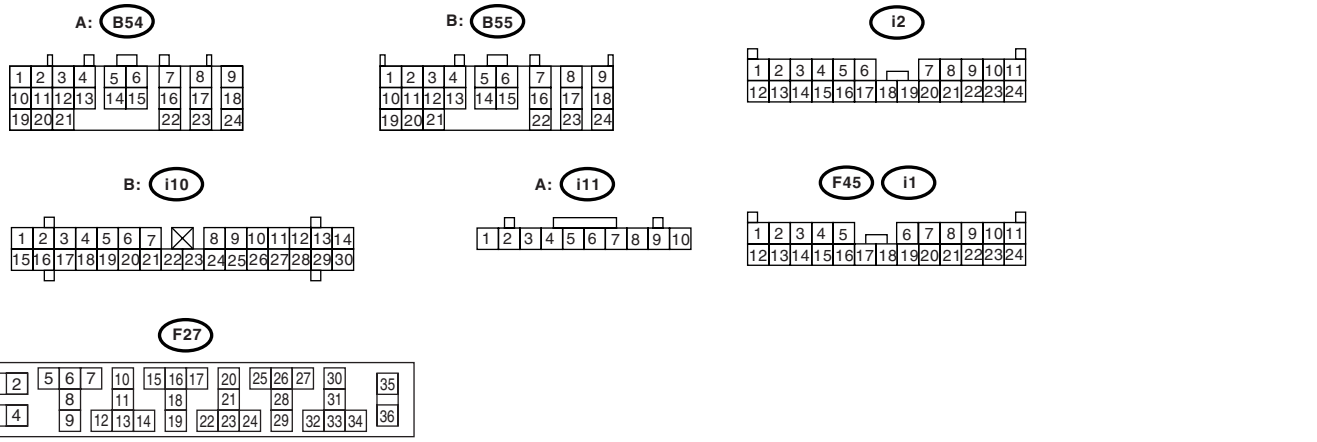
A: CHECK FWD SWITCH

DIAGNOSIS:

- The LED does not come on even if FWD switch is ON.
- The FWD switch circuit is open or short.

WIRING DIAGRAM:





AT-01301

	Step	Check	Yes	No
1	**CHECK VEHICLE.**	Is the target non-turbo model?	Go to step **2.**	Go to step CHECK BRAKE SWITCH. <Ref. to 4AT(diag)-103, CHECK BRAKE SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>
2	**CHECK FWD SWITCH.**	When the fuse is inserted to FWD switch, does LED light up?	Go to step CHECK BRAKE SWITCH.<Ref. to 4AT(diag)-103, CHECK BRAKE SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK FWD INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter.	Is the FWD indicator light bulb OK?	Go to step **4.**	Check the FWD indicator light bulb. <Ref. to IDI-10, Combination Meter Assembly.>
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND FWD SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM. 3) Measure the resistance of harness between TCM and FWD switch connector. ***Connector & terminal*** ***(B55) No. 14 — (F27) No. 36:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit in harness between TCM and FWD switch connector.
5	**CHECK HARNESS CONNECTOR BETWEEN FWD SWITCH AND CHASSIS GROUND.** Measure the resistance of harness between FWD switch and chassis ground. ***Connector & terminal*** ***(F27) No. 35 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between FWD switch connector and chassis ground.
6	**CHECK HARNESS CONNECTOR BETWEEN TCM AND FWD SWITCH.** Measure the resistance of harness connector between TCM and body to make sure that circuit does not short. ***Connector & terminal*** ***(B55) No. 14 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the short circuit in harness between TCM and FWD switch connector.
7	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM. 3) Turn the ignition switch to ON. 4) Measure the signal voltage for TCM while installing the fuse to FWD switch connector. ***Connector & terminal*** ***(B55) No. 14 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **8.**	Go to step **12.**
8	**CHECK INPUT SIGNAL FOR TCM.** Measure the signal voltage for TCM while removing the fuse from FWD switch connector. ***Connector & terminal*** ***(B55) No. 14 (+) — Chassis ground (−):***	Is the voltage 6 — 9.1 V?	Go to step **9.**	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

	Step	Check	Yes	No
9	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and combination meter. 3) Measure the resistance of harness between TCM and diagnosis connector. ***Connector & terminal*** ***(B54) No. 12 — (i10) No. 4:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair the open circuit in harness between TCM and combination meter and poor contact in coupling connector.
10	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** Measure the resistance of harness connector between TCM and chassis ground to make sure that circuit does not short. ***Connector & terminal*** ***(B54) No. 12 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **11.**	Repair the short circuit in harness between TCM and combination meter connector.
11	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and combination meter. 3) Turn the ignition switch to ON. 4) Measure the signal voltage for TCM while installing the fuse to FWD switch connector. ***Connector & terminal*** ***(B54) No. 12 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **12.**	Go to step **13.**
12	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** Measure the signal voltage for TCM while removing the fuse from FWD switch connector. ***Connector & terminal*** ***(B54) No. 12 (+) — Chassis ground (−):***	Is the voltage 6 — 9.1 V?	Go to step **13.**	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>
13	**CHECK POOR CONTACT.**	Is there poor contact in FWD switch circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

B: CHECK BRAKE SWITCH

Step		Check	Yes	No
1	**CHECK BRAKE SWITCH.**	When the brake pedal is depressed, does LED light up?	Go to step CHECK CRUISE CONTROL SWITCH. <Ref. to 4AT(diag)-103, CHECK CRUISE CONTROL SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Check the brake switch circuit.

C: CHECK CRUISE CONTROL SWITCH

Step		Check	Yes	No
1	**CHECK CRUISE CONTROL SWITCH.**	When the cruise control is set, does LED light up?	Go to step CHECK INHIBITOR SWITCH. <Ref. to 4AT(diag)-104, CHECK INHIBITOR SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Check the cruise control. <Ref. to CC(diag)-30, Diagnostic Procedure with DTC.>

D: CHECK INHIBITOR SWITCH

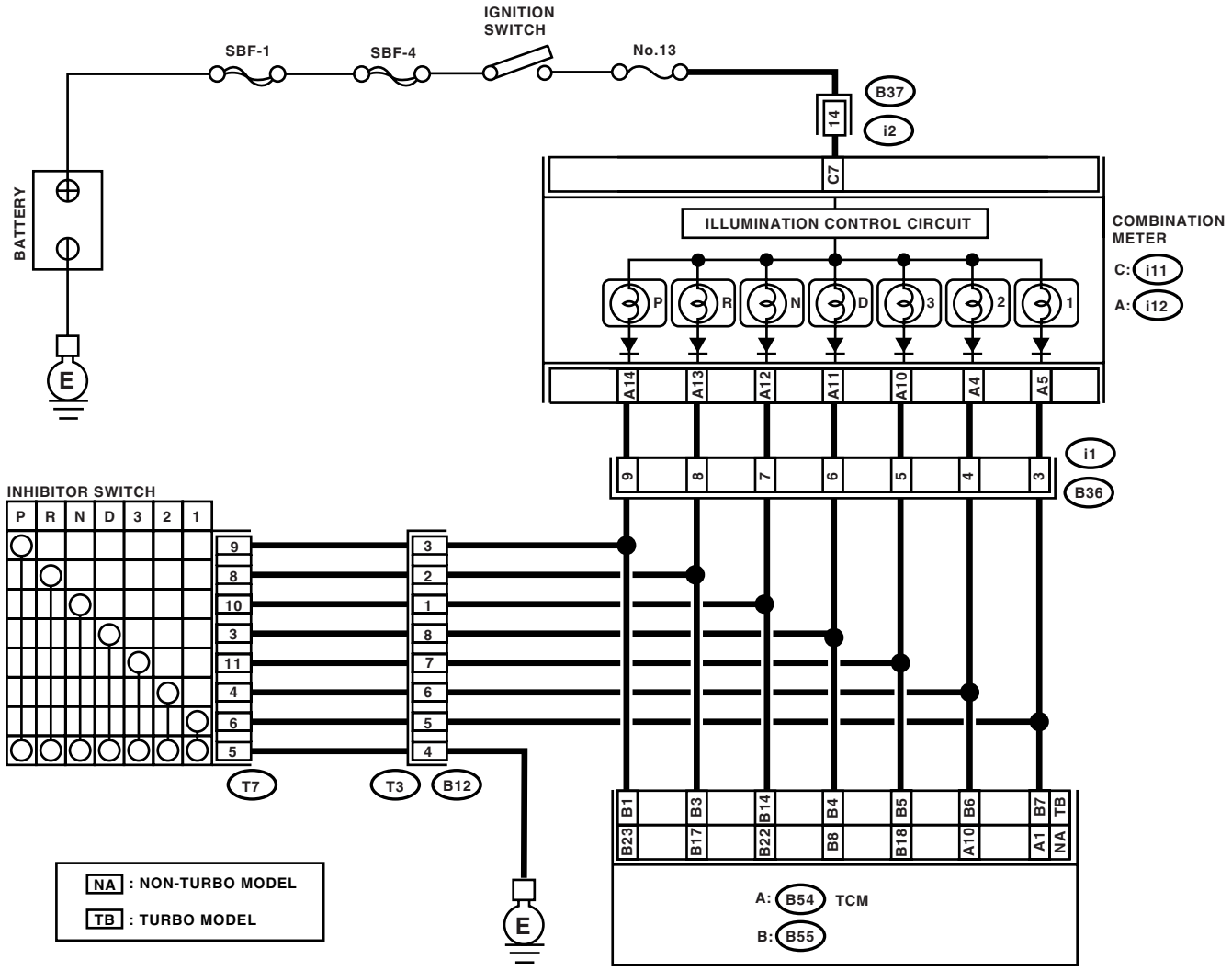
DIAGNOSIS:

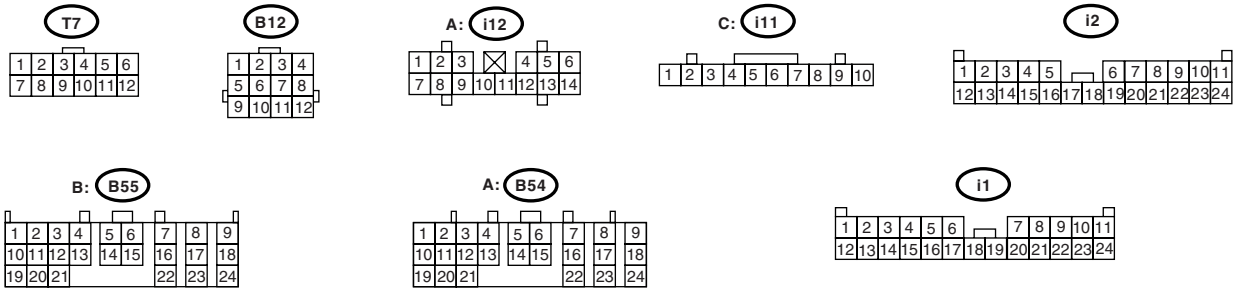
The input signal circuit of inhibitor switch is open or shorted.

TROUBLE SYMPTOM:

- Shift characteristics are erroneous.
- Engine brake is not effected when selector lever is in “3” range.
- Engine brake is not effected when selector lever is in “2” range.
- Engine brake is not effected when selector lever is in “1” range.

WIRING DIAGRAM:





AT-01302

Step		Check	Yes	No
1	CHECK “P” RANGE SWITCH.	When the “P” range is selected, does LED light up?	Go to step **2.**	Go to step **22.**
2	CHECK INDICATOR LIGHT.	Does the combination meter “P” range indicator illuminate?	Go to step **3.**	Go to step **26.**
3	CHECK “P” RANGE SWITCH.	When the “R” range is selected, does “P” range LED light up?	Go to step **28.**	Go to step **4.**
4	CHECK “R” RANGE SWITCH.	When the “R” range is selected, does LED light up?	Go to step **5.**	Go to step **29.**
5	CHECK INDICATOR LIGHT.	Does the combination meter “R” range indicator illuminate?	Go to step **6.**	Go to step **32.**
6	CHECK “R” RANGE SWITCH.	When the “N” range is selected, does “R” range LED light up?	Go to step **34.**	Go to step **7.**
7	CHECK “N” RANGE SWITCH.	When the “N” range is selected, does LED light up?	Go to step **8.**	Go to step **35.**
8	CHECK INDICATOR LIGHT.	Does the combination meter “N” range indicator illuminate?	Go to step **9.**	Go to step **38.**
9	CHECK “N” RANGE SWITCH.	When the “D” range is selected, does “N” range LED light up?	Go to step **40.**	Go to step **10.**
10	CHECK “D” RANGE SWITCH.	When the “D” range is selected, does LED light up?	Go to step **11.**	Go to step **41.**
11	CHECK INDICATOR LIGHT.	Does the combination meter “D” range indicator illuminate?	Go to step **12.**	Go to step **44.**
12	CHECK “D” RANGE SWITCH.	When the “3” range is selected, does “D” range LED light up?	Go to step **46.**	Go to step **13.**
13	CHECK “3” RANGE SWITCH.	When the “3” range is selected, does LED light up?	Go to step **14.**	Go to step **47.**
14	CHECK INDICATOR LIGHT.	Does the combination meter “3” range indicator illuminate?	Go to step **15.**	Go to step **50.**
15	CHECK “3” RANGE SWITCH.	When the “2” range is selected, does “3” range LED light up?	Go to step **52.**	Go to step **16.**
16	CHECK “2” RANGE SWITCH.	When the “2” range is selected, does LED light up?	Go to step **17.**	Go to step **53.**
17	CHECK INDICATOR LIGHT.	Does the combination meter “2” range indicator illuminate?	Go to step **18.**	Go to step **56.**
18	CHECK “2” RANGE SWITCH.	When the “1” range is selected, does “2” range LED light up?	Go to step **58.**	Go to step **19.**
19	CHECK “1” RANGE SWITCH.	When the “1” range is selected, does LED light up?	Go to step **20.**	Go to step **59.**
20	CHECK INDICATOR LIGHT.	Does the combination meter “1” range indicator illuminate?	Go to step **21.**	Go to step **62.**
21	CHECK “1” RANGE SWITCH.	When the “2” range is selected, does “1” range LED light UP?	Go to step **64.**	Go to step Symptom Related Diagnostic. <Ref. to 4AT(diag)-115, Symptom Related Diagnostic.>

	Step	Check	Yes	No
22	**CHECK HARNESS CONNECTOR BETWEEN INHIBITOR SWITCH AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from inhibitor switch. 3) Measure the resistance of harness between inhibitor switch and chassis ground. ***Connector & terminal*** ***(T7) No. 5 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **23.**	Repair the open circuit in harness between inhibitor switch connector and chassis ground, and poor contact in coupling connector.
23	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 23 — (T7) No. 9:*** ***TURBO MODEL*** ***(B55) No. 1 — (T7) No. 9:***	Is the resistance less than 1 Ω?	Go to step **24.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
24	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to “P” range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 23 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B55) No. 1 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **25.**	Go to step **65.**
25	**CHECK INPUT SIGNAL FOR TCM.** 1) Position the select lever to any other than “P” range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 23 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B55) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>
26	**CHECK “P” RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the “P” range indicator light bulb from combination meter.	Is the “P” range indicator light bulb OK?	Go to step **27.**	Replace the “P” range indicator light bulb. <Ref. to IDI-10, Combination Meter Assembly.>

	Step	Check	Yes	No
27	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 23 — (i12) No. 14:*** ***TURBO MODEL*** ***(B55) No. 1 — (i12) No. 14:***	Is the resistance more than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and poor contact in coupling connector.
28	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 23 — Chassis ground:*** ***TURBO MODEL*** ***(B55) No. 1 — Chassis ground:***	Is the resistance less than 1 MΩ?	Go to step **29.**	Repair the ground short circuit in "P" range circuit.
29	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 17 — (T7) No. 8:*** ***TURBO MODEL*** ***(B55) No. 3 — (T7) No. 8:***	Is the resistance less than 1 Ω?	Go to step **30.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
30	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "R" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 17 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B55) No. 3 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **31.**	Go to step **65.**
31	**CHECK INPUT SIGNAL FOR TCM.** 1) Position the select lever to any other than "R" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 17 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B55) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

	Step	Check	Yes	No
32	**CHECK "R" RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "R" range indicator light bulb from combination meter.	Is "R" range indicator light bulb OK?	Go to step **33.**	Replace the "R" range indicator light bulb. <Ref. to IDI-10, Combination Meter Assembly.>
33	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 17 — (i12) No. 13:*** ***TURBO MODEL*** ***(B55) No. 3 — (i12) No. 13:***	Is the resistance less than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.
34	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 17 — Chassis ground:*** ***TURBO MODEL*** ***(B55) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **35.**	Repair the ground short circuit in "R" range circuit.
35	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 22 — (T7) No. 10:*** ***TURBO MODEL*** ***(B55) No. 14 — (T7) No. 10:***	Is the resistance less than 1 Ω?	Go to step **36.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
36	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "N" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 22 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B55) No. 14 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **37.**	Go to step **65.**

	Step	Check	Yes	No
37	**CHECK INPUT SIGNAL FOR TCM.** 1) Position the select lever to any other than "N" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 22 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B55) No. 14 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>
38	**CHECK "N" RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "N" range indicator light bulb from combination meter.	Is the "N" range indicator light bulb OK?	Go to step **39.**	Replace the "N" range indicator light bulb. <Ref. to IDI-10, Combination Meter Assembly.>
39	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 22 — (i12) No. 12:*** ***TURBO MODEL*** ***(B55) No. 14 — (i12) No. 12:***	Is the resistance less than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.
40	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 22 — Chassis ground:*** ***TURBO MODEL*** ***(B55) No. 14 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **41.**	Repair the ground short circuit in "N" range circuit.
41	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 8 — (T7) No. 3:*** ***TURBO MODEL*** ***(B55) No. 4 — (T7) No. 3:***	Is the resistance less than 1 Ω?	Go to step **42.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.

	Step	Check	Yes	No
42	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to “D” range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 8 (+) — Chassis ground (–):*** ***TURBO MODEL*** ***(B55) No. 4 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **43.**	Go to step **65.**
43	**CHECK INPUT SIGNAL FOR TCM.** 1) Position select lever to any other than “D” range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 8 (+) — Chassis ground (–):*** ***TURBO MODEL*** ***(B55) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>
44	**CHECK “D” RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the “D” range indicator light bulb from combination meter.	Is the “D” range indicator light bulb OK?	Go to step **45.**	Replace the “D” range indicator light bulb. <Ref. to IDI-10, Combination Meter Assembly.>
45	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 8 — (i12) No. 11:*** ***TURBO MODEL*** ***(B55) No. 4 — (i12) No. 11:***	Is the resistance less than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and TCM connector.
46	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 8 — Chassis ground:*** ***TURBO MODEL*** ***(B55) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **47.**	Repair the ground short circuit in “D” range circuit.

	Step	Check	Yes	No
47	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 18 — (T7) No. 11:*** ***TURBO MODEL*** ***(B55) No. 5 — (T7) No. 11:***	Is the resistance less than 1 Ω?	Go to step **48.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
48	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "3" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 18 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B55) No. 5 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **49.**	Go to step **65.**
49	**CHECK INPUT SIGNAL FOR TCM.** 1) Position the select lever to any other than "3" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 18 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B55) No. 5 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>
50	**CHECK "3" RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "3" range indicator light bulb from combination meter.	Is the "3" range indicator light bulb OK?	Go to step **51.**	Replace the "3" range indicator light bulb. <Ref. to IDI-10, Combination Meter Assembly.>
51	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 18 — (i12) No. 10:*** ***TURBO MODEL*** ***(B55) No. 5 — (i12) No. 10:***	Is the resistance more than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.

	Step	Check	Yes	No
52	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 18 — Chassis ground:*** ***TURBO MODEL*** ***(B55) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **53.**	Repair the ground short circuit in "3" range circuit.
53	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 10 — (T7) No. 4:*** ***TURBO MODEL*** ***(B55) No. 6 — (T7) No. 4:***	Is the resistance less than 1 Ω?	Go to step **54.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
54	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "2" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 10 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B55) No. 6 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **55.**	Go to step **65.**
55	**CHECK INPUT SIGNAL FOR TCM.** 1) Position the select lever to any other than "2" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 10 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B55) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>
56	**CHECK "2" RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "2" range indicator light bulb from combination meter.	Is the "2" range indicator light bulb OK?	Go to step **57.**	Replace the "2" range indicator light bulb. <Ref. to IDI-10, Combination Meter Assembly.>

	Step	Check	Yes	No
57	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 10 — (i12) No. 4:*** ***TURBO MODEL*** ***(B55) No. 6 — (i12) No. 4:***	Is the resistance less than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM and combination meter, and poor contact in TCM connector.
58	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 10 — Chassis ground:*** ***TURBO MODEL*** ***(B55) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **59.**	Repair the ground short circuit in "2" range circuit.
59	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 1 — (T7) No. 6:*** ***TURBO MODEL*** ***(B55) No. 7 — (T7) No. 6:***	Is the resistance less than 1 Ω?	Go to step **60.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
60	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "1" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 1 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B55) No. 7 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **61.**	Go to step **65.**
61	**CHECK INPUT SIGNAL FOR TCM.** 1) Position the select lever to any other than "1" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 1 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B55) No. 7 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-67, Transmission Control Module (TCM).>

	Step	Check	Yes	No
62	**CHECK "1" RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "1" range indicator light bulb from combination meter.	Is the "1" range indicator light bulb OK?	Go to step **63.**	Replace the "1" range indicator light bulb. <Ref. to IDI-10, Combination Meter Assembly.>
63	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 1 — (i12) No. 5:*** ***TURBO MODEL*** ***(B55) No. 7 — (i12) No. 5:***	Is the resistance less than 1Ω?	Go to step **65.**	Repair the open circuit in harness between TCM and combination meter, poor contact in TCM connector.
64	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B54) No. 1 — Chassis ground:*** ***TURBO MODEL*** ***(B55) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **65.**	Repair the ground short circuit in "1" range circuit.
65	**CHECK POOR CONTACT.**	Is there poor contact in inhibitor switch circuit?	Repair the poor contact.	Adjust the inhibitor switch and select cable. <Ref. to 4AT-46, ADJUSTMENT, Inhibitor Switch.> and <Ref. to CS-25, Select Cable.>

16.Symptom Related Diagnostic

A: INSPECTION

Symptom	Problem parts
Starter does not rotate when select lever is in “P” or “N” range; starter rotates when select lever is in “R”, “D”, “3” or “2” range.	• Inhibitor switch • Select cable • Select lever • Starter motor and harness
Abnormal noise when select lever is in “P” or “N” range.	• Strainer • Transfer duty solenoid • Oil pump • Drive plate • ATF level too high or too low
Hissing noise occurs during standing start.	• Strainer • ATF level too high or too low
Noise occurs while driving in “D1”.	• Final gear • Planetary gear • Reduction gear • Differential gear oil level too high or too low
Noise occurs while driving in “D2”.	
Noise occurs while driving in “D3”.	• Final gear • Low & reverse brake • Reduction gear • Differential gear oil level too high or too low
Noise occurs while driving in “D4”.	• Final gear • Low & reverse brake • Planetary gear • Reduction gear • Differential gear oil level too high or too low
Engine stalls while shifting from one range to another.	• Control valve • Lock-up damper • Engine performance • Input shaft
Vehicle moves when select lever is in “N” range.	• TCM • Low clutch
Shock occurs when select lever is moved from “N” to “D” range.	• TCM • Harness • Control valve • ATF deterioration
Excessive time lag occurs when select lever is moved from “N” to “D” range.	• Control valve • Low clutch • Line pressure duty solenoid • Seal ring • Front gasket transmission case
Shock occurs when select lever is moved from “N” to “R” range.	• TCM • Harness • Control valve • ATF deterioration
Excessive time lag occurs when select lever is moved from “N” to “R” range.	• Control valve • Low & reverse clutch • Reverse clutch • Line pressure duty solenoid • Seal ring • Front gasket transmission case
Vehicle does not start in any shift range (engine stalls).	• Parking brake mechanism • Planetary gear

Symptom	Problem parts
Vehicle does not start in any shift range (engine revving up).	• Strainer • Line pressure duty solenoid • Control valve • Drive pinion • Hypoid gear • Axle shaft • Differential gear • Oil pump • Input shaft • Output shaft • Planetary gear • Drive plate • ATF level too low • Front gasket transmission case
Vehicle does not start in “R” range only (engine revving up).	• Select cable • Select lever • Control valve • Low & reverse clutch • Reverse clutch
Vehicle does not start in “R” range only (engine stalls).	• Low clutch • 2-4 brake • Planetary gear • Parking brake mechanism
Vehicle does not start in “D”, “3” range only (engine revving up).	• Low clutch • One-way clutch
Vehicle does not start in “D”, “3” or “2” range only (engine revving up).	• Low clutch
Vehicle does not start in “D”, “3” or “2” range only (engine stalls).	• Reverse clutch
Vehicle starts in “R” range only (engine revving up).	• Control valve
Acceleration during standing starts is poor (high stall rpm).	• Control valve • Low clutch • Reverse clutch • ATF level too low • Front gasket transmission case • Differential gear oil level too high or too low
Acceleration during standing starts is poor (low stall rpm).	• Oil pump • Torque converter one-way clutch • Engine performance
Acceleration is poor when select lever is in “D”, “3” or “2” range (normal stall rpm).	• TCM • Control valve • High clutch • 2-4 brake • Planetary gear
Acceleration is poor when select lever is in “R” (normal stall rpm).	• Control valve • High clutch • 2-4 brake • Planetary gear
No shift occurs from 1st to 2nd gear.	• TCM • Rear vehicle speed sensor • Front vehicle speed sensor • Throttle position sensor • Shift solenoid 1 • Control valve • 2-4 brake
No shift occurs from 2nd to 3rd gear.	• TCM • Control valve • High clutch • Shift solenoid 2

Symptom	Problem parts
No shift occurs from 3rd to 4th gear.	• TCM • Shift solenoid 1 • ATF temperature sensor • Control valve • 2-4 brake
Engine brake is not effected when select lever is in “3” range.	• Inhibitor switch • TCM • Throttle position sensor • Control valve
Engine brake is not effected when select lever is in “3” or “2” range.	• Control valve
Engine brake is not effected when select lever is in “1” range.	• Control valve • Low & reverse brake
Shift characteristics are erroneous.	• Inhibitor switch • TCM • Front vehicle speed sensor • Rear vehicle speed sensor • Throttle position sensor • Control valve • Ground earth
No lock-up occurs.	• TCM • Throttle position sensor • ATF temperature sensor • Control valve • Lock-up facing • Engine speed signal
Parking brake is not effected.	• Select cable • Select lever • Parking mechanism
Shift lever cannot be moved or is hard to move from “P” range.	
ATF spurts out.	• ATF level too high
Differential oil spurts out.	• Differential gear oil too high
Differential oil level changes excessively.	• Seal pipe • Double oil seal
Odor is produced from ATF supply pipe.	• High clutch • 2-4 brake • Low & reverse clutch • Reverse clutch • Lock-up facing • ATF deterioration
Shock occurs from 1st to 2nd gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake • ATF deterioration • Engine performance • 2-4 brake timing solenoid
Slippage occurs from 1st to 2nd gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake • 2-4 brake timing solenoid • High clutch

Symptom	Problem parts
Shock occurs from 2nd to 3rd gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • High clutch • 2-4 brake • ATF deterioration • Engine performance • 2-4 brake timing solenoid
Slippage occurs from 2nd to 3rd gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • High clutch • 2-4 brake • 2-4 brake timing solenoid
Shock occurs from 3rd to 4th gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake timing solenoid • 2-4 brake • ATF deterioration • Engine performance • Low clutch timing solenoid • Low clutch
Slippage occurs from 3rd to 4th gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake • 2-4 brake timing solenoid
Shock occurs when select lever is moved from “3” to “2” range.	• TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake duty solenoid • 2-4 brake • ATF deterioration • 2-4 brake timing solenoid
Shock occurs when select lever is moved from “D” to “1” range.	• TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • ATF deterioration • 2-4 brake duty solenoid • 2-4 brake timing solenoid • Low clutch timing solenoid

Symptom	Problem parts
Shock occurs when select lever is moved from “2” to “1” range.	• TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • Low & reverse clutch • ATF deterioration • 2-4 brake duty solenoid • 2-4 brake timing solenoid • Low clutch timing solenoid
Shock occurs when accelerator pedal is released at medium speeds.	• TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • Lock-up damper • Engine performance • 2-4 brake duty solenoid • 2-4 brake timing solenoid • Low clutch timing solenoid
Vibration occurs during straight-forward operation.	• TCM • Lock-up duty solenoid • Lock-up facing • Lock-up damper
Vibration occurs during turns (tight corner “braking” phenomenon).	• TCM • Front vehicle speed sensor • Rear vehicle speed sensor • Throttle position sensor • ATF temperature sensor • Transfer clutch • Transfer valve • Transfer duty solenoid • ATF deterioration • Harness
Front wheel slippage occurs during standing starts.	• TCM • Front vehicle speed sensor • FWD switch • Throttle position sensor • ATF temperature sensor • Control valve • Transfer clutch • Transfer valve • Transfer pipe • Transfer duty solenoid
Vehicle is not set in FWD mode.	• TCM • FWD switch • Transfer clutch • Transfer valve • Transfer duty solenoid
Select lever is hard to move.	• Select cable • Select lever • Detente spring • Manual plate
Select lever is too high to move (unreasonable resistance).	• Detente spring • Manual plate
Select lever slips out of operation during acceleration or while driving on rough terrain.	• Select cable • Select lever • Detente spring • Manual plate

MANUAL TRANSMISSION AND DIFFERENTIAL

5MT

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1. General Description

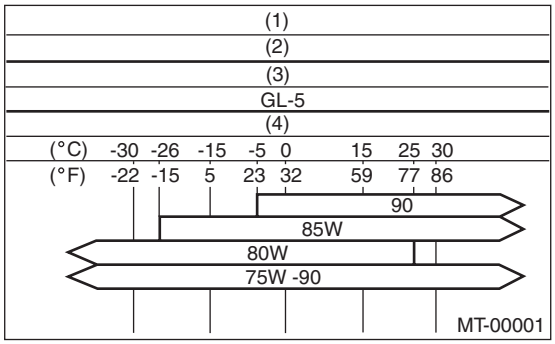
A: SPECIFICATIONS

1. MANUAL TRANSMISSION AND DIFFERENTIAL

Model			2.5 L		2.0 L Turbo
			Sedan	Wagon	
Type			5-forward speeds with synchromesh and 1-reverse		
Transmission gear ratio		1st	3.454		3.454
		2nd	2.062		1.947
		3rd	1.448		1.366
		4th	1.088		0.972
		5th	0.780		0.738
		Reverse	3.333		
Front reduction gear	Final	Type of gear	Hypoid		
		Gear ratio	4.111	3.900	
Rear reduction gear	Transfer	Type of gear	Helical		
		Gear ratio	1.000		1.100
	Final	Type of gear	Hypoid		
		Gear ratio	4.111	3.900	3.545
Front differential	Type and number of gear		Straight bevel gear (Bevel pinion: 2, Bevel gear: 2)		
Center differential	Type and number of gear		Straight bevel gear (Bevel pinion: 2, Bevel gear: 2 and viscous coupling)		
Transmission gear oil			GL-5		
Transmission oil capacity			3.5 ℓ (3.7 US qt, 3.1 Imp qt)		

2. TRANSMISSION GEAR OIL

Recommended oil



(1) Item
(2) Transmission gear oil
(3) API classification
(4) SAE viscosity No. and applicable temperature

3. TRANSMISSION CASE ASSEMBLY

Drive pinion shim adjustment
Hypoid gear backlash
0.13 — 0.18 mm (0.0051 — 0.0071 in)

Drive pinion shim			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
32295AA031	0.150 (0.0059)	32295AA071	0.250 (0.0098)
32295AA041	0.175 (0.0069)	32295AA081	0.275 (0.0108)
32295AA051	0.200 (0.0079)	32295AA091	0.300 (0.0118)
32295AA061	0.225 (0.0089)	32295AA101	0.500 (0.0197)

Selection of main shaft rear plate

Main shaft rear plate		
Dimension “A” mm (in)	Part No.	Mark
4.00 — 4.13 (0.1575 — 0.1626)	32294AA041	1
3.87 — 3.99 (0.1524 — 0.1571)	32294AA051	2

4. DRIVE PINION ASSEMBLY

Preload adjustment of thrust bearing
Starting torque
0.3 — 0.8 N·m (0.03 — 0.08 kgf-m, 0.2 — 0.6 ft-lb)

Adjusting washer No. 1	
Part No.	Thickness mm (in)
803025051	3.925 (0.1545)
803025052	3.950 (0.1555)
803025053	3.975 (0.1565)
803025054	4.000 (0.1575)
803025055	4.025 (0.1585)
803025056	4.050 (0.1594)
803025057	4.075 (0.1604)

Adjusting washer No. 2	
Part No.	Thickness mm (in)
803025059	3.850 (0.1516)
803025054	4.000 (0.1575)
803025058	4.150 (0.1634)

5. MAIN SHAFT

Snap ring (Outer-25) to synchronizer hub clearance
0.060 — 0.100 mm (0.0024 — 0.0039 in)

Snap ring (Outer-25)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
805025051	2.42 (0.0953)	805025055	2.62 (0.1031)
805025052	2.47 (0.0972)	805025056	2.67 (0.1051)
805025053	2.52 (0.0992)	805025057	2.72 (0.1071)
805025054	2.57 (0.1012)	805025058	2.37 (0.0933)

6. REVERSE IDLER GEAR

Adjustment of reverse idler gear position
Reverse idler gear to transmission case (LH) wall clearance
6.0 — 7.5 mm (0.236 — 0.295 in)

Reverse shifter lever		
Part No.	Mark	Remarks
32820AA070	7	Further from case wall
32820AA080	8	Standard
32820AA090	9	Closer to the case wall

After installing a suitable reverse shifter lever, adjust the reverse idler gear to transmission case wall clearance to within 0 to 0.5 mm (0 to 0.020 in) using washers.

Washer (20.5 × 26 × t)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
803020151	0.4 (0.016)	803020154	1.9 (0.075)
803020152	1.1 (0.043)	803020155	2.3 (0.091)
803020153	1.5 (0.059)	—	—

7. SHIFTER FORK AND ROD

Select the suitable shifter forks so that both coupling sleeve and reverse driven gear are positioned in the center of their synchromesh mechanisms.
Rod end clearance
A: 1st-2nd — 3rd-4th
0.4 — 1.4 mm (0.016 — 0.055 in)
B: 3rd-4th — 5th
0.5 — 1.3 mm (0.020 — 0.051 in)

1st-2nd shifter fork		
Part No.	Mark	Remarks
32804AA060	1	Approach to 1st gear by 0.2 mm (0.008 in)
32804AA070	No mark	Standard
32804AA080	3	Approach to 2nd gear by 0.2 mm (0.008 in)

3rd-4th shifter fork		
Part No.	Mark	Remarks
32810AA061	1	Approach to 4th gear by 0.2 mm (0.008 in)
32810AA071	No mark	Standard
32810AA101	3	Approach to 3rd gear by 0.2 mm (0.008 in)

5th shifter fork (Non-turbo model)		
Part No.	Mark	Remarks
32812AA201	4	Approach to 5th gear by 0.2 mm (0.008 in)
32812AA211	5	Standard
32812AA221	6	Become distant from 5th gear by 0.2 mm (0.008 in)

5th shifter fork (Turbo model)		
Part No.	Mark	Remarks
32812AA231	7	Approach to 5th gear by 0.2 mm (0.008 in)
32812AA241	No mark	Standard
32812AA251	9	Become distant from 5th gear by 0.2 mm (0.008 in)

8. TRANSFER CASE OR REAR CASE

Neutral position adjustment

Adjustment shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

Reverse accent shaft		
Part No.	Mark	Remarks
32188AA090	3	Neutral position is closer to 1st.
32188AA100	0	Standard
32188AA110	1	Neutral position is closer to reverse gear.

Reverse check plate adjustment

Reverse check plate			
Part No.	Mark	Angle θ	Remarks
32189AA000	0	28°	Arm stops closer to 5th gear.
32189AA010	1	31°	Arm stops closer to 5th gear.
33189AA020	2	34°	Arm stops in the center.
32189AA030	3	37°	Arm stops closer to reverse gear.
32189AA040	4	40°	Arm stops closer to reverse gear.

9. EXTENSION ASSEMBLY

Preload of the taper roller bearing (amount of standard protrusion):
0.15 — 0.20 mm (0.006 — 0.008 in)

NOTE:
Be sure that the amount of preload is within the standard value.

Thrust washer (50 × 61 × t)	
Part No.	Thickness mm (in)
803050060	0.50 (0.0197)
803050061	0.55 (0.0217)
803050062	0.60 (0.0236)
803050063	0.65 (0.0256)
803050064	0.70 (0.0276)
803050065	0.75 (0.0295)
803050066	0.80 (0.0315)
803050067	0.85 (0.0335)
803050068	0.90 (0.0354)
803050069	0.95 (0.0374)
803050070	1.00 (0.0394)
803050071	1.05 (0.0413)
803050072	1.10 (0.0433)
803050073	1.15 (0.0453)
803050074	1.20 (0.0472)
803050075	1.25 (0.0492)
803050076	1.30 (0.0512)
803050077	1.35 (0.0531)
803050078	1.40 (0.0551)
803050079	1.45 (0.0571)

Thrust washer to center differential side clearance
0.15 — 0.35 mm (0.0059 — 0.0138 in)

Thrust washer	
Part No.	Thickness mm (in)
803036050	0.9 (0.035)
803036054	1.0 (0.039)
803036051	1.1 (0.043)
803036055	1.2 (0.047)
803036052	1.3 (0.051)
803036056	1.4 (0.055)
803036053	1.5 (0.059)
803036057	1.6 (0.063)
803036058	1.7 (0.067)

10.FRONT DIFFERENTIAL

Bevel gear to pinion backlash
0.13 — 0.18 mm (0.0051 — 0.0071 in)

Washer (38.1 × 50 × t)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
803038021	0.925 — 0.950 (0.0364 — 0.0374)	803038023	1.025 — 1.050 (0.0404 — 0.0413)
803038022	0.975 — 1.000 (0.0384 — 0.0394)	—	—

Pinion shaft to axle drive shaft clearance
0 — 0.2 mm (0 — 0.008 in)

Snap ring (Outer-28)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
805028011	1.05 (0.0413)	805028012	1.20 (0.0472)

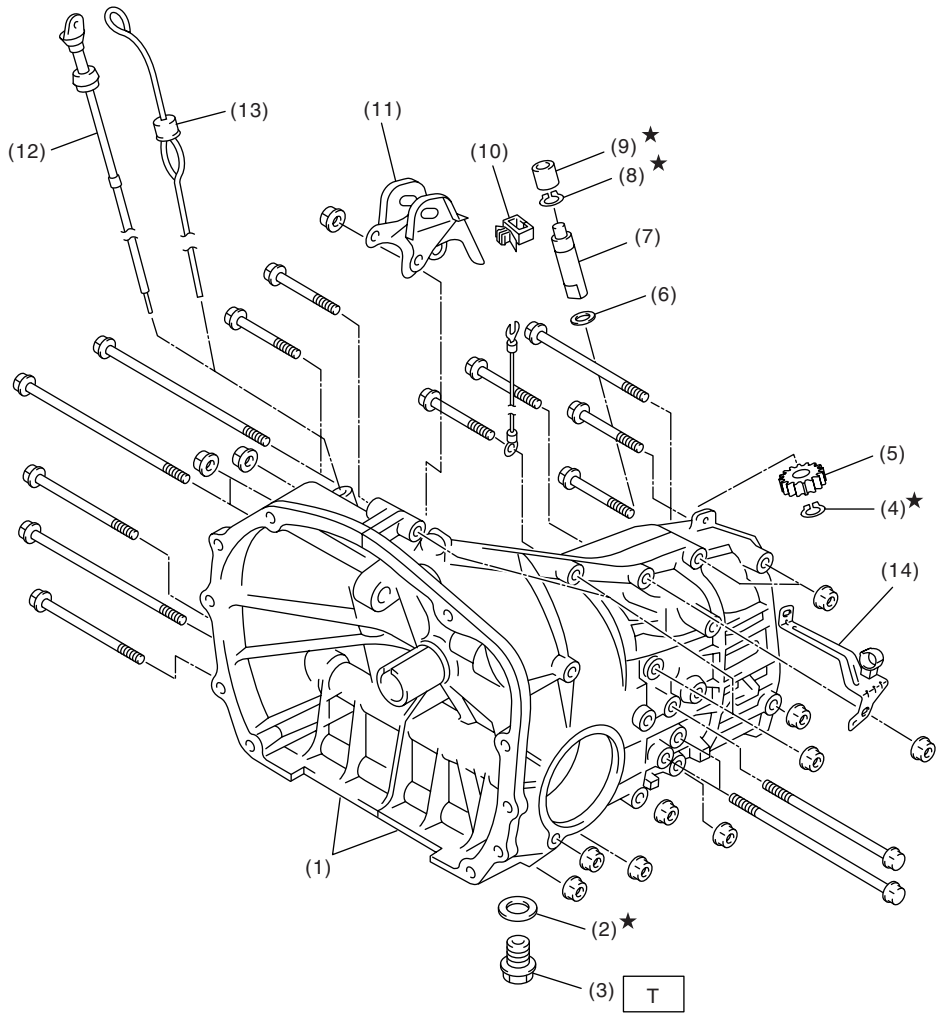
11.TRANSFER DRIVE GEAR

Snap ring (Outer-30) to ball bearing clearance
0.01 — 0.15 mm (0.0004 — 0.0059 in)

Snap ring (Outer-30)	
Part No.	Thickness mm (in)
805030041	1.53 (0.0602)
805030042	1.65 (0.0650)
805030043	1.77 (0.0697)

B: COMPONENT

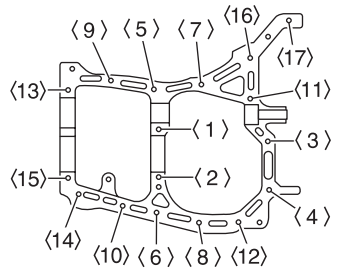
1. TRANSMISSION CASE



(1) Transmission case ASSY
(2) Gasket
(3) Drain plug
(4) Snap ring (Outer)
(5) Speedometer driven gear
(6) Washer
(7) Speedometer shaft
(8) Snap ring (Outer)
(9) Oil seal
(10) Clamp
(11) Pitching stopper bracket
(12) Oil level gauge (Non-turbo model)
(13) Oil level gauge (Turbo model)
(14) Harness bracket (Non-turbo model)

Tightening torque: N·m (kgf-m, ft-lb)
T: 69 (7.0, 50.6)

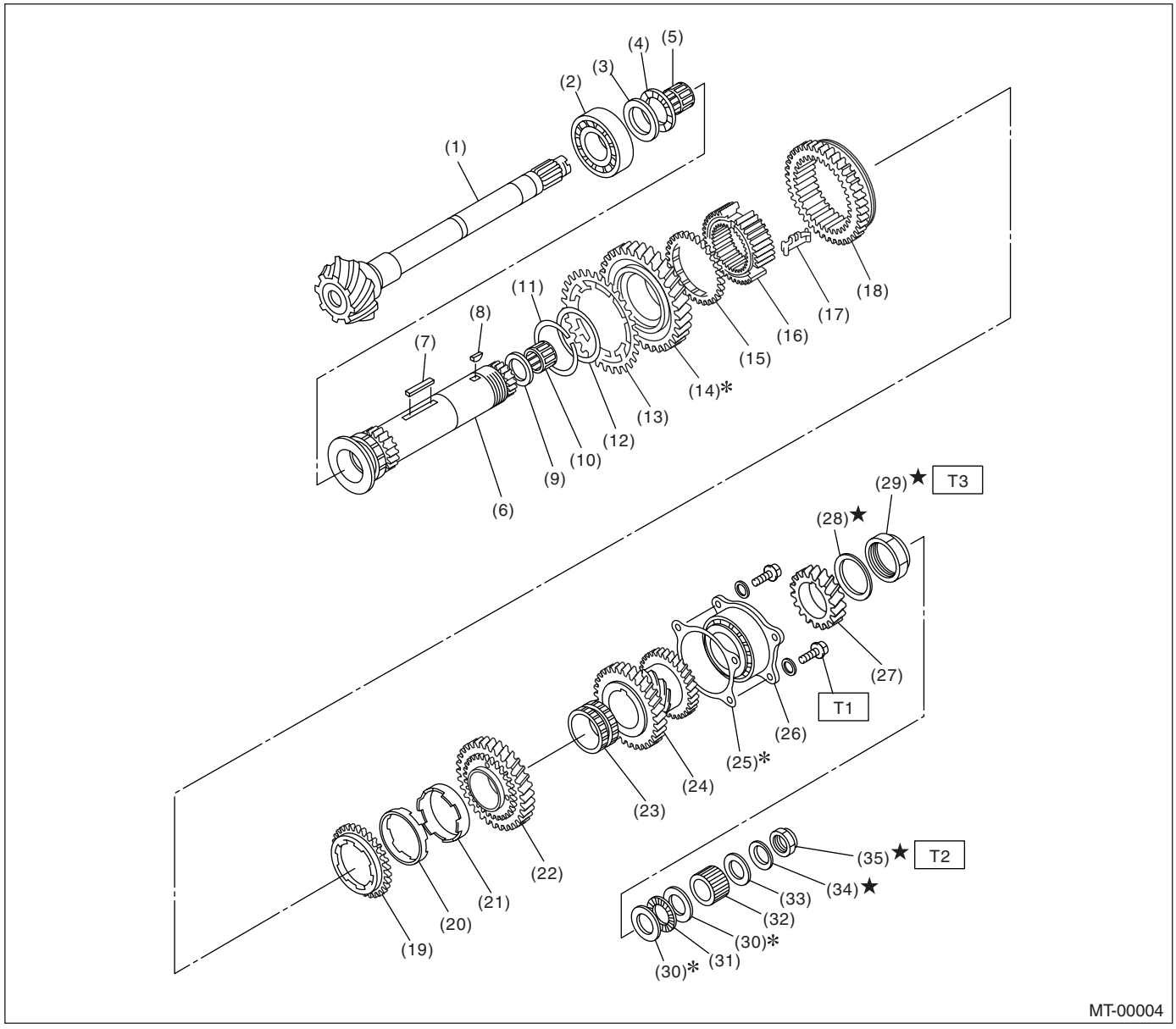
• Transmission case tightening torque



MT-00003

Bolt No.	Bolt size	Tightening torque: N·m (kgf-m, ft-lb)
<5> to <15>	8 mm	24.5 (2.5, 18.1)
<1> to <4> <16>, <17>	10 mm	39 (4.0, 28.9)

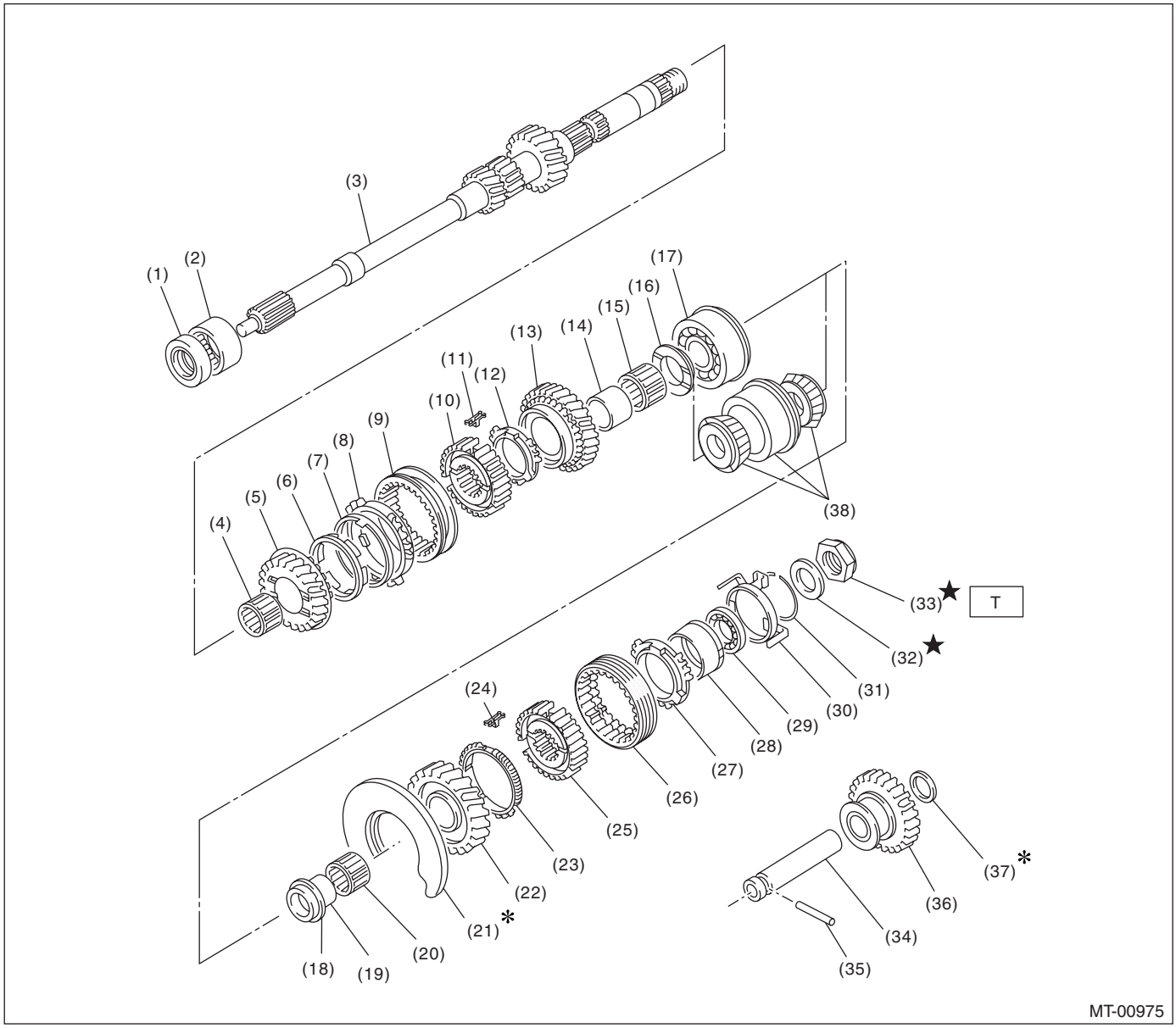
2. DRIVE PINION ASSEMBLY



(1) Drive pinion shaft
(2) Roller bearing
(3) Washer
(4) Thrust bearing
(5) Needle bearing
(6) Driven shaft
(7) Key
(8) Woodruff key
(9) Drive pinion collar
(10) Needle bearing
(11) Snap ring (Outer)
(12) Washer
(13) Sub gear
(14) 1st driven gear
(15) Baulk ring
(16) 1st-2nd synchronizer hub
(17) Insert key
(18) Reverse driven gear
(19) Outer baulk ring
(20) Synchro cone
(21) Inner baulk ring
(22) 2nd driven gear
(23) 2nd driven gear bush
(24) 3rd-4th driven gear
(25) Driven pinion shim
(26) Roller bearing
(27) 5th driven gear
(28) Lock washer
(29) Lock nut
(30) Washer
(31) Thrust bearing
(32) Differential bevel gear sleeve
(33) Washer
(34) Lock washer
(35) Lock nut

Tightening torque: N*·m *(kgf-m, ft-lb)
T1: 30.5 (3.1, 22.5)
T2: 120 (12.2, 88.5)
T3: 260 (26.5, 191.7)

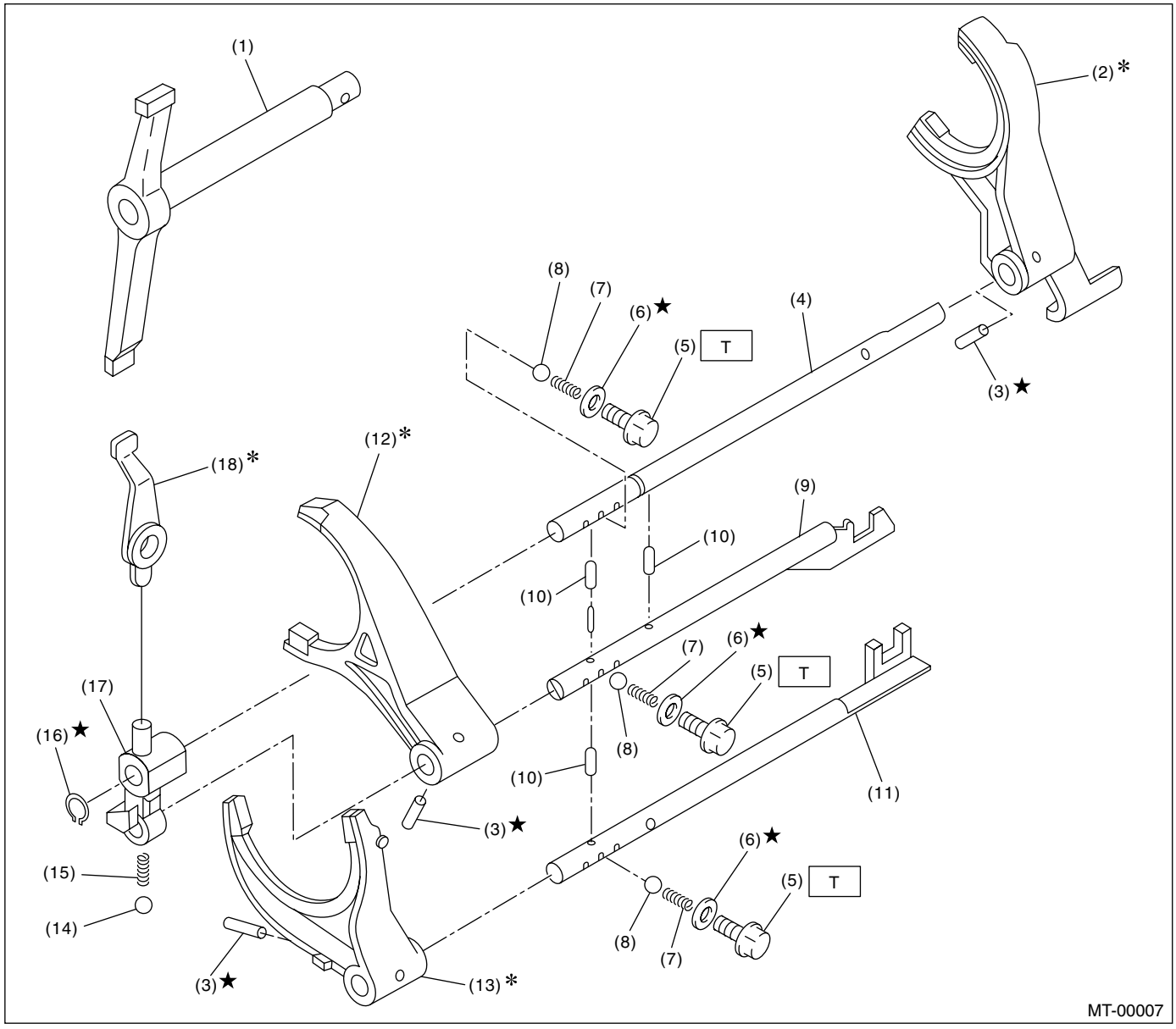
3. MAIN SHAFT ASSEMBLY



(1) Oil seal
(2) Needle bearing
(3) Transmission main shaft
(4) Needle bearing
(5) 3rd drive gear
(6) Inner baulk ring
(7) 3rd synchro cone
(8) Outer baulk ring
(9) 3rd-4th coupling sleeve
(10) 3rd-4th synchronizer hub
(11) 3rd-4th shifting insert key
(12) 4th baulk ring
(13) 4th drive gear
(14) 4th needle bearing race
(15) Needle bearing
(16) 4th gear thrust washer
(17) Ball bearing (Non-turbo model)
(18) 5th gear thrust washer
(19) 5th needle bearing race
(20) Needle bearing
(21) Main shaft rear plate
(22) 5th drive gear
(23) 5th baulk ring
(24) 5th-Rev shifting insert key
(25) 5th-Rev synchronizer hub
(26) 5th-Rev coupling sleeve
(27) Rev baulk ring
(28) Rev synchro cone
(29) Ball bearing
(30) Synchro cone stopper
(31) Snap ring
(32) Lock washer
(33) Lock nut
(34) Reverse idler gear shaft
(35) Straight pin
(36) Reverse idler gear
(37) Washer
(38) Taper roller bearing (Turbo model)

Tightening torque: N·m (kgf-m, ft-lb)
T: 120 (12.2, 88.5)

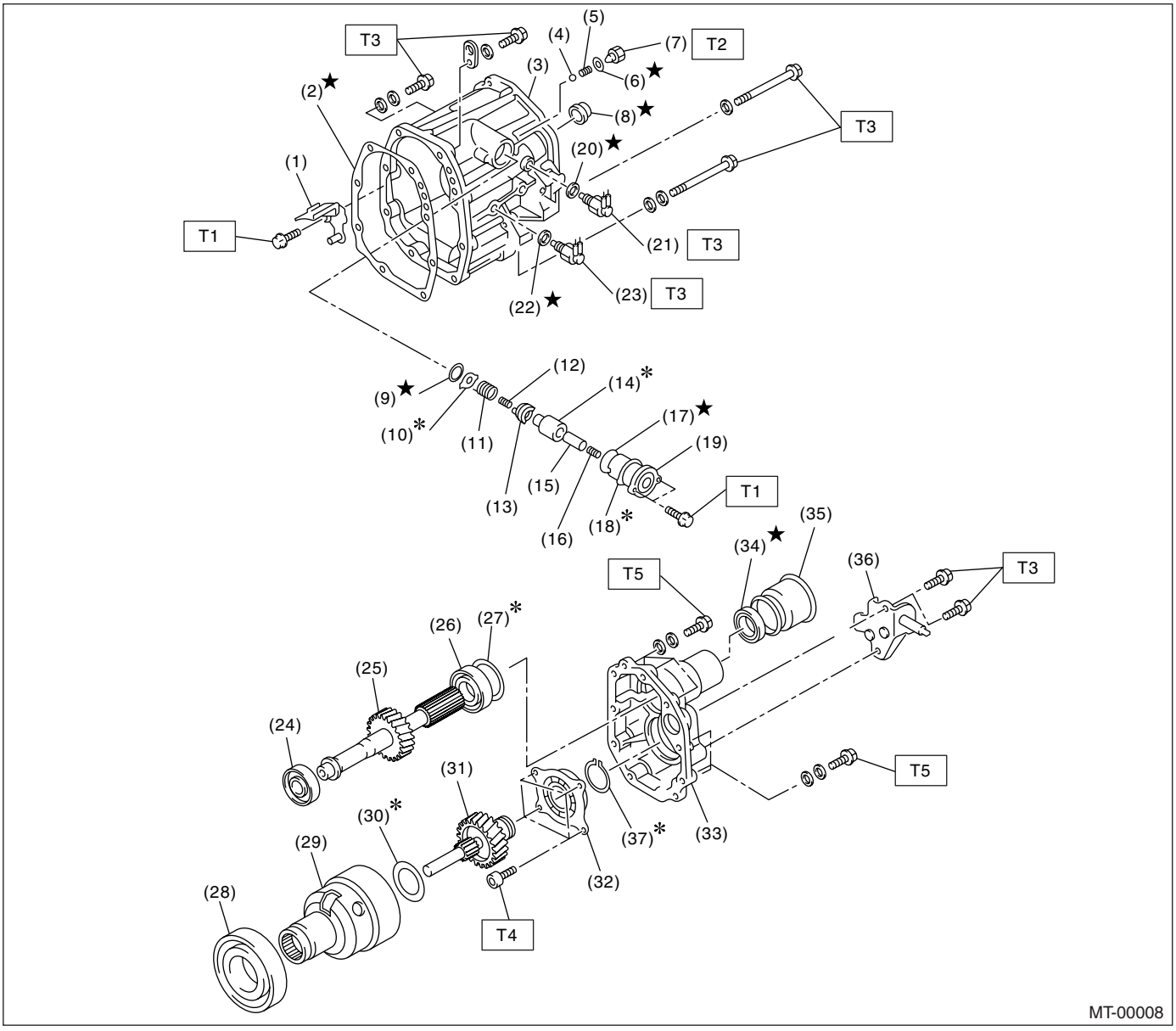
4. SHIFTER FORK AND SHIFTER ROD



(1) Shifter arm
(2) 5th shifter fork
(3) Straight pin
(4) Reverse fork rod
(5) Checking ball plug
(6) Gasket
(7) Checking ball spring
(8) Ball
(9) 3rd-4th fork rod
(10) Interlock plunger
(11) 1st-2nd fork rod
(12) 3rd-4th shifter fork
(13) 1st-2nd shifter fork
(14) Ball
(15) Spring
(16) Snap ring (Outer)
(17) Reverse fork rod arm
(18) Reverse shifter lever

Tightening torque: N·m (kgf-m, ft-lb)
T: 19.5 (2.0, 14.4)

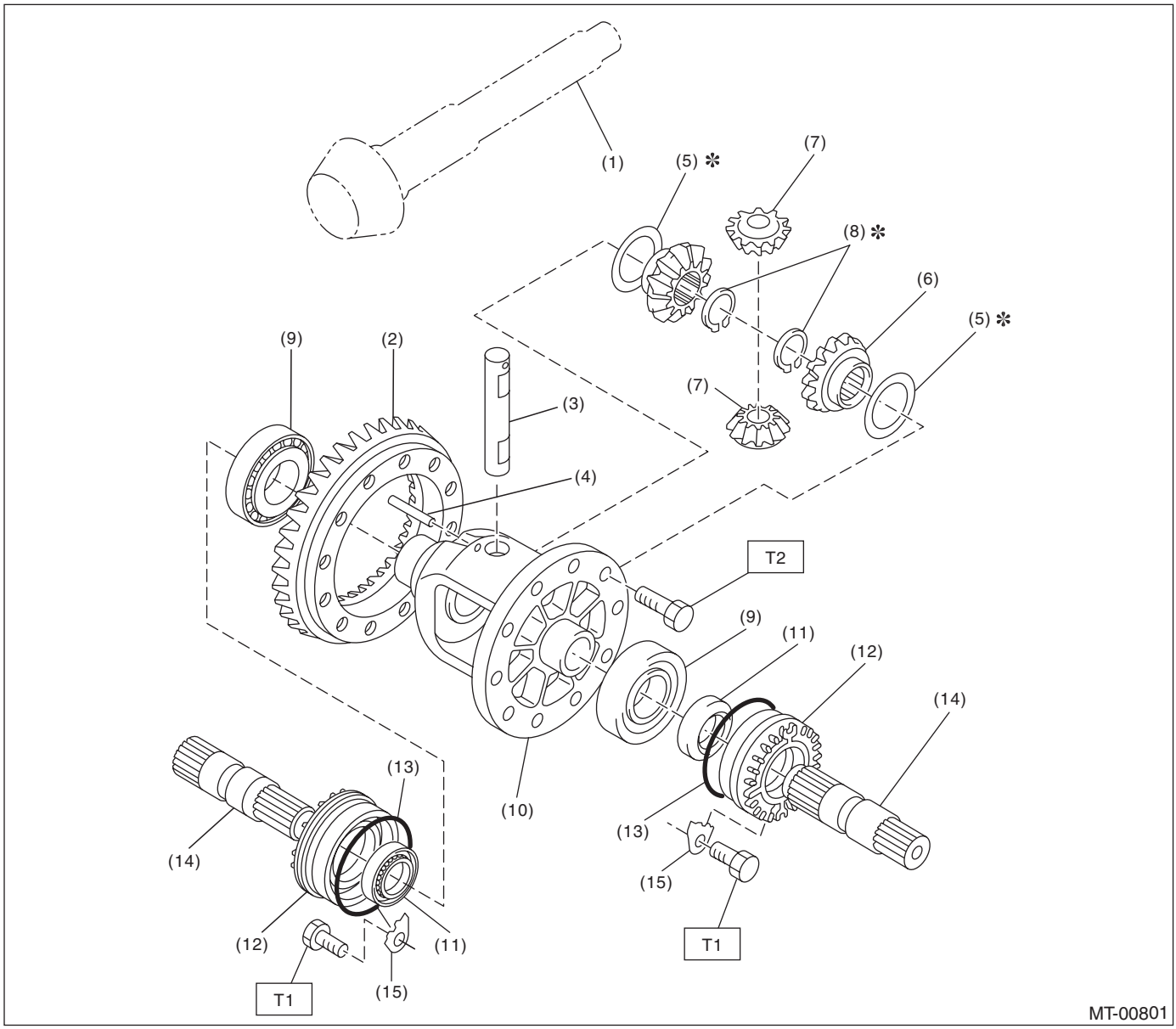
5. TRANSFER CASE AND EXTENSION



(1) Oil guide
(2) Gasket
(3) Transfer case
(4) Ball
(5) Reverse accent spring
(6) Gasket
(7) Plug
(8) Oil seal
(9) Snap ring (Inner)
(10) Reverse check plate
(11) Reverse check spring
(12) Reverse return spring
(13) Reverse check cam
(14) Reverse accent shaft
(15) Return spring cap
(16) Return spring
(17) O-ring
(18) Adjusting select shim
(19) Reverse check sleeve
(20) Gasket
(21) Neutral switch
(22) Gasket
(23) Back-up light switch
(24) Roller bearing
(25) Transfer driven gear
(26) Roller bearing
(27) Adjusting washer
(28) Ball bearing
(29) Center differential
(30) Adjusting washer
(31) Transfer drive gear
(32) Ball bearing
(33) Extension case
(34) Oil seal
(35) Dust cover
(36) Shift bracket
(37) Snap ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 9.75 (1.0, 7.2)
T3: 25 (2.5, 18.1)
T4: 26 (2.7, 20)
T5: 40 (4.1, 29.7)

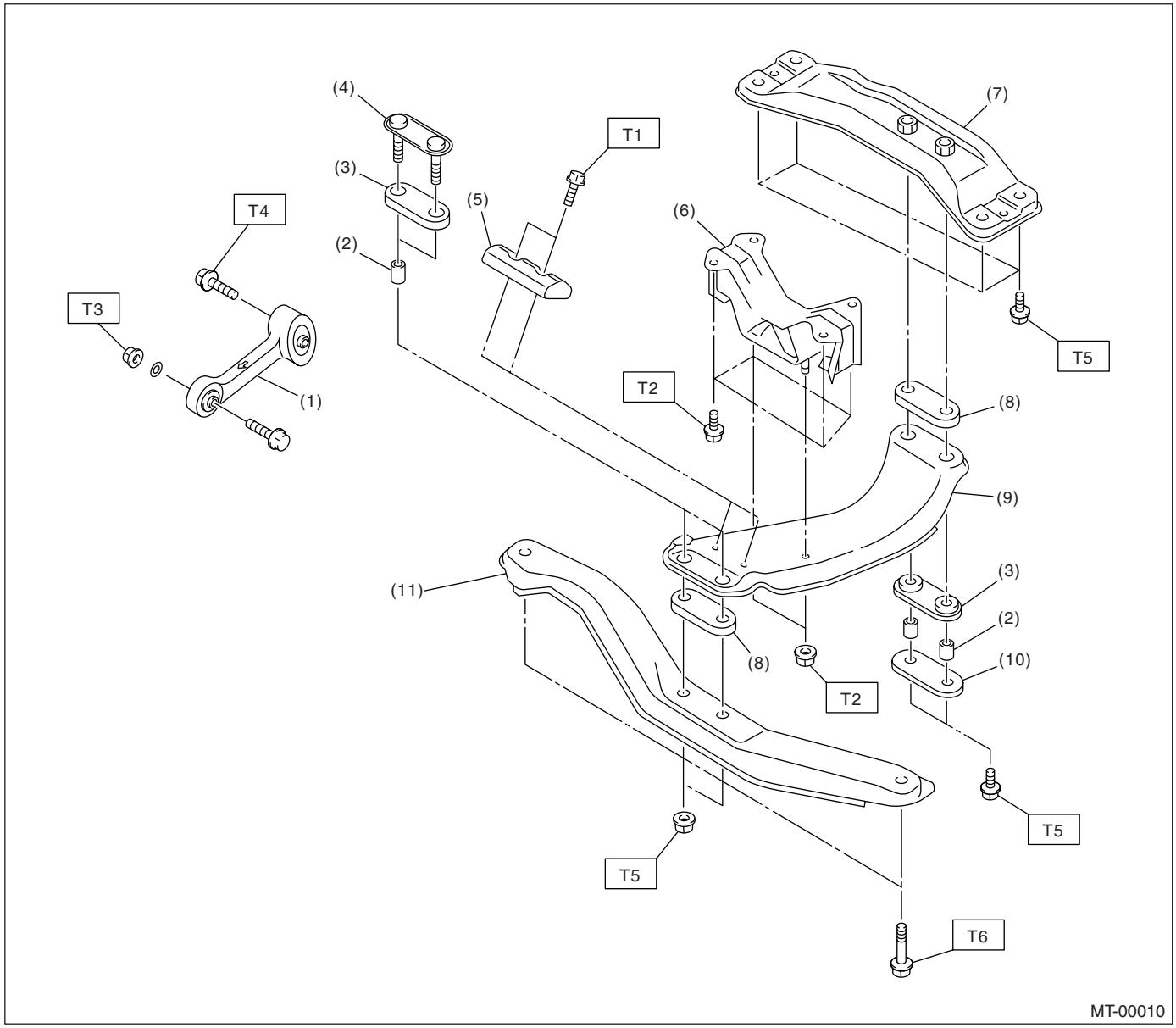
6. FRONT DIFFERENTIAL



(1) Drive pinion shaft
(2) Hypoid driven gear
(3) Pinion shaft
(4) Straight pin
(5) Washer
(6) Differential bevel gear
(7) Differential bevel pinion
(8) Snap ring (Outer)
(9) Roller bearing
(10) Differential case
(11) Oil seal
(12) Differential side retainer
(13) O-ring
(14) Axle drive shaft
(15) Retainer lock plate

Tightening torque: N·m (kgf-m, ft-lb)
T1: 24.5 (2.5, 18.1)
T2: 62 (6.3, 45.6)

7. TRANSMISSION MOUNTING



(1)	Pitching stopper	(8)	Cushion D
(2)	Spacer	(9)	Center crossmember
(3)	Cushion C	(10)	Rear plate
(4)	Front plate	(11)	Front crossmember
(5)	Dynamic damper		
(6)	Rear cushion rubber		
(7)	Rear crossmember		

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

- ***T1: 7.5 (0.76, 5.5)***
- ***T2: 35 (3.6, 26)***
- ***T3: 50 (5.1, 37)***
- ***T4: 58 (5.9, 43)***
- ***T5: 70 (7.1, 51)***
- ***T6: 140 (14.3, 103)***

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation, and disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• When disassembling the case and other light alloy parts, use a plastic hammer to force it apart. Do not pry it apart with a screwdriver or other tool.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply gear oil onto sliding or revolution surfaces before installation.
• Replace deformed or otherwise damaged snap rings with new ones.
• Before installing O-rings or oil seals, apply sufficient amount of gear oil to avoid damage and deformation.
• Be careful not to incorrectly install or fail to install O-rings, snap rings and other such parts.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Avoid damaging the mating surface of the case.
• Before applying sealant, completely remove the old seal.

D: PREPARATION TOOL

1. SPECIAL TOOLS

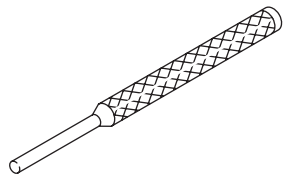
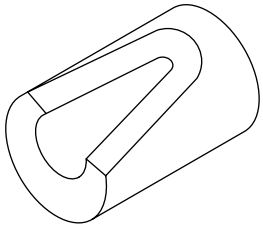
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398791700	398791700	REMOVER	Used for removing and installing spring pin (6 mm).
 ST-399411700	399411700	ACCENT BALL INSTALLER	Used for installing reverse shifter rail arm.

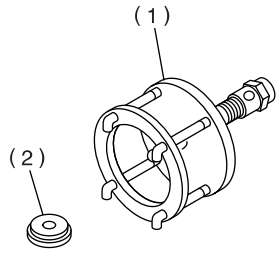
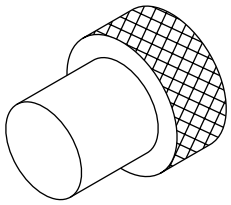
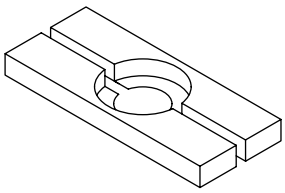
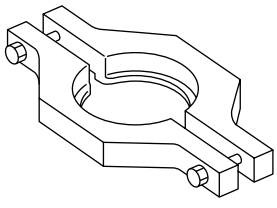
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899524100	899524100	PULLER SET	Used for removing and installing roller bearing (Differential). (1) PULLER (2) CAP
 ST-399780104	399780104	WEIGHT	Used for measuring preload on roller bearing.
 ST-498077000	498077000	REMOVER	Used for removing roller bearing of drive pinion shaft.
 ST-498077300	498077300	CENTER DIFFERENTIAL BEARING REMOVER	Used for removing the center differential cover ball bearing.

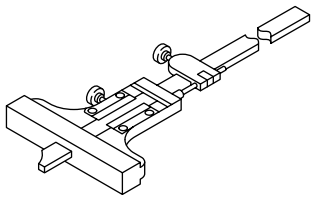
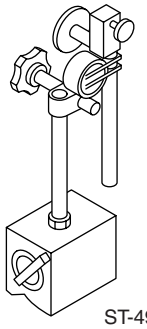
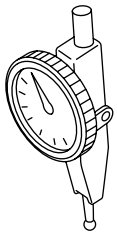
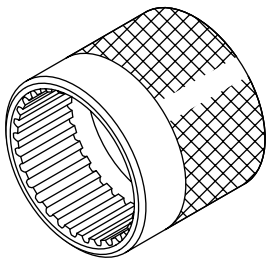
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498147000	498147000	DEPTH GAUGE	Used for adjusting main shaft axial end play.
 ST-498247001	498247001	MAGNET BASE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with DIAL GAUGE (498247100).
 ST-498247100	498247100	DIAL GAUGE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with MAGNET BASE (498247001).
 ST-498427100	498427100	STOPPER	Used for securing the drive pinion shaft assembly and driven gear assembly when removing the drive pinion shaft assembly lock nut.

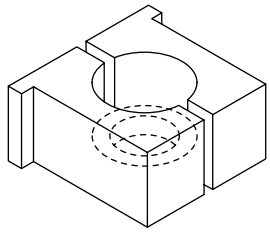
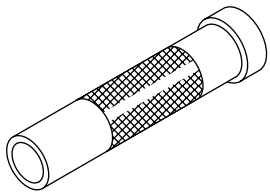
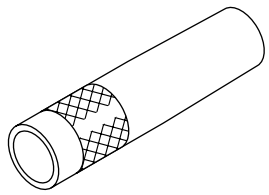
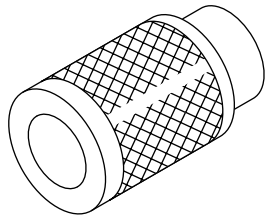
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498937000	498937000	TRANSMISSION HOLDER	Used for removing and installing transmission main shaft lock nut.
 ST-499277100	499277100	BUSH 1-2 INSTALLER	• Used for installing 1st driven gear thrust plate and 1st-2nd driven gear bush. • Used for installing roller bearing outer races to differential case.
 ST-499277200	499277200	INSTALLER	Used for press-fitting the 2nd driven gear, roller bearings and 5th driven gear onto the driven shaft.
 ST-499757002	499757002	INSTALLER	• Used for installing snap ring (OUT 25) and ball bearing (25 × 26 × 17). • Used for installing bearing cone of transfer driven gear (extension core side).

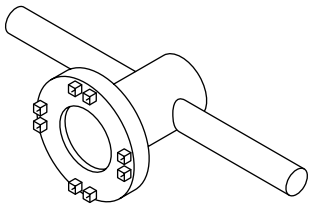
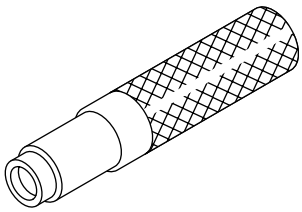
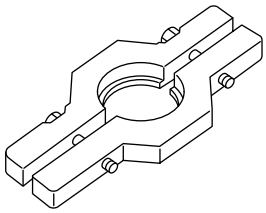
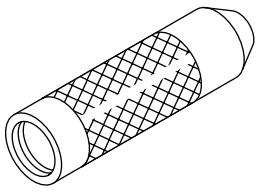
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499787000	499787000	WRENCH ASSY	Used for removing and installing differential side retainer.
 ST-499827000	499827000	PRESS	Used for installing speedometer oil seal when installing speedometer cable to transmission.
 ST-499857000	499857000	5TH DRIVEN GEAR REMOVER	Used for removing 5th driven gear.
 ST-499877000	499877000	RACE 4-5 INSTALLER	• Used for installing 4th needle bearing race and ball bearing onto transmission main shaft. • Used with REMOVER (899714110).

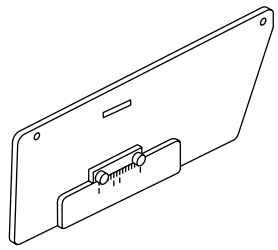
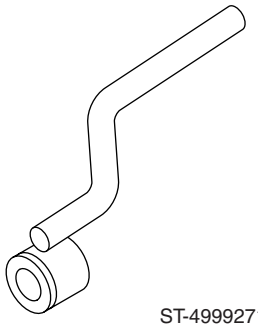
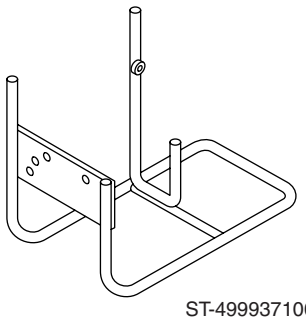
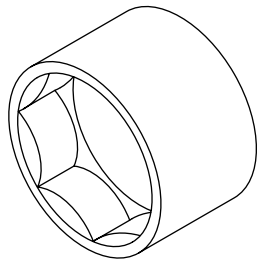
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499917500	499917500	DRIVE PINION GAUGE ASSY	Used for adjusting drive pinion shim.
 ST-499927100	499927100	HANDLE	Used for fitting transmission main shaft.
 ST-499937100	499937100	TRANSMISSION STAND SET	Stand used for transmission disassembly and assembly.
 ST-499987003	499987003	SOCKET WRENCH (35)	Used for removing and installing driven pinion lock nut and main shaft lock nut.

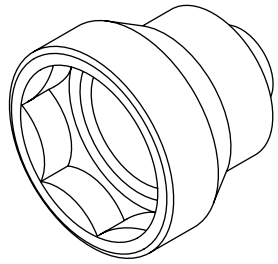
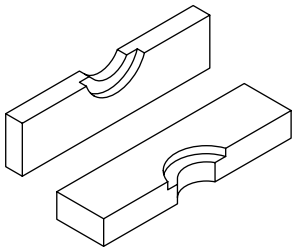
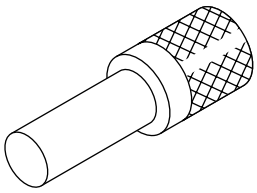
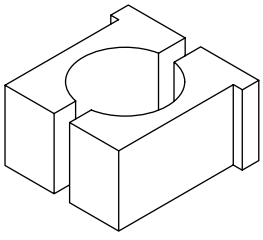
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499987300	499987300	SOCKET WRENCH (50)	Used for removing and installing driven gear assembly lock nut.
 ST-899714110	899714110	REMOVER	Used for fixing transmission main shaft, drive pinion and rear drive shaft.
 ST-899864100	899864100	REMOVER	Used for removing parts on transmission main shaft and drive pinion.
 ST-899884100	899884100	HOLDER	Used for tightening lock nut on sleeve.

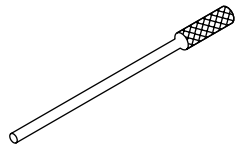
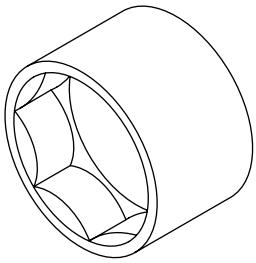
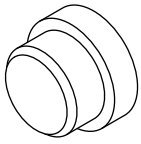
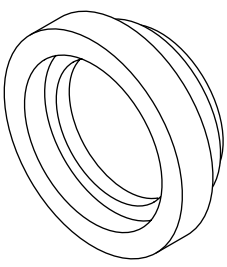
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899904100	899904100	REMOVER	Used for removing and installing straight pin.
 ST-899988608	899988608	SOCKET WRENCH (27)	Used for removing and installing drive pinion lock nut.
 ST-398497701	398497701	ADAPTER	• Used for installing roller bearing onto differential case. • Used with INSTALLER (499277100).
 ST-499587000	499587000	INSTALLER	Used for installing driven gears to driven shaft.

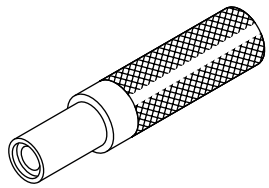
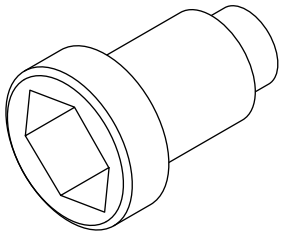
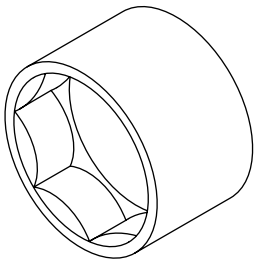
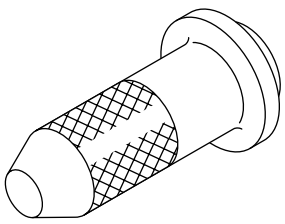
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899824100	899824100	PRESS	Used for installing speedometer shaft oil seal.
 ST-499987100	499987100	SOCKET WRENCH (35)	Used for removing and installing drive pinion lock nut.
 ST-899984103	899984103	SOCKET WRENCH (35)	Used for removing and installing drive pinion lock nut.
 ST-498057300	498057300	INSTALLER	Used for installing extension oil seal.

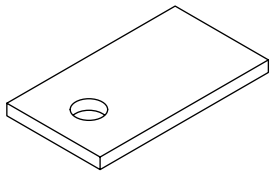
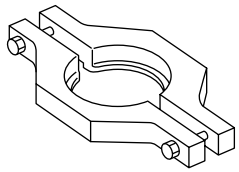
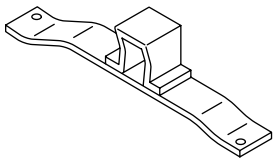
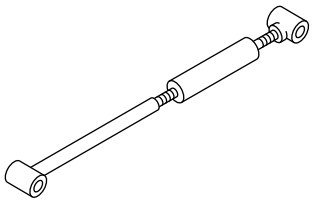
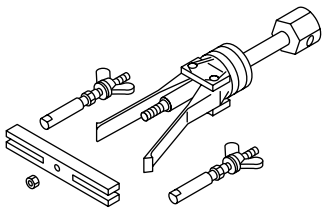
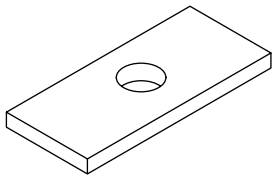
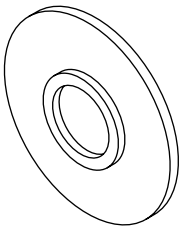
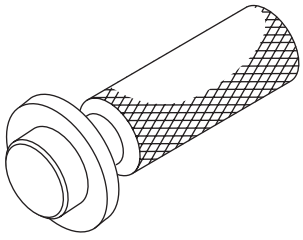
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498255400	498255400	PLATE	Used for measuring backlash.
 ST-498077400	498077400	SYNCHRONIZER CONE REMOVER	• Used for removing synchronizer cone of main shaft. • Used for removing 5th driven gear of drive pinion shaft.
 ST41099AA010	41099AA010	ENGINE SUPPORT BRACKET	• Used for supporting engine. • Used with ENGINE SUPPORT (41099AA020).
 ST41099AA020	41099AA020	ENGINE SUPPORT	• Used for supporting engine. • Used with ENGINE SUPPORT BRACKET (41099AA010).

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398527700	398527700	PULLER ASSY	Used for removing extension case roller bearing.
 ST-398643600	398643600	GAUGE	Used for measuring total end play, extension end play and drive pinion height.
 ST-398177700	38177700	INSTALLER	• Used for installing bearing cone of transfer driven gear (transfer case side). • Used for installing ball bearing of transfer drive gear.
 ST-499797000	499797000	INSTALLER	Used for installing differential side retainer oil seal.

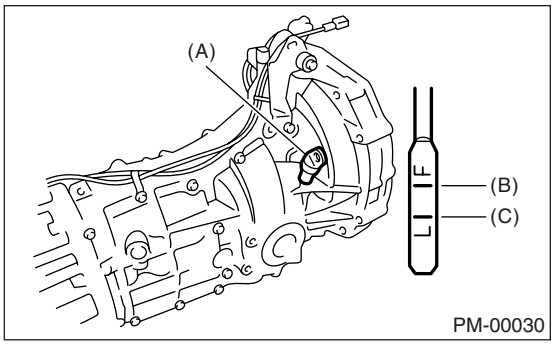
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.

2. Transmission Gear Oil

A: INSPECTION

1) Park the vehicle on a level surface.
2) Turn the ignition switch to OFF, and then wait until the engine cools.
3) Remove the oil level gauge and wipe it clean.
4) Reinsert the level gauge all the way. Be sure the level gauge is correctly inserted and in the proper direction.
5) Pull out the oil level gauge again and check the oil level on it. If it is below the lower level, add oil through the oil level gauge hole to bring the level up to the upper level.



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

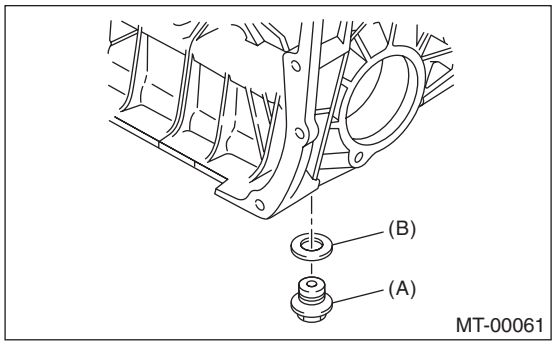
B: REPLACEMENT

1) Pull out the oil level gauge.
2) Lift-up the vehicle.
3) Drain the transmission gear oil completely.

CAUTION:
Directly after the engine has been running, the transmission gear oil is hot. Be careful not to burn yourself.

NOTE:
Tighten the transmission gear oil drain plug after draining the transmission gear oil.

Tightening torque:
69 N·m (7.0 kgf-m, 50.6 ft-lb)



(A) Drain plug
(B) Gasket

4) Lower the vehicle.
5) Pour gear oil into the gauge hole.

Recommended gear oil:
Use GL-5 (75W-90) or equivalent.

Gear oil capacity:
3.5 ℓ (3.7 US qt, 3.1 Imp qt)

6) Check the level of the transmission gear oil.

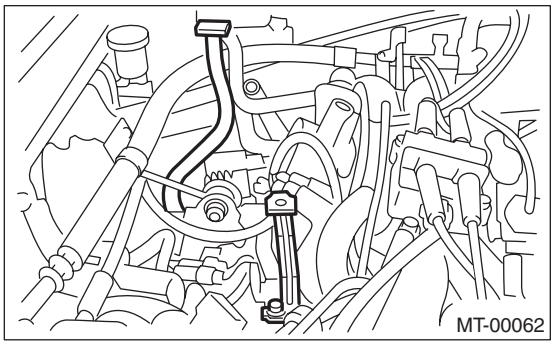
CAUTION:
When inserting the level gauge into transmission gear, align the protrusion on the side of the top part of level gauge with the notch in the gauge hole.

NOTE:
The level should be within the specified range marked on the gauge.

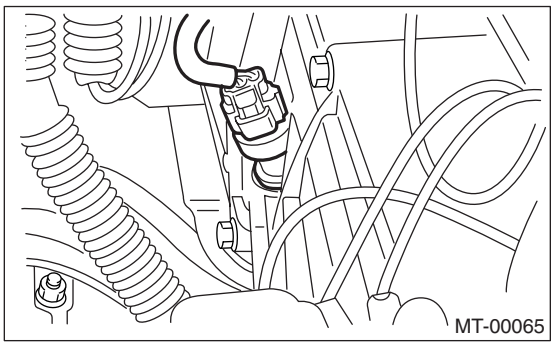
3. Manual Transmission Assembly

A: REMOVAL

1) Open the front hood fully, and support with stay.
2) Disconnect the ground cable from battery.
3) Remove the air intake duct and cleaner case. (Non-turbo model) <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.> and <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
4) Remove the air cleaner case stay. (Non-turbo model)

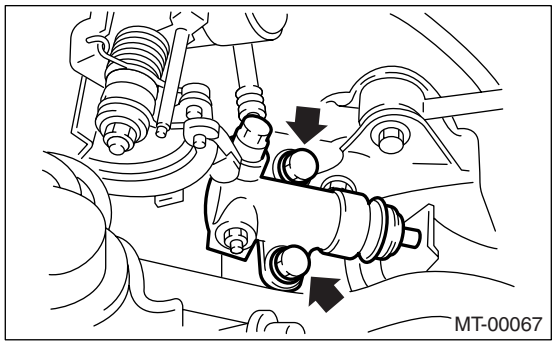

MT-00062

5) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
6) Disconnect the following connectors:
(1) Neutral position switch connector
(2) Back-up light switch connector
(3) Vehicle speed sensor

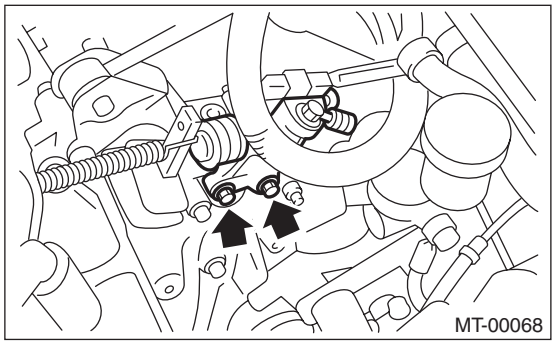

MT-00065

7) Remove the starter. <Ref. to SC(H4SO)-7, REMOVAL, Starter.>
8) Remove the operating cylinder from transmission.

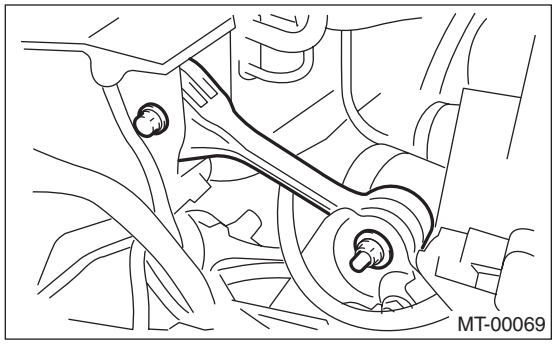
- NON-TURBO MODEL


MT-00067

- TURBO MODEL

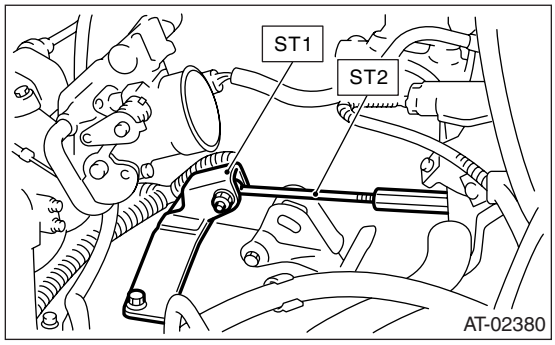

MT-00068

9) Remove the pitching stopper.


MT-00069

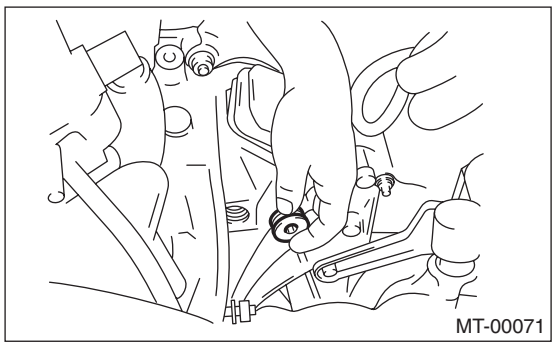
10) Set the ST.

ST1	41099AA010	ENGINE SUPPORT BRACKET
ST2	41099AA020	ENGINE SUPPORT

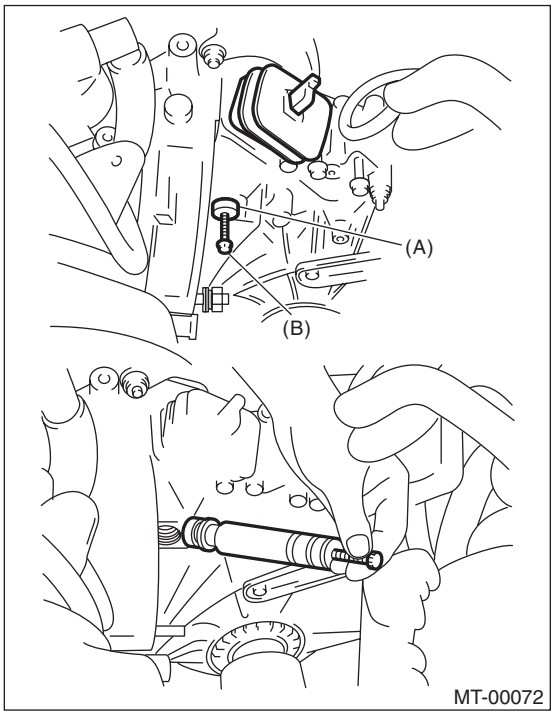


AT-02380

11) Separate the clutch release fork from release bearing. (Turbo model)
(1) Remove the clutch operating cylinder from transmission.
(2) Remove the plug using 10 mm hexagon wrench.


MT-00071

(3) Screw the 6 mm dia. bolt into release fork shaft, and then remove it.

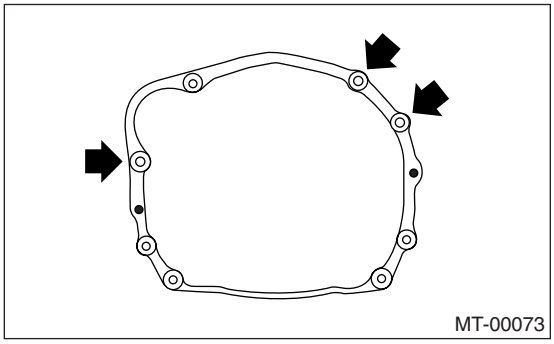


(A) Shaft
(B) Bolt

(4) Raise the release fork and unfasten the release bearing tabs to free release fork.

NOTE:
Step (4) is required to prevent interference with engine when removing the engine from transmission.

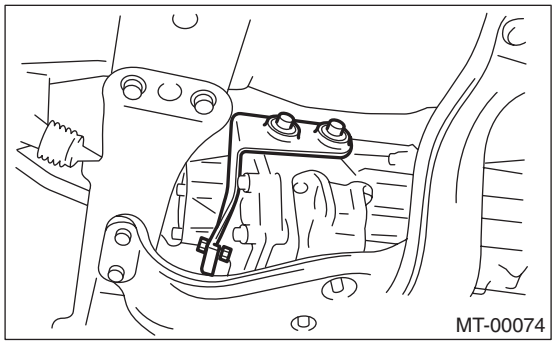
12) Remove the bolt which holds the right upper side of transmission to engine.



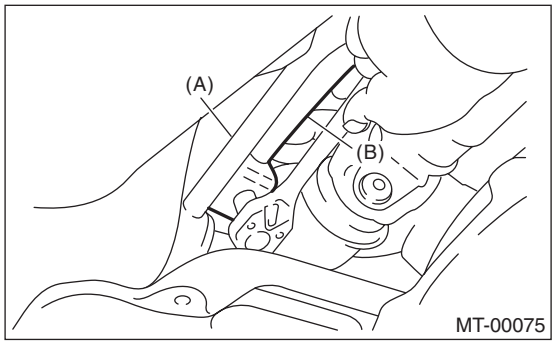
13) Remove the front and center exhaust pipes. (Non-turbo model) <Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>
14) Remove the center exhaust pipe. (Turbo model). <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
15) Remove the rear exhaust pipe and muffler.

CAUTION:
When removing the exhaust pipes, be careful each exhaust pipe does not drop out.

16) Remove the heat shield cover. (If equipped)
17) Remove the hanger bracket from right side of transmission.

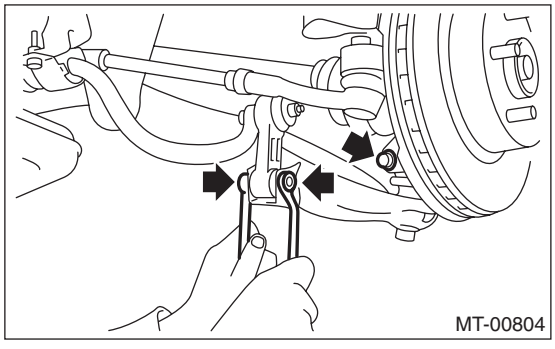


18) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
19) Remove the gear shift rod and stay from transmission.
(1) Disconnect the stay from transmission.
(2) Disconnect the rod from transmission.

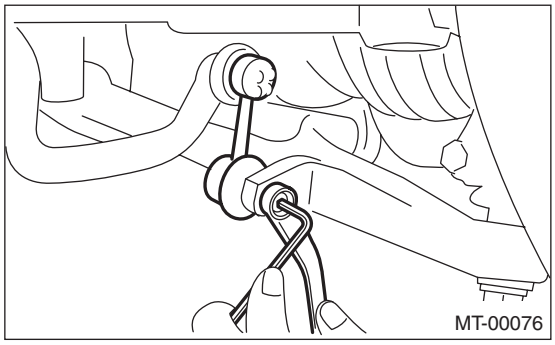


(A) Stay
(B) Rod

20) Disconnect the stabilizer link from transverse link.
21) Remove the bolt securing ball joint of transverse link to housing.
• WAGON MODEL

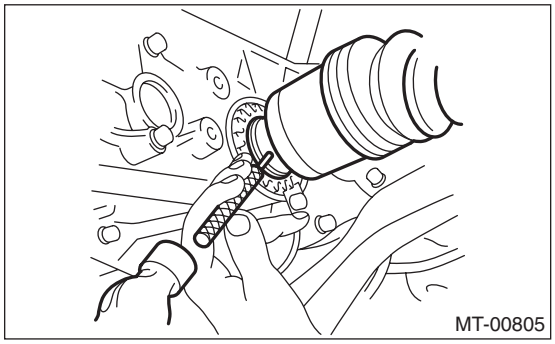


- SEDAN MODEL

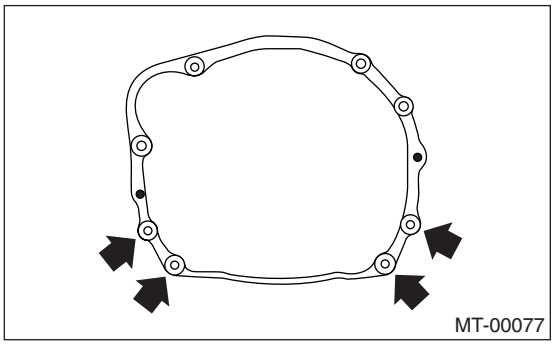


22) Remove the spring pins and separate the front drive shafts from each side of transmission.

NOTE:
Discard the removing spring pin. Replace with a new one.

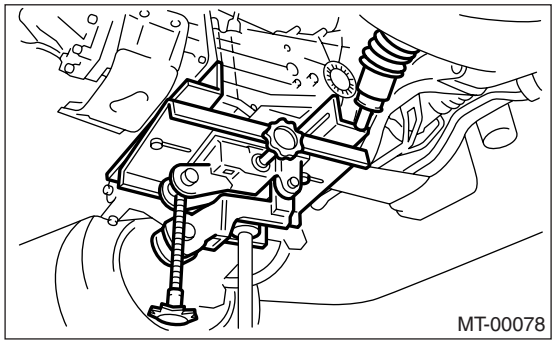


23) Remove the nuts which hold the lower side of transmission to engine.

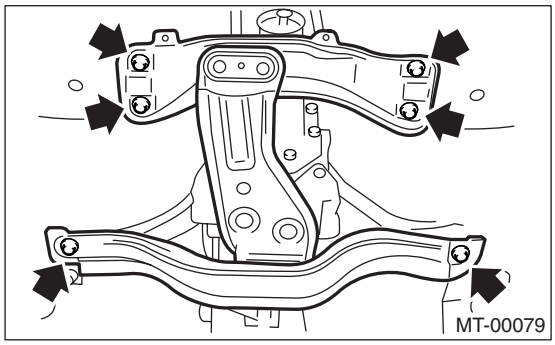


24) Place the transmission jack under transmission.

CAUTION:
Always support the transmission case with a transmission jack.



25) Remove the transmission rear crossmember from vehicle.



26) Remove the transmission.

NOTE:
Move the transmission jack toward rear until main shaft is withdrawn from clutch cover.

27) Separate the transmission assembly and rear cushion rubber.
28) Remove the clutch release bearing from engine side. (Turbo model) <Ref. to CL-14, REMOVAL, Release Bearing and Lever.>

B: INSTALLATION

1) Install the rear cushion rubber to transmission assembly.

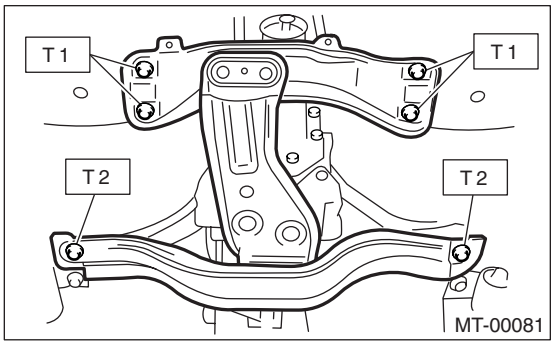
Tightening torque:
35 N·m (3.57 kgf-m, 25.8 ft-lb)

2) Install the clutch release lever and bearing onto transmission. (Turbo model) <Ref. to CL-14, INSTALLATION, Release Bearing and Lever.>
3) Install the transmission onto engine.
   (1) Gradually raise the transmission with transmission jack.
   (2) Engage them at splines.

NOTE:
Be careful not to strike the main shaft against clutch cover.

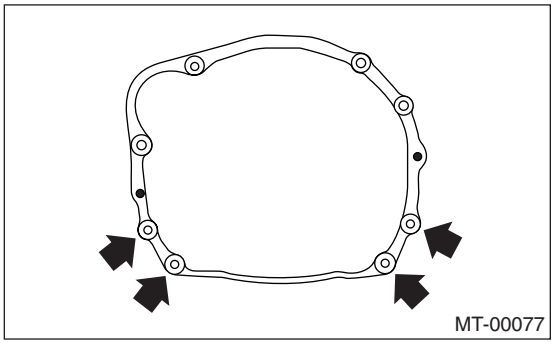
4) Install the transmission rear crossmember.

Tightening torque:
T1: 70 N·m (7.1 kgf-m, 51 ft-lb)
T2: 140 N·m (14.3 kgf-m, 103 ft-lb)



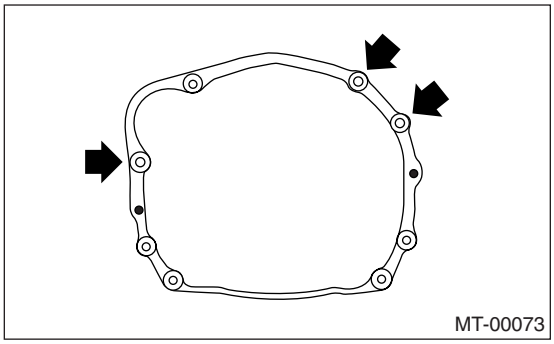
5) Take off the transmission jack.
6) Tighten the nuts which hold the lower side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

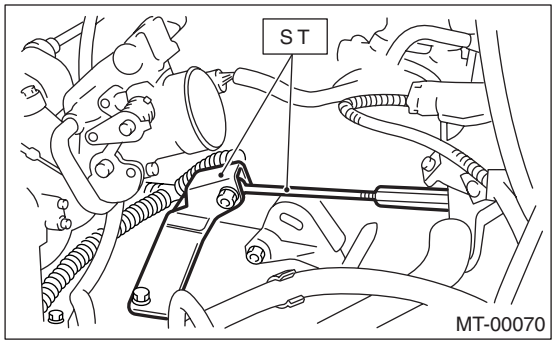


7) Connect the engine and transmission.
(1) Install the starter.
<Ref. to SC(H4SO)-7, INSTALLATION, Starter.>
(2) Tighten the bolt which holds right upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

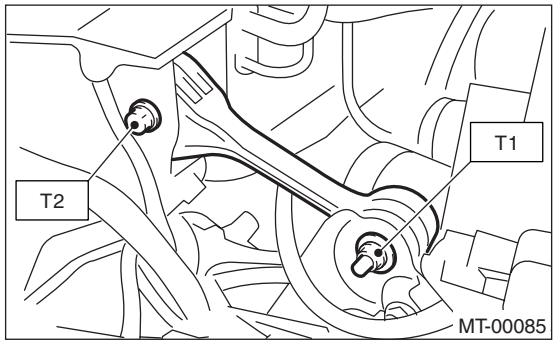


8) Remove the ST.



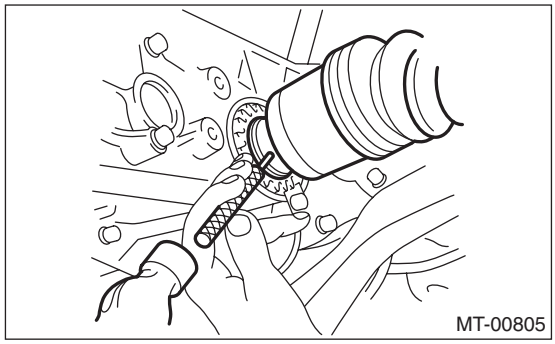
9) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



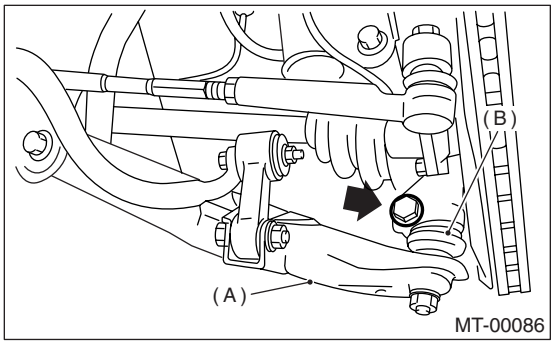
10) Lift-up the vehicle.
11) Install the front drive shaft into transmission.
12) Drive the spring pin into chamfered hole of drive shaft.

NOTE:
Always use a new spring pin.



13) Install the ball joints of lower arm into knuckle arm of housing, and tighten the installing bolts.

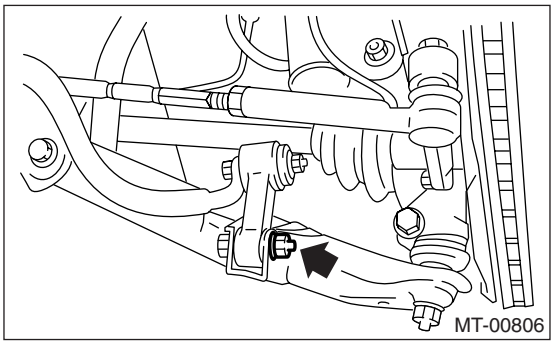
Tightening torque:
49 N·m (5.0 kgf-m, 36 ft-lb)



(A) Transverse link
(B) Ball joint

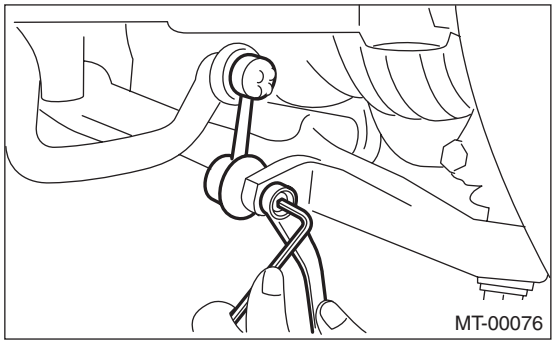
14) Install the stabilizer link from transverse link.
• WAGON MODEL

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)

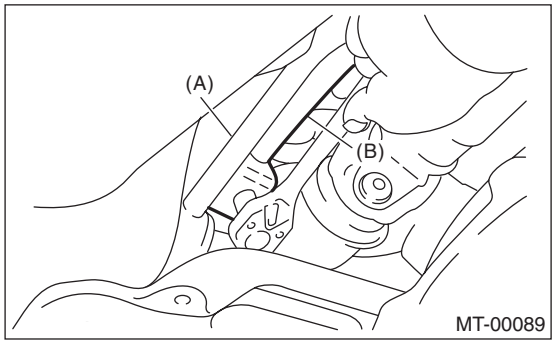


• SEDAN MODEL

Tightening torque:
45 N·m (4.6 kgf-m, 33.2 ft-lb)

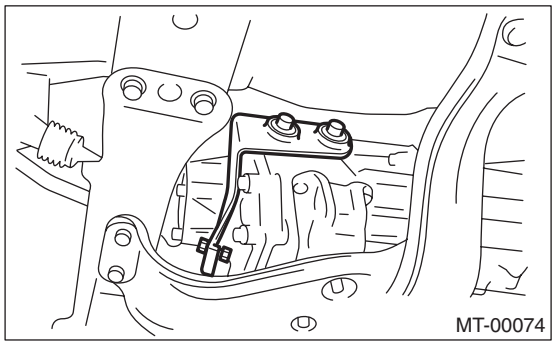


15) Install the gear shift rod and stay.
(1) Install the gear shift rod onto transmission.

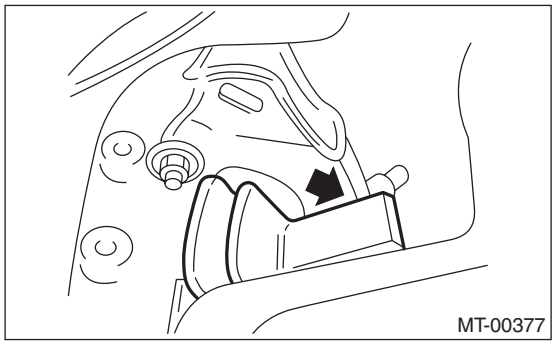


(A) Stay
(B) Rod

(2) Install the stay onto transmission.
16) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>
17) Install the heat shield cover. (If equipped)
18) Install the hanger bracket on right side of transmission.



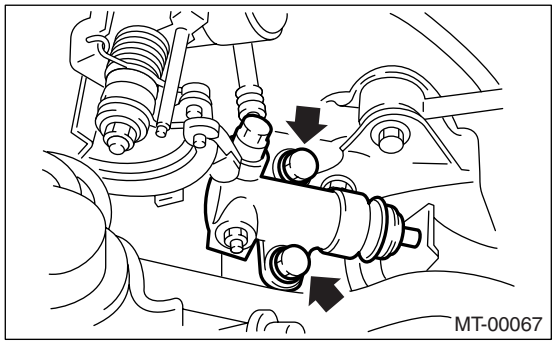
19) Install the rear exhaust pipe and muffler.
20) Install the front exhaust pipe and center exhaust pipe. (Non-turbo model)
<Ref. to EX(H4SO)-5, INSTALLATION, Front Exhaust Pipe.>
21) Install the center exhaust pipe. (Turbo model)<Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>
22) Install the under cover.
23) Push the clutch release lever to fit the bearing into clutch cover. (Turbo model)



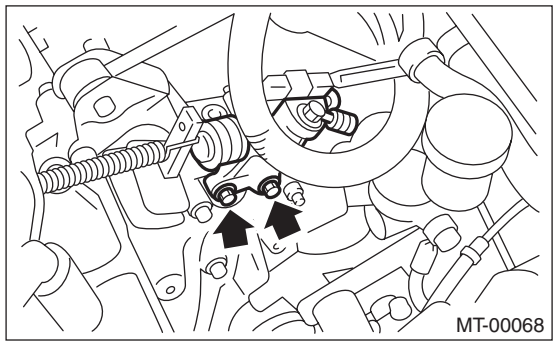
24) Install the operating cylinder.

Tightening torque:
37 N·m (3.8 kgf-m, 27.5 ft-lb)

- NON-TURBO MODEL



- TURBO MODEL



25) Connect the following connectors:
(1) Transmission ground cable

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

(2) Vehicle speed sensor connector
(3) Neutral position switch connector
(4) Back-up light switch connector

26) Install the air cleaner case stay.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)

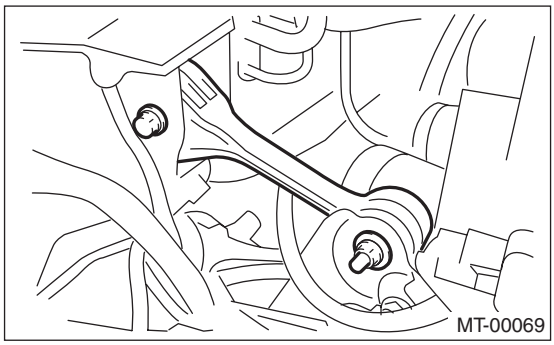
27) Install the air cleaner case and duct.
28) Connect the battery ground cable to battery.
29) Take off the vehicle from lift arms.

4. Transmission Mounting System

A: REMOVAL

1. PITCHING STOPPER

1) Disconnect the ground cable from battery.
2) Remove the air intake duct. (Non-turbo model) <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
3) Remove the air cleaner case. (Non-turbo model) <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.>
4) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
5) Remove the pitching stopper.

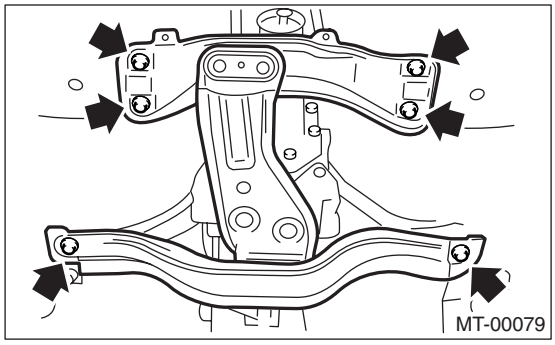


2. CROSSMEMBER AND CUSHION RUBBER

1) Disconnect the ground cable from battery.
2) Jack-up the vehicle and support it with sturdy racks.
3) Remove the front and center exhaust pipes. (Non-turbo model)
<Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>
4) Remove the center exhaust pipe. (Turbo model) <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
5) Remove the rear exhaust pipe and muffler.
6) Remove the heat shield cover. (If equipped)
7) Set the transmission jack under the transmission body.

CAUTION:
Always support the transmission case with a transmission jack.

8) Remove the rear crossmember.



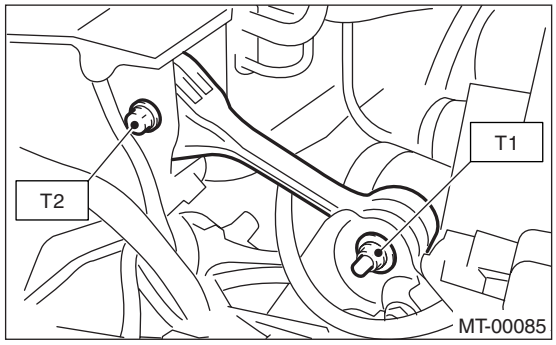
9) Remove the rear cushion rubber.

B: INSTALLATION

1. PITCHING STOPPER

1) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



2) Install the air intake duct and cleaner case. (Non-turbo model)
<Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Duct.>
3) Install the intercooler. (Turbo model)
<Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>
4) Connect the battery ground cable to battery.

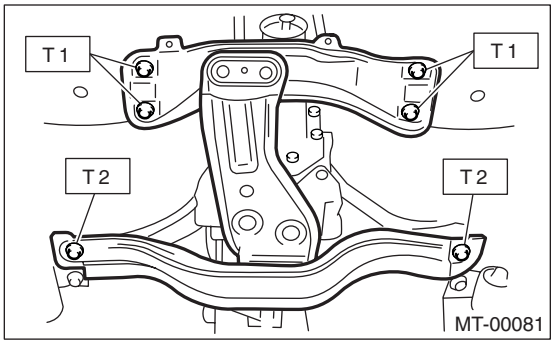
2. CROSSMEMBER AND CUSHION RUBBER

1) Install the rear cushion rubber.

Tightening torque:
35 N·m (3.6 kgf-m, 26 ft-lb)

2) Install the rear crossmember.

Tightening torque:
T1: 70 N·m (7.1 kgf-m, 51 ft-lb)
T2: 140 N·m (14.3 kgf-m, 103 ft-lb)



3) Remove the transmission jack.
4) Install the heat shield cover. (If equipped)
5) Install the front and center exhaust pipes. (Non-turbo model)
<Ref. to EX(H4SO)-5, INSTALLATION, Front Exhaust Pipe.>
6) Install the center exhaust pipe. (Turbo model) <Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>
7) Install the rear exhaust pipe and muffler.

C: INSPECTION

Repair or replace parts if the results of the inspection below are not satisfactory.

1. PITCHING STOPPER

Make sure the pitching stopper is not bent or damaged. Make sure the rubber is not stiff, cracked, or otherwise damaged.

2. CROSSMEMBER AND CUSHION RUBBER

Make sure the crossmember is not bent or damaged. Make sure the cushion rubber is not stiff, cracked, or otherwise damaged.

5. Oil Seal

A: INSPECTION

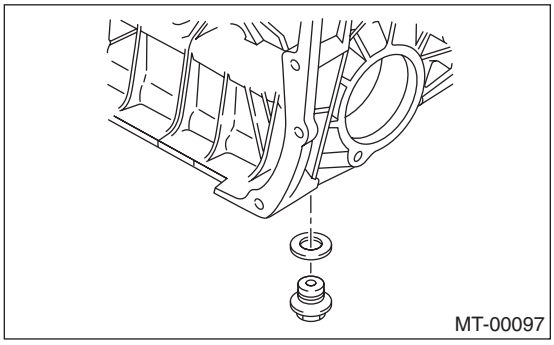
Check the oil seal portion for leakage. If leakage is found, replace the oil seal with a new one.

B: REPLACEMENT

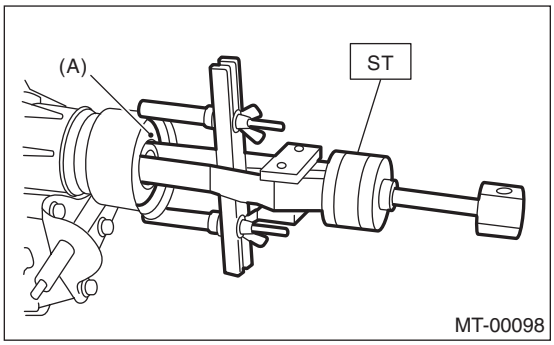
1) Clean the transmission exterior.
2) Drain the gear oil completely.

NOTE:
Tighten the drain plug after draining gear oil.

Tightening torque:
69 N·m (7.0 kgf-m, 50.6 ft-lb)

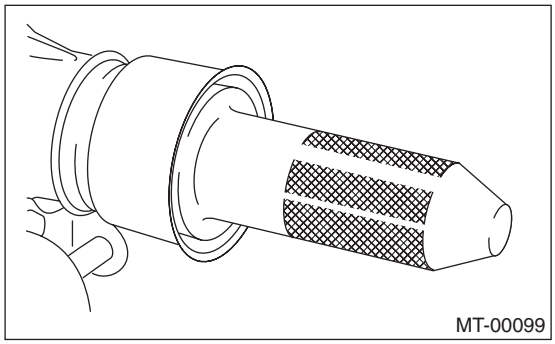


3) Remove the rear exhaust pipe and muffler.
4) Remove the heat shield cover. (If equipped)
5) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
6) Using the ST, remove the oil seal.
ST 398527700 PULLER ASSY



(A) Oil seal

7) Using the ST, install the oil seal.
ST 498057300 INSTALLER



8) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>
9) Install the heat shield cover. (If equipped)
10) Install the rear exhaust pipe and muffler.
11) Pour gear oil and check the oil level. <Ref. to 5MT-26, REPLACEMENT, Transmission Gear Oil.>

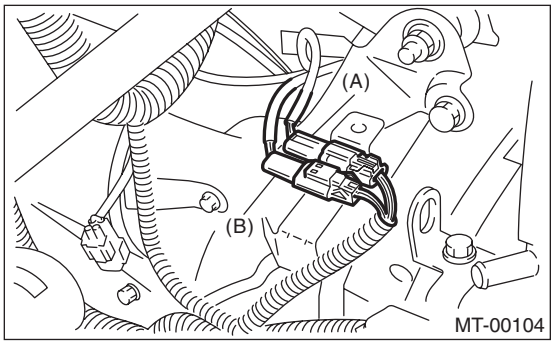
6. Switches and Harness

A: REMOVAL

1. BACK-UP LIGHT AND NEUTRAL POSITION SWITCH

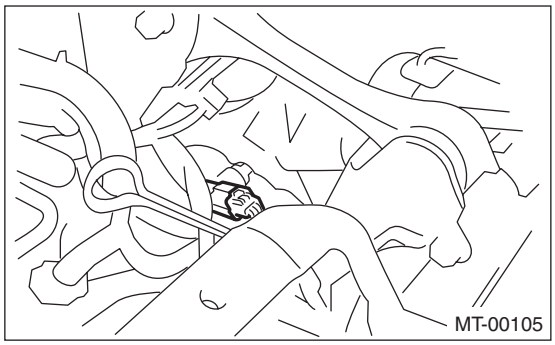
1) Disconnect the ground cable from battery.
2) Remove the air intake duct and cleaner case. (Non-turbo model) <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.> and <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
3) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
4) Disconnect the connector of back-up light switch and neutral position switch.

- NON-TURBO MODEL

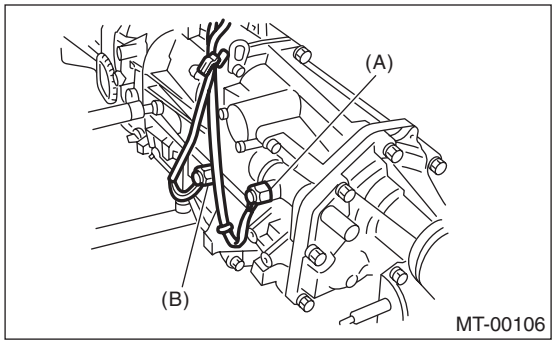


(A) Neutral switch (Brown)
(B) Back-up light switch (Gray)

- TURBO MODEL



5) Lift-up the vehicle.
6) Remove the back-up light switch and neutral position switch with harness.



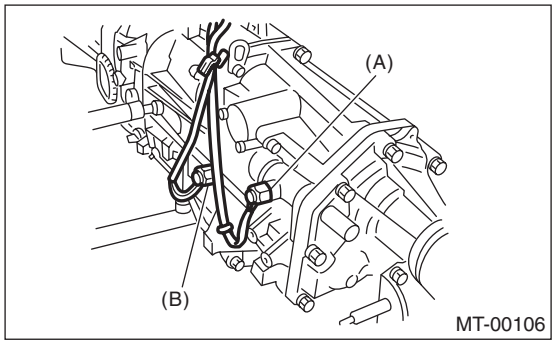
(A) Neutral switch (Brown)
(B) Back-up light switch (Gray)

B: INSTALLATION

1. BACK-UP LIGHT SWITCH AND NEUTRAL POSITION SWITCH

1) Install the back-up light switch and neutral position switch with harness.

Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Neutral switch
(B) Back-up light switch

2) Connect the connector of back-up light switch and neutral position switch.
3) Install the air intake duct and cleaner case. (Non-turbo model) <Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Duct.>
4) Install the intercooler. (Turbo model)
<Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>
5) Connect the battery ground cable to battery.

C: INSPECTION

1. BACK-UP LIGHT SWITCH

Inspect the back-up light switch. <Ref. to LI-6, INSPECTION, Back-up Light System.>

2. NEUTRAL POSITION SWITCH

1) Turn the ignition switch to OFF.
2) Disconnect the connector of neutral position switch.
3) Measure the resistance between neutral position switch terminals.

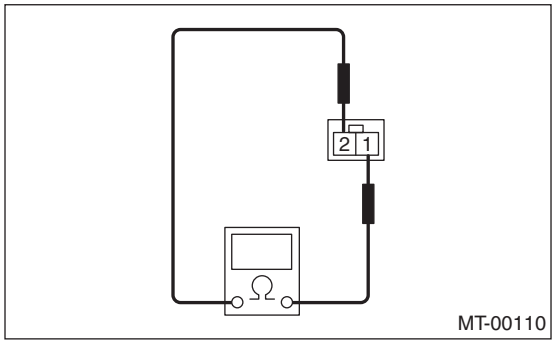
Non-turbo model:

Gear shift position	Terminal No.	Specified resistance
Neutral position	1 and 2	Less than 1 Ω
Other positions		More than 1 MΩ

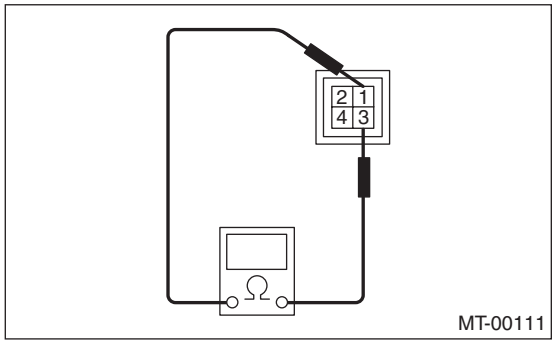
Turbo model:

Gear shift position	Terminal No.	Specified resistance
Neutral position	1 and 3	Less than 1 Ω
Other positions		More than 1 MΩ

- NON-TURBO MODEL



- TURBO MODEL

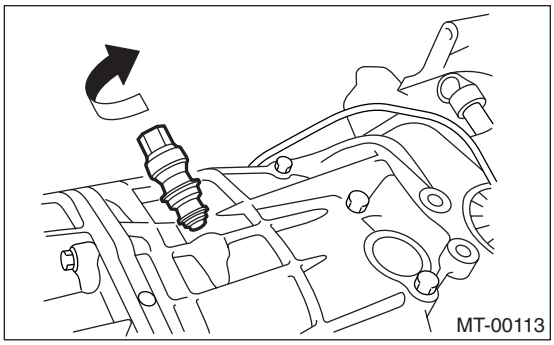


4) Replace defective parts.

7. Vehicle Speed Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle.
3) Remove the front, center rear exhaust pipes and muffler.
4) Disconnect the connector from vehicle speed sensor.
5) Turn and remove the vehicle speed sensor.



B: INSTALLATION

NOTE:
• Discard the vehicle speed sensor and after removal, replace with a new one.
• Ensure the sensor mounting hole is clean and free of foreign matter.
• Align the tip end of key with key groove on end of speedometer shaft during installation.

1) Hand tighten the vehicle speed sensor.
2) Tighten the vehicle speed sensor using suitable tool.

Tightening torque:
5.9 N·m (0.6 kgf-m, 4.3 ft-lb)

3) Connect the connector to vehicle speed sensor.
4) Install the front, center exhaust pipes and muffler.
5) Lower the vehicle.
6) Connect the battery ground cable to battery.

C: INSPECTION

The vehicle speed sensor can not be inspected as a single unit. Check if speedometer operates normally. If it does not operate normally, inspect the combination meter system. <Ref. to IDI-3, INSPECTION, Combination Meter System.>

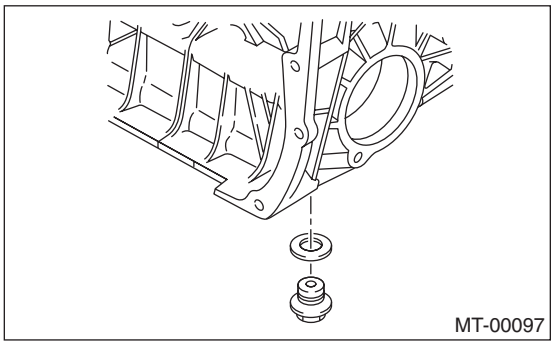
8. Preparation for Overhaul

A: PROCEDURE

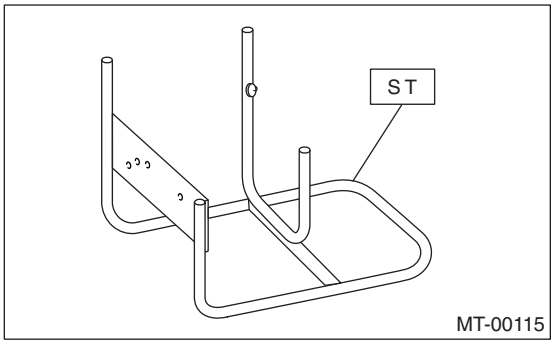
1) Clean oil, grease, dirt and dust from transmission.
2) Remove the drain plug to drain oil. After draining, retighten it as before.

NOTE:
Replace the gasket with a new one.

Tightening torque:
69 N·m (7.0 kgf-m, 50.6 ft-lb)



3) Attach the transmission to ST.
ST 499937100 TRANSMISSION STAND

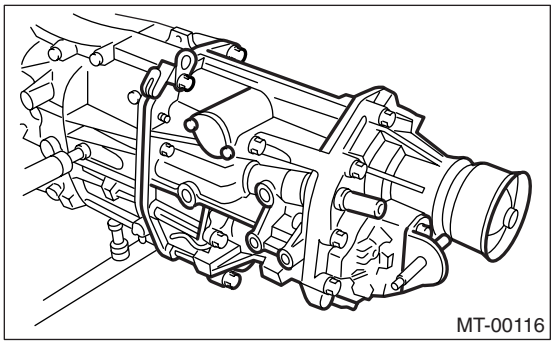


4) Rotating parts should be coated with oil prior to assembly.
5) All disassembled parts, if to be reused, should be reinstalled in the original positions and directions.
6) Gaskets, lock washers and lock nut must be replaced with new ones.
7) Liquid gasket should be used where specified to prevent leakage.

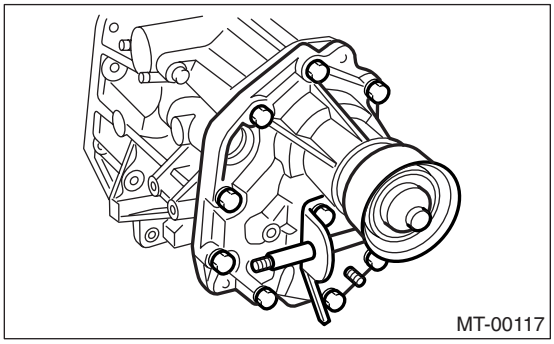
9. Transfer Case and Extension Case Assembly

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-36, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly.

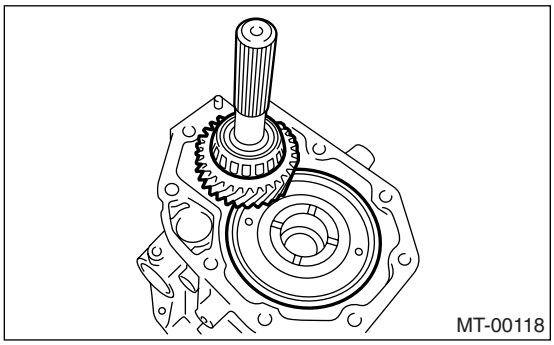

MT-00116

4) Remove the shifter arm.
5) Remove the extension case assembly.

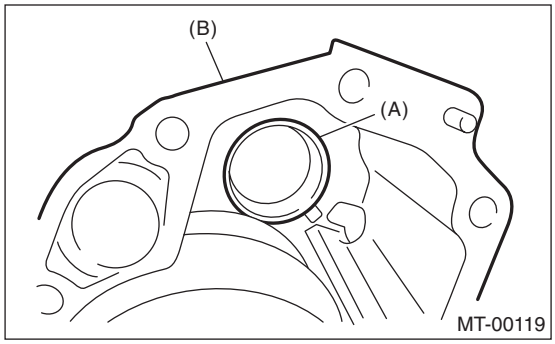

MT-00117

B: INSTALLATION

1) Install the center differential and transfer driven gear into transfer case.


MT-00118

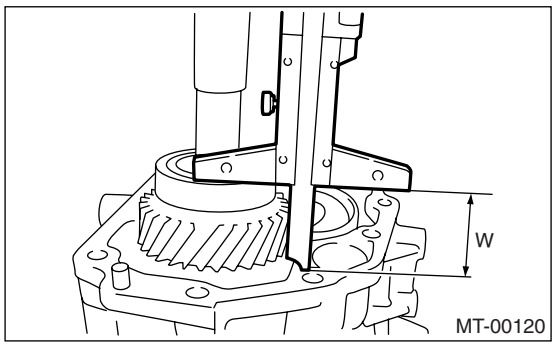
2) Remove the bearing outer race from the extension case.



MT-00119

(A) Bearing outer race
(B) Extension case

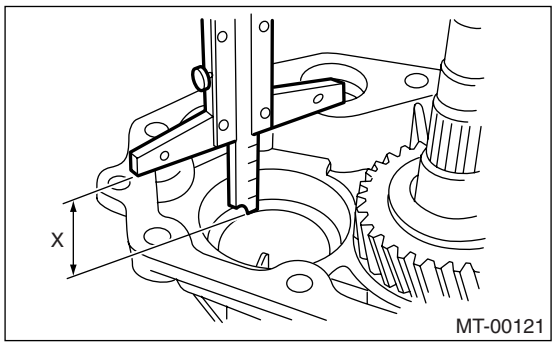
3) While pressing the bearing outer race horizontally, turn the driven shaft ten rotations.
4) Measure the height “W” between transfer case and taper roller bearing on the transfer driven gear.



MT-00120

5) Measure the depth “X”.

NOTE:
Measure with bearing outer race and thrust washer removed.



MT-00121

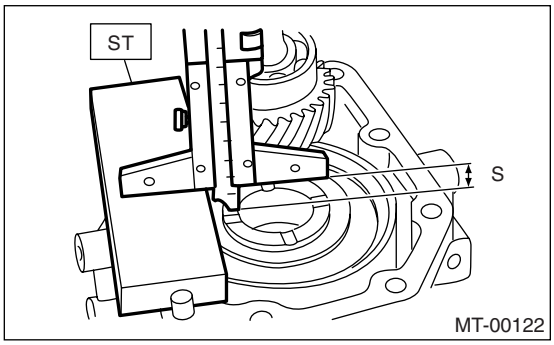
6) Calculate the thrust washer thickness “t” using the following calculation.
t = X − W + 0.15 to 0.20 mm (0.006 to 0.008 in)
7) Select the nearest washer in the following table:

Preload of the taper roller bearing (amount of standard protrusion):
0.15 — 0.20 mm (0.006 — 0.008 in)

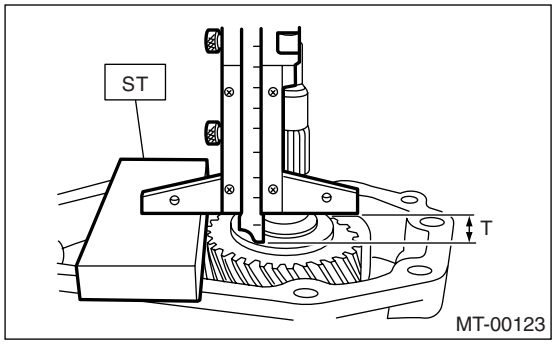
NOTE:
Be sure that the amount of preload is within the standard value.

Thrust washer (50 × 61 × t)	
Part No.	Thickness mm (in)
803050060	0.50 (0.0197)
803050061	0.55 (0.0217)
803050062	0.60 (0.0236)
803050063	0.65 (0.0256)
803050064	0.70 (0.0276)
803050065	0.75 (0.0295)
803050066	0.80 (0.0315)
803050067	0.85 (0.0335)
803050068	0.90 (0.0354)
803050069	0.95 (0.0374)
803050070	1.00 (0.0394)
803050071	1.05 (0.0413)
803050072	1.10 (0.0433)
803050073	1.15 (0.0453)
803050074	1.20 (0.0472)
803050075	1.25 (0.0492)
803050076	1.30 (0.0512)
803050077	1.35 (0.0531)
803050078	1.40 (0.0551)
803050079	1.45 (0.0571)

8) Fit the thrust washers on transfer drive shaft.
9) Install the bearing outer race into extension case.
10) Measure the depth “S” between transfer case and center differential.
ST 398643600 GAUGE



11) Measure the depth “T” between extension case and transfer drive gear.
ST 398643600 GAUGE



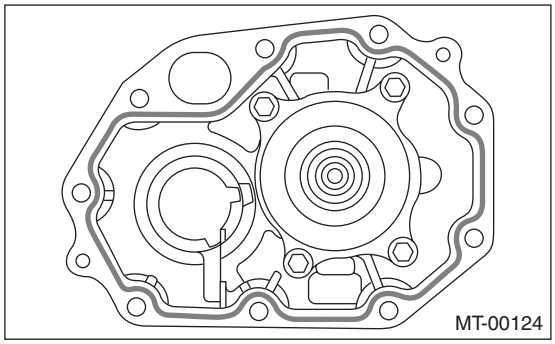
NOTE:
Thickness of ST: 15 mm (0.59 in)
12) Calculate the space “U” using the following equation: U = S + T − 30 mm (1.18 in) [Thickness of ST]
13) Select the suitable washer in the following table:

Standard clearance:
0.15 — 0.35 mm (0.0059 — 0.0138 in)

Thrust washer	
Part No.	Thickness mm (in)
803036050	0.9 (0.035)
803036054	1.0 (0.039)
803036051	1.1 (0.043)
803036055	1.2 (0.047)
803036052	1.3 (0.051)
803036056	1.4 (0.055)
803036053	1.5 (0.059)
803036057	1.6 (0.063)
803036058	1.7 (0.067)

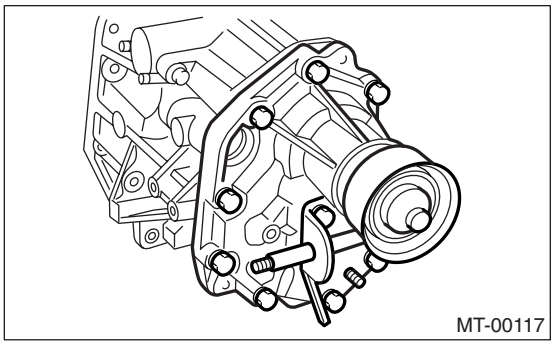
14) Fit the thrust washer on center differential.
15) Apply proper amount of liquid gasket to the transfer case mating surface.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent

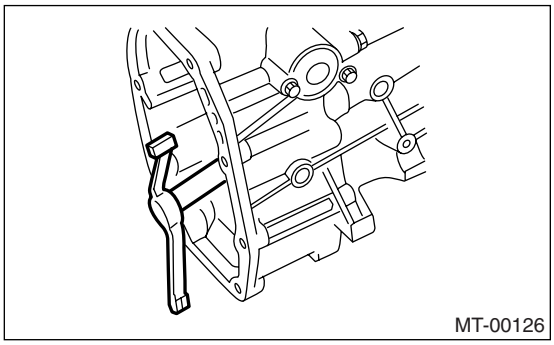


16) Install the extension assembly into transfer case.

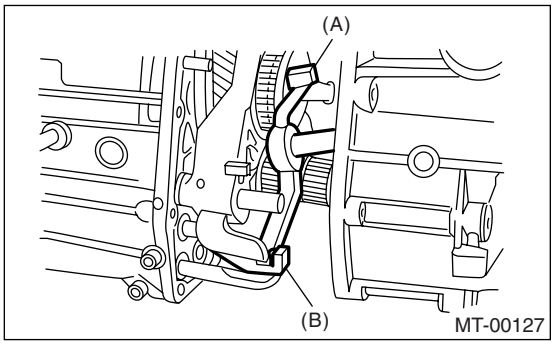
Tightening torque:
40 N·m (4.1 kgf-m, 29.7 ft-lb)


MT-00117

17) Install the shifter arm to transfer case.


MT-00126

18) Hang the shifter arm on 3rd-4th fork rod.

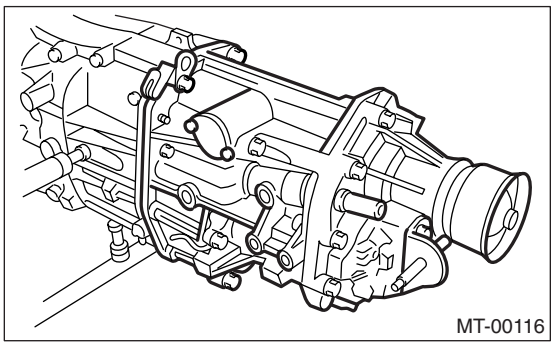


MT-00127

(A) Shifter arm
(B) 3rd-4th fork rod

19) Install the transfer case with extension case assembly to transmission case.

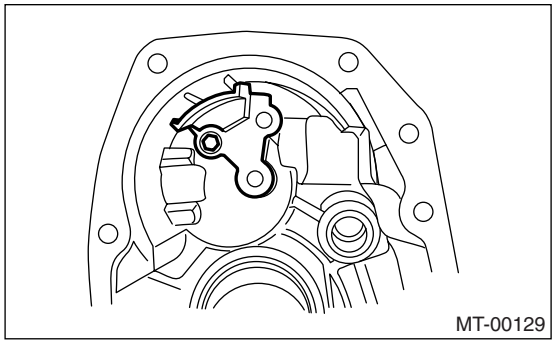
Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)


MT-00116

C: DISASSEMBLY

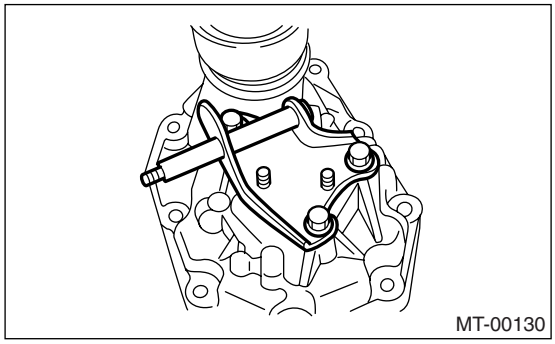
1. TRANSFER CASE

1) Remove the reverse check assembly. <Ref. to 5MT-49, REMOVAL, Reverse Check Sleeve.>
2) Remove the oil guide.


MT-00129

2. EXTENSION CASE

1) Remove the transfer drive gear assembly. <Ref. to 5MT-44, REMOVAL, Transfer Drive Gear.>
2) Remove the shift bracket.


MT-00130

3) Remove the oil seal from extension case. <Ref. to 5MT-35, Oil Seal.>

D: ASSEMBLY

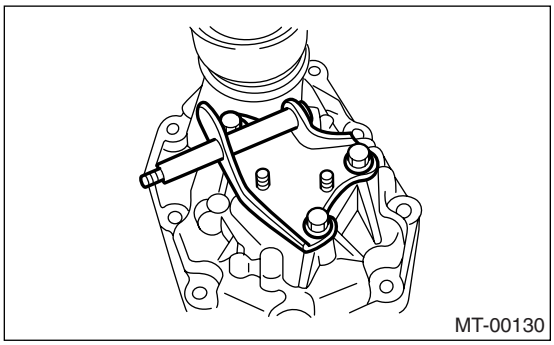
1. EXTENSION CASE

1) Using the ST, install the oil seal to extension case. <Ref. to 5MT-35, Oil Seal.>

NOTE:
Use a new oil seal.

2) Install the shift bracket to extension case.

Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)

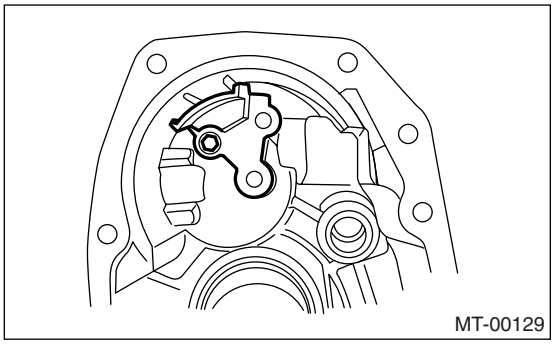


3) Install the transfer drive gear to extension case. <Ref. to 5MT-44, INSTALLATION, Transfer Drive Gear.>

2. TRANSFER CASE

1) Install the oil guide to transfer case.

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

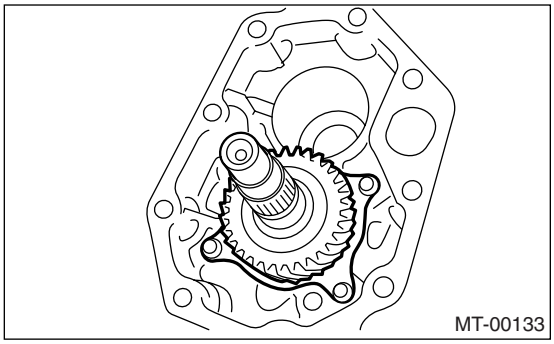


2) Install the reverse check sleeve assembly to transfer case. <Ref. to 5MT-49, INSTALLATION, Reverse Check Sleeve.>

10.Transfer Drive Gear

A: REMOVAL

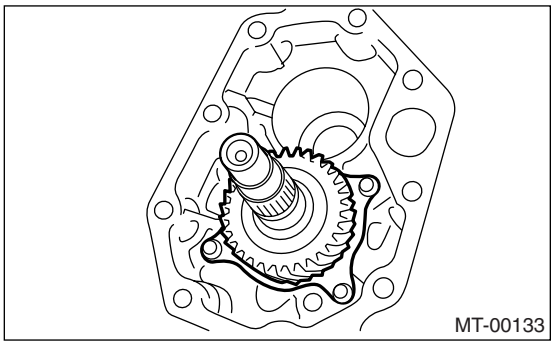
1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-36, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the extension case assembly.
5) Remove the transfer driven gear.
6) Remove the transfer drive gear.



B: INSTALLATION

1) Install the transfer drive gear.

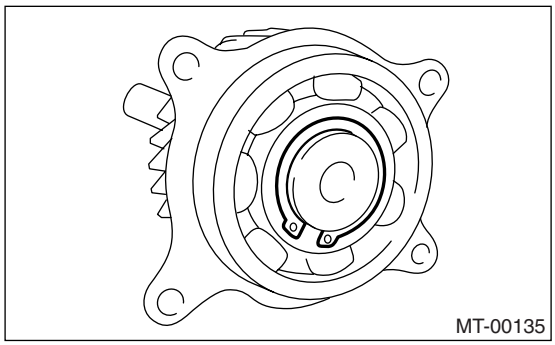
Tightening torque:
26 N·m (2.7 kgf-m, 20 ft-lb)



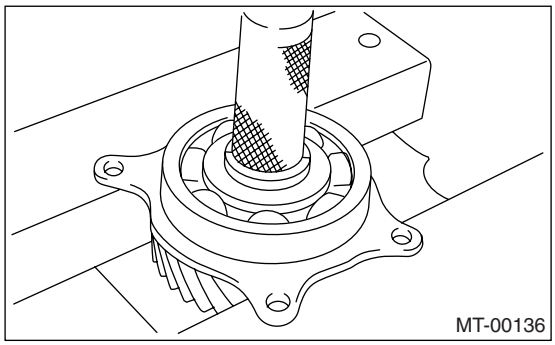
2) Install the transfer driven gear.
3) Install the extension case assembly.
4) Install the transfer case and extension case assembly. <Ref. to 5MT-40, INSTALLATION, Transfer Case and Extension Case Assembly.>
5) Install the back-up light switch and neutral position switch. <Ref. to 5MT-36, INSTALLATION, Switches and Harness.>
6) Install the manual transmission assembly from vehicle. <Ref. to 5MT-29, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

1) Remove the snap ring.



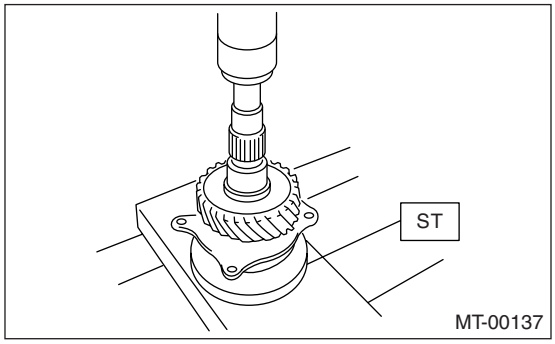
2) R emove the ball bearing.



D: ASSEMBLY

1) Set the ST applying to inner race of bearing and install to drive shaft.
ST 398177700 INSTALLER

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)



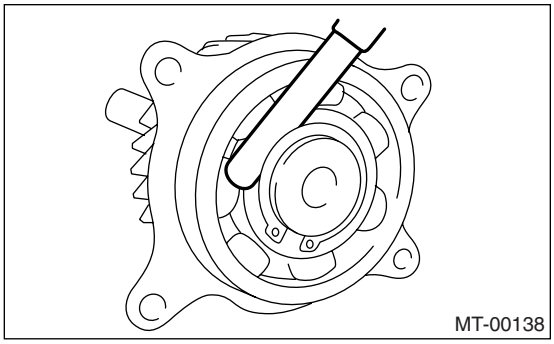
2) Install the snap ring on transfer drive shaft.
3) Check the clearance between snap ring and ball bearing. <Ref. to 5MT-44, INSPECTION, Transfer Drive Gear.>

E: INSPECTION

1) Bearings
Replace the bearings in the following cases:
- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.

2) Drive gear
Replace the drive gear in the following cases:
• If their tooth surfaces and shaft are excessively broken or damaged.
3) Measure the clearance between snap ring and inner race of ball bearing with a thickness gauge.

Clearance:
0.01 — 0.15 mm (0.0004 — 0.0059 in)



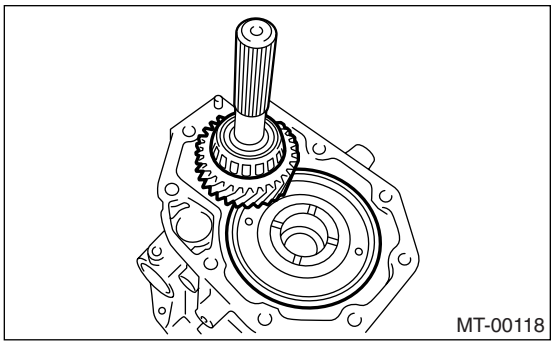
If the measurement is not within specification, select a suitable snap ring.

Snap ring (Outer-30)	
Part No.	Thickness mm (in)
805030041	1.53 (0.0602)
805030042	1.65 (0.0650)
805030043	1.77 (0.0697)

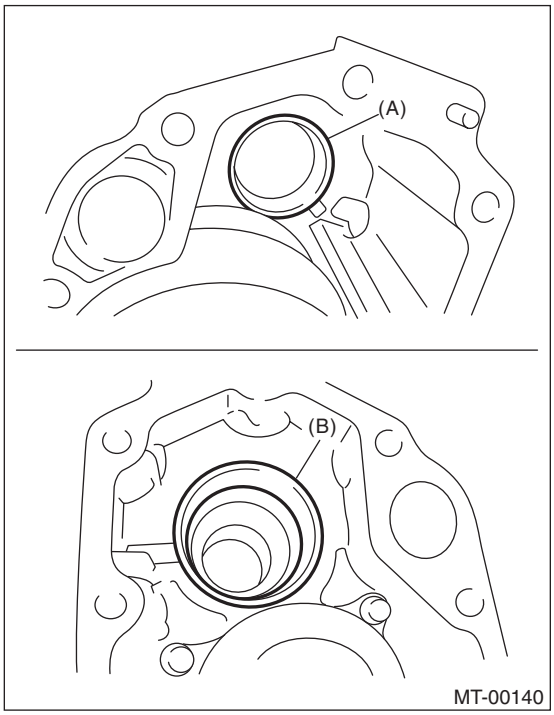
11.Transfer Driven Gear

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-36, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the extension case assembly.
5) Remove the transfer driven gear.



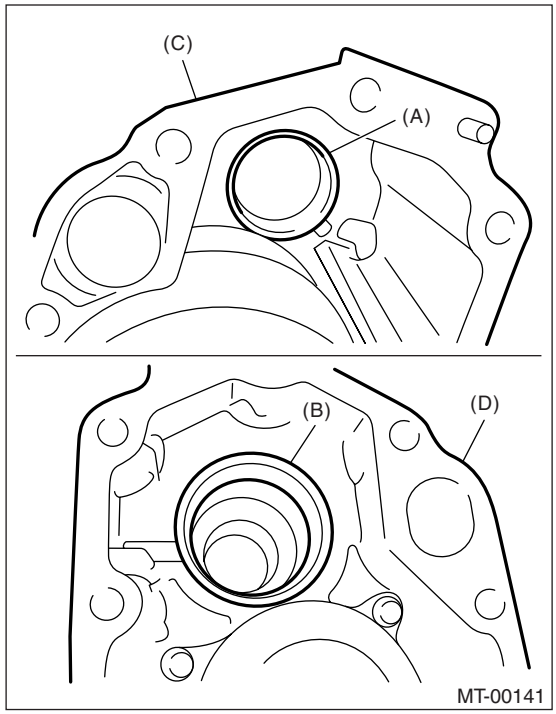
6) Remove the bearing outer race from extension case and transfer case.



(A) Bearing outer race (transfer case)
(B) Bearing outer race (extension case)

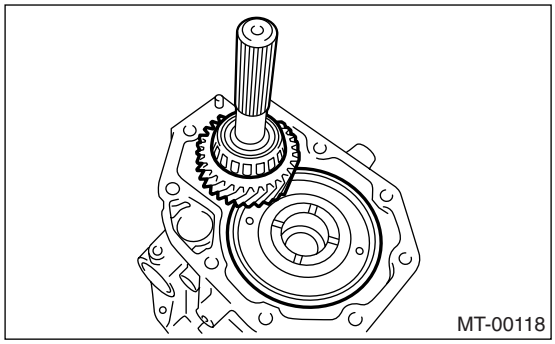
B: INSTALLATION

1) Install the bearing outer race to extension case and transfer case.



(A) Bearing outer race
(B) Bearing outer race
(C) Transfer case
(D) Extension case

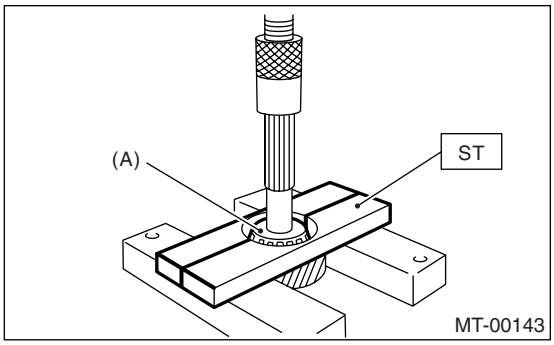
2) Install the transfer driven gear.



3) Install the transfer case and extension case assembly. <Ref. to 5MT-40, INSTALLATION, Transfer Case and Extension Case Assembly.>
4) Install the back-up light switch and neutral position switch. <Ref. to 5MT-36, INSTALLATION, Switches and Harness.>
5) Install the manual transmission assembly to vehicle. <Ref. to 5MT-29, INSTALLATION, Manual Transmission Assembly.>

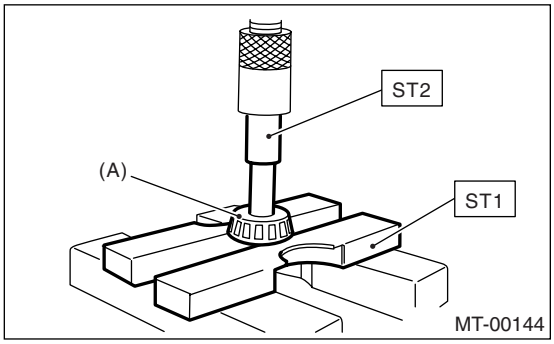
C: DISASSEMBLY

1) Using the ST, remove the roller bearing (extension case side).
ST 498077000 REMOVER



(A) Roller bearing

2) Using the ST1 and ST2, remove the roller bearing (transfer case side).
ST1 498077000 REMOVER
ST2 899864100 REMOVER

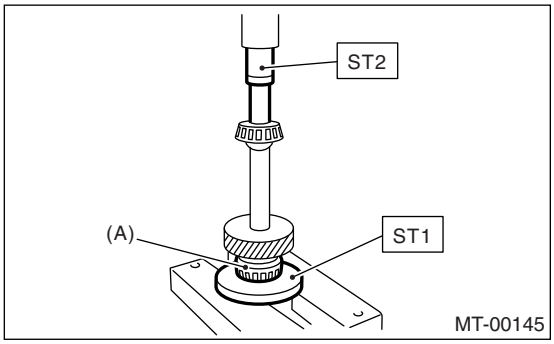


(A) Roller bearing

D: ASSEMBLY

1) Using the ST, install the roller bearing (extension case side).
ST1 398177700 INSTALLER
ST2 899864100 REMOVER

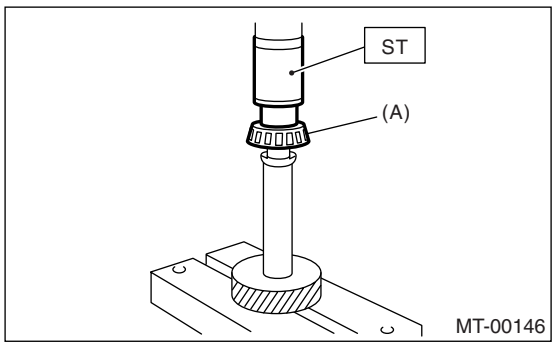
NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)



(A) Roller bearing

2) Using the ST, install the roller bearing (transfer case side).
ST 499757002 INSTALLER

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)



(A) Roller bearing

E: INSPECTION

1) Bearings
Replace the bearings in the following cases:
- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.

2) Driven gear
Replace the driven gear in the following cases:
- If their tooth surfaces and shaft are excessively broken or damaged.

12.Center Differential

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the transfer driven gear. <Ref. to 5MT-46, REMOVAL, Transfer Driven Gear.>
5) Remove the center differential.

B: INSTALLATION

1) Install the center differential into transfer case.
2) Install the transfer driven gear. <Ref. to 5MT-46, INSTALLATION, Transfer Driven Gear.>
3) Install the extension case assembly. <Ref. to 5MT-40, INSTALLATION, Transfer Case and Extension Case Assembly.>
4) Install the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
5) Install the back-up light switch and neutral position switch. <Ref. to 5MT-36, REMOVAL, Switches and Harness.>
6) Install the manual transmission assembly to vehicle. <Ref. to 5MT-29, INSTALLATION, Manual Transmission Assembly.>

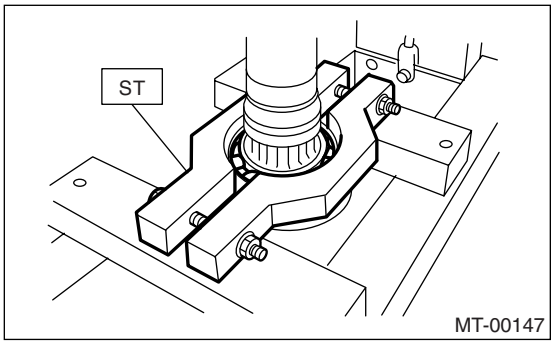
C: DISASSEMBLY

NOTE:
Do not disassemble the center differential because it is a non-disassemble part.

Remove the ball bearing using ST.

NOTE:
Do not reuse the ball bearing.

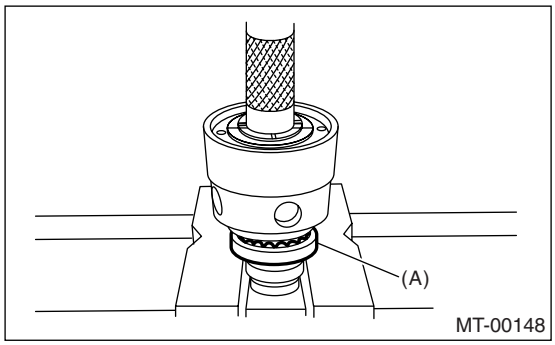
ST 498077300 CENTER DIFFERENTIAL BEARING REMOVER



D: ASSEMBLY

Install the ball bearing to center differential assembly.

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).



(A) Ba ll bearing

E: INSPECTION

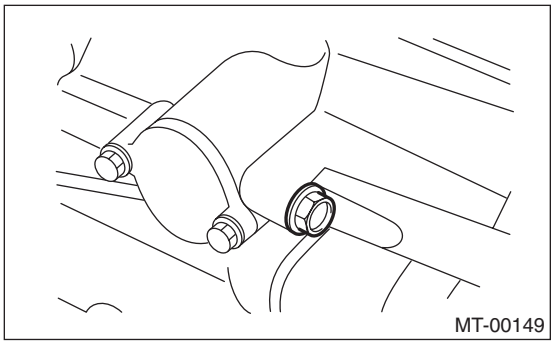
1) Bearings
Replace the bearings in the following cases:
- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.
- Bearings having other defects

2) Center differential
Replace the center differential assembly in the following case:
- Worn or damaged

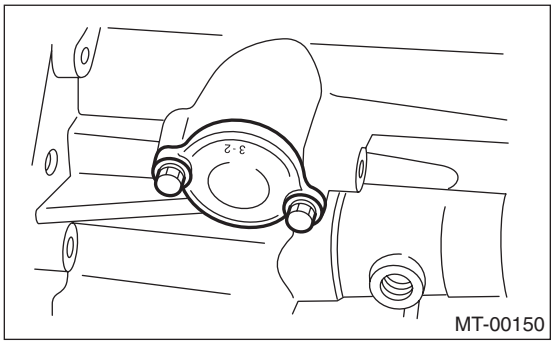
13.Reverse Check Sleeve

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the shifter arm.
4) Remove the plug, spring, washer and reverse check ball.


MT-00149

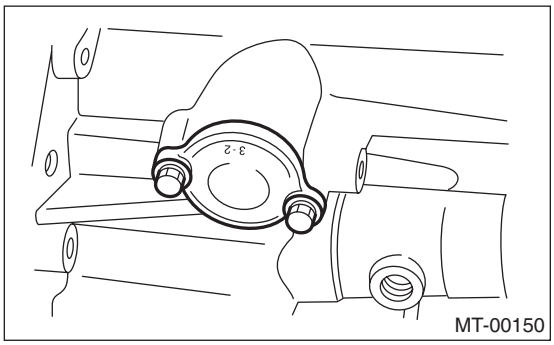
5) Remove the reverse check sleeve.


MT-00150

B: INSTALLATION

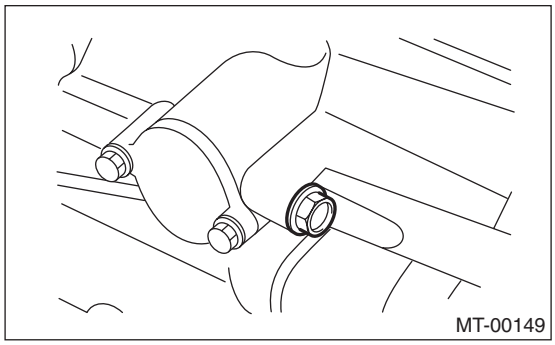
1) Install the reverse check sleeve.

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


MT-00150

2) Install the ball, spring, washer and plug to transfer case.

Tightening torque:
9.75 N·m (1.0 kgf-m, 7.2 ft-lb)

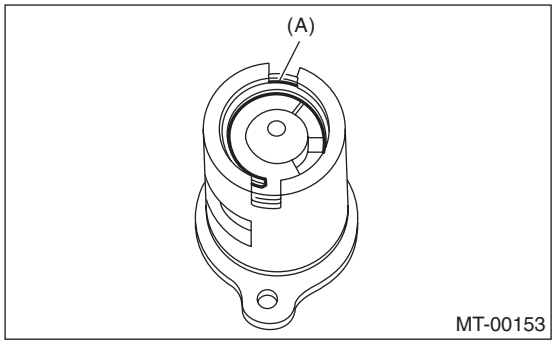

MT-00149

3) Install the shifter arm to transfer case assembly.
4) Install the transfer case with extension case assembly. <Ref. to 5MT-40, INSTALLATION, Transfer Case and Extension Case Assembly.>
5) Install the manual transmission assembly to vehicle. <Ref. to 5MT-29, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

1) Cover the reverse check sleeve with a rag, and remove the snap ring using a screwdriver.

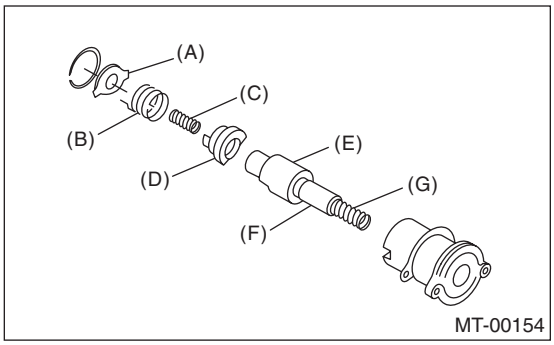
NOTE:
Replace the snap ring with a new one if deformed or weakened.



MT-00153

(A) Snap ring

2) Remove the reverse check plate, reverse check spring, reverse check cam, return spring (5th-Rev), reverse accent shaft, return spring cap and return spring (1st-2nd).



(A) Reverse check plate
(B) Reverse check spring
(C) Return spring (5th-Rev)
(D) Reverse check cam
(E) Reverse accent shaft
(F) Return spring cap
(G) Return spring (1st-2nd)

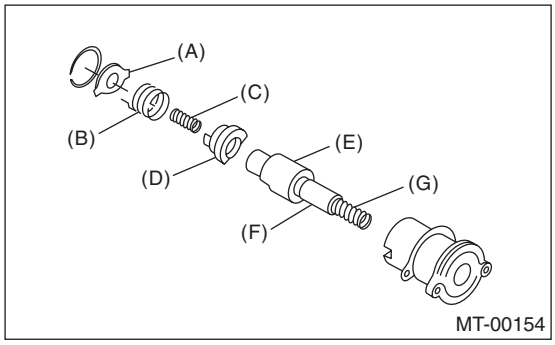
3) Remove the O-ring.

NOTE:
• Reverse check sleeve assembly uses an O-ring which should not be scratched.
• Be careful not to break the adjustment shim placed between reverse check sleeve assembly and case.

D: ASSEMBLY

1) Install the return spring (1st-2nd), return spring cap, reverse accent shaft, check cam, return spring and check spring onto reverse check sleeve.

NOTE:
Be sure the bent section of reverse check spring is positioned in the groove in check cam.

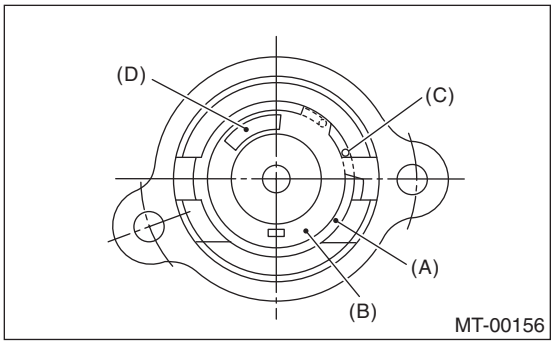


(A) Reverse check plate
(B) Reverse check spring
(C) Return spring (5th-Rev)
(D) Reverse check cam
(E) Reverse accent shaft
(F) Return spring cap
(G) Return spring (1st-2nd)

2) Hook the bent section of reverse check spring over reverse check plate.
3) Rotate the cam so that the protrusion of reverse check cam is at the opening in plate.
4) With the cam held in that position, install the plate onto reverse check sleeve and hold with snap ring.
5) Position the O-ring in groove in sleeve.

E: INSPECTION

• Make sure the cutout section of reverse accent shaft is aligned with the opening in reverse check sleeve.
• Spin the cam by hand for smooth rotation.
• Move the cam and shaft all the way toward plate and release.
If the cam does not return properly, replace the reverse check spring; if shaft does not, check for scratches on the inner surface of sleeve. If sleeve is in good order, replace the spring.



(A) Snap ring
(B) Reverse check plate
(C) Check spring
(D) Check cam

• Select a suitable reverse accent shaft and reverse check plate. <Ref. to 5MT-51, ADJUSTMENT, Reverse Check Sleeve.>

F: ADJUSTMENT

1. NEUTRAL POSITION ADJUSTMENT

1) Shift the gear into 3rd gear position.
2) Shifter arm turns lightly toward the 1st/2nd gear side but heavily toward the reverse gear side because of the function of return spring, until arm contacts the stopper.
3) Make adjustment so that the heavy stroke (reverse side) is a little more than the light stroke (1st/2nd side).
4) To adjust, remove the bolts holding reverse check sleeve assembly to the case, move the sleeve assembly outward, and place adjustment shim (0 to 1 ea.) between sleeve assembly and case to adjust the clearance.

CAUTION:
Be careful not to break the O-ring when placing shim(s).

NOTE:
• When the shim is removed, the neutral position will move closer to reverse; when shim is added, the neutral position will move closer to 1st gear.
• If the shims alone cannot adjust clearance, replace the reverse accent shaft and re-adjust.

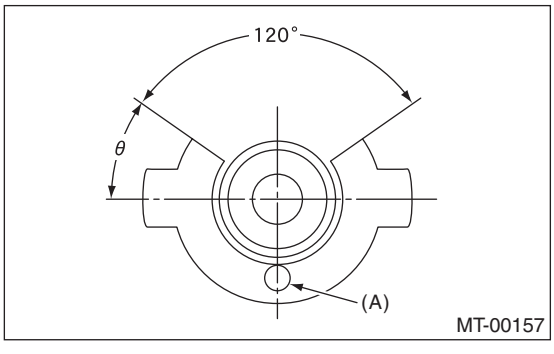
Adjustment shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

Reverse accent shaft		
Part No.	Mark	Remarks
32188AA090	3	Neutral position is closer to 1st gear.
32188AA100	0	Standard
32188AA110	1	Neutral position is closer to reverse gear.

2. REVERSE CHECK PLATE ADJUSTMENT

1) Shift the shifter arm to “5th” and then to reverse to see if reverse check mechanism operates properly.
2) Also check to see if the arm returns to neutral when released from reverse position. If the arm does not return properly, replace the reverse check plate.

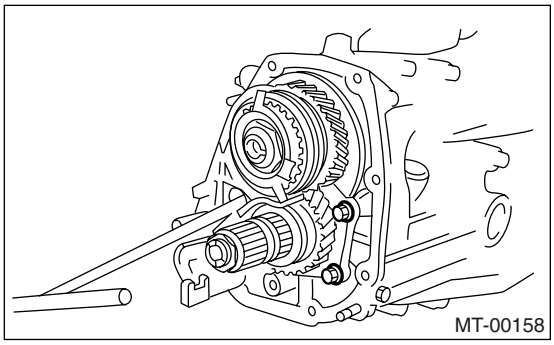
Reverse check plate			
Part No.	(A): No.	Angle θ	Remarks
32189AA000	0	28°	Arm stops closer to 5th gear.
32189AA010	1	31°	Arm stops closer to 5th gear.
32189AA020	2	34°	Arm stops in the center.
32189AA030	3	37°	Arm stops closer to reverse gear.
32189AA040	4	40°	Arm stops closer to reverse gear.



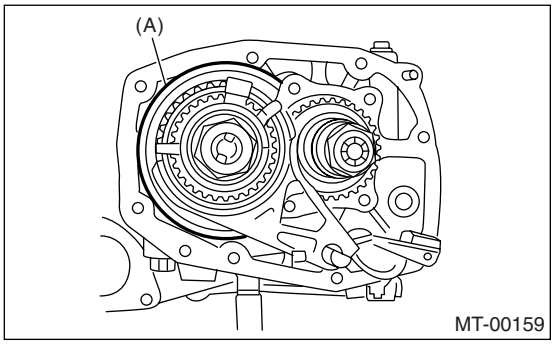
14.Transmission Case

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the clutch release lever. <Ref. to CL-14, REMOVAL, Release Bearing and Lever.>
3) Remove the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the bearing mounting bolts.

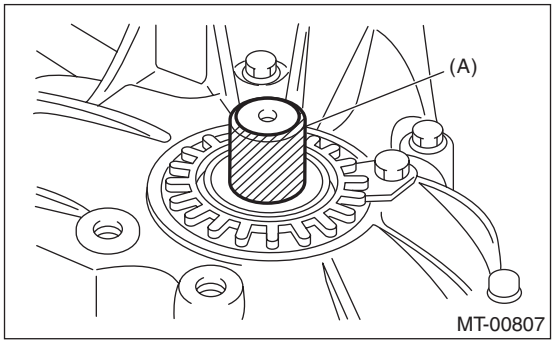


5) Remove the main shaft rear plate.



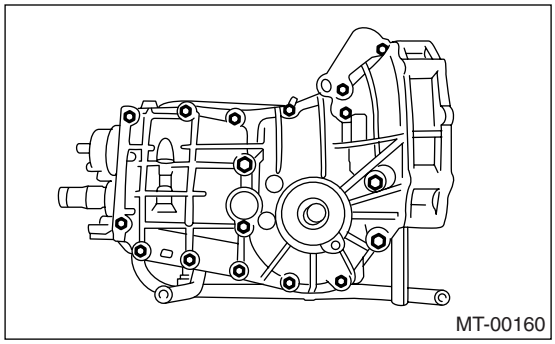
(A) Main shaft rear plate

6) Put vinyl tape around the splines of right and left axle drive shafts to prevent damage to oil seal.



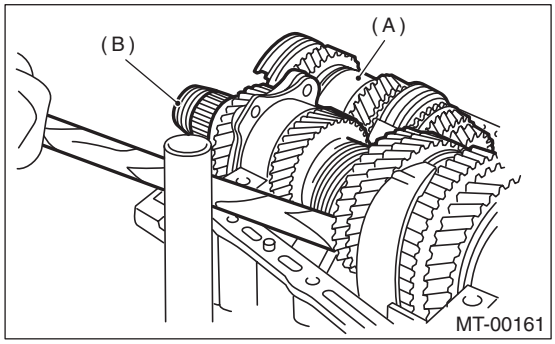
(A) Vinyl tape

7) Separate the transmission case into right and left cases by loosening the coupling bolts and nuts.



8) Remove the drive pinion shaft assembly from left side transmission case.

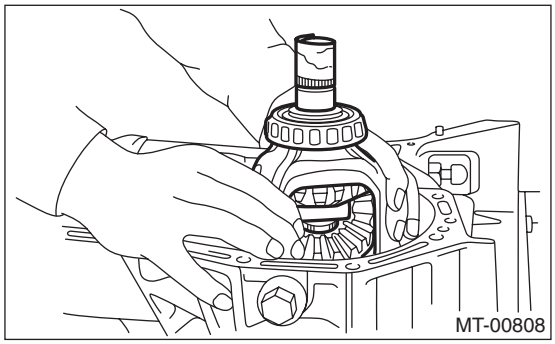
NOTE:
Use a hammer handle, etc. to remove if too tight.



(A) Main shaft assembly
(B) Drive pinion shaft assembly

9) Remove the main shaft assembly.
10) Remove the differential assembly.

NOTE:
• Be careful not to confuse the right and left roller bearing outer races.
• Be careful not to damage the retainer oil seal.



B: INSTALLATION

1) Wipe off grease, oil and dust on the mating surfaces of transmission cases with white gasoline.
2) Install the front differential assembly.

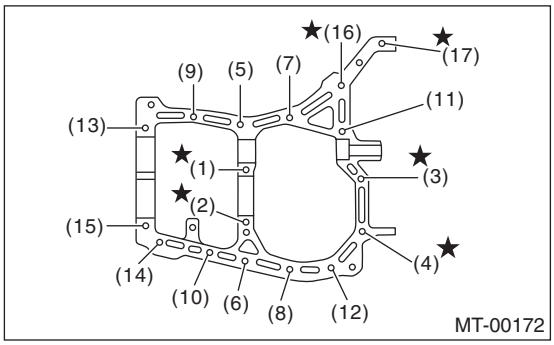
3) Install the main shaft assembly.
Install the transmission case knock pin into needle bearing knock pin hole.
4) Install the drive pinion shaft assembly.
Install the transmission case knock pin into roller bearing knock pin hole.
5) Apply liquid gasket, and then put the case right side and left side together.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent

6) Tighten the seventeen bolts with bracket, clip, etc. as shown in the figure.

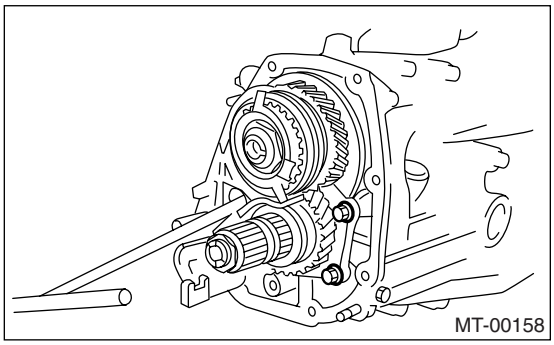
NOTE:
• Insert the bolts from bottom and tighten the nuts at top.
• Put the cases together so that drive pinion shim and input shaft holder shim are not caught up in between.
• Confirm that the speedometer gear is meshed.

Tightening torque:
8 mm bolt
25 N·m (2.5 kgf-m, 18.1 ft-lb)
★ 10 mm bolt
39 N·m (4.0 kgf-m, 28.9 ft-lb)



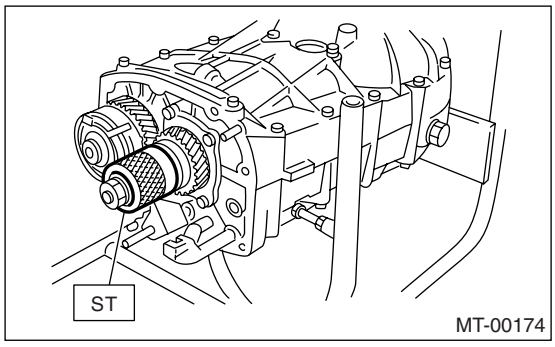
7) Tighten the ball bearing attachment bolts.

Tightening torque:
29 N·m (3.0 kgf-m, 21.7 ft-lb)

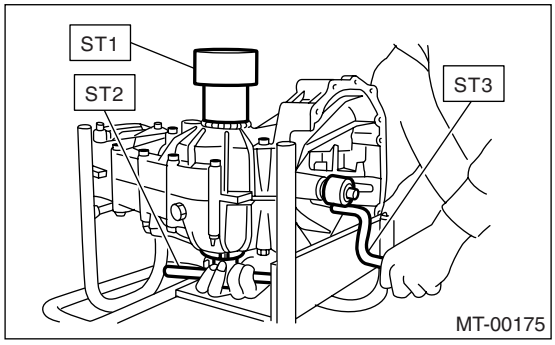


8) Backlash adjustment of hypoid gear and preload adjustment of roller bearing:

NOTE:
Support the drive pinion assembly with ST.
ST 498427100 STOPPER



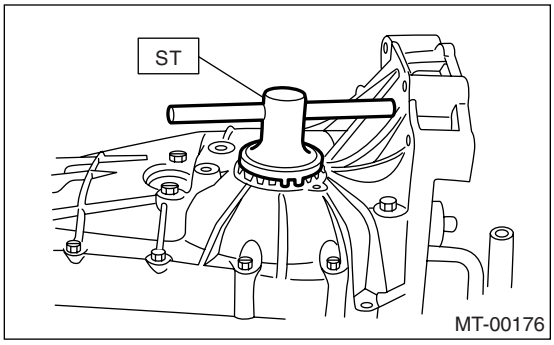
9) Place the transmission with case left side facing downward and put ST1 on bearing cup.
10) Screw the retainer assembly into left case from the bottom using ST2. Fit the ST3 on transmission main shaft. Shift the gear into 4th or 5th and turn the shaft several times. Screw in the retainer while turning ST3 until a slight resistance is felt on ST2. This is the contact point of hypoid gear and drive pinion shaft. Repeat the above sequence several times to ensure the contact point.
ST1 399780104 WEIGHT
ST2 499787000 WRENCH ASSY
ST3 499927100 HANDLE



11) Remove the weight and screw in the retainer without O-ring on upper side and stop at the point where slight resistance is felt.

NOTE:
At this point, the backlash between hypoid gear and drive pinion shaft is zero.

ST 499787000 WRENCH ASSY



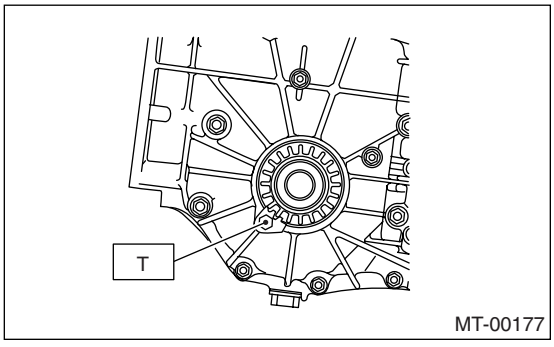
12) Loosen the retainer on the lower side by 3 notches and turn in the retainer on the upper side by the same amount in order to obtain the backlash.
13) Turn in the retainer on the upper side additionally by 1 notch in order to apply preload on taper roller bearing.
14) Install temporarily both the upper and lower lock plates and mark both holder and lock plate for later readjustment.

NOTE:
Install the lock plate upside down if it is hard to install.

15) Turn the transmission main shaft several times while tapping around the retainer lightly with plastic hammer.
16) Inspect and adjust the backlash and tooth contact of hypoid gear. <Ref. to 5MT-72, INSPECTION, Front Differential Assembly.>
17) After checking the tooth contact of hypoid gears, remove the lock plate. Then loosen the retainer until the O-ring groove appears. Fit O-ring into the groove and tighten the retainer to the original position.
Install the lock plate.

NOTE:
• Record how many times the retainer is turned while loosening.
• Carry out this job on both upper and lower retainers.

Tightening torque:
T: 24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



18) Selecting of main shaft rear plate. <Ref. to 5MT-60, ADJUSTMENT, Main Shaft Assembly.>
19) Install the clutch release lever and bearing. <Ref. to CL-14, INSTALLATION, Release Bearing and Lever.>
20) Install the transfer case with extension case assembly. <Ref. to 5MT-40, INSTALLATION, Transfer Case and Extension Case Assembly.>
21) Install the manual transmission assembly into the vehicle.<Ref. to 5MT-29, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

Check the transmission case for cracks, damage, and oil leaks.

15.Main Shaft Assembly

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the transmission case. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the drive pinion shaft assembly. <Ref. to 5MT-61, REMOVAL, Drive Pinion Shaft Assembly.>
5) Remove the main shaft assembly.

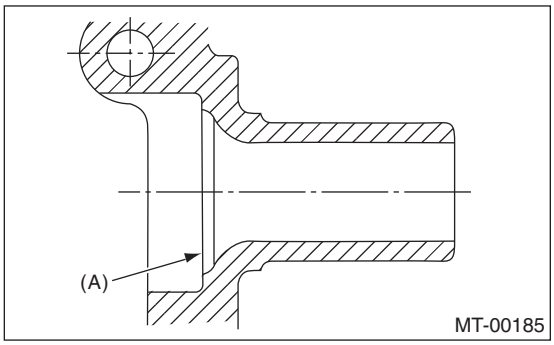
B: INSTALLATION

1) Install the needle bearing and oil seal onto the front of transmission main shaft assembly.

NOTE:
• Wrap the clutch splined section with vinyl tape to prevent damage to oil seal.
• Apply grease (Unilube #2 or equivalent) to the sealing lip of oil seal.
• Use a new one.

2) Install the needle bearing outer race knock pin hole into transmission case knock pin.

NOTE:
Align the end face of seal with surface (A) when installing oil seal.



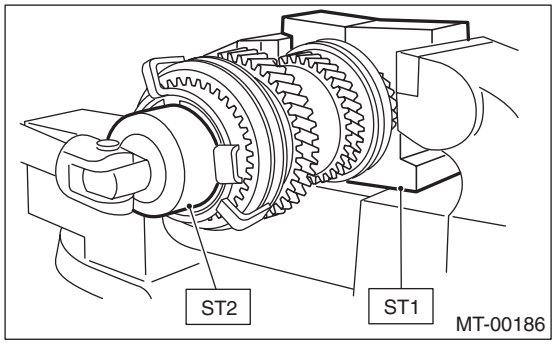
3) Install the drive pinion assembly. <Ref. to 5MT-61, INSTALLATION, Drive Pinion Shaft Assembly.>
4) Install the transmission case. <Ref. to 5MT-52, INSTALLATION, Transmission Case.>
5) Install the transfer case with extension case assembly. <Ref. to 5MT-40, INSTALLATION, Transfer Case and Extension Case Assembly.>
6) Install the manual transmission assembly to vehicle. <Ref. to 5MT-29, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

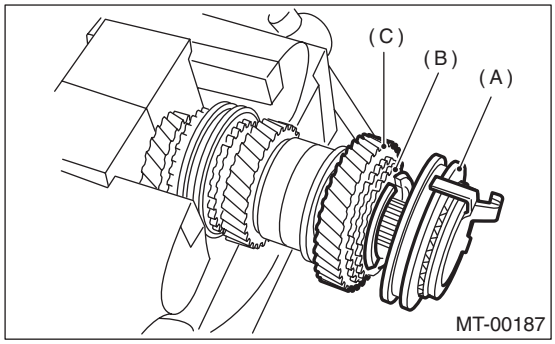
1) Put vinyl tape around the main shaft splines to protect oil seal from damage. Then pull out the oil seal and needle bearing by hand.
2) Remove the lock nut from transmission main shaft assembly.

NOTE:
Remove the caulking before removing lock nut.

ST1 498937000 TRANSMISSION HOLDER
ST2 499987003 SOCKET WRENCH (35)

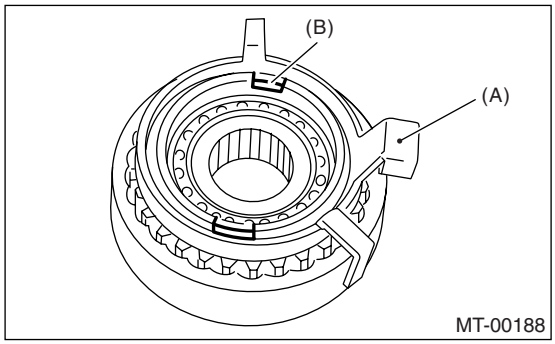


3) Remove the 5th-Rev sleeve and hub assembly, baulk ring, 5th drive gear and needle bearing.



(A) 5th-Rev sleeve and hub ASSY
(B) Baulk ring
(C) 5th drive gear

4) Remove the snap ring and synchro cone stopper from 5th-Rev sleeve and hub assembly.

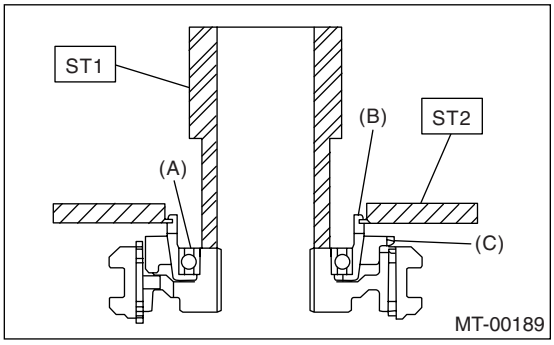


(A) Synchro cone stopper
(B) Snap ring

5) Using the ST1, ST2 and a press, remove the ball bearing, synchro cone and baulk ring (Rev).

NOTE:
• Replace the sleeve and hub with new ones. Do not attempt to disassemble because they must engage at a specified point. If they should be disassembled, mark engagement point on splines beforehand.
• Do not reuse the ball bearing.

ST1 499757002 INSTALLER
ST2 498077400 SYNCHRO CONE REMOVER

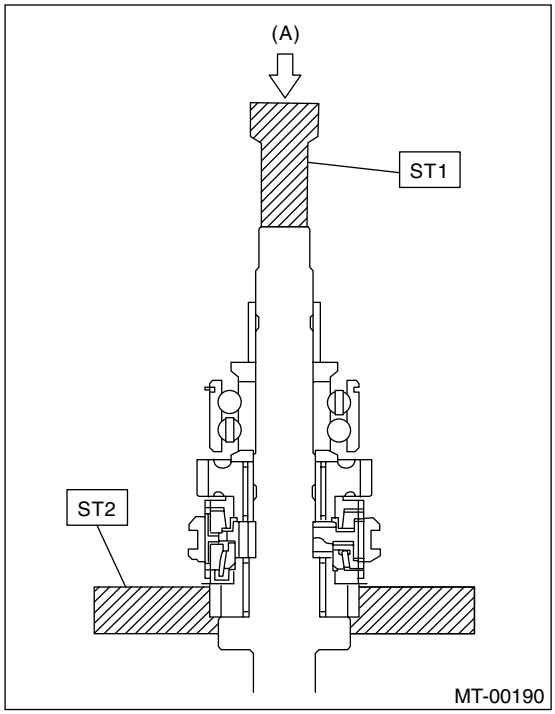


(A) Ball bearing
(B) Synchro cone
(C) Baulk ring

6) Using the ST1 and ST2, remove rest of the parts.

NOTE:
Replace the sleeve and hub with new ones. Do not attempt to disassemble because they must engage at a specified point. If they should be disassembled, mark engagement point on splines beforehand.

ST1 899864100 REMOVER
ST2 899714110 REMOVER

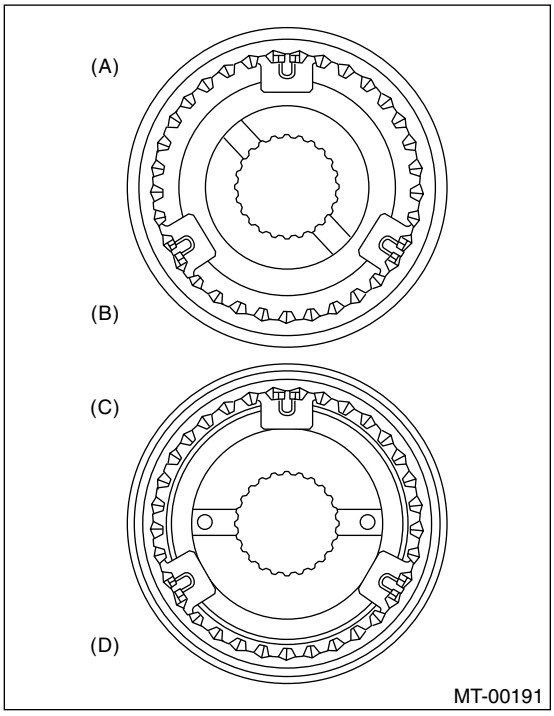


(A) Press

D: ASSEMBLY

1) Assemble each sleeve and hub assembly.

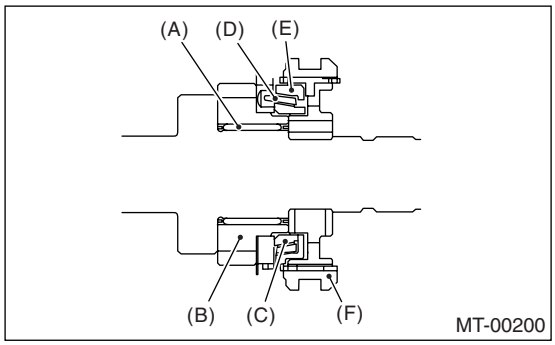
NOTE:
Position the open ends of spring 120° apart.



(A) 3rd-4th hub ASSY
(B) 3rd gear side
(C) 5th-Rev hub ASSY
(D) 5th gear side

2) Install the 3rd drive gear, outer baulk ring, synchro cone, inner baulk ring, sleeve and hub assembly for 3rd needle bearing on transmission main shaft.

NOTE:
Align the groove in baulk ring with shifting insert.

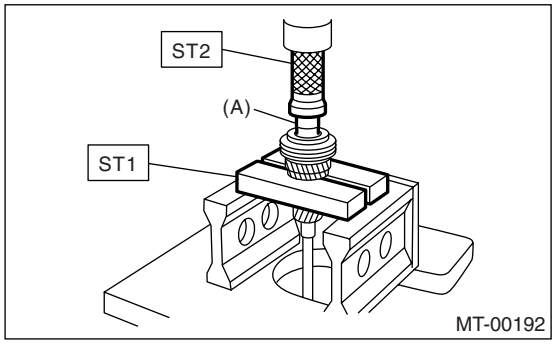


(A) 3rd needle bearing
(B) 3rd drive gear
(C) Inner baulk ring
(D) Synchro cone
(E) Outer baulk ring
(F) Sleeve and hub ASSY

3) Install the 4th needle bearing race onto transmission main shaft using ST1, ST2 and a press.

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

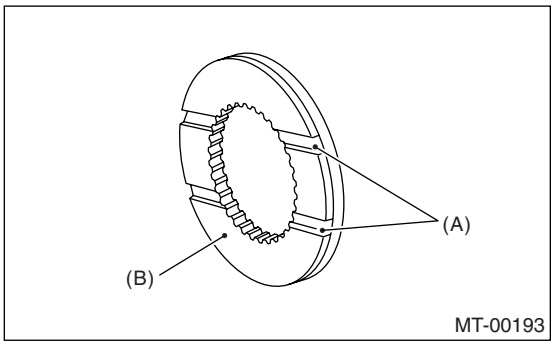
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



(A) 4th needle bearing race

4) Install the baulk ring, needle bearing, 4th drive gear and 4th gear thrust washer to transmission main shaft.

NOTE:
Align the baulk ring and gear & hub assembly with key groove.

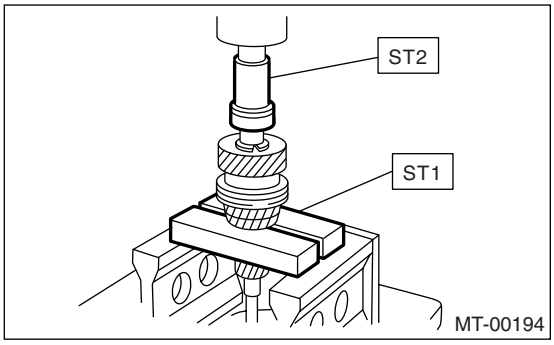


(A) Groove
(B) 4th gear side

5) Drive the ball bearing onto the rear section of transmission main shaft using ST1, ST2 and a press.

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

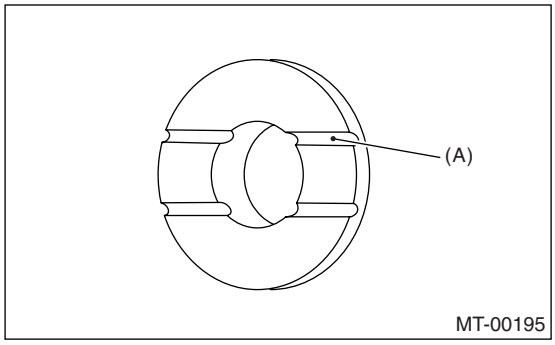
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



6) Using the ST1 and ST2, install the 5th gear thrust washer and 5th needle bearing race onto the rear section of transmission main shaft.

NOTE:
- Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
- Face the thrust washer in correct direction.

ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER

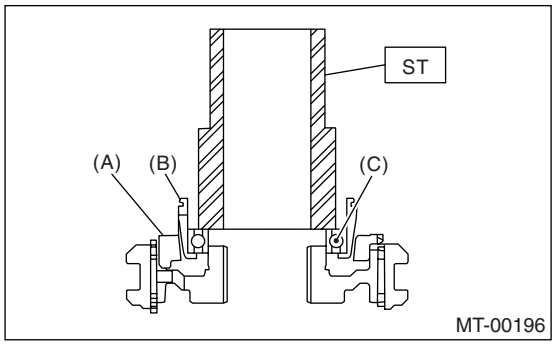


(A) Face this surface to 5th gear side.

7) Install the bearing onto synchro cone.
8) Install the baulk ring and synchro cone onto 5th-Rev sleeve and hub assembly using ST and a press.

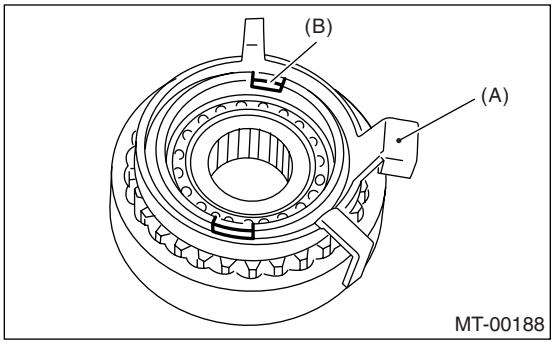
NOTE:
- Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
- Use a new ball bearing.
- After press fitting, make sure the synchro cone rotates freely.

ST 499757002 INSTALLER



(A) Baulk ring
(B) Synchro cone
(C) Ball bearing

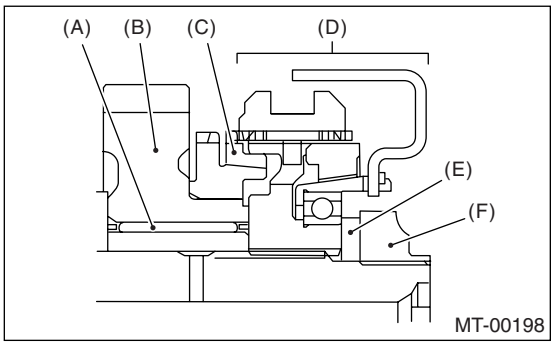
9) Install the synchro cone stopper and snap ring to 5th-Rev sleeve and hub assembly.



(A) Synchro cone stopper
(B) Snap ring

10) Install the rest parts to the rear section of transmission main shaft.

NOTE:
Align the groove in baulk ring with shifting insert.



(A) Needle bearing
(B) 5th drive gear
(C) Baulk ring
(D) 5th-Rev sleeve and hub ASSY
(E) Lock washer
(F) Lock nuts

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

NOTE:
Secure the lock nuts in two places after tightening.

ST1 499987003 SOCKET WRENCH
ST2 498937000 TRANSMISSION HOLDER

Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

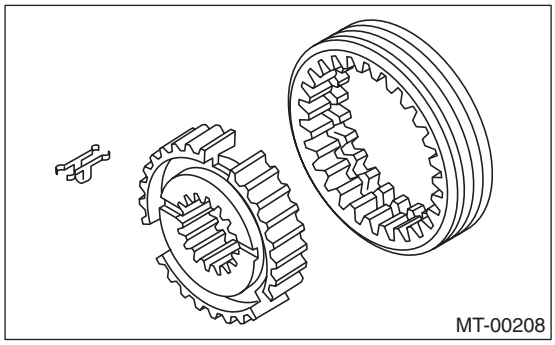
1) Bearings
Replace the bearings in the following cases:
• Bearings whose balls, outer races and inner races are broken or rusty.
• Worn bearings
• Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.
• Bearings having other defects

2) Bushing (each gear)
Replace the bushing in the following cases:
• When the sliding surface is damaged or abnormally worn.
• When the inner wall is abnormally worn.

3) Gears
• Replace the gears with new ones if their tooth surfaces are broken, damaged, or excessively worn.
• Correct or replace if the cone that contacts the baulk ring is rough or damaged.
• Correct or replace if the inner surface or end face is damaged.

4) Baulk ring
Replace the ring in the following cases:
• When the inner surface and end face are damaged.
• When the ring inner surface is abnormally or partially worn down.
• When the contact surface of the synchronizer ring insert is scored or abnormally worn down.

5) Shifting insert key
Replace the insert if deformed, excessively worn, or defective in any way.



6) Oil seal
Replace the oil seal if the lip is deformed, hardened, damaged, worn, or defective in any way.

7) O-ring
Replace the O-ring if the sealing face is deformed, hardened, damaged, worn, or defective in any way.

8) Gearshift mechanism
Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.

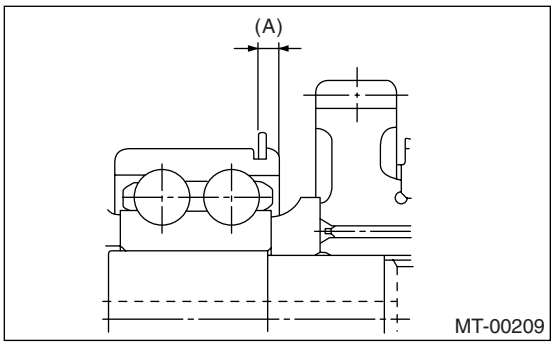
F: ADJUSTMENT

Selection of main shaft rear plate:
Using the ST, measure the amount (A) of ball bearing protrusion from transmission main case surface and select the proper plate in the following table:

NOTE:
Before measuring, tap the end of main shaft with a plastic hammer lightly in order to make the clearance zero between the main case surface and the moving flange of bearing.

ST 498147000 DEPTH GAUGE

Dimension (A) mm (in)	Part No.	Mark
4.00 — 4.13 (0.1575 — 0.1626)	32294AA041	1
3.87 — 3.99 (0.1524 — 0.1571)	32294AA051	2

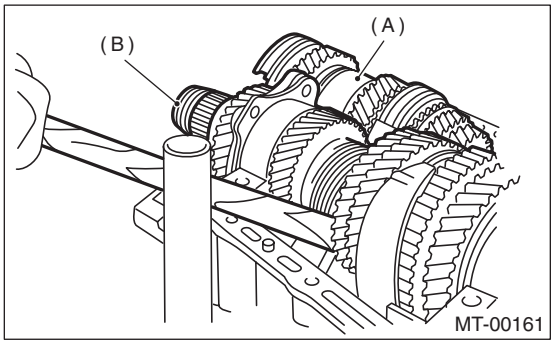


16.Drive Pinion Shaft Assembly

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the transmission case. <Ref. to 5MT-52, REMOVAL, Transmission Case.>
4) Remove the drive pinion shaft assembly.

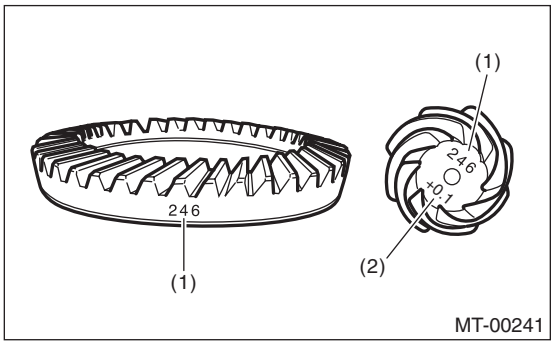
NOTE:
Use a hammer handle, etc. to remove if too tight.



(A) Main shaft assembly
(B) Drive pinion shaft assembly

B: INSTALLATION

1) Remove the differential assembly.
2) Alignment marks/numbers on hypoid gear set:
The upper number on drive pinion is the match number for combining it with hypoid driven gear. The lower number is for shim adjustment. If no lower number is shown, the value is zero. The number on hypoid driven gear indicates a number for combination with drive pinion.

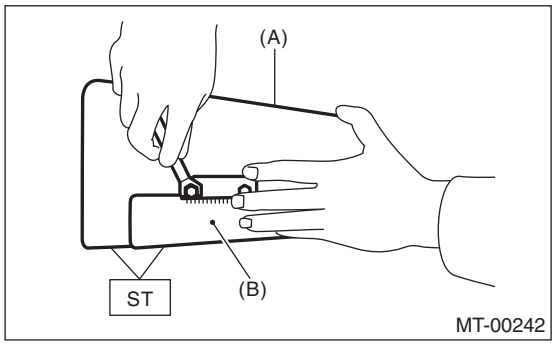


(A) Match number
(B) Shim adjust number

3) Place the drive pinion shaft assembly on right hand transmission main case without shim and tighten the bearing mounting bolts.
4) Inspection and adjustment of ST:

NOTE:
• Loosen the two bolts and adjust so that the scale indicates 0.5 correctly when the plate end and the scale end are on the same level.
• Tighten the two bolts.

ST 499917500 DRIVE PINION GAUGE ASSY



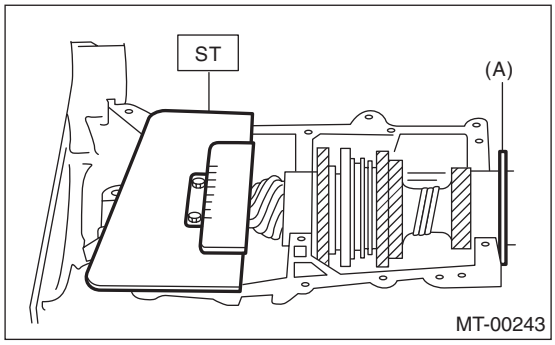
(A) Plate
(B) Scale

5) Position the ST by inserting the knock pin of ST into the knock hole in transmission case.

ST 499917500 DRIVE PINION GAUGE ASSY

6) Slide the drive pinion gauge scale with finger tip and read the value at the point where it matches with the end face of drive pinion.

ST 499917500 DRIVE PINION GAUGE ASSY



(A) Adjust clearance to zero without shim.

7) The thickness of shim shall be determined by adding the value indicated on drive pinion to the value indicated on ST. (Add if the number on drive pinion is prefixed by + and subtract if the number is prefixed by −.)

ST 499917500 DRIVE PINION GAUGE ASSY

8) Select one to three shims from the next table for the value determined as described above and take a shim thickness which is closest to the indicated value.

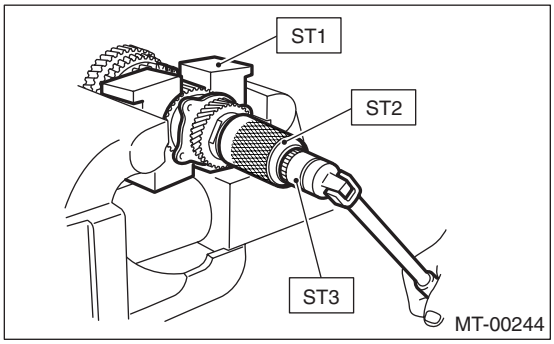
Drive pinion shim	
Part No.	Thickness mm (in)
32295AA031	0.150 (0.0059)
32295AA041	0.175 (0.0069)
32295AA051	0.200 (0.0079)
32295AA061	0.225 (0.0089)
32295AA071	0.250 (0.0098)
32295AA081	0.275 (0.0108)
32295AA091	0.300 (0.0118)
32295AA101	0.500 (0.0197)

9) Install the differential assembly. <Ref. to 5MT-69, INSTALLATION, Front Differential Assembly.>
10) Set the transmission main shaft assembly and drive pinion assembly in position. (So there is no clearance between the two when moved all the way to the front). Inspect the suitable 1st-2nd, 3rd-4th and 5th shifter fork so that coupling sleeve and reverse driven gear are positioned in the center of their synchronizing mechanisms. <Ref. to 5MT-66, INSPECTION, Drive Pinion Shaft Assembly.>
11) Install the transmission case. <Ref. to 5MT-52, INSTALLATION, Transmission Case.>
12) Install the transfer case with extension case assembly. <Ref. to 5MT-40, INSTALLATION, Transfer Case and Extension Case Assembly.>
13) Install the manual transmission assembly to vehicle. <Ref. to 5MT-27, Manual Transmission Assembly.>

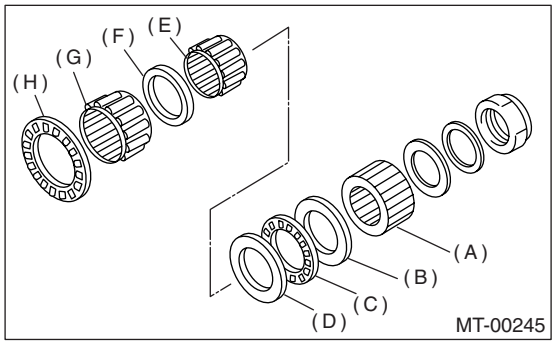
C: DISASSEMBLY

NOTE:
Attach a cloth to the end of driven shaft (on the frictional side of thrust needle bearing) to prevent damage during disassembly or reassembly.

1) Straighten the lock nut at staked portion. Remove the lock nut using ST1, ST2 and ST3.
ST1 899884100 HOLDER
ST2 498427100 STOPPER
ST3 899988608 SOCKET WRENCH (27)



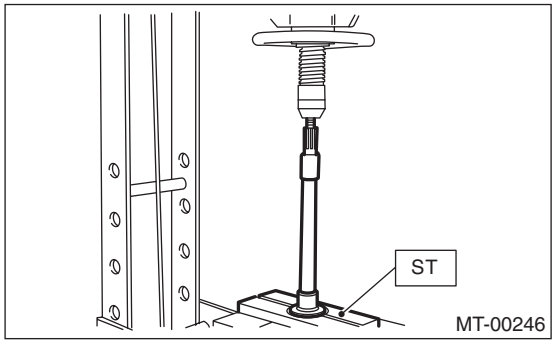
2) Withdraw the drive pinion from driven shaft.
Remove the differential bevel gear sleeve, adjusting washer No. 1, adjusting washer No. 2, thrust bearing, needle bearing, drive pinion collar, needle bearing and thrust bearing.



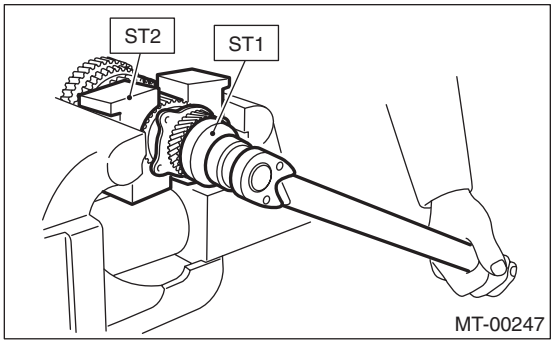
(A) Differential bevel gear sleeve
(B) Washer No. 1 (25 × 37.5 × t)
(C) Thrust bearing (25 × 37.5 × 3)
(D) Washer No. 2 (25 × 37.5 × 4)
(E) Needle bearing (25 × 30 × 20)
(F) Drive pinion collar
(G) Needle bearing (30 × 37 × 23)
(H) Thrust bearing (33 × 50 × 3)

3) Remove the roller bearing and washer using ST and press.

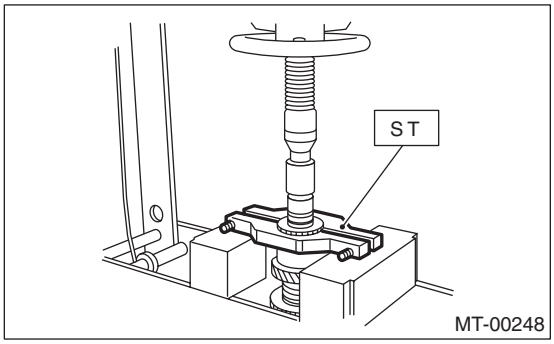
NOTE:
Do not reuse the roller bearing.
ST 498077000 REMOVER



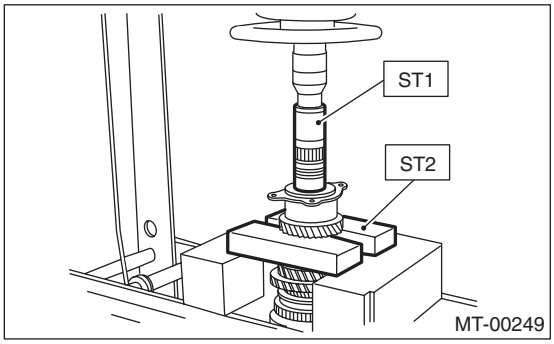
4) Straighten the lock nut at staked portion. Remove the lock nut using ST1 and ST2.
ST1 499987300 SOCKET WRENCH (50)
ST2 899884100 HOLDER



5) Remove the 5th driven gear using ST.
ST 499857000 5TH DRIVEN GEAR REMOVER

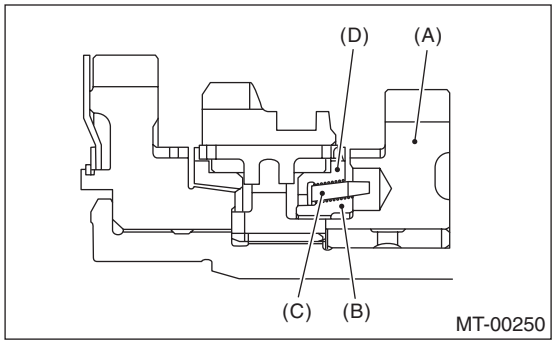


6) Remove the woodruff key.
7) Remove the roller bearing, 3rd-4th driven gear using ST1 and ST2.
ST1 499757002 INSTALLER
ST2 899714110 REMOVER



8) Remove the key.

9) Remove the 2nd driven gear, inner baulk ring, synchro cone and outer baulk ring.

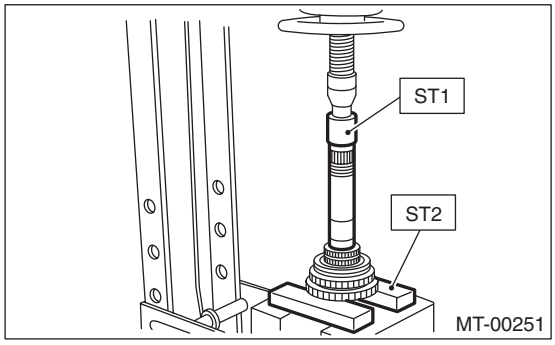


(A) 2nd driven gear
(B) Inner baulk ring
(C) Synchro cone
(D) Outer baulk ring

10) Remove the 1st driven gear, 2nd gear bushing, gear and hub using ST1 and ST2.

NOTE:
Replace the gear and hub if necessary. Do not attempt to disassemble if at all possible because they must engage at a specified point. If they should be disassembled, mark engagement point beforehand.

ST1 499757002 INSTALLER
ST2 899714110 REMOVER

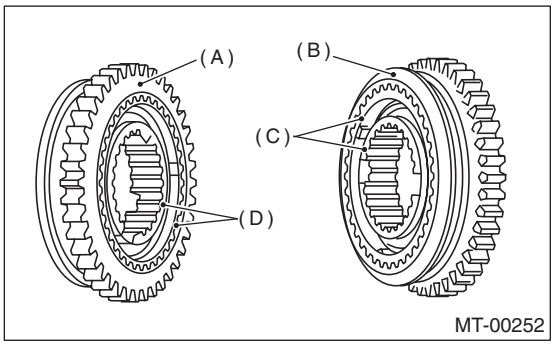


11) Remove the sub gear for 1st driven gear.

D: ASSEMBLY

1) Install the sleeve and hub assembly by matching alignment marks.

NOTE:
Use a new gear and hub assembly, if gear or hub have been replaced.



(A) 1st gear side
(B) 2nd gear side
(C) Flush surface
(D) Stepped surface

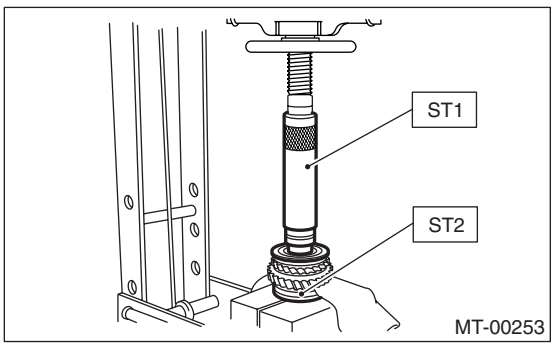
2) Install the washer, snap ring and sub gear to 1st driven gear.
3) Install the 1st driven gear, 1st baulk ring, gear and hub assembly onto driven shaft.

NOTE:
• Take care to install the gear and hub assembly in proper direction.
• Align the baulk ring and gear & hub assembly with key groove.

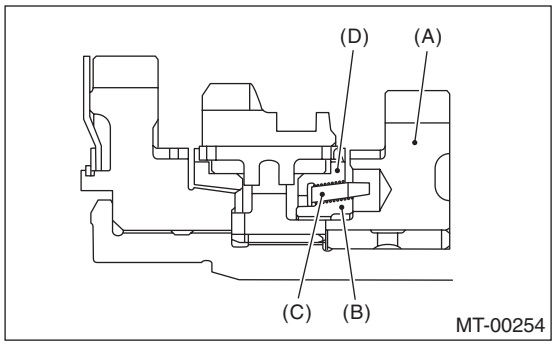
4) Install the 2nd driven gear bushing onto driven shaft using ST1, ST2 and press.

NOTE:
• Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
• Attach a cloth to the end of driven shaft to prevent damage.
• When press fitting, align the oil holes of shaft and bush.

ST1 499277200 INSTALLER
ST2 499587000 INSTALLER



5) Install the 2nd driven gear, inner baulk ring, synchro cone, outer baulk ring and insert onto driven shaft.

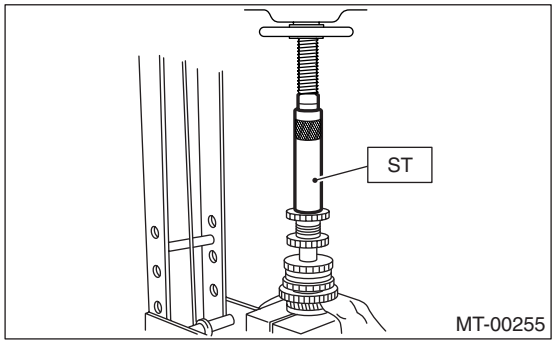


(A) 2nd driven gear
(B) Inner baulk ring
(C) Synchro cone
(D) Outer baulk ring

6) After installing the key on driven shaft, install the 3rd-4th driven gear using ST and press.

NOTE:
• Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
• Align the groove in baulk ring with insert.

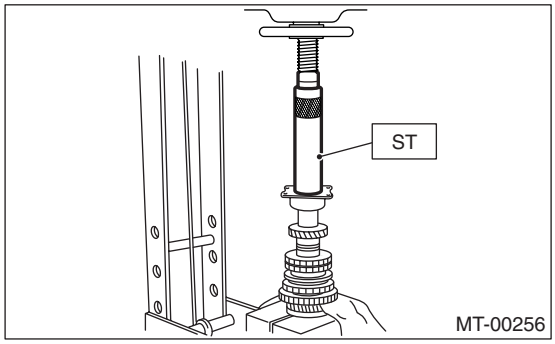
ST 499277200 INSTALLER



7) Install a set of roller bearings onto the driven shaft using ST and press.

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

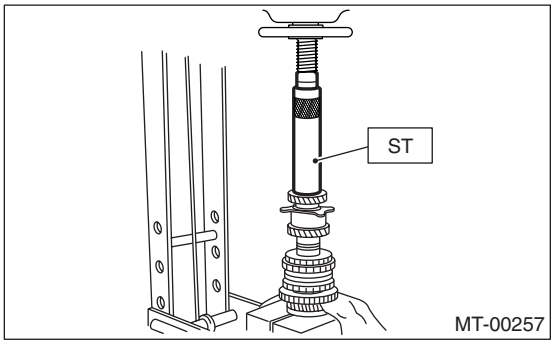
ST 499277200 INSTALLER



8) Position the woodruff key in groove on the rear of driven shaft. Install the 5th driven gear onto driven shaft using ST and press.

NOTE:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

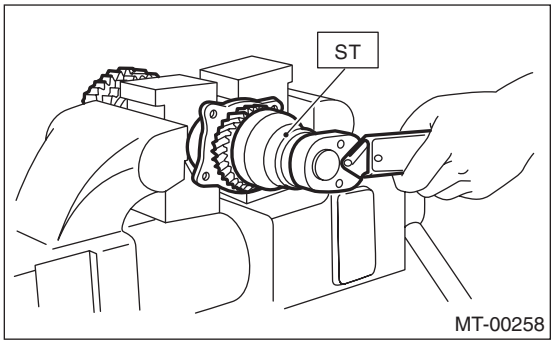
ST 499277200 INSTALLER



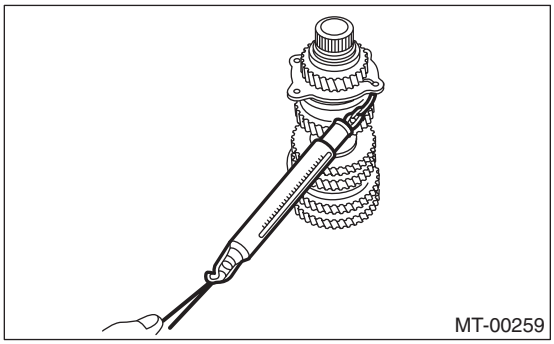
9) Install the lock washer. Install the lock nut and tighten to the specified torque using ST.

ST 499987300 SOCKET WRENCH (50)

Tightening torque:
260 N·m (26.5 kgf-m, 191.7 ft-lb)

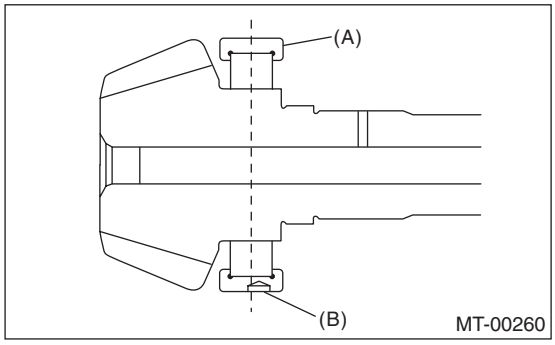


NOTE:
- Stake the lock nut at two points.
- Using the spring balancer, check that starting torque of roller bearing is 0.1 to 1.5 N (0.01 to 0.15 kgf, 0.02 to 0.33 ft).



10) Install the roller bearing onto drive pinion.

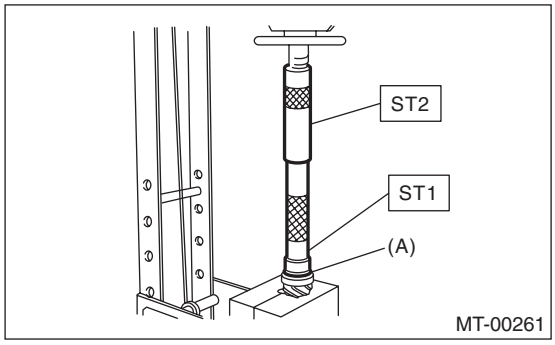
NOTE:
When installing the roller bearing, note its directions (front and rear) because the knock pin hole in outer race is offset.



(A) Roller bearing
(B) Knock pin hole

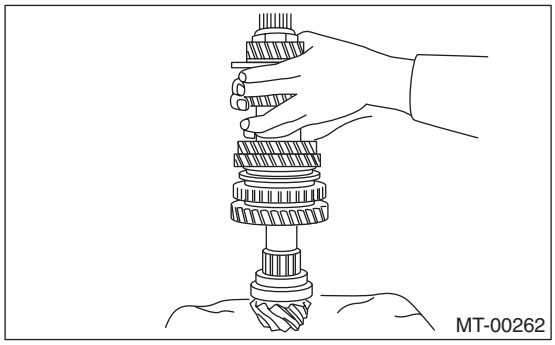
11) Install the washer using ST1, ST2 and press.

ST1 499277100 BUSH 1-2 INSTALLER
ST2 499277200 INSTALLER



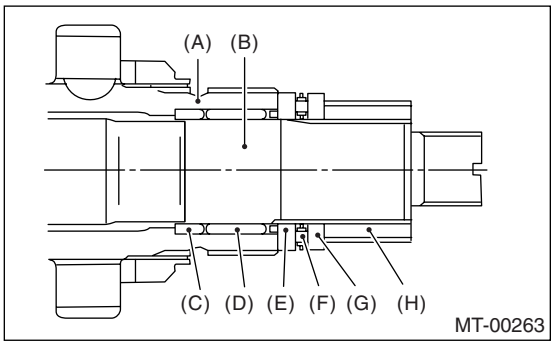
(A) Washer

12) Install the thrust bearing and needle bearing. Install the driven shaft assembly.



13) Install the drive pinion collar, needle bearing, adjusting washer No. 2, thrust bearing, adjusting washer No. 1 and differential bevel gear sleeve in that order.

NOTE:
Be careful because the spacer must be installed in proper direction.

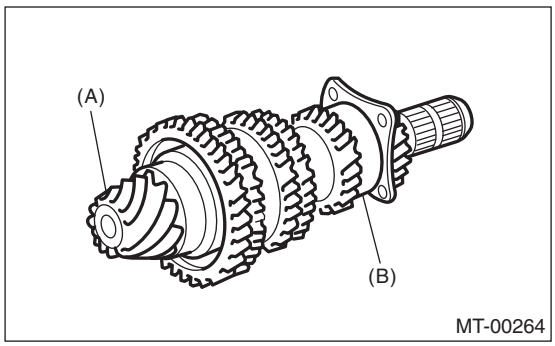


(A) Driven shaft
(B) Drive shaft
(C) Drive pinion collar
(D) Needle bearing (25 × 30 × 20)
(E) Washer No. 2 (25 × 36 × 4)
(F) Thrust bearing (25 × 37.5 × 3)
(G) Washer No. 1 (25 × 36 × t)
(H) Differential bevel gear sleeve

14) Adjust the thrust bearing preload. <Ref. to 5MT-67, ADJUSTMENT, Drive Pinion Shaft Assembly.>

E: INSPECTION

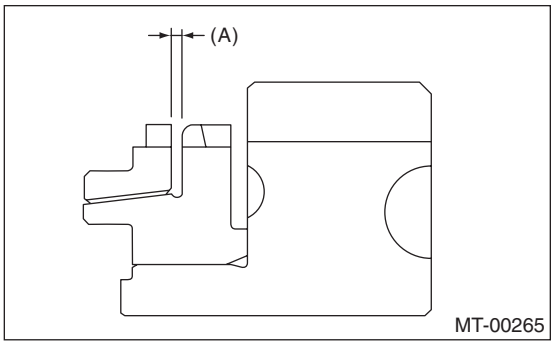
Disassembled parts should be washed clean first and then inspected carefully.
1) Bearings
Replace the bearings in the following cases:
• Bearings whose balls, outer races and inner races are broken or rusty.
• Worn bearings
• Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.
• The ball bearing on the rear side of the drive pinion shaft should be checked for smooth rotation before the drive pinion assembly is disassembled. In this case, because a preload is working on the bearing, its rotation feels like it is slightly dragging unlike the other bearings.



(A) Drive pinion shaft
(B) Ball bearing

• Bearings having other defects
2) Bushing (each gear)
Replace the bushing in the following cases:
• When the sliding surface is damaged or abnormally worn.
• When the inner wall is abnormally worn.
3) Gears
• Replace the gears with new ones if their tooth surfaces are broken, damaged, or excessively worn.
• Correct or replace if the cone that contacts the baulk ring is rough or damaged.
• Correct or replace if the inner surface or end face is damaged.
4) Baulk ring
Replace the ring in the following cases:
• When the inner surface and end face are damaged.
• When the ring inner surface is abnormally or partially worn down.
• If the gap between the end faces of the ring and the gear splined part is excessively small when the ring is pressed against the cone.

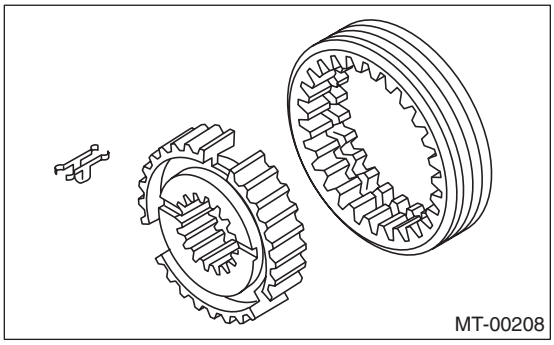
Clearance (A):
0.5 — 1.0 mm (0.020 — 0.040 in)



• When the contact surface of the synchronizer ring insert is scored or abnormally worn down.

5) Shifting insert key

Replace the insert if deformed, excessively worn, or defective in any way.



6) Oil seal

Replace the oil seal if the lip is deformed, hardened, damaged, worn, or defective in any way.

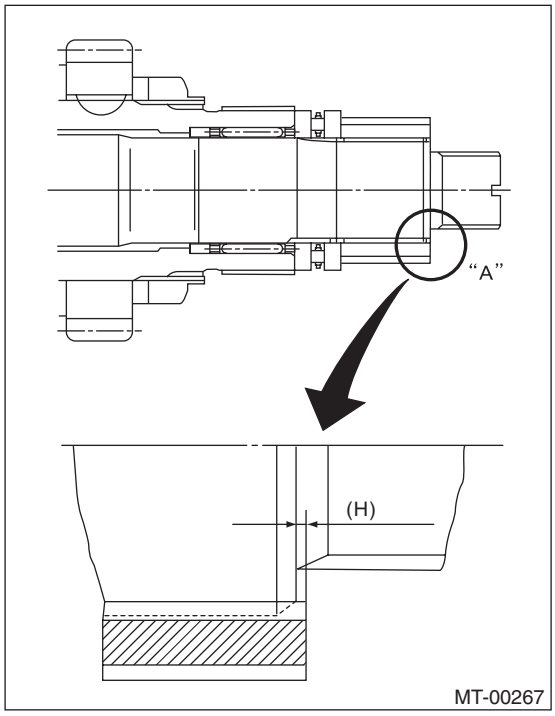
7) O-ring

Replace the O-ring if the sealing face is deformed, hardened, damaged, worn, or defective in any way.

F: ADJUSTMENT

1. THRUST BEARING PRELOAD

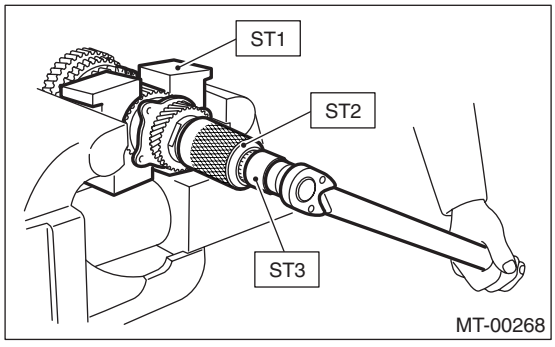
1) Select the adjusting washer No. 1 so that dimension (H) is zero through visual check. Position the washer (18.3 × 30 × 4) and lock washer (18 × 30 × 2) and install the lock nut (18 × 13.5).



2) Using the ST1, ST2 and ST3, tighten the new lock nut to specified torque.

ST1 899884100 HOLDER
ST2 498427100 STOPPER
ST3 899988608 SOCKET WRENCH (27)

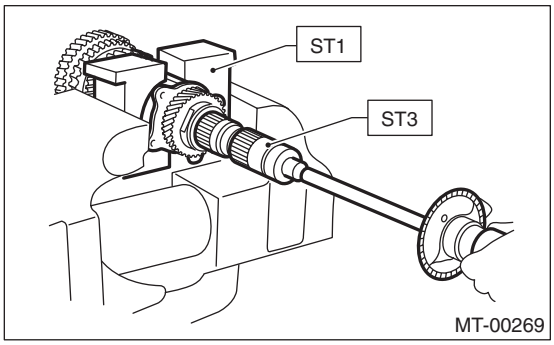
Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)



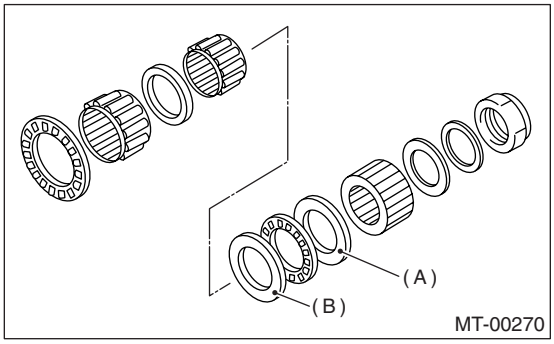
3) After removing the ST2, measure the starting torque using torque driver.

ST1 899884100 HOLDER
ST3 899988608 SOCKET WRENCH (27)

Starting torque:
0.3 — 0.8 N·m (0.03 — 0.08 kgf-m, 0.2 — 0.6 ft-lb)



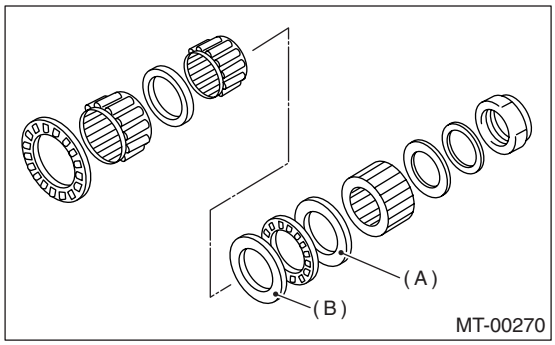
4) If the starting torque is not within specified limit, select a new adjusting washer No. 1 and recheck starting torque.



(A) Adjusting washer No. 1
(B) Adjusting washer No. 2

Adjusting washer No. 1	
Part No.	Thickness mm (in)
803025051	3.925 (0.1545)
803025052	3.950 (0.1555)
803025053	3.975 (0.1565)
803025054	4.000 (0.1575)
803025055	4.025 (0.1585)
803025056	4.050 (0.1594)
803025057	4.075 (0.1604)

5) If the specified starting torque range cannot be obtained when a No. 1 adjusting washer is used, then select a suitable No. 2 adjusting washer from those listed in the following table. Repeat steps 1) through 4) to adjust starting torque.



(A) Adjusting washer No. 1
(B) Adjusting washer No. 2

Starting torque	Dimension H	Washer No. 2
Low	Small	Select thicker one.
High	Large	Select thinner one.

Adjusting washer No. 2	
Part No.	Thickness mm (in)
803025059	3.850 (0.1516)
803025054	4.000 (0.1575)
803025058	4.150 (0.1634)

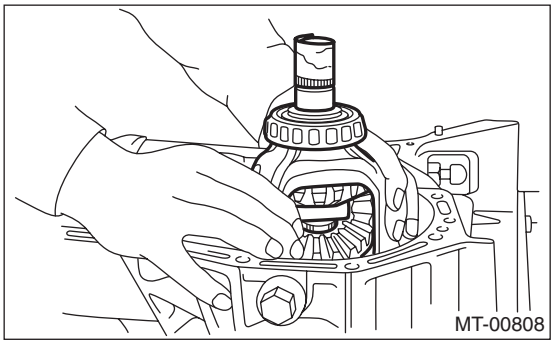
6) Recheck that the starting torque is within specified range, then clinch the lock nut at four positions.

17.Front Differential Assembly

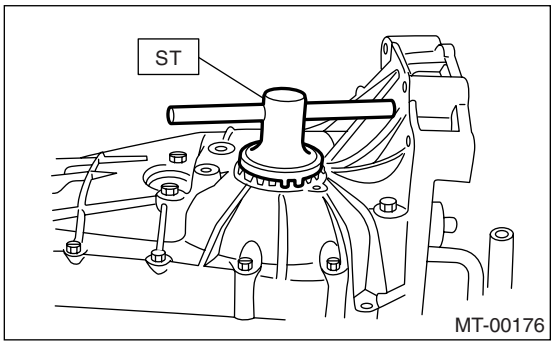
A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the transmission case. <Ref. to 5MT-52, REMOVAL, Transmission Case.>
4) Remove the drive pinion shaft assembly. <Ref. to 5MT-61, REMOVAL, Drive Pinion Shaft Assembly.>
5) Remove the main shaft assembly.
<Ref. to 5MT-55, REMOVAL, Main Shaft Assembly.>
6) Remove the differential assembly.

NOTE:
• Be careful not to confuse the right and left roller bearing outer races.
• Be careful not to damage the retainer oil seal.



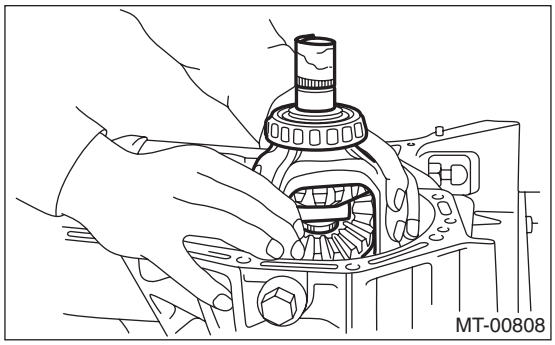
7) Remove the differential side retainers using ST.
ST 499787000 WRENCH ASSY



B: INSTALLATION

1) Install the differential side retainers using ST.
ST 499787000 WRENCH ASSY
2) Install the bearing outer race to transmission case.
3) Install the differential assembly.

NOTE:
• Be careful not to fold the sealing lip of oil seal.
• Wrap the right and left spline sections of axle shaft with vinyl tape to prevent scratches.



4) Install the main shaft assembly.
<Ref. to 5MT-55, INSTALLATION, Main Shaft Assembly.>
5) Install the drive pinion assembly. <Ref. to 5MT-61, INSTALLATION, Drive Pinion Shaft Assembly.>
6) Install the transmission case. <Ref. to 5MT-52, INSTALLATION, Transmission Case.>
7) Install the transfer case with extension case assembly. <Ref. to 5MT-40, INSTALLATION, Transfer Case and Extension Case Assembly.>
8) Install the manual transmission assembly to vehicle. <Ref. to 5MT-29, INSTALLATION, Manual Transmission Assembly.>

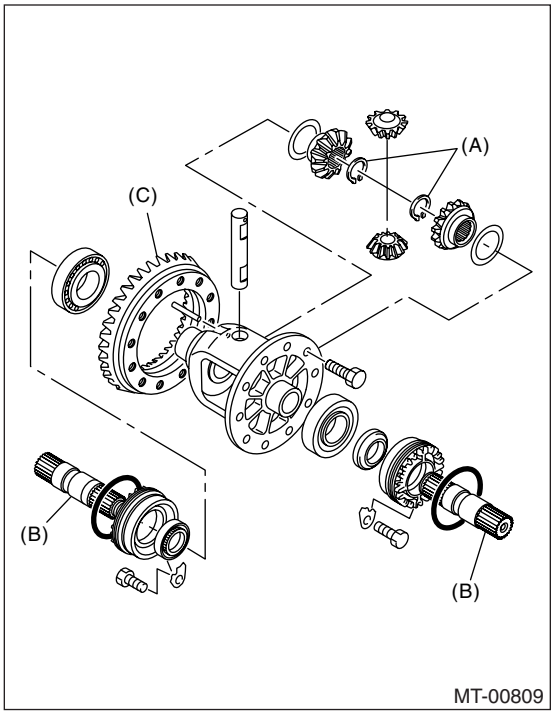
C: DISASSEMBLY

1. DIFFERENTIAL CASE ASSEMBLY

1) Remove the right and left snap rings from differential, and then remove the two axle drive shafts.

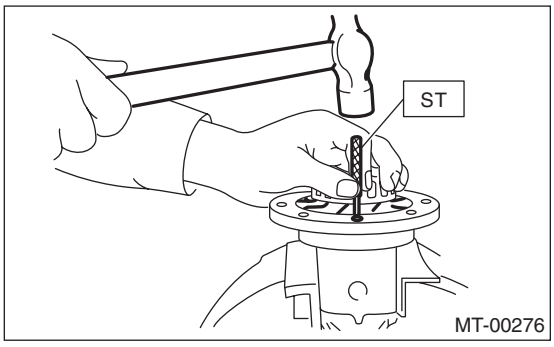
NOTE:
During reassembly, reinstall each axle drive shaft in the same place from which it was removed.

2) Loosen the twelve bolts and remove the hypoid driven gear.

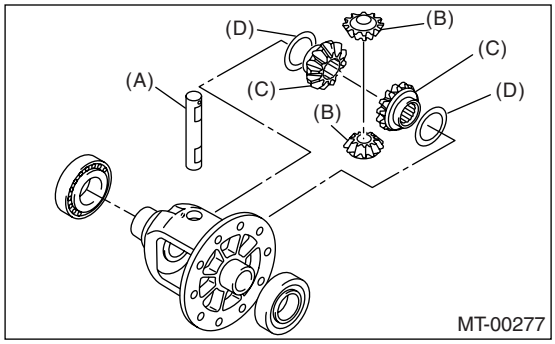


(A) Snap ring
(B) Axle drive shaft
(C) Hypoid driven gear

3) Drive out the straight pin from differential assembly toward hypoid driven gear.
ST 899904100 REMOVER

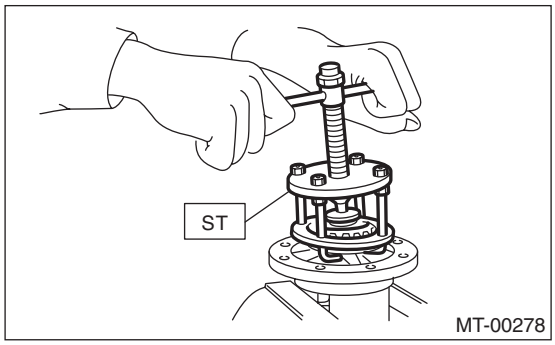


4) Pull out the pinion shaft, and remove the differential bevel pinion and gear and washer.



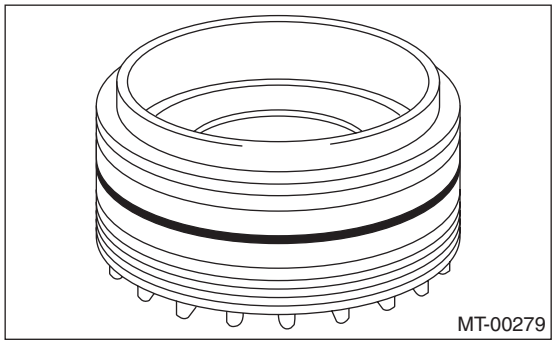
(A) Pinion shaft
(B) Bevel pinion
(C) Bevel gear
(D) Washer

5) Remove the roller bearing using ST.
ST 899524100 PULLER SET



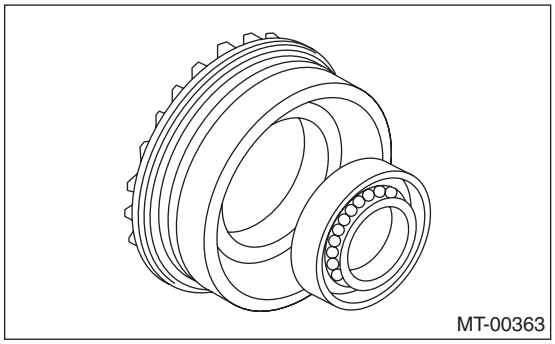
2. SIDE RETAINER

1) Remove the O-ring.



2) Remove the oil seal.

NOTE:
Do not reuse the oil seal. Prepare a new oil seal.

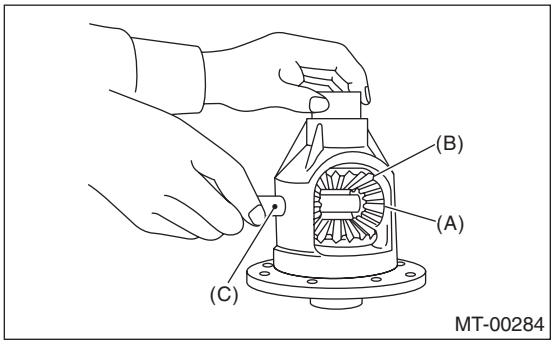


D: ASSEMBLY

1. DIFFERENTIAL CASE ASSEMBLY

1) Install the bevel gear and bevel pinion together with washers, and insert pinion shaft.

NOTE:
Face the chamfered side of washer toward gear.



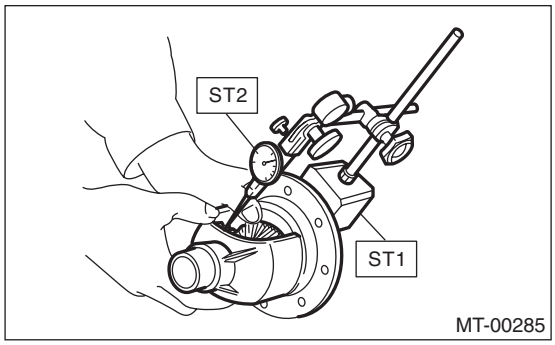
(A) Bevel pinion
(B) Bevel gear
(C) Pinion shaft

2) Measure the backlash between bevel gear and pinion. If it is not within specifications, install a suitable washer to adjust it. <Ref. to 5MT-74, ADJUSTMENT, Front Differential Assembly.>

NOTE:
Be sure the pinion gear tooth contacts adjacent gear teeth during measurement.

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

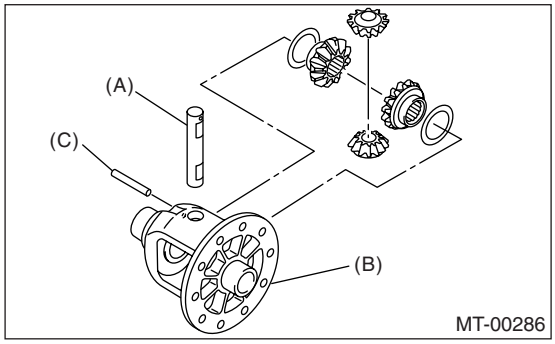
Standard backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)



3) Align the pinion shaft and differential case at their holes, and drive the straight pin into holes from the hypoid driven gear side, using ST.

NOTE:
Lock the straight pin after installing.

ST 899904100 REMOVER

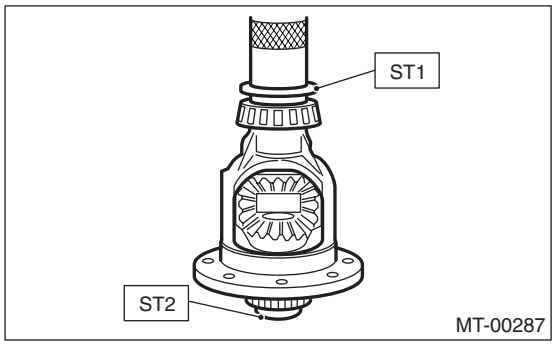


(A) Pinion shaft
(B) Differential case
(C) Straight pin

4) Install the roller bearing to differential case.

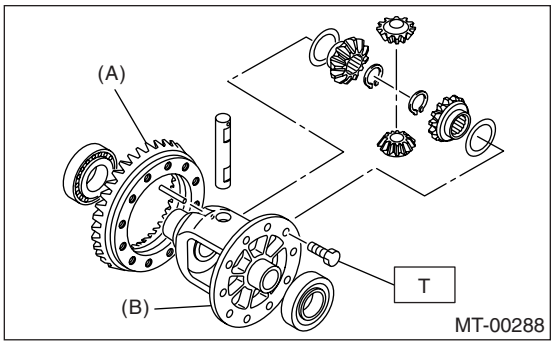
NOTE:
• Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
• Be careful because the roller bearing outer races are used as a set.

ST1 499277100 BUSH 1-2 INSTALLER
ST2 398497701 ADAPTER



5) Install the hypoid driven gear to differential case using twelve bolts.

Tightening torque:
T: 62 N·m (6.3 kgf-m, 45.6 ft-lb)



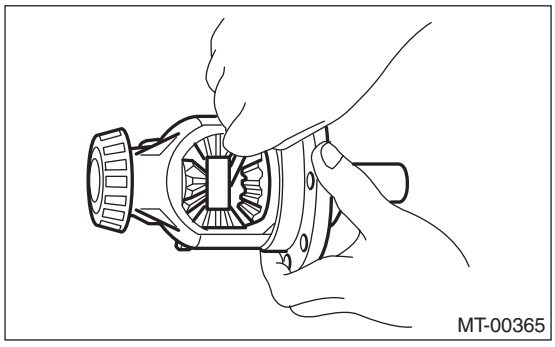
(A) Hypoid driven gear
(B) Differential case

6) Set the drive axle shaft into differential case and hold it using outer spring. Measure the shaft to case clearance to check if it is within specifications using thickness gauge.

NOTE:
Replace the snap ring with suitable one, if the measurement is not within specifications.

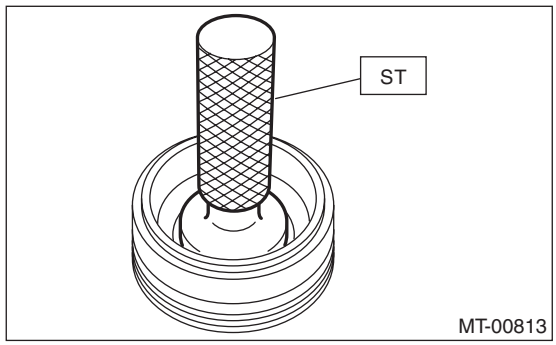
Snap ring (Outer)	
Part No.	Thickness mm (in)
805028011	1.05 (0.0413)
805028012	1.20 (0.0472)

Clearance
0 — 0.2 mm (0 — 0.008 in)



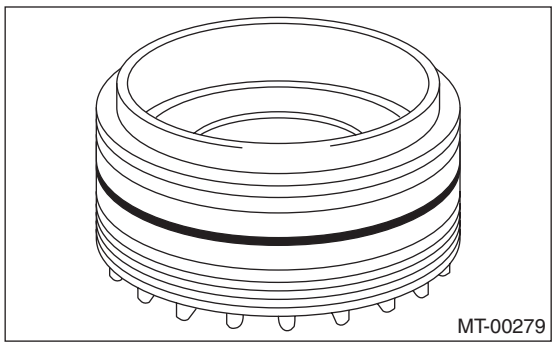
2. SIDE RETAINER

1) Install a new oil seal.
ST 49979700 INSTALLER



2) Install a new O-ring.

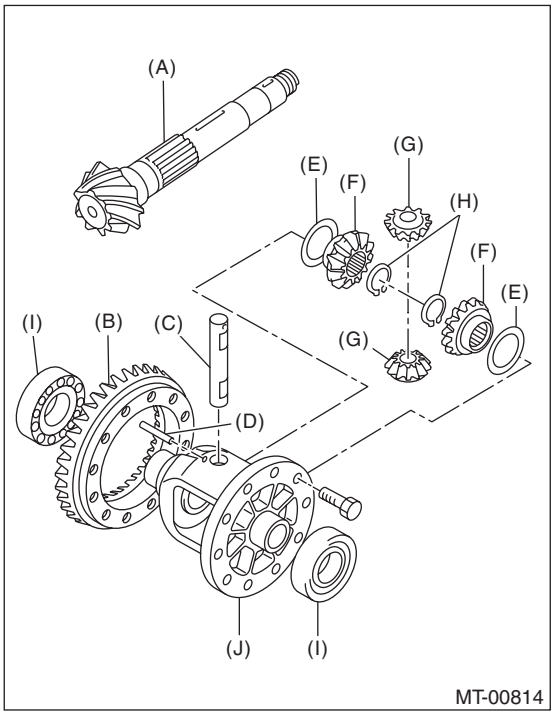
NOTE:
Do not stretch or damage the O-ring.



E: INSPECTION

Repair or replace the differential gear in the following cases:
• The hypoid drive gear and drive pinion shaft tooth surface are damaged, excessively worn, or seized.
• The roller bearing on the drive pinion shaft has a worn or damaged roller path.
• There is damage, wear, or seizure of the differential bevel pinion, differential bevel gear, washer, pinion shaft, and straight pin.

• The differential case has worn or damaged sliding surfaces.



(A) Drive pinion shaft
(B) Hypoid driven gear
(C) Pinion shaft
(D) Straight pin
(E) Washer
(F) Differential bevel gear
(G) Differential bevel pinion
(H) Snap ring
(I) Roller bearing
(J) Differential case

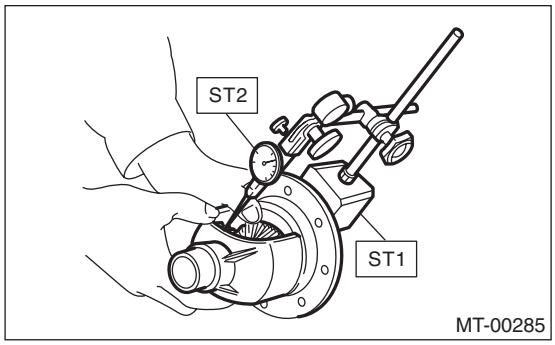
1. BEVEL PINION GEAR BACKLASH

Measure the backlash between bevel gear and pinion. If it is not within specifications, install a suitable washer to adjust it.

NOTE:
Be sure the pinion gear tooth contacts adjacent gear teeth during measurement.

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

Standard backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)

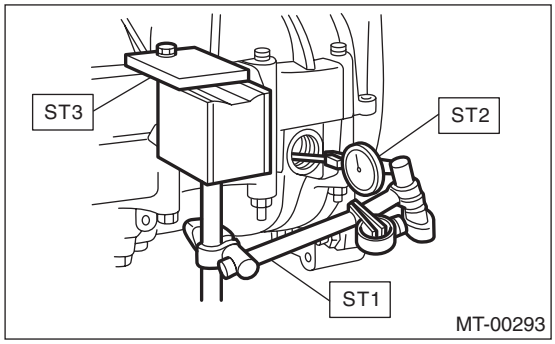


2. HYPOID GEAR BACKLASH

Set the ST1, ST2 and ST3 . Insert the needle through transmission oil drain plug hole so that the needle comes in contact with the tooth surface at a right angle and check the backlash.

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE
ST3 498255400 PLATE

Backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)

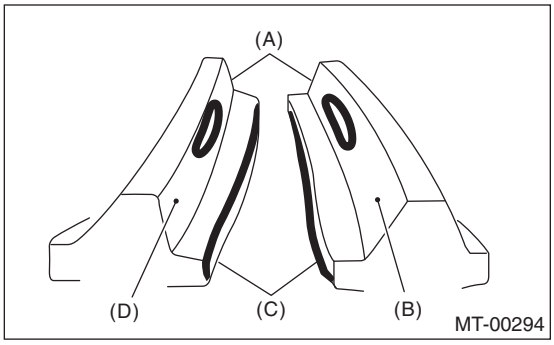


NOTE:
If the backlash is outside specified range, adjust it by turning the holder in right side case.

3. TOOTH CONTACT OF HYPOID GEAR

Check the tooth contact of hypoid gear as follows: Apply a uniform thin coat of red lead on both tooth surfaces of 3 or 4 teeth of the hypoid gear. Move the hypoid gear back and forth by turning the transmission main shaft until a definite contact pattern is developed on hypoid gear, and judge whether face contact is correct. If it is inaccurate, make adjustment. <Ref. to 5MT-74, ADJUSTMENT, Front Differential Assembly.>

• Tooth contact is correct.



(A) Toe
(B) Coast side
(C) Heel
(D) Drive side

F: ADJUSTMENT

1. BEVEL PINION GEAR BACKLASH

1) Disassemble the front differential. <Ref. to 5MT-69, REMOVAL, Front Differential Assembly.>
2) Select a differential washer from the table and install.

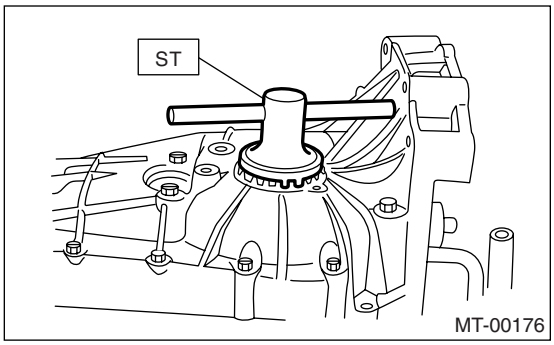
Washer	
Part No.	Thickness mm (in)
803038021	0.925 — 0.950 (0.0364 — 0.0374)
803038022	0.975 — 1.000 (0.0384 — 0.0394)
803038023	1.025 — 1.050 (0.0404 — 0.0413)

3) Adjust until the specified value is obtained.

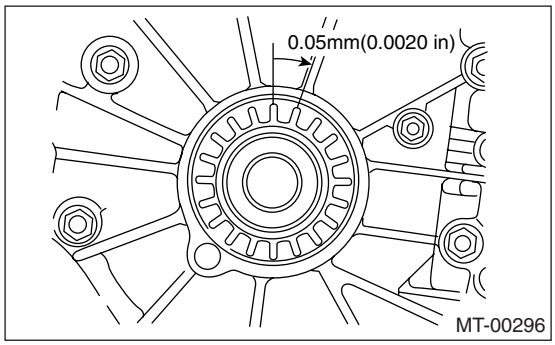
Standard backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)

2. HYPOID GEAR BACKLASH

Adjust backlash by turning the holder in right side case.
ST 499787000 WRENCH ASSY

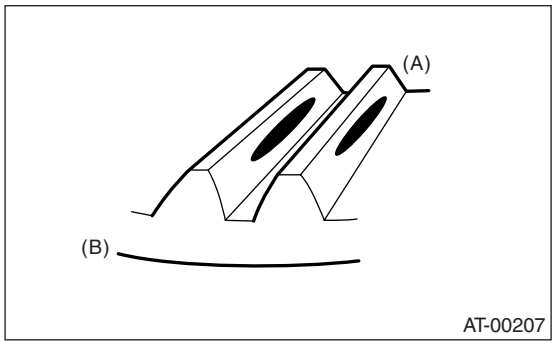


NOTE:
Each time holder rotates one tooth, backlash changes by 0.05 mm (0.020 in).



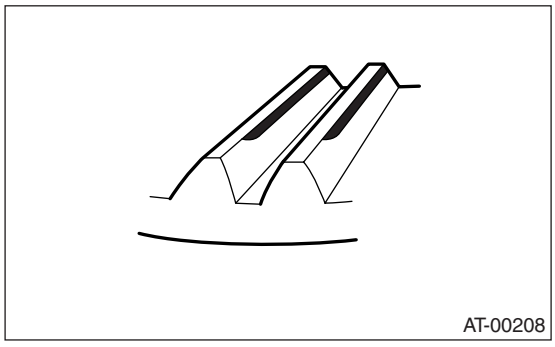
3. TOOTH CONTACT OF HYPOID GEAR

1) Adjust until the tooth contact is correct.
2) Check and adjust the tooth contact with following.
• Tooth contact
Checking item:Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. [When loaded, contact pattern moves toward heel.]

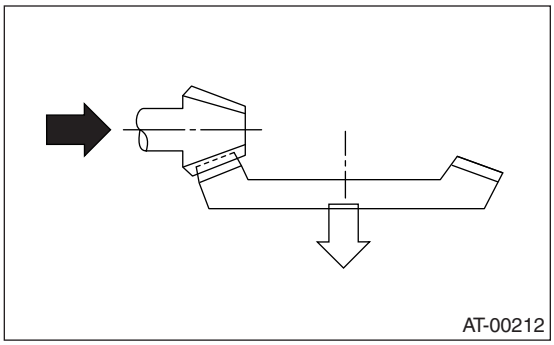


(A) Toe side
(B) Heel side

• Face contact
Checking item: Backlash is too large.
Contact pattern



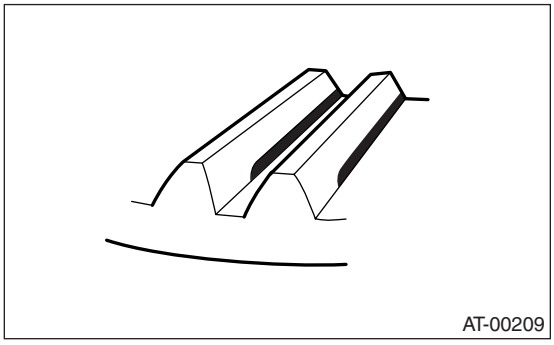
Corrective action: Reduce thickness of drive pinion shim in order to bring drive pinion close to driven gear.



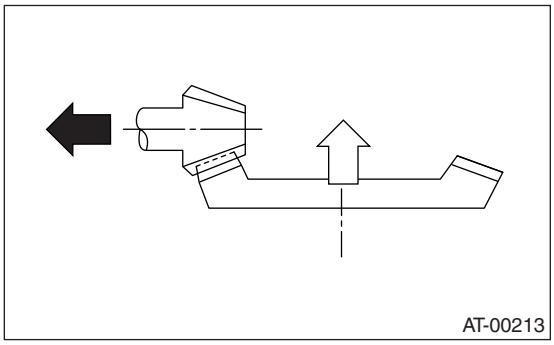
- Flank contact

Checking item: Backlash is too small.

Contact pattern



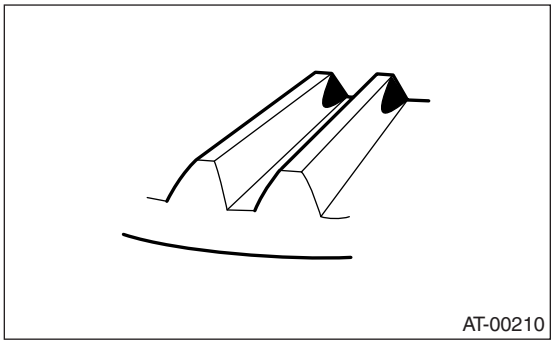
Corrective action: Increase thickness of drive pinion shim in order to move drive pinion away from driven gear.



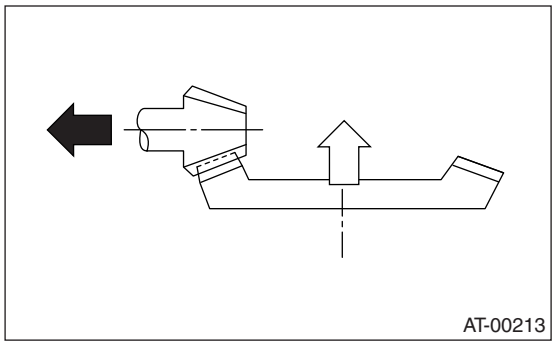
- Toe contact (Inside end contact)

Checking item: Contact area is small.

Contact pattern



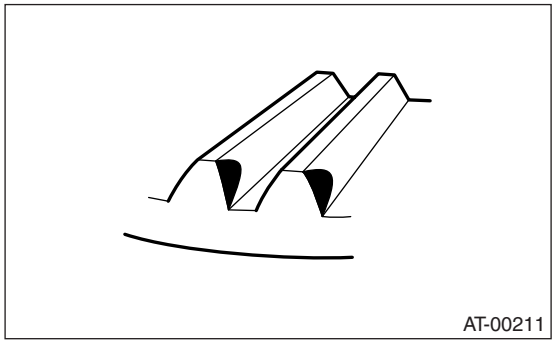
Corrective action: Increase thickness of drive pinion shim in order to bring drive pinion close to driven gear.



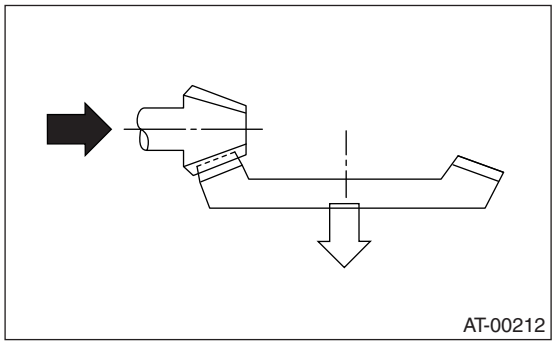
- Heel contact (Outside end contact)

Checking item: Contact area is small.

Contact pattern



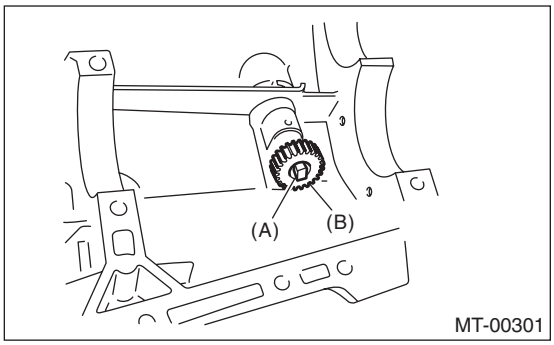
Corrective action: Reduce thickness of drive pinion shim in order to move drive pinion away from driven gear.



18.Speedometer Gear

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-36, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the transmission case. <Ref. to 5MT-52, REMOVAL, Transmission Case.>
5) Remove the vehicle speed sensor. <Ref. to 5MT-38, REMOVAL, Vehicle Speed Sensor.>
6) Remove the outer snap ring and pull out speedometer driven gear. Next, remove the oil seal, speedometer shaft and washer.



(A) Outer snap ring
(B) Speedometer driven gear

B: INSTALLATION

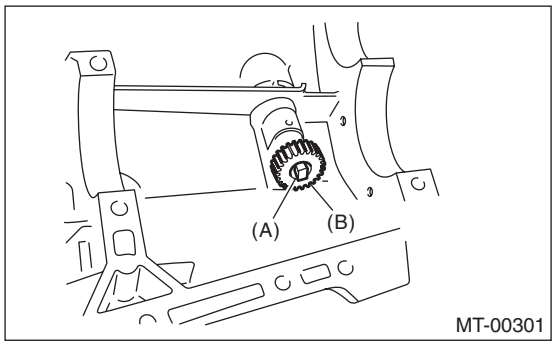
1) Install the washer and speedometer shaft, and press fit the oil seal with ST.

NOTE:
Use a new oil seal, if it has been removed.

ST 899824100 or 499827000PRESS

2) Install the vehicle speed sensor. <Ref. to 5MT-38, INSTALLATION, Vehicle Speed Sensor.>
3) Install the speedometer driven gear and snap ring.

NOTE:
Use a new snap ring, if it has been removed.



(A) Outer snap ring
(B) Speedometer driven gear

4) Install the transmission case. <Ref. to 5MT-52, INSTALLATION, Transmission Case.>
5) Install the transfer case with extension case assembly. <Ref. to 5MT-40, INSTALLATION, Transfer Case and Extension Case Assembly.>
6) Install the back-up light switch and neutral position switch. <Ref. to 5MT-36, INSTALLATION, Switches and Harness.>
7) Install the manual transmission assembly to vehicle. <Ref. to 5MT-29, INSTALLATION, Manual Transmission Assembly.>

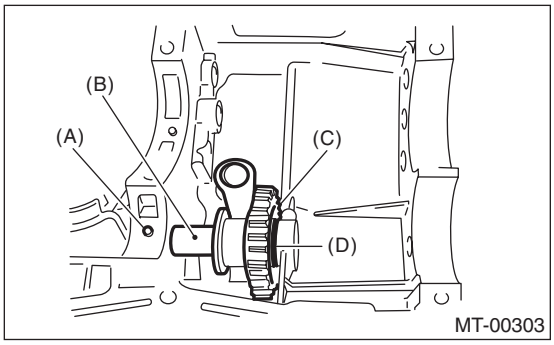
C: INSPECTION

Check the speedometer gear, oil seal and speedometer shaft for damage. Replace if damaged.

19.Reverse Idler Gear

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-36, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the transmission case. <Ref. to 5MT-61, REMOVAL, Drive Pinion Shaft Assembly.>
5) Remove the drive pinion shaft assembly. <Ref. to 5MT-61, REMOVAL, Drive Pinion Shaft Assembly.>
6) Remove the main shaft assembly.
<Ref. to 5MT-55, REMOVAL, Main Shaft Assembly.>
7) Remove the differential assembly. <Ref. to 5MT-69, REMOVAL, Front Differential Assembly.>
8) Remove the shifter forks and rods. <Ref. to 5MT-79, REMOVAL, Shifter Fork and Rod.>
9) Pull out the straight pin, and remove the idler gear shaft, reverse idler gear and washer.



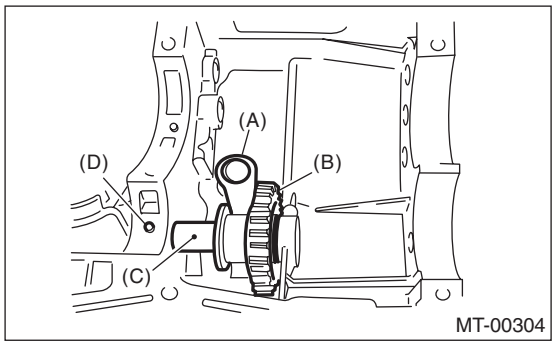
(A) Straight pin
(B) Idler gear shaft
(C) Idler gear
(D) Washer

10) Remove the reverse shifter lever.

B: INSTALLATION

1) Install the reverse shifter lever, reverse idler gear and reverse idler gear shaft, and secure with straight pin.

NOTE:
Be sure to install the reverse idler shaft from rear side.



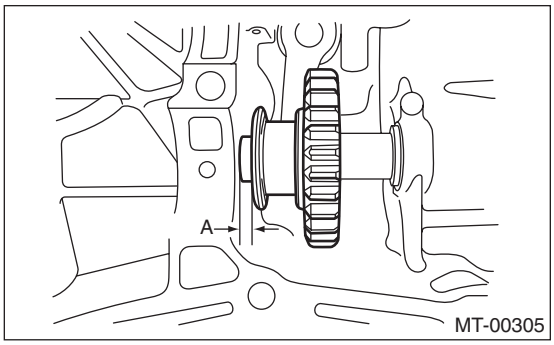
(A) Reverse shifter lever
(B) Reverse idler gear
(C) Reverse idler gear shaft
(D) Straight pin

2) Inspect and adjust the clearance between reverse idler gear and transmission case wall. <Ref. to 5MT-77, INSTALLATION, Reverse Idler Gear.> and <Ref. to 5MT-78, ADJUSTMENT, Reverse Idler Gear.>
3) Install the shifter forks and rods. <Ref. to 5MT-79, INSTALLATION, Shifter Fork and Rod.>
4) Install the differential assembly. <Ref. to 5MT-69, INSTALLATION, Front Differential Assembly.>
5) Install the main shaft assembly.
<Ref. to 5MT-55, INSTALLATION, Main Shaft Assembly.>
6) Install the drive pinion shaft assembly. <Ref. to 5MT-61, INSTALLATION, Drive Pinion Shaft Assembly.>
7) Install the transmission case. <Ref. to 5MT-52, INSTALLATION, Transmission Case.>
8) Install the transfer case with extension case assembly. <Ref. to 5MT-40, INSTALLATION, Transfer Case and Extension Case Assembly.>
9) Install the back-up light switch and neutral position switch. <Ref. to 5MT-36, INSTALLATION, Switches and Harness.>
10) Install the manual transmission assembly to vehicle. <Ref. to 5MT-29, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

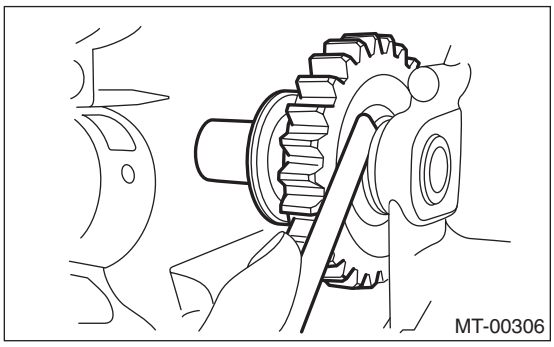
1) Move the reverse shifter rod toward the reverse side. Inspect the clearance between reverse idler gear and transmission case wall.
If out of specification, select the appropriate reverse shifter lever and adjust.

Clearance A:
6.0 — 7.5 mm (0.236 — 0.295 in)



2) After installing a suitable reverse shifter lever, shift into neutral. Inspect the clearance between reverse idler gear and transmission case wall.
If out of specification, select the appropriate washer and adjust.

Clearance:
0 — 0.5 mm (0 — 0.020 in)

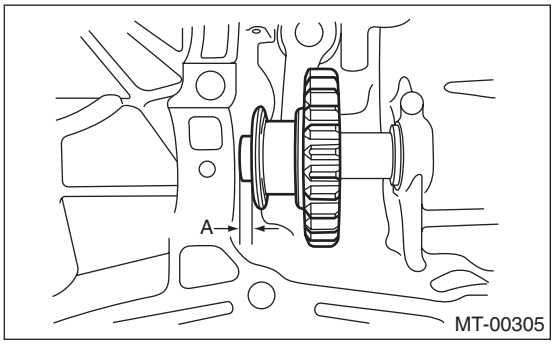


3) Check the reverse idler gear and shaft for damage. Replace if damaged.

D: ADJUSTMENT

1) Select the appropriate reverse shifter lever from the table below, and adjust until the gap between the reverse idler gear and transmission case wall is within specification.

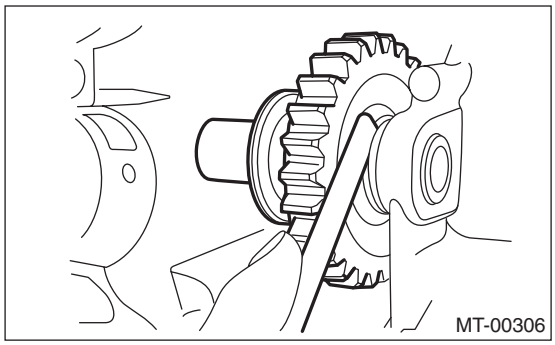
Clearance A:
6.0 — 7.5 mm (0.236 — 0.295 in)



Reverse shifter lever		
Part No.	Mark	Remarks
32820AA070	7	Further from case wall
32820AA080	8	Standard
32820AA090	9	Closer to case wall

2) Select the appropriate washer from the table below, and adjust until the gap between the reverse idler gear and transmission case wall is within specification.

Clearance:
0 — 0.5 mm (0 — 0.020 in)

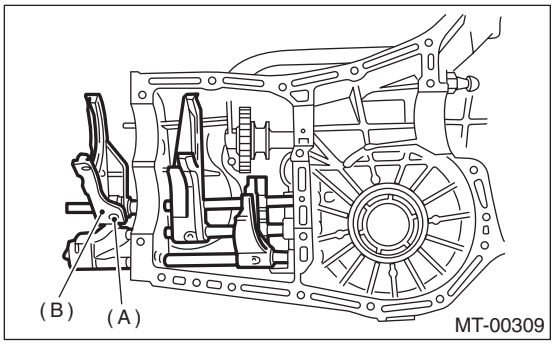


Washer	
Part No.	Thickness mm (in)
803020151	0.4 (0.016)
803020152	1.1 (0.043)
803020153	1.5 (0.059)
803020154	1.9 (0.075)
803020155	2.3 (0.091)

20.Shifter Fork and Rod

A: REMOVAL

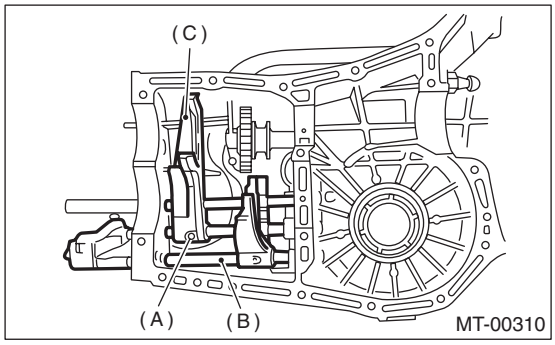
1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-36, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to 5MT-40, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the transmission case. <Ref. to 5MT-52, REMOVAL, Transmission Case.>
5) Remove the drive pinion shaft assembly. <Ref. to 5MT-61, REMOVAL, Drive Pinion Shaft Assembly.>
6) Remove the main shaft assembly.
<Ref. to 5MT-55, REMOVAL, Main Shaft Assembly.>
7) Remove the differential assembly. <Ref. to 5MT-69, REMOVAL, Front Differential Assembly.>
8) Drive out the straight pin with ST, and 5th shifter fork.
ST 398791700 STRAIGHT PIN REMOVER



(A) Straight pin
(B) 5th shifter fork

9) Remove the plugs, springs and checking balls.
10) Drive out the straight pin, and pull out 3-4 fork rod and shifter fork.

NOTE:
When removing the rod, keep other rods in neutral. Also, when pulling out the straight pin, remove it toward the inside of case so that it does not hit against the case.



(A) Straight pin
(B) 3-4 fork rod
(C) Shifter fork

11) Drive out the straight pin, and pull out 1-2 fork rod and shifter fork.
12) Remove the outer snap ring, and pull out the reverse shifter rod arm from reverse fork rod. Then take out the ball, spring and interlock plunger from rod.
And then remove the rod.

NOTE:
When pulling out the reverse shifter rod arm, be careful not to let the ball pop out of arm.

13) Remove the reverse shifter lever.

B: INSTALLATION

1) Install the reverse arm fork spring, ball and interlock plunger to reverse fork rod arm. Insert the reverse fork rod into hole in reverse fork rod arm, and hold it with outer snap ring using ST.

NOTE:
Apply grease to plunger to prevent it from falling.

ST 399411700 ACCENT BALL INSTALLER
2) Position the ball, spring and new gasket in reverse shifter rod hole, on left side transmission case, and tighten the checking ball plug.
3) Install the 1-2 fork rod into 1-2 shifter fork via the hole on the rear of transmission case.
4) Align the holes in rod and fork, and new drive straight pin into these holes using ST.

NOTE:
- Set other rods to neutral.
- Make sure the interlock plunger is on the 3-4 fork rod side.

ST 398791700 STRAIGHT PIN REMOVER

5) Install the interlock plunger onto 3-4 fork rod.

NOTE:
Apply a coat of grease to plunger to prevent it from falling.

6) Install the 3-4 fork rod into 3-4 shifter fork via the hole on the rear of transmission case.

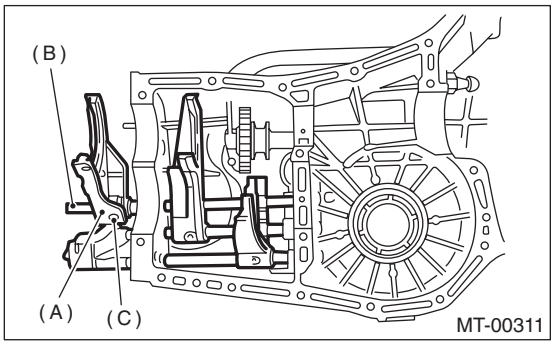
7) Align the holes in rod and fork, and new drive straight pin into these holes.

NOTE:
- Set the reverse fork rod to neutral.
- Make sure the interlock plunger (installing before) is on the reverse fork rod side.

ST 398791700 STRAIGHT PIN REMOVER

8) Install the 5th shifter fork onto the rear of reverse fork rod. Align holes in the two parts and new drive straight pin into place.

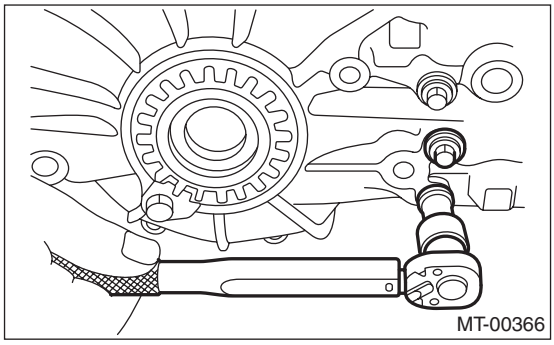
ST 398791700 STRAIGHT PIN REMOVER



(A) 5th shifter fork
(B) Reverse fork rod
(C) Straight pin

9) Position the balls, checking ball springs and new gaskets into 3-4 and 1-2 rod holes, and install plugs.

Tightening torque:
20 N·m (2.0 kgf-m, 14.5 ft-lb)



10) Install the differential assembly. <Ref. to 5MT-69, INSTALLATION, Front Differential Assembly.>

11) Install the main shaft assembly.
<Ref. to 5MT-55, INSTALLATION, Main Shaft Assembly.>

12) Install the drive pinion shaft assembly. <Ref. to 5MT-61, INSTALLATION, Drive Pinion Shaft Assembly.>

13) Install the transmission case. <Ref. to 5MT-52, INSTALLATION, Transmission Case.>

14) Install the transfer case with extension case assembly. <Ref. to 5MT-40, INSTALLATION, Transfer Case and Extension Case Assembly.>

15) Install the back-up light switch and neutral position switch. <Ref. to 5MT-36, INSTALLATION, Switches and Harness.>

16) Install the manual transmission assembly to vehicle. <Ref. to 5MT-29, INSTALLATION, Manual Transmission Assembly.>

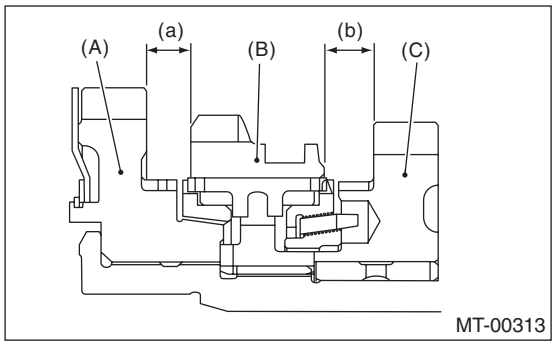
C: INSPECTION

1) Check the shift shaft and shift rod for damage. Replace if damaged.

2) Gearshift mechanism:
Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.

3) Inspect the clearance between 1st, 2nd driven gear and reverse driven gear. If any clearance is not within specifications, replace the shifter fork as required.

Clearance (a) and (b):
9.5 mm (0.374 in)

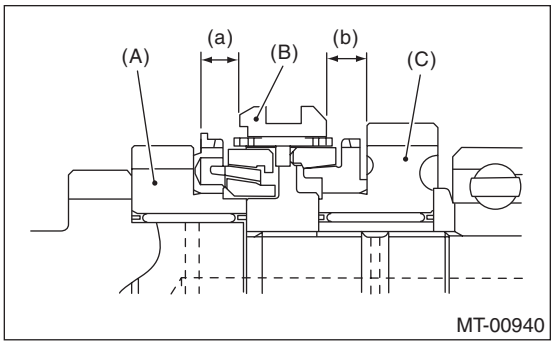


(A) 1st driven gear
(B) Reverse driven gear
(C) 2nd driven gear

1st-2nd shifter fork		
Part No.	Mark	Remarks
32804AA060	1	Approach to 1st gear by 0.2 mm (0.008 in).
32804AA070	—	Standard
32804AA080	3	Become distant from 2nd gear by 0.2 mm (0.008 in).

4) Inspect the clearance between 3rd, 4th drive gear and coupling sleeve. If any clearance is not within specifications, replace the shifter fork as required.

Clearance (a) and (b):
7.3 mm (0.287 in)

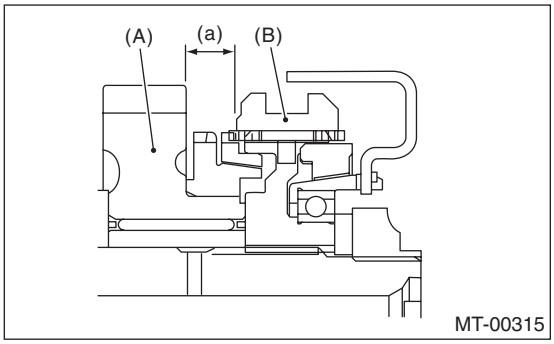


(A) 3rd drive gear
(B) Coupling sleeve
(C) 4th drive gear

3rd-4th shifter fork		
Part No.	Mark	Remarks
32810AA061	1	Approach to 4th gear by 0.2 mm (0.008 in).
32810AA071	—	Standard
32810AA101	3	Become distant from 3rd gear by 0.2 mm (0.008 in).

5) Inspect the clearance between 5th drive gear and coupling sleeve. If any clearance is not within specifications, replace the shifter fork as required.

Clearance (a):
9.3 mm (0.366 in)



(A) 5th drive gear
(B) Coupling sleeve

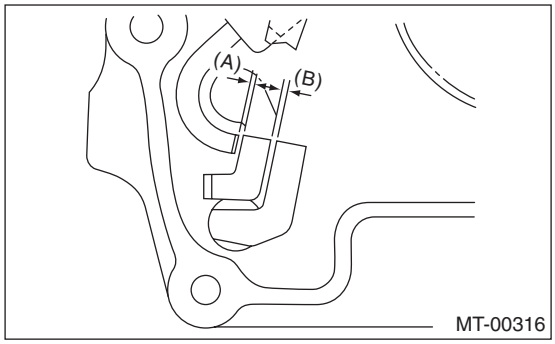
5th shifter fork (Non-turbo)		
Part No.	Mark	Remarks
32812AA201	4	Approach to 5th gear by 0.2 mm (0.008 in).
32812AA211	5	Standard
32812AA221	6	Become distant from 5th gear by 0.2 mm (0.008 in).

5th shifter fork (Turbo)		
Part No.	Mark	Remarks
32812AA231	7	Approach to 5th gear by 0.2 mm (0.008 in).
32812AA241	—	Standard
32812AA251	9	Become distant from 5th gear by 0.2 mm (0.008 in).

6) Inspect the rod end clearances (A) and (B). If any clearance is not within specifications, replace the rod or fork as required.

Clearance (A):
1st-2nd to 3rd-4th:
0.4 — 1.4 mm (0.016 — 0.055 in)

Clearance (B):
3rd-4th to 5th:
0.5 — 1.3 mm (0.020 — 0.051 in)



21.General Diagnostic

A: INSPECTION

1. MANUAL TRANSMISSION

Symptom	Possible cause	Remedy
1. Gears are difficult to intermesh. NOTE: The cause for difficulty in shifting gears can be classified into two kinds: one is malfunction of the gear shift system and the other is malfunction of the transmission. However, if the operation is heavy and engagement of the gears is difficult, defective clutch disengagement may also be responsible. Check whether the clutch is correctly functioning, before checking the gear shift system and transmission.	(a) Worn, damaged or burred chamfer of internal spline of sleeve and reverse driven gear	Replace.
	(b) Worn, damaged or burred chamfer of spline of gears	Replace.
	(c) Worn or scratched bushings	Replace.
	(d) Incorrect contact between synchronizer ring and gear cone or wear	Correct or replace.
2. Gear slips out. • Gear slips out when coasting on rough road. • Gear slips out during acceleration.	(a) Defective pitching stopper adjustment	Adjust.
	(b) Loose engine mounting bolts	Tighten or replace.
	(c) Worn fork shifter, broken shifter fork rail spring	Replace.
	(d) Worn or damaged ball bearing	Replace.
	(e) Excessive clearance between splines of synchronizer hub and synchronizer sleeve	Replace.
	(f) Worn tooth step of synchronizer hub (responsible for slip-out of 3rd gear)	Replace.
	(g) Worn 1st driven gear and driven shaft	Replace.
	(h) Worn 2nd driven gear and bushing	Replace.
	(i) Worn 3rd drive gear and needle bearing	Replace.
	(j) Worn 4th drive gear and needle bearing	Replace.
	(k) Worn reverse idler gear and bushing	Replace.
3. Unusual noise comes from transmission. NOTE: If an unusual noise is heard when the vehicle is parked with its engine idling and if the noise ceases when the clutch is disengaged, it may be considered that the noise comes from the transmission.	(a) Insufficient or improper lubrication	Lubricate or replace with specified oil.
	(b) Worn or damaged gears and bearings NOTE: If the trouble is only wear of the tooth surfaces, merely a high roaring noise will occur at high speeds, but if any part is broken, rhythmical knocking sound will be heard even at low speeds.	Replace.

2. DIFFERENTIAL

Symptom	Possible cause	Remedy
1. Broken differential (case, gear, bearing, etc.) NOTE: Abnormal noise will develop and finally it will become impossible to continue to run due to broken pieces obstructing the gear revolution.	(a) Insufficient or improper oil	Disassemble the differential and replace broken components and at the same time check other components for any trouble, and replace if necessary.
	(b) Use of vehicle under severe conditions such as excessive load and improper use of clutch	Readjust the bearing preload and backlash and face contact of gears.
	(c) Improper adjustment of taper roller bearing	Adjust.
	(d) Improper adjustment of drive pinion and hypoid driven gear	Adjust.
	(e) Excessive backlash due to worn differential side gear, washer or differential pinion vehicle under severe operating conditions.	Add recommended oil to specified level. Do not use the vehicle under severe operating conditions.
	(f) Loose hypoid driven gear clamping bolts	Tighten.
2. Differential and hypoid gear noises Troubles of the differential and hypoid gear always appear as noise problems. Therefore noise is the first indication of the trouble. However noises from the engine, muffler, tire, exhaust gas, bearing, body, etc. are easily mistaken for the differential noise. Pay special attention to the hypoid gear noise because it is easily confused with other gear noises. There are the following four kinds of noises. • Gear noise when driving: If noise increases as vehicle speed increases it may be due to insufficient gear oil, incorrect gear engagement, damaged gears, etc. • Gear noise when coasting: Damaged gears due to maladjusted bearings and incorrect shim adjustment • Bearing noise when driving or when coasting: Cracked, broken or damaged bearings • Noise which mainly occurs when turning: Unusual noise from differential side gear, differential pinion, differential pinion shaft, etc.	(a) Insufficient oil	Lubricate.
	(b) Improper adjustment of hypoid driven gear and drive pinion	Check tooth contact.
	(c) Worn teeth of hypoid driven gear and drive pinion	Replace as a set. Readjust the bearing preload.
	(d) Loose roller bearing	Readjust the hypoid driven gear to drive pinion backlash and check tooth contact.
	(e) Distorted hypoid driven gear or differential case	Replace.
	(f) Worn washer and differential pinion shaft	Replace.

MANUAL TRANSMISSION AND DIFFERENTIAL

6MT

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1. General Description

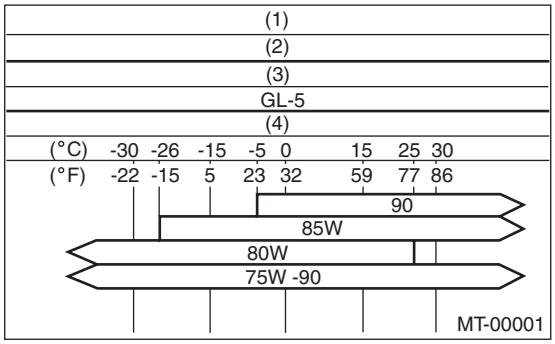
A: SPECIFICATION

1. MANUAL TRANSMISSION AND FRONT DIFFERENTIAL

Type			6-forward speeds and 1-reverse
Transmission gear ratio		1st	3.636
		2nd	2.375
		3rd	1.761
		4th	1.346
		5th	0.971
		6th	0.756
		Reverse	3.545
Front reduction gear	Final	Type of gear	Hypoid
		Gear ratio	3.900
Rear reduction gear	Transfer	Type of gear	Helical
		Gear ratio	1.000
	Final	Type of gear	Hypoid
		Gear ratio	3.900
Front differential	Type and number of gear		SURETRAC®
Center differential	Type and number of gear		Planetary gear (Internal gear: 1, Pinion gear: 6, Sun gear: 1 and Electromagnetic floating variable control multiple clutch)
Transmission gear oil			GL-5
Transmission gear oil capacity			4.1 ℓ (4.3 US qt, 3.6 Imp qt)

2. TRANSMISSION GEAR OIL

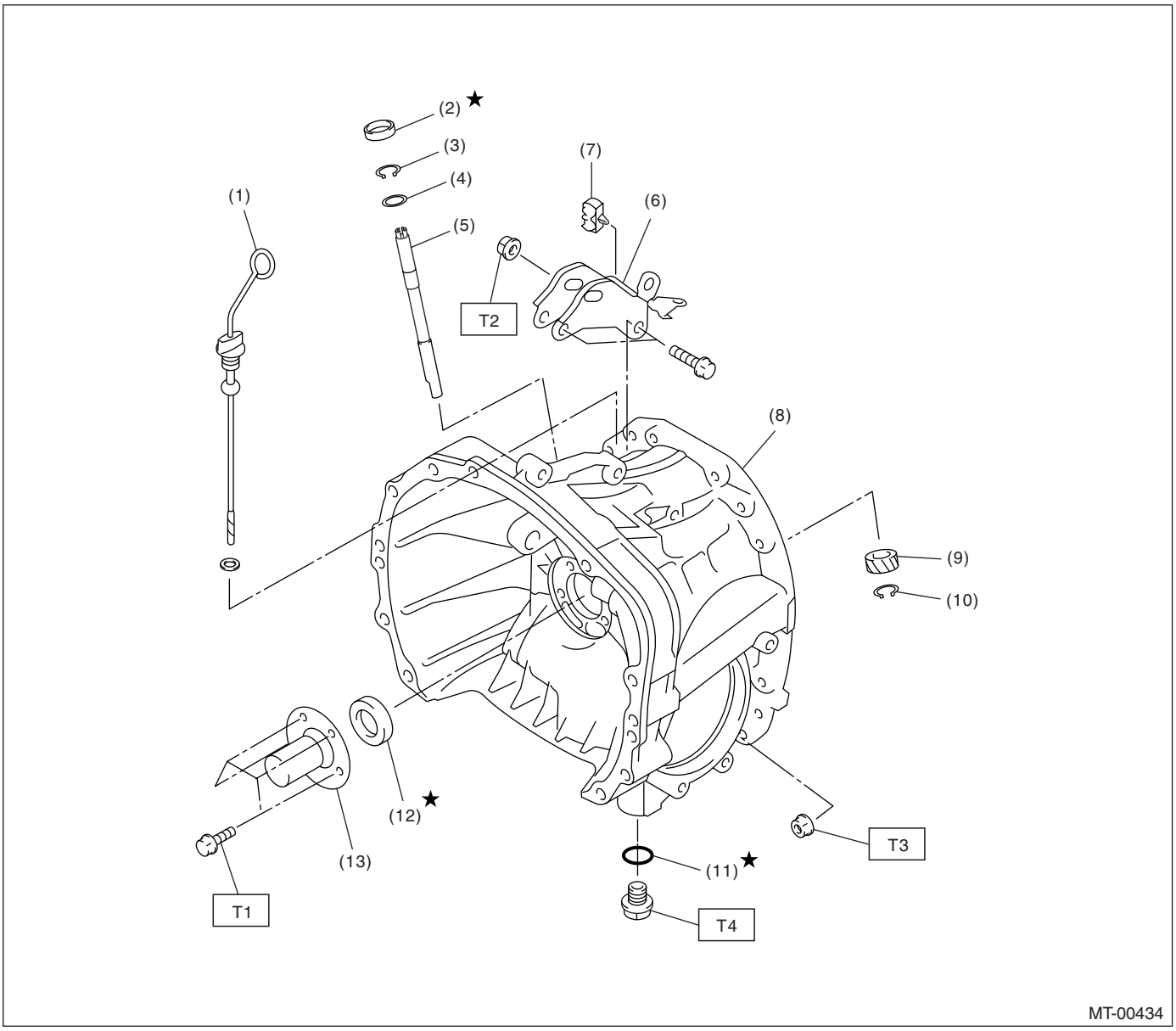
Recommended oil



(1) Item
(2) Transmission gear oil
(3) API classification
(4) SAE viscosity No. and applicable temperature

B: COMPONENT

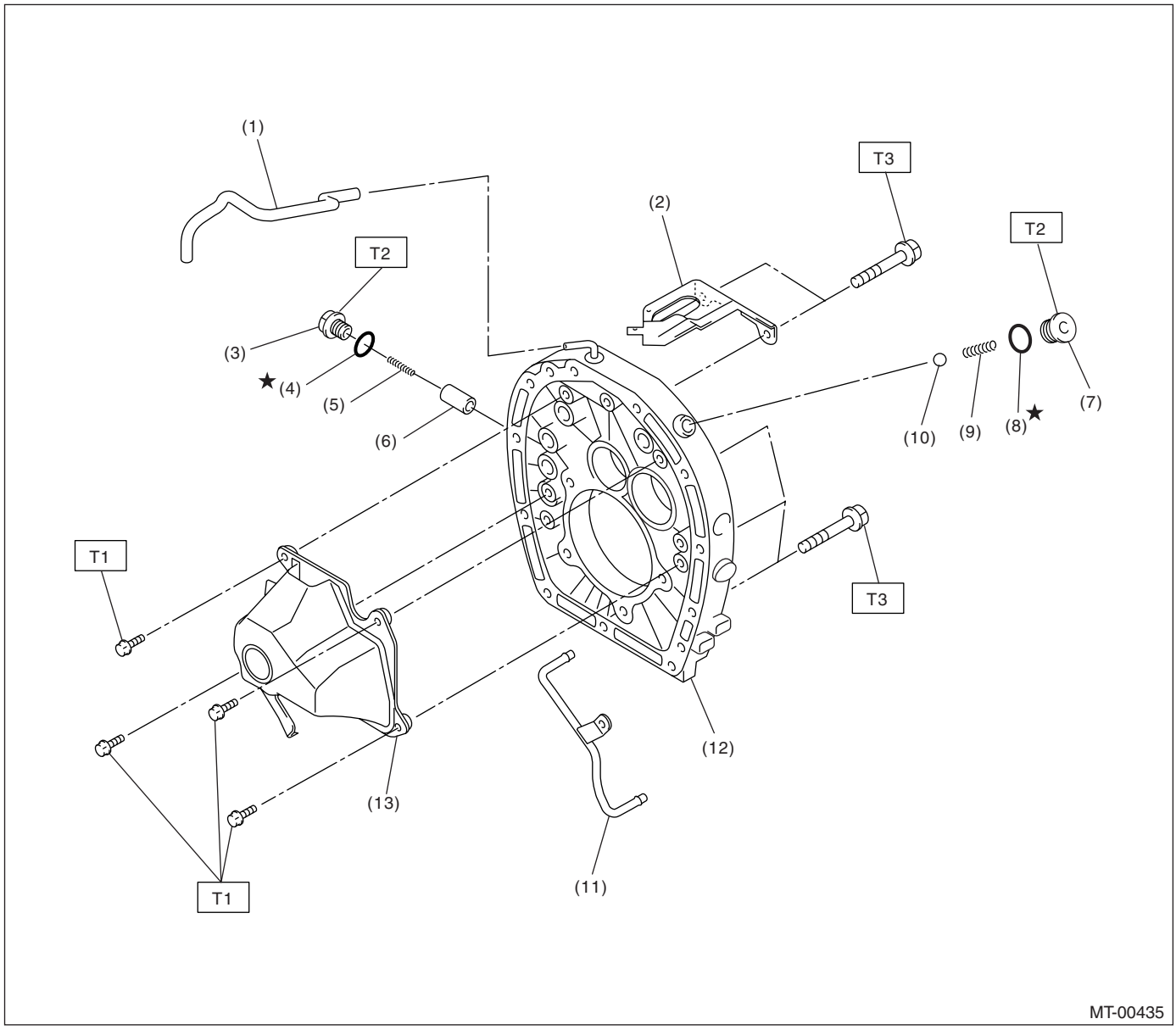
1. CLUTCH HOUSING



(1)	Oil level gauge	(8)	Clutch housing
(2)	Oil seal	(9)	Speedometer driven gear
(3)	Snap ring	(10)	Snap ring
(4)	Washer	(11)	Gasket
(5)	Speedometer gear shaft	(12)	Oil seal
(6)	Pitching stopper bracket	(13)	Clutch release bearing guide
(7)	Clip		

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 41 (4.2, 30.2)
T3: 50 (5.1, 36.9)
T4: 70 (7.1, 51.6)

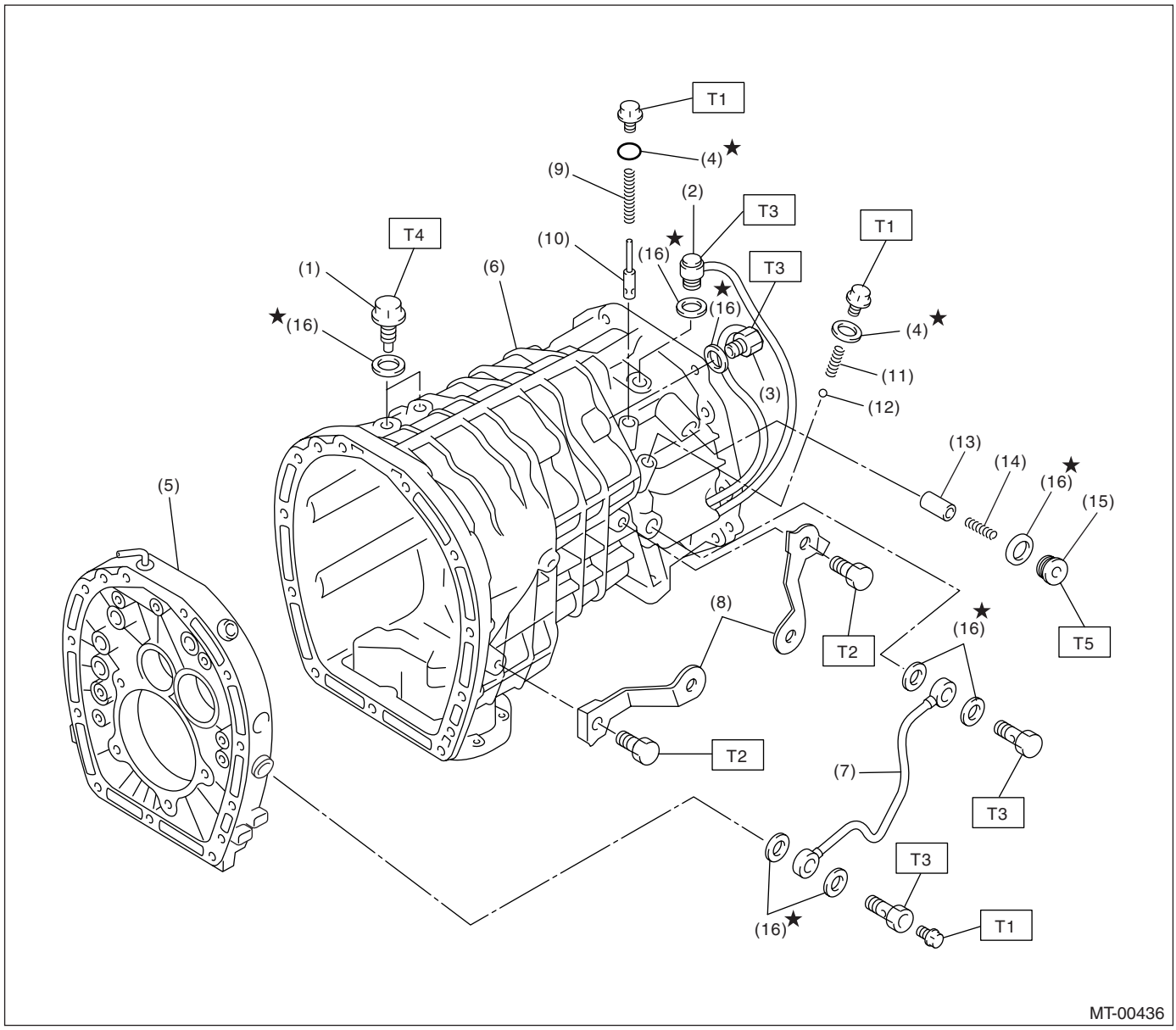
2. ADAPTER PLATE



(1)	Breather hose	(7)	Plug	(13)	Oil chamber
(2)	Transmission harness stay	(8)	Gasket		
(3)	Plug	(9)	Spring	***Tightening torque: N·m (kgf-m, ft-lb)***	
(4)	Gasket	(10)	Ball	***T1:***	***6.4 (0.65, 4.7)***
(5)	Spring	(11)	Lubrication pipe	***T2:***	***37 (3.8, 27.3)***
(6)	Plunger	(12)	Adapter plate	***T3:***	***50 (5.1, 36.9)***

3. TRANSMISSION CASE

- **Transmission serial No. 144576 or earlier**

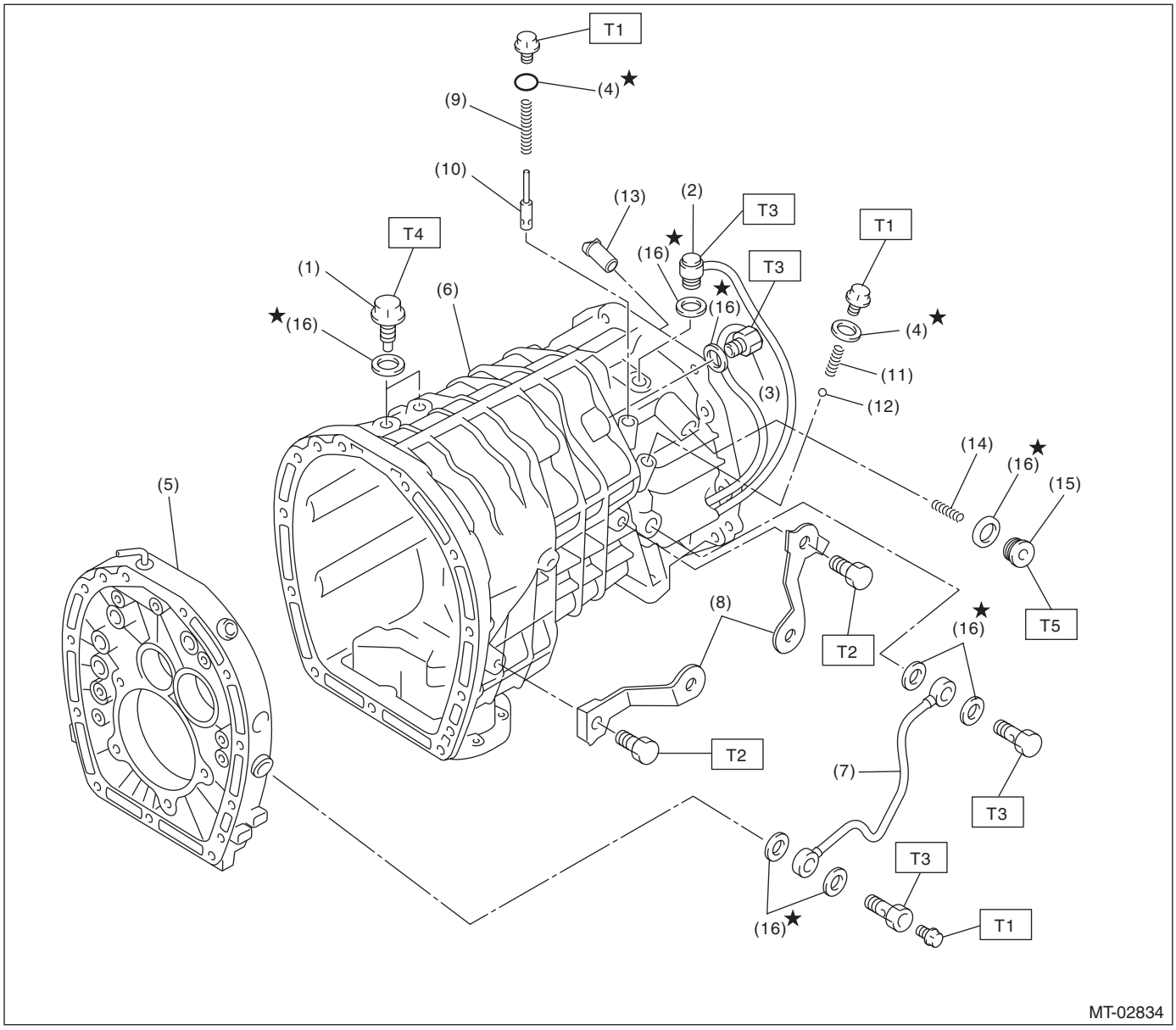


(1)	Pilot bolt	(9)	Return spring
(2)	Neutral switch	(10)	Pressure relief valve
(3)	Back-up light switch	(11)	Return spring
(4)	O-ring	(12)	Ball
(5)	Adapter plate	(13)	Plunger
(6)	Transmission case	(14)	Spring
(7)	Oil pipe	(15)	Plug
(8)	Harness bracket	(16)	Gasket

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

T1: 13 (1.3, 9.6)
T2: 16 (1.6, 11.8)
T3: 32 (3.3, 23.6)
T4: 34 (3.5, 25.1)
T5: 41 (4.2, 30.2)

- **Transmission serial No. 144577 or later**

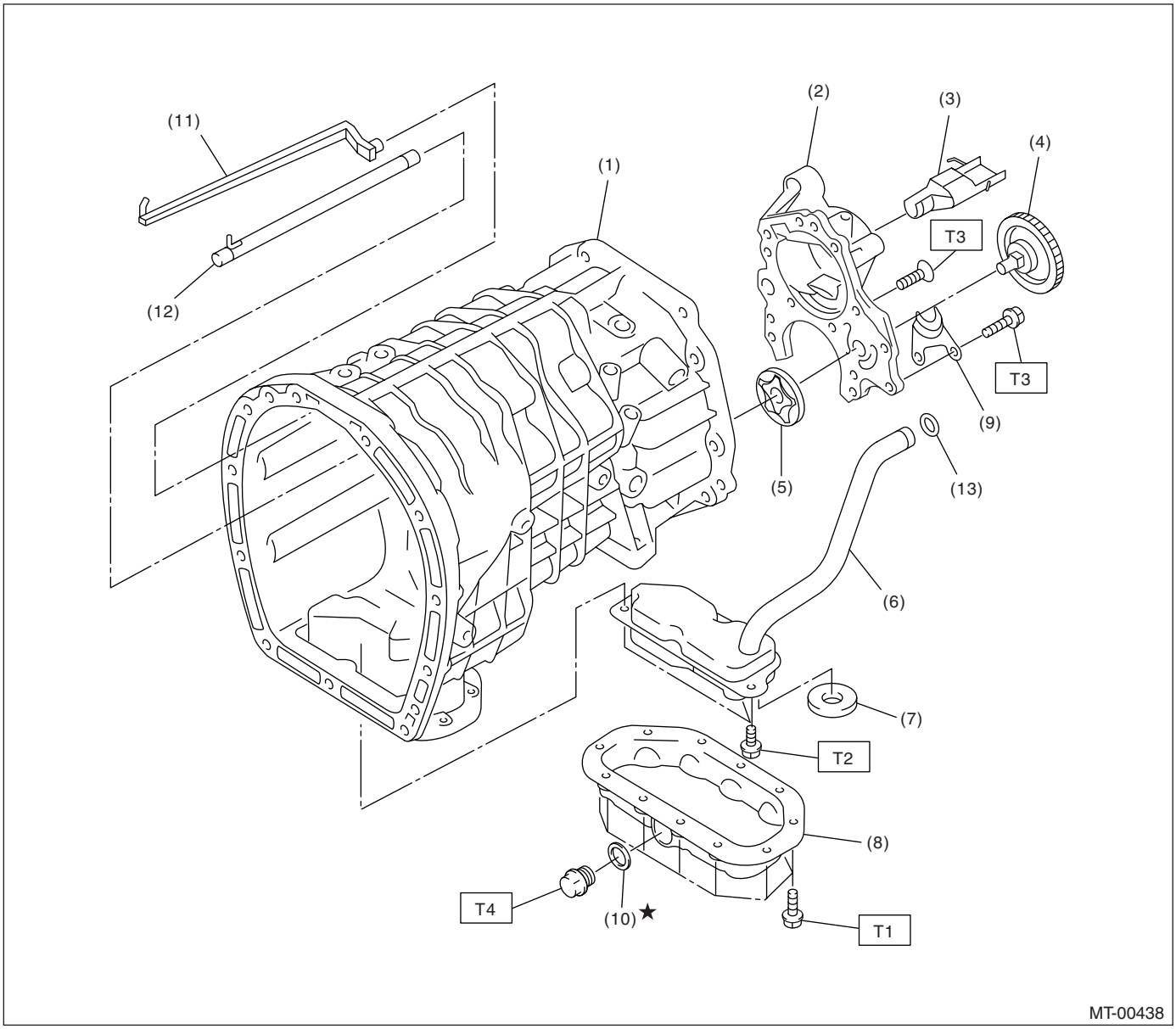


(1)	Pilot bolt	(9)	Return spring
(2)	Neutral switch	(10)	Pressure relief valve
(3)	Back-up light switch	(11)	Return spring
(4)	O-ring	(12)	Ball
(5)	Adapter plate	(13)	Selector plunger
(6)	Transmission case	(14)	Spring
(7)	Oil pipe	(15)	Plug
(8)	Harness bracket	(16)	Gasket

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

T1:	***13 (1.3, 9.6)***
T2:	***16 (1.6, 11.8)***
T3:	***32 (3.3, 23.6)***
T4:	***34 (3.5, 25.1)***
T5:	***41 (4.2, 30.2)***

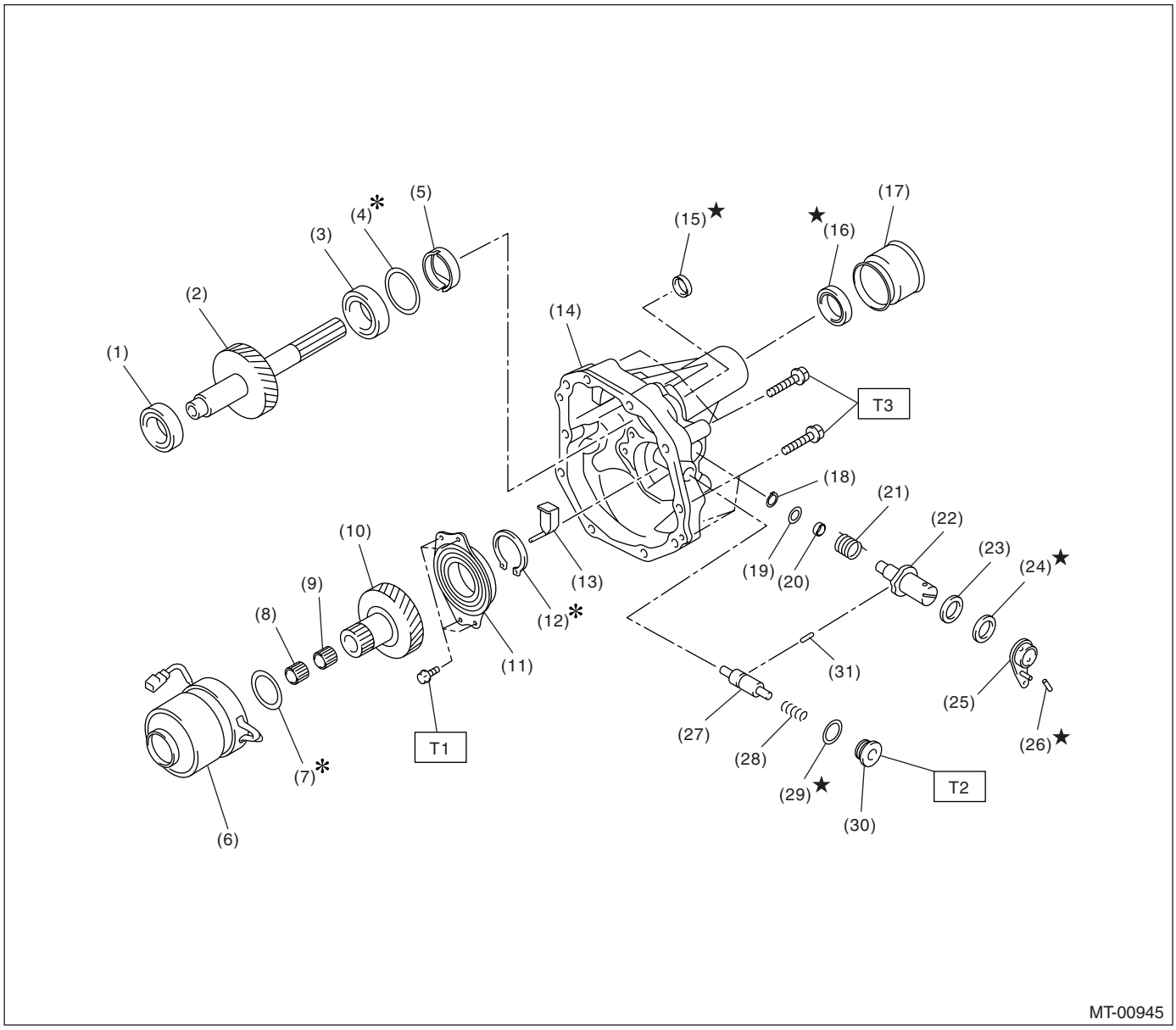
4. OIL PAN AND OIL PUMP



(1)	Main case	(8)	Oil pan
(2)	Oil pump cover	(9)	Plate
(3)	Oil guide	(10)	Gasket
(4)	Oil pump driven gear ASSY	(11)	Oil guide
(5)	Oil pump rotor ASSY	(12)	Oil pipe
(6)	Strainer ASSY	(13)	O-ring
(7)	Magnet		

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 10 (1.0, 7.4)
T3: 25 (2.5, 18.1)
T4: 44 (4.5, 32.5)

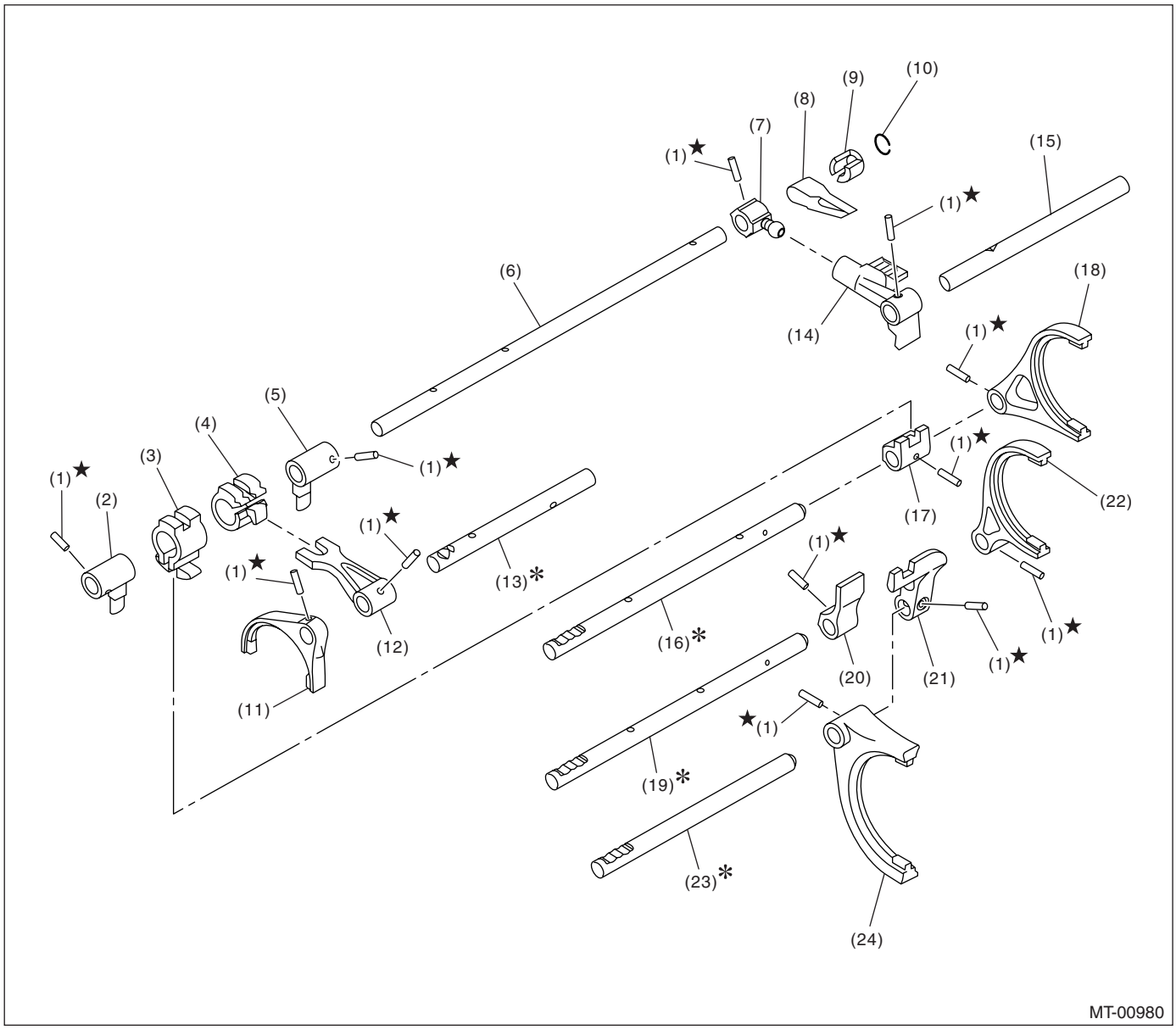
5. EXTENSION CASE AND CENTER DIFFERENTIAL



(1) Taper roller bearing
(2) Transfer driven gear
(3) Taper roller bearing
(4) Shim
(5) Oil plate
(6) Center differential
(7) Shim
(8) Needle bearing
(9) Needle bearing
(10) Transfer drive gear
(11) Ball bearing (with flange)
(12) Snap ring
(13) Extension guide
(14) Extension case
(15) Oil seal
(16) Oil seal
(17) Dust cover
(18) Snap ring
(19) Washer
(20) Bush
(21) Spring
(22) Reverse check shaft
(23) Ball bearing
(24) Oil seal
(25) Reverse check lever COMPL
(26) Straight pin
(27) Reverse check plug
(28) Spring
(29) Gasket
(30) Plug
(31) Plunger

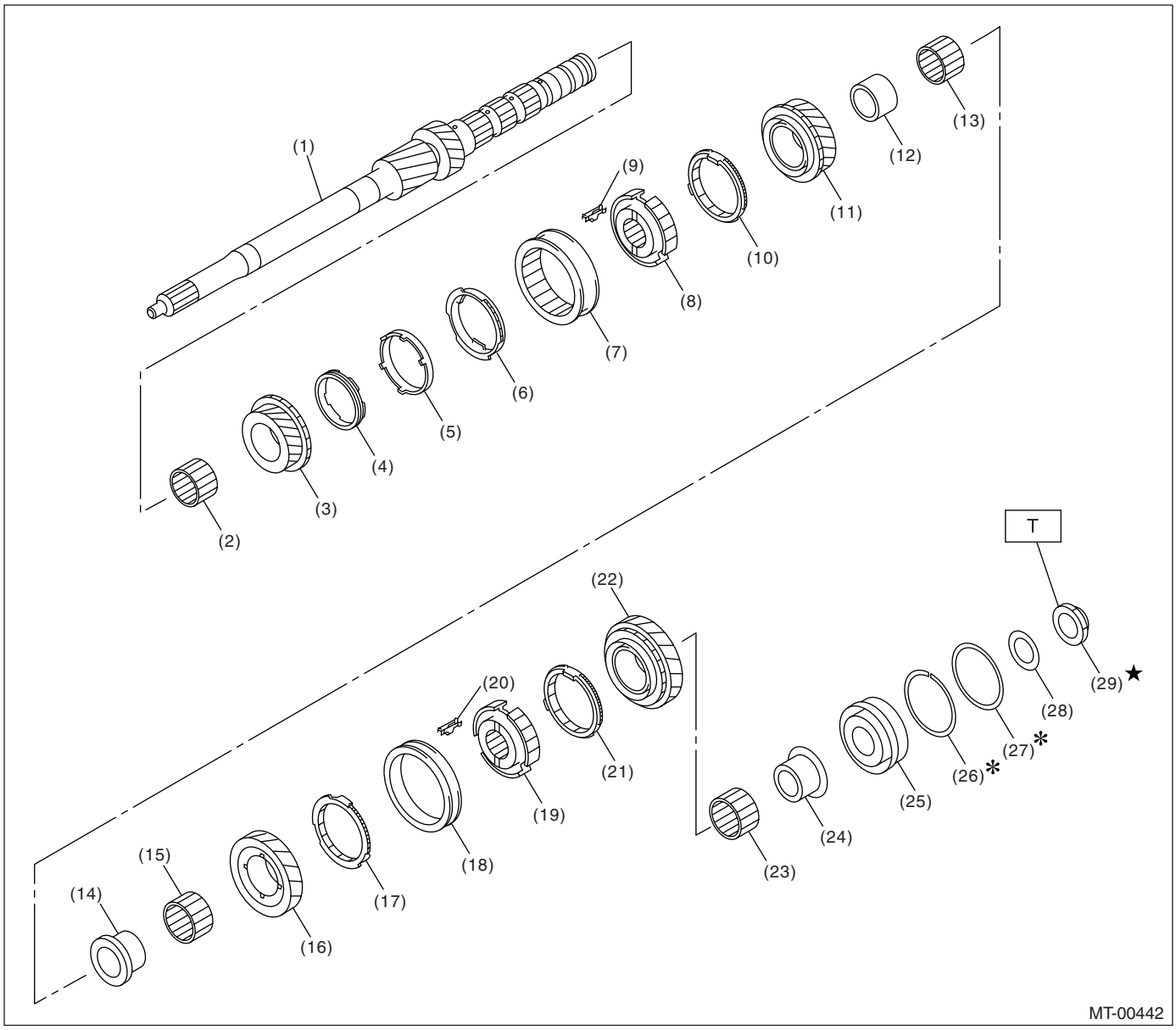
Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)
T2: 41 (4.2, 30.2)
T3: 48 (4.9, 35.4)

6. SHIFTER FORK AND FORK ROD



(1)	Spring pin	(9)	Support	(17)	5th-6th shifter arm
(2)	Interlock arm	(10)	Snap ring	(18)	5th-6th fork COMPL
(3)	Interlock block	(11)	Reverse fork COMPL	(19)	3rd-4th fork rod
(4)	Reverse interlock block	(12)	Reverse shifter arm	(20)	3rd-4th shifter arm
(5)	Interlock arm	(13)	Reverse fork rod	(21)	1st-2nd shifter arm
(6)	Striking rod	(14)	Selector arm COMPL	(22)	3rd-4th fork COMPL
(7)	Selector arm No. 2	(15)	Shifter arm shaft	(23)	1st-2nd fork rod
(8)	Neutral set spring	(16)	5th-6th fork rod	(24)	1st-2nd fork COMPL

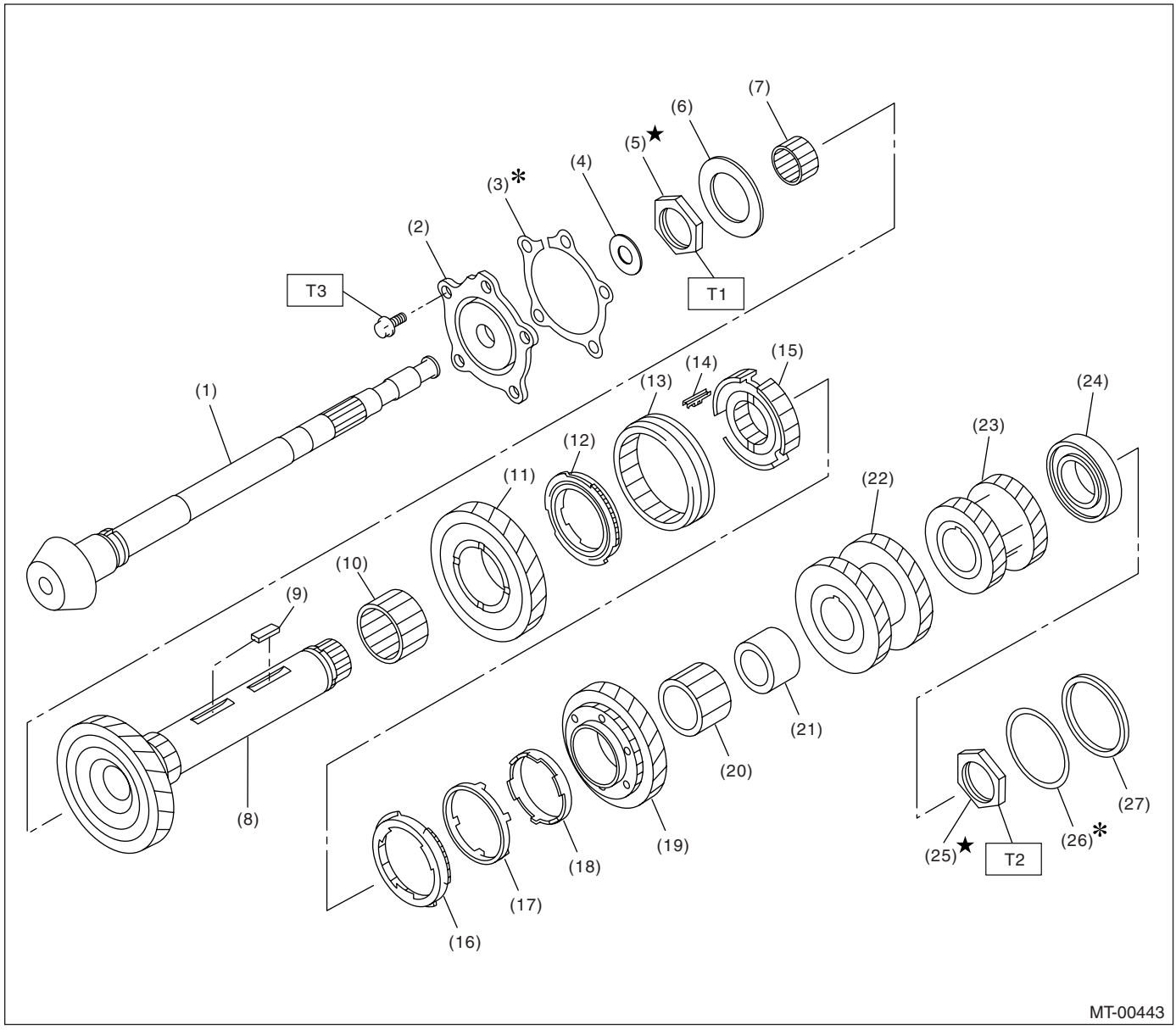
7. MAIN SHAFT ASSY



(1) Main shaft
(2) Needle bearing
(3) 3rd drive gear
(4) Inner baulk ring
(5) Synchro cone
(6) Outer baulk ring
(7) 3rd-4th sleeve
(8) 3rd-4th hub
(9) Shifting insert
(10) 4th baulk ring
(11) 4th gear
(12) 4th bush
(13) Needle bearing
(14) 5th bush
(15) Needle bearing
(16) 5th drive gear
(17) 5th baulk ring
(18) 5th-6th sleeve
(19) 5th-6th hub
(20) Shifting sleeve
(21) 6th baulk ring
(22) 6th drive gear
(23) Needle bearing
(24) 6th bush
(25) Taper roller bearing
(26) Snap ring
(27) Washer
(28) Washer
(29) Lock nut

Tightening torque: N·m (kgf-m, ft-lb)
T: 392 (40.0, 289)

8. DRIVE PINION AND DRIVEN SHAFT ASSY



(1) Drive pinion shaft
(2) Taper roller bearing
(3) Shim
(4) Washer
(5) Lock nut
(6) Thrust bearing
(7) Needle bearing
(8) Driven shaft
(9) Key
(10) Needle bearing
(11) 1st driven gear
(12) 1st synchro ring ASSY
(13) 1st-2nd sleeve
(14) Shifting insert
(15) 1st-2nd hub
(16) Outer baulk ring
(17) Synchro cone
(18) Inner baulk ring
(19) 2nd driven gear
(20) Needle bearing
(21) 2nd bush
(22) 3rd-4th driven gear
(23) 5th-6th driven gear
(24) Ball bearing
(25) Lock nut
(26) Shim
(27) Collar

Tightening torque: N·m (kgf-m, ft-lb)

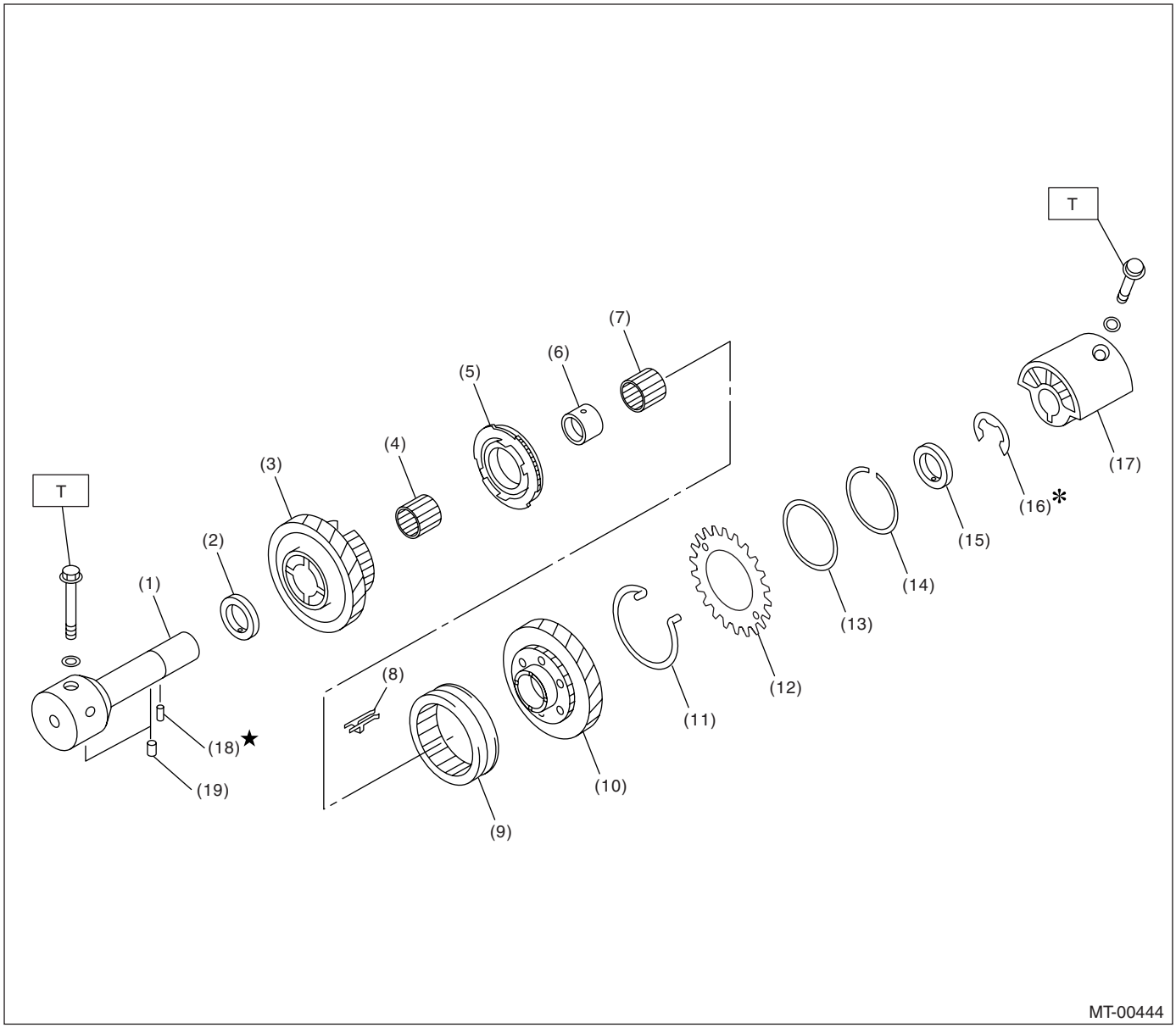
T1: 285 (29.1, 210)
**** 265 (27.0, 195)***

T2: 570 (58.1, 420)
**** 530 (54.0, 391)***

T3: 54 (5.5, 39.8)

* Tightening torque when using ST.

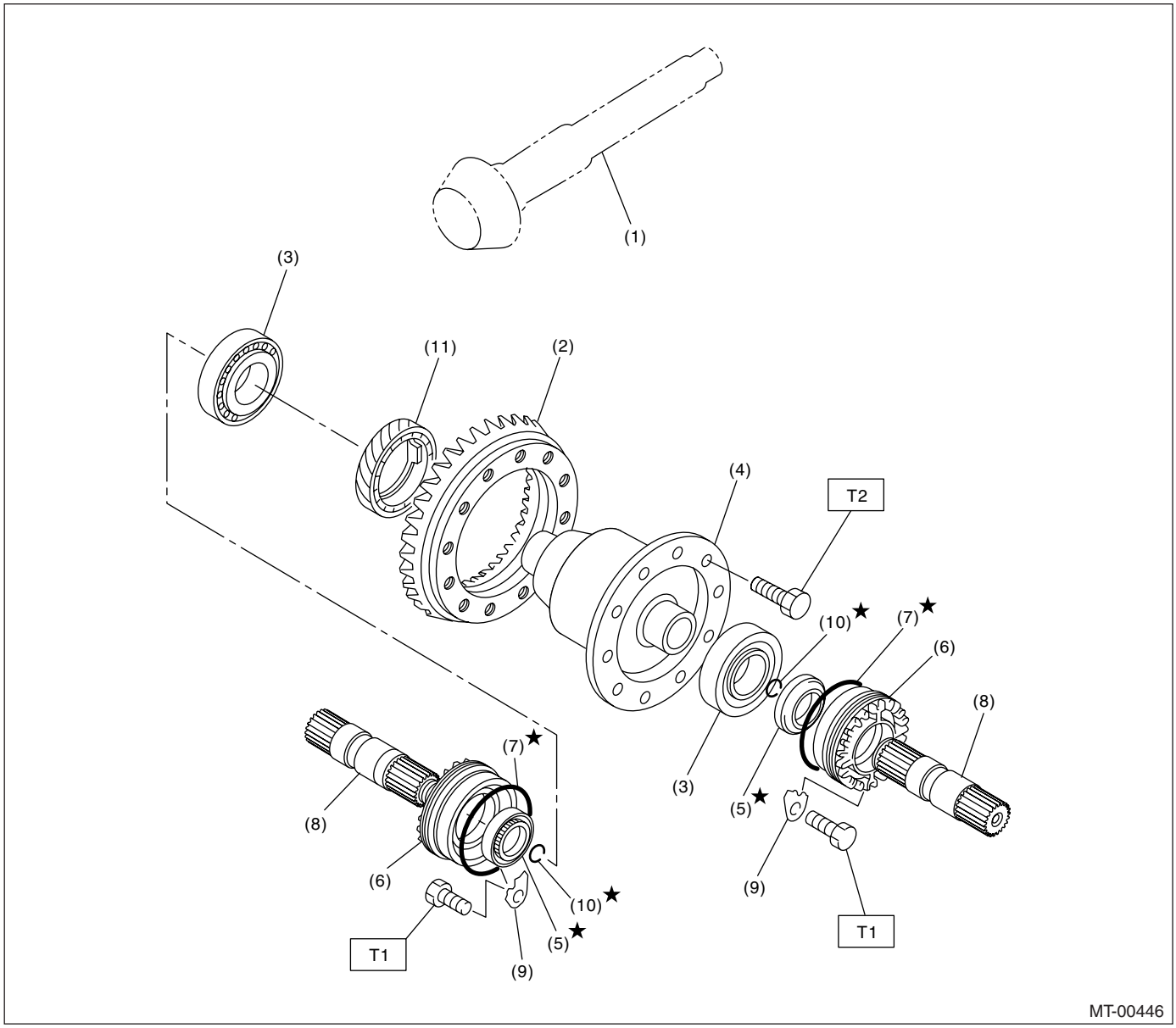
9. REVERSE IDLER GEAR ASSY



(1) Base
(2) Washer
(3) Reverse idler gear No. 2
(4) Needle bearing
(5) Reverse idler synchro set
(6) Reverse idler gear bush
(7) Needle bearing
(8) Shifting insert
(9) Reverse coupling sleeve
(10) Reverse idler gear
(11) Spring
(12) Sub gear
(13) Friction plate
(14) Snap ring
(15) Washer
(16) Snap ring
(17) Reverse idler holder
(18) Spring pin
(19) Knock pin

Tightening torque: N·m (kgf-m, ft-lb)
T: 25 (2.5, 18.1)

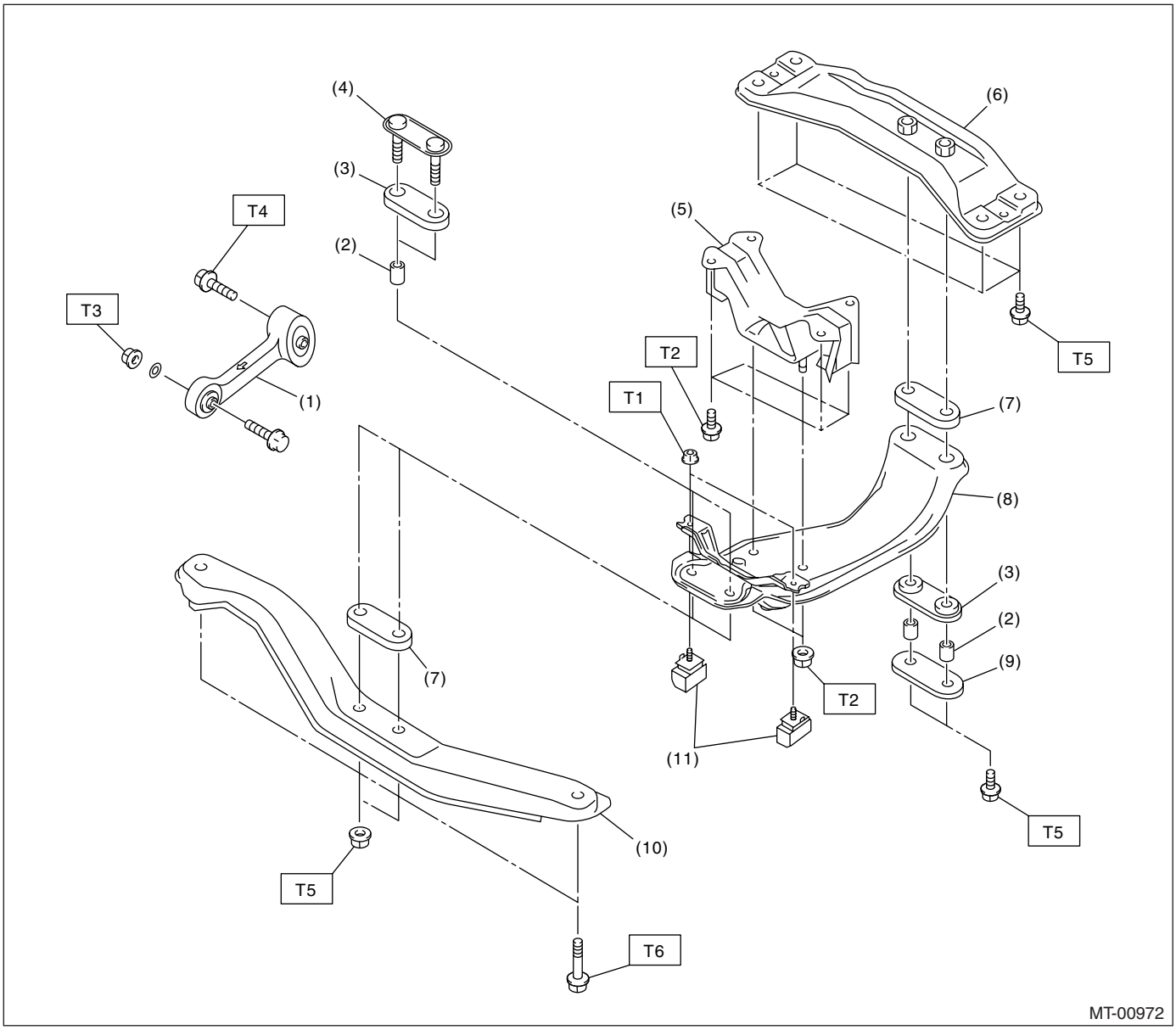
10.FRONT DIFFERENTIAL



(1) Drive pinion shaft
(2) Hypoid driven gear
(3) Roller bearing
(4) Differential ASSY
(5) Oil seal
(6) Differential side retainer
(7) O-ring
(8) Axle drive shaft
(9) Retainer lock plate
(10) Circlip
(11) Speedometer drive gear

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)
T2: 69 (7.0, 50.9)

11.TRANSMISSION MOUNTING



(1) Pitching stopper
(2) Spacer
(3) Cushion C
(4) Front plate
(5) Rear cushion rubber
(6) Rear crossmember
(7) Cushion D
(8) Center crossmember
(9) Rear plate
(10) Front crossmember
(11) Dynamic dumper

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 35 (3.6, 25.8)
T3: 50 (5.1, 36.9)
T4: 58 (5.9, 42.8)
T5: 70 (7.1, 51.6)
T6: 140 (14.3, 103)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation, and disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• When disassembling the case and other light alloy parts, use a plastic hammer to force it apart. Do not pry it apart with a screwdriver or other tool.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply gear oil onto sliding or revolution surfaces before installation.
• Replace deformed or otherwise damaged snap rings with new ones.
• Before installing O-rings or oil seals, apply sufficient amount of gear oil to avoid damage and deformation.
• Be careful not to incorrectly install or fail to install O-rings, snap rings and other such parts.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Avoid damaging the mating surface of the case.
• Before applying sealant, completely remove the old seal.

D: PREPARATION TOOL

1. SPECIAL TOOLS

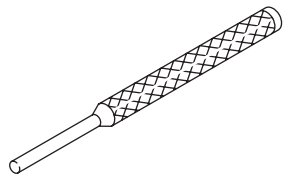
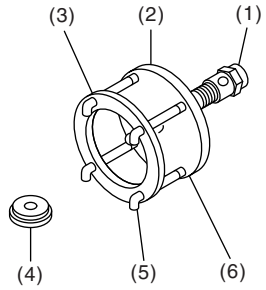
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398791700	398791700	REMOVER	Used for removing and installing spring pin (6 mm).
 ST-399527700	399527700	PULLER SET	Used for removing and installing roller bearing (Differential). (1) BOLT (2) PULLER (3) HOLDER (4) ADAPTER (5) BOLT (6) NUT

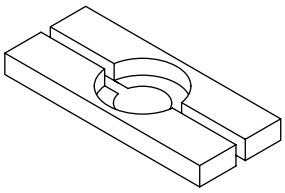
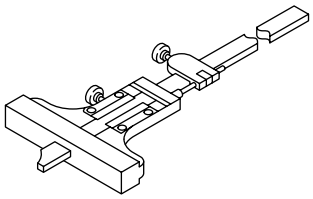
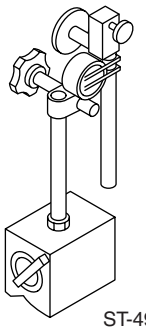
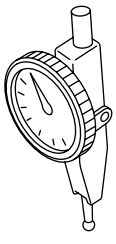
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498515700	498515700	REMOVER	Used for removing roller bearing of drive pinion shaft.
 ST-498147000	498147000	DEPTH GAUGE	Used for adjusting main shaft axial end play.
 ST-498247001	498247001	MAGNET BASE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with DIAL GAUGE (498247100).
 ST-498247100	498247100	DIAL GAUGE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with MAGNET BASE (498247001).

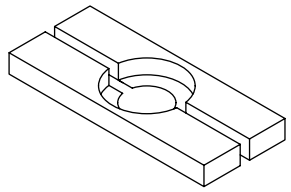
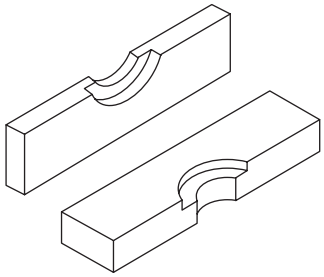
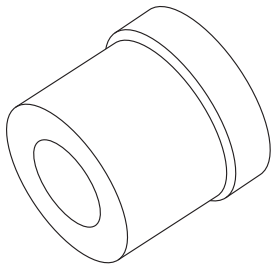
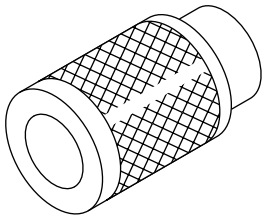
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498077000	498077000	REMOVER	Used for removing differential taper roller bearing.
 ST-899858600	899858600	REMOVER	Used for removing roller bearing.
 ST-399513600	399513600	INSTALLER	Used for installing oil seal.
 ST-499757002	499757002	INSTALLER	Used for installing bearing cone of transfer driven gear (extension core side).

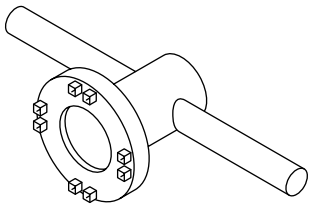
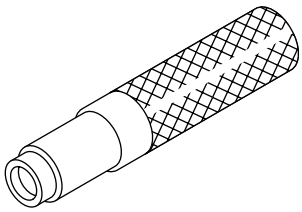
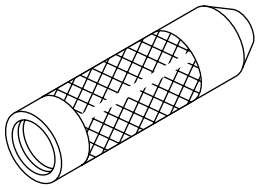
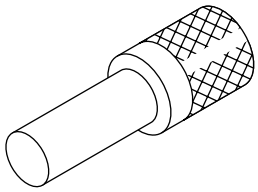
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499787000	499787000	WRENCH ASSY	Used for removing and installing differential side retainer.
 ST-499827000	499827000	PRESS	Used for installing speedometer oil seal when installing speedometer cable to transmission.
 ST-499877000	499877000	RACE 4-5 INSTALLER	Used for disassembling driven shaft and transfer driven gear.
 ST-899864100	899864100	REMOVER	Used for removing parts on transmission main shaft and drive pinion.

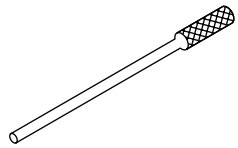
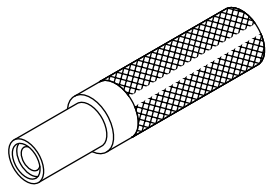
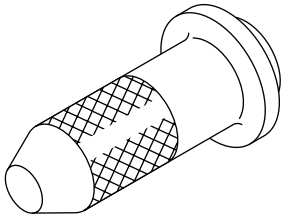
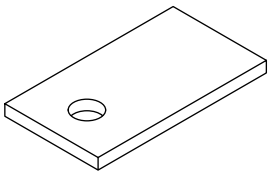
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899904100	899904100	REMOVER	Used for removing and installing straight pin.
 ST-899824100	899824100	PRESS	Used for installing speedometer shaft oil seal.
 ST-498057300	498057300	INSTALLER	Used for installing extension oil seal.
 ST-498255400	498255400	PLATE	Used for measuring backlash.

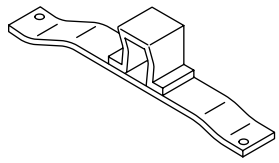
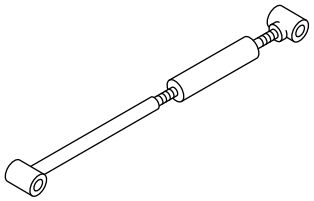
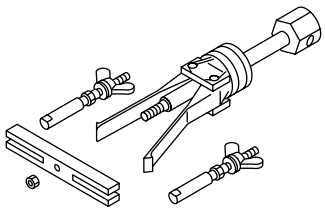
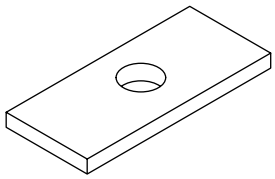
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST41099AA010	41099AA010	ENGINE SUPPORT BRACKET	• Used for supporting engine. • Used with ENGINE SUPPORT (41099AA020).
 ST41099AA020	41099AA020	ENGINE SUPPORT	• Used for supporting engine. • Used with ENGINE SUPPORT BRACKET (41099AA010).
 ST-398527700	398527700	PULLER ASSY	Used for removing extension case oil seal and clutch housing oil seal.
 ST-499575500	499575500	GAUGE	Used for measuring total end play, extension end play and drive pinion height.

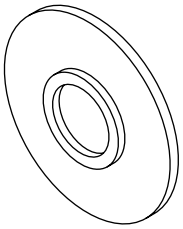
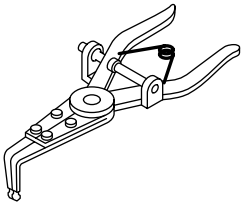
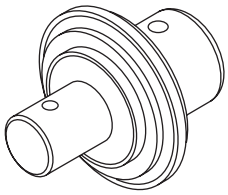
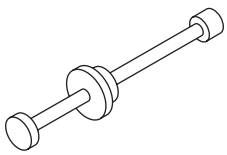
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398177700	398177700	INSTALLER	Used for assembling main shaft.
 ST-399893600	399893600	PLIERS	• Used for removing and installing neutral set spring. • Used with CLAW (18756AA000).
 ST-499247300	499247300	INSTALLER	• Used for removing axle shaft. • Used with REMOVER ASSY (499095500).
 ST-499095500	499095500	REMOVER ASSY	• Used for removing axle shaft. • Used with INSTALLER (499247300).

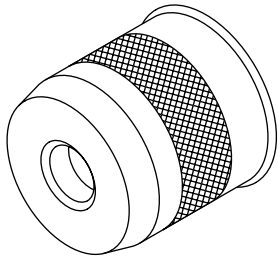
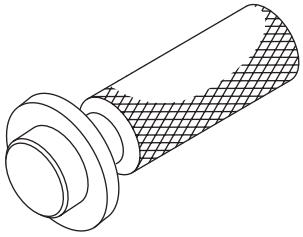
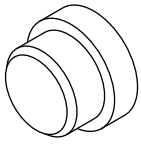
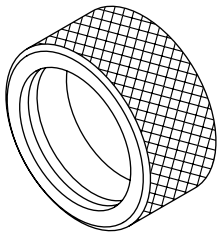
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499247400	499247400	INSTALLER	Used for installing transfer drive gear ball bearing.
 ST-499797000	499797000	OIL SEAL INSTALLER	Used for installing differential side retainer oil seal.
 ST-398497701	398497701	SEAT	Used for installing transfer drive gear ball bearing.
 ST-398437700	398437700	INSTALLER	Used for installing front differential side bearing.

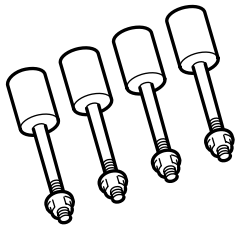
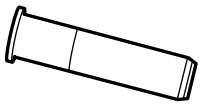
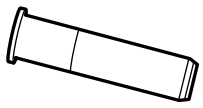
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18632AA000	18632AA000 (Newly adopted tool)	STAND ASSY	Used for disassembling and assembling transmission.
ST18671AA000	18671AA000 (Newly adopted tool)	OIL SEAL GUIDE	• Used for installing oil seal to reverse check. • Used with INSTALLER (18657AA010).
 ST18657AA010	18657AA010 (Newly adopted tool)	INSTALLER	• Used for installing oil seal to reverse check. • Used with OIL SEAL GUIDE (18671AA000).
 ST18657AA000	18657AA000 (Newly adopted tool)	INSTALLER	Used for installing oil seal to shift rod.

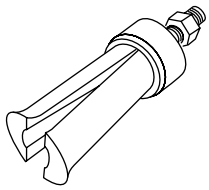
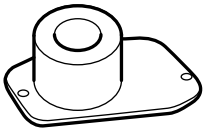
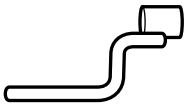
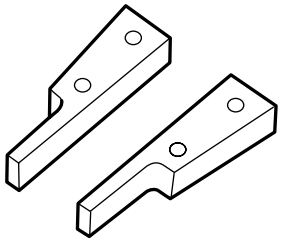
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18758AA000	18758AA000 (Newly adopted tool)	PULLER	Used for removing extension taper roller bearing outer race.
 ST18831AA000	18831AA000 (Newly adopted tool)	GAUGE	Used for measuring extension taper roller bearing.
 ST18631AA000	18631AA000 (Newly adopted tool)	HANDLE	Used for measuring front differential backlash.
 ST18756AA000	18756AA000 (Newly adopted tool)	CLAW	• Used for installing and removing neutral set spring. • Used with PLIERS (399893600).

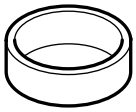
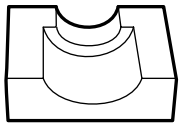
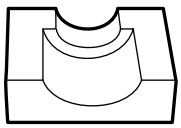
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18754AA000	18754AA000 (Newly adopted tool)	REMOVER	Used for removing each parts of driven gear.
ST18757AA000	18757AA000 (Newly adopted tool)	STRAIGHT PIN REMOVER	Used for installing reverse idler gear.
 ST18665AA000	18665AA000 (Newly adopted tool)	HOLDER	• Used for installing and removing main shaft lock nut. • Used with BASE (18664AA000).
 ST18666AA000	18666AA000 (Newly adopted tool)	HOLDER	• Used for installing and removing driven shaft lock nut. • Used with BASE (18664AA000).

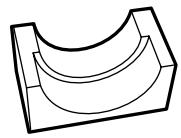
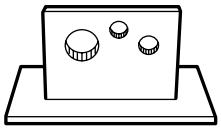
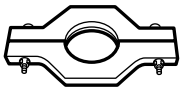
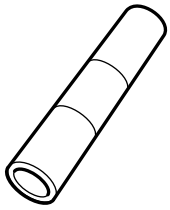
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18667AA000	18667AA000 (Newly adopted tool)	HOLDER	• Used for installing and removing drive pinion shaft lock nut. • Used with BASE (18664AA000).
 ST18664AA000	18664AA000 (Newly adopted tool)	BASE	• Used for installing and removing main shaft lock nut. • Used for installing and removing drive pinion shaft lock nut. • Used for installing and removing driven shaft lock nut.
 ST18722AA010	18722AA010 (Newly adopted tool)	REMOVER	Used for disassembling main shaft.
 ST18651AA000	18651AA000 (Newly adopted tool)	INSTALLER	Used for assembling main shaft.

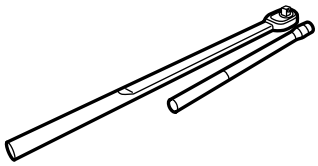
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18852AA000	18852AA000 (Newly adopted tool)	TORQUE WRENCH	• Used for tightening main shaft lock nut. • Used for tightening drive pinion shaft lock nut. • Used for tightening driven shaft lock nut.
ST18668AA000	18668AA000 (Newly adopted tool)	PUNCH	Used for caulking main shaft lock nut.
ST18669AA000	18669AA000 (Newly adopted tool)	PUNCH	Used for caulking driven shaft lock nut.
ST18670AA000	18670AA000 (Newly adopted tool)	PUNCH	Used for caulking drive pinion shaft lock nut.

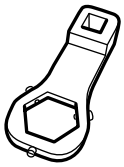
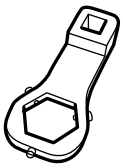
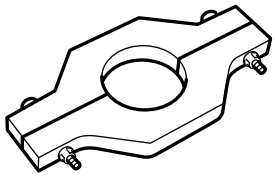
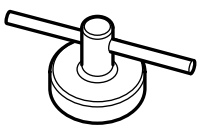
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18620AA000	18620AA000 (Newly adopted tool)	ADAPTER WRENCH	Used for installing and removing driven gear shaft lock nut.
 ST18621AA000	18621AA000 (Newly adopted tool)	ADAPTER WRENCH	Used for installing and removing drive pinion shaft lock nut.
 ST18723AA000	18723AA000 (Newly adopted tool)	REMOVER	Used for disassembling the driven shaft.
 ST18630AA000	18630AA000 (Newly adopted tool)	WRENCH ASSY	Used for removing and installing differential side retainer (left side).

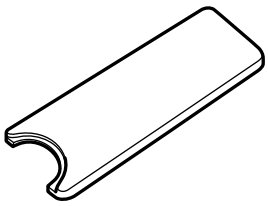
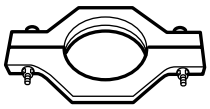
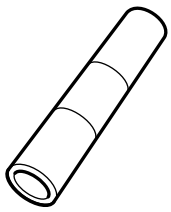
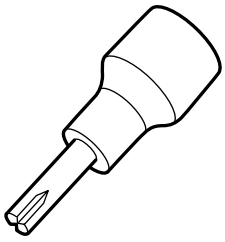
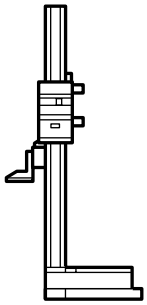
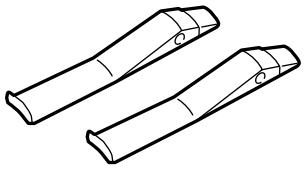
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18672AA000	18672AA000 (Newly adopted tool)	GUIDE CLIP	Used for installing reverse idler gear snap ring.
 ST18720AA000	18720AA000 (Newly adopted tool)	REMOVER	Used for disassembling main shaft.
 ST18654AA000	18654AA000 (Newly adopted tool)	INSTALLER	Used for assembling driven shaft.
 ST18663AA000	18663AA000 (Newly adopted tool)	SOCKET	Used for installing and removing oil pump cover.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18853AA000	18853AA000 (Newly adopted tool)	HEIGHT GAUGE	Used for selecting shift rod.
 ST18760AA000	18760AA000 (Newly adopted tool)	CLAW	• Used for removing front side retainer bearing outer race. • Used with PULLER ASSEMBLY (398527700).

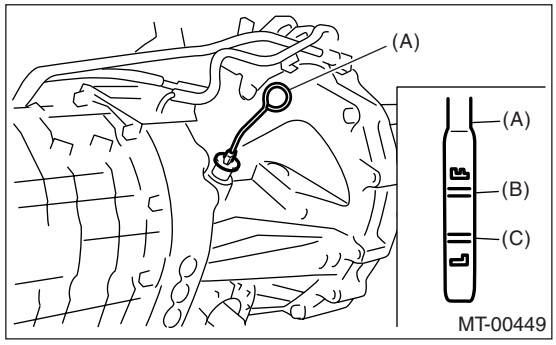
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.

2. Transmission Gear Oil

A: INSPECTION

1) Park the vehicle on a level surface.
2) Turn the ignition switch to OFF, and wait until the engine cools.
3) Remove the oil level gauge and wipe it clean.
4) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper direction.
5) Pull out the oil level gauge again and check the oil level on it. If it is below the lower level, add oil through the oil level gauge hole to bring the level up to the upper level.



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

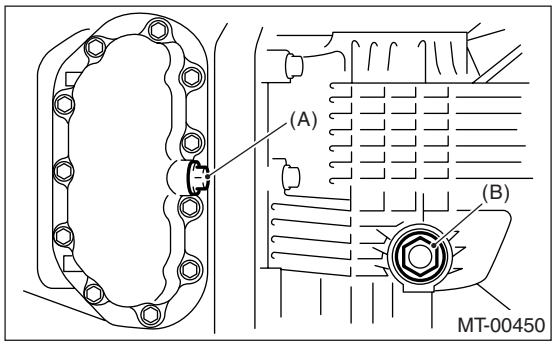
B: REPLACEMENT

1) Pull out the oil level gauge.
2) Lift-up the vehicle.
3) Remove the transmission under cover.
4) Drain the transmission gear oil completely.

CAUTION:
Directly after the vehicle has been running or the engine has been long idle running, the transmission gear oil is hot. Be careful not to burn yourself.

NOTE:
• Tighten the transmission gear oil drain plug after draining transmission gear oil.
• Always use a new gasket.

Tightening torque:
Oil pan side
44 N·m (4.5 kgf-m, 32.5 ft-lb)
Clutch housing side
70 N·m (7.1 kgf-m, 51.6 ft-lb)



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

5) Lower the vehicle.
6) Pour gear oil into the gauge hole.

Recommended gear oil:
Use GL-5 or equivalent.

Gear oil capacity:
4.1 ℓ (4.3 US qt, 3.6 Imp qt)

7) Check the level of the transmission gear oil.

NOTE:
• When inserting the level gauge into transmission gear, align the protrusion on the side of the top part of the level gauge with the notch in the gauge hole.
• The gear oil level should be within the specified range marked on the level gauge.

3. Oil Seal

A: INSPECTION

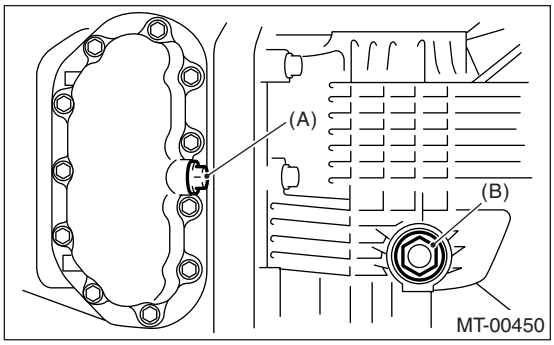
Inspect for oil leakage from the oil seal. Replace the oil seal if the lips is deformed, hardened, damaged, worn or defective if any.

B: REPLACEMENT

1) Clean the transmission exterior.
2) Drain the gear oil completely.

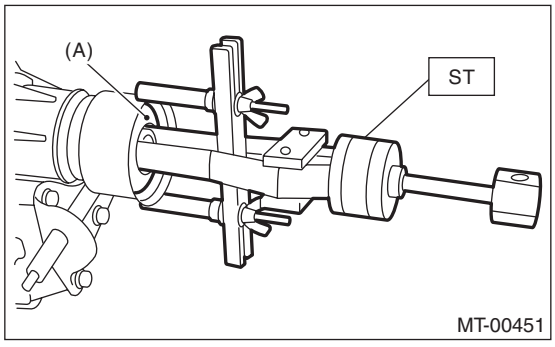
NOTE:
- Tighten the drain plug after draining gear oil.
- Always use a new gasket.

Tightening torque:
Oil pan side
44 N·m (4.5 kgf-m, 32.5 ft-lb)
Clutch housing side
70 N·m (7.1 kgf-m, 51.6 ft-lb)



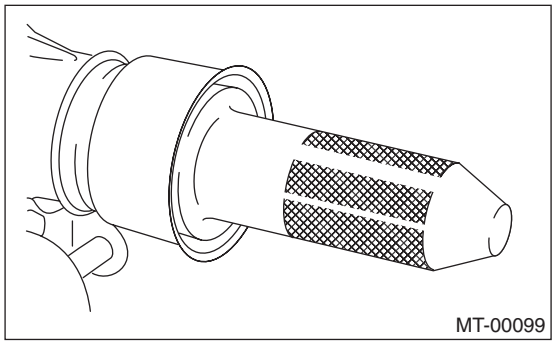
(A) Drain plug (Oil pan side)
(B) Drain plug (Clutch housing side)

3) Remove the rear exhaust pipe and muffler.
4) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
5) Using the ST, remove the oil seal.
ST 398527700 PULLER ASSY



(A) Oil seal

6) Using the ST, install the oil seal.
ST 498057300 INSTALLER

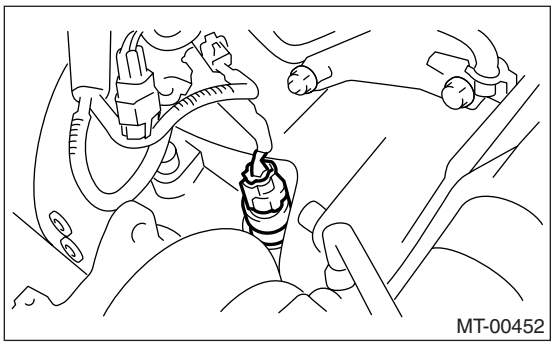


7) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>
8) Install the rear exhaust pipe and muffler.
9) Pour gear oil and check the oil level. <Ref. to 6MT-31, REPLACEMENT, Transmission Gear Oil.>

4. Vehicle Speed Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
3) Disconnect the vehicle speed sensor connector.



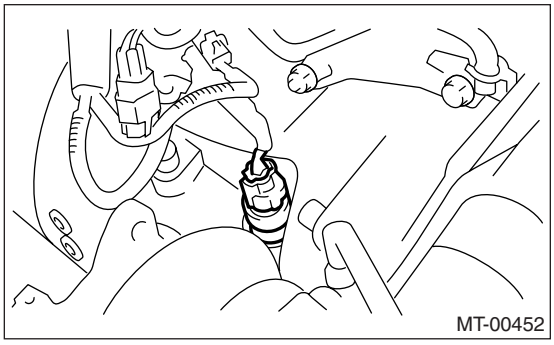
4) Remove the vehicle speed sensor.

B: INSTALLATION

1) Align the tip end of vehicle speed sensor key with key groove on the end of speedometer shaft, and then install it.

Tightening torque:
5.9 N·m (0.6 kgf-m, 4.4 ft-lb)

NOTE:
• Ensure the sensor mounting hole is clean and free of foreign matter.
• Discard the vehicle speed sensor after removal, and replace it with a new one.



2) Connect the connector to vehicle speed sensor.
3) Install the intercooler. <Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>

C: INSPECTION

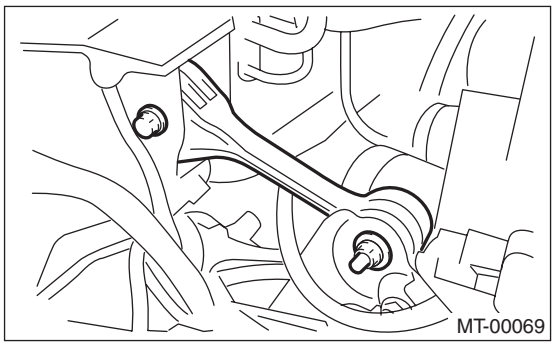
Inspect that the speedometer is normally operated, because vehicle speed sensor cannot be inspected as a single part. If it is not normally operated, inspect the combination meter system. <Ref. to IDI-3, INSPECTION, Combination Meter System.>

5. Transmission Mounting System

A: REMOVAL

1. PITCHING STOPPER

1) Disconnect the ground cable from battery.
2) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
3) Remove the pitching stopper.

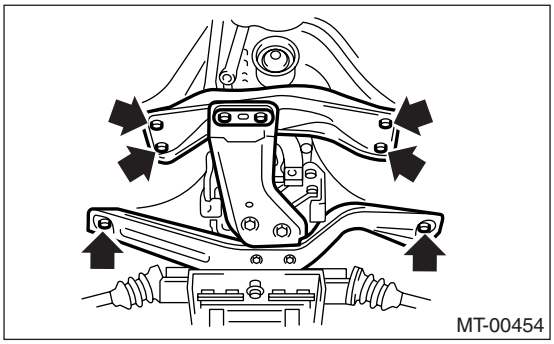


2. CROSSMEMBER AND CUSHION RUBBER

1) Disconnect the ground cable from battery.
2) Jack-up the vehicle and support it with sturdy racks.
3) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
4) Remove the rear exhaust pipe and muffler.
5) Set the transmission jack under the transmission body.

CAUTION:
Always support the transmission case with a transmission jack.

6) Remove the rear crossmember.



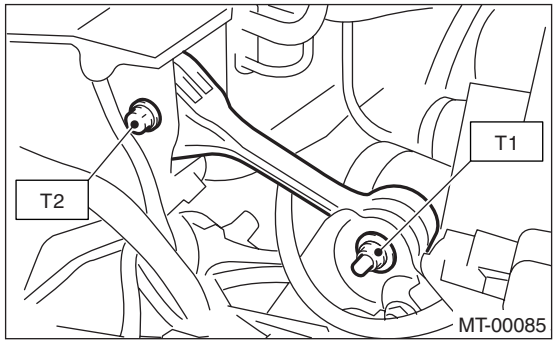
7) Remove the rear cushion rubber.

B: INSTALLATION

1. PITCHING STOPPER

1) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)



2) Install the intercooler. <Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>
3) Connect the battery ground cable to battery.

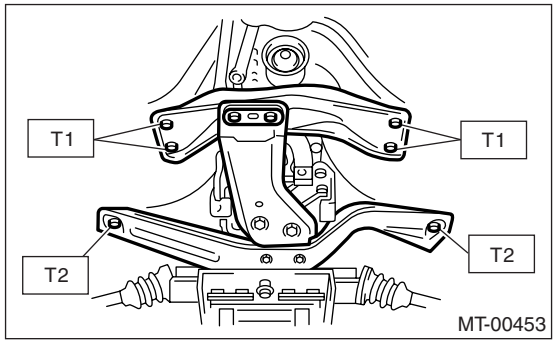
2. CROSSMEMBER AND CUSHION RUBBER

1) Install the rear cushion rubber.

Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

2) Install the crossmember.

Tightening torque:
T1: 70 N·m (7.1 kgf-m, 51.6 ft-lb)
T2: 140 N·m (14.3 kgf-m, 103 ft-lb)



3) Remove the transmission jack.
4) Install the center exhaust pipe. <Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>
5) Install the rear exhaust pipe and muffler.

C: INSPECTION

Repair or replace parts if the results of the inspection below are not satisfactory.

1. PITCHING STOPPER

Make sure that the pitching stopper is not bent or damaged. Make sure that the rubber is not stiff, cracked, or otherwise damaged.

2. CROSSMEMBER AND CUSHION RUBBER

Make sure that the crossmember is not bent or damaged. Make sure that the cushion rubber is not stiff, cracked, or otherwise damaged.

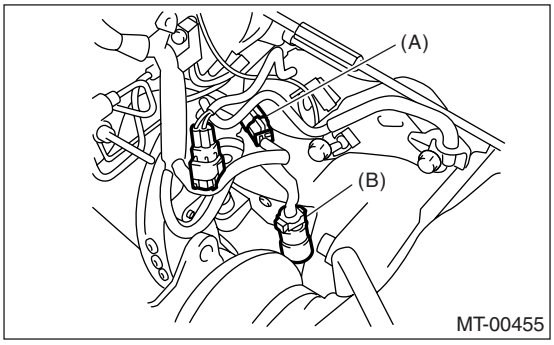
6. Manual Transmission Assembly

A: REMOVAL

1) Set the vehicle on a lift, and then open the front hood and support it with hood stay.

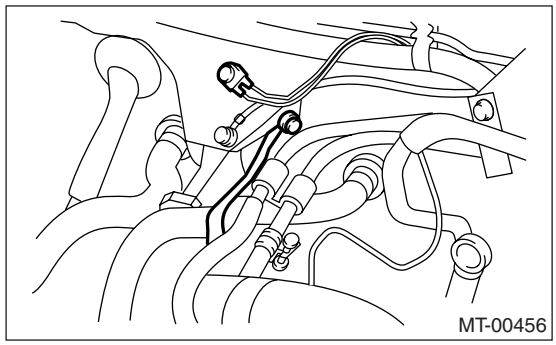
NOTE:
Set the hood stay to its specified hole.

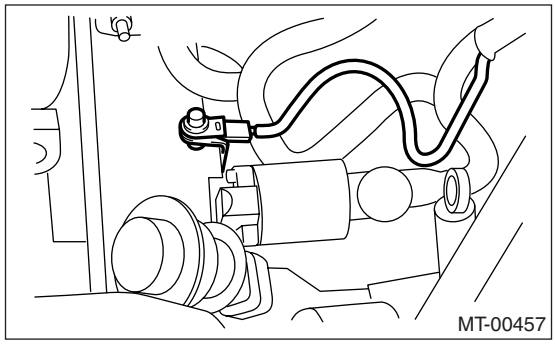
2) Remove the front wheel.
3) Disconnect the ground cable from battery.
4) Remove the intercooler assembly. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
5) Lift-up the vehicle, and then remove the under cover.
6) Remove the steering universal joint. <Ref. to PS-17, REMOVAL, Universal Joint.>
7) Lower the vehicle and disconnect the connector located on upper side of transmission.



(A) Transmission connector
(B) Vehicle speed sensor connector

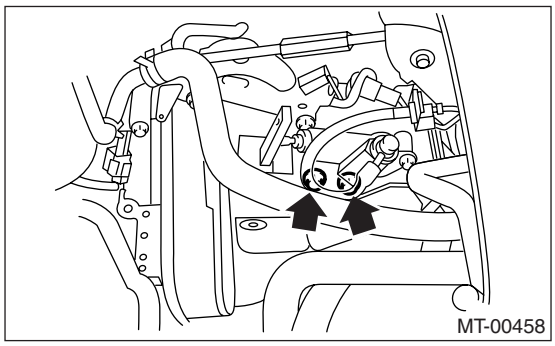
8) Disconnect the ground cable at upper side of transmission case and body.





9) Remove the starter assembly. <Ref. to SC(H4SO)-7, REMOVAL, Starter.>
10) Remove the clutch operating cylinder.

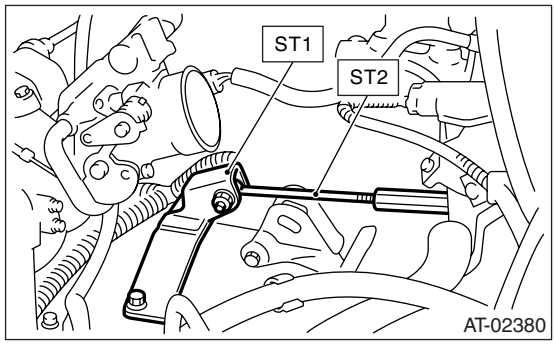
NOTE:
Hang the removed operating cylinder with a wire, etc.



11) Remove the clutch release shaft.
(1) Remove the plug with hexagon wrench.
(2) Install a 6 mm (0.24 in) bolt to the release shaft, then pull out the release shaft.
(3) Lift up the release fork, and then remove it from the release bearing claw. Pull it to the engine side and set it free.
12) Remove the pitching stopper, and then remove the pitching stopper bracket.

13) Set the ST.

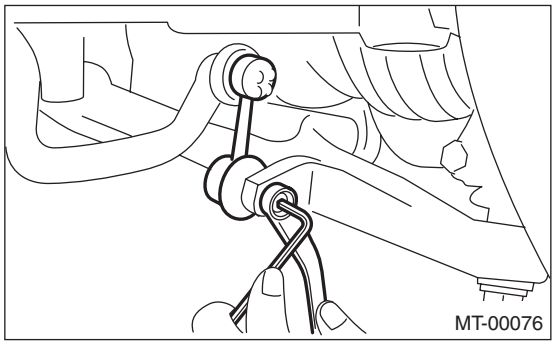
ST1 41099AA010 ENGINE SUPPORT BRACKET
ST2 41099AA020 ENGINE SUPPORT



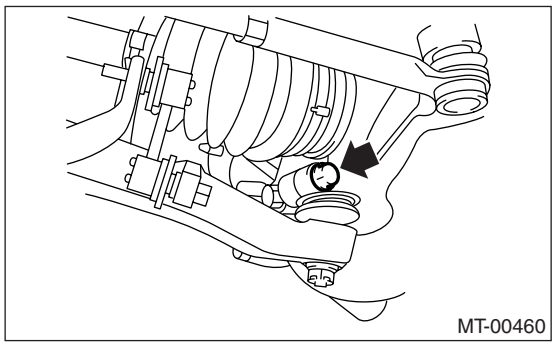
14) Remove the center and rear exhaust pipe and muffler. <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>

15) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>

16) Remove the front stabilizer bolt.



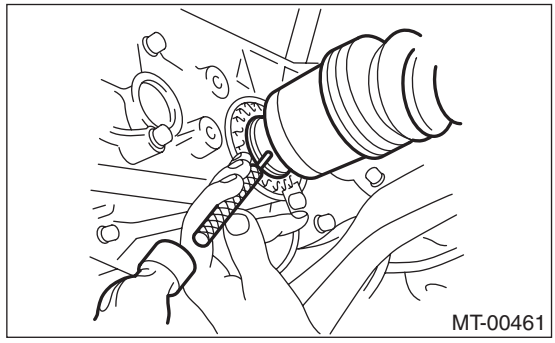
17) Remove the ball joint of transverse link from housing.



18) Using the ST, remove the spring pin of front drive shaft.

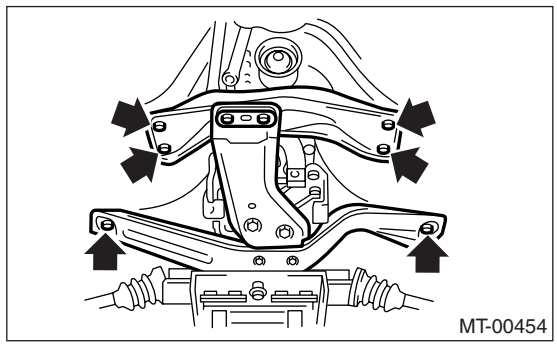
ST 398791700 REMOVER

NOTE:
Do not reuse the spring pin.



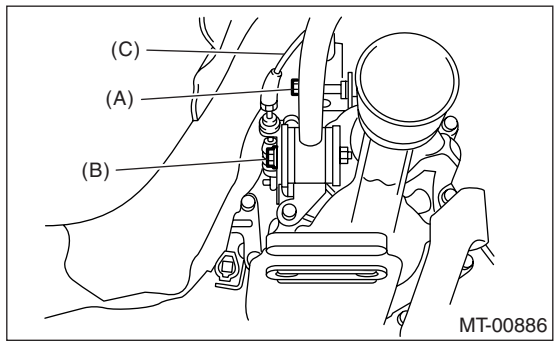
19) Remove the front drive shaft.

20) Set the transmission jack under the transmission, then remove the front crossmember and rear crossmember.



21) Move the transmission to right side, then remove the joint COMPL, stay bolt and reverse check cable.

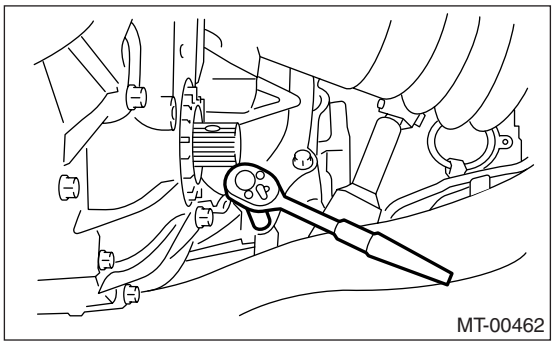
NOTE:
If the transmission is not moved, the joint COMPL and stay bolt will contact body and damage may occur.

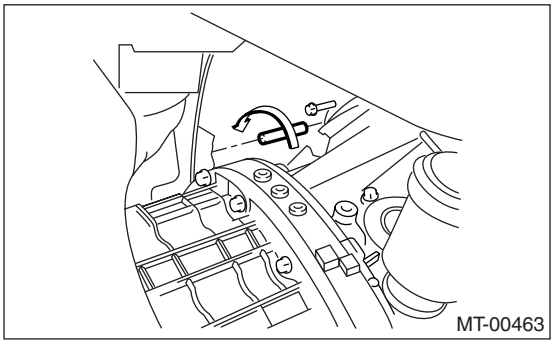


(A) Joint COMPL bolt
(B) Stay bolt
(C) Reverse check cable

22) Remove the fixing bolt of engine and transmission, then remove the transmission from vehicle.

NOTE:
• Rotate the ST (ENGINE SUPPORT ASSY) counterclockwise (to shorten the ST) and lower the rear side of engine to facilitate removal.
• Take care not to contact the transmission with body when pulling backward to remove.
• Remove the clutch pipe and breather pipe carefully which may interfere each other.


MT-00462

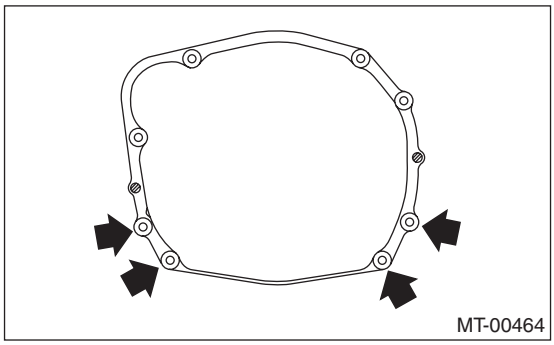

MT-00463

B: INSTALLATION

1) Set the release fork, release bearing and release shaft to transmission. <Ref. to CL-14, INSTALLATION, Release Bearing and Lever.>
2) Install the transmission.

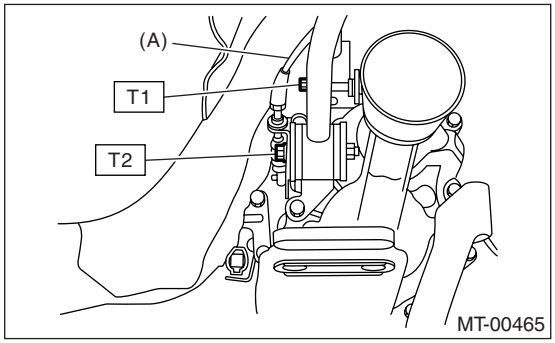
NOTE:
• Make sure the main shaft spline part is inserted completely.
• Make sure the rear side of engine is lowered.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)


MT-00464

3) Move the transmission to the right side, then install the joint COMPL bolt, stay bolt and reverse check cable.

Tightening torque:
T1: 11.8 N·m (1.2 kgf-m, 8.7 ft-lb)
T2: 32 N·m (3.3 kgf-m, 23.6 ft-lb)



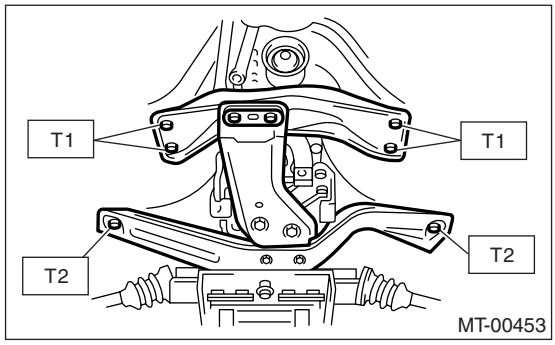
MT-00465

(A) Reverse check cable

4) Install the front crossmember and rear crossmember.

NOTE:
Rotate the ST (ENGINE SUPPORT ASSY) turn buckle clockwise (to make longer the ST) and lift up the rear side of engine to facilitate installation.

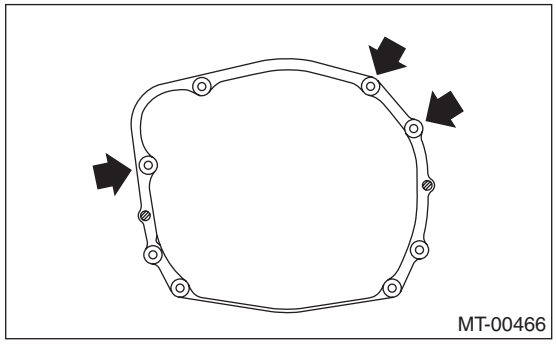
Tightening torque:
T1: 70 N·m (7.1 kgf-m, 51.6 ft-lb)
T2: 140 N·m (14.3 kgf-m, 103 ft-lb)



MT-00453

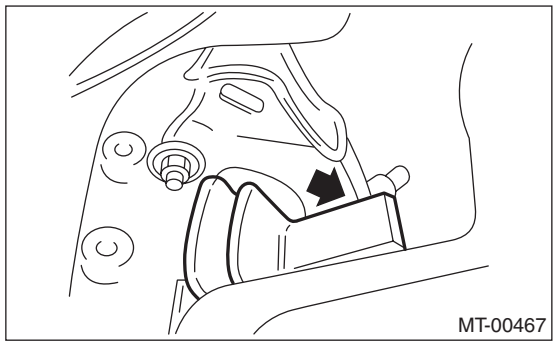
5) Lower the vehicle and install the fixing bolt.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)


MT-00466

6) Make sure the release bearing is installed completely.

NOTE:
• Push the release fork to operating cylinder side until you hear a “click” sound. Pull the release fork to engine side. Setting is completed if the release fork does not contact the case.
• Make sure the boot cover is firmly set.

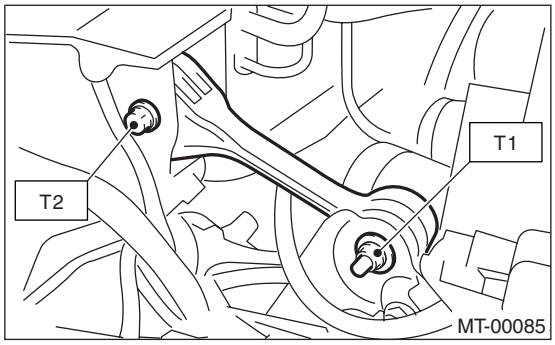


7) Install the pitching stopper bracket.

Tightening torque:
41 N·m (4.2 kgf-m, 30.2 ft-lb)

8) Install the pitching stopper.

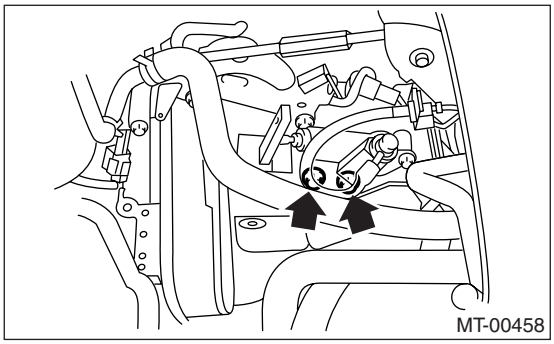
Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)



9) Install the clutch operating cylinder.

Tightening torque:
41 N·m (4.2 kgf-m, 30.2 ft-lb)

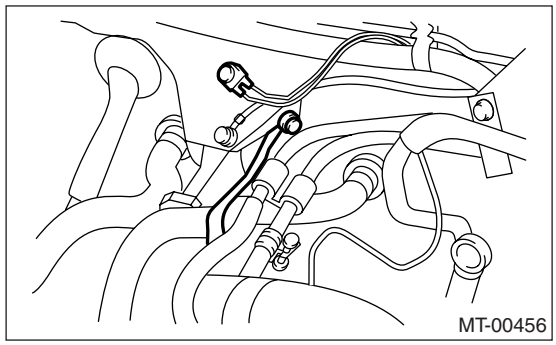
NOTE:
Check that the clutch hose is routed properly.

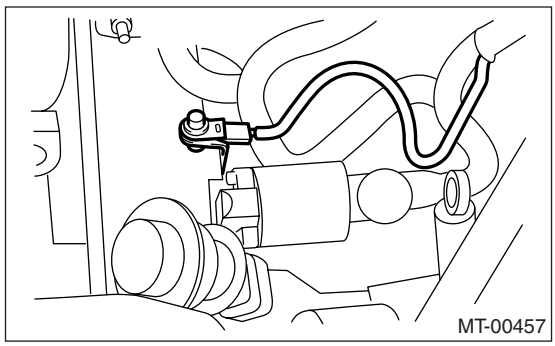


10) Install the starter assembly.

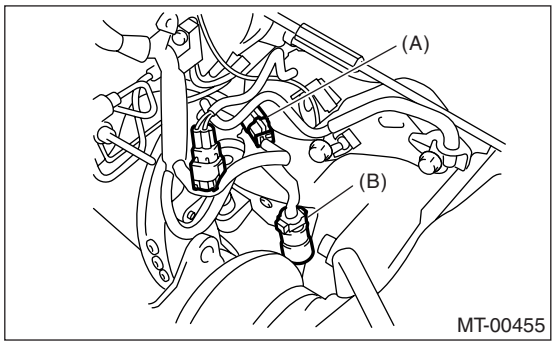
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

11) Install the transmission and body ground cable.





12) Connect the connector located on the upper side of transmission.



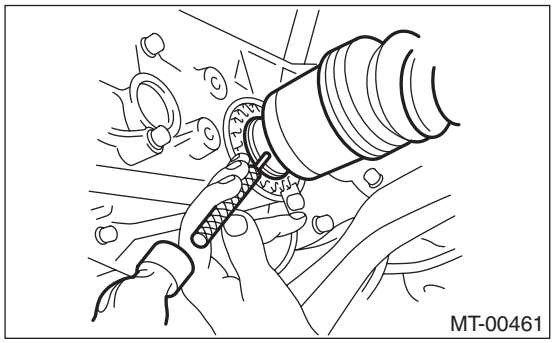
(A) Vehicle speed sensor connector
(B) Transmission connector

13) Lift-up the vehicle, and then install the drive shaft.

14) Using the ST, install the spring pin of front drive shaft.

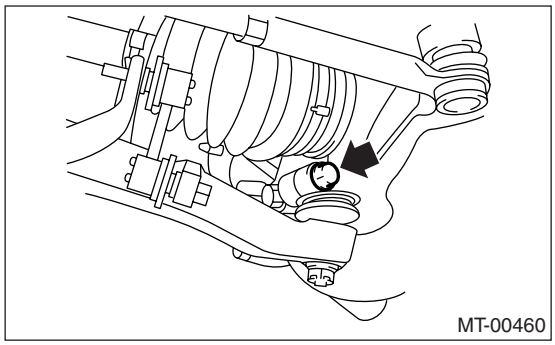
ST 398791700 REMOVER

NOTE:
Align each chamfered part of front drive shaft and axle drive shaft spring pin hole, and assemble them. Then insert the spring pin.



15) Install the ball joint of transverse link to housing.

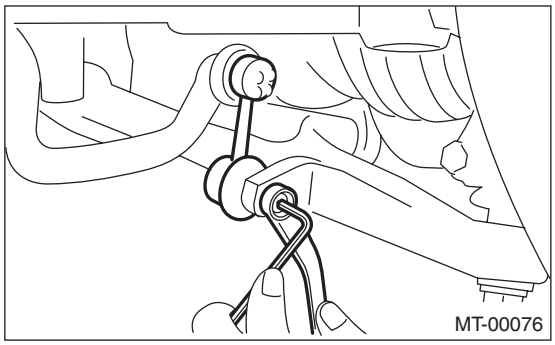
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



16) Install the stabilizer nut.

Tightening torque:
45 N·m (4.6 kgf-m, 33.2 ft-lb)

NOTE:
Discard the loosened self-locking nut and replace with a new one.



17) Install the propeller shaft. <Ref. to DS-15, INSTALLATION, Propeller Shaft.>
18) Install the center exhaust pipe. <Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>
19) Install the rear exhaust pipe and muffler. <Ref. to EX(H4DOTC)-13, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(H4DOTC)-14, INSTALLATION, Muffler.>
20) Install the universal joint. <Ref. to PS-17, INSTALLATION, Universal Joint.>
21) Install the under cover.
22) Install the intercooler assembly. <Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>
23) Connect the battery ground cable to battery.

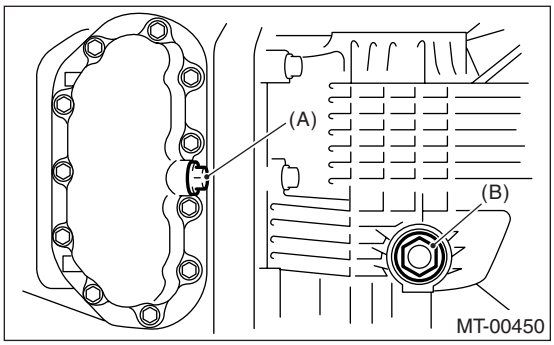
7. Preparation for Overhaul

A: PROCEDURE

1) Clean oil, grease, dirt and dust from transmission.
2) Remove the drain plug to drain oil. After draining, retighten it as before.

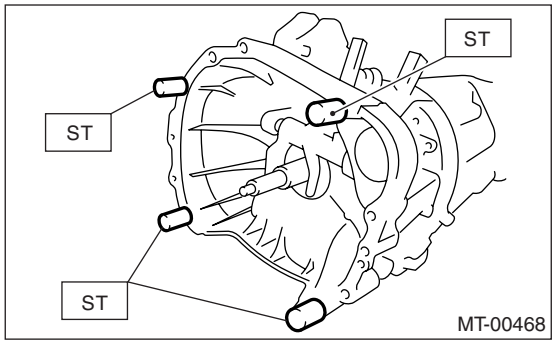
NOTE:
Replace the gasket with a new one.

Tightening torque:
Oil pan side
44 N·m (4.5 kgf-m, 32.5 ft-lb)
Clutch housing side
70 N·m (7.1 kgf-m, 51.6 ft-lb)



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

3) Attach the transmission to ST.
ST 18632AA000 STAND ASSY

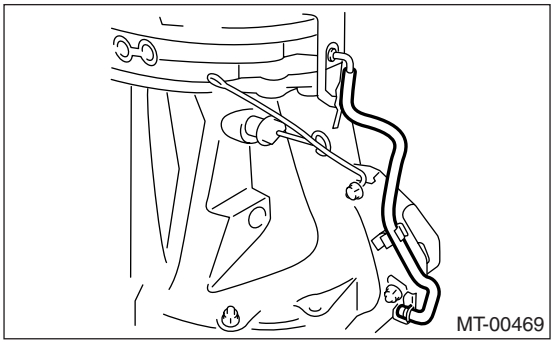


4) Rotating parts should be coated with oil prior to assembly.
5) All disassembled parts, if to be reused, should be reinstalled in the original positions and directions.
6) Gaskets, lock washers and lock nut must be replaced with new ones.
7) Liquid gasket should be used where specified to prevent leakage.

8. Air Breather Hose

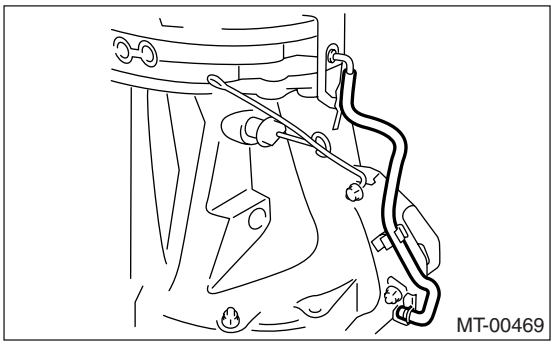
A: REMOVAL

Disconnect the air breather hose.



B: INSTALLATION

Install the air breather hose.



C: INSPECTION

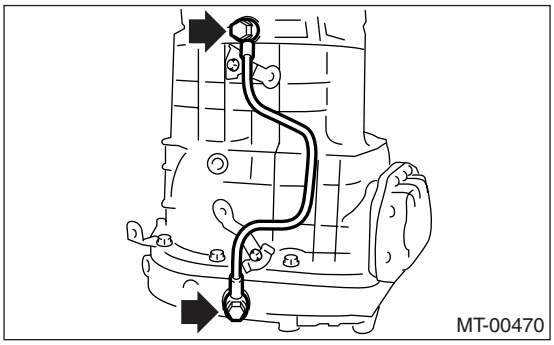
Make sure the hose is not cracked or clogged.

9. Oil Pipe

A: REMOVAL

Remove the oil pipe.

NOTE:
Always use a new gasket.

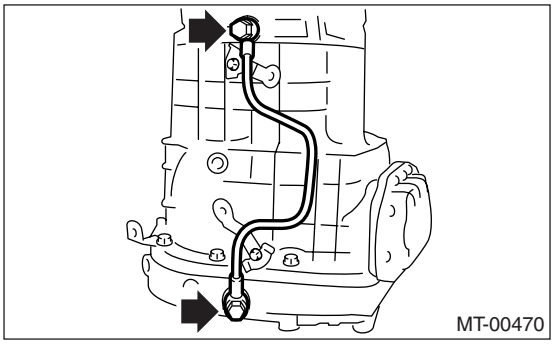


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use a new gasket.

Tightening torque:
32 N·m (3.3 kgf-m, 23.6 ft-lb)



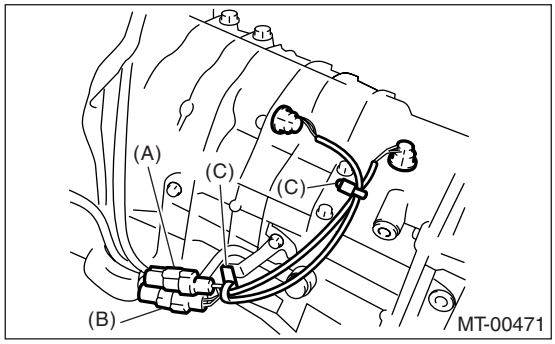
C: INSPECTION

1) Make sure there is no damage on pipe. If there is damage, replace the pipe.
2) Check the joint parts of pipe for oil leakage. If there is oil leakage, replace the gasket.

10.Back-up Light Switch

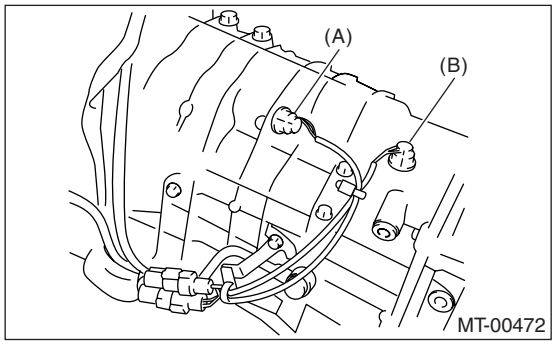
A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
2) Disconnect the back-up light switch connector.



(A) Back-up light switch connector (White)
(B) Neutral position switch connector (Black)
(C) Clip

3) Remove the back-up light switch.

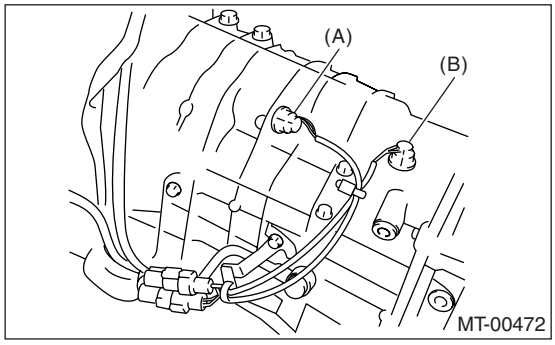


(A) Back-up light switch
(B) Neutral position switch

B: INSTALLATION

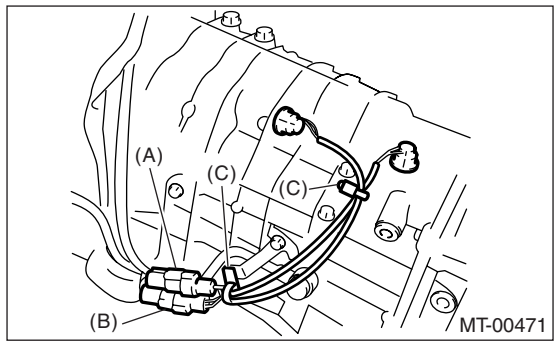
1) Install the back-up light switch.

Tightening torque:
32 N·m (3.3 kgf-m, 23.6 ft-lb)



(A) Back-up light switch
(B) Neutral position switch

2) Connect the back-up light switch connector.

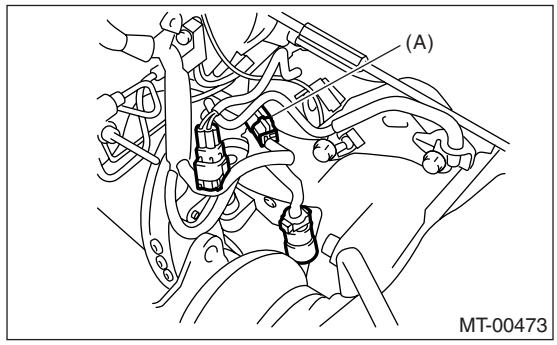


(A) Back-up light switch connector (White)
(B) Neutral position switch connector (Black)
(C) Clip

3) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

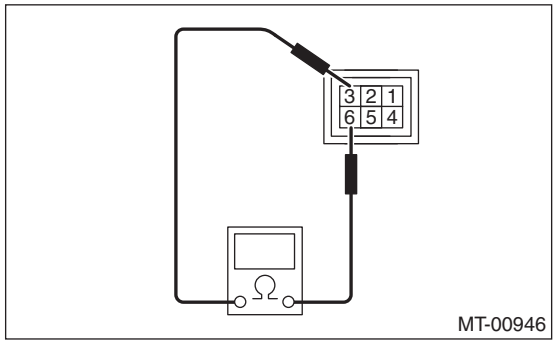
1) Disconnect the ground cable from battery.
2) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
3) Disconnect the transmission harness and chassis harness.



(A) Transmission connector

4) Measure the resistance between back-up light switch terminals. If it is not within specifications, replace the back-up light switch.

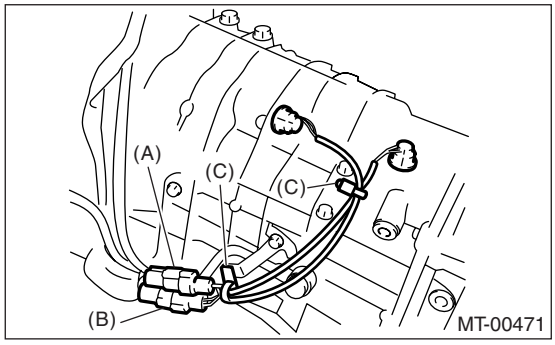
Gear shift position	Terminal No.	Specified resistance
Back-up position	3 and 6	Less than 1 Ω
Other positions		More than 1 MΩ



11.Neutral Position Switch

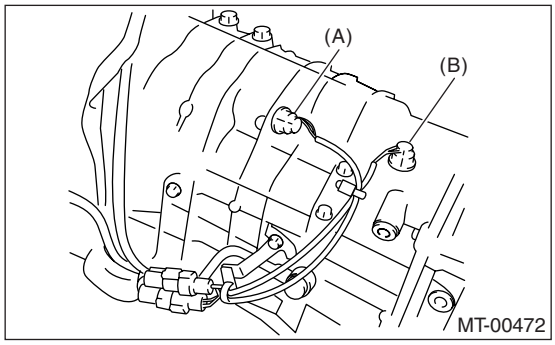
A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
2) Disconnect the neutral position switch connector and clip.



(A) Back-up light switch connector (White)
(B) Neutral position switch connector (Black)
(C) Clip

3) Remove the neutral position switch.

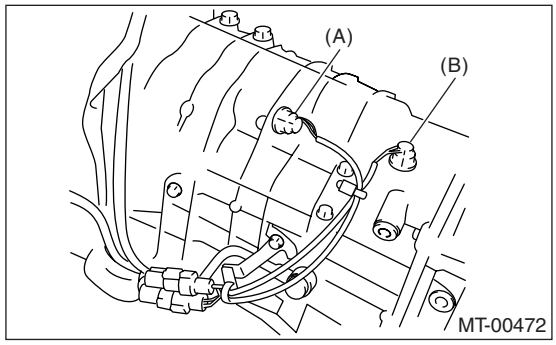


(A) Back-up light switch
(B) Neutral position switch

B: INSTALLATION

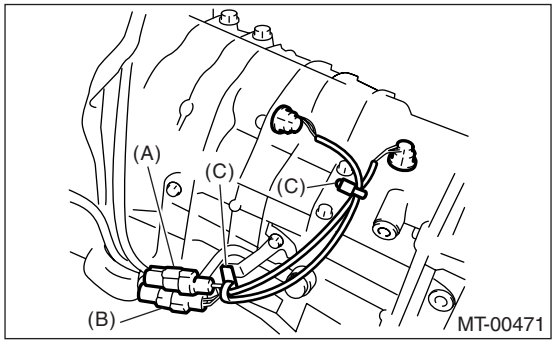
1) Install the neutral position switch.

Tightening torque:
32 N·m (3.3 kgf-m, 23.6 ft-lb)



(A) Back-up light switch
(B) Neutral position switch

2) Connect the neutral position switch connector and clip.

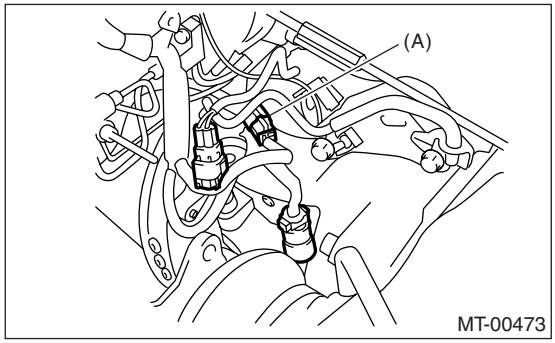


(A) Back-up light switch connector (White)
(B) Neutral position switch connector (Black)
(C) Clip

3) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

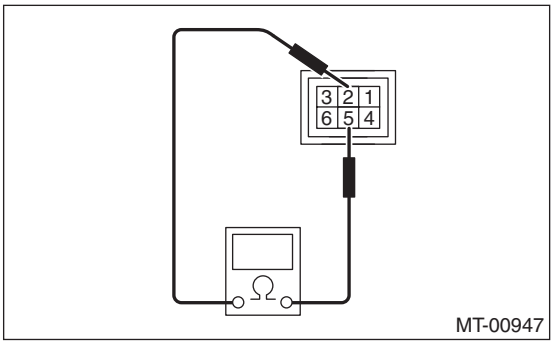
1) Disconnect the ground cable from battery.
2) Remove the intercooler. <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
3) Disconnect the transmission harness and chassis harness.



(A) Transmission connector

4) Measure the resistance between neutral position switch terminals. If it is not within specifications, replace the neutral position switch.

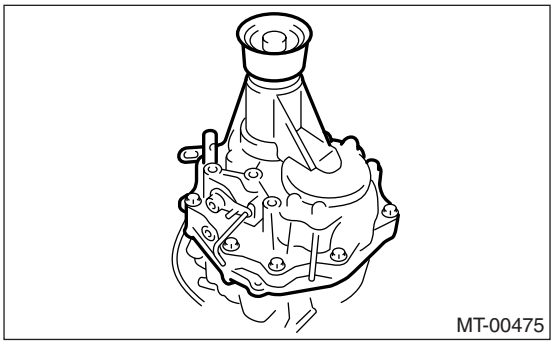
Gear shift position	Terminal No.	Specified resistance
Neutral position	2 and 5	More than 1 MΩ
Other positions		Less than 1 Ω



12.Extension Case

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
2) Prepare the transmission for overhaul. <Ref. to 6MT-41, Preparation for Overhaul.>
3) Remove the extension case.

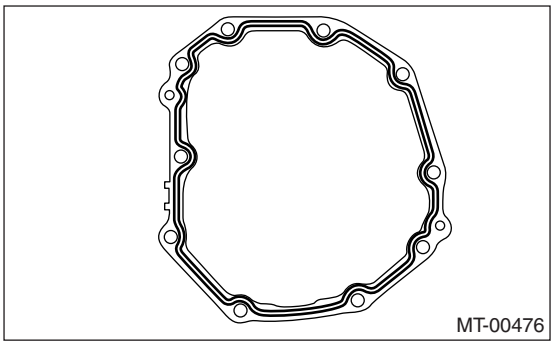


4) Completely remove the remaining liquid gasket from the extension case and transmission case.

B: INSTALLATION

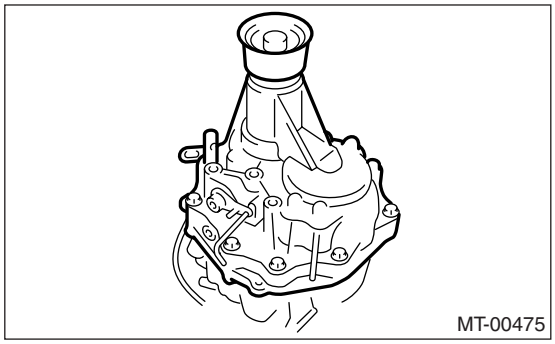
1) Select the transfer driven gear thrust washer, and then install it to extension case. <Ref. to 6MT-50, ADJUSTMENT, Extension Case.>
2) Apply oil lightly to the outer periphery of bearing cone, and then install it to extension case.
3) Select the thrust washer of transfer drive gear, and then install it to center differential.
4) Apply liquid gasket to the transmission case.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007)

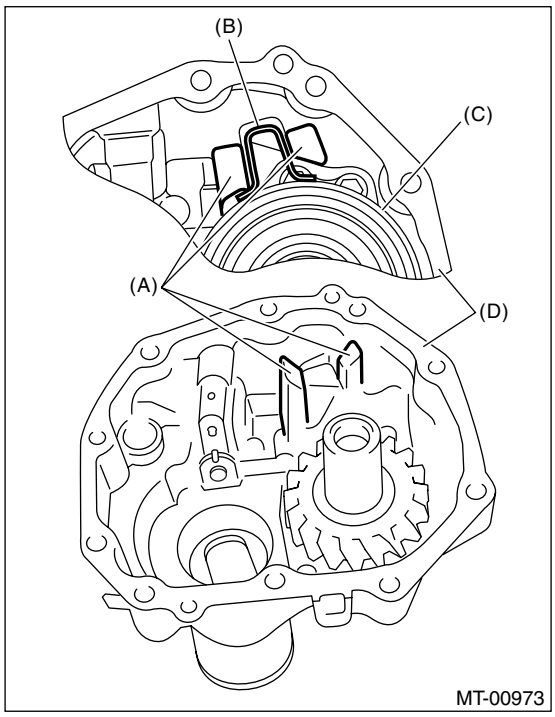


5) Install the extension case.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



NOTE:
Insert the stopper portion of center differential between extension guides.

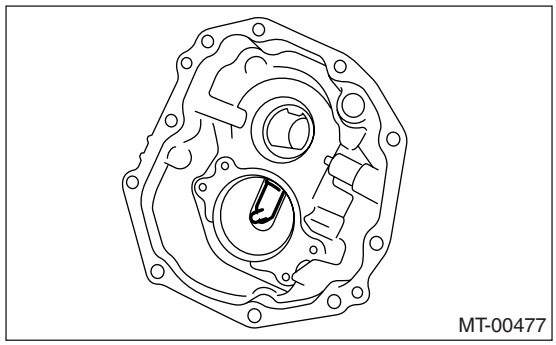


(A) Extension guides
(B) Stopper
(C) Center differential
(D) Extension case

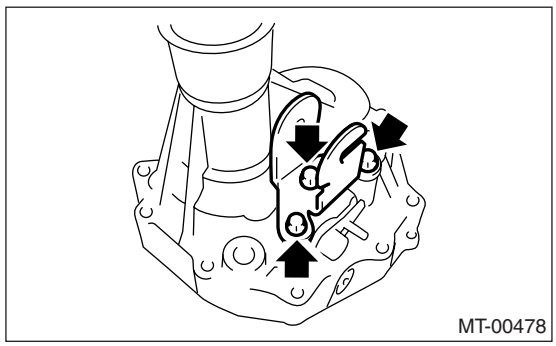
6) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

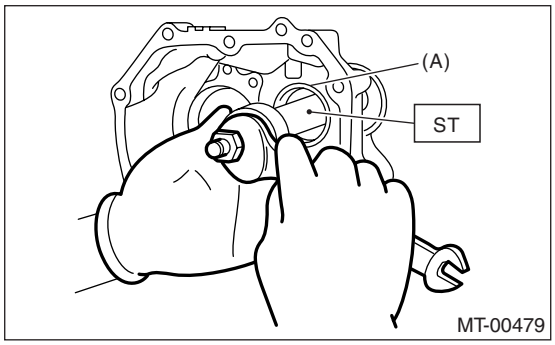
1) Remove the transfer drive gear. <Ref. to 6MT-58, REMOVAL, Transfer Drive Gear.>
2) Remove the extension guide.



3) Remove the shift bracket.

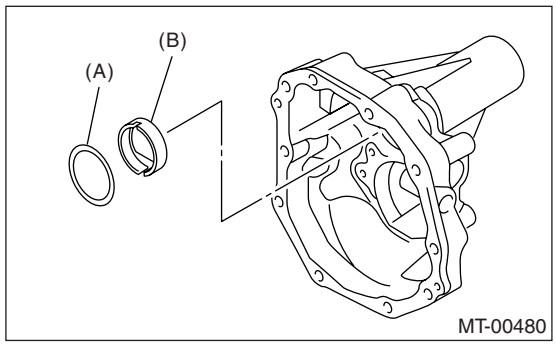


4) Using the ST, remove the bearing cone.
ST 18758AA000 PULLER



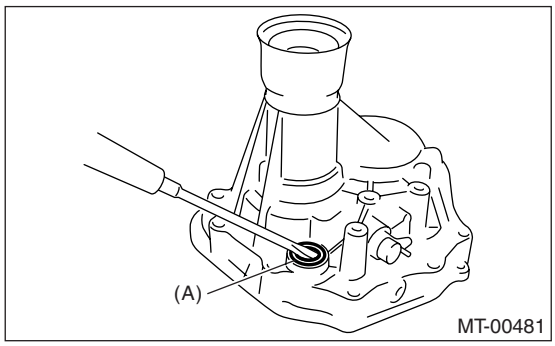
(A) Bearing cone

5) Remove the thrust washer and oil plate.



(A) Thrust washer
(B) Oil plate

6) Remove the shifter arm oil seal.

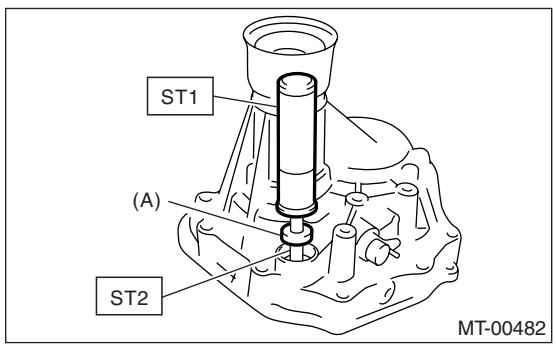


(A) Oil seal

7) Remove the reverse checking system. <Ref. to 6MT-55, REMOVAL, Reverse Checking System.>
8) Remove the extension oil seal. <Ref. to 6MT-32, REPLACEMENT, Oil Seal.>

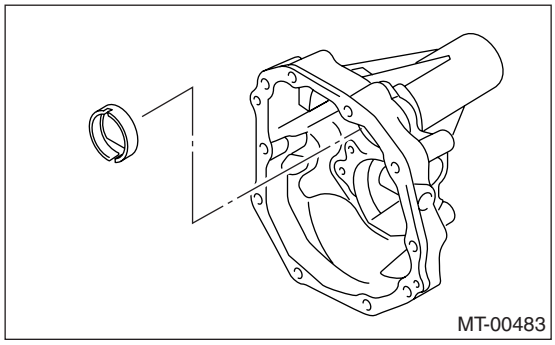
D: ASSEMBLY

1) Install the reverse checking system. <Ref. to 6MT-56, INSTALLATION, Reverse Checking System.>
2) Install the extension case oil seal. <Ref. to 6MT-32, REPLACEMENT, Oil Seal.>
3) Using the ST, install the shifter arm oil seal.
ST1 18657AA000 INSTALLER
ST2 18671AA000 OIL SEAL GUIDE



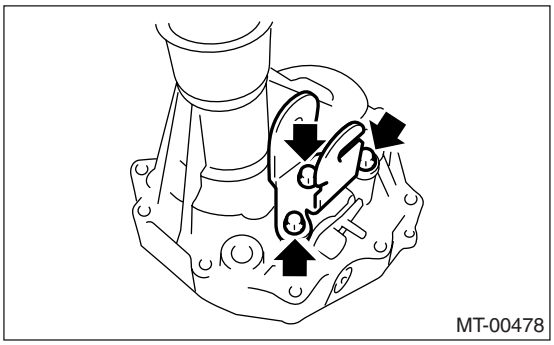
(A) Oil seal

4) Install the oil plate.



5) Select the bearing thrust washer, and then install it to extension case. <Ref. to 6MT-50, ADJUSTMENT, Extension Case.>
6) Apply oil lightly to the outer periphery of bearing cone, and then install it to extension case.
7) Install the shift bracket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



8) Install the extension guide, and then install the transfer driven gear. <Ref. to 6MT-58, INSTALLATION, Transfer Drive Gear.>

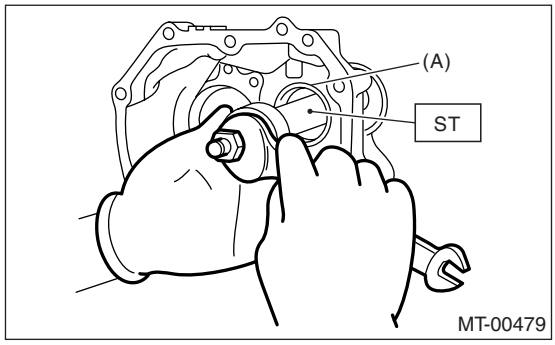
E: INSPECTION

1) Make sure there is no damage or crack on extension case. If there is damage or crack, replace the extension case.
2) Check each oil seal and joint part of extension case and transmission case for oil leakage. If there is oil leakage, replace the oil seal and liquid gasket.

F: ADJUSTMENT

1. TRANSFER DRIVEN GEAR BEARING THRUST WASHER ADJUSTMENT

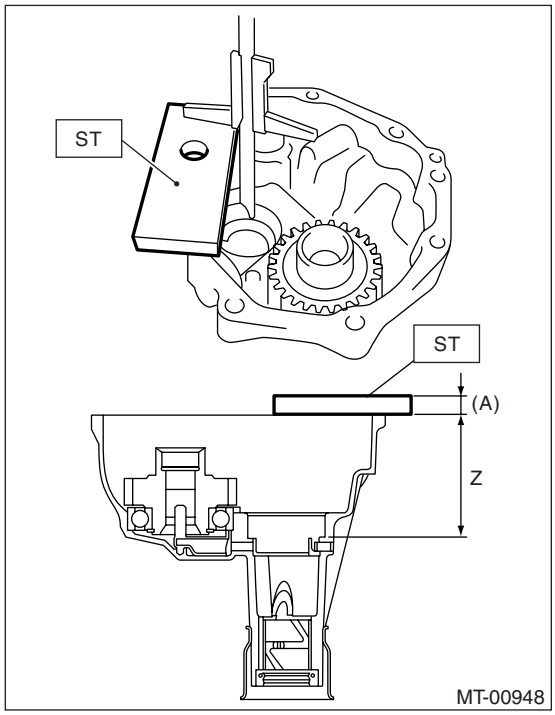
1) Using the ST, remove the bearing cone from extension case.
ST 18758AA000 PULLER



(A) Bearing cone

2) Remove the thrust washer.
3) Measure the depth “Z” between end of extension case and contact point of bearing cone.
ST 499575500 GAUGE

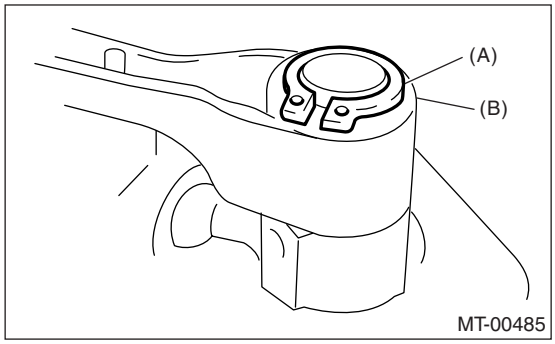
NOTE:
To measure the depth “Z”, subtract the thickness of ST [15 mm (0.59 in)] from the measured value.



(A) 15 mm (0.59 in)

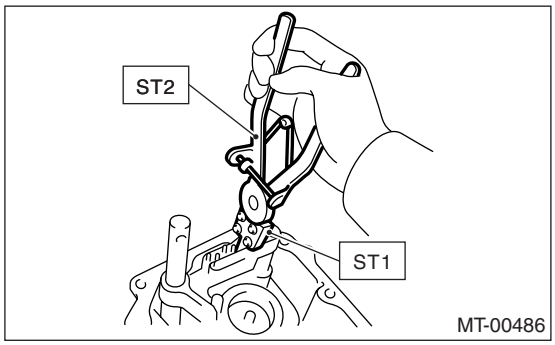
4) Remove the transfer driven gear. <Ref. to 6MT-60, REMOVAL, Transfer Driven Gear.>
5) Remove the center differential. <Ref. to 6MT-62, REMOVAL, Center Differential.>

6) Remove the snap ring and support from selector arm part.

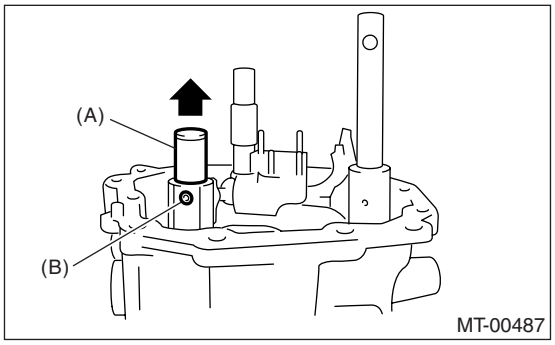


(A) Snap ring
(B) Support

7) Using the ST, remove the neutral set spring and support.
ST1 18756AA000 CLAW
ST2 399863600 PLIERS

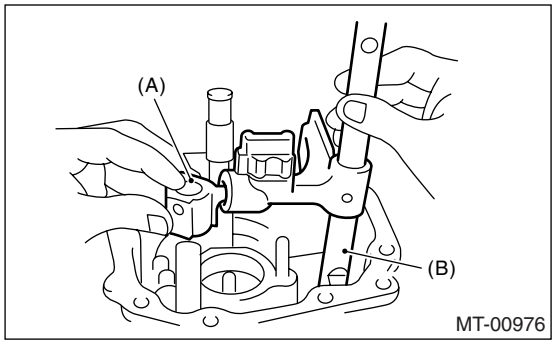


8) Lift-up the striking rod and remove the spring pin.



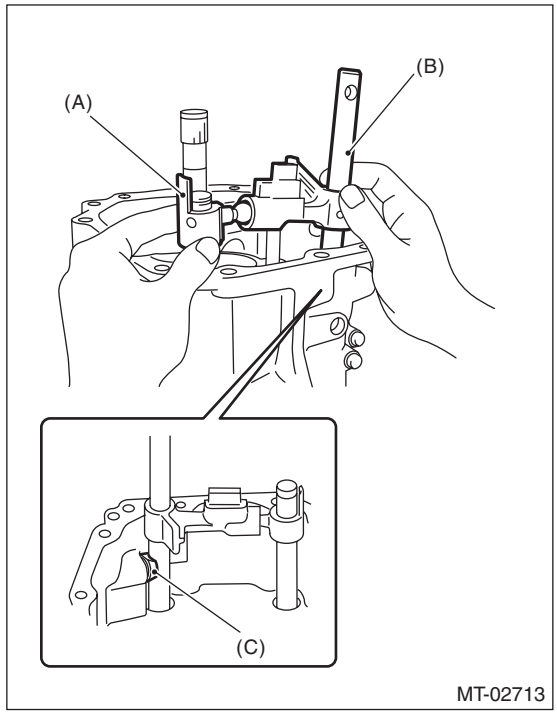
(A) Striking rod
(B) Spring pin

9) Remove the selector arm No. 2 and shifter arm. (Transmission serial No. 144576 or earlier)



(A) Selector arm No. 2
(B) Shifter arm

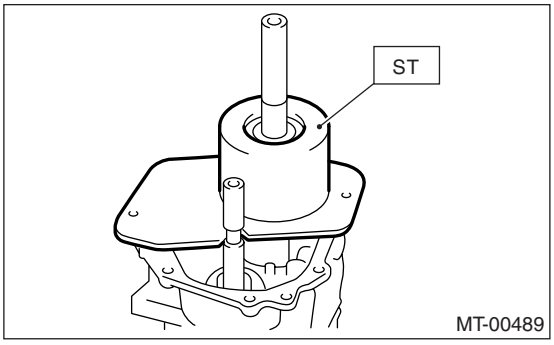
10) Remove the selector arm No. 2, shifter arm, selector plunger and spring. (Transmission serial No. 144577 or later)



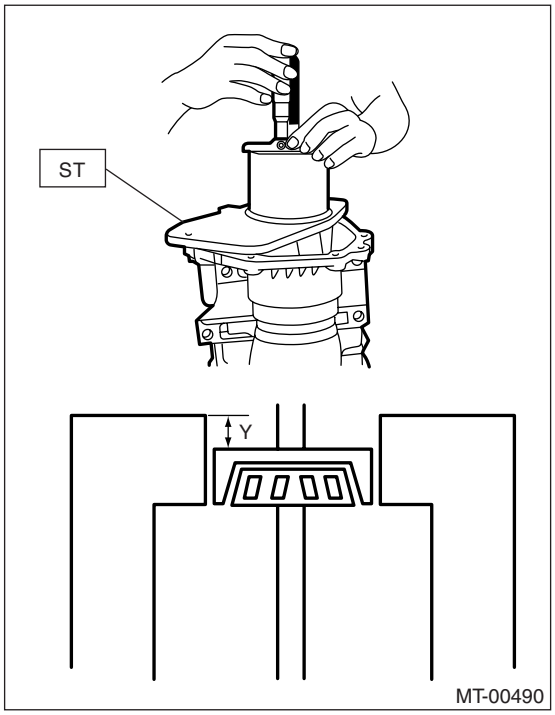
(A) Selector arm No. 2
(B) Shifter arm
(C) Selector plunger

11) Install the bearing cone to transfer driven gear.

12) Set the ST.
ST 18831AA000 GAUGE



13) Rotate the transfer driven gear approx. ten times to get the bearing accustomed.
14) Measure the depth "Y" between end of ST and bearing cone.
ST 18831AA000 GAUGE



15) Calculate the value "t" of transfer driven gear bearing thrust washer using the following equation.
t = Z − (100 − Y) − {−0.04 to 0.11 mm (−0.0016 to 0.0043 in)}

t mm (in)	Thickness of transfer driven gear bearing thrust washer.
Y mm (in)	Depth from end of ST to bearing cone.
Z mm (in)	Depth from end of extension case to contact point of bearing cone.
−0.04 — 0.11 mm (−0.0016 — 0.0043 in)	Standard clearance between thrust washer and taper roller bearing.
100 mm (3.94 in)	Height of ST.

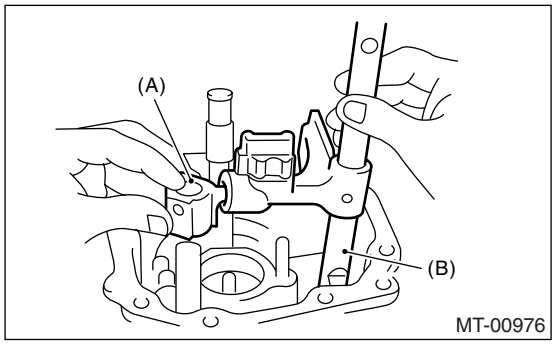
16) Select the nearest thrust washer from the following table, according to the calculated value "t".

Standard clearance between thrust washer and taper roller bearing:
−0.04 — 0.11 mm (−0.0016 — 0.0043 in)

NOTE:
Make clearance within standard.

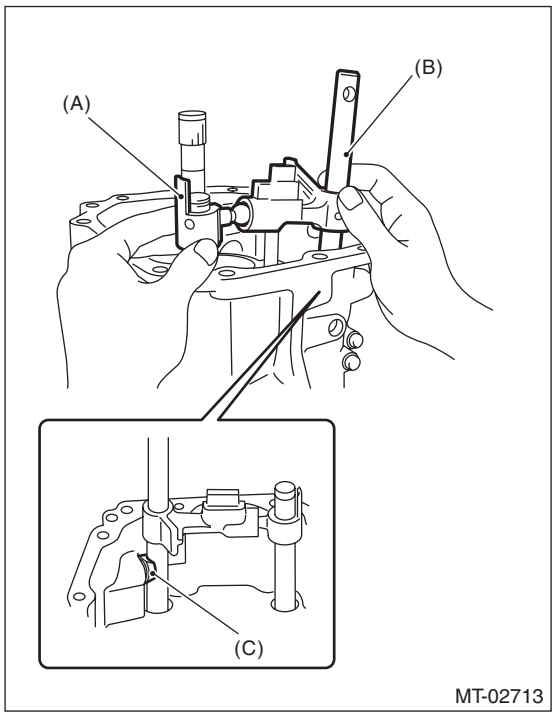
Thrust washer (50 × 61 × t)	
Part No.	Thickness mm (in)
803050060	0.50 (0.0197)
803050062	0.60 (0.0236)
803050064	0.70 (0.0276)
803050066	0.80 (0.0315)
803050068	0.90 (0.0354)
803050070	1.00 (0.0394)
803050072	1.10 (0.0433)
803050074	1.20 (0.0472)
803050076	1.30 (0.0512)
803050078	1.40 (0.0551)

17) Install the selector arm No. 2 and shifter arm. (Transmission serial No. 144576 or earlier)



(A) Selector arm No. 2
(B) Shifter arm

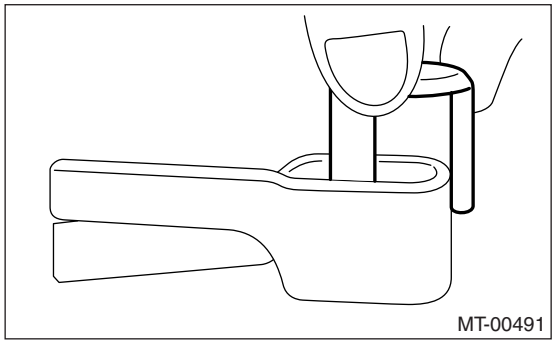
18) Install the selector arm No. 2, shifter arm, selector plunger and spring. (Transmission serial No. 144577 or later)



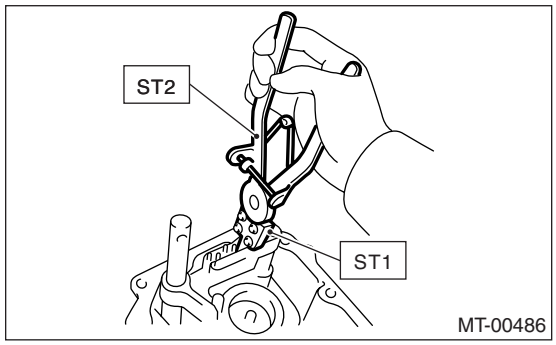
(A) Selector arm No. 2
(B) Shifter arm
(C) Selector plunger

19) Install a new spring pin.
20) Install the support to neutral set spring.

NOTE:
Make sure to install the support in proper direction.



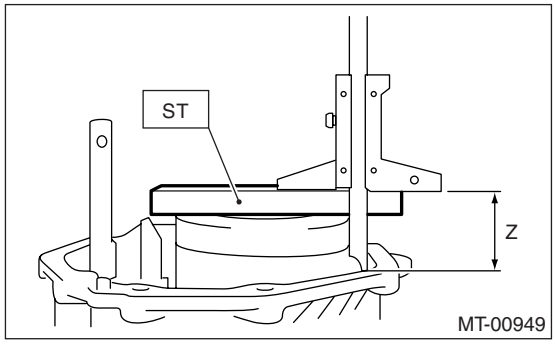
21) Using the ST, install the neutral set spring and support.
ST1 18756AA000 CLAW
ST2 399863600 PLIERS



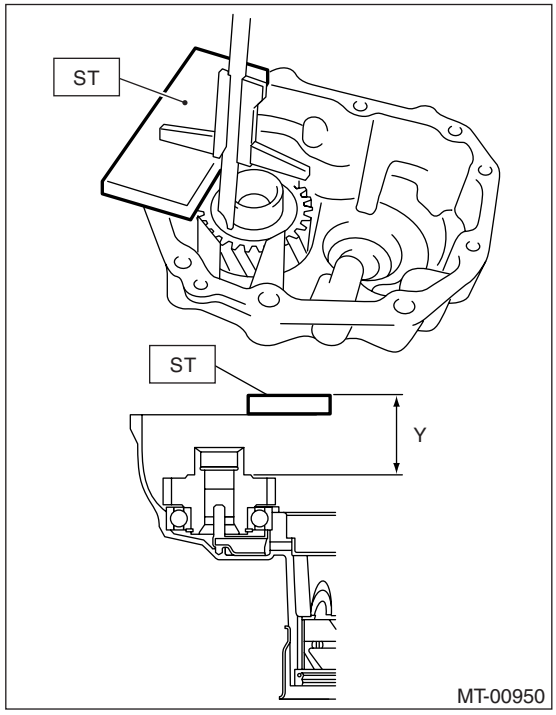
22) Install the snap ring.
23) Install the center differential.

2. SELECTING THE TRANSFER DRIVE GEAR THRUST WASHER

1) Measure the height "Z" between end of transmission case and end of ST.
ST 499575500 GAUGE



2) Measure the depth "Y" between end of ST and transfer drive gear.
ST 499575500 GAUGE



3) Calculate the value "t" of transfer drive gear thrust washer using the following equation.
t = {Y − 15 mm (1.18 in)} − {Z − 15 mm (1.18 in)} − 0.45 to 0.65 mm (0.018 to 0.026 in)

t mm (in)	Thickness of transfer drive gear thrust washer
Y mm (in)	Depth from end of ST to transfer drive gear
Z mm (in)	Height from end of transmission case to the end of ST
0.45 — 0.65 mm (0.018 — 0.026 in)	Standard clearance between thrust washer and transfer drive gear.
15 mm (1.18 in)	Thickness of ST

4) Select the nearest thrust washer from the following table, according to the calculated value "t".

Standard clearance between thrust washer and transfer drive gear:
0.45 — 0.65 mm (0.018 — 0.026 in)

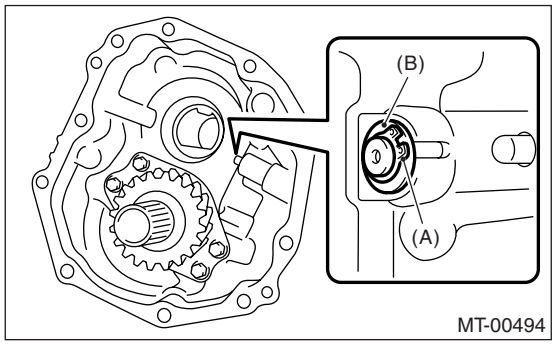
Thrust washer (36.3 × 52 × t)	
Part No.	Thickness mm (in)
803036070	0.80 (0.0315)
803036071	0.95 (0.0374)
803036072	1.10 (0.0433)
803036073	1.25 (0.0492)
803036074	1.40 (0.0551)
803036075	0.65 (0.0256)

5) Install the selected thrust washer.

13.Reverse Checking System

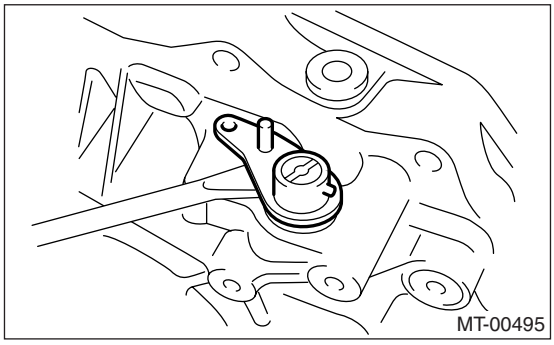
A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
2) Prepare the transmission for overhaul. <Ref. to 6MT-41, Preparation for Overhaul.>
3) Remove the extension case. <Ref. to 6MT-48, REMOVAL, Extension Case.>
4) Remove the snap ring and washer from reverse check shaft.



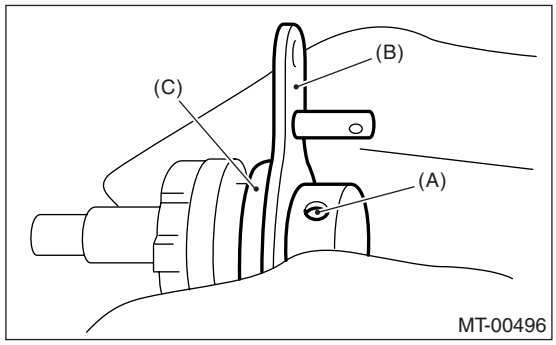
(A) Snap ring
(B) Washer

5) Remove the reverse check shaft and spring from extension case.



6) Remove the spring pin, and then remove the reverse check lever and oil seal from reverse check shaft.

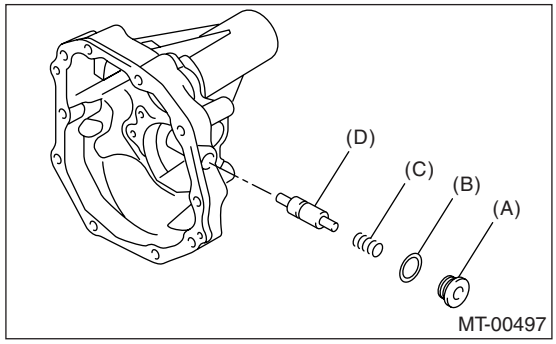
NOTE:
Do not reuse the oil seal.



(A) Spring pin
(B) Reverse check lever
(C) Oil seal

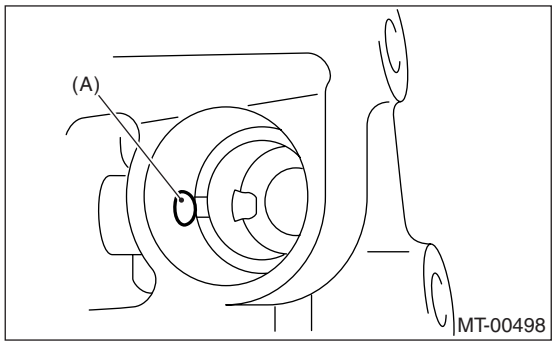
7) Remove the plug from extension case, then remove the gasket, spring and plunger.

NOTE:
Do not reuse the gasket.



(A) Plug
(B) Gasket
(C) Spring
(D) Plunger

8) Remove the reverse lock plunger.

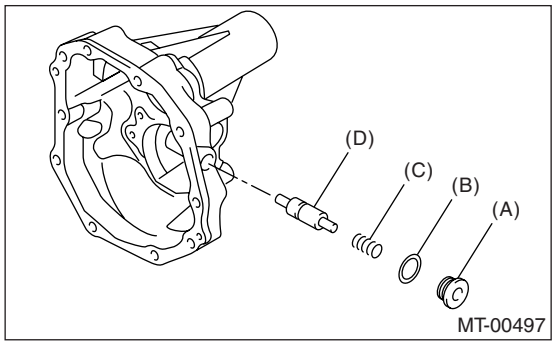


(A) Reverse lock plunger

B: INSTALLATION

1) Insert the reverse lock plunger.
2) Install in the order of reverse check plug, spring, gasket and plug.

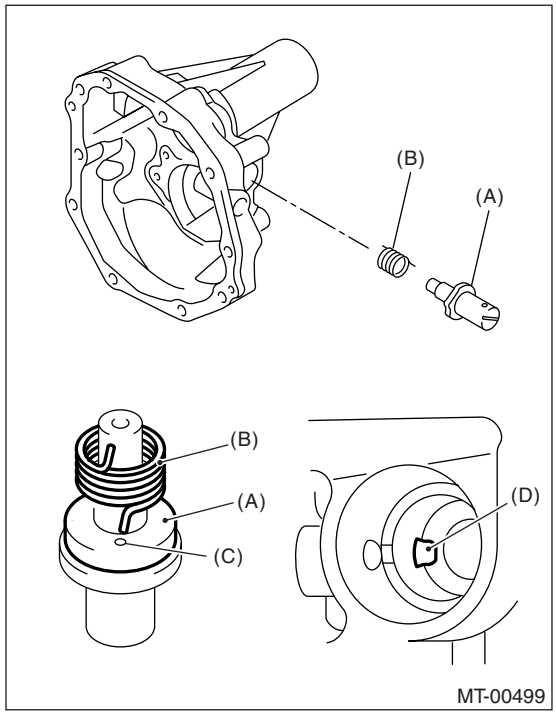
Tightening torque:
41 N·m (4.2 kgf-m, 30.2 ft-lb)



(A) Plug
(B) Gasket
(C) Spring
(D) Reverse check plug

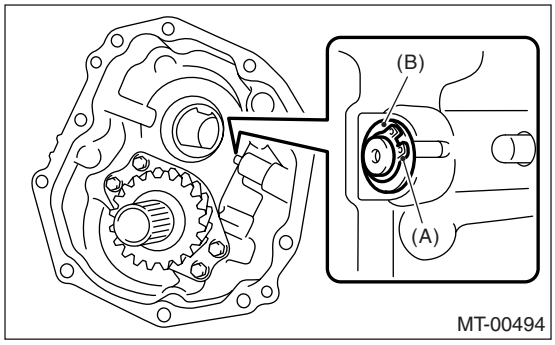
3) Install the spring and reverse check shaft to extension case.

NOTE:
Be sure the spring end aligns with the hole of reverse check shaft and cutout portion of extension case.



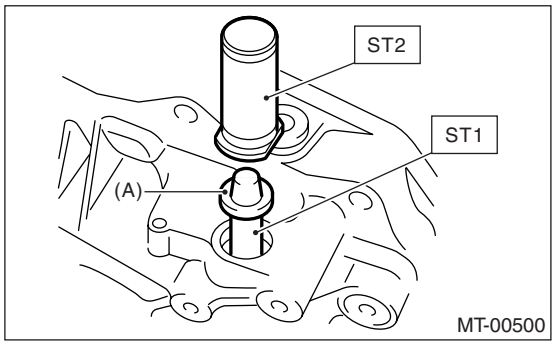
(A) Reverse check shaft
(B) Spring
(C) Hole
(D) Cutout portion

4) Install the washer and snap ring.



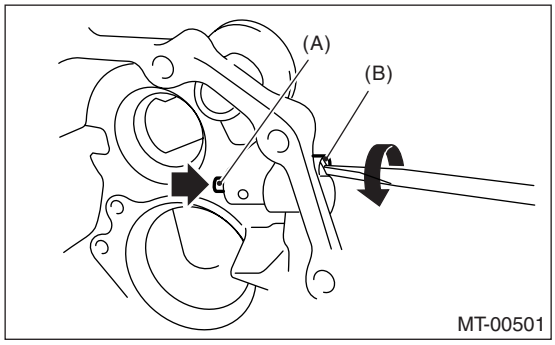
(A) Snap ring
(B) Washer

5) Set the ST1 to reverse check shaft. Install a new oil seal, then press with ST2.
ST1 18671AA000 OIL SEAL GUIDE
ST2 18657AA010 INSTALLER



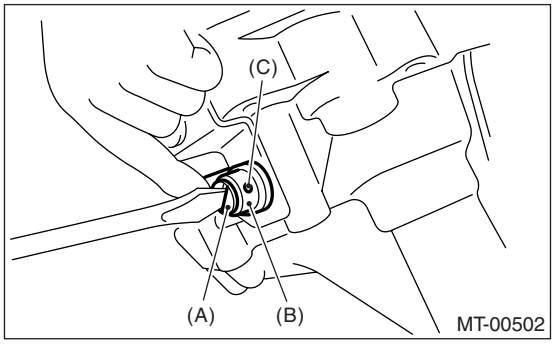
(A) Oil seal

6) Insert the reverse check lever, then rotate the reverse check shaft until the plunger can be pushed in first.



(A) Plunger
(B) Reverse check shaft

7) Align the hole of reverse check lever and reverse check shaft, then install the spring pin.



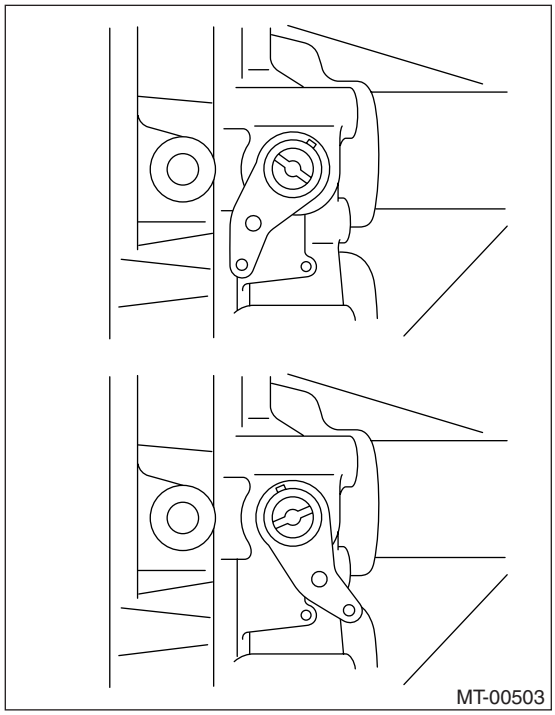
(A) Reverse check shaft
(B) Reverse check lever
(C) Hole

8) Make sure the reverse check operates correctly. <Ref. to 6MT-57, INSPECTION, Reverse Checking System.>

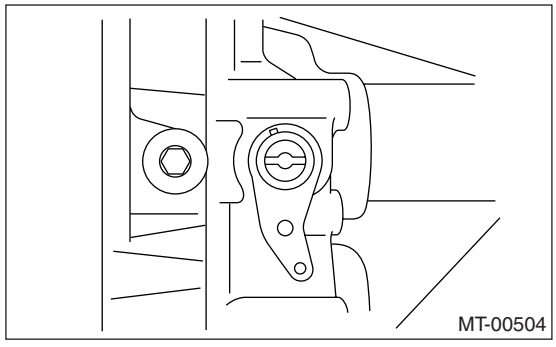
9) Install the extension case. <Ref. to 6MT-48, INSTALLATION, Extension Case.>
10) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

1) Make sure there is no damage on each parts.
2) Make sure the reverse check lever operates smoothly.
3) Make sure there is no oil leakage on oil seal part of reverse check shaft. If there is oil leakage, replace the oil seal.
4) Inspect the reverse check operation.
(1) The plunger can be pushed or the gear can be shifted to reverse, when reverse check lever is in the following position.



(2) The plunger cannot be pushed or the gear cannot be shifted to reverse, when reverse check lever is in the following position.

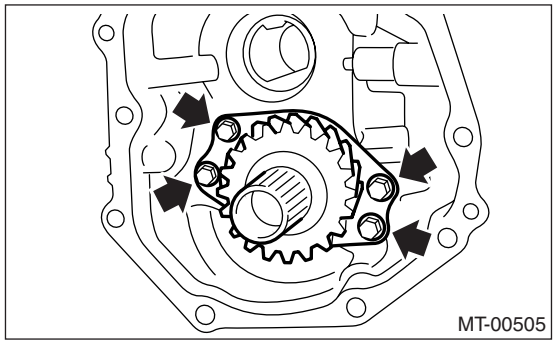


5) If not as specified, reassemble the reverse check system.

14.Transfer Drive Gear

A: REMOVAL

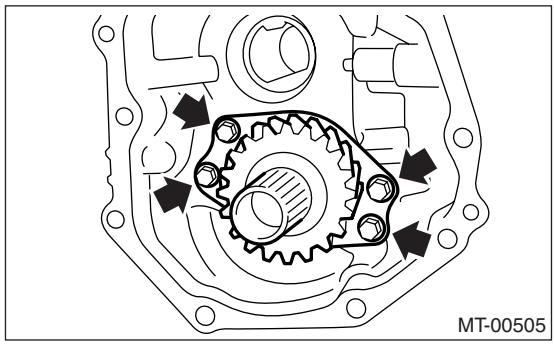
1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
2) Prepare the transmission for overhaul. <Ref. to 6MT-41, Preparation for Overhaul.>
3) Remove the extension case. <Ref. to 6MT-48, REMOVAL, Extension Case.>
4) Remove the transfer drive gear.



B: INSTALLATION

1) Install the transfer drive gear.

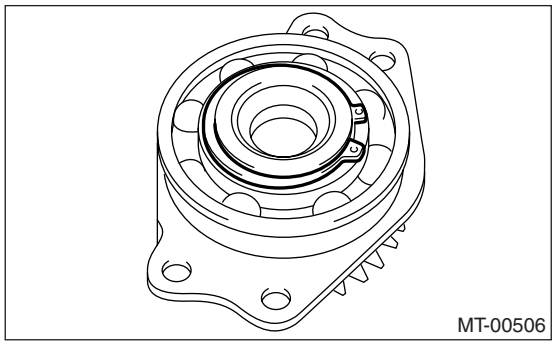
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



2) If the ball bearing, transfer drive gear or snap ring is replaced, select the transfer drive gear thrust washer. <Ref. to 6MT-49, ASSEMBLY, Extension Case.>
3) Install the extension case. <Ref. to 6MT-48, INSTALLATION, Extension Case.>
4) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

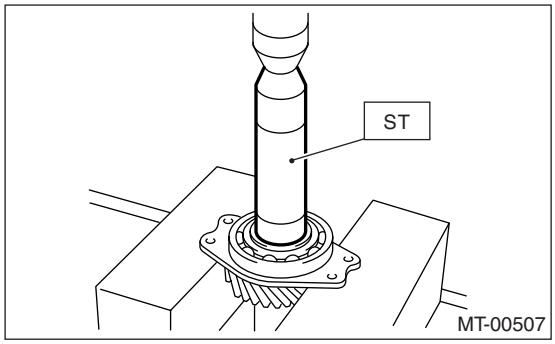
C: DISASSEMBLY

1) Remove the snap ring.



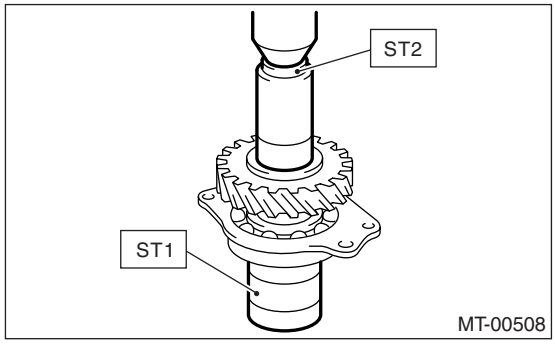
2) Using the ST, remove the ball bearing.
ST 499877000 RACE 4-5 INSTALLER

NOTE:
Do not reuse the ball bearing.

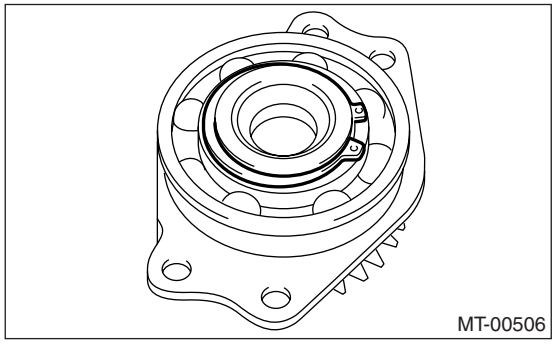


D: ASSEMBLY

1) Using the ST, install the ball bearing.
ST1 499247400 INSTALLER
ST2 398497701 SEAT



2) Install the snap ring.



3) Inspect the clearance between snap ring and ball bearing. <Ref. to 6MT-59, INSPECTION, Transfer Drive Gear.>

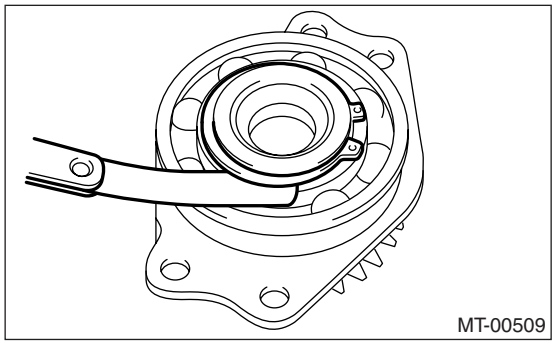
E: INSPECTION

1) Bearings
Replace the bearings in the following cases.
- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make abnormal noise.

2) Drive gear
Replace the drive gear in the following cases.
- If their tooth surface and shaft are excessively broken or damaged.

3) Measure the clearance between snap ring and inner race of ball bearing with a thickness gauge.

Standard clearance between snap ring and inner race:
0 — 0.15 mm (0 — 0.0059 in)



4) If the measurement is not within specifications, select suitable snap ring.

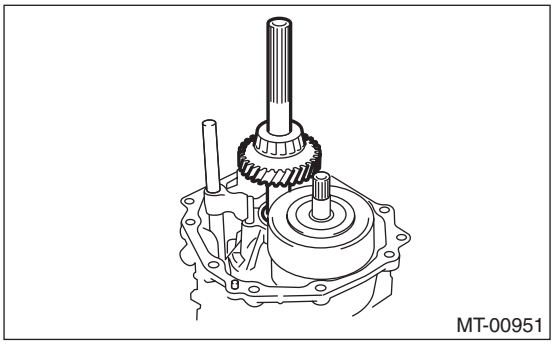
Thrust washer	
Part No.	Thickness mm (in)
805045050	1.76 (0.069)
805045060	1.88 (0.074)
805045070	2.00 (0.079)

After replacement of the snap ring, inspect the clearance again.

15.Transfer Driven Gear

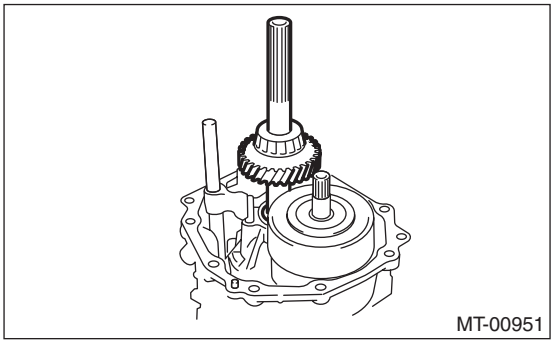
A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
2) Prepare the transmission for overhaul. <Ref. to 6MT-41, Preparation for Overhaul.>
3) Remove the extension case. <Ref. to 6MT-48, REMOVAL, Extension Case.>
4) Remove the transfer driven gear.



B: INSTALLATION

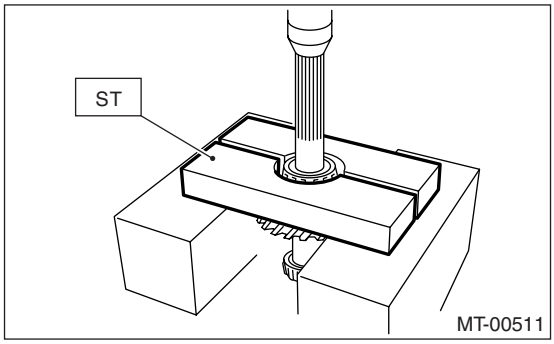
1) Install the transfer driven gear.



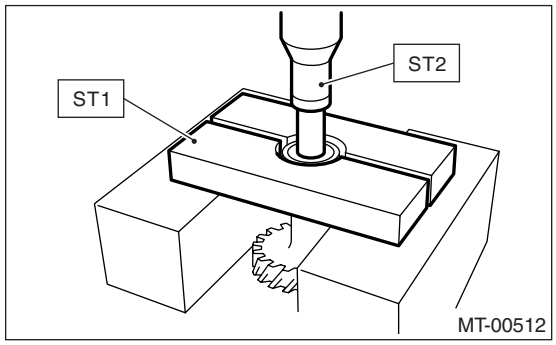
2) If the bearing or transfer driven gear is replaced, select the transfer driven thrust washer. <Ref. to 6MT-50, ADJUSTMENT, Extension Case.>
3) Install the extension case. <Ref. to 6MT-48, INSTALLATION, Extension Case.>
4) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

1) Using the ST, remove the roller bearing of extension case side.
ST 498515700 REMOVER



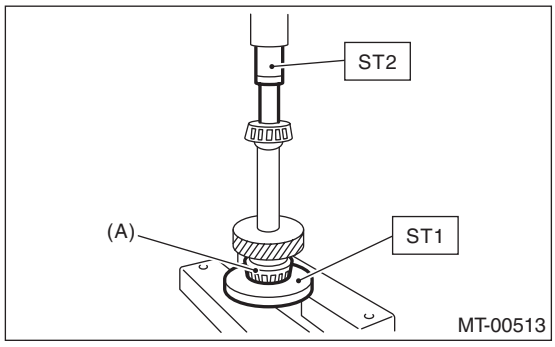
2) Using the ST, remove the roller bearing of transmission case side.
ST1 899858600 REMOVER
ST2 899864100 REMOVER



D: ASSEMBLY

1) Using the ST, install the roller bearing of extension case side.
ST1 398177700 INSTALLER
ST2 899864100 REMOVER

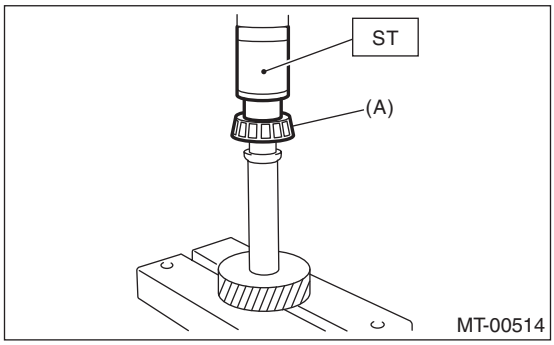
CAUTION:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).



(A) Roller bearing

2) Using the ST, install the roller bearing of transmission case side.
ST 499757002 INSTALLER

CAUTION:
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).



(A) Roller bearing

E: INSPECTION

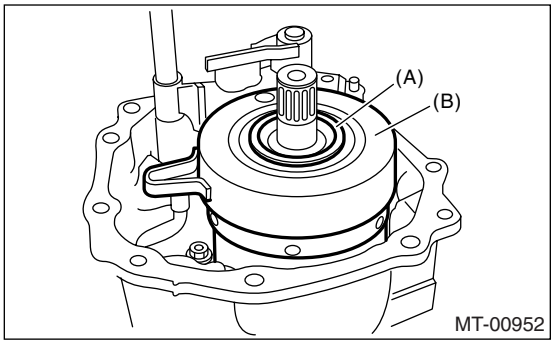
1) Bearings
Replace the bearing in following cases.
- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.

2) Driven gear
Replace the driven gear in following case.
- If their tooth surfaces and shaft are excessively broken or damaged.

16.Center Differential

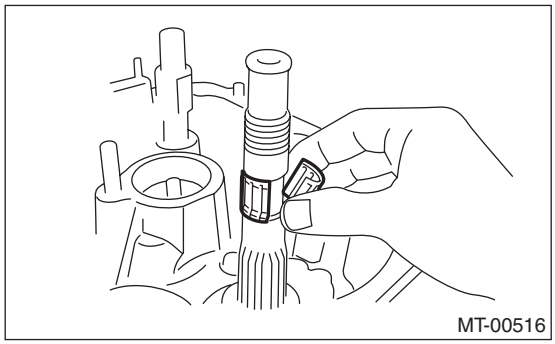
A: REMOVAL

1) Remove the manual transmission case assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
2) Prepare the transmission for overhaul. <Ref. to 6MT-41, Preparation for Overhaul.>
3) Remove the extension case. <Ref. to 6MT-48, REMOVAL, Extension Case.>
4) Remove the transfer driven gear. <Ref. to 6MT-60, REMOVAL, Transfer Driven Gear.>
5) Disconnect the center differential connector.
6) Remove the thrust washer and center differential.



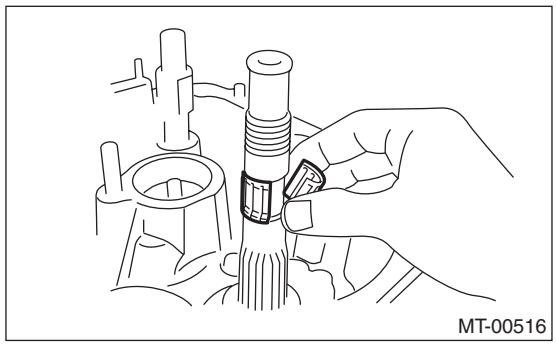
(A) Thrust washer
(B) Center differential

7) Remove the needle bearing.

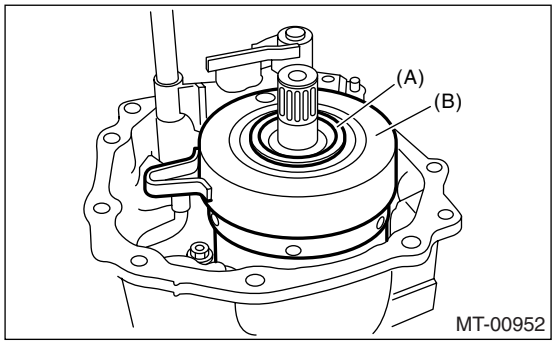


B: INSTALLATION

1) Install the needle bearing.



2) Install the thrust washer and center differential.



(A) Thrust washer
(B) Center differential

3) If replacing the center differential, select the transfer drive gear and thrust washer and install. <Ref. to 6MT-50, ADJUSTMENT, Extension Case.>
4) Connect the center differential connector, and secure it to oil guide.
5) Install the transfer driven gear. <Ref. to 6MT-60, INSTALLATION, Transfer Driven Gear.>
6) Install the extension case. <Ref. to 6MT-48, INSTALLATION, Extension Case.>
7) Install the manual transmission case assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

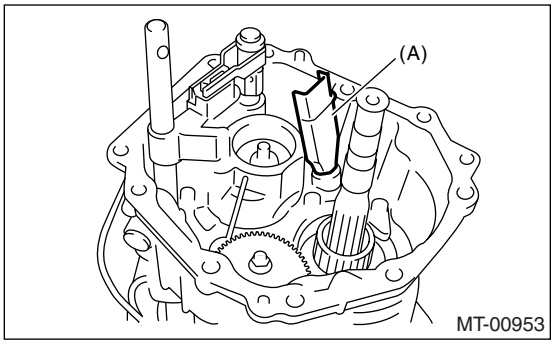
C: INSPECTION

Make sure there is no damage on the center differential, ball bearing and oil pump drive gear. Replace the center differential assembly if damaged.

17.Oil Pump

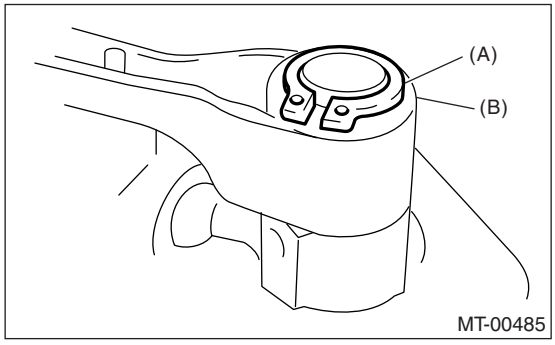
A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
2) Prepare the transmission for overhaul. <Ref. to 6MT-41, Preparation for Overhaul.>
3) Remove the extension case. <Ref. to 6MT-48, REMOVAL, Extension Case.>
4) Remove the transfer driven gear. <Ref. to 6MT-60, REMOVAL, Transfer Driven Gear.>
5) Remove the center differential. <Ref. to 6MT-62, REMOVAL, Center Differential.>
6) Remove the oil guide.



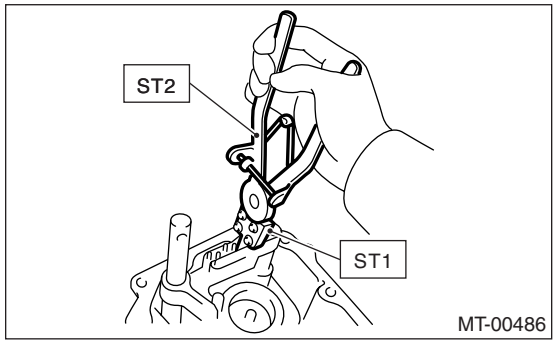
(A) Oil guide

7) Remove the snap ring.

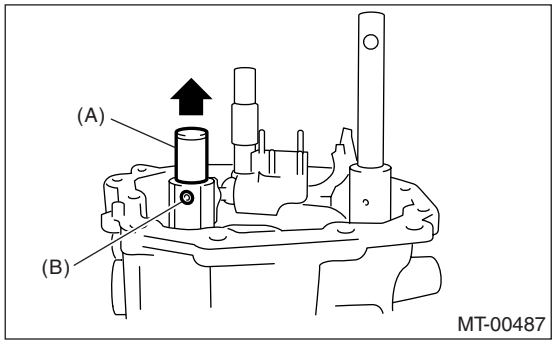


(A) Snap ring
(B) Support

8) Using the ST, remove the neutral set spring and support.
ST1 18756AA000 CLAW
ST2 399863600 PLIERS

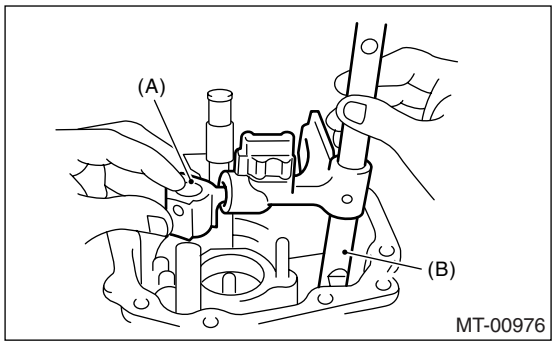


9) Raise the striking rod up, and then remove the spring pin.



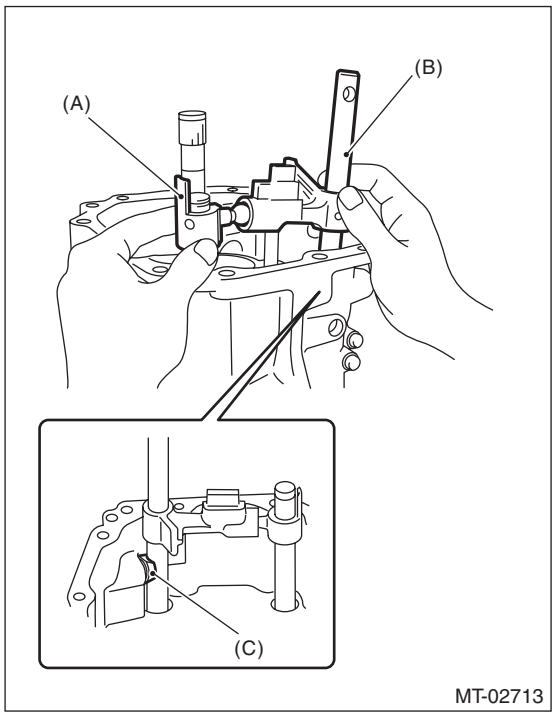
(A) Striking rod
(B) Spring pin

10) Remove the selector arm No. 2 and shifter arm. (Transmission serial No. 144576 or earlier)



(A) Selector arm No. 2
(B) Shifter arm

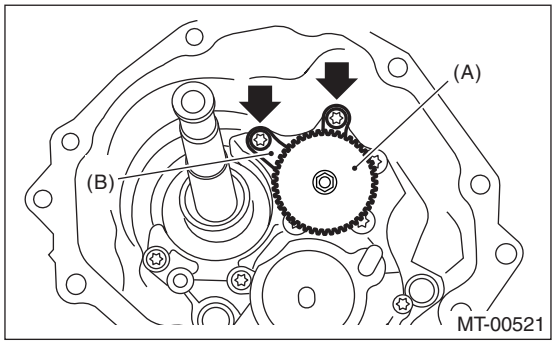
11) Remove the selector arm No. 2, shifter arm, selector plunger and spring. (Transmission serial No. 144577 or later)



(A) Selector arm No. 2
(B) Shifter arm
(C) Selector plunger

12) Remove the oil pump shaft assembly and plate.

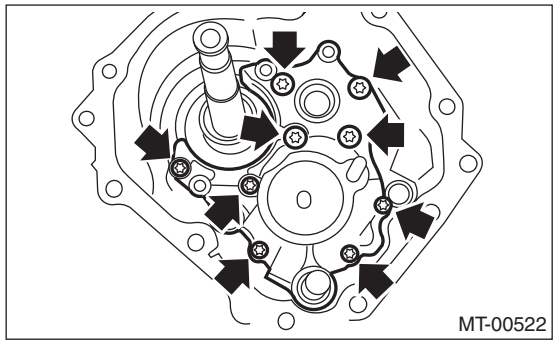
NOTE:
Remove the bolts using ST, because tool may break if general tool is used.
ST 18663AA000 SOCKET



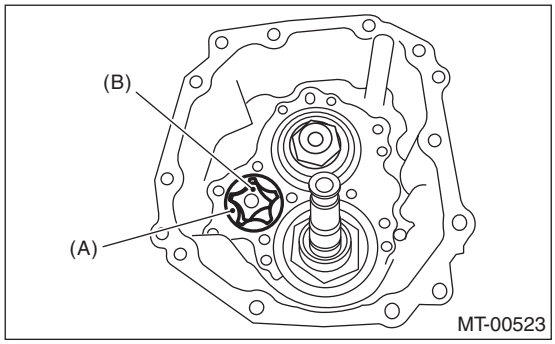
(A) Oil pump shaft assembly
(B) Plate

13) Remove the oil pump cover assembly.

NOTE:
Remove the bolts using ST, because tool may break if general tool is used.
ST 18663AA000 SOCKET



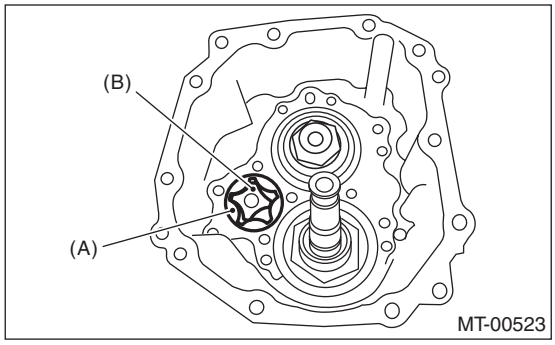
14) Remove the thrust washer on main shaft part.
15) Remove the oil pump rotor.



(A) Outer rotor
(B) Inner rotor

B: INSTALLATION

1) Apply oil to the outer periphery of outer rotor, then install to transmission case.

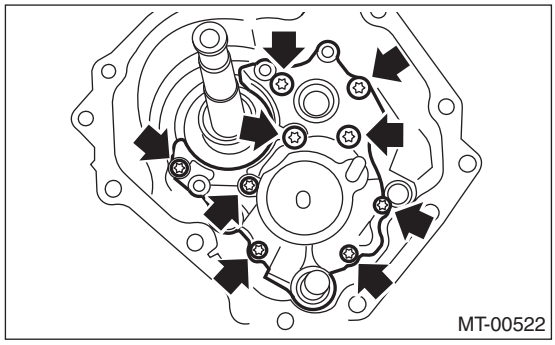


(A) Outer rotor
(B) Inner rotor

2) Install the thrust washer to main shaft part.
3) Install the oil pump cover assembly.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

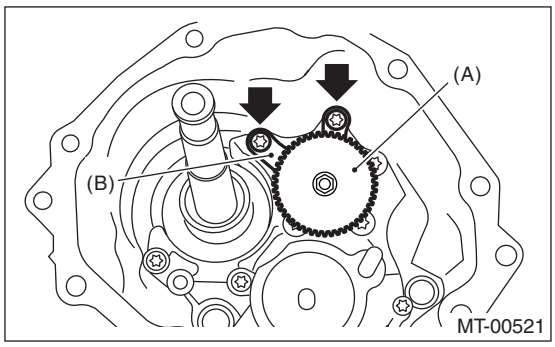
ST 18663AA000 SOCKET



4) Install the oil pump shaft assembly and plate.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

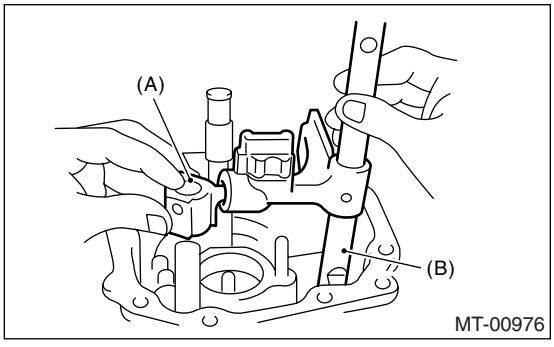
ST 18663AA000 SOCKET



(A) Oil pump shaft assembly
(B) Plate

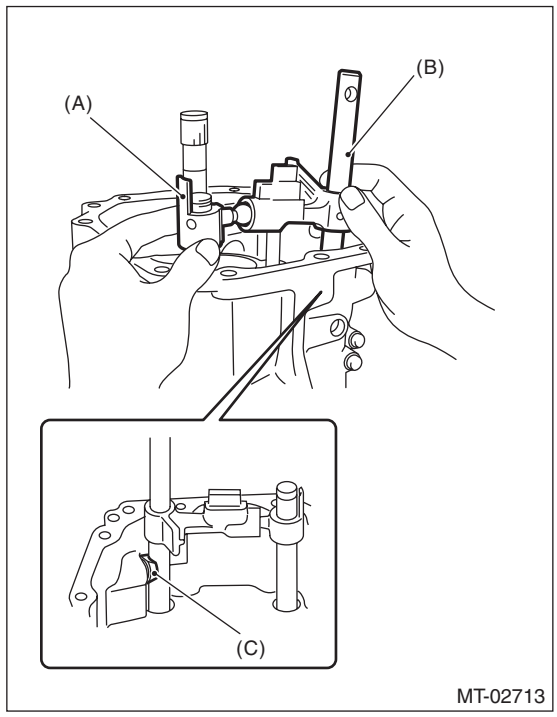
5) If replacing the oil pump cover assembly, select the transfer driven gear and thrust washer, then install them to the extension case. <Ref. to 6MT-50, ADJUSTMENT, Extension Case.>

6) Install the selector arm No. 2 and shifter arm. (Transmission serial No. 144576 or earlier)



(A) Selector arm No. 2
(B) Shifter arm

7) Install the selector arm No. 2, shifter arm, selector plunger and spring. (Transmission serial No. 144577 or later)

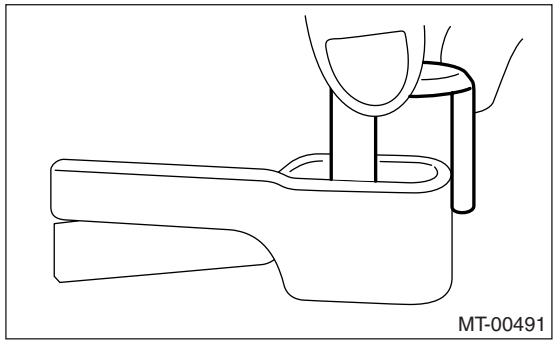


(A) Selector arm No. 2
(B) Shifter arm
(C) Selector plunger

8) Install a new spring pin.

9) Install the support to neutral set spring.

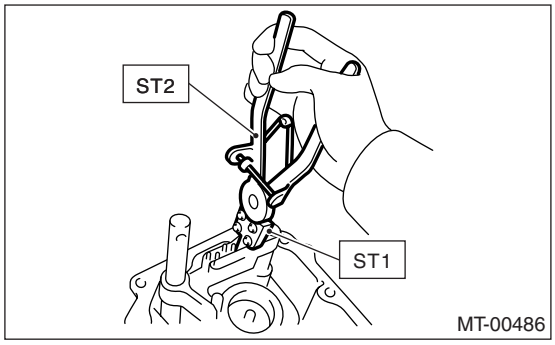
NOTE:
Make sure to install the support in proper direction.



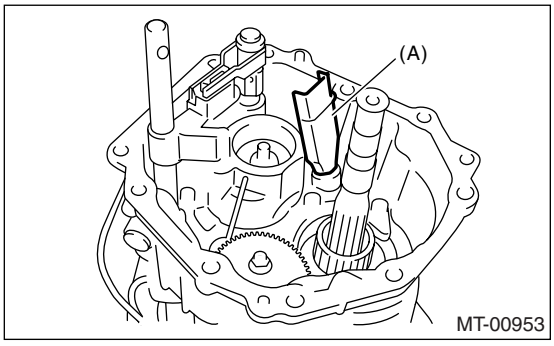
10) Using the ST, install the neutral set spring and support.

ST1 18756AA000 CLAW

ST2 399863600 PLIERS



11) Install the snap ring.
12) Install the oil guide.



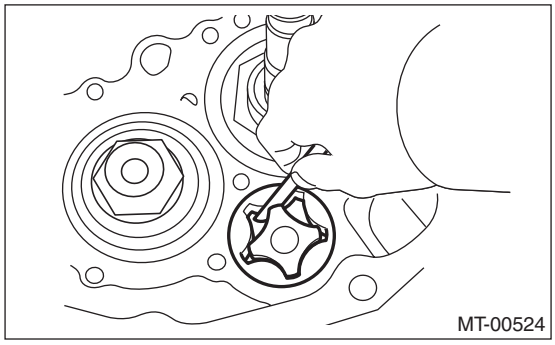
(A) Oil guide

13) Install the center differential. <Ref. to 6MT-62, INSTALLATION, Center Differential.>
14) Install the transfer driven gear. <Ref. to 6MT-60, INSTALLATION, Transfer Driven Gear.>
15) Install the extension case. <Ref. to 6MT-48, INSTALLATION, Extension Case.>
16) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

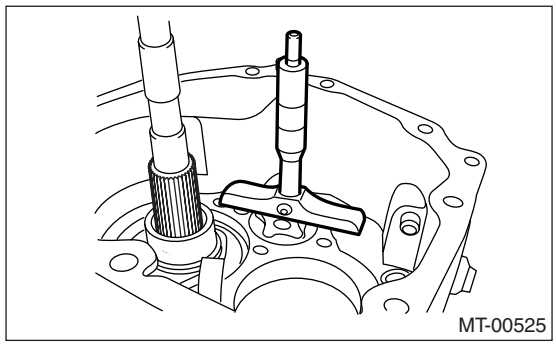
1) Make sure there is no damage on the inner rotor and outer rotor. Replace the inner rotor and outer rotor as assembly if damaged.
2) Clearance at tip Install the inner rotor and outer rotor to transmission case. Align tip of the inner rotor and outer rotor, then measure the clearance. Replace the inner rotor and outer rotor as a set if clearance exceeds specification.

Specification of clearance at tip:
Less than 0.15 mm (0.0059 in)



3) Side clearance Measure to the transmission case and rotor. Replace the inner rotor and outer rotor as a set if clearance exceeds specification.

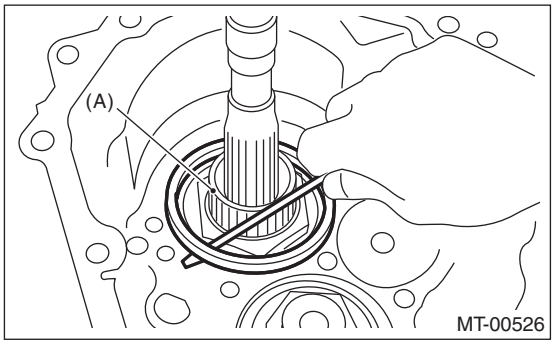
Specification of side clearance:
0.03 — 0.10 mm (0.0012 — 0.0039 in)



18.Transmission Case

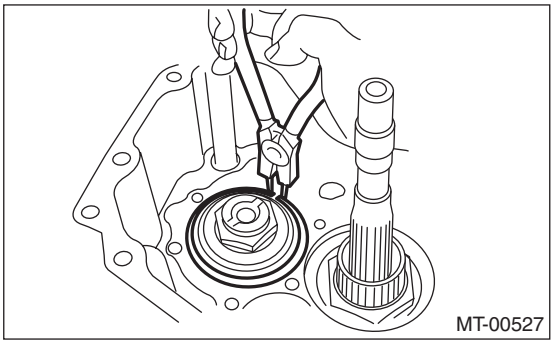
A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
2) Prepare the transmission for overhaul. <Ref. to 6MT-41, Preparation for Overhaul.>
3) Remove the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-43, REMOVAL, Oil Pipe.>, <Ref. to 6MT-46, REMOVAL, Neutral Position Switch.>, <Ref. to 6MT-44, REMOVAL, Back-up Light Switch.>
4) Remove the extension case. <Ref. to 6MT-48, REMOVAL, Extension Case.>
5) Remove the transfer driven gear. <Ref. to 6MT-60, REMOVAL, Transfer Driven Gear.>
6) Remove the center differential. <Ref. to 6MT-62, REMOVAL, Center Differential.>
7) Remove the oil pump. <Ref. to 6MT-63, REMOVAL, Oil Pump.>
8) Remove the shim and spacer of driven gear assembly.

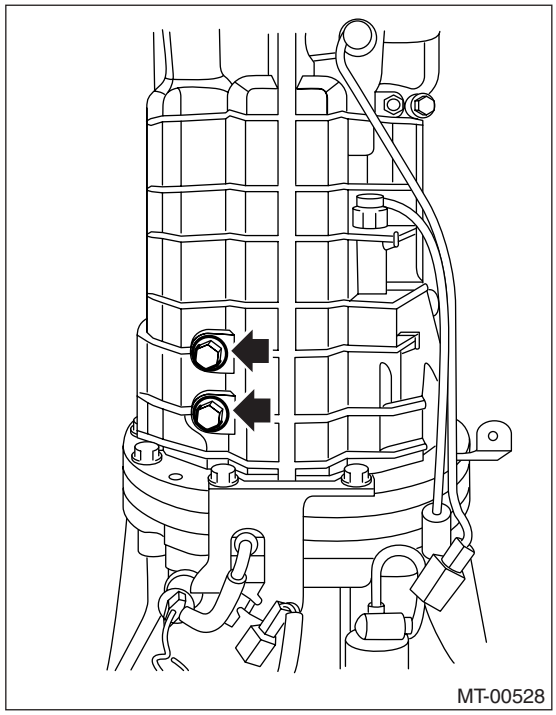


(A) Driven gear assembly

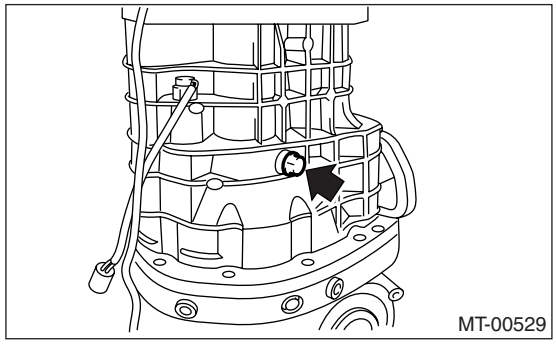
9) Remove the snap ring.



10) Remove the pilot bolt.

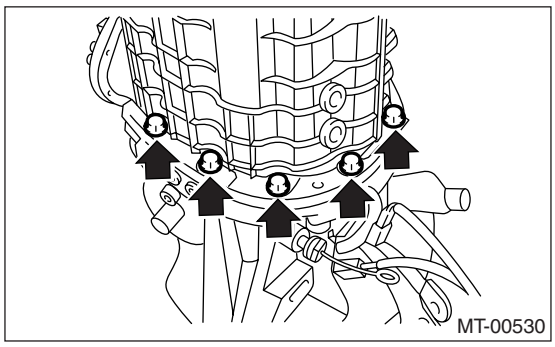


11) Remove the holder reverse bolt.



12) Remove the transmission case.

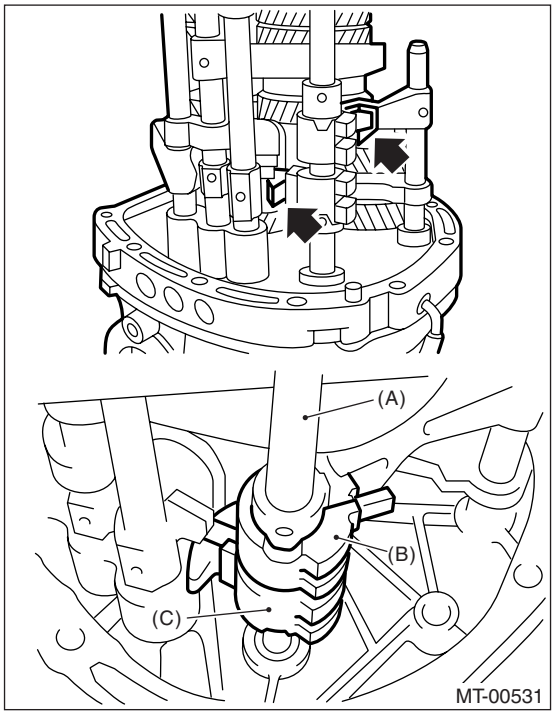
NOTE:
If the oil guide catches on shift fork, the transmission case may be difficult to be removed. Move the oil guide right and left to remove. Do not pull the transmission case by force.



13) Completely remove the remaining liquid gasket on transmission case and adapter plate.

B: INSTALLATION

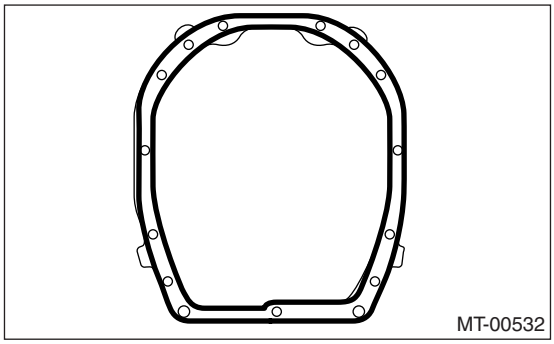
1) Make sure that each shifter fork and interlock block is shifted to neutral position. If not, shift to neutral position.



(A) Striking rod
(B) Reverse interlock block
(C) Interlock block

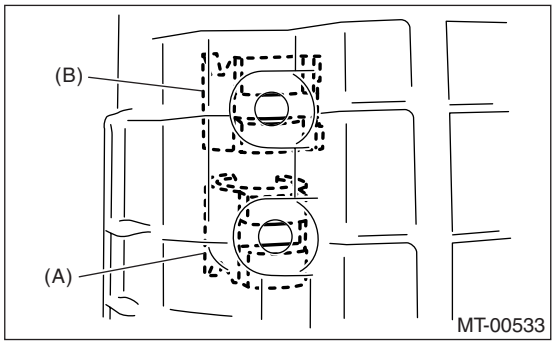
2) Apply liquid gasket to the adapter plate.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007)



3) Install the transmission case.

4) Make sure the interlock block and reverse interlock block are aligned in neutral position by inspecting through the pilot bolt installation hole. If not aligned, remove the transmission case, then shift each shifter fork and interlock block to neutral position.



(A) Interlock block
(B) Reverse interlock block

5) Using a new gasket, install the pilot bolts temporarily.
6) Tighten the transmission case with bolts and nuts.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

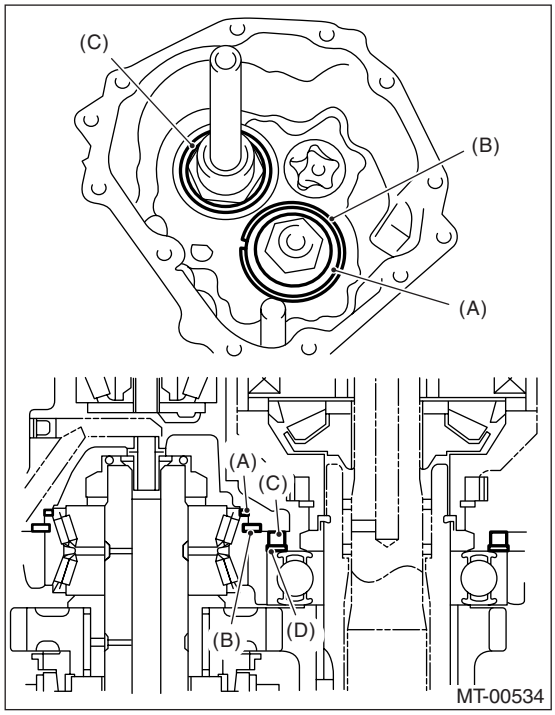
7) Tighten the pilot bolts.

Tightening torque:
34 N·m (3.5 kgf-m, 25.1 ft-lb)

8) Tighten the holder reverse bolt.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

9) Install the snap ring, washer and collar of driven gear assembly.

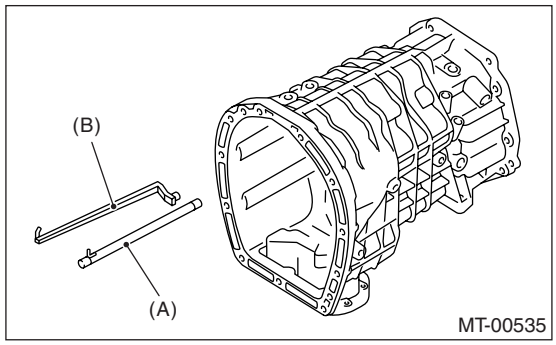


(A) Washer
(B) Snap ring
(C) Collar
(D) Washer

10) Install the oil pump. <Ref. to 6MT-64, INSTALLATION, Oil Pump.>
11) Install the center differential. <Ref. to 6MT-62, INSTALLATION, Center Differential.>
12) Install the transfer driven gear. <Ref. to 6MT-60, INSTALLATION, Transfer Driven Gear.>
13) Install the extension case. <Ref. to 6MT-48, INSTALLATION, Extension Case.>
14) Install the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-43, INSTALLATION, Oil Pipe.>, <Ref. to 6MT-46, INSTALLATION, Neutral Position Switch.>, <Ref. to 6MT-44, INSTALLATION, Back-up Light Switch.>
15) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

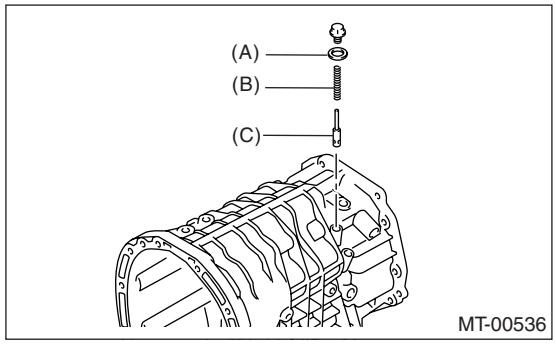
C: DISASSEMBLY

1) Remove the oil pipe and oil guide.



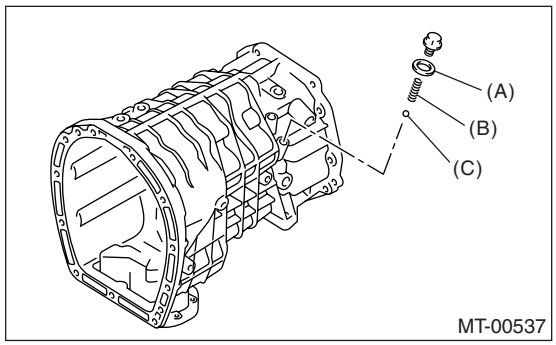
(A) Oil pipe
(B) Oil guide

2) Remove the bolt, and then remove the O-ring, relief spring and relief valve.



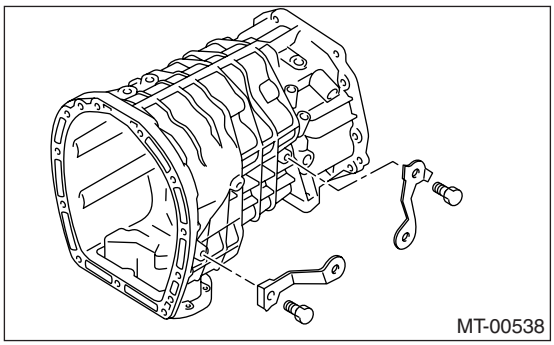
(A) O-ring
(B) Relief valve spring
(C) Relief valve

3) Remove the bolt, and then remove the O-ring, valve spring and ball.

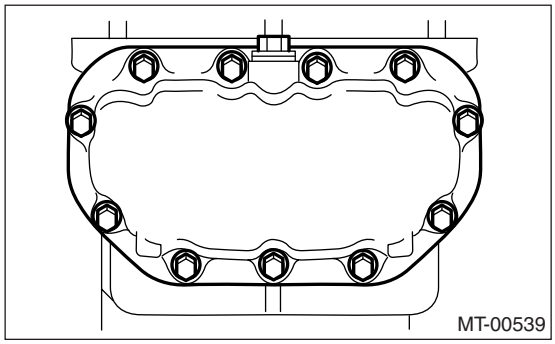


(A) O-ring
(B) Valve spring
(C) Ball

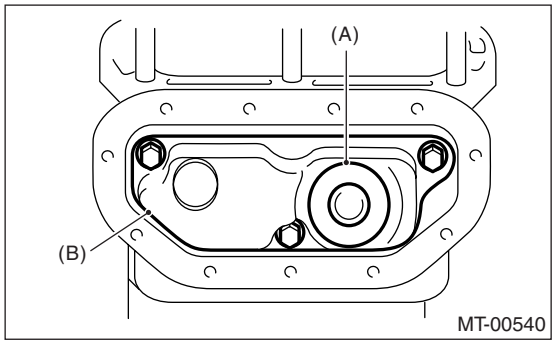
4) Remove the harness bracket.



5) Remove the oil pan.



6) Completely remove the remaining liquid gasket on transmission case and oil pan.
7) Remove the oil pan magnet, and then remove the oil strainer.

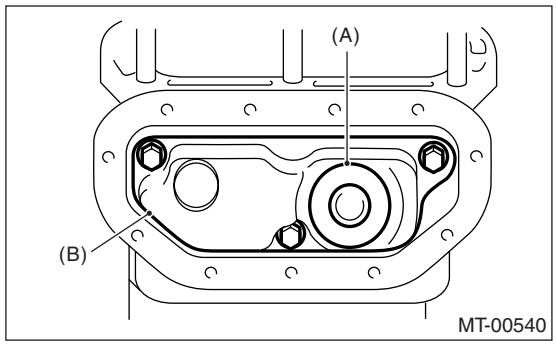


(A) Oil pan magnet
(B) Oil strainer

D: ASSEMBLY

1) Install the oil strainer and magnet.

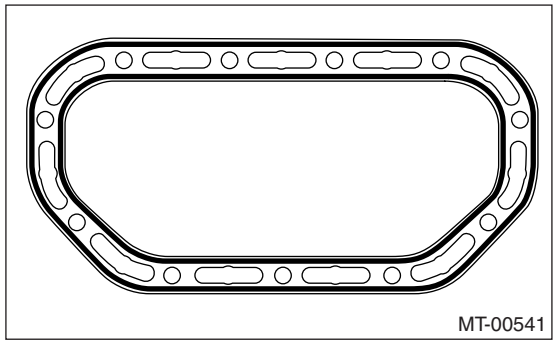
Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)



(A) Oil pan magnet
(B) Oil strainer

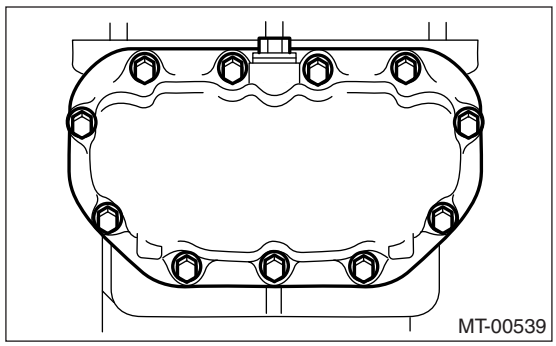
2) Apply liquid gasket to the oil pan.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007)



3) Install the oil pan.

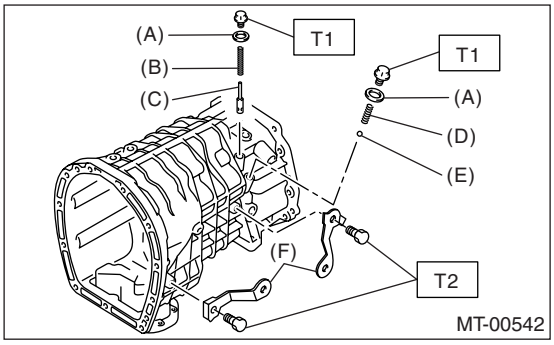
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



4) Install the relief valve, relief valve spring and new O-ring.

5) Install the ball, valve spring and new O-ring.

Tightening torque:
T1: 13 N·m (1.3 kgf-m, 9.6 ft-lb)
T2: 16 N·m (1.6 kgf-m, 11.8 ft-lb)



(A) O-ring
(B) Relief valve spring
(C) Relief valve
(D) Valve spring
(E) Ball
(F) Harness bracket

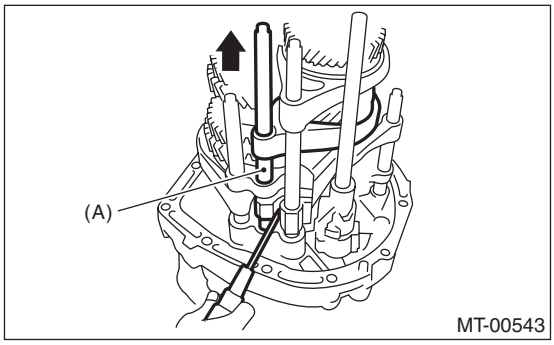
E: INSPECTION

1) Completely remove with shop cloth if sludge is adhered to the oil pan magnet.
2) Make sure there is no clog on the oil strainer. If clogged, remove clog or replace the oil strainer.
3) Make sure there is no damage on each parts. Replace damaged parts with new parts.

19.Main Shaft Assembly

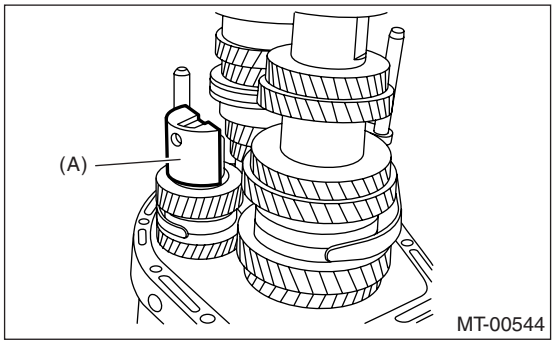
A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
2) Prepare the transmission for overhaul. <Ref. to 6MT-41, Preparation for Overhaul.>
3) Remove the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-43, REMOVAL, Oil Pipe.>, <Ref. to 6MT-46, REMOVAL, Neutral Position Switch.>, <Ref. to 6MT-44, REMOVAL, Back-up Light Switch.>
4) Remove the extension case. <Ref. to 6MT-48, REMOVAL, Extension Case.>
5) Remove the transfer driven gear. <Ref. to 6MT-60, REMOVAL, Transfer Driven Gear.>
6) Remove the center differential. <Ref. to 6MT-62, REMOVAL, Center Differential.>
7) Remove the oil pump. <Ref. to 6MT-63, REMOVAL, Oil Pump.>
8) Remove the transmission case. <Ref. to 6MT-67, REMOVAL, Transmission Case.>
9) Remove the striking rod.
10) Using a screwdriver, shift to 4th gear position.



(A) 3rd-4th shift rod

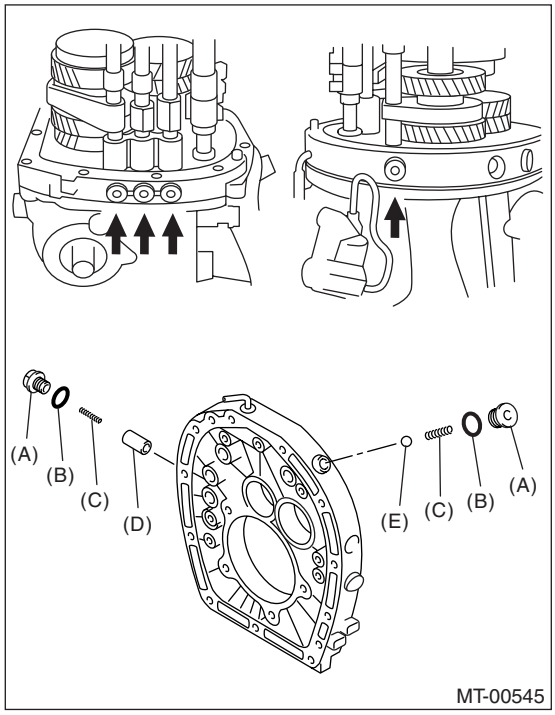
11) Remove the reverse idler holder.



(A) Reverse idler holder

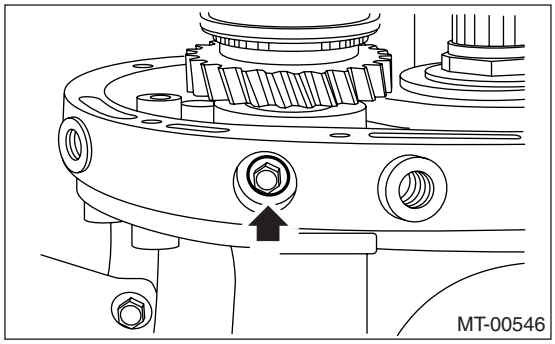
12) Remove all checking plug, gasket, checking spring, plunger and checking ball from adapter plate.

NOTE:
Do not reuse the gasket.



(A) Checking plug
(B) Gasket
(C) Checking spring
(D) Plunger
(E) Checking ball

13) Remove the bolt and gasket installing reverse idler shaft.

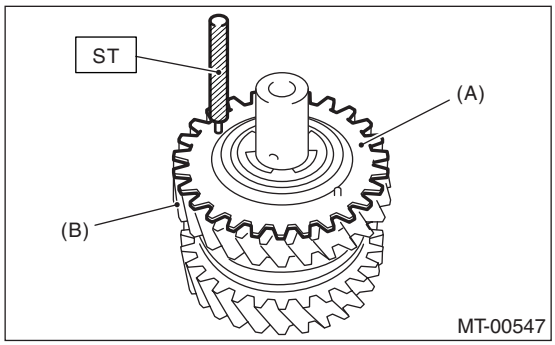


14) Press the main shaft assembly, driven gear assembly, reverse idler gear and each shifter fork, then remove from the adapter plate at once.

NOTE:
Two people should do the work.

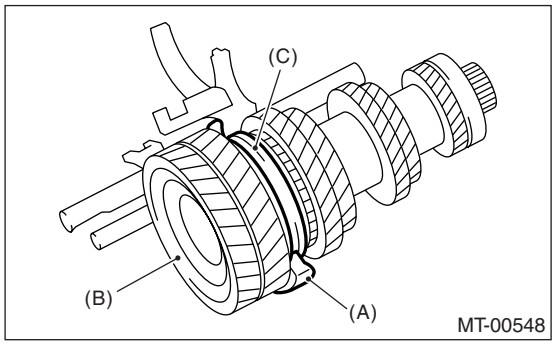
B: INSTALLATION

1) Adjust the 3rd-4th, and 5th-6th shifter fork rod. <Ref. to 6MT-117, ADJUSTMENT, Shifter Fork and Rod.>
2) Turn the sub gear counterclockwise for approx. three teeth. Align the sub gear and reverse idler gear hole, then insert the ST.
ST 18757AA000 STRAIGHT PIN



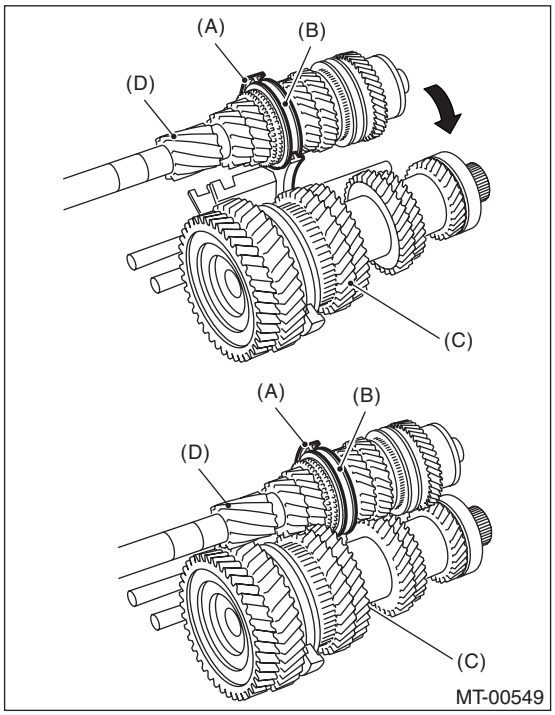
(A) Sub gear
(B) Reverse idler gear

3) Install the driven gear assembly to 1st-2nd shifter fork assembly.



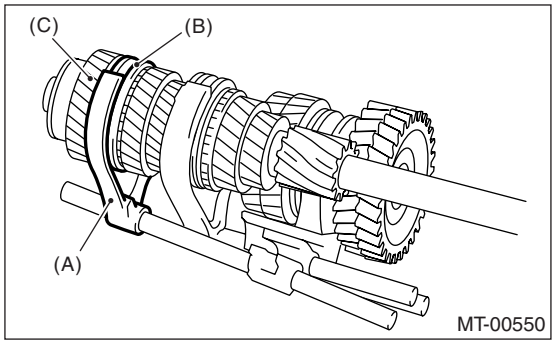
(A) 1st-2nd shifter fork
(B) Driven gear assembly
(C) 1st-2nd sleeve

4) Install the main shaft assembly to 3rd-4th shifter fork, and then assemble to driven gear assembly.



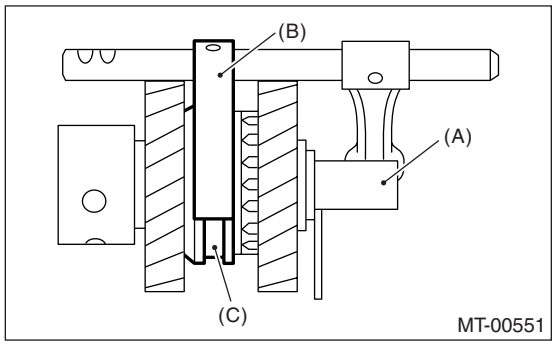
(A) 3rd-4th shifter fork
(B) 3rd-4th sleeve
(C) Driven gear assembly
(D) Main shaft assembly

5) Install the 5th-6th shifter fork assembly to main shaft assembly.



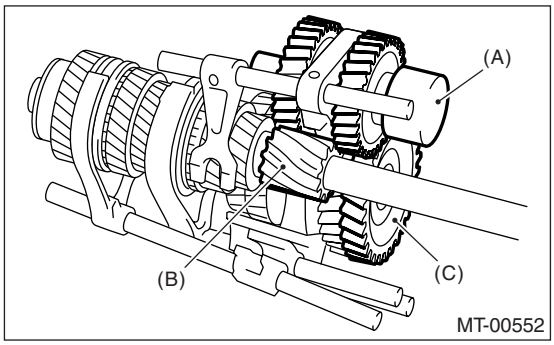
(A) 5th-6th shifter fork
(B) 5th-6th sleeve
(C) Main shaft assembly

6) Install the reverse shifter fork assembly to reverse idler gear assembly.



(A) Reverse idler gear assembly
(B) Reverse shifter fork
(C) Reverse sleeve

7) Install the reverse idler gear assembly.



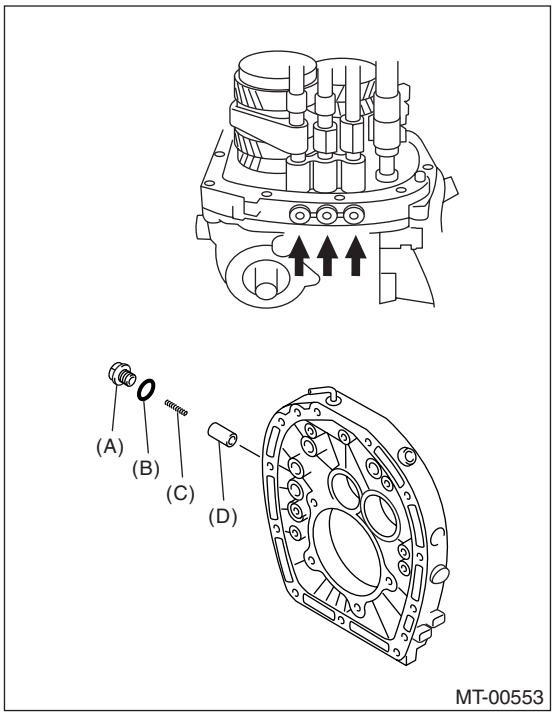
(A) Reverse idler gear assembly
(B) 1st drive gear
(C) Reverse gear

8) Install the thrust bearing of driven gear assembly.
9) Press each shifter fork, main shaft assembly, driven gear assembly and reverse idler gear assembly, then install them to the adapter plate at once.

NOTE:
Two people should do the work.

10) Install the plunger, checking spring, new gasket and checking plug.

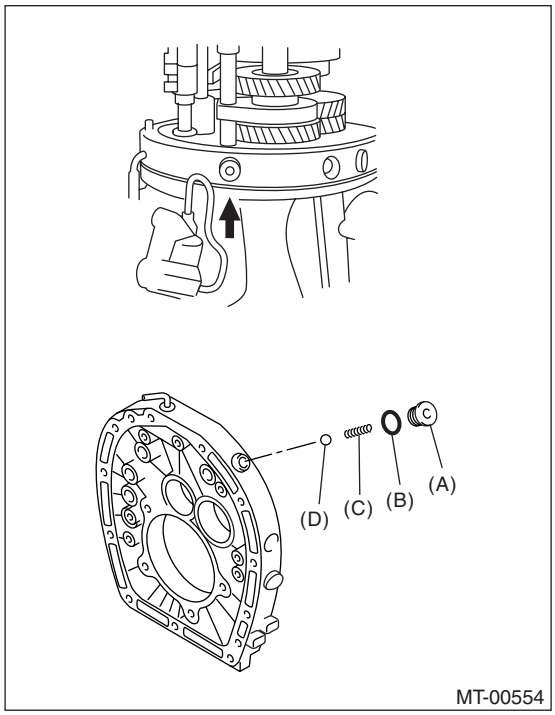
Tightening torque:
37 N·m (3.8 kgf-m, 27.3 ft-lb)



(A) Checking plug
(B) Gasket
(C) Checking spring
(D) Plunger

11) Install the checking ball, checking spring, new gasket and checking plug.

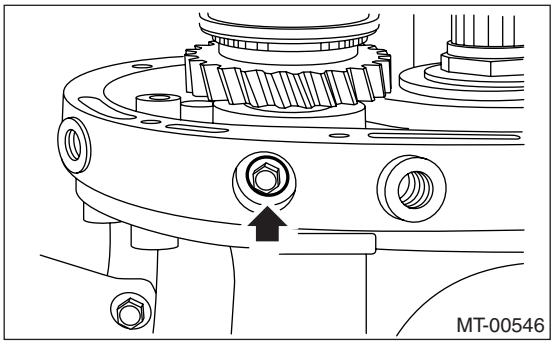
Tightening torque:
37 N·m (3.8 kgf-m, 27.3 ft-lb)



(A) Checking plug
(B) Gasket
(C) Checking spring
(D) Checking ball

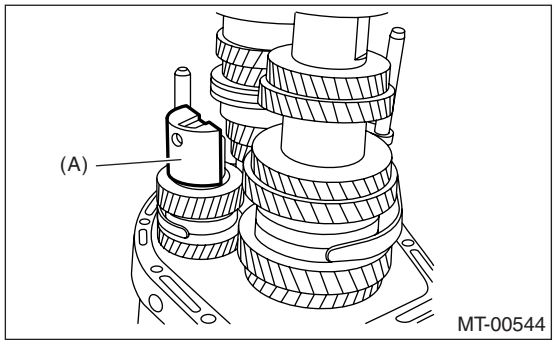
12) Install the bolt and a new gasket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



13) Using a screwdriver, shift to 4th gear position.

14) Install the reverse idler holder



(A) Reverse idler holder

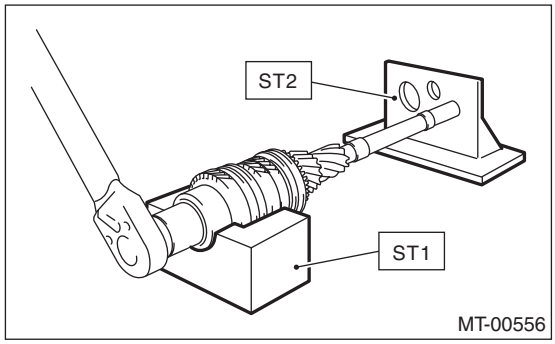
15) Install the striking rod.
16) Install the transmission case. <Ref. to 6MT-68, INSTALLATION, Transmission Case.>
17) Install the selected main shaft snap ring and washer.
18) Install the oil pump. <Ref. to 6MT-64, INSTALLATION, Oil Pump.>
19) Install the center differential. <Ref. to 6MT-62, INSTALLATION, Center Differential.>
20) Install the transfer driven gear. <Ref. to 6MT-60, INSTALLATION, Transfer Driven Gear.>
21) Install the extension case. <Ref. to 6MT-48, INSTALLATION, Extension Case.>
22) Install the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-43, INSTALLATION, Oil Pipe.>, <Ref. to 6MT-46, INSTALLATION, Neutral Position Switch.>, <Ref. to 6MT-44, INSTALLATION, Back-up Light Switch.>
23) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

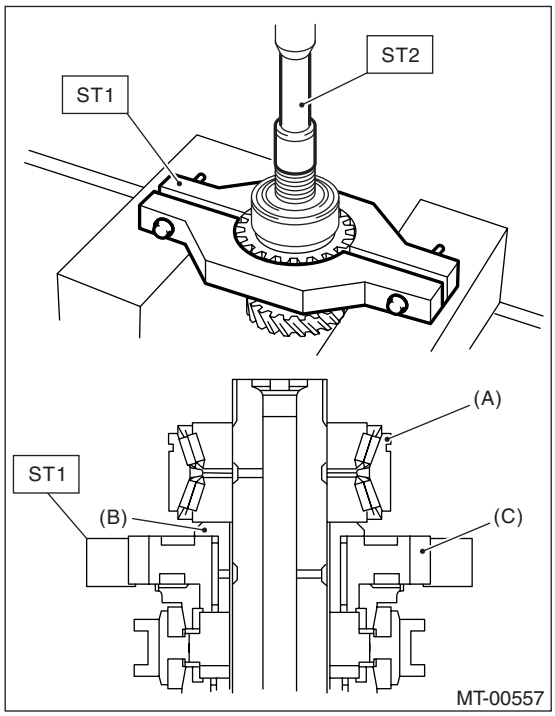
NOTE:
Each sleeve and hub engage at a specified point. Mark an engagement point on the sleeve and hub before disassembly.

1) Secure the ST on workbench.
ST 18664AA000 BASE
2) Lift the caulking of lock nut.
3) Set the main shaft assembly on ST, then remove the lock nut and washer.
ST1 18665AA000 HOLDER
ST2 18664AA000 BASE

NOTE:
Use a 38 mm (1.50 in) socket wrench.

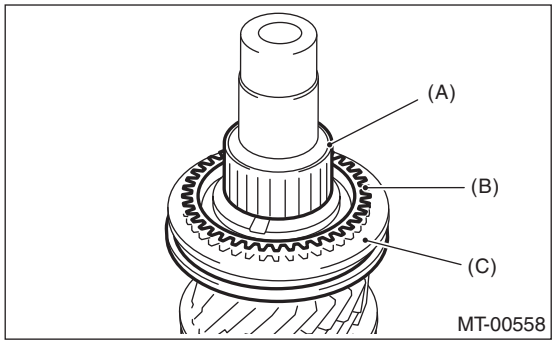


4) Remove the main shaft assembly from ST.
5) Set the ST1 on 6th drive gear, then remove the taper roller bearing, bush and 6th drive gear using press.
ST1 18722AA010 REMOVER
ST2 899864100 REMOVER



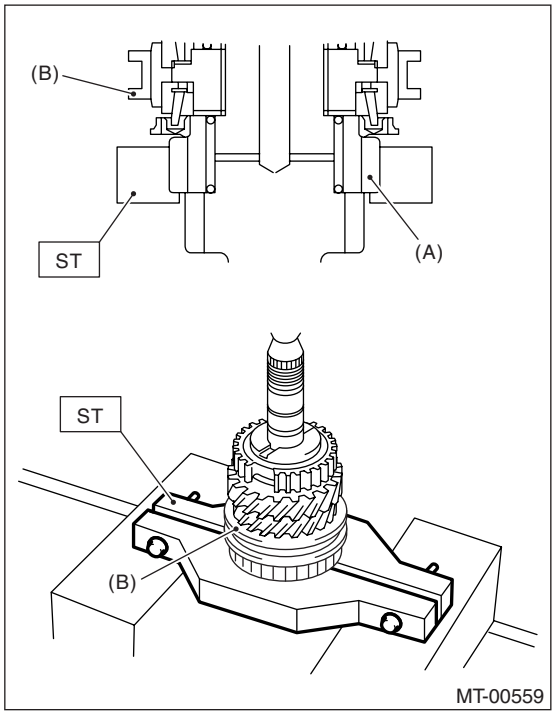
(A) Taper roller bearing
(B) Bush
(C) 6th drive gear

6) Remove the 5th-6th sleeve, 6th needle bearing and 6th baulk ring.



(A) Needle bearing
(B) 6th baulk ring
(C) 5th-6th sleeve

7) Set the ST on 3rd drive gear, then remove each part using press.
ST 18720AA000 REMOVER

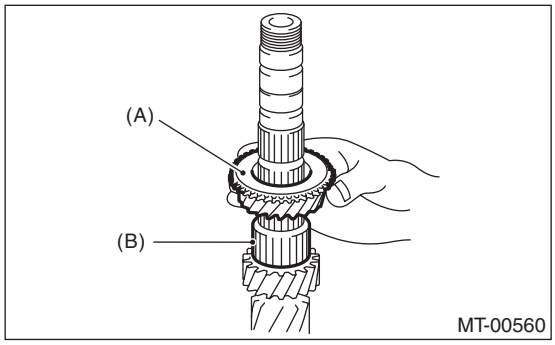


(A) 3rd drive gear
(B) 3rd-4th sleeve

D: ASSEMBLY

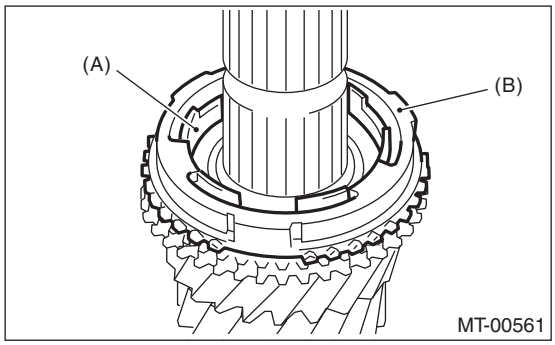
NOTE:
Replace the following parts as a set.
• Sleeve and hub
• Outer baulk ring, 3rd synchro cone and inner baulk ring
• Taper roller bearing

1) Sufficiently apply gear oil to the main shaft, 3rd needle bearing and inner periphery of 3rd drive gear.
2) Install the 3rd needle bearing and 3rd drive gear to main shaft.



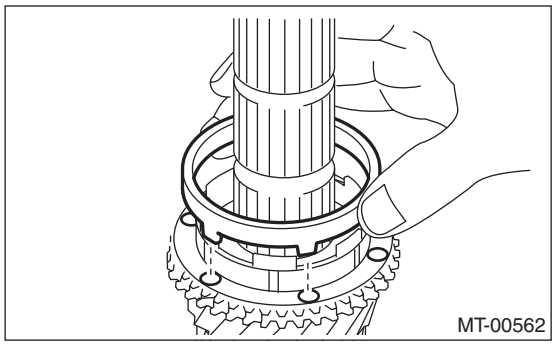
(A) 3rd needle bearing
(B) 3rd drive gear

3) Install the inner baulk ring, 3rd synchro cone and outer baulk ring.

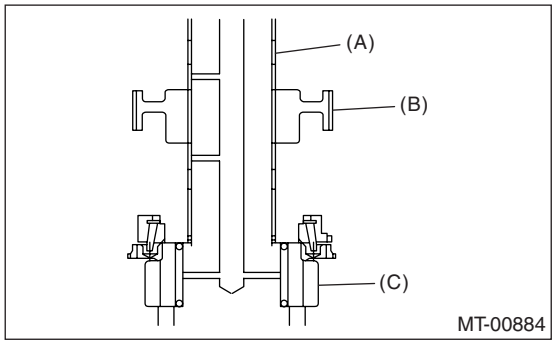


(A) Inner baulk ring
(B) Outer baulk ring

NOTE:
Install the 3rd synchro cone, by aligning protrusion portions of the 3rd synchro cone with 3rd drive gear hole portion.

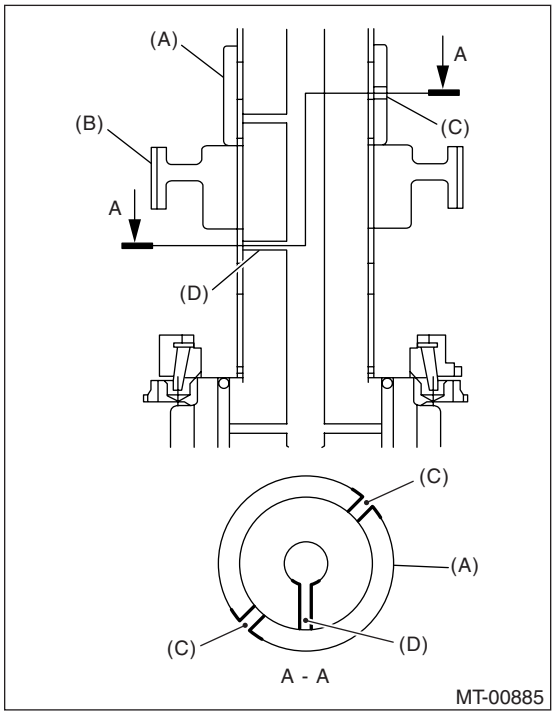


4) Install the 3rd-4th hub and 4th bush.
(1) Set them to the main shaft, taking care of 3rd-4th hub installing direction.



(A) Main shaft
(B) 3rd-4th hub
(C) 3rd drive gear

(2) Set them to the main shaft, taking care not to overlap the main shaft oil hole and 4th bush oil hole.



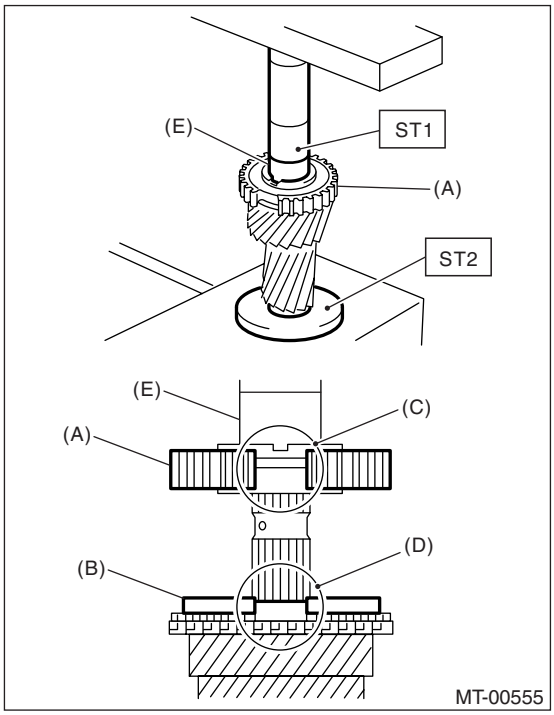
(A) 4th bush
(B) 3rd-4th hub
(C) 4th bush oil hole
(D) Main shaft oil hole

(3) Using the ST, press in the 3rd-4th hub and 4th bush at once.

ST1 18651AA000 INSTALLER
ST2 398177700 INSTALLER

CAUTION:
Do not apply pressure in excess of 40 kN (4.0 ton, 4.4 US ton, 3.9 Imp ton).

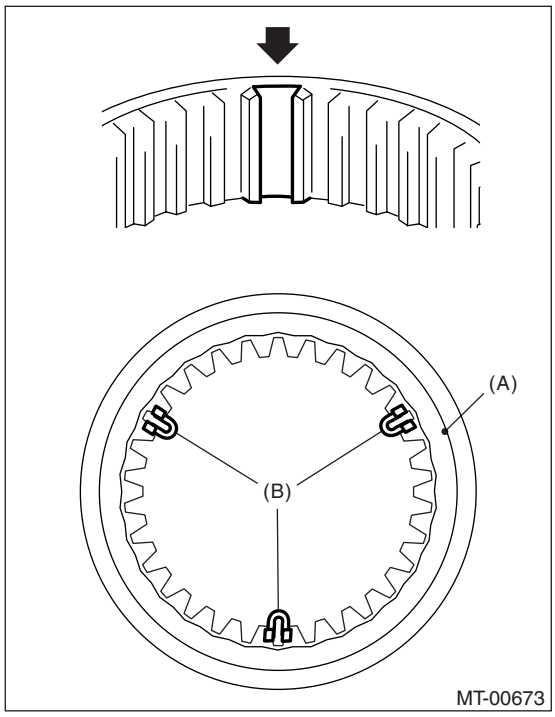
NOTE:
When pressing in 3rd-4th hub and 4th bush, align the protrusion portion of outer baulk ring and cutout portion of 3rd-4th bush by moving the outer baulk ring.



(A) 3rd-4th hub
(B) Outer baulk ring
(C) Cutout portion of 3rd-4th hub
(D) Protrusion portion of outer baulk ring
(E) 4th bush

5) Make sure the 3rd drive gear is smoothly turned by hand. If not, reassemble.
6) Install the 3rd-4th shifting insert key in proper place of 3rd-4th sleeve.

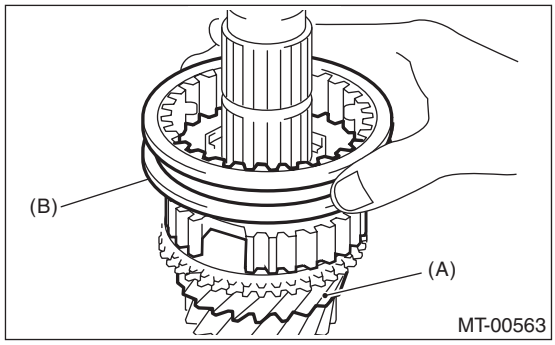
NOTE:
Angle of each shifting insert key is 120 apart.



(A) 3rd-4th sleeve
(B) 3rd-4th shifting insert key

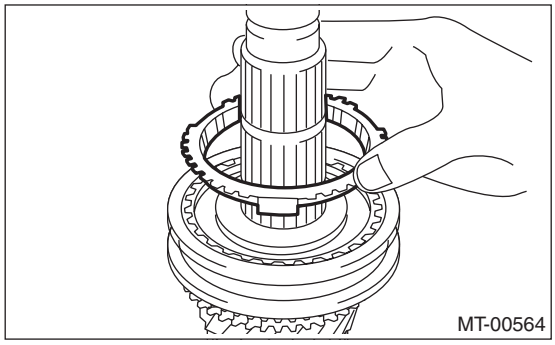
7) Install the 3rd-4th sleeve to 3rd-4th hub.

NOTE:
• 3rd-4th sleeve has a groove for identification.
• Install the 3rd-4th sleeve with groove facing to 3rd drive gear side.



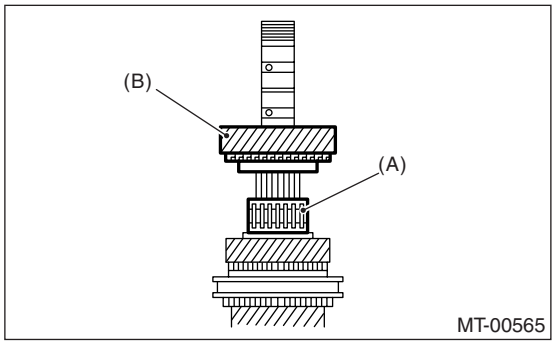
(A) 3rd drive gear
(B) Groove (1) for identification of 3rd-4th sleeve

8) Install the 4th baulk ring.



9) Sufficiently apply gear oil to the main shaft, 4th needle bearing and inner periphery of 4th drive gear.

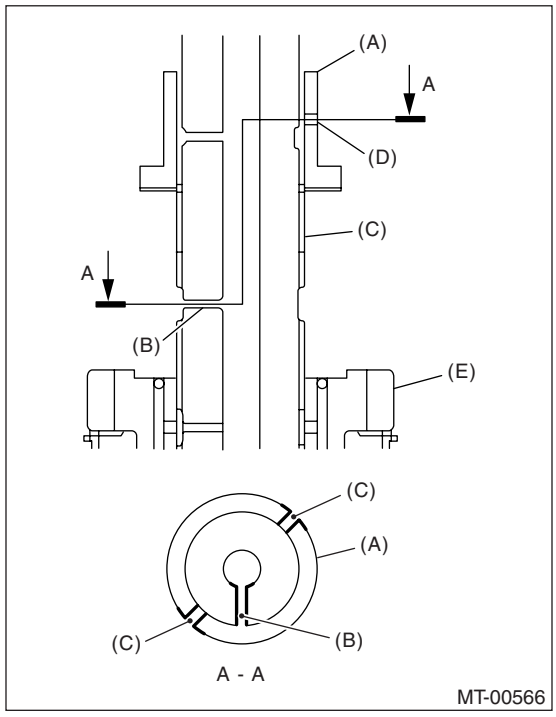
10) Install the 4th needle bearing and 4th drive gear.



(A) 4th needle bearing
(B) 4th drive gear

11) Install the 5th bush.

(1) Set it to the main shaft, taking care not to overlap the main shaft oil hole and 5th bush oil hole.

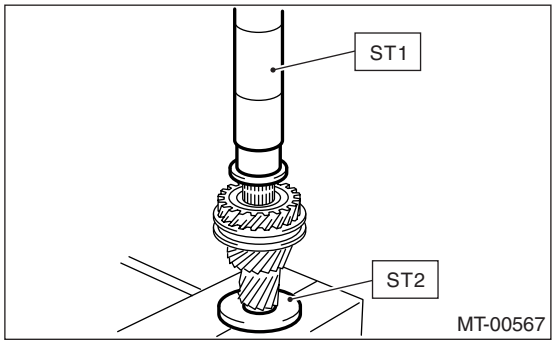


(A) 5th bush
(B) Main shaft oil hole
(C) Main shaft
(D) 5th bush oil hole
(E) 4th drive gear

(2) Using the ST, press in the 5th bush.

ST1 18651AA000 INSTALLER
ST2 398177700 INSTALLER

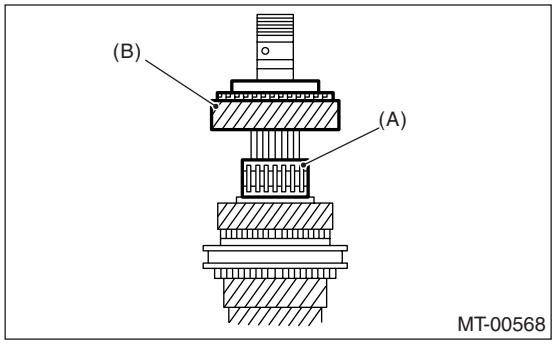
CAUTION:
Do not apply pressure in excess of 40 kN (4.0 ton, 4.4 US ton, 3.9 Imp ton).



12) Make sure the 4th drive gear is smoothly turned by hand. If not, reassemble.

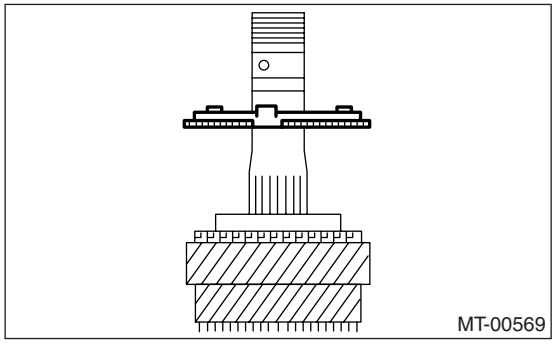
13) Sufficiently apply gear oil to the main shaft, 5th needle bearing and inner periphery of 5th drive gear.

14) Install the 5th needle bearing and 5th drive gear.

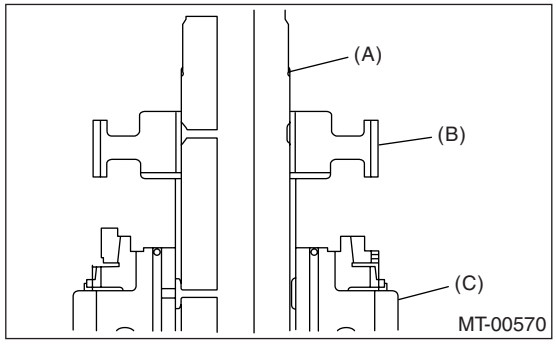


(A) 5th needle bearing
(B) 5th drive gear

15) Install the 5th baulk ring.



16) Install the 5th-6th hub.
(1) Set it to the main shaft, taking care of 5th-6th hub installing direction.

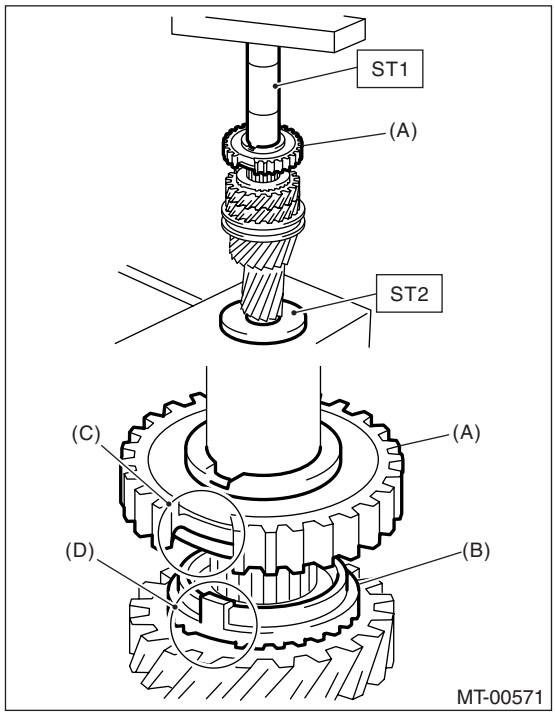


(A) Main shaft
(B) 5th-6th hub
(C) 5th drive gear

(2) Using the ST, press in the 5th-6th hub.
ST1 18651AA000 INSTALLER
ST2 398177700 INSTALLER

CAUTION:
Do not apply pressure in excess of 40 kN (4.0 ton, 4.4 US ton, 3.9 Imp ton).

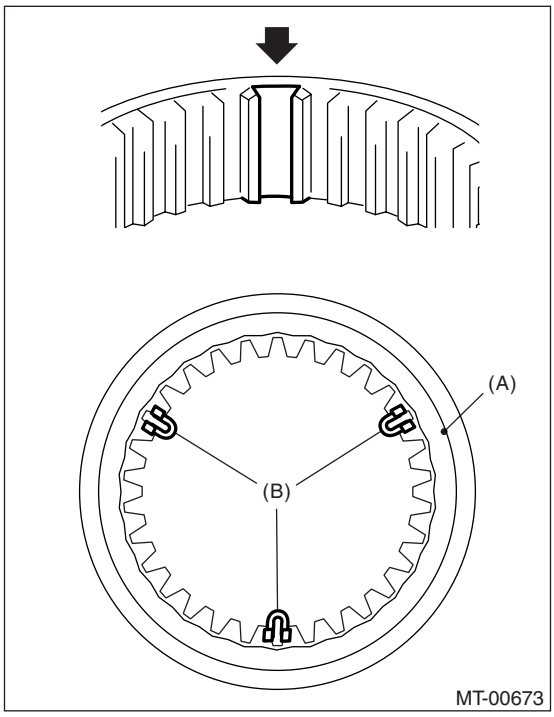
NOTE:
When pressing in 5th-6th hub, align the protrusion portion of outer baulk ring and cutout portion of 5th-6th bush by moving the outer baulk ring.



(A) 5th-6th hub
(B) Outer baulk ring
(C) Cutout portion of 5th-6th hub
(D) Protrusion portion of outer baulk ring

17) Make sure the 5th drive gear is smoothly turned by hand. If not, reassemble.
18) Install the 5th-6th shifting insert key in proper place of 5th-6th sleeve.

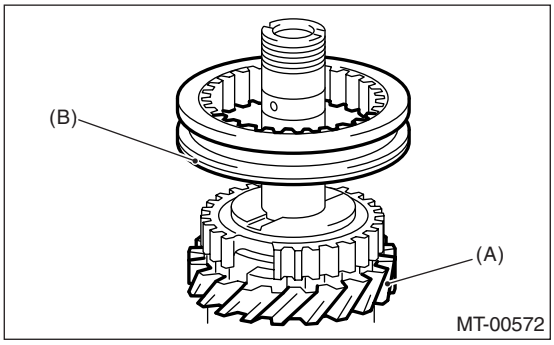
NOTE:
Angle of each shifting insert key is 120° apart.



(A) 5th-6th sleeve
(B) Shifting insert key

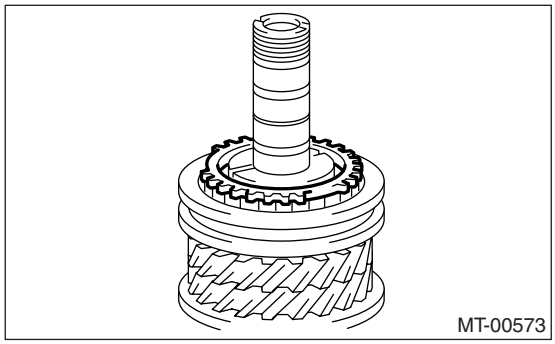
19) Install the 5th-6th sleeve to 5th-6th hub.

NOTE:
• 5th-6th sleeve has two grooves for identification.
• Install the 5th-6th sleeve with the groove facing to 5th drive gear side.

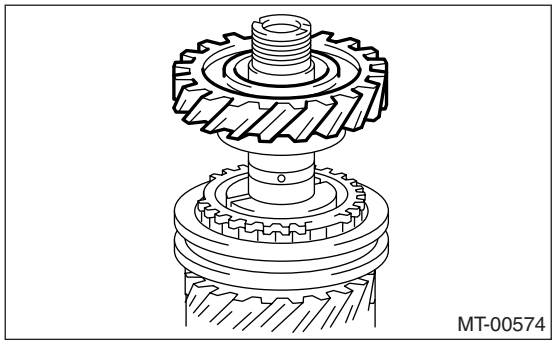


(A) 5th drive gear
(B) Groove (2) for identification of 5th-6th sleeve

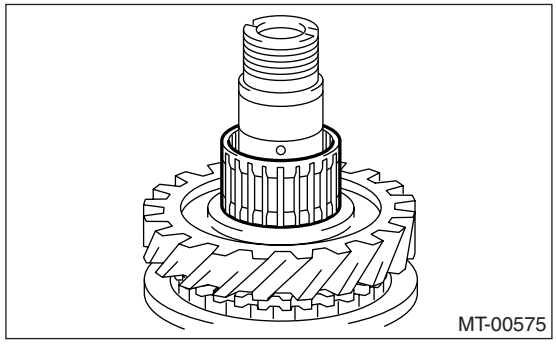
20) Install the 6th baulk ring.



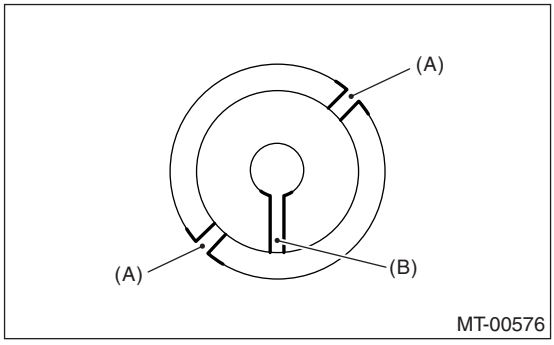
21) Sufficiently apply gear oil to the main shaft, 6th needle bearing and inner periphery of 6th drive gear.
22) Install the 6th drive gear.



23) Install the 6th needle bearing.



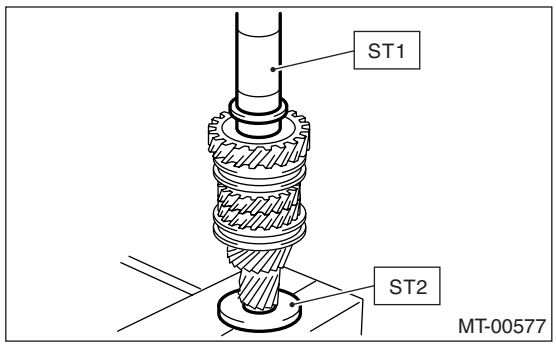
24) Set the 6th bush to main shaft, taking care not to overlap the 6th bush oil hole and main shaft oil hole.



(A) 6th bush oil hole
(B) Main shaft oil hole

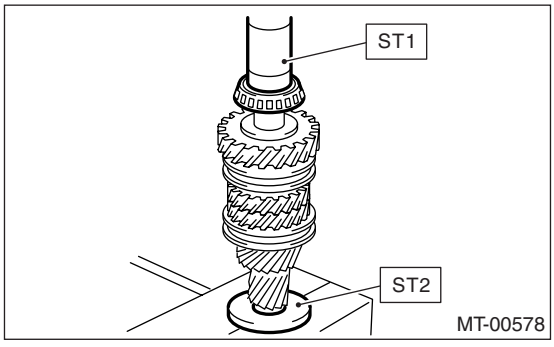
25) Using the ST, install the 6th bush.
ST1 18651AA000 INSTALLER
ST2 398177700 INSTALLER

CAUTION:
Do not apply pressure in excess of 40 kN (4.0 ton, 4.4 US ton, 3.9 Imp ton).



26) Make sure the 6th drive gear is smoothly turned by hand. If not, reassemble.
27) Using the ST, install the inner bearing inner race.
ST1 18651AA000 INSTALLER
ST2 398177700 INSTALLER

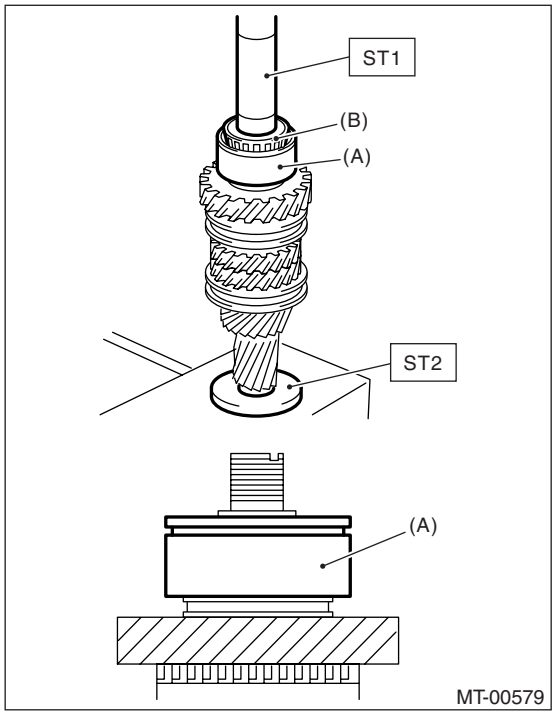
CAUTION:
Do not apply pressure in excess of 40 kN (4.0 ton, 4.4 US ton, 3.9 Imp ton).



28) Using the ST, install the retainer and outer bearing inner race.
ST1 18651AA000 INSTALLER
ST2 398177700 INSTALLER

CAUTION:
Do not apply pressure in excess of 40 kN (4.0 ton, 4.4 US ton, 3.9 Imp ton).

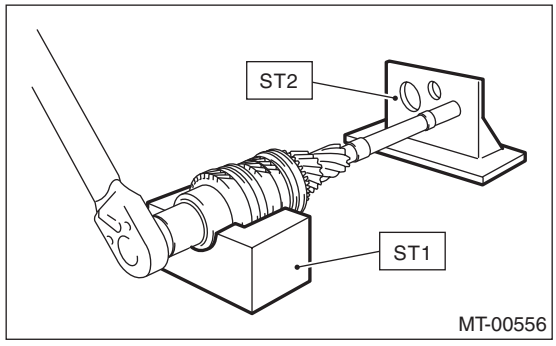
NOTE:
• Make sure to install the retainer in proper direction.
• Press in until there is no backlash in retainer and where bearing is smoothly turned by hand.



(A) Retainer
(B) Outer bearing inner race

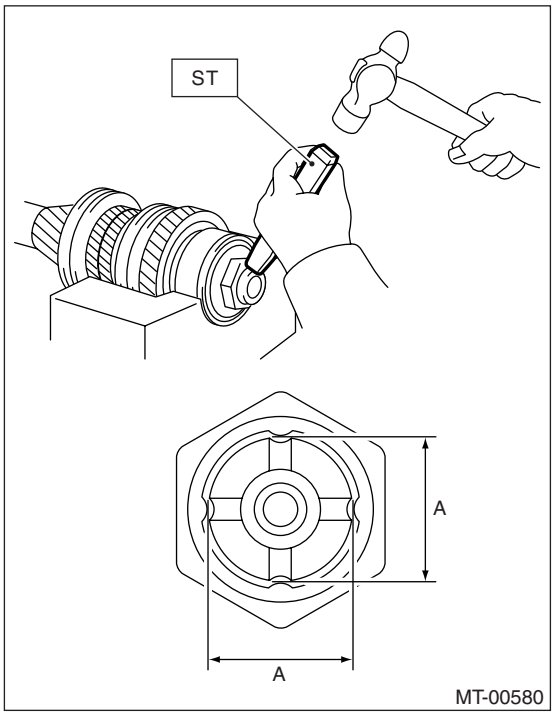
29) Make sure the taper roller bearing is smoothly turned by hand. If not, replace the taper roller bearing as a set and reassemble.
30) Install the lock washer and new lock nut.
31) Set the main shaft assembly to ST, then tighten the lock nut.
ST1 18665AA000 HOLDER
ST2 18664AA000 BASE

Tightening torque:
392 N·m (40.0 kgf-m, 289 ft-lb)



32) Using the ST, caulk four portions on the lock nut to obtain dimension A 27±0.3 mm (1.06±0.01 in).
ST 18668AA000 PUNCH

NOTE:
Do not crack the caulking part of lock nut.



E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

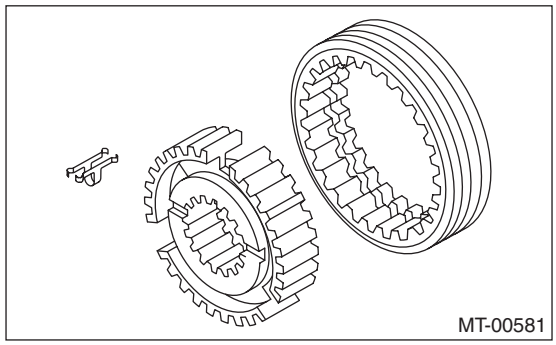
1) Bearing
Replace the bearings in the following cases.
- Worn, rusted and damaged bearing
- Bearings that fail to turn smoothly or make abnormal noise when turned
- Bearings having other defects

2) Bushing (each gear)
Replace the bushings in the following case.
- When the sliding surface is damaged or abnormally worn.

3) Gears
Replace the gears in the following cases.
- Gear teeth surfaces are broken or excessively worn.
- Parts that contact the baulk ring is damaged.
- The inner surface of gear is damaged.

4) Baulk ring, synchro cone
Replace the baulk ring and synchro cone in the following case.
- Worn, rusted and damaged baulk ring

5) Shifting insert key
Replace the shifting insert key if deformed, excessively worn or defective in any way.



F: ADJUSTMENT

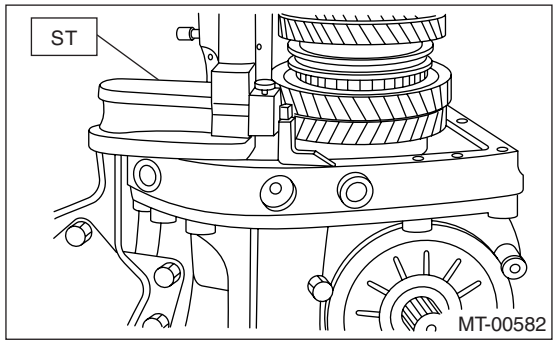
1. SELECTION OF MAIN SHAFT SNAP RING AND WASHER

NOTE:
Perform the following procedures when:
- Replacing the 1st to 6th driven gear.
- Replacing the 1st and 2nd synchro ring assembly.
- Replacing the ball bearing.
- Replacing the adapter plate.
- Replacing the driven shaft.

1) Insert the drive pinion assembly in adapter plate.

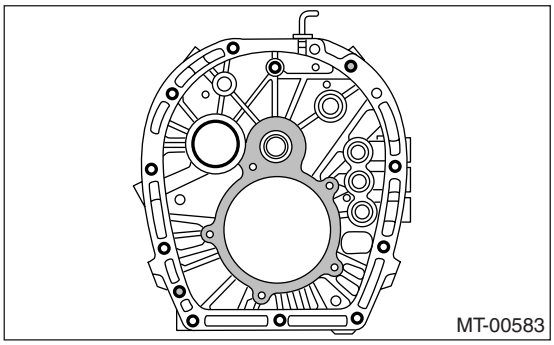
NOTE:
Make sure the thrust bearing outer race is not removed and drive pinion is not lift-up.

2) Set the height gauge to adapter plate. Lower the indicator of height gauge to mating surface of adapter plate and case, then set to zero point.
ST 18853AA000 HEIGHT GAUGE

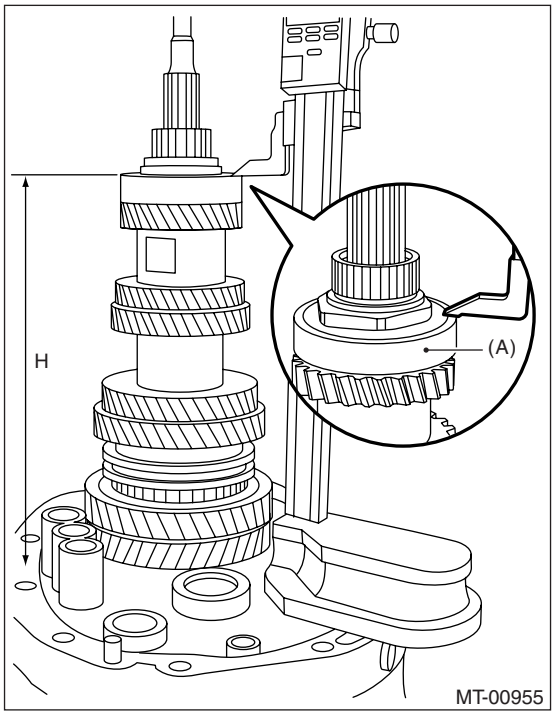


NOTE:
- Remove the remaining gasket on edge surface with scraper, since the adapter plate is base point of measurement.

• Do not place the height gauge on shaded area in the figure during measurement.

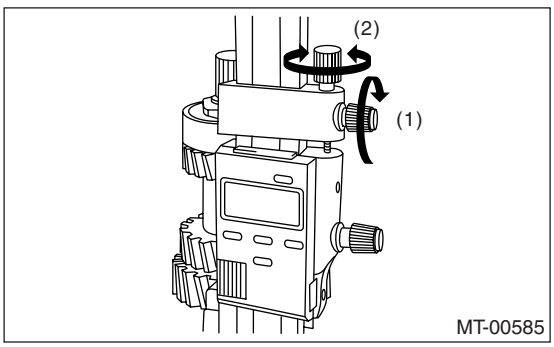


3) Measure the height to edge surface of ball bearing (height H).



(A) Ball bearing

NOTE:
Set the indicator of height gauge near measuring object, then lock the dial (1) as shown in the figure. Turn dial (2) to set the indicator to edge surface of bearing.



Measure the five points of ball bearing by turning every approx. 120°. Round off each two upper and lower measurement value. Use the remaining center value as measurement value.

4) According to measurement value, select the snap ring and washer from the following table.

Snap ring

H: mm (in)	Part No.	Thickness: mm (in)
270.83 — 271.40 (10.66 — 10.69)	805072010	1.65 (0.065)
271.41 — 271.98 (10.69 — 10.71)	805072011	1.95 (0.077)
271.99 — 272.56 (10.71 — 10.73)	805072012	2.25 (0.089)

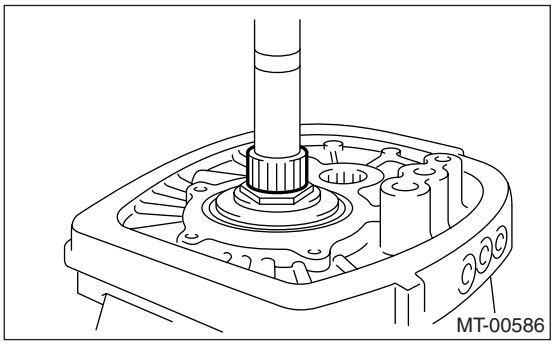
Washer

H: mm (in)	Part No.	Thickness: mm (in)
270.83 — 271.40 (10.66 — 10.69)	803067012	1.6 (0.063)
271.41 — 271.98 (10.69 — 10.71)	803067011	1.3 (0.051)
271.99 — 272.56 (10.71 — 10.73)	803067010	1.0 (0.039)

20.Driven Gear Assembly

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
2) Prepare the transmission for overhaul. <Ref. to 6MT-41, Preparation for Overhaul.>
3) Remove the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-43, REMOVAL, Oil Pipe.>, <Ref. to 6MT-46, REMOVAL, Neutral Position Switch.>, <Ref. to 6MT-44, REMOVAL, Back-up Light Switch.>
4) Remove the extension case. <Ref. to 6MT-48, REMOVAL, Extension Case.>
5) Remove the transfer driven gear. <Ref. to 6MT-60, REMOVAL, Transfer Driven Gear.>
6) Remove the center differential. <Ref. to 6MT-62, REMOVAL, Center Differential.>
7) Remove the oil pump. <Ref. to 6MT-63, REMOVAL, Oil Pump.>
8) Remove the transmission case. <Ref. to 6MT-67, REMOVAL, Transmission Case.>
9) Remove the driven gear assembly. <Ref. to 6MT-72, REMOVAL, Main Shaft Assembly.>
10) Remove the needle bearing.

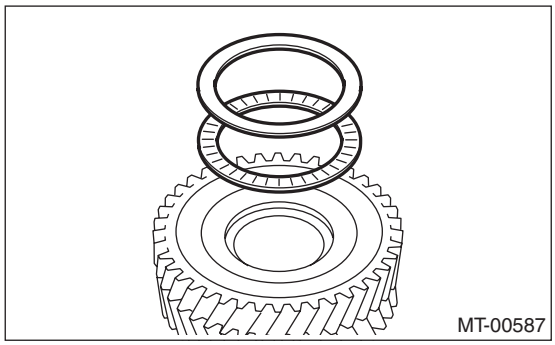


11) Remove the thrust needle bearing.

B: INSTALLATION

1) Adjust the main shaft snap ring. <Ref. to 6MT-83, ADJUSTMENT, Main Shaft Assembly.>
2) Adjust the 1st-2nd shifter rod. <Ref. to 6MT-117, ADJUSTMENT, Shifter Fork and Rod.>
3) Install the thrust needle bearing.

NOTE:
Make sure to install the thrust needle bearing in proper direction.



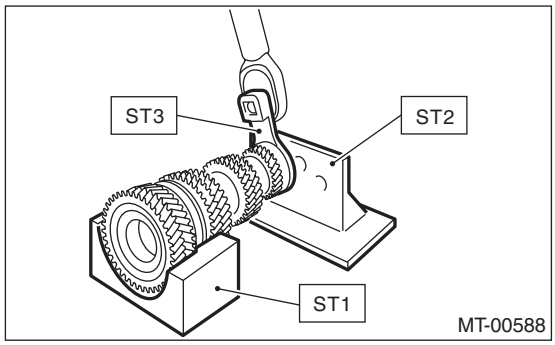
4) Install the 1st needle bearing.
5) Install the driven gear assembly. <Ref. to 6MT-73, INSTALLATION, Main Shaft Assembly.>
6) Install the transmission case. <Ref. to 6MT-68, INSTALLATION, Transmission Case.>
7) Adjust backlash at axial direction of driven gear assembly. <Ref. to 6MT-91, ADJUSTMENT, Driven Gear Assembly.>
8) Install the oil pump. <Ref. to 6MT-64, INSTALLATION, Oil Pump.>
9) Install the center differential. <Ref. to 6MT-62, INSTALLATION, Center Differential.>
10) Install the transfer driven gear. <Ref. to 6MT-60, INSTALLATION, Transfer Driven Gear.>
11) Install the extension case. <Ref. to 6MT-48, INSTALLATION, Extension Case.>
12) Install the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-43, INSTALLATION, Oil Pipe.>, <Ref. to 6MT-46, INSTALLATION, Neutral Position Switch.>, <Ref. to 6MT-44, INSTALLATION, Back-up Light Switch.>
13) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

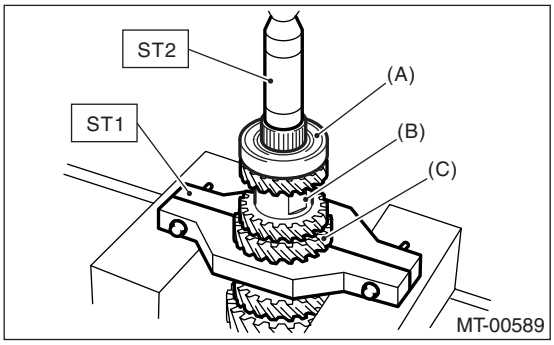
NOTE:
Each sleeve and hub engage at a specified point. Mark an engagement point on the sleeve and hub before disassembly.

1) Secure the ST on workbench.
ST 18664AA000 BASE
2) Lift the caulking of lock nut.
3) Install the ST3 to lock nut, set the driven gear assembly on ST, then remove the lock nut.
ST1 18666AA000 HOLDER
ST2 18664AA000 BASE

ST3 18620AA000 ADAPTER WRENCH

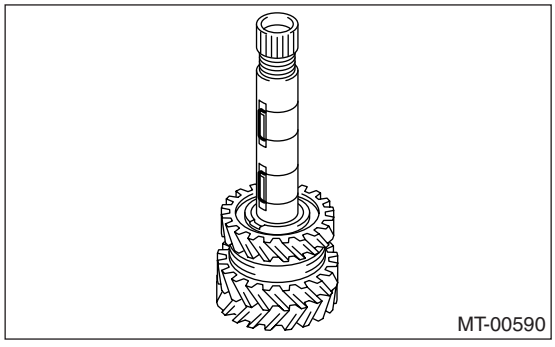


4) Install the ST1 to 4th gear, then remove the ball bearing, 5th-6th driven gear and 3rd-4th driven gear.
ST1 18723AA000 REMOVER
ST2 499877000 REMOVER

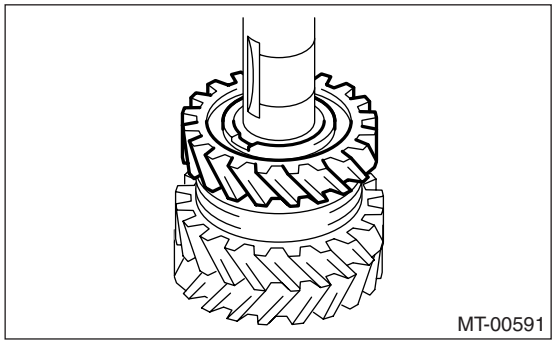


(A) Ball bearing
(B) 5th-6th driven gear
(C) 3rd-4th driven gear

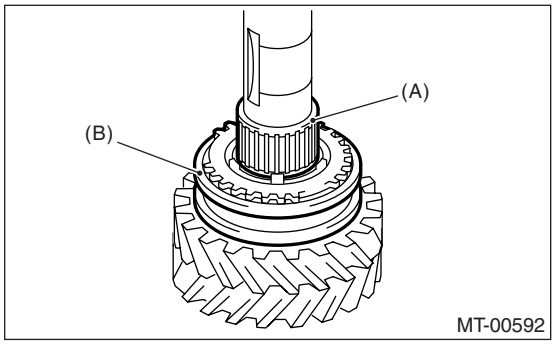
5) Remove the driven gear key.



6) Remove the 2nd gear.

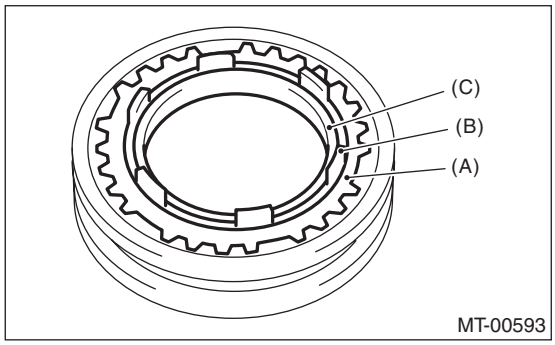


7) Remove the needle bearing and 1st-2nd sleeve.



(A) Needle bearing
(B) 1st-2nd sleeve

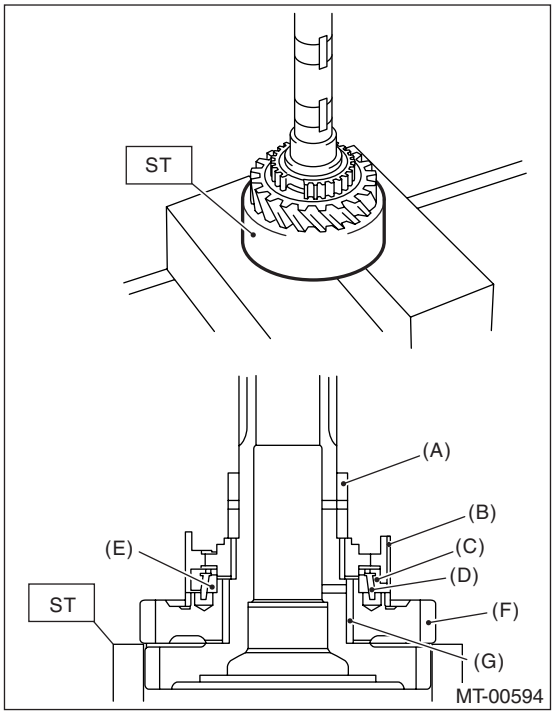
8) Remove the outer baulk ring, 2nd synchro cone and inner baulk ring.



(A) Outer baulk ring
(B) 2nd synchro cone
(C) Inner baulk ring

9) Using the ST, remove each part.

ST 18754AA000 REMOVER

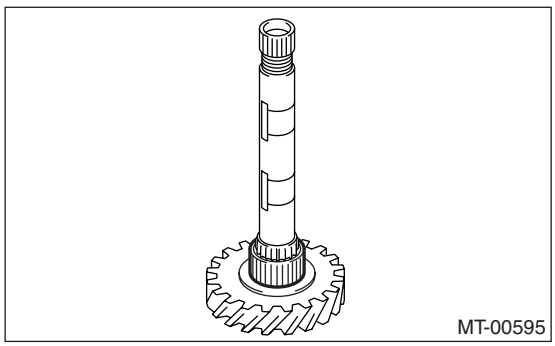


(A) 2nd bush
(B) 1st-2nd hub
(C) Outer baulk ring
(D) 1st synchro cone
(E) Inner baulk ring
(F) 1st driven gear
(G) 1st needle bearing

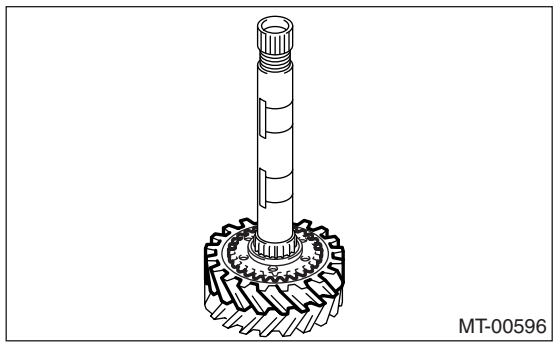
D: ASSEMBLY

NOTE:
Replace the following parts as a set.
• Sleeve and hub
• Outer baulk ring, 1st synchro cone, inner baulk ring
• Outer baulk ring, 2nd synchro cone, inner baulk ring

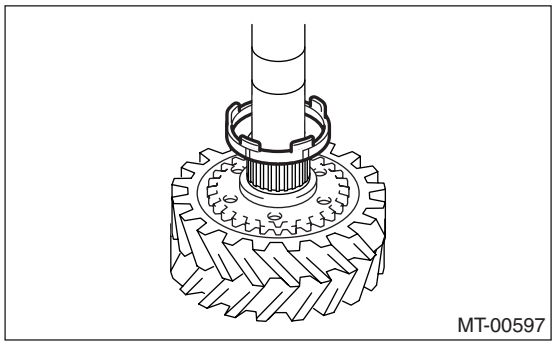
1) Sufficiently apply gear oil to the drive shaft, 1st needle bearing and inner periphery of 1st driven gear.
2) Install the 1st needle bearing.



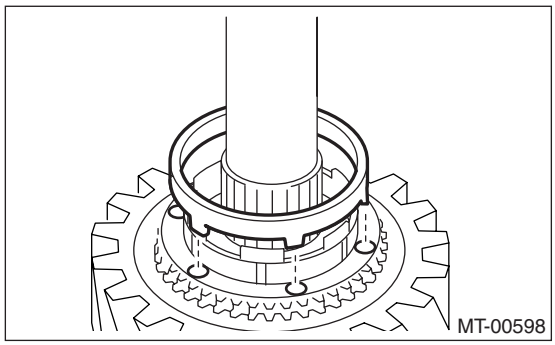
3) Install the 1st driven gear to driven shaft.



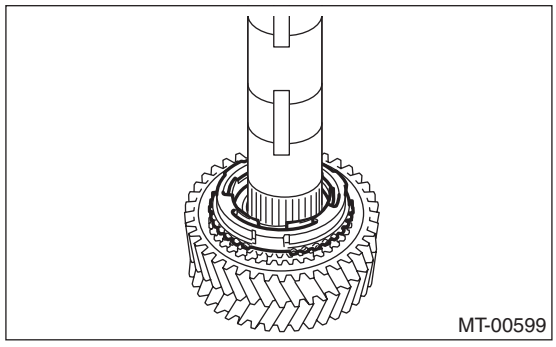
4) Install the inner baulk ring.



5) Align protrusion portions of the 1st synchro cone to the holes of 1st drive gear to install.



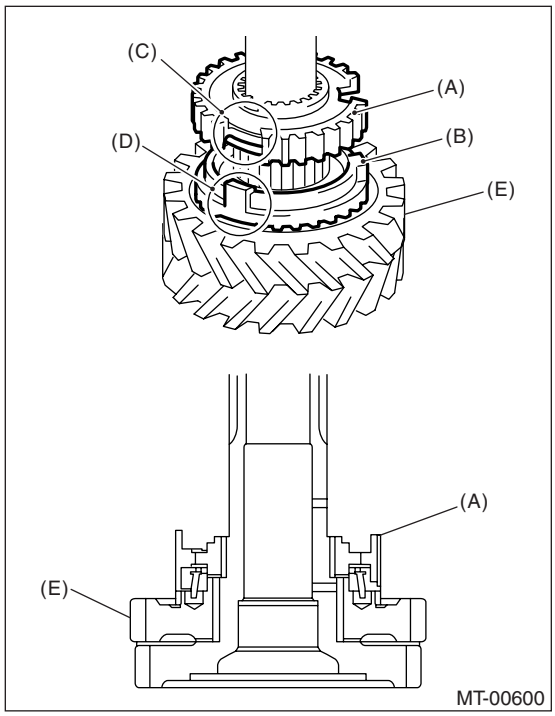
6) Install the outer baulk ring.



7) Install the 1st-2nd hub.

NOTE:
• Align the protrusion portion of outer baulk ring and cutout portion of 1st-2nd hub, then install.

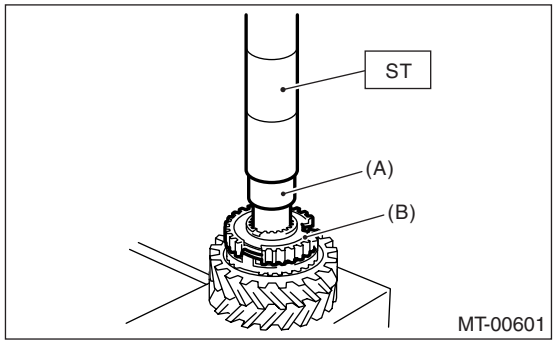
• Make sure to install the 1st-2nd hub in proper direction.



(A) 1st-2nd hub
(B) Outer baulk ring
(C) Cutout portion of 1st-2nd hub
(D) Protrusion portion of outer baulk ring
(E) 1st driven gear

8) Using the ST, install the 2nd hub.
ST 18654AA000 INSTALLER

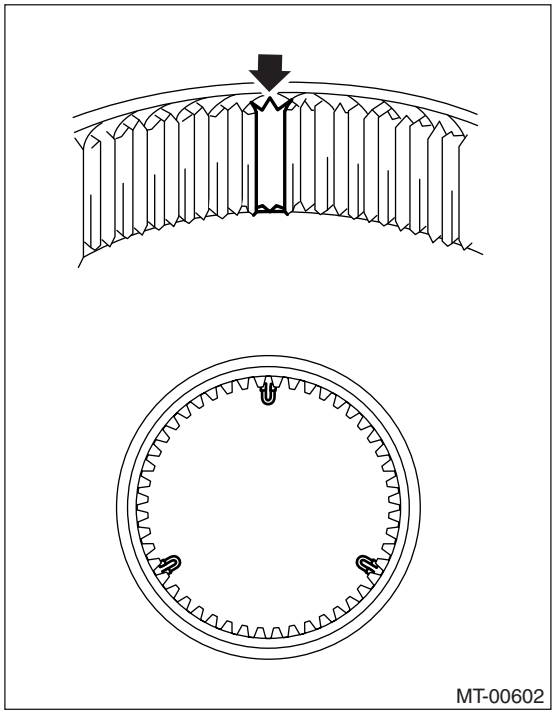
CAUTION:
Do not apply pressure in excess of 40 kN (4.0 ton, 4.4 US ton, 3.9 Imp ton).



(A) 2nd bush
(B) 1st-2nd hub

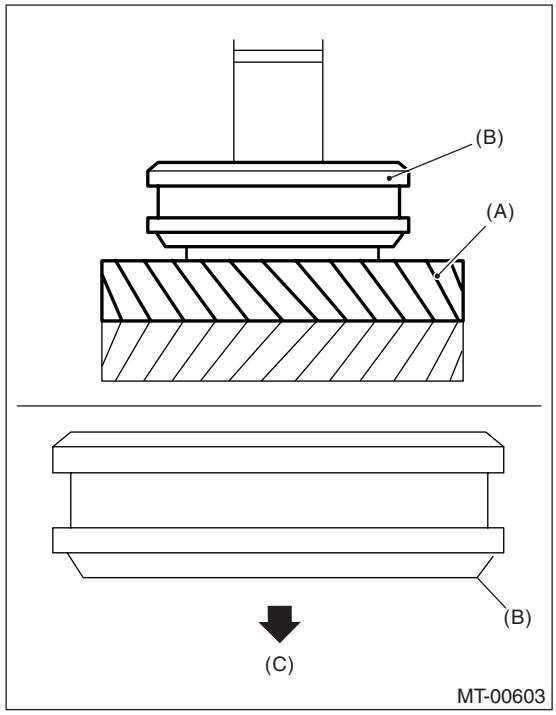
9) Make sure the 1st drive gear is smoothly turned by hand. If not, reassemble.
10) Install the shifting insert key in proper place of 1st-2nd sleeve.

NOTE:
Angle of each shifting insert key is 120° apart.



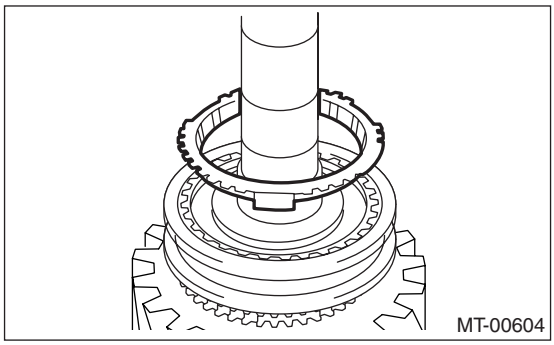
11) Install the 1st-2nd sleeve to 1st-2nd hub.

NOTE:
Make sure to install the 1st-2nd sleeve in proper direction.

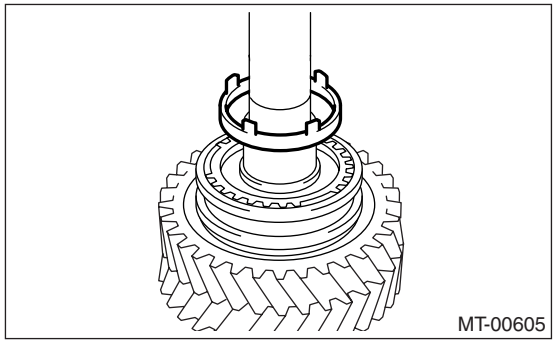


(A) 1st driven gear
(B) 1st-2nd sleeve
(C) 1st driven gear side

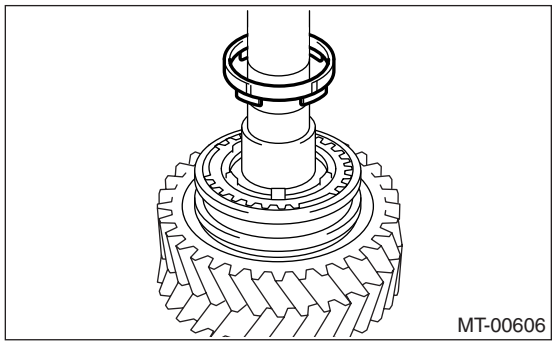
12) Install the outer baulk ring.



13) Install the 2nd synchro cone.

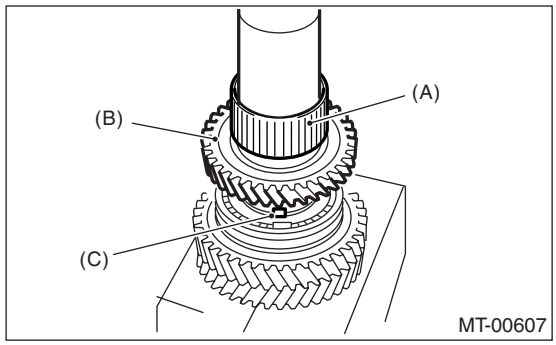


14) Install the inner baulk ring.



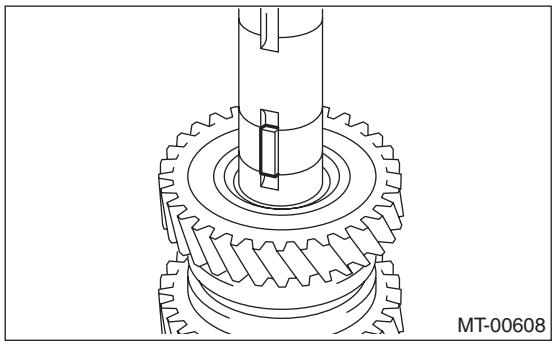
15) Sufficiently apply gear oil to the bush, 2nd needle bearing and inner periphery of 2nd drive gear.
16) Install the 2nd needle bearing and 2nd driven gear.

NOTE:
Align the protrusion portion of 2nd synchro cone with 2nd driven gear hole, then install them.



(A) 2nd needle bearing
(B) 2nd driven gear
(C) Protrusion portion of 2nd synchro cone

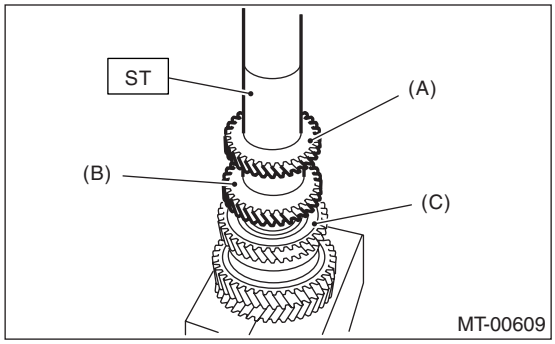
17) Install the key.



18) Using the ST, install the 3rd-4th driven gear.
ST 18654AA000 INSTALLER

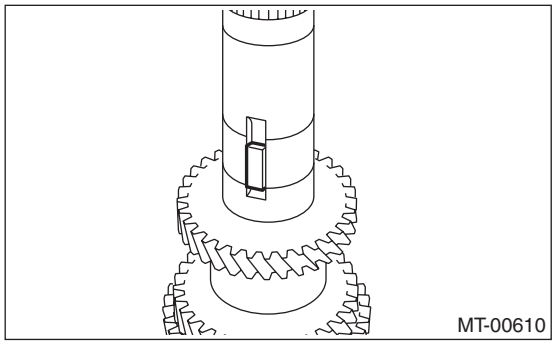
CAUTION:
Do not apply pressure in excess of 40 kN (4.0 ton, 4.4 US ton, 3.9 Imp ton).

NOTE:
• Make sure to install the 3rd-4th driven gear in proper direction.
• Align the groove of 3rd-4th driven gear with key.



(A) 4th gear
(B) 3rd gear
(C) 2nd gear

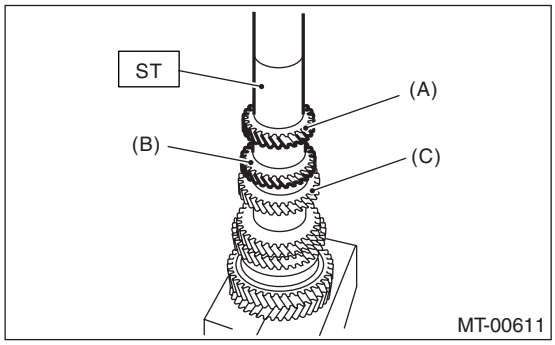
19) Make sure the 2nd driven gear is smoothly turned by hand. If not, reassemble.
20) Install the key.



21) Using the ST, install the 5th-6th driven gear.
ST 18654AA000 INSTALLER

CAUTION:
Do not apply pressure in excess of 40 kN (4.0 ton, 4.4 US ton, 3.9 Imp ton).

NOTE:
• Make sure to install the 5th-6th driven gear in proper direction.
• Align the groove of 5th-6th driven gear with key.

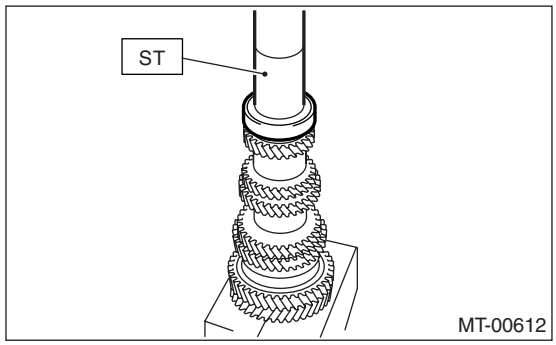


(A) 6th gear
(B) 5th gear
(C) 4th gear

22) Using the ST, install the ball bearing.
ST 18654AA000 INSTALLER

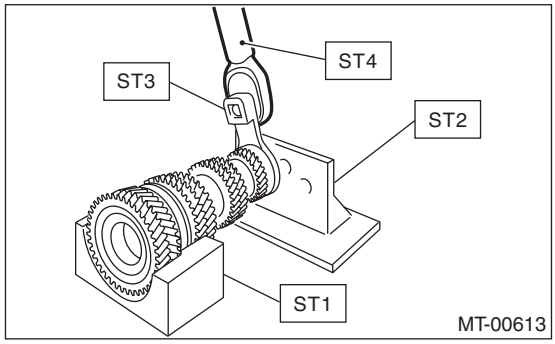
CAUTION:
Do not apply pressure in excess of 40 kN (4.0 ton, 4.4 US ton, 3.9 Imp ton).

NOTE:
Make sure to install the ball bearing in proper direction.



23) Make sure the ball bearing is smoothly turned by hand. If not, reassemble.
24) Install a new lock nut.
25) Install the ST3 to lock nut, then install the ST to driven gear assembly and tighten lock nut.
ST1 18666AA000 HOLDER
ST2 18664AA000 BASE
ST3 18620AA000 ADAPTER WRENCH
ST4 18852AA000 TORQUE WRENCH

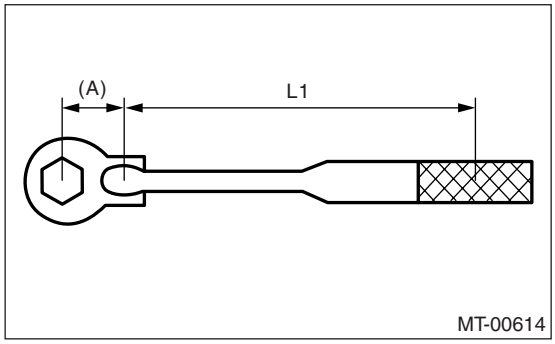
Tightening torque:
530 N·m (54.0 kgf-m, 391 ft-lb)



NOTE:
If torque wrench except ST4 is used, calculate the following equation, then tighten the lock nut.

$T = L1/(0.1 + L1) \times 570$

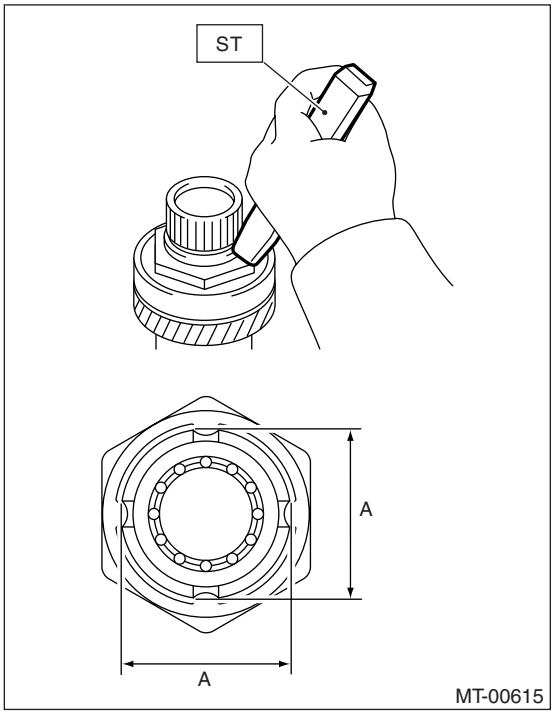
T N·m (kgf-m, ft-lb)	Setting value of torque wrench
L1 m (in)	Torque wrench length
0.1 m (3.94 in)	ST length
570 N·m (58.1 kgf-m, 420 ft-lb)	Tightening torque of lock nut



(A) 0.1 m (3.94 in)

26) Using the ST, caulk four portions on the lock nut to obtain dimension A 44±0.5 mm (1.73±0.02 in).
ST1 18669AA000 PUNCH DRIVEN SHAFT

NOTE:
Do not crack the caulking part of lock nut.



E: INSPECTION

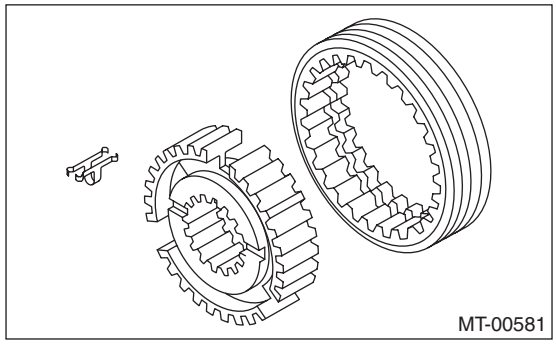
Disassembled parts should be washed clean first and then inspected carefully.
1) Bearing
Replace the bearings in the following cases.
- Worn, rusted and damaged bearing
- Bearings that fail to turn smoothly or make abnormal noise when turned
- Bearings having other defects

2) Bushing (each gear)
Replace the bushings in the following case.
- When the sliding surface is damaged or abnormally worn.

3) Gears
Replace the gears in the following cases.
- Gear teeth surfaces are broken or excessively worn.
- Parts that contact the baulk ring is damaged.
- The inner surface of gear is damaged.

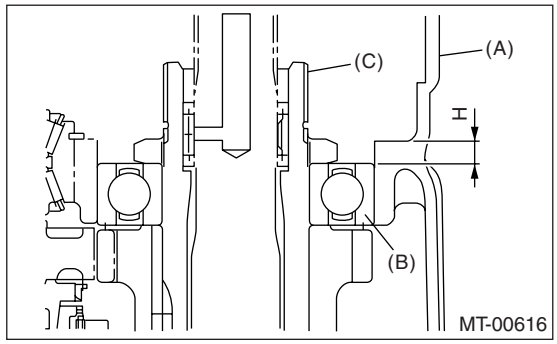
4) Baulk ring, synchro cone
Replace the baulk ring and synchro cone in the following case:
- Worn, rusted and damaged baulk ring

5) Shifting insert key
Replace the shifting insert key if deformed, excessively worn or defective in any way.



F: ADJUSTMENT

1) Measure length “H”, which is from transmission case and oil pump cover mating surface to ball bearing edge.



(A) Transmission case
(B) Ball bearing
(C) Driven gear assembly

2) Using the following equation, calculate the washer thickness of driven gear assembly.
T = H – {5.8±0.05 mm (0.23±0.002 in)} – {0.1 to 0.3 mm (0.0039 to 0.0118 in)}

t	Thickness of washer
H	Length from transmission case and oil pump cover mating surface to ball bearing edge
5.8±0.05 mm (0.23±0.002 in)	Thickness of collar
0.1 to 0.3 mm (0.0039 to 0.0118 in)	Backlash specification at axial direction of driven gear assembly

3) Select 0 to 3 washers from the following table to adjust backlash closest to specification.

Backlash specification at axial direction of driven gear assembly:
0.1 — 0.3 mm (0.0039 — 0.0118 in)

Washer	
Part No.	Thickness t mm (in)
803072030	0.15 (0.0059)
803072031	0.30 (0.0118)
803072032	0.45 (0.0177)
803072033	0.60 (0.0236)

21.Reverse Idler Gear Assembly

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
2) Prepare the transmission for overhaul. <Ref. to 6MT-41, Preparation for Overhaul.>
3) Remove the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-43, REMOVAL, Oil Pipe.>, <Ref. to 6MT-46, REMOVAL, Neutral Position Switch.>, <Ref. to 6MT-44, REMOVAL, Back-up Light Switch.>
4) Remove the extension case. <Ref. to 6MT-48, REMOVAL, Extension Case.>
5) Remove the transfer driven gear. <Ref. to 6MT-60, REMOVAL, Transfer Driven Gear.>
6) Remove the center differential. <Ref. to 6MT-62, REMOVAL, Center Differential.>
7) Remove the oil pump. <Ref. to 6MT-63, REMOVAL, Oil Pump.>
8) Remove the transmission case. <Ref. to 6MT-67, REMOVAL, Transmission Case.>
9) Remove the reverse idler gear assembly. <Ref. to 6MT-72, REMOVAL, Main Shaft Assembly.>

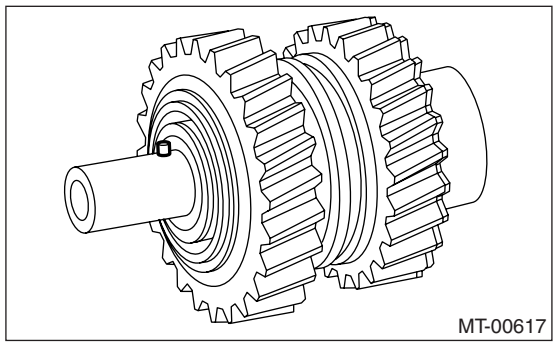
B: INSTALLATION

1) Select the reverse fork rod. <Ref. to 6MT-117, ADJUSTMENT, Shifter Fork and Rod.>
2) Install the reverse idler gear assembly. <Ref. to 6MT-73, INSTALLATION, Main Shaft Assembly.>
3) Install the transmission case. <Ref. to 6MT-68, INSTALLATION, Transmission Case.>
4) Install the oil pump. <Ref. to 6MT-64, INSTALLATION, Oil Pump.>
5) Install the center differential. <Ref. to 6MT-62, INSTALLATION, Center Differential.>
6) Install the transfer driven gear. <Ref. to 6MT-60, INSTALLATION, Transfer Driven Gear.>
7) Install the extension case. <Ref. to 6MT-48, INSTALLATION, Extension Case.>
8) Install the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-43, INSTALLATION, Oil Pipe.>, <Ref. to 6MT-46, INSTALLATION, Neutral Position Switch.>, <Ref. to 6MT-44, INSTALLATION, Back-up Light Switch.>
9) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

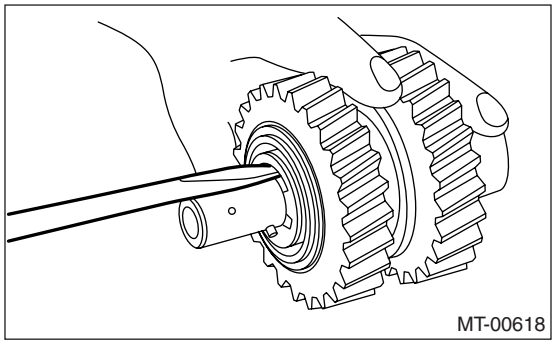
C: DISASSEMBLY

NOTE:
Sleeve and reverse gear engage at a specified point. Mark an engagement point on the sleeve and hub before disassembly.

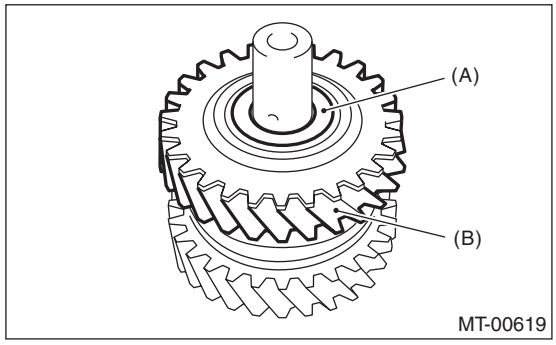
1) Remove the spring pin.


MT-00617

2) Remove the snap ring.


MT-00618

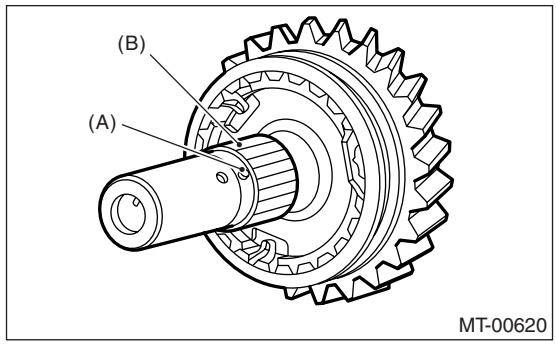
3) Remove the washer and reverse idler gear.



MT-00619

(A) Washer
(B) Reverse idler gear

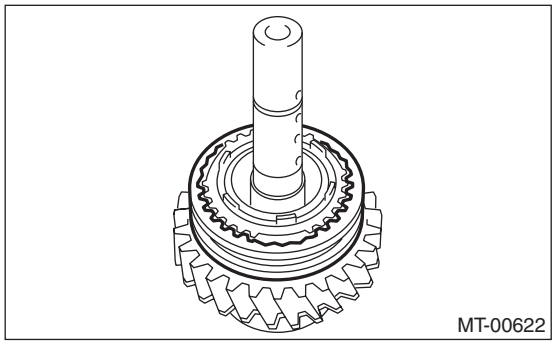
4) Remove the knock pin and reverse idler gear needle bearing.



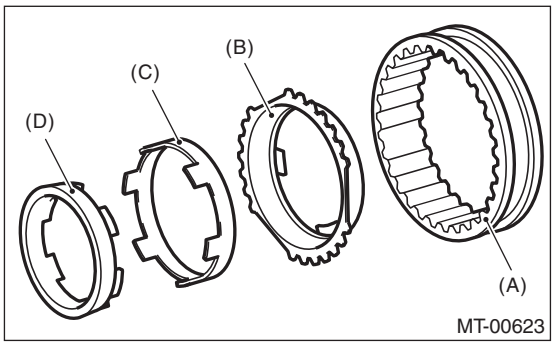
MT-00620

(A) Knock pin
(B) Reverse idler gear needle bearing

5) Remove the collar.
6) Remove the reverse sleeve.

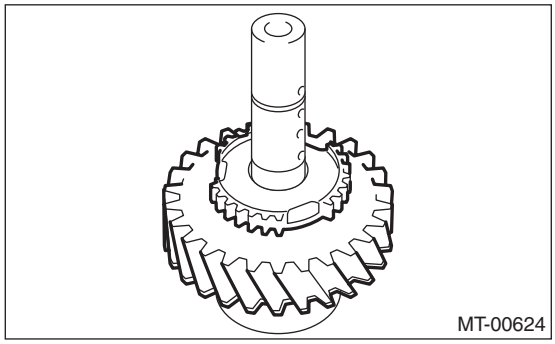


7) Remove the outer baulk ring, reverse synchro cone and inner baulk ring from reverse sleeve.

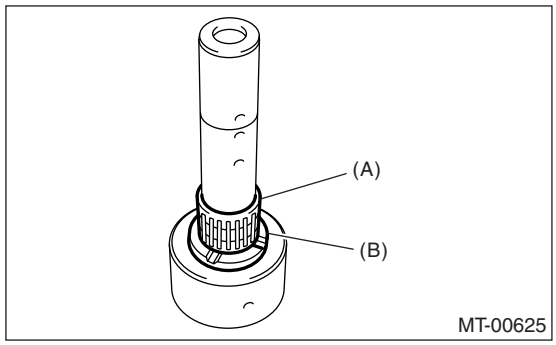


(A) Reverse sleeve
(B) Outer baulk ring
(C) Reverse synchro cone
(D) Inner baulk ring

8) Remove the reverse idler gear No. 2.

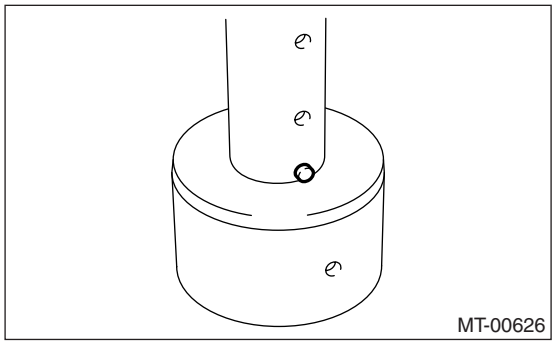


9) Remove the washer and needle bearing.

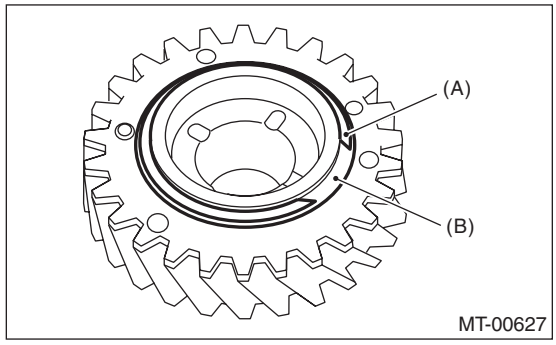


(A) Needle bearing
(B) Washer

10) Remove the knock pin.

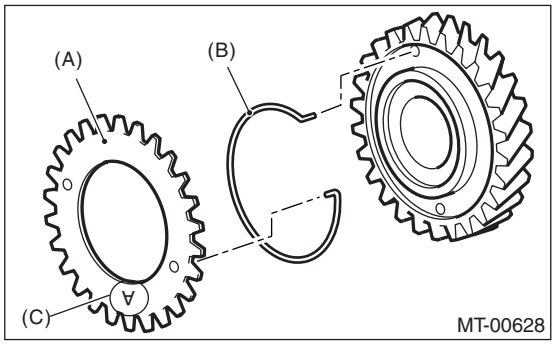


11) Remove the snap ring and friction plate from reverse gear.



(A) Snap ring
(B) Friction plate

12) Remove the sub gear and spring.

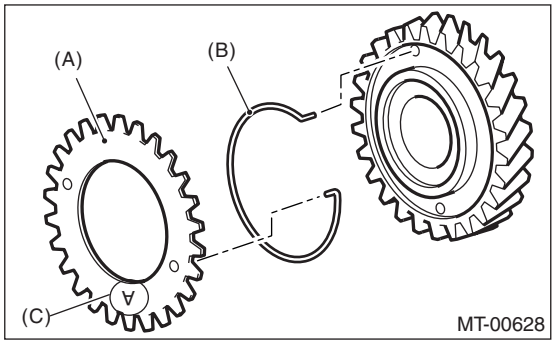


(A) Sub gear
(B) Spring
(C) Punch mark (mark A)

D: ASSEMBLY

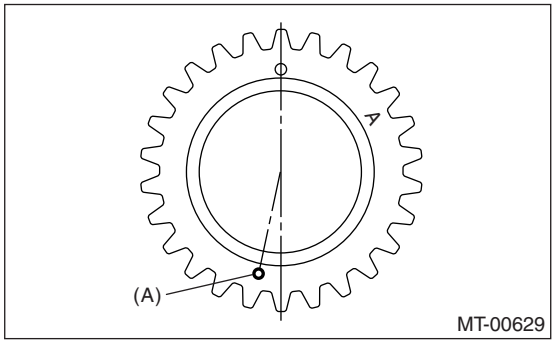
1) Install the sub gear and spring.

NOTE:
• Install the spring with white marking on hook part facing to sub gear side.
• Install the sub gear with punch mark (mark A) facing outside.



(A) Sub gear
(B) Spring
(C) Punch mark (mark A)

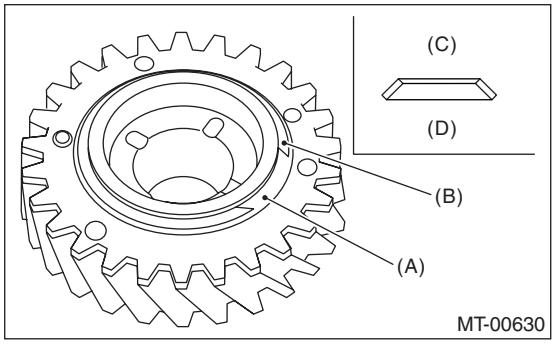
NOTE:
• Install the spring and sub gear, taking care to install the sub gear installation hole in proper direction.



(A) Installation hole

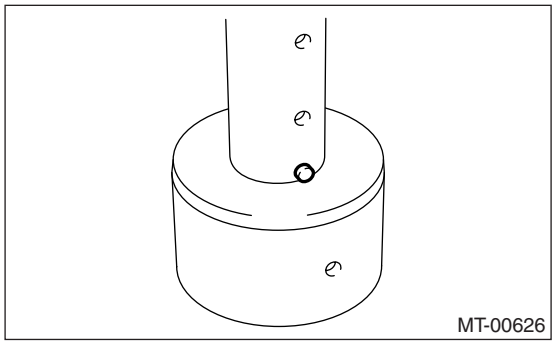
2) Install the friction plate and snap ring.

NOTE:
Make sure to install the friction plate in proper direction.



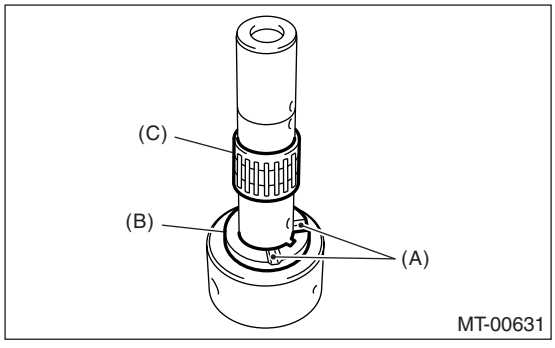
(A) Friction plate
(B) Snap ring
(C) Snap ring side
(D) Sub gear side

3) Sufficiently apply gear oil to the shaft, needle bearing and inner periphery of reverse drive gear.
4) Install the knock pin.



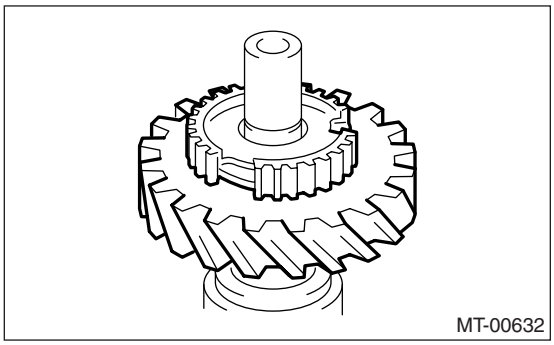
5) Install the washer and needle bearing.

NOTE:
Install the washer with groove facing to reverse idler gear.



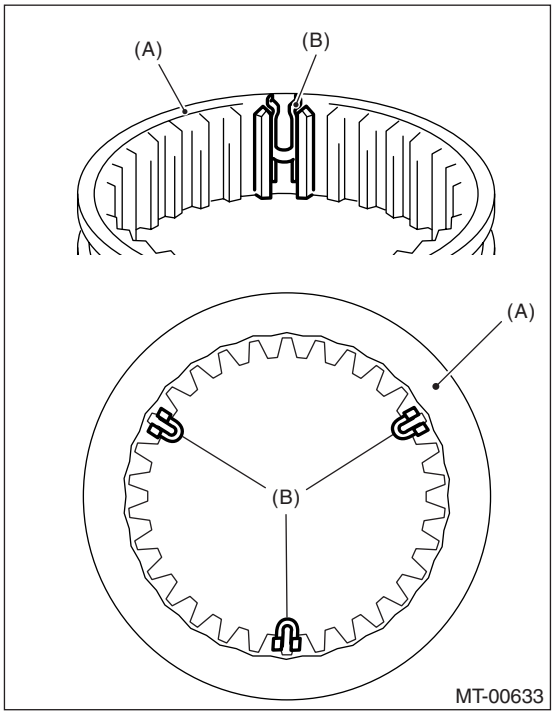
(A) Groove
(B) Washer
(C) Needle bearing

6) Install the reverse idler gear No. 2.



7) Install the shifting insert key in proper place of reverse sleeve.

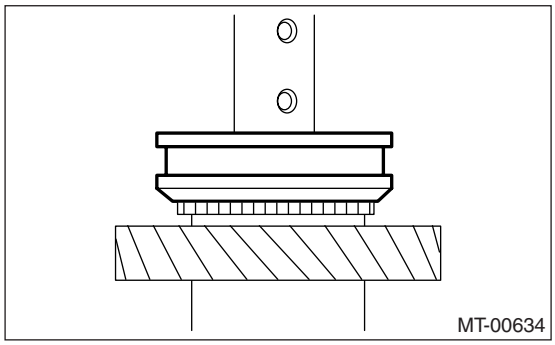
NOTE:
Angle of each shifting insert key is 120° apart.



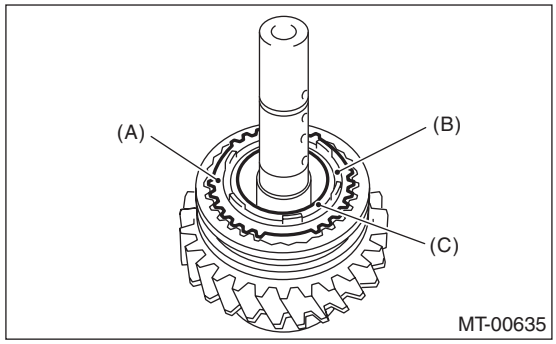
(A) Reverse sleeve
(B) Shifting insert key

8) Install the reverse sleeve to reverse idler gear No. 2.

NOTE:
Make sure to install the reverse sleeve in proper direction.

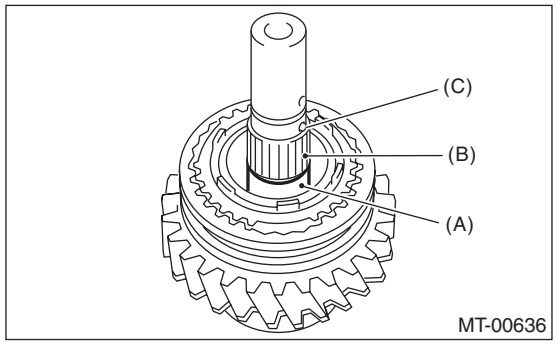


9) Sufficiently apply gear oil to the collar, needle bearing and inner periphery of reverse drive gear.
10) Install the outer baulk ring, reverse synchro cone and inner baulk ring.



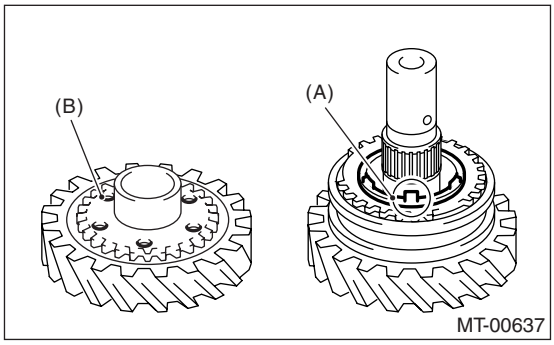
(A) Outer baulk ring
(B) Reverse synchro cone
(C) Inner baulk ring

11) Install the collar and needle bearing, then install the knock pin.



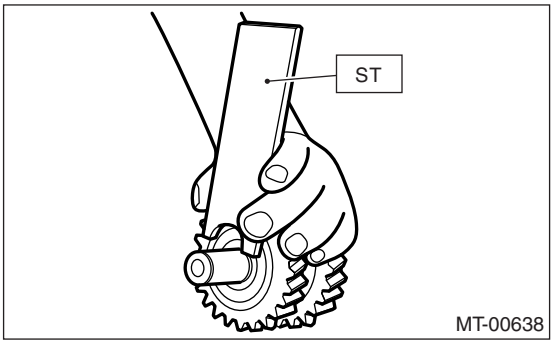
(A) Collar
(B) Needle bearing
(C) Knock pin

12) Align the protrusion portion of reverse synchro cone with reverse idler gear hole, then install the reverse idler gear.



(A) Protrusion portion of reverse synchro cone
(B) Reverse idler gear hole

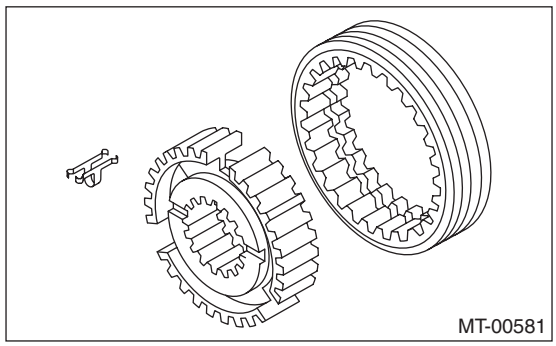
13) Install the washer with groove facing to reverse idler gear.
14) Using the ST, install the snap ring.
ST 18672AA000 GUIDE CLIP



15) Inspect and adjust the clearance between snap ring and washer. <Ref. to 6MT-97, INSPECTION, Reverse Idler Gear Assembly.>
16) Install a new spring pin.

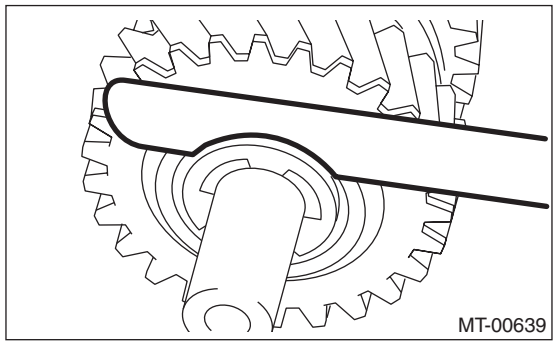
E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.
1) Bearings
Replace the bearings in the following cases.
• Worn, rusted and damaged bearing
• Bearings that fail to turn smoothly or make abnormal noise when turned
• Bearings having other defects
2) Bushing (each gear)
Replace the bushings in the following case:
• When the sliding surface is damaged or abnormally worn.
3) Gears
Replace the gears in the following cases:
• The gear teeth surfaces are broken or excessively worn.
• The parts that contact the baulk ring is damaged.
• The inner surface of gear is damaged.
4) Baulk ring, synchro cone
Replace the baulk ring and synchro cone in the following case:
• Worn, rusted and damaged baulk ring
5) Shifting insert key
Replace the shifting insert key if deformed, excessively worn or defective in any way.



6) Inspect the clearance between snap ring and washer.

Specification of clearance:
0.1 — 0.3 mm (0.0039 — 0.0118 in)



Select and replace the snap ring from the following table if clearance is out of specification.

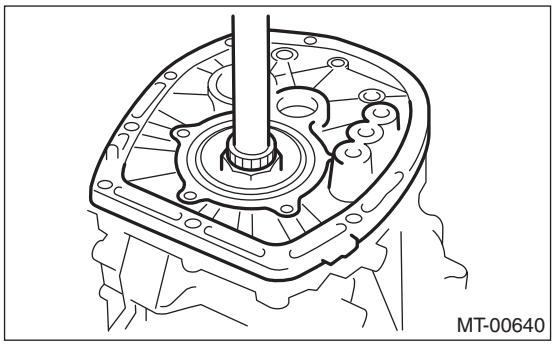
Snap ring	
Parts No.	Thickness mm (in)
031319000	1.50 (0.059)
805019030	1.60 (0.062)
805019010	1.72 (0.068)

Inspect the clearance again after replacing snap ring.

22.Drive Pinion Shaft Assembly

A: REMOVAL

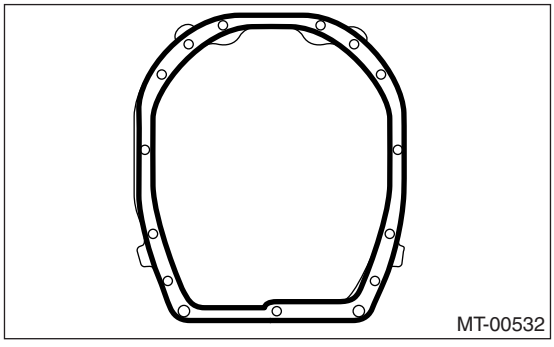
1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
2) Prepare the transmission for overhaul. <Ref. to 6MT-41, Preparation for Overhaul.>
3) Remove the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-43, REMOVAL, Oil Pipe.>, <Ref. to 6MT-46, REMOVAL, Neutral Position Switch.>, <Ref. to 6MT-44, REMOVAL, Back-up Light Switch.>
4) Remove the extension case. <Ref. to 6MT-48, REMOVAL, Extension Case.>
5) Remove the transfer driven gear. <Ref. to 6MT-60, REMOVAL, Transfer Driven Gear.>
6) Remove the center differential. <Ref. to 6MT-62, REMOVAL, Center Differential.>
7) Remove the oil pump. <Ref. to 6MT-63, REMOVAL, Oil Pump.>
8) Remove the transmission case. <Ref. to 6MT-67, REMOVAL, Transmission Case.>
9) Remove each gear assembly. <Ref. to 6MT-72, REMOVAL, Main Shaft Assembly.>
10) Remove the drive pinion shaft assembly.


MT-00640

B: INSTALLATION

1) Completely remove the remaining gasket on drive plate and clutch housing.
2) Apply liquid gasket to the clutch housing.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007)

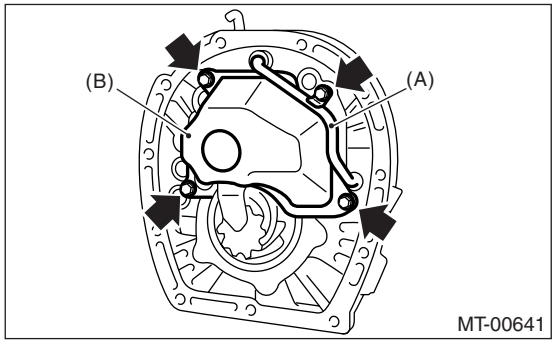

MT-00532

3) Install each gear assembly. <Ref. to 6MT-73, INSTALLATION, Main Shaft Assembly.>
4) Install the transmission case. <Ref. to 6MT-68, INSTALLATION, Transmission Case.>
5) Install the oil pump. <Ref. to 6MT-64, INSTALLATION, Oil Pump.>
6) Install the center differential. <Ref. to 6MT-62, INSTALLATION, Center Differential.>
7) Install the transfer driven gear. <Ref. to 6MT-60, INSTALLATION, Transfer Driven Gear.>
8) Install the extension case. <Ref. to 6MT-48, INSTALLATION, Extension Case.>
9) Install the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-43, INSTALLATION, Oil Pipe.>, <Ref. to 6MT-46, INSTALLATION, Neutral Position Switch.>, <Ref. to 6MT-44, INSTALLATION, Back-up Light Switch.>
10) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

NOTE:
Replace the drive pinion shaft as a set with hypoid driven gear.

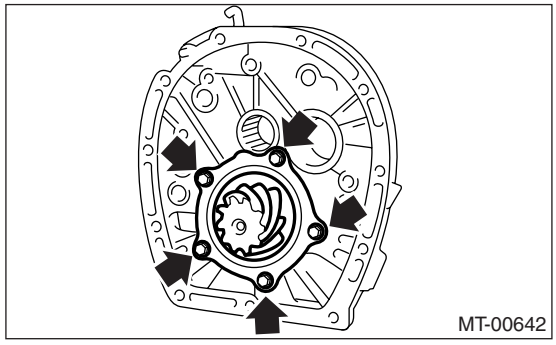
1) Remove the pipe and oil chamber.



MT-00641

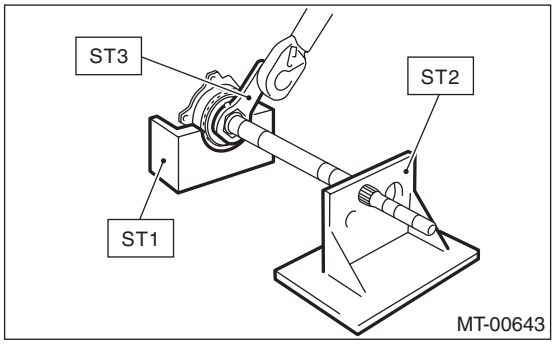
(A) Pipe
(B) Oil chamber

2) Remove the drive pinion shaft and shim from adapter plate.

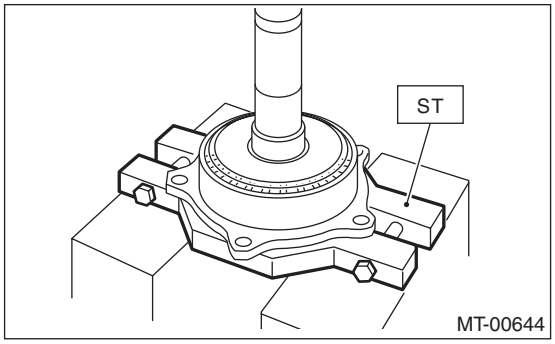

MT-00642

3) Secure the ST on workbench.
ST 18664AA000 BASE
4) Lift the caulking of lock nut.

5) Install the ST3 to lock nut, then set drive pinion shaft to ST. Remove the lock nut and washer.
ST1 18667AA000 HOLDER
ST2 18664AA000 BASE
ST3 18621AA000 ADAPTER WRENCH



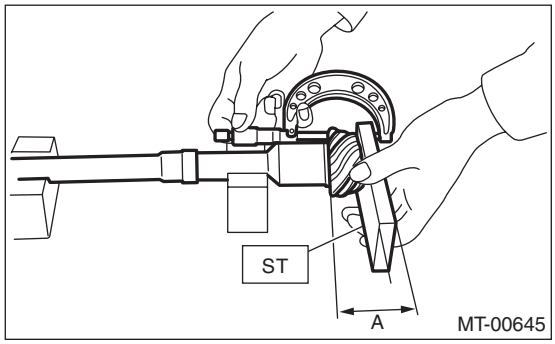
6) Using the ST, remove the taper roller bearing assembly.
ST 18723AA000 REMOVER



D: ASSEMBLY

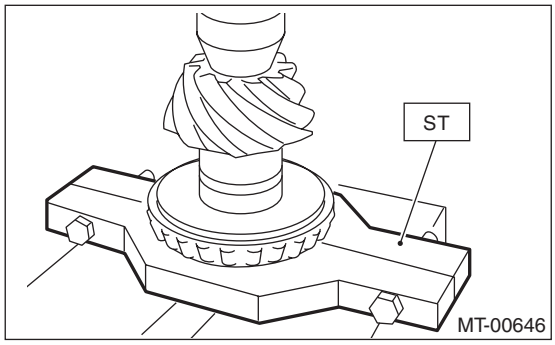
1) Using the ST, measure dimension A of drive pinion.

NOTE:
Note dimension A for selection of drive pinion shim.
ST 398643600 GAUGE



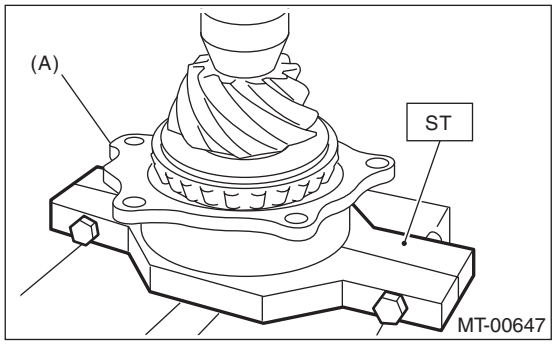
2) Install the inner bearing inner race to drive pinion shaft using ST and press.
ST 18723AA000 REMOVER

CAUTION:
Do not apply pressure in excess of 40 kN (4.0 ton, 4.4 US ton, 3.9 Imp ton).



3) Install the retainer and outer bearing inner race to drive pinion shaft using ST and press.
ST 18723AA000 REMOVER

NOTE:
Press to the point where bearing is turned smoothly without slack.

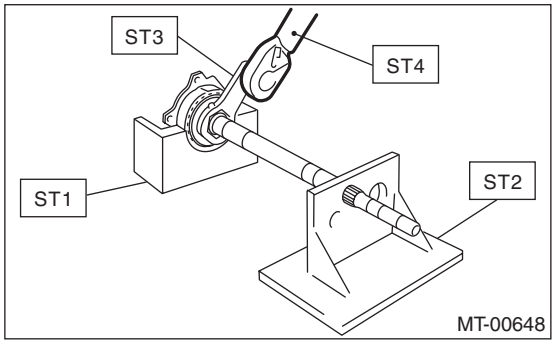


(A) Retainer

4) Install the washer and a new lock nut.
5) Set the ST to drive pinion, then tighten the lock nut.
ST1 18667AA000 HOLDER
ST2 18664AA000 BASE
ST3 18621AA000 ADAPTER WRENCH
ST4 18852AA000 TORQUE WRENCH

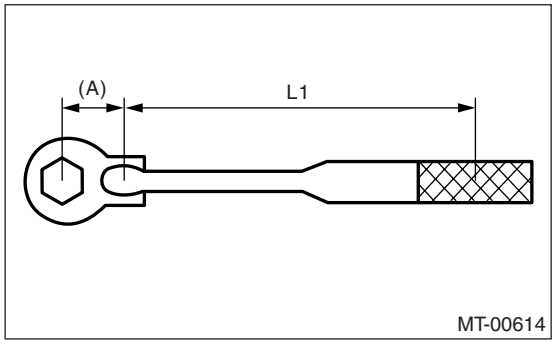
NOTE:
Tighten with the ST and torque wrench straight-lined.

Tightening torque:
265 N·m (27.0 kgf-m, 195 ft-lb)



NOTE:
• If torque wrench except ST4 is used, calculate the following equation, then tighten the lock nut.
Tighten with the ST and torque wrench straight-lined.
T = L1/(0.1 + L1)285

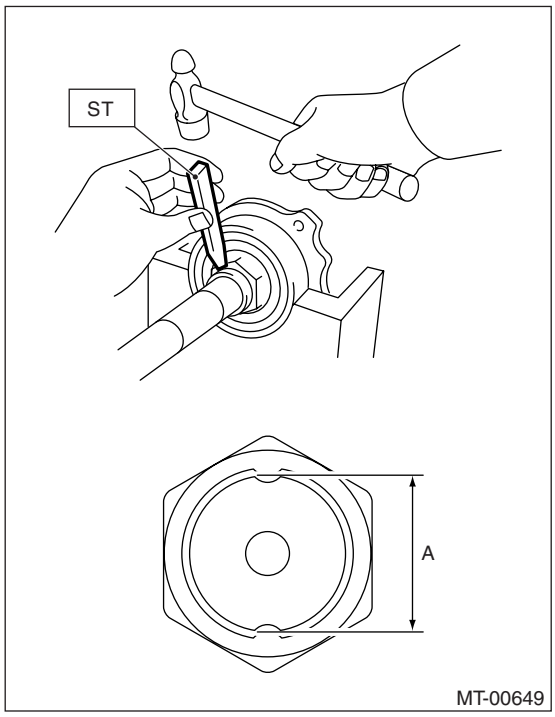
T N·m (kgf-m, ft-lb)	Setting value of torque wrench
L1 m (in)	Torque wrench length
0.1 m (3.94 in)	ST length
285 N·m (29.0 kgf-m, 210 ft-lb)	Tightening torque of lock nut



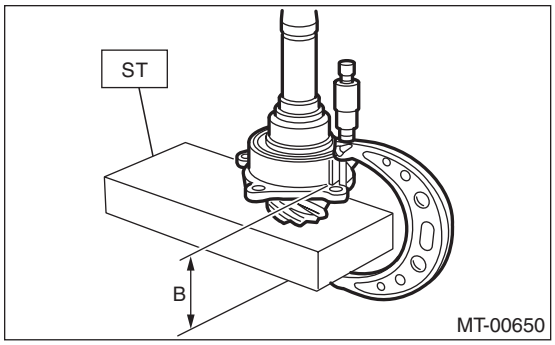
(A) 0.1 m (3.94 in)

6) Measure the starting torque. <Ref. to 6MT-101, INSPECTION, Drive Pinion Shaft Assembly.>
7) Using the ST, caulk two portions on the lock nut to obtain dimension A 37±0.5 mm (1.46±0.02 in).
ST 18670AA000 PUNCH

NOTE:
Do not crack the caulking part of lock nut.



8) Using the ST, measure dimension B of the drive pinion.
ST 398643600 GAUGE



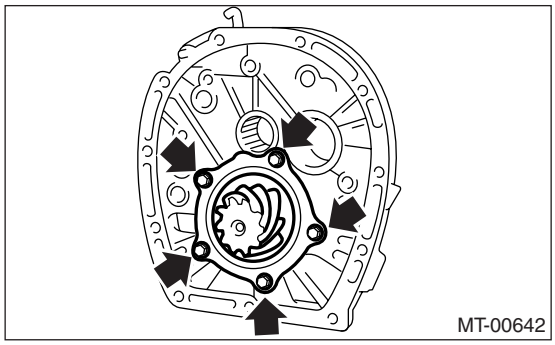
9) Calculate the following formula, then select one or two pieces of drive pinion shim from the table below.
6.5±0.0625 mm – (B – A) [0.26±0.0025 in – (B – A)]

NOTE:
A: Measured value from step 1).
B: Measured value from step 8).

Drive pinion shim	
Part No.	Thickness mm (in)
32295AA270	0.15 (0.0059)
32295AA280	0.175 (0.0069)
32295AA290	0.20 (0.0079)
32295AA300	0.225 (0.0089)
32295AA310	0.25 (0.0098)
32295AA320	0.275 (0.0108)

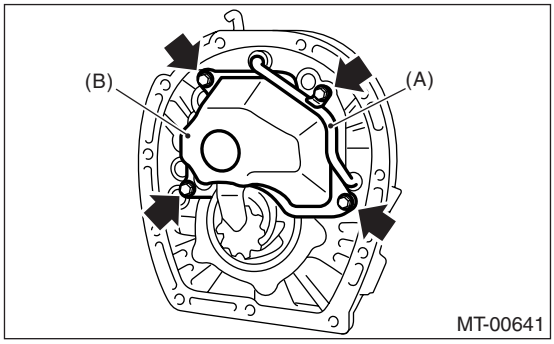
10) Apply gear oil to the side face of taper roller bearing, then install the drive pinion shaft and selected shim to adapter plate.

Tightening torque:
54 N·m (5.5 kgf-m, 40 ft-lb)



11) Install the oil chamber and pipe.

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

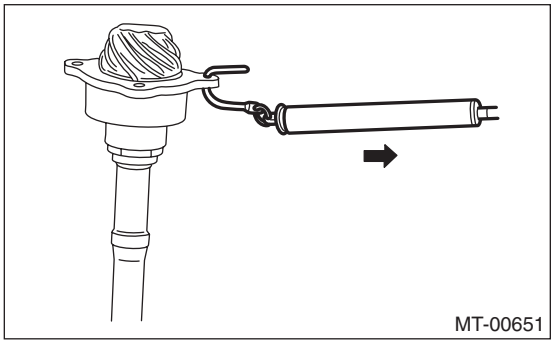


(A) Pipe
(B) Oil chamber

E: INSPECTION

1) Using the spring balancer, measure the starting torque. If the starting torque is out of specification, replace the taper roller bearing.

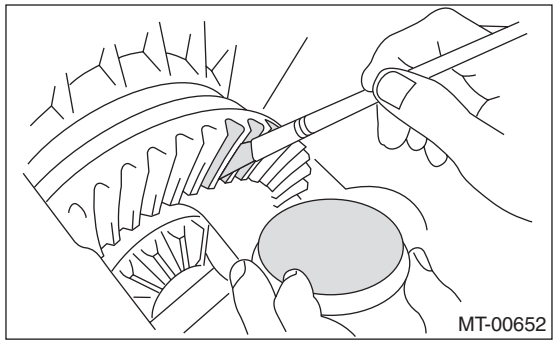
Starting torque:
0 — 0.95 N (0 — 0.097 kgf, 0 — 0.21 lb)



2) Gears
Replace the gears in the following case.
• Gear teeth surfaces are broken or excessively worn.
3) Bearings
Replace the bearings in the following cases.
• Worn, rusted and damaged bearing
• Bearings that fail to turn smoothly or make abnormal noise when turned
4) Adapter plate
Replace the adapter plate in the following cases.
• Worn, rusted and damaged bearing
• Damaged adapter plate
5) Make sure the pipe and pipe chamber is not damaged or clogged. Repair or replace if damaged or clogged.

F: ADJUSTMENT

1) Inspect and adjust the backlash between hypoid driven gear and drive pinion. <Ref. to 6MT-109, HYPOID GEAR BACKLASH, ADJUSTMENT, Front Differential Assembly.>
2) Apply a uniform thin coat of red lead on both teeth surfaces of three or four teeth of the hypoid driven gear.

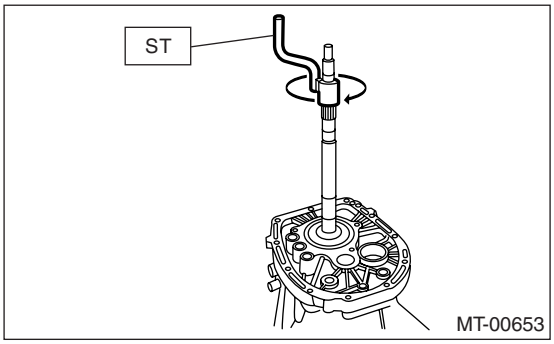


3) Install the drive pinion shaft assembly to clutch housing, then tighten it with at least four bolts.

NOTE:
Install it with the remaining liquid gasket to prevent the mating surface of clutch housing and adapter plate from damaging.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

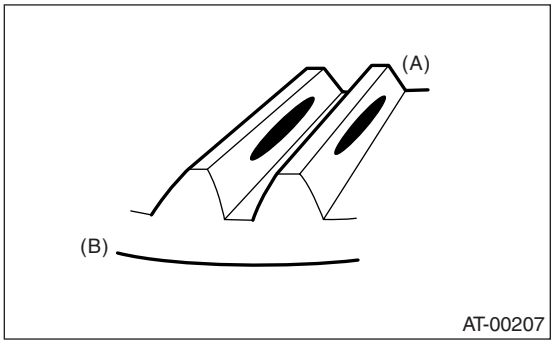
4) Using the ST, rotate several times.
ST 18631AA000 HANDLE



5) Remove the drive pinion shaft assembly, and then check tooth contact. If it is inaccurate, adjust the backlash or thickness of shim.

• Tooth contact

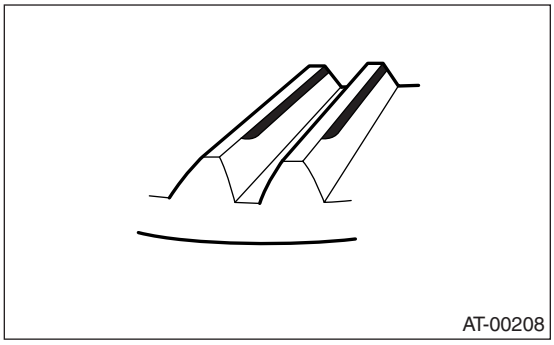
Checking item:Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. [When loaded, contact pattern moves toward heel.]



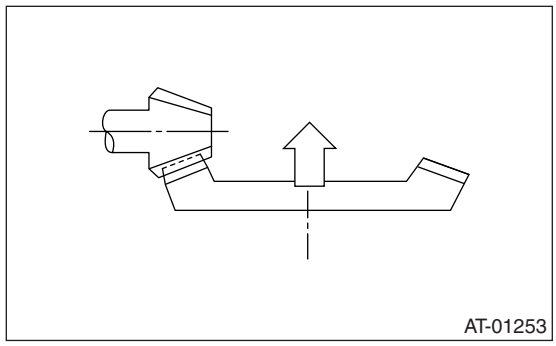
(A) Toe side
(B) Heel side

• Face contact

Checking item: Backlash is too large.
Contact pattern

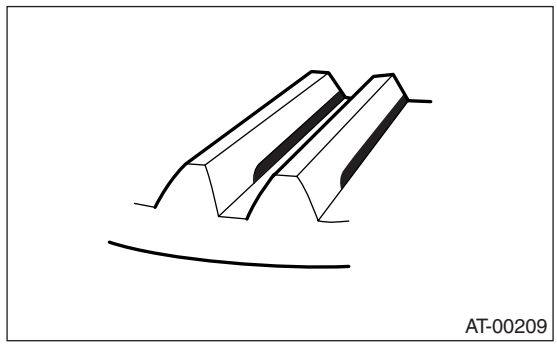


Corrective action: Verify the backlash again, and then adjust it.

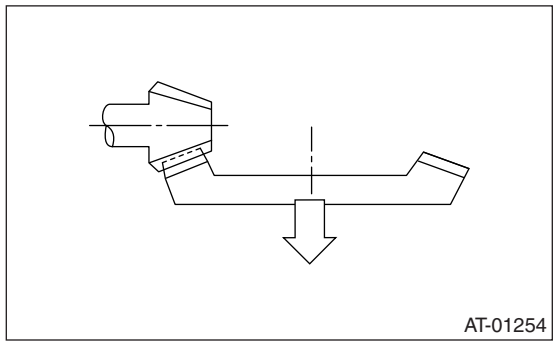


• Flank contact

Checking item: Backlash is too small.
Contact pattern

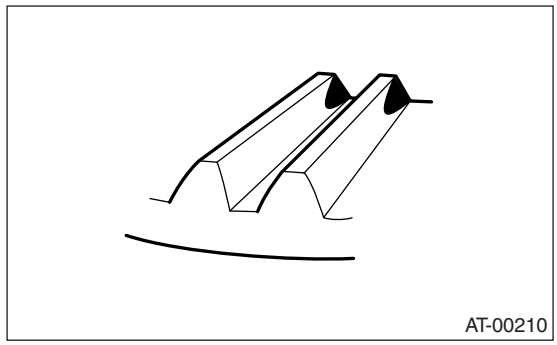


Corrective action: Verify the backlash again, and then adjust it.

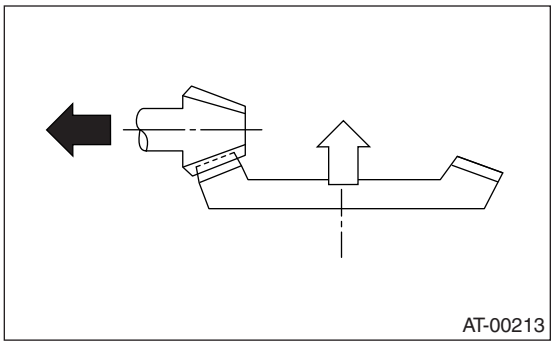


• Toe contact (Inside end contact)

Checking item: Contact areas is small.
Contact pattern

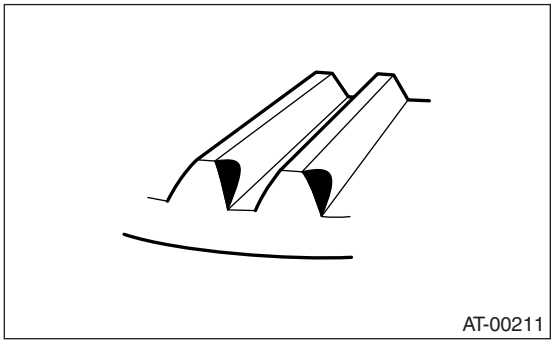


Corrective action: Reduce thickness of drive pinion shim in order to move drive pinion away from crown gear.

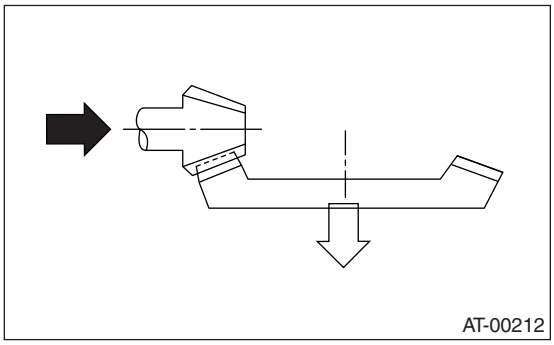


- Heel contact (Outside end contact)

Checking item: Contact areas is small.
Contact pattern



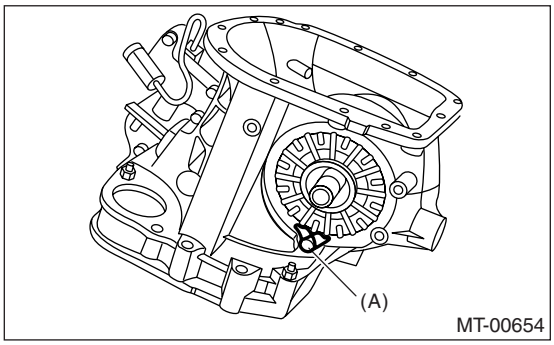
Corrective action: Increase thickness of drive pinion shim in order to bring drive pinion close to crown gear.



23.Front Differential Assembly

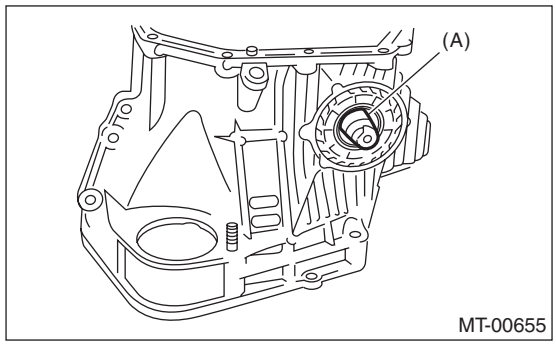
A: REMOVAL

1) Remove the manual transmission assembly. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
2) Prepare the transmission for overhaul. <Ref. to 6MT-41, Preparation for Overhaul.>
3) Remove the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-43, REMOVAL, Oil Pipe.>, <Ref. to 6MT-46, REMOVAL, Neutral Position Switch.>, <Ref. to 6MT-44, REMOVAL, Back-up Light Switch.>
4) Remove the extension case. <Ref. to 6MT-48, REMOVAL, Extension Case.>
5) Remove the transfer driven gear. <Ref. to 6MT-60, REMOVAL, Transfer Driven Gear.>
6) Remove the center differential. <Ref. to 6MT-62, REMOVAL, Center Differential.>
7) Remove the oil pump. <Ref. to 6MT-63, REMOVAL, Oil Pump.>
8) Remove the transmission case. <Ref. to 6MT-67, REMOVAL, Transmission Case.>
9) Remove each gear assembly. <Ref. to 6MT-72, REMOVAL, Main Shaft Assembly.>
10) Remove the drive pinion shaft assembly. <Ref. to 6MT-98, REMOVAL, Drive Pinion Shaft Assembly.>
11) Remove the lock plates on both side.



(A) Lock plate

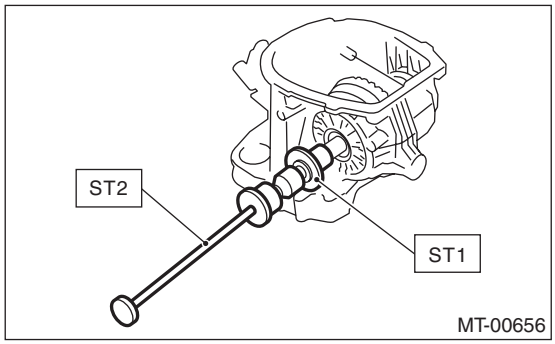
12) Wrap the spline part of axle shaft around with vinyl tape.



(A) Vinyl tape

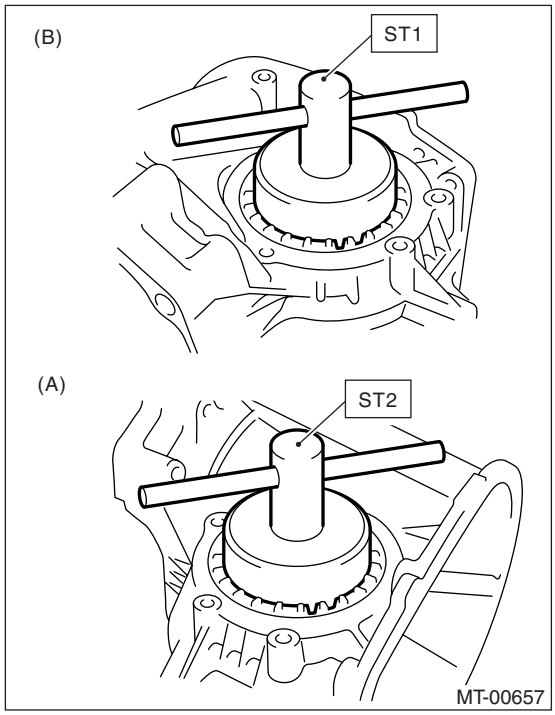
13) Using the ST, remove the axle shaft.
ST1 499247300 INSTALLER
ST2 499095500 REMOVER ASSY

NOTE:
- Do not reuse the circlip.
- Mark to identify the right and left axle shaft.



14) Using the ST, remove the differential side retainer on both sides.
ST1 499787000 WRENCH ASSY (RIGHT SIDE)
ST2 18630AA000 WRENCH ASSY (LEFT SIDE)

NOTE:
Be careful not to damage the part of clutch case where the retainer is to be installed.



(A) Left side
(B) Right side

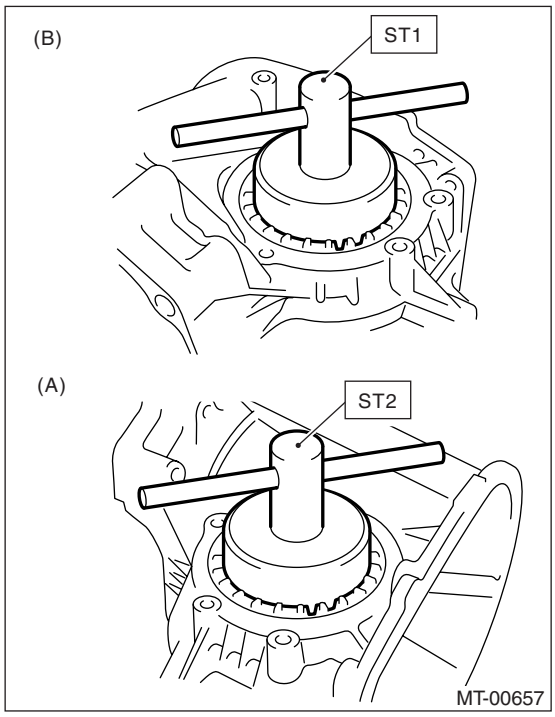
15) Remove the front differential.

B: INSTALLATION

1) Install the differential assembly into clutch housing.
2) Apply oil to the threaded portion part of side retainer.
3) Remove the O-ring from side retainer of both sides.
4) Using the ST, install the differential side retainer to both sides.

ST1	499787000	WRENCH ASSY (RIGHT SIDE)
ST2	18630AA000	WRENCH ASSY (LEFT SIDE)

NOTE:
Be careful not to damage the oil seal.

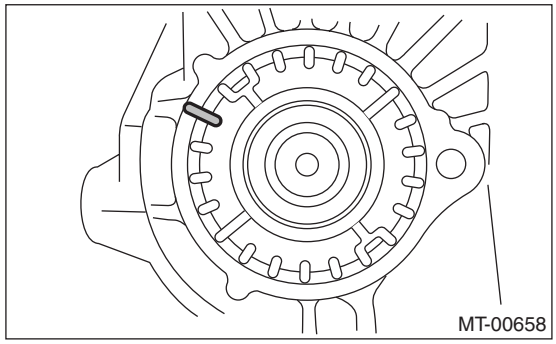


(A) Left side
(B) Right side

5) Install the axle shaft.

NOTE:
- Replace the circlip with a new one.
- Be careful not to confuse right and left axle shaft.
- Wrap vinyl tape around the spline part of axle shaft.

6) Check and adjust the hypoid gear backlash. <Ref. to 6MT-108, HYPOID GEAR BACKLASH, INSPECTION, Front Differential Assembly.>
7) Check and adjust the tooth contact. <Ref. to 6MT-101, ADJUSTMENT, Drive Pinion Shaft Assembly.>
8) Mark an engagement point on the right and left side retainer and clutch housing.



9) Remove the differential side retainer from both sides.

NOTE:
Note the rotating number of time till removal, when removing the side retainer.

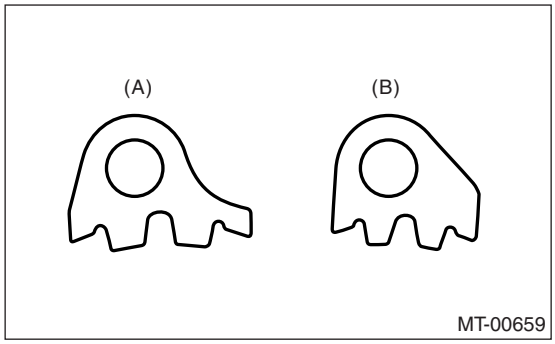
10) Install a new O-ring to side retainer of both sides.
11) Install the differential side retainer to both sides.

NOTE:
Install the side retainer by screwing in the same rotating number of time till removal, and then align the mark.

12) Install the lock plate.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

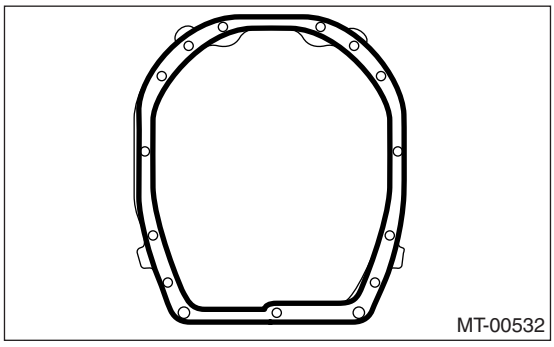
NOTE:
Be careful not to confuse right and left lock plates.



(A) Left
(B) Right

13) Completely remove the remaining gasket from the clutch housing and adapter plate.
14) Apply liquid gasket to the clutch housing.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007)

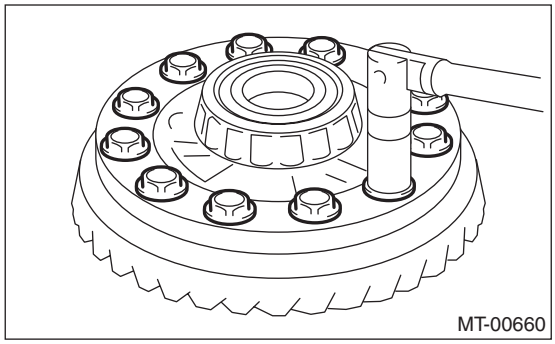


15) Install the drive pinion shaft assembly. <Ref. to 6MT-98, INSTALLATION, Drive Pinion Shaft Assembly.>
16) Install each gear assembly at once. <Ref. to 6MT-73, INSTALLATION, Main Shaft Assembly.>
17) Install the transmission case. <Ref. to 6MT-68, INSTALLATION, Transmission Case.>
18) Install the oil pump. <Ref. to 6MT-64, INSTALLATION, Oil Pump.>
19) Install the center differential. <Ref. to 6MT-62, INSTALLATION, Center Differential.>
20) Install the transfer driven gear. <Ref. to 6MT-60, INSTALLATION, Transfer Driven Gear.>
21) Install the extension case. <Ref. to 6MT-48, INSTALLATION, Extension Case.>
22) Install the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-43, INSTALLATION, Oil Pipe.>, <Ref. to 6MT-46, INSTALLATION, Neutral Position Switch.>, <Ref. to 6MT-44, INSTALLATION, Back-up Light Switch.>
23) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

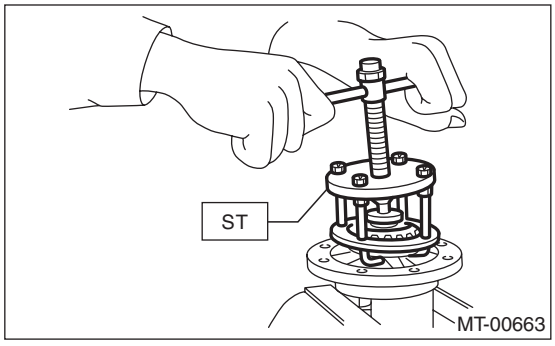
C: DISASSEMBLY

1. DIFFERENTIAL CASE

1) Secure the differential assembly on a vise, and then remove the hypoid driven gear.

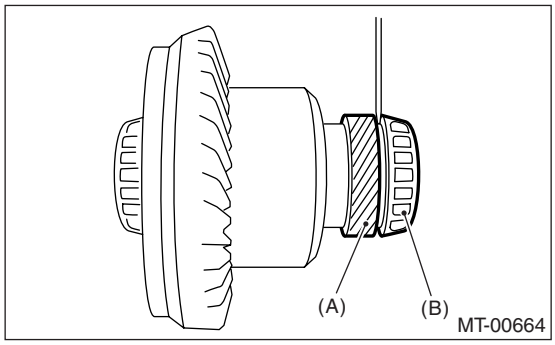


2) Using the ST, remove the hypoid driven gear side bearing.
ST 399527700 PULLER SET



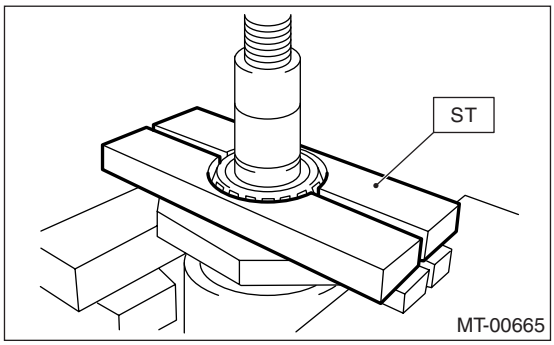
3) Using a screw driver, make clearance of 2 — 3 mm (0.079 — 0.118 in) between the speedometer drive gear and roller bearing.

NOTE:
Be careful not to damage the differential case.



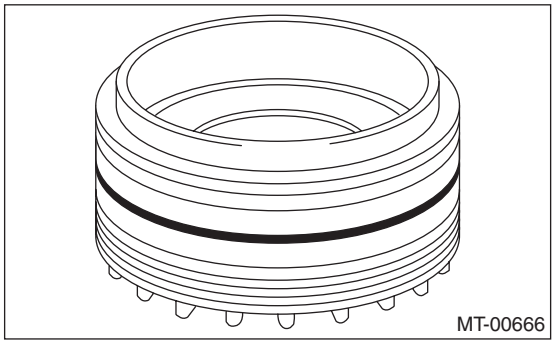
(A) Speedometer drive gear
(B) Roller bearing

4) Using the ST, remove the roller bearing.
ST 498077000 REMOVER

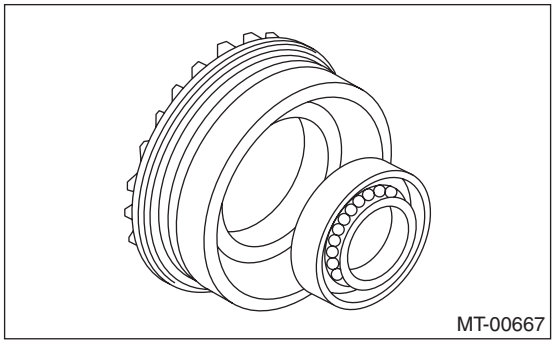


2. SIDE RETAINER

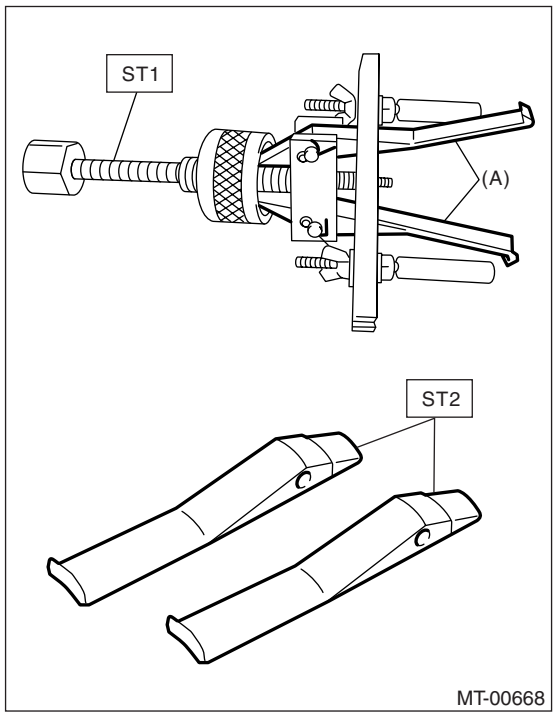
1) Remove the O-ring from side retainer.



2) Remove the oil seal from side retainer.

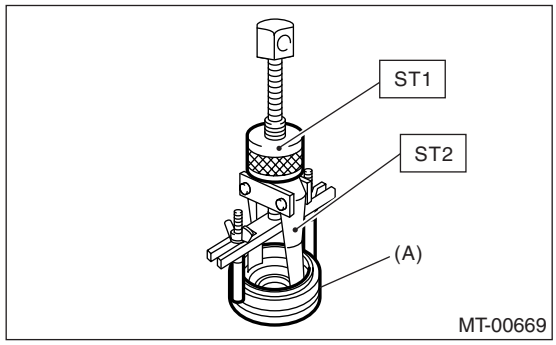


3) Remove the claw of ST1, and then install the claw of ST2.
ST1 398527700 PULLER ASSY
ST2 18760AA000 CLAW



(A) Claw

4) Remove the bearing outer race from side retainer.
ST1 398527700 PULLER ASSY
ST2 18760AA000 CLAW



(A) Side retainer

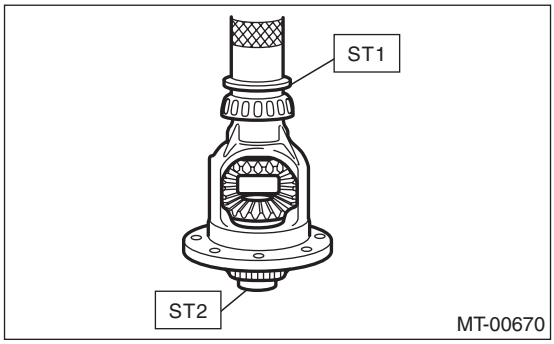
D: ASSEMBLY

1. DIFFERENTIAL CASE

1) Using the ST, install a new speedometer drive gear and right and left side bearing inner race to differential case.
ST1 398437700 INSTALLER
ST2 398497701 SEAT

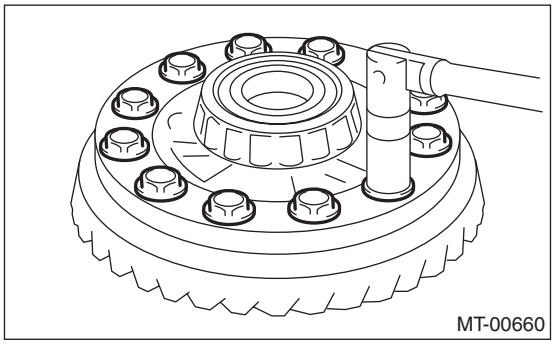
CAUTION:
Do not apply pressure in excess of 20 kN (2.0 ton, 2.2 US ton, 2.0 Imp ton).

NOTE:
Always replace the inner race and outer race as a set.



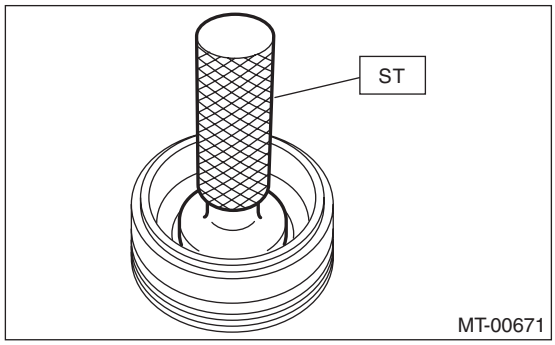
2) Install the hypoid driven gear to differential case.

Tightening torque:
69 N·m (7.0 kgf-m, 50.9 ft-lb)



2. SIDE RETAINER

1) Using the ST, install the oil seal.
ST 499797000 OIL SEAL INSTALLER



2) Install the bearing outer race to retainer on both sides.
3) Install the O-ring to retainer on both sides.

NOTE:
Be careful not to damage the O-ring.

E: INSPECTION

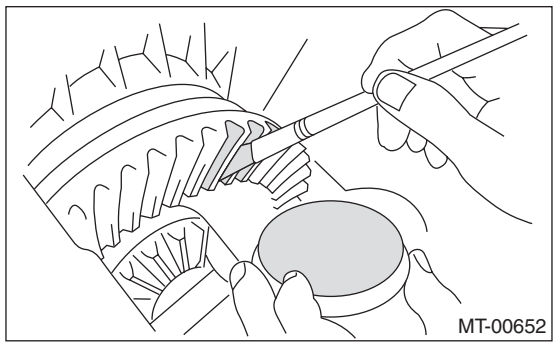
Repair or replace the front differential in following cases.
- Each gear is damaged, seized, or excessively worn.
- Sliding surface of the differential case is damaged, seized or excessively worn.
- Bearings and bearings part are damaged, rusted or worn.
- Bearings fail to turn smoothly or make abnormal noise when turned.

1. HYPOID GEAR BACKLASH

Check the hypoid gear backlash. If it is not within specifications, adjust it. <Ref. to 6MT-109, HYPOID GEAR BACKLASH, ADJUSTMENT, Front Differential Assembly.>

2. TOOTH CONTACT OF HYPOID GEAR

1) Be sure the hypoid gear backlash is within specifications. If it is not within specifications, adjust it. <Ref. to 6MT-109, HYPOID GEAR BACKLASH, ADJUSTMENT, Front Differential Assembly.>
2) Apply a uniform thin coat of red lead on both tooth surfaces of three or four teeth of the hypoid driven gear.



3) Install the drive pinion shaft assembly, and then secure it with four bolts.

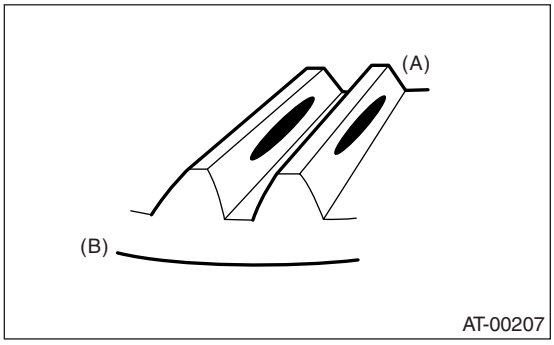
NOTE:
Use the old gasket and washer to prevent the mating surface of housing from damaging.

Tightening torque:
50 N·m (5.0 kgf-m, 36.9 ft-lb)

4) Rotate the drive pinion shaft to right and left for several times.
5) Remove the drive pinion shaft assembly, and then check tooth contact. If tooth contact is inaccurate, adjust it. <Ref. to 6MT-101, ADJUSTMENT, Drive Pinion Shaft Assembly.>

- Correct tooth contact.

NOTE:
Under no load, tooth contacts 50 — 60% from center to toe side (tooth contact shifts to heel side when driving).



(A) Toe side
(B) Heel side

F: ADJUSTMENT

1. HYPOID GEAR BACKLASH

1) Install the right and left side retainer.
ST1 499787000 WRENCH ASSY (RIGHT SIDE)
ST2 18630AA000 WRENCH ASSY (LEFT SIDE)

NOTE:
Screw in the right side retainer a bit further than left side.

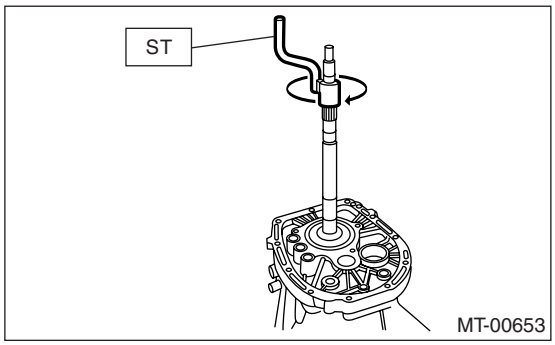
2) Install the drive pinion shaft assembly, and then secure it with four bolts.

NOTE:
Use the old gasket and washer to prevent the mating surface of housing from damaging.

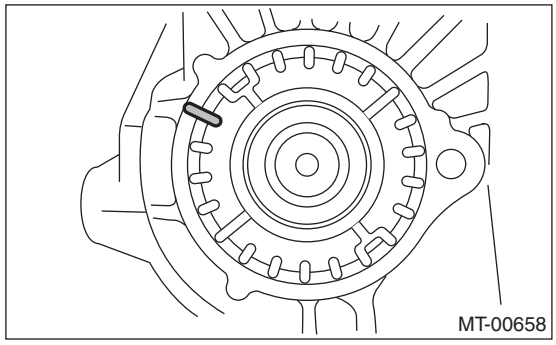
Tightening torque:
50 N·m (5.0 kgf-m, 36.9 ft-lb)

3) Using the ST, screw in the left side retainer until the drive pinion and hypoid driven gear contacts lightly. Then loosen the right side retainer.
ST1 499787000 WRENCH ASSY (RIGHT SIDE)
ST2 18630AA000 WRENCH ASSY (LEFT SIDE)

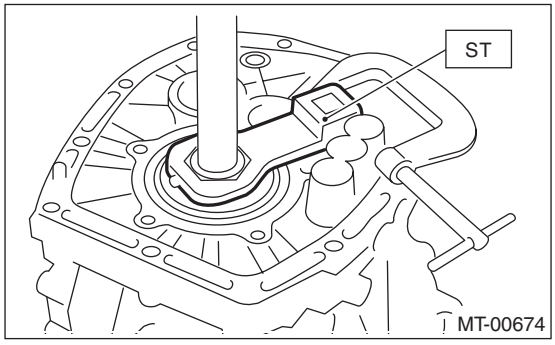
4) Using the ST, rotate the drive pinion shaft several times.
ST 18631AA000 HANDLE



5) Repeat step 3) and 4) until the left side retainer can not be rotated. For the right side retainer, screw it in until the inner race and outer race contacts lightly. This condition is “0” backlash.
6) Mark an engagement point on the right and left side retainer and clutch housing.

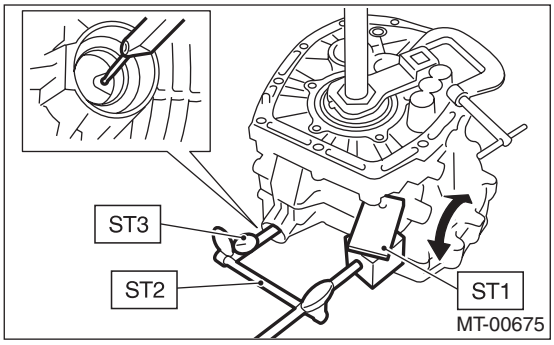


7) Return the left side retainer for three teeth, and screw in the right side retainer for three teeth.
8) Using the ST, secure the drive pinion shaft.
ST 18621AA000 ADAPTER WRENCH



9) After rotating the drive pinion shaft several times, measure the hypoid gear backlash using the ST.
ST1 498255400 PLATE
ST2 498247001 MAGNET BASE
ST3 498247100 DIAL GAUGE

Hypoid gear backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)



10) If the backlash is out of specification, adjust it by turning the right and left side retainers.
11) Screw in the right side retainer for further 1.75 teeth.

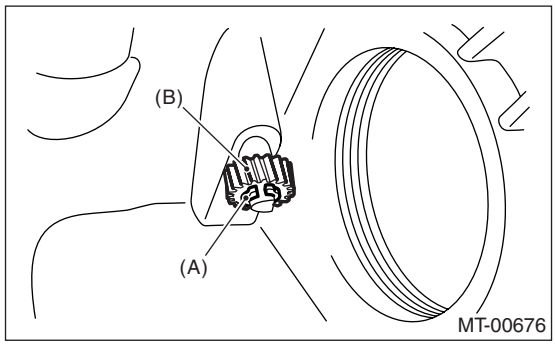
2. TOOTH CONTACT OF HYPOID GEAR

Refer to the section of drive pinion shaft for checking of tooth contact. <Ref. to 6MT-108, TOOTH CONTACT OF HYPOID GEAR, INSPECTION, Front Differential Assembly.>

24.Speedometer Gear

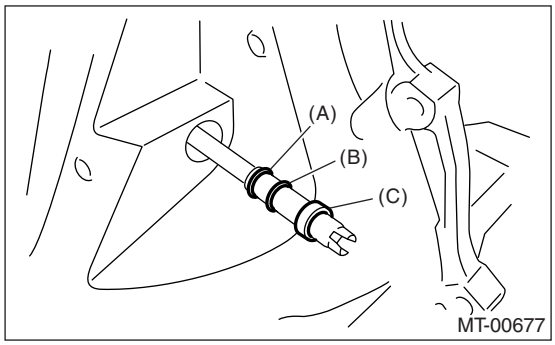
A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
2) Prepare the transmission for overhaul. <Ref. to 6MT-41, Preparation for Overhaul.>
3) Remove the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-43, REMOVAL, Oil Pipe.>, <Ref. to 6MT-46, REMOVAL, Neutral Position Switch.>, <Ref. to 6MT-44, REMOVAL, Back-up Light Switch.>
4) Remove the extension case. <Ref. to 6MT-48, REMOVAL, Extension Case.>
5) Remove the transfer driven gear. <Ref. to 6MT-60, REMOVAL, Transfer Driven Gear.>
6) Remove the center differential. <Ref. to 6MT-62, REMOVAL, Center Differential.>
7) Remove the oil pump. <Ref. to 6MT-63, REMOVAL, Oil Pump.>
8) Remove the transmission case. <Ref. to 6MT-67, REMOVAL, Transmission Case.>
9) Remove each gear assembly. <Ref. to 6MT-72, REMOVAL, Main Shaft Assembly.>
10) Remove the drive pinion shaft assembly. <Ref. to 6MT-98, REMOVAL, Drive Pinion Shaft Assembly.>
11) Remove the front differential assembly. <Ref. to 6MT-104, REMOVAL, Front Differential Assembly.>
12) Remove the vehicle speed sensor. <Ref. to 6MT-33, REMOVAL, Vehicle Speed Sensor.>
13) Remove the snap ring, and then remove the speedometer driven gear.



(A) Snap ring
(B) Speedometer driven gear

14) Remove the speedometer shaft from clutch housing.
15) Remove the oil seal, speedometer shaft and washer.

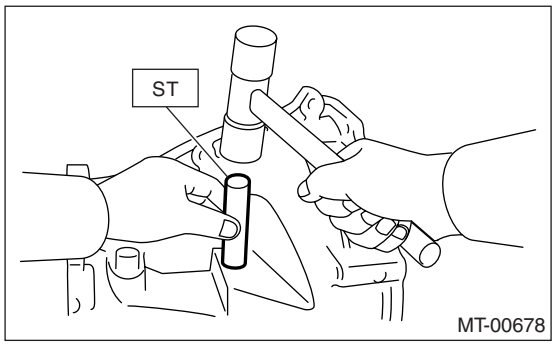


(A) Washer
(B) Snap ring
(C) Oil seal

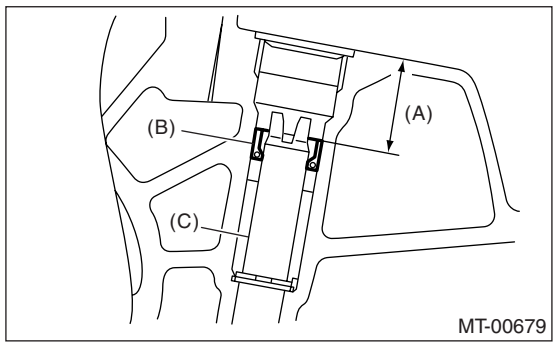
16) Remove the snap ring from speedometer shaft.

B: INSTALLATION

1) Install the oil seal, washer and snap ring to speedometer shaft.
2) Insert the speedometer shaft. Using the ST, press the oil seal.
ST 899824100 or 499827000 PRESS

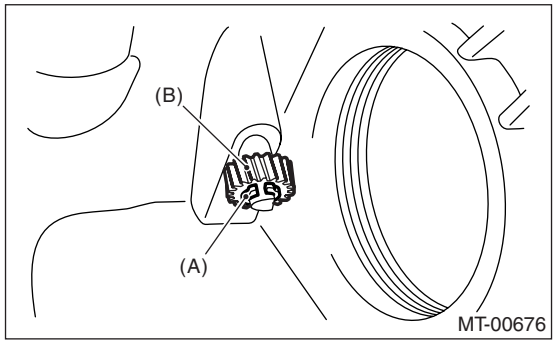


NOTE:
• Replace the oil seal with a new one.
• Insert the oil seal approx. 24 mm (0.94 in) from the edge of clutch case.



(A) Approx. 24 mm (0.94 in)
(B) Oil seal
(C) Speedometer shaft

3) Install the speedometer driven gear and snap ring.



(A) Snap ring
(B) Speedometer driven gear

4) Install the vehicle speed sensor. <Ref. to 6MT-33, INSTALLATION, Vehicle Speed Sensor.>
5) Install the front differential assembly. <Ref. to 6MT-105, INSTALLATION, Front Differential Assembly.>
6) Install the drive pinion shaft assembly. <Ref. to 6MT-98, INSTALLATION, Drive Pinion Shaft Assembly.>
7) Install each gear assembly at once. <Ref. to 6MT-73, INSTALLATION, Main Shaft Assembly.>
8) Install the transmission case. <Ref. to 6MT-68, INSTALLATION, Transmission Case.>
9) Install the oil pump. <Ref. to 6MT-64, INSTALLATION, Oil Pump.>
10) Install the center differential. <Ref. to 6MT-62, INSTALLATION, Center Differential.>
11) Install the transfer driven gear. <Ref. to 6MT-60, INSTALLATION, Transfer Driven Gear.>
12) Install the extension case. <Ref. to 6MT-48, INSTALLATION, Extension Case.>
13) Install the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-43, INSTALLATION, Oil Pipe.>, <Ref. to 6MT-46, INSTALLATION, Neutral Position Switch.>, <Ref. to 6MT-44, INSTALLATION, Back-up Light Switch.>
14) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

25.Shifter Fork and Rod

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
2) Prepare the transmission for overhaul. <Ref. to 6MT-41, Preparation for Overhaul.>
3) Remove the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-43, REMOVAL, Oil Pipe.>, <Ref. to 6MT-46, REMOVAL, Neutral Position Switch.>, <Ref. to 6MT-44, REMOVAL, Back-up Light Switch.>
4) Remove the extension case. <Ref. to 6MT-48, REMOVAL, Extension Case.>
5) Remove the transfer driven gear. <Ref. to 6MT-60, REMOVAL, Transfer Driven Gear.>
6) Remove the center differential. <Ref. to 6MT-62, REMOVAL, Center Differential.>
7) Remove the oil pump. <Ref. to 6MT-63, REMOVAL, Oil Pump.>
8) Remove the transmission case. <Ref. to 6MT-67, REMOVAL, Transmission Case.>
9) Remove each gear assembly. <Ref. to 6MT-72, REMOVAL, Main Shaft Assembly.>

B: INSTALLATION

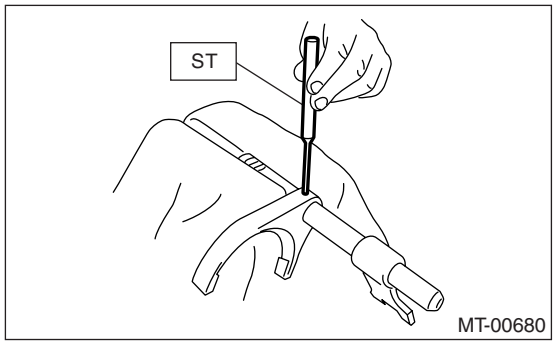
1) Install each gear assembly at once. <Ref. to 6MT-73, INSTALLATION, Main Shaft Assembly.>
2) Install the transmission case. <Ref. to 6MT-68, INSTALLATION, Transmission Case.>
3) Install the oil pump. <Ref. to 6MT-64, INSTALLATION, Oil Pump.>
4) Install the center differential. <Ref. to 6MT-62, INSTALLATION, Center Differential.>
5) Install the transfer driven gear. <Ref. to 6MT-60, INSTALLATION, Transfer Driven Gear.>
6) Install the extension case. <Ref. to 6MT-48, INSTALLATION, Extension Case.>
7) Install the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-43, INSTALLATION, Oil Pipe.>, <Ref. to 6MT-46, INSTALLATION, Neutral Position Switch.>, <Ref. to 6MT-44, INSTALLATION, Back-up Light Switch.>
8) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

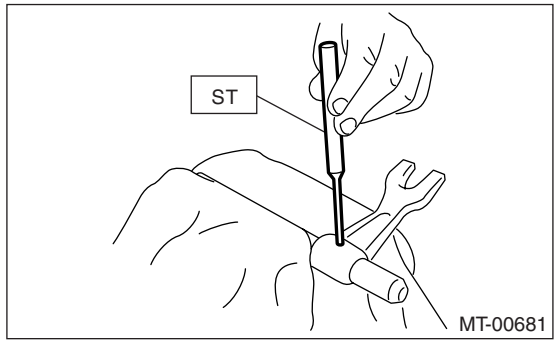
NOTE:
Discard the removed spring pin and replace it with a new one.

1. REVERSE SHIFTER FORK

1) Using the ST, remove the reverse fork.
ST 398791700 REMOVER

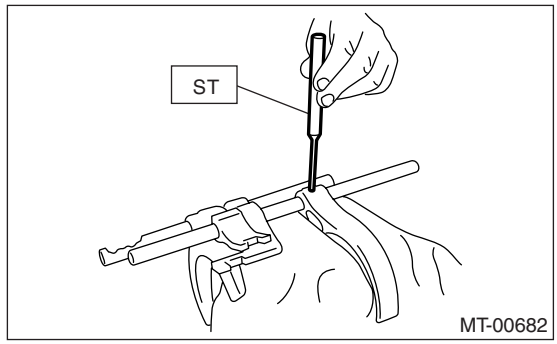


2) Using the ST, remove the reverse shifter arm.
ST 398791700 REMOVER

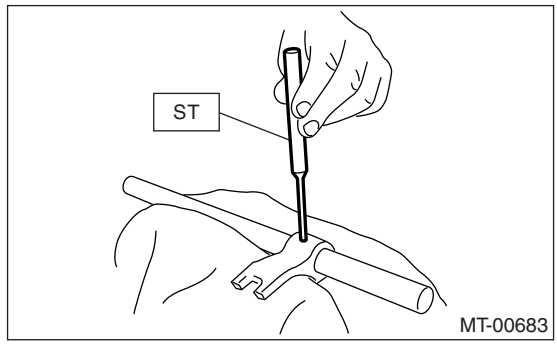


2. 1st-2nd, 3rd-4th SHIFTER FORK

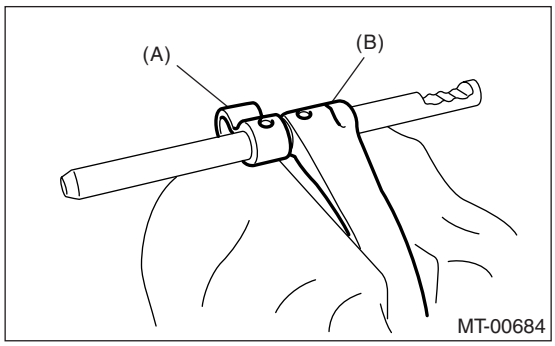
1) Using the ST, remove the 3rd-4th shifter fork.
ST 398791700 REMOVER



2) Using the ST, remove the 3rd-4th shifter arm.
ST 398791700 REMOVER



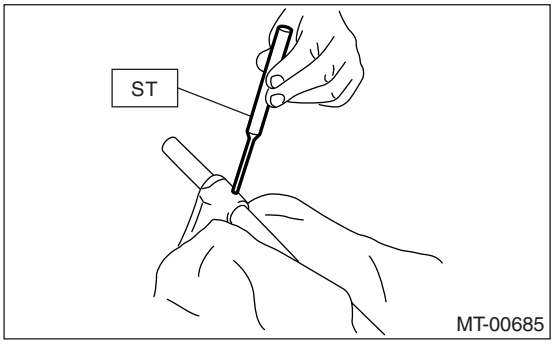
3) Using the ST, remove the 1st-2nd shifter arm and 1st-2nd shifter fork.
ST 398791700 REMOVER



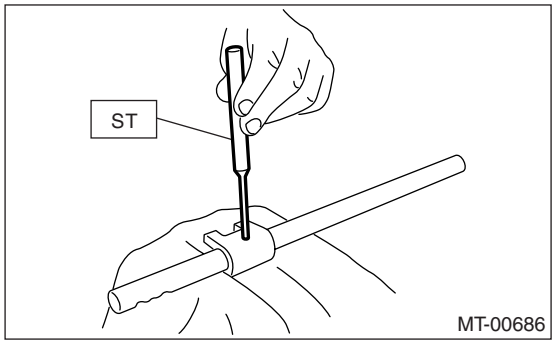
(A) 1st-2nd shifter arm
(B) 1st-2nd shifter fork

3. 5th-6th SHIFTER FORK

1) Using the ST, remove the 5th-6th shifter fork.
ST 398791700 REMOVER

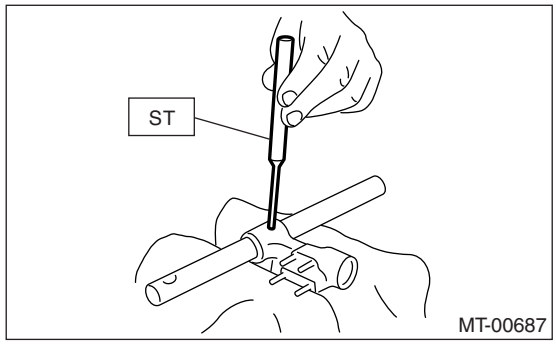


2) Using the ST, remove the 5th-6th shifter arm.
ST 398791700 REMOVER



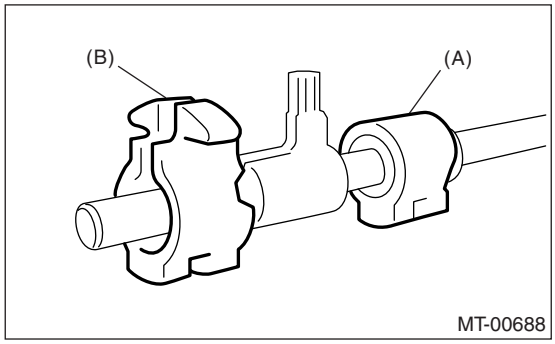
4. SHIFT ARM SHAFT

Using the ST, remove the selector arm.
ST 398791700 REMOVER



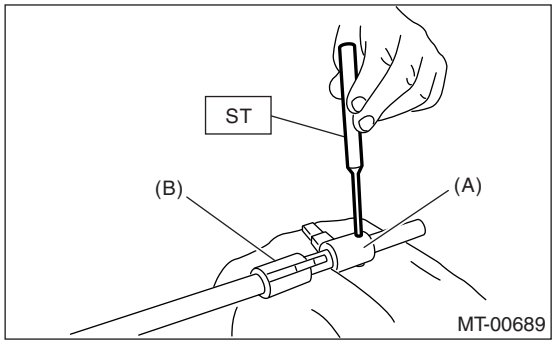
5. STRIKING ROD

1) Remove the reverse interlock block and interlock block from striking rod.



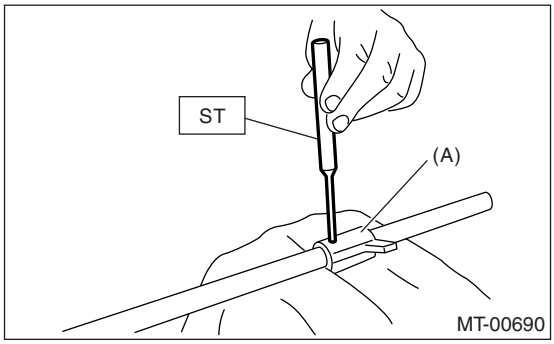
(A) Reverse interlock block
(B) Interlock block

2) Using the ST, remove the reverse interlock arm.
ST 398791700 REMOVER



(A) Reverse interlock arm
(B) Interlock arm

3) Using the ST, remove the interlock arm.
ST 398791700 REMOVER



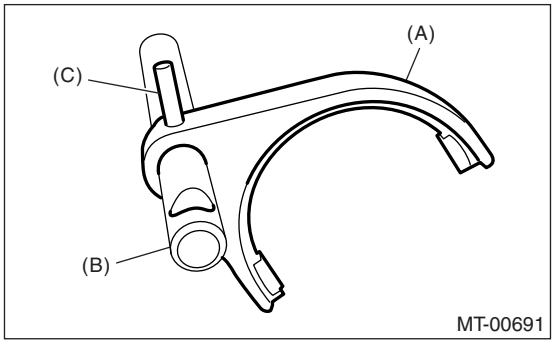
(A) Interlock arm

D: ASSEMBLY

1. REVERSE SHIFTER FORK

1) Using the ST, install the reverse fork.
ST 398791700 REMOVER

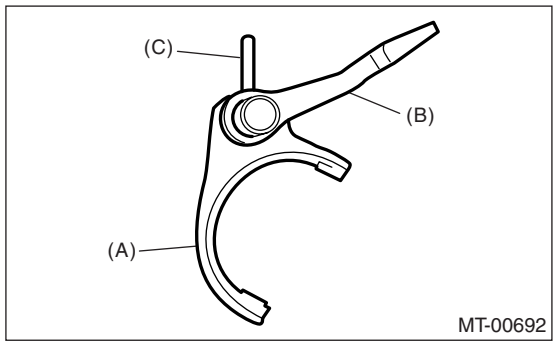
NOTE:
Make sure to install the reverse fork and rod in proper direction.



(A) Reverse fork
(B) Reverse rod
(C) Spring pin

2) Using the ST, install the reverse arm.
ST 398791700 REMOVER

NOTE:
Make sure to install the reverse arm and rod in proper direction.

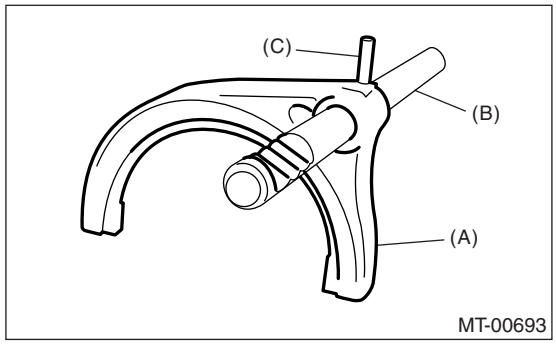


(A) Reverse arm
(B) Reverse rod
(C) Spring pin

2. 1st-2nd, 3rd-4th SHIFTER FORK

1) Using the ST, install the 1st-2nd shifter fork.
ST 398791700 REMOVER

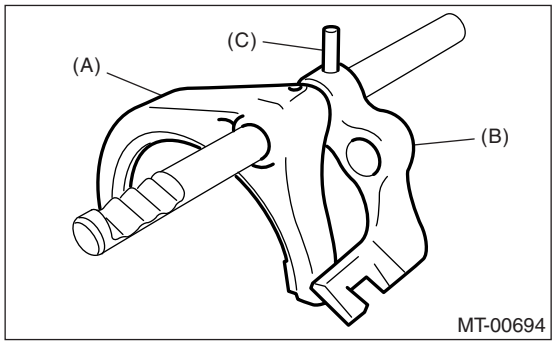
NOTE:
Make sure to install the 1st-2nd shifter fork and rod in proper direction.



(A) 1st-2nd shifter fork
(B) 1st-2nd shifter rod
(C) Spring pin

2) Using the ST, install the 1st-2nd shifter arm.
ST 398791700 REMOVER

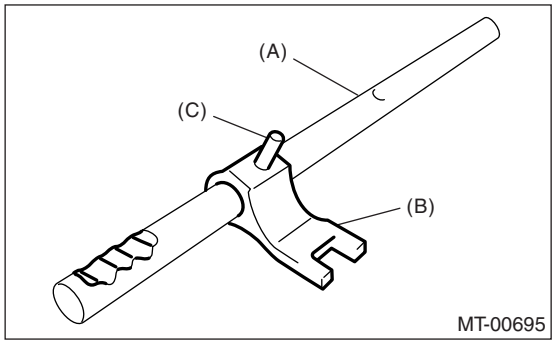
NOTE:
Make sure to install the 1st-2nd shifter arm and fork in proper direction.



(A) 1st-2nd shifter fork
(B) 1st-2nd shifter arm
(C) Spring pin

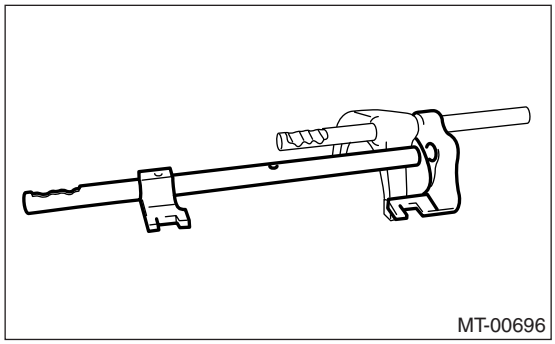
3) Using the ST, install the 3rd-4th shifter arm.
ST 398791700 REMOVER

NOTE:
Make sure to install the 3rd-4th shifter arm and rod in proper direction.



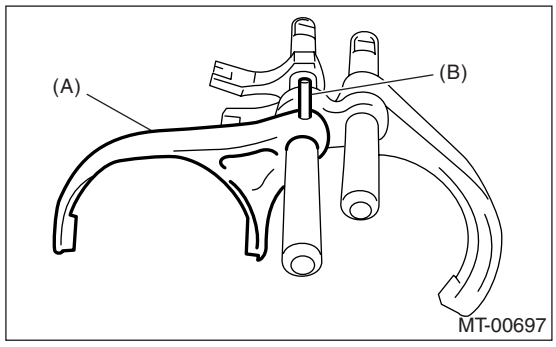
(A) 3rd-4th shifter rod
(B) 3rd-4th shifter arm
(C) Spring pin

4) Install the 3rd-4th fork rod into 1st-2nd shifter arm.



5) Using the ST, install the 3rd-4th shifter fork.
ST 398791700 REMOVER

NOTE:
Make sure to install the 3rd-4th shifter fork in proper direction.

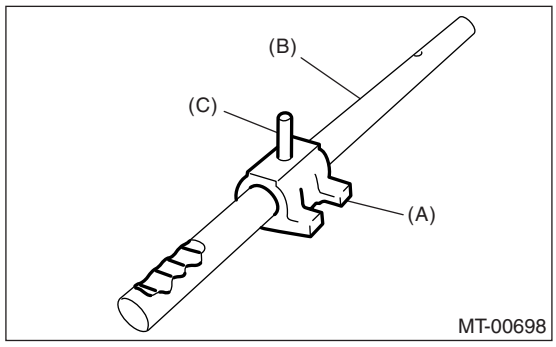


(A) 3rd-4th shifter fork
(B) Spring pin

3. 5th-6th SHIFTER FORK

1) Using ST, install the 5th-6th shifter arm.
ST 398791700 REMOVER

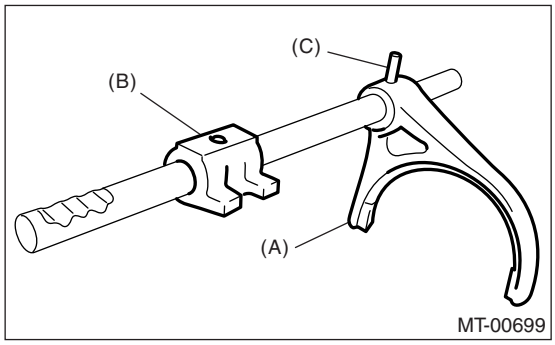
NOTE:
Make sure to install the 5th-6th shifter arm and rod in proper direction.



(A) 5th-6th shifter arm
(B) 5th-6th shifter rod
(C) Spring pin

2) Using the ST, install the 5th-6th shifter fork.
ST 398791700 REMOVER

NOTE:
Make sure to install the 5th-6th shifter fork and arm in proper direction.

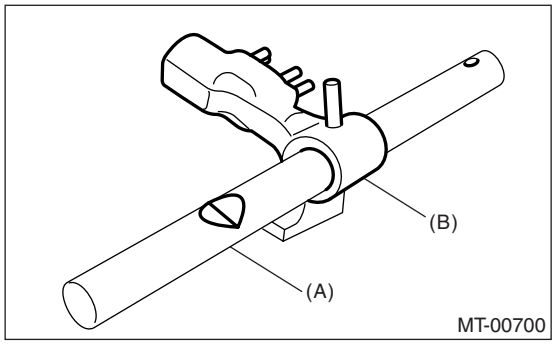


(A) 5th-6th shifter fork
(B) 5th-6th shifter arm
(C) Spring pin

4. SHIFT ARM SHAFT

Using the ST, install the selector arm.
ST 398791700 REMOVER

NOTE:
Make sure to install the selector arm and rod in proper direction.



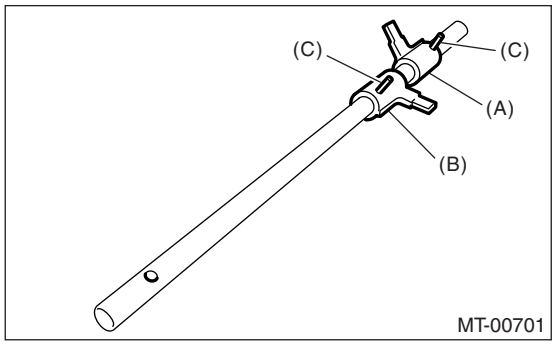
(A) Selector rod
(B) Selector arm

5. STRIKING ROD

1) Using the ST, install the reverse interlock arm and interlock arm.
ST 398791700 REMOVER

NOTE:
• Make sure to install the reverse interlock arm and rod in proper direction.

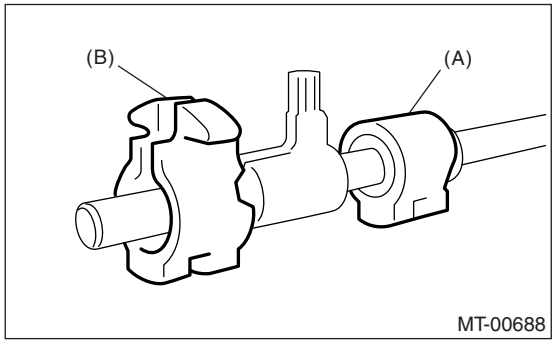
• Make sure to install the interlock arm and rod in proper direction.



(A) Reverse interlock arm
(B) Interlock arm
(C) Spring pin

2) Install the reverse interlock block and interlock block to striking rod.

NOTE:
Make sure to install the reverse interlock block and interlock block in proper direction.



(A) Reverse interlock block
(B) Interlock block

E: INSPECTION

1) Check the shift shaft and shift rod for damage. Replace if damaged.
2) Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.

F: ADJUSTMENT

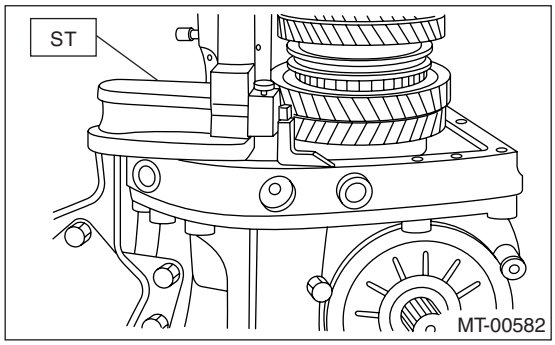
1. SELECTION OF 1st-2nd FORK ROD

NOTE:
• Perform the following procedures when.
Replacing the 1st, 2nd driven gear.
• Replacing the 1st, 2nd synchro ring assembly.
• Replacing the adapter plate.
• Replacing the driven shaft.
• Replacing the 1st-2nd hub, sleeve assembly.

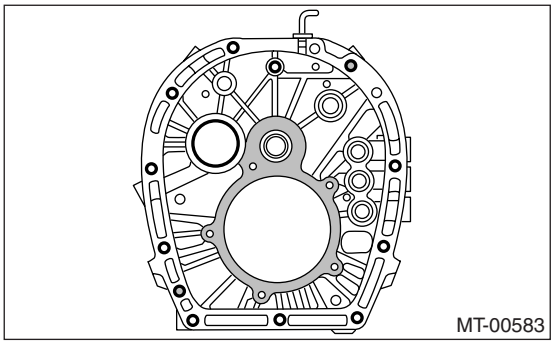
1) Insert the drive pinion assembly in adapter plate.

NOTE:
Make sure the thrust bearing outer race is not removed and drive pinion is not lift-up.

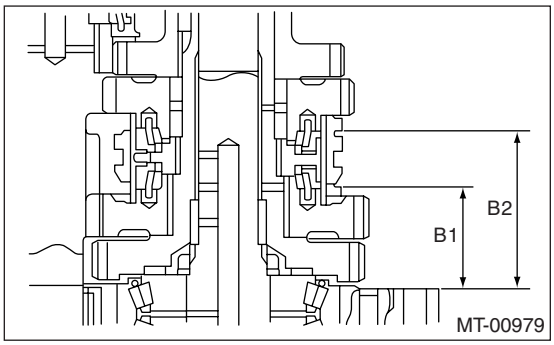
2) Set the height gauge to adapter plate. Lower the indicator of height gauge to mating surface of adapter plate and case, then set to zero point.
ST 18853AA000 HEIGHT GAUGE



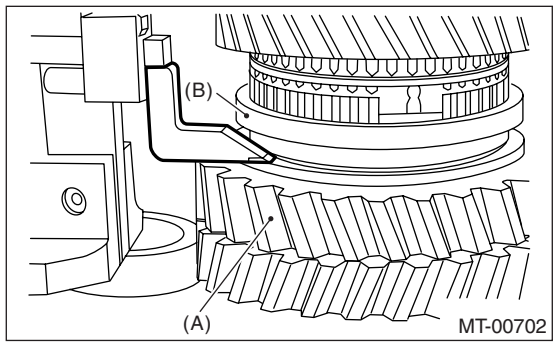
NOTE:
• Remove the remaining gasket on edge surface with scraper, since the adapter plate is base point of measurement.
• Do not place the height gauge on shaded area in the figure during measurement.



3) Select the main shaft snap ring. <Ref. to 6MT-83, ADJUSTMENT, Main Shaft Assembly.>
4) Measure “B1” and “B2” as shown in the figure.

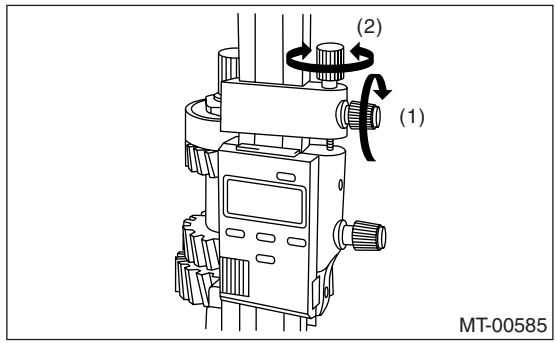


(1) Shift the 1st-2nd sleeve to 1st driven gear side, then press down to the stopper and measure “B1”.

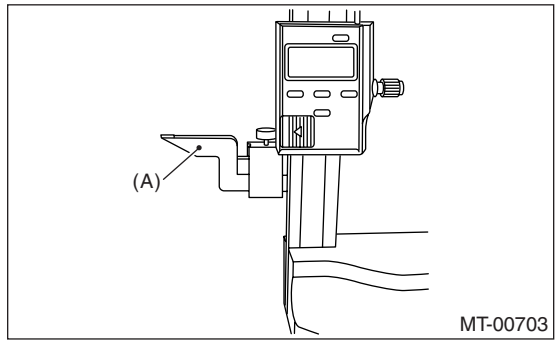


(A) 1st driven gear
(B) 1st-2nd sleeve

NOTE:
• Set the indicator of height gauge near measuring object, then lock the dial (1) as shown in the figure. Turn dial (2) to set the indicator to edge surface of sleeve 1st side.
• Measure five points of the sleeve turning every approx. 72°. Round off each two upper and lower measurement value. Use the remaining center value as measurement value.

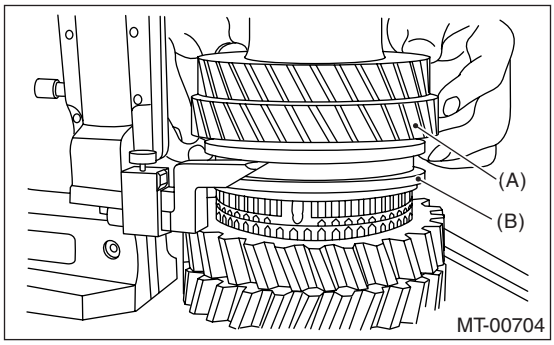


(2) Set the height gauge indicator upside down.



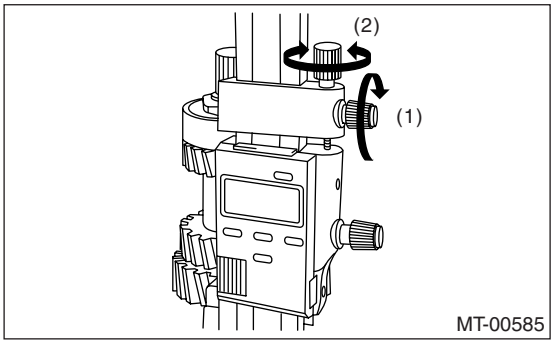
(A) Indicator

(3) Shift the 1st-2nd sleeve to 2nd driven gear side, then press up to the stopper and measure "B2".



(A) 2nd driven gear
(B) 1st-2nd sleeve

NOTE:
• Set the indicator of height gauge near measuring object, then lock the dial (1) as shown in the figure. Turn dial (2) to set the indicator to edge surface of sleeve 2nd side.
• Perform the measuring procedure with two people, and measure the sleeve lifted up straight.
• Measure five points of the sleeve turning every approx. 72° apart. Round off each two upper and lower measurement value. Use the remaining center value as measurement value.

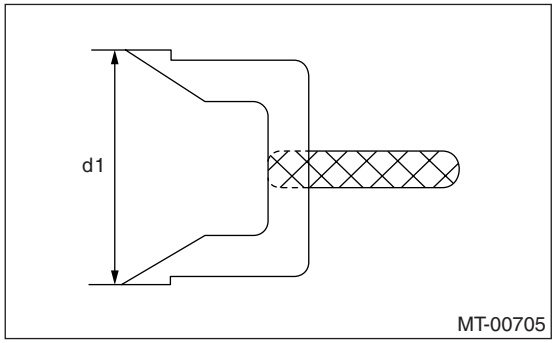


(4) According to both measurements, calculate the 1st-2nd sleeve neutral position. Select the fork rod which applies to the calculated value from following equation.

Equation: T = (B1 + B2) / 2

T: 1st-2nd sleeve center position
B1: Height from adapter plate edge to sleeve edge when shifted to 1st gear.
B2: Height from adapter plate edge to sleeve edge when shifted to 2nd gear. [measurement value + 55 mm (2.17 in)]

NOTE:
The indicator is installed upside down compared to the setting procedure of zero point. Add d1 [fixing value: 55 mm (2.17 in)] from the following figure to "B2", to obtain measurement value of "B2".

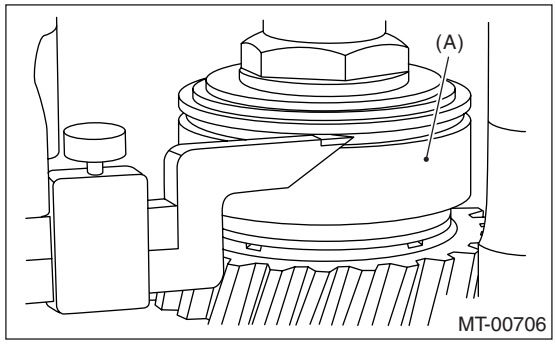


T mm (in)	Lot No. (Mark)
62.93 — 63.23 (2.4776 — 2.4894)	32801AA111 (1)
63.23 — 63.53 (2.4894 — 2.5012)	32801AA131 (None)
63.53 — 63.83 (2.5012 — 2.5130)	32801AA141 (2)

2. SELECTION OF 3rd-4th FORK ROD

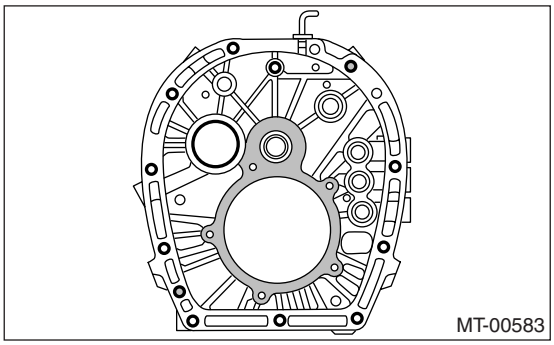
NOTE:
Perform the following procedures when.
• Replacing the main shaft.
• Replacing the 3rd, 3rd to 6th drive gear and bush.
• Replacing the 3rd, 3rd to 6th synchro assembly.
• Replacing the 3rd-4th hub, sleeve assembly.

1) Insert the main shaft assembly in adapter plate.
2) Set the height gauge to adapter plate. Lower the indicator of height gauge to upper surface of snap ring groove, on the upper side of main rear bearing, then set to zero point.
ST 18853AA000 HEIGHT GAUGE

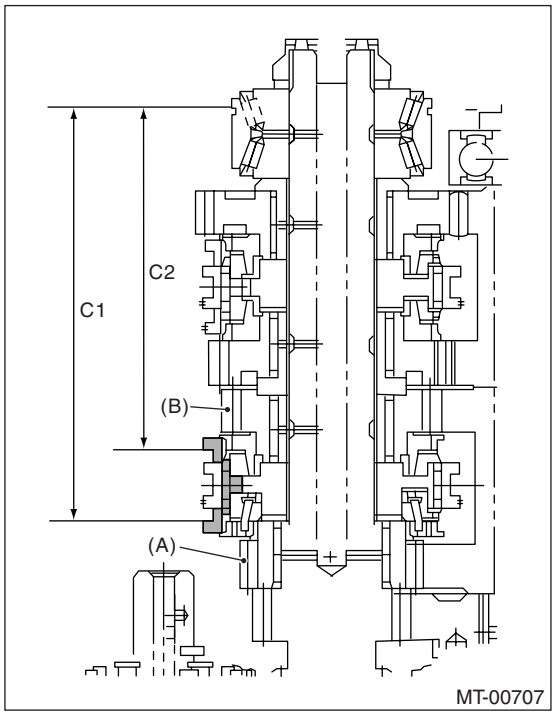


(A) Roller bearing

NOTE:
• Remove the remaining gasket on edge surface with scraper, since the height gauge is set on adapter plate during measurement.
• Do not put the height gauge on shaded area in the figure during the measurement.

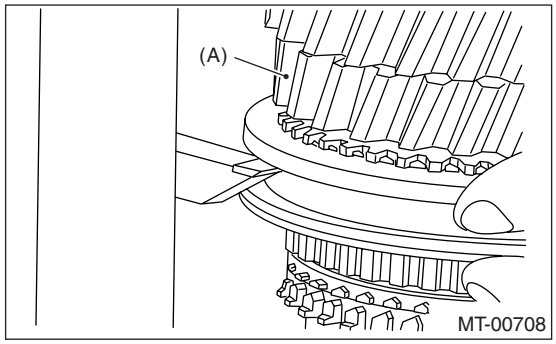


3) Using the height gauge, measure “C1” and “C2” shown in the figure.



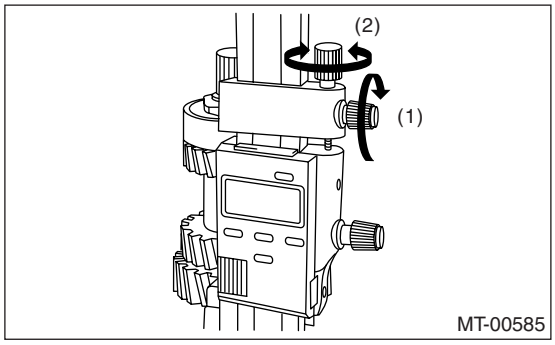
(A) 3rd drive gear
(B) 4th drive gear

(1) Shift the 3rd-4th sleeve to 4th gear side, then press up to the stopper and measure “C2”.

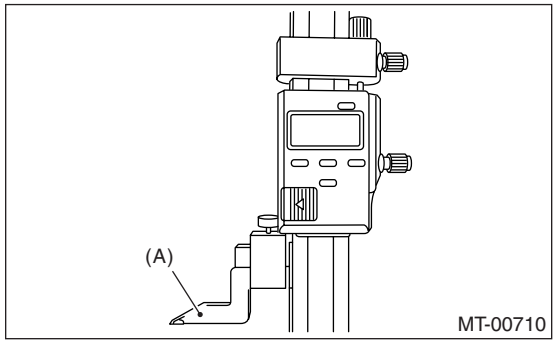


(A) 4th drive gear

NOTE:
• Set the indicator of height gauge near measuring object, then lock the dial (1) as shown in the figure.
• Turn dial (2) to set the indicator to edge surface of sleeve 4th side.
• Perform the measuring procedure with two people, and measure the sleeve lifted up straight.
• Measure five points of the sleeve turning every approx. 72°. Round off each two upper and lower measurement value. Use the remaining center value as measurement value.

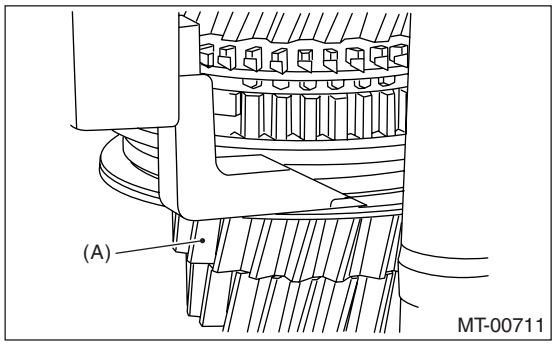


(2) Set the height gauge indicator upside down.



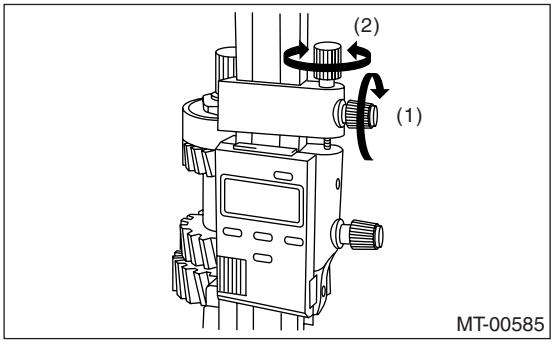
(A) Indicator

(3) Shift the 3rd-4th sleeve to 3rd drive gear side, then press down to the stopper and measure “C1”.



(A) 3rd drive gear

NOTE:
• Set the indicator of height gauge near measuring object, then lock the dial (1) as shown in the figure. Turn dial (2) to set the indicator to edge surface of sleeve 3rd side.
• Measure five points of the sleeve turning every approx. 72°. Round off each two upper and lower measurement value. Use the remaining center value as measurement value.

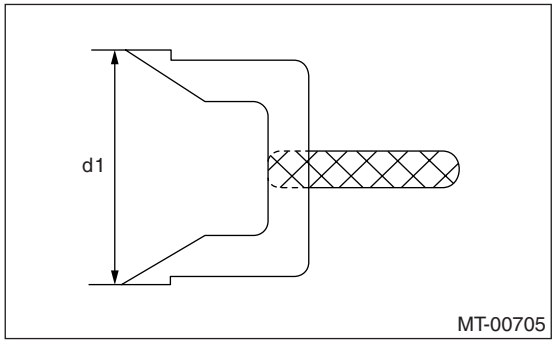


4) According to both measurements, calculate the 3rd-4th sleeve neutral position. Select the fork rod which applies to the calculated value from following equation.

Equation: T = (C1 + C2) / 2

T: 3rd-4th sleeve center position
C1: Length from main shaft rear bearing snap ring groove to sleeve edge when shifted to 3rd gear. [measurement value +55 mm (2.17 in)]
C2: Length from main shaft rear bearing snap ring groove to sleeve edge when shifted to 4th gear.

NOTE:
The indicator is installed upside down compared to the setting procedure of zero point. Add d1 [fixing value: 55 mm (2.17 in)] from the following figure to “C1”, to obtain measurement value of “C1”.



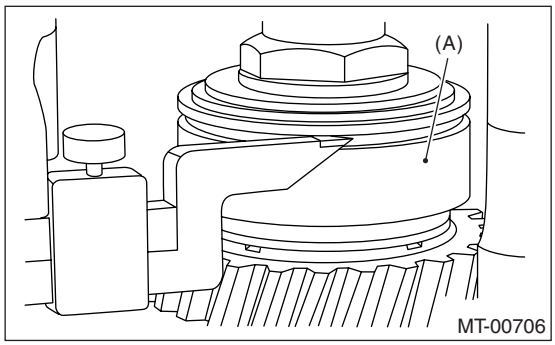
T mm (in)	Lot No. (Mark)		
	M.SFT Snap ring 805072010 [t = 1.65 mm (0.065 in)]	M.SFT Snap ring 805072011 [t = 1.95 mm (0.077 in)]	M.SFT Snap ring 805072012 [t = 2.25 mm (0.089 in)]
137.22 — 137.52 (5.4024 — 5.4142)	32809AA171 (None)	32809AA181 (2)	32809AA191 (4)
137.52 — 137.82 (5.4142 — 5.4260)	32809AA161 (1)	32809AA171 (None)	32809AA181 (2)
137.82 — 138.12 (5.4260 — 5.4379)	32809AA141 (3)	32809AA161 (1)	32809AA171 (None)
T = Thickness			

3. SELECTION OF 5th-6th FORK ROD

NOTE:
Perform the following procedures when.
• Replacing the main shaft.
• Replacing the 3rd to 6th drive gear and bush.
• Replacing the 3rd to 6th synchro ring assembly.
• Replacing the 3rd-4th hub, sleeve assembly.
• Replacing the 5th-6th hub, sleeve assembly.

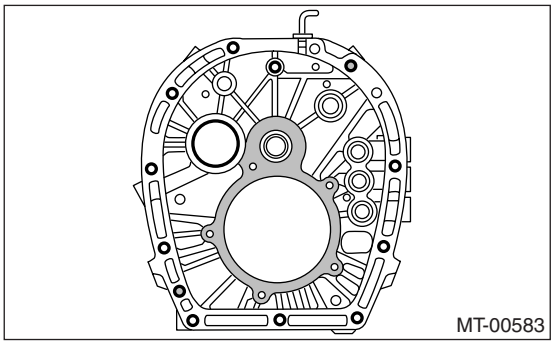
1) Insert the main shaft assembly in adapter plate.
2) Set the height gauge to adapter plate. Lower the indicator of height gauge to upper surface of snap ring groove, or the upper side of main rear bearing. Then set to zero point.

ST 18853AA000 HEIGHT GAUGE

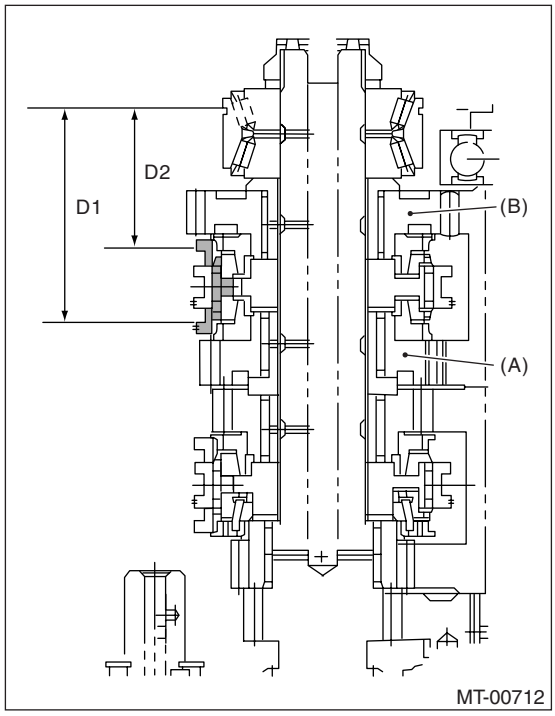


(A) Ball bearing

NOTE:
• Remove the remaining gasket on edge surface with scraper, since the height gauge is set on adapter plate during measurement.
• Do not place the height gauge on shaded area in the figure during the measurement.

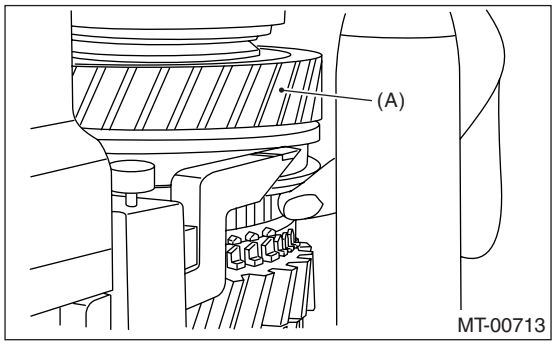


3) Using the height gauge, measure “D1” and “D2” shown in the figure.



(A) 5th main gear
(B) 6th main gear

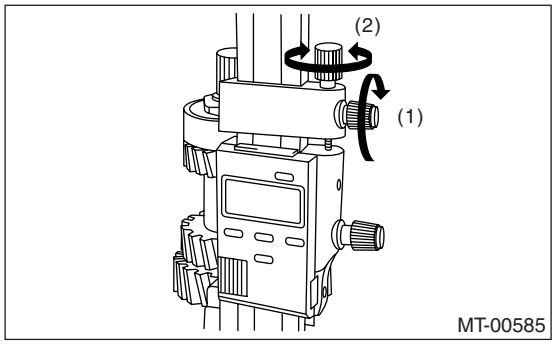
(1) Shift the 5th-6th sleeve to 6th main gear side, then press up to the stopper and measure “D2”.



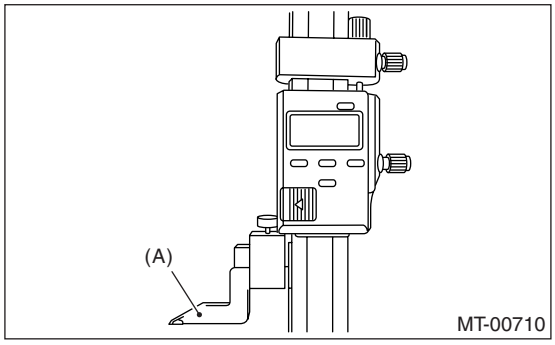
(A) 6th main gear

NOTE:
• Set the indicator of height gauge near measuring object, then lock the dial (1) as shown in the figure. Turn dial (2) to set the indicator to edge surface of sleeve 6th side.
• Perform the measuring procedure with two people, and measure the sleeve lifted up straight.

• Measure five points of the sleeve turning every approx. 72°. Round off each two upper and lower measurement value. Use the remaining center value as measurement value.

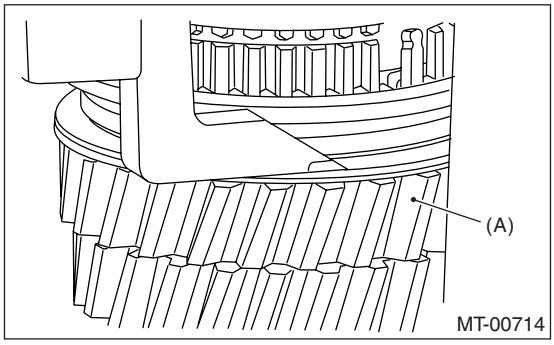


(2) Set the height gauge indicator upside down.



(A) Indicator

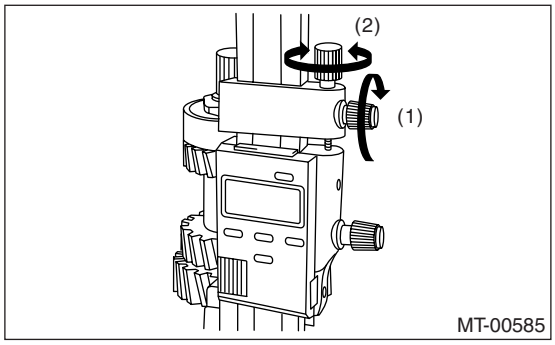
(3) Shift the 5th-6th sleeve to 5th main gear side, then press down to the stopper and measure “D1”.



(A) 5th main gear

NOTE:
• Set the indicator of height gauge near measuring object, then lock the dial (1) as shown in the figure. Turn dial (2) to set the indicator to edge surface of sleeve 5th side.

• Measure five points of the sleeve turning every approx. 72°. Round off each two upper and lower measurement value. Use the remaining center value as measurement value.

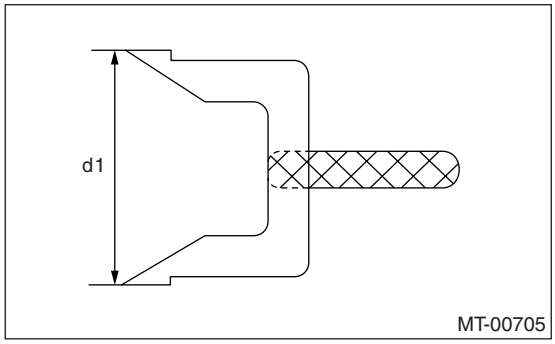


4) According to both measurements, calculate the 5th-6th sleeve neutral position. Select the fork rod, which applies to the calculated value from following equation.

Equation: T = (D1 + D2) / 2

T: 5th-6th sleeve center position
D1: Length from the shaft rear bearing snap ring groove to sleeve groove edge when shifted to 5th gear. [measurement value + 55 mm (2.17 in)]
D2: Length from main shaft rear bearing snap ring groove to sleeve groove edge when shifted to 6th gear.

NOTE:
The indicator is installed upside down compared to the setting procedure of zero point. Add d1 [fixing value: 55 mm (2.17 in)] from the following figure to “D1”, to obtain measurement value of “D1”.



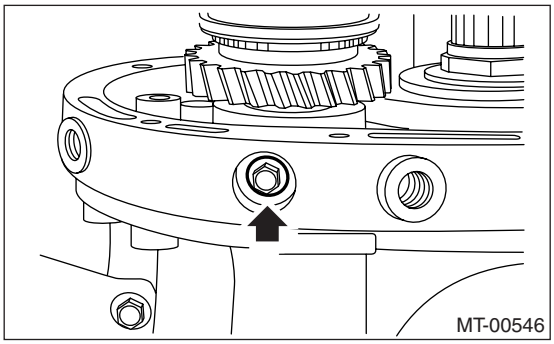
T mm (in)	Lot No. (Mark)		
	M.SFT Snap ring 805072010 [t = 1.65 mm (0.065 in)]	M.SFT Snap ring 805072011 [t = 1.95 mm (0.077 in)]	M.SFT Snap ring 805072012 [t = 2.25 mm (0.089 in)]
64.12 — 64.42 (2.5244 — 2.5362)	32945AA021 (None)	32945AA031 (2)	32945AA041 (4)
64.42 — 64.72 (2.5362 — 2.5480)	32945AA011 (1)	32945AA021 (None)	32945AA031 (2)
64.72 — 65.02 (2.5480 — 2.5598)	32945AA001 (3)	32945AA011 (1)	32945AA021 (None)
T = Thickness			

4. SELECTION OF REVERSE FORK ROD

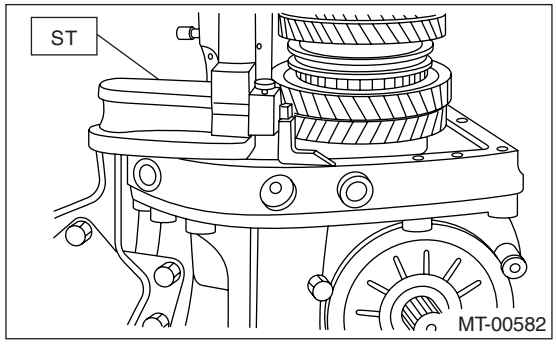
NOTE:
Perform the following procedures when.
- Replacing the reverse idler gear.
- Replacing the reverse idler gear No. 2.
- Replacing the adapter plate.
- Replacing the base.

1) Insert the reverse idler gear assembly in adapter plate.
2) Tighten the base COMPL fixing bolt.

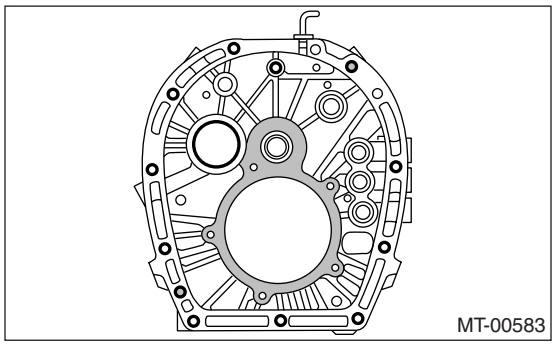
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



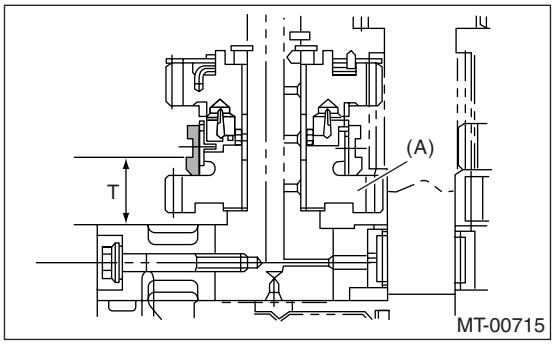
3) Set the height gauge to adapter plate. Lower the indicator of height gauge to mating surface of adapter plate and case, then set to zero point.
ST 18853AA000 HEIGHT GAUGE



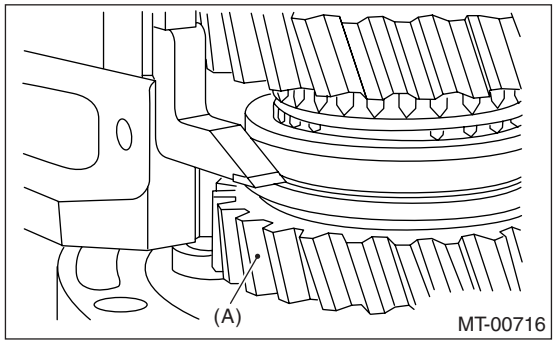
NOTE:
- Remove the remaining gasket on edge surface with scraper, since the adapter plate is base point of measurement.
- Do not place the height gauge on shaded area in the figure during measurement.



4) Press the reverse sleeve to reverse side idler gear No. 2, then measure "T".

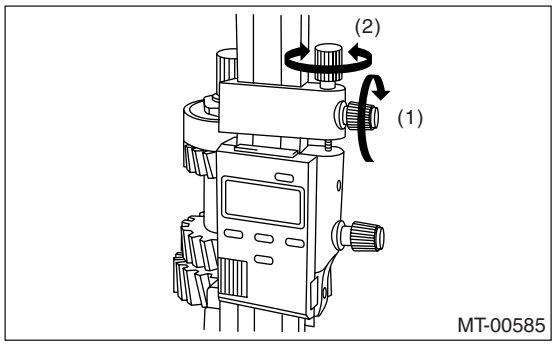


(A) Reverse idler gear No. 2



(A) Reverse idler gear No. 2

NOTE:
• Set the indicator of height gauge near measuring object, then lock the dial (1) as shown in the figure. Turn dial (2) to set the indicator to edge surface of reverse sleeve side.
• Measure five points of the sleeve turning every approx. 72°. Round off each two upper and lower measurement value. Use the remaining center value as measurement value.



5) According to measurement, calculate the reverse sleeve neutral position. Select the fork rod which applies to the calculated value from following equation.

Equation: T + 4.8 mm (0.189 in)

T + 4.8 mm (0.189 in)	Lot No. (Mark)
33.50 — 33.80 (1.3189 — 1.3307)	32816AA110 (1)
33.80 — 34.10 (1.3307 — 1.3425)	32816AA130 (None)
34.10 — 34.40 (1.3425 — 1.3543)	32816AA140 (2)
T = Thickness	

26.Clutch Housing

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 6MT-36, REMOVAL, Manual Transmission Assembly.>
2) Prepare the transmission for overhaul. <Ref. to 6MT-41, Preparation for Overhaul.>
3) Remove the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-43, REMOVAL, Oil Pipe.>, <Ref. to 6MT-46, REMOVAL, Neutral Position Switch.>, <Ref. to 6MT-44, REMOVAL, Back-up Light Switch.>
4) Remove the extension case. <Ref. to 6MT-48, REMOVAL, Extension Case.>
5) Remove the transfer driven gear. <Ref. to 6MT-60, REMOVAL, Transfer Driven Gear.>
6) Remove the center differential. <Ref. to 6MT-62, REMOVAL, Center Differential.>
7) Remove the oil pump. <Ref. to 6MT-63, REMOVAL, Oil Pump.>
8) Remove the transmission case. <Ref. to 6MT-67, REMOVAL, Transmission Case.>
9) Remove each gear assembly. <Ref. to 6MT-72, REMOVAL, Main Shaft Assembly.>
10) Remove the drive pinion shaft assembly. <Ref. to 6MT-98, REMOVAL, Drive Pinion Shaft Assembly.>
11) Remove the front differential assembly. <Ref. to 6MT-104, REMOVAL, Front Differential Assembly.>
12) Remove the vehicle speed sensor. <Ref. to 6MT-33, REMOVAL, Vehicle Speed Sensor.>
13) Remove the speedometer gear. <Ref. to 6MT-111, REMOVAL, Speedometer Gear.>

B: INSTALLATION

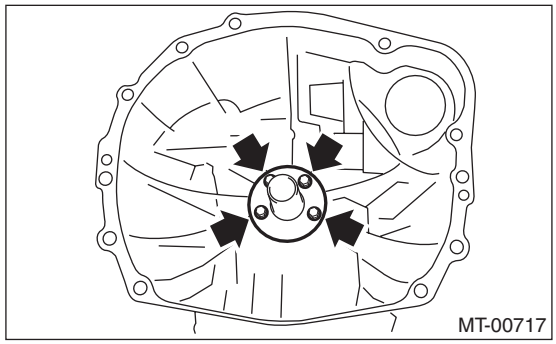
1) Install the pitching stopper bracket.

Tightening torque:
41 N·m (4.2 kgf-m, 30.2 ft-lb)

2) Install the speedometer gear. <Ref. to 6MT-111, INSTALLATION, Speedometer Gear.>
3) Install the vehicle speed sensor. <Ref. to 6MT-33, INSTALLATION, Vehicle Speed Sensor.>
4) Install the front differential assembly. <Ref. to 6MT-105, INSTALLATION, Front Differential Assembly.>
5) Install the drive pinion shaft assembly. <Ref. to 6MT-98, INSTALLATION, Drive Pinion Shaft Assembly.>
6) Install each gear assembly at once. <Ref. to 6MT-73, INSTALLATION, Main Shaft Assembly.>
7) Install the transmission case. <Ref. to 6MT-68, INSTALLATION, Transmission Case.>
8) Install the oil pump. <Ref. to 6MT-64, INSTALLATION, Oil Pump.>
9) Install the center differential. <Ref. to 6MT-62, INSTALLATION, Center Differential.>
10) Install the transfer driven gear. <Ref. to 6MT-60, INSTALLATION, Transfer Driven Gear.>
11) Install the extension case. <Ref. to 6MT-48, INSTALLATION, Extension Case.>
12) Install the oil pipe, neutral position switch, back-up light switch and harness. <Ref. to 6MT-43, INSTALLATION, Oil Pipe.>, <Ref. to 6MT-46, INSTALLATION, Neutral Position Switch.>, <Ref. to 6MT-44, INSTALLATION, Back-up Light Switch.>
13) Install the manual transmission assembly to vehicle. <Ref. to 6MT-38, INSTALLATION, Manual Transmission Assembly.>

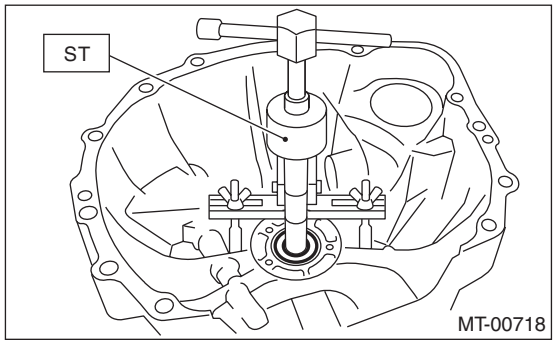
C: DISASSEMBLY

1) Remove the clutch release bearing guide.



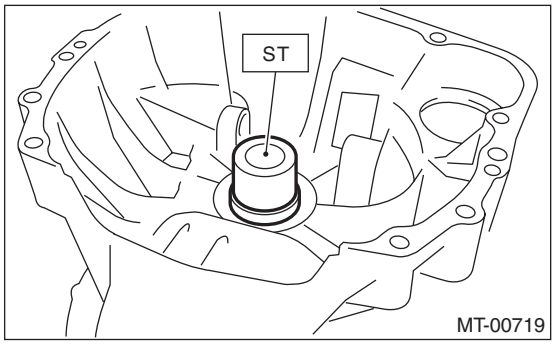
2) Remove the oil seal.
ST 398527700 PULLER ASSY

NOTE:
Do not reuse the oil seal.



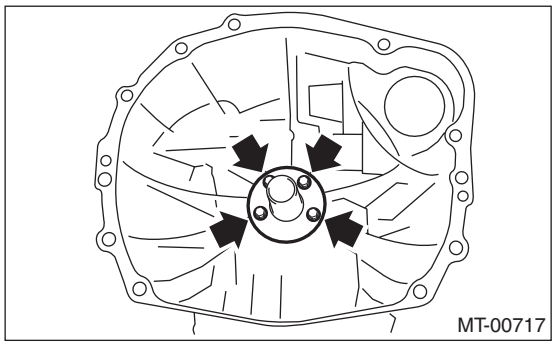
D: ASSEMBLY

1) Install the oil seal into clutch housing without damaging.
ST 399513600 INSTALLER



2) Install the clutch release bearing guide.

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



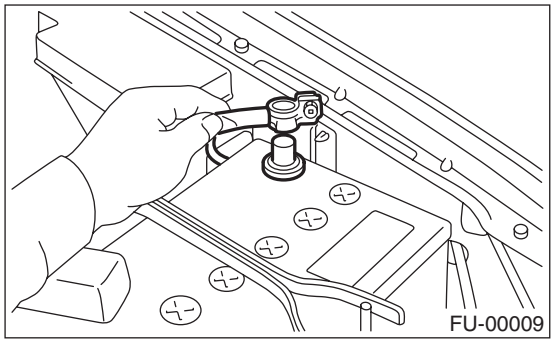
E: INSPECTION

1) Make sure there is no damage or crack on the clutch housing. Replace the clutch housing with a new one if there is excessive damage.
2) Check the clutch housing for gear oil leakage. If there is oil leakage, repair or replace the leakage part.

27.G Sensor

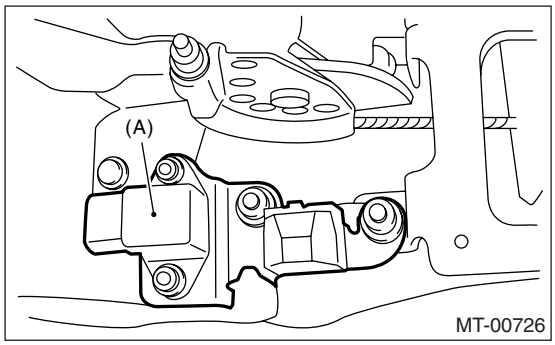
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the console cover. <Ref. to EI-44, Console Box.>
3) Disconnect the connector from G sensor.
4) Remove the G sensor from body.

CAUTION:
Do not drop or bump the G sensor.



(A) G sensor

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Do not drop or bump the G sensor.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

C: INSPECTION

Step		Check	Yes	No
1	**CHECK G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the G sensor from vehicle. 3) Connect the connector to G sensor. 4) Turn the ignition switch to ON. 5) Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B338) No. 2 (+) — No. 3 (−):***	Is the voltage 2.3±0.2 V when G sensor is horizontal?	Go to step **2.**	Replace the G sensor.
2	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B338) No. 2 (+) — No. 3 (−):***	Is the voltage 3.9±0.2 V when G sensor is inclined forwards to 90°?	Go to step **3.**	Replace the G sensor.
3	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B338) No. 2 (+) — No. 3 (−):***	Is the voltage 0.7±0.2 V when G sensor is inclined backwards to 90°?	G sensor is normal.	Replace the G sensor.

28. Driver's Control Center Differential Control Module

A: REMOVAL

1) Remove the ground cable from battery.
2) Remove the glove box. <Ref. to EI-41, REMOVAL, Glove Box.>
3) Disconnect the connector after removing the bolt from the inside of glove box, and then remove the control module.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)

29.General Diagnostic Table

A: INSPECTION

1. MANUAL TRANSMISSION

Symptom	Possible cause	Remedy
1. Gears are difficult to intermesh. NOTE: The cause for difficulty in shifting gears can be classified into two kinds: one is malfunction of the gear shift system and the other is malfunction of the transmission. However, if the operation is heavy and engagement of the gears is difficult, defective clutch disengagement may also be responsible. Check whether the clutch is correctly functioning, before checking the gear shift system and transmission.	(a) Worn, damaged or burred chamfer of internal spline of sleeve and reverse driven gear	Replace.
	(b) Worn, damaged or burred chamfer of spline of gears	Replace.
	(c) Worn or scratched bushings	Replace.
	(d) Incorrect contact between synchronizer ring and gear cone or wear	Correct or replace.
2. Gear slips out. • Gear slips out when coasting on rough road. • Gear slips out during acceleration.	(a) Defective pitching stopper adjustment	Adjust.
	(b) Loose engine mounting bolts	Tighten or replace.
	(c) Worn fork shifter, broken shifter fork rail spring	Replace.
	(d) Worn or damaged ball bearing	Replace.
	(e) Excessive clearance between splines of synchronizer hub and synchronizer sleeve	Replace.
	(f) Worn tooth step of synchronizer hub (responsible for slip-out of 3rd gear)	Replace.
	(g) Worn 1st driven gear, needle bearing and race	Replace.
	(h) Worn 2nd driven gear, needle bearing and race	Replace.
	(i) Worn 3rd drive gear and bushing	Replace.
	(j) Worn 4th drive gear and bushing	Replace.
	(k) Worn 5th drive gear and bushing	Replace.
	(l) Worn 6th drive gear and bushing	Replace.
	(m) Worn reverse idler gear and bushing	Replace.
3. Unusual noise comes from transmission. NOTE: If an unusual noise is heard when the vehicle is parked with its engine idling and if the noise ceases when the clutch is disengaged, it may be considered that the noise comes from the transmission.	(a) Insufficient or improper lubrication	Lubricate or replace with specified oil.
	(b) Worn or damaged gears and bearings NOTE: If the trouble is only wear of the tooth surfaces, merely a high roaring noise will occur at high speeds, but if any part is broken, rhythmical knocking sound will be heard even at low speeds.	Replace.

2. DIFFERENTIAL

Symptom	Possible cause	Remedy
1. Broken differential (case, gear, bearing, etc.) NOTE: Abnormal noise will develop and finally it will become impossible to continue to run due to broken pieces obstructing the gear revolution.	(a) Insufficient or improper oil	Replace.
	(b) Use of vehicle under severe conditions such as excessive load and improper use of clutch	Replace.
	(c) Improper adjustment of taper roller bearing	Adjust.
	(d) Improper adjustment of drive pinion and hypoid driven gear	Adjust.
	(e) Loose hypoid driven gear clamping bolts	Tighten.
2. Differential and hypoid gear noises Troubles of the differential and hypoid gear always appear as noise problems. Therefore noise is the first indication of the trouble. However noises from the engine, muffler, tire, exhaust gas, bearing, body, etc. are easily mistaken for the differential noise. Pay special attention to the hypoid gear noise because it is easily confused with other gear noises. There are the following four kinds of noises. • Gear noise when driving: If noise increases as the vehicle speed increases it may be due to insufficient gear oil, incorrect gear engagement, damaged gears, etc. • Gear noise when coasting: Damaged gears due to maladjusted bearings and incorrect shim adjustment • Bearing noise when driving or when coasting: Cracked, broken or damaged bearings • Noise which mainly occurs when turning: Unusual noise from the differential side gear, differential pinion, differential pinion shaft, etc.	(a) Insufficient oil	Lubricate.
	(b) Improper adjustment of hypoid driven gear and drive pinion	Check tooth contact.
	(c) Worn teeth of hypoid driven gear and drive pinion	Replace as a set. Readjust bearing preload.
	(d) Loose roller bearing	Readjust hypoid driven gear to drive pinion backlash and check tooth contact.
	(e) Distorted hypoid driven gear or differential case	Replace.
	(f) Broken or damaged LSD.	Replace.

MANUAL TRANSMISSION AND DIFFERENTIAL (DIAGNOSTICS)

6MT(diag)

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9.	Driver's Control Center Differential Indicator Light Display	16
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12.	General Diagnostic Table	57

1. Basic Diagnostics Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how trouble occurred using the check list for interview. <Ref. to 6MT(diag)-3, Check List for Interview.> 2) Before performing diagnosis, inspect the unit which might influence the driver's control center differential. <Ref. to 6MT(diag)-4, INSPECTION, General Information.>	Is unit that might influence the driver's control center differential problem normal?	Go to step **2.**	Repair the faulty unit.
2	**CALLING UP THE DTC.** Check the DTC. <Ref. to 6MT(diag)-12, STORED DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Read Diagnostic Trouble Code (DTC).> NOTE: For DTC, refer to "List of Diagnostic Trouble Code (DTC)". <Ref. to 6MT(diag)-17, List of Diagnostic Trouble Code (DTC).>	Is the DTC called up?	Go to step **3.** NOTE: Record all DTC (Include: normal code).	Inspect using "Can not calling up DTC". NOTE: After the inspection, read the DTC again. <Ref. to 6MT(diag)-12, STORED DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Read Diagnostic Trouble Code (DTC).>
3	**PERFORM THE DIAGNOSIS.** 1) Inspect and repair the all DTC using "Diagnostic Procedure with Diagnostic Trouble Code (DTC)". <Ref. to 6MT(diag)-18, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: For DTC, refer to "List of Diagnostic Trouble Code (DTC)". <Ref. to 6MT(diag)-17, List of Diagnostic Trouble Code (DTC).> 2) Perform the inspection mode. <Ref. to 6MT(diag)-14, Inspection Mode.>	Is the DTC displayed?	Record all DTC, and inspect using "Diagnostic Procedure with Diagnostic Trouble Code (DTC)" <Ref. to 6MT(diag)-18, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Repeat "PERFORM THE DIAGNOSIS" until normal code called up.	Inspect using "General Diagnostic Table".

2. Check List for Interview

A: CHECK

Check the following items when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name			
Date of purchase			
Date of repair			
Trans. model	TRANSMISSION	VIN	
Odometer reading	km or miles		
Frequency	❑ Continuous ❑ Intermittent (times a day)		
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others ( )		
Place	❑ High ❑ Suburbs ❑ Inner city ❑ Uphill ❑ Rough road ❑ Others ( )		
Outdoor temperature	❑ Hot ❑ Warm ❑ Cool ❑ Cold		
Vehicle speed	km/h (MPH)		
Driver's control center differential indicator light	❑ Flashing	❑ Except flashing	
Driving condition	❑ Not affected ❑ While decelerating	❑ At starting ❑ While accelerating	❑ While turning (❑ RH / ❑ LH) ❑ While cruising
Symptoms	❑ No change to AUTO or MANUAL		
	❑ No change of front and rear torque distribution		
	❑ No change to differential free		
	❑ No change to differential lock		
	❑ Tight cornering condition is occurred in AUTO or MANUAL mode with differential free		
	❑ Noise or vibration		
	❑ Others ( )		

3. General Information

A: CAUTION

Supplemental restraint system airbag wiring harness is routed near the driver's control center differential control module.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use the electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when performing diagnostics and servicing the driver's control center differential control module.
• When measuring the voltage or resistance of ECM or each sensor, use a tapered pin with diameter of less than 0.64 mm (0.025 in) in order to avoid poor contact. Do not insert the pin with diameter of more than 0.65 mm (0.026 in).

B: INSPECTION

1. POWER SUPPLY

1) Measure battery voltage and specific gravity of electrolyte.

Standard of voltage: More than 12 V

Standard of gravity: More than 1.260

2) Check the condition of fuse.
3) Check the condition of harness and harness connector.

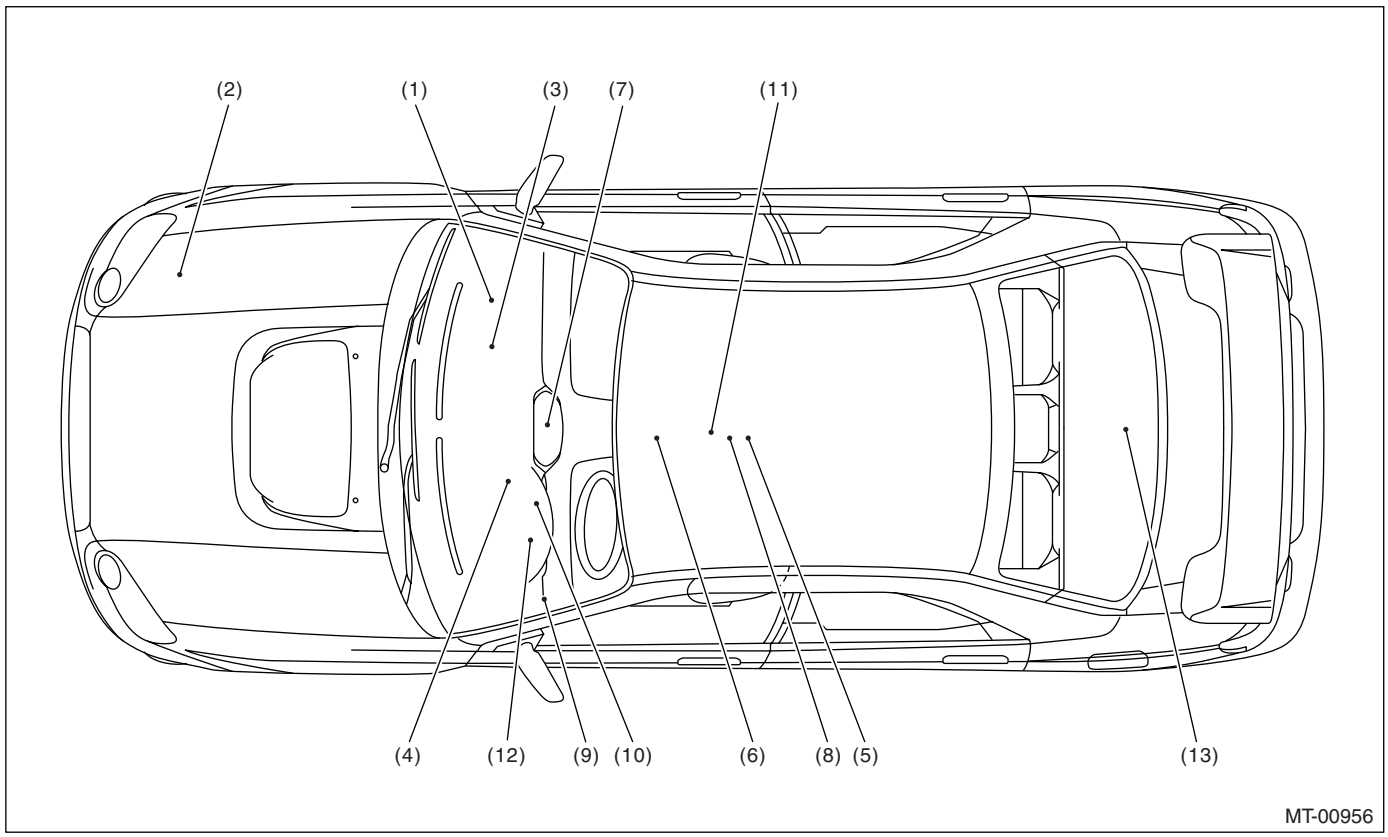
C: PREPARATION TOOL

1. GENERAL PURPOSE TOOL

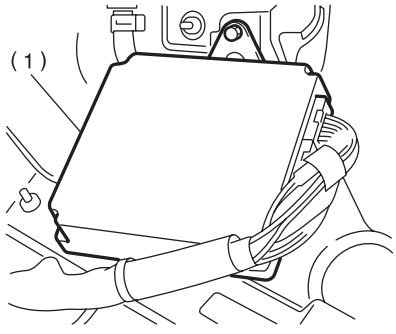
TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Oscilloscope	Used for measuring sensor.

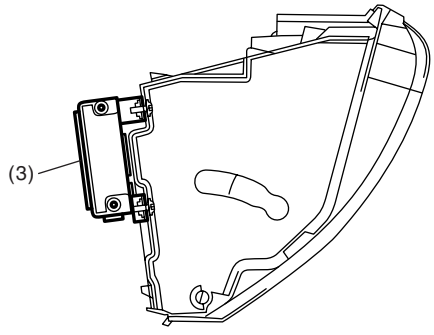
4. Electrical Component Location

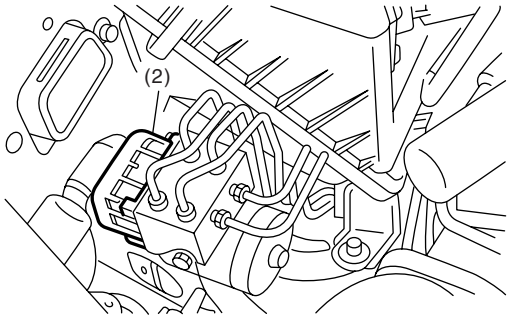
A: POSITION



(1) Engine control module (ECM)
(2) ABS control module & hydraulic control unit (ABSCM&H/U)
(3) Driver's control center differential control module
(4) Accelerator position sensor
(5) Lateral G sensor
(6) Center differential control dial
(7) Center differential
(8) Manual mode switch
(9) Driver's control center differential relay
(10) Driver's control center differential indicator (driver's control center differential diagnostic indicator)
(11) Parking brake switch
(12) Brake light switch
(13) Rear differential oil temperature switch







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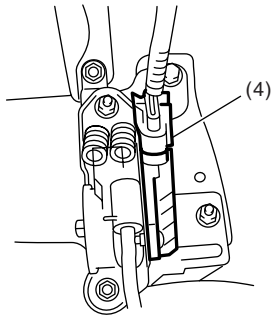

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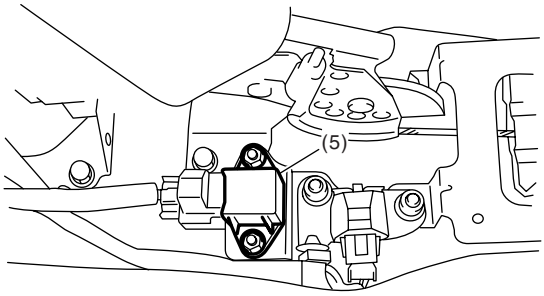

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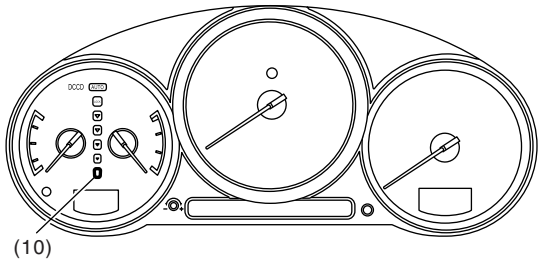

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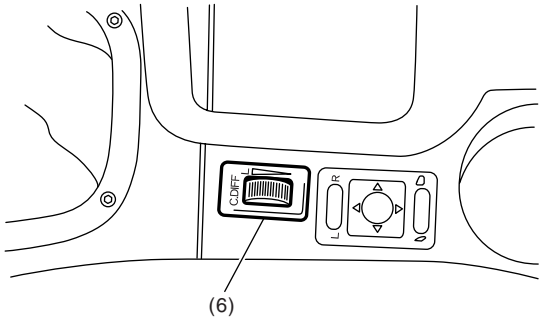

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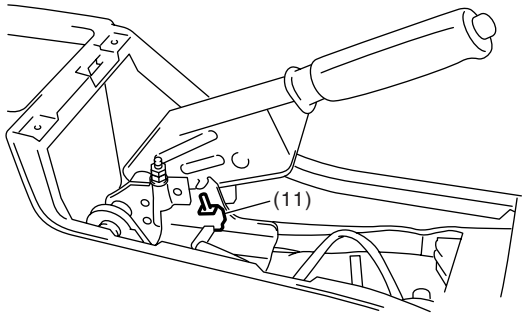

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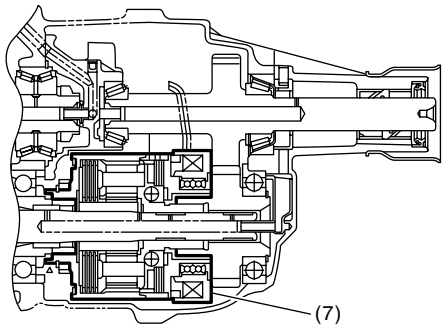

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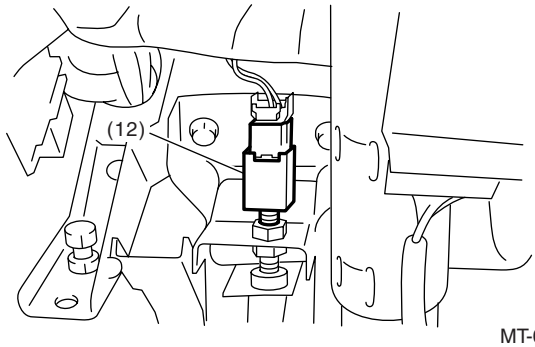

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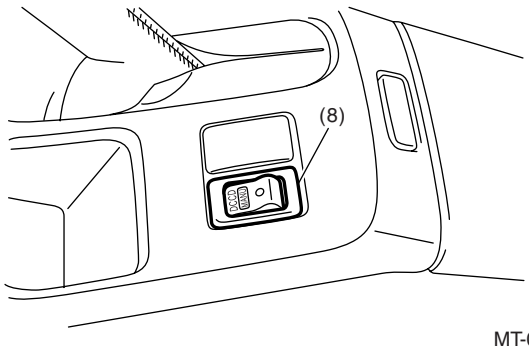

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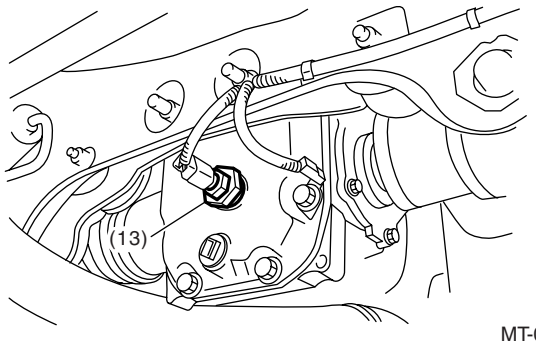

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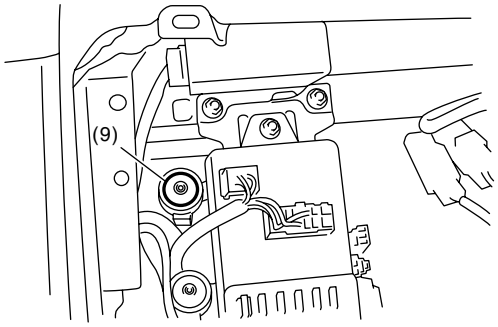
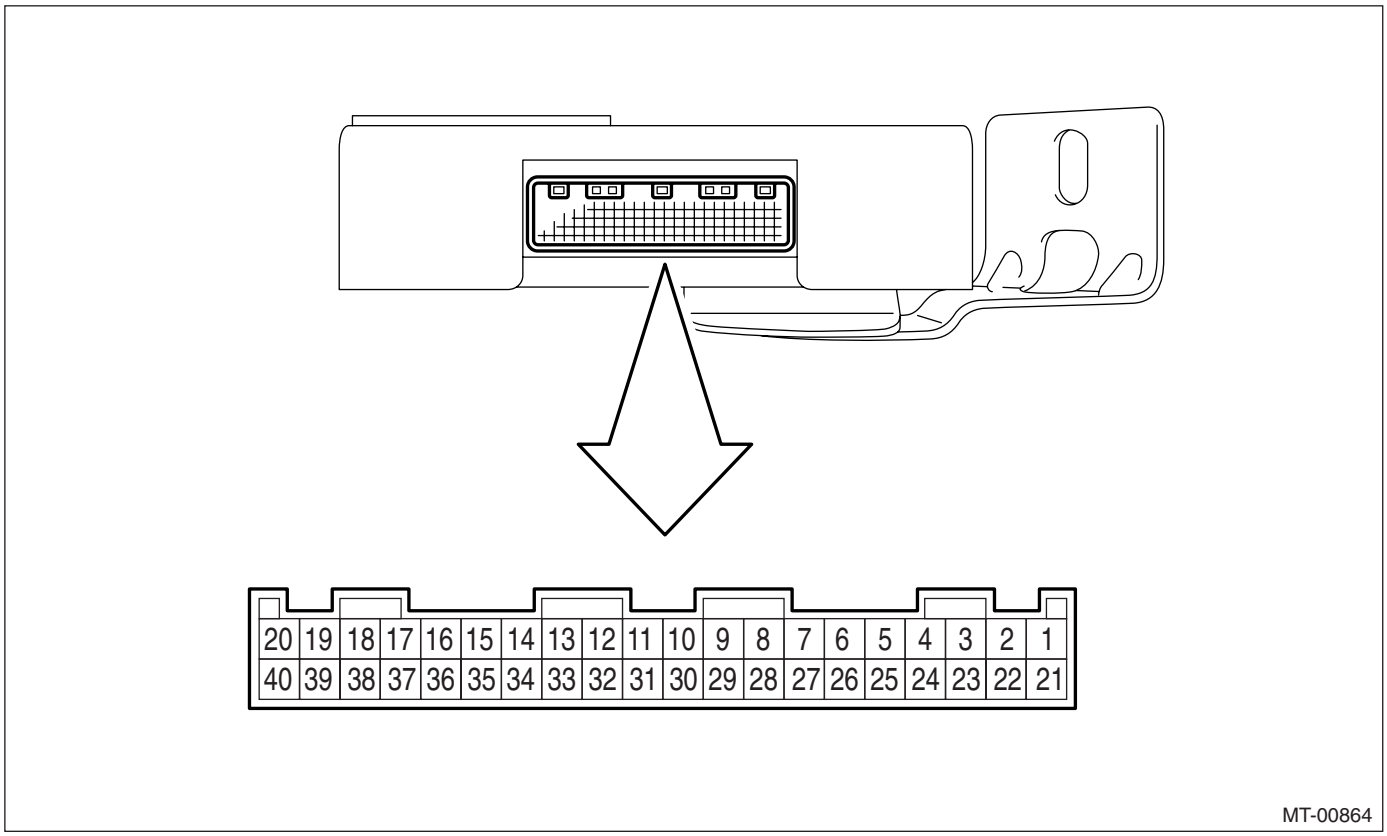


MT-00960

5. Driver's Control Center Differential Control Module I/O Signal

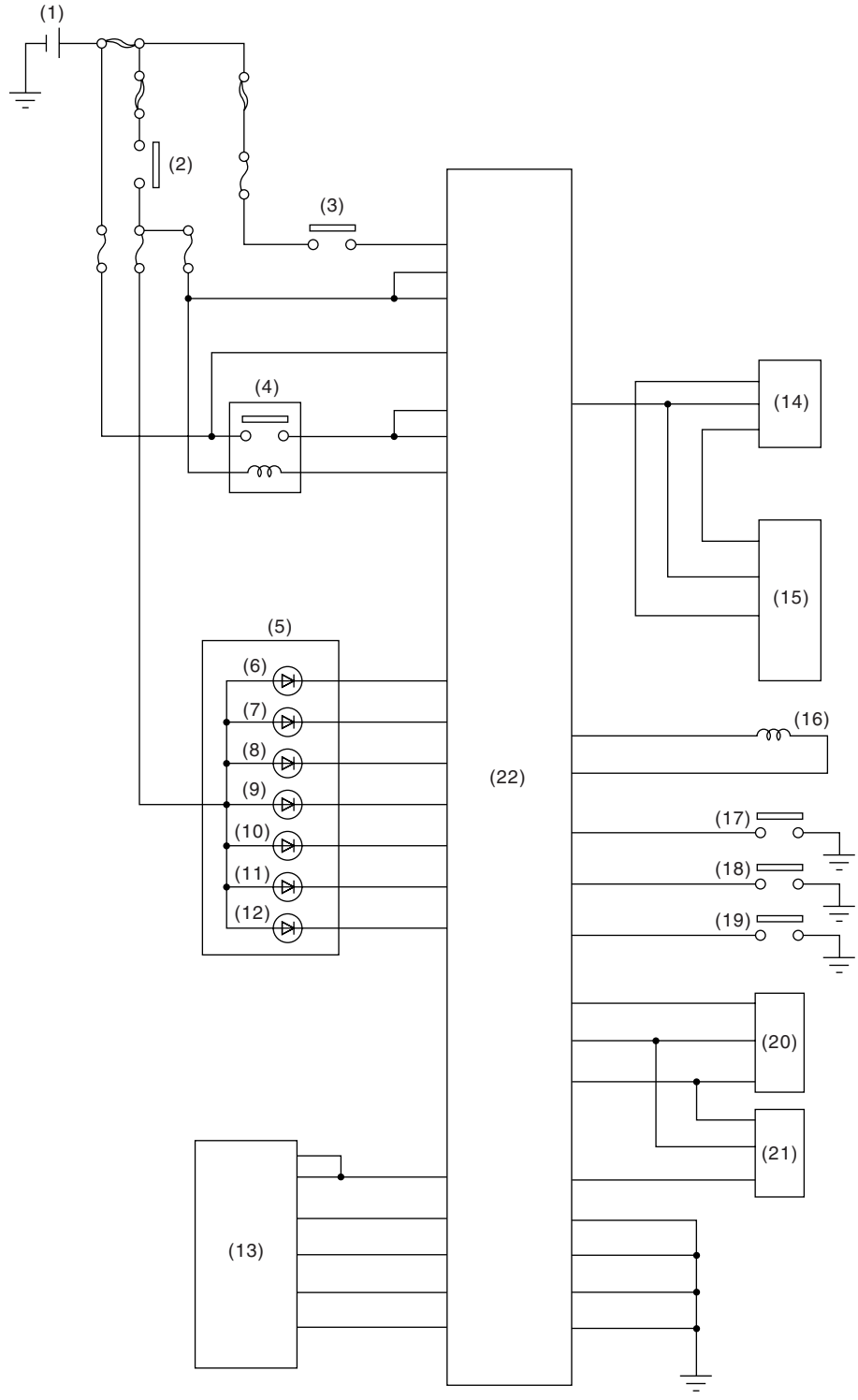
A: ELECTRICAL SPECIFICATION



Check with ignition switch ON.				
Content	Terminal No.	Measuring conditions	Voltage (V)	To body resistance (ohm)
Back-up power supply	17	Ignition switch ON or OFF	10 — 13	—
Ignition power supply	15	Ignition switch ON (engine OFF)	10 — 13	—
	16			—
Driver's control center differential power supply	18			—
	19			—
Driver's control relay	21	Ignition switch ON	Less than 1	—
Accelerator position sensor	32	Accelerator pedal is released.	0.3 — 1.8	—
		Accelerator pedal is fully depressed.	2.8 — 4.7	
Center differential control dial power supply	13	Ignition switch ON	Approx. 5	—
Center differential control dial ground line	34	Ignition switch ON	0	—
Center differential control dial input signal	12	When differential is locked	Approx. 5	—
		When differential is free	Less than 0.5	
Lateral G sensor	33	Ignition switch ON (When lateral G sensor is horizontal)	2.3 — 2.7	—
Driver's control center differential output	20	When differential is locked (When driver's control center differential indicator light is in differential lock)	6.0 — 7.0	1.0 — 2.0 (between connector terminals)
		When differential is free (When parking brake is applied)	Less than 0.5	
Driver's control center differential ground line	40	When differential is free	Less than 0.5	

Check with ignition switch ON.				
Content	Terminal No.	Measuring conditions	Voltage (V)	To body resistance (ohm)
Parking brake switch	11	When parking brake is applied	Less than 0.4	—
		When parking brake is released	More than 8	
Driver's control center differential indicator light (Lock ratio 0%)	4	When illuminates	Less than 1	—
		When turned off	More than 8	
Driver's control center differential indicator light (Lock ratio 15%)	3	When illuminates	Less than 1	—
		When turned off	More than 8	
Driver's control center differential indicator light (Lock ratio 35%)	2	When illuminates	Less than 1	—
		When turned off	More than 8	
Driver's control center differential indicator light (Lock ratio 65%)	1	When illuminates	Less than 1	—
		When turned off	More than 8	
Driver's control center differential indicator light (Lock ratio 85%)	24	When illuminates	Less than 1	—
		When turned off	More than 8	
Driver's control center differential indicator light (Lock ratio 100%)	23	When illuminates	Less than 1	—
		When turned off	More than 8	
AUTO indicator light	22	When illuminates	Less than 1	—
		When turned off	More than 8	
ABSCM&H/U	10	When ABS control operates	Less than 1	—
		When ABS control does not operate	More than 8	
Rear LH ABS wheel speed sensor signal	26	When stopped	Less than 1	—
		When driving	Less than 1 ←→ More than 8	
Rear RH ABS wheel speed sensor signal	27	When stopped	Less than 1	—
		When driving	Less than 1 ←→ More than 8	
Front LH ABS wheel speed sensor signal	28	When stopped	Less than 1	—
		When driving	Less than 1 ←→ More than 8	
Front RH ABS wheel speed sensor signal	29	When stopped	Less than 1	—
		When driving	Less than 1 ←→ More than 8	
Stop light switch	9	Brake pedal depressed.	More than 8	—
		Brake pedal released.	Less than 1	
Rear differential oil temperature switch	7	Rear differential oil temperature switch OFF	More than 8	—
		Rear differential oil temperature switch ON	Less than 0.4	
Manual mode switch	8	Switch is released	More than 4.3	—
		Switch is depressed	Less than 0.1	
Data link signal (Subaru Select Monitor)	5	—	—	—
	6			—
Driver's control center differential control module ground line	36	—	0	—
	37			—
	38			—
	39			—

B: WIRING DIAGRAM



(1) Battery
(2) Ignition relay
(3) Stop light switch
(4) Driver's control center differential relay
(5) Combination Meter
(6) Driver's control center differential indicator light (Lock ratio 0%)
(7) Driver's control center differential indicator light (Lock ratio 15%)
(8) Driver's control center differential indicator light (Lock ratio 35%)
(9) Driver's control center differential indicator light (Lock ratio 65%)
(10) Driver's control center differential indicator light (Lock ratio 85%)
(11) Driver's control center differential indicator light (Lock ratio 100%)
(12) AUTO indicator light
(13) ABS control module & hydraulic control unit (ABSCM&H/U)
(14) Accelerator position sensor
(15) Engine control module (ECM)
(16) Driver's control center differential
(17) Parking brake switch
(18) Manual mode switch
(19) Rear differential oil temperature switch
(20) Center differential control dial
(21) Lateral G sensor
(22) Driver's control center differential control module

6. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. STORED DIAGNOSTIC TROUBLE CODE (DTC)

1) Securely apply the parking brake.
2) Turn the ignition switch to ON.
3) Set the driver's control dial to differential lock or differential free.
4) Hold the accelerator pedal depressed fully.

NOTE:
Hold the accelerator pedal depressed fully until reading of DTC is completed.

5) Set the driver's control dial to differential lock and differential free for ten times each.

NOTE:
• Repeat the step from the beginning when DTC is not displayed or diagnostic indicator light does not blink.
• Refer to "HOW TO READ DIAGNOSTIC TROUBLE CODE (DTC)" for reading DTC. <Ref. to 6MT(diag)-13, HOW TO READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Read Diagnostic Trouble Code (DTC).>

2. SELF-DIAGNOSIS DIAGNOSTIC TROUBLE CODE (DTC)

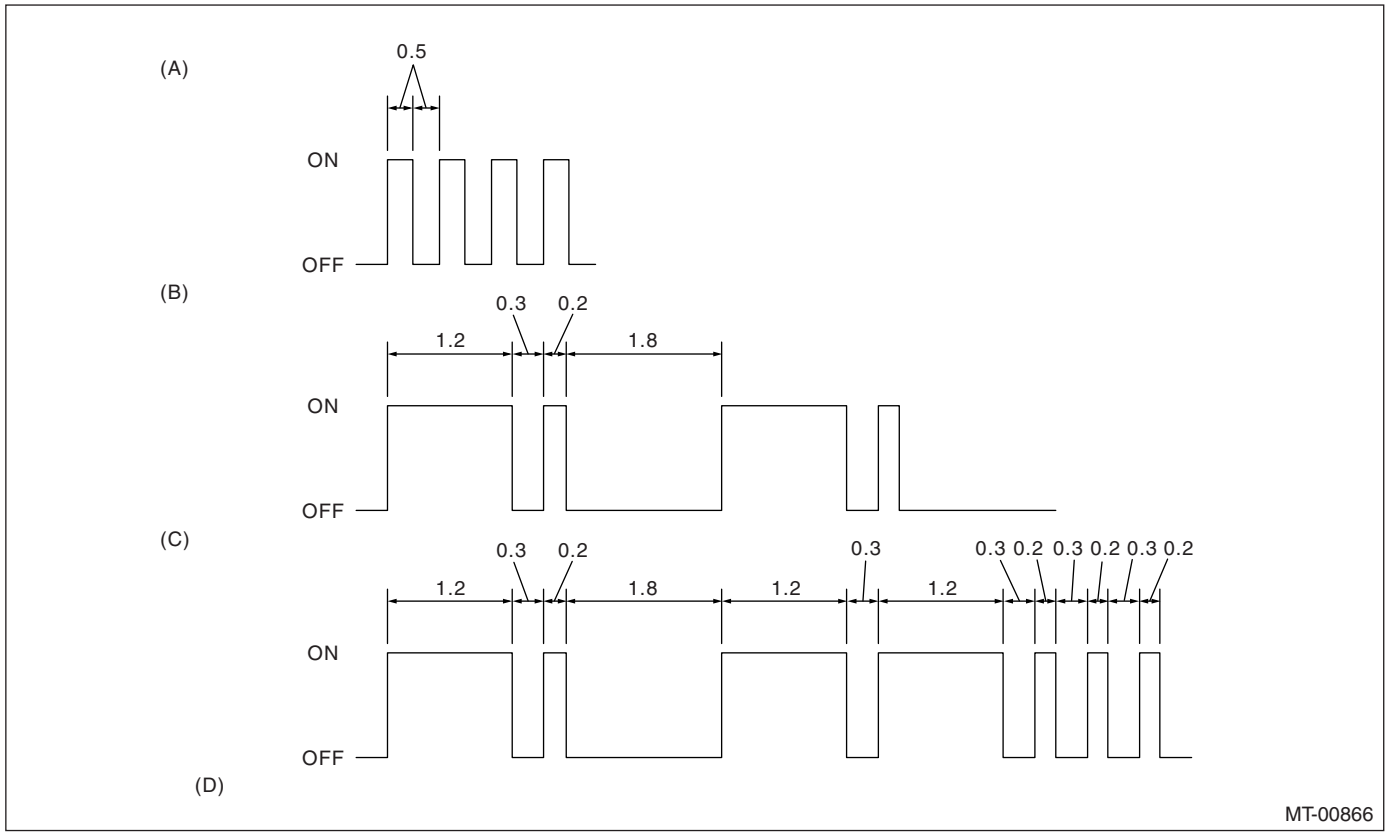
NOTE:
Perform the following step 4) to 8) within 30 sec.

1) Securely apply the parking brake.
2) Set the center differential control dial to differential free.
3) Start the engine.
4) Set the center differential control dial to differential lock.
5) Release the parking brake.
6) Set the center differential control dial to differential free.
7) Securely apply the parking brake.
8) Repeat the step 4) to 7) for twice.

NOTE:
• ABS wheel speed sensor DTC is displayed. Do not judge it as a problem. Perform the inspection mode.
• Repeat the step from the beginning when DTC is not displayed or diagnostic indicator light does not blink.
• Refer to "HOW TO READ DIAGNOSTIC TROUBLE CODE (DTC)" for reading DTC. <Ref. to 6MT(diag)-13, HOW TO READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Read Diagnostic Trouble Code (DTC).>

3. HOW TO READ DIAGNOSTIC TROUBLE CODE (DTC)

DTC for faulty part is indicated by blinking of driver's control center differential indicator. Long blink (1.2 sec.) means ten's place, short blink (0.2 sec.) means one's place.



(A) Normal code
(B) DTC 11
(C) DTC 11 and 23
(D) Unit: Seconds

NOTE:

- The codes which are memorized in control module as previous DTC by occurring the trouble in the past, and the codes which are appeared to inform the trouble to driver in normal driving condition; are only "11", "12", "13", "14", "21", "22" and "23".
- For details of DTC, refer to "List of Diagnostic Trouble Code (DTC)". <Ref. to 6MT(diag)-17, List of Diagnostic Trouble Code (DTC).>

7. Inspection Mode

A: OPERATION

WARNING:
Observe the road traffic law.

1) Call up the Self-diagnosis diagnostic trouble code (DTC). <Ref. to 6MT(diag)-12, SELF-DIAGNOSIS DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Read Diagnostic Trouble Code (DTC).>
2) Apply the parking brake.
3) Depress the brake pedal.
4) Operate the Manual mode switch once or more, and then set to Manual mode.
5) Turn the center differential control dial to differential lock and differential free for once, and turn it to differential lock, and then wait three seconds.
6) Drive the vehicle in 15 km/h (9 MPH) for more than 5 sec.

8. Clear Memory Mode

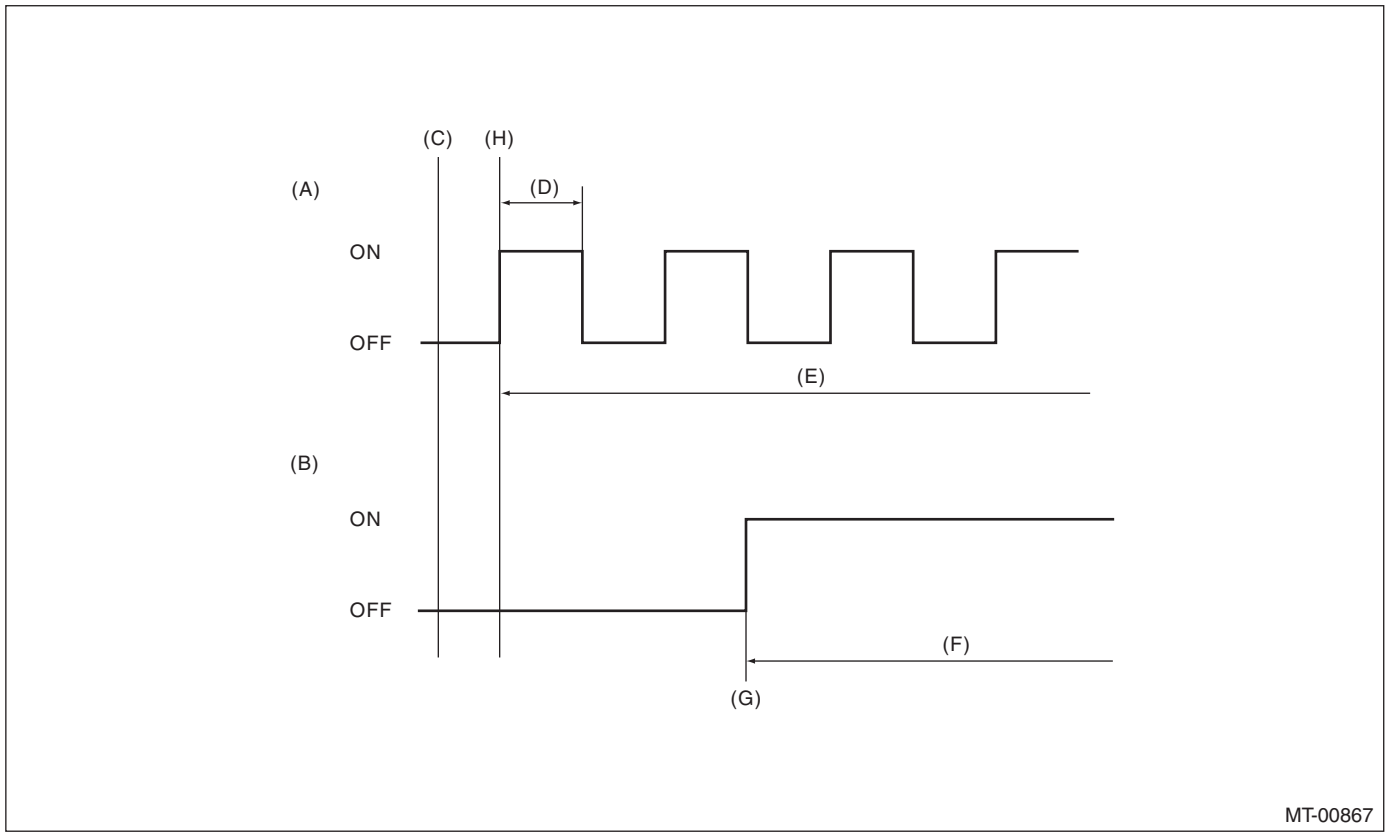
A: OPERATION

Stored DTC is cleared when ignition switch turns on next time, if there is no malfunction on each I/O signal at the time when finishing inspection mode after calling up the Self-diagnosis DTC (all Self-diagnosis DTC is cleared).

9. Driver's Control Center Differential Indicator Light Display

A: INSPECTION

When the malfunction occurs on part or unit, the control module performs self diagnosis and driver's control center differential indicator light (at the bottom differential free light) keep blinking until detect the malfunction and the ignition switch is turned to OFF. Faulty part or unit can be identified by calling up DTC.
Indicator display is as shown in the figure.



(A) Faulty
(B) Normal
(C) Ignition switch ON
(D) 1 sec.
(E) Blink
(F) Driver's control center differential indicator light illuminates
(G) Set manual mode dial to differential free position
(H) Malfunction is detected

10.List of Diagnostic Trouble Code (DTC)

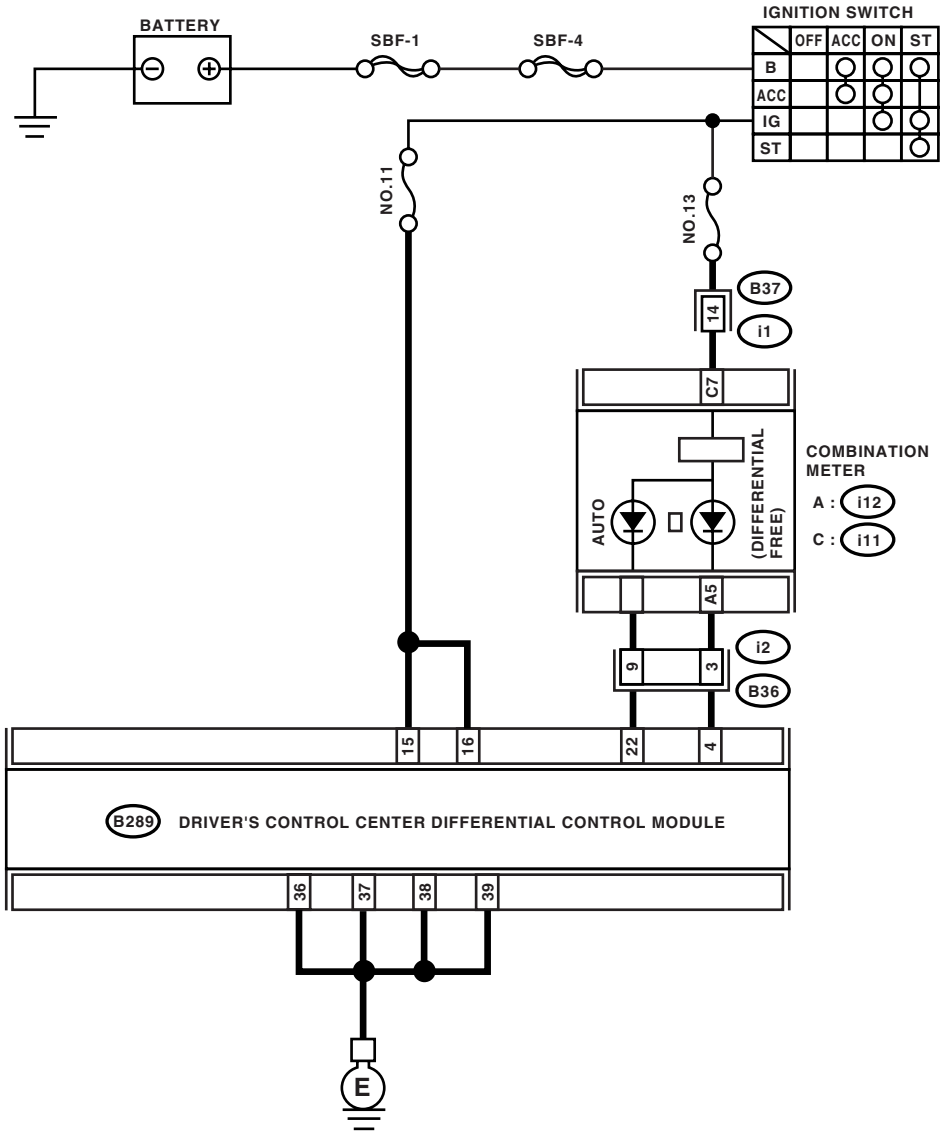
A: LIST

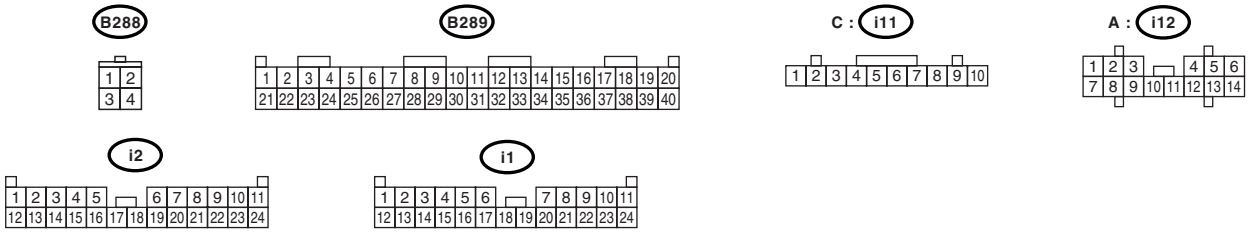
DTC	Item	Content of diagnosis	Index
—	Diagnosis indicator light, Center differential control dial, Parking brake switch, accelerator position sensor	Diagnosis indicator light does not illuminate. Can not calling up the DTC.	<Ref. to 6MT(diag)-18, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
—	Rear differential gear oil temperature switch	Diagnosis indicator light blinks at 2 Hz, but driver's control center differential does not operate.	<Ref. to 6MT(diag)-21, CHECK REAR DIFFERENTIAL OIL TEMPERATURE SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
11	Front ABS wheel speed sensor RH	Open or short circuit in front ABS wheel speed sensor RH circuit	<Ref. to 6MT(diag)-24, DTC 11 FRONT ABS WHEEL SPEED SENSOR RH SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
12	Front ABS wheel speed sensor LH	Open or short circuit in front ABS wheel speed sensor LH circuit	<Ref. to 6MT(diag)-27, DTC 12 FRONT ABS WHEEL SPEED SENSOR LH SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
13	Rear ABS wheel speed sensor RH	Open or short circuit in rear ABS wheel speed sensor RH circuit	<Ref. to 6MT(diag)-30, DTC 13 REAR ABS WHEEL SPEED SENSOR RH SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
14	Rear ABS wheel speed sensor LH	Open or short circuit in rear ABS wheel speed sensor LH circuit	<Ref. to 6MT(diag)-33, DTC 14 REAR ABS WHEEL SPEED SENSOR LH SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
21	Accelerator position sensor	Open or short circuit in accelerator position sensor circuit	<Ref. to 6MT(diag)-36, DTC 21 ACCELERATOR POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	Lateral G sensor	Open or short circuit in lateral G sensor circuit	<Ref. to 6MT(diag)-39, DTC 22 LATERAL G SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	Driver's control center differential output	Open or short circuit in driver's control center differential output circuit	<Ref. to 6MT(diag)-41, DTC 23 CHECK CENTER DIFFERENTIAL., Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	Center differential control dial	Open or short circuit in center differential control dial circuit	<Ref. to 6MT(diag)-45, DTC 24 CHECK CENTER DIFFERENTIAL CONTROL DIAL., Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	Manual mode switch	Open or short circuit in manual mode switch circuit	<Ref. to 6MT(diag)-47, DTC 31 MANUAL MODE SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
32	Parking brake switch	Open or short circuit in parking brake switch circuit	<Ref. to 6MT(diag)-51, DTC 32 CHECK PARKING BRAKE SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
33	Brake switch	Open or short circuit in brake switch circuit	<Ref. to 6MT(diag)-53, DTC 33 STOP LIGHT SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
34	ABS switch	Open or short circuit in ABS switch circuit	<Ref. to 6MT(diag)-55, DTC 34 ABS SWITCH SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

11.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC CANNOT BE CALLED UP

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK THE AUTO INDICATOR LIGHT.** Turn the ignition switch to ON.	Does the AUTO indicator light illuminate?	Go to step **5.**	Go to step **2.**
2	**CHECK THE GROUND CIRCUIT OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector of driver's control center differential control module. 3) Measure the resistance between driver's control center differential control module harness connector and chassis ground. ***Connector & terminal*** ***(B289) No. 36 — Chassis ground:*** ***(B289) No. 37 — Chassis ground:*** ***(B289) No. 38 — Chassis ground:*** ***(B289) No. 39 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit of driver's control center differential control module ground circuit.
3	**CHECK FUSE (No. 11).** Remove the fuse (No. 11).	Is the fuse (No. 11) is blown out?	Replace fuse (No. 11). If the replaced fuse (No. 11) is blown out easily, repair short circuit in harness between fuse (No. 11) and driver's control center differential control module.	Go to step **4.**
4	**CHECK IGNITION POWER SUPPLY CIRCUIT OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between driver's control center differential control module and chassis ground. ***Connector & terminal*** ***(B289) No. 15 (+) — Chassis ground (−):*** ***(B289) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **5.**	Repair the open circuit in harness between fuse (No. 11) and driver's control center differential control module, or fuse (No. 11) and battery.
5	**CHECK MANUAL MODE SWITCH.** Push the manual mode switch to enter the manual mode.	Is the manual mode obtained?	Go to step **6.**	Repair the switch. <Ref. to 6MT(diag)-47, DTC 31 MANUAL MODE SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
6	**CHECK DRIVER'S CONTROL CENTER DIFFERENTIAL INDICATOR LIGHT.** Operate the center differential control dial.	Does the center differential indicator light illuminate according to center differential control dial?	Go to step **8.**	Go to step **7.**
7	**CHECK THE CENTER DIFFERENTIAL CONTROL DIAL** <Ref. to 6MT(diag)-45, DTC 24 CHECK CENTER DIFFERENTIAL CONTROL DIAL., Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is the center differential control dial circuit normal?	Go to step **8.**	Repair it.

	Step	Check	Yes	No
8	**CHECK THE PARKING BRAKE SWITCH** <Ref. to 6MT(diag)-51, DTC 32 CHECK PARKING BRAKE SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is the parking brake switch circuit normal?	Go to step **9.**	Repair it.
9	**CHECK THE ACCELERATOR POSITION SENSOR** <Ref. to 6MT(diag)-36, DTC 21 ACCELERATOR POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is the accelerator position sensor circuit normal?	Go to step **10.**	Repair it.
10	**READ THE DTC** Read the DTC. <Ref. to 6MT(diag)-12, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is the DTC called up?	Go back to the Basic Diagnostic Procedure. <Ref. to 6MT(diag)-2, PROCEDURE, Basic Diagnostics Procedure.>	Go to step **11.**
11	**CHECK THE DRIVER'S CONTROL CENTER DIFFERENTIAL INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Disconnect harness connector from combination meter. 3) Turn the ignition switch to ON. (engine OFF) 4) Short between the combination meter harness connector and chassis ground. ***Connector & terminal*** ***(i12) No. 5 — Chassis ground:***	Does the lowest light of driver's control center differential indicator illuminate?	Go to step **12.**	Check the combination meter.
12	**CHECK THE HARNESS BETWEEN COMBINATION METER AND DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from driver's control center differential control module. 3) Measure the resistance of harness between combination meter harness connector and driver's control center differential control module harness connector. ***Connector & terminal*** ***(i12) No. 5 — (B289) No. 4:***	Is the resistance less than 1 Ω?	Go to step **13.**	Repair the open circuit and connector of harness between combination meter harness connector and driver's control center differential control module harness connector.
13	**CHECK THE HARNESS BETWEEN COMBINATION METER AND DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** Measure the resistance of harness between driver's control center differential control module harness connector and chassis ground. ***Connector & terminal*** ***(B289) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **14.**	Repair the open circuit and connector of harness between combination meter harness connector and driver's control center differential control module harness connector.
14	**CHECK THE POOR CONTACT IN HARNESS CONNECTOR**	Is there any poor contact in harness connectors of each circuit?	Repair the poor contact.	Replace the driver's control center differential control module.

B: CHECK REAR DIFFERENTIAL OIL TEMPERATURE SWITCH

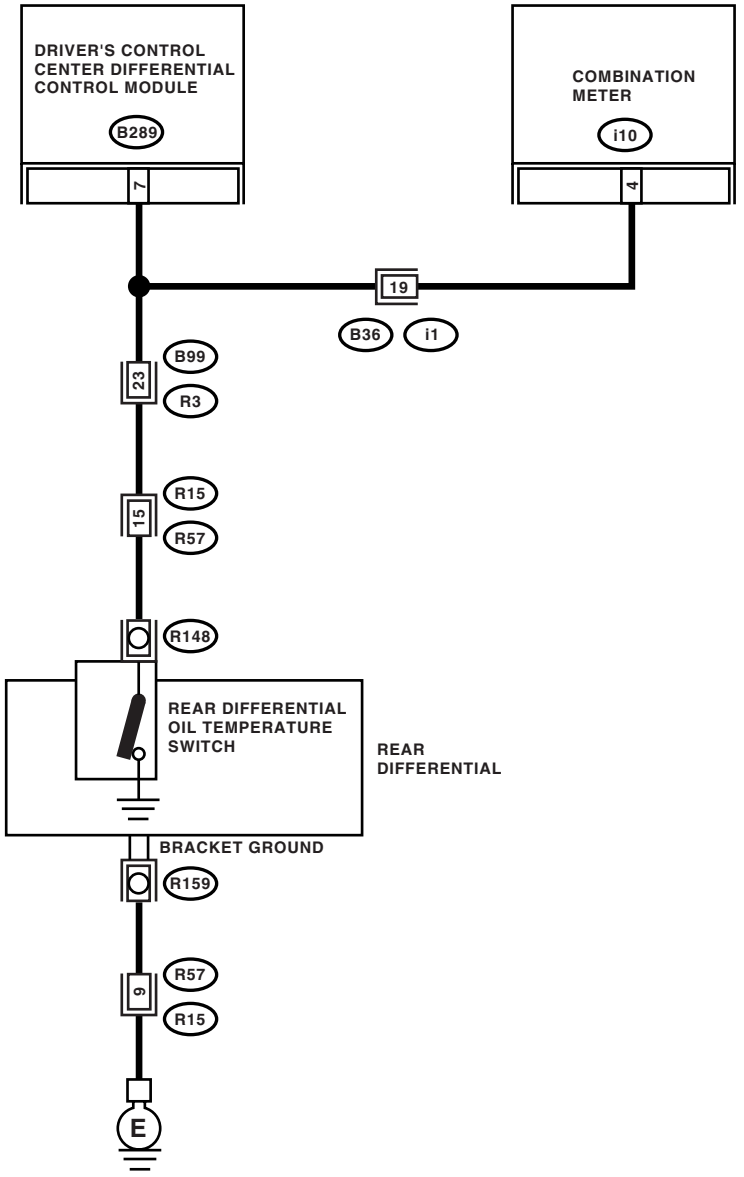
DIAGNOSIS:

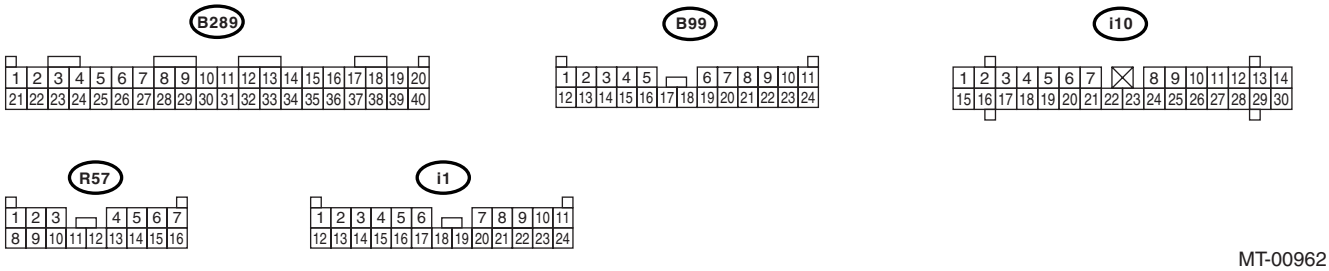
Input signal circuit of rear differential oil temperature switch is open or shorted.

TROUBLE SYMPTOM:

- Center differential stays free.
- Handling tends to oversteer.
- Rear differential oil temperature switch warning light illuminates.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK REAR DIFFERENTIAL OIL TEMPERATURE SWITCH WARNING LIGHT CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector of driver's control center differential control module harness connector. 3) Turn the ignition switch to ON. (engine OFF) 4) Measure the power supply voltage of rear differential oil temperature switch. ***Connector & terminal*** ***(B289) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 0.4 V?	Go to step **7.**	Go to step **2.**
2	**CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from the combination meter. 3) Measure the resistance between combination meter and driver's control center differential control module harness connector. ***Connector & terminal*** ***(B289) No. 7 — (i10) No. 4:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit between driver's control center differential control module and combination meter.
3	**CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND REAR DIFFERENTIAL OIL TEMPERATURE SWITCH.** 1) Disconnect the connector from the rear differential oil temperature switch. 2) Measure the resistance between driver's control center differential control module harness connector and rear differential oil temperature switch harness connector. ***Connector & terminal*** ***(B289) No. 7 — (R148) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit between driver's control center differential control module and rear differential oil temperature switch.
4	**CHECK REAR DIFFERENTIAL OIL TEMPERATURE SWITCH GROUND CIRCUIT.** 1) Disconnect the harness connector from bracket ground of rear differential. 2) Measure the resistance between the rear differential oil temperature switch ground harness connector and chassis ground. ***Connector & terminals*** ***(R159) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Repair the open circuit of rear differential oil temperature switch ground circuit and poor contact of harness connector.	Go to step **5.**
5	**CHECK REAR DIFFERENTIAL OIL TEMPERATURE SWITCH.** Measure the resistance between rear differential oil temperature switch terminal and rear differential oil temperature switch body. ***Terminals*** ***No. 1 — Rear differential oil temperature switch body:***	Is the resistance less than 1 Ω?	Go to step **6.**	Replace the rear differential oil temperature switch.
6	**CHECK REAR DIFFERENTIAL OIL TEMPERATURE SWITCH WARNING LIGHT.** 1) Turn the ignition switch to ON. 2) Short between the combination meter harness connector and chassis ground. ***Terminals*** ***No. 4 (+) — Chassis ground (–):***	Does the rear differential oil temperature switch warning light turn OFF?	Go to step **7.**	Replace the combination meter.

Step		Check	Yes	No
7	CHECK POOR CONTACT.	Is there any poor contact in the circuit of rear differential oil temperature switch?	Repair the poor contact.	Replace the driver's control center differential control module.

C: DTC 11 FRONT ABS WHEEL SPEED SENSOR RH SIGNAL

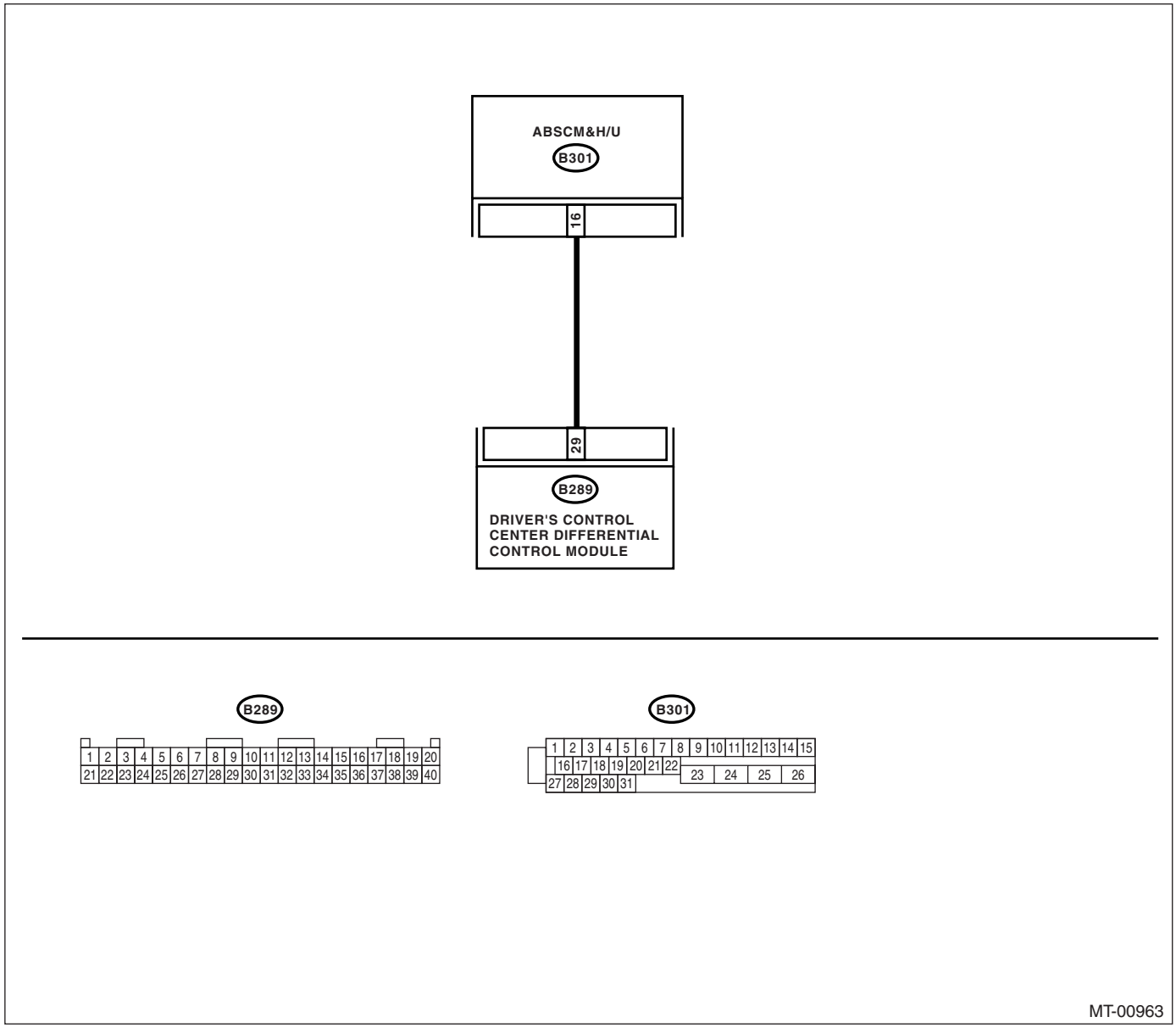
DIAGNOSIS:

Front ABS wheel speed sensor RH signal circuit is open or shorted.

TROUBLE SYMPTOM:

Tight corner braking condition occurs.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ABSCM&H/U.**	Is the DTC of front ABS wheel speed sensor RH displayed on ABS self diagnosis test mode?	Check with referring to DTC section of ABS. <Ref. to ABS(diag)-24, LIST, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of driver's control center differential control module and ABSCM&H/U. 3) Measure the resistance of harness between driver's control center differential control module and ABSCM&H/U harness connector. ***Connector & terminal*** ***(B289) No. 29 — (B301) No. 16:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open harness between driver's control center differential control module and ABSCM&H/U.
3	**CHECK HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ABSCM&H/U.** Measure the resistance of harness between harness connector of driver's control center differential control module and chassis ground. ***Connector & terminal*** ***(B289) No. 29 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short of harness between driver's control center differential control module and ABSCM&H/U.
4	**CHECK BATTERY SHORT OF HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ABSCM&H/U.** 1) Connect all the harness connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage of harness between harness connector of driver's control center differential control module and chassis ground. ***Connector & terminal*** ***(B289) No. 29 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **5.**	Repair the short of harness between driver's control center differential control module and ABSCM&H/U.

	Step	Check	Yes	No
5	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of driver's control center differential control module. 3) Lift-up the vehicle and place safety stands. NOTE: Raise all wheels off floor. 4) Connect the oscilloscope to terminal of driver's control center differential control module connector. ***Connector & terminal*** ***Positive probe; (B289) No. 29:*** ***Ground lead; (B289) No. 36:*** 5) Start the engine, and drive the wheels slowly. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-22, Clear Memory Mode.> 6) Measure the signal voltage indicated on oscilloscope.	Is the voltage less than 1 V ←→ more than 8 V?	Go to step **6.**	Check the ABSCM&H/U.
6	**CHECK POOR CONTACT IN HARNESS CONNECTORS.**	Is there any poor contact in harness connector?	Repair the poor contact.	Replace the driver's control center differential control module.

D: DTC 12 FRONT ABS WHEEL SPEED SENSOR LH SIGNAL

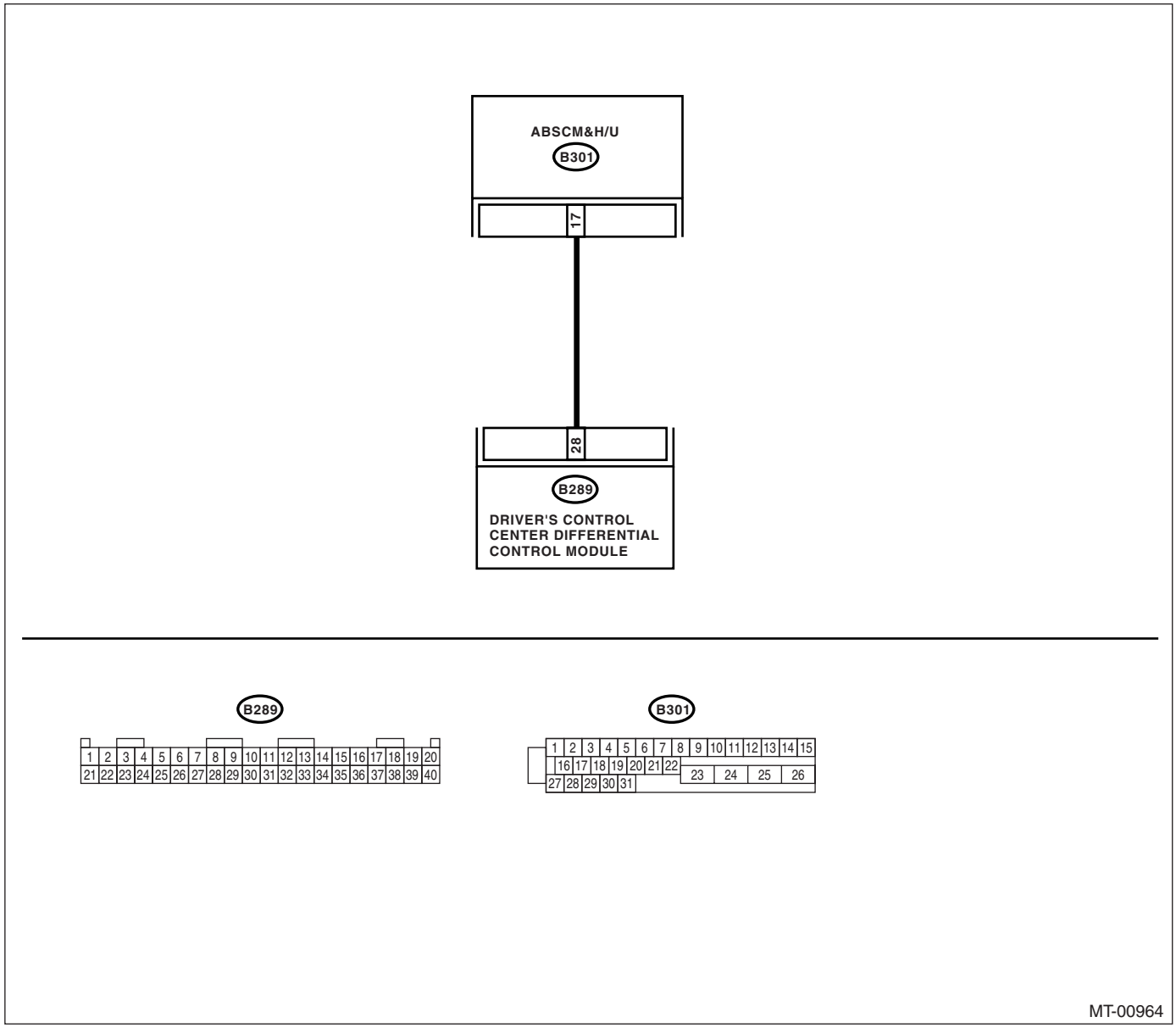
DIAGNOSIS:

Front ABS wheel speed sensor LH signal circuit is open or shorted.

TROUBLE SYMPTOM:

Tight corner braking condition occurs.

WIRING DIAGRAM:

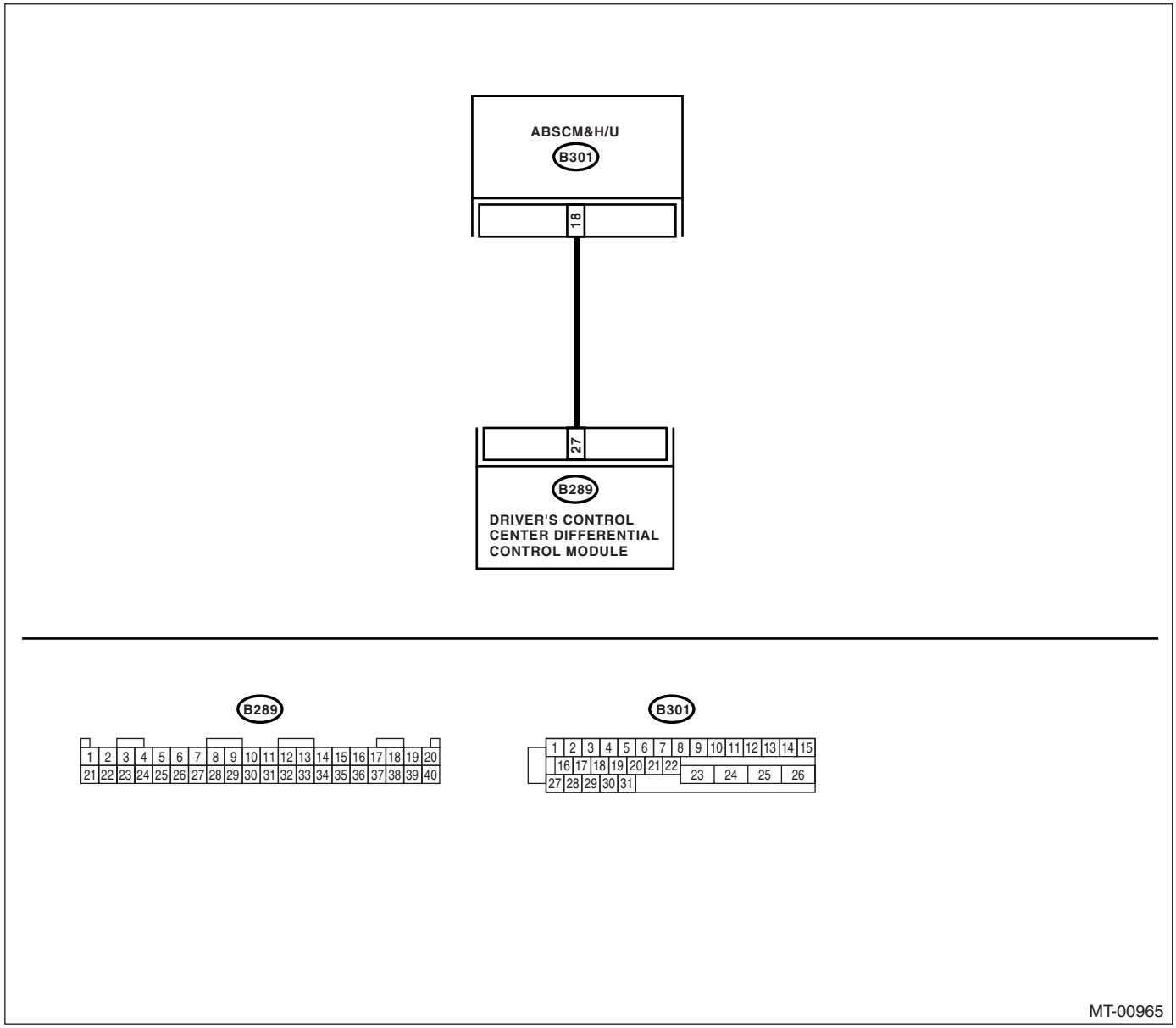


	Step	Check	Yes	No
1	**CHECK ABSCM&H/U.**	Is the DTC of front ABS wheel speed sensor LH displayed on ABS self diagnosis test mode?	Check with referring to DTC section of ABS. <Ref. to ABS(diag)-24, LIST, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of driver's control center differential control module and ABSCM&H/U. 3) Measure the resistance of harness between driver's control center differential control module and ABSCM&H/U harness connector. ***Connector & terminal*** ***(B289) No. 28 — (B301) No. 17:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open harness between driver's control center differential control module and ABSCM&H/U.
3	**CHECK HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ABSCM&H/U.** Measure the resistance of harness between harness connector of driver's control center differential control module and chassis ground. ***Connector & terminal*** ***(B289) No. 28 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short of harness between driver's control center differential control module and ABSCM&H/U.
4	**CHECK BATTERY SHORT OF HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ABSCM&H/U.** 1) Connect all the harness connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage of harness between harness connector of driver's control center differential control module and chassis ground. ***Connector & terminal*** ***(B289) No. 28 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **5.**	Repair the short of harness between driver's control center differential control module and ABSCM&H/U.

	Step	Check	Yes	No
5	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of driver's control center differential control module. 3) Lift-up the vehicle and place safety stands. NOTE: Raise all wheels off floor. 4) Connect the oscilloscope to terminal of driver's control center differential control module connector. ***Connector & terminal*** ***Positive probe; (B289) No. 28:*** ***Ground lead; (B289) No. 36:*** 5) Start the engine, and drive the wheels slowly. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-22, Clear Memory Mode.> 6) Measure the signal voltage indicated on oscilloscope.	Is the voltage less than 1 V ⟷ more than 8 V?	Go to step **6.**	Check the ABSCM&H/U.
6	**CHECK POOR CONTACT IN HARNESS CONNECTORS.**	Is there any poor contact in harness connector?	Repair the poor contact.	Replace the driver's control center differential control module.

E: DTC 13 REAR ABS WHEEL SPEED SENSOR RH SIGNAL

DIAGNOSIS:
Rear ABS wheel speed sensor RH signal circuit is open or shorted.
TROUBLE SYMPTOM:
Tight corner braking condition occurs.
WIRING DIAGRAM:



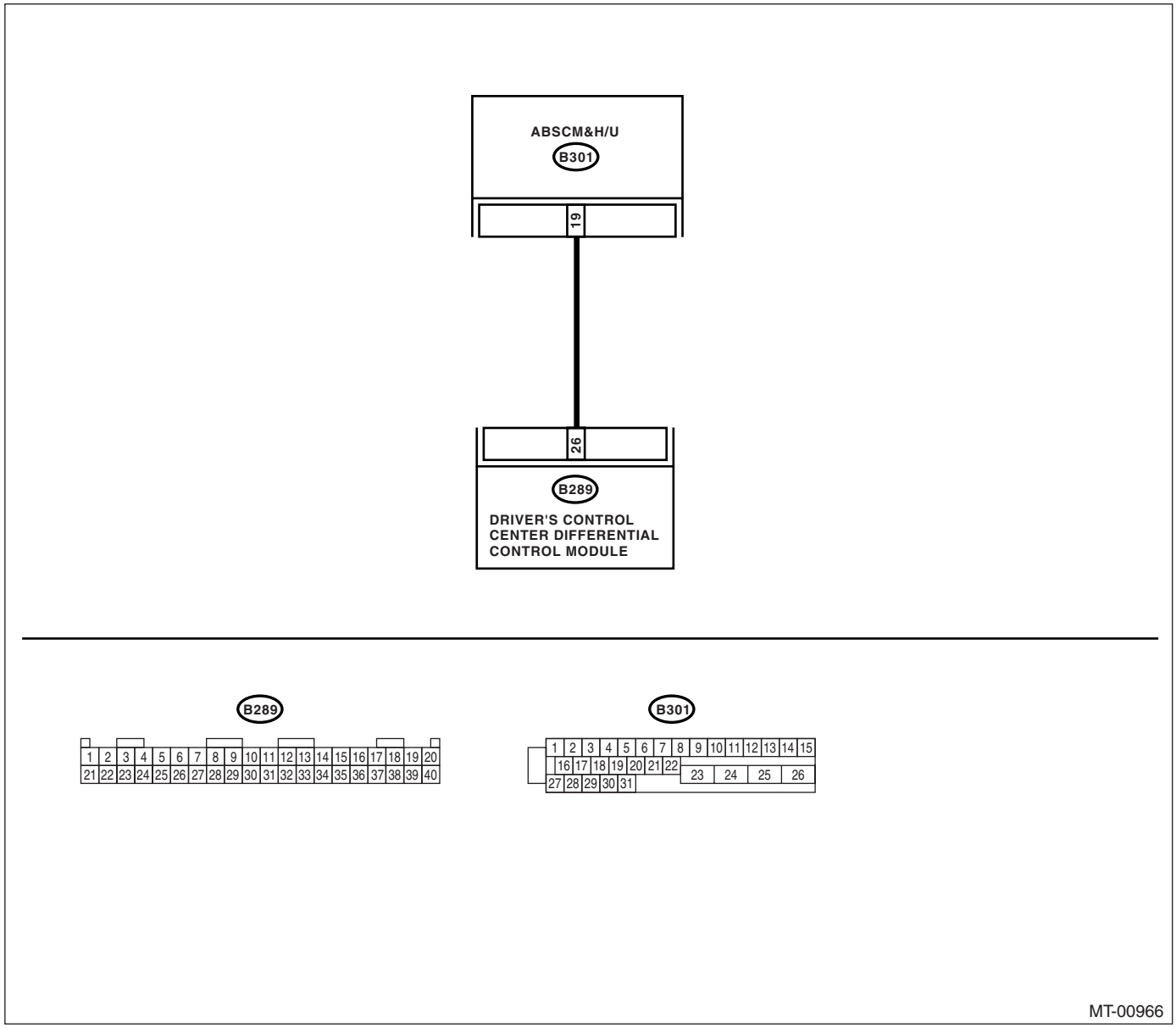
Step	Check	Yes	No
1 **CHECK ABSCM&H/U.**	Is the DTC of rear ABS wheel speed sensor RH displayed on ABS self diagnosis test mode?	Check with referring to DTC section of ABS. <Ref. to ABS(diag)-24, LIST, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of driver's control center differential control module and ABSCM&H/U. 3) Measure the resistance of harness between driver's control center differential control module and ABSCM&H/U harness connector. ***Connector & terminal*** ***(B289) No. 27 — (B301) No. 18:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open harness between driver's control center differential control module and ABSCM&H/U.
3	**CHECK HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ABSCM&H/U.** Measure the resistance of harness between harness connector of driver's control center differential control module and chassis ground. ***Connector & terminal*** ***(B289) No. 27 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short of harness between driver's control center differential control module and ABSCM&H/U.
4	**CHECK BATTERY SHORT OF HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ABSCM&H/U.** 1) Connect all the harness connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage of harness between harness connector of driver's control center differential control module and chassis ground. ***Connector & terminal*** ***(B289) No. 27 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **5.**	Repair the short of harness between driver's control center differential control module and ABSCM&H/U.
5	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of driver's control center differential control module. 3) Lift-up the vehicle and place safety stands. NOTE: Raise all wheels off floor. 4) Connect the oscilloscope to terminal of driver's control center differential control module connector. ***Connector & terminal*** ***Positive probe; (B289) No. 27:*** ***Ground lead; (B289) No. 36:*** 5) Start the engine, and drive the wheels slowly. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-22, Clear Memory Mode.> 6) Measure the signal voltage indicated on oscilloscope.	Is the voltage less than 1 V ⟷ more than 8 V?	Go to step **6.**	Check the ABSCM&H/U.

Step		Check	Yes	No
6	**CHECK POOR CONTACT IN HARNESS CONNECTORS.**	Is there any poor contact in harness connector?	Repair the poor contact.	Replace the driver's control center differential control module.

F: DTC 14 REAR ABS WHEEL SPEED SENSOR LH SIGNAL

DIAGNOSIS:
Rear ABS wheel speed sensor LH signal circuit is open or shorted.
TROUBLE SYMPTOM:
Tight corner braking condition occurs.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ABSCM&H/U.**	Is the DTC of rear ABS wheel speed sensor LH displayed on ABS self diagnosis test mode?	Check with referring to DTC section of ABS. <Ref. to ABS(diag)-24, LIST, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of driver's control center differential control module and ABSCM&H/U. 3) Measure the resistance of harness between driver's control center differential control module and ABSCM&H/U harness connector. ***Connector & terminal*** ***(B289) No. 26 — (B301) No. 19:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open harness between driver's control center differential control module and ABSCM&H/U.
3	**CHECK HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ABSCM&H/U.** Measure the resistance of harness between harness connector of driver's control center differential control module and chassis ground. ***Connector & terminal*** ***(B289) No. 26 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short of harness between driver's control center differential control module and ABSCM&H/U.
4	**CHECK BATTERY SHORT OF HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ABSCM&H/U.** 1) Connect all the harness connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage of harness between harness connector of driver's control center differential control module and chassis ground. ***Connector & terminal*** ***(B289) No. 26 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **5.**	Repair the short of harness between driver's control center differential control module and ABSCM&H/U.
5	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of driver's control center differential control module. 3) Lift-up the vehicle and place safety stands. NOTE: Raise all wheels off floor. 4) Connect the oscilloscope to terminal of driver's control center differential control module connector. ***Connector & terminal*** ***Positive probe; (B289) No. 26:*** ***Ground lead; (B289) No. 36:*** 5) Start the engine, and drive the wheels slowly. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-22, Clear Memory Mode.> 6) Measure the signal voltage indicated on oscilloscope.	Is the voltage less than 1 V ⟷ more than 8 V?	Go to step **6.**	Check the ABSCM&H/U.

Step		Check	Yes	No
6	**CHECK POOR CONTACT IN HARNESS CONNECTORS.**	Is there any poor contact in harness connector?	Repair the poor contact.	Replace the driver's control center differential control module.

G: DTC 21 ACCELERATOR POSITION SENSOR

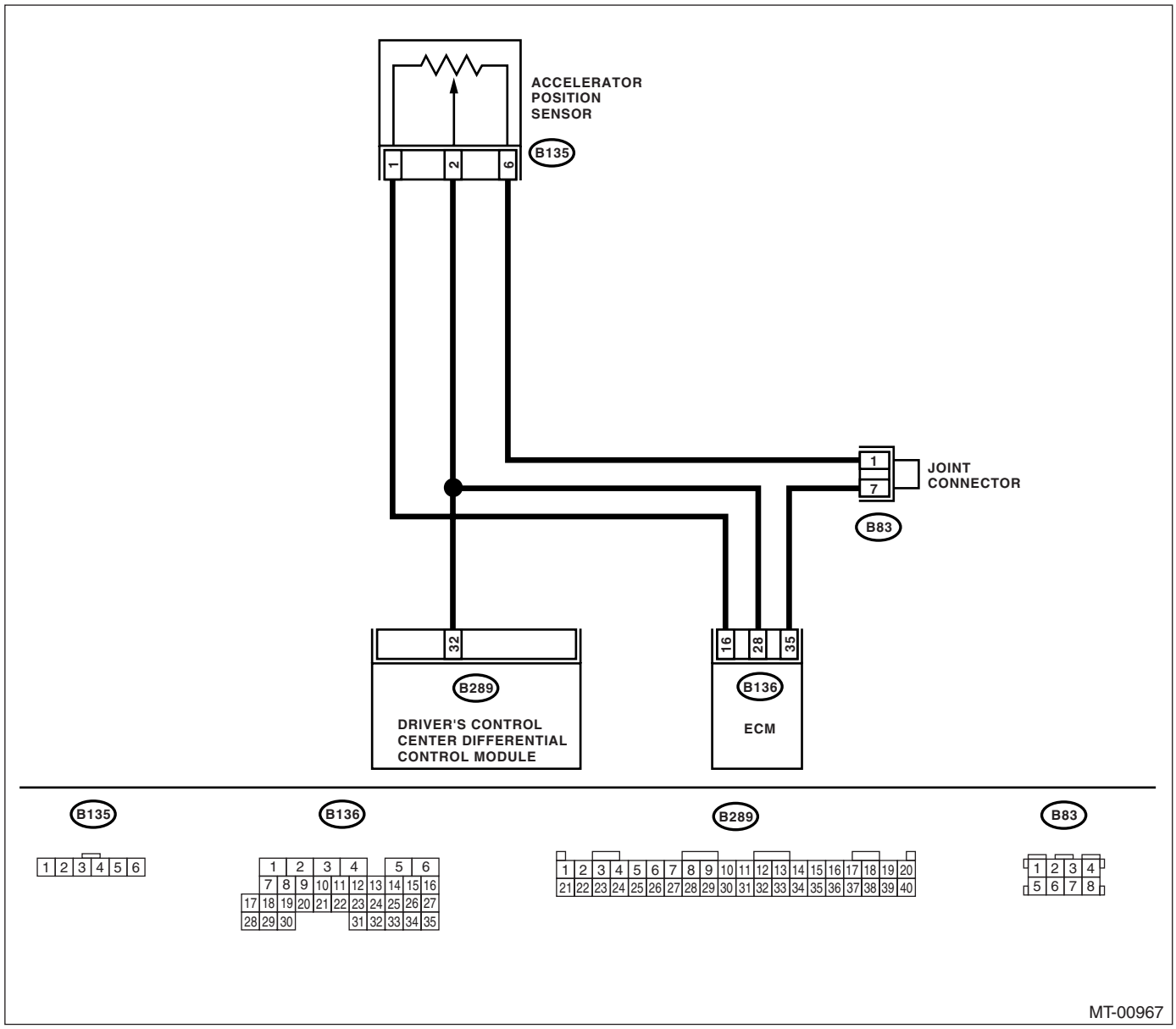
DIAGNOSIS:

The accelerator position sensor input signal circuit is open or shorted.

TROUBLE SYMPTOM:

- Tight corner braking condition occurs.
- Handling tends to oversteer.

WIRING DIAGRAM:



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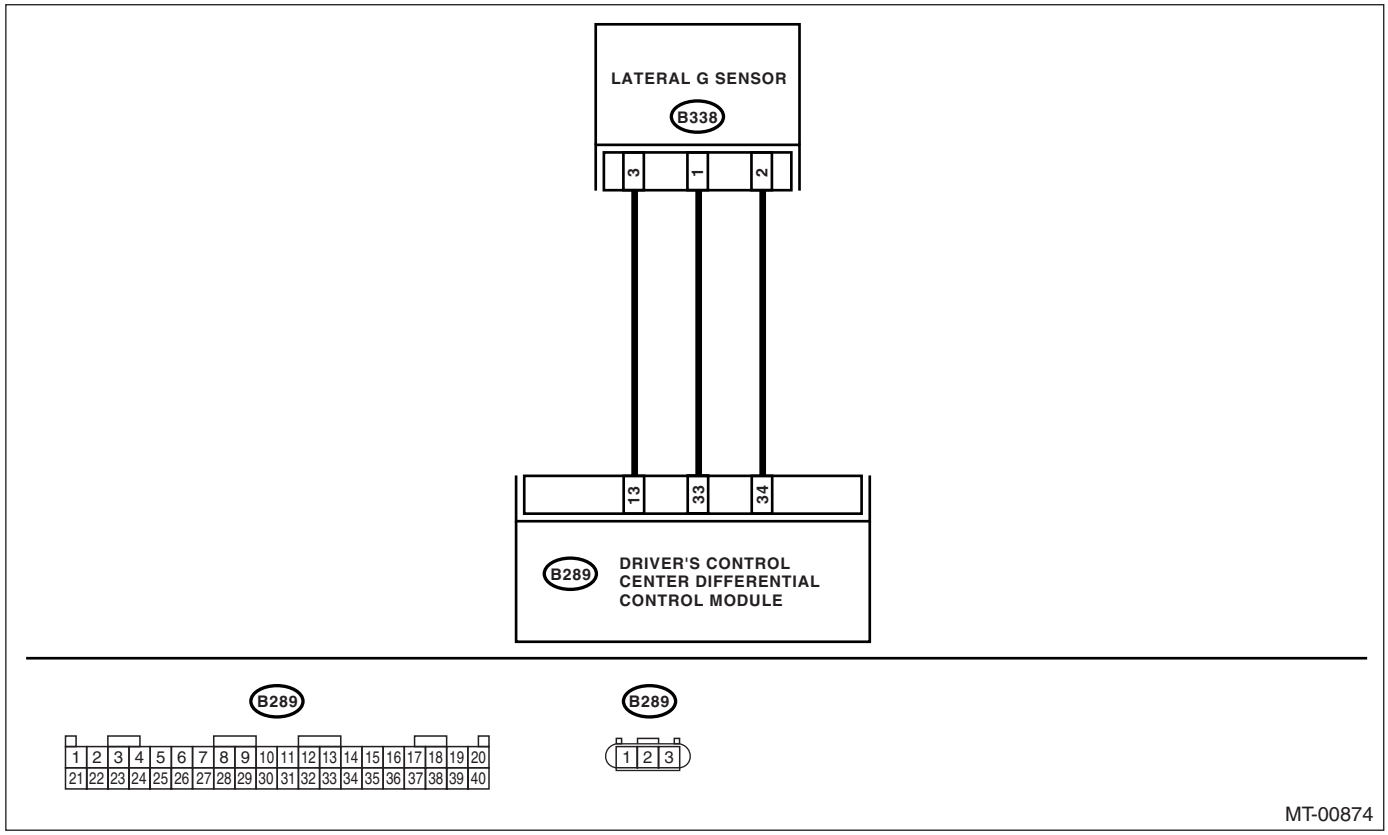
	Step	Check	Yes	No
1	**CHECK DTC.**	Is the DTC displayed on engine self diagnosis test mode?	Check with referring to DTC section of engine. <Ref. to EN(H4DOTC)(diag)-71, LIST, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ACCELERATOR POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of driver's control center differential control module and accelerator position sensor. 3) Measure the resistance of harness between driver's control center differential control module harness connector and accelerator position sensor. ***Connector & terminal*** ***(B289) No. 32 — (B135) No. 2:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit of harness between driver's control center differential control module and accelerator position sensor.
3	**CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ECM.** 1) Disconnect the harness connector of ECM. 2) Measure the resistance of harness between driver's control center differential control module harness connector and ECM harness connector. ***Connector & terminal*** ***(B289) No. 32 — (B136) No. 28:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness between driver's control center differential control module and ECM.
4	**CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ACCELERATOR POSITION SENSOR.** Measure the resistance of harness between driver's control center differential control module harness connector and chassis ground. ***Connector & terminal*** ***(B289) No. 32 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit of harness between driver's control center differential control module and accelerator position sensor and ECM.
5	**CHECK INPUT SIGNAL OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** 1) Connect the connectors to driver's control center differential control module and accelerator position sensor. 2) Turn the ignition switch to ON (engine OFF). 3) Release the accelerator pedal. 4) Measure the voltage between driver's control center differential control module harness connector and chassis ground. ***Connector & terminal*** ***(B289) No. 32 (+) — Chassis ground (−):***	Is the voltage 0.3 — 1.8 V?	Go to step **6.**	Go to step **7.**

	Step	Check	Yes	No
6	**CHECK INPUT SIGNAL OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** 1) Fully depress the accelerator pedal. 2) Measure the voltage between driver's control center differential control module harness connector and chassis ground. ***Connector & terminal*** ***(B289) No. 32 (+) — Chassis ground (−):***	Is the voltage 2.8 — 4.7 V?	Go to step **8.**	Go to step **7.**
7	**CHECK THE POOR CONTACT.**	Is there any poor contact in accelerator position sensor circuit?	Repair the poor contact.	Replace the driver's control center differential control module.
8	**CHECK THE POOR CONTACT.**	Is there any poor contact in accelerator position sensor circuit?	Repair the poor contact.	Check the ECM.

H: DTC 22 LATERAL G SENSOR

DIAGNOSIS:
The lateral G sensor input signal circuit is open or shorted.
TROUBLE SYMPTOM:
Handling tends to understeer at high speed cornering.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE CONNECTOR AND LATERAL G SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from driver's control center differential control module and lateral G sensor. 3) Measure the resistance of harness between driver's control center differential control module connector and lateral G sensor connector. ***Connector & terminal*** ***(B289) No. 33 — (B338) No. 1:*** ***(B289) No. 34 — (B338) No. 2:*** ***(B289) No. 13 — (B338) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open harness between driver's control center differential control module connector and lateral G sensor connector.

	Step	Check	Yes	No
2	**CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE CONNECTOR AND LATERAL G SENSOR CONNECTOR.** Measure the resistance between driver's control center differential control module harness connector and chassis ground. ***Connector & terminal*** ***(B289) No. 33 — Chassis ground:*** ***(B289) No. 34 — Chassis ground:*** ***(B289) No. 13 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short of harness between driver's control center differential control module connector and lateral G sensor connector.
3	**CHECK THE LATERAL G SENSOR.** 1) Remove the lateral G sensor from body. 2) Connect the connector to lateral G sensor. 3) Connect the connector to driver's control center differential control module. 4) Turn the ignition switch to ON. 5) Measure the voltage between lateral G sensor terminals when the lateral G sensor is horizontal. ***Connector & terminal*** ***(B338) No. 1 (+) — No. 2 (–):***	Is the voltage 2.3 — 2.7 V?	Go to step **4.**	Replace the lateral G sensor.
4	**CHECK THE G SENSOR.** Measure the voltage between lateral G sensor terminals when the lateral G sensor connector is tilted 90° to right. ***Connector & terminal*** ***(B338) No. 1 (+) — No. 2 (–):***	Is the voltage 3.5 — 4.1 V?	Go to step **5.**	Replace the lateral G sensor.
5	**CHECK THE G SENSOR.** Measure the voltage between lateral G sensor terminals when lateral G sensor connector is tilted 90° to left. ***Connector & terminal*** ***(B338) No. 1 (+) — No. 2 (–):***	Is the voltage 0.8 — 1.5 V?	Go to step **6.**	Replace the lateral G sensor.
6	**CHECK THE POOR CONTACT OF CONNECTOR.**	Is there any poor contact in connector between driver's control center differential control module and lateral G sensor.	Repair the poor contact.	Replace the driver's control center differential control module.

I: DTC 23 CHECK CENTER DIFFERENTIAL.

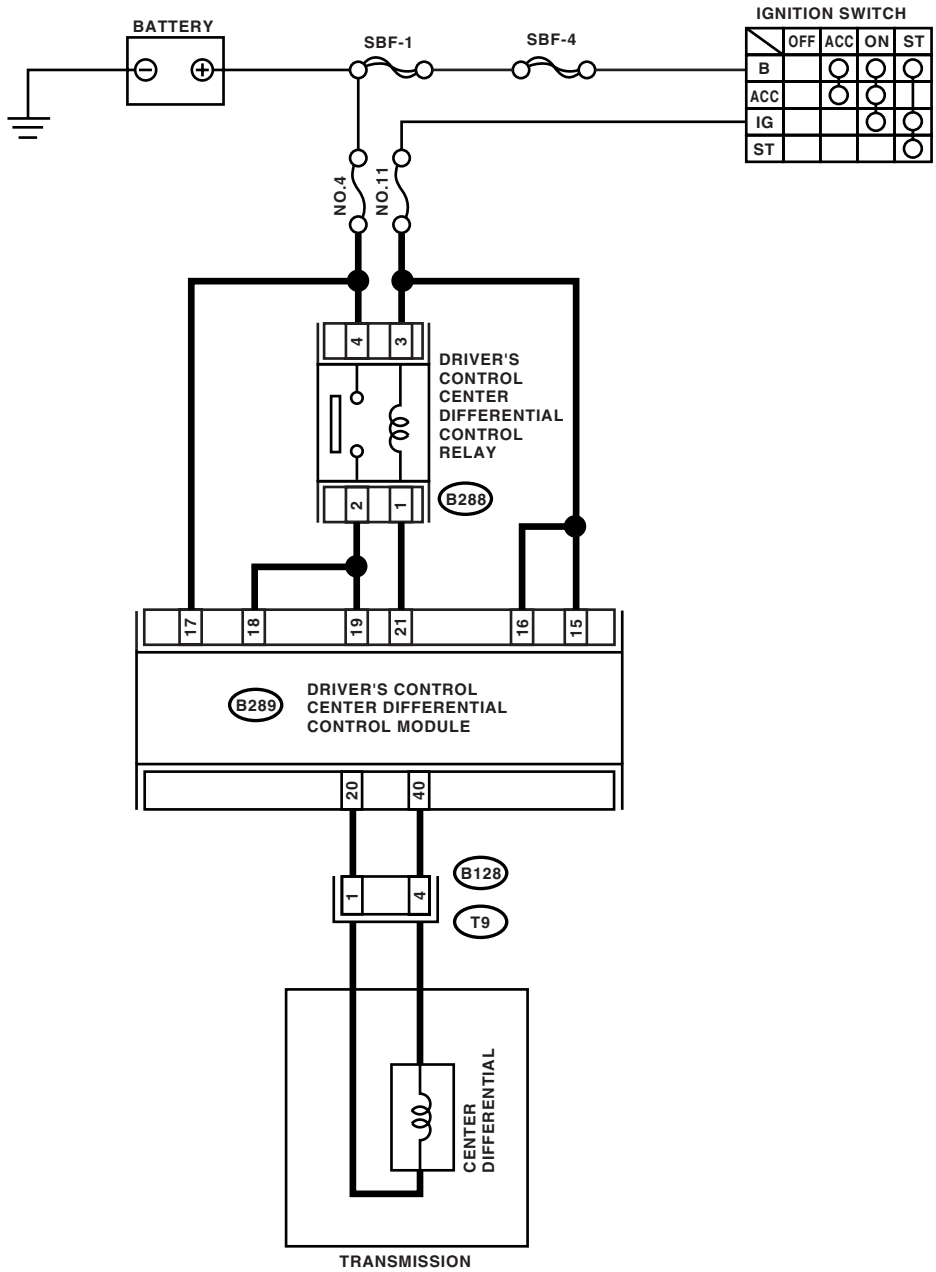
DIAGNOSIS:

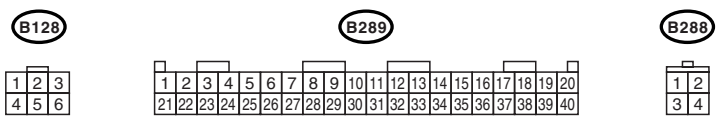
Output signal circuit of center differential is open or shorted.

TROUBLE SYMPTOM:

- Center differential does not operate.
- Lock ratio of center differential does not operate, or malfunction occurs.
- Tight corner braking condition occurs.
- Handling tends to oversteer.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND TRANSMISSION HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of driver's control center differential control module. 3) Disconnect the transmission harness connector and bulk harness connector. 4) Measure the resistance of harness between driver's control center differential control module harness connector and transmission harness connector. ***Connector & terminal*** ***(B289) No. 20 — (B128) No. 1:*** ***(B289) No. 40 — (B128) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit of bulk harness between driver's control center differential control module and transmission harness.
2	**CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND TRANSMISSION HARNESS.** Measure the resistance between driver's control center differential control module harness connector and chassis ground. ***Connector & terminal*** ***(B289) No. 20 — Chassis ground:*** ***(B289) No. 40 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit of bulk harness between driver's control center differential control module and transmission harness.
3	**CHECK THE CENTER DIFFERENTIAL.** Measure the resistance between transmission harness connector terminals. ***Connector & terminals*** ***(T9) No. 1 — No. 4:***	Is the resistance 1.0 — 2.0 Ω?	Go to step **4.**	Replace the center differential.
4	**CHECK THE OUTPUT SIGNAL OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** 1) Connect all the harness connectors. 2) Turn the ignition switch to ON. (engine OFF) 3) Release the parking brake. 4) Set the center differential control dial to differential lock. 5) Measure the voltage between driver's control center differential control module and harness connector. ***Connector & terminal*** ***(B289) No. 20 (+) — (B289) No. 40 (–):***	Is the voltage 6.0 — 7.0 V?	Go to step **5.**	Go to step **6.**

	Step	Check	Yes	No
5	**CHECK THE OUTPUT SIGNAL OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** 1) Turn the center differential control dial from differential lock to differential free position. 2) Measure the voltage between driver's control center differential control module and harness connector. ***Connector & terminal*** ***(B289) No. 20 (+) — (B289) No. 40 (–):***	Does the voltage change smoothly?	Circuit is already returned to normal condition this time though the indicator light illuminates. A temporary poor connector or harness may be the case. Repair the poor contact in connector or harness of driver's control center differential control module and transmission harness. Check the poor contact in power supply circuit, too.	Go to step **6.**
6	**CHECK FUSE (No. 4).** Remove the fuse (No. 4).	Is the fuse (No. 4) is blown out?	Replace fuse (No. 4). If the replaced fuse (No. 4) is blown out easily, repair short circuit in harness between fuse (No. 4) and driver's control center differential control module.	Go to step **7.**
7	**CHECK POWER SUPPLY CIRCUIT OF DRIVER'S CONTROL CENTER DIFFERENTIAL RELAY.** 1) Disconnect the harness connector of driver's control center differential relay. 2) Measure the voltage between driver's control center differential relay harness connector and chassis ground. ***Connector & terminal*** ***(B288) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **8.**	Repair the open or short circuit between fuse (No. 4) and driver's control center differential relay.
8	**CHECK IGNITION POWER SUPPLY CIRCUIT OF DRIVER'S CONTROL CENTER DIFFERENTIAL RELAY.** Measure the voltage between driver's control center differential relay and chassis ground. ***Connector & terminal*** ***(B288) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **9.**	Repair the open circuit between fuse (No. 11) and driver's control center differential control module.
9	**CHECK HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND DRIVER'S CONTROL RELAY.** Measure the resistance of harness between driver's control center differential control module harness connector and driver's control relay harness connector. ***Connector & terminal*** ***(B289) No. 18 — (B288) No. 2:*** ***(B289) No. 19 — (B288) No. 2:*** ***(B289) No. 21 — (B288) No. 1:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair the open circuit between driver's control center differential control module harness connector and driver's control relay harness connector.

	Step	Check	Yes	No
10	**CHECK HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND DRIVER'S CONTROL RELAY.** Measure the resistance of harness between driver's control center differential control module harness connector and chassis ground. ***Connector & terminal*** ***(B289) No. 18 — Chassis ground:*** ***(B289) No. 19 — Chassis ground:*** ***(B289) No. 21 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **11.**	Repair the short circuit between driver's control center differential control module harness connector and driver's control relay harness connector.
11	**CHECK DRIVER'S CONTROL RELAY.** Measure the resistance between driver's control relay terminals. ***Terminals*** ***No. 4 — No. 2:***	Is the resistance more than 1 MΩ?	Go to step **12.**	Replace the driver's control relay.
12	**CHECK DRIVER'S CONTROL RELAY.** Connect the terminal No. 3 to battery positive side, and terminal No. 1 to battery negative side, and then measure the resistance between driver's control relay terminals. ***Terminals*** ***No. 4 — No. 2:***	Is the resistance less than 1 Ω?	Go to step **13.**	Replace the driver's control relay.
13	**CHECK IGNITION POWER SUPPLY CIRCUIT OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** 1) Connect all connectors. 2) Turn the ignition switch to ON. (engine OFF) 3) Measure the voltage between driver's control center differential control module and chassis ground. ***Connector & terminal*** ***(B289) No. 21 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **14.**	Go to step **15.**
14	**CHECK IGNITION POWER SUPPLY CIRCUIT OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** Measure the voltage between driver's control center differential control module and chassis ground. ***Connector & terminal*** ***(B289) No. 18 (+) — Chassis ground (−):*** ***(B289) No. 19 (+) — Chassis ground (−):***	Is the voltage 8 V or more?	Even if the indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact in connector or harness may be the cause. Repair the poor contact in harness or connector for driver's control center differential control module and transmission.	Go to step **15.**
15	**CHECK THE POOR CONTACT IN HARNESS CONNECTOR**	Is there any poor contact in harness connectors of each circuit?	Repair the poor contact.	Replace the driver's control center differential control module.

J: DTC 24 CHECK CENTER DIFFERENTIAL CONTROL DIAL.

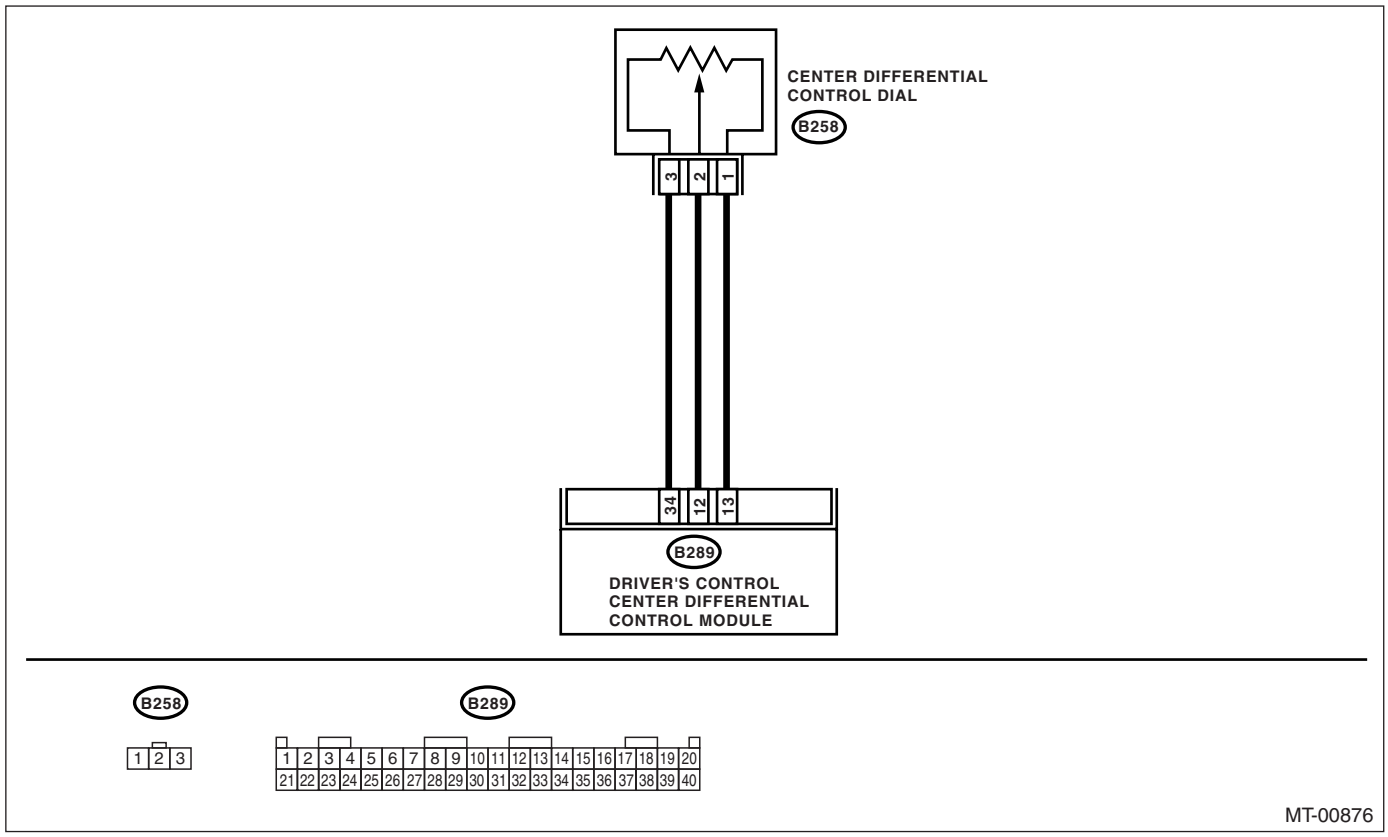
DIAGNOSIS:

Input signal circuit of center differential control dial is open or shorted.

TROUBLE SYMPTOM:

- Indicator light does not operate though setting the center differential control dial.
- Torque characteristics do not change.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND CENTER DIFFERENTIAL CONTROL DIAL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector of driver's control center differential control module and center differential control dial. 3) Measure the resistance of harness between driver's control center differential control module and center differential control dial harness connector. ***Connector & terminal*** ***(B258) No. 1 — (B289) No. 13:*** ***(B258) No. 2 — (B289) No. 12:*** ***(B258) No. 3 — (B289) No. 34:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit between driver's control center differential control module and center differential control dial.

	Step	Check	Yes	No
2	**CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND CENTER DIFFERENTIAL CONTROL DIAL.** Measure the resistance between driver's control center differential control module harness connector and chassis ground. ***Connector & terminal*** ***(B289) No. 13 — Chassis ground:*** ***(B289) No. 12 — Chassis ground:*** ***(B289) No. 34 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit between driver's control center differential control module and center differential control dial.
3	**CHECK THE CENTER DIFFERENTIAL CONTROL DIAL.** 1) Remove the center differential control dial. 2) Measure the resistance between center differential control dial connectors. ***Terminals*** ***No. 1 — No. 3:***	Is the resistance 7.5 — 12.5 kΩ?	Go to step **4.**	Replace the driver's control dial.
4	**CHECK THE CENTER DIFFERENTIAL CONTROL DIAL.** Measure the resistance between center differential control dial connectors. ***Terminals*** ***No. 1 — No. 2:***	Dose the resistance change smoothly when setting the dial from differential lock to differential free?	Go to step **5.**	Replace the center differential control dial.
5	**CHECK THE OUTPUT POWER SUPPLY OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** 1) Connect all the harness connectors. 2) Turn the ignition switch to ON. (engine OFF) 3) Set the manual mode switch to manual mode. 4) Measure the voltage between driver's control center differential control module harness connector and chassis ground. ***Connector & terminal*** ***(B289) No. 13 (+) — (B289) No. 34 (−):***	Is the voltage approx. 5 V?	Go to step **6.**	Replace the driver's control center differential control module.
6	**CHECK POOR CONTACT IN HARNESS CONNECTORS.**	Is there any poor contact in harness connector of center differential control dial circuit?	Repair the poor contact of harness connector.	Replace the driver's control center differential control module.

K: DTC 31 MANUAL MODE SWITCH

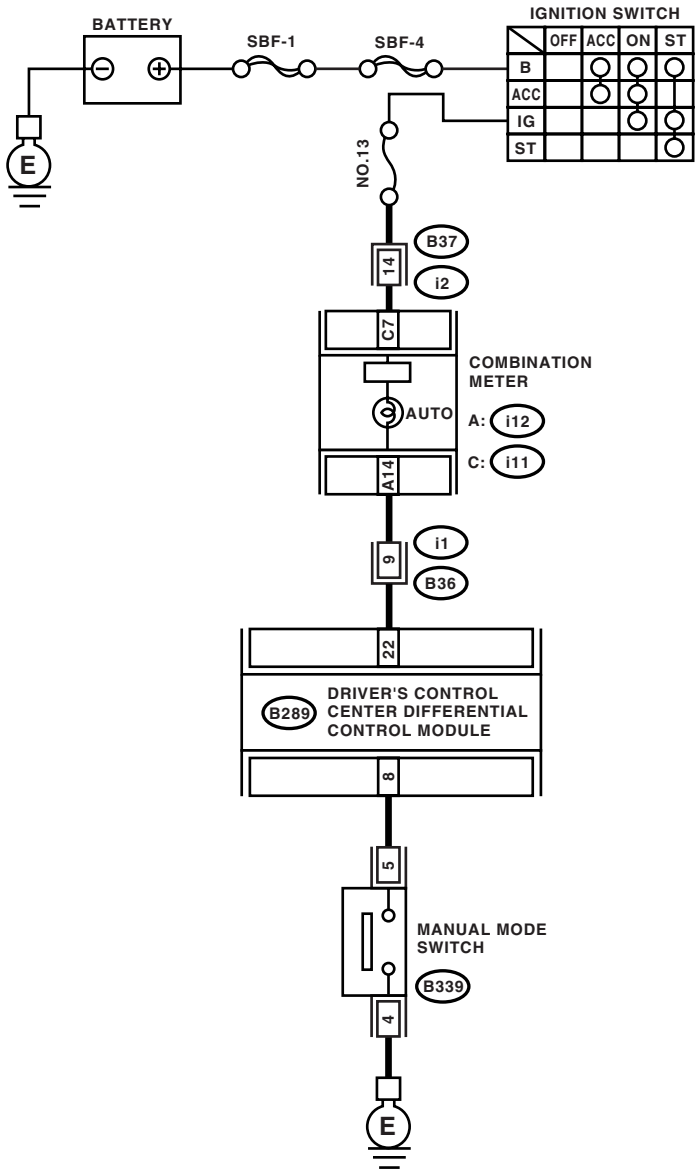
DIAGNOSIS:

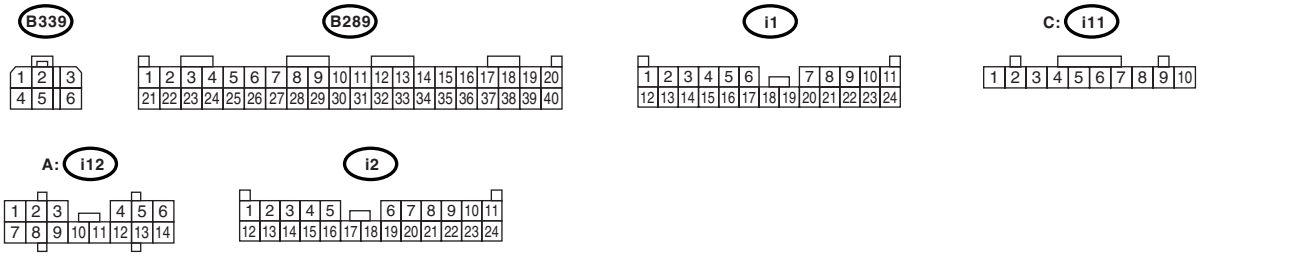
Input signal circuit of manual mode switch circuit is open or shorted.

TROUBLE SYMPTOM:

- Driver's control center differential can not be manual mode. Or can not be auto mode.
- AUTO indicator does not illuminate, or does not go off.

WIRING DIAGRAM:





MT-00968

	Step	Check	Yes	No
1	**CHECK OPERATION OF MANUAL MODE SWITCH.** Set the manual mode switch to auto mode.	Does the AUTO indicator light in combination meter illuminate?	Go to step **8.**	Go to step **2.**
2	**CHECK AUTO INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of driver's control center differential control module. 3) Turn the ignition switch to ON. (Engine OFF) 4) Short between the driver's control center differential control module and chassis ground. ***Connector & terminal*** ***(B289) No. 22 — Chassis ground:***	Does the AUTO indicator light in combination meter illuminate?	Go to step **8.**	Go to step **3.**
3	**CHECK POWER SUPPLY OF COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of combination meter. 3) Turn the ignition switch to ON. (Engine OFF) 4) Measure the voltage between combination meter harness connector and chassis ground. ***Connector & terminal*** ***(i11) No. 7 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Check and repair the open and short of harness between battery and combination meter, and poor contact of harness connector.
4	**CHECK THE HARNESS BETWEEN COMBINATION METER AND DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of combination meter. 3) Measure the resistance between combination meter harness connector and driver's control center differential control module harness connector. ***Connector & terminal*** ***(i12) No. 14 — (B289) No. 22:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit of harness between combination meter harness connector and driver's control center differential control module harness connector, and poor contact of harness connector.
5	**CHECK THE HARNESS BETWEEN COMBINATION METER AND DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** Measure the resistance between driver's control center differential control module harness connector and chassis ground. ***Connector & terminal*** ***(B289) No. 22 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the short circuit of harness between combination meter harness connector and driver's control center differential control module harness connector.
6	**CHECK HARNESS CONNECTOR POOR CONTACT.**	Is there any poor contact in the circuit between combination meter and driver's control module?	Repair the poor contact.	Go to step **7.**
7	**CHECK AUTO INDICATOR LIGHT.** 1) Connect the harness connector of combination meter. 2) Short between the driver's control center differential control module harness connector and chassis ground. ***Connector & terminal*** ***(B289) No. 22 — Chassis ground:***	Does the AUTO indicator light light up?	Replace the driver's control center differential control module.	Replace the combination meter.

	Step	Check	Yes	No
8	**CHECK GROUND CIRCUIT OF MANUAL MODE SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the manual mode switch connector. 3) Measure the resistance between manual mode switch harness connector and chassis ground. ***Connector & terminal*** ***(B339) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Repair the open circuit of harness between manual mode switch harness connector and chassis ground.	Go to step **9.**
9	**CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND MANUAL MODE SWITCH.** 1) Disconnect the driver's control center differential control module harness connector. 2) Measure the resistance of harness between driver's control center differential control module and manual mode switch. ***Connector & terminal*** ***(B289) No. 8 — (B339) No. 5:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair the open circuit of harness between driver's control center differential control module and manual mode switch.
10	**CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND MANUAL MODE SWITCH.** Measure the resistance of harness between driver's control center differential control module and chassis ground. ***Connector & terminal*** ***(B289) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **11.**	Repair the short circuit of harness between driver's control center differential control module and manual mode switch.
11	**CHECK THE MANUAL MODE SWITCH.** 1) Remove the manual mode switch. 2) Measure the resistance of between manual mode switch connectors. ***Terminals*** ***No. 4 — No. 5:***	Is the resistance more than 1 MΩ?	Go to step **12.**	Replace the manual mode switch.
12	**CHECK THE MANUAL MODE SWITCH.** 1) Keep depressing the manual mode switch. 2) Measure the resistance of between manual mode switch connectors. ***Terminals*** ***No. 4 — No. 5:***	Is the resistance less than 1 Ω?	Go to step **13.**	Replace the manual mode switch.
13	**CHECK THE INPUT SIGNAL OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** 1) Install the manual mode switch. 2) Connect the harness connector of driver's control center differential control module. 3) Turn the ignition switch to ON. (engine OFF) 4) Measure the voltage between driver's control center differential control module and chassis ground. ***Connector & terminal*** ***(B289) No. 8 (+) — Chassis ground (−):***	Is the voltage more than 4.3 V?	Go to step **14.**	Replace the driver's control center differential control module.

	Step	Check	Yes	No
14	**CHECK THE INPUT SIGNAL OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** 1) Keep depressing the manual mode switch. 2) Measure the voltage between driver's control center differential control module and chassis ground. ***Connector & terminal*** ***(B289) No. 8 (+) — Chassis ground (−):***	Is the voltage less than 0.1 V?	Go to step **15.**	Replace the driver's control center differential control module.
15	**CHECK POOR CONTACT IN HARNESS CONNECTOR.**	Is there any poor contact in manual mode switch circuit?	Repair the poor contact.	Replace the driver's control center differential control module.

L: DTC 32 CHECK PARKING BRAKE SWITCH

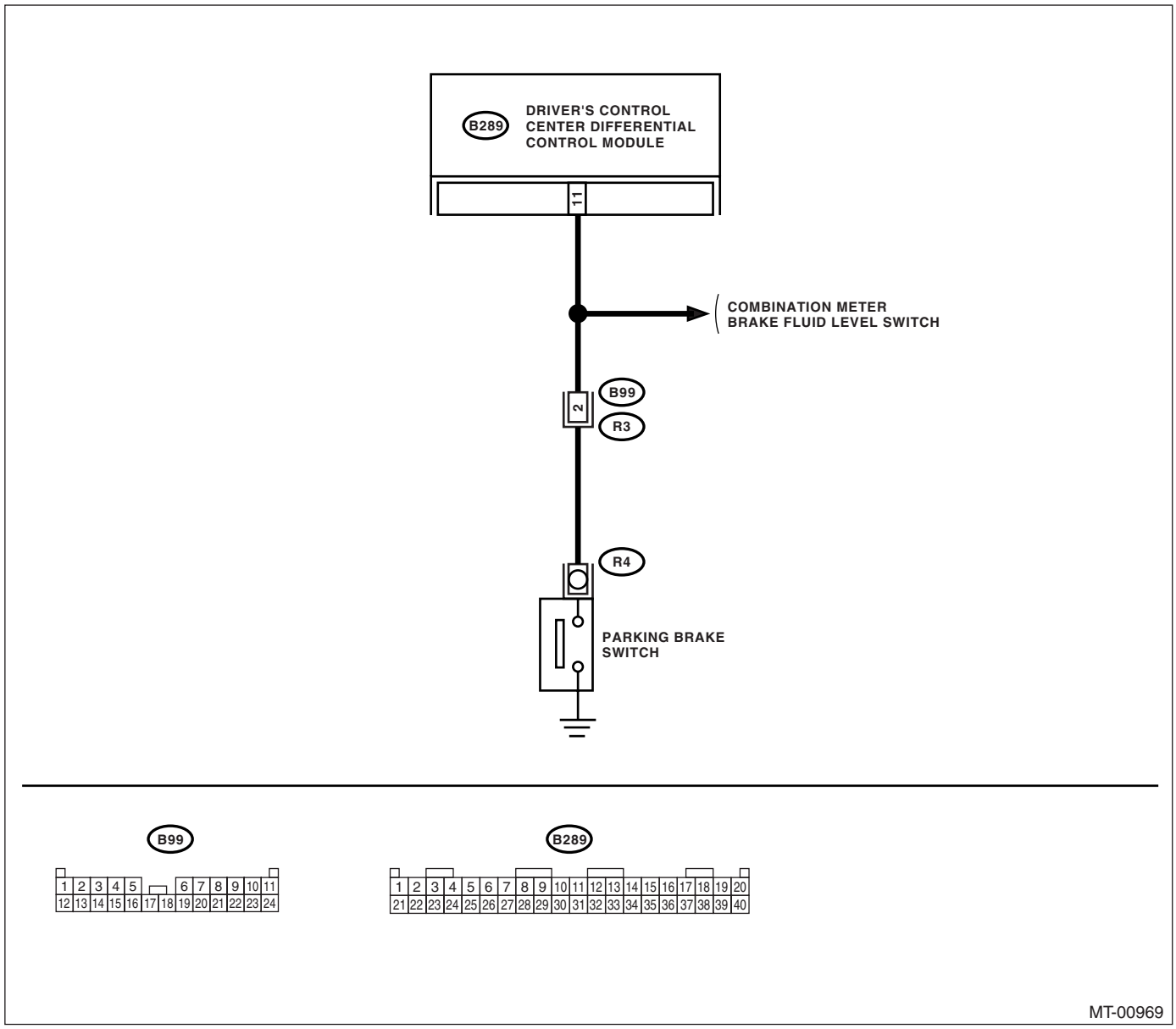
DIAGNOSIS:

Input signal circuit of parking brake switch is open or shorted.

TROUBLE SYMPTOM:

- Differential does not tend to be free though apply the parking brake.
- Differential stays free by releasing the parking brake.

WIRING DIAGRAM:

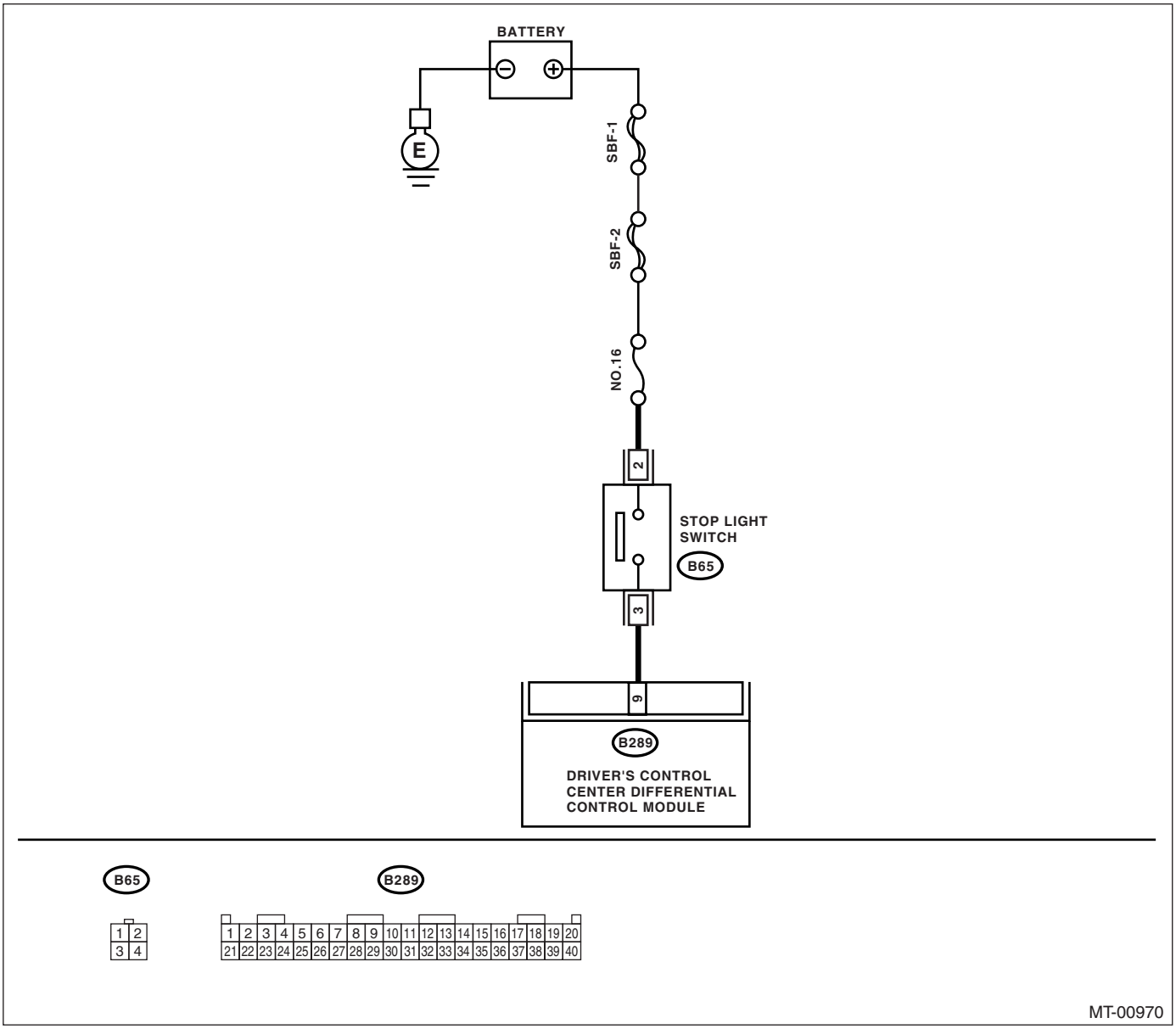


	Step	Check	Yes	No
1	**CHECK THE PARKING BRAKE SWITCH CIRCUIT.** 1) Turn the ignition switch to ON. 2) Start the engine. 3) Apply the parking brake.	Does the parking brake warning light illuminate?	Go to step **2.**	Check the parking pilot & brake fluid warning light circuit.
2	**CHECK THE PARKING BRAKE SWITCH CIRCUIT.** Release the parking brake.	Does the parking brake warning light turn OFF?	Go to step **3.**	Check the brake fluid level and ABS circuit.

	Step	Check	Yes	No
3	**CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND PARKING BRAKE SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of driver's control center differential control module and parking brake switch. 3) Measure the resistance of harness between driver's control center differential control module and parking brake switch. ***Connector & terminal*** ***(B289) No. 11 — (R4) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness and poor contact of connector.
4	**CHECK THE HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND PARKING BRAKE SWITCH.** Measure the resistance between driver's control center differential control module harness connector and chassis ground. ***Connector & terminal*** ***(B289) No. 11 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit of harness.
5	**CHECK THE INPUT SIGNAL OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** 1) Connect all the harness connectors. 2) Disconnect the harness connector of combination meter. 3) Turn the ignition switch to ON. 4) Release the parking brake. 5) Measure the voltage between driver's control center differential control module harness connector and chassis ground. ***Connector & terminal*** ***(B289) No. 11 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **6.**	Replace the driver's control center differential control module.
6	**CHECK THE INPUT SIGNAL OF DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** 1) Apply the parking brake. 2) Measure the voltage between driver's control center differential control module harness connector and chassis ground. ***Connector & terminal*** ***(B289) No. 11 (+) — Chassis ground (–):***	Is the voltage less than 0.4 V?	Go to step **7.**	Replace the driver's control center differential control module.
7	**CHECK POOR CONTACT IN HARNESS CONNECTOR.**	Is there any poor contact in harness connector of parking brake circuit?	Repair the poor contact of harness connector.	Replace the driver's control center differential control module.

M: DTC 33 STOP LIGHT SWITCH

DIAGNOSIS:
Open or short circuit in stop light switch circuit.
TROUBLE SYMPTOM:
Wheels are locked while the ABS operates.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK DTC.**	Is the stop light switch related DTC displayed during ABS self-diagnosis test mode?	Check according to ABS DTC.	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK INPUT SIGNAL OF STOP LIGHT SWITCH AND DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector of driver's control center differential control module. 3) Set the brake pedal depressed. 4) Measure the voltage between driver's control center differential control module and chassis ground. ***Connector & terminal*** ***(B289) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **3.**	Repair the open or short circuit of harness between driver's control center differential control module and stop light switch.
3	**CHECK POOR CONTACT.**	Is there any poor contact?	Repair the poor contact.	Replace the driver's control center differential control module.

N: DTC 34 ABS SWITCH SIGNAL

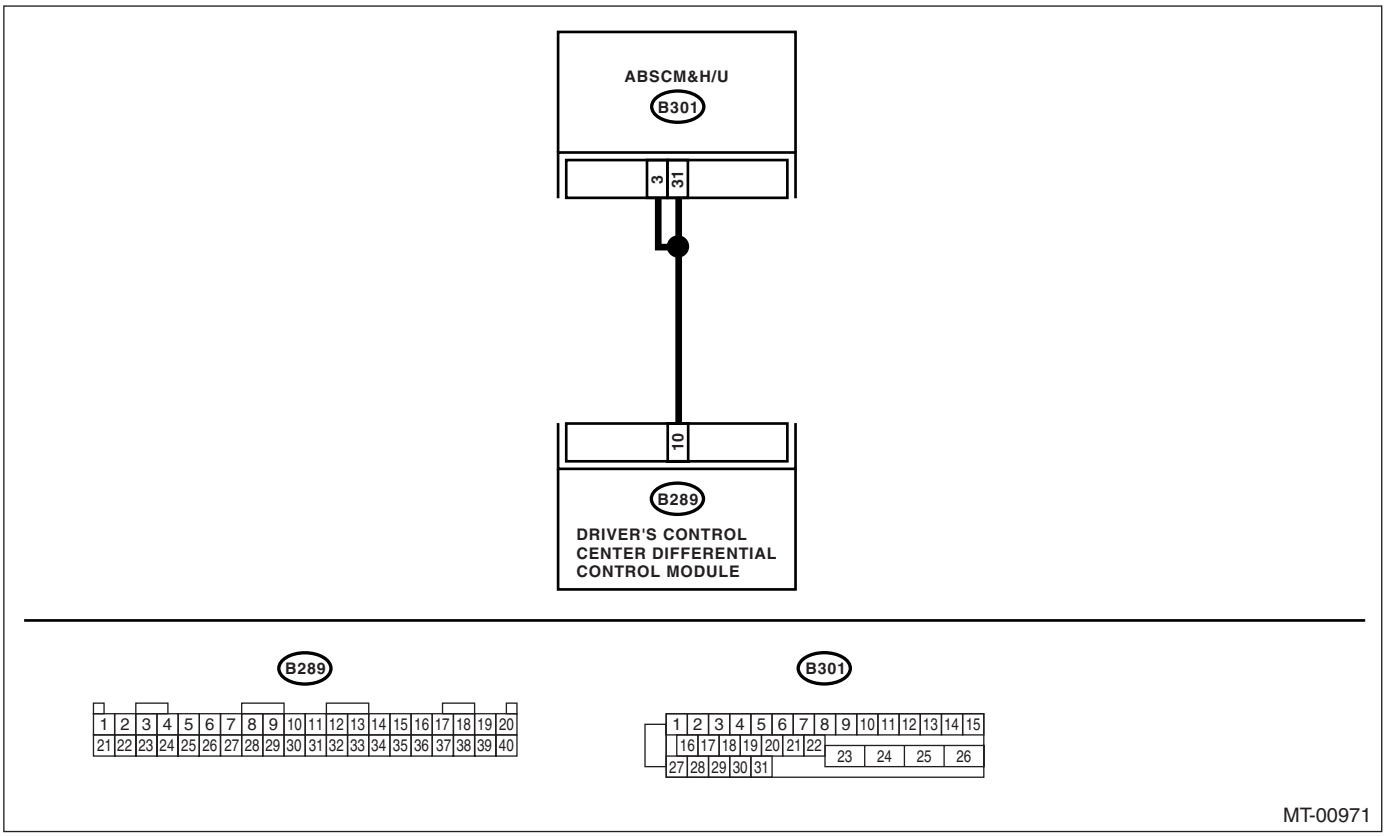
DIAGNOSIS:

Open or short in combination signal circuit of driver's control center differential control.

TROUBLE SYMPTOM:

- ABS warning light illuminates.
- Wheels are locked while the ABS operates.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DTC.**	Is DTC code displayed during ABS self-diagnosis test mode?	Check according to ABS DTC.	Go to step **2.**
2	**CHECK HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of driver's control center differential control module and ABSCM&H/U. 3) Measure the resistance of harness between driver's control center differential control module and ABSCM&H/U harness connector. ***Connector & terminal*** ***(B289) No. 10 — (B301) No. 31:*** ***(B289) No. 10 — (B301) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit of harness connector between driver's control center differential control module and ABSCM&H/U, and poor contact of harness connector.

	Step	Check	Yes	No
3	**CHECK HARNESS BETWEEN DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE AND ABSCM&H/U.** Measure the resistance between driver's control center differential control module and chassis ground. ***Connector & terminal*** ***(B289) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short of harness between driver's control center differential control module and ABSCM&H/U.
4	**CHECK THE DRIVER'S CONTROL CENTER DIFFERENTIAL CONTROL MODULE.** 1) Connect driver's control center differential control module connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between driver's control center differential control module harness connector and chassis ground. ***Connector & terminal*** ***(B289) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **5.**	Replace the driver's control center differential control module.
5	**CHECK POOR CONTACT IN HARNESS CONNECTOR.**	Is there any poor contact in combination circuit of driver's control center differential control?	Repair the poor contact.	Check the ABSCM&H/U.

12.General Diagnostic Table

A: INSPECTION

Symptom	Abnormal units/parts
Tight cornering condition	• ABSCM&H/U • ABS wheel speed sensor • Accelerator position sensor • ECM • Center differential • Center differential control dial • Manual mode switch • Tire/Wheel • Driver's control center differential control module
Tendency to oversteer	• Accelerator position sensor • ECM • Center differential control dial • Manual mode switch • Tire/Wheel • Driver's control center differential control module • Center differential • Driver's control center differential relay • Rear differential oil temperature switch
Tendency to understeer at high speed cornering	• Lateral G sensor • Center differential
No change in the center differential torque character	• Center differential control dial • Driver's control center differential relay • Center differential • Driver's control center differential control module
Driver's control center differential indicator does not operate	• Combination meter • Driver's control center differential control module
Driver's control center differential indicator does not operate though setting the center differential control dial	• Center differential control dial • Combination meter • Driver's control center differential control module
No change to AUTO or MANUAL	• Manual mode switch • Combination meter • Driver's control center differential control module
AUTO indicator light does not illuminate	• Manual mode switch • Combination meter • Driver's control center differential control module
Differential does not become free, or stays free	• Parking brake switch • Center differential • Manual mode switch • Center differential control dial • Rear differential • Tire/Wheel • Driver's control center differential relay • Rear differential oil temperature switch • Driver's control center differential control module
Wheel lock at ABS operation	• ABSCM&H/U • Stop light switch • Driver's control center differential control module

Symptom	Abnormal units/parts
Differential does not become lock, or stays lock	• ABSCM&H/U • ABS wheel speed sensor • Accelerator position sensor • ECM • Center differential • Center differential control dial • Manual mode switch • Tire/Wheel • Driver's control center differential control module • Driver's control center differential relay

CLUTCH SYSTEM

CL

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1. General Description

A: SPECIFICATIONS

Model			2.0 L TURBO	2.5 L
Clutch cover	Type		Pull type	Push type
	Diaphragm set load	kgf (lb)	800 (1,764)	580 (1,279)
Clutch disc	Facing material		Woven (Non asbestos)	
	O.D. × I.D. × thickness	mm (in)	230 × 150 × 3.5 (9.06 × 5.91 × 0.138)	225 × 150 × 3.5 (8.86 × 5.91 × 0.138)
	Spline O.D.	mm (in)	25.2 (0.992), (No. of teeth: 24)	
Clutch release lever ratio			1.7	1.6
Release bearing			Grease-packed self-aligning	
Clutch pedal	Full stroke	mm (in)	130 — 135 (5.12 — 5.31)	
	Free play	mm (in)	4 — 11 (0.16 — 0.43)	
Release lever	Stroke	mm (in)	13.3 — 14.7 (0.524 — 0.579)	24 — 26 (0.94 — 1.02)
	Play at release lever center	mm (in)	—	3 — 4 (0.12 — 0.16)
Clutch disc	Depth of rivet head mm (in)	Standard	1.35 — 1.95 (0.053 — 0.076)	
		Limit of sinking	0.3 (0.012)	
	Limit for deflection	mm (in)	0.7 (0.028) at R = 110 (4.33)	

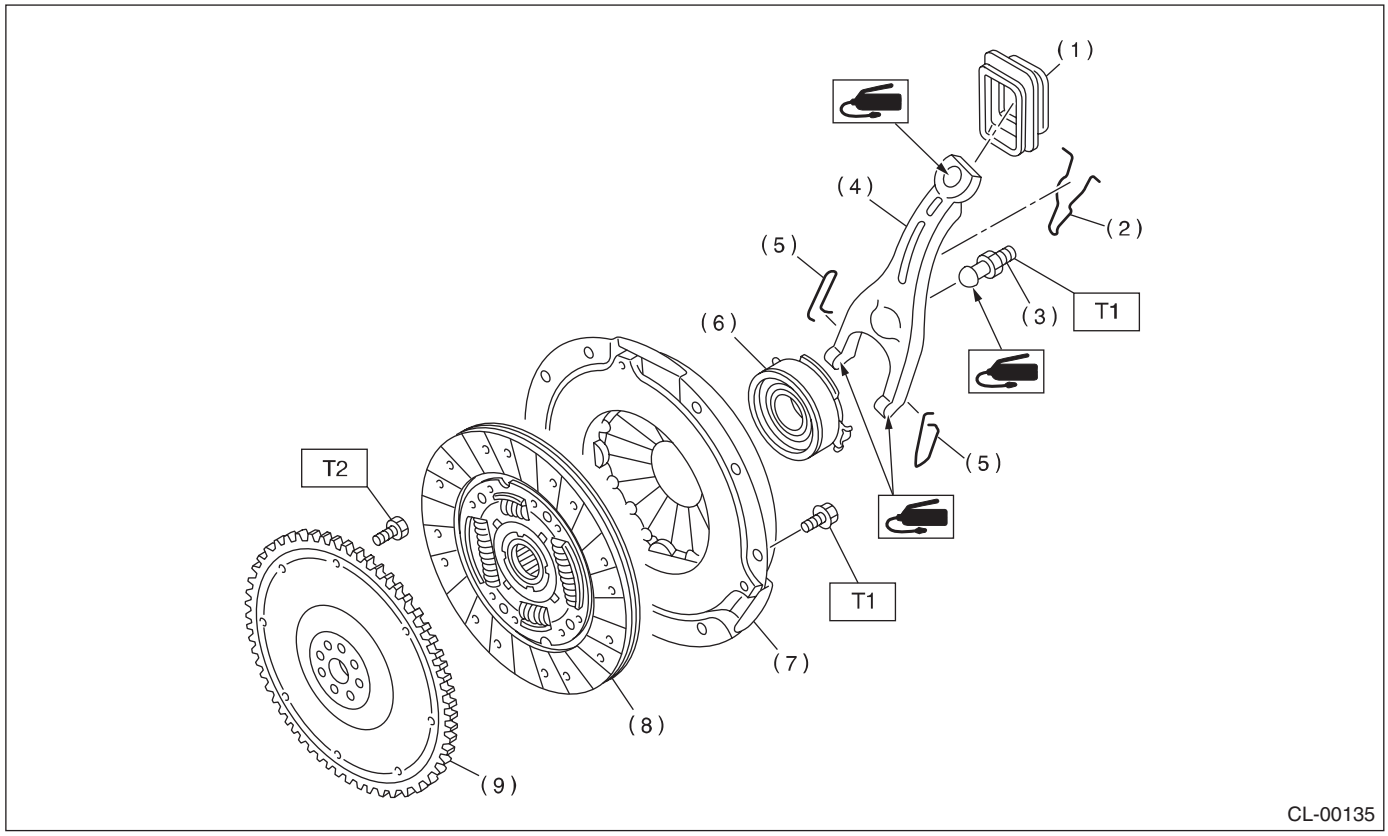
Model			2.5 L TURBO STi
Clutch cover	Type		Pull type
	Diaphragm set load	kgf (lb)	930 (2,050)
Clutch disc	Facing material		Woven (Non asbestos)
	O.D. × I.D. × thickness	mm (in)	Flywheel side: 240 × 160 × 3.2 (9.45 × 6.30 × 0.126) Clutch cover side: 240 × 160 × 3.5 (9.45 × 6.30 × 0.138)
	Spline O.D.	mm (in)	25.2 (0.992), (No. of teeth: 24)
Clutch release lever ratio			1.7
Release bearing			Grease-packed self-aligning
Clutch pedal	Full stroke	mm (in)	130 — 135 (5.12 — 5.31)
	Free play	mm (in)	3 — 13 (0.12 — 0.51)
Release lever	Stroke	mm (in)	13.3 — 14.7 (0.524 — 0.579)
	Play at release lever center	mm (in)	—
Clutch disc	Depth of rivet head mm (in)	Standard	Flywheel side: 1.35 — 1.95 (0.053 — 0.077) Clutch cover side: 1.65 — 2.25 (0.065 — 0.089)
		Limit of sinking	0.3 (0.012)
	Limit for deflection	mm (in)	0.7 (0.028) at R = 115 (4.53)

I.D.: Inner diameter O.D.: Outer diameter

B: COMPONENT

1. CLUTCH ASSEMBLY

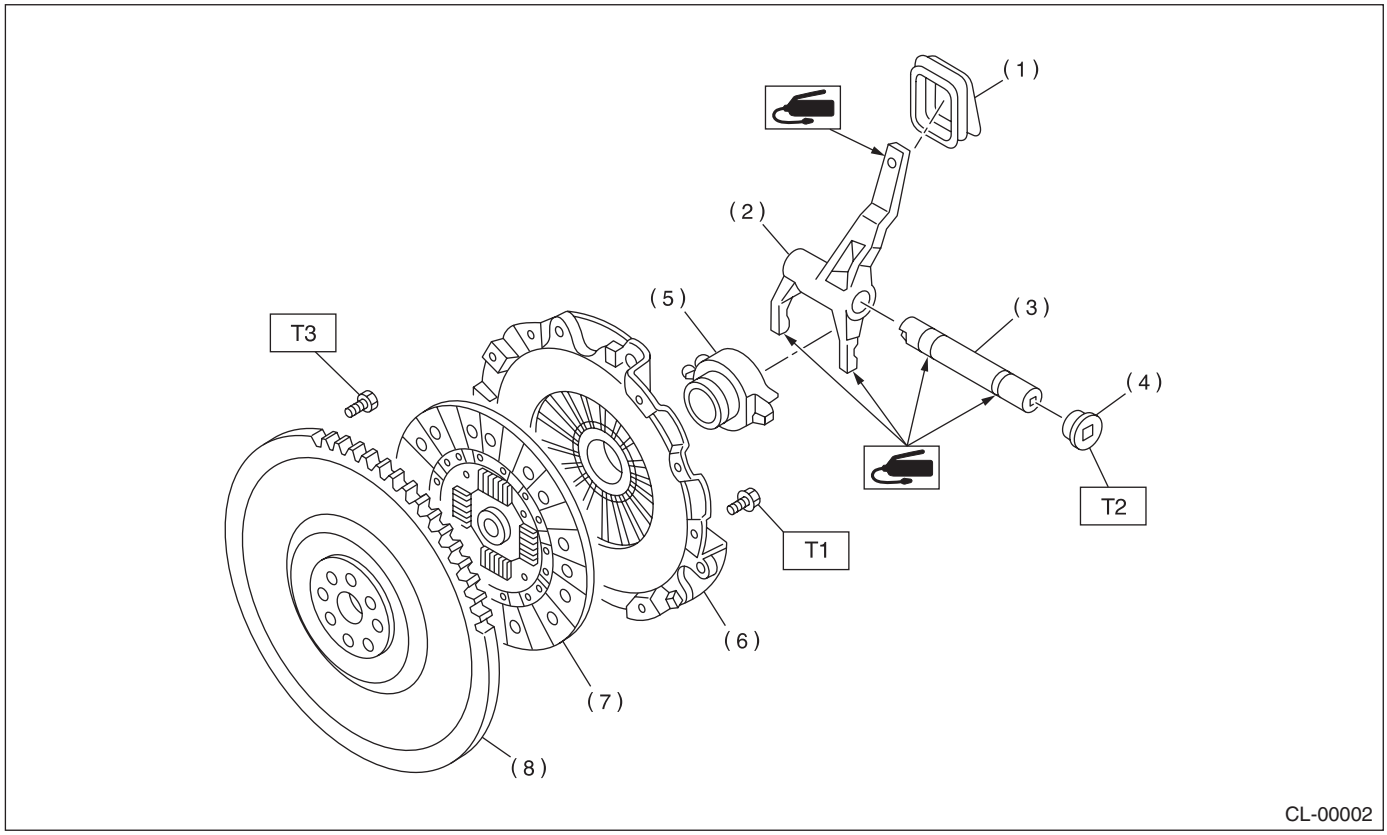
• NON-TURBO MODEL



(1) Clutch release lever sealing
(2) Retainer spring
(3) Pivot
(4) Clutch release lever
(5) Clip
(6) Clutch release bearing
(7) Clutch cover
(8) Clutch disc
(9) Flywheel

Tightening torque: N·m (kgf-m, ft-lb)
T1: 16 (1.6, 11.8)
T2: 72 (7.3, 52.8)

• TURBO MODEL

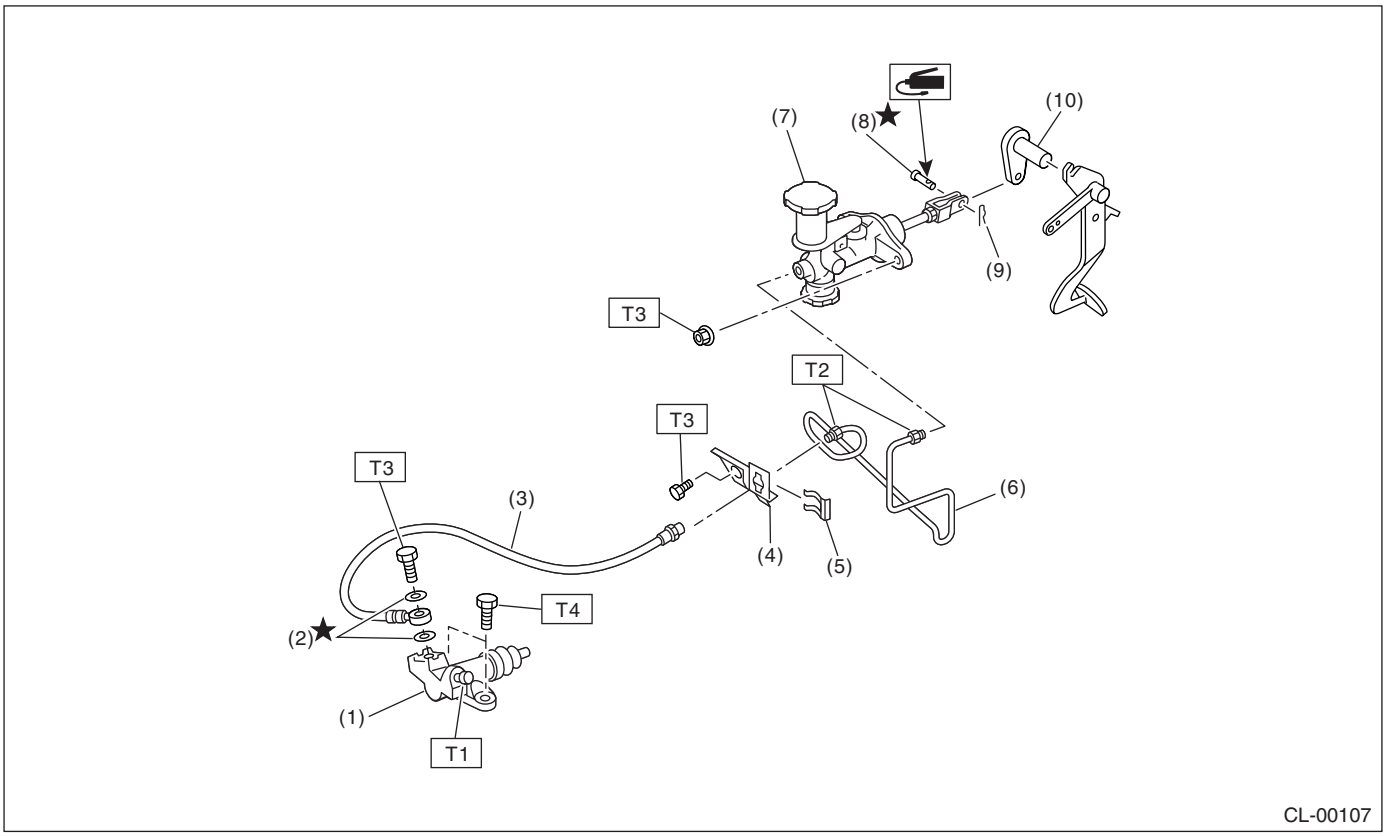


(1) Clutch release lever sealing
(2) Clutch release lever
(3) Clutch release lever shaft
(4) Plug
(5) Clutch release bearing
(6) Clutch cover
(7) Clutch disc
(8) Flywheel

Tightening torque: N·m (kgf-m, ft-lb)
T1: 16 (1.6, 11.8)
T2: 44 (4.5, 32.5)
T3: Except STi model
72 (7.3, 52.8)
STi model
75 (7.6, 55.3)

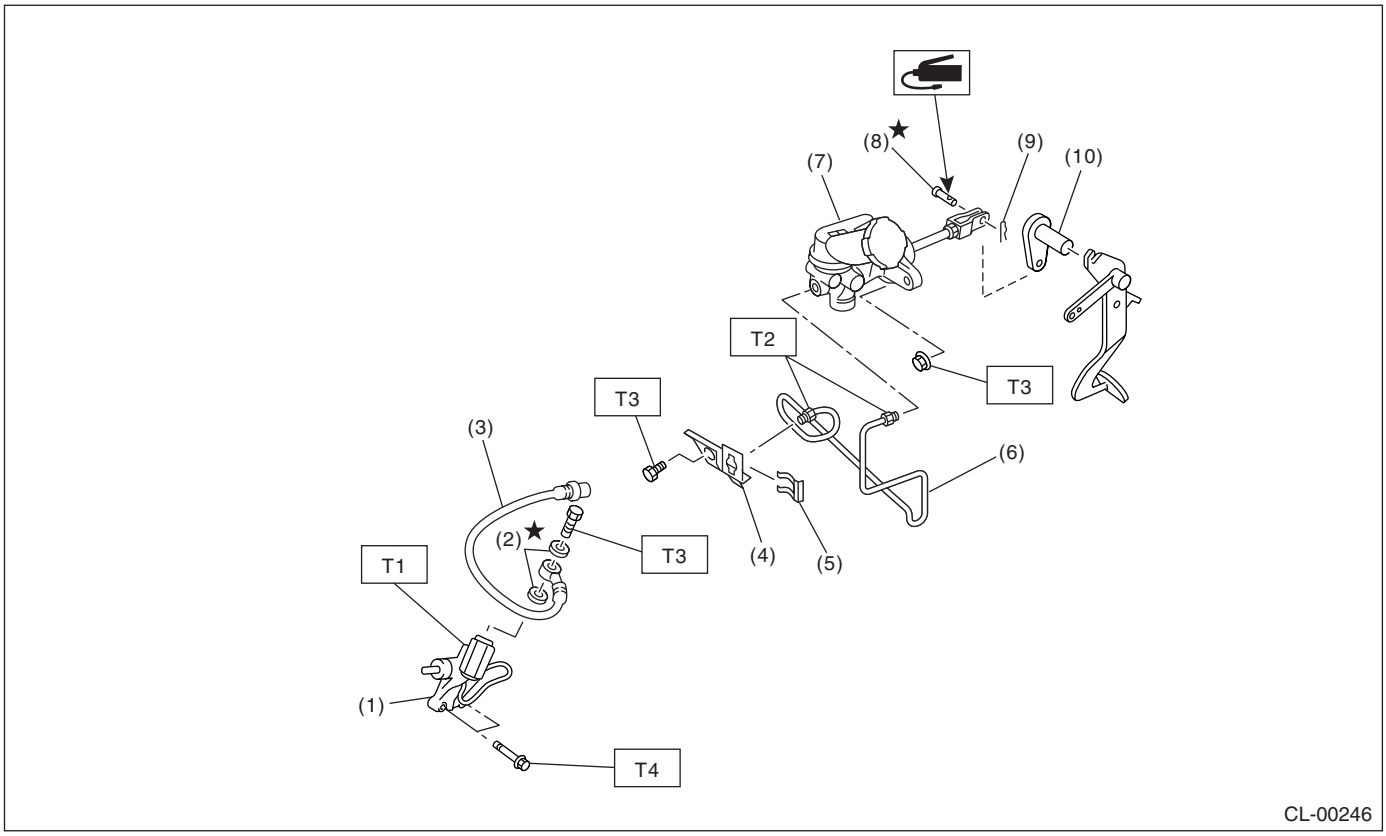
2. CLUTCH PIPE AND HOSE

• NON-TURBO MODEL



(1)	Operating cylinder	(6)	Pipe	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Washer	(7)	Master cylinder ASSY	***T1: 8 (0.8, 5.8)***
(3)	Clutch hose	(8)	Clevis pin	***T2: 15 (1.5, 10.8)***
(4)	Bracket	(9)	Snap pin	***T3: 18 (1.8, 13.0)***
(5)	Clip	(10)	Lever	***T4: 37 (3.8, 27.5)***

• TURBO MODEL

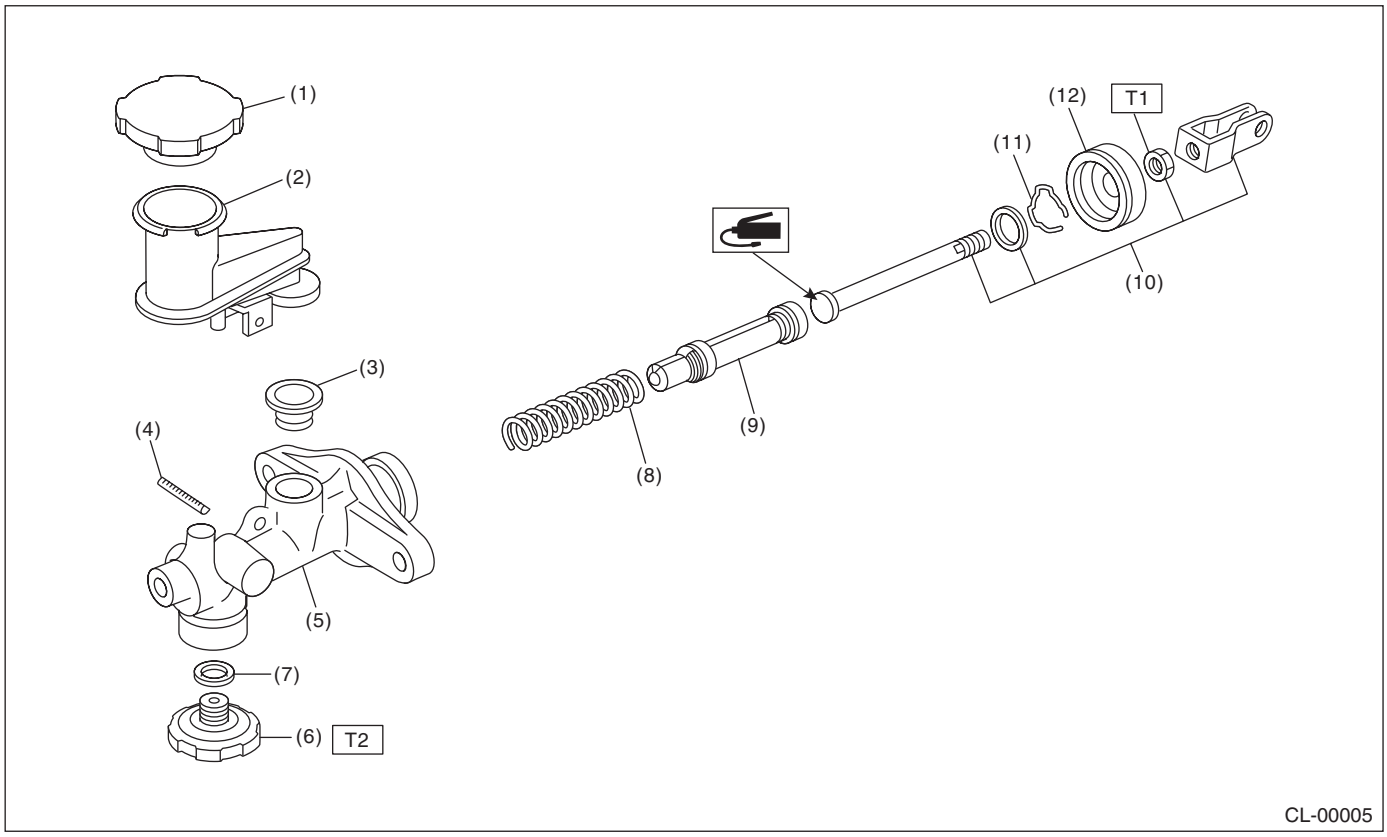


(1) Operating cylinder
(2) Washer
(3) Clutch hose
(4) Bracket
(5) Clip
(6) Pipe
(7) Master cylinder ASSY
(8) Clevis pin
(9) Snap pin
(10) Lever

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 15 (1.5, 10.8)
T3: 18 (1.8, 13.0)
T4: Except STi model
37 (3.8, 27.5)
STi model
41 (4.2, 30.2)

3. MASTER CYLINDER

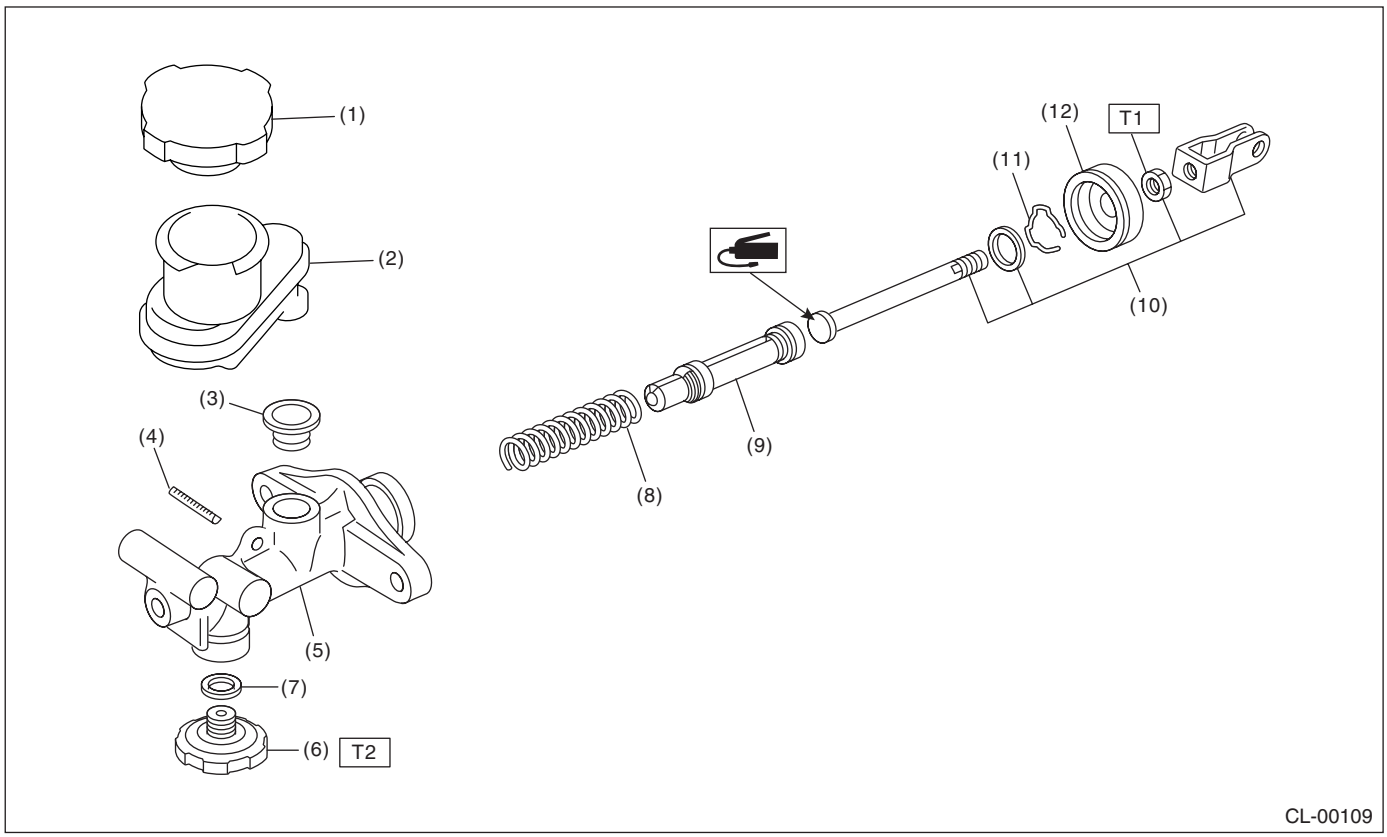
• NON-TURBO MODEL



(1) Reservoir cap
(2) Reservoir tank
(3) Oil seal
(4) Straight pin
(5) Master cylinder
(6) Clutch damper
(7) Gasket
(8) Return spring
(9) Piston
(10) Push rod
(11) Piston stop ring
(12) Cylinder boot

Tightening torque: N·m (kgf-m, ft-lb)
T1: 10 (1.0, 7)
T2: 46.6 (4.75, 34.4)

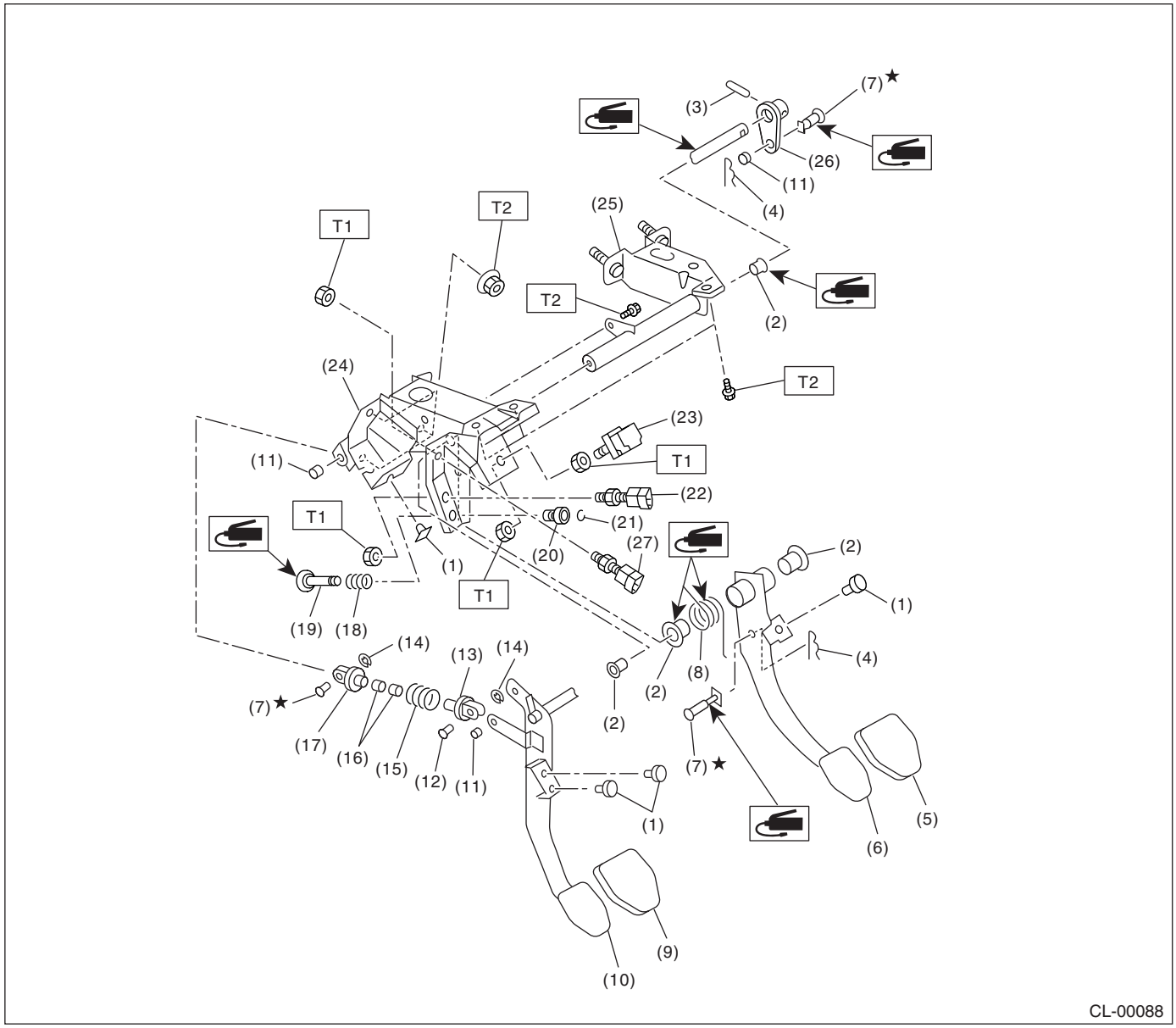
• TURBO MODEL



(1)	Reservoir cap	(7)	Gasket
(2)	Reservoir tank	(8)	Return spring
(3)	Oil seal	(9)	Piston
(4)	Straight pin	(10)	Push rod
(5)	Master cylinder	(11)	Piston stop ring
(6)	Clutch damper	(12)	Cylinder boot

Tightening torque: N·m (kgf-m, ft-lb)
T1: 10 (1.0, 7)
T2: 46.6 (4.75, 34.4)

4. CLUTCH PEDAL



(1) Stopper
(2) Bushing
(3) Spring pin
(4) Snap pin
(5) Brake pedal pad
(6) Brake pedal
(7) Clevis pin
(8) Brake pedal spring
(9) Clutch pedal pad
(10) Clutch pedal
(11) Bushing C
(12) Clutch clevis pin
(13) Assist rod A
(14) Clip
(15) Assist spring
(16) Assist bushing
(17) Assist rod B
(18) Spring S
(19) Rod S
(20) Bushing S
(21) Clip
(22) Clutch switch (Cruise control)
(23) Stop light switch
(24) Pedal bracket
(25) Clutch master cylinder bracket
(26) Lever
(27) Clutch switch (Starter interlock)

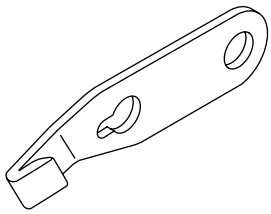
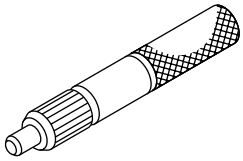
Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use Subaru genuine fluid, grease etc. or the equivalent. Do not mix fluid, grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply grease onto sliding or revolution surfaces before installation.
• Before installing O-rings or snap rings, apply sufficient amount of fluid to avoid damage and deformation.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Keep fluid away from the vehicle body. If any fluid contacts the vehicle body, immediately flush the area with water.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening tightening bolt, etc.
 ST-499747100	499747100	CLUTCH DISC GUIDE	Used when installing clutch disc to flywheel.

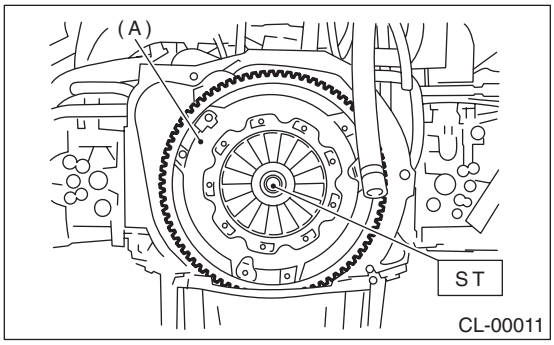
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Dial Gauge	Used for measuring clutch disk run-out.

2. Clutch Disc and Cover

A: REMOVAL

1) Remove the transmission assembly from vehicle body.
5MT:
<Ref. to 5MT-27, REMOVAL, Manual Transmission Assembly.>
6MT:
<Ref. to 6MT-35, REMOVAL, Manual Transmission Assembly.>
2) Install the ST on flywheel.
ST 499747100 CRANKSHAFT STOPPER



(A) Clutch cover

3) Remove the clutch cover and clutch disc.

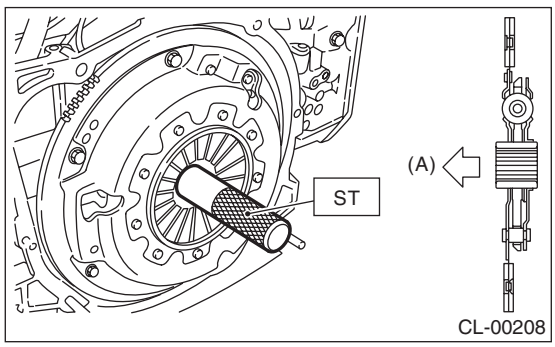
NOTE:
• Take care not to allow oil on the clutch disc facing.
• Do not disassemble either the clutch cover or clutch disc.

B: INSTALLATION

1) Insert the ST into clutch disc and install them on the flywheel by inserting the ST end into pilot bearing.

NOTE:
When installing the clutch disc, be careful to its direction.

ST 499747100 CLUTCH DISC GUIDE

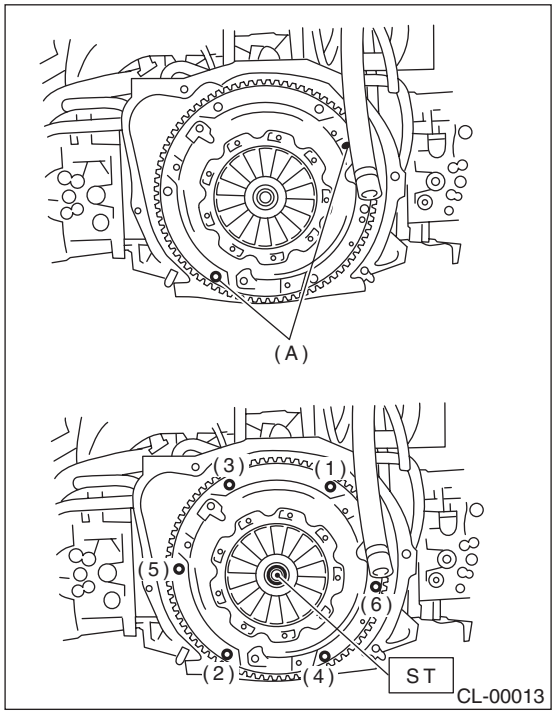


(A) Flywheel side

2) Install the clutch cover on flywheel and tighten the bolts to specified torque.

NOTE:
• When installing the clutch cover on flywheel, position the clutch cover so that there is a gap of 120° or more between “0” marks on the flywheel and clutch cover. (“0” marks indicate the directions of residual unbalance.)
• Note the front and rear of the clutch disc when installing.
• Temporarily tighten the bolts by hand. Each bolt should be tightened to the specified torque in a crisscross fashion.

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



(A) “0” marks

3) Remove the ST.
ST 499747100 CLUTCH DISC GUIDE
4) Install the transmission assembly.
5MT:
<Ref. to 5MT-29, INSTALLATION, Manual Transmission Assembly.>
6MT:
<Ref. to 6MT-37, INSTALLATION, Manual Transmission Assembly.>

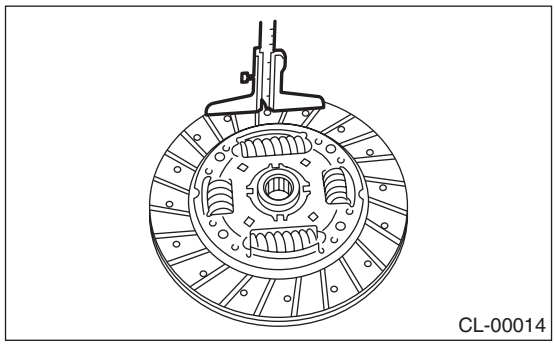
C: INSPECTION

1. CLUTCH DISC

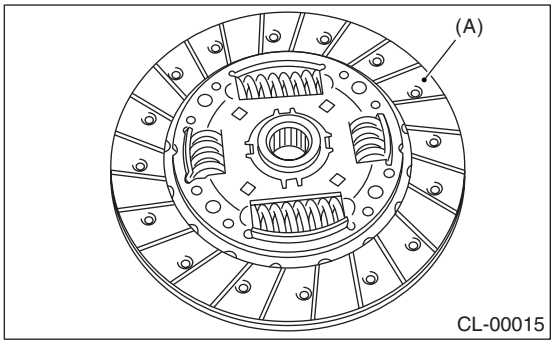
1) Facing wear
Measure the depth of rivet head from the surface of facing. Replace if facings are worn locally or worn down to less than the specified value.

Depth of rivet head:
Limit of sinking
0.3 mm (0.012 in)

NOTE:
Do not wash the clutch disc with any cleaning fluid.



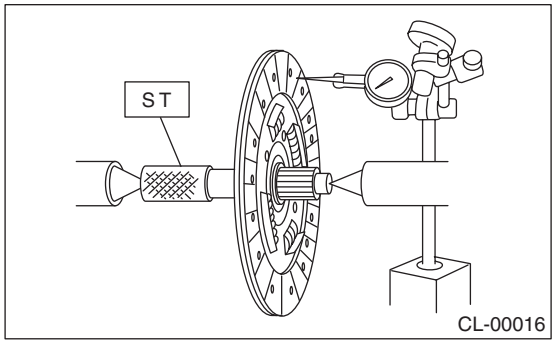
2) Hardened facing
Correct by using emery paper or replace.
3) Oil soakage on facing
Replace the clutch disc and inspect the transmission front oil seal, transmission case mating surface, engine rear oil seal and other points for oil leakage.



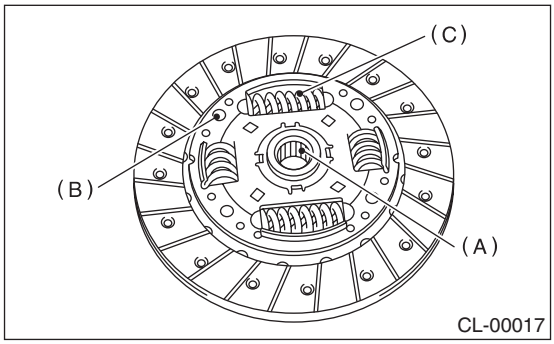
(A) Clutch facing

4) Deflection on facing
If deflection exceeds the specified value at the outer circumference of facing, repair or replace.
ST 499747100 CLUTCH DISC GUIDE

Limit for deflection:
Except STi model
0.7 mm (0.028 in) at R = 110 mm (4.33 in)
STi model
0.7 mm (0.028 in) at R = 115 mm (4.53 in)



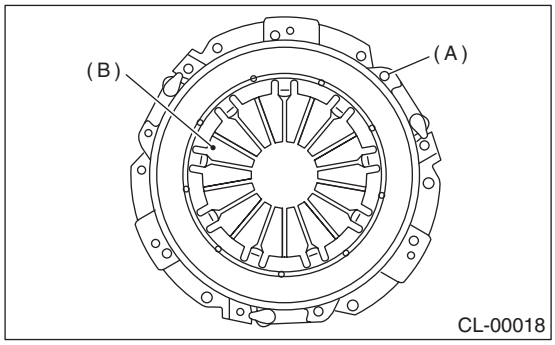
5) Worn spline, loose rivets and torsion spring failure
Replace defective parts.



(A) Spline
(B) Rivet
(C) Torsion spring

2. CLUTCH COVER

NOTE:
Visually check for the following items without disassembling, and replace or repair if defective.
- Loose thrust rivet
- Damaged or worn bearing contact area at center of diaphragm spring

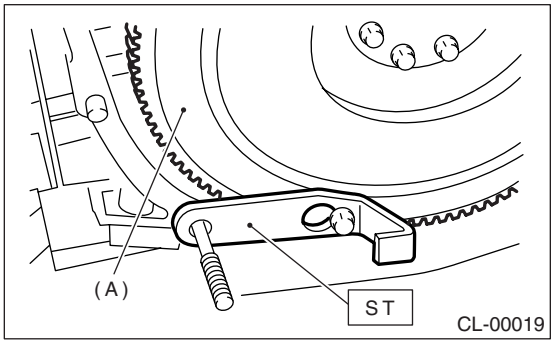


(A) Thrust rivet
(B) Diaphragm spring

3. Flywheel

A: REMOVAL

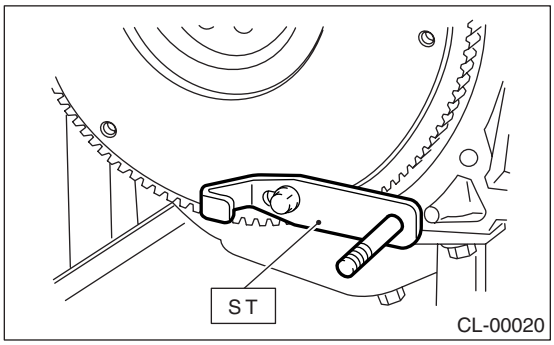
1) Remove the transmission assembly.
5MT:
<Ref. to 5MT-27, REMOVAL, Manual Transmission Assembly.>
6MT:
<Ref. to 6MT-35, REMOVAL, Manual Transmission Assembly.>
2) Remove the clutch cover and clutch disc. <Ref. to CL-11, REMOVAL, Clutch Disc and Cover.>
3) Using the ST, remove the flywheel.
ST 498497100 CRANKSHAFT STOPPER



(A) Flywheel

B: INSTALLATION

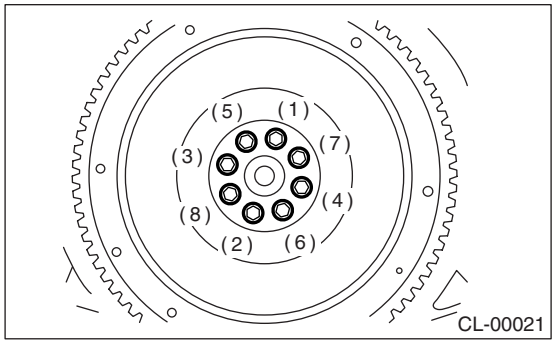
1) Install the flywheel and ST.
ST 498497100 CRANKSHAFT STOPPER



2) Tighten the flywheel attaching bolts to the specified torque.

NOTE:
Tighten the flywheel installing bolts gradually. Each bolt should be tightened to the specified torque in a crisscross fashion.

Tightening torque:
Except STi model
72 N·m (7.3 kgf-m, 52.8 ft-lb)
STi model
75 N·m (7.6 kgf-m, 55.3 ft-lb)

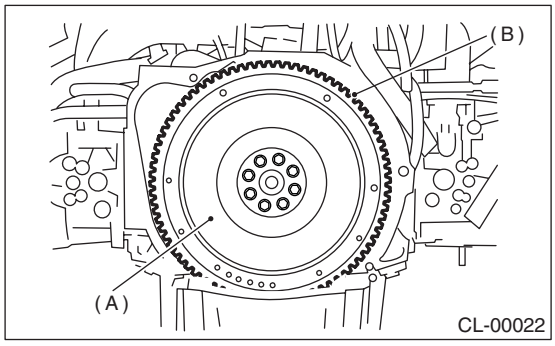


3) Install the clutch disc and cover. <Ref. to CL-11, INSTALLATION, Clutch Disc and Cover.>
4) Install the transmission assembly.
5MT:
<Ref. to 5MT-29, INSTALLATION, Manual Transmission Assembly.>
6MT:
<Ref. to 6MT-37, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

CAUTION:
Since this bearing is grease sealed and is of a non-lubrication type, do not wash with gasoline or any solvent.

1) Damage of facing and ring gear
If defective, replace the flywheel.



(A) Flywheel
(B) Ring gear

2) Smoothness of rotation
Rotate the ball bearing applying pressure in thrust direction.
3) If noise or excessive play is noted, replace the flywheel.

4. Release Bearing and Lever

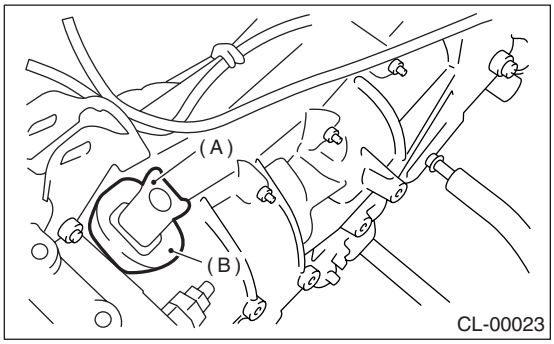
A: REMOVAL

1. NON-TURBO MODEL

1) Remove the transmission assembly from vehicle body.
<Ref. to 5MT-27, REMOVAL, Manual Transmission Assembly.>
2) Remove the two clips from clutch release lever and remove the release bearing.

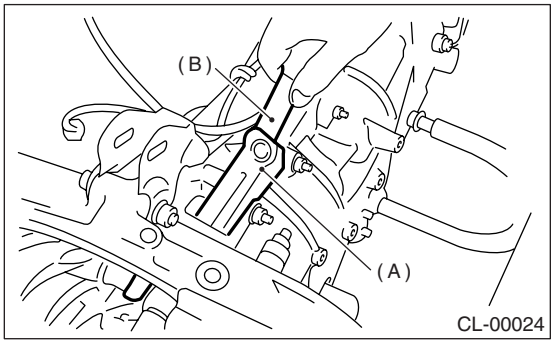
CAUTION:
Be careful not to deform clips.

3) Remove the release lever seal.



(A) Clutch release lever
(B) Release lever seal

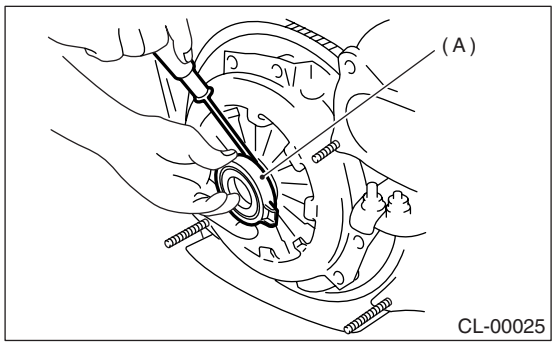
4) Remove the release lever retainer spring from release lever pivot with a screwdriver by accessing it through clutch housing release lever hole. Then remove the release lever.



(A) Clutch release lever
(B) Screwdriver

2. TURBO MODEL

1) Remove the transmission assembly from vehicle body.
5MT:
<Ref. to 5MT-27, REMOVAL, Manual Transmission Assembly.>
6MT:
<Ref. to 6MT-35, REMOVAL, Manual Transmission Assembly.>
2) Remove the clutch release lever from transmission.
3) Put the clutch release bearing in engine side.
4) Remove the clutch release bearing from the clutch cover using flat-type screwdriver.



(A) Clutch release bearing

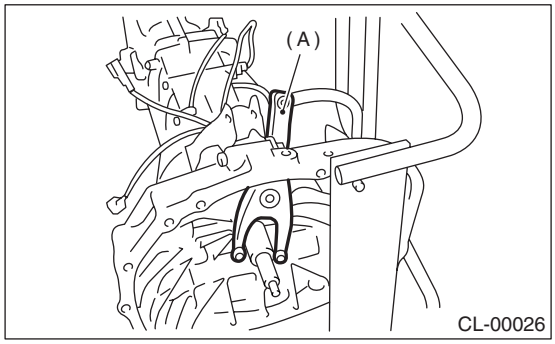
B: INSTALLATION

1. NON-TURBO MODEL

NOTE:
Before or during assembling, lubricate the following points with a light coat of grease.
- Contact surface of lever and pivot
- Contact surface of lever and bearing
- Transmission main shaft spline (Use grease containing molybdenum disulphide.)

1) While pushing the release lever to pivot and twisting it to both sides, fit the retainer spring onto the constricted portion of pivot.

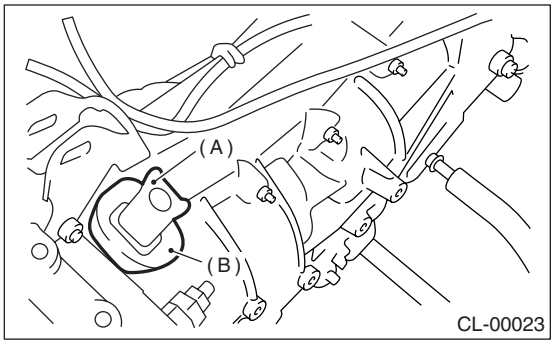
NOTE:
- Apply grease (KOPR-KOTE: Part No. 003603001) to the contact point of release lever and operating cylinder.
- Confirm that the retainer spring is securely fitted by observing it through the main case hole.



(A) Release lever

2) Install the release bearing and fasten it with two clips.

3) Install the release lever seal.

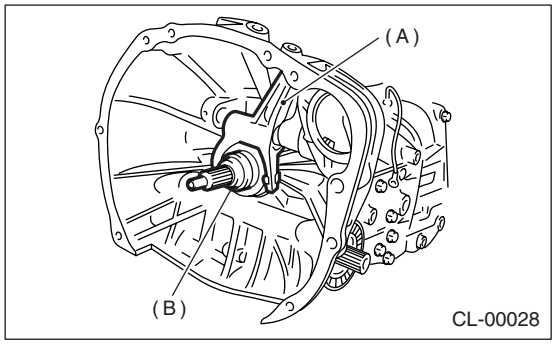


(A) Release lever
(B) Release lever seal

4) Install the transmission assembly.
<Ref. to 5MT-29, INSTALLATION, Manual Transmission Assembly.>

2. TURBO MODEL

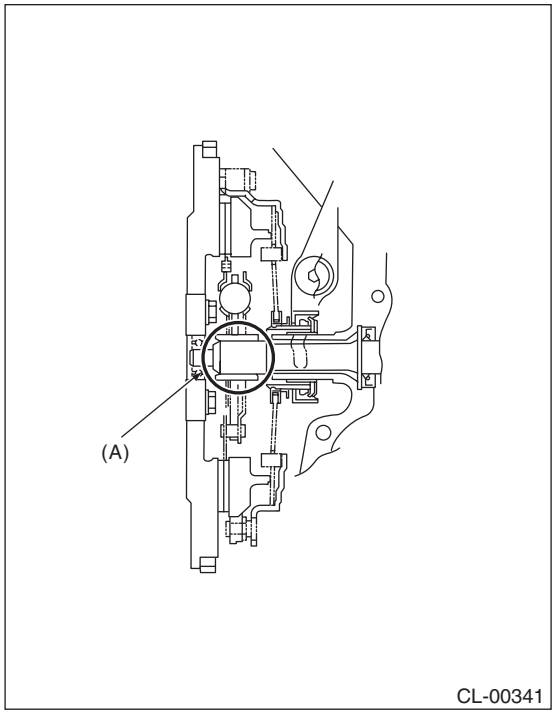
1) Install the release bearing on transmission.
2) Insert the release fork into release bearing tab.



(A) Release fork
(B) Release bearing

3) Apply grease to the specified points.

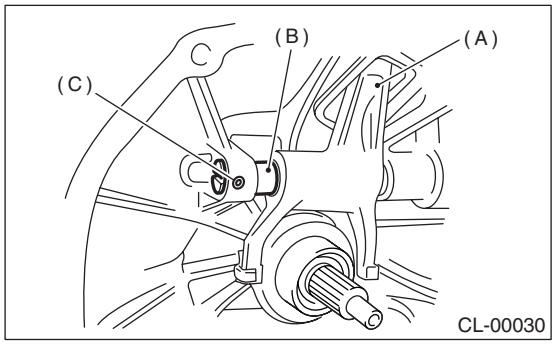
Grease:
NICHIMOLY N-130



(A) Spline

4) Insert the release fork shaft into release fork.

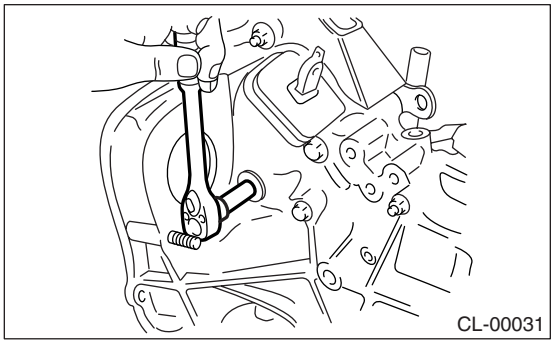
NOTE:
Make sure the cutout portion of release fork shaft contacts spring pin.



(A) Release fork
(B) Release shaft
(C) Spring pin

5) Tighten the plug.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)



6) Install the transmission assembly.
5MT:
<Ref. to 5MT-29, INSTALLATION, Manual Transmission Assembly.>
6MT:
<Ref. to 6MT-37, INSTALLATION, Manual Transmission Assembly.>

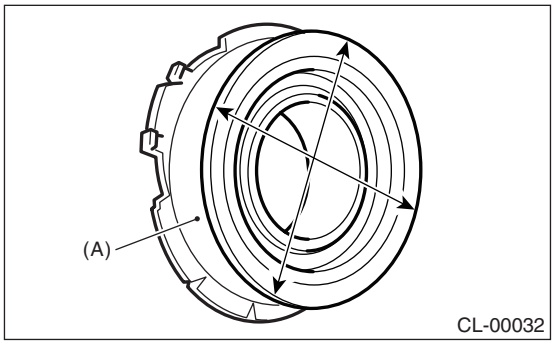
C: INSPECTION

1. RELEASE BEARING

NOTE:
Since this bearing is grease sealed and is of a non-lubrication type, do not wash with gasoline or any solvent when servicing the clutch.

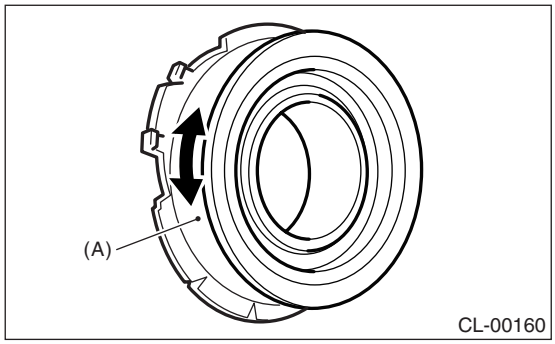
1) Check the bearing for smooth movement by applying force in the radial direction.

Radial direction stroke:
1.4 mm (0.055 in)



(A) Bearing case

2) Check the bearing for smooth rotation by applying pressure in the thrust direction.

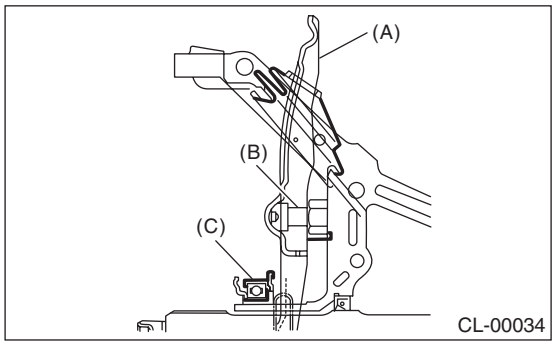


(A) Bearing case

3) Check wear and damage of the bearing case surface contacting with lever.

2. RELEASE LEVER

Check the lever pivot portion and the point of contact with release bearing case for wear.



(A) Clutch release lever
(B) Pivot
(C) Clutch release bearing

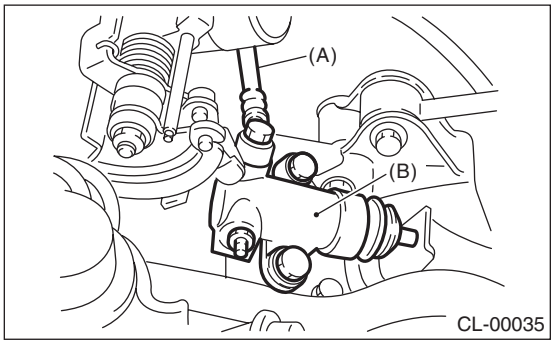
5. Operating Cylinder

A: REMOVAL

1) Remove the air cleaner case and air intake duct (Non-turbo model). <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.> and <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
2) Remove the intercooler (Turbo model). <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
3) Remove the clutch hose from operating cylinder.

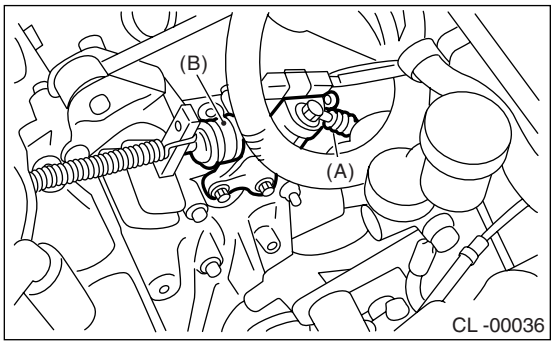
CAUTION:
Cover the hose joint to prevent clutch fluid from flowing out.

- NON-TURBO MODEL



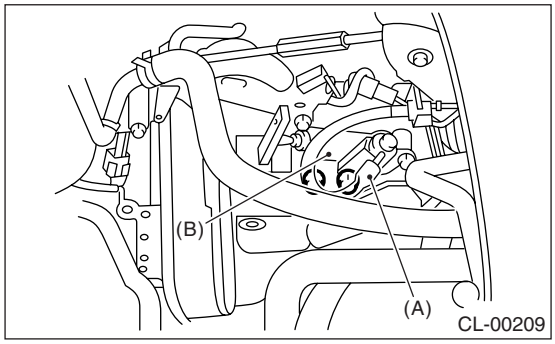
(A) Clutch hose
(B) Operating cylinder

- TURBO MODEL (5MT)



(A) Clutch hose
(B) Operating cylinder

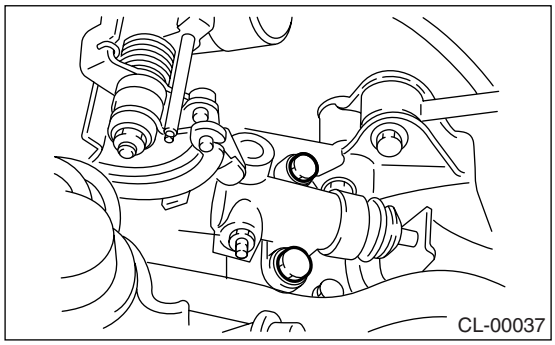
- TURBO MODEL (6MT)



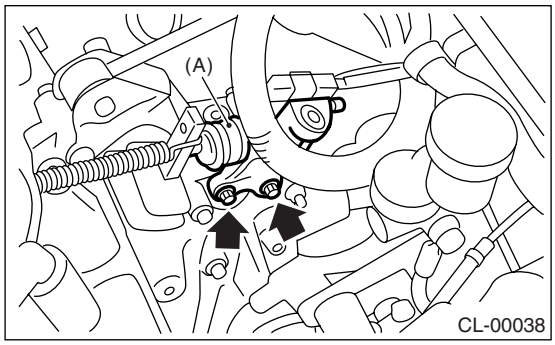
(A) Clutch hose
(B) Operating cylinder

4) Remove the operating cylinder from transmission.

- NON-TURBO MODEL

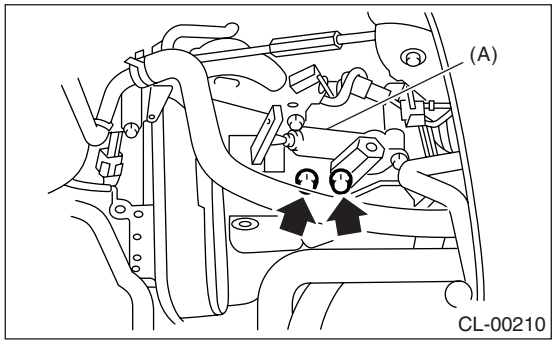


- TURBO MODEL (5MT)



(A) Operating cylinder

• TURBO MODEL (6MT)



(A) Operating cylinder

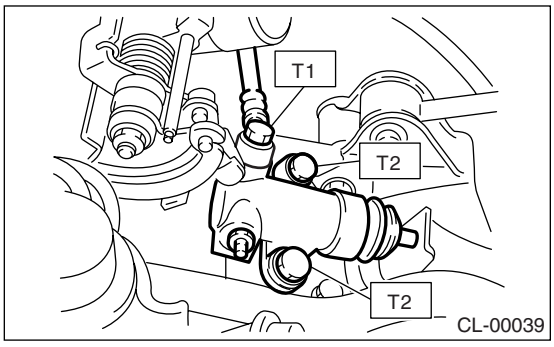
B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
Before installing the operating cylinder, apply grease (KOPR-KOTE: Part No. 003603001) to contact point of the release lever and operating cylinder.

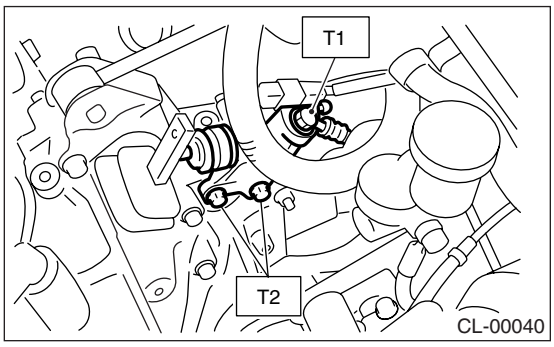
• NON-TURBO MODEL

Tightening torque:
T1: 18 N·m (1.8 kgf-m, 13.0 ft-lb)
T2: 37 N·m (3.8 kgf-m, 27.5 ft-lb)



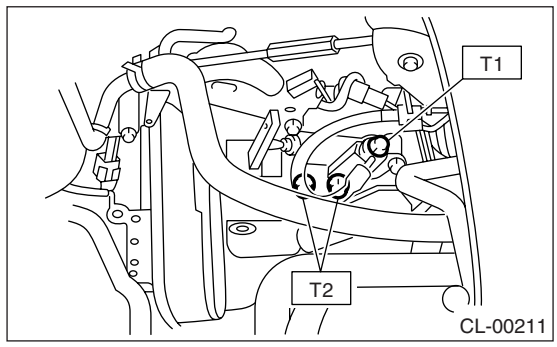
• TURBO MODEL (5MT)

Tightening torque:
T1: 18 N·m (1.8 kgf-m, 13.0 ft-lb)
T2: 37 N·m (3.8 kgf-m, 27.5 ft-lb)

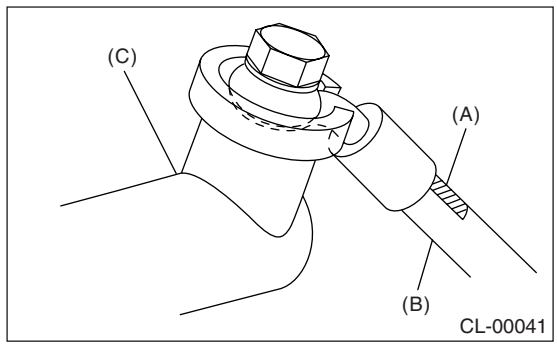


• TURBO MODEL (6MT)

Tightening torque:
T1: 18 N·m (1.8 kgf-m, 13.0 ft-lb)
T2: 41 N·m (4.2 kgf-m, 30.2 ft-lb)



NOTE:
• Be sure to install the clutch hose with the mark side facing upward.
• Be careful not to twist the clutch hose during installation.



(A) Marking
(B) Clutch hose
(C) Operating cylinder

2) After bleeding air from the operating cylinder, ensure that clutch operates properly.
<Ref. to CL-23, Clutch Fluid Air Bleeding.>

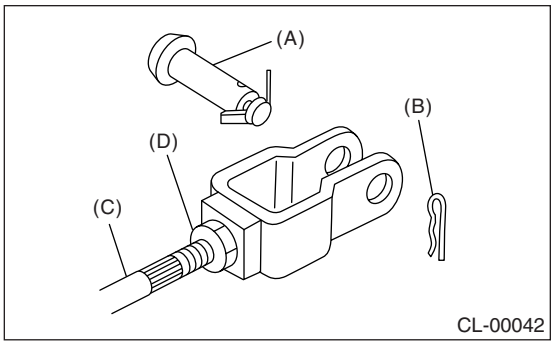
C: INSPECTION

1) Check the operating cylinder for damage. If operating cylinder is damaged, replace it.
2) Check the operating cylinder for fluid leakage or damage on boot. If any leakage or damage is found, replace the operating cylinder.

6. Master Cylinder

A: REMOVAL

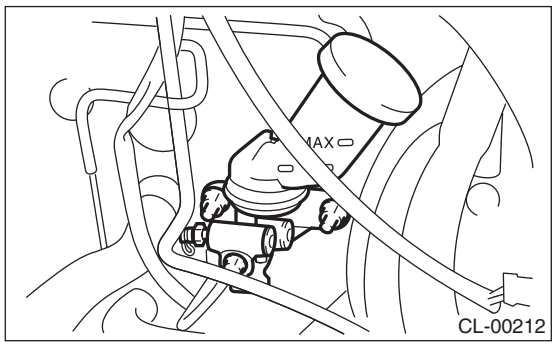
1) Thoroughly drain the brake fluid from reservoir tank.
2) Remove the snap pin, clevis pin and separate the push rod of master cylinder from clutch pedal.



(A) Clevis pin
(B) Snap pin
(C) Push rod
(D) Lock nut

3) Remove the air cleaner case and air intake duct (Non-turbo model). <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.> and <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
4) Remove the intercooler (Turbo model). <Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
5) Remove the clutch pipe from master cylinder.
6) Remove the master cylinder with reservoir tank.

CAUTION:
Be extremely careful not to spill brake fluid. Brake fluid spilt on the vehicle body will harm the paint surface; wipe it off quickly if spilt.

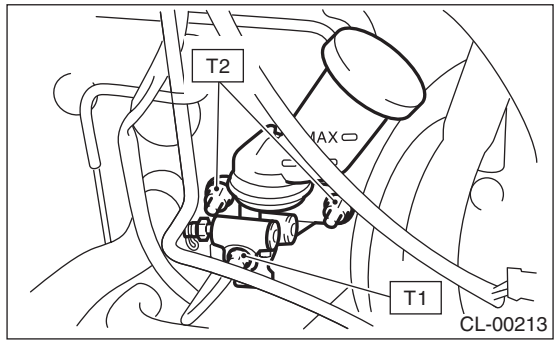


B: INSTALLATION

1) Install the master cylinder to body, and install the clutch pipe to master cylinder.

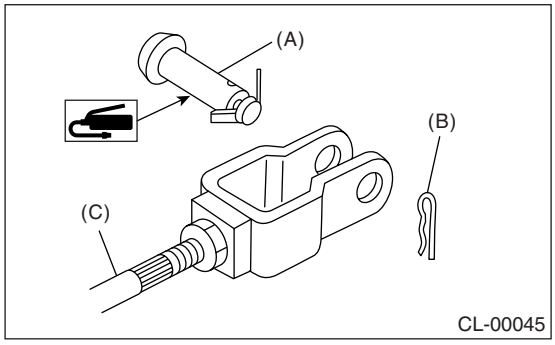
NOTE:
Check that the pipe is routed properly.

Tightening torque:
T1: 15 N·m (1.5 kgf-m, 10.8 ft-lb)
T2: 18 N·m (1.8 kgf-m, 13.0 ft-lb)



2) Connect the push rod of master cylinder to clutch pedal, and install the clevis pin and snap pin.

NOTE:
Apply grease to the clevis pin.

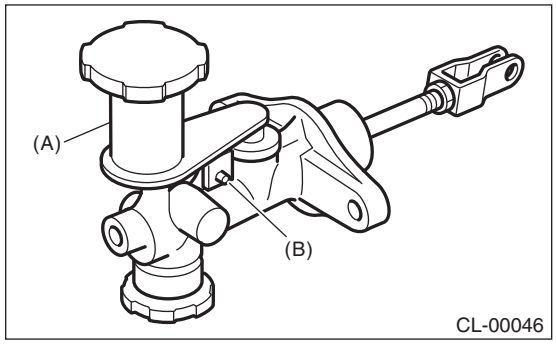


(A) Clevis pin
(B) Snap pin
(C) Push rod

3) After bleeding air from the system, ensure that clutch operates properly.
<Ref. to CL-23, Clutch Fluid Air Bleeding.>
4) Install the air cleaner case and air intake duct (Non-turbo model). <Ref. to IN(H4SO)-5, INSTALLATION, Air Cleaner Case.> and <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Duct.>
5) Install the intercooler (Turbo model). <Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>

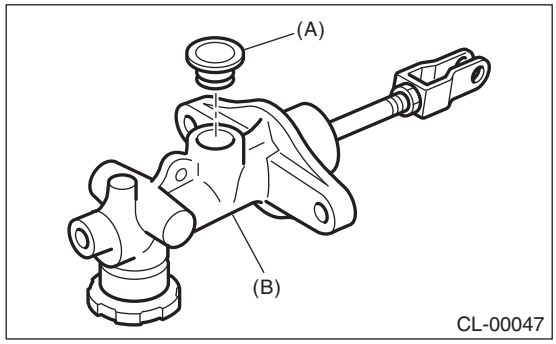
C: DISASSEMBLY

1) Remove the straight pin and reservoir tank.



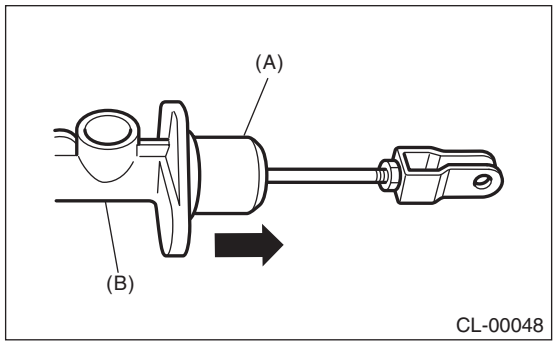
(A) Reservoir tank
(B) Straight pin

2) Remove the oil seal.



(A) Oil seal
(B) Master cylinder

3) Move the cylinder boot backward.



(A) Cylinder boot
(B) Master cylinder

4) Remove the stop ring.

CAUTION:
Be careful when removing the snap ring to prevent the rod, washer, piston and return spring from flying out.

5) Remove the clutch damper.

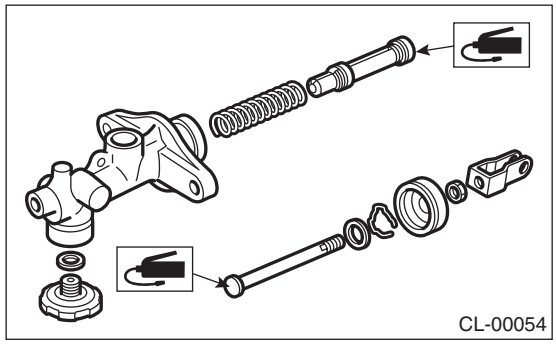
D: ASSEMBLY

1) Install the clutch damper.

Tightening torque:
46.6 N·m (4.75 kgf-m, 34.4 ft-lb)

2) Apply a coat of grease to the contacting surfaces of the push rod and piston before installation.

Grease:
SILICONE GREASE G40M (Part No. 004404003)

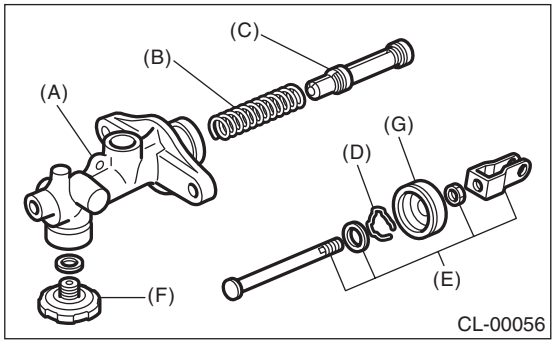


3) To assemble the master cylinder, reverse the sequence of disassembly procedure.

Tightening torque:
10 N·m (1.0 kgf-m, 7 ft-lb)

E: INSPECTION

If any damage, deformation, wear, swelling, rust or other faults are found on the cylinder, piston, push rod, fluid reservoir, return spring, gasket, clutch damper, cylinder boot and hose replace the faulty part.

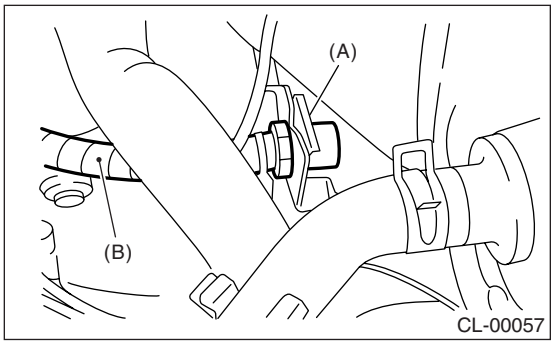


(A) Master cylinder body
(B) Return spring
(C) Piston
(D) Stop ring
(E) Rod ASSY
(F) Clutch damper
(G) Cylinder boot

7. Clutch Pipe and Hose

A: REMOVAL

1) Remove the air cleaner case and air intake duct. (Non-turbo model)
<Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.> and <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
2) Remove the intercooler. (Turbo model)
<Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
3) Drain the clutch fluid. <Ref. to CL-22, Clutch Fluid.>
4) Remove the clutch pipe from the clutch hose and master cylinder.
5) Pull out the clamp, then remove the clutch hose from bracket.



(A) Clamp
(B) Clutch hose

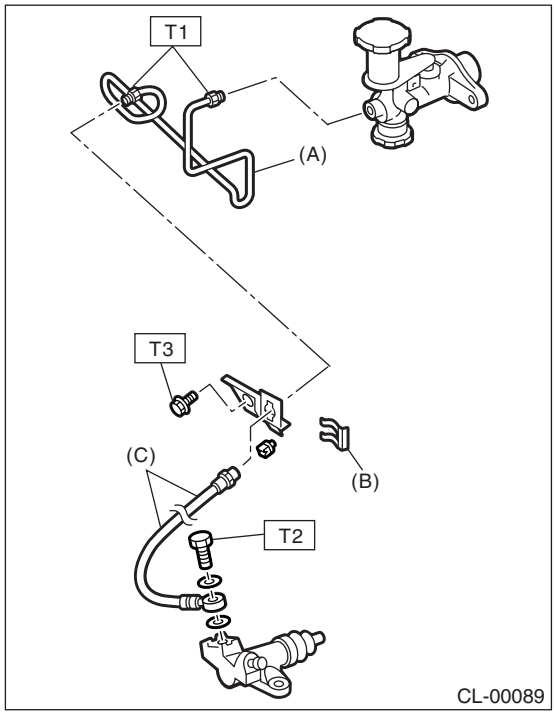
6) Remove the hose from operating cylinder.
7) Remove the bracket.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Bleed the clutch fluid. <Ref. to CL-23, Clutch Fluid Air Bleeding.>

Tightening torque:
T1: 15 N·m (1.5 kgf-m, 10.8 ft-lb)
T2: 18 N·m (1.8 kgf-m, 13.0 ft-lb)
T3: 25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Clutch pipe
(B) Clip
(C) Clutch hose

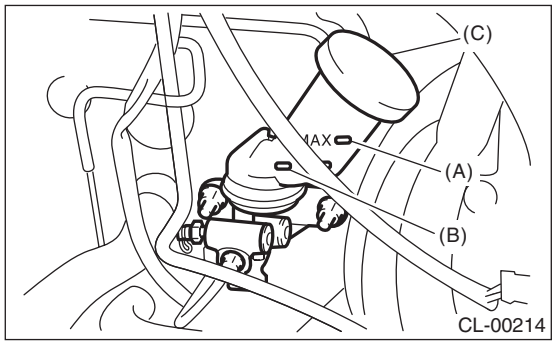
C: INSPECTION

Check the pipes and hoses for cracks, breakage, or damage. Check the joints for fluid leakage. If any cracks, breakage, damage, or leakage is found, repair or replace the applicable pipe or hose.

8. Clutch Fluid

A: INSPECTION

1) Park the vehicle on a level surface.
2) Inspect the fluid level using scale on the outside of the reservoir tank. If the level is below “MIN”, add fluid to bring it up to “MAX”, and also inspect for leakage.



(A) Max. level
(B) Min. level
(C) Reservoir tank

B: REPLACEMENT

CAUTION:
• The FMVSS No. 116, fresh DOT3 or 4 brake fluid must be used.
• Cover the bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
• Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.

NOTE:
• During bleeding operation, keep the clutch reservoir tank filled with brake fluid to eliminate entry of air.
• Clutch pedal operating must be very slow.
• For convenience and safety, it is advisable to have two men working.
• The amount of brake fluid required is approx. 70 mℓ (2.4 US fl oz, 2.5 Imp fl oz) for total clutch system.

1) Remove the air cleaner case and air duct.
2) Either jack-up the vehicle and place a safety stand under it, or lift-up the vehicle.
3) Draw out the brake fluid from reservoir tank with syringe.
4) Refill the reservoir tank with recommended brake fluid.

Recommended brake fluid:
FMVSS No. 116, fresh DOT3 or 4 brake fluid

5) Drain fluid in the same method as air bleeding.
6) Refill the brake fluid before reservoir tank becomes empty, and drain contaminated fluid again.
7) Repeat the above procedure until the contaminated fluid is completely drained.

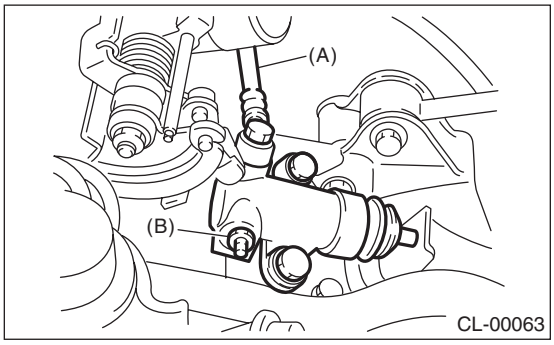
9. Clutch Fluid Air Bleeding

A: PROCEDURE

1. NON-TURBO MODEL

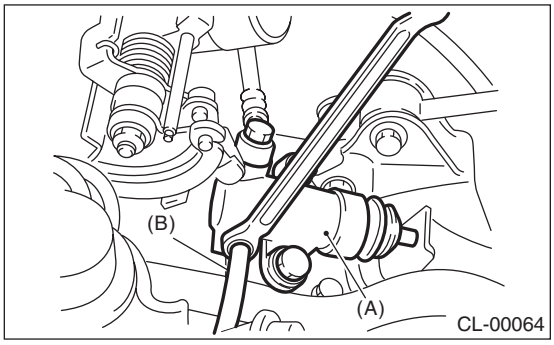
NOTE:
Bleed air from the oil line with help of a co-worker.

1) Remove the air cleaner case and air intake duct. <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.> and <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
2) Fit one end of a vinyl tube into the air bleeder of operating cylinder and put the other end into a brake fluid container.



(A) Clutch hose
(B) Air bleeder

3) Slowly depress the clutch pedal and keep it depressed. Then open the air bleeder to discharge air together with the fluid.
Release the air bleeder for 1 or 2 seconds. Next, with the bleeder closed, slowly release the clutch pedal.



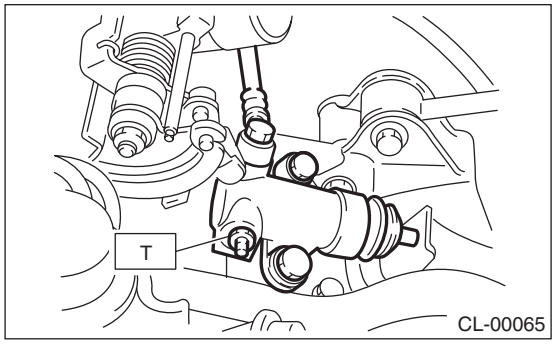
(A) Operating cylinder
(B) Vinyl tube

4) Repeat these steps until there are no more air bubbles in the vinyl tube.

CAUTION:
Cover the bleeder with waste cloth when loosening it, to prevent brake fluid from being splashed over surrounding parts.

5) Tighten the air bleeder.

Tightening torque:
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)



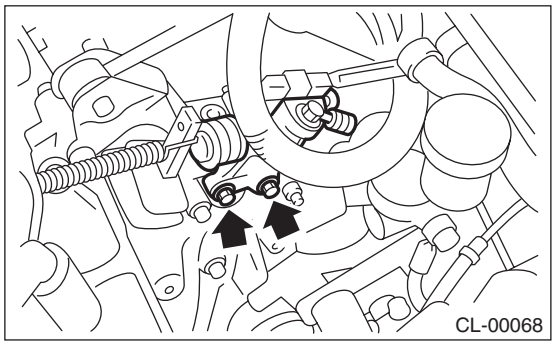
6) After depressing the clutch pedal, make sure that there are no leaks evident in the entire system.
7) After bleeding air from the system, ensure that clutch operates properly.

2. TURBO MODEL

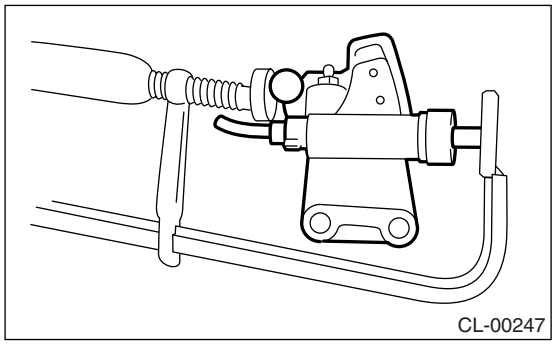
NOTE:
Bleed air from the oil line with help of a co-worker.

1) Remove the operating cylinder.

NOTE:
Do not remove the clutch hose.



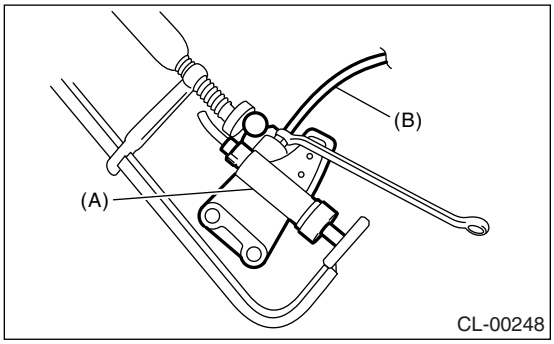
2) Fix the piston with clamp to avoid the piston from jumping out.



3) Fit one end of a vinyl tube into the air bleeder of operating cylinder and put the other end into a brake fluid container.

4) Slowly depress the clutch pedal and keep it depressed. Then open the air bleeder to discharge air together with the fluid.
Release the air bleeder for 1 or 2 seconds. Next, with the bleeder closed, slowly release the clutch pedal.

NOTE:
Set the air breather screw part higher than tip of operating cylinder when performing this procedure.



(A) Operating cylinder
(B) Vinyl tube

5) Repeat these steps until there are no more air bubbles in the vinyl tube.

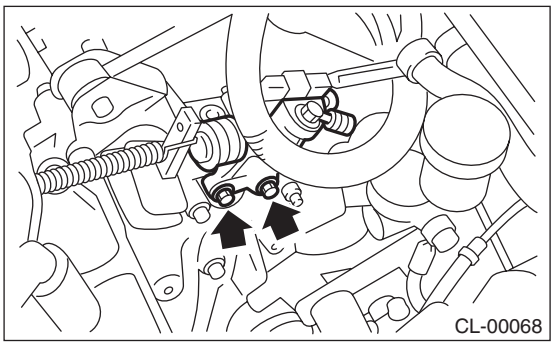
CAUTION:
Cover the bleeder with waste cloth when loosening it, to prevent brake fluid from being splashed over surrounding parts.

6) Tighten the air bleeder.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

7) Install the operating cylinder.

Tightening torque:
5MT model:
37 N·m (3.8 kgf-m, 27.5 ft-lb)
6MT model:
41 N·m (4.2 kgf-m, 30.2 ft-lb)



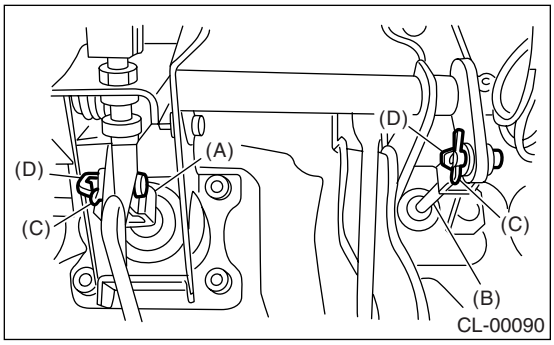
8) After depressing the clutch pedal, make sure that there are no leaks evident in the entire system.
9) After bleeding air from the system, ensure that clutch operates properly.

10) Install the intercooler. <Ref. to IN(H4DOTC)-10, INSTALLATION, Intercooler.>

10.Clutch Pedal

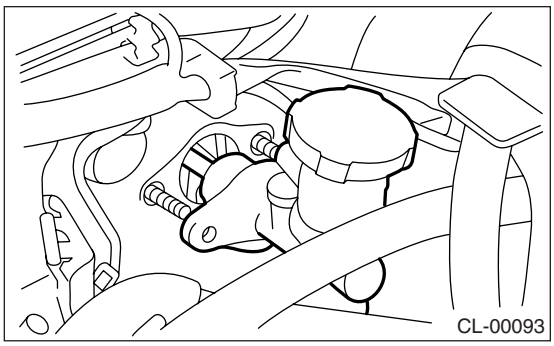
A: REMOVAL

1) Remove the steering column. <Ref. to PS-19, REMOVAL, Tilt Steering Column.>
2) Disconnect the connectors from stop light and clutch switches.
3) Remove the snap pins which secure lever to push rod and operating rod.
4) Remove the clevis pins which secure lever to push rod and operating rod.



(A) Operating rod
(B) Push rod
(C) Snap pin
(D) Clevis pin

5) Remove the air cleaner case and intake duct. (Non-turbo model) <Ref. to IN(H4SO)-5, REMOVAL, Air Cleaner Case.> and <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
6) Remove the intercooler. (Turbo model)
<Ref. to IN(H4DOTC)-10, REMOVAL, Intercooler.>
7) Remove the nut which secures clutch master cylinder.



8) Remove the bolts and nuts which secure brake and clutch pedals, and remove the pedal assembly.

B: INSTALLATION

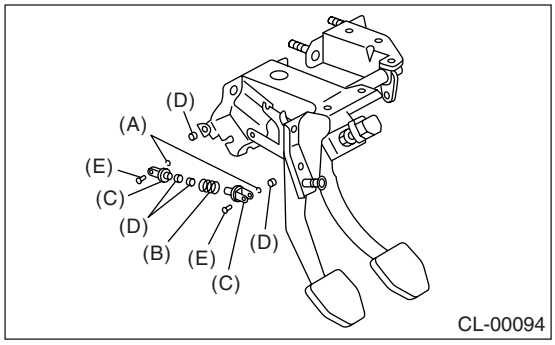
1) Install in the reverse order of removal.

CAUTION:
- **Be careful not to kink the accelerator cable.**
- **Always use new clevis pins.**

2) Adjust the clutch pedal after installation. <Ref. to CL-26, ADJUSTMENT, Clutch Pedal.>

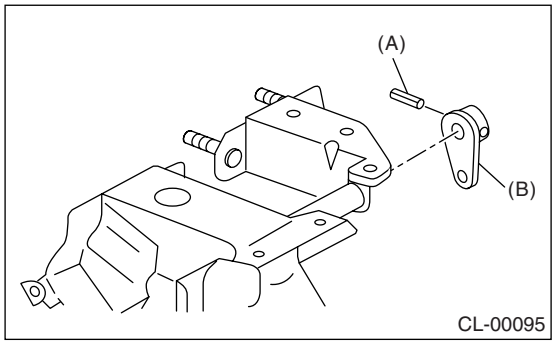
C: DISASSEMBLY

1) Remove the clips, assist spring, rod and bushing.



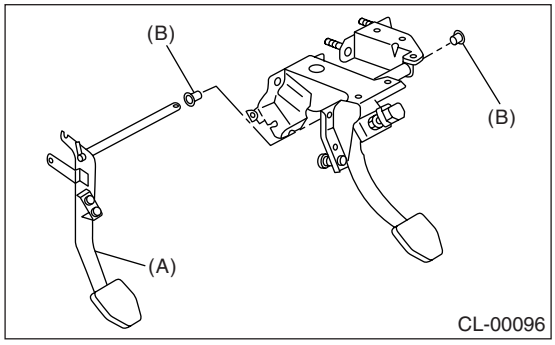
(A) Clip
(B) Assist spring
(C) Assist rod
(D) Bushing
(E) Clevis pin

2) Remove the spring pin and lever.



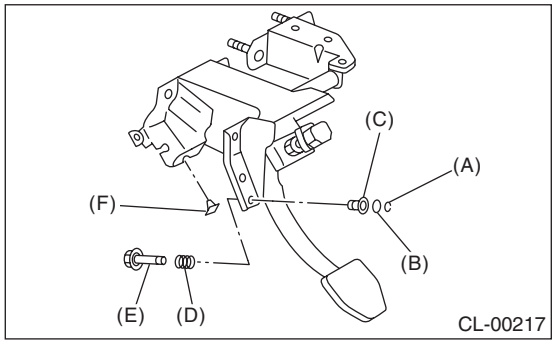
(A) Pin
(B) Lever

3) Remove the clutch pedal and bushings.



(A) Clutch pedal
(B) Bushing

4) Remove the stopper, clip, O-ring, rod S, and then remove the spring and bushing S.



(A) Clip
(B) O-ring
(C) Bushing S
(D) Spring S
(E) Rod S
(F) Stopper

5) Remove the stoppers from clutch pedal.
6) Remove the clutch pedal pad. (Non-turbo model)

D: ASSEMBLY

1) Attach the stopper, etc. to pedal bracket temporarily.
2) Clean inside of bores of clutch pedal and brake pedal, apply grease, and set bushings into bores.
3) Align bores of pedal bracket, clutch pedal and brake pedal, attach the brake pedal return spring, assist rods, spring, and bushing.

NOTE:
Clean up inside of bushings and apply grease before installing the spacer.

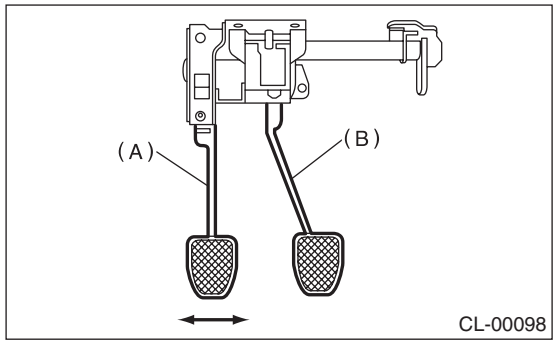
E: INSPECTION

1. CLUTCH PEDAL

Move the clutch pedal pads in the lateral direction with a force of approximately 10 N (1 kgf, 2 lb) to ensure pedal play is in specified range.

CAUTION:
If excessive movement is noted, replace the bushings with new ones.

Play of clutch pedal:
Service limit
5.0 mm (0.197 in) or less



(A) Clutch pedal
(B) Brake pedal

F: ADJUSTMENT

1. CLUTCH PEDAL

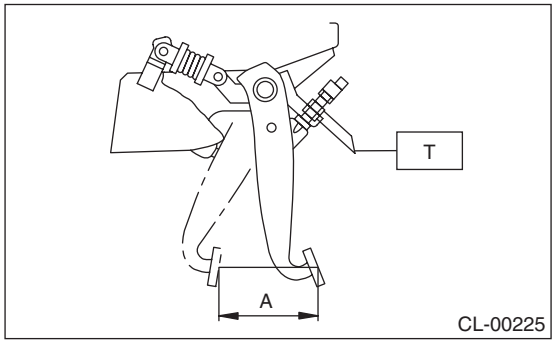
1) Turn the lock nuts until clutch pedal full stroke length is within specifications.

CAUTION:
Do not attempt to turn the clutch switch to adjust clutch pedal full stroke length.

NOTE:
If lock nuts cannot adjust the clutch pedal full stroke length to specifications, turn the master cylinder push rod to adjust it.

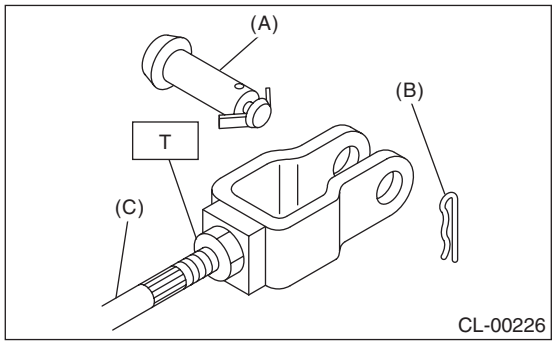
Specified clutch pedal full stroke: A
130 — 135 mm (5.12 — 5.31 in)

Tightening torque (Clutch switch lock nut):
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)



2) Turn the master cylinder push rod so that clevis pin moves to the left and then to the right. Clevis pin must move without resistance while it is rattling.

Tightening torque (Push rod lock nut):
T: 10 N·m (1.0 kgf-m, 7 ft-lb)

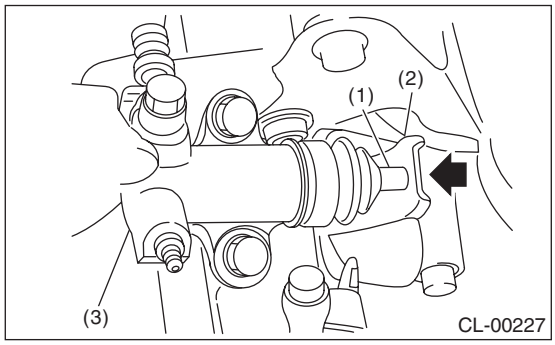


(A) Clevis pin
(B) Snap pin
(C) Push rod

3) Depress and release the clutch pedal two to three times to ensure that clutch pedal and release fork operates smoothly. If the clutch pedal and release fork do not operate smoothly, bleed air from the clutch hydraulic system. <Ref. to CL-23, Clutch Fluid Air Bleeding.>
4) Measure the clutch pedal full stroke length again to ensure that it is within specifications. If it is not, repeat adjustment procedures again from the beginning.

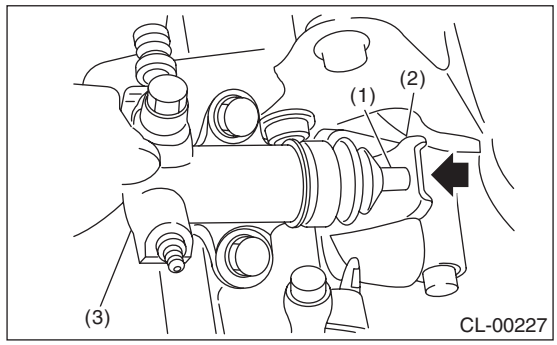
Specified clutch pedal full stroke:
130 — 135 mm (5.12 — 5.31 in)

5) Move the clevis pin to the left and then to the right. It should move without resistance while it is rattling. If resistance is felt, repeat adjustment procedures again from the beginning.
6) Push the release lever until operating cylinder push rod retracts. Ensure that clutch fluid level in reservoir tank increases. If the clutch fluid level increases, the hydraulic clutch is properly adjusted; if fluid level does not increase or push rod does not retract, replace the master cylinder with a new one. <Ref. to CL-19, Master Cylinder.>



(1) Push rod
(2) Release lever
(3) Operating cylinder

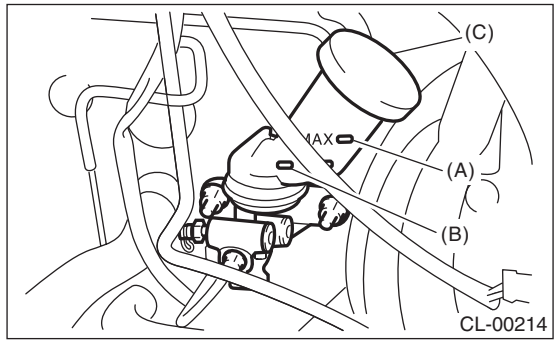
7) Push the release lever until operating cylinder push rod retracts. Check that the clutch fluid level in reservoir tank increases.



(1) Push rod
(2) Release lever
(3) Operating cylinder

8) If the clutch fluid level increases, hydraulic clutch play is correct.
9) If the clutch fluid level does not increase or push rod does not retract, clutch pedal must be readjusted.
10) Check the fluid level on the outside of the reservoir tank. If the level is below “MIN”, add clutch fluid to bring it up to “MAX”.

Recommended clutch fluid:
FMVSS No. 116, fresh DOT 3 or DOT 4 brake fluid



(A) Max. level
(B) Min. level
(C) Reservoir tank

11.Clutch Switch

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover.
3) Disconnect the connector from clutch switch.
4) Remove the clutch switch.

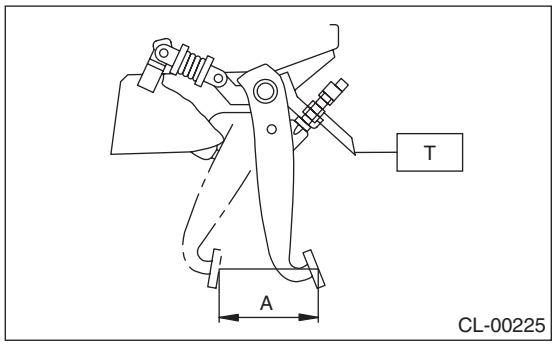
B: INSTALLATION

1. CLUTCH SWITCH (CRUISE CONTROL)

1) Move the clevis pin of the push rod right and left and hold where it moves smoothly, then measure stroke of clutch pedal.

Specified clutch pedal full stroke: A
130 — 135 mm (5.12 — 5.31 in)

Tightening torque:
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)

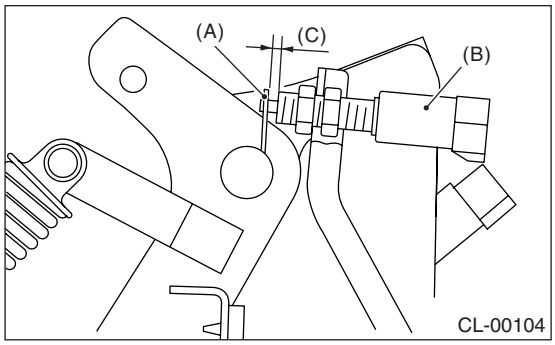


2) If the clutch pedal stroke is out of specification, adjust the stroke. <Ref. to CL-26, ADJUSTMENT, Clutch Pedal.>
3) Connect clutch switch connector.

2. CLUTCH SWITCH (STARTER INTERLOCK)

1) Fully depress the clutch pedal.
2) Install the clutch pedal plate and clutch pedal so that the gap between them is 3 — 3.5 mm (0.12 — 0.14 in), and then tighten the lock nut.

Tightening torque:
8 N·m (0.8 kgf-m, 13.0 ft-lb)



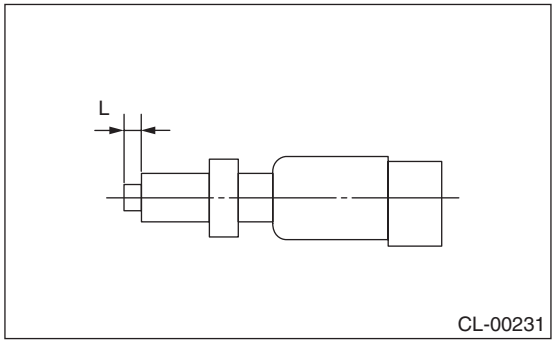
(A) Plate
(B) Clutch pedal
(C) 3 — 3.5 mm (0.12 — 0.14 in)

3) Connect the clutch switch connector.
4) Confirm that the engine does not start when the clutch pedal is released.
5) Confirm that the engine starts when the clutch pedal is fully depressed.

C: INSPECTION

1) If the clutch switch (cruise control) does not operate properly (or if it does not stop at the specified position), replace with a new one.

Specified position: L
$2^{+1.5}/_{0}$ mm ($0.079^{+0.059}/_{0}$ in)

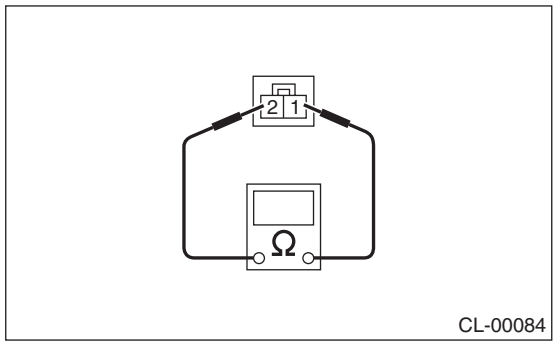


2) Check the clutch switch continuity. If continuity is not as specified, replace the switch.
(1) Disconnect the clutch switch connector.
(2) Measure the resistance between 1 and 2 of switch terminal.

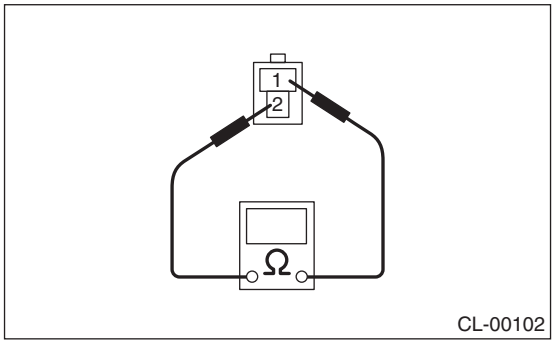
Terminals/Specified resistance
When clutch pedal depressed:
1 — 2/Less than 1 Ω

Terminals/Specified resistance
When clutch pedal not depressed:
1 — 2/More than 1 MΩ

Clutch switch (Cruise control)



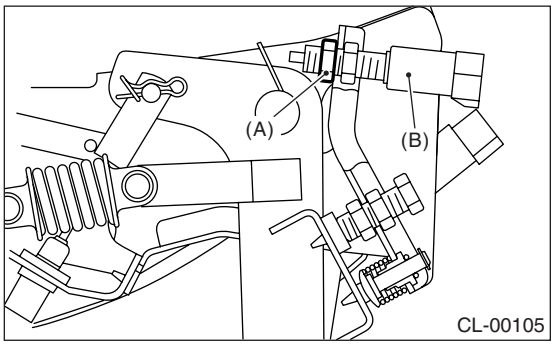
Clutch switch (Starter interlock)



3) Confirm that the engine does not start when the clutch pedal is not depressed. If the engine starts, adjust the clutch switch, and inspect the starter interlock circuit.
4) Confirm that the engine starts when the clutch pedal is fully depressed. If the engine does not start, adjust the clutch switch, and inspect the starter interlock circuit.

D: ADJUSTMENT

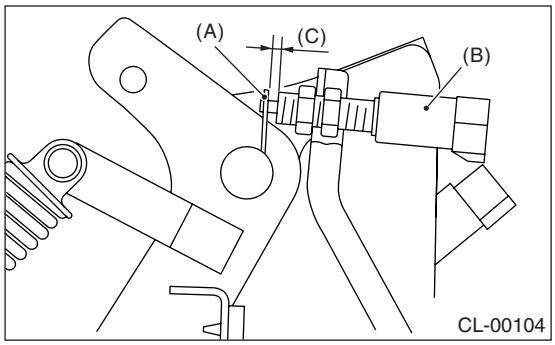
1) Loosen the clutch switch mounting lock nut (Starter interlock).



(A) Lock nut
(B) Clutch switch (Starter interlock)

2) Fully depress the clutch pedal.

3) Adjust the clutch pedal plate and clutch switch so that the gap between them is 3 — 3.5 mm (0.12 — 0.14 in).



(A) Plate
(B) Clutch switch (Starter interlock)
(C) 3 — 3.5 mm (0.12 — 0.14 in)

4) Tighten the lock nut.

Tightening torque:
8 N·m (0.8 kgf-m, 13.0 ft-lb)

12.General Diagnostic Table

A: INSPECTION

1. CLUTCH

Symptom	Possible cause	Corrective
1. Clutch slippage. It is hard to perceive clutch slippage in the early stage, but pay attention to the following symptoms • Engine speed up when shifting. • High speed driving is impossible; especially rapid acceleration impossible and vehicle speed does not increase in proportion to an increase in engine speed. • Power falls, particularly when ascending a slope, and there is a smell of burning of the clutch facing. • Method of testing: Put the vehicle in stationary condition with parking brake fully applied. Disengage the clutch and shift the transmission gear into the first. Gradually allow the clutch to engage while gradually increasing the engine speed. The clutch function is satisfactory if the engine stalls. However, the clutch is slipping if the vehicle does not start off and the engine does not stall.	(a) Clutch facing smeared by oil	Replace.
	(b) Worn clutch facing	Replace.
	(c) Deteriorated diaphragm spring	Replace.
	(d) Distorted pressure plate or flywheel	Correct or replace.
	(e) Defective release bearing holder	Correct or replace.
2. Clutch drags. As a symptom of this trouble, a harsh scratching noise develops and control becomes quite difficult when shifting gears. The symptom becomes more apparent when shifting into the first gear. However, because much trouble of this sort is due to defective synchronization mechanism, carry out the test as described after. • Method of testing: <Ref. to CL-30, CLUTCH, INSPECTION, General Diagnostic Table.> It may be judged as insufficient disengagement of clutch if any noise occurs during this test.	(a) Worn or rusty clutch disc hub spline	Replace the clutch disc.
	(b) Excessive deflection of clutch disc facing	Correct or replace.
	(c) Seized crankshaft pilot needle bearing	Replace.
	(d) Cracked clutch disc facing	Replace.
	(e) Stuck clutch disc (smeared by oil or water)	Replace.
3. Clutch chatters. Clutch chattering is an unpleasant vibration to the whole body when the vehicle is just started with clutch partially engaged.	(a) Adhesion of oil on the facing	Replace the clutch disc.
	(b) Weak or broken torsion spring	Replace the clutch disc.
	(c) Defective facing contact or excessive disc wear	Replace the defective clutch disc.
	(d) Warped pressure plate or flywheel	Correct or replace.
	(e) Loose disc rivets	Replace the clutch disc.
	(f) Loose engine mounting	Retighten or replace the mounting.
	(g) Improper adjustment of pitching stopper	Adjustment.
4. Noisy clutch Examine whether the noise is generated when the clutch is disengaged, engaged, or partially engaged.	(a) Broken, worn or unlubricated release bearing	Replace the release bearing.
	(b) Insufficient lubrication of pilot bearing	Apply grease.
	(c) Loose clutch disc hub	Replace the clutch disc.
	(d) Loose torsion spring retainer	Replace the clutch disc.
	(e) Deteriorated or broken torsion spring	Replace the clutch disc.

Symptom	Possible cause	Corrective
5. Clutch grabs. When starting the vehicle with the clutch partially engaged, the clutch engages suddenly and the vehicle jumps instead of making a smooth start.	(a) Grease or oil on facing	Replace the clutch disc.
	(b) Deteriorated cushioning spring	Replace the clutch disc.
	(c) Worn or rusted spline of clutch disc or main shaft	Take off rust, apply grease or replace the clutch disc or main shaft.
	(d) Deteriorated or broken torsion spring	Replace the clutch disc.
	(e) Loose engine mounting	Retighten or replace the mounting.
	(f) Deteriorated diaphragm spring	Replace.

2. CLUTCH PEDAL

Trouble	Corrective action
Insufficient pedal play	Adjust pedal play.
Clutch pedal free play insufficient	Adjust pedal free play.
Excessively worn and damaged pedal shaft and/or bushing	Replace the bushing and/or shaft with a new one.

3. DIAGNOSTIC DIAGRAM OF CLUTCH DRAG

	Step	Check	Yes	No
1	**CHECK GEAR NOISE.** 1) Start the engine. 2) Disengage the clutch and shift quickly from neutral to reverse in idling condition.	Is there any abnormal noise from the transmission gear?	Go to step **2.**	Clutch is normal.
2	**CHECK GEAR NOISE.** Disengage the clutch at idle and shift from neutral to reverse within 0.5 — 1.0 seconds.	Is there any abnormal noise from the transmission gear?	Go to step **3.**	Defective transmission or excessive clutch drag torque. Inspect the pilot bearing, clutch disc, transmission and clutch disc hub spline.
3	**CHECK GEAR NOISE.** 1) Disengage the clutch at idle and shift from neutral to reverse within 0.5 — 1.0 seconds. 2) With the clutch disengaged, shift from N to R, R to N several times.	Is there any abnormal noise from the transmission gear?	Defect in clutch disengaging. Inspect the clutch disc, clutch cover, clutch release, and clutch pedal free play.	Clutch and flywheel seizure. Inspect the clutch disc, spline of clutch disc hub.

CHASSIS SECTION

FRONT SUSPENSION	FS
REAR SUSPENSION	RS
WHEEL AND TIRE SYSTEM	WT
DIFFERENTIALS	DI
TRANSFER CASE	TC
DRIVE SHAFT SYSTEM	DS
ABS	ABS
ABS (DIAGNOSTICS)	ABS(diag)
BRAKE	BR
PARKING BRAKE	PB
POWER ASSISTED SYSTEM (POWER STEERING)	PS

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

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

FUJI HEAVY INDUSTRIES LTD.

G1870BE6

FRONT SUSPENSION

FS

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4.	Front Ball Joint	18
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6.	Front Stabilizer	23
7.	Front Crossmember	24
8.	Sub Frame	25
9.	Front Support Arm	27
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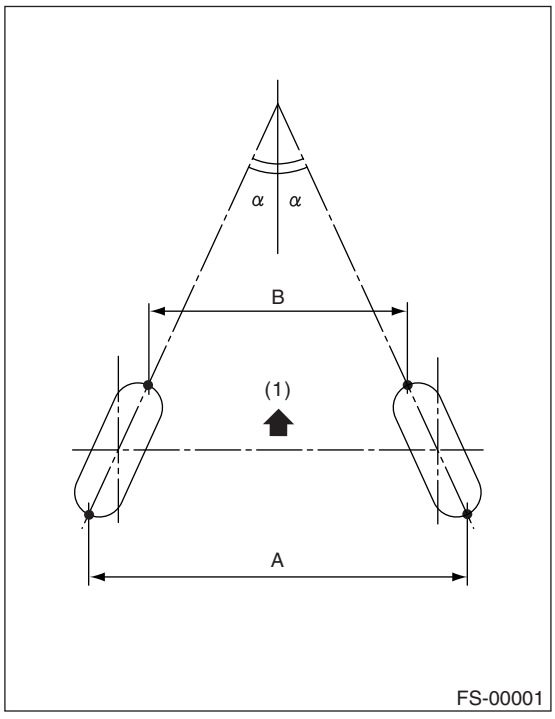
1. General Description

A: SPECIFICATIONS

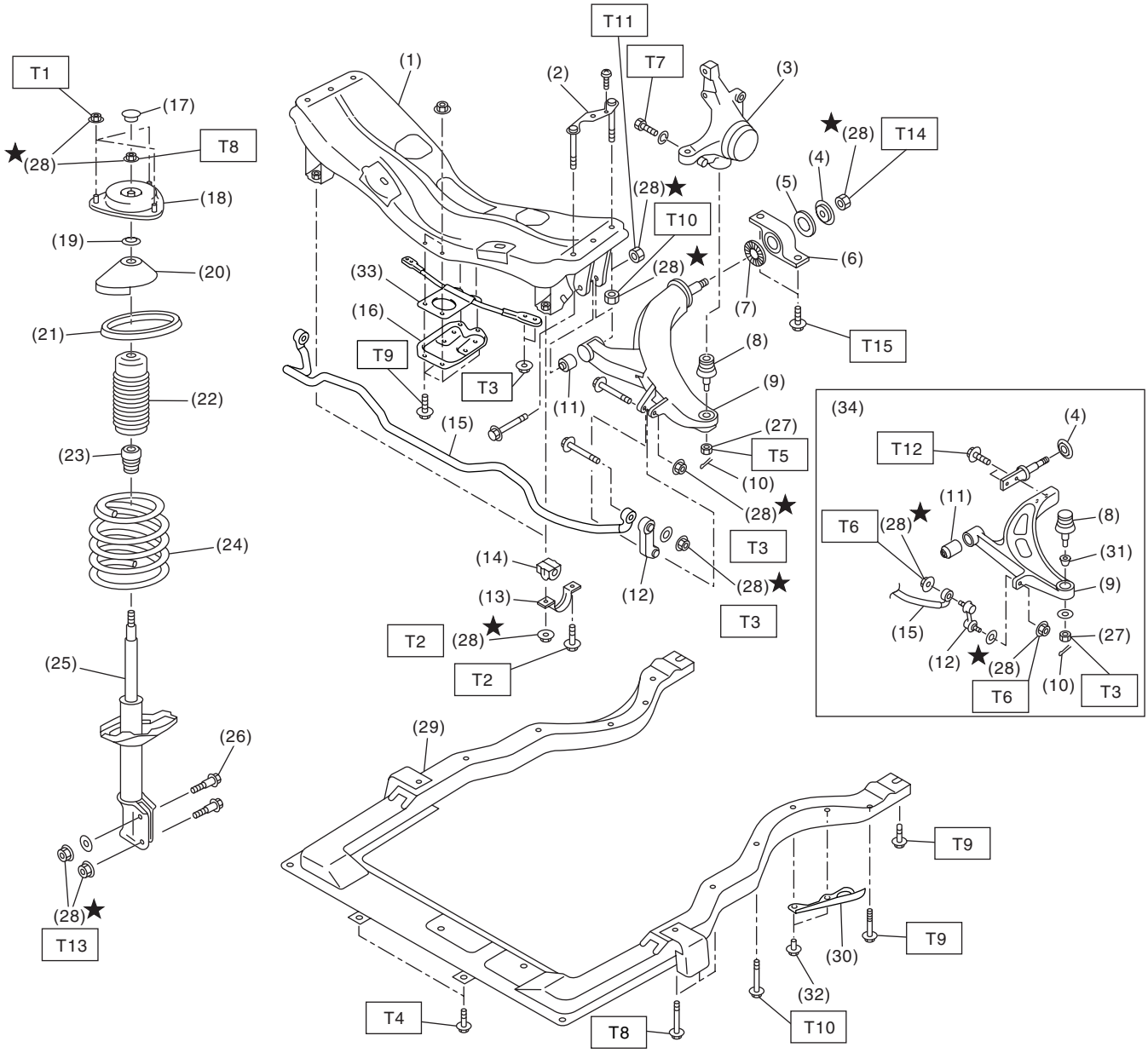
	Model	Sedan			Wagon		OUT-BACK
		Non-turbo	Turbo	STi	Non-turbo	Turbo	
Front	Camber (tolerance: ±0°45′)	−0°15′	−0°25′	−0°30′	−0°10′	−0°20′	−0°05′
	Caster (common difference: ±0°45′)	3°25′	3°35′	4°50′	3°25′	3°35′	3°25′
	Toe-in	0±3 mm (0±0.12 in) Each toe angle: ±0°07′30					
	Kingpin angle (tolerance: ±0°45′)	14°20′	14°35′	14°50′	13°30′	13°45′	13°20′
	Wheel arch height [tolerance: ±12 mm (±0.47 in)]	406 mm (15.98 in)	396 mm (15.59 in)	386 mm (15.20 in)	397 mm (15.28 in)	387 mm (15.24 in)	402 mm (15.83 in)
	Diameter of stabilizer	20 mm (0.79 in)	20 mm (0.79 in)	19 mm (0.75 in)	20 mm (0.79 in)	20 mm (0.79 in)	20 mm (0.79 in)
Rear	Camber (tolerance: ±0°45′)	−1°25′	−1°30′	−0°40′	−1°15′	−1°20′	−1°10′
	Toe-in	0±3 mm (0±0.12 in) Each toe angle: ±0°09′					
	Thrust angle	0°±30′					
	Wheel arch height [tolerance: ±12 mm (±0.47 in)]	381 mm (15.0 in)	376 mm (14.80 in)	366 mm (14.41 in)	381 mm (15.0 in)	376 mm (14.80 in)	386 mm (15.20 in)
	Diameter of stabilizer	13 mm (0.51 in)	17 mm (0.67 in)	20 mm (0.79 in)	13 mm (0.51 in)	17 mm (0.67 in)	13 mm (0.51 in)

NOTE:
• Front and rear toe-ins and front camber can be adjusted. If toe-in or camber tolerance exceeds specifications, adjust toe-in and camber to the middle value of specification.
• The other items indicated in the specification table cannot be adjusted. If the other items exceeds specifications, check suspension parts and connections for deformities; replace with new ones as required.



(1) Front
A − B = Positive: Toe-in, Negative: Toe-out
α = Each toe angle

B: COMPONENT



FS-00093

(1)	Front crossmember	(18)	Strut mount	
(2)	Bolt ASSY	(19)	Spacer	
(3)	Housing	(20)	Upper spring seat	
(4)	Washer	(21)	Rubber seat	
(5)	Stopper rubber (Rear)	(22)	Dust cover	
(6)	Rear bushing	(23)	Helper	
(7)	Stopper rubber (Front)	(24)	Coil spring	
(8)	Ball joint	(25)	Damper strut	
(9)	Transverse link	(26)	Adjusting bolt	
(10)	Cotter pin	(27)	Castle nut	
(11)	Front bushing	(28)	Self-locking nut	
(12)	Stabilizer link	(29)	Sub frame	
(13)	Clamp	(30)	Cover	
(14)	Bushing	(31)	Boss	
(15)	Stabilizer	(32)	Clip	
(16)	Jack-up plate	(33)	Front support arm	
(17)	Dust seal	(34)	STi model	

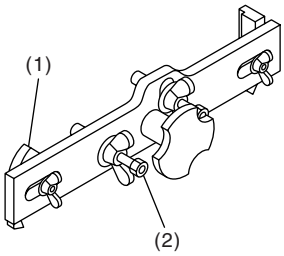
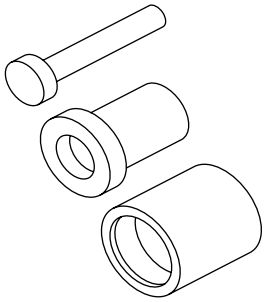
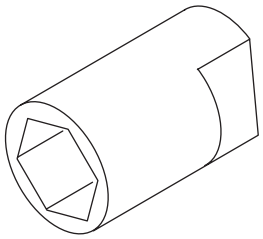
Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*20 (2.0, 14.5)*
T2:	*25 (2.5, 18.1)*
T3:	*30 (3.1, 22)*
T4:	*34 (3.5, 25)*
T5:	*40 (4.1, 30)*
T6:	*45 (4.6, 33)*
T7:	*50 (5.1, 37)*
T8:	*55 (5.6, 41)*
T9:	*70 (7.1, 52)*
T10:	*105 (10.7, 77)*
T11:	*125 (12.7, 92)*
T12:	*155 (15.8, 114)*
T13:	*175 (17.8, 129)*
T14:	*190 (19.4, 140)*
T15:	*250 (25.5, 184)*

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927380002	927380002	ADAPTER	Used as an adapter for camber & caster gauge when measuring camber and caster. (1) 28199AC000 PLATE (2) 28199AC010 BOLT
 ST-927680000	927680000	INSTALLER & REMOVER SET	Used for replacing transverse link bushing.
 ST-927760000	927760000	STRUT MOUNT SOCKET	Used for disassembling and assembling strut and shock mount.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Alignment gauge	Used for wheel alignment measurement.
Turning radius gauge	Used for wheel alignment measurement.
Toe-in gauge	Used for toe-in measurement.
Dial gauge	Used for damper strut measurement.
Coil spring compressor	Used for strut disassembly/assembly.

2. Wheel Alignment

A: INSPECTION

Check the following items before taking wheel alignment measurement.
Check items before taking wheel alignment measurement:

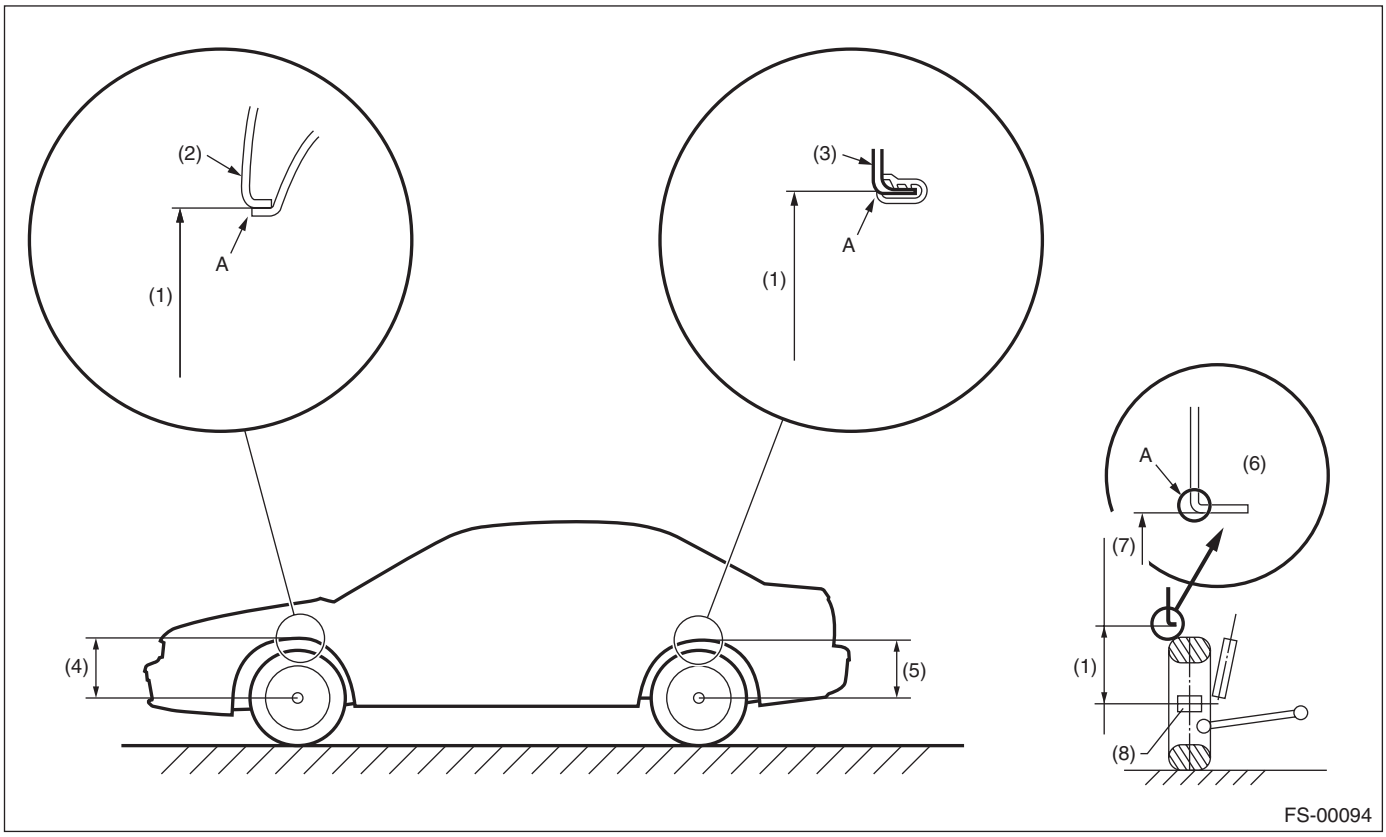
- tire air pressure
- unbalanced right and left tire wear, size difference
- tire run-out
- ball joint excessive play, wear
- tie rod end excessive play, wear
- wheel bearing excessive play
- right and left wheel base imbalance
- steering link part deformed, excessive play
- suspension part deformed, excessive play

Check, adjust and/or measure the wheel alignment in accordance with procedures indicated in the figure:

Wheel arch height (Front and rear) <Ref. to FS-7, WHEEL ARCH HEIGHT, INSPECTION, Wheel Alignment.>
↓
Camber (Front and rear) <Ref. to FS-8, CAMBER, INSPECTION, Wheel Alignment.>
↓
Caster (Front) <Ref. to FS-10, CASTER, INSPECTION, Wheel Alignment.>
↓
Steering angle <Ref. to FS-10, STEERING ANGLE, INSPECTION, Wheel Alignment.>
↓
Front wheel toe-in <Ref. to FS-10, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>
↓
Rear wheel toe-in <Ref. to FS-11, REAR WHEEL TOE-IN, INSPECTION, Wheel Alignment.>
↓
Thrust angle <Ref. to FS-13, THRUST ANGLE, INSPECTION, Wheel Alignment.>

1. WHEEL ARCH HEIGHT

1) Set the vehicle on a level surface.
2) Set the vehicle to “curb weight” conditions. (Empty luggage compartment, install spare tire, jack, service tools, and top up fuel tank.)
3) Set the steering wheel in a straight line, then remove the vehicle straight ahead more than 5 m (16 ft) to settle the suspension.
4) Suspend the thread from wheel arch (point “A” in figure below) to determine a point directly above center of wheel.
5) Measure the distance between measuring point “A” and center of wheel.



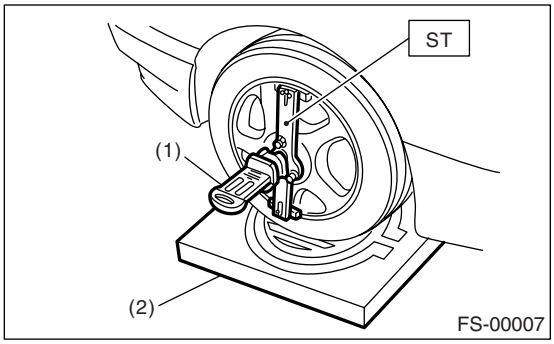
(1) Wheel arch height
(2) Front fender
(3) Rear quarter
(4) Front wheel arch height
(5) Rear wheel arch height
(6) Flange bend line
(7) Measuring point
(8) End of spindle

Model		Specified wheel arch height	
		Non-turbo	Turbo
Sedan	Front	406±12 mm (15.98±0.47 in)	396±12 mm (15.59±0.47 in)
	Rear	381±12 mm (15.0±0.47 in)	376±12 mm (14.80±0.47 in)
Wagon	Front	397±12 mm (15.63±0.47 in)	387±12 mm (15.24±0.47 in)
	Rear	381±12 mm (15.0±0.47 in)	376±12 mm (14.80±0.47 in)
OUTBACK	Front	402±12 mm (15.83±0.47 in)	—
	Rear	386±12 mm (15.20±0.47 in)	—
STi	Front	—	386±12 mm (15.20±0.47 in)
	Rear	—	366±12 mm (14.41±0.47 in)

2. CAMBER

• Inspection

1) Place the front wheel on turning radius gauge. Make sure ground contacting surfaces of front and rear wheels are set at the same height.
2) Set the ST into the center of wheel, and then install the wheel alignment gauge.
ST 927380002 ADAPTER



(1) Alignment gauge
(2) Turning radius gauge

3) Follow the wheel alignment gauge operation manual to measure camber angle.

NOTE:
Refer to the “SPECIFICATIONS” for camber values.
Front: <Ref. to FS-2, SPECIFICATIONS, General Description.>
Rear: <Ref. to RS-2, SPECIFICATIONS, General Description.>

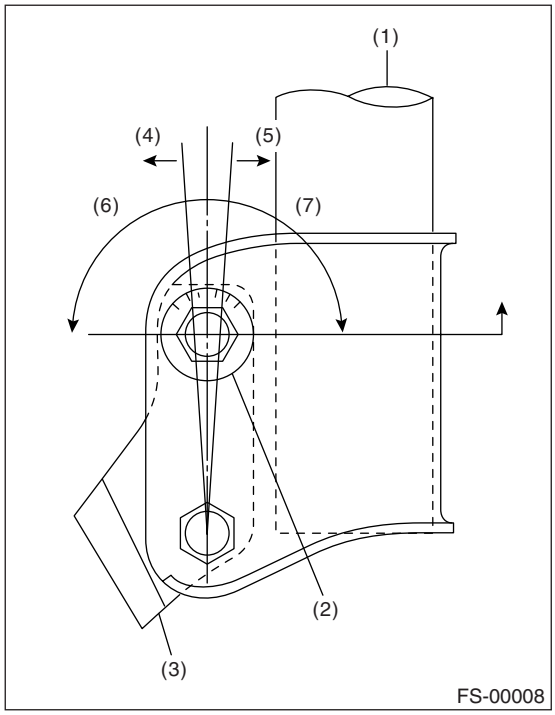
• Front Camber Adjustment

1) Loosen the two self-locking nuts located at lower front portion of strut.

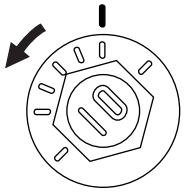
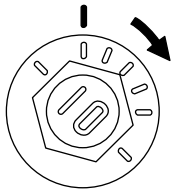
NOTE:
When adjusting bolt needs to be loosened or tightened, hold its head with a wrench and turn self-locking nut.

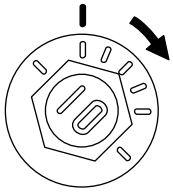
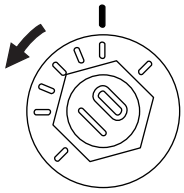
2) Turn the camber adjusting bolt so that camber is set at the specification.

NOTE:
Moving the adjusting bolt by one scale graduation changes camber by approx. 0°10′.



(1) Strut
(2) Adjusting bolt
(3) Housing
(4) Outer
(5) Inner
(6) Camber is increased.
(7) Camber is decreased.

Camber is increased.	
Rotate camber adjusting bolt LH counterclockwise.	Rotate camber adjusting bolt RH clockwise.
 FS-00009	 FS-00010

Camber is decreased.	
Rotate camber adjusting bolt LH clockwise.	Rotate camber adjusting bolt RH counterclockwise.
 FS-00010	 FS-00009

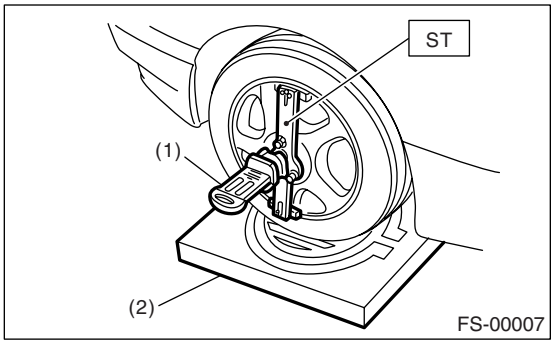
3) Tighten the new two self-locking nuts.

Tightening torque:
175 N·m (17.8 kgf-m, 129 ft-lb)

3. CASTER

• Inspection

1) Place the front wheel on turning radius gauge. Make sure ground contacting surfaces of front and rear wheels are set at the same height.
2) Set the ST into center of wheel, and then install the wheel alignment gauge.
ST 927380002 ADAPTER



(1) Alignment gauge
(2) Turning radius gauge

3) Follow the wheel alignment gauge operation manual to measure caster angle.

NOTE:
Refer to the “SPECIFICATIONS” for caster values. <Ref. to FS-2, SPECIFICATIONS, General Description.>

4. STEERING ANGLE

• Inspection

1) Place the vehicle on a turning radius gauge.
2) While depressing the brake pedal, turn the steering wheel fully to the right and left. With the steering wheel held at each fully turned position, measure both the inner and outer wheel steering angle.

Steering angle:

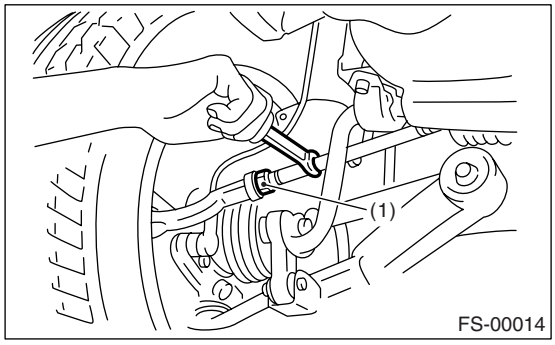
Model	*Turbo and OUTBACK*	*Others*
Inner wheel	*34.5°±1.5°*	*37.3°±1.5°*
Outer wheel	*30.3°±1.5°*	*32.4°±1.5°*

• Adjustment

1) Turn the tie-rod to adjust steering angle of both inner and outer wheels.

2) Check the toe-in.

NOTE:
Correct the boot if it is twisted.



(1) Lock nut

5. FRONT WHEEL TOE-IN

• Inspection

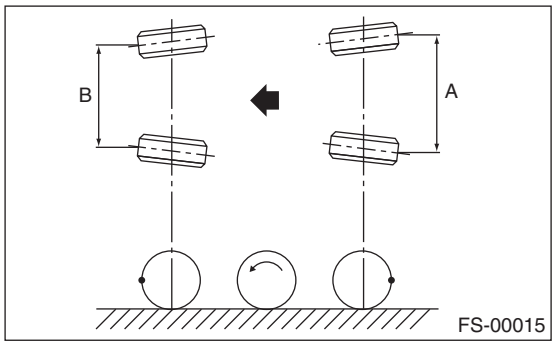
Toe-in:
0±3 mm (0±0.12 in)

1) Set the toe-in gauge to rear sides of right and left front tires at height corresponding to center of spindle.
2) Mark each right and left tires at height corresponding to center of spindle and measure the distance “A” between marks.
3) Move the vehicle forward to rotate wheels 180°.

NOTE:
Whenever rotating the wheels, drive the vehicle forward.

4) Measure the distance “B” between right and left marks. Toe-in can then be obtained by the following equation:

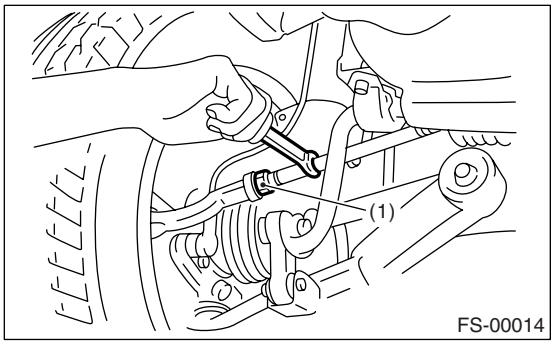
A − B = Toe-in



• Adjustment

1) Make sure that the right and left steering angles are within specified value.
2) Loosen the right and left side steering tie-rods lock nuts.

3) Turn the right and left tie rods equal amounts until the toe-in is at the specification.
Both the right and left tie-rods are right-hand threaded. To increase toe-in, turn both tie-rods clockwise equal amounts (as viewed from inside of the vehicle).



(1) Lock nut

4) Tighten the tie-rod lock nut.

Tightening torque:
83 N·m (8.5 kgf-m, 61.5 ft-lb)

NOTE:
Correct the tie-rod boot, if it is twisted.

6. REAR WHEEL TOE-IN

• Inspection

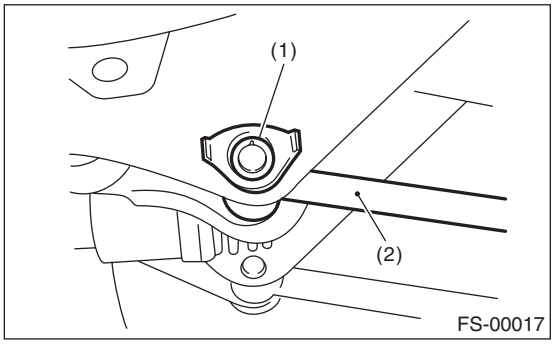
Toe-in:
0±3 mm (0±0.12 in)

For rear toe-in inspection procedure, refer to FRONT WHEEL TOE-IN procedure.
<Ref. to FS-10, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

• Adjustment

1) Loosen the self-locking nut on inner side of link rear.

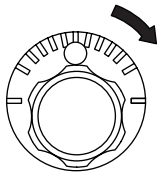
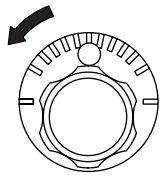
NOTE:
When loosening or tightening the adjusting bolt, hold the bolt head and turn self-locking nut.

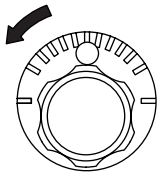
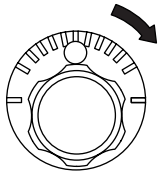


(1) Adjusting bolt
(2) Link rear

2) Turn the adjusting bolt head until toe-in is at the specification.

NOTE:
When the right and left wheels are adjusted for toe-in at the same time, the movement of one scale graduation changes toe-in by approx. 1.5 mm (0.6 in).

Toe-in is increased.	
Rotate camber adjusting bolt LH clockwise.	Rotate camber adjusting bolt RH counterclockwise.
 FS-00018	 FS-00019

Toe-in is decreased.	
Rotate camber adjusting bolt LH counterclockwise.	Rotate camber adjusting bolt RH clockwise.
 FS-00019	 FS-00018

3) Tighten a new self-locking nut.

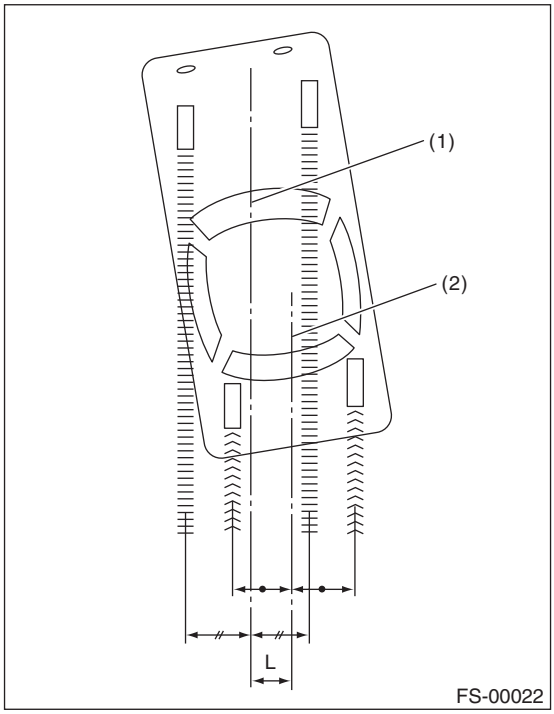
Tightening torque:
100 N·m (10.2 kgf-m, 74 ft-lb)

7. THRUST ANGLE

• Inspection

1) Position the vehicle on a level surface.
2) Move the vehicle 3 to 4 m (10 to 13 ft) directly forward.
3) Determine the center lines of loci of both front and rear axles.
4) Measure the distance “L” between center lines of loci of the axles.

Thrust angle:
Less than 30 ′ when “L” is less than 22 mm (0.9 in).

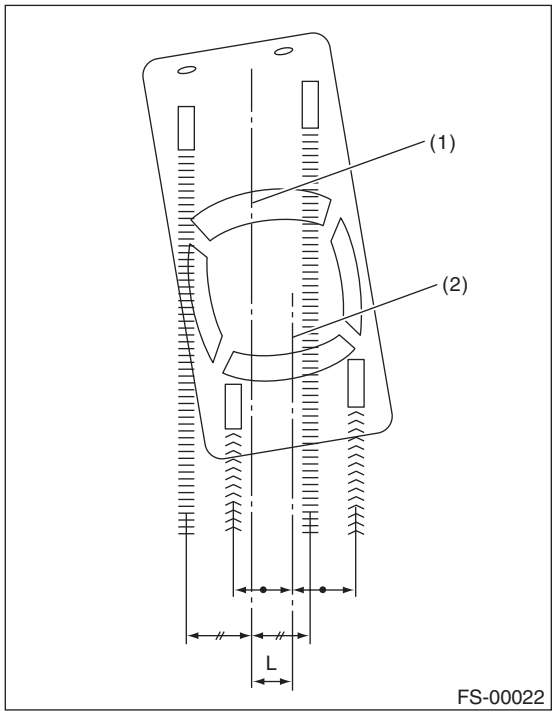


(1) Center line of loci (front axle)
(2) Center line of loci (rear axle)

• Adjustment

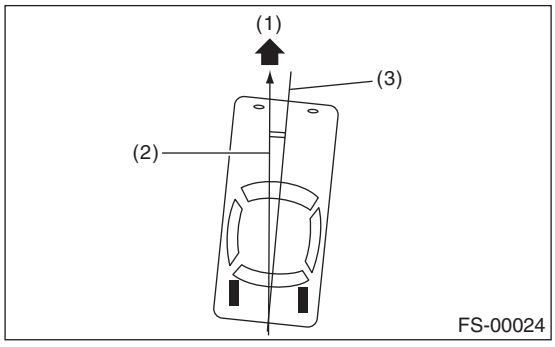
1) Make the thrust angle adjustments by turning toe-in adjusting bolts of rear suspension equally in the same direction.
2) When one rear wheel is adjusted in a toe-in direction, adjust the other rear wheel equally in toe-out direction, in order to make thrust angle adjustment.
3) When the right and left adjusting bolts are turned incrementally by one graduation in the same direction, the thrust angle will change approx. 16′ [“L” is almost equal to 12 mm (0.472 in)].

Thrust angle:
0°±30 ′



(1) Center line of loci (front axle)
(2) Center line of loci (rear axle)

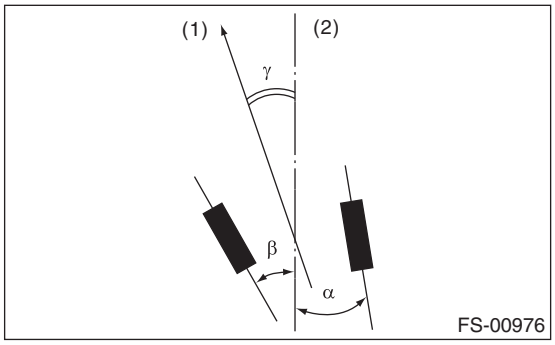
NOTE:
Thrust angle refers to a mean value of right and left rear wheel toe angles in relation to the vehicle body center line. Vehicle is driven straight in the thrust angle direction while swinging in the oblique direction depending on the degree of the mean thrust angle.



(1) Front
(2) Thrust angle
(3) Body center line

Thrust angle: r = ($\alpha - \beta$)/2

α: Right rear wheel toe-in angle
β: Left rear wheel toe-in angle
Here, use only positive toe-in values from each wheel to substitute for α and β in the equation.



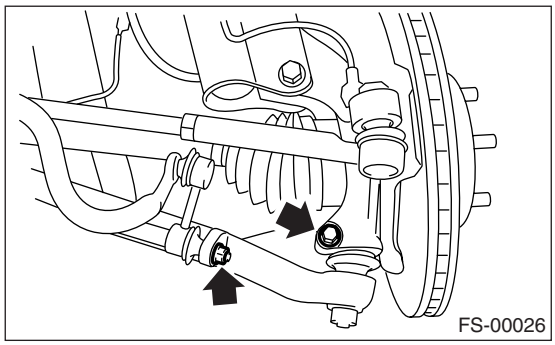
(1) Front
(2) Body center line

3. Front Transverse Link

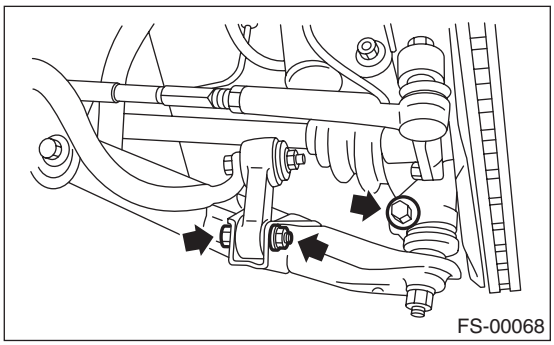
A: REMOVAL

1) Set the vehicle on a lift.
2) Lift-up the vehicle and remove the wheel.
3) Remove the sub frame.
4) Disconnect the stabilizer link from transverse link.
5) Remove the bolt securing ball joint of transverse link to housing.

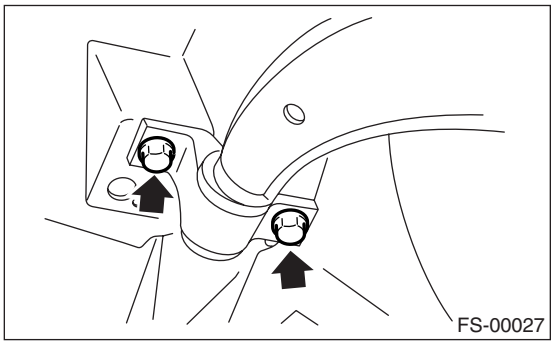
SEDAN MODEL:



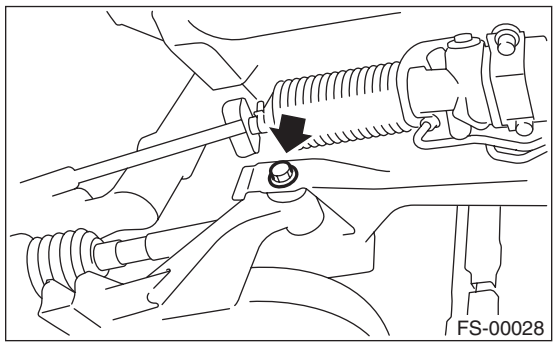
WAGON MODEL:



6) Remove the nut (do not remove bolt) securing transverse link to crossmember.
7) Remove the two bolts securing bushing bracket of transverse link to the vehicle body at rear bushing location.



8) Extract the ball joint from housing.
9) Remove the bolt securing transverse link to crossmember, and then extract the transverse link from crossmember.



B: INSTALLATION

1) Temporarily tighten the two bolts used to secure rear bushing of transverse link to body.

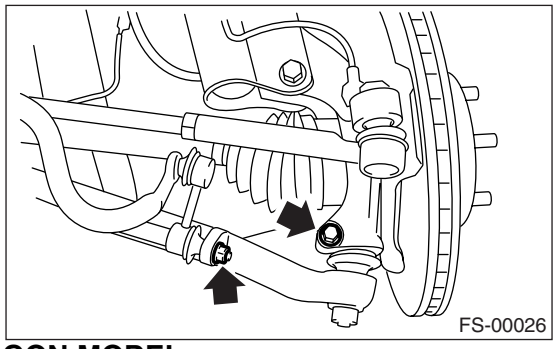
NOTE:
These bolts should be tightened to such an extent that they can still move back and forth in the oblong shaped hole in the bracket (which holds the bushing).

2) Install the bolts used to connect transverse link to crossmember and temporarily tighten with a new self-locking nut.

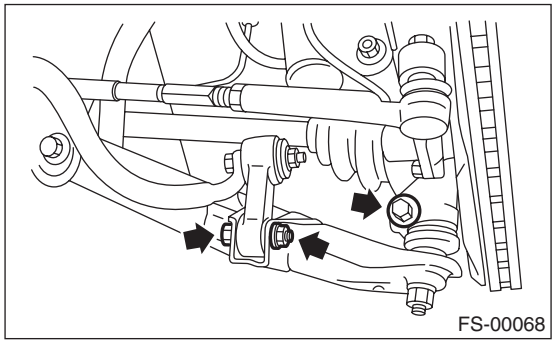
CAUTION:
Discard the loosened self-locking nut and replace with a new one.

3) Insert the ball joint into housing.
4) Connect the stabilizer link to transverse link, and then temporarily tighten a new self-locking nut.

SEDAN MODEL:



WAGON MODEL:



5) Tighten the following points in the order shown below when tires are in full contact with the ground and vehicle is curb weight.
(1) Transverse link and stabilizer

Tightening torque:
STi model:
45 N·m (4.6 kgf-m, 33 ft-lb)
Except STi model:
30 N·m (3.1 kgf-m, 22 ft-lb)

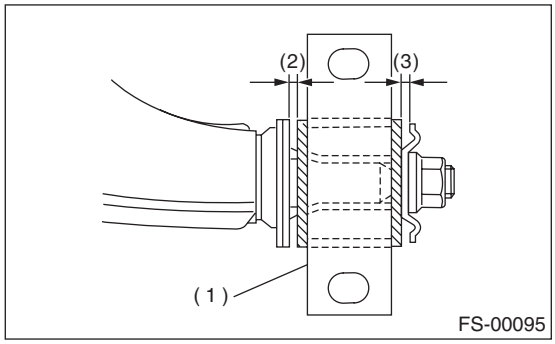
(2) Transverse link and crossmember

Tightening torque:
125 N·m (12.7 kgf-m, 92 ft-lb)

(3) Transverse link rear bushing and body

Tightening torque:
250 N·m (25.5 kgf-m, 184 ft-lb)

NOTE:
Move the rear bushing back and forth until transverse link-to-rear bushing clearance is established (as indicated in the figure) before tightening. (Except STi model)



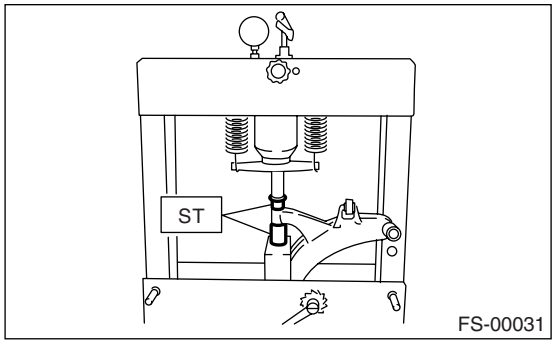
(1) Rear bushing
(2) 1 mm (0.04 in)
(3) 1.5 mm (0.059 in)

6) Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

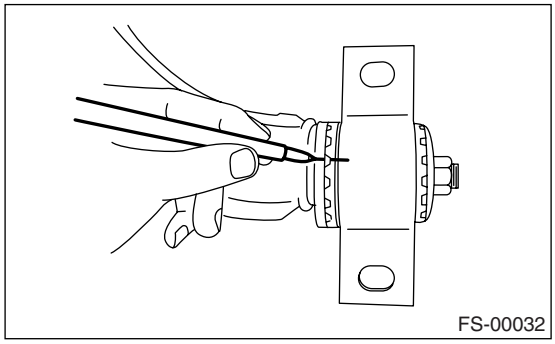
1. FRONT BUSHING

Using the ST, press the front bushing out of place.
ST 927680000 INSTALLER & REMOVER SET



2. REAR BUSHING

1) Scribe an aligning mark on the transverse link and rear bushing.
2) Loosen the nut, and then remove the rear bushing.

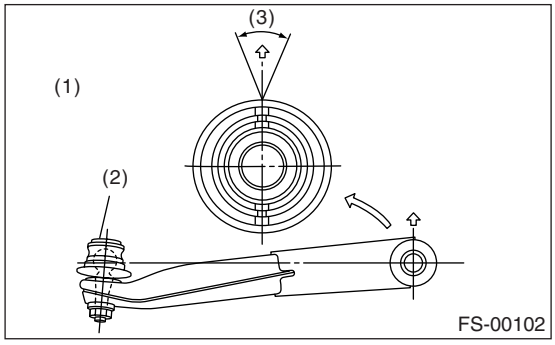


D: ASSEMBLY

1. FRONT BUSHING

Assemble in the reverse order of disassembly.

CAUTION:
Install the front bushing in correct direction, as shown in the figure.



(1) Face bushing toward center of ball joint
(2) Ball joint
(3) ±3°

2. REAR BUSHING

1) Install the rear bushing to transverse link, and then align the aligning marks scribed on the two.
2) Tighten the new self-locking nut.

NOTE:
While holding the rear bushing so as not to change position of aligning marks, tighten the self-locking nut.

Tightening torque:
190 N·m (19.4 kgf-m, 140 ft-lb)

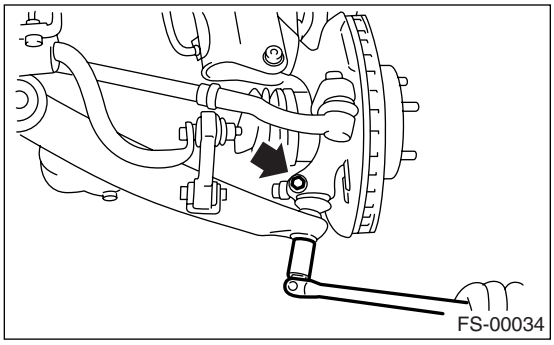
E: INSPECTION

1) Check the transverse link for wear, damage and cracks, and correct or replace if defective.
2) Check the bushings for cracks, fatigue or damage.
3) Check the rear bushing for oil leaks.

4. Front Ball Joint

A: REMOVAL

1) Remove the wheel.
2) Pull out the cotter pin from ball stud, remove the castle nut, and extract the ball stud from transverse link.
3) Remove the bolt securing ball joint to housing.



4) Extract the ball joint from housing.

B: INSTALLATION

1) Install the ball joint onto housing.

Tightening torque (Bolt):
50 N·m (5.1 kgf-m, 37 ft-lb)

CAUTION:
Do not apply grease to tapered portion of ball stud.

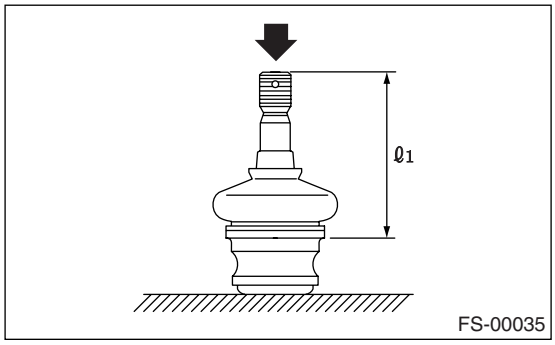
2) Connect the ball joint to transverse link.

Tightening torque (Castle nut):
STi model:
30 N·m (3.1 kgf-m, 22 ft-lb)
Except STi model:
40 N·m (4.1 kgf-m, 30 ft-lb)

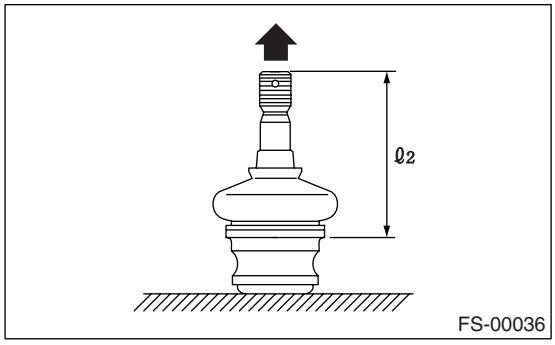
3) Retighten the castle nut further within 60° until a slot in castle nut is aligned with the hole in ball stud end, then insert a new cotter pin and bend it around castle nut.
4) Install the front wheel.

C: INSPECTION

1) Measure the play of ball joint by the following procedures. Replace with a new one when the play exceeds specified value.
(1) With 686 N (70 kgf, 154 lb) loaded in direction shown in the figure, measure the dimension ℓ_1.



(2) With 686 N (70 kgf, 154 lb) loaded in opposite direction shown in the figure, measure the dimension ℓ_2.



(3) Calculate plays from the following formula. $S = \ell_2 - \ell_1$
(4) When plays are larger than the following value, replace with a new one.

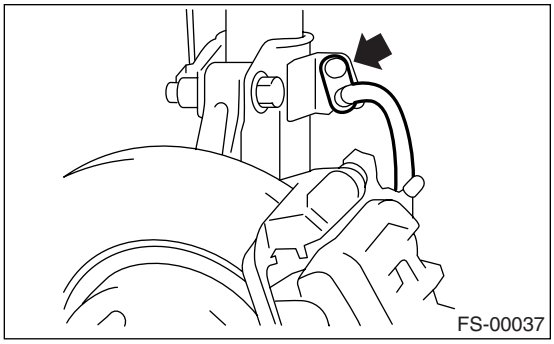
FRONT BALL JOINT
Specified play for replacement: S
Less than 0.3 mm (0.012 in)

2) When the play is smaller than specified value, visually inspect the dust cover.
3) The ball joint and cover that have been removed must be checked for wear, damage or cracks, and any defective part must be replaced.
4) If the dust cover is damaged, replace with a new ball joint.

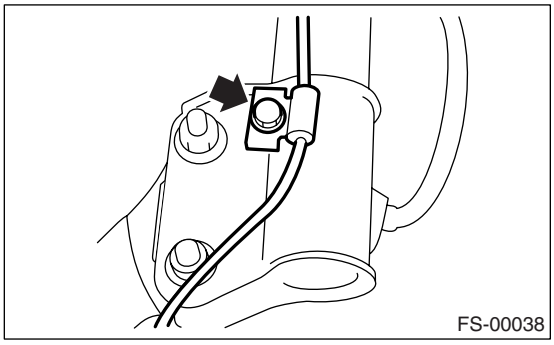
5. Front Strut

A: REMOVAL

1) Remove the wheel.
2) Remove the bolt securing the brake hose from strut.



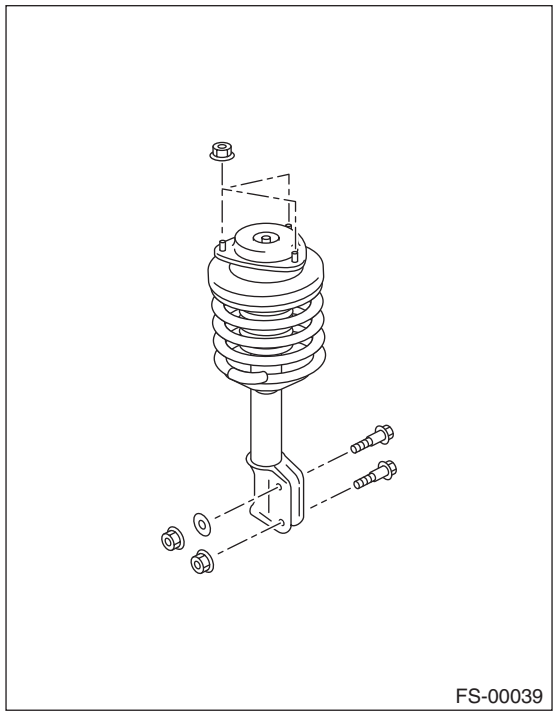
3) Scribe an alignment mark on the camber adjusting bolt which secures the strut to housing.
4) Remove the bolt securing ABS wheel speed sensor harness.



5) Remove the two bolts securing housing to strut.

NOTE:
While holding the head of adjusting bolt, loosen self-locking nut.

6) Remove the three nuts securing the strut mount to body.



B: INSTALLATION

1) Install the strut mount at upper side of strut to body, and then tighten with the nuts.

Tightening torque:
20 N·m (2.0 kgf-m, 14.5 ft-lb)

2) Position the aligning mark on camber adjustment bolt with aligning mark on lower side of strut. Install the strut to housing with a new self-locking nut.

NOTE:
While holding the head of adjusting bolt, tighten the self-locking nut.

Tightening torque:
175 N·m (17.8 kgf-m, 129 ft-lb)

3) Install the ABS wheel speed sensor harness to strut.

Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)

4) Install the bolts which secure the brake hose to strut.

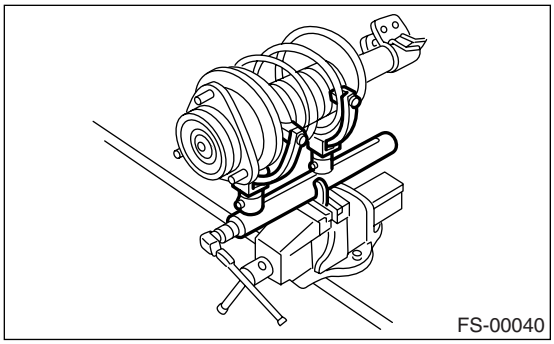
Tightening torque:
32 N·m (3.3 kgf-m, 23.6 ft-lb)

5) Install the wheels.

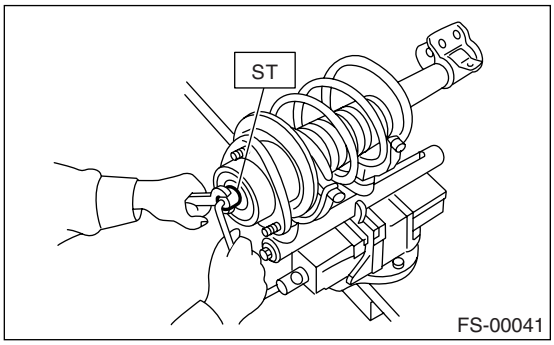
NOTE:
Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

1) Using a coil spring compressor, compress the coil spring.



2) Using the ST, remove the self-locking nut.
ST 927760000 STRUT MOUNT SOCKET



3) Remove the strut mount, upper spring seat and rubber seat from strut.
4) Gradually decreasing the compression force of compressor, and then remove the coil spring.
5) Remove the dust cover and helper spring.

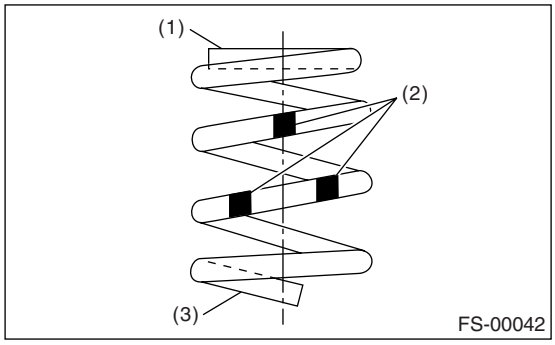
D: ASSEMBLY

1) Before installing the coil spring, strut mount, etc., on strut, check for the presence of air in the damping force generating mechanism of strut since air prevents proper damping force from being produced.
2) Checking for the presence of air
   (1) Place the strut vertically with piston rod facing up.
   (2) Move the piston rod to center of its entire stroke.
   (3) While holding the piston rod end with fingertips, move the rod up and down.
   (4) If the piston rod moves at least 10 mm (0.39 in) in the former step, purge air from the strut.
3) Air purging procedure
   (1) Place the strut vertically with piston rod facing up.
   (2) Fully extend the piston rod.
   (3) With the piston rod fully extended, place the piston rod side down. The strut must stand vertically.
   (4) Fully contract the piston rod.
   (5) Repeat three or four times from first step.

NOTE:
After completely purging air from strut, be sure to place the strut with piston rod facing up. If it is laid down, check for entry of air in the strut as outlined under “Checking for the presence of air”.

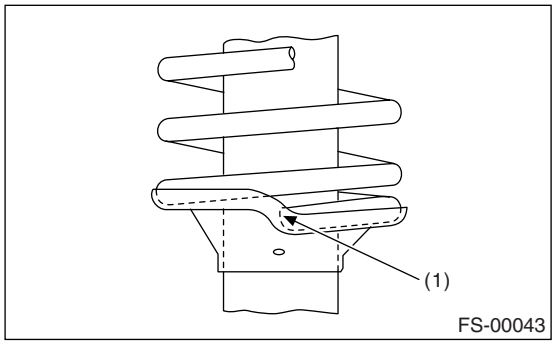
4) Using a coil spring compressor, compress the coil spring.

NOTE:
Make sure that the installing direction of coil spring is as shown in the figure.



(1) Flat (top side)
(2) Identification paint
(3) Inclined (bottom side)

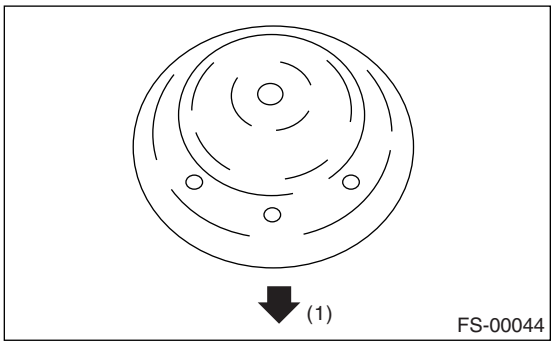
5) Set the coil spring correctly so that its end face fits well into the spring seat as shown in the figure.



(1) Coil spring end face

6) Install the helper and dust cover to the piston rod.
7) Pull the piston rod fully upward, and install the rubber seat and spring seat.

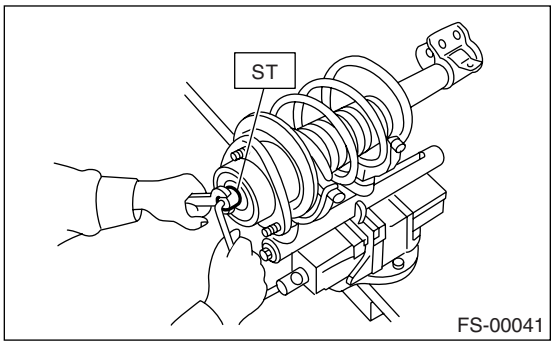
NOTE:
Ensure that the upper spring seat is positioned as shown in the figure.



(1) Outside of body

8) Install the strut mount to the piston rod, and then tighten a new self-locking nut temporarily.
9) Using a hexagon wrench to prevent strut rod from turning, tighten the self-locking nut with ST.
ST 927760000 STRUT MOUNT SOCKET

Tightening torque:
55 N·m (5.6 kgf-m, 41 ft-lb)



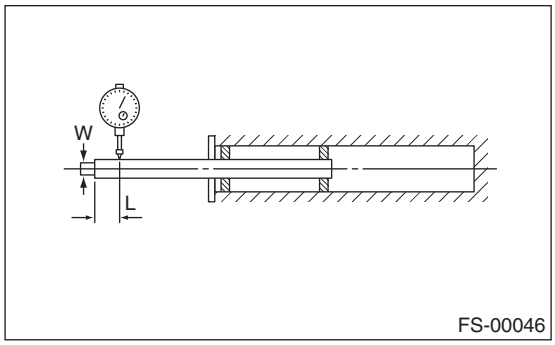
10) Loosen the coil spring carefully.

E: INSPECTION

Check the disassembled parts for cracks, damage and wear, and replace with new parts if defective.

1. DAMPER STRUT

1) Check for oil leakage.
2) Move the piston rod up and down to check that it operates smoothly without any binding.
3) Play of piston rod
• Measure the play as follows:
Fix outer shell and fully extend the rod. Set a dial gauge at the end of rod: L [10 mm (0.39 in)], then apply a force of W [20 N (2 kgf, 4 lb)] to threaded portion. With the force of 20 N (2 kgf, 4 lb) applied, read dial gauge indication: P_1. Apply a force of 20 N (2 kgf, 4 lb) in the opposite direction of “W”, then read dial gauge indication: P_2.



Limit of play ($P_1 + P_2$):
0.8 mm (0.031 in)

If the play is greater than limit, replace the strut.

2. STRUT MOUNT

Check the rubber part for creep, cracks and deterioration, and replace it with a new one if defective.

3. DUST COVER

If any cracks or damage are found, replace it with a new one.

4. COIL SPRING

One having permanent strain should be replaced with a new one. When the vehicle posture is uneven, although there are no considerable reasons like tire puncture, uneven loading, etc., check the coil spring for its free length referring to specifications, cracks, etc., and replace it with a new one if defective.

5. HELPER

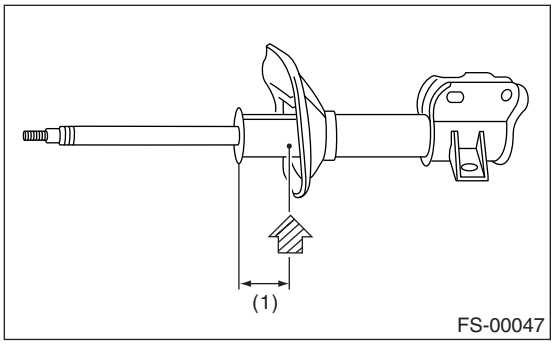
Replace it with a new one if cracked or damaged.

F: DISPOSAL

1. EXCEPT STi MODEL

CAUTION:
• Before handling gas filled struts, be sure to wear goggles to protect eyes from gas, oil and filings.
• Do not disassemble the strut damper or place into a fire.
• Drill holes before disposing of gas filled struts.

1) Place the gas filled strut on a flat and level surface with piston rod fully extended.
2) Using a 2 to 3 mm (0.08 to 0.12 in) dia. drill, make holes in areas shown in the figure.

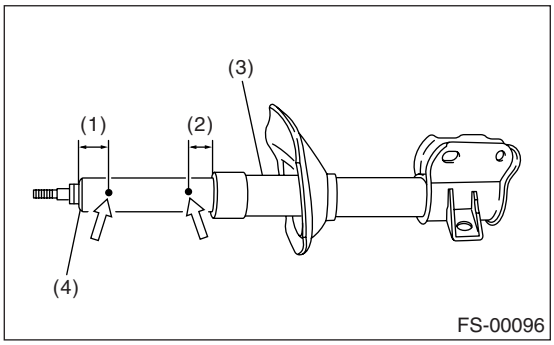


(1) 40 mm (1.57 in)

2. STi MODEL

CAUTION:
• Before handling gas filled struts, be sure to wear goggles to protect eyes from gas, oil and filings.
• Do not disassemble the strut damper or place into a fire.
• Drill holes before disposing of gas filled struts.

1) Place the gas filled strut on a flat and level surface with damping tube fully extended.
2) Using a 2 to 3 mm (0.08 to 0.12 in) dia. drill, make holes in (1), and then make a hole in (2).



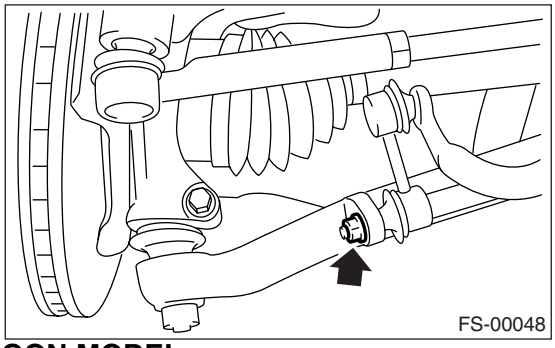
(1) 20 mm (0.78 in)
(2) 10 mm (0.39 in)
(3) Strut
(4) Damping tube

6. Front Stabilizer

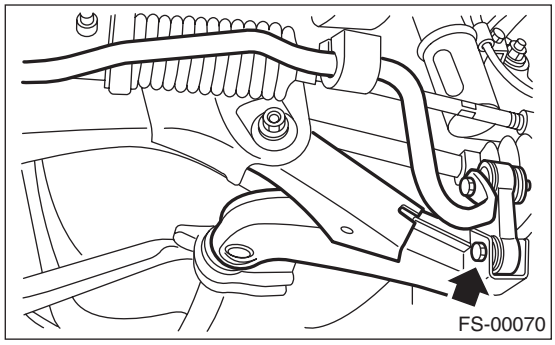
A: REMOVAL

1) Jack-up the front part of the vehicle and support it with rigid racks.
2) Remove the jack-up plate from lower part of crossmember.
3) Remove the sub frame.
4) Remove the nut which secures stabilizer link to front transverse link.

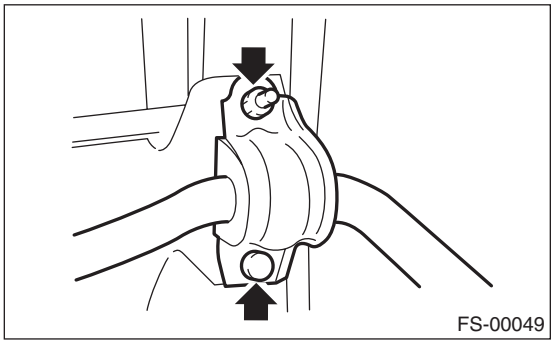
SEDAN MODEL:



WAGON MODEL:



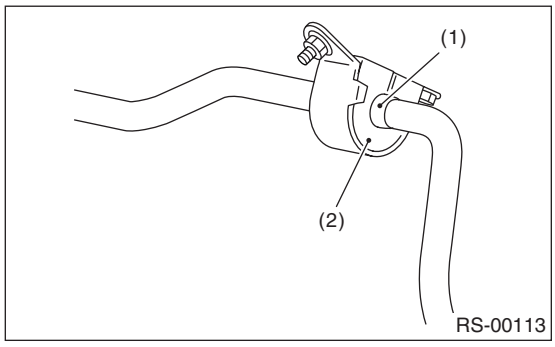
5) Remove the bolts which secure stabilizer to crossmember.



B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
• Install the bushing (on front crossmember side) while aligning it with paint mark on stabilizer.
• Ensure that bushing and stabilizer have the same identification colors when installing.



(1) Mark stamped on stabilizer
(2) Bushing identification color

2) Always tighten the bushing location when tires are in full contact with the ground and vehicle is curb weight.

Tightening torque:
Jack-up plate to crossmember (Except STi model):
20 N·m (2.0 kgf-m, 14.5 ft-lb)
Jack-up plate to crossmember (STi model):
70 N·m (7.1 kgf-m, 52 ft-lb)
Stabilizer link to front transverse link (STi model):
45 N·m (4.6 kgf-m, 33 ft-lb)
Stabilizer link to front transverse link (Except STi model):
30 N·m (3.1 kgf-m, 22 ft-lb)
Stabilizer to crossmember:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

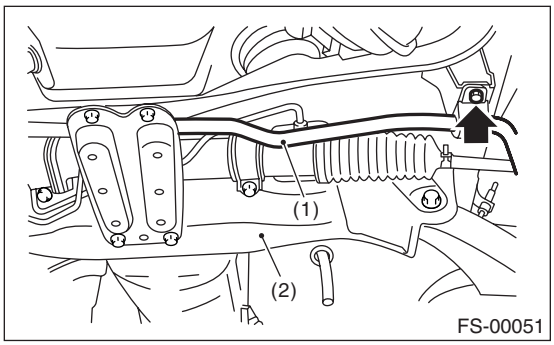
C: INSPECTION

1) Check the bushing for cracks, fatigue or damage.
2) Check the stabilizer link for deformities, cracks, or damage, and bushing for protrusions from the hole of stabilizer link.

7. Front Crossmember

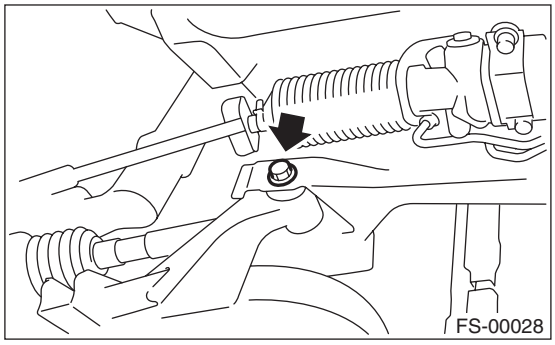
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and then remove the front wheels.
3) Remove the sub frame.
4) Remove both the stabilizer and jack-up plate.



(1) Front stabilizer
(2) Front crossmember

5) Disconnect the tie-rod end from housing.
6) Remove the front exhaust pipe.
7) Remove the front transverse link from front crossmember and body.



8) Remove the nuts attaching engine mount cushion rubber to crossmember.
9) Remove the steering universal joint.
10) Disconnect the power steering pipe from steering gear box.
11) Lift the engine by approx. 10 mm (0.39 in) by using chain block.
12) Support the crossmember with a jack, remove nuts securing crossmember to body and lower the crossmember gradually along with steering gearbox.

CAUTION:
When removing the crossmember downward, be careful that tie-rod end does not interfere with SFJ boot.

B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
Always tighten the bushing when tires are in full contact with the ground and vehicle is curb weight.

Tightening torque:
Transverse link bushing to crossmember:
125 N·m (12.7 kgf-m, 92 ft-lb)
Stabilizer to bushing:
25 N·m (2.5 kgf-m, 18.1 ft-lb)
Tie-rod end to housing:
27.0 N·m (2.75 kgf-m, 19.9 ft-lb)
Front cushion rubber to crossmember:
85 N·m (8.7 kgf-m, 62.7 ft-lb)
Universal joint to pinion shaft:
24 N·m (2.4 kgf-m, 17.4 ft-lb)
Crossmember to body:
105 N·m (10.7 kgf-m, 77 ft-lb)

2) Purge air from the power steering system.
3) Check the wheel alignment and adjust if necessary.

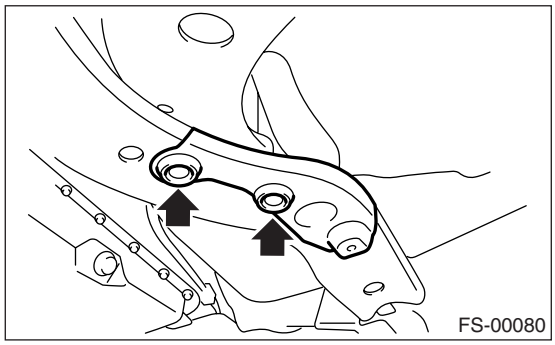
C: INSPECTION

Check the crossmember for wear, damage and cracks, and correct or replace if defective.

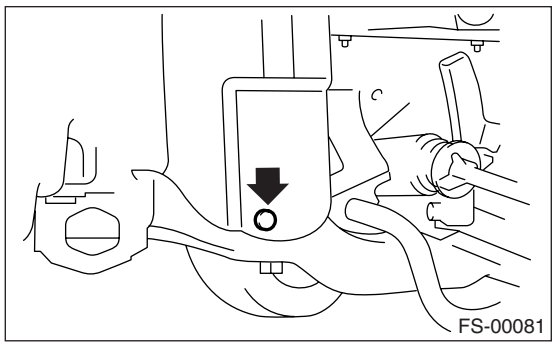
8. Sub Frame

A: REMOVAL

1) Lift-up the vehicle.
2) Remove the under cover.
3) Remove the bolt cover.

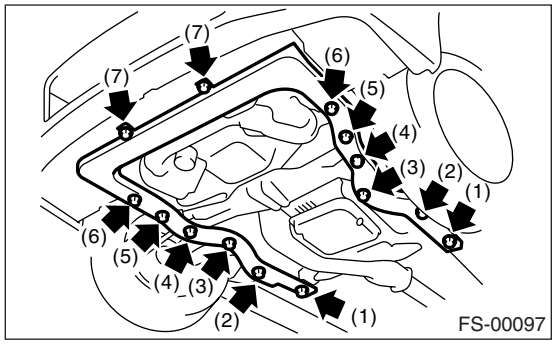


4) Remove the clip.



5) Remove the sub frame.

NOTE:
Loosen bolt (1) and leave a few threads caught, then remove the bolts in the order of (2), (3), (4), (5), and (6).



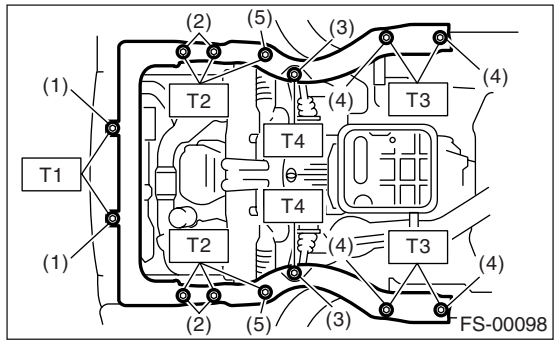
(4) Only for STi model

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace the M12 bolt with a new one.

Tightening torque:
T1: 34 N·m (3.5 kgf-m, 25 ft-lb)
T2: 55 N·m (5.6 kgf-m, 41 ft-lb)
T3: 71 N·m (7.2 kgf-m, 52 ft-lb)
T4: 105 N·m (10.7 kgf-m, 77 ft-lb)



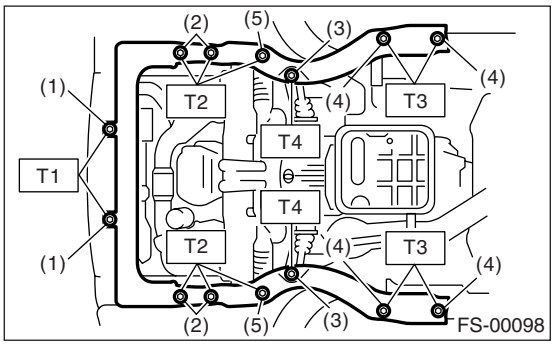
(1) M8 bolt
(2) M12 bolt (with wax)
(3) M12 bolt (with oil)
(4) M10 bolt
(5) M12 bolt (Only for STi model)

C: INSPECTION

1) Check that there is no damage and distortion at the sub frame.
2) Check that the bolts are tightened with the specified torque. If there is looseness, tighten to the specified torque.

NOTE:
The tightening torque differs by the color for bolt (3). Always verify the bolt color before checking tightening torque.

Tightening torque:
T1: 34 N·m (3.5 kgf-m, 25 ft-lb)
T2: 55 N·m (5.6 kgf-m, 41 ft-lb)
T3: 71 N·m (7.2 kgf-m, 52 ft-lb)
T4: Dark green bolt
105 N·m (10.7 kgf-m, 77 ft-lb)
T4: Except dark green bolt
55 N·m (5.6 kgf-m, 41 ft-lb)

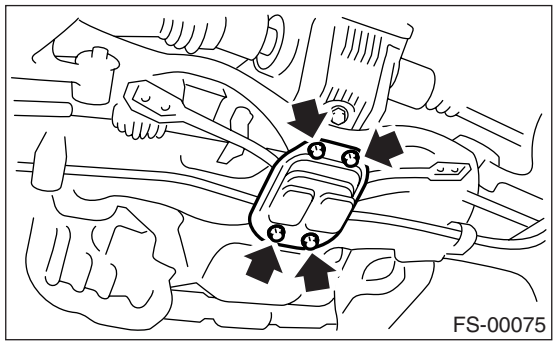


(1) M8 bolt
(2) M12 bolt
(3) M12 bolt
(4) M10 bolt
(5) M12 bolt (Only for STi model)

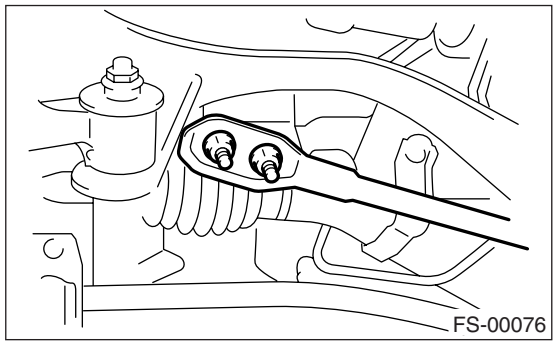
9. Front Support Arm

A: REMOVAL

1) Set the vehicle on a lift.
2) Lift-up the vehicle.
3) Remove the under cover.
4) Remove the four bolts and jack-up plate.



5) Remove the two nuts at both ends of arm respectively.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Front support arm to crossmember:
30 N·m (3.1 kgf-m, 22 ft-lb)
Jack-up plate to crossmember:
70 N·m (7.1 kgf-m, 52 ft-lb)

C: INSPECTION

Check the front support arm for wear, damage and cracks, and correct or replace if defective.

10.General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible causes	Countermeasures
(1) Permanent distortion or breakage of coil spring	Replace.
(2) Unsmooth operation of damper strut and/or shock absorber	Replace.
(3) Installation of wrong strut and/or shock absorber	Replace with proper parts.
(4) Installation of wrong coil spring	Replace with proper parts.

2. POOR RIDE COMFORT

1) Large rebound shock
2) Rocking of the vehicle continues too long after running over bump and/or hump.
3) Large shock in bumping

Possible causes	Countermeasures
(1) Breakage of coil spring	Replace.
(2) Overinflating pressure of tire	Adjust.
(3) Improper wheel arch height	Adjust or replace the coil springs with new ones.
(4) Fault in operation of damper strut and/or shock absorber	Replace.
(5) Damage or deformation of strut mount and/or shock absorber mount	Replace.
(6) Unsuitability of maximum and/or minimum length of damper strut and/or shock absorber	Replace with proper parts.
(7) Deformation or loss of bushing	Replace.
(8) Deformation or damage of helper in strut assembly and/or shock absorber	Replace.
(9) Oil leakage of damper strut and/or shock absorber	Replace.

3. NOISE

Possible causes	Countermeasures
(1) Wear or damage of damper strut and/or shock absorber component parts	Replace.
(2) Loosening of suspension link installing bolt	Retighten to the specified torque.
(3) Deformation or loss of bushing	Replace.
(4) Unsuitability of maximum and/or minimum length of damper strut and/or shock absorber	Replace with proper parts.
(5) Breakage of coil spring	Replace.
(6) Wear or damage of ball joint	Replace.
(7) Deformation of stabilizer clamp	Replace.

REAR SUSPENSION

RS

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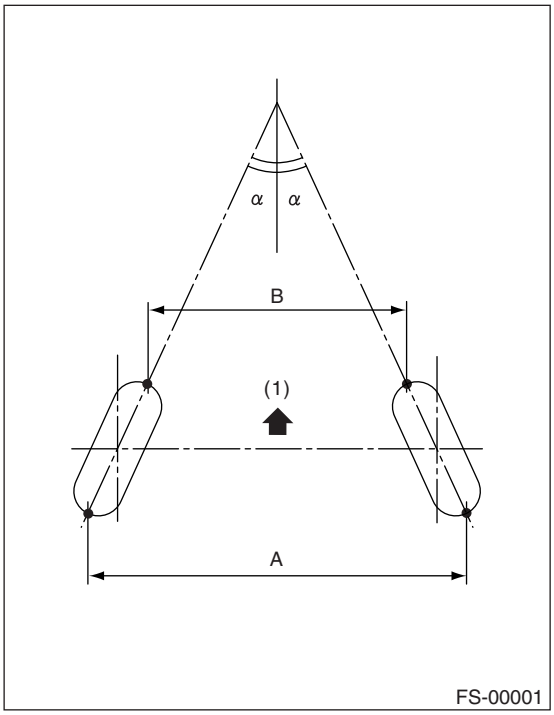
1. General Description

A: SPECIFICATIONS

Model	Sedan			Wagon		OUTBACK
	Non-turbo	Turbo	STi	Non-turbo	Turbo	
Camber (tolerance: ±0°45′)	−1°25′	−1°30′	−1°40′	−1°15′	−1°20′	−1°10′
Toe-in	0±3 mm (0±0.12 in) Each toe angle: ±0°09′					
Thrust angle	0°±30′					
Wheel arch height [tolerance: ±12 mm (±0.47 in)]	381 mm (15.0 in)	376 mm (14.80 in)	366 mm (14.41 in)	381 mm (15.0 in)	376 mm (14.80 in)	386 mm (15.20 in)
Diameter of stabilizer	13 mm (0.51 in)	17 mm (0.67 in)	20 mm (0.79 in)	13 mm (0.51 in)	17 mm (0.67 in)	13 mm (0.51 in)

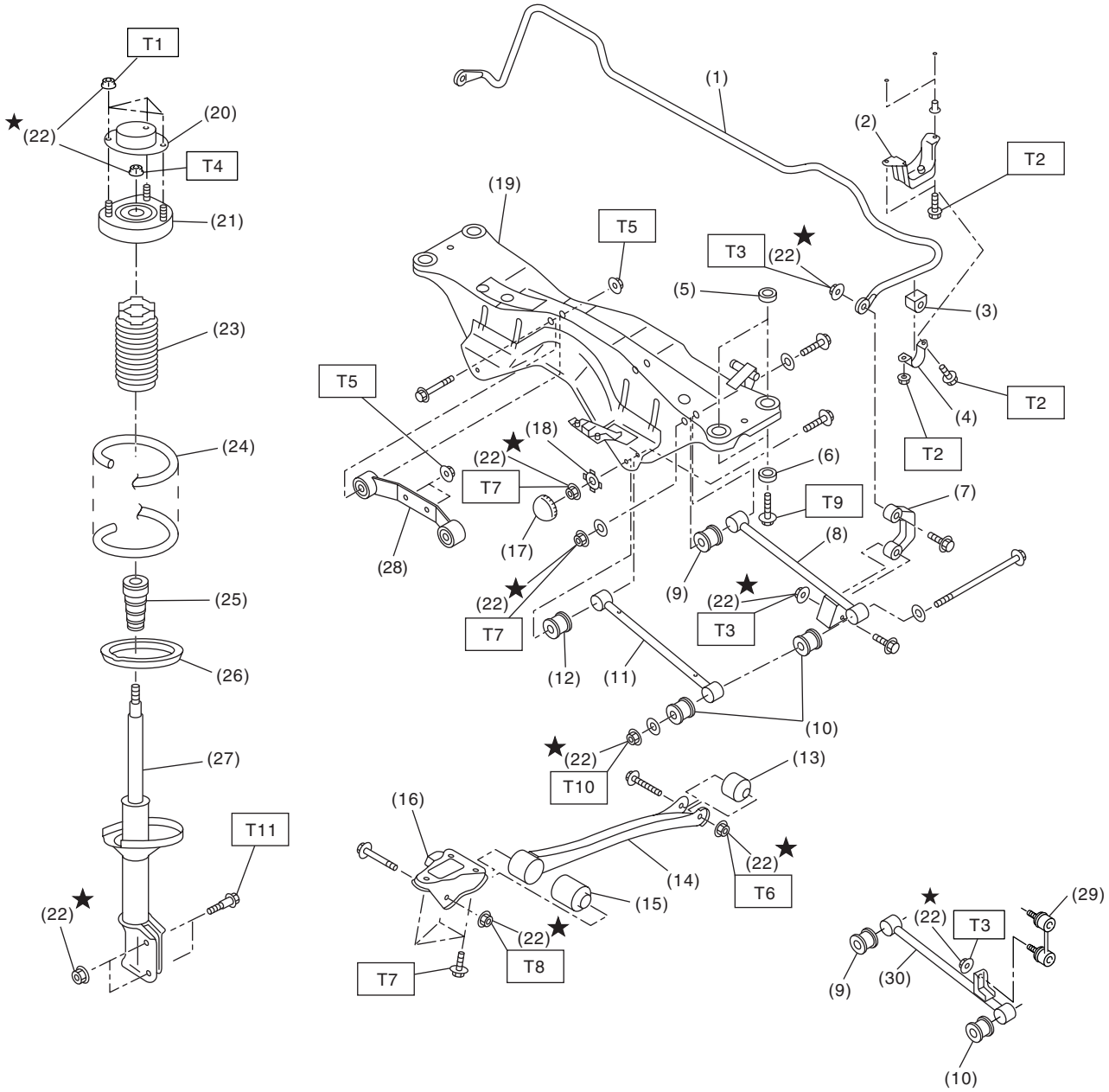
NOTE:
• Front and rear toe-ins and front camber can be adjusted. If toe-in or camber tolerance exceeds specifications, adjust toe-in and camber to the middle value of specification.
• The other items indicated in the specification table cannot be adjusted. If the other items exceeds specifications, check suspension parts and connections for deformities; replace with new ones as required.



(1) Front
A − B = Positive: Toe-in, Negative: Toe-out
α = Each toe angle

B: COMPONENT

1. REAR SUSPENSION



RS-00111

(1) Stabilizer
(2) Stabilizer bracket
(3) Stabilizer bushing
(4) Clamp
(5) Floating bushing
(6) Stopper
(7) Stabilizer link (except STi model)
(8) Rear lateral link (with stabilizer, except STi model)
(9) Bushing (C)
(10) Bushing (A)
(11) Front lateral link
(12) Bushing (B)
(13) Trailing link rear bushing
(14) Trailing link
(15) Trailing link front bushing
(16) Trailing link bracket
(17) Cap (Protection)
(18) Washer
(19) Rear crossmember
(20) Strut mount cap
(21) Strut mount
(22) Self-locking nut
(23) Dust cover
(24) Coil spring
(25) Helper
(26) Lower rubber seat
(27) Damper strut
(28) Rear differential member rear
(29) Stabilizer link (STi model)
(30) Rear lateral link (STi model)

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*20 (2.0, 14.5)*
T2:	*25 (2.5, 18.1)*
T3:	*45 (4.6, 33.2)*
T4:	*60 (6.1, 44)*
T5:	*70 (7.1, 52)*
T6:	*90 (9.2, 66)*
T7:	*100 (10.2, 74)*
T8:	*115 (11.7, 85)*
T9:	*130 (13.3, 96)*
T10:	*140 (14.3 103)*
T11:	*200 (20.0, 145)*

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Before disposing shock absorbers, be sure to bleed gas completely. Also, do not throw away in fire.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

D: PREPARATION TOOL

1. SPECIAL TOOLS

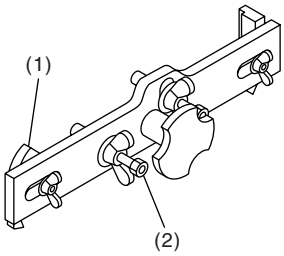
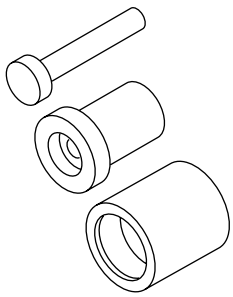
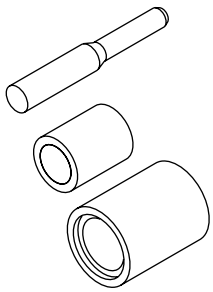
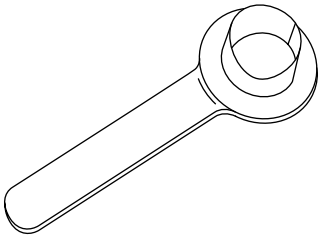
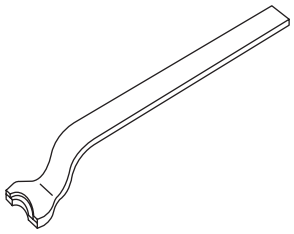
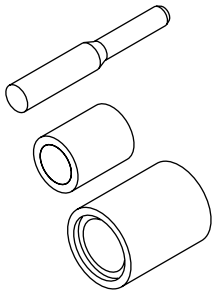
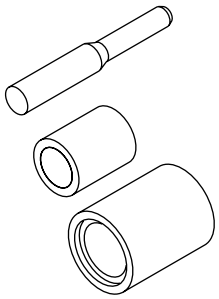
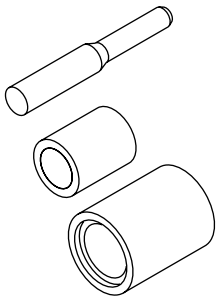
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927380002	927380002	ADAPTER	Used as an adapter for camber & caster gauge when measuring camber and caster. (1) 28199AC000 PLATE (2) 28199AC010 BOLT
 ST-927720000	927720000	INSTALLER & REMOVER	Used for replacing front bushing.
 ST-927730000	927730000	INSTALLER & REMOVER	Used for replacing rear bushing.
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing rear drive shaft to rear differential. • For protecting oil seal.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28099PA100	28099PA100	REMOVER	Used for removing DOJ.
 ST-927710000	927710000	INSTALLER & REMOVER	Used for replacing lateral link bushing.
 ST-927700000	927700000	INSTALLER & REMOVER	Used for replacing lateral link bushing.
 ST-927690000	927690000	INSTALLER & REMOVER	Used for replacing lateral link bushing.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Alignment gauge	Used for wheel alignment measurement.
Turning radius gauge	Used for wheel alignment measurement.
Toe-in gauge	Used for toe-in measurement.
Transmission jack	Used for suspension assembly/disassembly.
Bearing puller	Used for removing bushings.
Coil spring compressor	Used for strut assembly/disassembly.

2. Wheel Alignment

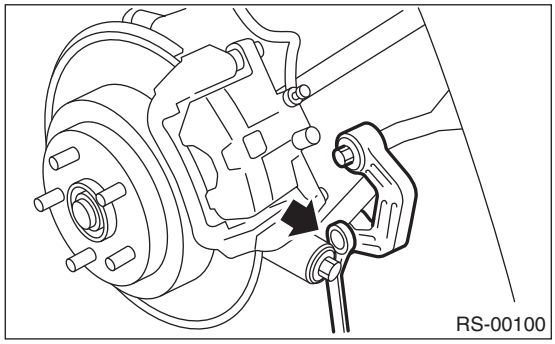
A: INSPECTION

NOTE:
Front and rear wheel alignment must be simultaneously measured and/or adjusted. Follow the procedure in “FS” section “Wheel Alignment” for measurement and/or adjustment of wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

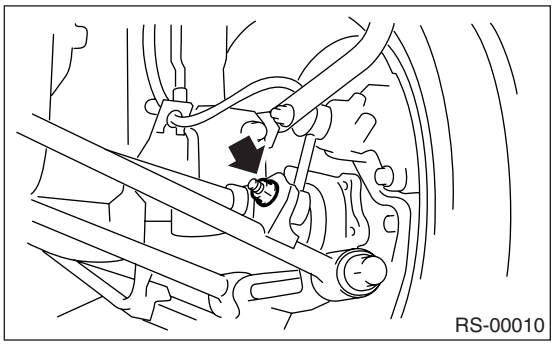
3. Rear Stabilizer

A: REMOVAL

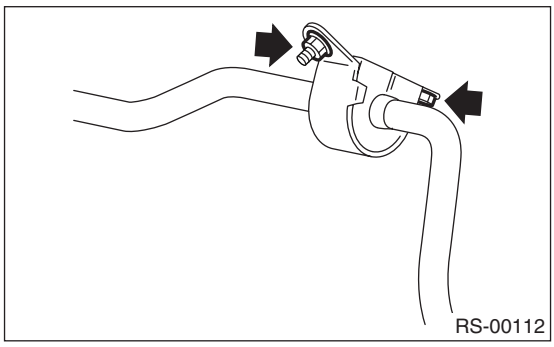
1) Lift-up the vehicle.
2) Remove the stabilizer link.
• Except STi MODEL



• STi MODEL



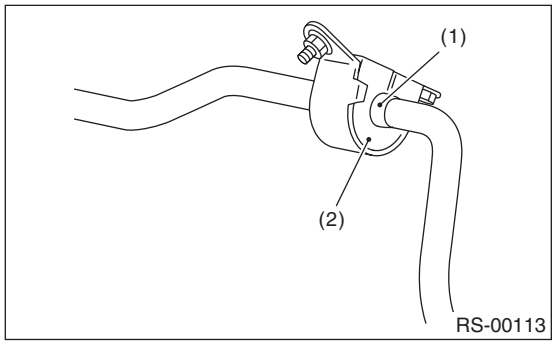
3) Remove the bolt and nut which secure the stabilizer to stabilizer bracket.



B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
• Install the stabilizer bushing while aligning it with paint mark on stabilizer.
• Ensure the stabilizer bushing and stabilizer have the same identification colors when installing.



(1) Mark painted on stabilizer
(2) Bushing identification color

2) Always tighten the stabilizer bushing location when tires are in full contact with the ground and the vehicle is curb weight.

Tightening torque:
Stabilizer link to rear lateral link
45 N·m (4.6 kgf-m, 33.2 ft-lb)
Stabilizer to stabilizer bracket
25 N·m (2.5 kgf-m, 18.1 ft-lb)

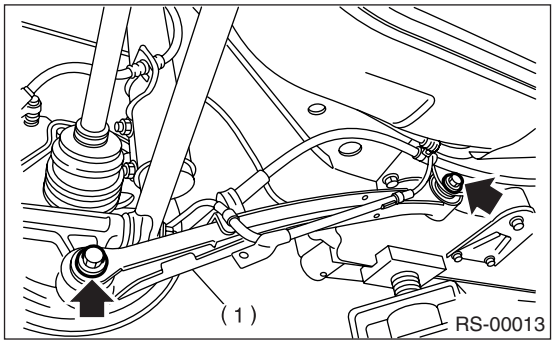
C: INSPECTION

1) Check the bushing for cracks, fatigue or damage.
2) Check the stabilizer links for deformities, cracks, or damage, and bushing for protrusions from the hole of stabilizer link.

4. Rear Trailing Link

A: REMOVAL

1) Loosen the rear wheel nuts.
2) Lift-up the vehicle, and then remove the rear wheels.
3) Remove both the rear parking brake clamp and ABS wheel speed sensor harness.
4) Remove the bolt which secures the trailing link to trailing link bracket.



(1) Trailing link

5) Remove the bolt which secures the trailing link to rear housing.

B: INSTALLATION

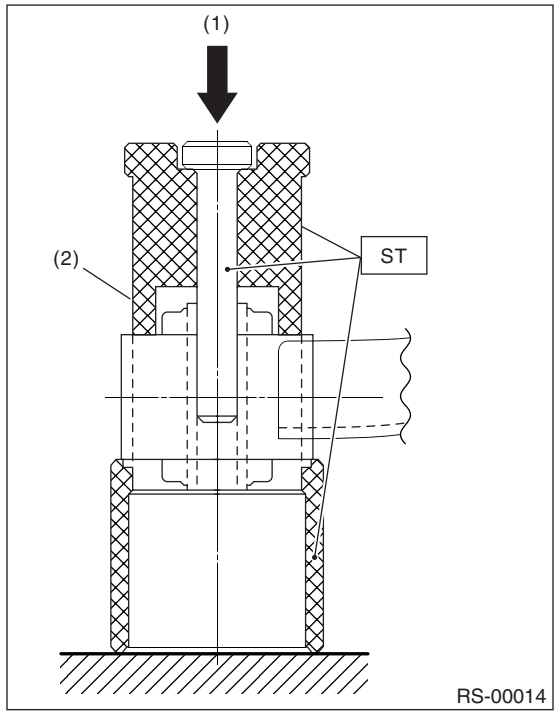
1) Install in the reverse order of removal.
2) Always tighten the bushing location when tires are in full contact with the ground and the vehicle is at curb weight condition.

NOTE:
Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

1. FRONT BUSHING

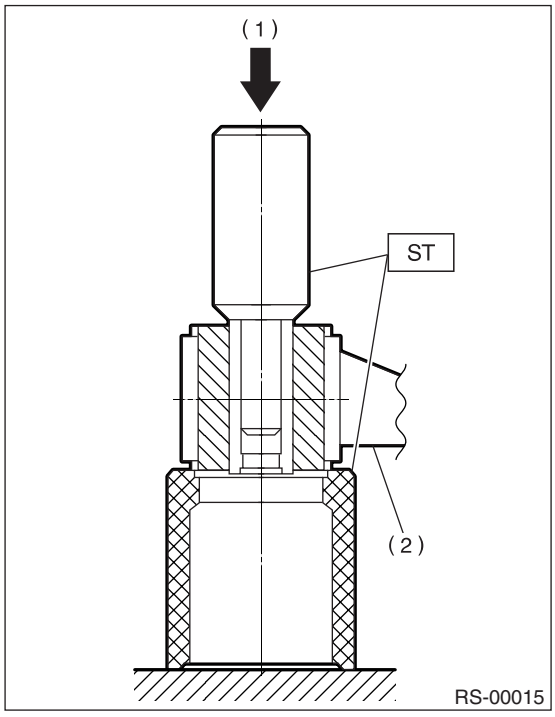
Using the ST, press the front bushing out of place.
ST 927720000 INSTALLER & REMOVER SET



(1) Press
(2) Trailing link

2. REAR BUSHING

1) Remove the housing. <Ref. to DS-22, REMOVAL, Rear Axle.>
2) Using the ST, press the rear bushing out of place.
ST 927730000 INSTALLER & REMOVER SET



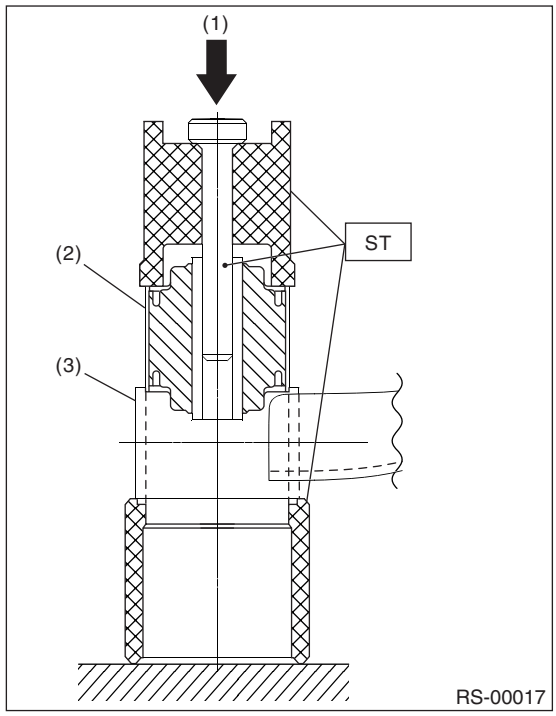
(1) Press
(2) Housing

D: ASSEMBLY

1. FRONT BUSHING

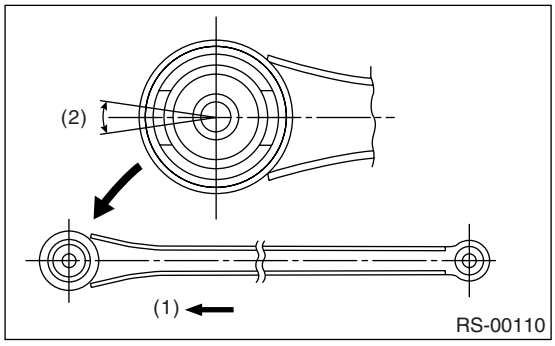
Using the ST, press the bushing into trailing link.
ST 927720000 INSTALLER & REMOVER SET

CAUTION:
Turn the ST plunger upside down and press it until the plunger end surface contacts the trailing link end surface.



(1) Press
(2) Front bushing
(3) Trailing link

CAUTION:
Install the front bushing in the proper direction, as shown in the figure.



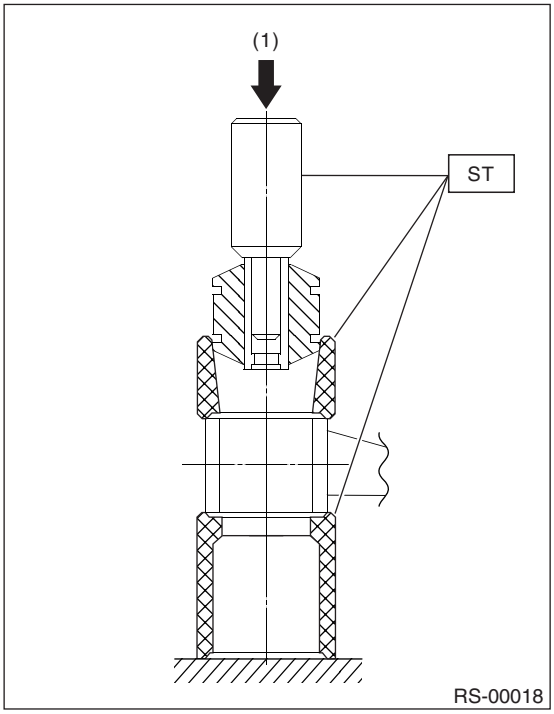
(1) Front
(2) ±5°

2. REAR BUSHING

1) Using the ST, press the bushing into trailing link.
ST 927730000 INSTALLER & REMOVER SET

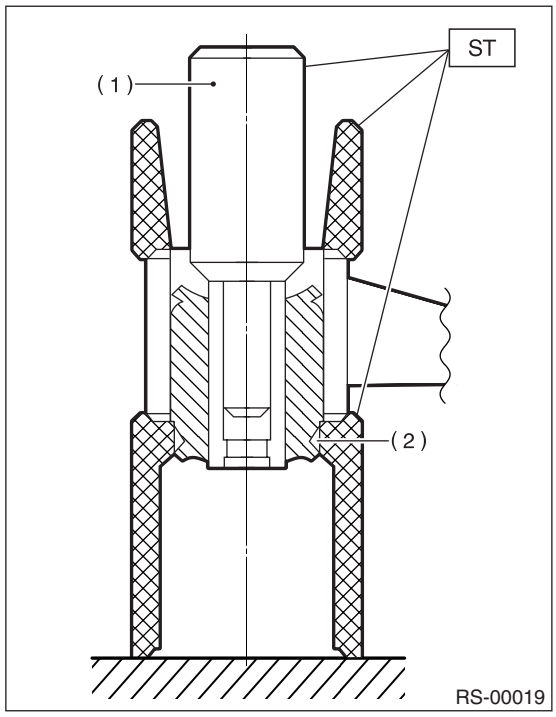
NOTE:
If it is difficult to press the bushing into trailing link, apply water-diluted TIRE LUBE to the inner surface of ST as a lubricant.

SPECIFOED lubricant:
TIRE LUBE: water = 1: 3



(1) Press

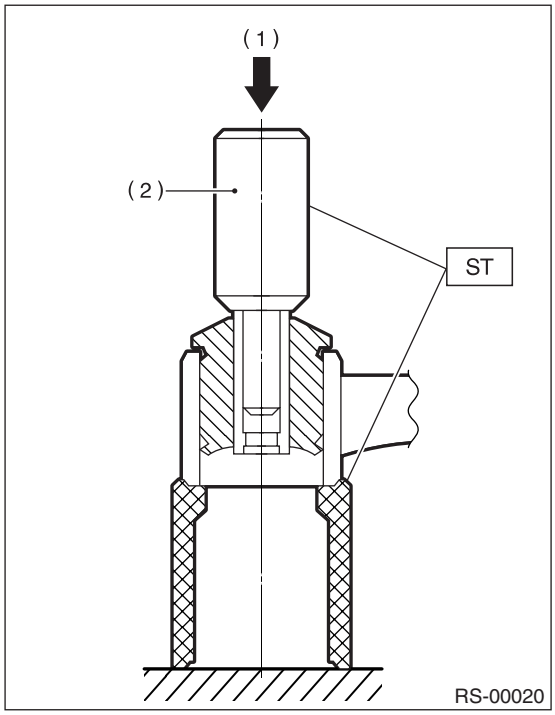
2) Press the ST plunger until the bushing flange protrudes beyond trailing link.
ST 927730000 INSTALLER & REMOVER SET



(1) Plunger
(2) Flange

3) Turn the trailing link upside down. Press the ST plunger in the opposite direction that outlines in the former procedure until bushing is correctly positioned in trailing link.

ST 927730000 INSTALLER & REMOVER SET



(1) Press
(2) Plunger

4) Install the housing. <Ref. to DS-23, INSTALLATION, Rear Axle.>

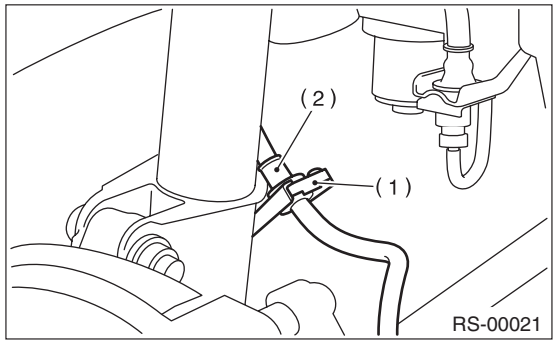
E: INSPECTION

Check the trailing links for bends, corrosion or damage.

5. Rear Strut

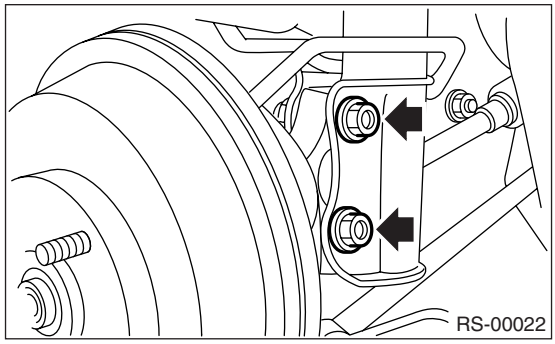
A: REMOVAL

1) Remove the rear seat cushion and backrest. (Sedan model)
2) Remove the strut cap of quarter trim. (Wagon model)
3) Loosen the rear wheel nuts.
4) Lift-up the vehicle, and remove rear wheels.
5) Remove the brake hose clip, and then remove the brake hose from rear strut.



(1) Brake hose clip
(2) Brake hose

6) Remove the bolts which secure the rear strut to housing.



7) Remove the nuts securing strut mount to body.

B: INSTALLATION

1) Secure the strut mount to vehicle body using a new self-locking nut.

Tightening torque:
20 N·m (2.0 kgf-m, 14.5 ft-lb)

2) Secure the rear strut to housing using a new self-locking nut.

Tightening torque:
200 N·m (20.0 kgf-m, 145 ft-lb)

3) Install the brake hose to lower side of strut, then insert the brake hose clip.

CAUTION:
• Check the hose clip is positioned properly.
• Check the brake hose for twisting, or excessive tension.
• Do not subject the ABS wheel speed sensor harness to excessive tension.

4) Lower the vehicle and tighten wheel nut.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

5) Install the rear seat backrest and rear seat cushion. (Sedan model)
6) Install the strut cap to rear quarter trim. (Wagon model)

NOTE:
Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

For disassembly of rear strut, refer to procedures outlined under front strut as a guide. <Ref. to FS-20, DISASSEMBLY, Front Strut.>

D: ASSEMBLY

Refer to Front Strut as a guide for assembly procedures. <Ref. to FS-20, ASSEMBLY, Front Strut.>

E: INSPECTION

Refer to Front Strut as a guide for inspection procedures. <Ref. to FS-21, INSPECTION, Front Strut.>

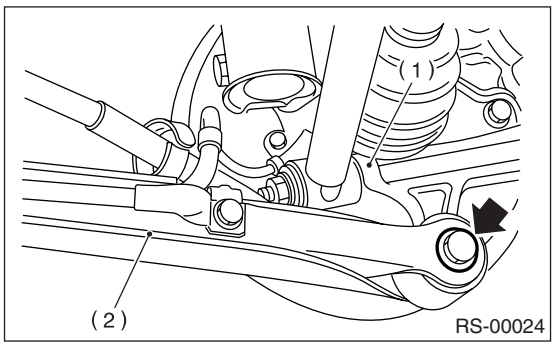
F: DISPOSAL

Refer to Front Strut as a guide for disposal procedures. <Ref. to FS-21, DISPOSAL, Front Strut.>

6. Lateral link

A: REMOVAL

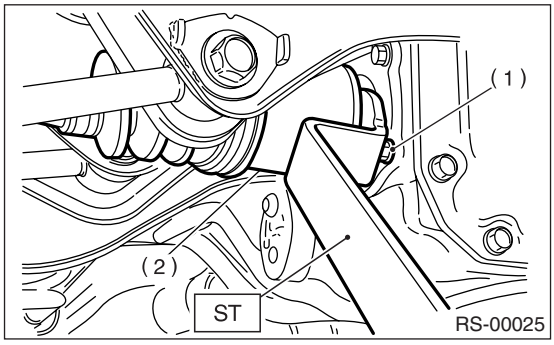
1) Loosen the wheel nuts. Lift-up the vehicle and remove wheel.
2) Remove the stabilizers.
3) Remove the ABS wheel speed sensor harness from trailing link.
4) Remove the bolt securing trailing link to rear housing.



(1) Rear housing
(2) Trailing link

5) Remove the bolts which secure the lateral link assembly to rear housing.
6) Remove the DOJ from rear differential using ST.
ST 28099PA100 DRIVE SHAFT REMOVER

NOTE:
The side spline shaft circlip comes out together with the shaft.



(1) Bolt
(2) DOJ

CAUTION:
Be careful not to damage the side bearing retainer. Always use bolt shown in the figure, as supporting point for ST during removal.

7) Scribe an alignment mark on the rear lateral link adjusting bolt and crossmember.
8) Remove the bolts securing front and rear lateral links to crossmember, detach lateral links.

CAUTION:
To loosen the adjusting bolt, always loosen the nut while holding head of adjusting bolt.

B: INSTALLATION

Install in the reverse order of removal. Observe the following instructions.

- Installation of DOJ to differential: <Ref. to DS-33, INSTALLATION, Rear Drive Shaft.>

CAUTION:
- **Replace the self-locking nut and DOJ circlip with new ones.**
- **Always use the special tool not to allow the DOJ splines to damage the side oil seal.**

ST 28099PA090 OIL SEAL PROTECTOR

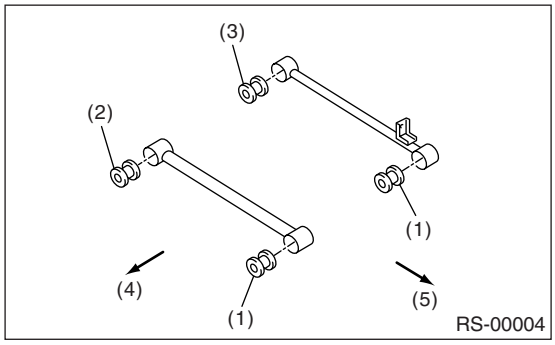
- **Always tighten the bushing location when tires are in full contact with the ground and vehicle is curb weight.**
- **Secure the bolt head and tighten the nut when installing the adjusting bolt.**

NOTE:
Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

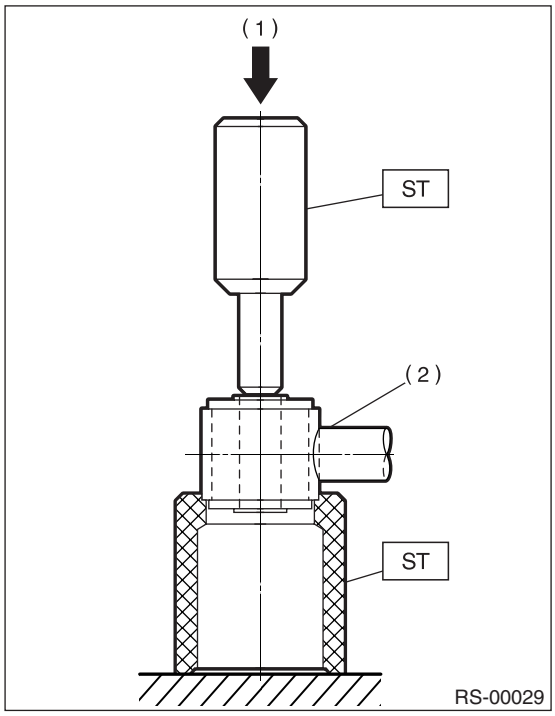
1) Using the following table as a guide, verify the type of bushings.
2) Select the ST according to type of bushings used.

Bushing	ST: INSTALLER & REMOVER SET
Bushing A	927700000
Bushing B	927690000
Bushing C	927700000



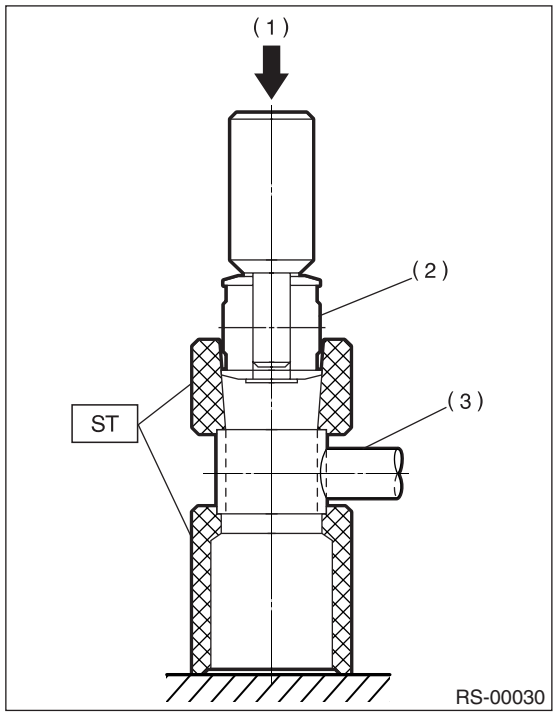
(1) Bushing A
(2) Bushing B
(3) Bushing C
(4) Front
(5) Outside of body

3) Using the ST, press the bushing out of place.



(1) Press
(2) Lateral link

3) Using the ST, press the bushing into place.



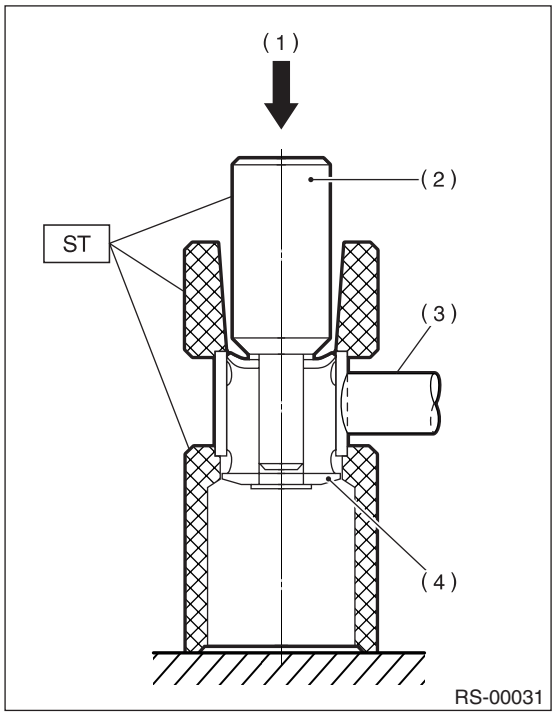
(1) Press
(2) Bushing
(3) Lateral link

D: ASSEMBLY

1) Use the same ST that was used during disassembly.
2) If it is difficult to press the bushing into trailing link, apply water-diluted TIRE LUBE to the inner surface of ST as a lubricant.

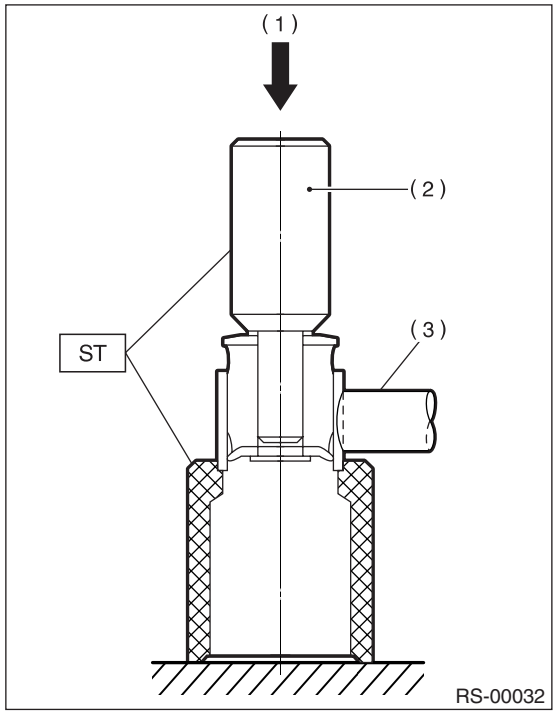
Specified lubricant:
TIRE LUBE: water = 1: 3

4) Press the ST plunger until bushing flange protrudes beyond lateral link.



(1) Press
(2) Plunger
(3) Lateral link
(4) Flange

5) Turn the lateral link upside down. Press the ST plunger in opposite direction that outlined in the former procedure until bushing is correctly positioned in trailing link.



(1) Press
(2) Plunger
(3) Lateral link

E: INSPECTION

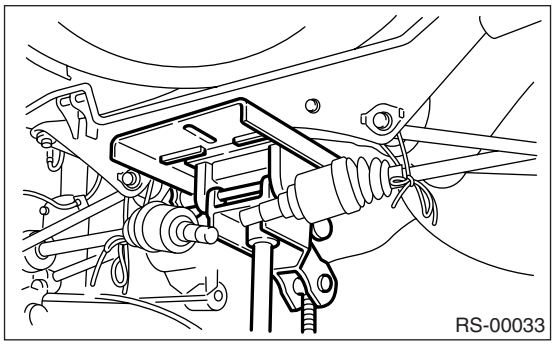
Visually check the lateral links for damage or bends.

7. Rear Crossmember

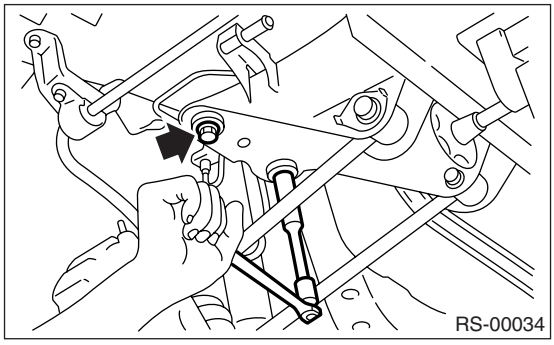
A: REMOVAL

CAUTION:
Do not subject the ABS wheel speed sensor harness to excessive tension.

1) Separate the front exhaust pipe and rear exhaust pipe.
2) Remove the rear exhaust pipe and muffler.
3) Remove the rear differential. <Ref. to DI-21, REMOVAL, Rear Differential.>
4) Place the transmission jack under rear crossmember.


RS-00033

5) Remove the bolts securing crossmember to vehicle body, and then remove the crossmember.


RS-00034

6) Scribe an alignment mark on the rear lateral link cam bolt and crossmember.
7) Remove the front and rear lateral links by loosening nuts.

B: INSTALLATION

NOTE:
• Discard the loosened self-locking nut and replace it with a new one.
• Always secure the bolt head and tighten the nut when tightening the adjusting bolt.

1) Install in the reverse order of removal.
2) For installation and tightening torque of rear differential;
<Ref. to DI-22, INSTALLATION, Rear Differential.>
3) Always tighten the rubber bushing when tires are in full contact with the ground and vehicle is curb weight.
4) Check the wheel alignment and adjust if necessary.

C: INSPECTION

Check the removed parts for wear, damage and cracks, and correct or replace if defective.

8. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible causes	Countermeasures
(1) Permanent distortion or breakage of coil spring	Replace.
(2) Irregular operation of damper strut or shock absorber	Replace.
(3) Installation of wrong strut or shock absorber	Replace with proper parts.
(4) Installation of wrong coil spring	Replace with proper parts.

2. POOR RIDE COMFORT

1) Large rebound shock
2) Rocking of the vehicle continues too long after running over bump and/or hump
3) Large shock in bumping

Possible causes	Countermeasures
(1) Breakage of coil spring	Replace.
(2) Overinflating pressure of tire	Adjust.
(3) Improper wheel arch height	Adjust or replace the coil springs with new ones.
(4) Fault in operation of damper strut or shock absorber	Replace.
(5) Damage or deformation of strut mount or shock absorber mount	Replace.
(6) Unsuitability of maximum or minimum length of damper strut or shock absorber	Replace with proper parts.
(7) Deformation or loss of bushing	Replace.
(8) Deformation or damage of helper in strut assembly or shock absorber	Replace.
(9) Oil leakage of damper strut or shock absorber	Replace.

3. NOISE

Possible causes	Countermeasures
(1) Wear or damage of damper strut or shock absorber component parts	Replace.
(2) Loosening of suspension link installing bolt	Retighten to the specified torque.
(3) Deformation or loss of bushing	Replace.
(4) Unsuitability of maximum or minimum length of damper strut or shock absorber	Replace with proper parts.
(5) Breakage of coil spring	Replace.
(6) Wear or damage of ball joint	Replace.
(7) Deformation of stabilizer clamp	Replace.

WHEEL AND TIRE SYSTEM

WT

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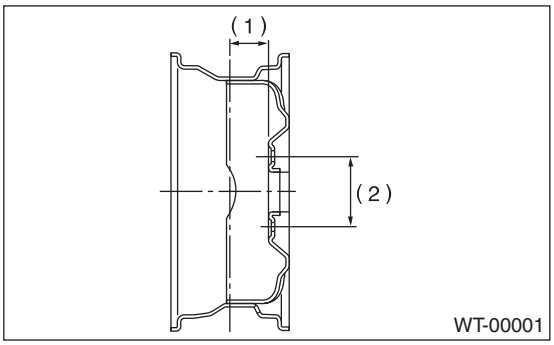
1. General Description

A: SPECIFICATIONS



(1) Offset
(2) P.C.D.

Specifications		Tire size	Rim size	Rim offset mm (in)	P.C.D. mm (in)
Front and rear	TS	P195/60R15 87H	15 × 6JJ	55 (2.17)	100 (3.94)
	RS, OBK, WRX	P205/55R16 89V	16 × 6 1/2JJ		
	WRX: OPTION	215/45R17 87W	17 × 7JJ	55 (2.17)	
	STi	225/45R17 90W	17 × 7 1/2JJ	53 (2.09)	
T-type tire	TS, RS, OBK, WRX	T135/70D16 100M	16 × 4T	50 (1.97)	
	STi	T135/70D17 102M	17 × 4T	40 (1.57)	

Specifications		Tire size	Tire air pressure kPa (kgf/cm^2, psi)
Front and rear	TS	P195/60R15 87H	Fr: 220 (2.2, 32) Rr: 200 (2.0, 29)
	RS, OBK, WRX	P205/55R16 89V	
	WRX: OPTION	215/45R17 87W	Fr: 230 (2.3, 33) Rr: 220 (2.2, 32)
	STi	225/45R17 90W	Fr: 250 (2.5, 36) Rr: 210 (2.1, 30)
T-type tire	TS, RS, OBK, WRX	T135/70D16 100M	420 (4.2, 60)
	STi	T135/70D17 102M	

NOTE:
“T-type” tire for temporary use is supplied as a spare tire.

1. SERVICE DATA

Item	Axial runout	Radial runout
Steel wheel	1.5 mm (0.059 in)	
Aluminum wheel	1.0 mm (0.039 in)	

2. ADJUSTING PARTS

Wheel balance	Standard	Service limit
Dynamic unbalance	Less than 5 g (0.18 oz)	

Balance weight part number (For steel wheel)	Weight
28101TC000	5 g (0.18 oz)
28101SA060	10 g (0.35 oz)
28101SA070	15 g (0.53 oz)
28101SA080	20 g (0.71 oz)
28101SA090	25 g (0.88 oz)
723141340	30 g (1.06 oz)
723141350	35 g (1.23 oz)
723141360	40 g (1.41 oz)
723141370	45 g (1.59 oz)
723241380	50 g (1.76 oz)
723241580	55 g (1.94 oz)
723241590	60 g (2.12 oz)

Balance weight part number (For aluminum wheel)	Weight
28101SA000	5 g (0.18 oz)
28101SA010	10 g (0.35 oz)
28101SA020	15 g (0.53 oz)
28101SA030	20 g (0.71 oz)
28101SA040	25 g (0.88 oz)
23141GA512	30 g (1.06 oz)
23141GA522	35 g (1.23 oz)
23141GA532	40 g (1.41 oz)
23141GA542	45 g (1.59 oz)
23141GA552	50 g (1.76 oz)
—	55 g (1.94 oz)
23141GA572	60 g (2.12 oz)

B: PREPARATION TOOL

1. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Air pressure gauge	Used for measuring tire air pressure.
Dial gauge	Used for measuring wheel runout.

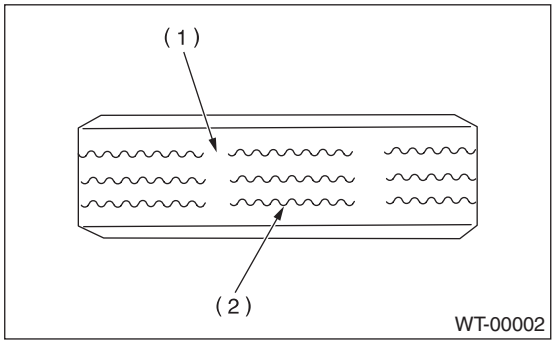
2. Tire

A: INSPECTION

1) Take stone, glass, nail etc. off from tread groove.
2) Replace the tire if as follows.

CAUTION:
When replacing a tire, make sure to use only the same size, construction and load range tire as originally installed.

(1) When a large crack on the side wall, damage or a crack on tread are found.
(2) When the “tread wear indicator” appears as a solid band across the tread.

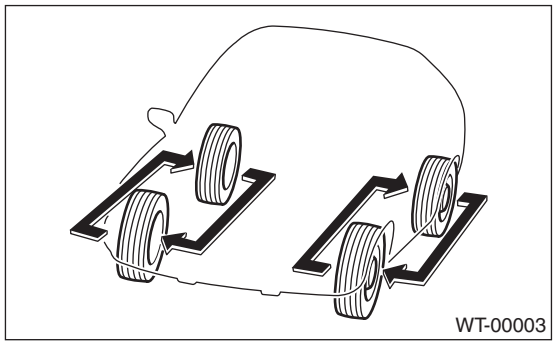


(1) Tread wear indicator
(2) Tire tread

3) When a crack on tire valve is found, replace the tire valve.

1. TIRE ROTATION

Rotate tires periodically (12,500 km/7,500 miles) as shown in the figure, in order to prevent them from uneven wear and to prolong their life.



3. Steel Wheel

A: REMOVAL

1) Apply parking brake, and position the select lever to “P” or “LOW”.
2) Set jacks or a lift to the specified point, and support the vehicle with its wheels slightly contacting the floor.
3) Loosen the wheel nuts.
4) Raise the vehicle until its wheels take off the ground using a jack or a lift.
5) Remove the wheel nuts and wheels.

NOTE:
• While removing the wheels, prevent the hub bolts from damage.
• Place the wheels with their outer sides facing upward to prevent the wheels from damage.

B: INSTALLATION

1) Remove dirt from the mating surface of wheel and brake rotor.
2) Attach the wheel to hub by aligning the wheel bolt hole with hub bolt.
3) Temporarily attach the wheel nuts to hub bolts. (In the case of aluminum wheel, use SUBARU genuine wheel nut for aluminum wheel.)
4) Manually tighten the nuts making sure the wheel hub hole is aligned correctly to guide portion of hub.
5) Tighten the wheel nuts in a diagonal selection to specified torque. Use a wheel nut wrench.

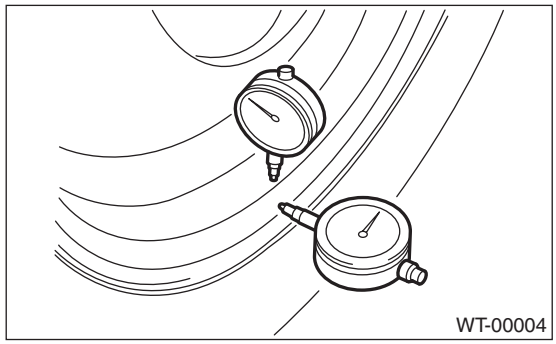
Wheel nut tightening torque:
90 N·m (9.1 kgf-m, 65.7 ft-lb)

CAUTION:
• Tighten the wheel nuts in two or three steps by gradually increasing the torque and working diagonally, until the specified torque is reached. For drum brake models, excess tightening of wheel nuts may cause wheels to “judder”.
• Do not depress the wrench with foot; Always use both hands when tightening.
• Make sure the bolt, nut and nut seating surface of the wheel are free from oils.

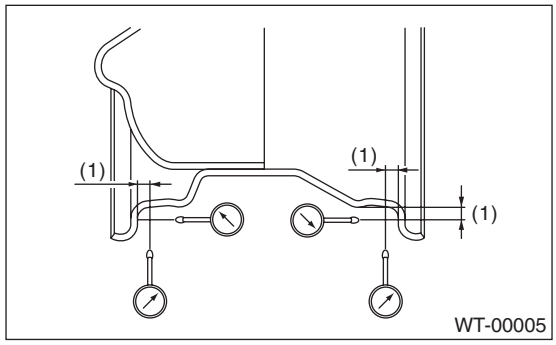
6) If a wheel is removed for replacement or for repair of a puncture, retighten the wheel nuts to the specified torque after running 1,000 km (600 miles).

C: INSPECTION

1) Deformation or damage on the rim can cause air leakage. Check the rim flange for deformation, crack or damage, and repair or replace as necessary.
2) Jack-up the vehicle until wheels clear the floor.
3) Slowly rotate the wheel to check the rim “runout” using a dial gauge.



Axial runout limit	Radial runout limit
1.5 mm (0.059 in)	



(1) Approx. 7 mm (0.28 in)

4) If the rim runout exceeds specifications, remove the tire from rim and check runout while attaching the dial gauge to positions shown in the figure.
5) If the measured runout still exceeds specifications, replace the wheel.

4. Aluminum Wheel

A: REMOVAL

Refer to Steel Wheel for removal procedure of aluminum wheels. <Ref. to WT-5, REMOVAL, Steel Wheel.>

B: INSTALLATION

Refer to Steel Wheel for installation procedure of aluminum wheels. <Ref. to WT-5, INSTALLATION, Steel Wheel.>

C: INSPECTION

Refer to Steel Wheel for inspection procedure of aluminum wheels. <Ref. to WT-5, INSPECTION, Steel Wheel.>

Rim runout:

Axial runout limit	Radial runout limit
1.0 mm (0.039 in)	

D: CAUTION

Aluminum wheels are easily scratched. To maintain their appearance and safety, do the following:
1) Do not damage the aluminum wheels during removal, installation, wheel balancing, etc. After removing the aluminum wheels, place them on a rubber mat, etc.
2) While the vehicle is being driven, be careful not to ride over sharp obstacles or allow the aluminum wheels to contact the shoulder of road.
3) When installing a tire chain, be sure to install it properly not to have slack; otherwise it may hit the wheel while driving.
4) When washing the aluminum wheel, use neutral synthetic detergent and water. Avoid using the cleanser including abrasive, hard brushes or an automatic car washer.

5. Wheel Balancing

A: REPLACEMENT

1) Remove the balance weights.
2) Using wheel balancer, measure the wheel balance.
3) Select a weight close to the value measured by wheel balancer.

Balance weight part number (For steel wheel)	Weight
28101TC000	5 g (0.18 oz)
28101SA060	10 g (0.35 oz)
28101SA070	15 g (0.53 oz)
28101SA080	20 g (0.71 oz)
28101SA090	25 g (0.88 oz)
723141340	30 g (1.06 oz)
723141350	35 g (1.23 oz)
723141360	40 g (1.41 oz)
723141370	45 g (1.59 oz)
723241380	50 g (1.76 oz)
723241580	55 g (1.94 oz)
723241590	60 g (2.12 oz)

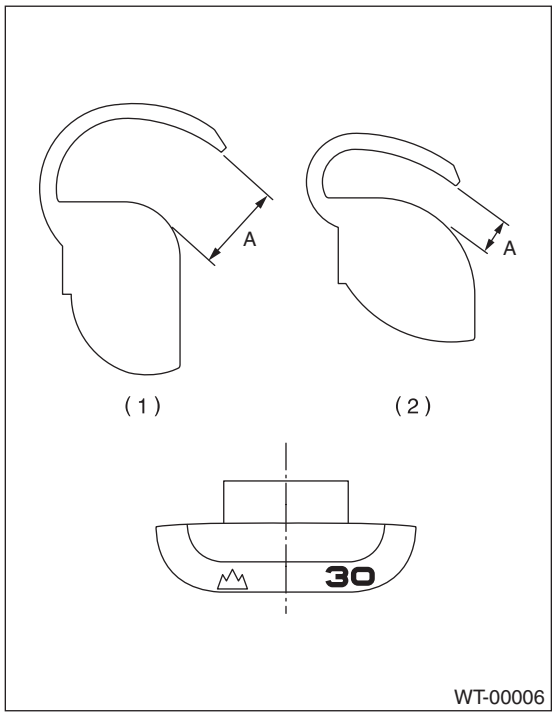
Balance weight part number (For aluminum wheel)	Weight
28101SA000	5 g (0.18 oz)
28101SA010	10 g (0.35 oz)
28101SA020	15 g (0.53 oz)
28101SA030	20 g (0.71 oz)
28101SA040	25 g (0.88 oz)
23141GA512	30 g (1.06 oz)
23141GA522	35 g (1.23 oz)
23141GA532	40 g (1.41 oz)
23141GA542	45 g (1.59 oz)
23141GA552	50 g (1.76 oz)
—	55 g (1.94 oz)
23141GA572	60 g (2.12 oz)

4) Install the selected weight to the point designated by wheel balancer.
5) Using wheel balancer, measure the wheel balance again. Check the wheel balance is correctly adjusted.

B: INSPECTION

1) Proper wheel balance may be lost if the tire is repaired or if it wears. Check the tire for dynamic balance, and repair as necessary.
2) To check for dynamic balance, use a wheel balancer. Drive in the balance weight on both the top and rear sides of rim.
3) Some types of balancer can cause damage to the wheel. Use an appropriate balancer when adjusting the wheel balance.
4) Use genuine balance weights.

NOTE:
• 55 g (1.94 oz) weight used with the aluminum wheel is not available.
• Balance weights are available for use with any of 15 to 17-inch wheels.



(1) Weight for aluminum wheel
(2) Weight for steel wheel

Service limit: A
Weight for steel wheel;
5 g (0.18 oz) — 25 g (0.88 oz) 2.0 mm (0.08 in)
30 g (1.06 oz) or more 1.8 mm (0.07)
Weight for aluminum wheel;
5 g (0.18 oz) — 25 g (0.88 oz) 5.0 mm (0.20 in)
30 g (1.06 oz) or more 4.5 mm (0.177 in)

6. "T-type" Tire

A: NOTE

"T-type" tire for temporary use is prepared as a spare tire.

CAUTION:
• Do not use a tire chain with the "T-type" tire. Because of the smaller tire size, a tire chain will not fit properly and will result in damage to the vehicle and the tire.
• Do not drive at a speed greater than 80 km/h (50 MPH).
• Drive as slowly as possible and avoid passing over bumps.

B: REPLACEMENT

Refer to Removal and Installation of Steel Wheel for removal/installation of "T-type" tires. <Ref. to WT-5, Steel Wheel.>

CAUTION:
Replace with a conventional tire as soon as possible since the "T-type" tire is only for temporary use.

C: INSPECTION

1) Check the tire inflation pressure.

Specification:
420 kPa (4.2 kg/cm^2, 60 psi)

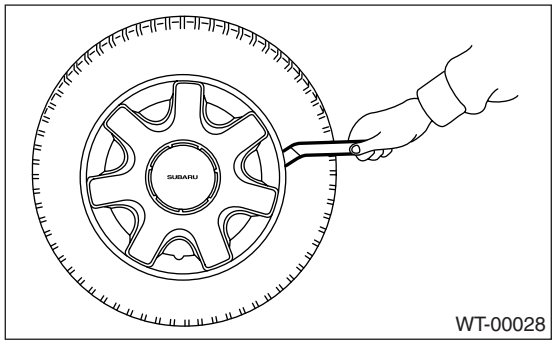
2) Take stones, glass, nails, etc. out of the tread groove.
3) Check the tires for deformation, cracks, partial or over limit wear.

CAUTION:
Replace the tire with a new one.

7. Full Wheel Cap

A: REMOVAL

Pry off the full wheel cap with a wheel cap remover inserted between openings on cap.



B: INSTALLATION

Align the valve hole in wheel cap with the valve on wheel and secure the wheel cap by tapping four points by hand.

C: INSPECTION

1) Check the wheels for missing wheel caps.
2) Check the pawls of wheel caps for damage or bend.
3) Check the wheel caps for cracks.

8. General Diagnostics Table

A: INSPECTION

Symptom	Possible cause	Remedy
Front wheel shimmy	Worn or improperly inflated tire.	In case of worn tire, replace the tire. In case of improperly inflated tire, adjust the tire air pressure properly.
	Wheel is out of balance.	Adjustment
Abnormal tire wear	Improperly inflated tire.	Replace
Sways/pitches	Worn or improperly inflated tire.	In case of worn tire, replace the tire. In case of improperly inflated tire, adjust the tire air pressure properly.
Wander/pulls	Worn or improperly inflated tire.	In case of worn tire, replace the tire. In case of improperly inflated tire, adjust the tire air pressure properly.

DIFFERENTIALS

DI

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1. General Description

A: SPECIFICATIONS

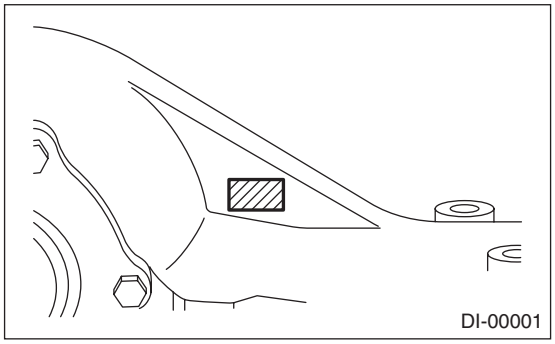
When replacing a rear differential assembly, select the correct one according to the following table.

NOTE:
Using the different rear differential assembly causes the drive line and tires to “drag” or emit abnormal noise when AWD is selected.

MODEL	2.5 L				2.0 L Turbo	
	AT		MT		AT	MT
	Wagon	Sedan	Wagon	Sedan		
Rear differential type	T-type model without LSD				T-type model with LSD	
LSD type	—				Viscous coupling	
Identification	EH	EL	EG	EH	EJ	EF
Type of gear	Hypoid gear					
Gear ratio (Number of gear teeth)	4.111 (37/9)	4.444 (37/9)	3.900 (39/10)	4.111 (37/9)		3.545 (39/11)
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)					
Rear differential gear oil	GL-5					

MODEL	2.5 L Turbo STi
	6MT
Rear differential type	T-type model with LSD
LSD type	Mechanical
Identification	HK
Type of gear	Hypoid gear
Gear ratio (Number of gear teeth)	3.900 (39/10)
Oil capacity	0.9 — 1.1 ℓ (1.0 — 1.2 US qt, 0.8 — 1.0 Imp qt)
Rear differential gear oil	GL-5 (For mechanical LSD)

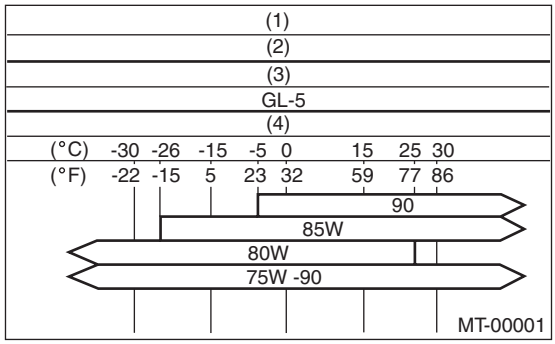
- **Identification**



- **Rear differential gear oil**

Recommended oil

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



(1) Item
(2) Differential gear oil
(3) API Classification
(4) SAE Viscosity NO. and Application Temperature

1. SERVICE DATA

Front and rear bearing preload at companion flange bolt hole N (kgf, lb)	Except STi model	18.1 — 38.8 (1.8 — 4.0, 4.1 — 8.7)
	STi model	24.1 — 38.6 (2.5 — 3.9, 5.4 — 8.7)
Side gear backlash mm (in)		0.10 — 0.20 (0.0039 — 0.0079)
Side bearing standard width mm (in)		20.00 (0.7874)
Crown gear to drive pinion backlash mm (in)		0.10 — 0.20 (0.0039 — 0.0079)
Crown gear runout on its back surface mm (in)		Less than 0.05 (0.0020)

2. ADJUSTING PARTS

• Except STi model

Front and rear bearing preload at companion flange bolt hole N (kgf, lb)	18.1 — 38.8 (1.8 — 4.0, 4.1 — 8.7)	
Preload adjusting spacer	Part No.	Length mm (in)
	383695201	56.2 (2.213)
	383695202	56.4 (2.220)
	383695203	56.6 (2.228)
	383695204	56.8 (2.236)
	383695205	57.0 (2.244)
	383695206	57.2 (2.252)
Preload adjusting washer	Part No.	Length mm (in)
	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)
	383805200	2.39 (0.0941)
	383815200	2.37 (0.0933)
	383825200	2.35 (0.0925)
	383835200	2.33 (0.0917)
	383845200	2.31 (0.0909)

Pinion height adjusting shim	Part No.	Thickness mm (in)
	383495200	3.09 (0.1217)
	383505200	3.12 (0.1228)
	383515200	3.15 (0.1240)
	383525200	3.18 (0.1252)
	383535200	3.21 (0.1264)
	383545200	3.24 (0.1276)
	383555200	3.27 (0.1287)
	383565200	3.30 (0.1299)
	383575200	3.33 (0.1311)
	383585200	3.36 (0.1323)
	383595200	3.39 (0.1335)
	383605200	3.42 (0.1346)
	383615200	3.45 (0.1358)
	383625200	3.48 (0.1370)
	383635200	3.51 (0.1382)
	383645200	3.54 (0.1394)
	383655200	3.57 (0.1406)
	383665200	3.60 (0.1417)
	383675200	3.63 (0.1429)
	383685200	3.66 (0.1441)
Side gear backlash mm (in)	0.1 — 0.2 (0.0039 — 0.0079)	
Side gear thrust washer (Model without LSD)	Part No.	Thickness mm (in)
	383445201	0.75 — 0.80 (0.0295 — 0.0315)
	383445202	0.80 — 0.85 (0.0315 — 0.0335)
	383445203	0.85 — 0.90 (0.0335 — 0.0354)
Side bearing standard width mm (in)	—	20.00 (0.7874)
Side bearing retainer shim	Part No.	Thickness mm (in)
	383475201	0.20 (0.0079)
	383475202	0.25 (0.0098)
	383475203	0.30 (0.0118)
	383475204	0.40 (0.0157)
	383475205	0.50 (0.0197)
Crown gear to drive pinion backlash mm (in)	Limit	0.10 — 0.20 (0.0039 — 0.0079)
Crown gear runout on its back surface mm (in)		0.05 (0.0020)

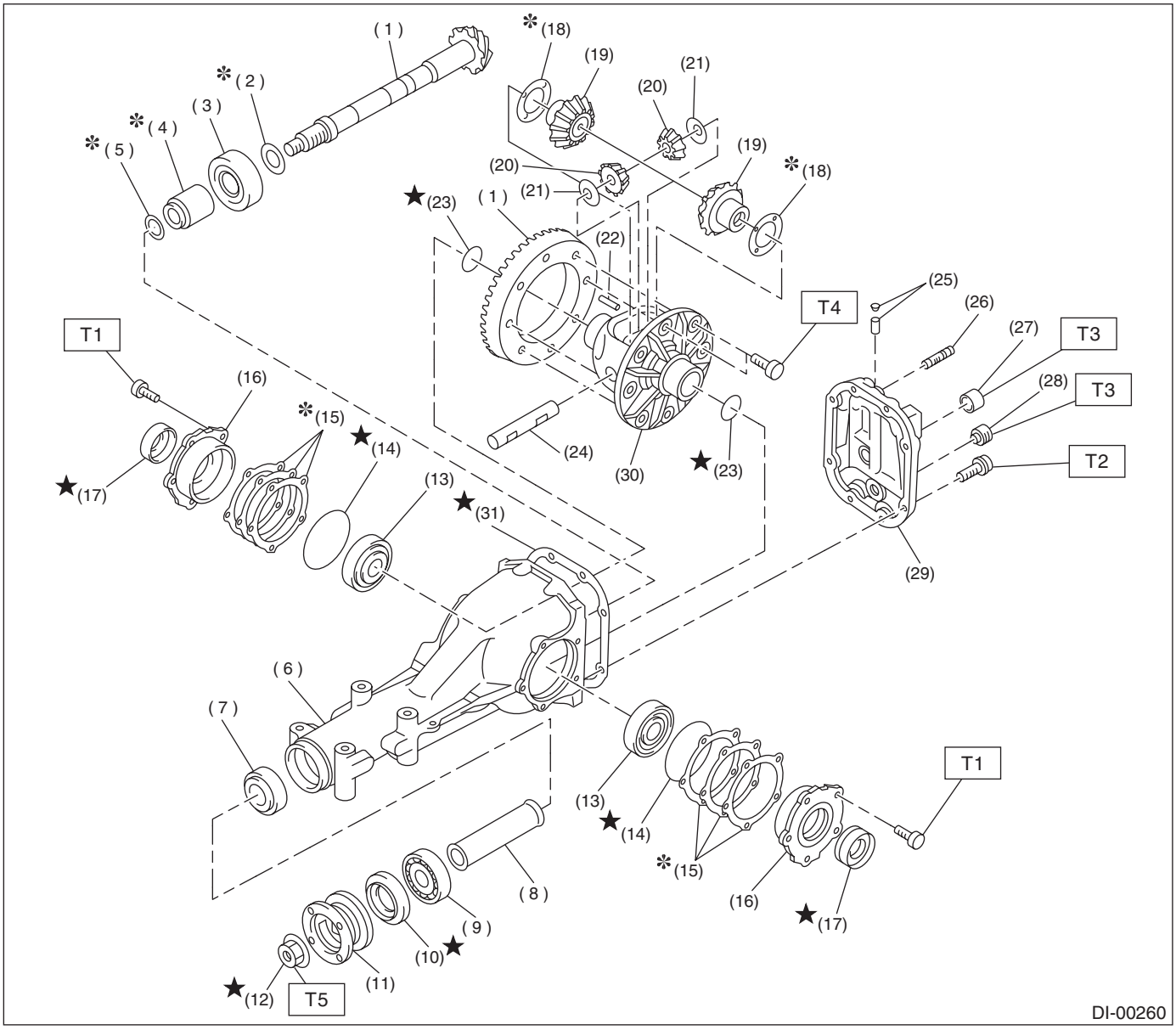
• STi model

Front and rear bearing preload at companion flange bolt hole N (kgf, lb)	24.1 — 38.6 (2.5 — 3.9, 5.4 — 8.7)	
Preload adjusting spacer	Part No.	Length mm (in)
	31454AA130	52.2 (2.055)
	31454AA140	52.4 (2.063)
	31454AA150	52.6 (2.071)
	31454AA160	52.8 (2.079)
	31454AA170	53.0 (2.087)
	31454AA180	53.2 (2.094)

Preload adjusting washer	Part No.	Length mm (in)
	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)
	383805200	2.39 (0.0941)
	383815200	2.37 (0.0933)
	383825200	2.35 (0.0925)
	383835200	2.33 (0.0917)
	383845200	2.31 (0.0909)
Pinion height adjusting shim	Part No.	Length mm (in)
	38336AA230	3.09 (0.1217)
	38336AA240	3.12 (0.1228)
	38336AA250	3.15 (0.1240)
	38336AA260	3.18 (0.1252)
	38336AA270	3.21 (0.1264)
	38336AA280	3.24 (0.1276)
	38336AA290	3.27 (0.1287)
	38336AA300	3.30 (0.1299)
	38336AA310	3.33 (0.1311)
	38336AA320	3.36 (0.1323)
	38336AA330	3.39 (0.1335)
	38336AA340	3.42 (0.1346)
	38336AA350	3.45 (0.1358)
	38336AA360	3.48 (0.1370)
	38336AA370	3.51 (0.1382)
	38336AA380	3.54 (0.1394)
	38336AA390	3.57 (0.1406)
	38336AA400	3.60 (0.1417)
	38336AA410	3.63 (0.1429)
	38336AA420	3.66 (0.1441)
Side bearing standard width mm (in)	20.00 (0.7874)	
Side bearing retainer shim	Part No.	Thickness mm (in)
	383475201	0.20 (0.0079)
	383475202	0.25 (0.0098)
	383475203	0.30 (0.0118)
	383475204	0.40 (0.0157)
	383475205	0.50 (0.0197)
Crown gear to drive pinion backlash mm (in)	Limit	0.10 — 0.20 (0.0039 — 0.0079)
Crown gear runout on its back surface mm (in)		0.05 (0.0020)

B: COMPONENT

1. REAR DIFFERENTIAL WITHOUT LSD

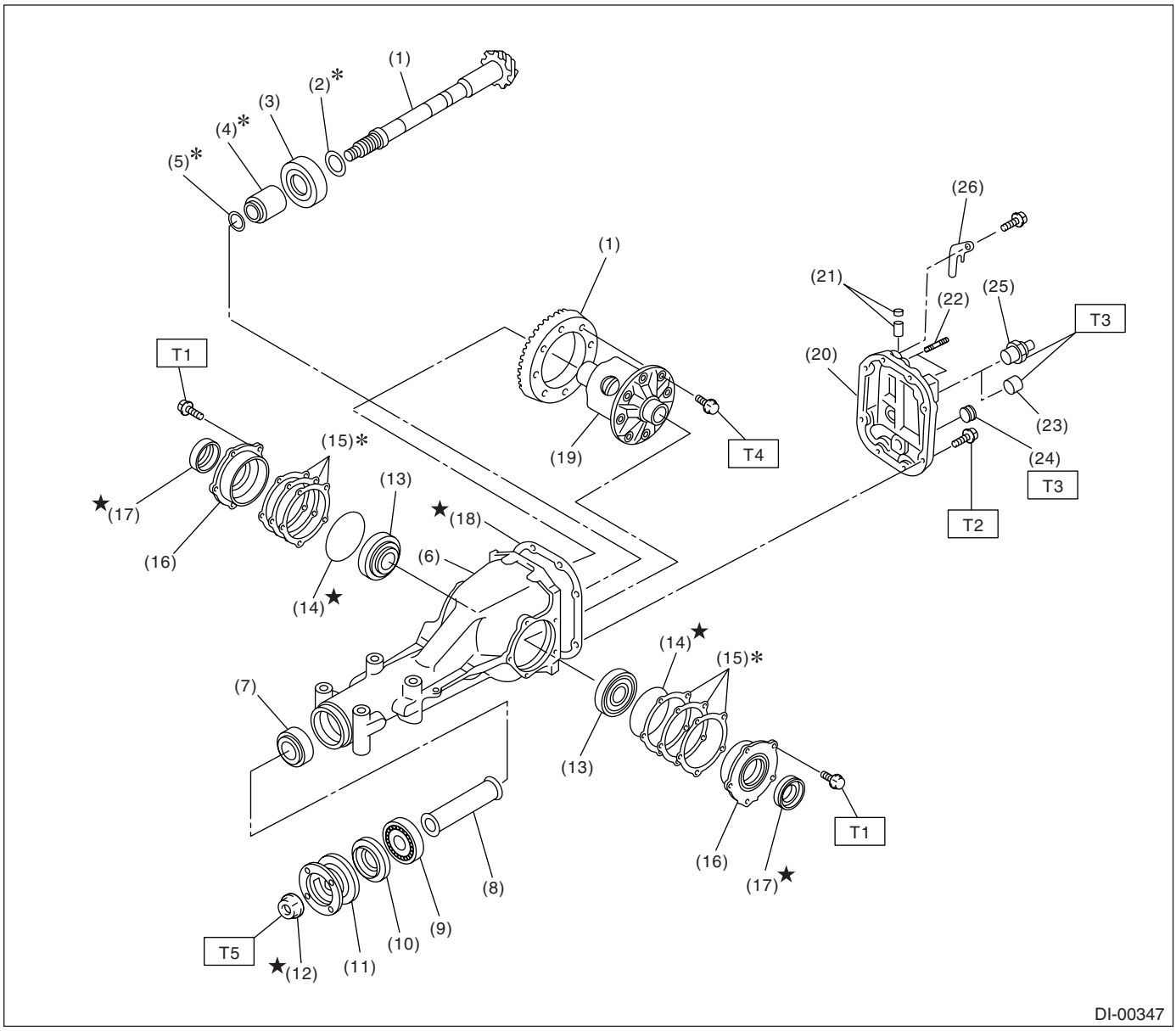


(1)	Pinion crown gear and drive pinion set	(13)	Side bearing	(26)	Stud bolt
(2)	Pinion height adjusting shim	(14)	O-ring	(27)	Oil filler plug
(3)	Rear bearing	(15)	Side bearing retainer shim	(28)	Oil drain plug
(4)	Bearing preload adjusting spacer	(16)	Side bearing retainer	(29)	Rear cover
(5)	Bearing preload adjusting washer	(17)	Side oil seal	(30)	Differential case
(6)	Differential carrier	(18)	Side gear thrust washer	(31)	Gasket
(7)	Front bearing	(19)	Side gear		
(8)	Spacer	(20)	Pinion mate gear		
(9)	Pilot bearing	(21)	Pinion mate gear washer		
(10)	Front oil seal	(22)	Pinion shaft lock pin		
(11)	Companion flange	(23)	Circlip		
(12)	Self-locking nut	(24)	Pinion mate shaft		
		(25)	Air breather cap		

Tightening torque: N·m (kgf-m, ft-lb)

T1: 10.3 (1.05, 7.6)
T2: 29 (3.0, 21.7)
T3: 49 (5.0, 36.2)
T4: 105 (10.7, 77.4)
T5: 181 (18.5, 134)

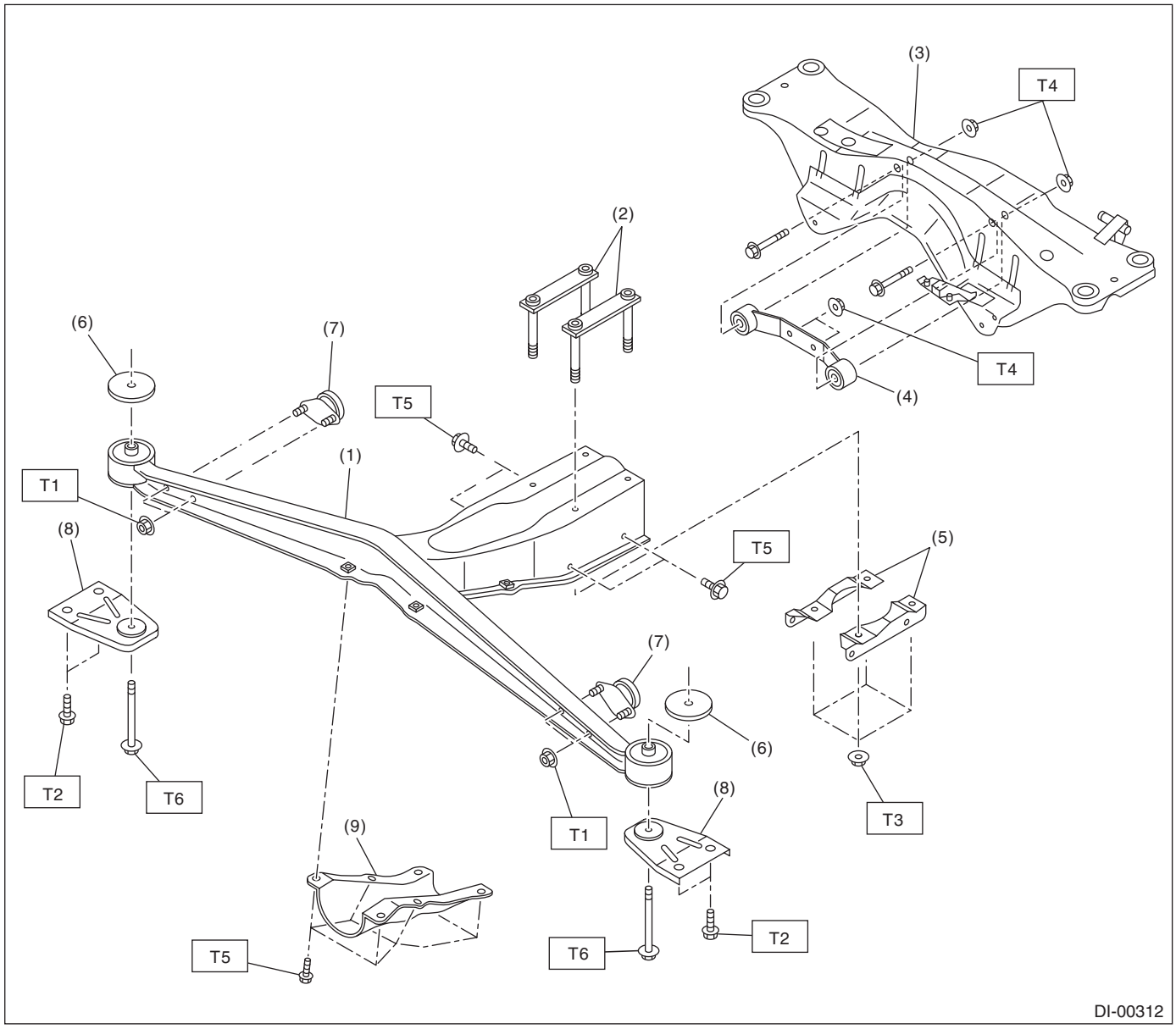
2. REAR DIFFERENTIAL WITH LSD



(1) Pinion crown gear and drive pinion set
(2) Pinion height adjusting shim
(3) Rear bearing
(4) Bearing preload adjusting spacer
(5) Bearing preload adjusting washer
(6) Differential carrier
(7) Front bearing
(8) Collar
(9) Pilot bearing
(10) Front oil seal
(11) Companion flange
(12) Self-locking nut
(13) Side bearing
(14) O-ring
(15) Side bearing retainer shim
(16) Side bearing retainer
(17) Side oil seal
(18) Gasket
(19) Differential case (Viscous coupling type) (Except for STi model)
Differential case (Mechanical type) (STi model)
(20) Rear cover
(21) Air breather cap
(22) Stud bolt
(23) Oil filler plug
(24) Oil drain plug
(25) Oil filler plug (Rear differential oil temperature switch) (STi model)
(26) Stay ground (STi model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 10.3 (1.05, 7.6)
T2: 29 (3.0, 21.7) (Except for STi model)
44 (4.5, 32.5) (STi model)
T3: 49 (5.0, 36.2)
T4: 105 (10.7, 77.4)
T5: 181 (18.5, 134)

3. REAR DIFFERENTIAL MOUNTING SYSTEM



(1) Differential front member
(2) Plate
(3) Crossmember
(4) Differential rear member
(5) Differential mount lower bracket
(6) Stopper
(7) Dynamic damper
(8) Differential mount bracket
(9) Differential mount front cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 20 (2.0, 14.5)
T2: 33 (3.4, 24.3)
T3: 65 (6.6, 47.9)
T4: 70 (7.1, 51.6)
T5: 90 (9.2, 66.4)
T6: 100 (10.2, 73.8)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Apply gear oil onto sliding or revolution surfaces before installation.
• Before installing O-rings or snap rings, apply sufficient amount of gear oil to avoid damage and deformation.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Avoid damaging the mating face of the case.

D: PREPARATION TOOL

1. SPECIAL TOOLS

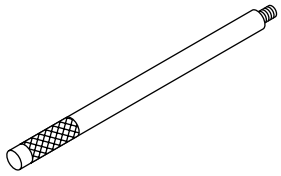
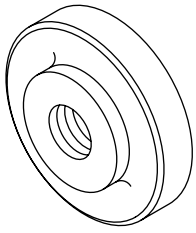
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398477701	398477701	HANDLE	Used for installing front and rear bearing cone.
 ST-398477702	398477702	DRIFT	Used press-fitting the bearing cone of differential carrier (rear).

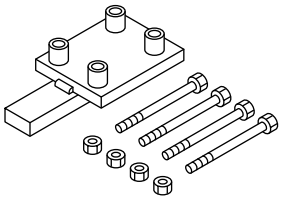
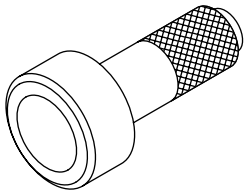
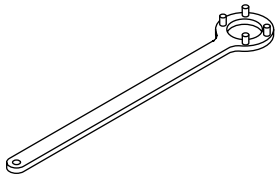
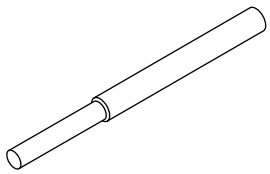
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398217700	398217700	ATTACHMENT SET	Stand for rear differential carrier disassembly and assembly.
 ST-498447120	498447120	INSTALLER	Used for installing front oil seal.
 ST-498427200	498427200	FLANGE WRENCH	• Used for stopping rotation of companion flange when loosening and tightening self-lock nut. • For except STi model.
 ST-398467700	398467700	DRIFT	Used for removing pinion, pilot bearing and front bearing cone.

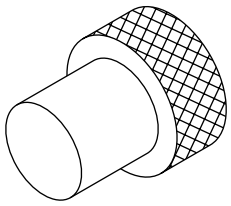
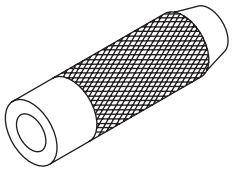
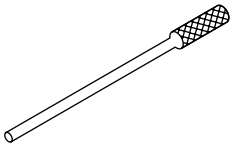
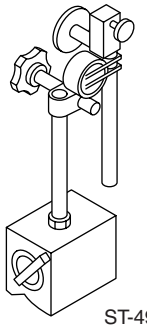
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-399780104	399780104	WEIGHT	Used for installing front bearing cone, pilot bearing companion flange.
 ST-899580100	899580100	INSTALLER	Used for press-fitting the front bearing cone, pilot bearing.
 ST-899904100	899904100	STRAIGHT PIN REMOVER	Used for driving out differential pinion shaft lock pin.
 ST-498247001	498247001	MAGNET BASE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with DIAL GAUGE (498247100).

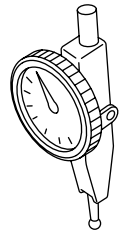
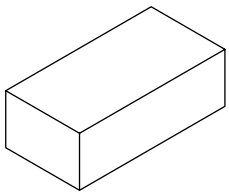
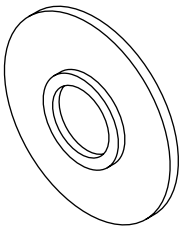
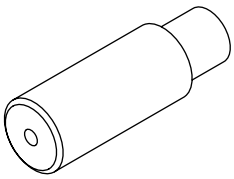
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498247100	498247100	DIAL GAUGE	• Used measuring backlash between side gear and pinion, hypoid gear. • Used with MAGNET BASE (498247001).
 ST-398507704	398507704	BLOCK	Used for adjusting pinion height and preload.
 ST-398177700	398177700	INSTALLER	Used for installing rear bearing cone.
 ST-398457700	398457700	ATTACHMENT	Used for removing side bearing retainer.

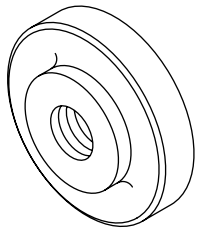
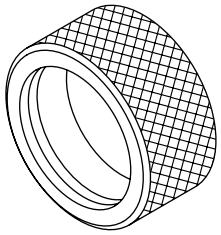
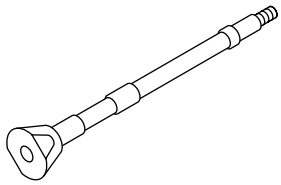
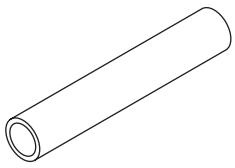
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398477703	398477703	DRIFT2	Used for press-fitting the bearing race (rear) of differential carrier.
 ST-398437700	398437700	DRIFT	Used for installing side oil seal.
 ST-398507702	398507702	DUMMY SHAFT	Used for adjusting pinion height and preload.
 ST-398507703	398507703	DUMMY COLLAR	Used for adjusting pinion height and preload.

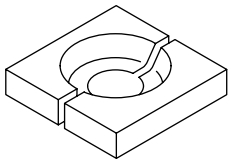
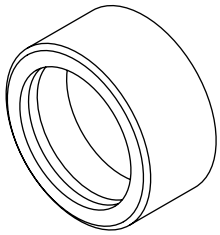
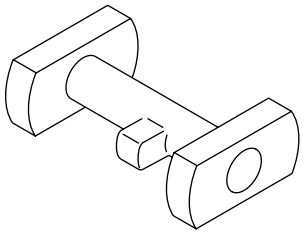
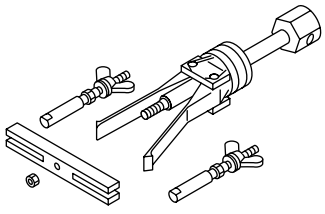
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398517700	398517700	REPLACER	Used for removing rear bearing cone.
 ST-398487700	398487700	DRIFT	Used for press-fitting the side bearing cone.
 ST-398507701	398507701	DIFFERENTIAL CARRIER GAUGE	Used for adjusting pinion height.
 ST-398527700	398527700	PULLER ASSY	• Used for removing front oil seal. • Used for removing side bearing cup.

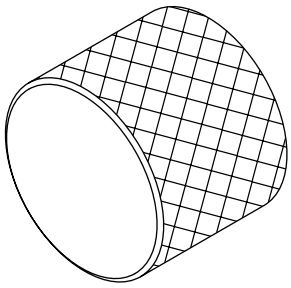
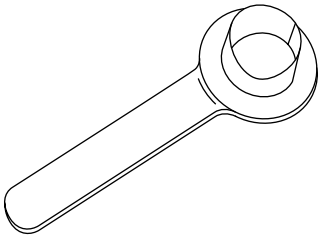
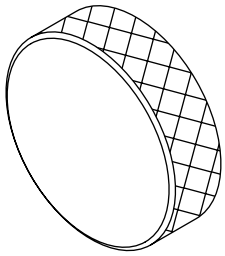
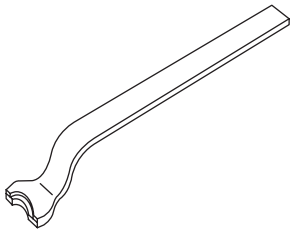
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398227700	398227700	WEIGHT	Used for installing side bearing.
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing rear drive shaft into rear differential. • For protecting oil seal.
 ST-398237700	398237700	GAUGE	Used for installing side bearing.
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	Used for removing rear drive shaft from rear differential.

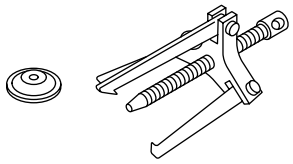
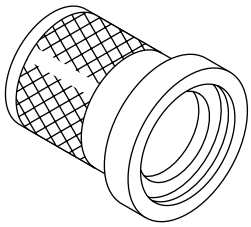
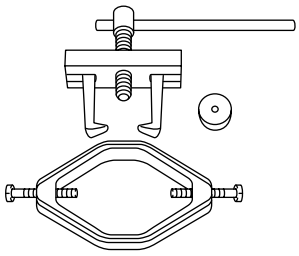
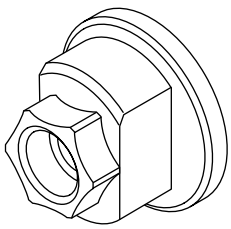
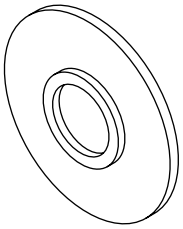
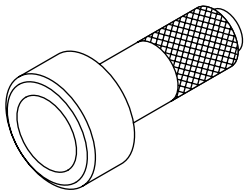
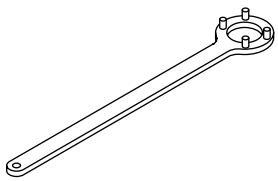
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-399703600	399703600	PULLER ASSY	Used for removing companion flange.
 ST-899874100	899874100	INSTALLER	Used for installing companion flange.
 ST18759AA000	18759AA000 (Newly adopted tool)	PULLER ASSY	Used for removing side bearing cone of differential.
 ST-498937110	498937110	HOLDER DRIVE PINION (This special tool is used for current automatic transmission.)	• Used for installing pilot bearing. • For STi model.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18674AA000	18674AA000 (Newly adopted tool)	INSTALLER	• Used for installing rear bearing cone. • For STi model.
 ST-398417700	398417700	DRIFT (This special tool was prepared for the vehicles of 92MY and before.)	• Used for installing side bearing race. • For STi model.
 ST18633AA000	18633AA000 (Newly adopted tool)	WRENCH COMPL	• Used for stopping rotating of companion flange when loosening and tightening self-locking nut. • For STi model.

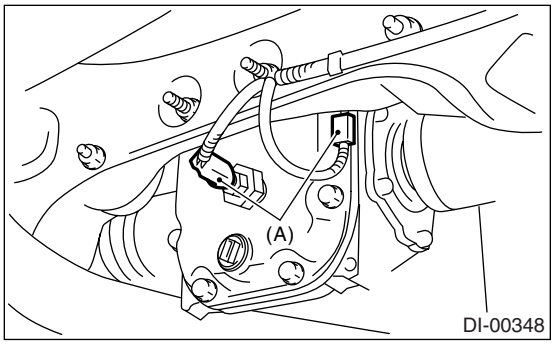
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Transmission jack	Used for assembly/disassembly of rear differential.
Puller	Used for removal of side bearing retainer.
Thickness gauge	Used for measuring clearance.

2. Differential Gear Oil

A: INSPECTION

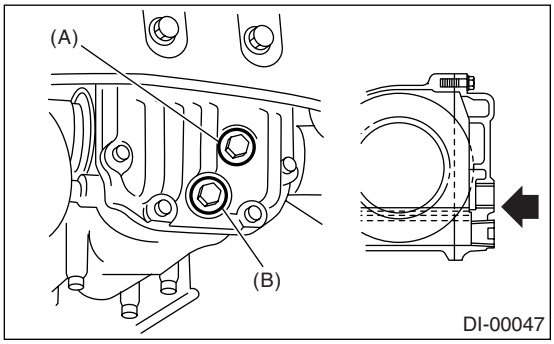
1) Disconnect the oil temperature switch connector. (STi model)



(A) Connector

2) Remove the filler plug or rear differential oil temperature switch and then check the gear oil. If it is contaminated or deteriorated, replace the gear oil. <Ref. to DI-18, REPLACEMENT, Differential Gear Oil.>

3) Check the gear oil level is up to the bottom part of filler bolt. If the level is low, refill up to the bottom of filler bolt.

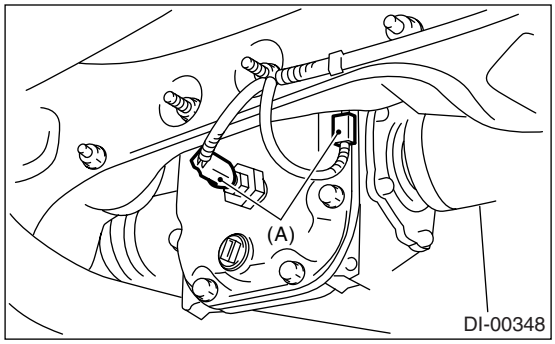


(A) Filler plug
(B) Drain plug

B: REPLACEMENT

1) Jack-up the vehicle and support it with sturdy racks.

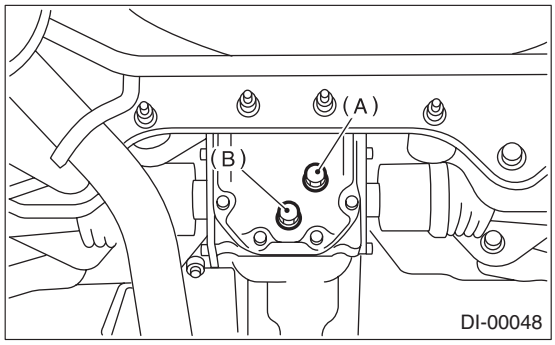
2) Disconnect the oil temperature switch connector. (STi model)



(A) Connector

3) Remove the oil drain plug and filler plug, and drain the gear oil.

CAUTION:
Be careful not to burn your hands, because gear oil becomes extremely hot after running.



(A) Filler plug
(B) Drain plug

4) Tighten the oil drain plug.

NOTE:
Apply fluid packing to the drain plug.

Fluid packing:
THREE BOND 1105 (Part No. 004403010) or equivalent

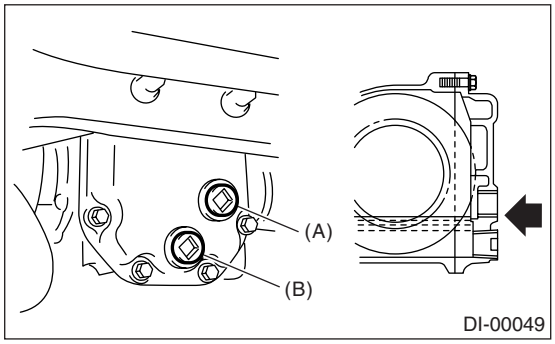
Tightening torque:
49 N·m (5.0 kgf-m, 36.2 ft-lb)

5) Fill the differential carrier with gear oil to the upper plug level.

NOTE:
• Carefully refill oil while watching the level. Excess or insufficient oil must be avoided.
• Use gear oil for the mechanical LSD for STi model.

Recommended oil:
Except for STi model:
GL-5 (75W-90) or equivalent
STi model:
GEAR OIL LSD (Part No. K0904AA080) or equivalent

Oil capacity:
Except STi model:
0.8 ℓ (0.8 US qt, 0.7 Imp qt)
STi model:
0.9 — 1.1 ℓ (1.0 — 1.2 US qt, 0.8 — 1.0 Imp qt)



(A) Filler plug
(B) Drain plug

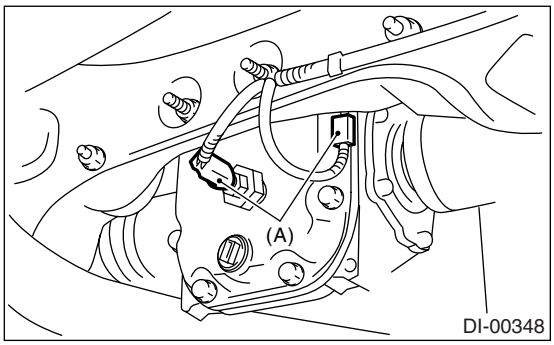
6) Install the filler plug or rear differential oil temperature switch.

NOTE:
Apply fluid packing to the filler plug or rear differential oil temperature switch.

Fluid packing:
THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:
49 N·m (5.0 kgf-m, 36.2 ft-lb)

7) Connect the oil temperature switch connector. (STi model)



(A) Connector

3. Front Differential

A: NOTE

1. AT MODEL

For front differential of AUTOMATIC TRANSMISSION, refer to “AT” section. <Ref. to 4AT-107, Front Differential.>

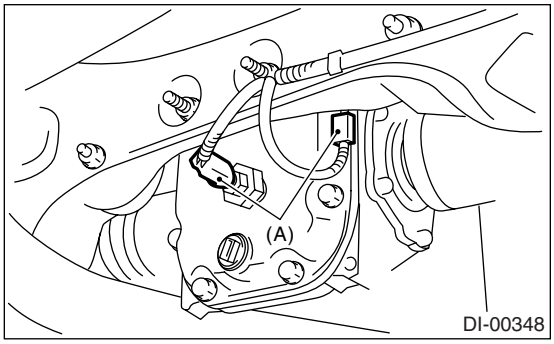
2. MT MODEL

For front differential of manual transmission, refer to “5MT” or “6MT” section. <Ref. to 5MT-69, Front Differential Assembly.> or <Ref. to 6MT-102, Front Differential Assembly.>

4. Rear Differential

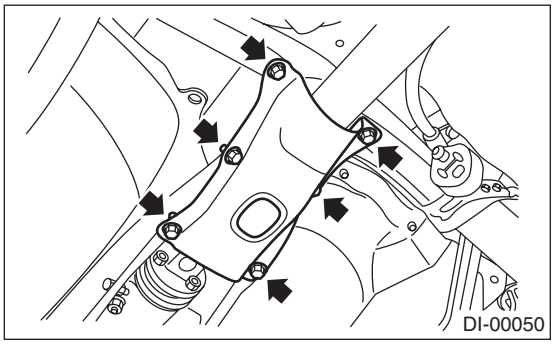
A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Move the select lever or gear shift lever to “N”.
4) Release the parking brake.
5) Loosen the wheel nuts.
6) Jack-up the vehicle and support it with sturdy racks.
7) Remove the wheels.
8) Disconnect the connector from oil temperature switch. (STi model)

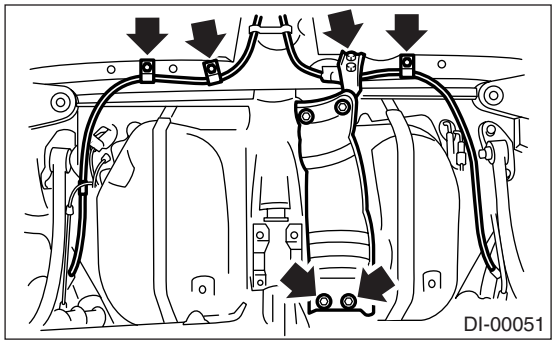


(A) Connector

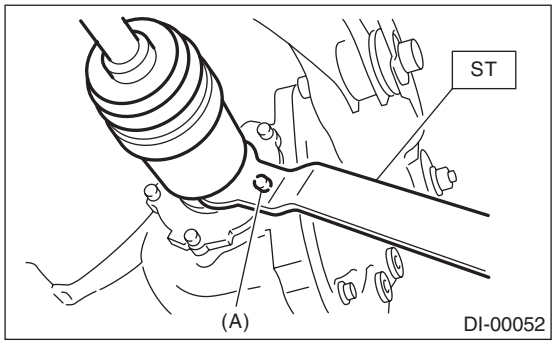
9) Remove the rear exhaust pipe and muffler.
SOHC model
<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, REMOVAL, Muffler.>
DOHC Turbo model
<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
10) Remove the heat shield cover. (If equipped)
11) Remove the front cover of rear differential mount.



12) Remove the propeller shaft. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
13) Remove the rear differential protector. (If equipped)
14) Remove the clamps and bracket of parking brake cable.

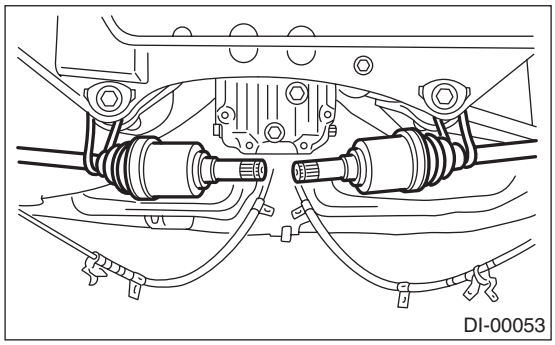


15) Remove the DOJ of rear drive shaft from rear differential using ST. <Ref. to DI-48, REPLACEMENT, Rear Differential Side Oil Seal.>
ST 28099PA100 DRIVE SHAFT REMOVER

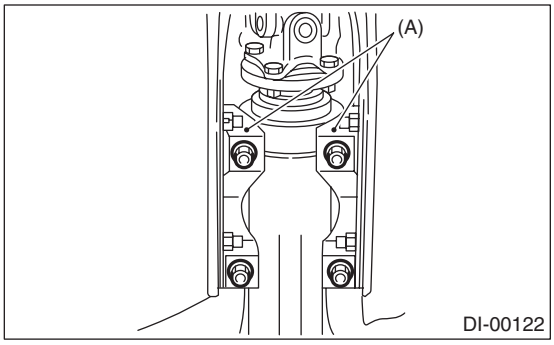


(A) Bolt

16) Secure the rear drive shaft to rear crossmember using wire.

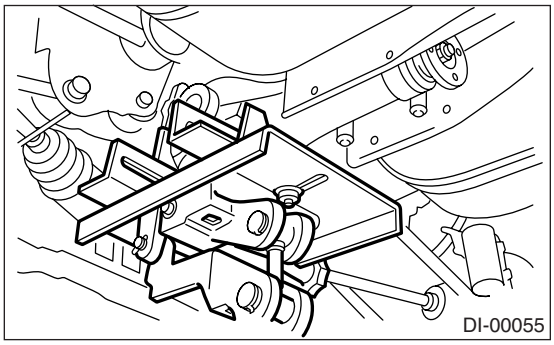


17) Remove the lower bracket.

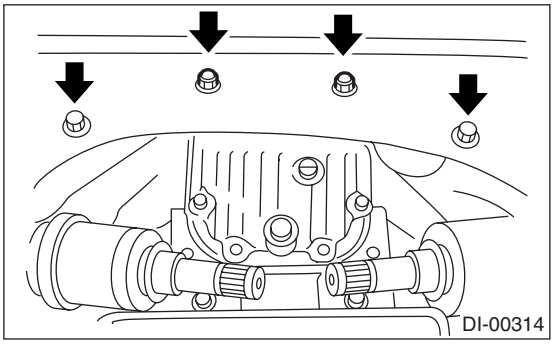


(A) Lower bracket

18) Support the rear differential with transmission jack.

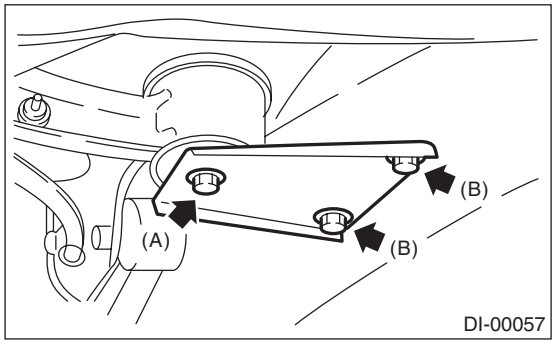


19) Remove the self-locking nuts and bolts.



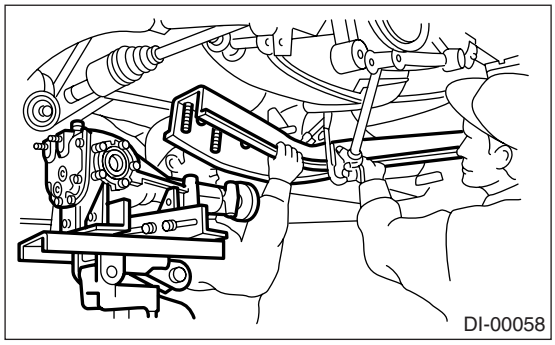
20) Remove the bolts which secure the rear differential front member to body.
Loosen the bolt A first, then remove the bolts B.

NOTE:
Support the front member with use of a helper to prevent it from dropping.

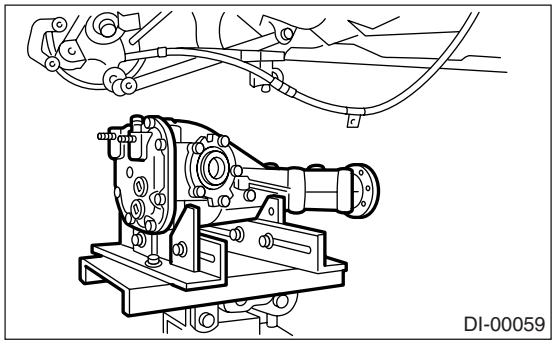


(A) Bolt A
(B) Bolt B

21) Remove the bolt A.
22) While slowly lowering the transmission jack, move the rear differential forward and remove front member and rear differential from vehicle.



23) Remove the rear differential from vehicle.



B: INSTALLATION

1) Install the air breather cap tapping with a plastic hammer.

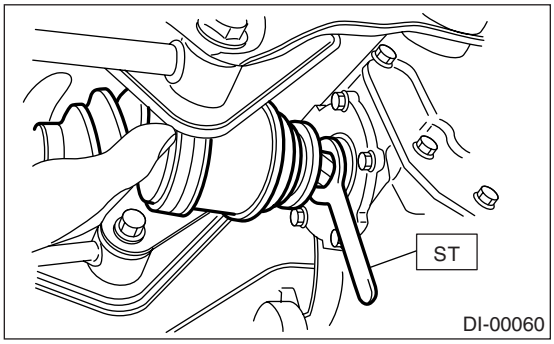
NOTE:
Be sure to install a new air breather cap.

2) Position the front member on body by passing it under the parking brake cable and securing to rear differential.

NOTE:
When installing the rear differential front member, do not confuse the installation sequence of the upper and lower stoppers.

3) Install the DOJ of drive shaft into rear differential. <Ref. to DI-48, REPLACEMENT, Rear Differential Side Oil Seal.>

ST 28099PA090 SIDE OIL SEAL PROTECTOR



4) Installing procedure hereafter is in the reverse order of removal.
5) After installation, fill the differential carrier with gear oil to the filler plug level. <Ref. to DI-18, Differential Gear Oil.>

C: DISASSEMBLY

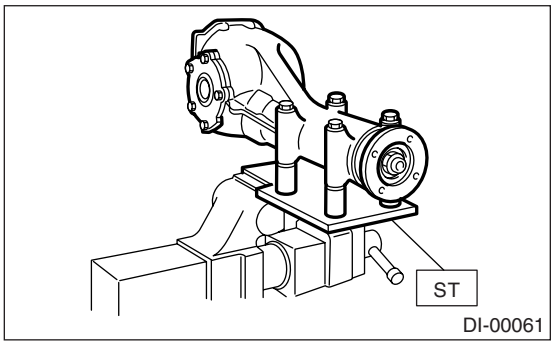
1. EXCEPT STi MODEL

To detect the real cause of trouble, inspect the following items before disassembling.

- Tooth contact of crown gear and pinion, and backlash
- Runout of crown gear at its back surface
- Turning resistance of drive pinion

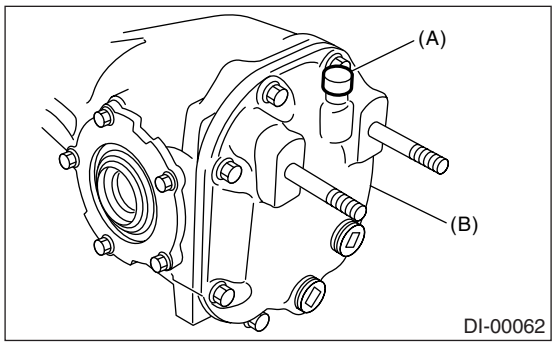
1) Set the ST on vise and install the differential assembly to ST.

ST 398217700 ATTACHMENT



2) Drain the gear oil by removing the plug.
3) Remove the air breather cap.

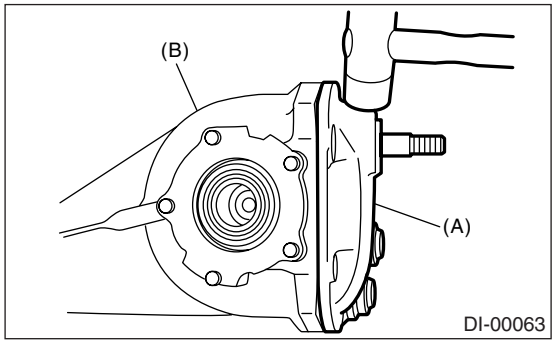
NOTE:
- Do not attempt to remove the air breather cap if unnecessary.
- When removing the air breather cap, replace the air breather cap with a new one.



(A) Air breather cap
(B) Rear cover

4) Remove the bolts, and then remove the rear cover.

NOTE:
Remove it by tapping with plastic hammer.

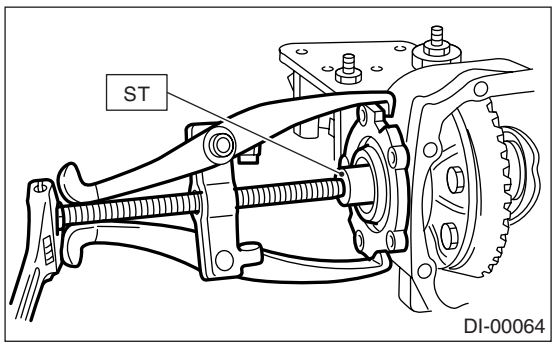


(A) Rear cover
(B) Differential carrier

5) Make right and left side bearing retainers in order to identify them at reassembly. Remove the side bearing retainer attaching bolts, set the ST to differential case, and extract right and left side bearing retainers with a puller.

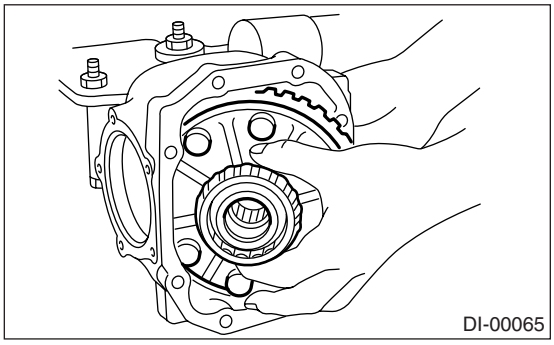
NOTE:
Each shim, which is installed to adjust the side bearing preload, should be kept together with its mating retainer.

ST 398457700 ATTACHMENT

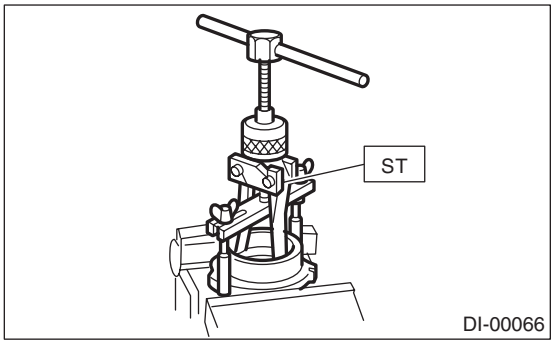


6) Pull out the differential case assembly from differential carrier.

NOTE:
Be careful not to hit the teeth against the case.


DI-00065

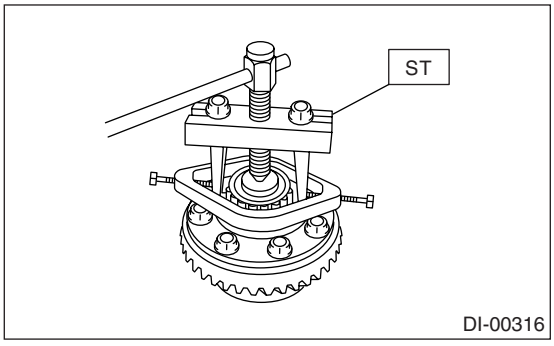
7) When replacing the side bearing, pull the bearing cup from side bearing retainer using ST.
ST 398527700 PULLER ASSY



DI-00066

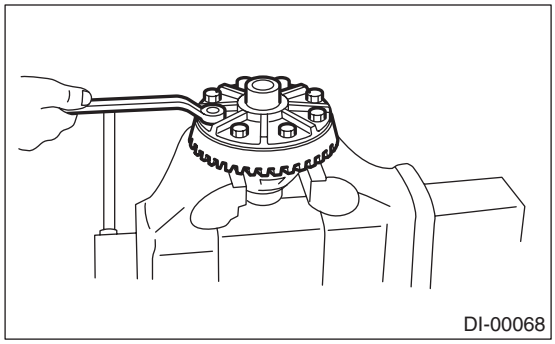
8) Extract the bearing cone with ST.

NOTE:
• Do not attempt to disassemble the parts unless necessary.
• Set the puller so that its claws catch the edge of bearing cone.
• Never mix up the right and left hand bearing races and cones.
ST 18759AA000 PULLER ASSY



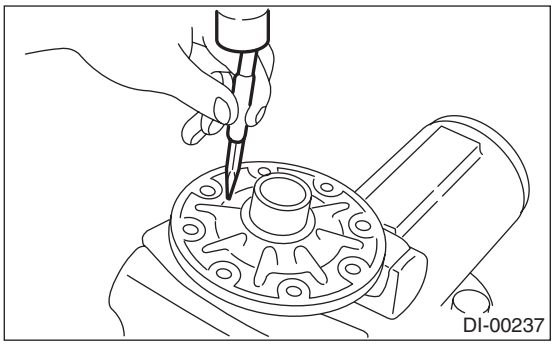
DI-00316

9) Remove the crown gear by loosening the crown gear bolts.


DI-00068

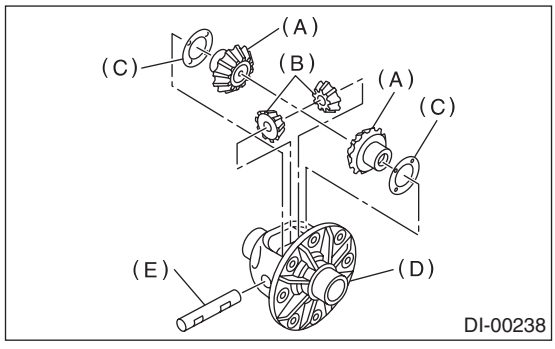
10) Drive out the pinion shaft lock pin from crown gear side. (Model without LSD)

NOTE:
The lock pin is staked at the pin hole end on the differential carrier; do not drive it out forcibly before unstaking it.
ST 899904100 STRAIGHT PIN REMOVER


DI-00237

11) Draw out the pinion mate shaft and remove the pinion mate gears, side gears and thrust washers. (Model without LSD)

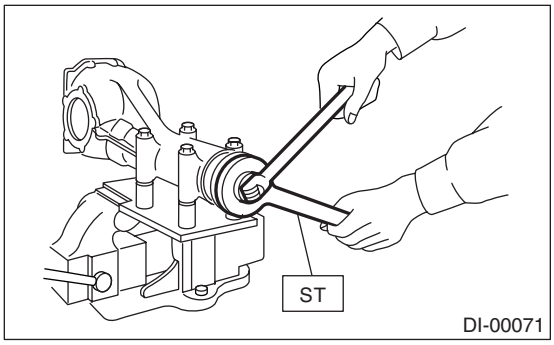
NOTE:
The gears as well as thrust washers should be marked or kept separated right and left, front and rear.



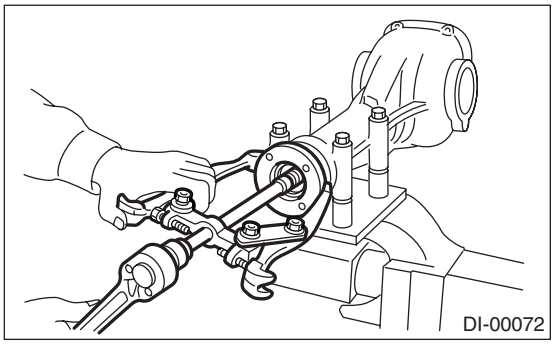
DI-00238

(A) Side gear
(B) Pinion mate gear
(C) Thrust washer
(D) Differential case
(E) Pinion mate shaft

12) Hold the companion flange with ST and remove the drive pinion nut.
ST 498427200 FLANGE WRENCH

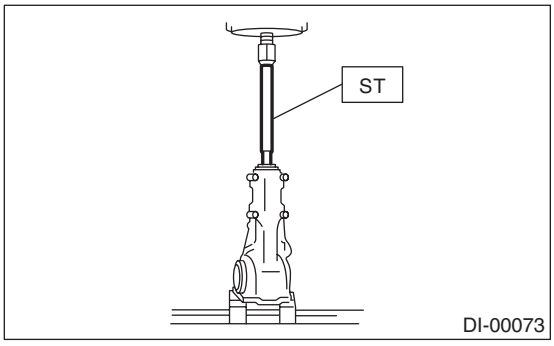


13) Extract the companion flange with a puller.



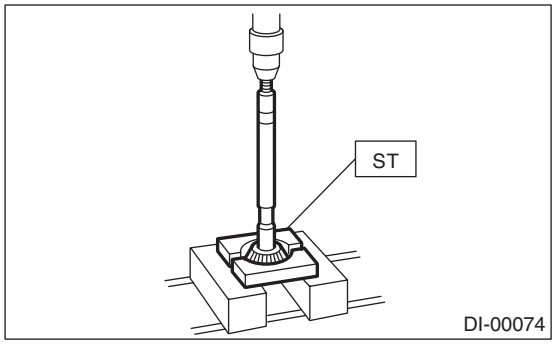
14) Press the end of drive pinion shaft and extract it together with the rear bearing cone, preload adjusting spacer and washer.

NOTE:
Hold the drive pinion so as not to drop it.
ST 398467700 DRIFT

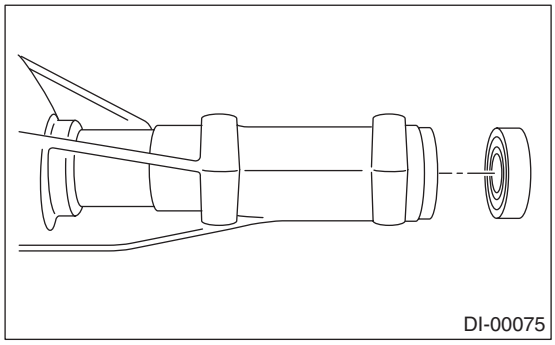


15) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

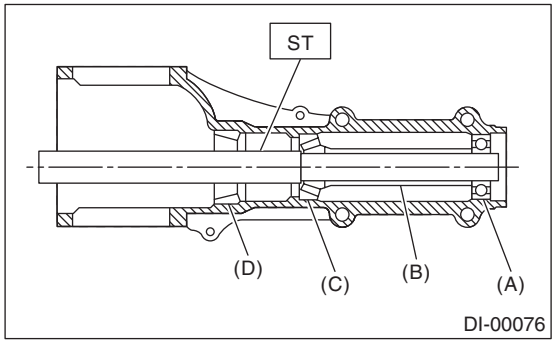
NOTE:
Place the replacer so that its center-recessed side faces the pinion gear.
ST 398517700 REPLACER



16) Remove the front oil seal from differential carrier using ST.
ST 398527700 PULLER ASSY

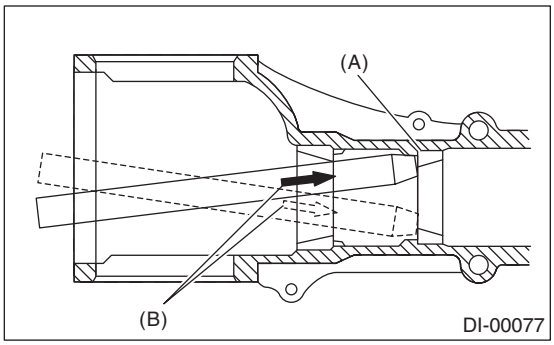


17) Remove the pilot bearing together with front bearing cone using ST.
ST 398467700 DRIFT



(A) Pilot bearing
(B) Spacer
(C) Front bearing
(D) Rear bearing cup

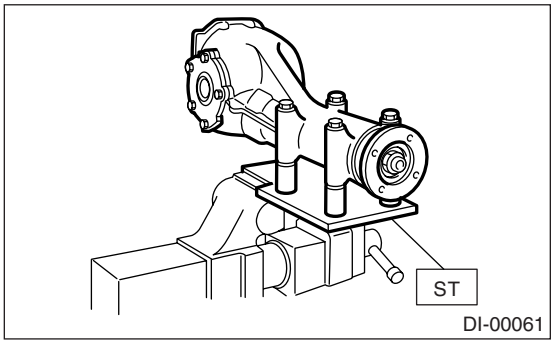
18) When replacing the bearings, hit out the front bearing cup and rear bearing cup in this order out of case by using a brass bar.



(A) 2 cutouts along diagonal lines
(B) Hit out alternately with brass bar.

2. STi MODEL

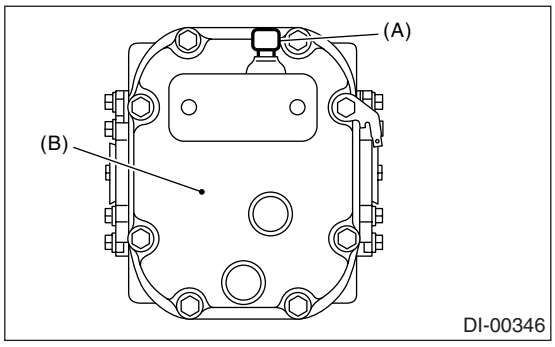
To detect the real cause of trouble, inspect the following items before disassembling.
• Tooth contact of crown gear and pinion, and backlash
• Runout of crown gear at its back surface
• Turning resistance of drive pinion
1) Set the ST on vise and install the differential assembly to ST.
ST 398217700 ATTACHMENT



2) Drain the gear oil by removing the plug.
3) Remove the air breather cap.

NOTE:
• Do not attempt to remove the air breather cap if unnecessary.

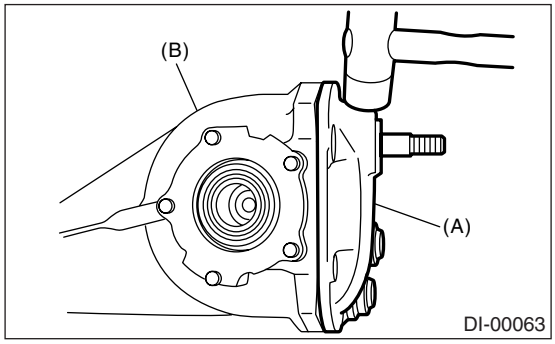
• When removing the air breather cap, replace the air breather cap with a new one.



(A) Air breather cap
(B) Rear cover

4) Remove the bolts, and then remove the rear cover.

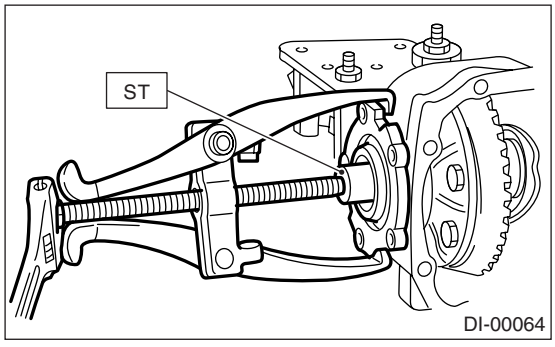
NOTE:
Remove it by tapping with plastic hammer.



(A) Rear cover
(B) Differential carrier

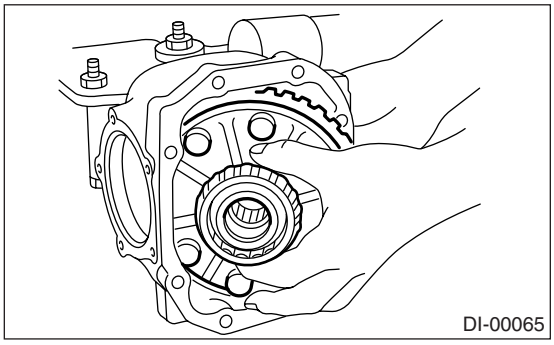
5) Make right and left side bearing retainers in order to identify them at reassembly. Remove the side bearing retainer attaching bolts, set the ST to differential case, and extract right and left side bearing retainers with a puller.

NOTE:
Each shim, which is installed to adjust the side bearing preload, should be kept together with its mating retainer.
ST 398457700 ATTACHMENT

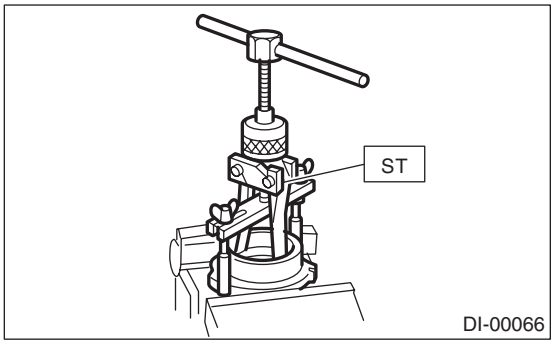


6) Pull out the differential case assembly from differential carrier.

NOTE:
Be careful not to hit the teeth against the case.

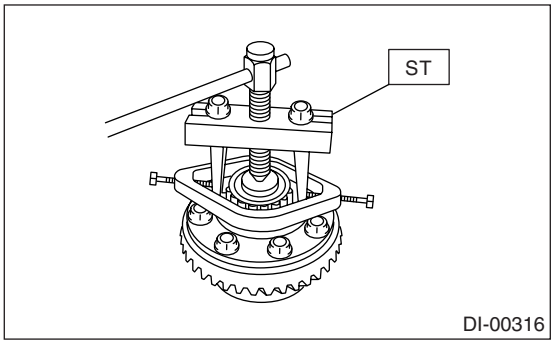


7) When replacing the side bearing, pull the bearing cup from side bearing retainer using ST.
ST 398527700 PULLER ASSY



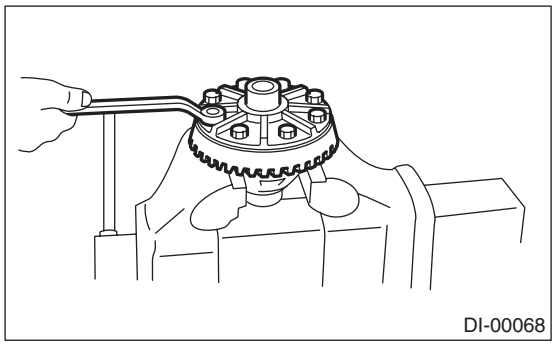
8) Extract the bearing cone with ST.

NOTE:
• Do not attempt to disassemble the parts if unnecessary.
• Set the puller so that its claws catch the edge of bearing cone.
• Never mix up the right and left hand bearing races and cones.
ST 18759AA000 PULLER ASSY

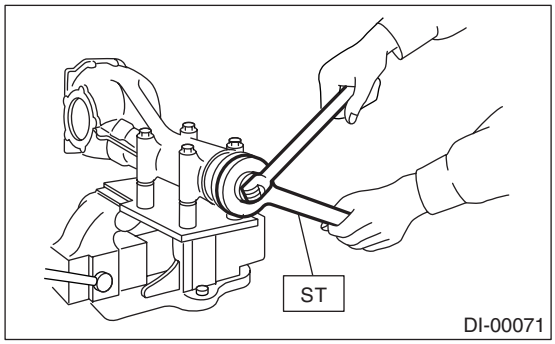


9) Remove the crown gear by loosening the crown gear bolts.

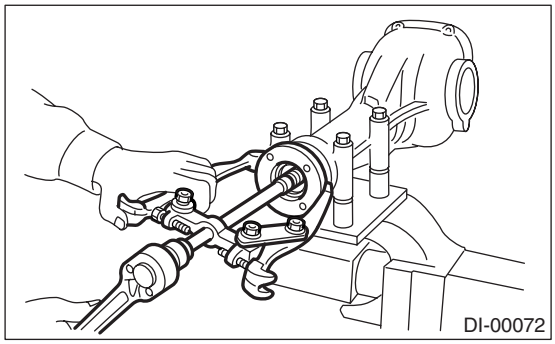
NOTE:
Disassembling the differential case is not allowed.



10) Hold the companion flange with ST and remove the drive pinion nut.
ST 18633AA000 WRENCH COMPL



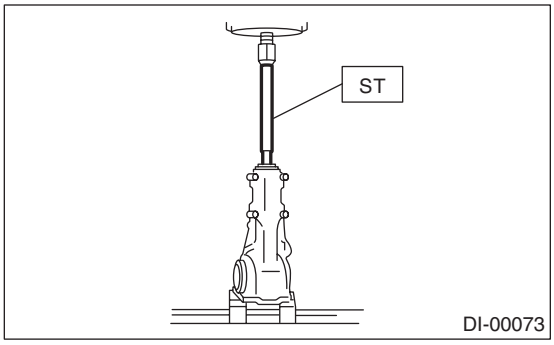
11) Extract the companion flange with a puller.



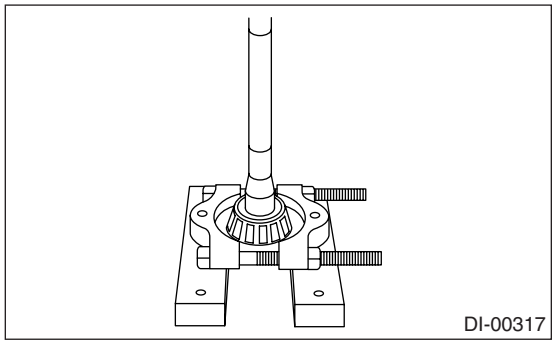
12) Press the end of drive pinion shaft and extract it together with the rear bearing cone, preload adjusting spacer and washer.

NOTE:
Hold the drive pinion so as not to drop it.

ST 398467700 DRIFT

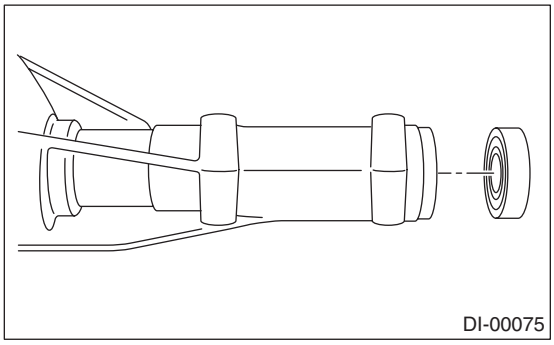


13) Remove the rear bearing cone from drive pinion.



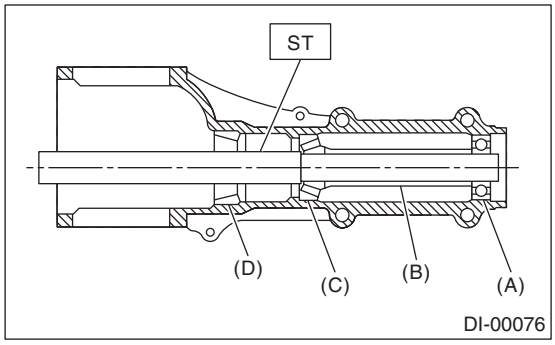
14) Remove the front oil seal from differential carrier using ST.

ST 398527700 PULLER ASSY



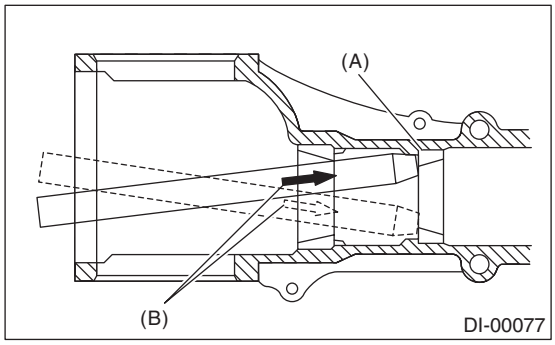
15) Remove the pilot bearing together with front bearing cone and spacer using ST.

ST 398467700 DRIFT



(A) Pilot bearing
(B) Spacer
(C) Front bearing
(D) Rear bearing cup

16) When replacing the bearings, tap the front bearing cup and rear bearing cup in this order out of case by using a brass bar.



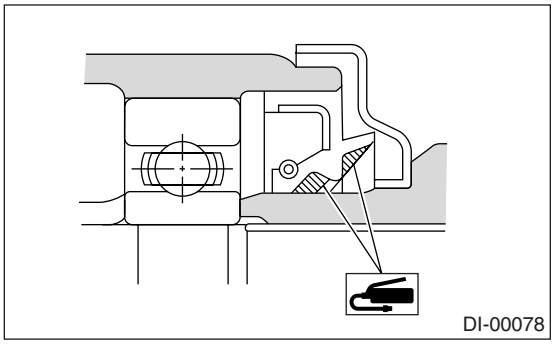
(A) 2 cutouts along diagonal lines
(B) Hit out alternately with brass bar.

D: ASSEMBLY

1. EXCEPT STi MODEL

NOTE:
• Assemble in the reverse order of disassembling.
• Check and adjust each part during assembly.
• Keep the shims and washers in order, so that they are not improperly installed.
• Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
• Apply gear oil when installing the bearings and thrust washers.
• Be careful not to mix up the right and left hand races of the bearings.
• Use a new O-ring and gasket.
• Replace the oil seal with a new one at every disassembly. Apply chassis grease between the lips when installing the oil seal.

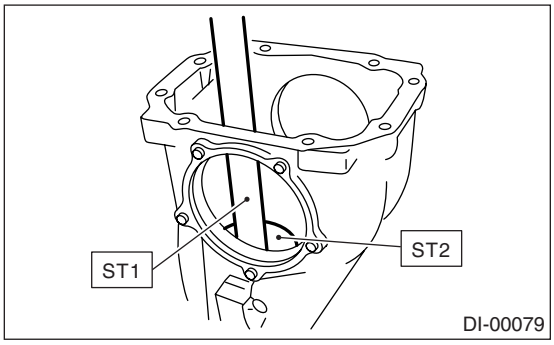
• Be careful not to confuse the installing direction of oil seal.



1) Adjusting preload for front and rear bearings
Adjust the bearing preload with spacer and washer between front and rear bearings. Pinion height adjusting washer are not affected by this adjustment. The adjustment must be carried out without oil seal inserted.

(1) Press the rear bearing race into differential carrier using ST1 and ST2.

ST1 398477701 HANDLE
ST2 398477703 DRIFT 2



(2) Install the front bearing race to differential carrier using ST1 and ST2.

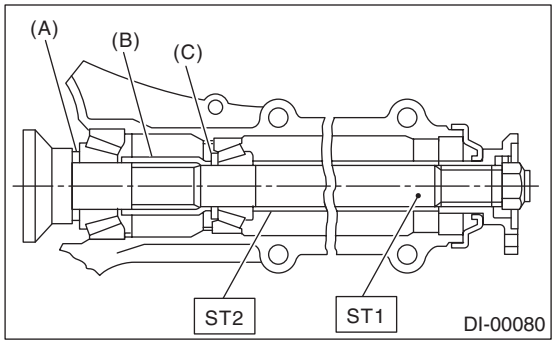
ST1 398477701 HANDLE
ST2 398477703 DRIFT 2

(3) Insert the ST1 into carrier with pinion height adjusting washer and rear bearing cone fitted onto it.

NOTE:
• If tooth contact (Drive pinion, Crown gear) is normal in the inspection before disassembling, verify that the washer is not deformed, and then re-use the used washer.
• Use a new rear bearing cone.

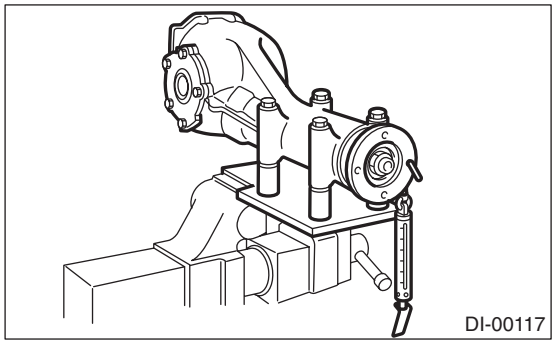
(4) Then install the preload adjusting spacer and washer, front bearing cone, ST2, companion flange, and washer and drive pinion nut.

ST1 398507702 DUMMY SHAFT
ST2 398507703 DUMMY COLLAR



(A) Pinion height adjusting shim
(B) Preload adjusting spacer
(C) Preload adjusting washer

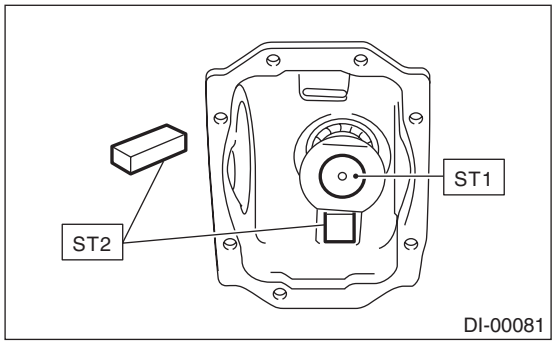
(5) Turn the ST1 with hand to make it seated, and tighten the drive pinion nut while measuring the preload with spring balance. Select the preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque.



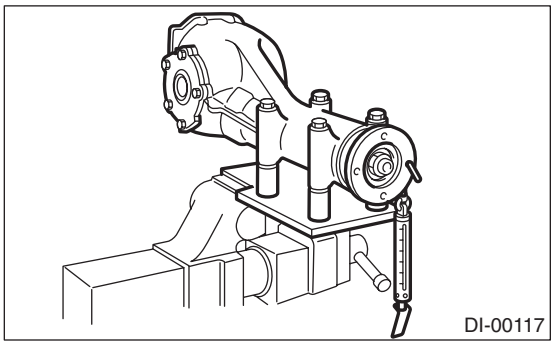
NOTE:
• Use a new lock nut.
• Be careful not to give excessive preload.
• When tightening the drive pinion nut, lock ST1 with ST2 as shown in the figure.
• Measure the preload in direction of tangent to flange.

ST1 398507702 DUMMY SHAFT
ST2 398507704 BLOCK

Tightening torque:
181 N·m (18.5 kgf-m, 134 ft-lb)



Front and rear bearing preload
For new bearing: 18.1 — 38.8 N (1.8 — 4.0 kgf, 4.1 — 8.7 lb) at companion flange bolt hole



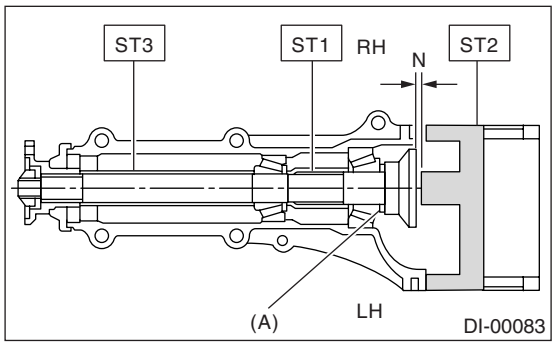
	Part No.	Thickness mm (in)
Preload adjusting washer	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)
	383805200	2.39 (0.0941)
	383815200	2.37 (0.0933)
	383825200	2.35 (0.0925)
	383835200	2.33 (0.0917)
	383845200	2.31 (0.0909)
	Part No.	Length mm (in)
Preload adjusting spacer	383695201	56.2 (2.213)
	383695202	56.4 (2.220)
	383695203	56.6 (2.228)
	383695204	56.8 (2.236)
	383695205	57.0 (2.244)
	383695206	57.2 (2.252)

2) Adjusting drive pinion height
Adjust the drive pinion height with shim installed between the rear bearing cone and back of pinion gear.

(1) Install the ST2.

NOTE:
At this time, install a pinion height adjusting shim which is temporarily selected or the same as that used before. Measure and record the thickness.

ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE
ST3 398507703 DUMMY COLLAR

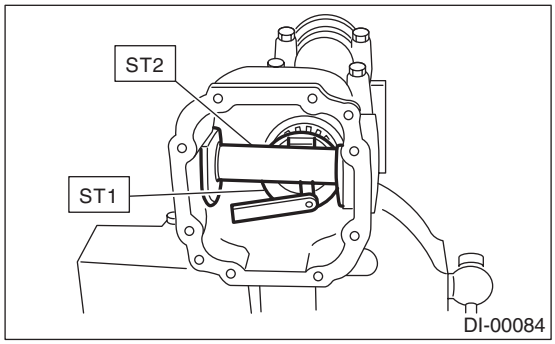


(A) Pinion height adjusting shim

(2) Measure the clearance N between the end of ST2 and end surface of ST1 by using a thickness gauge.

NOTE:
Make sure there is no clearance between the case and ST2.

ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE



(3) Obtain the thickness of pinion height adjusting shim to be inserted from the following formula, and replace the temporarily installed shim with this one.

$T = To + N - (H \times 0.01) - 0.20$ mm (0.0079 in)

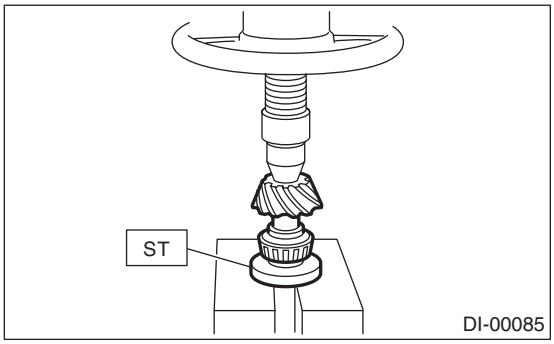
NOTE:
Use copies of this page.

T	Thickness of pinion height adjusting shim mm (in)	
To	Thickness of shim temporarily inserted mm (in)	
N	Reading of thickness gauge mm (in)	
H	Figure marked on drive pinion head	
Memo:		

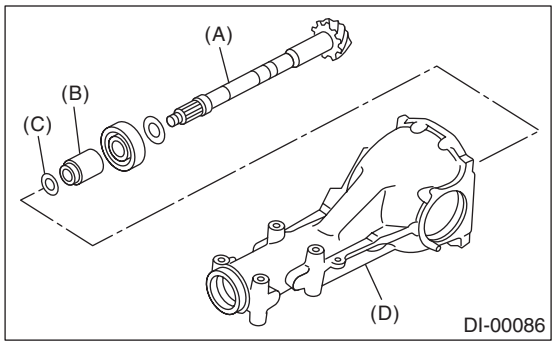
(Example of calculation)
To = 2.20 + 1.20 = 3.40 mm
N = 0.23 mm
H = + 1
T = 3.40 + 0.23 − 0.01 − 0.20 = 3.42
Result: Thickness = 3.42 mm
Therefore use the shim 383605200.

Pinion height adjusting shim	
Part No.	Thickness mm (in)
383495200	3.09 (0.1217)
383505200	3.12 (0.1228)
383515200	3.15 (0.1240)
383525200	3.18 (0.1252)
383535200	3.21 (0.1264)
383545200	3.24 (0.1276)
383555200	3.27 (0.1287)
383565200	3.30 (0.1299)
383575200	3.33 (0.1311)
383585200	3.36 (0.1323)
383595200	3.39 (0.1335)
383605200	3.42 (0.1346)
383615200	3.45 (0.1358)
383625200	3.48 (0.1370)
383635200	3.51 (0.1382)
383645200	3.54 (0.1394)
383655200	3.57 (0.1406)
383665200	3.60 (0.1417)
383675200	3.63 (0.1429)
383685200	3.66 (0.1441)

3) Install the selected pinion height adjusting shim on drive pinion, and press the rear bearing cone into position with ST.
ST 398177700 INSTALLER

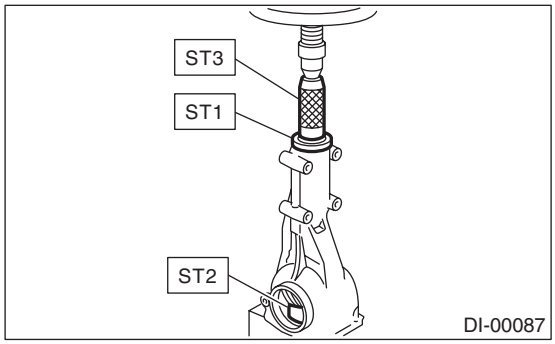


4) Insert the drive pinion into differential carrier, install the previously selected bearing preload adjusting spacer and washer.

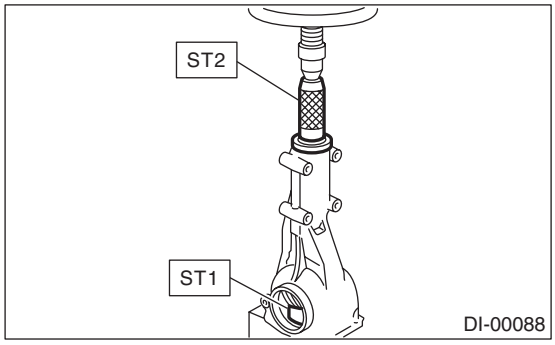


(A) Drive pinion
(B) Bearing adjusting spacer
(C) Washer
(D) Differential carrier

5) Press-fit the front bearing cone into case with ST1, ST2 and ST3.
ST1 398507703 DUMMY COLLAR
ST2 399780104 WEIGHT
ST3 899580100 INSTALLER



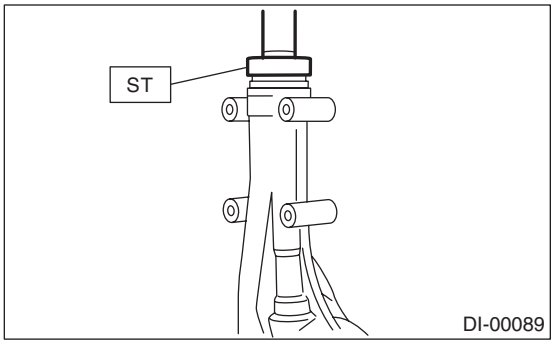
6) Insert the spacer, then press-fit the pilot bearing with ST1 and ST2.
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER



7) Fit a new oil seal with ST.

NOTE:
• Press-fit until the end of oil seal is 1 mm (0.04 in) inward from end of carrier.
• Apply grease between the oil seal lips.

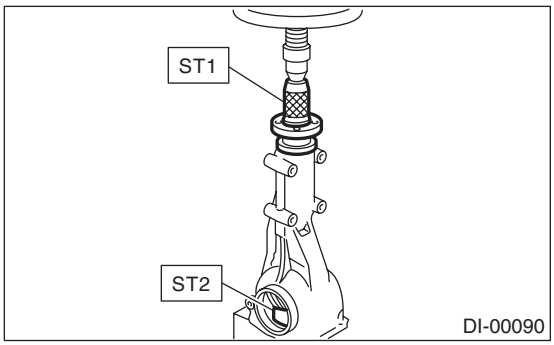
ST 498447120 INSTALLER



8) Press-fit the companion flange with ST1 and ST2.

NOTE:
Be careful not to damage the bearing.

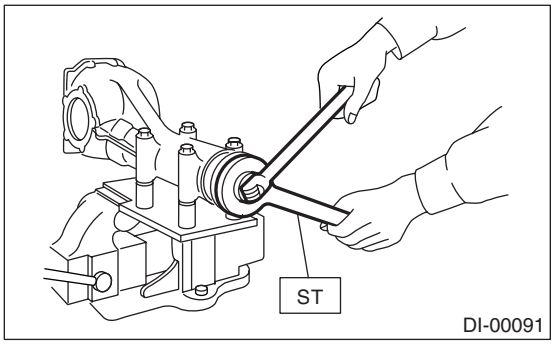
ST1 899874100 INSTALLER
ST2 399780104 WEIGHT



9) Install a new self-locking nut. Then tighten it with the ST.

ST 498427200 FLANGE WRENCH

Tightening torque:
181 N·m (18.5 kgf-m, 134 ft-lb)

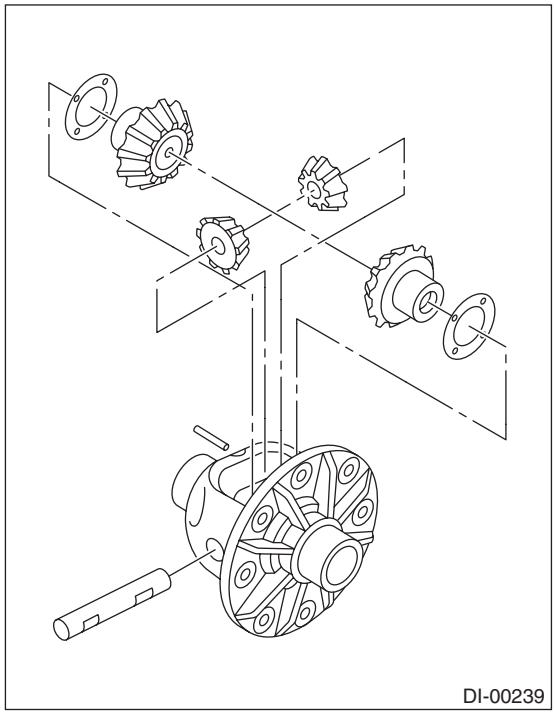


10) Assembling differential case

Install the side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into differential case. (Model without LSD)

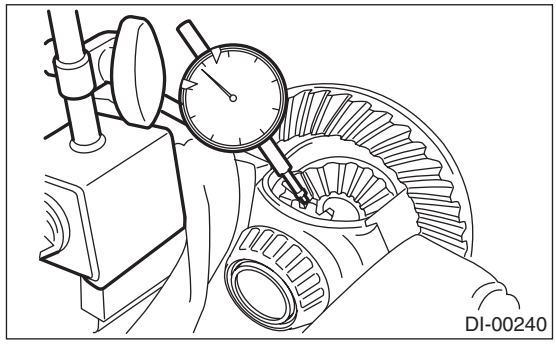
NOTE:

- Apply gear oil on both sides of the washer and on the side gear shaft before installing.
- Insert the pinion mate shaft into the differential case by aligning the lock pin holes.



(1) Measure the side gear backlash.

Side gear backlash:
0.10 — 0.20 mm (0.0039 — 0.0079 in)



(2) Adjust the backlash as specified by selecting the side gear thrust washer.

Side gear thrust washer	
Part No.	Thickness mm (in)
383445201	0.75 — 0.80 (0.0295 — 0.0315)
383445202	0.80 — 0.85 (0.0315 — 0.0335)
383445203	0.85 — 0.90 (0.0335 — 0.0354)

(3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust surfaces.

(4) After inserting the pinion shaft lock pin into differential case, stake both sides of the hole to prevent pin from falling off.

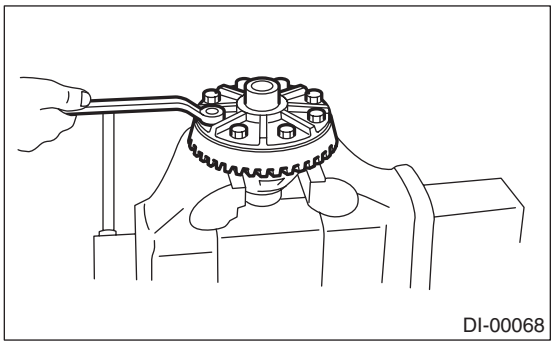
11) Install the crown gear on differential case.

NOTE:
Before installing the bolts, apply Lock Tite to bolt threads.

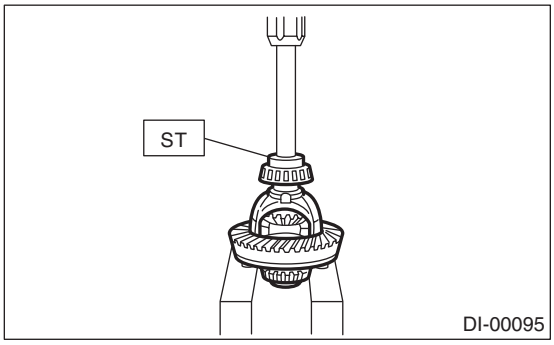
Lock Tite:
THREE BOND 1324 (Part No. 004403042) or equivalent

NOTE:
Tighten diagonally while tapping the bolt heads.

Tightening torque:
105 N·m (10.7 kgf-m, 77.4 ft-lb)


DI-00068

12) Press the side bearing into differential case using ST.
ST 398237700 DRIFT

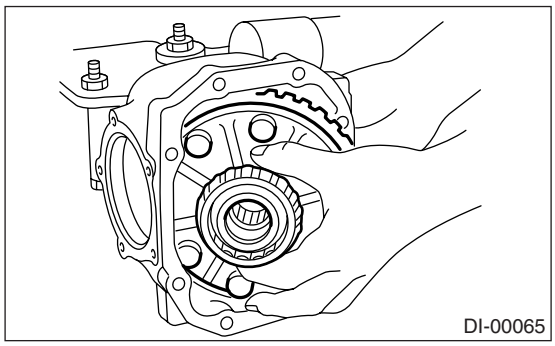


DI-00095

13) Press the side bearing cone into side bearing retainer using ST.
ST 398487700 DRIFT

14) Adjusting side bearing retainer shims
(1) The driven gear backlash and side bearing preload can be determined by the side bearing retainer shim thickness.

(2) Install the differential case assembly into differential carrier in the reverse order of disassembly.


DI-00065

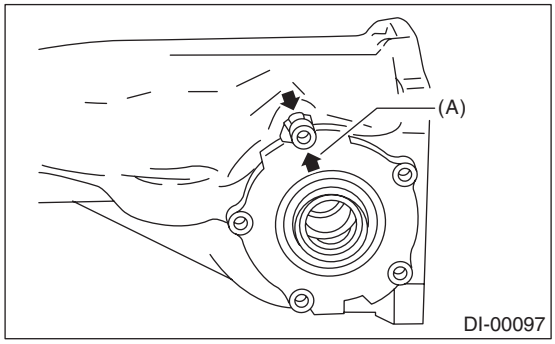
(3) Install the side retainer shims to the right and left retainers from which they were removed.

NOTE:
Replace the broken or corroded side retainer shim with a new one of same thickness.

Side bearing retainer shim	
Part No.	Thickness mm (in)
383475201	0.20 (0.0079)
383475202	0.25 (0.0098)
383475203	0.30 (0.0118)
383475204	0.40 (0.0157)
383475205	0.50 (0.0197)

(4) Align the arrow mark on differential carrier with the mark on side retainer during installation.

NOTE:
Be careful that side bearing outer race is not damaged by bearing roller.



DI-00097

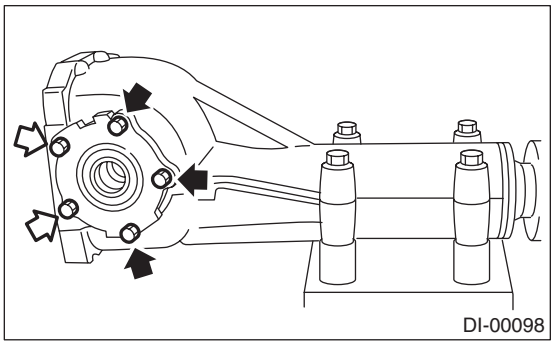
(A) Arrow mark

(5) Tighten the side bearing retainer bolts.

NOTE:
Before tightening the two side bearing retainer bolts, apply Lock Tite to bolt threads.

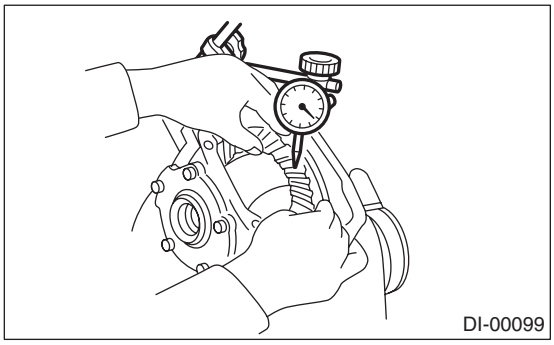
Lock Tite:
THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:
10.3 N·m (1.05 kgf-m, 7.6 ft-lb)


DI-00098

(6) Measure the crown gear-to-drive pinion backlash. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of crown gear, and move the crown gear while holding drive pinion still. Read the value indicated on dial gauge.

Backlash:
0.10 — 0.20 mm (0.0039 — 0.0079 in)

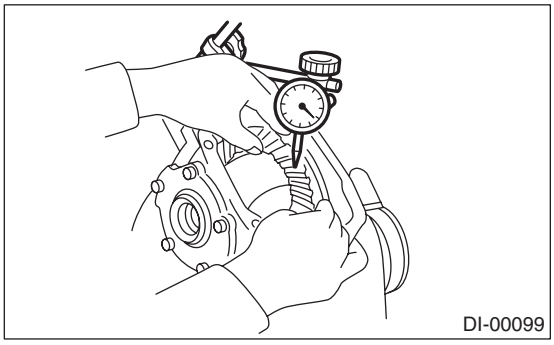

DI-00099

(7) At the same time, measure the total preload of drive pinion. Compared with the resistance when differential case is not installed, if the total preload is not within specification, adjust the thickness of side bearing retainer shims, increasing/reducing by an even amount at a time.

Total preload:
20.7 — 54.4 N (2.1 — 5.5 kgf, 4.7 — 12.2 lb)

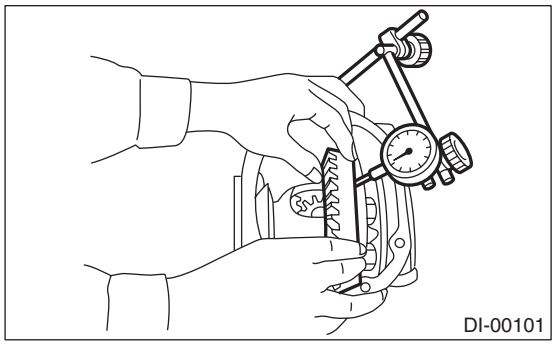
15) Re-check the crown gear-to-pinion backlash.

Backlash:
0.10 — 0.20 mm (0.0039 — 0.0079 in)


DI-00099

16) Check the crown gear runout on its back surface, and make sure that pinion and crown gear rotate smoothly.

Limit of runout:
Less than 0.05 mm (0.0020 in)


DI-00101

17) Checking and adjusting tooth contact of crown gear

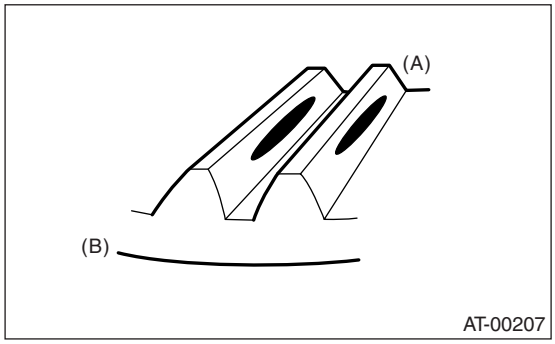
(1) Apply an even coat of red lead on both sides of three or four teeth on the crown gear. Check the contact pattern after rotating the crown gear several revolutions back and forth until a definite contact pattern appears on the crown gear.

(2) When the contact pattern is incorrect, readjust according to the instructions given in "TOOTH CONTACT PATTERN".

NOTE:
Be sure to wipe off red lead completely after adjustment is completed.

- Correct tooth contact

Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. (When loaded, contact pattern moves toward heel)

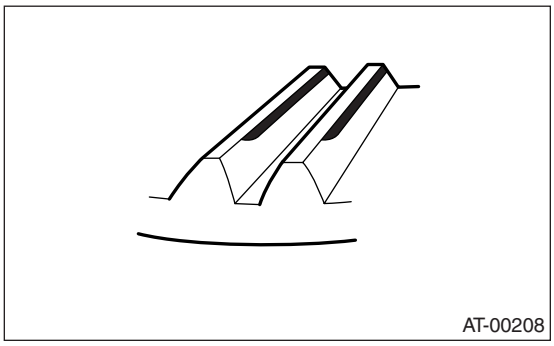


AT-00207

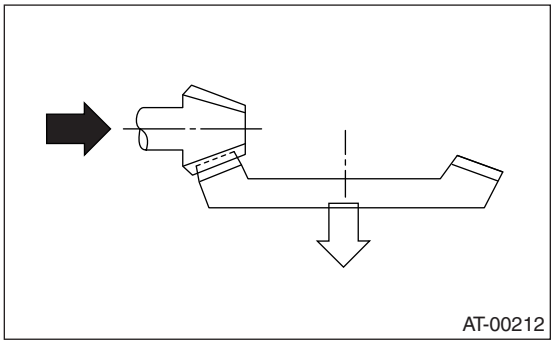
(A) Toe side
(B) Heel side

- Face contact

Checking item: Backlash is too large.
Contact pattern

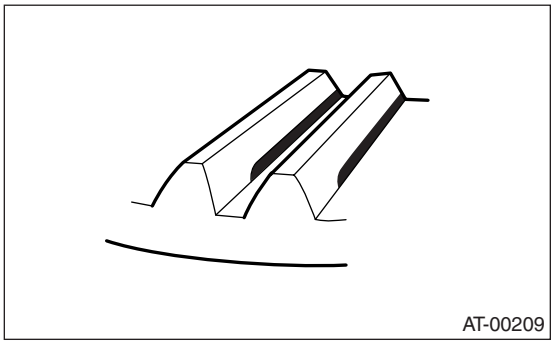


Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.

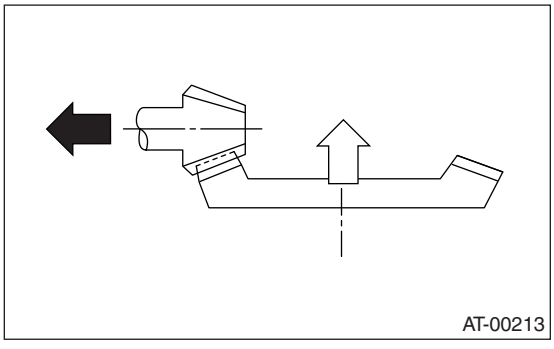


- Flank contact

Checking item: Backlash is too small.
Contact pattern

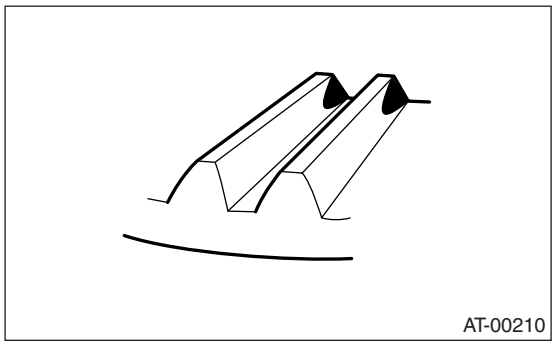


Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.

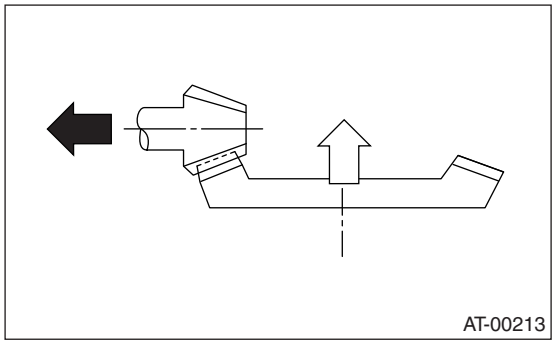


- Toe contact (Inside end contact)

Checking item: Contact area is small.
Contact pattern

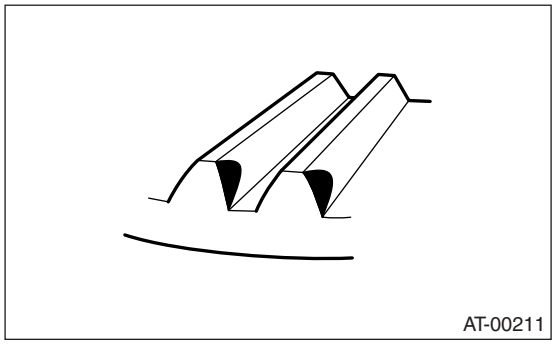


Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.

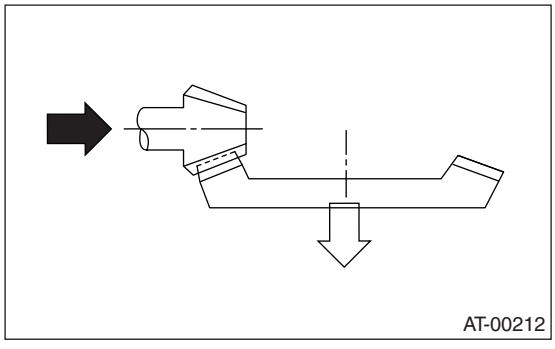


- Heel contact (Outside end contact)

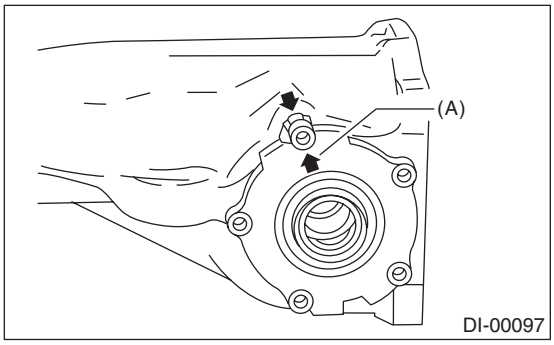
Checking item: Contact area is small.
Contact pattern



Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.



18) If proper tooth contact is not obtained, once again adjust the drive pinion height by changing RH and LH side bearing retainer shims and the hypoid gear backlash.
19) Remove the side bearing retainers on right and left side.
20) Install new O-rings to side bearing retainers on right and left side.
21) Install the oil seals to side bearing retainers on right and left side.
22) Align the arrow mark on differential carrier with the mark on side retainer during installation.

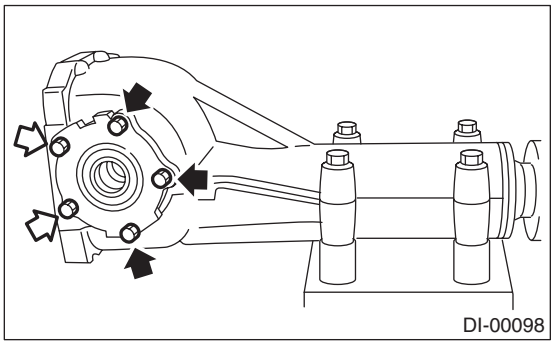


(A) Arrow mark

23) Tighten the side bearing retainer bolts.

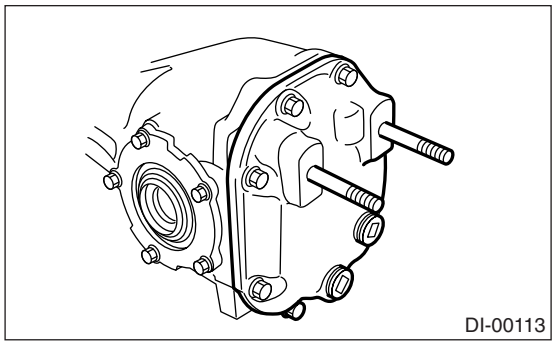
Lock Tite:
THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:
10.3 N·m (1.05 kgf-m, 7.6 ft-lb)



24) Install the new gasket and rear cover and tighten the bolts to specified torque.

Tightening torque:
29 N·m (3.0 kgf-m, 21.7 ft-lb)

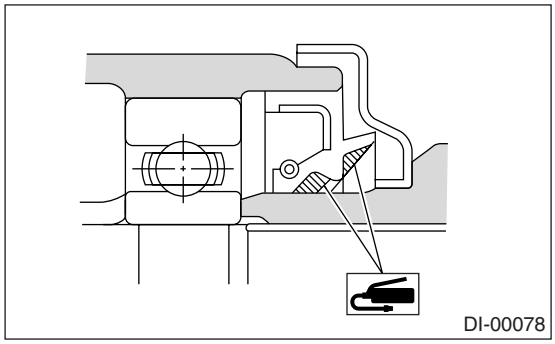


25) Install the breather cap.
26) Install the drain plug and filler plug.

Tightening torque:
49 N·m (5.0 kgf-m, 36.2 ft-lb)

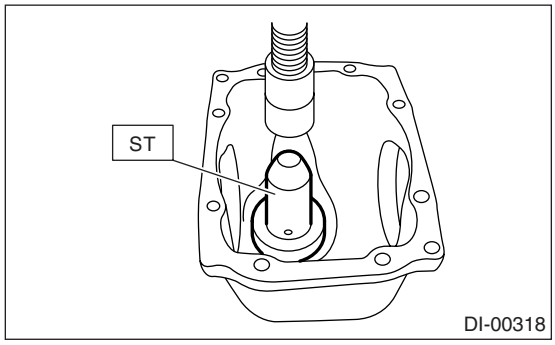
2. STi MODEL

1) Precautions for assembling
• Assemble in the reverse order of disassembling.
• Check and adjust each part during assembly.
• Keep the shims and washers in order, so that they are not improperly installed.
• Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
• Apply gear oil when installing the bearings and thrust washers.
• Be careful not to mix up the right and left hand races of the bearings.
• Replace the oil seal with a new one at every disassembly. Apply chassis grease between the lips when installing the oil seal.



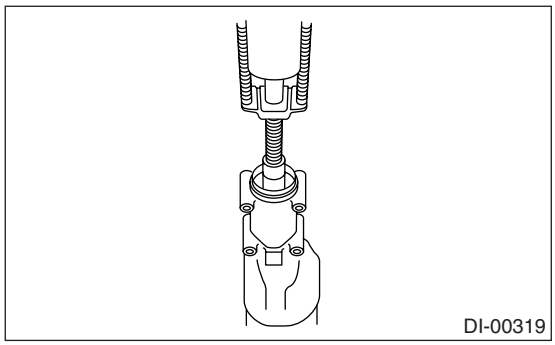
• Adjust the bearing preload with spacer and washer between front and rear bearings. Pinion height adjusting shim are not affected by this adjustment. The adjustment must be carried out without oil seal inserted.
2) Press-fit the rear bearing race into differential carrier using ST.

ST 398417700 DRIFT



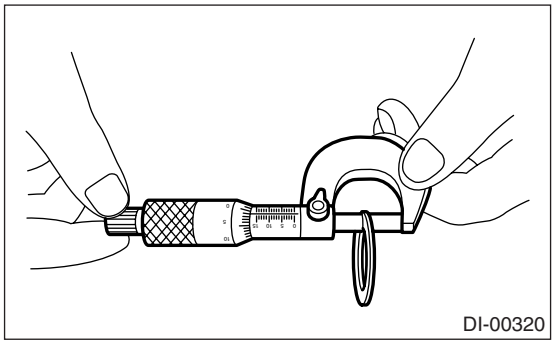
3) Press-fit the front bearing race into differential carrier using ST.

ST 398477702 DRIFT



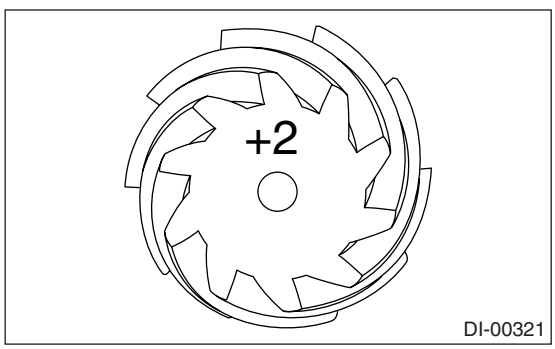
4) Pinion height adjusting shim selection.

(1) Measure the thickness of inserted pinion height adjusting shim.



(2) Read the punch mark of installed drive pinion gear and new one.

NOTE:
If there is no punch mark, it means 0 (zero).



(3) Obtain the thickness of pinion height adjust shim to be inserted from the following formula, and replace the inserted shim with this one.

$T = T1 + (T2 \times 0.01 - T3 \times 0.01)$

T mm	Thickness of selected pinion height adjusting shim.
T1 mm	Thickness of inserted pinion height adjusting shim.
T2 mm	Punch mark number on installed drive pinion gear.
T3 mm	Punch mark number on new drive pinion gear.

(Example of calculation)

$T1 = 3.30, T2 = +2, T3 = -1$

$T = 3.30 + \{(2 \times 0.01) - (-1 \times 0.01)\} = 3.33$

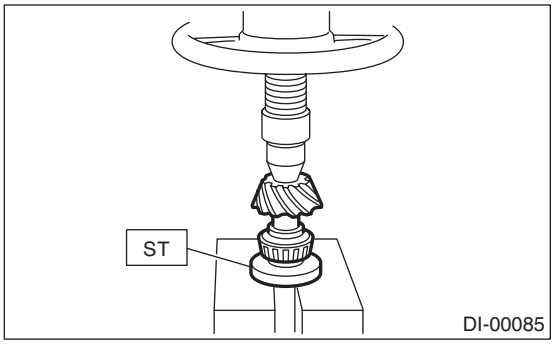
Result: Thickness = 3.33 mm

Therefore use the shim 38336AA310.

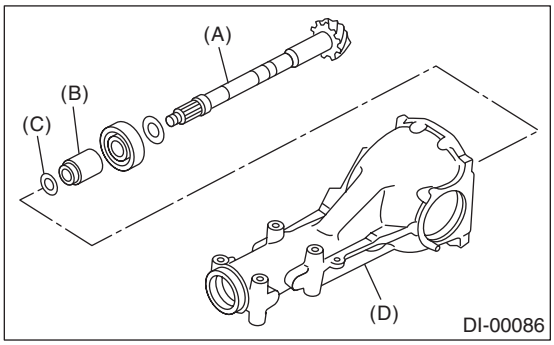
Pinion height adjusting shim	
Part No.	Thickness T mm (in)
38336AA230	3.09 (0.1217)
38336AA240	3.12 (0.1228)
38336AA250	3.15 (0.1240)
38336AA260	3.18 (0.1252)
38336AA270	3.21 (0.1264)
38336AA280	3.24 (0.1276)
38336AA290	3.27 (0.1287)
38336AA300	3.30 (0.1299)
38336AA310	3.33 (0.1311)
38336AA320	3.36 (0.1323)
38336AA330	3.39 (0.1335)
38336AA340	3.42 (0.1346)
38336AA350	3.45 (0.1358)
38336AA360	3.48 (0.1370)
38336AA370	3.51 (0.1382)
38336AA380	3.54 (0.1394)
38336AA390	3.57 (0.1406)
38336AA400	3.60 (0.1417)
38336AA410	3.63 (0.1429)
38336AA420	3.66 (0.1441)

5) Install the selected pinion height adjusting shim on drive pinion, and press-fit the rear bearing cone into position with ST.

ST 18674AA000 INSTALLER

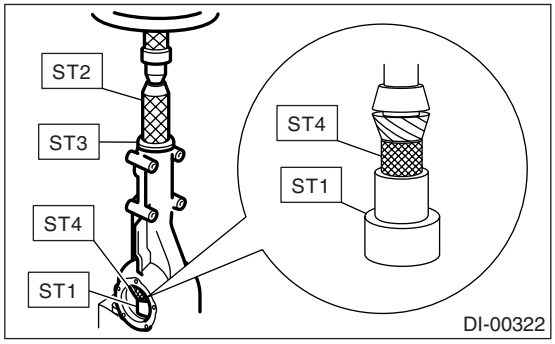


6) Insert the drive pinion into differential carrier, install the previously selected bearing preload adjusting spacer and washer.



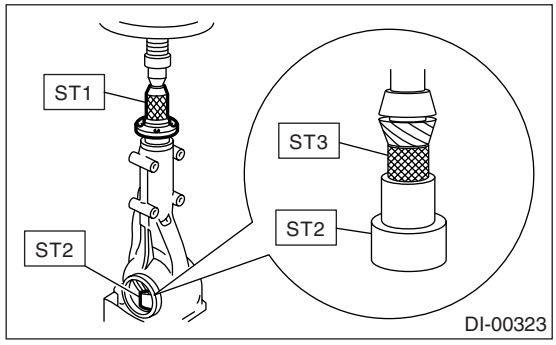
(A) Drive pinion
(B) Bearing preload adjusting spacer
(C) Bearing preload adjusting washer
(D) Differential carrier

7) Insert the spacer, then press-fit the pilot bearing with STs.
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER
ST3 398507703 DUMMY COLLER
ST4 498937110 HOLDER DRIVE PINION



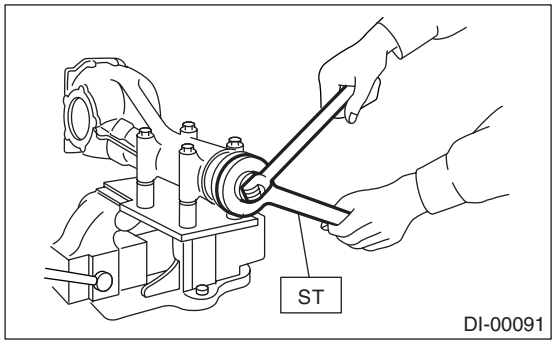
8) Press-fit the companion flange with ST1, ST2 and ST3.

NOTE:
Be careful not to damage the bearing.
ST1 899874100 INSTALLER
ST2 399780104 WEIGHT
ST3 498937110 HOLDER DRIVE PINION



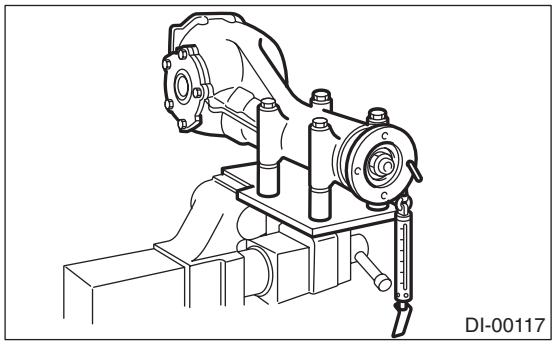
9) Install the self-locking nut. Then tighten it with the ST.
ST 18633AA000 WRENCH COMPL

Tightening torque:
181 N·m (18.5 kgf-m, 134 ft-lb)



10) Rotate the drive pinion shaft more than ten times to accustom each taper roller bearing, and then measure the preload.

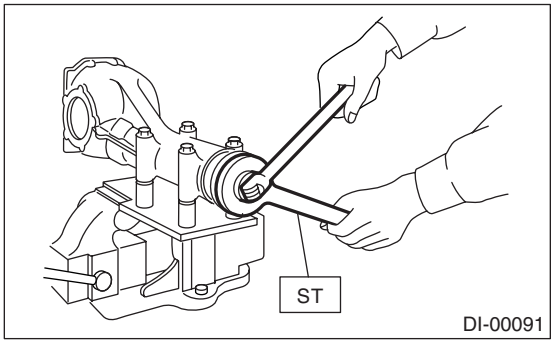
Bearing preload:
24.1 — 38.6 N (2.5 — 3.9 kgf, 5.4 — 8.7 lb)



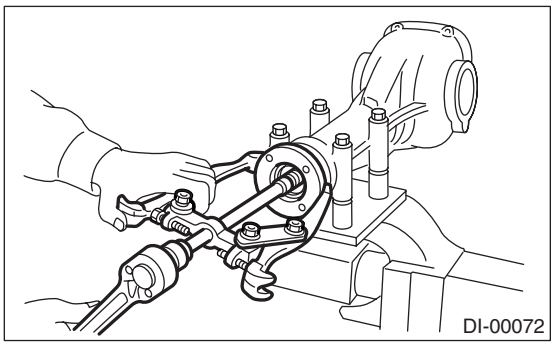
11) If bearing preload is out of specification, adjust to specification by selecting preload adjusting washer and spacer from the following table.

	Part No.	Thickness mm (in)
Preload adjusting washer	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)
	383805200	2.39 (0.0941)
	383815200	2.37 (0.0933)
	383825200	2.35 (0.0925)
	383835200	2.33 (0.0917)
	383845200	2.31 (0.0909)
	Part No.	Length mm (in)
Preload adjusting spacer	31454AA130	52.2 (2.055)
	31454AA140	52.4 (2.063)
	31454AA150	52.6 (2.071)
	31454AA160	52.8 (2.079)
	31454AA170	53.0 (2.087)
	31454AA180	53.2 (2.094)

12) Hold the companion flange with ST and remove the self-lock nut.
ST 18633AA000 WRENCH COMPL



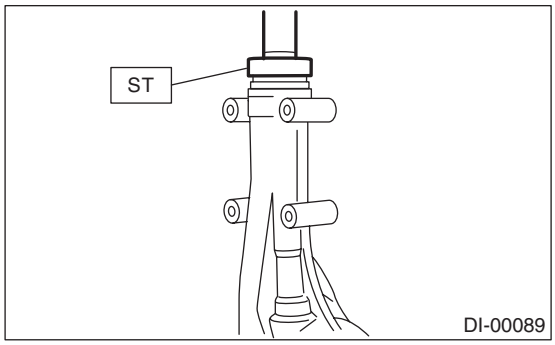
13) Extract the companion flange with a puller.



14) Fit a new oil seal with ST.

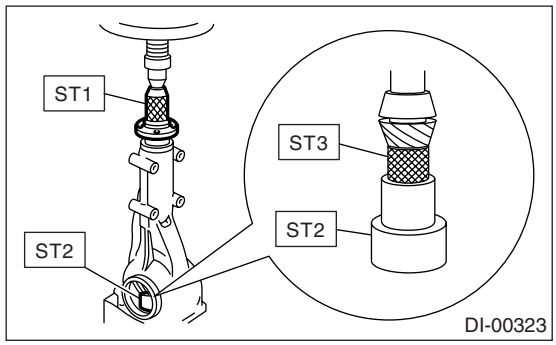
NOTE:
• Press-fit until the end of oil seal is 1 mm (0.04 in) inward from end of carrier.
• Apply grease between the oil seal lips.

ST 498447120 INSTALLER

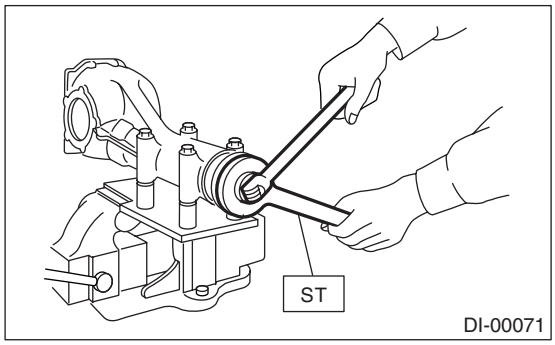


15) Press-fit the companion flange with ST1, ST2 and ST3.
ST1 899874100 INSTALLER
ST2 399780104 WEIGHT
ST3 498937110 HOLDER DRIVE PINION

NOTE:
Be careful not to damage the bearing.



16) Install the self-lock nut. Then tighten it with the ST.
ST 18633AA000 WRENCH COMPL



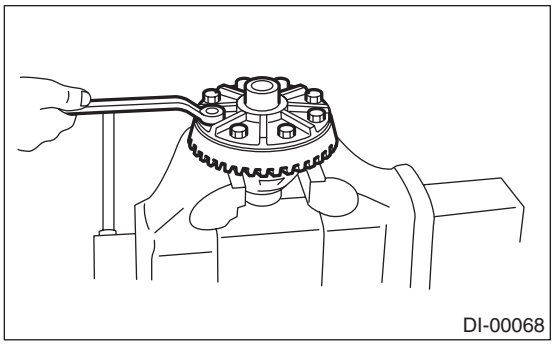
17) Install the crown gear on differential case.

NOTE:
Before installing the bolts, apply Lock Tite to bolt threads.

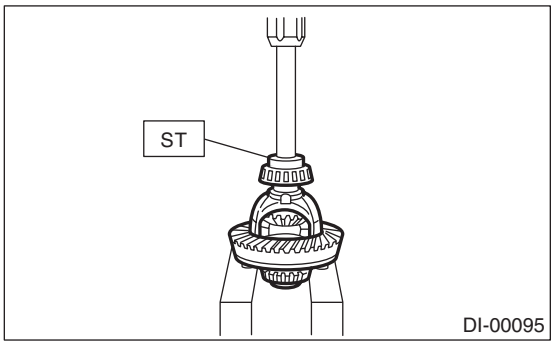
Lock Tite:
THREE BOND 1324 (Part No. 004403042) or equivalent

NOTE:
Tighten diagonally while tapping the bolt heads.

Tightening torque:
105 N·m (10.7 kgf-m, 77.4 ft-lb)

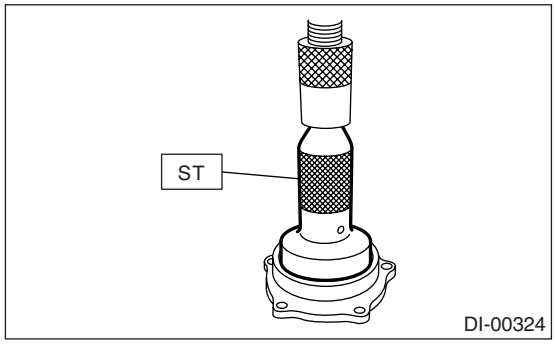

DI-00068

18) Press-fit the side bearing onto differential case with ST.
ST 398487700 DRIFT



DI-00095

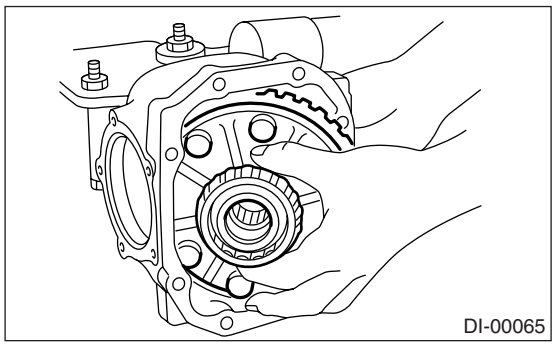
19) Assembling side retainer.
(1) Press-fit the side bearing outer race with press and ST.
ST 398417700 DRIFT



DI-00324

(2) Install the oil seal. <Ref. to DI-48, REPLACEMENT, Rear Differential Side Oil Seal.>
20) Adjusting side bearing retainer shims
(1) The driven gear backlash and side bearing preload can be determined by the side bearing retainer shim thickness.

(2) Install the differential case assembly into differential carrier in the reverse order of disassembly.


DI-00065

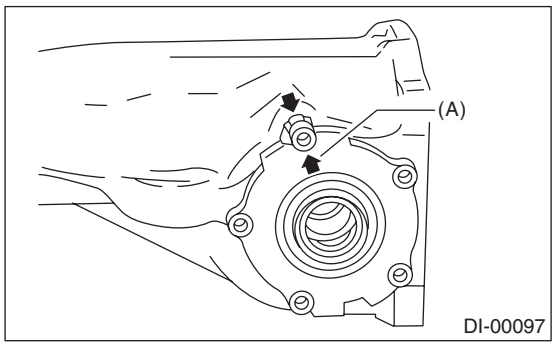
(3) Install the side retainer shims to the right and left retainers from which they were removed.

NOTE:
Replace the broken or corroded side retainer shim with a new one of same thickness.

Side bearing retainer shim	
Part No.	Thickness mm (in)
383475201	0.20 (0.0079)
383475202	0.25 (0.0098)
383475203	0.30 (0.0118)
383475204	0.40 (0.0157)
383475205	0.50 (0.0197)

(4) Align the arrow mark on differential carrier with the mark on side retainer during installation.

NOTE:
Be careful that side bearing outer race is not damaged by bearing roller.

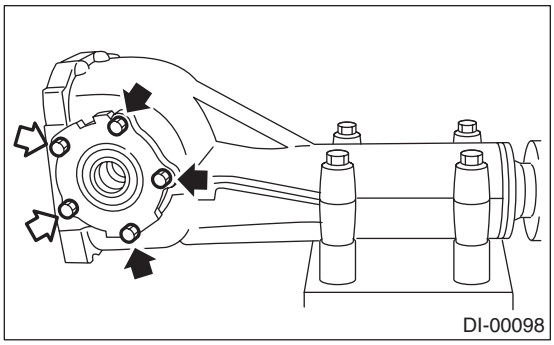


DI-00097

(A) Arrow mark

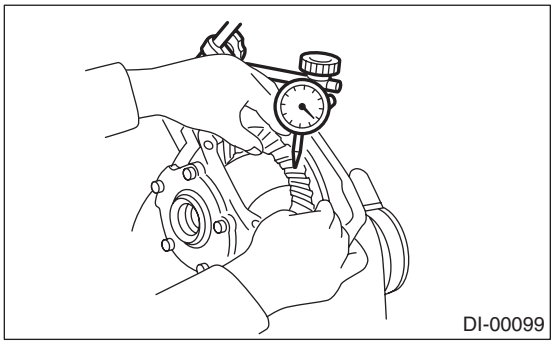
(5) Tighten the side bearing retainer bolts.

Tightening torque:
10.3 N·m (1.05 kgf-m, 7.6 ft-lb)



(6) Measure the crown gear-to-drive pinion backlash. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of crown gear, and move the crown gear while holding drive pinion still. Read the value indicated on dial gauge.

Backlash:
0.10 — 0.20 mm (0.0039 — 0.0079 in)

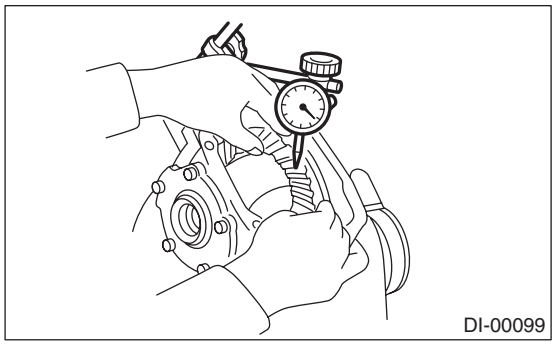


(7) At the same time, measure the total preload of drive pinion. Compared with the resistance when differential case is not installed, if the total preload is not within the specified range, readjust side bearing retainer shims, increasing/reducing by an even amount at a time.

Total preload:
26.95 — 53.90 N (2.75 — 5.50 kgf, 6.1 — 12.1 lb)

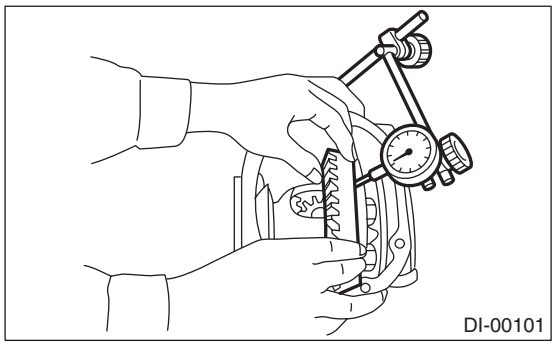
21) Re-check the crown gear-to-pinion backlash.

Backlash:
0.10 — 0.20 mm (0.0039 — 0.0079 in)



22) Check the crown gear runout on its back surface, and make sure that pinion and crown gear rotate smoothly.

Limit of runout:
Less than 0.05 mm (0.0020 in)



23) Checking and adjusting tooth contact of crown gear

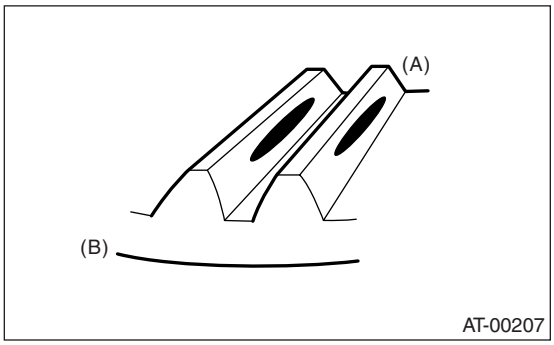
(1) Apply an even coat of red lead on both sides of three or four teeth on the crown gear. Check the contact pattern after rotating the crown gear several revolutions back and forth until a definite contact pattern appears on the crown gear.

(2) When the contact pattern is incorrect, readjust according to the instructions given in “TOOTH CONTACT PATTERN”.

NOTE:
Be sure to wipe off red lead completely after adjustment is completed.

- Correct tooth contact

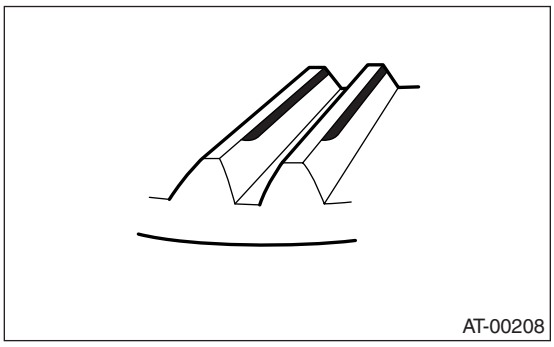
Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. (When loaded, contact pattern moves toward heel)



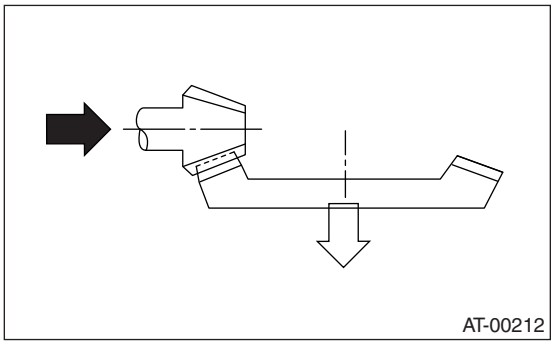
(A) Toe side
(B) Heel side

- Face contact

Checking item: Backlash is too large.
Contact pattern

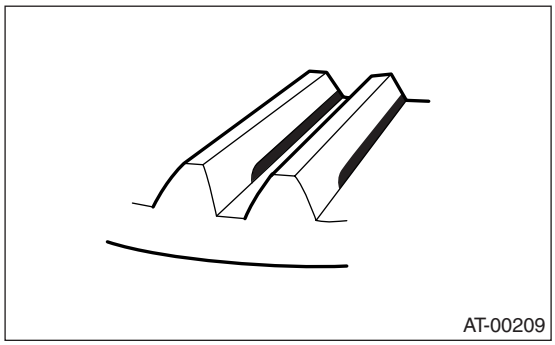


Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.

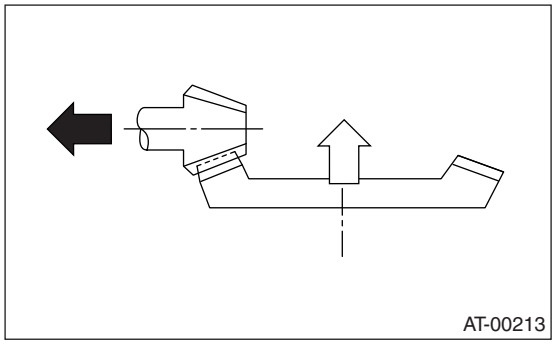


- Flank contact

Checking item: Backlash is too small.
Contact pattern

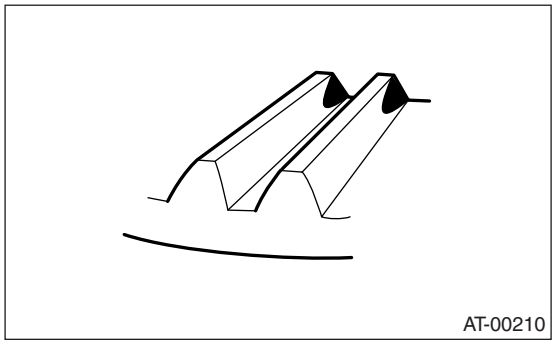


Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.

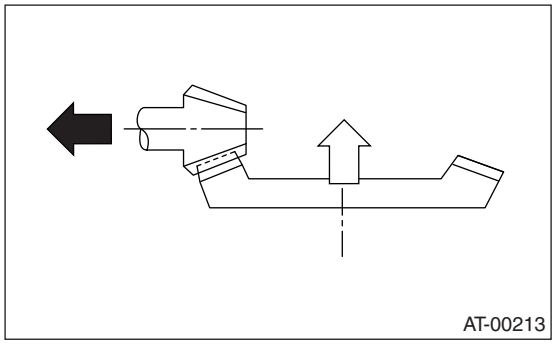


- Toe contact (Inside end contact)

Checking item: Contact area is small.
Contact pattern



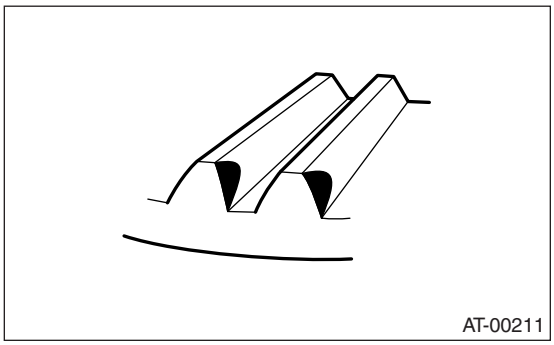
Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear.



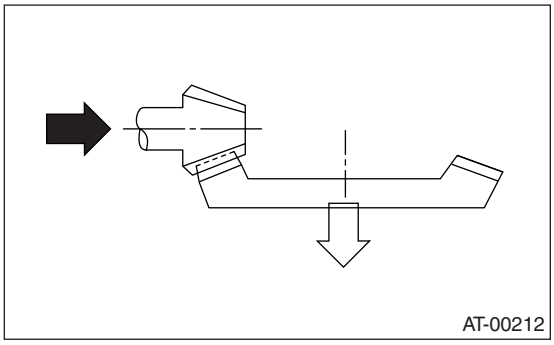
• Heel contact (Outside end contact)

Checking item: Contact area is small.

Contact pattern



Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to crown gear.

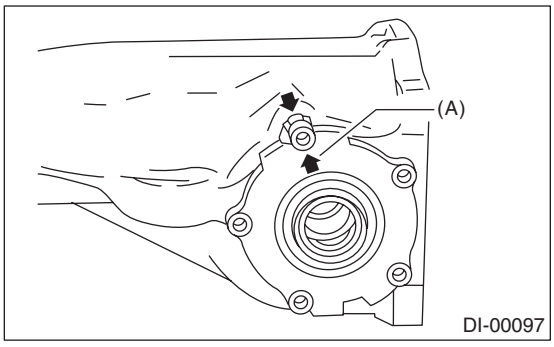


24) If proper tooth contact is not obtained, once again adjust the drive pinion height by changing RH and LH side bearing retainer shims and the hypoid gear backlash.

25) Remove the side bearing retainers on right and left side.

26) Install new O-rings to side bearing retainers on right and left side.

27) Align the arrow mark on differential carrier with the mark on side retainer during installation.



(A) Arrow mark

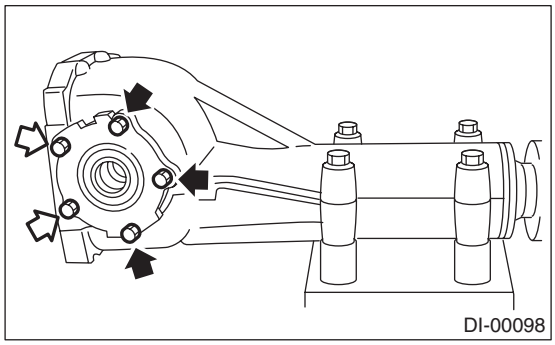
28) Tighten the side bearing retainer bolts.

Lock Tite:

THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:

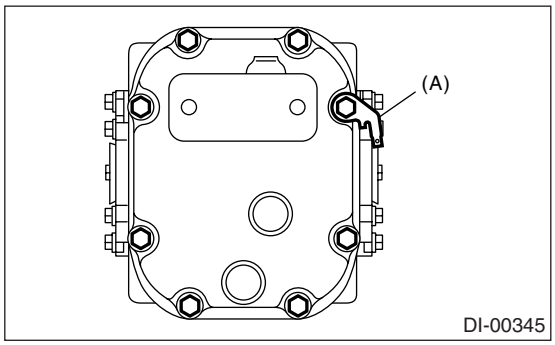
10.3 N·m (1.05 kgf-m, 7.6 ft-lb)



29) Install the new gasket, rear cover and stay ground and tighten the bolts to specified torque.

Tightening torque:

44 N·m (4.5 kgf-m, 32.5 ft-lb)



(A) Stay ground

30) Install the breather cap.

31) Install the drain plug and rear differential oil temperature switch or oil temperature sensor.

Tightening torque:

49 N·m (5.0 kgf-m, 36.2 ft-lb)

E: INSPECTION

Wash all the disassembled parts clean, and examine them for wear, damage, or other defects. Repair or replace defective parts as necessary.

1) Crown gear and drive pinion

• If abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact at assembly. Replace the gear if excessively worn or incapable of adjustment.

• If crack, score, or seizure is evident, replace as a set. Slight damage of tooth can be corrected by oil stone or the like.

2) Side gear and pinion mate gear

• Replace if crack, score, or other defects are evident on tooth surface.

• Replace if thrust washer contacting surface is worn or seized. Slight damage of the surface can be corrected by oil stone or the like.

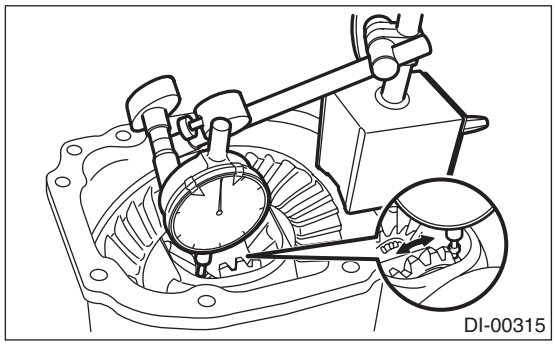
3) Bearing
Replace if seizure, peeling, wear, rust, dragging during rotation, abnormal noise or other defect is evident.
4) Thrust washers of side gear and pinion mate gear
Replace if seizure, flaw, abnormal wear or other defect is evident.
5) Oil seal
Replace if deformed or damaged, and at every disassembling.
6) Differential carrier
Replace if the bearing bores are worn or damaged.
7) Differential case
Replace if its sliding surfaces are worn or cracked.
8) Companion flange
Replace if the oil seal lip contacting surfaces have flaws.
9) Rear differential oil temperature switch
If the results of the following inspections are not satisfactory, replace rear differential temperature switch.
(1) At room temperature, check for continuity between the sensor terminal and body.
(2) Soak the sensor in oil, then raise the oil temperature. Check that the continuity is cut off when the oil temperature is between 144°C (291°F) and 156°C (313°F). Then, check that the continuity resumes by the time the oil temperature drops to 135°C (275°F).

1. SIDE GEAR BACKLASH

Using a dial gauge, check the backlash of the side gear.

Side gear backlash:
0.1 — 0.2 mm (0.004 — 0.008 in)

If the side gear backlash is not within the specification, adjust clearance as specified by selecting the side gear thrust washer.

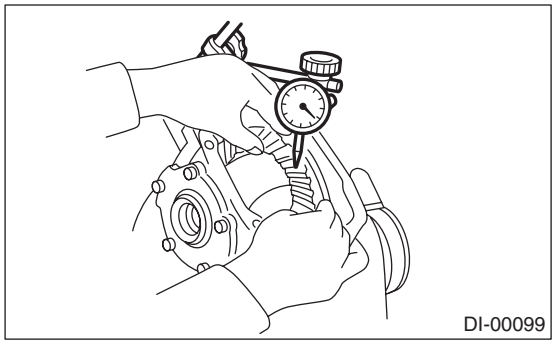

DI-00315

2. CROWN GEAR BACKLASH

Using a dial gauge, check the backlash of the crown gear.

Crown gear backlash:
0.1 — 0.2 mm (0.004 — 0.008 in)

If the crown gear backlash is not within the specification, adjust the side bearing preload or repair if necessary.

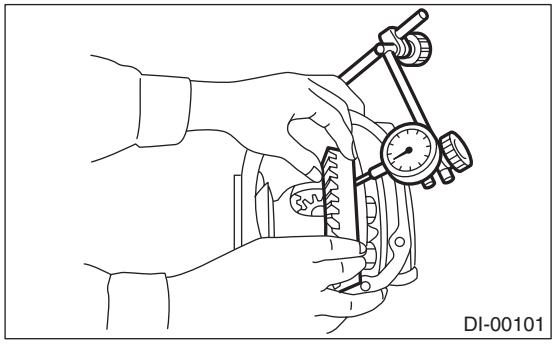

DI-00099

3. CROWN GEAR RUNOUT

Using a dial gauge, check the crown gear runout.

Crown gear runout:
Less than 0.05 mm (0.0020 in)

If the crown gear runout exceeds 0.05 mm (0.0020 in), replace the crown gear.


DI-00101

4. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

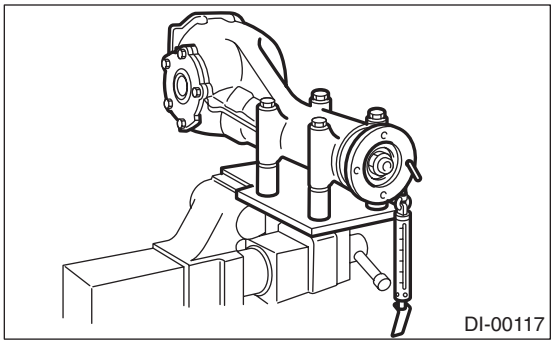
Inspect the tooth contact between crown gear and driven pinion. <Ref. to DI-28, ASSEMBLY, Rear Differential.>

5. TOTAL PRELOAD

Using a gauge, check the turning resistance increase.

Total preload:
Except for STi model:
20.7 — 54.4 N (2.1 — 5.5 kgf, 4.7 — 12.2 lb)
STi model:
26.95 — 53.90 N (2.75 — 5.50 kgf, 6.1 — 12.1 lb)

If the total preload is not within the specification, adjust the side bearing retainer shims.



F: ADJUSTMENT

1. SIDE GEAR BACKLASH

Adjust the side gear backlash. <Ref. to DI-28, ASSEMBLY, Rear Differential.>

2. CROWN GEAR BACKLASH

Adjust the crown gear backlash. <Ref. to DI-28, ASSEMBLY, Rear Differential.>

3. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

Adjust the tooth contact between crown gear and drive pinion gear. <Ref. to DI-28, ASSEMBLY, Rear Differential.>

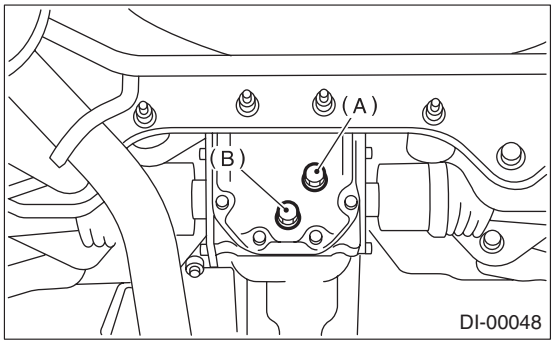
4. TOTAL PRELOAD

Adjust the side bearing shim. <Ref. to DI-28, ASSEMBLY, Rear Differential.>

5. Rear Differential Front Oil Seal

A: REPLACEMENT

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Move the select lever or gear shift lever to “N”.
4) Release the parking brake.
5) Remove the oil drain plug, and drain the gear oil.



(A) Filler plug
(B) Drain plug

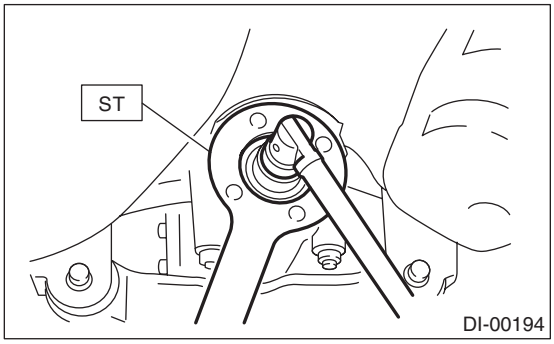
6) Install the oil drain plug.

NOTE:
Apply liquid gasket to the drain plug.

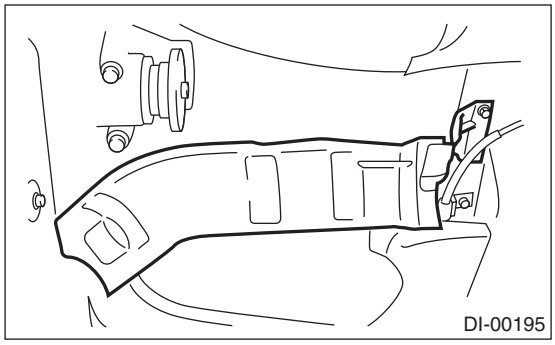
Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent.

Tightening torque:
49 N·m (5.0 kgf-m, 36.2 ft-lb)

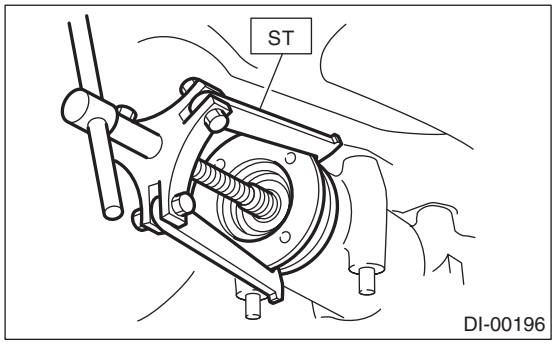
7) Jack-up the vehicle and support with sturdy racks.
8) Remove the rear exhaust pipe and muffler.
9) Remove the propeller shaft from body. <Ref. to DS-14, REMOVAL, Propeller Shaft.>
10) Remove the self-locking nut while holding the companion flange with ST.
Except STi model
ST 498427200 FLANGE WRENCH
STi model
ST 18633AA000 WRENCH COMPL



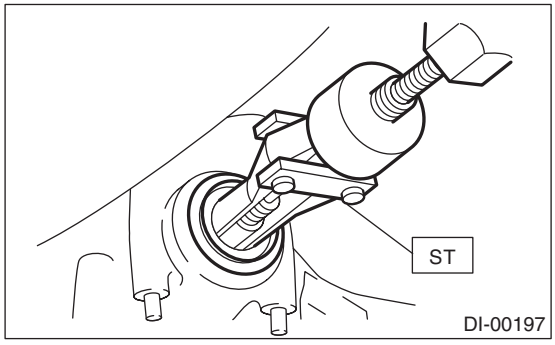
11) Remove the tank cover.



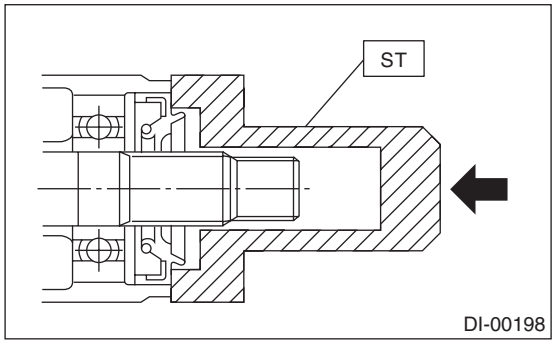
12) Extract the companion flange using ST.
ST 399703600 PULLER ASSY



13) Remove the oil seal using ST.
ST 398527700 PULLER ASSY



14) Fit a new oil seal using ST.
ST 498447120 INSTALLER



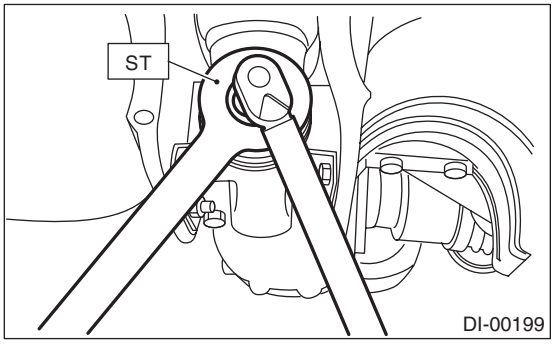
15) Install the companion flange.

NOTE:
Use a plastic hammer to install the companion flange.

16) Tighten the self-locking nut within the specified torque range so that the preload of companion flange becomes the same as that before replacing oil seal.
Except STi model
ST 498427200 FLANGE WRENCH
STi model
ST 18633AA000 WRENCH COMPL

NOTE:
Use a new self-locking nut.

Tightening torque:
181 N·m (18.5 kgf-m, 134 ft-lb)



17) Hereafter, reassemble in the reverse order of disassembly.
18) Fill the differential carrier with gear oil to the bottom of filler plug hole after installing. <Ref. to DI-18, Differential Gear Oil.>

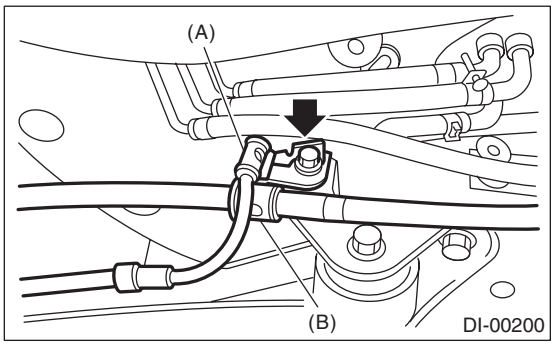
6. Rear Differential Side Oil Seal

A: INSPECTION

Make sure that there is no oil leakage from side oil seal.
If there is any oil leakage, replace the oil seal.

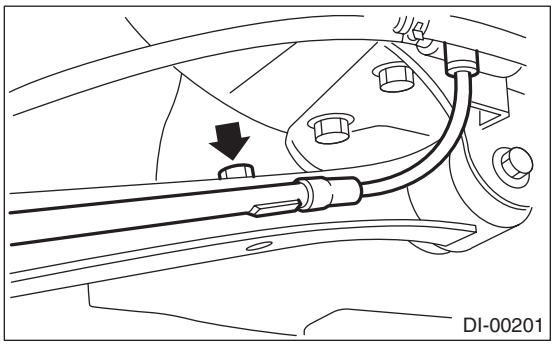
B: REPLACEMENT

1) Disconnect the ground cable from battery.
2) Move the select lever or gear shift lever to “N”.
3) Release the parking brake.
4) Loosen both wheel nuts.
5) Jack-up the vehicle and support it with rigid racks.
6) Remove the wheels.
7) Remove the rear exhaust pipe and muffler.
SOHC model
<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, REMOVAL, Muffler.>
DOHC Turbo model
<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
8) Remove the DOJ of rear drive shaft from rear differential.
(1) Remove the ABS wheel speed sensor cable clamp and parking brake cable clamp from bracket.

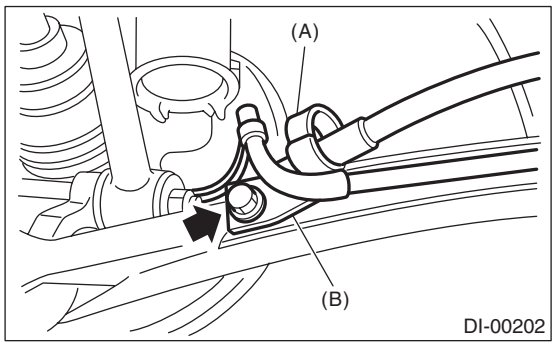


(A) ABS wheel speed sensor cable clamp
(B) Parking brake cable clamp

(2) Remove the ABS wheel speed sensor cable clamp from trailing link.

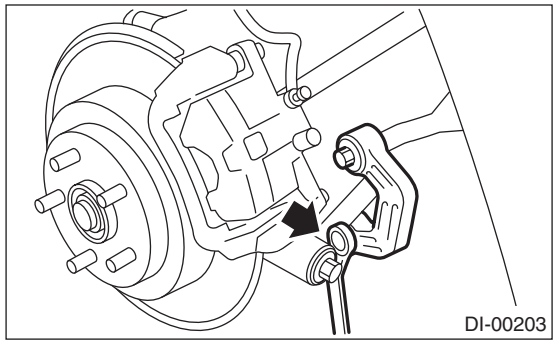


(3) Remove the ABS wheel speed sensor cable clamp and parking brake cable guide from trailing link.

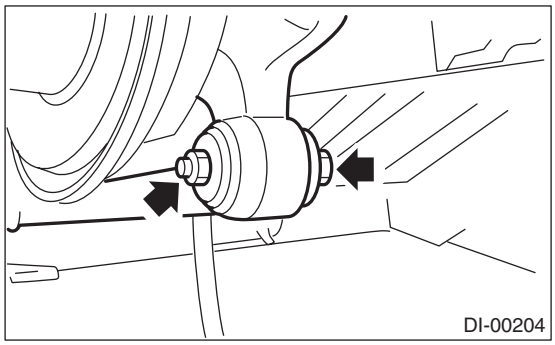


(A) Parking brake cable guide
(B) ABS wheel speed sensor cable clamp

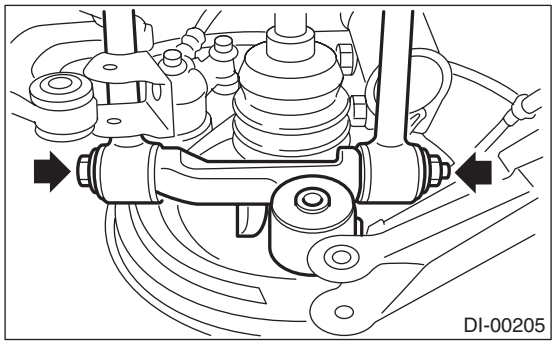
(4) Remove the rear stabilizer link.



(5) Remove the bolts which secure trailing link to housing.



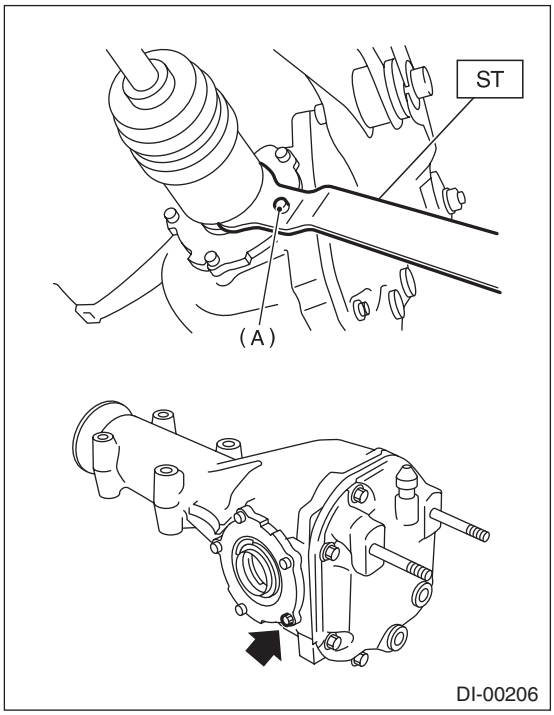
(6) Remove the bolts which secure the front and rear lateral link to rear housing.



(7) Remove the DOJ from the rear differential by using ST.

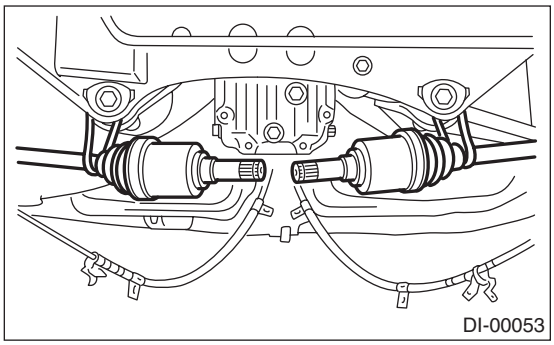
NOTE:
When removing the DOJ from rear differential, fit ST to the bolts as shown in the figure so as not to damage the side bearing retainer.

ST 208099PA100 DRIVE SHAFT REMOVER



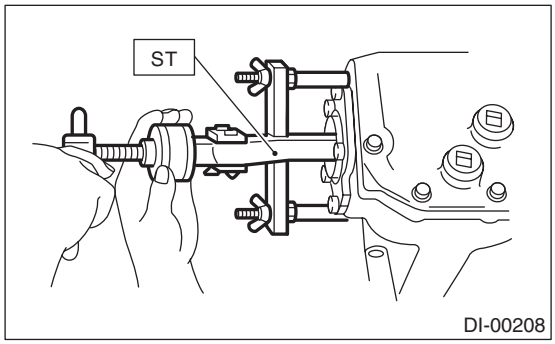
(A) Bolt

9) Suspend the rear drive shaft to the rear cross-member using wire.



10) Remove the oil seal using ST.

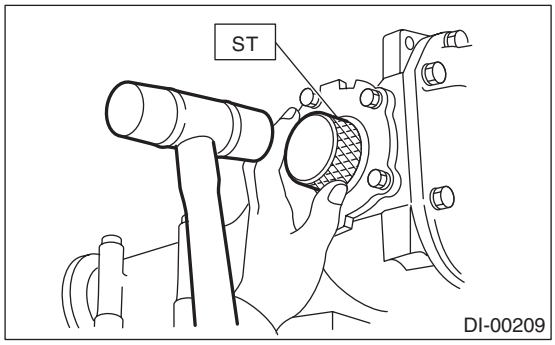
ST 398527700 PULLER ASSY



11) Drive in a new side oil seal using ST.

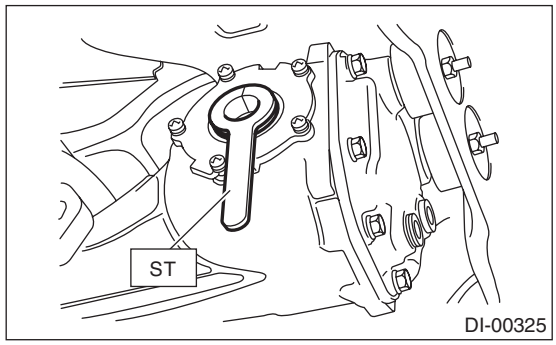
NOTE:
Apply chassis grease between the oil seal lips.

ST 398437700 DRIFT



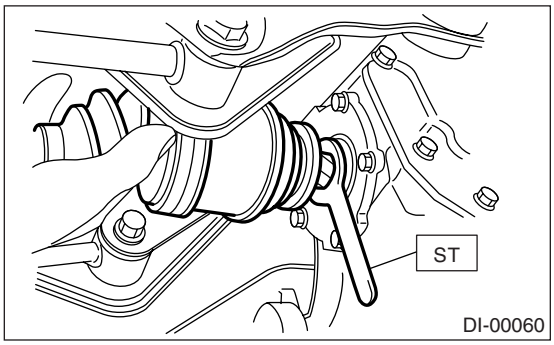
12) Insert the DOJ into rear differential.
(1) Install the ST to rear differential.

ST 28099PA090 SIDE OIL SEAL PROTECTOR



(2) Install the spline shaft until the spline portion is inside the side oil seal using ST.

ST 28099PA090 SIDE OIL SEAL PROTECTOR



(3) Remove the ST.

ST 28099PA090 SIDE OIL SEAL PROTECTOR

13) Hereafter, reassemble in the reverse order of disassembly.

7. Rear Differential Member

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Move the selector lever or gear shift lever to “N”.
4) Release the parking brake.
5) Loosen the wheel nuts.
6) Jack-up the vehicle and support it with study racks.
7) Remove the wheels.
8) Remove the rear exhaust pipe and muffler.
SOHC model
<Ref. to EX(H4SO)-8, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4SO)-9, REMOVAL, Muffler.>
DOHC Turbo model
<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
9) Remove the rear differential front member.

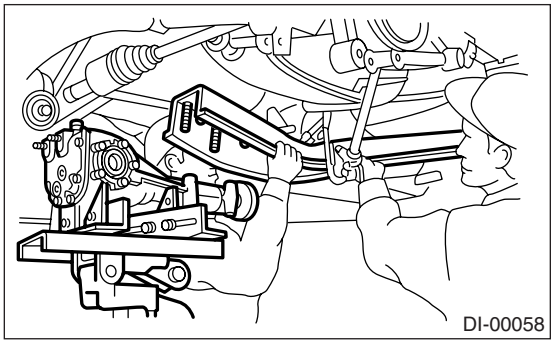
NOTE:
When removing the rear differential front member, work the removal procedure as rear differential.
<Ref. to DI-21, REMOVAL, Rear Differential.>

10) Remove the differential rear member.

B: INSTALLATION

1) Position the front member on body by passing it under the parking brake cable and securing to rear differential.

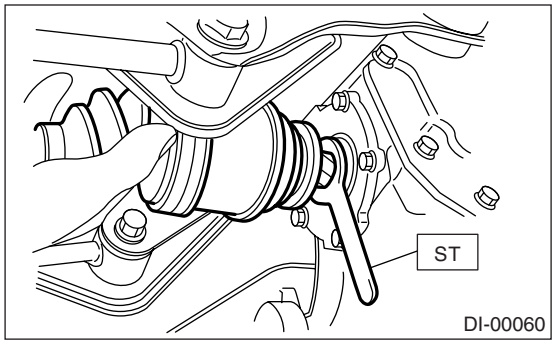
NOTE:
When installing the rear differential front member, do not confuse the installation sequence of the stopper.


DI-00058

2) Insert the DOJ of rear drive shaft into rear differential. <Ref. to DI-48, REPLACEMENT, Rear Differential Side Oil Seal.>

NOTE:
Before inserting, replace the differential side oil seal with a new one.

ST 28099PA090 SIDE OIL SEAL PROTEXTOR



DI-00060

3) Hereafter, install in the reverse order of removal.

C: INSPECTION

1) Check the rear differential member for damage, bend, or corrosion.
If damage, bend, or corrosion is excessive, replace the rear differential member.
2) Check the bushings of rear differential member for cracking, hardening, or damage.
If cracking, hardening, or damage is excessive, replace the rear differential member.

8. General Diagnostic Table

A: INSPECTION

Symptom or trouble	Possible cause	Remedy
1. Oil leakage	(1) Worn, scratched, or incorrectly seated front or side oil seal. Scored, battered, or excessively worn sliding surface of companion flange.	Repair or replace.
	(2) Clogged or damaged air breather.	Clean, repair or replace.
	(3) Loose bolts on differential spindle or side retainer, or incorrectly fitted O-ring.	Tighten the bolts to specified torque. Replace the O-ring.
	(4) Loose rear cover attaching bolts or damaged gasket.	Tighten the bolts to specified torque. Replace the gasket and apply liquid packing.
	(5) Loose oil filler or drain plug.	Retighten and apply liquid packing.
	(6) Wear, damage or incorrectly fitting for spindle, side retainer and oil seal.	Repair or replace.
2. Seizure NOTE: Seized or damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	(1) Insufficient backlash for hypoid gear.	Readjust or replace.
	(2) Excessive preload for side, rear, or front bearing.	Readjust or replace.
	(3) Insufficient or improper oil used.	Replace the seized part and fill with specified oil to specified level.
3. Damage NOTE: Damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	(1) Improper backlash for hypoid gear.	Replace.
	(2) Insufficient or excessive preload for side, rear, or front bearing.	Readjust or replace.
	(3) Excessive backlash for differential gear.	Replace the gear or thrust washer.
	(4) Loose bolts and nuts such as crown gear bolt.	Retighten.
	(5) Damage due to overloading.	Replace.
4. Noises when starting or shifting gears NOTE: Noises may be caused by differential assembly, universal joint, wheel bearing, etc. Find out what is actually making noise before disassembly.	(1) Excessive backlash for hypoid gear.	Readjust.
	(2) Excessive backlash for differential gear.	Replace the gear or thrust washer.
	(3) Insufficient preload for front or rear bearing.	Readjust.
	(4) Loose drive pinion nut.	Tighten to specified torque.
	(5) Loose bolts and nuts such as side bearing retainer attaching bolt.	Tighten to specified torque.
5. Noises when cornering	(1) Damaged differential gear.	Replace.
	(2) Excessive wear or damage of thrust washer.	Replace.
	(3) Broken pinion mate shaft.	Replace.
	(4) Seized or damaged side bearing.	Replace.

Symptom or trouble	Possible cause	Remedy
6. Gear noises NOTE: Since noises from engine, muffler, transmission, propeller shaft, wheel bearings, tires, and body are sometimes mistaken for noises from differential assembly, be careful in checking them. Inspection methods to locate noises include coasting, accelerating, cruising, and jacking-up all four wheels. Perform these inspections according to condition of trouble. When listening to noises, shift gears into four wheel drive and fourth speed position, trying to pick up only differential noise.	(1) Improper tooth contact of hypoid gear.	Readjust or replace the hypoid gear set.
	(2) Improper backlash for hypoid gear.	Readjust.
	(3) Scored or chipped teeth of hypoid gear.	Replace the hypoid gear set.
	(4) Seized hypoid gear.	Replace the hypoid gear set.
	(5) Improper preload for front or rear bearings.	Readjust.
	(6) Seized, scored, or chipped front or rear bearing.	Replace.
	(7) Seized, scored, or chipped side bearing.	Replace.
	(8) Vibrating differential carrier.	Replace.

TRANSFER CASE

TC

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3. Transfer Clutch and Extension (4AT) 4
4. Oil Seal 5
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6. Transfer Driven Gear (MT) 7
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13. Transfer Duty Solenoid and Valve Body 14

1. General Description

A: NOTE

For general description, refer to “4AT”, “5MT” or “6MT” section.
4AT model: <Ref. to 4AT-2, General Description.>
5MT model: <Ref. to 5MT-2, General Description.>
6MT model: <Ref. to 6MT-2, General Description.>

2. Transfer Case and Extension (MT)

A: NOTE

For removal, installation and inspection work, refer to “5MT” or “6MT” section.
5MT model:
<Ref. to 5MT-40, Transfer Case and Extension Case Assembly.>
6MT model:
<Ref. to 6MT-47, Extension Case.>

3. Transfer Clutch and Extension (4AT)

A: NOTE

For removal, installation and inspection work, refer to “4AT” section. <Ref. to 4AT-79, Transfer Clutch.>, <Ref. to 4AT-75, Extension Case.>

4. Oil Seal

A: NOTE

For removal, installation and inspection work, refer to “4AT”, “5MT” or “6MT” section.
4AT model:
<Ref. to 4AT-45, Extension Case Oil Seal.>
5MT model:
<Ref. to 5MT-35, Oil Seal.>
6MT model:
<Ref. to 6MT-31, Oil Seal.>

5. Transfer Drive Gear (MT)

A: NOTE

For removal, installation and inspection work, refer to “5MT” or “6MT” section.
5MT model:
<Ref. to 5MT-44, Transfer Drive Gear.>
6MT model:
<Ref. to 6MT-56, Transfer Drive Gear.>

6. Transfer Driven Gear (MT)

A: NOTE

For removal, installation and inspection work, refer to “5MT” or “6MT” section.
5MT model:
<Ref. to 5MT-46, Transfer Driven Gear.>
6MT model:
<Ref. to 6MT-58, Transfer Driven Gear.>

7. Reduction Drive Gear (4AT without VTD)

A: NOTE

For removal, installation and inspection work, refer to “4AT” section. <Ref. to 4AT-89, Reduction Drive Gear.>

8. Reduction Drive Gear (4AT with VTD)

A: NOTE

For removal, installation and inspection work, refer to “4AT” section. <Ref. to 4AT-89, Reduction Drive Gear.>

9. Reduction Driven Gear (4AT without VTD)

A: NOTE

For removal, installation and inspection work, refer to “4AT” section. <Ref. to 4AT-87, Reduction Driven Gear.>

10. Reduction Driven Gear (4AT with VTD)

A: NOTE

For removal, installation and inspection work, refer to “4AT” section. <Ref. to 4AT-87, Reduction Driven Gear.>

11.Center Differential

A: NOTE

For removal, installation and inspection work, refer to “4AT”, “5MT” or “6MT” section.
4AT model:
<Ref. to 4AT-91, Center Differential Carrier.>
5MT model:
<Ref. to 5MT-48, Center Differential.>
6MT model:
<Ref. to 6MT-60, Center Differential.>

12. Transfer Clutch Pressure Test

A: NOTE

For inspection work, refer to “4AT” section. <Ref. to 4AT-36, Transfer Clutch Pressure Test.>

13. Transfer Duty Solenoid and Valve Body

A: NOTE

For removal, installation and inspection work, refer to “4AT” section. <Ref. to 4AT-61, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>

DRIVE SHAFT SYSTEM

DS

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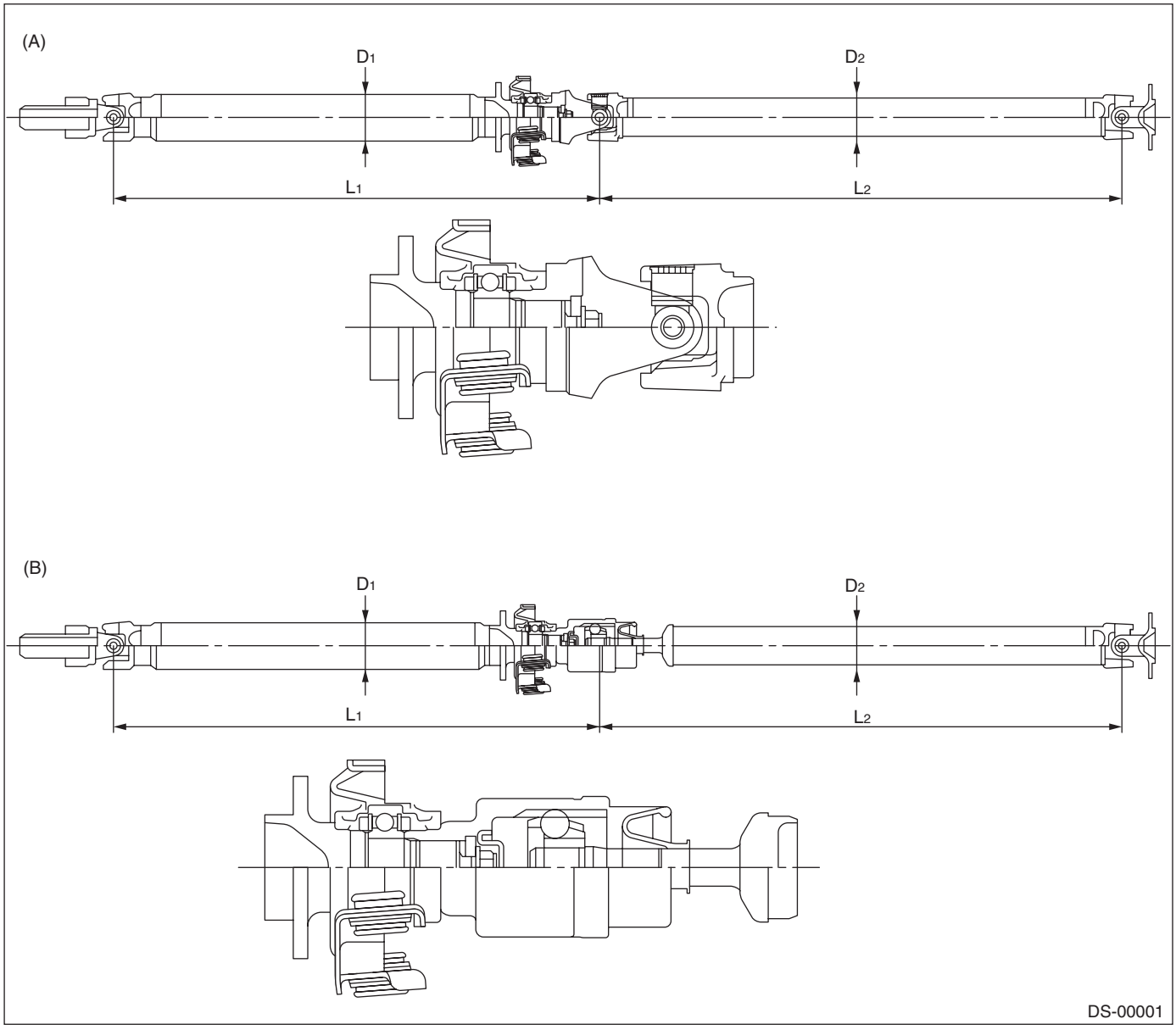
4.	Rear Axle	22
5.	Front Drive Shaft	27
6.	Rear Drive Shaft	32
7.	General Diagnostic Table	38

1. General Description

A: SPECIFICATIONS

1. PROPELLER SHAFT

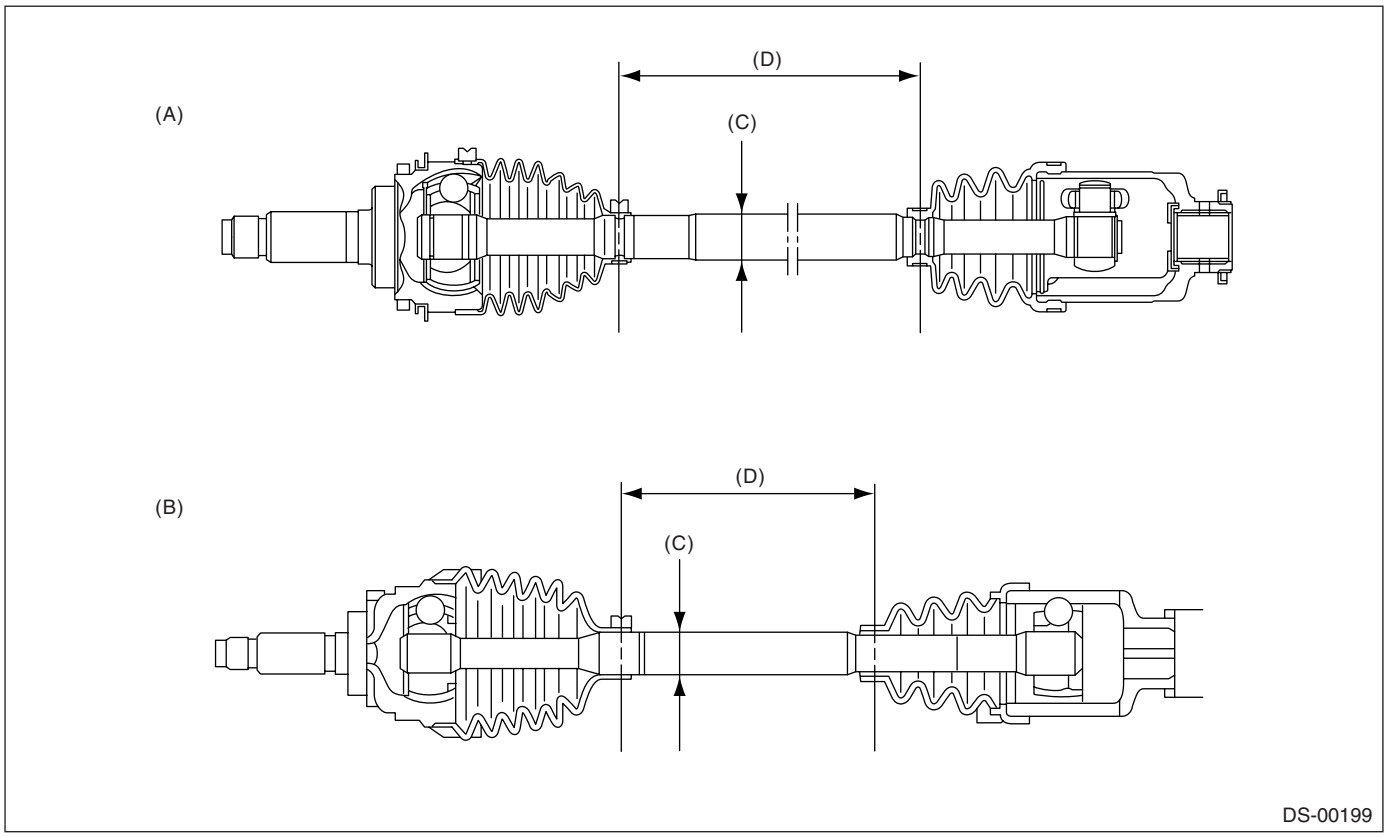
Model		Non-turbo	Turbo (except STi)	STi
Propeller shaft type		UJ	DOJ	UJ
Front propeller shaft Joint-to-joint length: L_1 mm (in)	AT	584 (22.99)	579 (22.79)	—
	MT	643 (25.32)	638 (25.12)	574 (22.60)
Rear propeller shaft Joint-to-joint length: L_2 mm (in)		708 (27.87)	713 (28.07)	706 (27.80)
Outer diameter of tube: mm (in)	D_1	63.5 (2.500)		70 (2.756)
	D_2	57.0 (2.244)		



(A) UJ type (B) DOJ type

2. FRONT DRIVE SHAFT ASSEMBLY

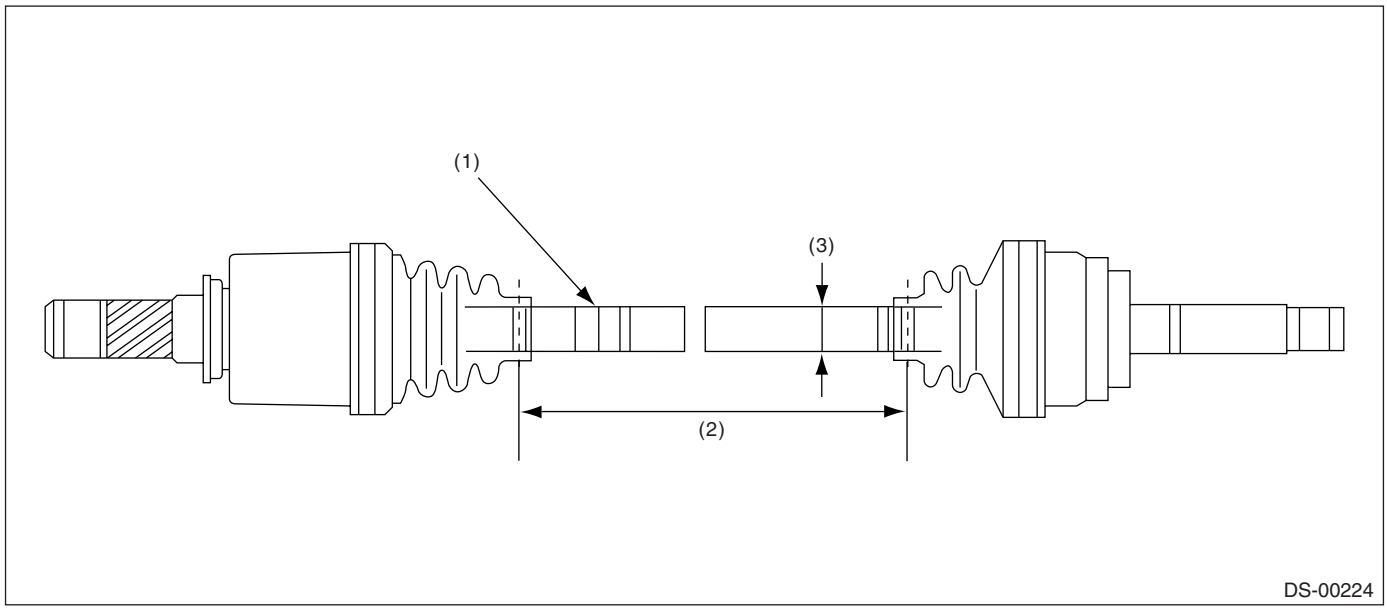
Model		Type of drive shaft	Axle diameter ϕ D (mm)	Axle length L (mm)
Sedan	Non-turbo, Turbo AT	EBJ87+SFJ82	26 (1.02)	325
	Turbo MT (except STi)	EBJ87+SFJ82	28 (1.10)	325
	Turbo MT (STi)	BJ92+DOJ87	28 (1.10)	250
Wagon	Non-turbo, Turbo AT	EBJ87+SFJ82	26 (1.02)	314
	Turbo MT	EBJ87+SFJ82	28 (1.10)	314



(A) EBJ87+SFJ82
(B) BJ92+DOJ87
(C) Axle diameter
(D) Axle length

3. REAR DRIVE SHAFT ASSEMBLY

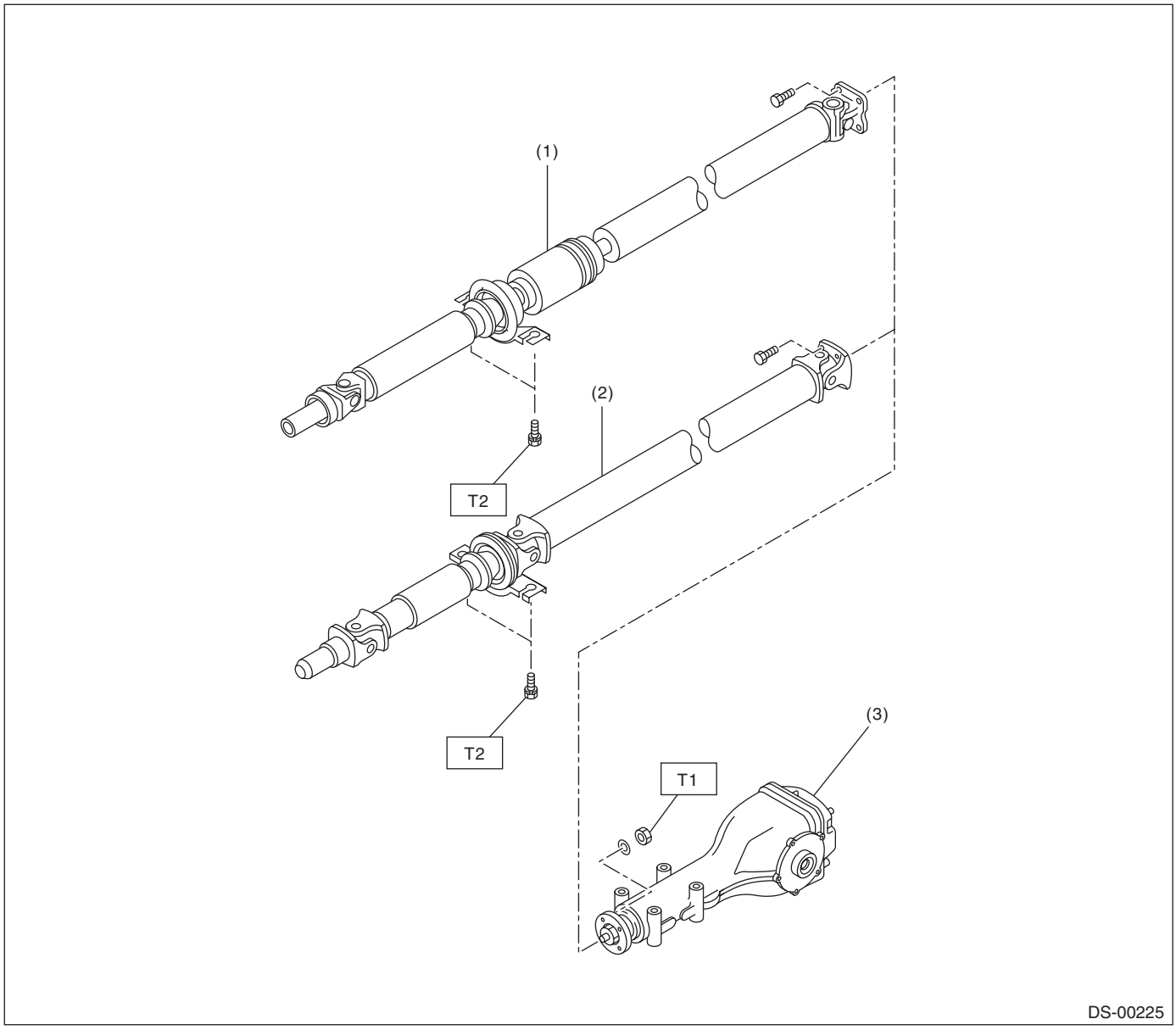
Type of drive shaft assembly	Model	No. of identification protrusion on shaft	Axle length (mm)	Axle diameter (mm)
EBJ82+DOJ82 RH	Sedan turbo	2 (Two)	363	24
EBJ82+DOJ82 LH		1 (One)	353	24
BJ79+DOJ79 RH	Sedan Non-turbo	2 (Two)	368	23
BJ79+DOJ79 LH		1 (One)	358	23
EBJ82+DOJ82 RH	Wagon turbo	2 (Two)	353	24
EBJ82+DOJ82 LH		1 (One)	343	24
BJ79+DOJ79 RH	Wagon Non-turbo	2 (Two)	358	23
BJ79+DOJ79 LH		1 (One)	348	23
BJ87+DOJ87	STi	1 (One)	295.2	25



(1) Identification protrusion (2) Axle length (3) Axle diameter

B: COMPONENT

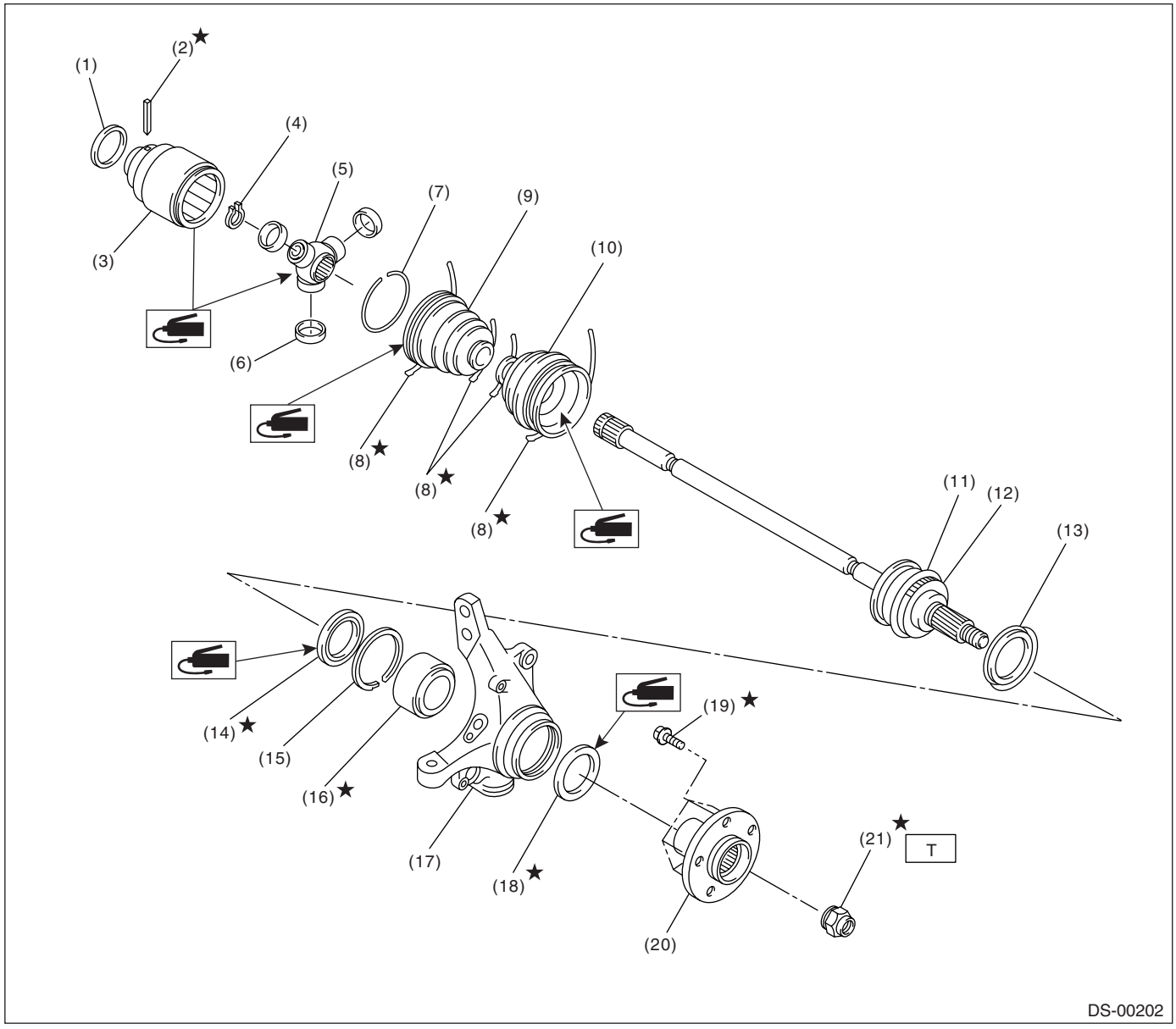
1. PROPELLER SHAFT



(1) Propeller shaft (DOJ type)
(2) Propeller shaft (UJ type)
(3) Rear differential

Tightening torque: N·m (kgf-m, ft-lb)
T1: 38 (3.9, 28.3)
T2: 52 (5.3, 38.3)

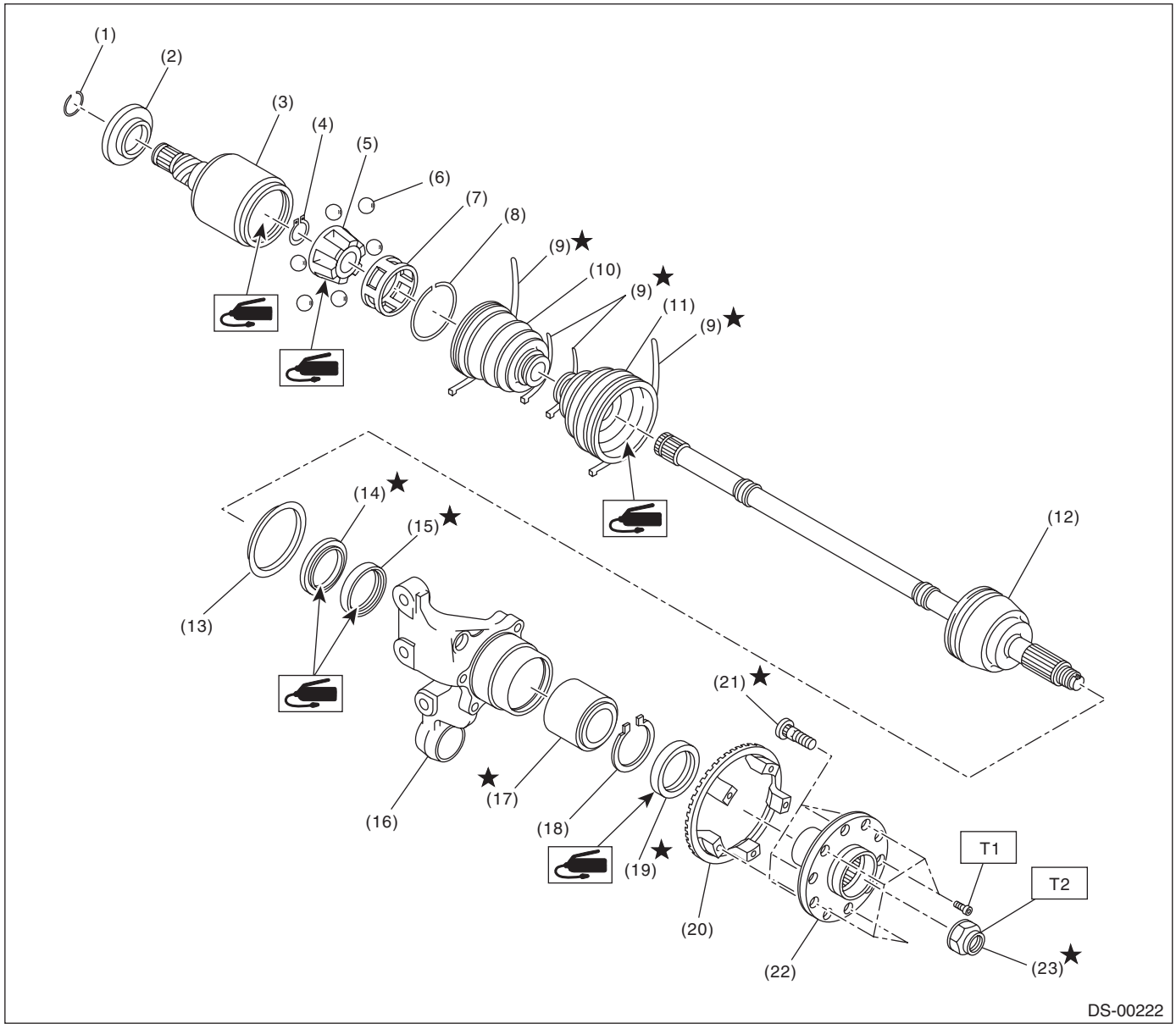
2. FRONT AXLE



(1) Baffle plate (SFJ)
(2) Spring pin
(3) Outer race (SFJ)
(4) Snap ring
(5) Trunnion
(6) Free ring
(7) Circlip
(8) Boot band
(9) Boot (SFJ)
(10) Boot (EBJ)
(11) EBJ ASSY
(12) Tone wheel
(13) Baffle plate
(14) Oil seal (IN)
(15) Snap ring
(16) Bearing
(17) Housing
(18) Oil seal (OUT)
(19) Hub bolt
(20) Hub
(21) Axle nut

Tightening torque: N·m (kgf-m, ft-lb)
T: 220 (22.4, 162)

3. REAR AXLE



(1) Circlip
(2) Baffle plate (DOJ)
(3) Outer race (DOJ)
(4) Snap ring
(5) Inner race
(6) Ball
(7) Cage
(8) Circlip
(9) Boot band
(10) Boot (DOJ)
(11) Boot
(12) Non-turbo: BJ ASSY
Turbo: EBJ ASSY
(13) Baffle plate
(14) Oil seal (IN. No. 2)
(15) Oil seal (IN.)
(16) Housing
(17) Bearing
(18) Snap ring
(19) Oil seal (OUT)
(20) Tone wheel
(21) Hub bolt
(22) Hub
(23) Axle nut

Tightening torque: N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.4)
T2: 190 (19.4, 140)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply grease onto sliding or revolution surfaces before installation.
- Before installing snap rings, apply sufficient amount of grease to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

D: PREPARATION TOOL

1. SPECIAL TOOLS

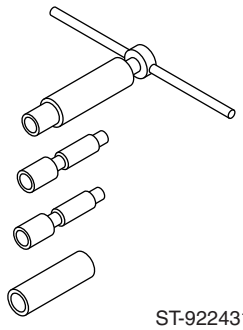
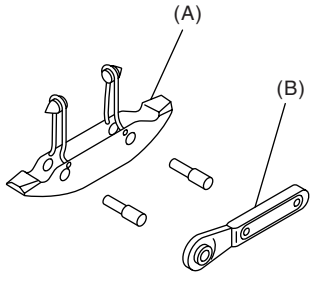
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-922431000	922431000	AXLE SHAFT INSTALLER	• Used for installing axle shaft into housing. • Used with ADAPTER (927390000).
 ST-925091000	925091000	BAND TIGHTENING TOOL	Used for tightening boot band. (A) Jig for band (B) Ratchet wrench

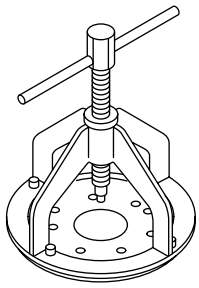
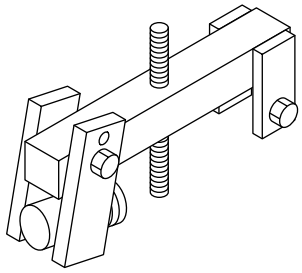
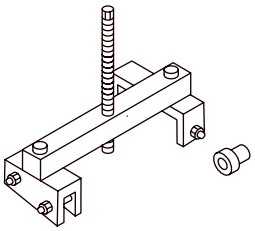
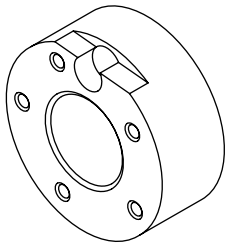
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926470000	926470000	AXLE SHAFT PULLER	Used for removing axle shaft.
 ST-927060000	927060000	HUB REMOVER	• Used for removing front hub. • Used with HUB STAND (927080000).
 ST-927420000	927420000	HUB REMOVER	• Used for removing rear hub. • Used with HUB STAND (927080000).
 ST-927080000	927080000	HUB STAND	Used for disassembling and assembling hub bolt in hub.

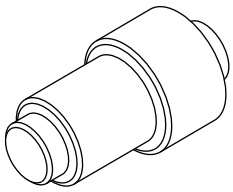
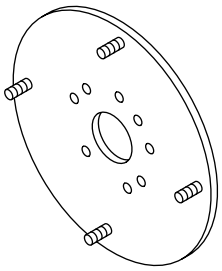
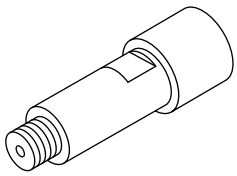
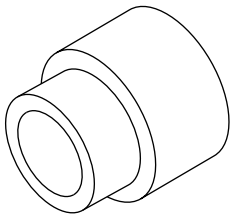
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927100000	927100000	BEARING PULLER	• Used for disassembling and assembling front housing bearing. • Used with HOUSING STAND (927400000).
 ST-927140000	927140000	AXLE SHAFT PULLER PLATE	Same as plate 2 included in AXLE SHAFT PULLER (926470000).
 ST-927390000	927390000	ADAPTER	Used as an adapter for AXLE SHAFT INSTALLER (922431000).
 ST-927400000	927400000	HOUSING STAND	• Used for disassembling and assembling front housing bearing. • Used with BEARING PULLER (927100000).

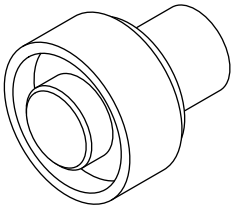
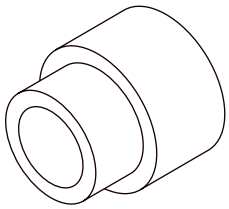
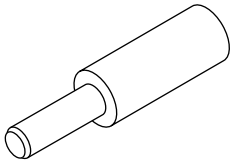
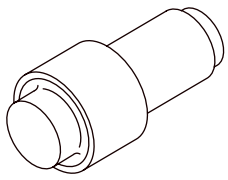
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927410000	927410000	OIL SEAL INSTALLER	• Used for installing oil seal into front housing. • Used with HOUSING STAND (927400000).
 ST-927430000	927430000	HOUSING STAND	• Used for disassembling and assembling rear housing bearing. • Used with BEARING PULLER (927440000).
 ST-927120000	927120000	HUB INSTALLER	Used for installing hub.
 ST-927440000	927440000	BEARING REMOVER	• Used for disassembling and assembling rear wheel bearing. • Used with HOUSING STAND (927430000).

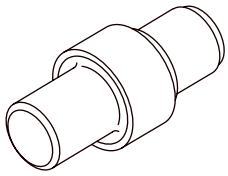
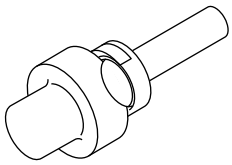
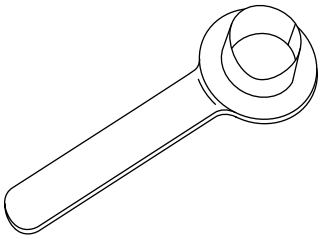
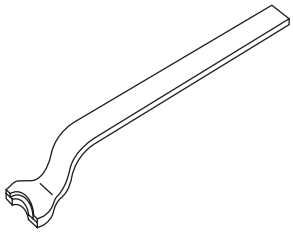
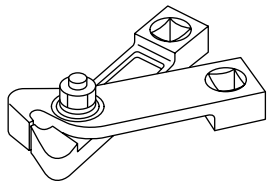
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927460000	927460000	OIL SEAL INSTALLER	• Used for installing outer oil seal. • Used with HOUSING STAND (927430000).
 ST-927450000	927450000	HUB INSTALLER	• Used for pressing hub bearing into hub. • Used with HUB STAND (927080000).
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing rear drive shaft into rear differential. • For protecting oil seal.
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	Used for removing rear drive shaft from rear differential.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28099AC000	28099AC000	BOOT BAND PLIERS	Used for tightening front BJ boot band.

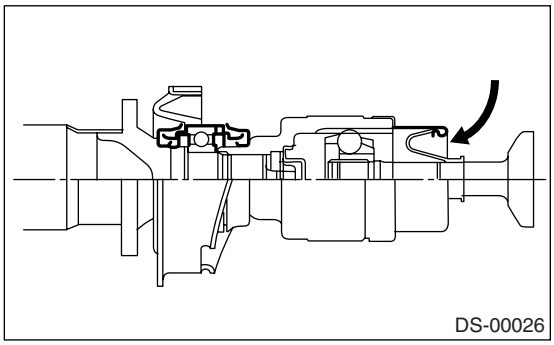
2. GENERAL PURPOSE TOOLS

TOOL NAME	REMERKS
Puller	Used for removing ball joint from knuckle arm.
Dial gauge	Used for inspecting propeller shaft run-out.
Snap ring pliers	Used for installing and removing snap ring.

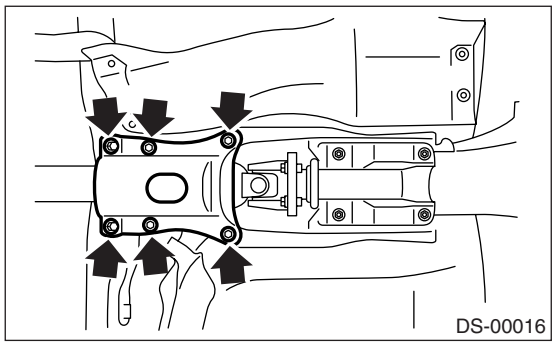
2. Propeller Shaft

A: REMOVAL

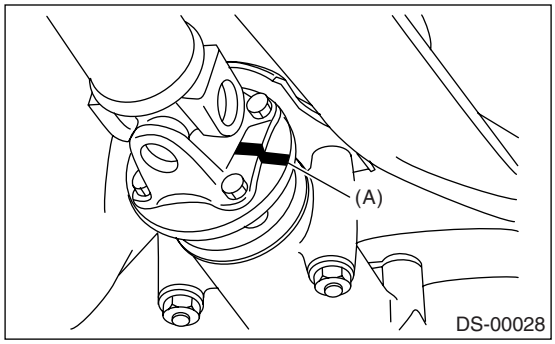
NOTE:
• Before removing the propeller shaft, wrap the metal parts with a cloth or rubber material.
• In case of DOJ type, before removing the propeller shaft, wrap the metal parts (installed at the rubber boot of center DOJ) with a cloth or rubber material, as shown in the figure. Rubber boot may be damaged due to interference with adjacent metal parts while bending the DOJ during removal.


DS-00026

1) Disconnect the ground cable from battery.
2) Move the select lever or gear shift lever to “N”.
3) Release the parking brake.
4) Jack-up the vehicle and support it with sturdy racks.
5) Remove the center exhaust pipes.
6) Remove the rear exhaust pipe and muffler.
7) Remove the differential mount front cover.


DS-00016

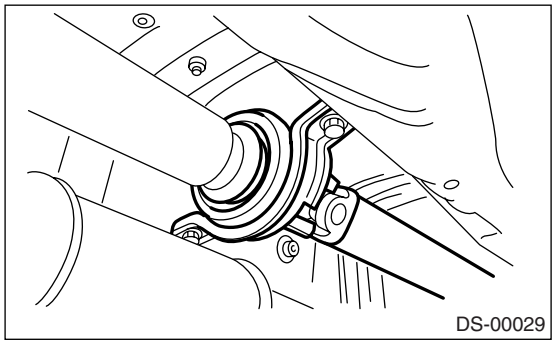
8) Make matching marks on affected parts before removal.



DS-00028

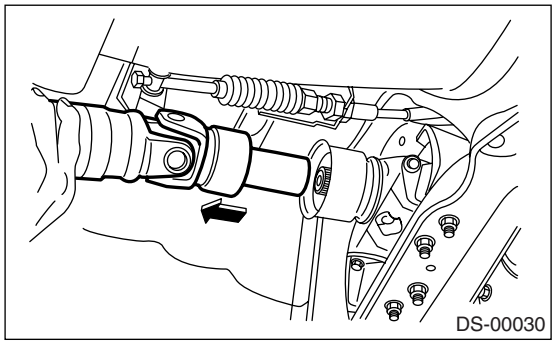
(A) Matching mark

9) Remove the three bolts which hold the propeller shaft to rear differential.
10) Remove the remaining bolt.
11) Remove the two bolts which hold the center bearing to vehicle body.


DS-00029

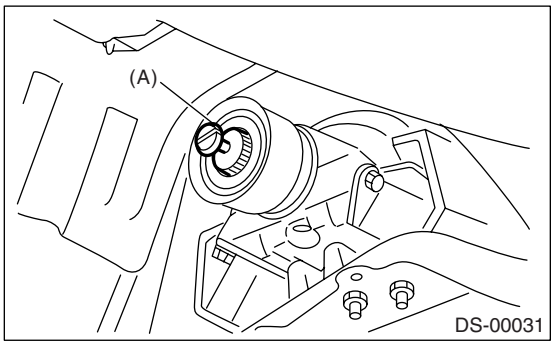
12) Remove the propeller shaft from transmission.

CAUTION:
• Be careful not to damage the oil seals and frictional surface of sleeve yoke.
• Cover the center exhaust pipe with a cloth to keep off any ATF or oil spilled from transmission when removing the propeller shaft.


DS-00030

13) Install the extension cap to transmission.

NOTE:
If the extension cap is not available, place a vinyl bag over opening and fasten it with string to prevent gear oil or ATF from leaking.

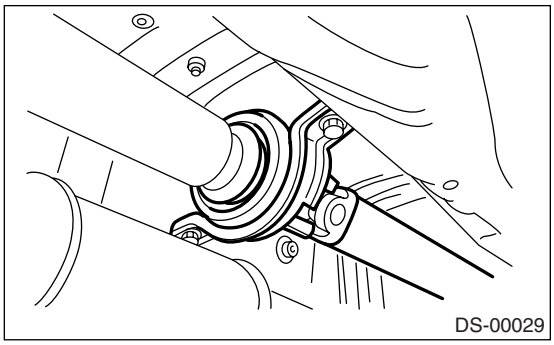


(A) Extension cap

B: INSTALLATION

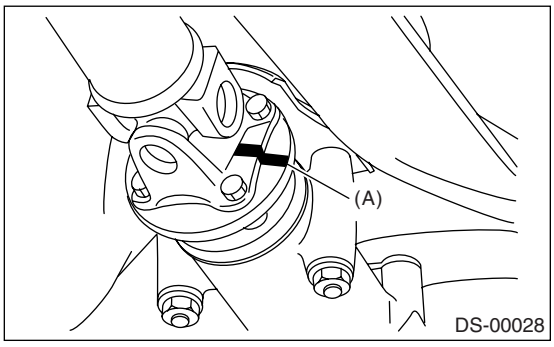
1) Insert the sleeve yoke into transmission, and then attach the center bearing to body.

Tightening torque:
52 N·m (5.3 kgf-m, 38.3 ft-lb)



2) Align the matching marks, and then connect the flange yoke and rear differential.

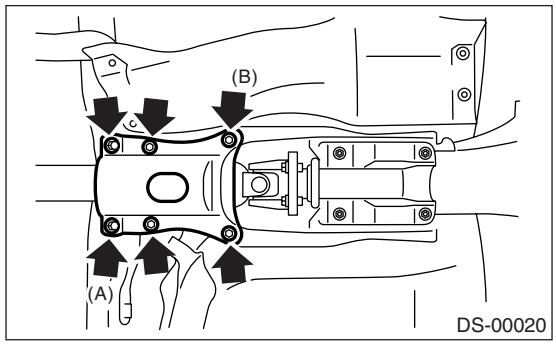
Tightening torque:
38 N·m (3.9 kgf-m, 28.3 ft-lb)



(A) Matching mark

3) Using new bolts, install the differential mount front cover.
(1) Temporarily tighten the bolt (A) while pushing cover forward.
(2) Tighten the bolt (B) to specified torque.
(3) Tighten the bolt (A) to specified torque.
(4) Tighten the remaining bolts to specified torque.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)



4) Install the center exhaust pipes.
5) Install the rear exhaust pipe and muffler.

C: INSPECTION

NOTE:
Do not disassemble the propeller shaft. Check the following and replace if necessary.
1) Tube surfaces for dents or cracks
2) Splines for deformation or abnormal wear
3) Joints for non-smooth operation or abnormal noise
4) Center bearing for free play, noise or non-smooth operation
5) Oil seals for abnormal wear or damage
6) Center bearing for breakage
Check the following points with propeller shaft installed in vehicle.

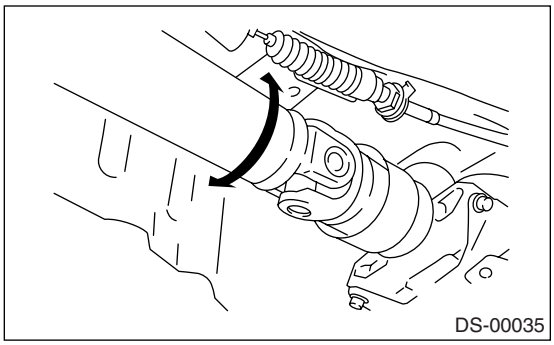
1. JOINTS AND CONNECTIONS

1) Remove the center exhaust pipes.
2) Remove the heat shield cover.
3) Check for any looseness of the yoke flange mounting bolts which connect to rear differential and center bearing bracket mounting bolts.

2. SPLINES AND BEARING LOCATIONS

1) Remove the center exhaust pipes.
2) Remove the rear exhaust pipe and muffler.
3) Remove the heat shield cover.

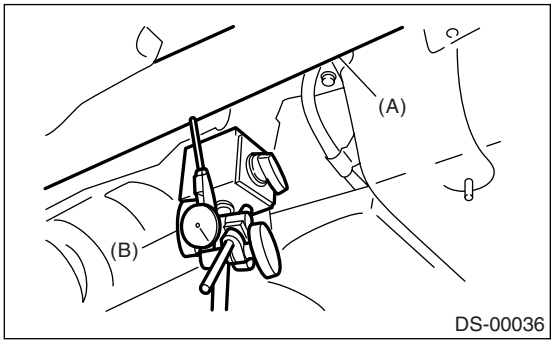
4) Turn the propeller shaft by hand to see if abnormal free play exists at splines. Also move the yokes to see if abnormal free play exists at spiders and bearings.



3. RUNOUT OF PROPELLER SHAFT

1) Remove the center exhaust pipes.
2) Remove the rear exhaust pipe and muffler.
3) Remove the heat shield cover.
4) Set the dial gauge with its indicator stem at center of propeller shaft tube.
5) Turn the propeller shaft slowly by hands to check for “runout” of propeller shaft.

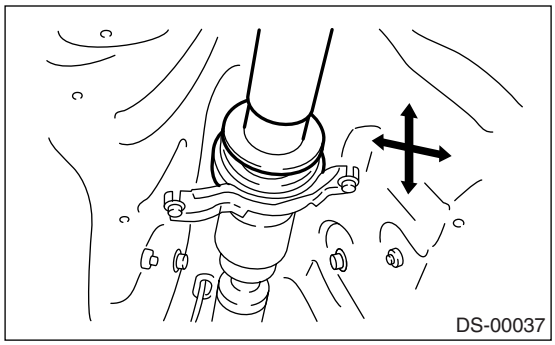
Runout:
Limit 0.6 mm (0.024 in)



(A) Propeller shaft
(B) Dial gauge

4. CENTER BEARING FREE PLAY

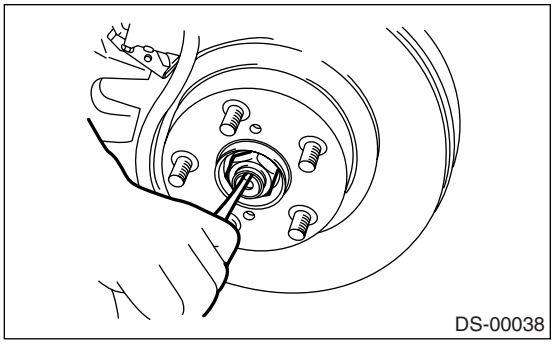
1) Remove the front and center exhaust pipes.
2) Remove the rear exhaust pipe and muffler.
3) Remove the heat shield cover.
4) Move the propeller shaft near center bearing up and down, and left and right with your hand to check for any abnormal bearing free play.



3. Front Axle

A: REMOVAL

1) Lift-up the vehicle and remove the front wheels.
2) Unlock the axle nut.

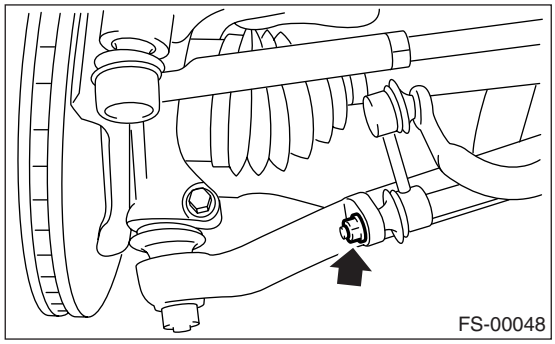


3) Remove the axle nut using a socket wrench while depressing the brake pedal.

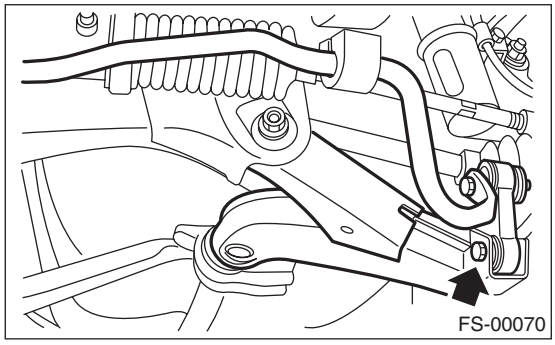
CAUTION:
Remove the axle nut with vehicle weight not applied on axle. Failure to follow this rule may damage the wheel bearings.

4) Remove the stabilizer link.

SEDAN:

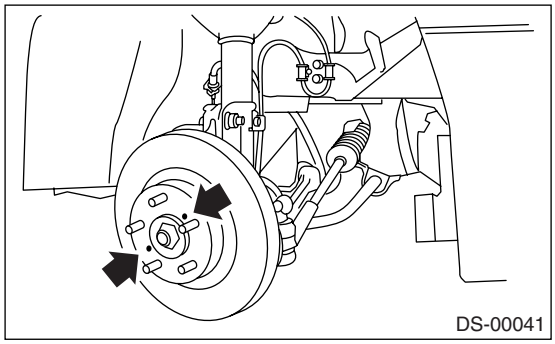


WAGON:

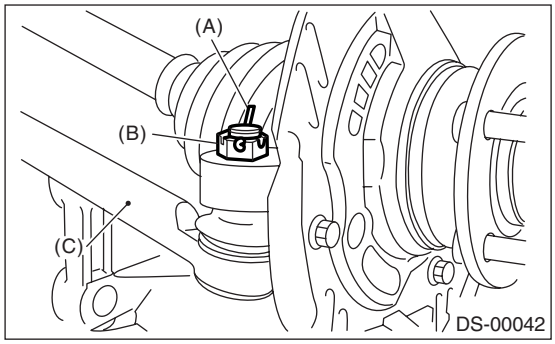


5) Remove the disc brake caliper from housing, and suspend it from strut using a wire.
6) Remove the disc rotor from hub.

NOTE:
If the disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in screw hole on rotor.

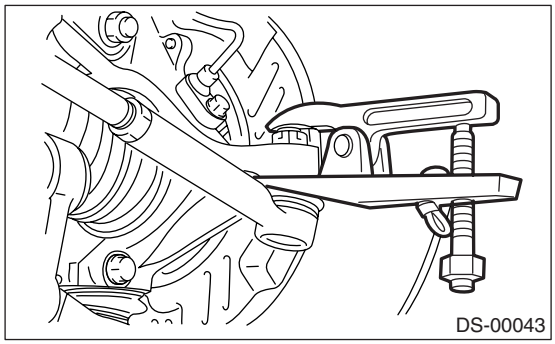


7) Remove the cotter pin and castle nut which secure tie-rod end to housing knuckle arm.

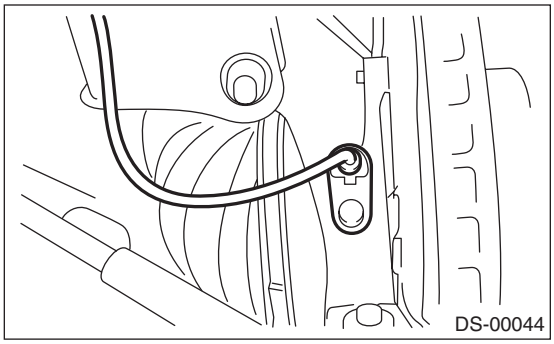


(A) Cotter pin
(B) Castle nut
(C) Tie-rod

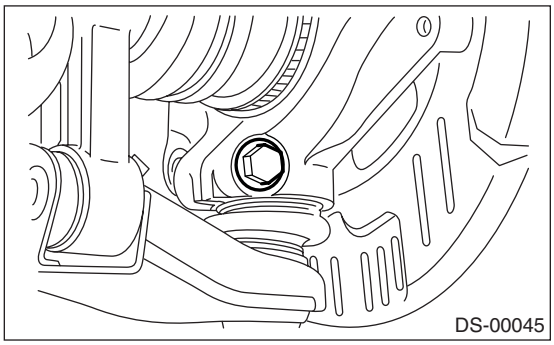
8) Using a puller, remove the tie-rod ball joint from knuckle arm.



9) Remove the ABS wheel speed sensor assembly and harness.



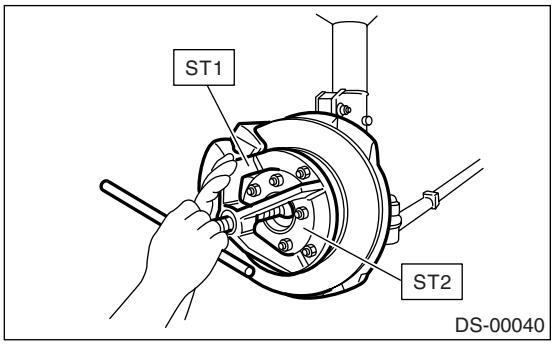
10) Remove the transverse link ball joint from housing.



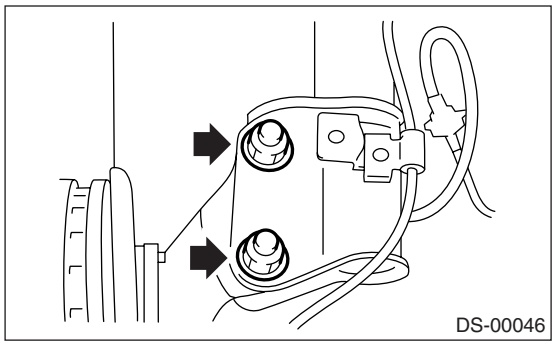
11) Remove the front drive shaft assembly from hub. If it is hard to remove, use the STs.

ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

CAUTION:
• Be sure to replace the differential side retainer oil seal at transmission side with a new one when removing the front drive shaft.
• Suspend the front drive shaft to vehicle body using a wire.



12) After scribing an alignment mark on the camber adjusting bolt head, remove the bolts which connect the housing and strut, and disconnect the housing from strut.



B: INSTALLATION

1) Temporarily tighten the front axle to front strut.
2) Insert the front drive shaft into front axle.
3) Temporarily tighten the axle nut.
4) Install the transverse link ball joint to housing.

Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)

5) While aligning the alignment mark on the camber adjusting bolt head, tighten the housing and strut using a new self-locking nut.

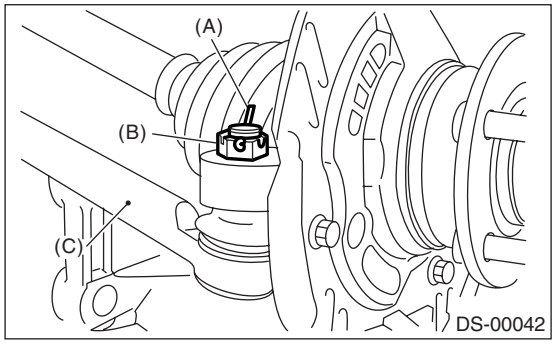
Tightening torque:
175 N·m (17.8 kgf-m, 129 ft-lb)

6) Connect the tie-rod end ball joint to the knuckle arm with a castle nut.

Tightening torque:
27.0 N·m (2.75 kgf-m, 19.9 ft-lb)

CAUTION:
When connecting, do not hit the cap at bottom of tie-rod with hammer.

7) Tighten the castle nut to specified torque and tighten further within 60° until the pin hole is aligned with the slot in nut. Bend the cotter pin to lock.



(A) Cotter pin
(B) Castle nut
(C) Tie-rod

8) Install the disc rotor on hub.

9) Install the disc brake caliper on housing.

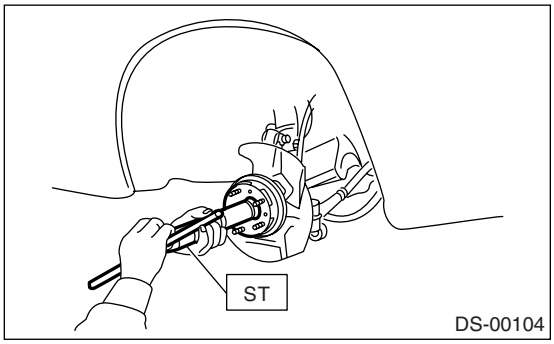
Tightening torque:
Except STi model
80 N·m (8.2 kgf-m, 59 ft-lb)
STi model
155 N·m (15.8 kgf-m, 114.3 ft-lb)

10) Connect the stabilizer link.

Tightening torque:
Except STi model
30 N·m (3.1 kgf-m, 22 ft-lb)
STi model
45 N·m (4.6 kgf-m, 33 ft-lb)

CAUTION:
Use a new self-locking nut.

11) Using the ST1 and ST2, pull the front drive shaft into place.
ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER

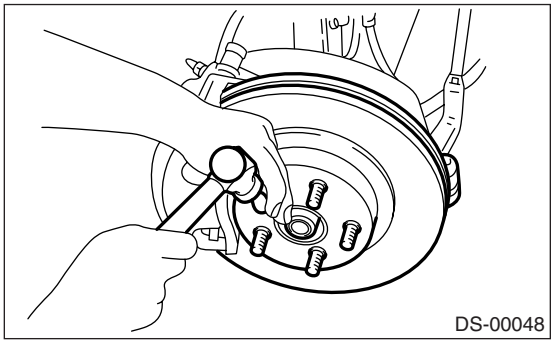


12) While depressing the brake pedal, tighten a new axle nut to specified torque and lock it securely.

Tightening torque:
220 N·m (22.4 kgf-m, 162 ft-lb)

CAUTION:
Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage the wheel bearing.

13) After tightening the axle nut, lock it securely.



14) Install the ABS wheel speed sensor on housing.

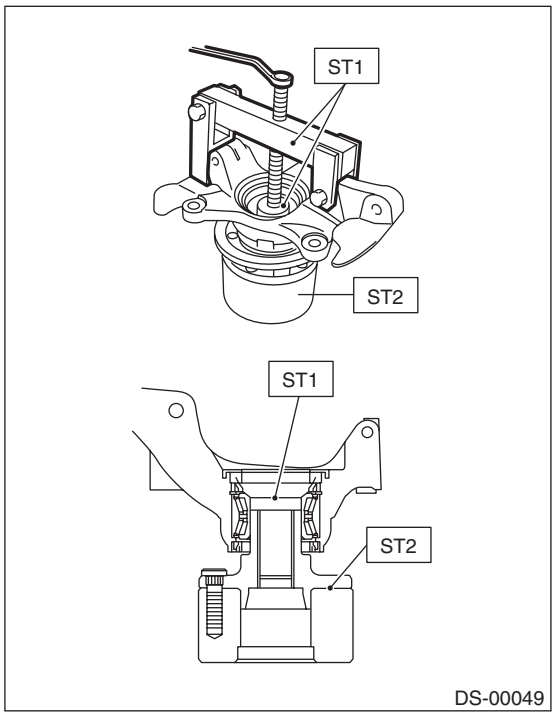
Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)

15) Install the wheel and tighten the wheel nuts to specified torque.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

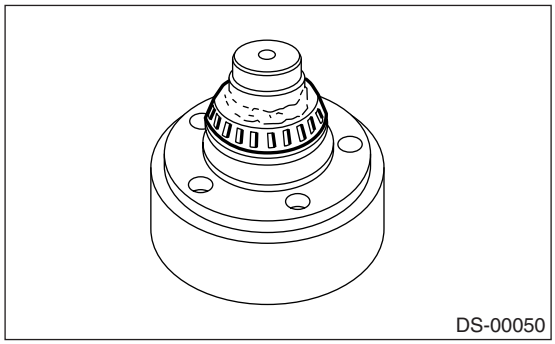
C: DISASSEMBLY

1) Using the ST1, support the housing and hub securely.
2) Attach the ST2 to housing and drive the hub out.
ST1 927060000 HUB REMOVER
ST2 927080000 HUB STAND



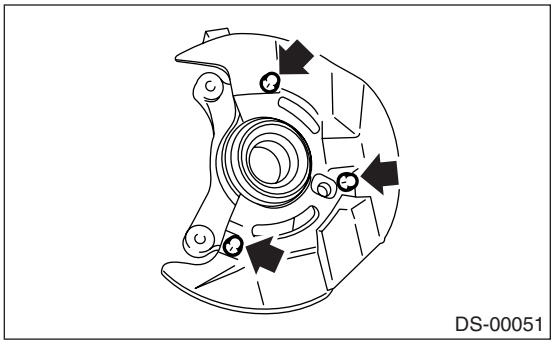
If the inner bearing race remains in hub, remove it with a suitable tool (commercially available).

NOTE:
Be careful not to scratch the polished area of hub.



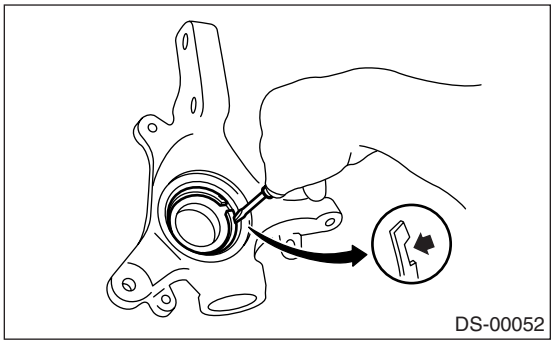
CAUTION:
Do not reuse the bearing if the hub was removed.

3) Remove the disc cover from housing.

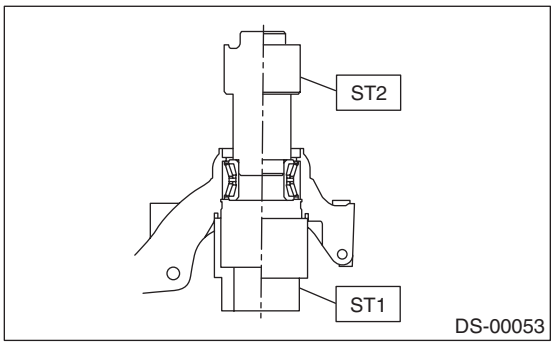


4) Using a standard screwdriver, remove the outer and inner oil seals.
5) Using a flat tip screwdriver, remove the snap ring.

NOTE:
Be careful not to damage the housing at removal.

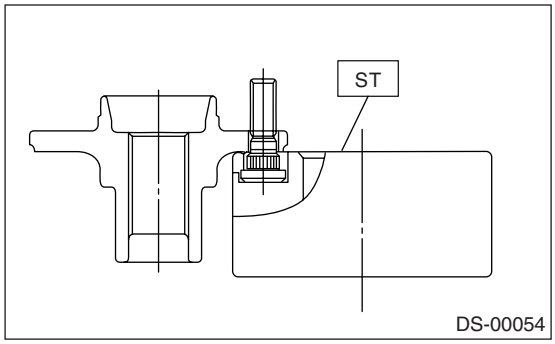


6) Using the ST1, support the housing securely.
7) Using the ST2, hold the inner race to drive out the outer race of bearing.
ST1 927400000 HOUSING STAND
ST2 927100000 BEARING PULLER



8) Using the ST and a hydraulic press, drive the hub bolts out.

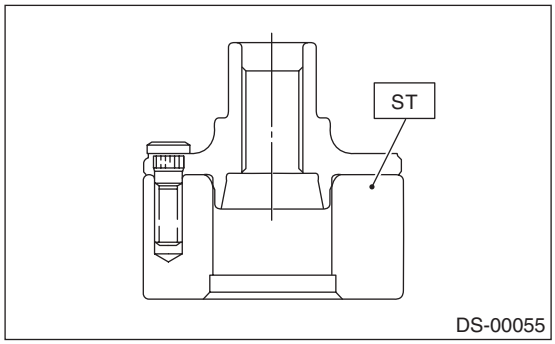
ST 927080000 HUB STAND



D: ASSEMBLY

NOTE:
When the hub is to be removed from housing, replace the bearing set and oil seal with new ones.

1) Attach the hub to ST securely.
ST 927080000 HUB STAND

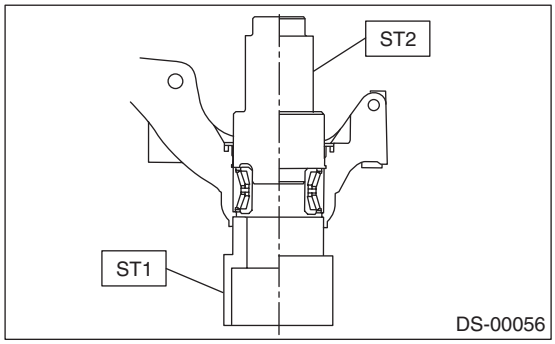


2) Using a hydraulic press, press new hub bolts until their seating surfaces contact the hub.

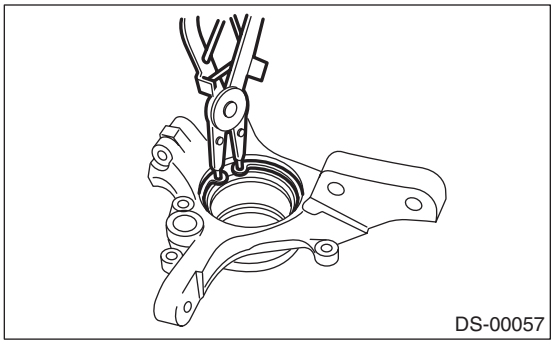
NOTE:
Use 12 mm (0.47 in) dia. holes in HUB STAND to prevent bolts from tilting.

3) Clean dust or foreign particles from inside of housing.
4) Using the ST1 and ST2, press a new bearing into place.
ST1 927400000 HOUSING STAND
ST2 927100000 BEARING PULLER

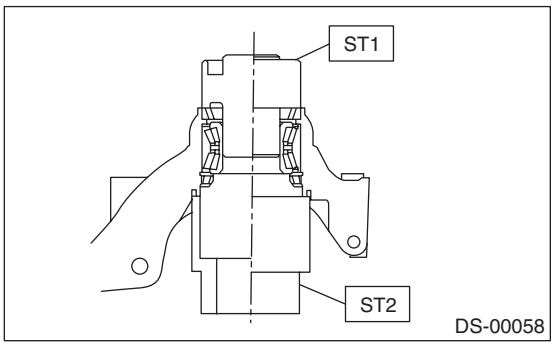
NOTE:
Be careful not to remove the plastic lock from inner race when installing the bearing.



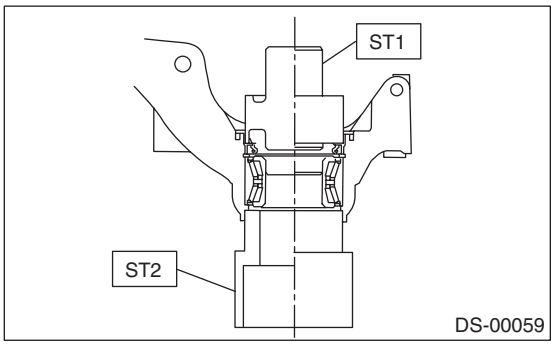
5) Using pliers, install the snap ring firmly.



6) Using the ST1 and ST2, press the outer oil seal until it contacts the bottom of housing.
ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND



7) Using the ST1 and ST2, press the inner oil seal until it contacts the circlip.
ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND



8) Invert the ST and housing.
ST 927400000 HOUSING STAND
9) Apply sufficient grease to the oil seal lip.

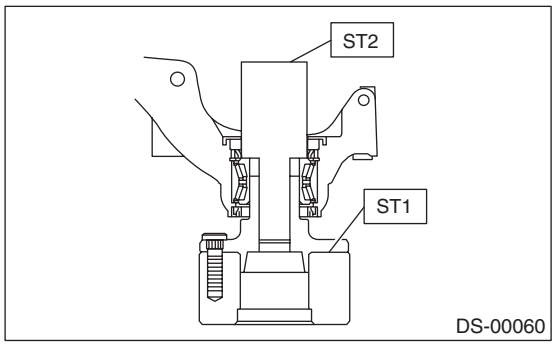
Specified grease:
SHELL 6459N

NOTE:
• If specified grease is not available, remove the bearing grease and apply Auto Rex A instead.
• Do not mix different types of grease.

10) Install the disc cover to housing with three bolts.

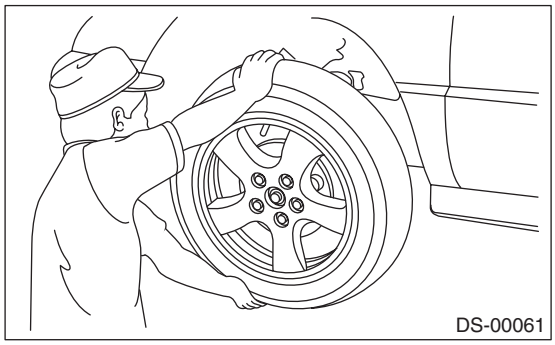
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

11) Attach the hub to ST1 securely.
12) Clean dust or foreign particles from the polished surface of hub.
13) Using the ST2, press the bearing into hub by driving the inner race.
ST1 927080000 HUB STAND
ST2 927120000 HUB INSTALLER



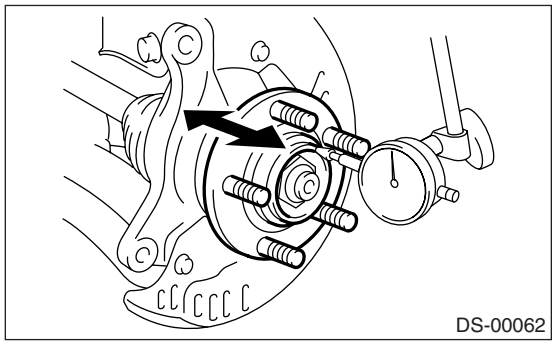
E: INSPECTION

1) Moving the front tire up and down by hand, check there is no backlash in bearing, and check the wheel rotates smoothly.



2) Inspect the lean of axis direction using a dial gauge. Replace the hub bearing if the load range exceeds the limitation.

Limit:
Maximum: 0.05 mm (0.0020 in)



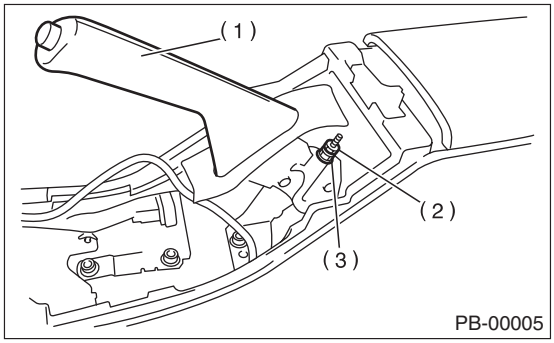
4. Rear Axle

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and remove the rear wheel.
3) Unlock the axle nut.
4) Remove the axle nut using a socket wrench with parking brake applied.

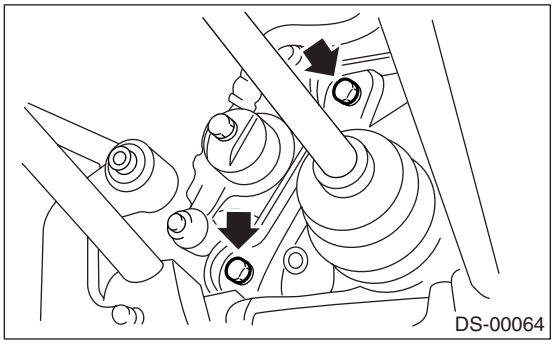
CAUTION:
Remove the axle nut with vehicle weight not applied on axle. Failure to follow this rule may damage the wheel bearings.

5) Return the parking brake lever and loosen the adjusting nut.



(1) Parking brake lever
(2) Lock nut
(3) Adjusting nut

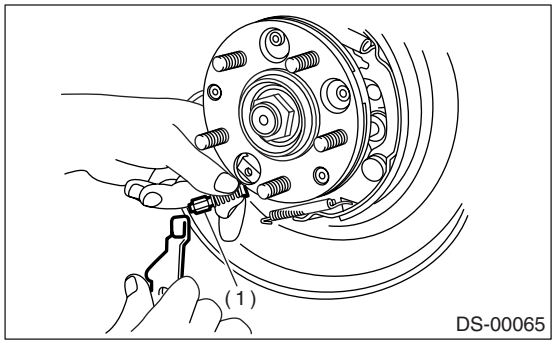
6) Remove the disc brake caliper from back plate, and suspend it from strut using a piece of wire.



7) Remove the disc rotor from hub.

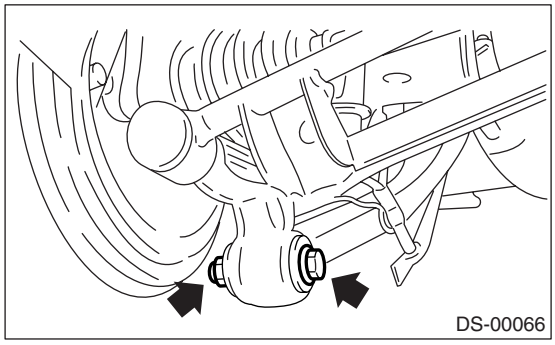
NOTE:
If the disc rotor seizes up within hub, drive it out by installing an 8-mm bolt into bolt hole in disc rotor.

8) Disconnect the parking brake cable end.

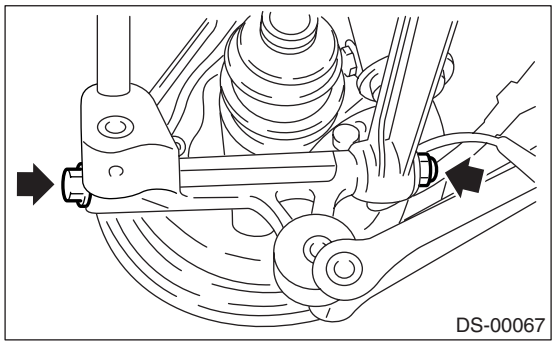


(1) Cable end

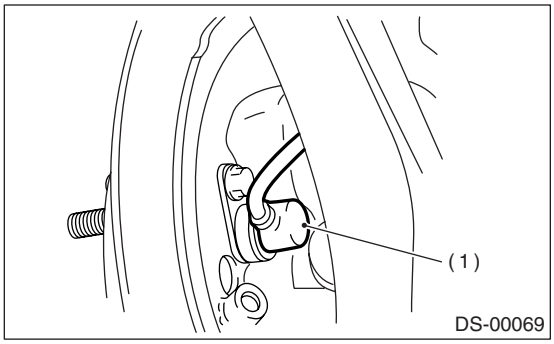
9) Disconnect the rear stabilizer from rear lateral link.
10) Remove the bolts which secure the trailing link assembly to rear housing.



11) Remove the bolts which secure the lateral assembly to rear housing.



12) Remove the rear ABS wheel speed sensor from back plate.

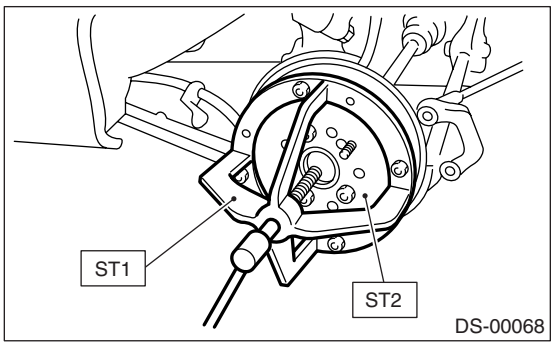


(1) ABS wheel speed sensor

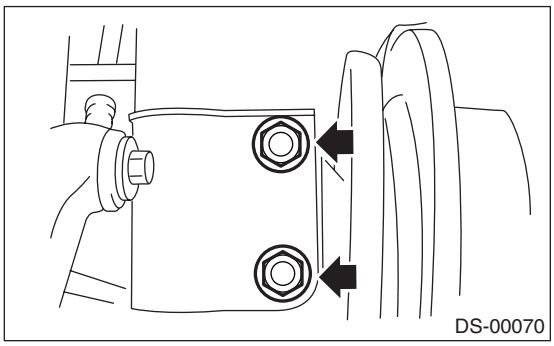
13) Disengage the BJ from housing splines, and then remove the rear drive shaft assembly.
If it is hard to remove, use the STs.

ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

NOTE:
• Be careful not to damage the oil seal lip when removing the rear drive shaft.
• When the rear drive shaft is to be replaced, also replace the inner oil seal with a new one.



14) Remove the bolts which secure the rear housing to strut, and separate the two.

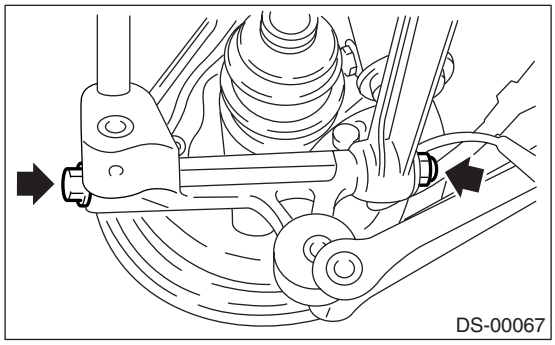


B: INSTALLATION

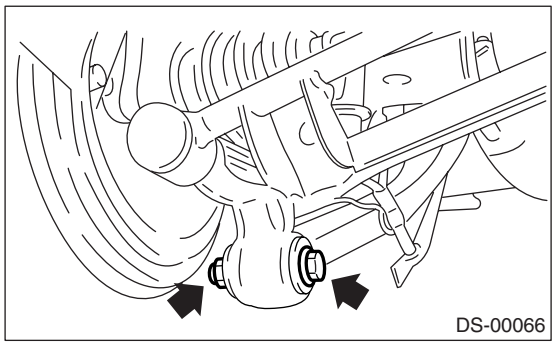
1) Temporarily tighten the rear axle to strut.
2) Insert the rear drive shaft into rear axle.

NOTE:
Be careful not to damage the inner oil seal lip.

3) Temporarily tighten the axle nut.
4) Using a new self-locking nut, temporarily tighten the rear housing assembly and lateral link assembly.



5) Using a new self-locking nut, temporarily tighten the rear housing assembly and trailing link assembly.



6) Tighten the rear housing assembly and strut assembly using a new self-locking nut.

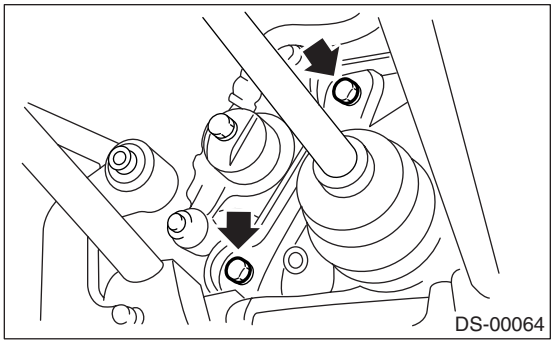
Tightening torque:
200 N·m (20.4 kgf-m, 148 ft-lb)

7) Using a new self-locking nut, install the rear stabilizer and rear lateral link.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)

8) Connect the parking brake cable to parking brake.
9) Install the disc rotor on rear housing assembly.
10) Install the disc brake caliper on back plate.

Tightening torque:
Except STi model
52 N·m (5.3 kgf-m, 38.3 ft-lb)
STi model
65 N·m (6.6 kgf-m, 47.9 ft-lb)

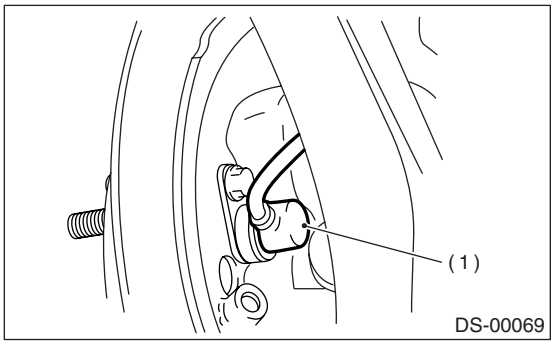


11) Adjust the parking brake lever stroke by turning the adjuster.
12) While applying the parking brake, tighten a new axle nut using a socket wrench. Lock the axle nut after tightening.

Tightening torque:
190 N·m (19.4 kgf-m, 140 ft-lb)

CAUTION:
Do not overtighten it as this may damage the wheel bearing.

13) Install rear ABS wheel speed sensor.



(1) ABS wheel speed sensor

14) Install the wheel and tighten the wheel nuts to specified torque.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

15) Make the tires contact the ground fully.

CAUTION:
Make the tires contact the ground fully and the vehicle be in curb weight whenever carrying out the tightening of bush portions.

16) Tighten the installation bolt of rear housing assembly and lateral link assembly.

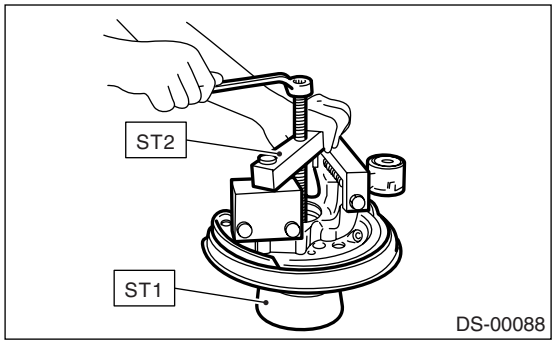
Tightening torque:
140 N·m (14.3 kgf-m, 103 ft-lb)

17) Tighten the installation bolt of rear housing assembly and trailing link assembly.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

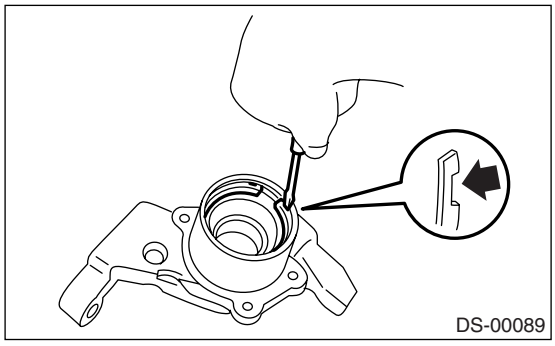
C: DISASSEMBLY

1) Using the ST1 and ST2, remove the hub from rear housing.
ST1 927080000 HUB STAND
ST2 927420000 HUB REMOVER

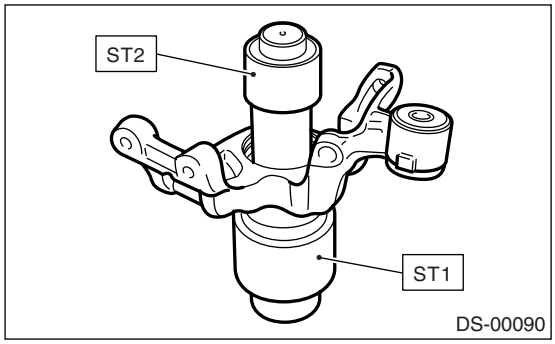


2) Remove the back plate from rear housing.
3) Using a standard screwdriver, remove the outer and inner oil seals.
4) Using a flat tip screwdriver, remove the snap ring.

NOTE:
Be careful not to damage the housing at removal.

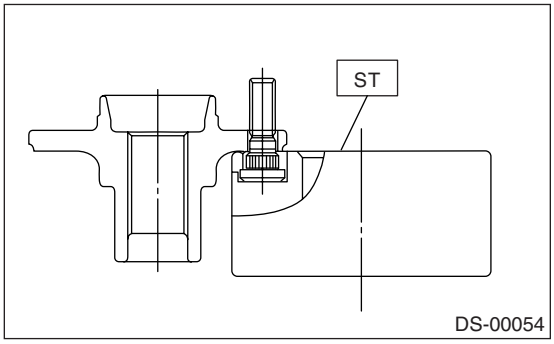


5) Using the ST1 and ST2, remove the bearing by pressing the inner race.
ST1 927430000 HOUSING STAND
ST2 927440000 BEARING REMOVER



6) Remove the tone wheel bolts, and then remove the tone wheel from hub.
7) Using the ST, press the hub bolt out.
ST 927080000 HUB STAND

CAUTION:
Be careful not to hammer the hub bolts. This may deform the hub.



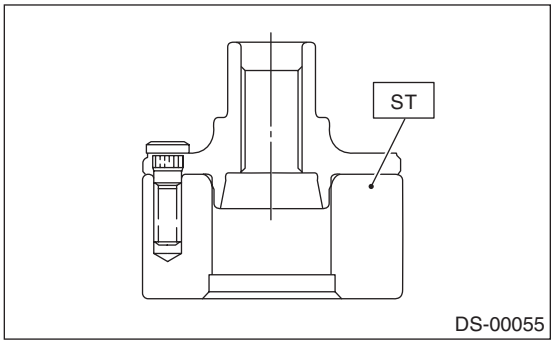
D: ASSEMBLY

NOTE:
When the hub is to be removed from housing, replace the bearing set and oil seal with new ones.

1) Using the ST, press the new hub bolt into place.

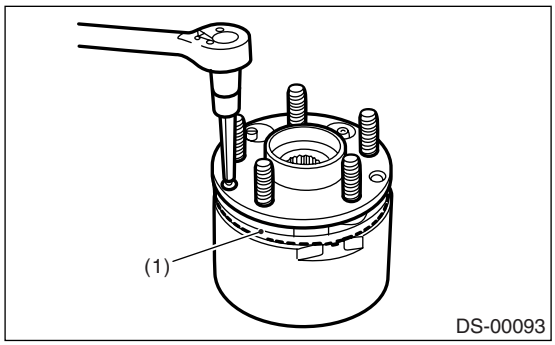
NOTE:
- Ensure the hub bolt closely contacts the hub.
- Use a 12 mm (0.47 in) hole in the ST to prevent the hub bolt from tilting during installation.

ST 927080000 HUB STAND



2) Remove foreign particles (dust, rust, etc.) from mating surfaces of the hub tone wheel, and then install the tone wheel to hub.

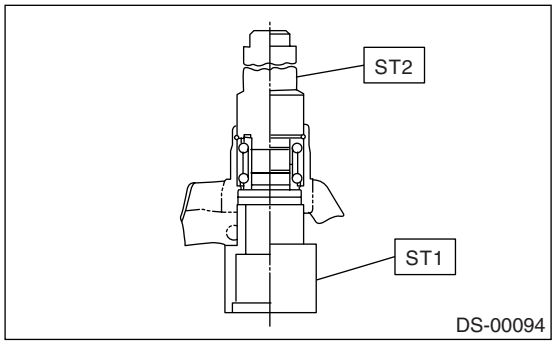
NOTE:
- Ensure the tone wheel closely contacts the hub.
- Be careful not to damage the tone wheel teeth.



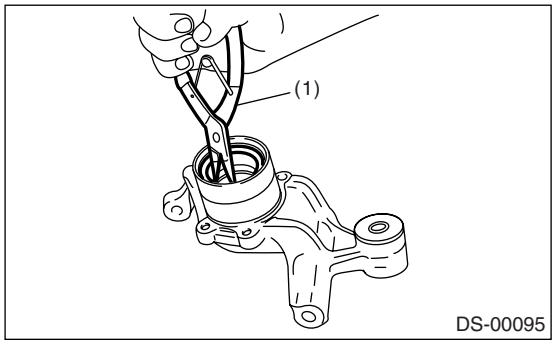
(1) Tone wheel

3) Clean the housing interior completely. Using the ST1 and ST2, press the bearing into housing.
ST1 927430000 HOUSING STAND
ST2 927440000 BEARING REMOVER

NOTE:
Be careful not to remove the plastic lock from inner race when installing the bearing.



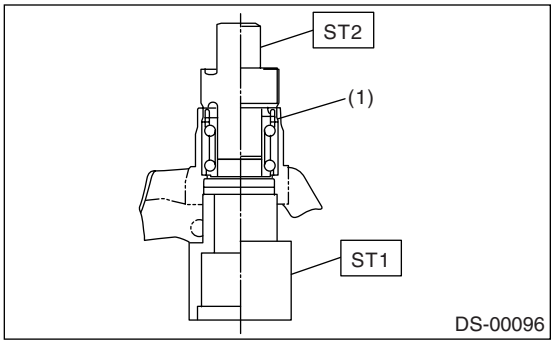
4) Using pliers, install the snap ring firmly.



(1) Pliers

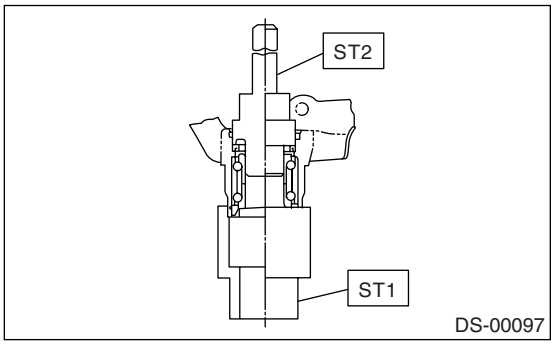
5) Using the ST1 and ST2, press the outer oil seal until it comes in contact with snap ring.
ST1 927430000 HOUSING STAND

ST2 927460000 OIL SEAL INSTALLER

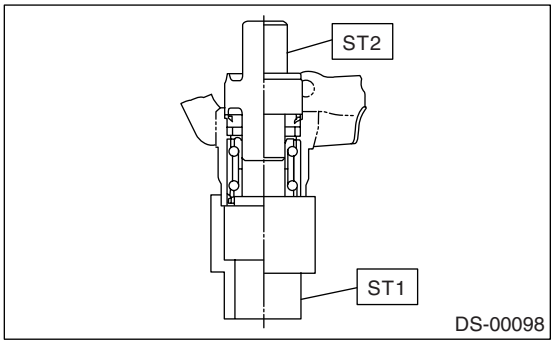


(1) Snap ring

6) Invert both ST1 and housing.
7) Using the ST2, press the inner oil seal into housing until it touches the bottom.
ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER



8) Using the ST1 and ST2, press the sub seal into place.
ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER



9) Apply sufficient grease to oil seal lip.

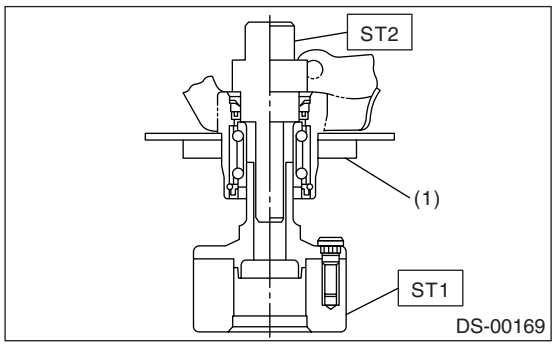
Specified grease:
SHELL 6459N

NOTE:
• If specified grease is not available, remove the bearing grease and apply Auto Rex A instead.
• Do not mix different types of grease.

10) Install the back plate to rear housing.

Tightening torque:
52 N·m (5.3 kgf-m, 38.3 ft-lb)

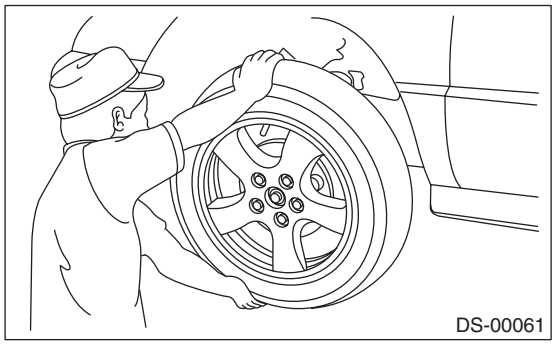
11) Using the ST1 and ST2, press the bearing into hub.
ST1 927080000 HUB STAND
ST2 927450000 HUB INSTALLER



(1) Back plate

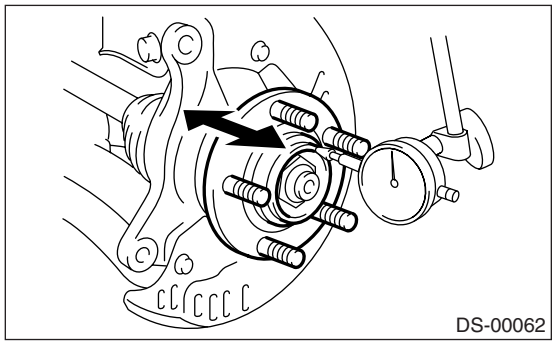
E: INSPECTION

1) Moving the front tire up and down by hand, check there is no backlash in bearing, and check the wheel rotates smoothly.



2) Inspect the lean of axis direction using a dial gauge. Replace the hub bearing if the load range exceeds the limitation.

Limit:
Maximum: 0.05 mm (0.0020 in)



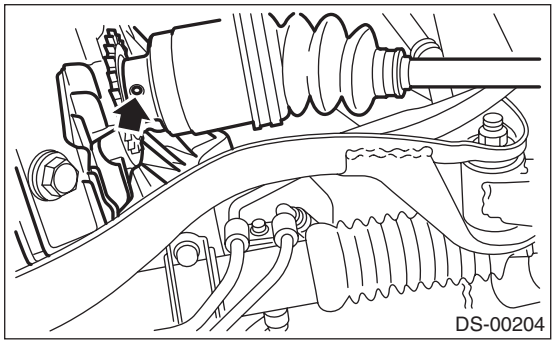
5. Front Drive Shaft

A: REMOVAL

1) Jack-up the vehicle, support it with rigid racks, and then remove the front wheel cap and wheels.
2) Raise the caulking portion of axle nut.
3) Depress the brake pedal and remove the axle nut using a socket wrench.

CAUTION:
Be sure to loosen the axle nut after removing the wheel from vehicle. Failure to follow this rule may damage the wheel bearings.

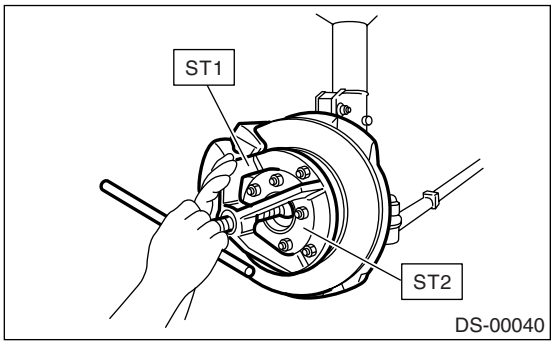
4) Remove the stabilizer link from transverse link.
5) Disconnect the transverse link from housing.
6) Remove the spring pin which secures the transmission spindle to SFJ.



7) Remove the front drive shaft assembly. If it is hard to remove, use the ST1 and ST2.

ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

CAUTION:
• Be careful not to damage the oil seal lip and tone wheel when removing the front drive shaft.
• When the front drive shaft is to be replaced, also replace the inner oil seal.



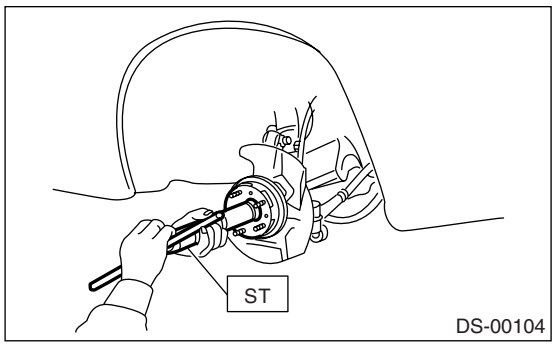
B: INSTALLATION

1) Insert the BJ into hub splines.

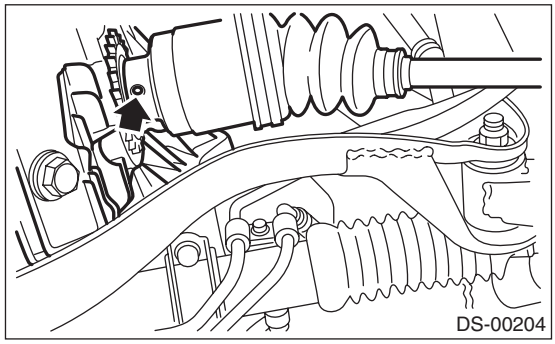
CAUTION:
Be careful not to damage the inner oil seal lip and tone wheel.

2) Using the ST1 and ST2, pull the drive shaft into place.

ST1	922431000	AXLE SHAFT INSTALLER
ST2	927390000	ADAPTER



3) Tighten the axle nut temporarily.
4) Install the SFJ on transmission spindle and drive a new spring pin into place.



5) Connect the transverse link to housing.

Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)

6) Install the stabilizer bracket.
7) While depressing the brake pedal, tighten the axle nut to specified torque.

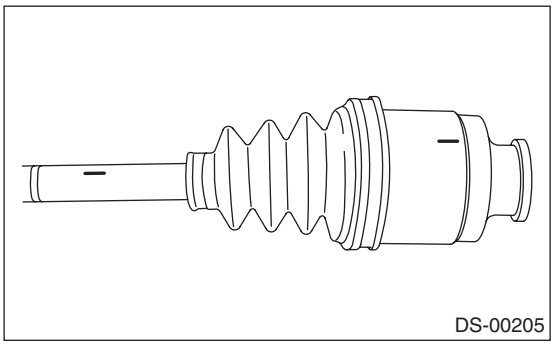
Tightening torque:
220 N·m (22.4 kgf-m, 162 ft-lb)

CAUTION:
• Always tighten the axle nut before installing wheel on vehicle. If the tire is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.
• Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage the wheel bearing.

8) After tightening the axle nut, caulk and lock it.

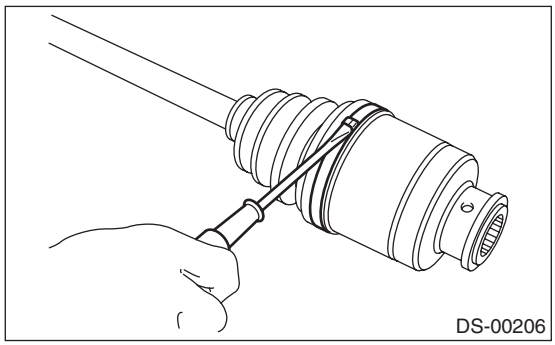
C: DISASSEMBLY

1) Place alignment marks on shaft and outer race.

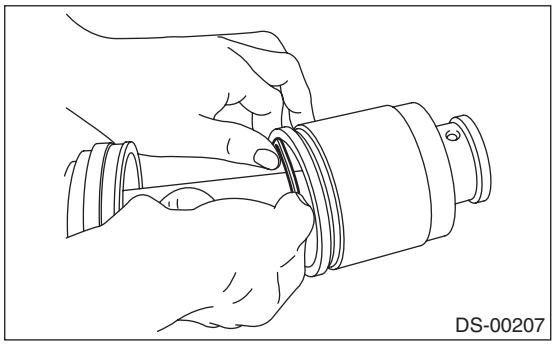

DS-00205

2) Remove the SFJ boot band and boot.

CAUTION:
Be careful not to damage the boot.


DS-00206

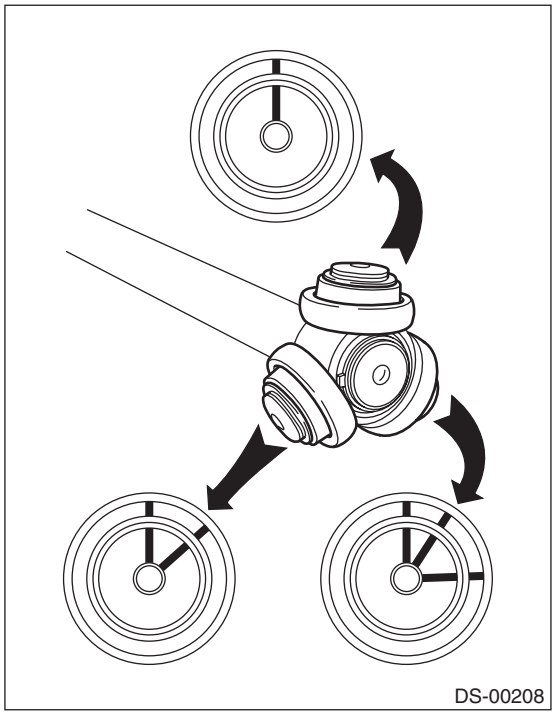
3) Remove the circlip from SFJ outer race using a screwdriver.


DS-00207

4) Remove the SFJ outer race from shaft assembly.
5) Wipe off the grease.

CAUTION:
The grease is a special grease. Do not confuse with other greases.

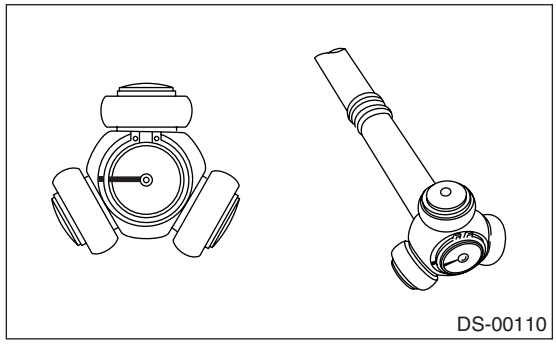
6) Place alignment marks on free ring and trunnion.


DS-00208

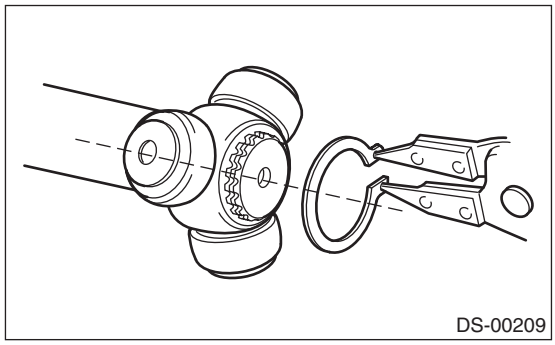
7) Remove the free ring from trunnion.

CAUTION:
Be careful with the free ring position.

8) Place an alignment mark on trunnion and shaft.


DS-00110

9) Remove the snap ring and trunnion.


DS-00209

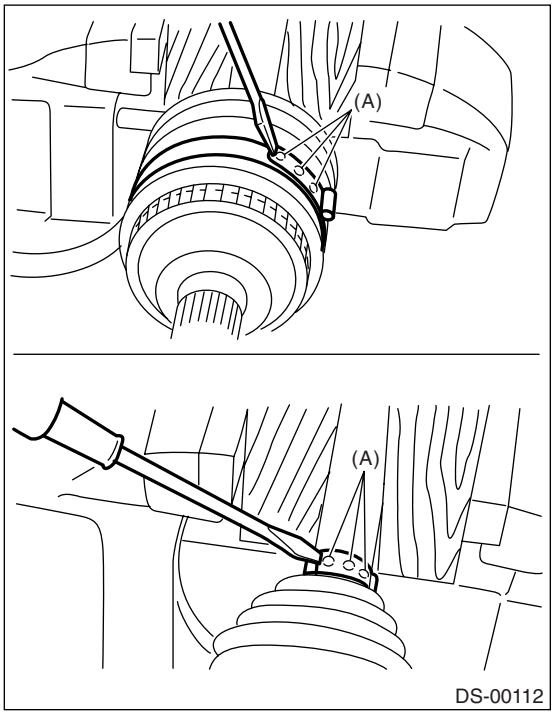
CAUTION:
Be sure to wrap the shaft splines with vinyl tape to prevent the boot from scratches.

10) Remove the SFJ boot.

11) Place the drive shaft in a vise between wooden blocks.

CAUTION:
Do not place the drive shaft directly in a vise; use wooden block.

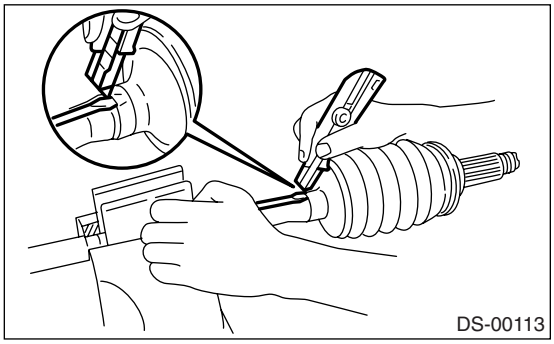
12) Raise the boot band claws by means of screwdriver and hammer.



(A) Boot band claws

13) Cut and remove the boot.

CAUTION:
The boot must be replaced with a new one whenever it is removed.



NOTE:
Further disassembly of axle is impossible because the BJ cannot be disassembled.

D: ASSEMBLY

NOTE:
Use specified grease.

BJ side:
NTG2218 (Part No. 28093AA000)

SFJ side:
SSG6003 (Part No. 28093TA000)

DOJ side:
VU-3A702 (Part No. 23223GA050)

1) Place the BJ boot and small boot band on BJ side of shaft.

CAUTION:
Be sure to wrap the shaft splines with vinyl tape to prevent the boot from scratches.

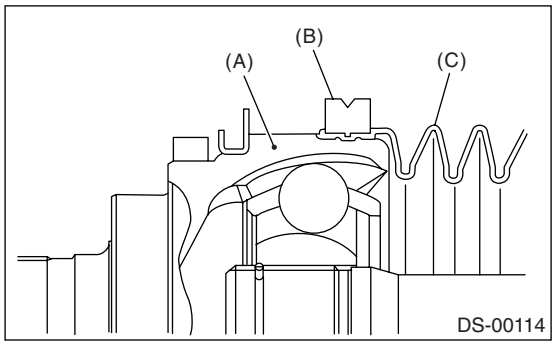
2) Place the drive shaft in a vise.

CAUTION:
Do not place the drive shaft directly in a vise; use wooden blocks.

3) Apply a coat of specified grease [60 to 70 g (2.12 to 2.47 oz)] to BJ.
4) Apply an even coat of specified grease [20 to 30 g (0.71 to 1.06 oz)] to entire inner surface of boot. Also apply grease to shaft.

NOTE:
BJ installation surface of BJ boot shall be cleaned so as to be free from grease and other substances.

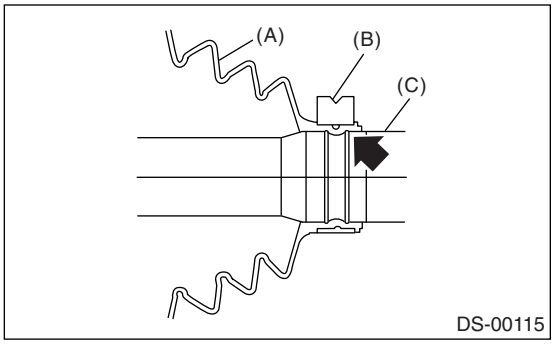
5) Install the boot projecting portion to BJ groove.



(A) BJ
(B) Large boot band
(C) Boot

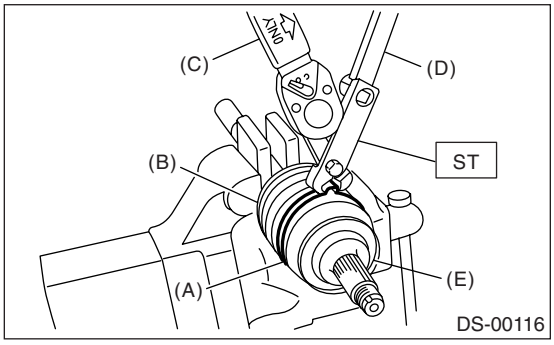
6) Set the large boot band in place.

7) Install the boot projecting portion to shaft groove.



(A) Boot
(B) Small boot band
(C) Shaft

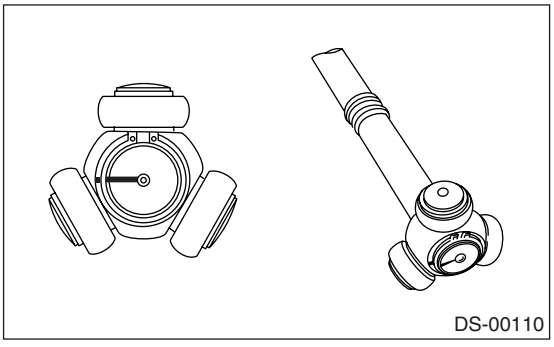
8) Tighten the boot bands using the ST, torque wrench and socket flex handle.
ST 28099AC000 BOOT BAND PLIER



(A) Large boot band
(B) Boot
(C) Torque wrench
(D) Socket flex handle
(E) BJ

Tightening torque:
Large boot band
157 N·m (16.0 kgf-m, 116 ft-lb) or more
Small boot band
133 N·m (13.6 kgf-m, 98 ft-lb) or more

9) Place the SFJ boot at the center of shaft.
10) Align the alignment marks, and then install the trunnion on shaft.

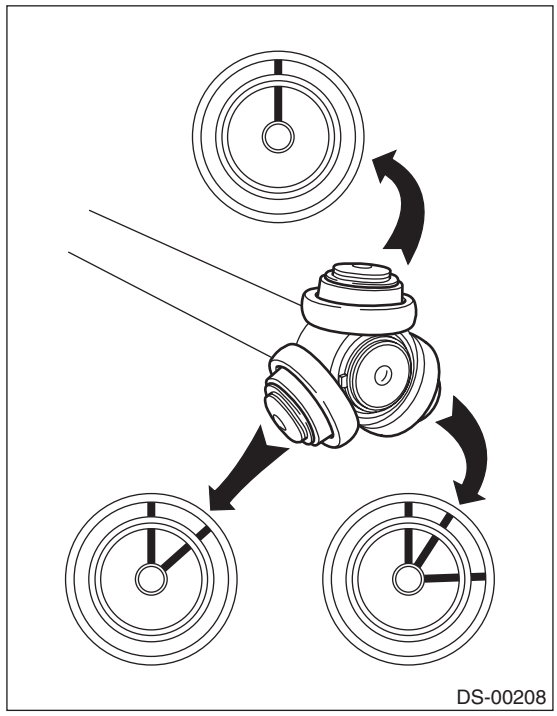


11) Install the snap ring to shaft.

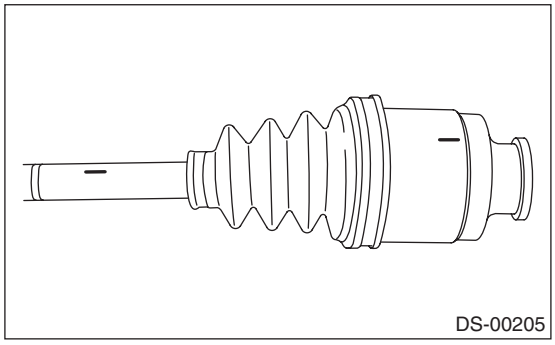
CAUTION:
Confirm that the snap ring is completely fitted in shaft groove.

12) Fill 100 to 110 g (3.53 to 3.88 oz) of specified grease into the interior of SFJ outer race.
13) Apply a coat of specified grease to free ring and trunnion.
14) Align the alignment marks on free ring and trunnion, and then install the free ring.

CAUTION:
Be careful with the free ring position.



15) Align the alignment marks on shaft and outer race, and then install the outer race.



16) Install the circlip in the groove on SFJ outer race.

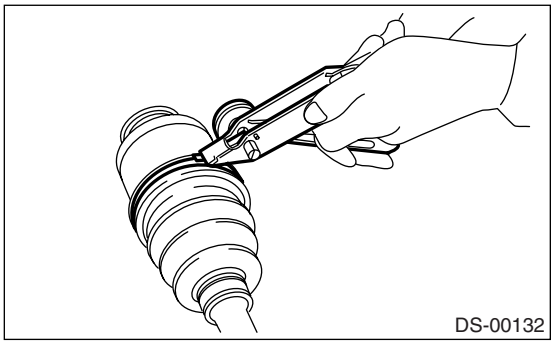
CAUTION:
Pull the shaft lightly and assure the circlip is completely fitted in groove.

17) Apply an even coat of the specified grease 30 to 40 g (1.06 to 1.41 oz) to the entire inner surface of boot.
18) Install the SFJ boot taking care not to twist it.

CAUTION:
• SFJ installation surface of SFJ boot shall be cleaned so as to be free from grease and other substances.
• When installing the SFJ boot, position the outer race of SFJ at center of its travel.

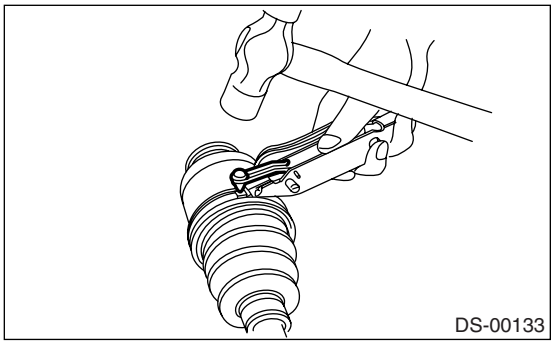
19) Put a new band through the clip and wind twice in alignment with band groove of boot.
20) Tighten the band by using the ST.
ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tighten the band until it cannot be moved by hand.



21) Tap on the clip with punch provided at the end of ST.
ST 925091000 BAND TIGHTENING TOOL

CAUTION:
Tap to an extent that the boot underneath is not damaged.



22) Cut off the band with an allowance of about 10 mm (0.39 in) left from clip, and bend this allowance over clip.

CAUTION:
Be careful so that the end of band is in close contact with clip.

23) Extend and retract the SFJ to provide equal grease coating.

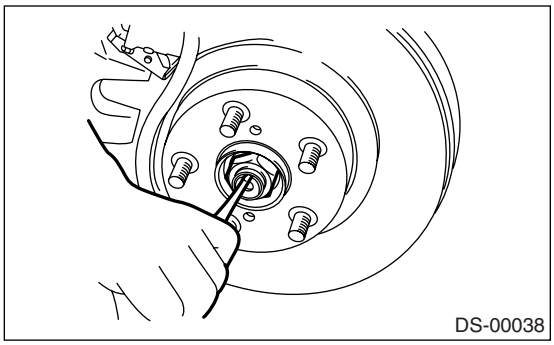
E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. If faulty, repair or replace.
1) DOJ (Double Offset Joint)
Check seizure, corrosion, damage, wear and excessive play.
2) SFJ (Shudder-less Freering tripod Joint)
Check seizure, corrosion, damage and excessive play.
3) Shaft
Check excessive bending, twisting, damage and wear.
4) BJ (Bell Joint)
Check seizure, corrosion, damage and excessive play.
5) Boot
Check for wear, warping, breakage or scratches.
6) Grease
Check for discoloration or fluidity.

6. Rear Drive Shaft

A: REMOVAL

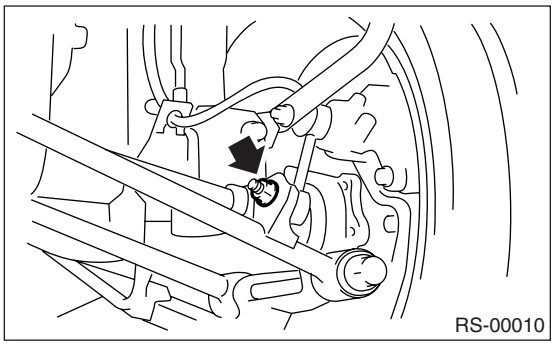
1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and remove the rear wheel.
3) Unlock the axle nut.



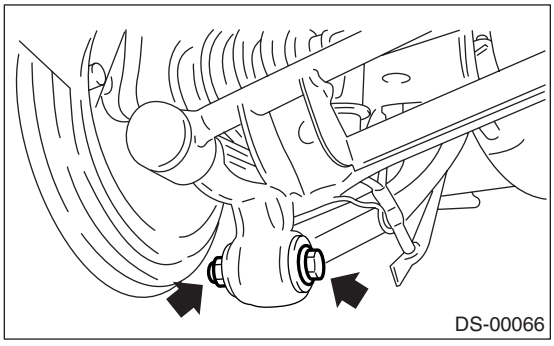
4) Remove the axle nut using a socket wrench with parking brake applied.

CAUTION:
Remove the axle nut with vehicle weight not applied on axle.

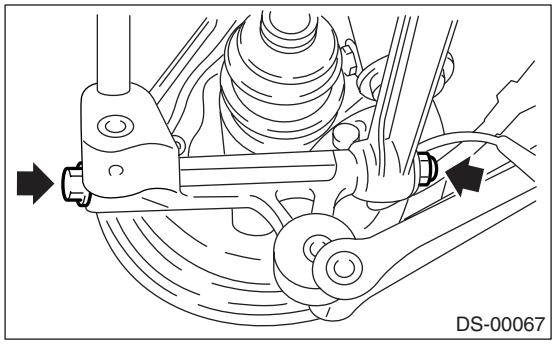
5) Disconnect the stabilizer link.



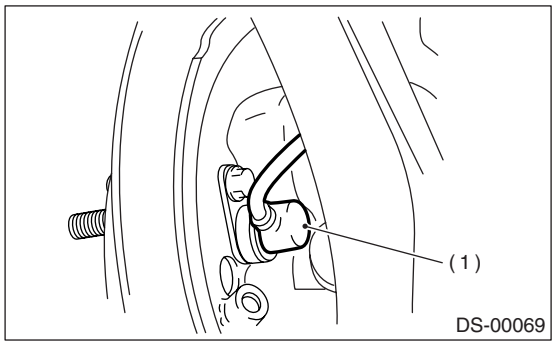
6) Remove the bolt which secures the trailing link to housing.



7) Remove the bolts which secure the front lateral link and rear lateral link to housing.



8) Remove the rear ABS wheel speed sensor from back plate.

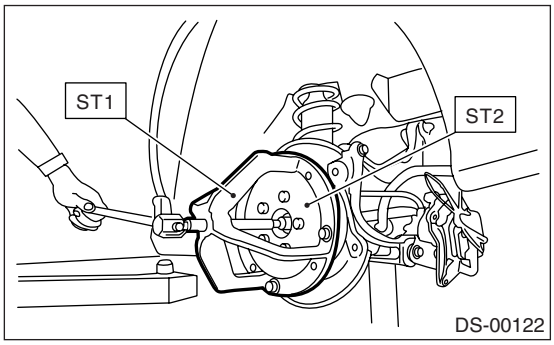


(1) ABS wheel speed sensor

9) Remove the rear drive shaft from rear axle. If it is hard to remove, remove the brake disk rotor using the ST1 and ST2.

ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

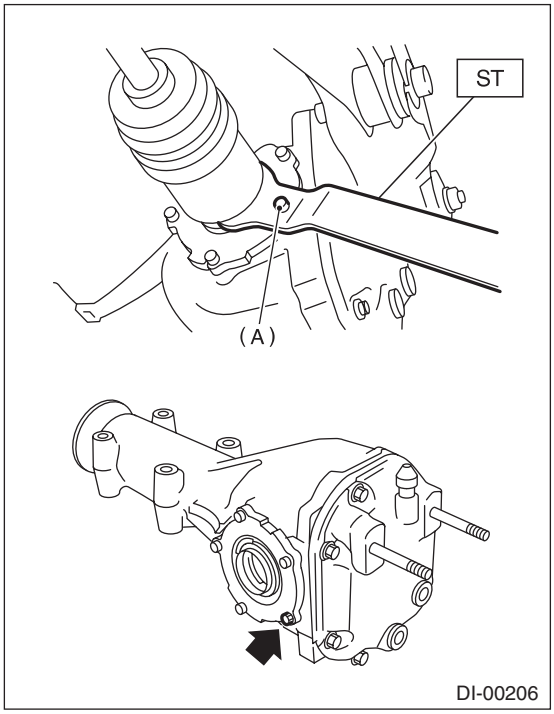
CAUTION:
- **Do not hammer the drive shaft when removing.**
- **Do not damage the oil seal and tone wheel.**



10) Remove the rear drive shaft from rear differential using the ST.

ST	208099PA100	DRIVE SHAFT REMOVER

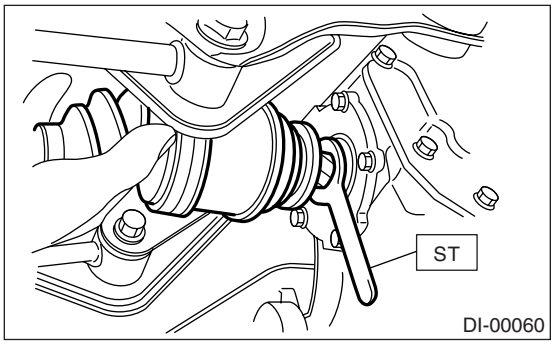
NOTE:
Fit the ST to the bolt (A) as shown in the figure to avoid damage on the side bearing retainer.



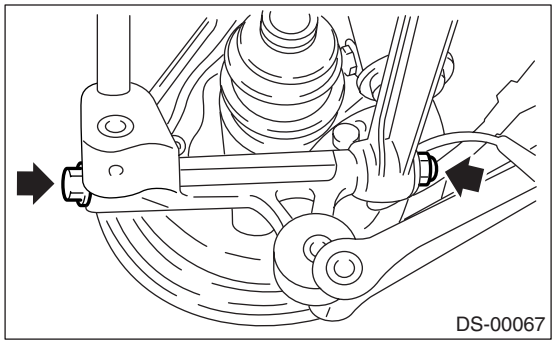
(A) Bolt

B: INSTALLATION

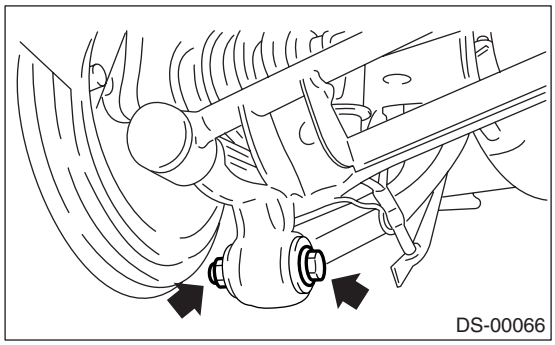
1) Insert the rear drive shaft into rear axle.
2) Temporarily tighten the axle nut.
3) Install the rear drive shaft to rear differential using the ST.
ST 28099PA090 OIL SEAL PROTECTOR



4) Temporarily tighten the front lateral link and rear lateral link to housing using a new self-locking nuts.

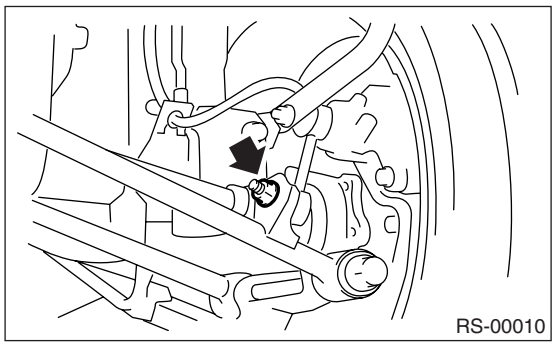


5) Temporarily tighten the trailing link to housing using a new self-locking nut.



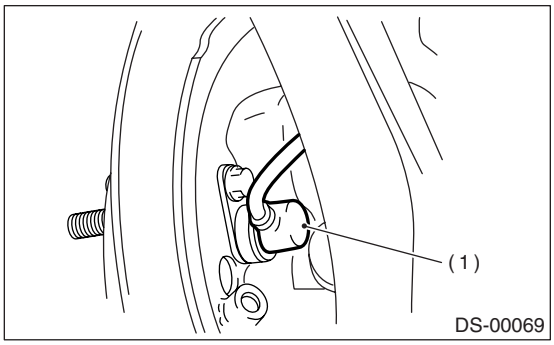
6) Install the stabilizer link.

Tightening torque:
Except STi model
30 N·m (3.1 kgf-m, 22 ft-lb)
STi model
45 N·m (4.6 kgf-m, 33 ft-lb)



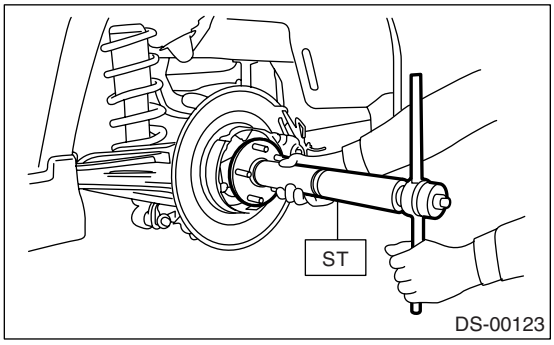
7) Install the ABS wheel speed sensor.

Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)



(1) ABS wheel speed sensor

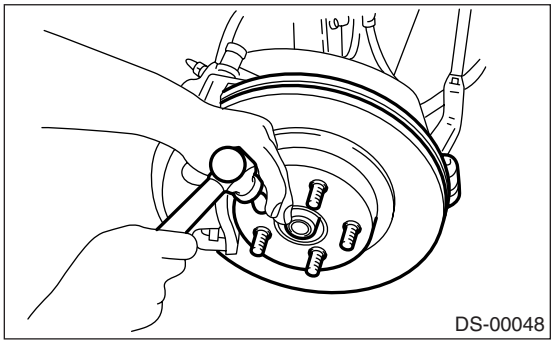
8) Using the ST1 and ST2, pull the rear drive shaft into place.
ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER



9) Tighten a new axle nut to the specified torque with parking brake applied.

Tightening torque:
190 N·m (19.4 kgf-m, 140 ft-lb)

10) Lock the axle nut.



11) Install the wheel.

Tightening torque:
88 N·m (9.0 kgf-m, 65 ft-lb)

12) Make the tires contact the ground fully.

CAUTION:
Make the tires contact the ground fully and the vehicle be in curb weight whenever carrying out the tightening of bush portions.

13) Tighten the installation bolt of rear housing assembly and lateral link assembly.

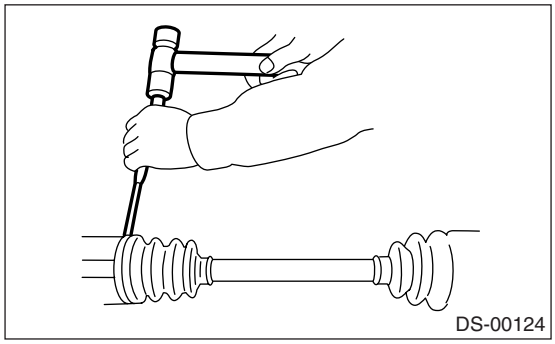
Tightening torque:
140 N·m (14.3 kgf-m, 103 ft-lb)

14) Tighten the installation bolt of rear housing assembly and trailing link assembly.

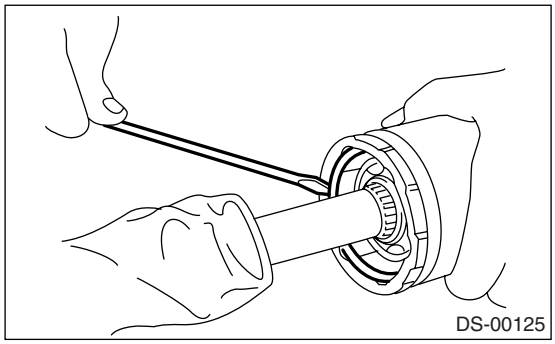
Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

C: DISASSEMBLY

1) Straighten the bent claw of larger end of DOJ boot.
2) Loosen the band by means of screwdriver or pliers with care of not damaging boot.



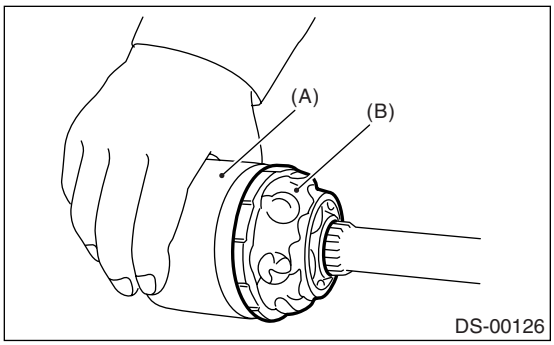
3) Remove the boot band on the small end of DOJ boot in the same manner.
4) Remove the larger end of DOJ boot from DOJ outer race.
5) Pry and remove the round circlip located at neck of DOJ outer race with a screwdriver.



6) Take out the DOJ outer race from shaft assembly.
7) Wipe off the grease, and then take out the balls.

NOTE:
• The grease is a special grease (grease for constant velocity joint). Do not confuse with other greases.

• Disassemble with exercising care not to lose balls (6 pcs).



(A) Outer race
(B) Grease

8) To remove the cage from inner race, turn the cage by a half pitch to the track groove of inner race, and shift the cage.
9) Remove the snap ring, which fixes the inner race to shaft, by using pliers.
10) Take out the DOJ inner race.
11) Take off the DOJ cage from shaft and remove the DOJ boot.
12) Wrap the shaft splines with vinyl tape.
13) Remove the BJ boot in the same procedure as DOJ boot.

NOTE:
Further disassembly of axle is impossible because the BJ cannot be disassembled.

D: ASSEMBLY

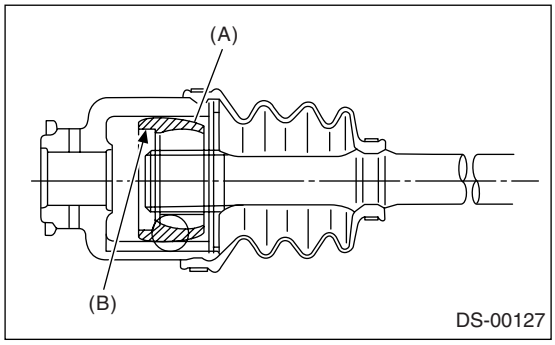
NOTE:
Use specified grease.

BJ side:
Except STi model:
Molylex No. 2 (Part No. 723223010)
STi model:
NTG2218-M (Part No. 28395FE010)

DOJ side:
VU-3A702 (Yellow) (Part No. 23223GA050)

1) Install the BJ boot in specified position, and fill it with 60 to 70 g (2.12 to 2.47 oz) of specified grease.
2) Place the DOJ boot at the center of shaft.
3) Wrap the shaft splines with vinyl tape.
4) Insert the DOJ cage onto shaft.

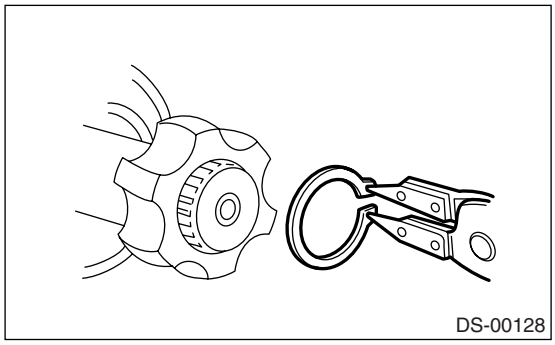
NOTE:
Insert the cage with cut-out portion facing the shaft end, since the cage has an orientation.



(A) Cage
(B) Cut-out portion

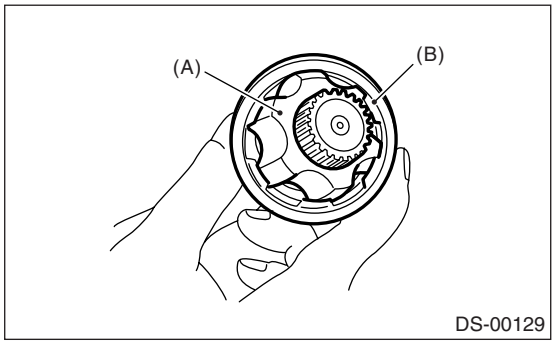
5) Install the DOJ inner race on shaft, and fit the snap ring with pliers.

NOTE:
Confirm the snap ring is completely fitted in shaft groove.



6) Install the cage, which was previously fitted, to inner race fixed upon shaft.

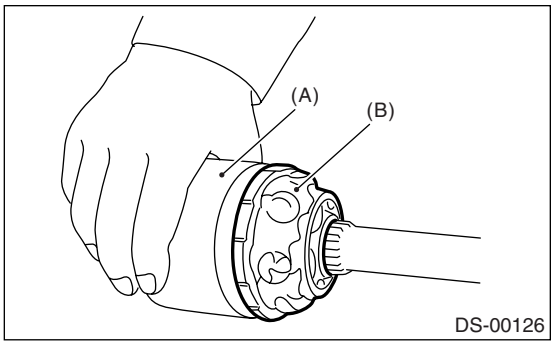
NOTE:
Fit the cage with protruded part aligned with the track on inner race, and then turn by a half pitch.



(A) Inner race
(B) Cage

7) Fill 80 to 90 g (2.82 to 3.17 oz) of specified grease into the interior of DOJ outer race.

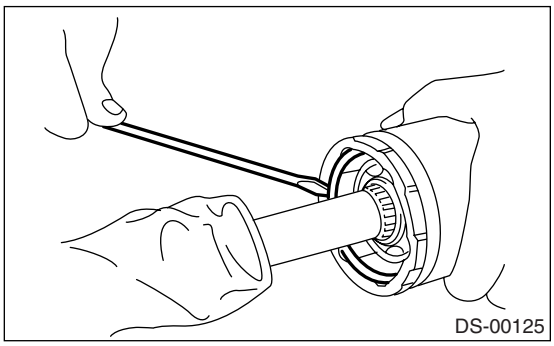
8) Apply a coat of specified grease to cage pocket and six balls.
9) Insert six balls into cage pocket.
10) Align the outer race track and ball positions and place in the part where shaft, inner race, cage and balls are previously installed, and then fit the outer race.



(A) Outer race
(B) Grease

11) Install the circlip in the groove on DOJ outer race.

NOTE:
• Assure the balls, cage and inner race are completely fitted in the outer race of DOJ.
• Exercise care not to place the matched position of circlip in ball groove of outer race.
• Pull the shaft lightly and assure that the circlip is completely fitted in groove.



12) Apply an even coat of the specified grease [20 to 30 g (0.71 to 1.06 oz)] to the entire inner surface of boot. Also apply grease to shaft.
13) Install the DOJ boot taking care not to twist it.

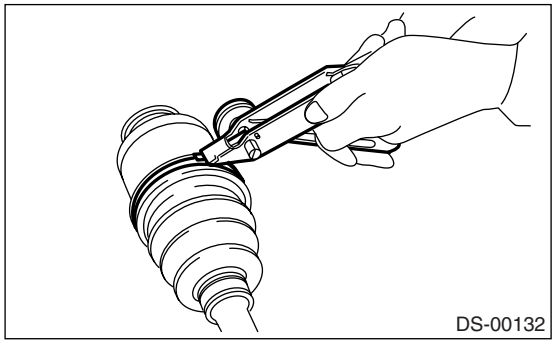
NOTE:
• Inside of the larger end of DOJ boot and boot groove shall be cleaned so as to be free from grease and other substances.
• When installing the DOJ boot, position the outer race of DOJ at center of its travel.

14) Put a new band through the clip and wind twice in alignment with band groove of boot.

NOTE:
When tightening the boot, exercise care so that air within boot is appropriate.

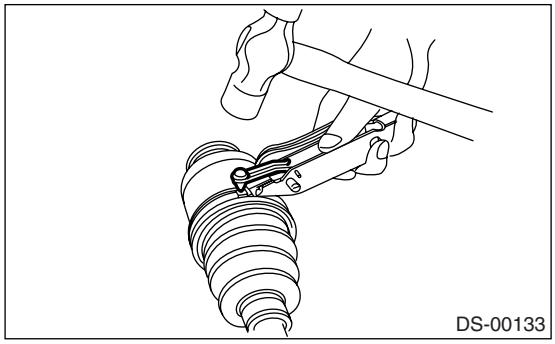
15) Tighten the band using the ST.
ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tighten the band until it cannot be moved by hand.



16) Tap on the clip with the punch provided at the end of ST.
ST 925091000 BAND TIGHTENING TOOL

NOTE:
Tap to an extent that the boot underneath is not damaged.



17) Cut off the band with an allowance of about 10 mm (0.39 in) left from clip, and bend this allowance over the clip.

NOTE:
Be careful so that the end of band is in close contact with clip.

18) Fix up the boot on BJ in the same manner.
19) Extend and retract the DOJ to provide equal grease coating.

E: INSPECTION

Check the removed parts for damage, wear, corrosion, etc. If faulty, repair or replace.
1) DOJ (Double Offset Joint)
Check seizure, corrosion, damage, wear and excessive play.
2) Shaft
Check excessive bending, twisting, damage and wear.

3) BJ (Bell Joint)
Check seizure, corrosion, damage and excessive play.
4) Boot
Check for wear, warping, breakage or scratches.
5) Grease
Check for discoloration or fluidity.

7. General Diagnostic Table

A: INSPECTION

NOTE:
Vibration while cruising may be caused by an unbalanced tire, improper tire inflation pressure, improper wheel alignment, etc.

Symptom	Possible cause	Remedy
1. Vibration of propeller shaft NOTE: Vibration is caused by propeller shaft during operation and is transferred to vehicle body. Generally vibration increase in proportion to vehicle speed.	(1) Worn or damaged universal joint.	Replace.
	(2) Unbalanced propeller shaft due to bend or dent.	Replace.
	(3) Loose installation of propeller shaft.	Retighten.
	(4) Worn or damaged center bearing and damaged center mounting rubber.	Replace.
2. Tapping when starting and noise while cruising, caused by propeller shaft	(1) Worn or damaged universal joint.	Replace.
	(2) Worn spline of sleeve yoke.	Replace.
	(3) Loose installation of propeller shaft.	Retighten.
	(4) Loose installation of joint.	Replace.
	(5) Worn or damaged center bearing and damaged center mounting rubber.	Replace.

ABS

		Page
1.	General Description	2
2.	ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)	6
3.	ABS Sequence Control	9
4.	Front ABS Wheel Speed Sensor	12
5.	Rear ABS Wheel Speed Sensor	15
6.	Front Tone Wheel	18
7.	Rear Tone Wheel	19
8.	G Sensor	20
9.	Lateral G Sensor	22

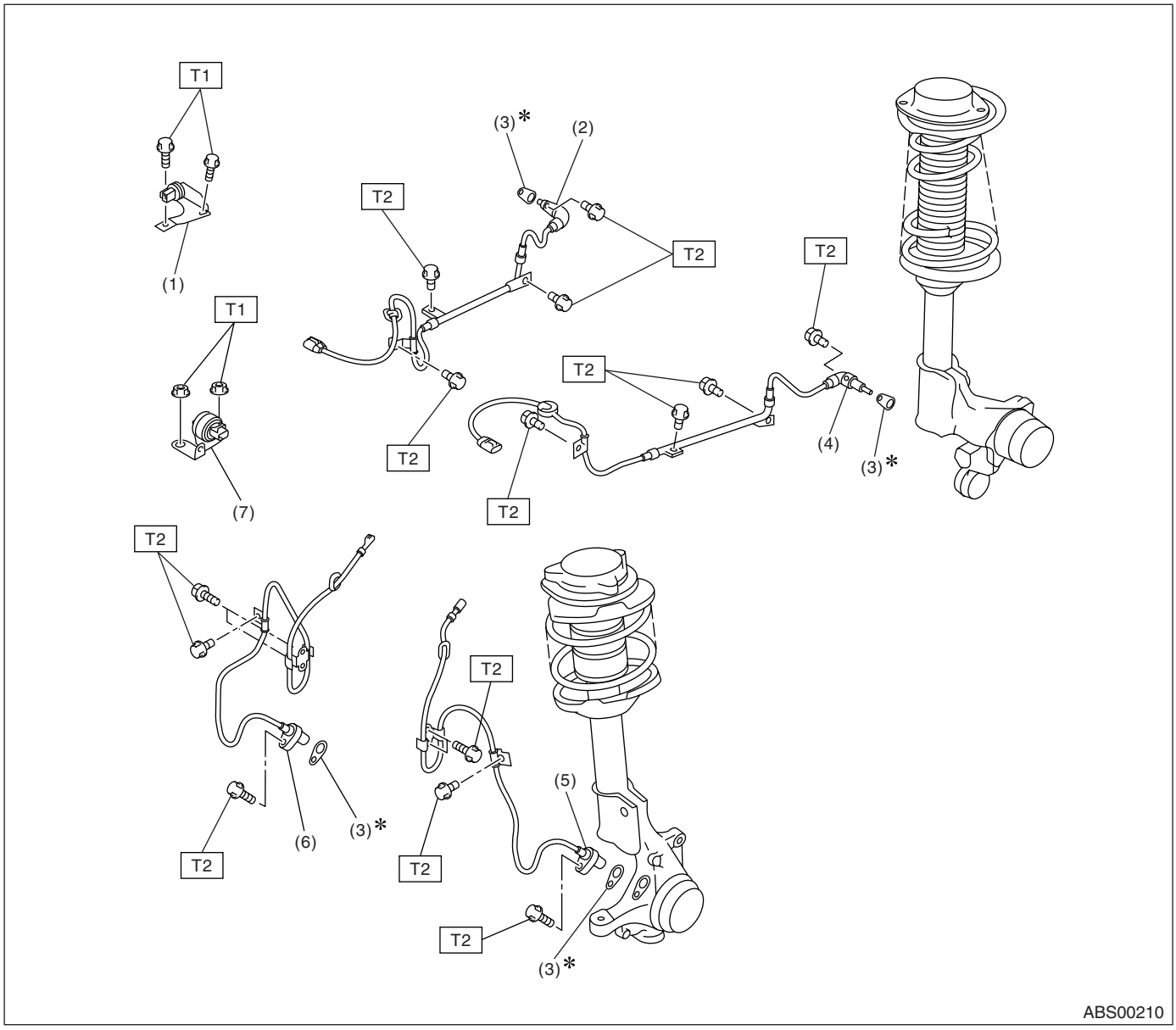
1. General Description

A: SPECIFICATIONS

Item				Specification or remarks
ABS wheel speed sensor	ABS wheel speed sensor gap		Front	0.3 — 0.8 mm (0.012 — 0.031 in)
			Rear	0.7 — 1.2 mm (0.028 — 0.047 in)
	ABS wheel speed sensor resistance		Front	1.25±0.25 kΩ
			Rear	1.15±0.115 kΩ
	Marks of harness	Front	RH	White
			LH	Yellow
		Rear	RH	Light blue
			LH	Brown
G sensor	G sensor voltage			2.3±0.2 V
Lateral G sensor (STi model)	Lateral G sensor voltage			2.5±0.2 V
ABSCM&H/U marks	AT model			CU
	MT model (Except Sedan STi model)			CV
	MT model (Sedan STi model)			CY

B: COMPONENT

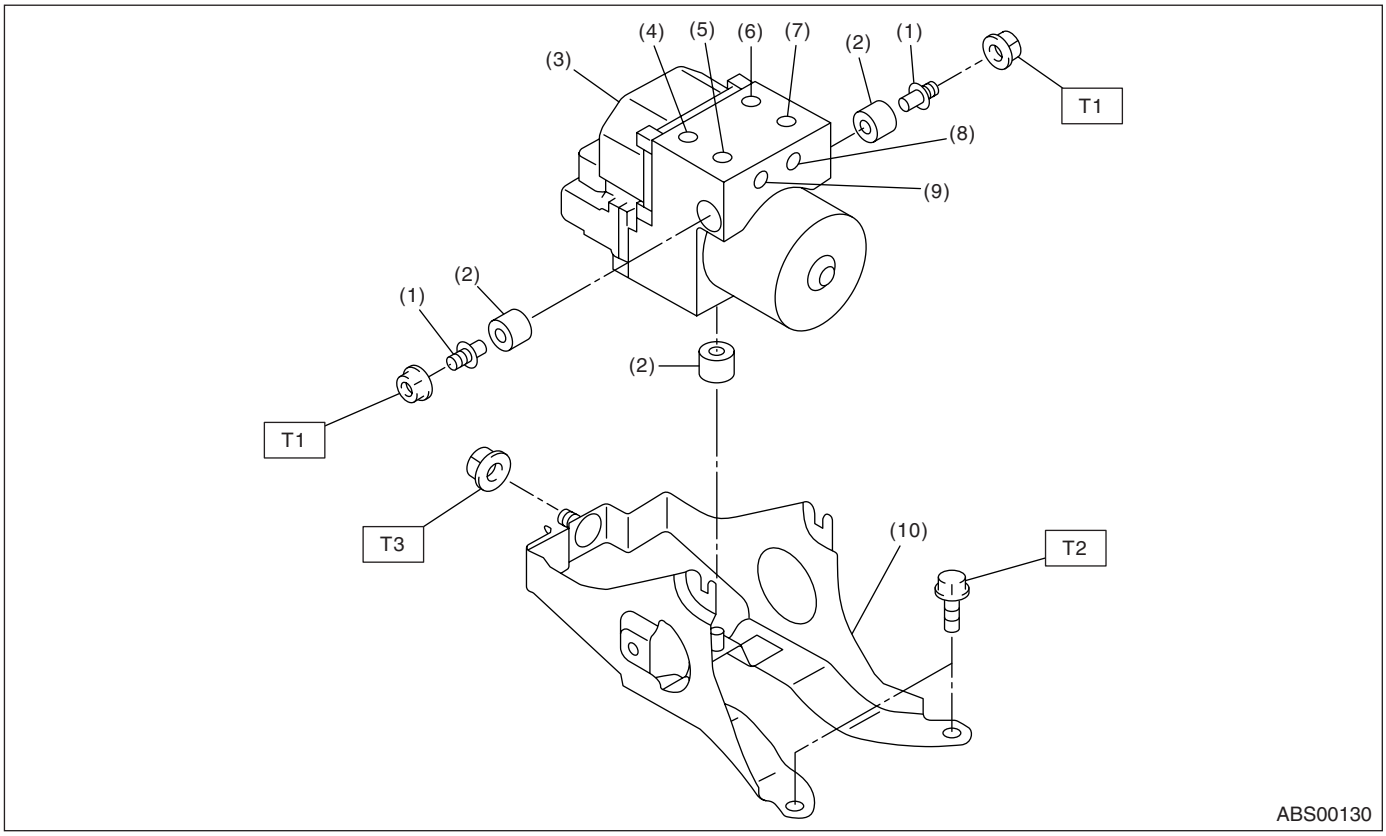
1. SENSOR



(1) G sensor
(2) Rear ABS wheel speed sensor RH
(3) Adjusting spacer
(4) Rear ABS wheel speed sensor LH
(5) Front ABS wheel speed sensor LH
(6) Front ABS wheel speed sensor RH
(7) Lateral G sensor (STi model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 18 (1.8, 13.0)
T2: 33 (3.3, 24)

2. ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)



(1) Stud bolt
(2) Damper
(3) ABS control module and hydraulic control unit (ABSCM&H/U)
(4) Front-LH outlet
(5) Secondary inlet
(6) Front-RH outlet
(7) Primary inlet
(8) Rear-LH outlet
(9) Rear-RH outlet
(10) Bracket

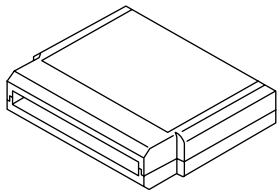
Tightening torque: N·m (kgf-m, ft-lb)
T1: 18 (1.8, 13.0)
T2: 33 (3.3, 24)
T3: 38 (3.8, 27.5)

C: CAUTION

- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and ampere.
Pressure gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring sensor.

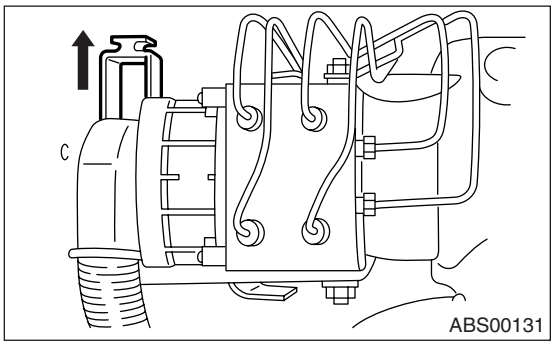
2. ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the air intake duct from engine compartment to facilitate removal of ABSCM&H/U.
3) Use an air gun to get rid of water around the ABSCM&H/U.

NOTE:
Contact will be insufficient if the terminal gets wet.

4) Remove the ground cable from ABSCM&H/U.
5) Pull off the lock of ABSCM&H/U connector to remove it.



6) Disconnect the connector from ABSCM&H/U.

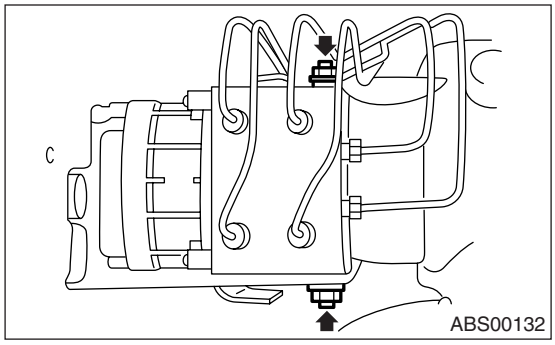
CAUTION:
Do not pull the harness when disconnecting the connector.

7) Unlock the cable clip.
8) Disconnect the brake pipes from ABSCM&H/U.
9) Wrap the brake pipes with vinyl bag to avoid spilling brake fluid on vehicle body.

CAUTION:
Brake fluid spilt on the vehicle body will harm the painted surface; wash away quickly with water if spilt.

10) Remove the ABSCM&H/U from engine compartment.

CAUTION:
• ABSCM&H/U cannot be disassembled. Do not attempt to loosen bolts and nuts.
• Do not drop or bump the ABSCM&H/U.
• Do not turn the ABSCM&H/U upside down or place it on its side.
• Be careful to prevent foreign particles from getting into ABSCM&H/U.
• Do not let water get into the connector.



B: INSTALLATION

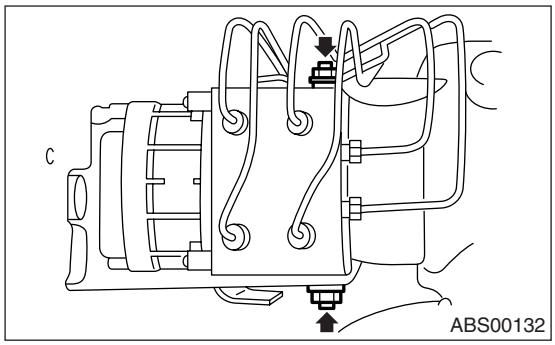
1) Install the ABSCM&H/U bracket.

Tightening torque:
33 N·m (3.3 kgf-m, 24 ft-lb)

2) Apply a coat of grease (Nippeco LT or GB) to the bracket attaching bolt.
3) Align the width across flat portion of ABSCM& H/U side stud bolt with the bolt hole groove on bracket, and then install the ABSCM&H/U.

NOTE:
Confirm the specification mark of ABSCM&H/U.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



4) Connect the brake pipes to their correct ABSCM&H/U connections.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

5) Using the cable clip, secure the ABSCM&H/U harness to bracket.
6) Connect the connector to ABSCM&H/U.

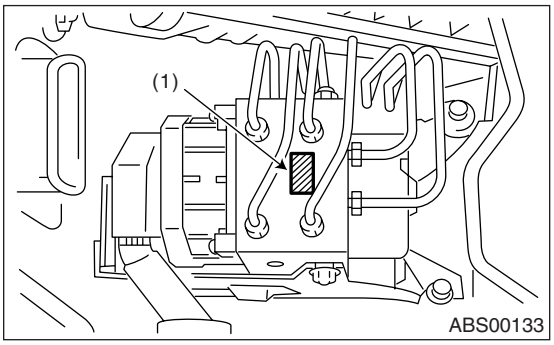
NOTE:
• Be sure to remove all foreign matter from inside of the connector before connecting.
• Ensure the ABSCM&H/U connector is securely locked.

7) Connect the ground cable to ABSCM&H/U, and then apply grease.
8) Install the air intake duct.
9) Bleed air from the brake system.

C: INSPECTION

1) Check the connected and fixed condition of connector.
2) Check specifications of the mark with ABSCM&H/U.

Mark	Model
CU	AT model
CV	MT model (Except Sedan STi model)
CY	Sedan STi model



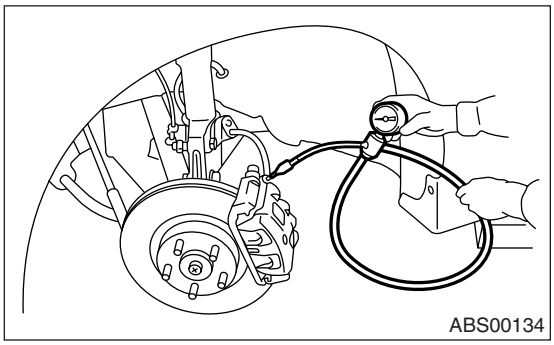
(1) Mark

1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

1) Lift-up the vehicle and remove the wheels.
2) Disconnect the air bleeder screws from the FL and FR caliper bodies.
3) Connect two pressure gauges to the FL and FR caliper bodies.

CAUTION:
• Pressure gauges used exclusively for brake fluid must be used.
• Do not employ pressure gauge previously used for transmission since the piston seal is expanded which may lead to malfunction of the brake.

NOTE:
Wrap sealing tape around the pressure gauge.



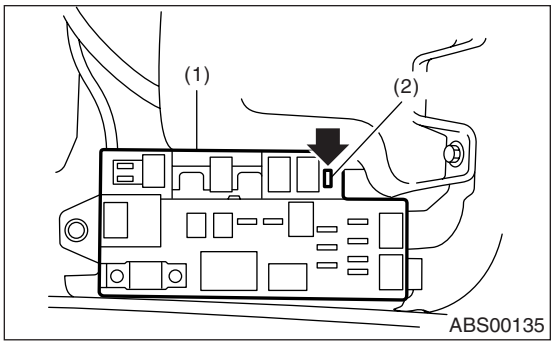
4) Bleed air from the pressure gauges.
5) Perform the ABS sequence control. <Ref. to ABS-9, ABS Sequence Control.>
6) When the hydraulic unit begins to work, and first the FL side performs decompression, holding, and compression, and then the FR side performs decompression, holding, and compression.
7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the standard values. Also check if any irregular brake pedal tightness is felt.

	Front wheel	Rear wheel
Initial value	3,500 kPa (36 kgf/cm^2, 511 psi)	3,500 kPa (36 kgf/cm^2, 511 psi)
Decompressed	500 kPa (5 kgf/cm^2, 73 psi) or less	500 kPa (5 kgf/cm^2, 73 psi) or less
Compressed	3,500 kPa (36 kgf/cm^2, 511 psi) or more	3,500 kPa (36 kgf/cm^2, 511 psi) or more

8) Remove the pressure gauges from the FL and FR caliper bodies.
9) Remove the air bleeder screws from the RL and RR caliper bodies.
10) Connect the air bleeder screws to the FL and FR caliper bodies.
11) Connect two pressure gauges to the RL and RR caliper bodies.
12) Bleed air from the pressure gauges and the FL and FR caliper bodies.
13) Perform the ABS sequence control.
<Ref. to ABS-9, ABS Sequence Control.>
14) When the hydraulic unit begins to work, at first the RR side performs decompression, holding, and compression, and then the RL side performs decompression, holding, and compression.
15) Read values indicated on the pressure gauges and check if they meet the standard value.
16) After checking, remove the pressure gauges from caliper bodies.
17) Connect the air bleeder screws to RL and RR caliper bodies.
18) Bleed air from the brake line.

2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER

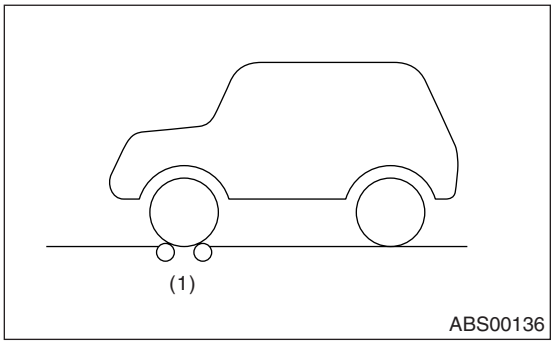
1) In the case of AWD AT models, install a spare fuse with the FWD connector in the main fuse box to simulate FWD models.

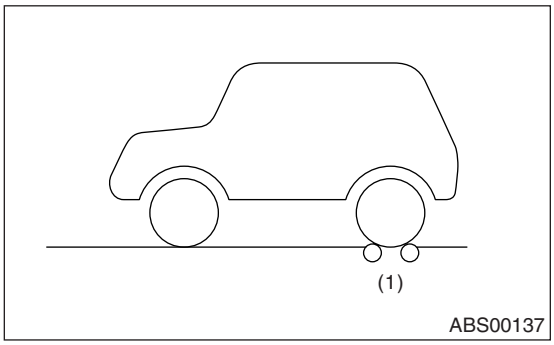


(1) Main fuse box
(2) FWD connector

NOTE:
AWD circuit of MT models can not be disabled because viscous coupling is used inside center differential.

2) Prepare for operating the ABS sequence control. <Ref. to ABS-9, ABS Sequence Control.>
3) Set the front wheels or rear wheels on the brake tester and set the select lever's position at "N" range.





(1) Brake tester

4) Operate the brake tester.
5) Perform the ABS sequence control. <Ref. to ABS-9, ABS Sequence Control.>
6) Hydraulic unit begins to work; and check the following working sequence.
(1) The FL wheel performs decompression, holding, and compression in sequence, and subsequently the FR wheel repeats the cycle.
(2) The RR wheel performs decompression, holding, and compression in sequence, and subsequently the RL wheel repeats the cycle.
7) Read values indicated on the brake tester and check if the fluctuation of values, when decompressed and compressed, meets the standard values.

	Front wheel	Rear wheel
Initial value	1,000 N (102 kgf, 225 lb)	1,000 N (102 kgf, 225 lb)
Decompressed	500 N (51 kgf, 112 lb) or less	500 N (51 kgf, 112 lb) or less
Compressed	1,000 N (102 kgf, 225 lb) or more	1,000 N (102 kgf, 225 lb) or more

8) After checking, also check if any irregular brake pedal tightness is felt.

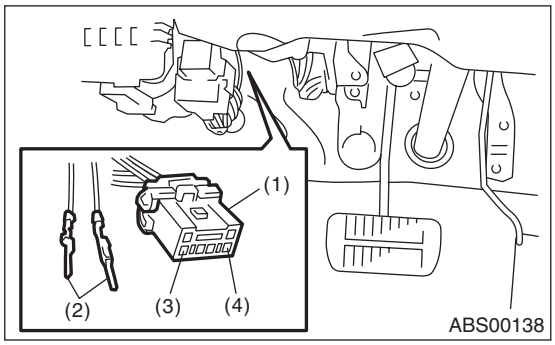
3. ABS Sequence Control

A: OPERATION

1) Under the ABS sequence control, after the hydraulic unit solenoid valve is driven, the operation of the hydraulic unit can be checked by means of the brake tester or pressure gauge.
2) ABS sequence control can be started by diagnosis connector or Subaru Select Monitor.

1. ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR

1) Turn the ignition switch to OFF.
2) Connect the diagnosis terminal to terminal No. 6 of the diagnosis connector beside driver's seat.



(1) Diagnosis connector
(2) Diagnosis terminals
(3) Terminal No. 3
(4) Terminal No. 6

3) Turn the ignition switch to ON.
4) Confirm that start code (code 11) is only displayed.
5) Turn the ignition switch to OFF.
6) Connect the diagnosis terminals to terminals No. 6 and No. 3 of diagnosis connector.
7) Set the speed of all wheels at 4 km/h (2 MPH) or less.
8) Turn the ignition switch to ON.
9) Within 0.5 seconds after the ABS warning light goes out, depress the brake pedal and hold it depressed.

NOTE:
Engine must not operate.

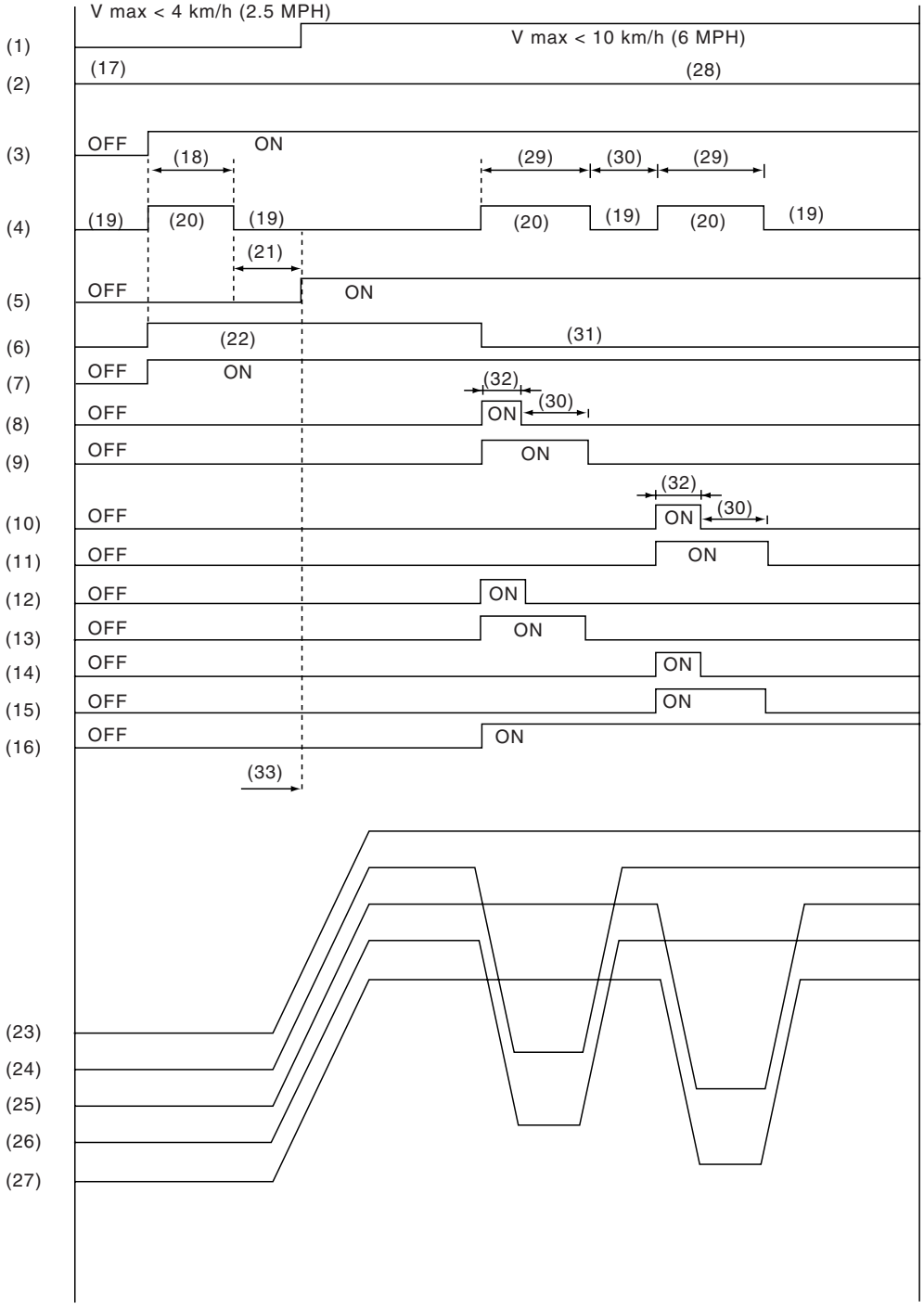
10) After completion of ABS sequence control, turn the ignition switch to OFF.

2. ABS SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

NOTE:
• In the event of any trouble, the sequence control may not be operative. In such a case, activate the sequence control, referring to "ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR". <Ref. to ABS-9, ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR, OPERATION, ABS Sequence Control.>
• When the diagnosis terminal is connected to the diagnosis connector, the sequence control will not operate.

1) Connect the Subaru Select Monitor to data link connector under driver's seat instrument panel lower cover.
2) Turn the ignition switch to ON.
3) Turn the Subaru Select Monitor switch to ON.
4) Put the Subaru Select Monitor to "BRAKE CONTROL" mode.
5) When "Function check sequence" is selected, 'ABS sequence control' will start.
6) When the message "Press Brake Pedal Firmly" is displayed, perform the followings.
   (1) When using the brake tester, depress the brake pedal with braking force of 1,000 N (102 kgf, 225 lb).
   (2) When using the pressure gauge, depress the brake pedal so as to make the pressure gauge indicate 3,500 kPa (36 kg/cm^2 , 511 psi).
7) When the message "Press YES" is displayed, press the YES key.
8) The braking system in operation is displayed on Subaru Select Monitor.

3. CONDITIONS FOR ABS SEQUENCE CONTROL



ABS00014

(1) Speed of wheels
(2) Terminal DK and DL
(3) Ignition key
(4) ABS warning light
(5) Stop light switch
(6) Signal to Transmission control module (TCM)
(7) Valve relay
(8) FL outlet valve
(9) FL inlet valve
(10) FR outlet valve
(11) FR inlet valve
(12) RR outlet valve
(13) RR inlet valve
(14) RL outlet valve
(15) RL inlet valve
(16) Pump motor
(17) Connection to ground terminal
(18) 1.5 seconds
(19) Not illuminated
(20) Illuminated
(21) Within 0.5 second
(22) ABS not working
(23) Pressure of master cylinder
(24) Pressure of FL wheel cylinder
(25) Pressure of FR wheel cylinder
(26) Pressure of RR wheel cylinder
(27) Pressure of RL wheel cylinder
(28) Either HI or LO possible, if using Subaru Select Monitor
(29) 1.4 second
(30) 1.0 second
(31) ABS working
(32) 0.4 second
(33) Point A

NOTE:
When the Subaru Select Monitor is used, control operation starts at point A. The patterns from IGN key ON to the point A show that operation is started by diagnosis connector. (However, the brake light switch must be ON before point A.)

B: SPECIFICATION

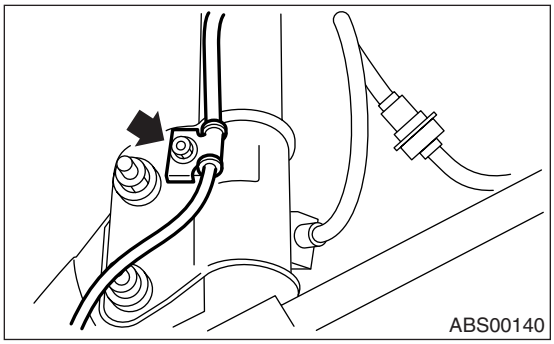
1. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal control mode.
1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
2) When terminal No. 3 or No. 6 are separated from diagnosis terminals. (When the Subaru Select Monitor is not used.)
3) When the brake pedal is released during sequence control and the braking lamp switch is set to off.
4) When the brake pedal is depressed after ignition key is turned to ON, and before ABS warning light goes out. (When the Subaru Select Monitor is not used.)
5) When the brake pedal is not depressed after ignition key is turned to ON, and within 0.5 seconds after ABS warning light goes out. (When the Subaru Select Monitor is not used.)
6) After completion of the sequence control.
7) When malfunction is detected. (When the Subaru Select Monitor is used.)

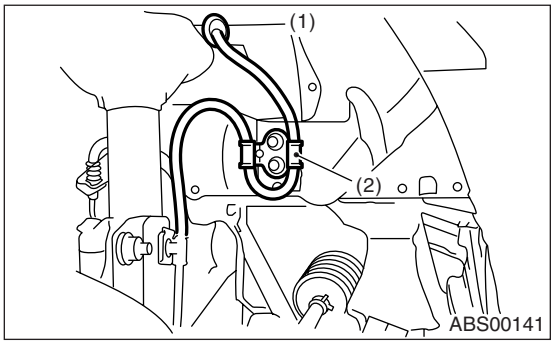
4. Front ABS Wheel Speed Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Disconnect the front ABS wheel speed sensor connector located next to the front strut mounting house in engine compartment. Pull the connector out from grommet hole to tire side.
3) Remove the bolts which secure the sensor harness to strut.



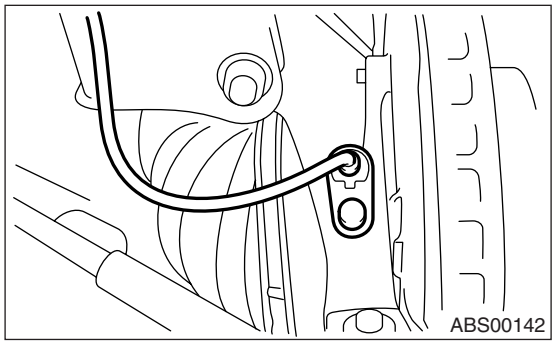
4) Remove the bolts which secure the sensor harness to body.



(1) To front ABS wheel speed sensor connector
(2) Bracket

5) Remove the bolts which secure the front ABS wheel speed sensor to housing, and remove the front ABS wheel speed sensor.

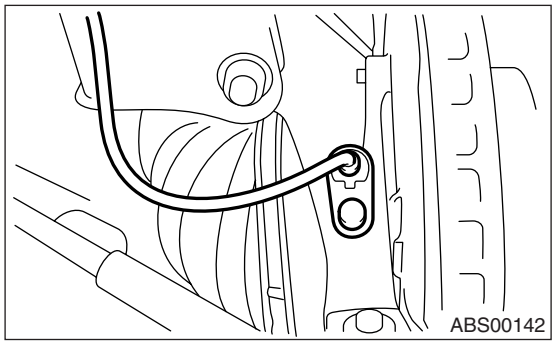
CAUTION:
• Be careful not to damage the pole piece located at tip of the sensor and teeth faces during removal.
• Do not pull the sensor harness during removal.



B: INSTALLATION

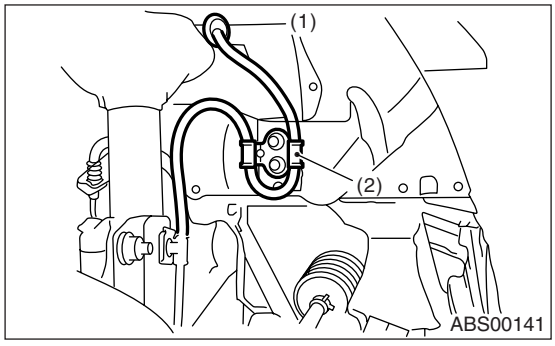
1) Temporarily install the front ABS wheel speed sensor on housing.

CAUTION:
Be careful not to strike the ABS wheel speed sensor's pole piece against tone wheel and adjacent metal parts during installation.



2) Install the front ABS wheel speed sensor on strut and wheel apron bracket.

Tightening torque:
33 N·m (3.3 kgf-m, 24 ft-lb)



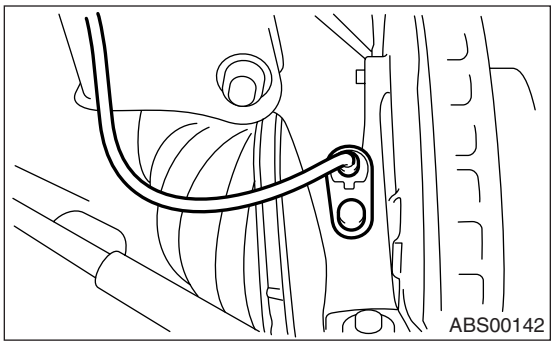
(1) To front ABS wheel speed sensor connector
(2) Bracket

3) Check the ABS wheel speed sensor gap. <Ref. to ABS-13, SENSOR GAP, INSPECTION, Front ABS Wheel Speed Sensor.> After standard clearance is obtained, tighten the ABS wheel speed sensor on housing to specified torque.

If the clearance is outside specification, readjust using spacer (Part No. 26755AA000).

ABS wheel speed sensor standard clearance:
0.3 — 0.8 mm (0.012 — 0.031 in)

Tightening torque:
33 N·m (3.3 kgf-m, 24 ft-lb)



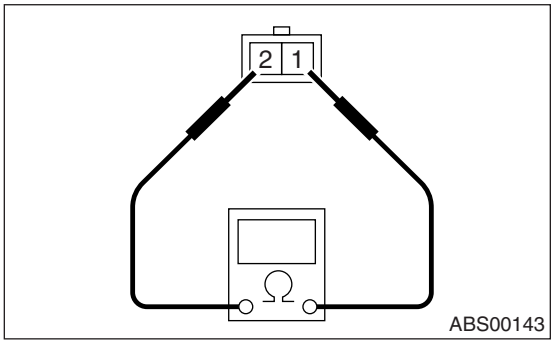
NOTE:
• Check the marks on the harness and make sure that no kink exists. (RH: White, LH: Yellow)
• Make sure the harness is not pulled and does not contact to suspension or body when steering wheel is turned.

4) After confirmation of the ABS wheel speed sensor clearance, connect the connector to ABS wheel speed sensor.
5) Connect the battery ground cable to battery.

C: INSPECTION

1. ABS WHEEL SPEED SENSOR

1) Check the pole piece of ABS wheel speed sensor for foreign particles or damage. If necessary, clean the pole piece or replace ABS wheel speed sensor.
2) Measure the ABS wheel speed sensor resistance.
If the resistance is outside standard value, replace the ABS wheel speed sensor with a new one.

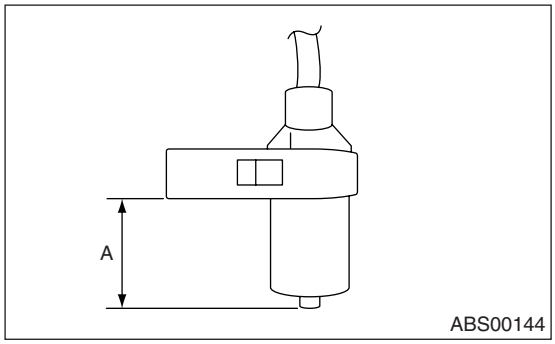


Terminal No.	Standard
1 and 2	1.25±0.25 kΩ

NOTE:
Check the ABS wheel speed sensor cable for discontinuity. If necessary, replace with a new one.

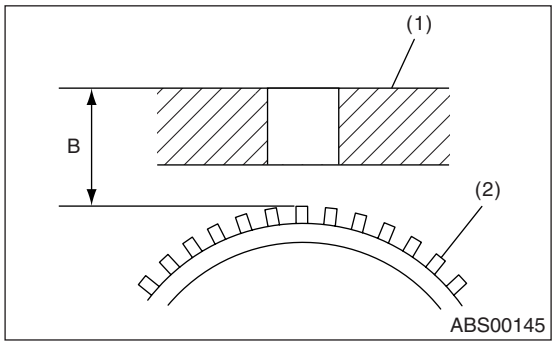
2. SENSOR GAP

1) Measure the distance “A” between ABS wheel speed sensor surface and sensor pole face.



2) Measure the distance “B” between surface where the front axle housing meets the ABS wheel speed sensor, and the tone wheel.

NOTE:
Measure so that the gauge touches the tone wheel teeth top.



(1) Axle housing
(2) Tone wheel

3) Find the gap between the ABS wheel speed sensor pole face and the surface of the tone wheel teeth by putting the measured values in the formula below and calculating.
ABS wheel speed sensor clearance = B − A

ABS wheel speed sensor standard clearance:
0.3 — 0.8 mm (0.012 — 0.031 in)

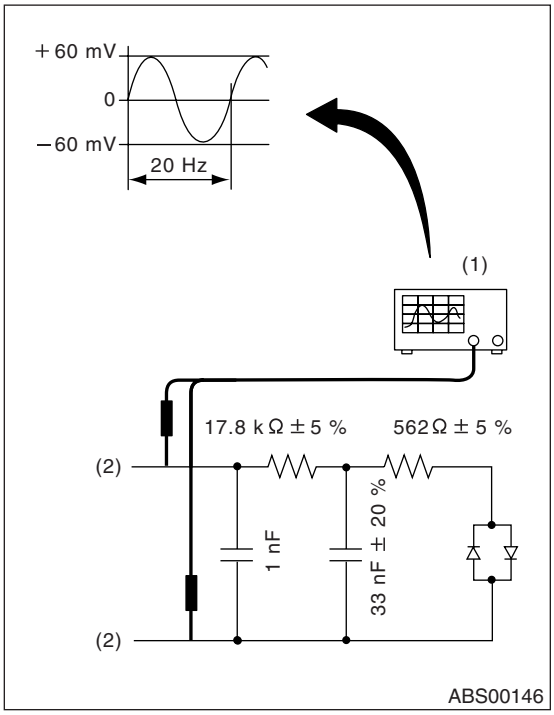
NOTE:
If the clearance is out of specification, readjust using spacer (Part No. 26755AA000).

3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install the resistor and condenser, then rotate the wheel about 2.75 km/h (2 MPH) or equivalent.

Output voltage specification:
0.12 to 1 V (at 20 Hz)

NOTE:
Regarding terminal No., please refer to item 1. ABS WHEEL SPEED SENSOR. <Ref. to ABS-13, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>



(1) Oscilloscope
(2) Terminal

D: ADJUSTMENT

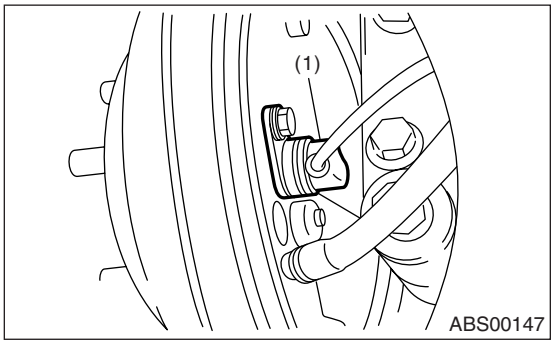
Adjust the gap using spacer (Part No. 26755A000).

5. Rear ABS Wheel Speed Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle.
3) Remove the rear seat and disconnect the rear ABS wheel speed sensor connector. Pull the connector out from grommet hole to under floor.
4) Remove the rear sensor harness bracket from the rear trailing link and bracket.
5) Remove the rear ABS wheel speed sensor from back plate.

CAUTION:
• Be careful not to damage the pole piece located at tip of the sensor and teeth faces during removal.
• Do not pull the sensor harness during removal.



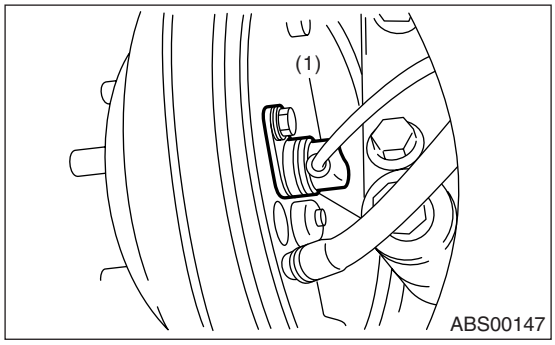
(1) Rear ABS wheel speed sensor

6) Remove the rear tone wheel while removing the hub from housing and hub assembly. <Ref. to DS-22, REMOVAL, Rear Axle.>

B: INSTALLATION

1) Install the rear tone wheel on hub, then rear housing on hub. <Ref. to DS-25, ASSEMBLY, Rear Axle.>
2) Temporarily install the rear ABS wheel speed sensor on back plate.

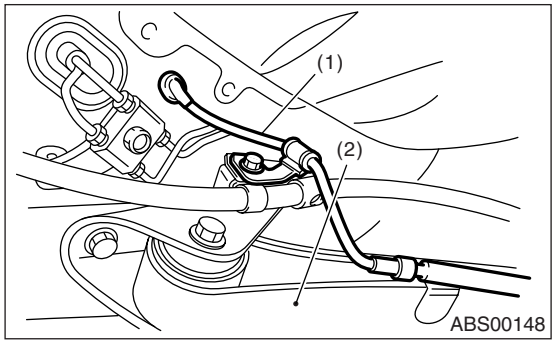
CAUTION:
Be careful not to strike the ABS wheel speed sensor's pole piece against tone wheel and adjacent metal parts during installation.



(1) Rear ABS wheel speed sensor

3) Install the rear drive shaft to rear housing and rear differential spindle. <Ref. to DS-23, INSTALLATION, Rear Axle.>
4) Install the rear sensor harness on rear trailing link.

Tightening torque:
33 N·m (3.3 kgf-m, 24 ft-lb)



(1) Rear sensor harness
(2) Trailing link

5) Check the ABS wheel speed sensor gap. <Ref. to ABS-16, SENSOR GAP, INSPECTION, Rear ABS Wheel Speed Sensor.> After standard clearance is obtained, tighten the ABS wheel speed sensor on back plate to specified torque.
If the clearance is outside specification, readjust using spacer (Part No. 26755AA000).

ABS wheel speed sensor standard clearance:
0.7 — 1.2 mm (0.028 — 0.047 in)

Tightening torque:
33 N·m (3.3 kgf-m, 24 ft-lb)

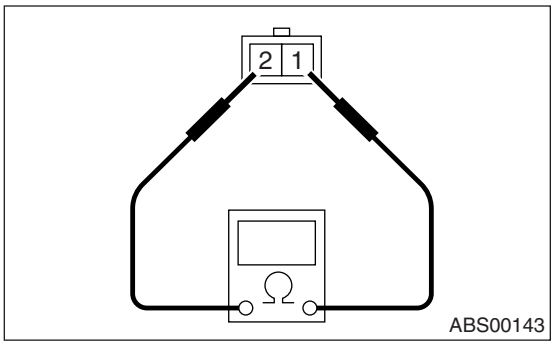
NOTE:
Check the marks on the harness and make sure no kink exists. (RH: Light blue, LH: Brown)

6) After confirmation of the ABS wheel speed sensor clearance, connect the connector to ABS wheel speed sensor.
7) Connect the battery ground cable to battery.

C: INSPECTION

1. ABS WHEEL SPEED SENSOR

1) Check the pole piece of ABS wheel speed sensor for foreign particles or damage. If necessary, clean the pole piece or replace ABS wheel speed sensor.
2) Measure the ABS wheel speed sensor resistance.
If resistance is out of standard value, replace the ABS wheel speed sensor with a new one.



Terminal No.	Standard
1 and 2	1.15±0.115 kΩ

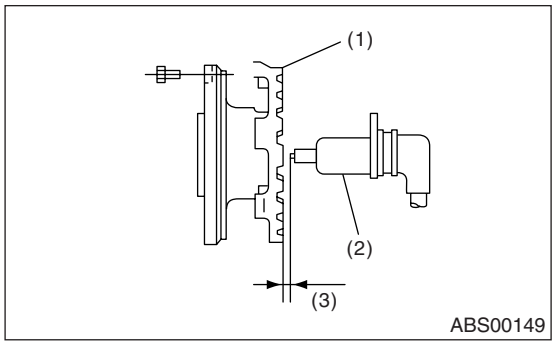
NOTE:
Check the ABS wheel speed sensor cable for discontinuity. If necessary, replace with a new one.

2. SENSOR GAP

1) Measure the clearance between tone wheel and ABS wheel speed sensor at whole periphery.

NOTE:
If clearance is narrow, adjust by using spacer (Part No. 26755AA000).
If clearance is wide, check the outputted voltage then replace the ABS wheel speed sensor or tone wheel if the outputted voltage is outside specification.

ABS wheel speed sensor clearance:
0.7 — 1.2 mm (0.028 — 0.047 in)



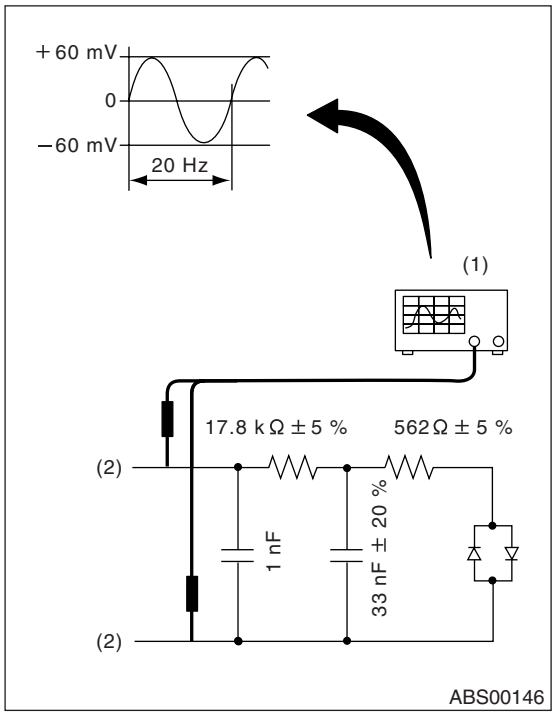
(1) Tone wheel
(2) ABS wheel speed sensor
(3) Sensor gap

3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install the resistor and condenser, then rotate the wheel about 2.75 km/h (2 MPH) or equivalent.

Output voltage specification:
0.12 — 1 V (at 20 Hz)

NOTE:
Regarding terminal No., please refer to item 1. ABS WHEEL SPEED SENSOR. <Ref. to ABS-16, ABS WHEEL SPEED SENSOR, INSPECTION, Rear ABS Wheel Speed Sensor.>



(1) Oscilloscope
(2) Terminal

D: ADJUSTMENT

Adjust the gap using spacer (Part No. 26755AA000).

6. Front Tone Wheel

A: REMOVAL

Refer to Front Drive Shaft, because front tone wheel is integrated with front drive shaft.
<Ref. to DS-27, REMOVAL, Front Drive Shaft.>

B: INSTALLATION

Refer to Front Drive Shaft, because front tone wheel is integrated with front drive shaft.
<Ref. to DS-27, INSTALLATION, Front Drive Shaft.>

C: INSPECTION

Visually check the tone wheel's teeth (44 pieces) for cracks or dents. If necessary, replace the tone wheel with a new one.

NOTE:
Replace the BJ assembly with a new one as a single unit if there are any defects found on tone wheel is unitized with BJ assembly of drive shaft.

7. Rear Tone Wheel

A: REMOVAL

Refer to Rear Axle, because the rear tone wheel is installed to rear hub.
<Ref. to DS-22, REMOVAL, Rear Axle.>

B: INSTALLATION

Refer to Rear Axle, because the rear tone wheel is installed to rear hub.
<Ref. to DS-23, INSTALLATION, Rear Axle.>

C: INSPECTION

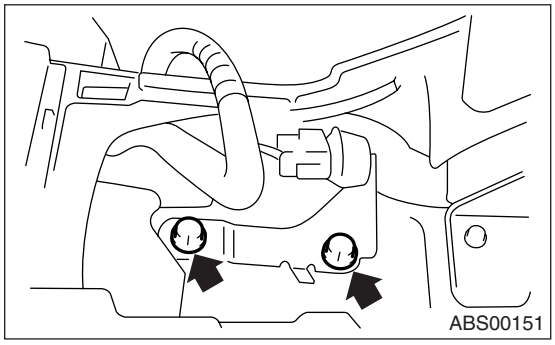
Visually check the tone wheel's teeth (44 pieces) for cracks or dents. If necessary, replace the tone wheel with a new one.

8. G Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the console cover. <Ref. to EI-44, REMOVAL, Console Box.>
3) Disconnect the connector from G sensor.
4) Remove the G sensor from body.

CAUTION:
- **Do not drop or bump the G sensor.**
- **G sensor and the bracket are integrated into one unit. Therefore, do not disassemble it.**



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Do not drop or bump the G sensor.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

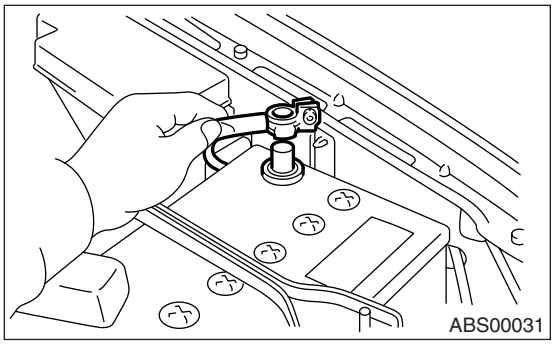
C: INSPECTION

Step		Check	Yes	No
1	**CHECK SUBARU SELECT MONITOR.**	Do you have a SUBARU SELECT MONITOR?	Go to step **5.**	Go to step **2.**
2	**CHECK G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the G sensor from vehicle. 3) Connect the connector to G sensor. 4) Turn the ignition switch to ON. 5) Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 2.3±0.2 V when G sensor is horizontal?	Go to step **3.**	Replace the G sensor.
3	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 3.9±0.2 V when G sensor is inclined forwards to 90°?	Go to step **4.**	Replace the G sensor.
4	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 0.7±0.2 V when G sensor is inclined backwards to 90°?	G sensor is normal.	Replace the G sensor.
5	**CHECK G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the Subaru Select Monitor into {BRAKE CONTROL} mode. 4) Set the display in the {Current Data Display & Save} mode. 5) Read the G sensor output voltage.	Is the indicated reading 2.3±0.2 V when the vehicle is in horizontal position?	Go to step **6.**	Replace the G sensor.
6	**CHECK G SENSOR.** 1) Remove the console box. 2) Remove the G sensor from vehicle. (Do not disconnect the connector.) 3) Read the Subaru Select Monitor display.	Is the indicated reading 3.9±0.2 V when G sensor is inclined forwards to 90°?	Go to step **7.**	Replace the G sensor.
7	**CHECK G SENSOR.** Read the Subaru Select Monitor display.	Is the indicated reading 0.7±0.2 V when G sensor is inclined backwards to 90°?	G sensor is normal.	Replace the G sensor.

9. Lateral G Sensor

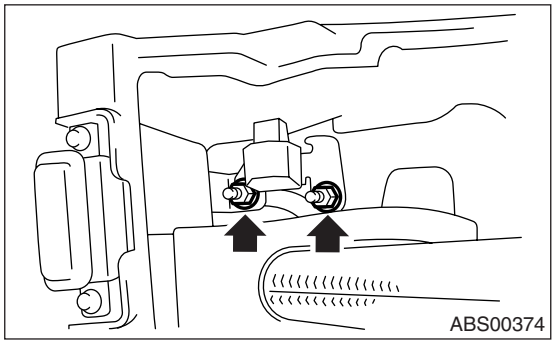
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the console cover. <Ref. to EI-44, REMOVAL, Console Box.>
3) Disconnect the connector from lateral G sensor.
4) Remove the lateral G sensor from vehicle.

CAUTION:
Do not drop or bump the lateral G sensor.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Do not drop or bump the lateral G sensor.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

C: INSPECTION

	Step	Check	Yes	No
1	**CHECK SUBARU SELECT MONITOR.**	Do you have a SUBARU SELECT MONITOR?	Go to step **5.**	Go to step **2.**
2	**CHECK LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the lateral G sensor from vehicle. 3) Connect the connector to lateral G sensor. 4) Turn the ignition switch to ON. 5) Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (−):***	Is the voltage 2.5±0.2 V when lateral G sensor is horizontal?	Go to step **3.**	Replace the lateral G sensor.
3	**CHECK LATERAL G SENSOR.** Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (−):***	Is the voltage 3.5±0.2 V when lateral G sensor is inclined forwards to 90°?	Go to step **4.**	Replace the lateral G sensor.
4	**CHECK LATERAL G SENSOR.** Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (−):***	Is the voltage 1.5±0.2 V when lateral G sensor is inclined backwards to 90°?	Lateral G sensor is normal.	Replace the lateral G sensor.
5	**CHECK LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the Subaru Select Monitor into {BRAKE CONTROL} mode. 4) Set the display in the {Current Data Display & Save} mode. 5) Read the lateral G sensor output voltage.	Is the indicated reading 2.5±0.2 V when the vehicle is in horizontal position?	Go to step **6.**	Replace the lateral G sensor.
6	**CHECK LATERAL G SENSOR.** 1) Remove the console box. 2) Remove the lateral G sensor from vehicle. (Do not disconnect the connector.) 3) Read the Subaru Select Monitor display.	Is the indicated reading 3.5±0.2 V when lateral G sensor is inclined forwards to 90°?	Go to step **7.**	Replace the lateral G sensor.
7	**CHECK LATERAL G SENSOR.** Read the Subaru Select Monitor display.	Is the indicated reading 1.5±0.2 V when lateral G sensor is inclined backwards to 90°?	Lateral G sensor is normal.	Replace the lateral G sensor.

ABS (DIAGNOSTICS)

ABS(diag)

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1. Basic Diagnostic Procedure

A: PROCEDURE

1. WITHOUT SUBARU SELECT MONITOR

CAUTION:
Remove foreign matter (dust, water, etc.) from the ABSCM&H/U connector during removal and installation.

NOTE:
- To check the harness for broken wires or short circuits, shake it while holding it or the connector.
- When the ABS warning light illuminates, read and record the DTC indicated by ABS warning light.

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how trouble occurred using interview checklist. <Ref. to ABS(diag)-5, Check List for Interview.> 2) Before performing diagnosis, inspect the unit which might influence ABS problem. <Ref. to ABS(diag)-9, INSPECTION, General Description.>	Is the unit that might influence the ABS problem normal?	Go to step **2.**	Repair or replace each unit.
2	**CHECK INDICATION OF DTC.** Calling up the DTC. <Ref. to ABS(diag)-20, Read Diagnostic Trouble Code (DTC).> Record all DTCs.	Is only the start code issued?	Go to step **3.**	Go to step **4.**
3	**PERFORM THE GENERAL DIAGNOSTICS.** 1) Inspect using “General Diagnostics Table”. <Ref. to ABS(diag)-151, General Diagnostics Table.> 2) Perform the clear memory mode. <Ref. to ABS(diag)-22, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 3) Perform the inspection mode. <Ref. to ABS(diag)-21, Inspection Mode.> Calling up the DTC. <Ref. to ABS(diag)-20, Read Diagnostic Trouble Code (DTC).>	Is only the start code issued?	Complete the diagnosis.	Go to step **4.**
4	**PERFORM THE DIAGNOSIS.** 1) Repair trouble cause. NOTE: For DTC list, refer to “List of DTC”.<Ref. to ABS(diag)-24, WITHOUT SUBARU SELECT MONITOR, LIST, List of Diagnostic Trouble Code (DTC).> 2) Perform the clear memory mode. <Ref. to ABS(diag)-22, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 3) Perform the inspection mode. <Ref. to ABS(diag)-21, Inspection Mode.> 4) Calling up the DTC. <Ref. to ABS(diag)-20, Read Diagnostic Trouble Code (DTC).>	Is only the start code issued?	Complete the diagnosis.	Repeat the step 4 until only start code is issued.

2. WITH SUBARU SELECT MONITOR

CAUTION:
Remove foreign matter (dust, water, etc.) from the ABSCM&H/U connector during removal and installation.

NOTE:
- To check the harness for broken wires or short circuits, shake it while holding it or the connector.
- Check list for interview. <Ref. to ABS(diag)-5, Check List for Interview.>

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how trouble occurred using interview checklist. <Ref. to ABS(diag)-5, Check List for Interview.> 2) Before performing diagnosis, inspect the unit which might influence the ABS problem. <Ref. to ABS(diag)-9, INSPECTION, General Description.>	Is the unit that might influence the ABS problem normal?	Go to step **2.**	Repair or replace each unit.
2	**CHECK INDICATION OF DTC DISPLAY.** 1) Turn the ignition switch to OFF. 2) Connect the SUBARU SELECT MONITOR to data link connector. 3) Turn the ignition switch to ON and SUBARU SELECT MONITOR to ON. NOTE: If the communication function of Subaru Select Monitor cannot be executed normally, check communication circuit. <Ref. to ABS(diag)-77, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostics Procedure with Subaru Select Monitor.> 4) Read the DTC. <Ref. to ABS(diag)-18, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 5) Record all DTCs and freeze frame data.	Is the DTC displayed?	Go to step **4.**	Go to step **3.**
3	**PERFORM THE GENERAL DIAGNOSTICS.** 1) Inspect using “General Diagnostics Table”. <Ref. to ABS(diag)-151, General Diagnostics Table.> 2) Perform the clear memory mode. <Ref. to ABS(diag)-18, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 3) Perform the inspection mode. <Ref. to ABS(diag)-21, Inspection Mode.> 4) Calling up the DTC. <Ref. to ABS(diag)-17, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.> Check DTC is not displayed.	Is the ABS warning light turned off after ignition switch OFF?	Complete the diagnosis.	Inspect using “diagnostics procedure for No DTC”. <Ref. to ABS(diag)-79, NO TROUBLE CODE, Diagnostics Procedure with Subaru Select Monitor.>

	Step	Check	Yes	No
4	**PERFORM THE DIAGNOSIS.** 1) For the DTC list, refer to “List of DTC”. <Ref. to ABS(diag)-26, WITH SUBARU SELECT MONITOR, LIST, List of Diagnostic Trouble Code (DTC).> 2) Repair trouble cause. 3) Perform the clear memory mode. <Ref. to ABS(diag)-18, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 4) Perform the inspection mode. <Ref. to ABS(diag)-21, Inspection Mode.> 5) Calling up the DTC. <Ref. to ABS(diag)-17, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Are the DTCs indicated on display?	Inspect using “diagnostics procedure with Subaru Select Monitor”. <Ref. to ABS(diag)-77, Diagnostics Procedure with Subaru Select Monitor.>	Complete the diagnosis.

2. Check List for Interview

A: CHECK

Check the following items about the vehicle's state.

1. STATE OF ABS WARNING LIGHT

ABS warning light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on • When / how long does it come on?:		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ On after starting (Engine is running) ❑ On after starting (Engine is stop)		
Timing	❑ Immediately after ignition is ON. ❑ Immediately after ignition starts.		
	❑ When advancing	km/h to	km/h
		MPH to	MPH
	❑ While traveling at a constant speed	km/h	MPH
	❑ When decelerating	km/h to	km/h
		MPH to	MPH
	❑When turning to right	Steering angle :	deg
		Steering time :	sec
	❑ When turning to left	Steering angle :	deg
		Steering time :	sec
	❑ When moving other electrical parts		
	• Parts name : • Operating condition :		

2. STATE OF BRAKE WARNING LIGHT

Brake warning light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Does not come on ❑ When parking brake lever is pulled ❑ When parking brake lever is released • When / how long does it come on?:		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ On after starting (Engine is running) ❑ On after starting (Engine is stop)		
Timing	❑ Immediately after ignition is ON. ❑ Immediately after ignition starts.		
	❑ When advancing		km/h to km/h
			MPH to MPH
	❑ While traveling at a constant speed	km/h	MPH
	❑ When decelerating		km/h to km/h
			MPH to MPH
	❑When turning to right	Steering angle :	deg
		Steering time :	sec
	❑ When turning to left	Steering angle :	deg
		Steering time :	sec
	❑ When operating other electrical parts		
	• Parts name : • Operating condition :		

3. SYMPTOMS

<table>
<tr><td rowspan="11">ABS operating condition</td><td colspan="3">❑ Does not operate.</td></tr>
<tr><td>❑ Operates only when abruptly applying brakes.</td><td>Vehicle speed :</td><td>km/h
MPH</td></tr>
<tr><td colspan="3">• How to step on brake pedal :</td></tr>
<tr><td>a) Operating time :</td><td colspan="2">sec</td></tr>
<tr><td colspan="3">b) Operating noise : ❑ Produce / ❑ Does not produce</td></tr>
<tr><td>• What kind of noise?</td><td colspan="2">❑ Knock
❑ Gong gong
❑ Bong
❑ Buzz
❑ Gong gong buzz
❑ Others :</td></tr>
<tr><td colspan="3">c) Reaction force of brake pedal</td></tr>
<tr><td></td><td colspan="2">❑ Stick
❑ Press down once with a clunk
❑ Press and released
❑ Others :</td></tr>
<tr><td rowspan="11">Behavior of vehicle</td><td colspan="3">a) Directional stability cannot be obtained or steering refuses to work when applying brakes :
❑ Yes / ❑ No</td></tr>
<tr><td>• When :</td><td colspan="2">❑ Vehicle turns to right
❑ Vehicle turns to left
❑ Spins
❑ Others :</td></tr>
<tr><td colspan="3">b) Directional stability cannot be obtained or steering refuses to work when accelerating :
❑ Yes / ❑ No</td></tr>
<tr><td>• When :</td><td colspan="2">❑ Vehicle turns to right
❑ Vehicle turns to left
❑ Spins
❑ Others :</td></tr>
<tr><td colspan="3">c) Brakes out of order : ❑ Yes / ❑ No</td></tr>
<tr><td>• What :</td><td colspan="2">❑ Braking distance is long
❑ Brakes lock or drag
❑ Pedal stroke is long
❑ Pedal sticks
❑ Others :</td></tr>
<tr><td colspan="3">d) Poor acceleration : ❑ Yes / ❑ No</td></tr>
<tr><td>• What :</td><td colspan="2">❑ Fails to accelerate
❑ Engine stalls
❑ Others :</td></tr>
<tr><td colspan="3">e) Occurrence of vibration : ❑ Yes / ❑ No</td></tr>
<tr><td colspan="3">• Where
• What kind :</td></tr>
<tr><td colspan="3">f) Occurrence of abnormal noise : ❑ Yes / ❑ No</td></tr>
<tr><td colspan="3">• Where
• What kind :</td></tr>
<tr><td colspan="3">g) Occurrence of other phenomena : ❑ Yes / ❑ No</td></tr>
<tr><td colspan="3">• What kind :</td></tr>
</table>

4. CONDITIONS UNDER WHICH TROUBLE OCCURS

Environment	a) Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others :	
	b) Ambient temperature	°C (°F)	
	c) Road	❑ Urban area ❑ Suburbs ❑ Highway ❑ General road ❑ Ascending slope ❑ Descending slope ❑ Paved road ❑ Gravel road ❑ Muddy road ❑ Sandy place ❑ Others :	
	d) Road surface	❑ Dry ❑ Wet ❑ New-fallen snow ❑ Compressed snow ❑ Frozen slope ❑ Others :	
Condition	a) Brakes	Deceleration :	g
		❑ Continuous / ❑ Intermittent	
	b) Accelerator	Acceleration :	g
		❑ Continuous / ❑ Intermittent	
	c) Vehicle speed	km/h	MPH
		❑ Advancing ❑ Accelerating ❑ Reducing speed ❑ Low speed ❑ Turning ❑ Others :	
	d) Tire inflation pressure	Front RH tire :	kPa
		Front LH tire :	kPa
		Rear RH tire :	kPa
		Rear LH tire :	kPa
	e) Degree of wear	Front RH tire :	
		Front LH tire :	
		Rear RH tire :	
		Rear LH tire :	
	f) Genuine parts are used. : ❑ Yes / ❑ No		
	g) Chain is passed around tires. : ❑ Yes / ❑ No		
	h) T tire is used. : ❑ Yes / ❑ No		
	i) Condition of suspension alignment :		
	j) Loading state :		
	k) Repair parts are used. : ❑ Yes / ❑ No		
	• What :		
	l) Others :		

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the ABS wheel speed sensor, ABS control module and hydraulic control unit.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
• Be careful not to damage the airbag system wiring harness when servicing the ABS wheel speed sensor, ABS control module and hydraulic control unit.

B: INSPECTION

Before performing diagnostics, check the following items which might affect ABS problems:

1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V, or more

Specific gravity: Above 1.260

2. BRAKE FLUID

1) Check the brake fluid level.
2) Check the brake fluid leakage.

3. HYDRAULIC UNIT

Check the hydraulic unit.
• With brake tester <Ref. to ABS-8, CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
• Without brake tester <Ref. to ABS-7, CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

4. BRAKE DRAG

Check for brake drag.

5. BRAKE PAD AND ROTOR

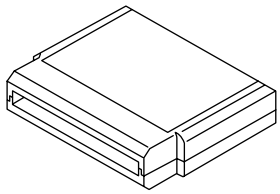
Check the brake pad and rotor.
• Front <Ref. to BR-18, INSPECTION, Front Brake Pad.> and <Ref. to BR-20, INSPECTION, Front Disc Rotor.>
• Rear <Ref. to BR-29, INSPECTION, Rear Brake Pad.> and <Ref. to BR-30, INSPECTION, Rear Disc Rotor.>

6. TIRE

Check the tire specifications, tire wear and air pressure. <Ref. to WT-2, SPECIFICATIONS, General Description.>

C: PREPARATION TOOL

1. SPECIAL TOOLS

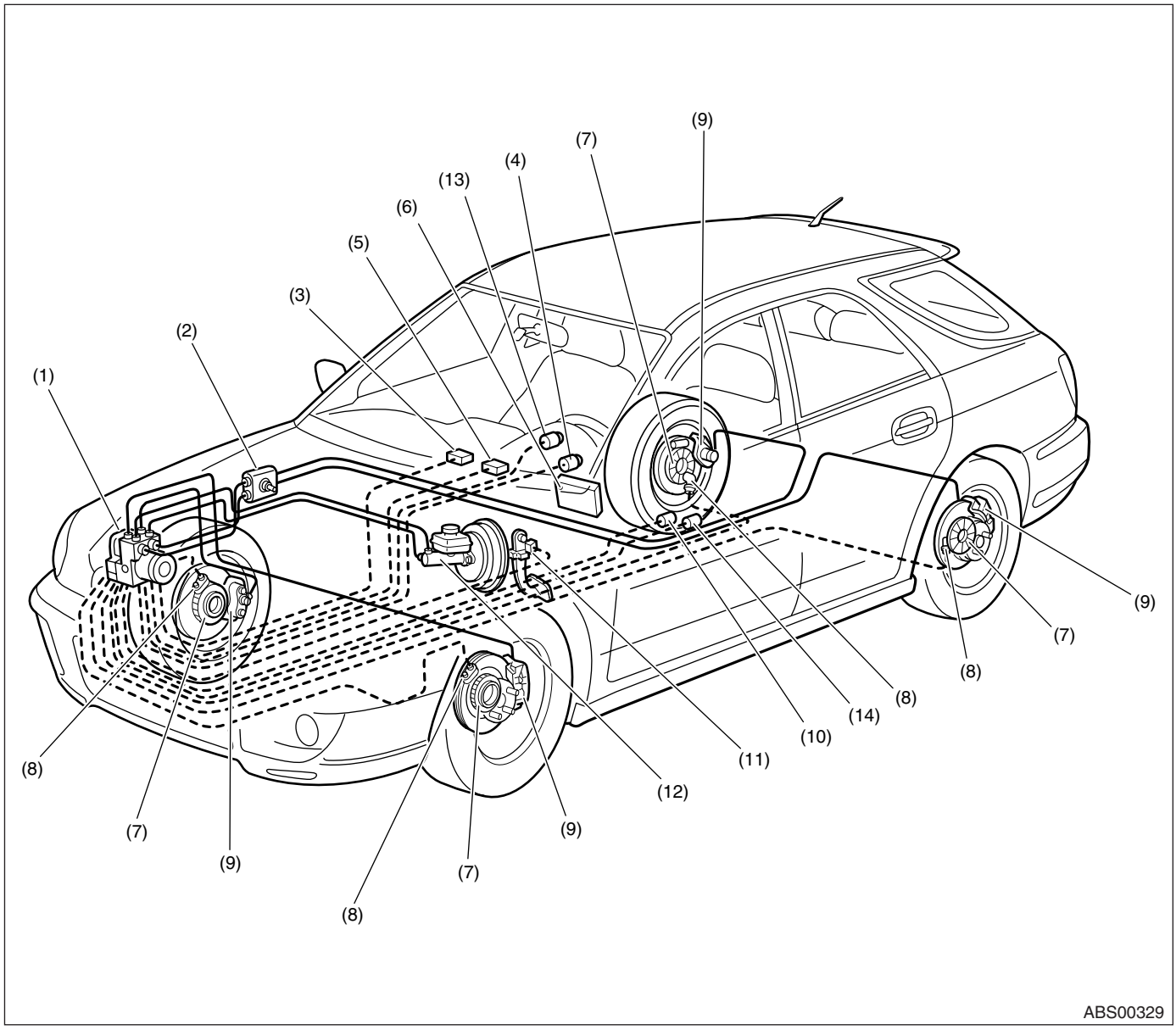
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and amperage.
Oscilloscope	Used for measuring sensor.

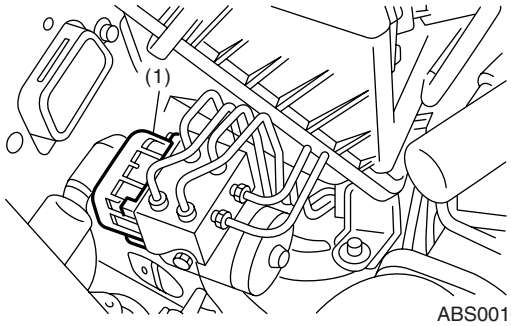
4. Electrical Components Location

A: LOCATION

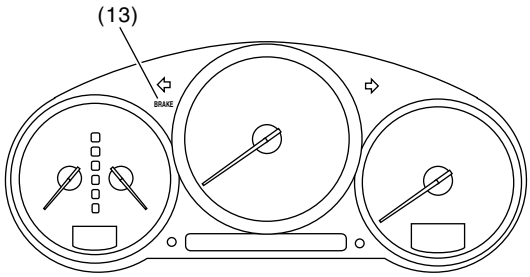


(1) ABS control module and hydraulic control unit (ABSCM&H/U)
(2) Connector
(3) Diagnosis connector
(4) ABS warning light
(5) Data link connector (for Subaru Select Monitor)
(6) Transmission control module (TCM) (AT model)
(7) Tone wheel
(8) ABS wheel speed sensor
(9) Wheel cylinder
(10) G sensor
(11) Stop light switch
(12) Master cylinder
(13) Brake & EBD warning light
(14) Lateral G sensor (STi model)

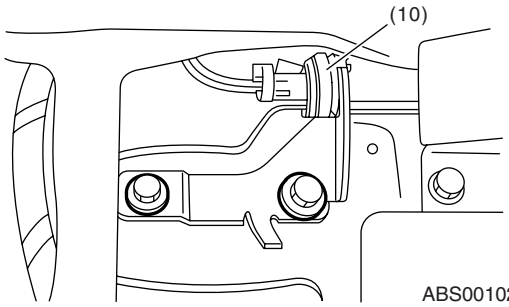
Electrical Components Location



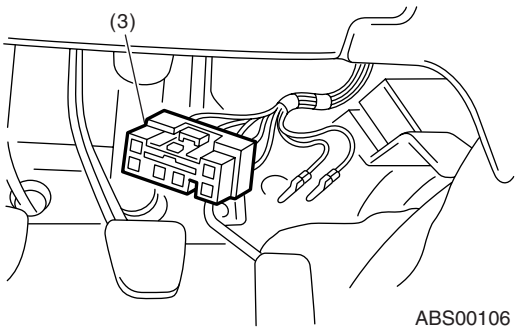
ABS00101



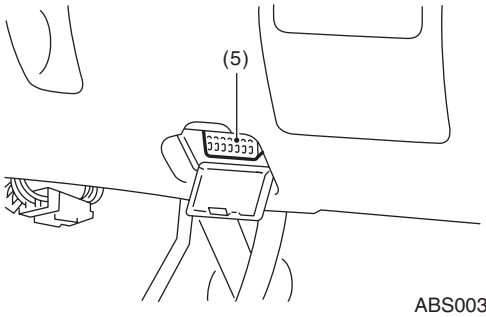
ABS-00379



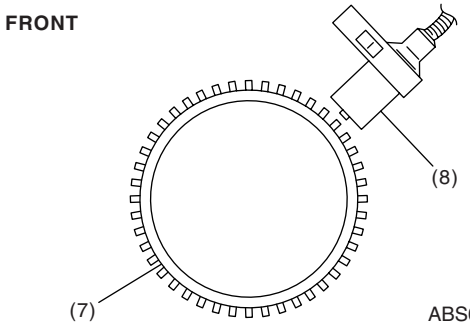
ABS00102



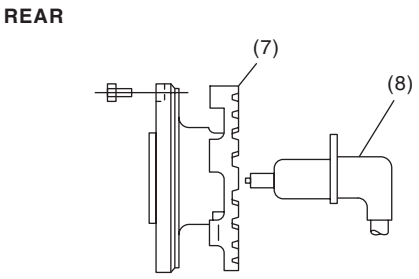
ABS00106



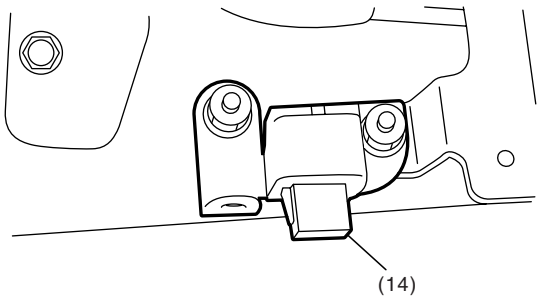
ABS00344



ABS00107



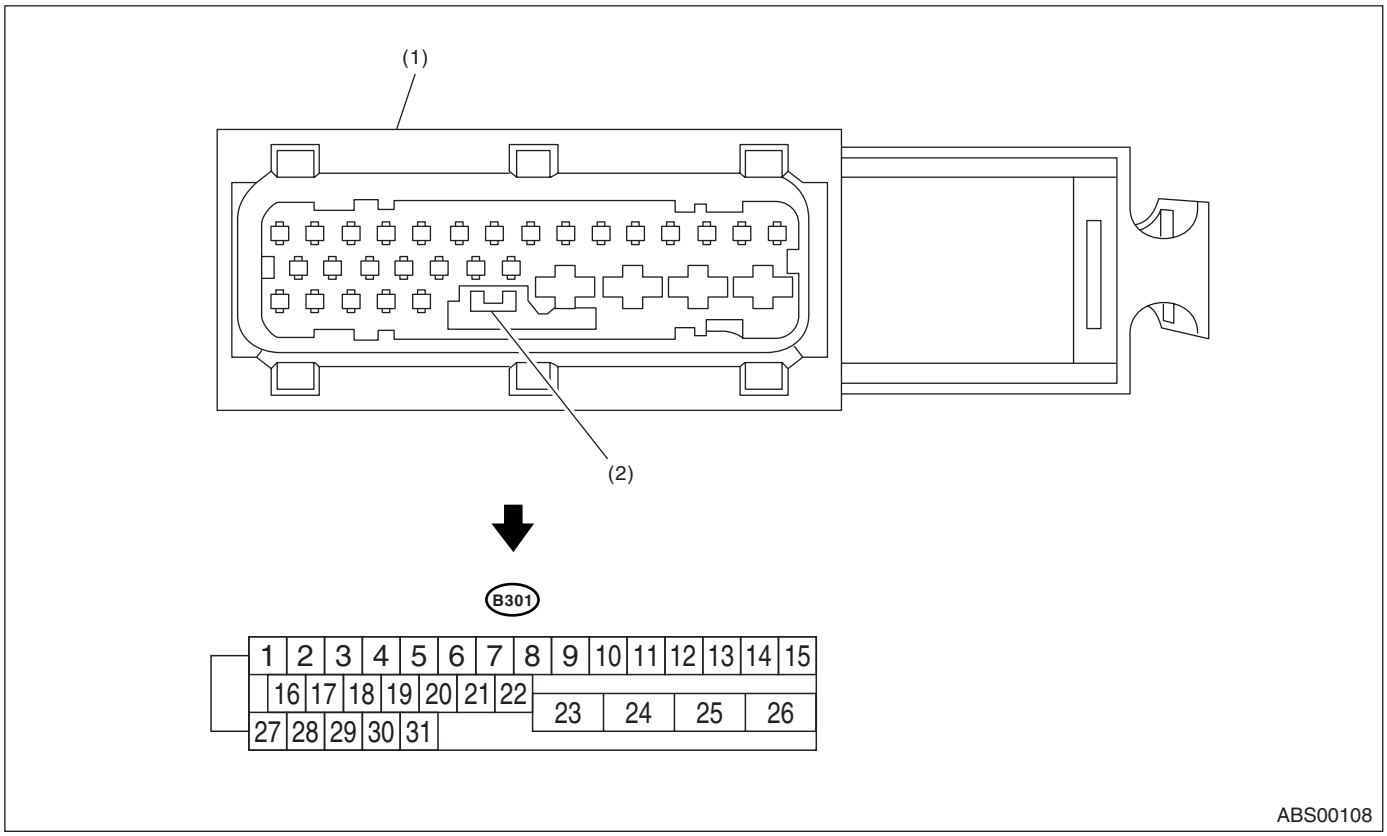
ABS00104



ABS00345

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



(1) ABS control module and hydraulic control unit (ABSCM&H/U) connector
(2) Connector switch

NOTE:
• The terminal numbers in ABS control module and hydraulic control unit connector are as shown in the figure.
• When the connector is removed from ABSCM&H/U, the connector switch closes the circuit between terminal No. 22 and No. 23. The ABS warning light illuminates.

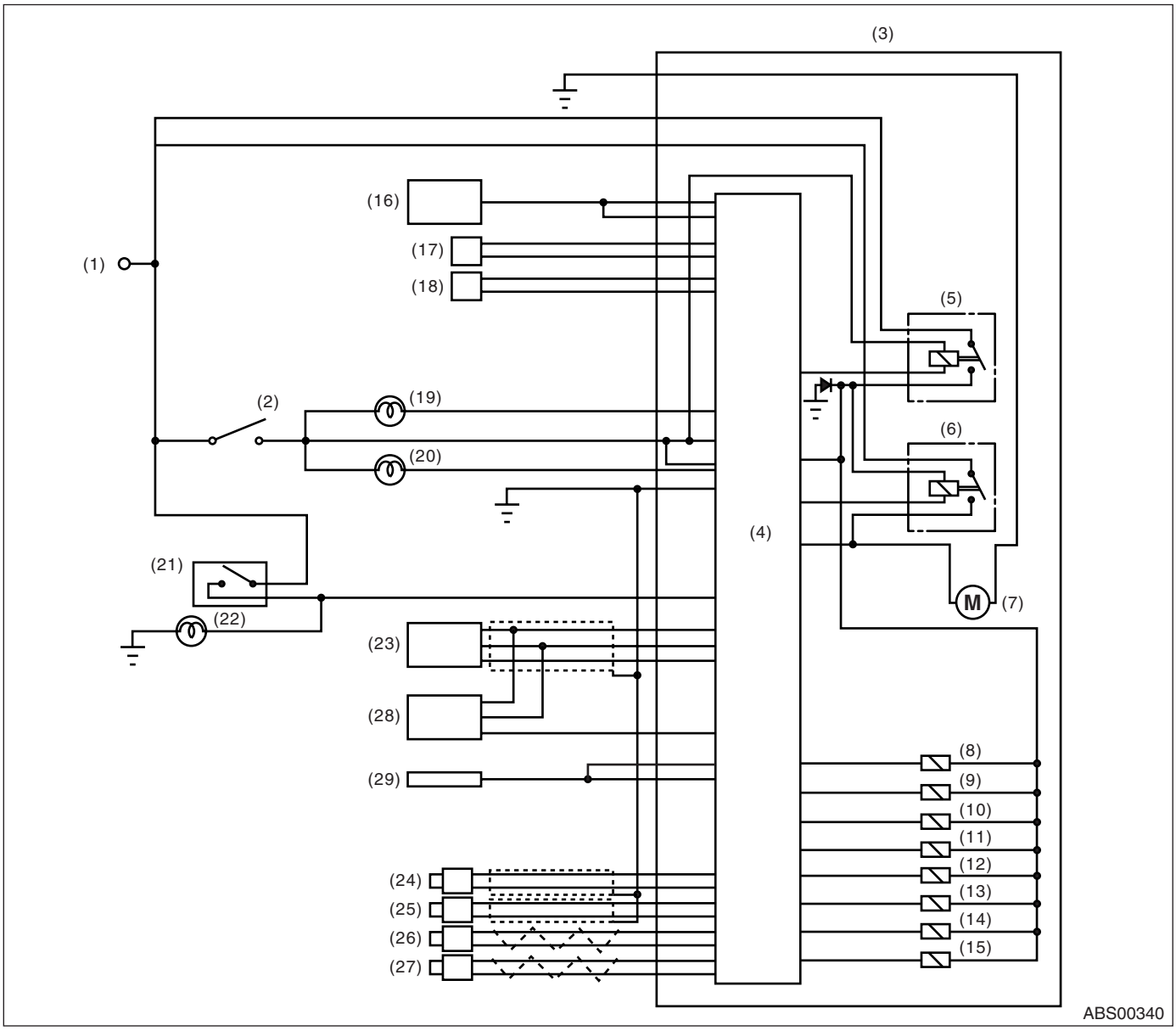
Contents		Terminal No. (+) — (–)	Input/Output signal Measured value and measuring conditions
ABS wheel speed sensor*2 (Wheel speed sensor)	Front left wheel	9 — 10	0.12 — 1 V (When it is 20 Hz.)
	Front right wheel	11 — 12	
	Rear left wheel	7 — 8	
	Rear right wheel	14 — 15	
Valve relay power supply*1		24 — 23	10 — 15 V
Motor relay power supply*1		25 — 23	10 — 15 V
G sensor*2	Power supply	30 — 28	4.75 — 5.25 V
	Ground	28	—
	Output	6 — 28	2.1 — 2.5 V when vehicle is in horizontal position.
Lateral G sensor (STi model)	Power supply	30 — 28	4.75 — 5.25 V
	Ground	28	—
	Output	29 — 28	2.3 — 2.7 V when vehicle is in horizontal position.
Stop light switch*1		2 — 23	Less than 1.5 V when the stop light is OFF and, 10 — 15 V when the stop light is ON.

Control Module I/O Signal

Contents		Terminal No. (+) — (−)	Input/Output signal Measured value and measuring conditions
ABS warning light*2		22 — 23	Less than 1.5 V within 1.5 seconds immediately after ignition switch has been turned to ON, and 10 — 15 V after 1.5 seconds has elapsed.
Brake warning light*2 (EBD warning light)		21 — 23	Less than 1.5 V within 1.5 seconds immediately after ignition switch has been turned to ON, and 10 — 15 V after 1.5 seconds has elapsed.
AT ABS signal (AT models only)		31 — 23	Less than 1.5 V when the ABS control still operates and more than 5.5 V when ABS does not operate.
ABS operation signal monitor		3 — 23	Less than 1.5 V when the ABS control still operates and more than 5.5 V when ABS does not operate.
Subaru Select Monitor*2	Data is received.	20 — 23	Less than 1.5 V when no data is received.
	Data is sent.	5 — 23	4.75 — 5.25 V when no data is sent.
ABS diagnosis connector	Terminal No. 3	29 — 23	10 — 15 V when ignition switch is ON.
	Terminal No. 6	4 — 23	10 — 15 V when ignition switch is ON.
Power supply*1		1 — 23	10 — 15 V when ignition switch is ON.
Grounding line		23	—
Grounding line		26	—

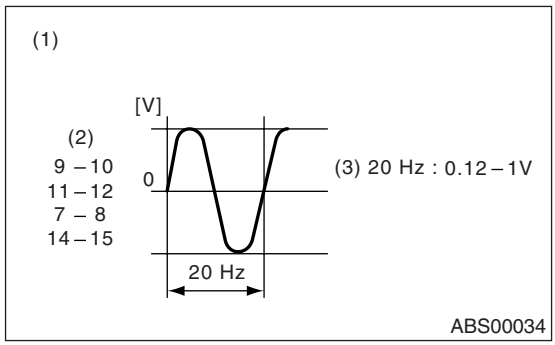
*1: Measure the I/O signal voltage after removing the connector from the ABSCM&H/U terminal.
*2: Measure the I/O signal voltage at connector (F2).

B: WIRING DIAGRAM



(1) Battery
(2) IGN
(3) ABS control module and hydraulic control unit (ABSCM&H/U)
(4) ABS control module area
(5) Valve relay
(6) Motor relay
(7) Motor
(8) Front inlet solenoid valve LH
(9) Front outlet solenoid valve LH
(10) Front inlet solenoid valve RH
(11) Front outlet solenoid valve RH
(12) Rear inlet solenoid valve LH
(13) Rear outlet solenoid valve LH
(14) Rear inlet solenoid valve RH
(15) Rear outlet solenoid valve RH
(16) Transmission control module (TCM) (AT model)
(17) Diagnosis connector
(18) Data link connector
(19) Brake warning light
(20) ABS warning light
(21) Stop light switch
(22) Stop light
(23) G sensor
(24) Front ABS wheel speed sensor LH
(25) Front ABS wheel speed sensor RH
(26) Rear ABS wheel speed sensor LH
(27) Rear ABS wheel speed sensor RH
(28) Lateral G sensor (STi model)
(28) Lateral G sensor (STi model)
(29) Driver's control center differential control module (STi model)

C: WAVEFORM



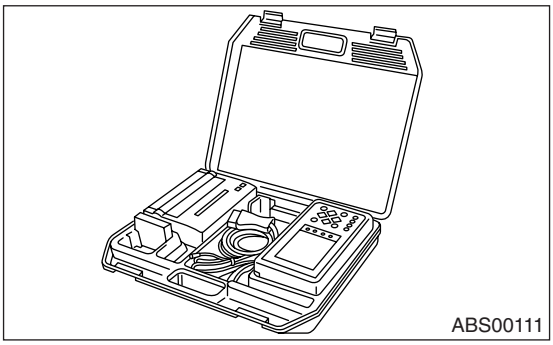
(1) ABS wheel speed sensor
(2) Terminal No.
(3) Standard output voltage

6. Subaru Select Monitor

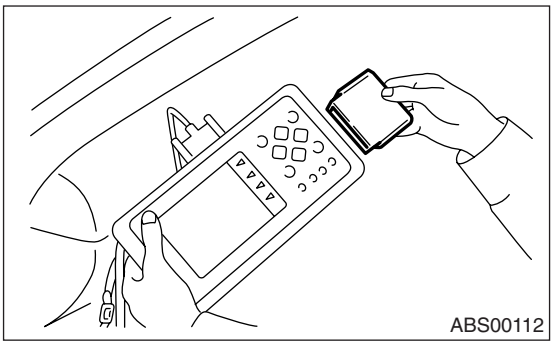
A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE (DTC)

1) Prepare the Subaru Select Monitor kit.

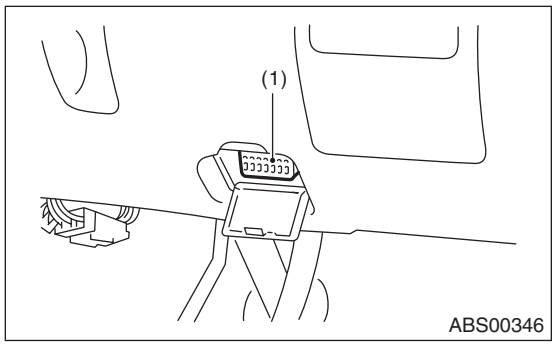


2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to ABS(diag)-10, SPECIAL TOOLS, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector located in the lower portion of instrument panel (on the driver's side).

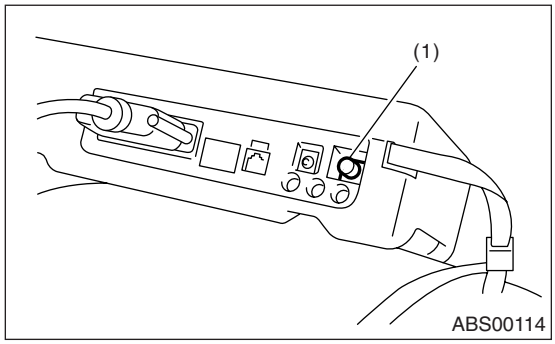


(1) Data link connector

(2) Connect the diagnosis cable to data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(1) Power switch

6) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.
7) On the «System Selection Menu» display screen, select the {Brake Control System} and press [YES] key.
8) Press the [YES] key after the information of engine type is displayed.
9) On the «ABS Diagnosis» display screen, select the {DTC Display} and press [YES] key.
10) On the «DTC Display» display screen, select the {Current DTC} or {History DTC} and press [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning the DTC, refer to the LIST OF DTC. <Ref. to ABS(diag)-24, List of Diagnostic Trouble Code (DTC).>
• A maximum of 3 DTCs are displayed in order of occurrence.
• If a particular DTC is not properly stored in memory (due to a drop in ABSCM&H/U power supply, etc.) when a problem occurs, the DTC, followed by a question mark "?", appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.

Display screen	Contents to be monitored
Latest	The most recent DTC appears on Subaru Select Monitor display.
Old	The second most recent DTC appears on Subaru Select Monitor display.
Older	The third most recent DTC appears on Subaru Select Monitor display.
Reference	DTC issued after elapse of a specified period of time.

2. READ CURRENT DATA

1) On the «Main Menu» display screen, select the {Each System Check} and press «YES» key.
2) On the «System Selection Menu» display screen, select the {Brake Control System} and press «YES» key.
3) Press the «YES» key after the information of ABS type is displayed.
4) On the «Brake Control Diagnosis» display screen, select the {Current Data Display & Save} and press «YES» key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press «YES» key.
6) Using the scroll key, move the display screen up or down until desired data is shown.
• A list of the support data is shown in the following table.

Display screen	Contents to be monitored	Unit of measure
FR Wheel Speed	Wheel speed detected by Front ABS wheel speed sensor RH is displayed	km/h or MPH
FL Wheel Speed	Wheel speed detected by Front ABS wheel speed sensor LH is displayed	km/h or MPH
RR Wheel Speed	Wheel speed detected by Rear ABS wheel speed sensor RH is displayed	km/h or MPH
RL Wheel Speed	Wheel speed detected by Rear ABS wheel speed sensor LH is displayed	km/h or MPH
Stop Light Switch	Stop light switch signal	ON or OFF
Stop Light Switch	Stop light switch monitor voltage is displayed.	V
G Sensor Output Signal	Voltage equivalent to vehicle acceleration detected by analog G sensor is displayed.	V
Lateral G Sensor Output Signal	Lateral G detected by Lateral G sensor is displayed in voltage. (STi model)	V
Valve Relay Signal	Valve Relay Signal	ON or OFF
Motor Relay Signal	Motor Relay Signal	ON or OFF
ABS Signal to TCM	ABS operation signal from ABS control module to TCM	ON or OFF
ABS Warning Lamp	ON operation of ABS warning light is displayed.	ON or OFF
EBD Warning Light	ON operation of EBD warning light is displayed.	ON or OFF
Motor Relay Monitor	Operating condition of motor relay is displayed.	ON or OFF
Valve Relay Monitor	Operating condition of the valve relay is displayed.	ON or OFF
CCM Signal	ABS operation signal from ABS control module to TCM	ON or OFF

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

3. CLEAR MEMORY MODE

1) On the «Main Menu» display screen, select the {2. Each System Check} and press «YES» key.
2) On the «System Select Menu» display screen, select the {Brake System} and press «YES» key.
3) Press the «YES» key after the information of engine type is displayed.
4) On the «Brake Control Diagnosis» display screen, select the {Clear Memory} and press «YES» key.

Display screen	Contents to be monitored
Clear memory?	Function of clearing DTC.

5) When the “Done” and “turn ignition switch to OFF” are shown on display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

4. ABS SEQUENCE CONTROL

Display screen	Contents to be monitored	Index No.
ABS sequence control	Perform ABS sequence control by operating valve and pump motor sequentially.	<Ref. to ABS-9, ABS Sequence Control.>

5. FREEZE FRAME DATA

NOTE:
• Data stored at the time of trouble occurrence is shown on display.
• Each time trouble occurs, the latest information is stored in the freeze frame data in memory.
• Freeze frame data will be memorized maximum to three.
• If freeze frame data is not properly stored in memory (due to a drop in ABSCM power supply, etc.), a DTC, preceded by a question mark "?", appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.

Display screen	Contents to be monitored
FR wheel speed	Wheel speed detected by Front ABS wheel speed sensor RH is displayed in km/h or mile/h.
FL wheel speed	Wheel speed detected by Front ABS wheel speed sensor LH is displayed in km/h or mile/h.
RR wheel speed	Wheel speed detected by Rear ABS wheel speed sensor RH is displayed in km/h or mile/h.
RL wheel speed	Wheel speed detected by Rear ABS wheel speed sensor LH is displayed in km/h or mile/h.
ABSCM power voltage	Power (in volts) supplied to ABSCM& H/U appears on the Subaru Select Monitor display.
G sensor output voltage	Voltage equivalent to vehicle acceleration detected by analog G sensor is displayed.
Lateral G sensor output voltage	Voltage equivalent to Lateral G detected by analog Lateral G sensor is displayed.
Motor relay monitor	Motor relay operation monitor signal
Stop light switch	Stop light switch signal
ABS signal to TCM	ABS operation signal from ABS control module to TCM
ABS-AT control	ABS operation signal from ABS control module to TCM
ABS operation signal	ABS operation signal
Condition of malfunction	Displays if the malfunction has occurred to ABS only, or to ABS and EBD.

6. ANALOG DATA ARE DISPLAYED

Display screen	Contents to be monitored
FR wheel speed	Wheel speed detected by Front ABS wheel speed sensor RH is displayed in km/h or mile/h.
FL wheel speed	Wheel speed detected by Front ABS wheel speed sensor LH is displayed in km/h or mile/h.
RR wheel speed	Wheel speed detected by Rear ABS wheel speed sensor RH is displayed in km/h or mile/h.
RL wheel speed	Wheel speed detected by Rear ABS wheel speed sensor LH is displayed in km/h or mile/h.
Stop light switch	Stop light switch monitor voltage is displayed.
G sensor output voltage	Refers to vehicle acceleration detecting by analog G sensor. It appears on the Subaru Select Monitor display in volts.
Lateral G sensor output voltage	Voltage equivalent to Lateral G detected by analog Lateral G sensor is displayed.

7. ON/OFF DATA ARE DISPLAYED

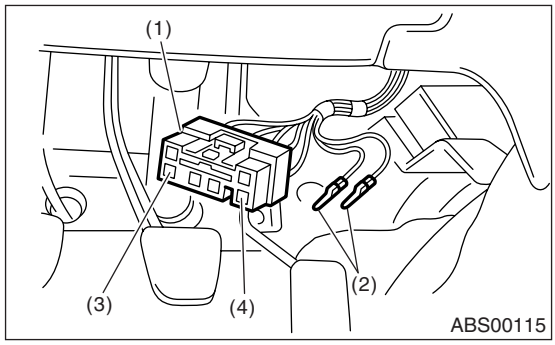
Display screen	Contents to be monitored
Stop light switch	Stop light switch signal
Valve relay signal	Valve relay signal
Motor relay signal	Motor relay signal
ABS signal to TCM	ABS operation signal from ABS control module to TCM
ABS warning light	ABS warning light
Valve relay monitor	Valve relay operation monitor signal
Motor relay monitor	Motor relay operation monitor signal
CCM signal	ABS operation signal from ABS control module to TCM

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

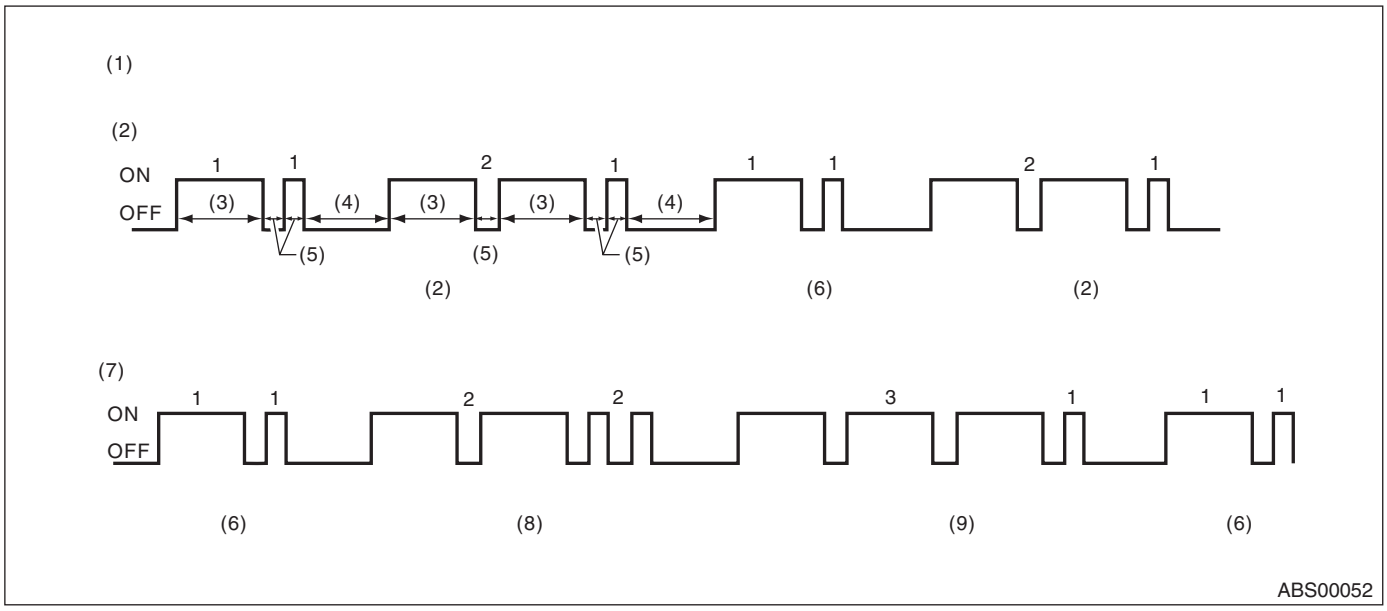
1) Take out the diagnosis connector from side of driver's seat.



(1) Diagnosis connector
(2) Ground terminal
(3) Terminal No. 3
(4) Terminal No. 6

2) Turn the ignition switch to OFF.
3) Connect the diagnosis connector terminal 6 to Ground terminal.
4) Turn the ignition switch to ON.
5) ABS warning light is set in the diagnostic mode and blinks to identify DTC.
6) After the start code (11) is shown, the DTCs will be shown in order of the last information first.
These repeat for a maximum of 3 minutes.

NOTE:
• When there are no DTCs in memory, only the start code (11) is shown.
• When on-board diagnosis of the ABS control module detects a problem, the information (up to a maximum of three) will be stored in EEP ROM as a DTC. When there are more than three, the most recent three will be stored. (Stored codes will stay in memory until they are cleared.)



(1) Example of DTC indication
(2) DTC: 21
(3) 1.2 sec.
(4) 1.0 sec.
(5) 0.3 sec.
(6) Start code
(7) DTC: 22, 31
(8) DTC: 22
(9) DTC: 31

2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to obtain and understand DTCs. <Ref. to ABS(diag)-17, Subaru Select Monitor.>

8. Inspection Mode

A: PROCEDURE

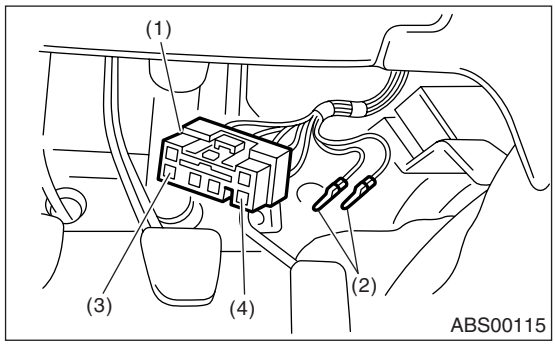
Reproduce the condition under which the problem has occurred as much as possible.
Drive the vehicle at a speed more than 40 km/h (25 MPH) for at least 1 minute.

9. Clear Memory Mode

A: OPERATION

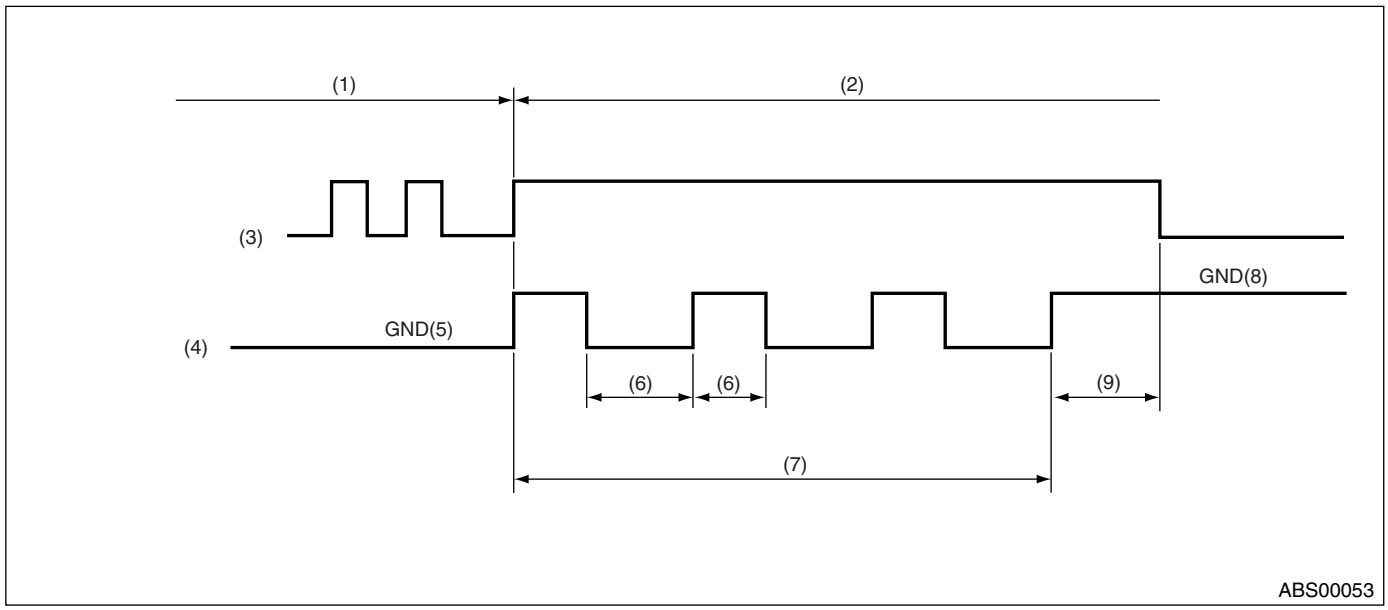
1. WITHOUT SUBARU SELECT MONITOR

1) After calling up a DTC, disconnect the diagnosis connector terminal 6 from Ground terminal.



(1) Diagnosis connector
(2) Ground terminal
(3) Terminal No. 3
(4) Terminal No. 6

2) Repeat 3 times within approx. 12 seconds; connecting and disconnecting terminal 6 and Ground terminal for at least 0.2 seconds each time.



(1) Diagnostic trouble code (DTC) indication mode
(2) Clear memory mode
(3) ABS warning lamp
(4) Terminal No. 8
(5) Low level
(6) 0.2 sec. or more
(7) 12 sec. or less
(8) Open (high level)
(9) 1.5 sec.

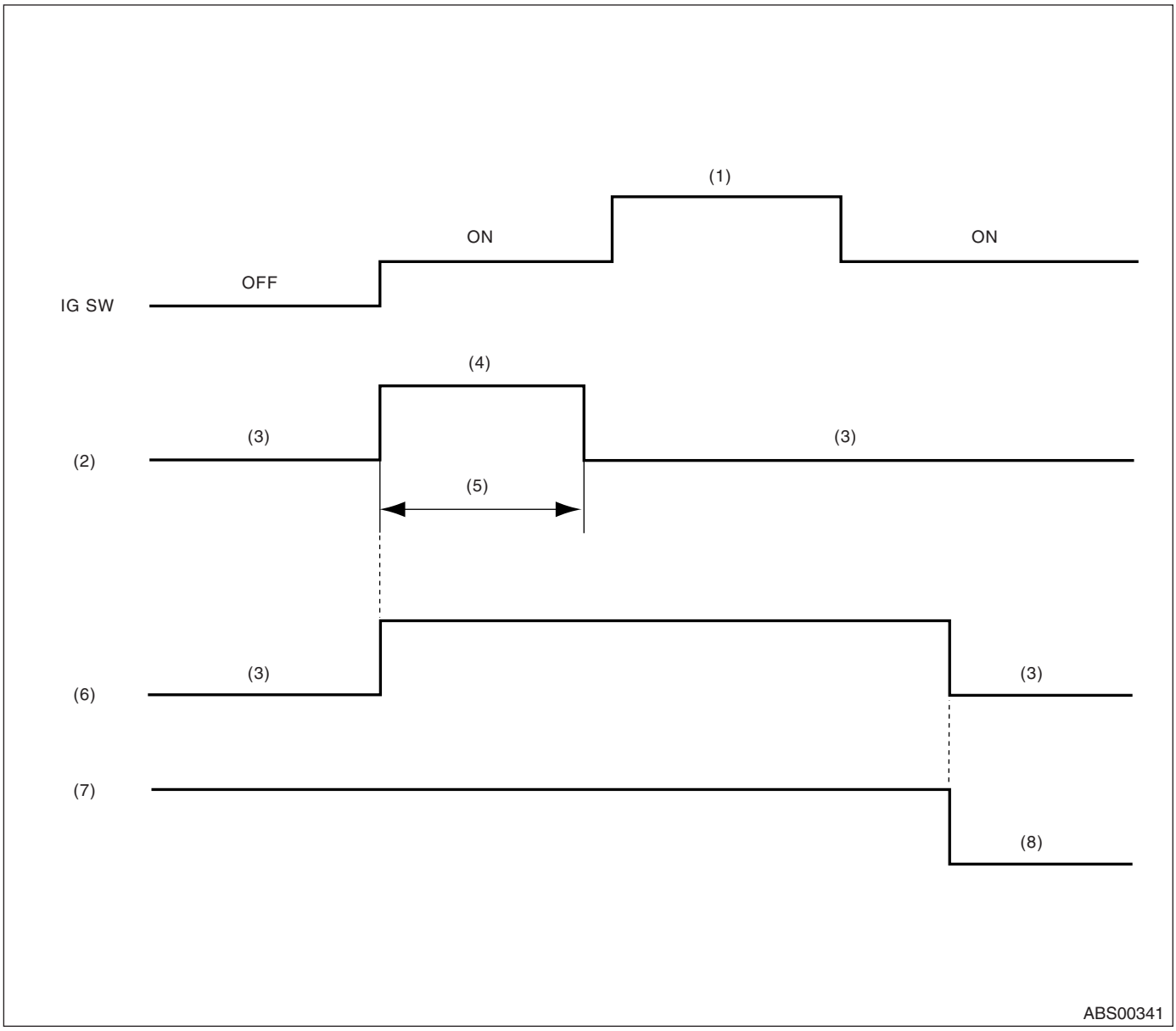
NOTE:
After the diagnostics is completed, make sure to clear memory. Make sure only start code (11) is shown after memory is cleared.

2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to clear DTC. <Ref. to ABS(diag)-17, Subaru Select Monitor.>

10.ABS Warning Light/Brake Warning Light Illumination Pattern

A: INSPECTION



(1) START
(2) ABS warning light
(3) Goes out
(4) Illuminates
(5) 1.5 sec.
(6) Brake warning light (EBD warning light)
(7) Parking brake
(8) Release

1) When the ABS warning light does not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.
2) When the ABS warning light remains constantly OFF, repair the ABS warning light circuit or diagnosis circuit. <Ref. to ABS(diag)-29, Diagnostics Procedure without Subaru Select Monitor.>

NOTE:
Even though the ABS warning light does not go out 1.5 seconds after it illuminates, the ABS system operates normally when the warning light goes out while driving at approx. 12 km/h (7 MPH). However, the Anti-lock brakes do not work while ABS warning light is illuminated.

11.List of Diagnostic Trouble Code (DTC)

A: LIST

1. WITHOUT SUBARU SELECT MONITOR

DTC	Contents of diagnosis		Index No.
—	ABS warning light does not illuminate.		<Ref. to ABS(diag)-29, ABS WARNING LIGHT DOES NOT COME ON, Diagnostics Procedure without Subaru Select Monitor.>
—	ABS warning light remains on.		<Ref. to ABS(diag)-32, ABS WARNING LIGHT DOES NOT GO OFF, Diagnostics Procedure without Subaru Select Monitor.>
—	Brake warning light remains on.		<Ref. to ABS(diag)-35, BRAKE WARNING LIGHT DO NOT GO OFF, Diagnostics Procedure without Subaru Select Monitor.>
—	DTC does not illuminate.		<Ref. to ABS(diag)-37, DTC DOES NOT APPEAR, Diagnostics Procedure without Subaru Select Monitor.>
11	Start code • DTC is shown after start code. • Only start code is shown in normal condition.		—
21	Abnormal ABS wheel speed sensor (Open circuit or input voltage too high)	Front ABS wheel speed sensor RH	<Ref. to ABS(diag)-38, DTC 21 ABNORMAL ABS WHEEL SPEED SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT RH), Diagnostics Procedure without Subaru Select Monitor.>
23		Front ABS wheel speed sensor LH	<Ref. to ABS(diag)-38, DTC 23 ABNORMAL ABS WHEEL SPEED SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT LH), Diagnostics Procedure without Subaru Select Monitor.>
25		Rear ABS wheel speed sensor RH	<Ref. to ABS(diag)-38, DTC 25 ABNORMAL ABS WHEEL SPEED SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR RH), Diagnostics Procedure without Subaru Select Monitor.>
27		Rear ABS wheel speed sensor LH	<Ref. to ABS(diag)-39, DTC 27 ABNORMAL ABS WHEEL SPEED SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Procedure without Subaru Select Monitor.>
22	Abnormal ABS wheel speed sensor (Abnormal ABS wheel speed sensor signal)	Front ABS wheel speed sensor RH	<Ref. to ABS(diag)-43, DTC 22 ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (FRONT RH), Diagnostics Procedure without Subaru Select Monitor.>
24		Front ABS wheel speed sensor LH	<Ref. to ABS(diag)-43, DTC 24 ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (FRONT LH), Diagnostics Procedure without Subaru Select Monitor.>
26		Rear ABS wheel speed sensor RH	<Ref. to ABS(diag)-43, DTC 26 ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (REAR RH), Diagnostics Procedure without Subaru Select Monitor.>
28		Rear ABS wheel speed sensor LH	<Ref. to ABS(diag)-44, DTC 28 ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (REAR LH), Diagnostics Procedure without Subaru Select Monitor.>
29		Any one of four	<Ref. to ABS(diag)-48, DTC 29 ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (ANY ONE OF FOUR), Diagnostics Procedure without Subaru Select Monitor.>

List of Diagnostic Trouble Code (DTC)

DTC	Contents of diagnosis		Index No.
31	Inlet valve, outlet valve in hydraulic control unit	Front inlet valve RH	<Ref. to ABS(diag)-52, DTC 31 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH), Diagnostics Procedure without Subaru Select Monitor.>
32		Front outlet valve RH	<Ref. to ABS(diag)-55, DTC 32 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH), Diagnostics Procedure without Subaru Select Monitor.>
33		Front inlet valve LH	<Ref. to ABS(diag)-52, DTC 33 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH), Diagnostics Procedure without Subaru Select Monitor.>
34		Front outlet valve LH	<Ref. to ABS(diag)-55, DTC 34 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH), Diagnostics Procedure without Subaru Select Monitor.>
35		Rear inlet valve RH	<Ref. to ABS(diag)-52, DTC 35 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH), Diagnostics Procedure without Subaru Select Monitor.>
36		Rear outlet valve RH	<Ref. to ABS(diag)-55, DTC 36 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH), Diagnostics Procedure without Subaru Select Monitor.>
37		Rear inlet valve LH	<Ref. to ABS(diag)-52, DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Procedure without Subaru Select Monitor.>
38		Rear outlet valve LH	<Ref. to ABS(diag)-55, DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Procedure without Subaru Select Monitor.>
41	Abnormal ABS control module		<Ref. to ABS(diag)-58, DTC 41 ABNORMAL ABS CONTROL MODULE, Diagnostics Procedure without Subaru Select Monitor.>
42	Source voltage is abnormal.		<Ref. to ABS(diag)-59, DTC 42 SOURCE VOLTAGE IS ABNORMAL, Diagnostics Procedure without Subaru Select Monitor.>
44	A combination of AT control abnormal		<Ref. to ABS(diag)-62, DTC 44 A COMBINATION OF AT CONTROL ABNORMAL, Diagnostics Procedure without Subaru Select Monitor.>
51	Abnormal valve relay		<Ref. to ABS(diag)-64, DTC 51 ABNORMAL VALVE RELAY, Diagnostics Procedure without Subaru Select Monitor.>
52	Abnormal motor and/or motor relay		<Ref. to ABS(diag)-66, DTC 52 ABNORMAL MOTOR AND/OR MOTOR RELAY, Diagnostics Procedure without Subaru Select Monitor.>
54	Abnormal stop light switch		<Ref. to ABS(diag)-69, DTC 54 ABNORMAL STOP LIGHT SWITCH, Diagnostics Procedure without Subaru Select Monitor.>
56	Abnormal G sensor output voltage		<Ref. to ABS(diag)-71, DTC 56 ABNORMAL G SENSOR OUTPUT VOLTAGE, Diagnostics Procedure without Subaru Select Monitor.>
73	Abnormal Lateral G sensor output voltage		<Ref. to ABS(diag)-74, DTC 73 ABNORMAL LATERAL G SENSOR OUTPUT VOLTAGE, Diagnostics Procedure without Subaru Select Monitor.>

2. WITH SUBARU SELECT MONITOR

DTC	Sub code No.	Display screen	Contents of diagnosis	Index No.
—	—	Communication for initializing impossible	Subaru Select Monitor communication failure	<Ref. to ABS(diag)-77, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostics Procedure with Subaru Select Monitor.>
—	—	No DTC	Although no DTC appears on the Subaru Select Monitor display, the ABS warning light remains on.	<Ref. to ABS(diag)-79, NO TROUBLE CODE, Diagnostics Procedure with Subaru Select Monitor.>
21	4A02	Open or short circuit in Front ABS wheel speed sensor RH circuit	Open or short circuit in Front ABS wheel speed sensor RH circuit	<Ref. to ABS(diag)-82, DTC 21 PEN OR SHORT CIRCUIT IN FRONT RIGHT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostics Procedure with Subaru Select Monitor.>
22	48C5, 4945 48E5, 4845 4905, 4885	Front ABS wheel speed sensor RH abnormal signal	Front ABS wheel speed sensor RH abnormal signal	<Ref. to ABS(diag)-88, DTC 22 FRONT RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostics Procedure with Subaru Select Monitor.>
23	4202	Open or short circuit in Front ABS wheel speed sensor LH circuit	Open or short circuit in Front ABS wheel speed sensor LH circuit	<Ref. to ABS(diag)-82, DTC 23 OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostics Procedure with Subaru Select Monitor.>
24	40C5, 4145 40E5, 4045 4105, 4085	Front ABS wheel speed sensor LH abnormal signal	Front ABS wheel speed sensor LH abnormal signal	<Ref. to ABS(diag)-88, DTC 24 FRONT LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostics Procedure with Subaru Select Monitor.>
25	4602	Open or short circuit in Rear ABS wheel speed sensor RH circuit	Open or short circuit in Rear ABS wheel speed sensor RH circuit	<Ref. to ABS(diag)-82, DTC 25 OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostics Procedure with Subaru Select Monitor.>
26	44C5, 4545 44E5, 4445 4505, 4485	Rear ABS wheel speed sensor RH abnormal signal	Rear ABS wheel speed sensor RH abnormal signal	<Ref. to ABS(diag)-88, DTC 26 REAR RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostics Procedure with Subaru Select Monitor.>
27	4E02	Open or short circuit in Rear ABS wheel speed sensor LH circuit	Open or short circuit in Rear ABS wheel speed sensor LH circuit	<Ref. to ABS(diag)-83, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostics Procedure with Subaru Select Monitor.>
28	4CC5, 4D45 4CE5, 4C45 4D05, 4C85	Rear ABS wheel speed sensor LH abnormal signal	Rear ABS wheel speed sensor LH abnormal signal	<Ref. to ABS(diag)-89, DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostics Procedure with Subaru Select Monitor.>
29	5080 50C0	Abnormal ABS wheel speed sensor signal on any one of four sensor	Abnormal ABS wheel speed sensor signal on any one of four	<Ref. to ABS(diag)-94, DTC 29 ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR, Diagnostics Procedure with Subaru Select Monitor.>
31	3200	Front inlet valve RH malfunction	Front inlet valve RH malfunction	<Ref. to ABS(diag)-98, DTC 31 FRONT RIGHT INLET VALVE MALFUNCTION, Diagnostics Procedure with Subaru Select Monitor.>
32	3600	Front outlet valve RH malfunction	Front outlet valve RH malfunction	<Ref. to ABS(diag)-100, DTC 32 FRONT RIGHT OUTLET VALVE MALFUNCTION, Diagnostics Procedure with Subaru Select Monitor.>
33	2200	Front inlet valve LH malfunction	Front inlet valve LH malfunction	<Ref. to ABS(diag)-98, DTC 33 FRONT LEFT INLET VALVE MALFUNCTION, Diagnostics Procedure with Subaru Select Monitor.>
34	2600	Front outlet valve LH malfunction	Front outlet valve LH malfunction	<Ref. to ABS(diag)-100, DTC 34 FRONT LEFT OUTLET VALVE MALFUNCTION, Diagnostics Procedure with Subaru Select Monitor.>
35	2A00	Rear inlet valve RH malfunction	Rear inlet valve RH malfunction	<Ref. to ABS(diag)-98, DTC 35 REAR RIGHT INLET VALVE MALFUNCTION, Diagnostics Procedure with Subaru Select Monitor.>

List of Diagnostic Trouble Code (DTC)

DTC	Sub code No.	Display screen	Contents of diagnosis	Index No.
36	2E00	Rear outlet valve RH malfunction	Rear outlet valve RH malfunction	<Ref. to ABS(diag)-100, DTC 36 REAR RIGHT OUTLET VALVE MALFUNCTION, Diagnostics Procedure with Subaru Select Monitor.>
37	3A00	Rear inlet valve LH malfunction	Rear inlet valve LH malfunction	<Ref. to ABS(diag)-98, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostics Procedure with Subaru Select Monitor.>
38	3E00	Rear outlet valve LH malfunction	Rear outlet valve LH malfunction	<Ref. to ABS(diag)-100, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostics Procedure with Subaru Select Monitor.>
41	02A0, 0040, 0020, 02C0, 00E0, 0340, 0140, 0160, 0280, 0460, 0260, 0060, 0080, 0300	ABS control module malfunction	ABS control module and hydraulic control unit malfunction	<Ref. to ABS(diag)-103, DTC 41 ABS CONTROL MODULE MALFUNCTION, Diagnostics Procedure with Subaru Select Monitor.>
42	5A00	Power supply voltage too low	Power supply voltage too low	<Ref. to ABS(diag)-104, DTC 42 POWER SUPPLY VOLTAGE TOO LOW, Diagnostics Procedure with Subaru Select Monitor.>
	5A80	Power supply voltage too high	Power supply voltage too high	<Ref. to ABS(diag)-106, DTC 42 POWER SUPPLY VOLTAGE TOO HIGH, Diagnostics Procedure with Subaru Select Monitor.>
44	1600	ABS-AT control (Non Controlled)	ABS-AT control (Non Controlled)	<Ref. to ABS(diag)-109, DTC 44 ABS-AT CONTROL (NON CONTROLLED), Diagnostics Procedure with Subaru Select Monitor.>
	1500	ABS-AT control (Controlled)	ABS-AT control (Controlled)	<Ref. to ABS(diag)-111, DTC 44 ABS-AT CONTROL (CONTROLLED), Diagnostics Procedure with Subaru Select Monitor.>
51	0C80 0EA0	Valve relay malfunction	Valve relay malfunction	<Ref. to ABS(diag)-113, DTC 51 VALVE RELAY MALFUNCTION, Diagnostics Procedure with Subaru Select Monitor.>
	0C40	Valve relay ON failure	Valve relay ON failure	<Ref. to ABS(diag)-115, DTC 51 VALVE RELAY ON FAILURE, Diagnostics Procedure with Subaru Select Monitor.>
52	10A1	Open circuit in motor relay circuit	Open circuit in motor relay circuit	<Ref. to ABS(diag)-117, DTC 52 OPEN CIRCUIT IN MOTOR RELAY CIRCUIT, Diagnostics Procedure with Subaru Select Monitor.>
	10E1	Motor relay ON failure	Motor relay ON failure	<Ref. to ABS(diag)-119, DTC 52 MOTOR RELAY ON FAILURE, Diagnostics Procedure with Subaru Select Monitor.>
	10C1	Motor malfunction	Motor malfunction	<Ref. to ABS(diag)-121, DTC 52 MOTOR MALFUNCTION, Diagnostics Procedure with Subaru Select Monitor.>
54	5600	Stop light switch signal circuit malfunction	Stop light switch signal circuit malfunction	<Ref. to ABS(diag)-123, DTC 54 STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION, Diagnostics Procedure with Subaru Select Monitor.>
56	7600	Open or short circuit in G sensor circuit	Open or short circuit in G sensor circuit	<Ref. to ABS(diag)-125, DTC 56 OPEN OR SHORT CIRCUIT IN G SENSOR CIRCUIT, Diagnostics Procedure with Subaru Select Monitor.>
	7580	Battery short in G sensor circuit	Battery short in G sensor circuit	<Ref. to ABS(diag)-128, DTC 56 BATTERY SHORT IN G SENSOR CIRCUIT, Diagnostics Procedure with Subaru Select Monitor.>
	7540	Abnormal G sensor high μ output	Abnormal G sensor high μ output	<Ref. to ABS(diag)-132, DTC 56 ABNORMAL G SENSOR HIGH μ OUTPUT, Diagnostics Procedure with Subaru Select Monitor.>
	7500	Detection of G sensor stick	Detection of G sensor stick	<Ref. to ABS(diag)-135, DTC 56 DETECTION OF G SENSOR STICK, Diagnostics Procedure with Subaru Select Monitor.>

DTC	Sub code No.	Display screen	Contents of diagnosis	Index No.
73	7A00	Open or short circuit in Lateral G sensor circuit	Open or short circuit in Lateral G sensor circuit	<Ref. to ABS(diag)-138, DTC 73 OPEN OR SHORT CIRCUIT IN LATERAL G SENSOR CIRCUIT, Diagnostics Procedure with Subaru Select Monitor.>
	7980	Battery short in Lateral G sensor circuit	Battery short in Lateral G sensor circuit	<Ref. to ABS(diag)-141, DTC 73 BATTERY SHORT IN LATERAL G SENSOR CIRCUIT, Diagnostics Procedure with Subaru Select Monitor.>
	7940	Abnormal Lateral G sensor high μ output	Abnormal Lateral G sensor high μ output	<Ref. to ABS(diag)-145, DTC 73 ABNORMAL LATERAL G SENSOR HIGH μ OUTPUT, Diagnostics Procedure with Subaru Select Monitor.>
	7900	Detection of Lateral G sensor stick	Detection of Lateral G sensor stick	<Ref. to ABS(diag)-148, DTC 73 DETECTION OF LATERAL G SENSOR STICK, Diagnostics Procedure with Subaru Select Monitor.>

12.Diagnostics Procedure without Subaru Select Monitor

A: ABS WARNING LIGHT DOES NOT COME ON

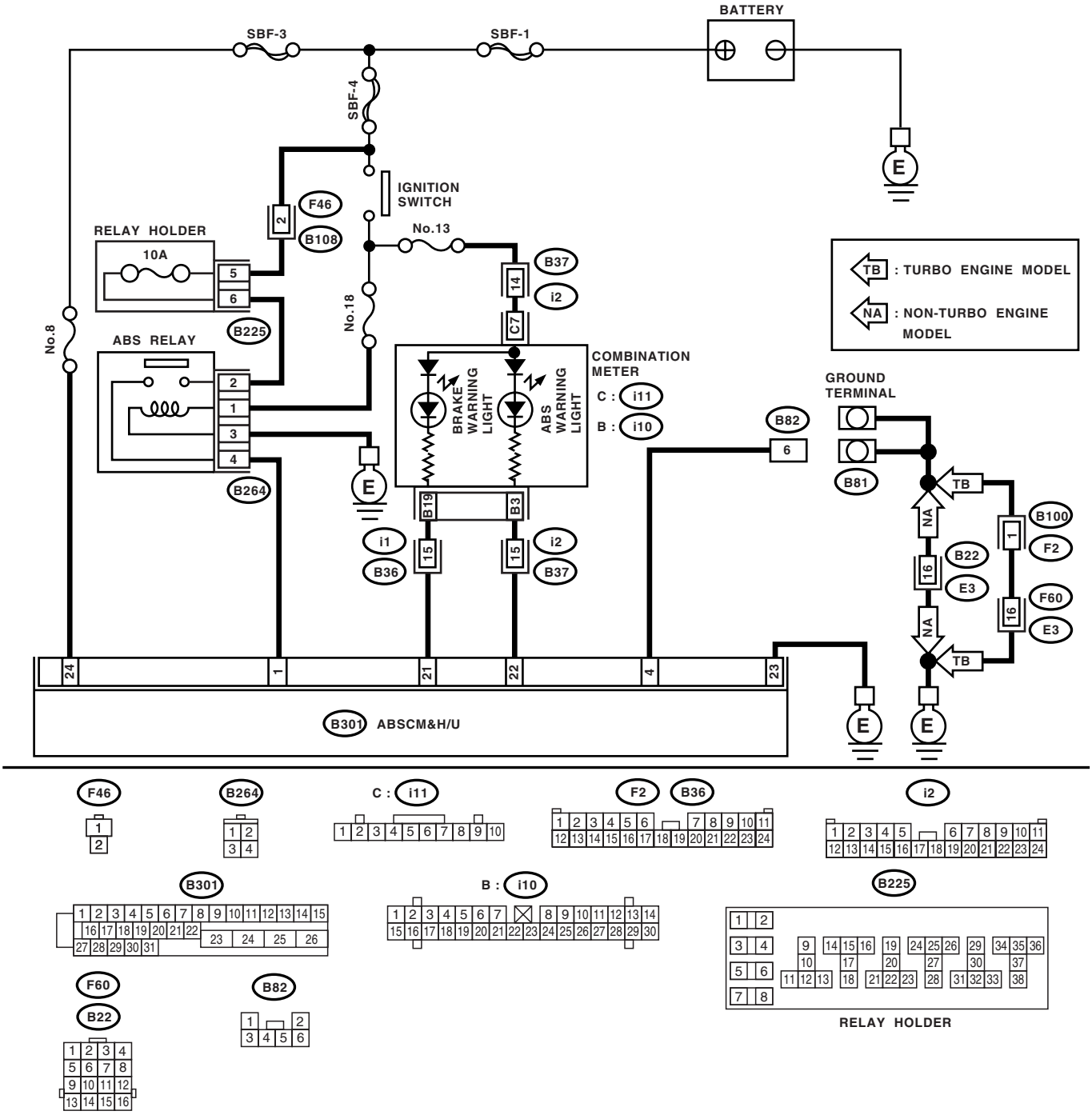
DIAGNOSIS:

ABS warning light circuit is open or shorted.

TROUBLE SYMPTOM:

When the ignition switch is turned to ON (engine OFF), ABS warning light does not come on.

WIRING DIAGRAM:



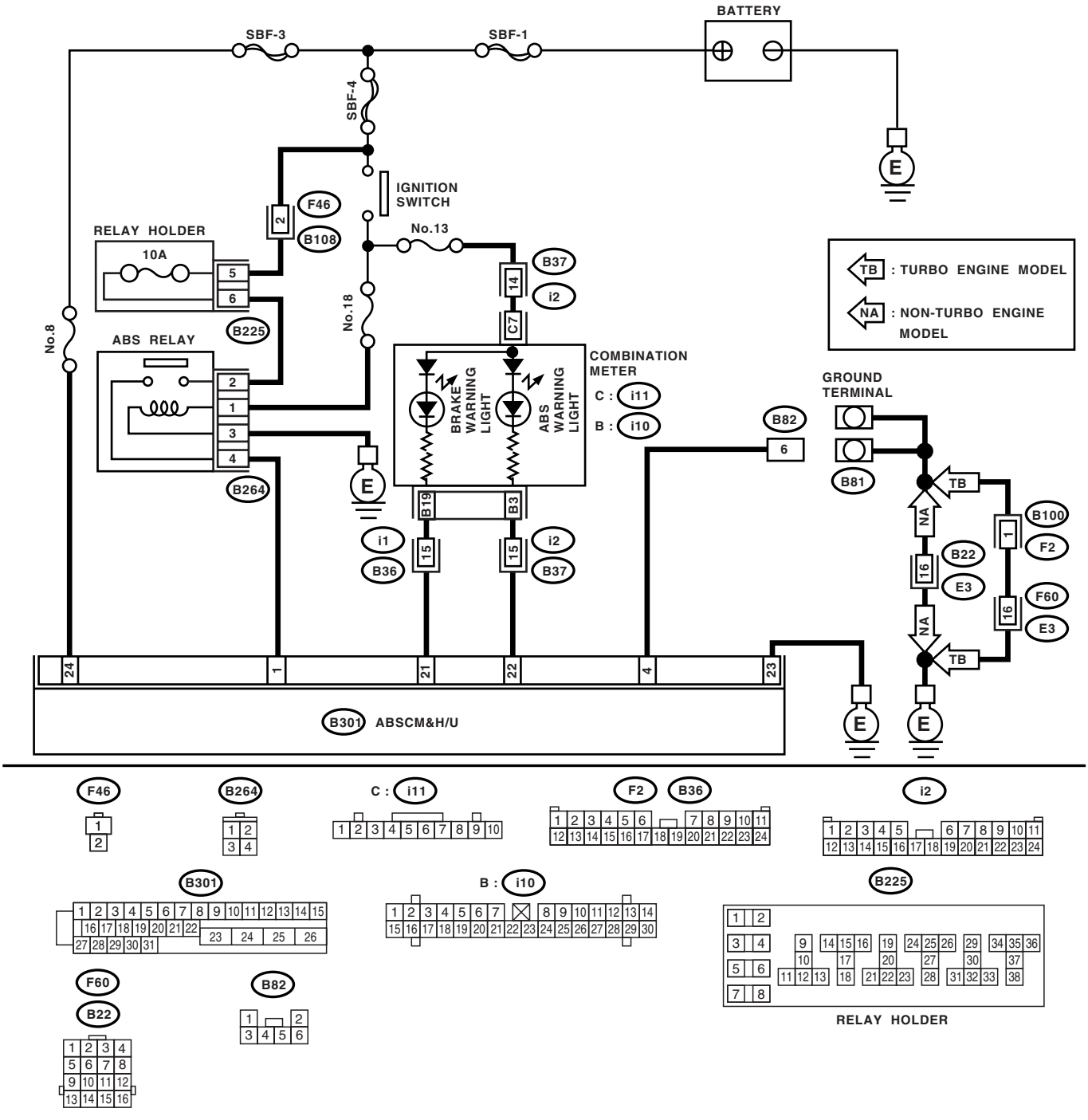
ABS00347

	Step	Check	Yes	No
1	**CHECK IF OTHER WARNING LIGHTS TURN ON.** Turn the ignition switch to ON (engine OFF).	Are other warning lights turned on?	Go to step **2.**	Repair the combination meter. <Ref. to IDI-10, Combination Meter Assembly.>
2	**CHECK ABS AND BRAKE WARNING LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the ABS warning light and brake warning light.	Is the ABS warning light bulb open?	Replace the ABS and brake warning light bulb. <Ref. to IDI-10, Combination Meter Assembly.>	Go to step **3.**
3	**CHECK BATTERY SHORT OF ABS HARNESS.** 1) Disconnect the connector (i2) from connector (B37). 2) Measure the voltage between connector (i2) and chassis ground. ***Connector & terminal*** ***(i2) No. 15 (+) — Chassis ground (−):***	Is the voltage less than 3 V?	Go to step **4.**	Repair battery short in the warning light harness.
4	**CHECK BATTERY SHORT OF ABS AND BRAKE WARNING LIGHT HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between connector (i2) and chassis ground. ***Connector & terminal*** ***(i2) No. 15 (+) — Chassis ground (−):***	Is the voltage less than 3 V?	Go to step **5.**	Repair battery short in the warning light harness.
5	**CHECK WIRING HARNESS.** 1) Turn the ignition switch to OFF. 2) Install the combination meter. 3) Turn the ignition switch to ON. 4) Measure the voltage between connector (i2) and chassis ground. ***Connector & terminal*** ***(i2) No. 15 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **6.**	Repair open circuit in the wiring harness.
6	**CHECK BATTERY SHORT OF ABS AND BRAKE WARNING LIGHT HARNESS.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between connector (B37) and chassis ground. ***Connector & terminal*** ***(B37) No. 15 (+) — Chassis ground (−):***	Is the voltage less than 3 V?	Go to step **7.**	Repair battery short in the wiring harness.
7	**CHECK BATTERY SHORT OF ABS AND BRAKE WARNING LIGHT HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between connector (B37) and chassis ground. ***Connector & terminal*** ***(B37) No. 15 (+) — Chassis ground (−):***	Is the voltage less than 3 V?	Go to step **8.**	Repair battery short in the wiring harness.
8	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(B301) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **9.**	Repair open circuit in the ABSCM&H/U ground harness.

	Step	Check	Yes	No
9	**CHECK WIRING HARNESS.** Measure the resistance between connector (B37) and chassis ground. ***Connector & terminal*** ***(B37) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **10.**	Repair open circuit in the harness/ connector.
10	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connectors between combination meter and ABSCM&H/U?	Repair the connector.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

B: ABS WARNING LIGHT DOES NOT GO OFF

DIAGNOSIS:
ABS warning light circuit is open or shorted.
TROUBLE SYMPTOM:
When starting the engine and while ABS warning light is kept ON.
WIRING DIAGRAM:



ABS00347

	Step	Check	Yes	No
1	**CHECK INSTALLATION OF ABSCM&H/U CONNECTOR.** Turn the ignition switch to OFF.	Is the ABSCM&H/U connector inserted into ABSCM until the clamp locks onto it?	Go to step **2.**	Insert the ABSCM&H/U connector into ABSCM&H/U until the clamp locks onto it.
2	**CHECK GROUND TERMINAL.** Measure the resistance between Ground terminals (B81) and chassis ground. ***Terminals*** ***Ground terminal (A) — Chassis ground:*** ***Ground terminal (B) — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the open circuit in Ground terminal harness.
3	**CHECK DIAGNOSIS LINE.** 1) Connect the Ground terminal (B81) to diagnosis connector (B82) No. 6. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 4 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **4.**	Repair the open circuit in harness connector between ABSCM&H/U and diagnosis connector.
4	**CHECK GENERATOR.** 1) Start the engine. 2) Idle the engine. 3) Measure the voltage between generator and chassis ground. ***Terminals*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **5.**	Repair the generator. <Ref. to SC(H4SO)-14, Generator.>
5	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Is there poor contact at battery terminal?	Repair or tighten the battery terminal.	Go to step **6.**
6	**CHECK POWER SUPPLY OF ABSCM.** 1) Start the engine. 2) Idle the engine. 3) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 1 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **7.**	Repair the ABSCM&H/U power supply circuit.
7	**CHECK WIRING HARNESS.** 1) Disconnect the connector (i2) from connector (B37). 2) Turn the ignition switch to ON.	Does the ABS warning light turn on?	Repair the front or body wiring harness.	Go to step **8.**
8	**CHECK PROJECTION AT ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Check for damage at the ABSCM&H/U terminal. NOTE: For detail of connector switch, refer to following. <Ref. to ABS(diag)-13, ELECTRICAL SPECIFICATION, Control Module I/O Signal.>	Is there any damage on projection which switches connector switch?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **9.**
9	**CHECK ABSCM&H/U.** Measure the resistance between ABSCM&H/U terminals. ***Terminals*** ***No. 22 — No. 23:***	Is the resistance more than 1 MΩ?	Go to step **10.**	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

	Step	Check	Yes	No
10	**CHECK WIRING HARNESS.** Measure the resistance between connector (B37) and chassis ground. ***Connector & terminal*** ***(B37) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **11.**	Repair the harness.
11	**CHECK WIRING HARNESS.** 1) Connect the connector to ABSCM&H/U. 2) Measure the resistance between connector (B37) and chassis ground. ***Connector & terminal*** ***(B37) No. 15 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **12.**	Repair the harness.
12	**CHECK POOR CONTACT IN ABSCM&H/U CONNECTOR.**	Is there poor contact in ABSCM&H/U connector?	Repair the connector.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

C: BRAKE WARNING LIGHT DO NOT GO OFF

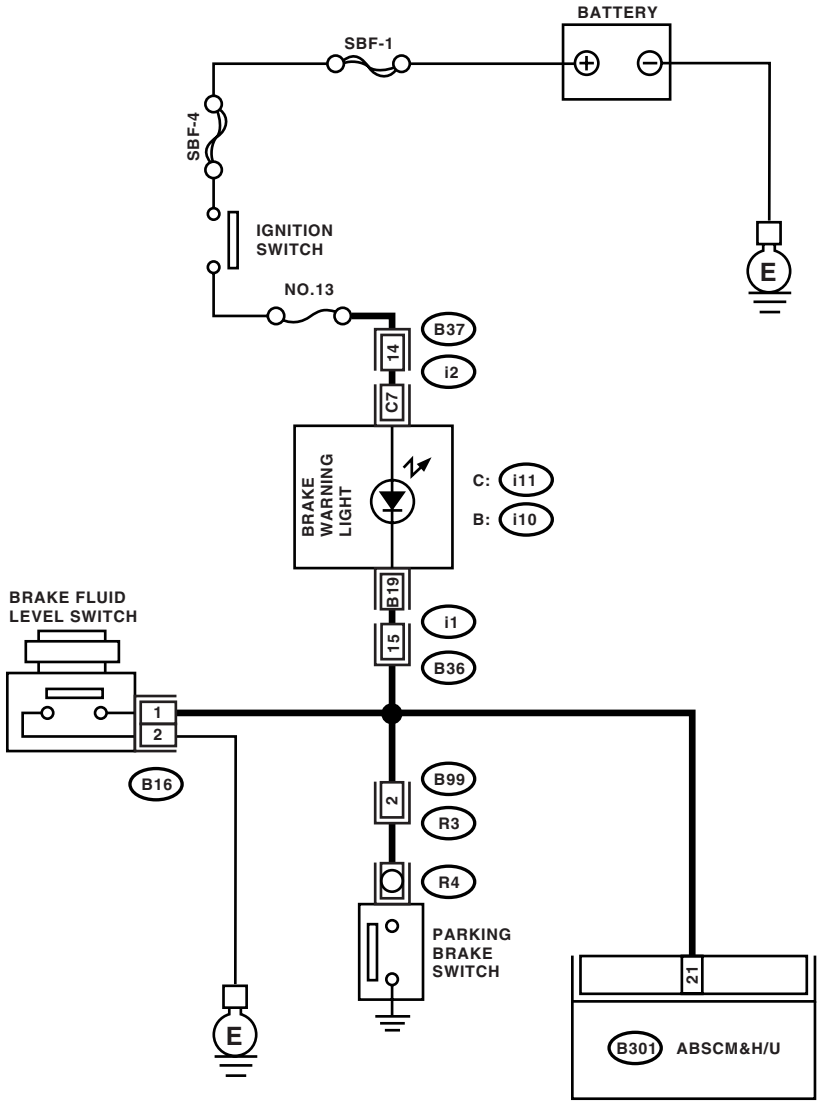
DIAGNOSIS:

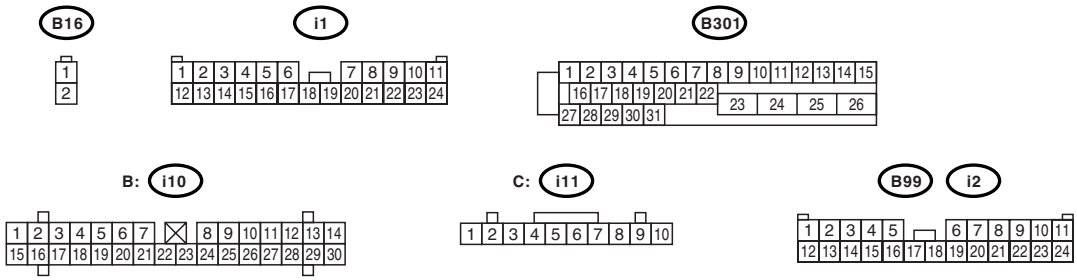
- Brake warning light circuit is shorted.
- Faulty sensor/connector

TROUBLE SYMPTOM:

After starting the engine, brake warning light is kept ON, even if the parking brake lever has been released.

WIRING DIAGRAM:





ABS00350

Diagnostics Procedure without Subaru Select Monitor

	Step	Check	Yes	No
1	**CHECK BRAKE FLUID AMOUNT.** Check the amount of brake fluid in reservoir tank of master cylinder.	Is the brake fluid amount between “MAX” line and “MIN” line?	Go to step **2.**	Fill the brake fluid to specified amount.
2	**CHECK BRAKE FLUID LEVEL SWITCH.** 1) Disconnect the level switch connector (B16) from master cylinder. 2) Measure the resistance of master cylinder terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Replace the master cylinder.
3	**CHECK PARKING BRAKE SWITCH.** 1) Disconnect the connector (R4) from parking brake switch. 2) Release the parking brake switch. 3) Measure the resistance between parking brake switch terminal and chassis ground.	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the parking brake switch.
4	**CHECK GROUND SHORT OF HARNESS.** 1) Disconnect the connector form ABSCM & H/U. 2) Disconnect the connector (i1) from combination meter. 3) Turn the ignition switch to ON.	Does the brake warning light go off?	Go to step **5.**	Repair the harness.
5	**CHECK POOR CONTACT IN ABSCM & H/U.**	Is there poor contact in ABSCM & H/U connector?	Repair the connector.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

D: DTC DOES NOT APPEAR

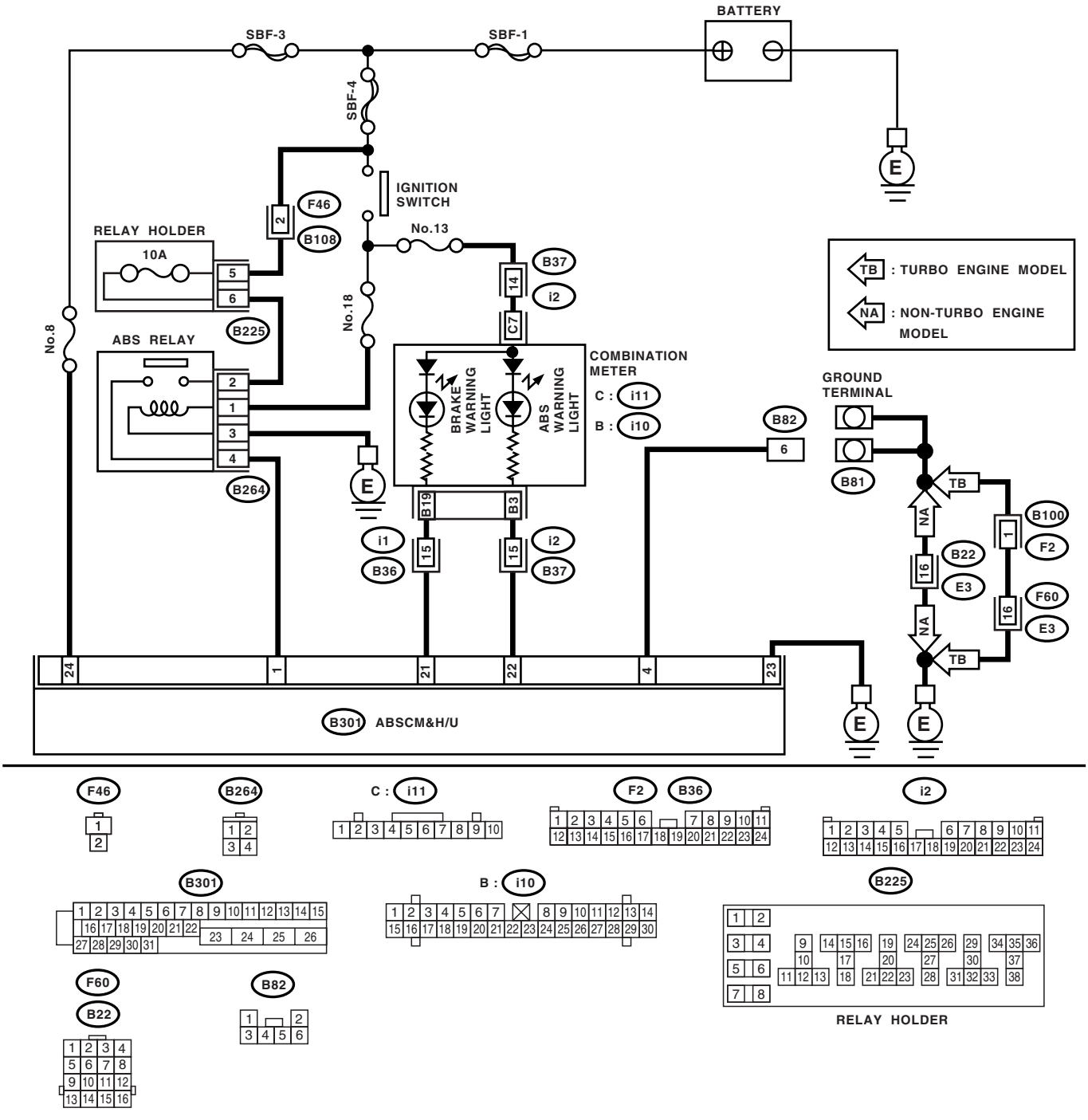
DIAGNOSIS:

Diagnosis circuit is open.

TROUBLE SYMPTOM:

The ABS warning light turns on or off normally but the start code cannot be read out in diagnostic mode.

WIRING DIAGRAM:



ABS00347

	Step	Check	Yes	No
1	**CHECK GROUND TERMINAL.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between Ground terminals (B81) and chassis ground. ***Terminals*** ***Ground terminal (A) — Chassis ground:*** ***Ground terminal (B) — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **2.**	Repair the Ground terminal harness.
2	**CHECK DIAGNOSIS LINE.** 1) Connect the Ground terminal (B81) to diagnosis connector (B82) No. 6. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 4 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the harness connector between ABSCM&H/U and diagnosis connector.
3	**CHECK POOR CONTACT IN ABSCM&H/U CONNECTOR.**	Is there poor contact in ABSCM&H/U connector?	Repair the connector.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

E: DTC 21 ABNORMAL ABS WHEEL SPEED SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT RH)

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS(diag)-39, DTC 27 ABNORMAL ABS WHEEL SPEED SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Procedure without Subaru Select Monitor.>

F: DTC 23 ABNORMAL ABS WHEEL SPEED SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT LH)

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS(diag)-39, DTC 27 ABNORMAL ABS WHEEL SPEED SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Procedure without Subaru Select Monitor.>

G: DTC 25 ABNORMAL ABS WHEEL SPEED SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR RH)

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS(diag)-39, DTC 27 ABNORMAL ABS WHEEL SPEED SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH), Diagnostics Procedure without Subaru Select Monitor.>

H: DTC 27 ABNORMAL ABS WHEEL SPEED SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH)

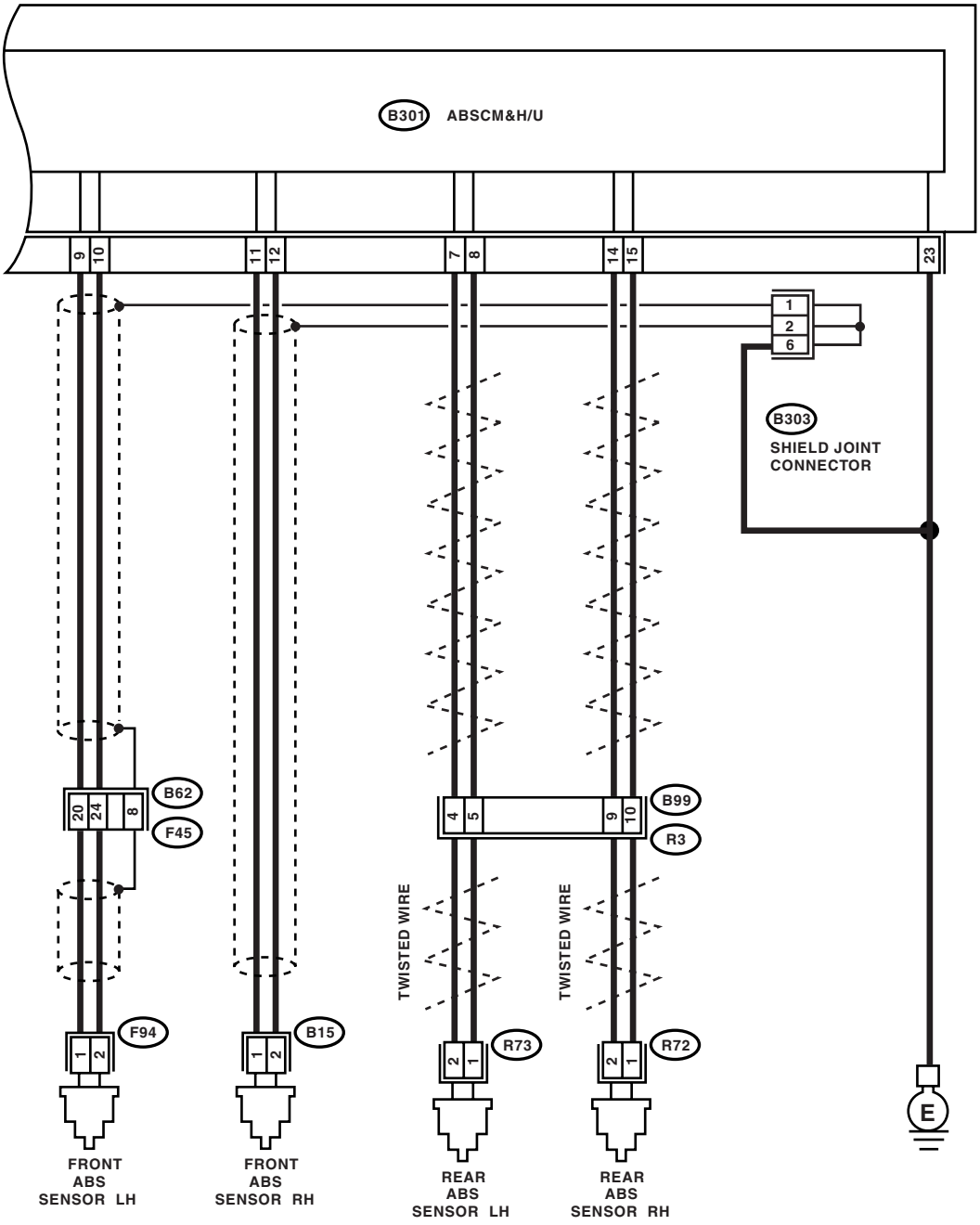
DIAGNOSIS:

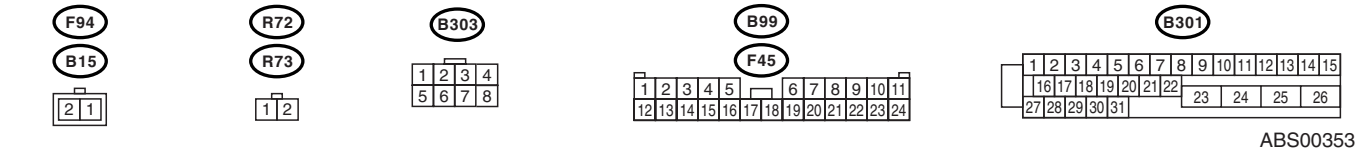
- Faulty ABS wheel speed sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:





ABS00353

	Step	Check	Yes	No
1	**CHECK ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABS wheel speed sensor. 3) Measure the resistance of ABS wheel speed sensor connector terminals while shaking the harness lightly. ***Terminals*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:***	Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **2.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.>
2	**CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR.** 1) Disconnect the connector from ABSCM&H/U. 2) Measure the voltage between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH No. 1 (+) — Chassis ground (−):*** ***Front LH No. 1 (+) — Chassis ground (−):*** ***Rear RH No. 1 (+) — Chassis ground (−):*** ***Rear LH No. 1 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **3.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.>
3	**CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH No. 1 (+) — Chassis ground (−):*** ***Front LH No. 1 (+) — Chassis ground (−):*** ***Rear RH No. 1 (+) — Chassis ground (−):*** ***Rear LH No. 1 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **4.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.>
4	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the connector to ABS wheel speed sensor. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***DTC 21*** ***(B301) No. 11 — No. 12:*** ***DTC 23*** ***(B301) No. 9 — No. 10:*** ***DTC 25*** ***(B301) No. 14 — No. 15:*** ***DTC 27*** ***(B301) No. 7 — No. 8:***	Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **5.**	Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.

	Step	Check	Yes	No
5	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21*** ***(B301) No. 11 (+) — Chassis ground (–):*** ***DTC 23*** ***(B301) No. 9 (+) — Chassis ground (–):*** ***DTC 25*** ***(B301) No. 14 (+) — Chassis ground (–):*** ***DTC 27*** ***(B301) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **6.**	Repair the harness between ABSCM&H/U and ABS wheel speed sensor.
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21*** ***(B301) No. 11 (+) — Chassis ground (–):*** ***DTC 23*** ***(B301) No. 9 (+) — Chassis ground (–):*** ***DTC 25*** ***(B301) No. 14 (+) — Chassis ground (–):*** ***DTC 27*** ***(B301) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **7.**	Repair the harness between ABSCM&H/U and ABS wheel speed sensor.
7	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.** Turn the ignition switch to OFF.	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step **8.**	Tighten the ABS wheel speed sensor installation bolts securely.
8	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **9.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
9	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **10.**	Replace the tone wheel. Front: <Ref. to ABS-18, Front Tone Wheel.> Rear: <Ref. to ABS-19, Rear Tone Wheel.>

	Step	Check	Yes	No
10	**CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the resistance between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **11.**	Replace the ABS wheel speed sensor and ABSCM&H/U. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.> and <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
11	**CHECK GROUND SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Connect the connector to ABS wheel speed sensor. 3) Measure the resistance between ABSCM&H/U connector terminal and chassis ground. ***Connector & terminal*** ***DTC 21*** ***(B301) No. 11 — Chassis ground:*** ***DTC 23*** ***(B301) No. 11 — Chassis ground:*** ***DTC 25*** ***(B301) No. 14 — Chassis ground:*** ***DTC 27*** ***(B301) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **12.**	Repair the harness between ABSCM&H/U and ABS wheel speed sensor. Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
12	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step **13.**
13	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **14.**
14	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact. NOTE: Check the harness and connectors between ABSCM&H/U and ABS wheel speed sensor.

I: DTC 22 ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (FRONT RH)

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS(diag)-44, DTC 28 ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (REAR LH), Diagnostics Procedure without Subaru Select Monitor.>

J: DTC 24 ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (FRONT LH)

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS(diag)-44, DTC 28 ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (REAR LH), Diagnostics Procedure without Subaru Select Monitor.>

K: DTC 26 ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (REAR RH)

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS(diag)-44, DTC 28 ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (REAR LH), Diagnostics Procedure without Subaru Select Monitor.>

L: DTC 28 ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (REAR LH)

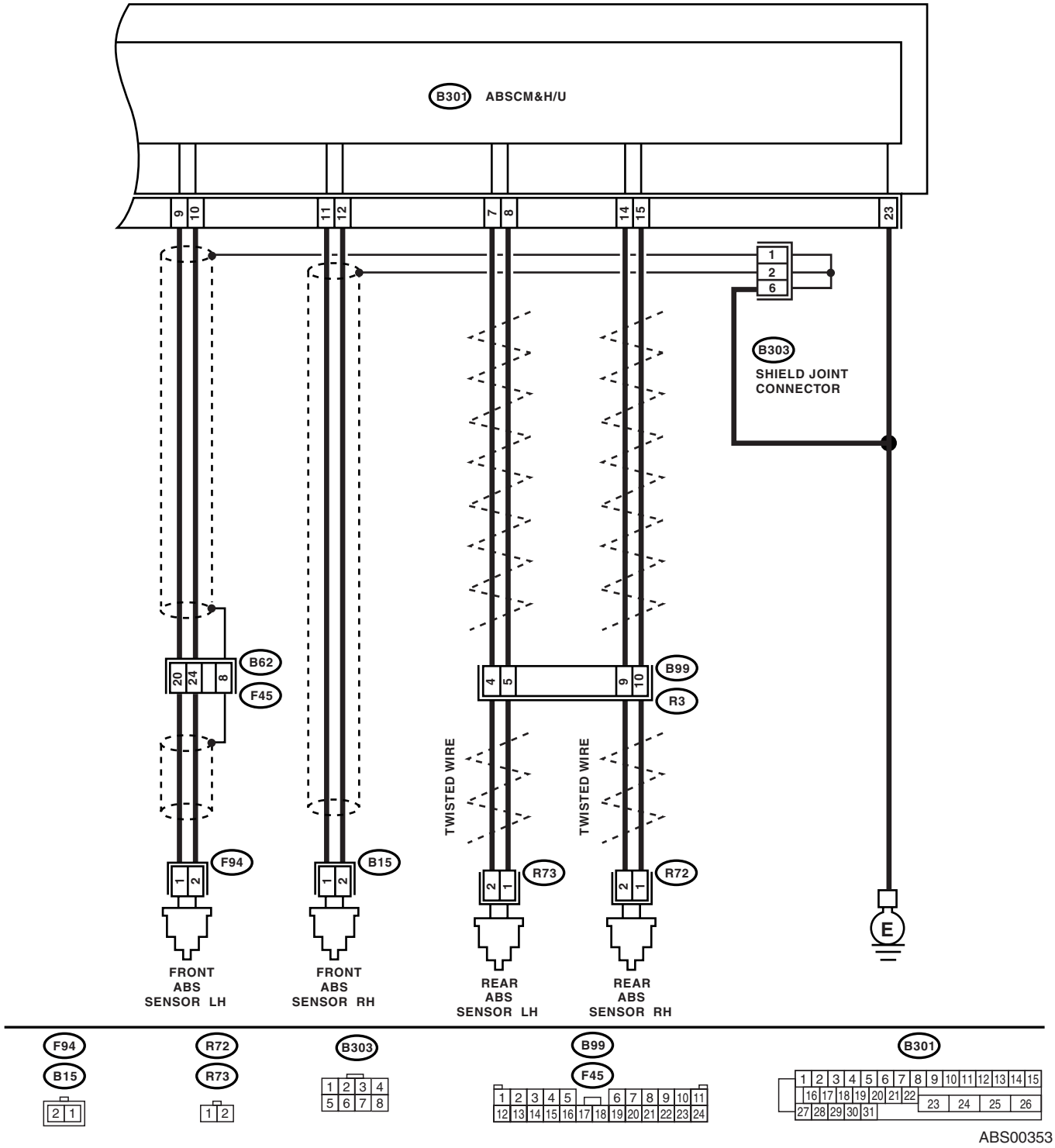
DIAGNOSIS:

- Faulty ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:



ABS00353

	Step	Check	Yes	No
1	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.** Turn the ignition switch to OFF.	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step **2.**	Tighten the ABS wheel speed sensor installation bolts securely.
2	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **3.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacer cannot correct gap, replace worn sensor or worn tone wheel.
3	**PREPARE OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **4.**	Go to step **5.**
4	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Raise all four wheels off ground. 2) Turn the ignition switch to OFF. 3) Connect the oscilloscope to the connector. 4) Turn the ignition switch to ON. 5) Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS(diag)-16, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABS control module sometimes stores DTC 29 or DTC 56. ***Connector & terminal*** ***DTC 22*** ***(B15) No. 1 (+) — No. 2 (–):*** ***DTC 24*** ***(F45) No. 20 (+) — No. 24 (–):*** ***DTC 26*** ***(B99) No. 10 (+) — No. 9 (–):*** ***DTC 28*** ***(B99) No. 5 (+) — No. 4 (–):***	Is an oscilloscope pattern smooth, as shown in the figure?	Go to step **8.**	Go to step **7.**
5	**CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.** Remove the disc rotor or drum from hub in accordance with DTC.	Is the ABS wheel speed sensor piece or the tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **6.**
6	**CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.**	Are there broken or damaged in the ABS wheel speed sensor piece or the tone wheel?	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.> and Front: <Ref. to ABS-18, Front Tone Wheel.> Rear: <Ref. to ABS-19, Rear Tone Wheel.>	Go to step **7.**

	Step	Check	Yes	No
7	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **8.**	Replace the tone wheel. Front: <Ref. to ABS-18, Front Tone Wheel.> Rear: <Ref. to ABS-19, Rear Tone Wheel.>
8	**CHECK RESISTANCE OF ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABS wheel speed sensor. 3) Measure the resistance between ABS wheel speed sensor connector terminals while shaking the harness lightly. ***Terminals*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:***	Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **9.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.>
9	**CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR.** Measure the resistance between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **10.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.>
10	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS WHEEL SPEED SENSOR.** 1) Connect the connector to ABS wheel speed sensor. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance at ABSCM&H/U connector terminals. ***Connector & terminal*** ***DTC 22*** ***(B301) No. 11 — No. 12:*** ***DTC 24*** ***(B301) No. 9 — No. 10:*** ***DTC 26*** ***(B301) No. 14 — No. 15:*** ***DTC 28*** ***(B301) No. 7 — No. 8:***	Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **11.**	Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.
11	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 22*** ***(B301) No. 11 — Chassis ground:*** ***DTC 24*** ***(B301) No. 9 — Chassis ground:*** ***DTC 26*** ***(B301) No. 14 — Chassis ground:*** ***DTC 28*** ***(B301) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **12.**	Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.

	Step	Check	Yes	No
12	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** Measure the resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(B301) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **13.**	Repair the ABSCM&H/U ground harness.
13	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Go to step **14.**	Repair the connector.
14	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or wireless transmitter properly installed?	Go to step **15.**	Properly install the car telephone or wireless transmitter.
15	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Go to step **16.**	Install the noise sources apart from sensor harness.
16	**CHECK SHIELD CIRCUIT.** 1) Disconnect the connectors (B303). 2) Measure the resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 22*** ***(B303) No. 2 — Chassis ground:*** ***DTC 24*** ***(B303) No. 1 — Chassis ground:*** NOTE: If the DTC is 26, 28: Go to YES.	Is the resistance less than 0.5 Ω?	Go to step **17.**	Repair the shield harness.
17	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **18.**
18	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary noise interference. NOTE: Although the ABS warning light remains illuminating at this point, this is a normal condition. Vehicle must be driven at approx. 12 km/h (7.46 MPH) or faster to turn off ABS warning light. Make sure that the ABS warning light goes off after driving vehicle.

M: DTC 29 ABNORMAL ABS WHEEL SPEED SENSOR (ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL) (ANY ONE OF FOUR)

DIAGNOSIS:

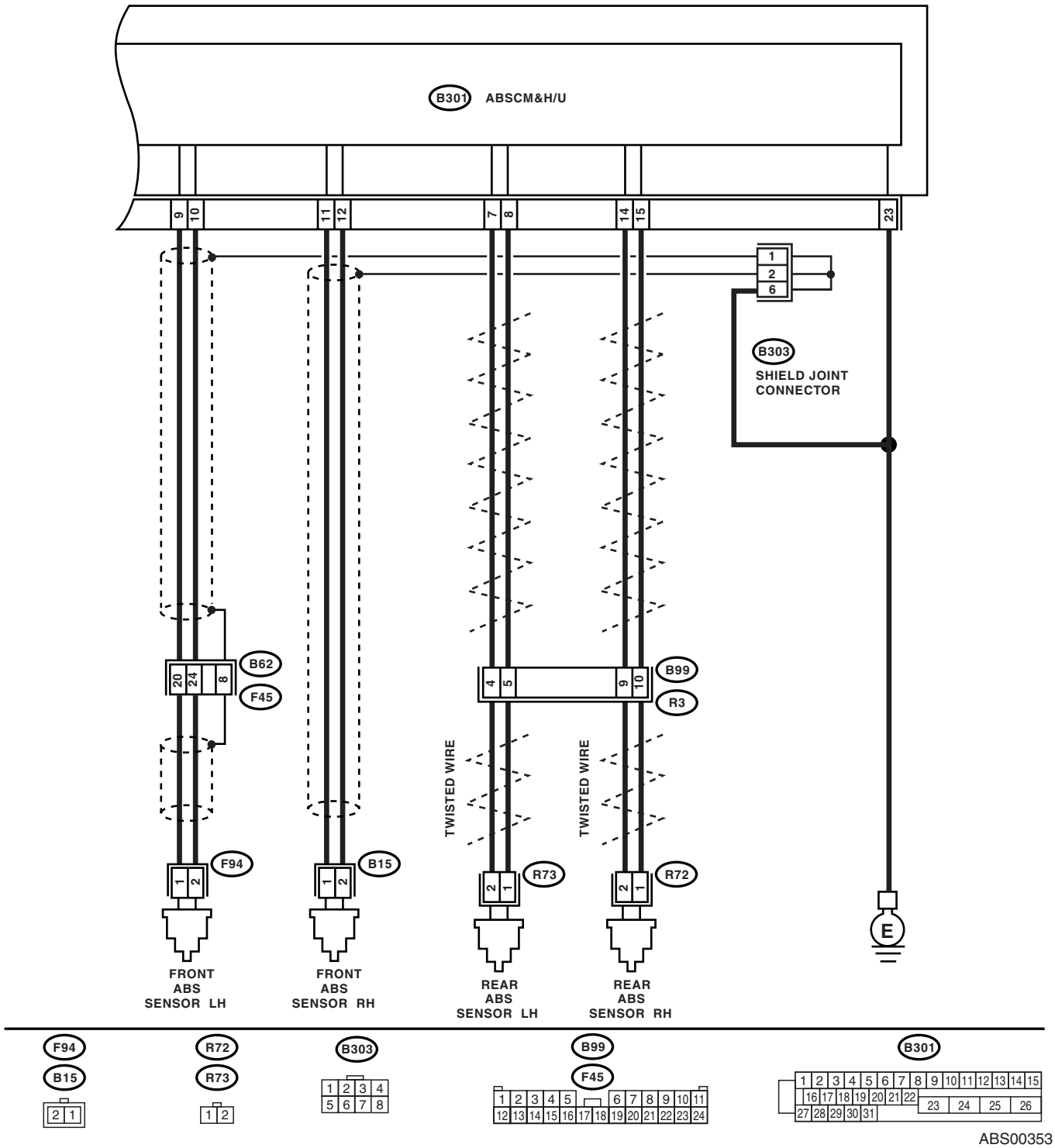
- Faulty ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK IF THE WHEELS HAVE TURNED FREELY FOR A LONG TIME.** Check if the wheels have been turned freely for more than 1 minute, such as when vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.	Have the wheels been turned freely?	The ABS is normal. Erase the DTC. NOTE: When the wheels turn freely for a long time, such as when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way, this DTC may sometimes occur.	Go to step **2.**
2	**CHECK TIRE SPECIFICATIONS.** Turn the ignition switch to OFF.	Are the tire specifications correct?	Go to step **3.**	Replace the tire.
3	**CHECK WEAR OF TIRE.**	Is the tire worn excessively?	Replace tire.	Go to step **4.**
4	**CHECK TIRE PRESSURE.**	Is the tire pressure correct?	Go to step **5.**	Adjust tire pressure.
5	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step **6.**	Tighten the ABS wheel speed sensor installation bolts securely.
6	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **7.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacer cannot correct gap, replace worn sensor or worn tone wheel.
7	**PREPARE OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **8.**	Go to step **9.**
8	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Raise all four wheels off ground. 2) Turn the ignition switch to OFF. 3) Connect the oscilloscope to the connector. 4) Turn the ignition switch to ON. 5) Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS(diag)-16, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABSCM&H/U sometimes stores the DTC 29. ***Connector & terminal*** ***Front RH*** ***(B15) No. 1 (+) — No. 2 (–):*** ***Front LH*** ***(F45) No. 20 (+) — No. 24 (–):*** ***Rear RH*** ***(B99) No. 10 (+) — No. 9 (–):*** ***Rear LH*** ***(B99) No. 5 (+) — No. 4 (–):***	Is an oscilloscope pattern smooth, as shown in the figure?	Go to step **12.**	Go to step **9.**

	Step	Check	Yes	No
9	**CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.** Remove the disc rotor or drum from hub.	Is the ABS wheel speed sensor piece or the tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **10.**
10	**CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.**	Are there broken or damaged teeth in the ABS wheel speed sensor piece or the tone wheel?	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.> and Front: <Ref. to ABS-18, Front Tone Wheel.> Rear: <Ref. to ABS-19, Rear Tone Wheel.>	Go to step **11.**
11	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **12.**	Replace the tone wheel. Front: <Ref. to ABS-18, Front Tone Wheel.> Rear: <Ref. to ABS-19, Rear Tone Wheel.>
12	**CHECK ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

N: DTC 31 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH)

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS(diag)-52, DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Procedure without Subaru Select Monitor.>

O: DTC 33 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH)

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS(diag)-52, DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Procedure without Subaru Select Monitor.>

P: DTC 35 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH)

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS(diag)-52, DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Procedure without Subaru Select Monitor.>

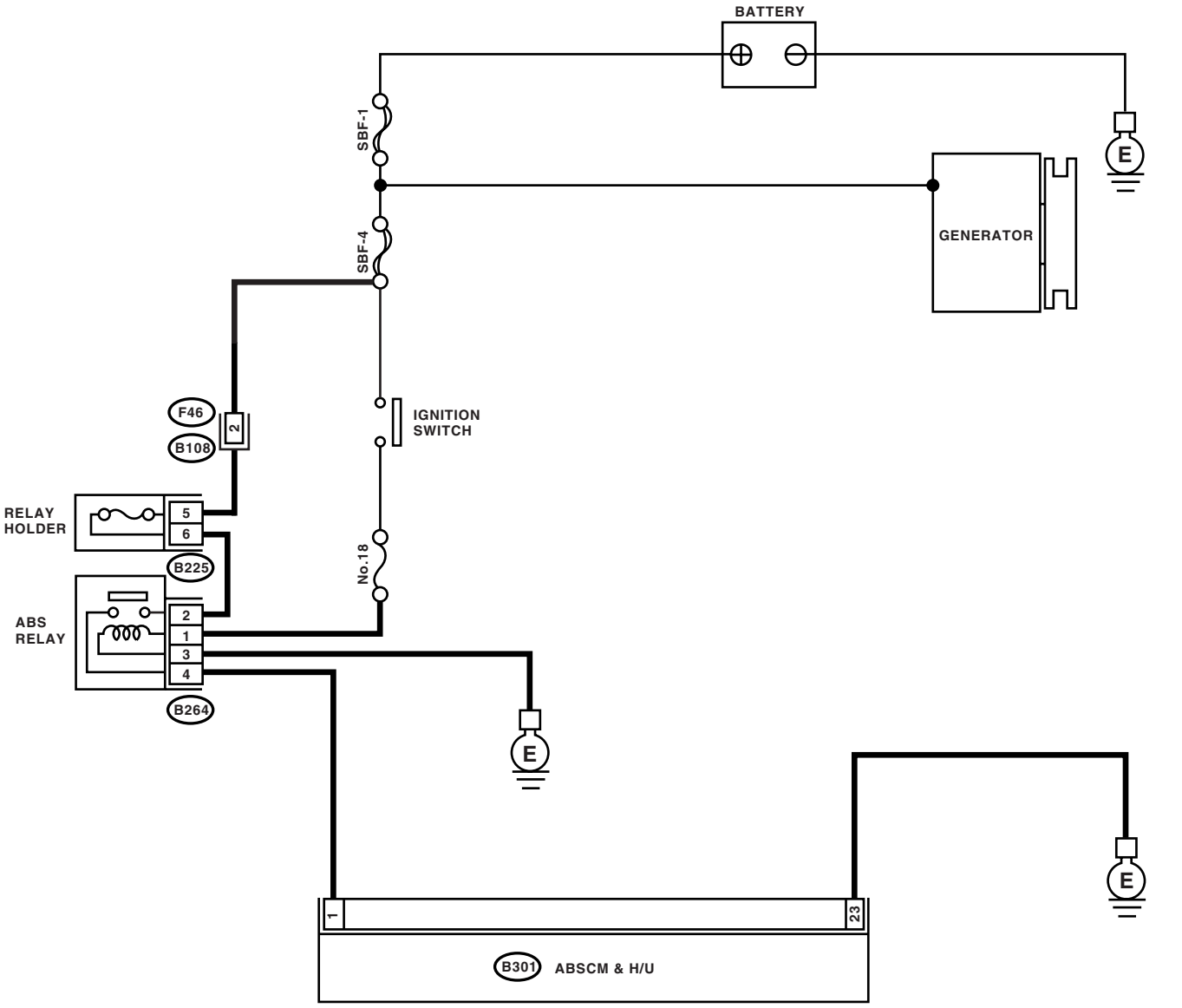
Q: DTC 37 ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH)

DIAGNOSIS:
- Faulty harness/connector
- Faulty inlet solenoid valve in ABSCM&H/U

TROUBLE SYMPTOM:
- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates.

WIRING DIAGRAM:



ABS00322

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 1 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the power supply circuit and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

R: DTC 32 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH)

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS(diag)-55, DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Procedure without Subaru Select Monitor.>

S: DTC 34 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH)

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS(diag)-55, DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Procedure without Subaru Select Monitor.>

T: DTC 36 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH)

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS(diag)-55, DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH), Diagnostics Procedure without Subaru Select Monitor.>

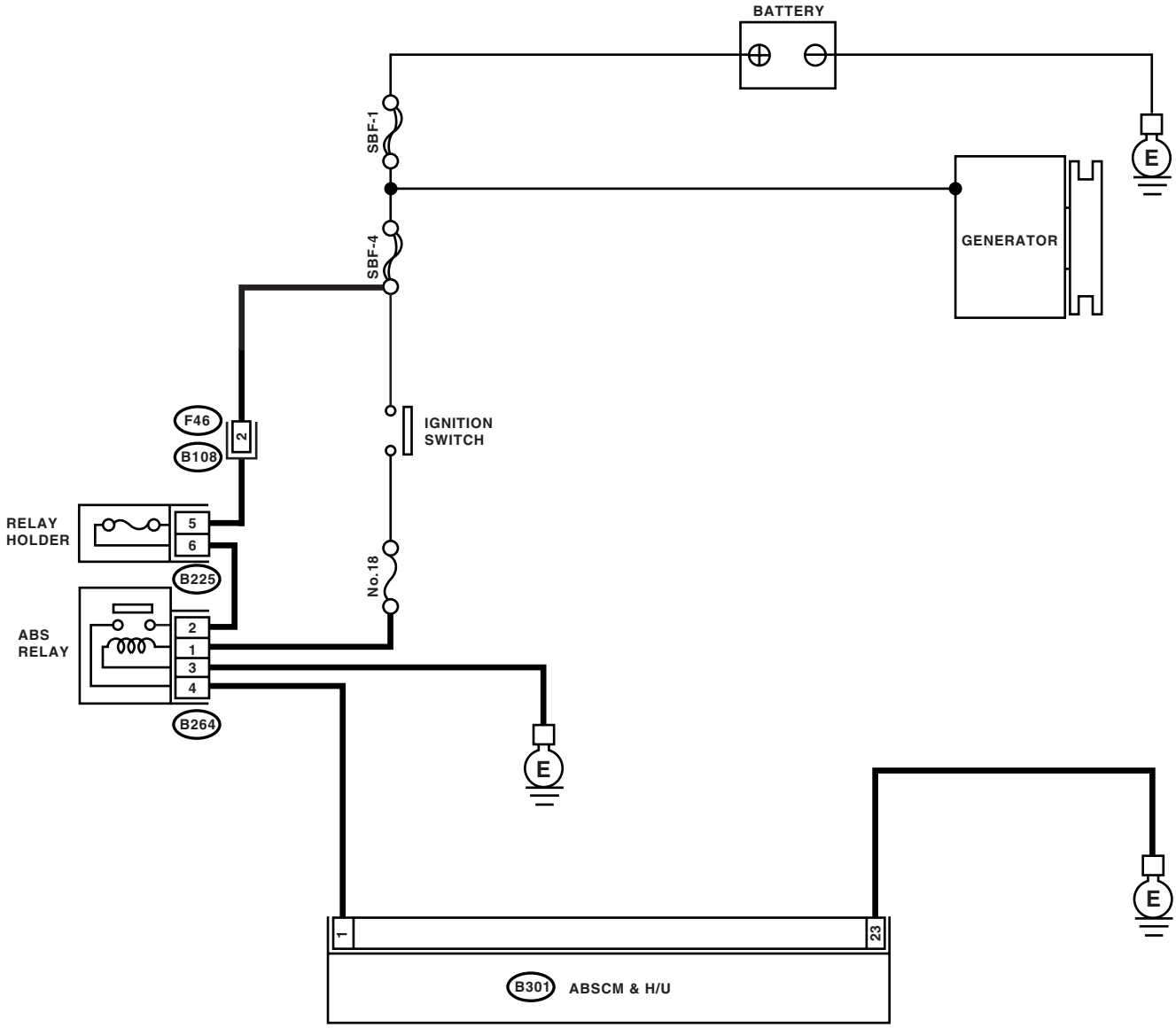
U: DTC 38 ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH)

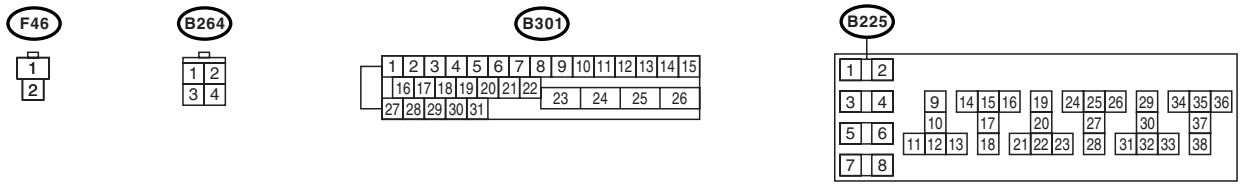
DIAGNOSIS:
- Faulty harness/connector
- Faulty outlet solenoid valve in ABSCM&H/U

TROUBLE SYMPTOM:
- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates.

WIRING DIAGRAM:





ABS00322

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 1 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the power supply circuit and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

V: DTC 41 ABNORMAL ABS CONTROL MODULE

DIAGNOSIS:

Faulty ABSCM&H/U.

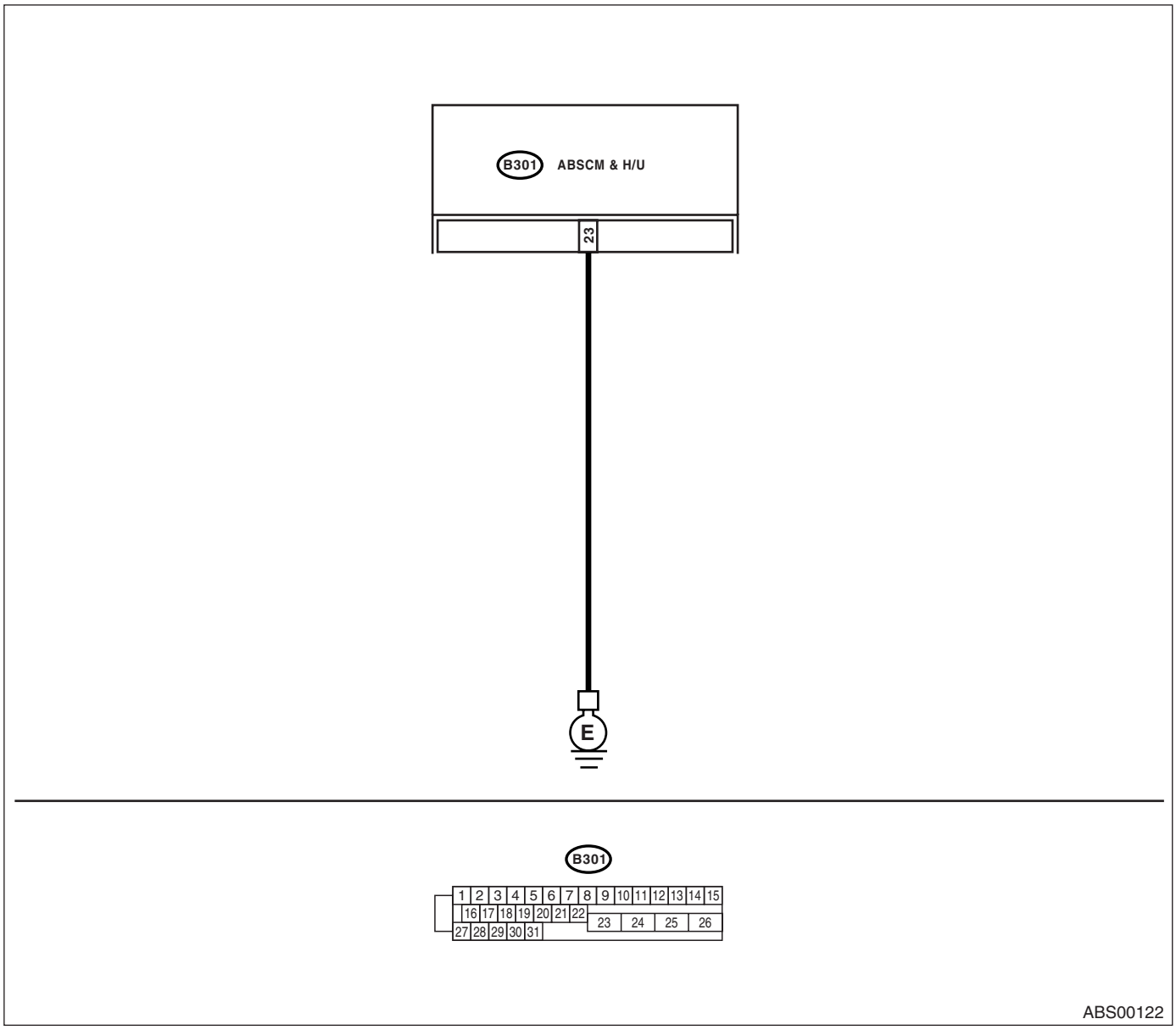
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:

In addition to the ABS warning light, brake warning light illuminates.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(B301) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **2.**	Repair the ABSCM&H/U ground harness.
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between battery, ignition switch and ABSCM&H/U?	Repair the connector.	Go to step **3.**
3	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or the wireless transmitter properly installed?	Go to step **4.**	Properly install the car telephone or wireless transmitter.
4	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from the sensor harness.	Go to step **5.**
5	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

W: DTC 42 SOURCE VOLTAGE IS ABNORMAL

DIAGNOSIS:

Power source voltage of the ABSCM&H/U is low or high.

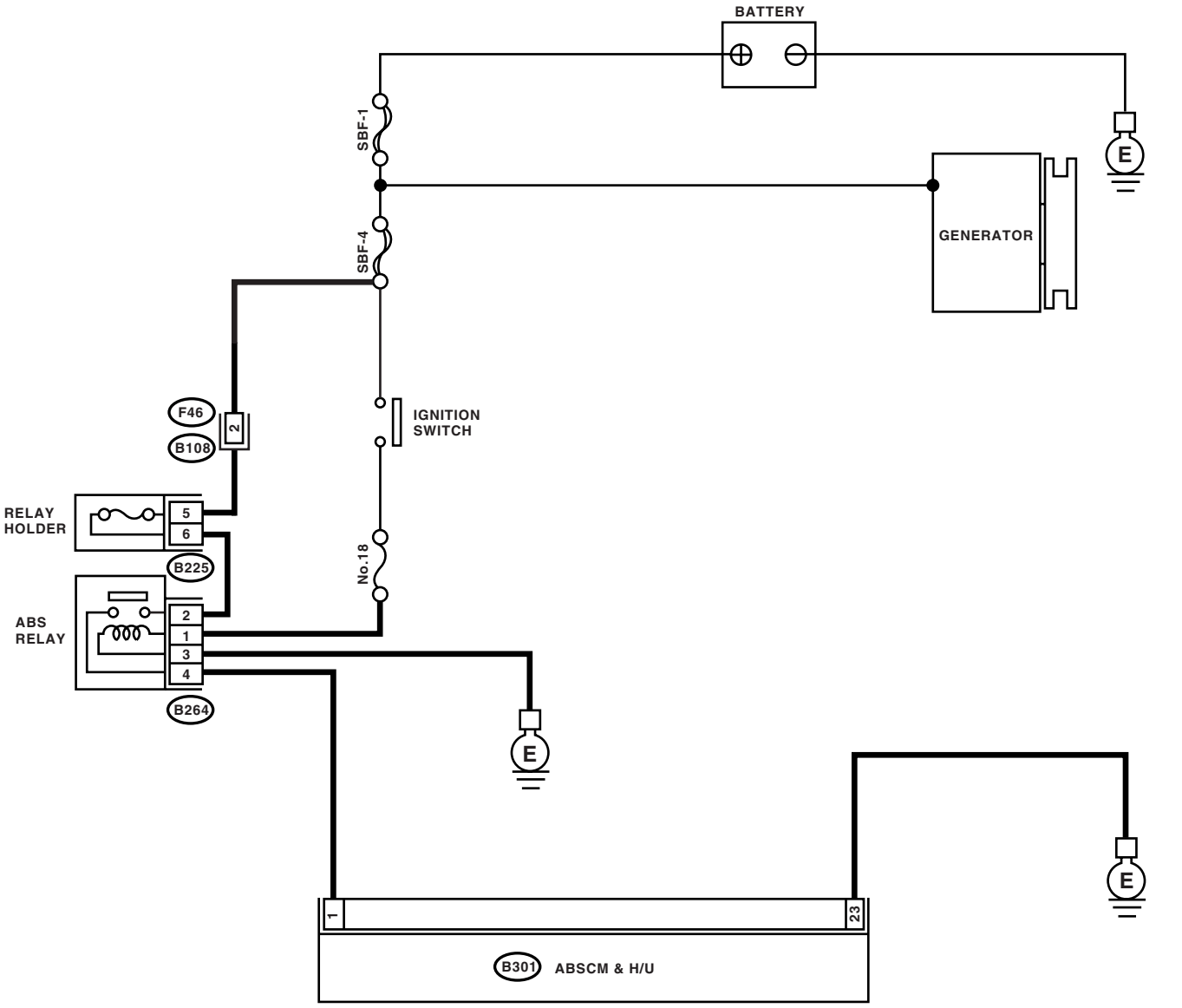
TROUBLE SYMPTOM:

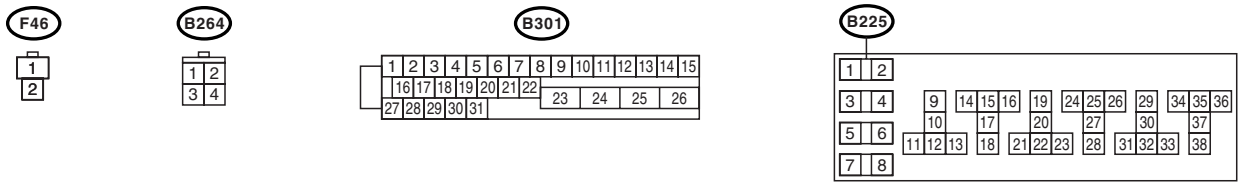
- ABS does not operate.
- EBD does not operate.

NOTE:

In addition to the ABS warning light, brake warning light illuminates temporarily. Both warning lights go off on the recovery of voltage.

WIRING DIAGRAM:



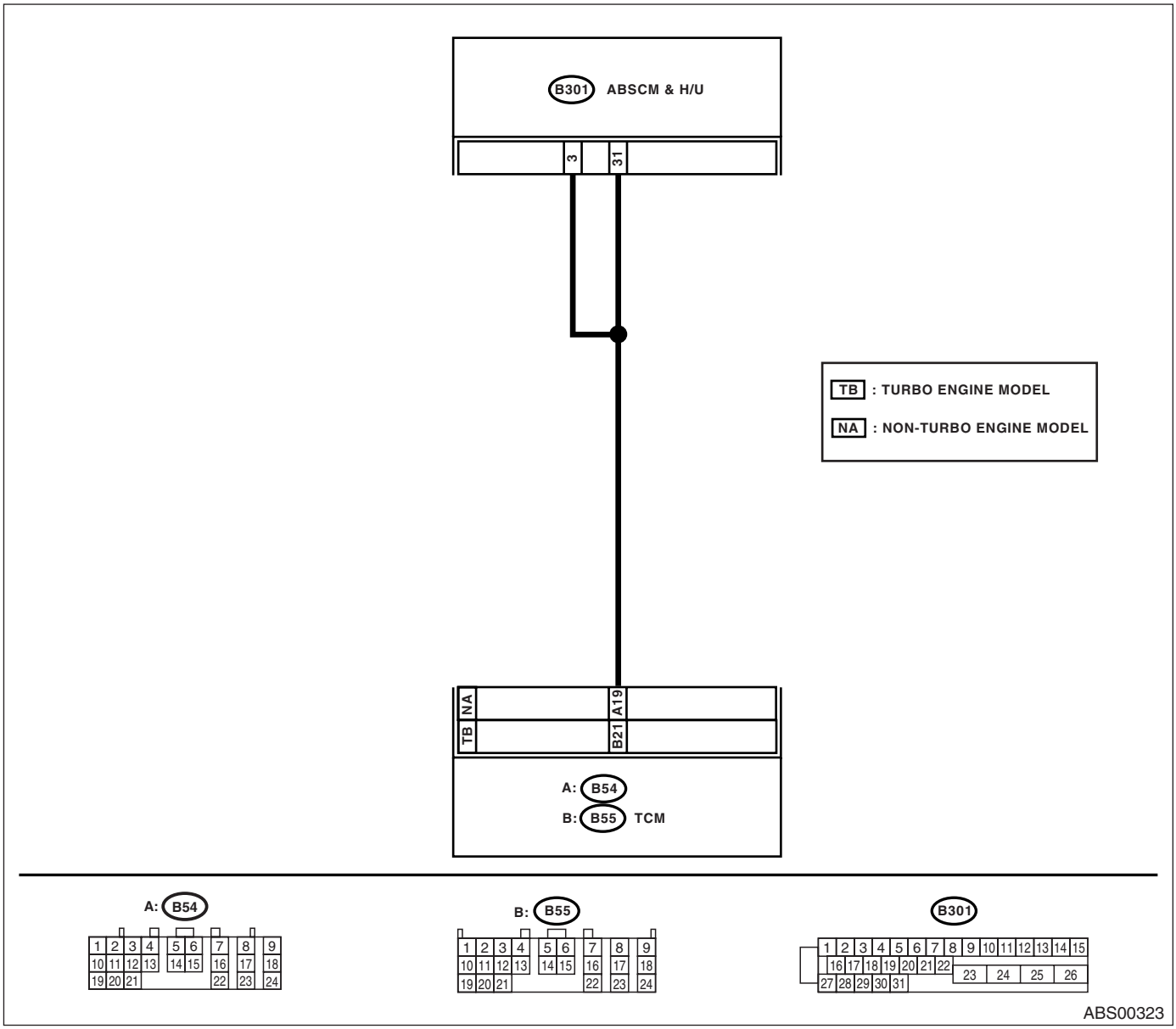


ABS00322

	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start the engine. 2) Idle after warm-up. 3) Measure the voltage between generator B terminal and chassis ground. ***Terminals*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage 10 — 17 V?	Go to step **2.**	Repair the generator. <Ref. to SC(H4SO)-14, Generator.>
2	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Are the positive and negative battery terminals tightly clamped?	Go to step **3.**	Tighten the clamp of terminal.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Disconnect the connector from ABSCM&H/U. 2) Run the engine at idle. 3) Operate the electric load applying devices, such as the headlight, A/C, and defogger. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 1 (+) — Chassis ground (−):***	Is the voltage 10 — 17 V?	Go to step **4.**	Repair the power supply circuit and ABSCM&H/U.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **5.**	Repair the ABSCM&H/U ground harness.
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

X: DTC 44 A COMBINATION OF AT CONTROL ABNORMAL

DIAGNOSIS:
Combination of AT control faults
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK SPECIFICATIONS OF THE ABSCM&H/U.** Check the specifications of mark on ABSCM&H/U. ***CU: AT*** ***CV: MT (Except STi model)*** ***CY: MT (STi model)***	Specifications between vehicle and ABSCM&H/U are matched?	Go to step **2.**	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

	Step	Check	Yes	No
2	**CHECK GROUND SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect all connectors from TCM. 3) Disconnect the connector from ABSCM&H/U. 4) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the harness between TCM and ABSCM&H/U.
3	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 3 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **4.**	Repair the harness between TCM and ABSCM&H/U.
4	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 3 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **5.**	Repair the harness between TCM and ABSCM&H/U.
5	**CHECK TCM.** 1) Turn the ignition switch to OFF. 2) Connect all connectors to TCM. 3) Turn the ignition switch to ON. 4) Measure the voltage between TCM connector terminal and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 19 (+) — Chassis ground (−):*** ***Turbo model*** ***(B55) No. 21 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **7.**	Go to step **6.**
6	**CHECK AT.**	Is the AT functioning normally?	Replace the TCM.	Repair the AT.
7	**CHECK OPEN CIRCUIT OF HARNESS.** Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 3 (+) — Chassis ground (−):*** ***(B301) No. 31 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **8.**	Repair the harness/connector between TCM and ABSCM&H/U.
8	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between TCM and ABSCM&H/U?	Repair the connector.	Go to step **9.**
9	**CHECK ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **10.**
10	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

Y: DTC 51 ABNORMAL VALVE RELAY

DIAGNOSIS:

Faulty valve relay

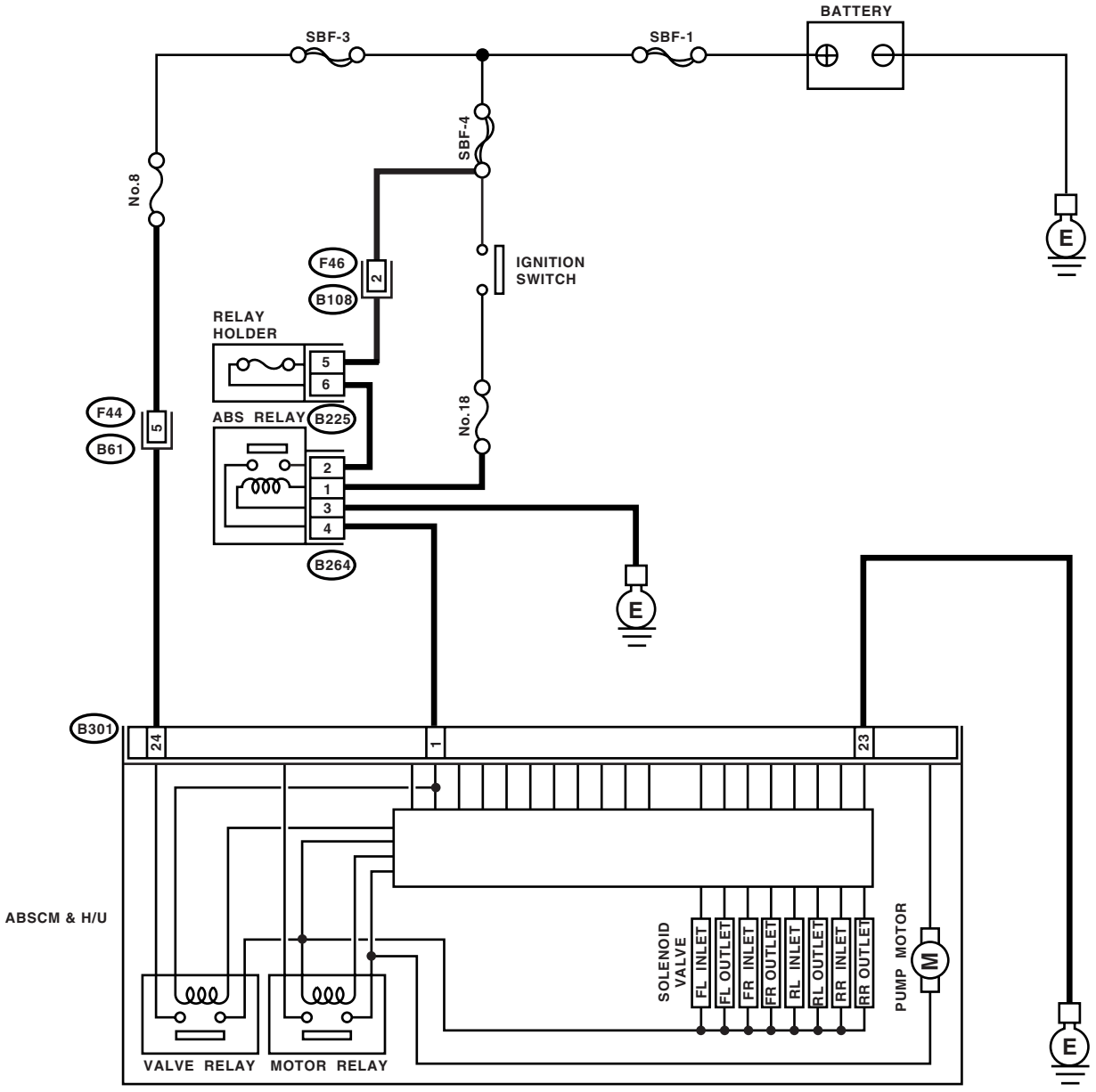
TROUBLE SYMPTOM:

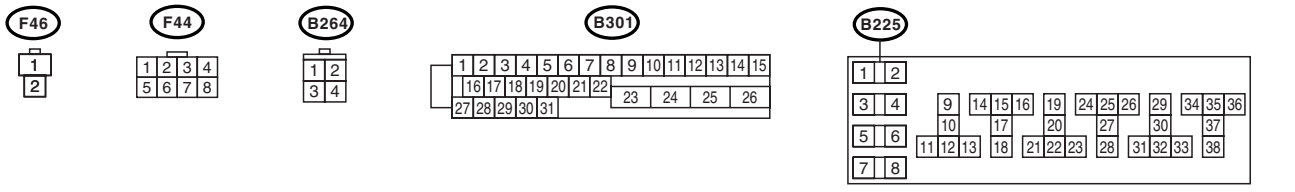
- ABS does not operate.
- EBD does not operate in some malfunctions.

NOTE:

In addition to the ABS warning light, brake warning light illuminates, if the EBD does not operate.

WIRING DIAGRAM:





ABS00377

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 1 (+) — Chassis ground (−):*** ***(B301) No. 24 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the harness connector between battery, ABS relay and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK VALVE RELAY IN ABSCM&H/U.** Measure the resistance between ABSCM&H/U and terminals. ***Terminals*** ***No. 23 — No. 24:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **5.**
5	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

Z: DTC 52 ABNORMAL MOTOR AND/OR MOTOR RELAY

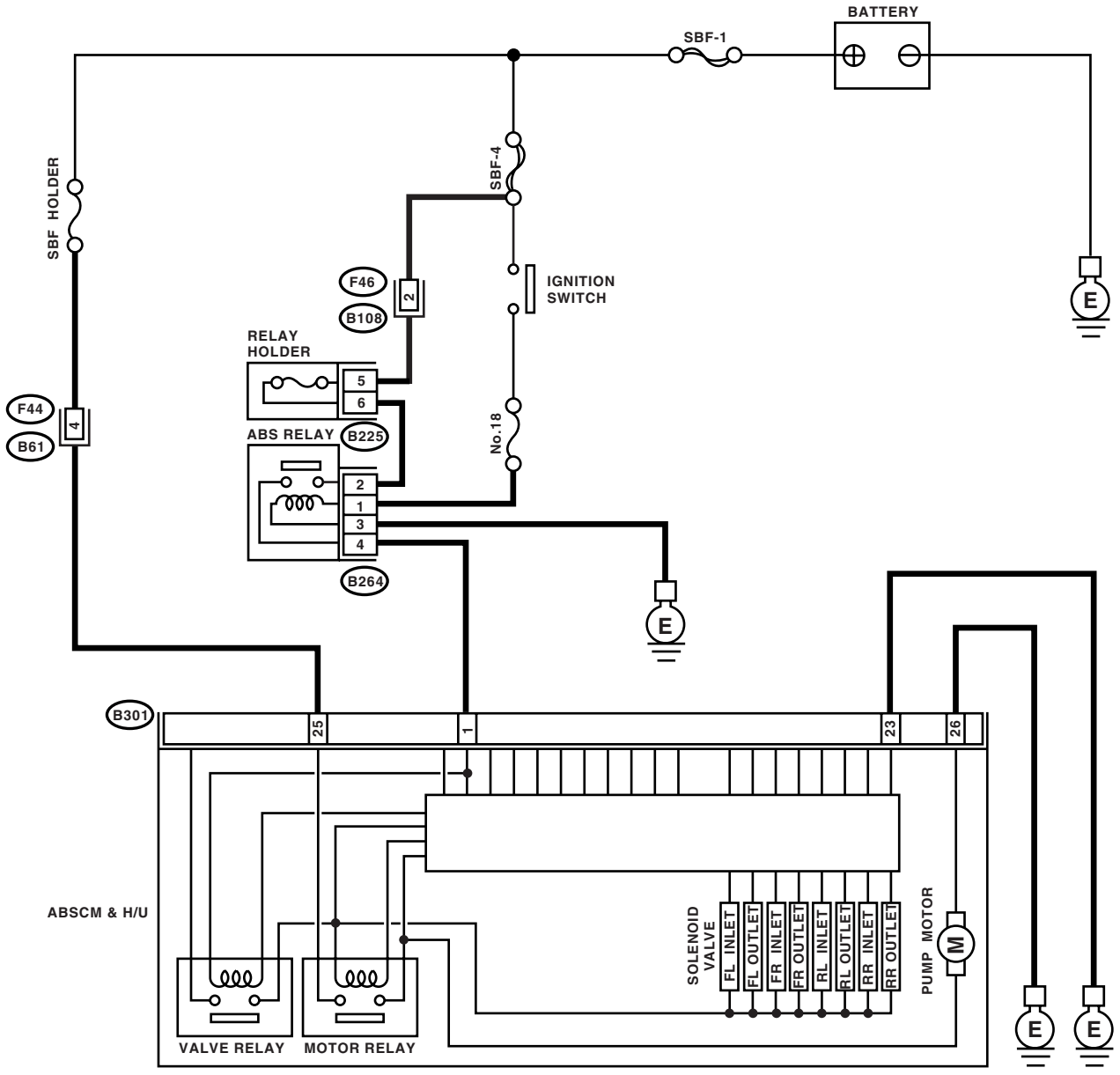
DIAGNOSIS:

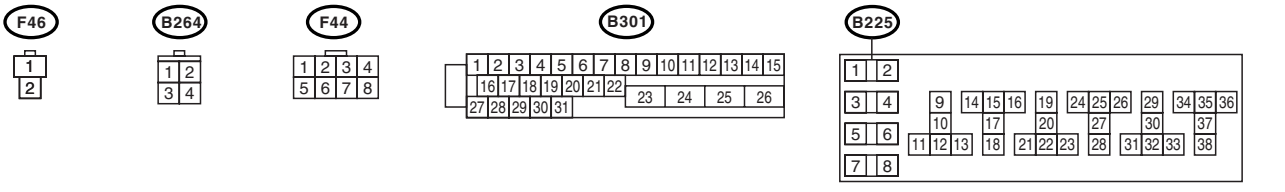
- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:





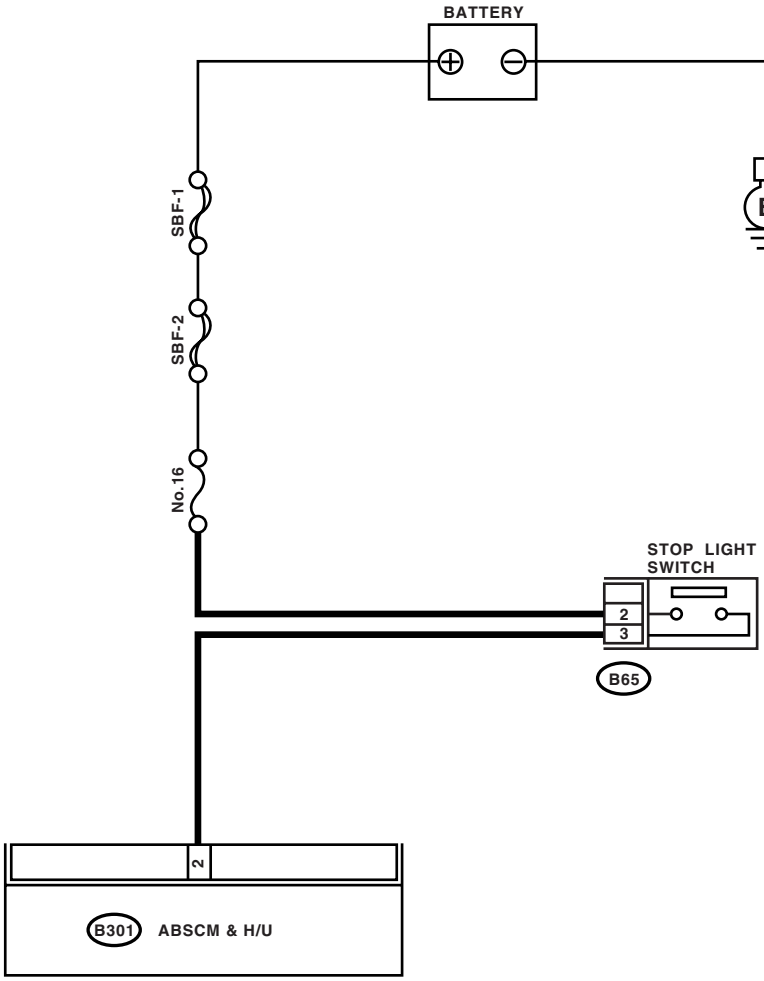
ABS00325

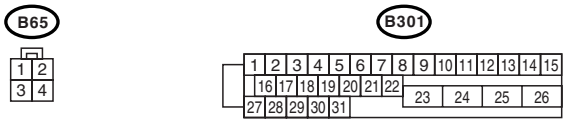
	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 25 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the harness/connector between battery and ABSCM&H/U and check fuse SBF-holder.
2	**CHECK GROUND CIRCUIT OF MOTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 26 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Run the engine at idle. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 1 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **4.**	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **5.**	Repair the ABSCM&H/U ground harness.
5	**CHECK MOTOR OPERATION.** Operate the sequence control. <Ref. to ABS-9, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate the sequence control.	Can motor revolution noise (buzz) be heard when carrying out the sequence control?	Go to step **6.**	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **7.**
7	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **8.**

Step		Check	Yes	No
8	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact. NOTE: Although the ABS warning light remains illuminating at this point, this is a normal condition. Vehicle must be driven at approx. 12 km/h (7.46 MPH) or faster to turn off ABS warning light. Make sure that the ABS warning light goes off after driving vehicle.

AA:DTC 54 ABNORMAL STOP LIGHT SWITCH

DIAGNOSIS:
Faulty stop light switch
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:



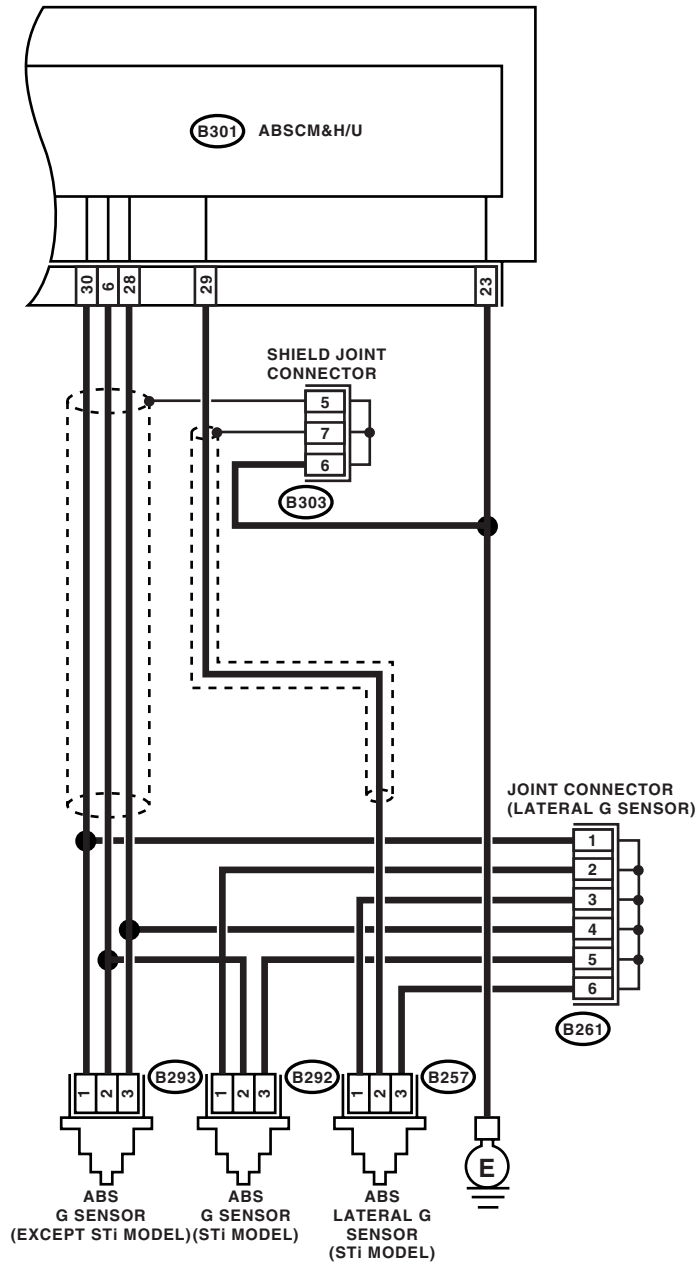


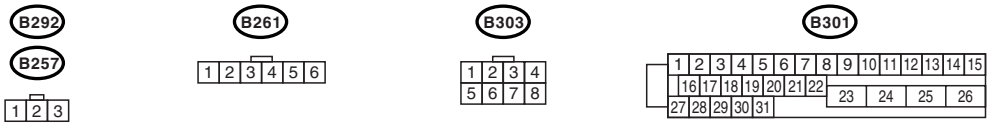
ABS00378

	Step	Check	Yes	No
1	**CHECK STOP LIGHTS COME ON.** Depress the brake pedal.	Do the stop lights come on?	Go to step **2.**	Repair the stop lights circuit.
2	**CHECK OPEN CIRCUIT IN HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Depress the brake pedal. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 2 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **3.**	Repair the harness between stop light switch and ABSCM&H/U.
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between stop light switch and ABSCM&H/U?	Repair the connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

AB:DTC 56 ABNORMAL G SENSOR OUTPUT VOLTAGE

DIAGNOSIS:
Faulty G sensor output voltage
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:





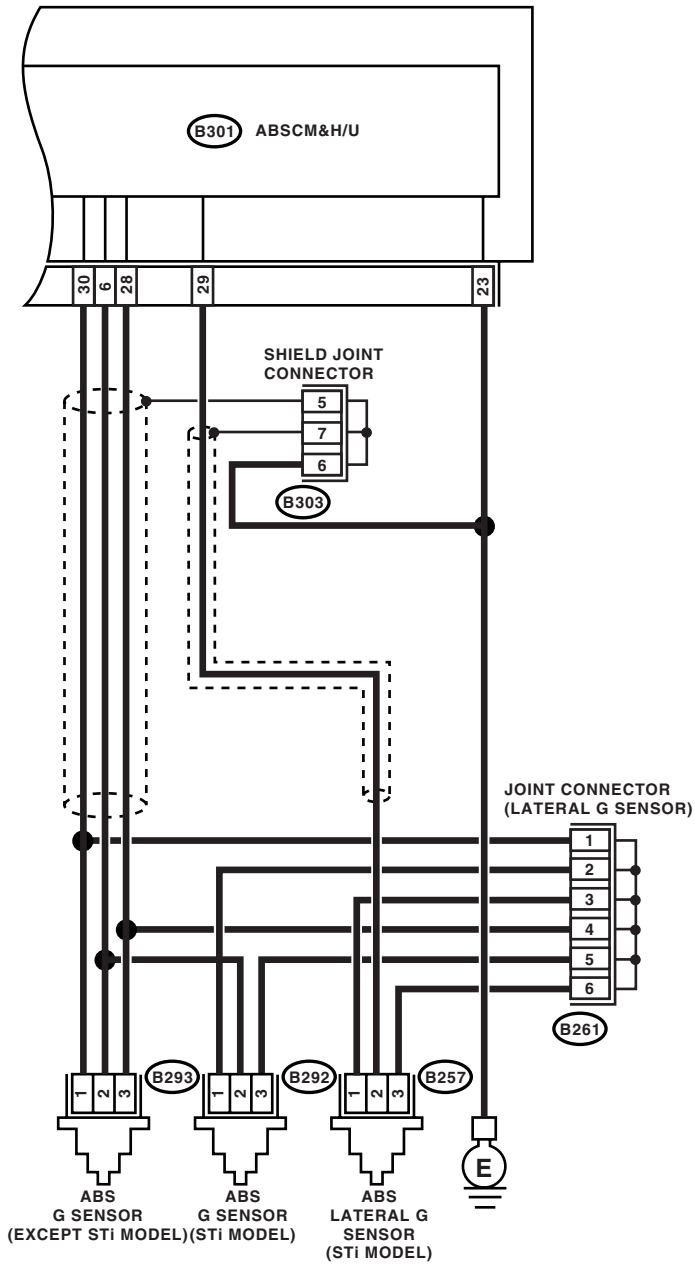
ABS00368

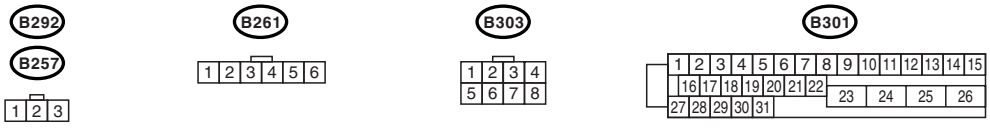
	Step	Check	Yes	No
1	**CHECK ALL FOUR WHEELS FOR FREE TURNING.**	Have the wheels been turned freely such as when the vehicle is lifted up, or operated on a free roller or rolling road?	The ABS is normal. Erase the DTC.	Go to step **2.**
2	**CHECK SPECIFICATIONS OF ABSCM&H/U.** Check the specifications of mark on ABSCM&H/U. ***CU: AT*** ***CV: MT (Except STi model)*** ***CY: MT (STi model)***	Does the vehicle specification and ABSCM&H/U specification match?	Go to step **3.**	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
3	**CHECK INPUT VOLTAGE OF G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the G sensor from vehicle. (Do not disconnect the connector.) 4) Turn the ignition switch to ON. 5) Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 1 (+) — No. 3 (–):***	Is the voltage 4.75 — 5.25 V?	Go to step **4.**	Repair the harness/connector between G sensor and ABSCM&H/U.
4	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(B301) No. 6 — No. 28:***	Is the resistance 5.0 — 5.6 kΩ?	Go to step **5.**	Repair the harness/connector between G sensor and ABSCM&H/U.
5	**CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS.** 1) Disconnect the connector from G sensor. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the harness between G sensor and ABSCM&H/U.
6	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 6 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **7.**	Repair the harness between G sensor and ABSCM&H/U.
7	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 6 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **8.**	Repair the harness between G sensor and ABSCM&H/U.
8	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 28 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the harness between G sensor and ABSCM&H/U. Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

	Step	Check	Yes	No
9	**CHECK G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the G sensor from vehicle. 3) Connect the connector to G sensor. 4) Connect the connector to ABSCM&H/U. 5) Turn the ignition switch to ON. 6) Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 2.1 — 2.4 V when G sensor is horizontal?	Go to step **10.**	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
10	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 3.7 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step **11.**	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
11	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 0.5 — 0.9 V when G sensor is inclined backwards to 90°?	Go to step **12.**	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
12	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step **13.**
13	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **14.**
14	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

AC:DTC 73 ABNORMAL LATERAL G SENSOR OUTPUT VOLTAGE

DIAGNOSIS:
Faulty Lateral G sensor output voltage
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:





ABS00368

	Step	Check	Yes	No
1	**CHECK ALL FOUR WHEELS FOR FREE TURNING.**	Have the wheels been turned freely such as when the vehicle is lifted up, or operated on a free roller or rolling road?	The ABS is normal. Erase the DTC.	Go to step **2.**
2	**CHECK SPECIFICATIONS OF ABSCM&H/U.** Check the specifications of mark on ABSCM&H/U. ***CU: AT*** ***CV: MT (Except STi model)*** ***CY: MT (STi model)***	Does the vehicle specification and ABSCM&H/U specification match?	Go to step **3.**	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
3	**CHECK INPUT VOLTAGE OF LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the lateral G sensor from vehicle. (Do not disconnect the connector.) 4) Turn the ignition switch to ON. 5) Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 1 (+) — No. 3 (–):***	Is the voltage 4.75 — 5.25 V?	Go to step **4.**	Repair the harness/connector between lateral G sensor and ABSCM&H/U.
4	**CHECK OPEN CIRCUIT IN LATERAL G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(B301) No. 29 — No. 28:***	Is the resistance 5.0 — 5.6 kΩ?	Go to step **5.**	Repair the harness/connector between lateral G sensor and ABSCM&H/U.
5	**CHECK GROUND SHORT IN LATERAL G SENSOR OUTPUT HARNESS.** 1) Disconnect the connector from lateral G sensor. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 29 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the harness between lateral G sensor and ABSCM&H/U.
6	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 29 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **7.**	Repair the harness between lateral G sensor and ABSCM&H/U.
7	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 29 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **8.**	Repair the harness between lateral G sensor and ABSCM&H/U.

	Step	Check	Yes	No
8	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 28 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the harness between lateral G sensor and ABSCM&H/U. Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
9	**CHECK LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the lateral G sensor from vehicle. 3) Connect the connector to lateral G sensor. 4) Connect the connector to ABSCM&H/U. 5) Turn the ignition switch to ON. 6) Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (−):***	Is the voltage 2.3 — 2.7 V when lateral G sensor is horizontal?	Go to step **10.**	Replace the lateral G sensor. <Ref. to ABS-20, G Sensor.>
10	**CHECK LATERAL G SENSOR.** Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (−):***	Is the voltage between 3.7 — 4.1 V when lateral G sensor is inclined right to 90°?	Go to step **11.**	Replace the lateral G sensor. <Ref. to ABS-20, G Sensor.>
11	**CHECK LATERAL G SENSOR.** Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (−):***	Is the voltage between 0.5 — 0.9 V when lateral G sensor is inclined left to 90°?	Go to step **12.**	Replace the lateral G sensor. <Ref. to ABS-20, G Sensor.>
12	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step **13.**
13	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **14.**
14	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

13.Diagnostics Procedure with Subaru Select Monitor

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

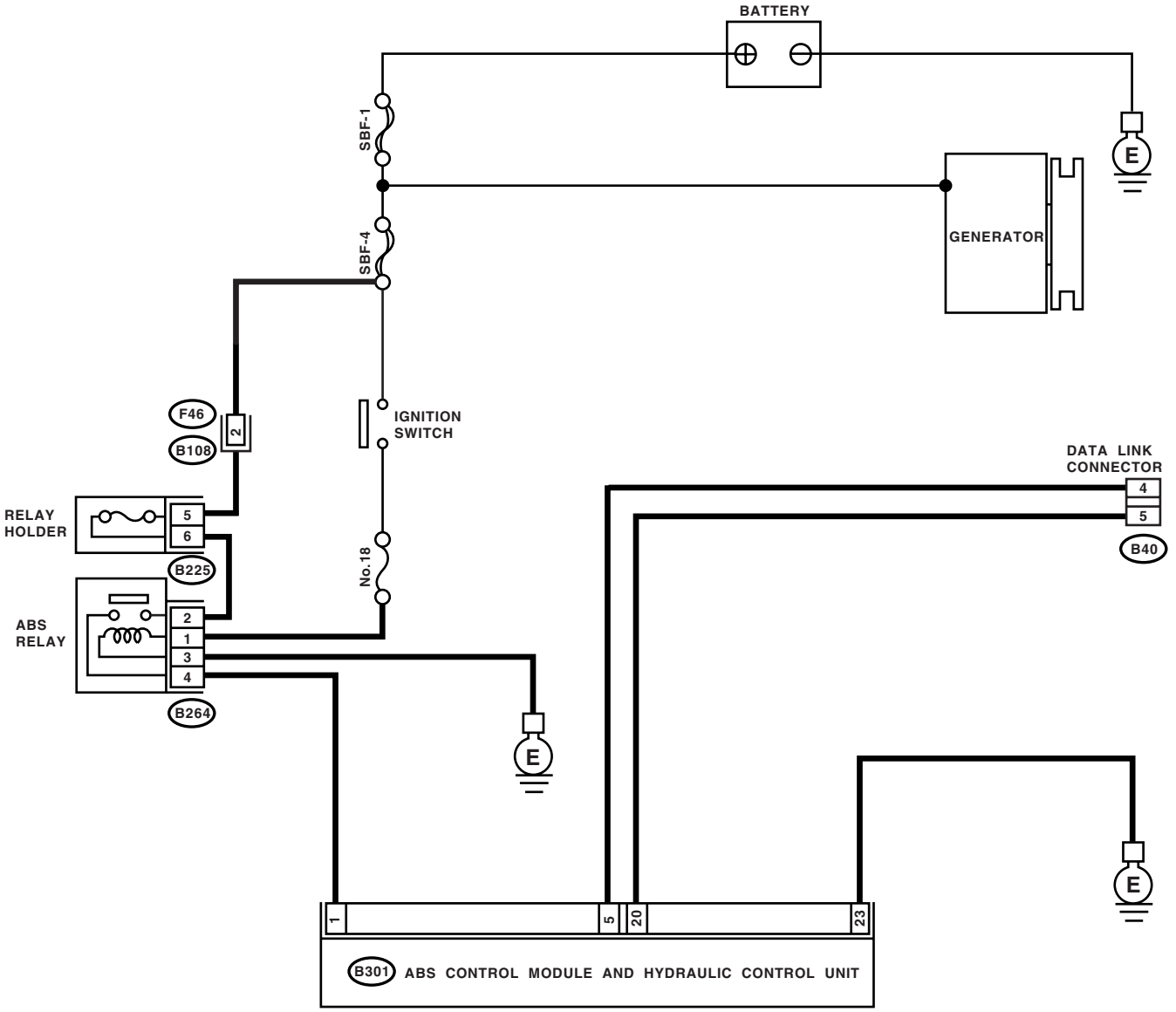
DIAGNOSIS:

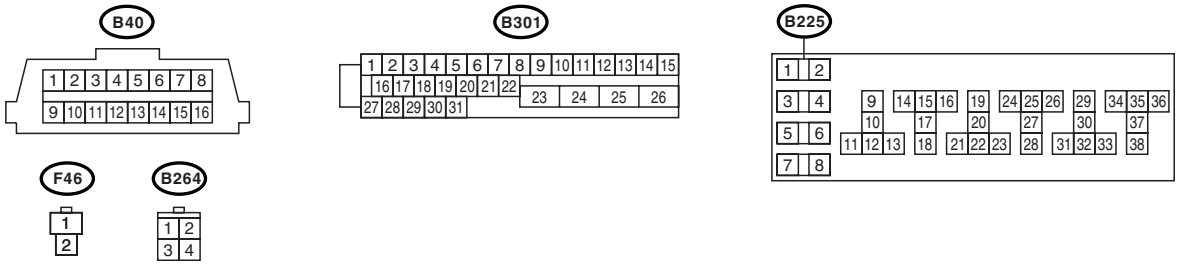
Faulty harness connector

TROUBLE SYMPTOM:

Communication cannot be executed between ABS and Subaru select monitor.

WIRING DIAGRAM:





ABS00328

	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH.**	Is the ignition switch turned to ON?	Go to step **2.**	Turn the ignition switch to ON, and select ABS mode using Subaru Select Monitor.
2	**CHECK BATTERY.** 1) Turn the ignition switch to OFF. 2) Measure the battery voltage.	Is the voltage or more 11 V?	Go to step **3.**	Charge or replace the battery.
3	**CHECK BATTERY TERMINAL.**	Is there poor contact at battery terminal?	Repair or tighten the battery terminal.	Go to step **4.**
4	**CHECK COMMUNICATION OF SUBARU SELECT MONITOR.** 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to other system can be executed normally.	Are the name and year of system displayed on Subaru Select Monitor?	Go to step **8.**	Go to step **5.**
5	**CHECK COMMUNICATION OF SUBARU SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connector. 3) Turn the ignition switch to ON. 4) Check whether communication to other systems can be executed normally.	Are the name and year of system displayed on Subaru Select Monitor?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U, ECM and TCM connectors. 3) Measure the resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 5 — Chassis ground:*** ***(B40) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the harness and connector between each control module and data link connector.
7	**CHECK OUTPUT SIGNAL FOR ABSCM& H/U.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(B40) No. 5 (+) — Chassis ground (−):*** ***(B40) No. 4 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **8.**	Repair the harness and connector between each control module and data link connector.
8	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND DATA LINK CONNECTOR.** Measure the resistance between ABSCM&H/U connector and data link connector. ***Connector & terminal*** ***(B301) No. 20 — (B40) No. 5:*** ***(B301) No. 5 — (B40) No. 4:***	Is the resistance less than 0.5 Ω?	Go to step **9.**	Repair the harness and connector between ABSCM&H/U and data link connector.
9	**CHECK INSTALLATION OF ABSCM&H/U CONNECTOR.** Turn the ignition switch to OFF.	Is the ABSCM&H/U connector inserted into ABSCM&H/U until the clamp locks onto it?	Go to step **10.**	Insert the ABSCM&H/U connector into ABSCM&H/U.

	Step	Check	Yes	No
10	**CHECK POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the ignition power supply voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 1 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **11.**	Repair the open circuit in harness between ABSCM&H/U and battery.
11	**CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U and transmission. 3) Measure the resistance of harness between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(B301) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **12.**	Repair the open circuit in harness between ABSCM&H/U and inhibitor side connector, and poor contact in coupling connector.
12	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in control module power supply, ground line and data link connector?	Repair the connector.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

B: NO TROUBLE CODE

DIAGNOSIS:

ABS warning light circuit is shorted.

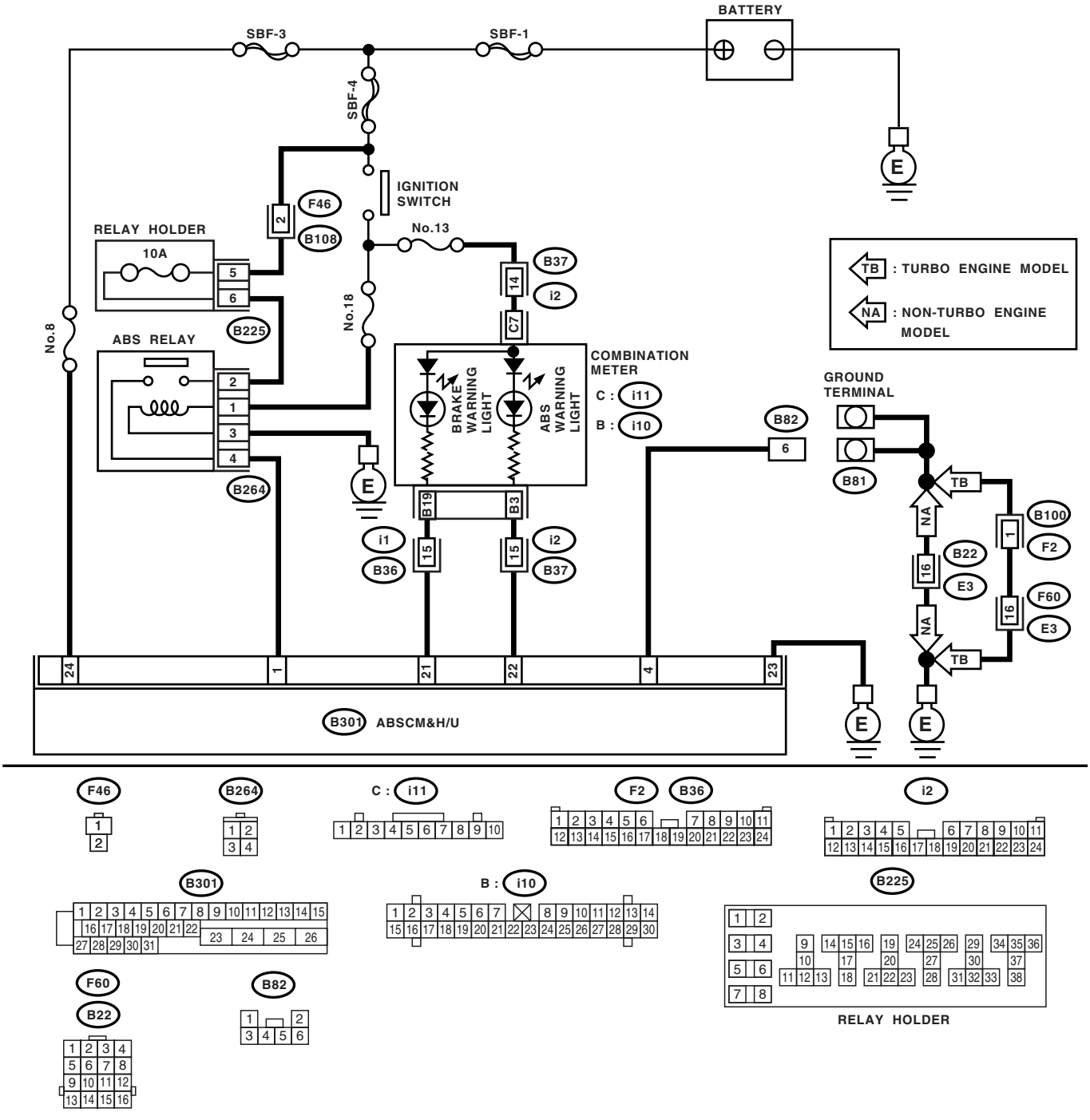
TROUBLE SYMPTOM:

- ABS warning light remains on.
- NO TROUBLE CODE displayed on the Subaru Select Monitor.

NOTE:

When the ABS warning light is OFF and “NO TROUBLE CODE” is displayed on Subaru Select Monitor, the system is in normal condition.

WIRING DIAGRAM:



ABS00347

	Step	Check	Yes	No
1	**CHECK WIRING HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector (i2) from connector (B37). 3) Turn the ignition switch to ON.	Does the ABS warning light turn on?	Go to step **2.**	Repair the front wiring harness.
2	**CHECK PROJECTION AT ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. NOTE: For detail of connector switch, refer to following. <Ref. to ABS(diag)-13, ELECTRICAL SPECIFICATION, Control Module I/O Signal.>	Is there any damage on projection which switches connector switch?	Go to step **3.**	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
3	**CHECK ABSCM&H/U.** Measure the resistance between ABSCM&H/U terminals. ***Terminals*** ***No. 22 — No. 23:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK WIRING HARNESS.** Measure the resistance between connector and chassis ground. ***Connector & terminal*** ***(B301) No. 22 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **5.**	Repair the harness.
5	**CHECK WIRING HARNESS.** 1) Connect the connector to ABSCM&H/U. 2) Measure the resistance between connector and chassis ground. ***Connector & terminal*** ***(B301) No. 22 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the harness.
6	**CHECK POOR CONTACT IN ABSCM&H/U CONNECTOR.**	Is there poor contact in ABSCM&H/U connector?	Repair the connector.	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

C: DTC 21 PEN OR SHORT CIRCUIT IN FRONT RIGHT ABS WHEEL SPEED SENSOR CIRCUIT

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS(diag)-83, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostics Procedure with Subaru Select Monitor.>

D: DTC 23 OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS WHEEL SPEED SENSOR CIRCUIT

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS(diag)-83, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostics Procedure with Subaru Select Monitor.>

E: DTC 25 OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS WHEEL SPEED SENSOR CIRCUIT

NOTE:
For the diagnostic procedure, refer to DTC 27. <Ref. to ABS(diag)-83, DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT, Diagnostics Procedure with Subaru Select Monitor.>

F: DTC 27 OPEN OR SHORT CIRCUIT IN REAR LEFT ABS WHEEL SPEED SENSOR CIRCUIT

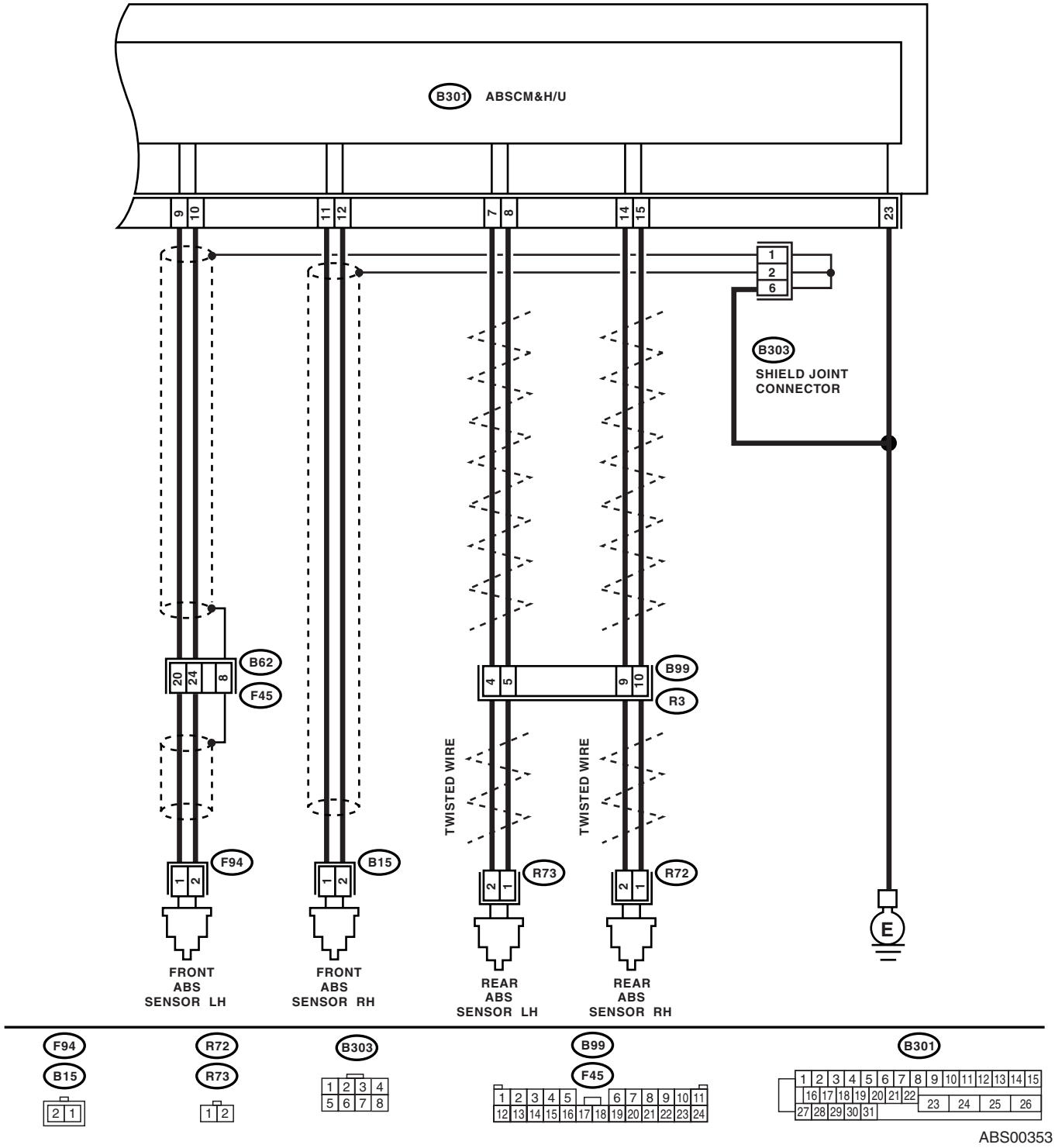
DIAGNOSIS:

- Faulty ABS wheel speed sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:



ABS00353

Diagnostics Procedure with Subaru Select Monitor

	Step	Check	Yes	No
1	**CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR.** 1) Select “Current data display & Save” on the Subaru Select Monitor. 2) Read the ABS wheel speed sensor output corresponding to faulty system in the Subaru Select Monitor data display mode.	Does the speed indicated on display change in response to speedometer reading during acceleration/deceleration when the steering wheel is in straight-ahead position?	Go to step **2.**	Go to step **8.**
2	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step **3.**	Tighten the ABS wheel speed sensor installation bolts securely.
3	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **4.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
4	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **5.**	Replace the tone wheel. Front: <Ref. to ABS-18, Front Tone Wheel.> Rear: <Ref. to ABS-19, Rear Tone Wheel.>
5	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact. NOTE: Check the harness and connectors between ABSCM&H/U and ABS wheel speed sensor.

	Step	Check	Yes	No
8	**CHECK ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABS wheel speed sensor. 3) Measure the resistance of ABS wheel speed sensor connector terminals while shaking the harness lightly. ***Terminals*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:***	Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **9.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.>
9	**CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR.** 1) Disconnect the connector from ABSCM&H/U. 2) Measure the voltage between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH No. 1 (+) — Chassis ground (−):*** ***Front LH No. 1 (+) — Chassis ground (−):*** ***Rear RH No. 1 (+) — Chassis ground (−):*** ***Rear LH No. 1 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **10.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.>
10	**CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH No. 1 (+) — Chassis ground (−):*** ***Front LH No. 1 (+) — Chassis ground (−):*** ***Rear RH No. 1 (+) — Chassis ground (−):*** ***Rear LH No. 1 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **11.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.>
11	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the connector to ABS wheel speed sensor. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***DTC 21*** ***(B301) No. 11 — No. 12:*** ***DTC 23*** ***(B301) No. 9 — No. 10:*** ***DTC 25*** ***(B301) No. 14 — No. 15:*** ***DTC 27*** ***(B301) No. 7 — No. 8:***	Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **12.**	Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.

	Step	Check	Yes	No
12	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21*** ***(B301) No. 11 (+) — Chassis ground (−):*** ***DTC 23*** ***(B301) No. 9 (+) — Chassis ground (−):*** ***DTC 25*** ***(B301) No. 14 (+) — Chassis ground (−):*** ***DTC 27*** ***(B301) No. 7 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **13.**	Repair the harness between ABSCM&H/U and ABS wheel speed sensor.
13	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21*** ***(B301) No. 11 (+) — Chassis ground (−):*** ***DTC 23*** ***(B301) No. 9 (+) — Chassis ground (−):*** ***DTC 25*** ***(B301) No. 14 (+) — Chassis ground (−):*** ***DTC 27*** ***(B301) No. 7 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **14.**	Repair the harness between ABSCM&H/U and ABS wheel speed sensor.
14	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step **15.**	Tighten the ABS wheel speed sensor installation bolts securely.
15	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **16.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
16	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **17.**	Replace the tone wheel. Front: <Ref. to ABS-18, Front Tone Wheel.> Rear: <Ref. to ABS-19, Rear Tone Wheel.>

	Step	Check	Yes	No
17	**CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the resistance between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **18.**	Replace the ABS wheel speed sensor and ABSCM&H/U. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.> and <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
18	**CHECK GROUND SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Connect the connector to ABS wheel speed sensor. 3) Measure the resistance between ABSCM&H/U connector terminal and chassis ground. ***Connector & terminal*** ***DTC 21*** ***(B301) No. 11 — Chassis ground:*** ***DTC 23*** ***(B301) No. 9 — Chassis ground:*** ***DTC 25*** ***(B301) No. 14 — Chassis ground:*** ***DTC 27*** ***(B301) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **19.**	Repair the harness between ABSCM&H/U and ABS wheel speed sensor. And replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
19	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step **20.**
20	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U.	Go to step **21.**
21	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact. NOTE: Check the harness and connectors between ABSCM&H/U and ABS wheel speed sensor.

G: DTC 22 FRONT RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS(diag)-89, DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostics Procedure with Subaru Select Monitor.>

H: DTC 24 FRONT LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS(diag)-89, DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostics Procedure with Subaru Select Monitor.>

I: DTC 26 REAR RIGHT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL

NOTE:
For the diagnostic procedure, refer to DTC 28. <Ref. to ABS(diag)-89, DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL, Diagnostics Procedure with Subaru Select Monitor.>

J: DTC 28 REAR LEFT ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL

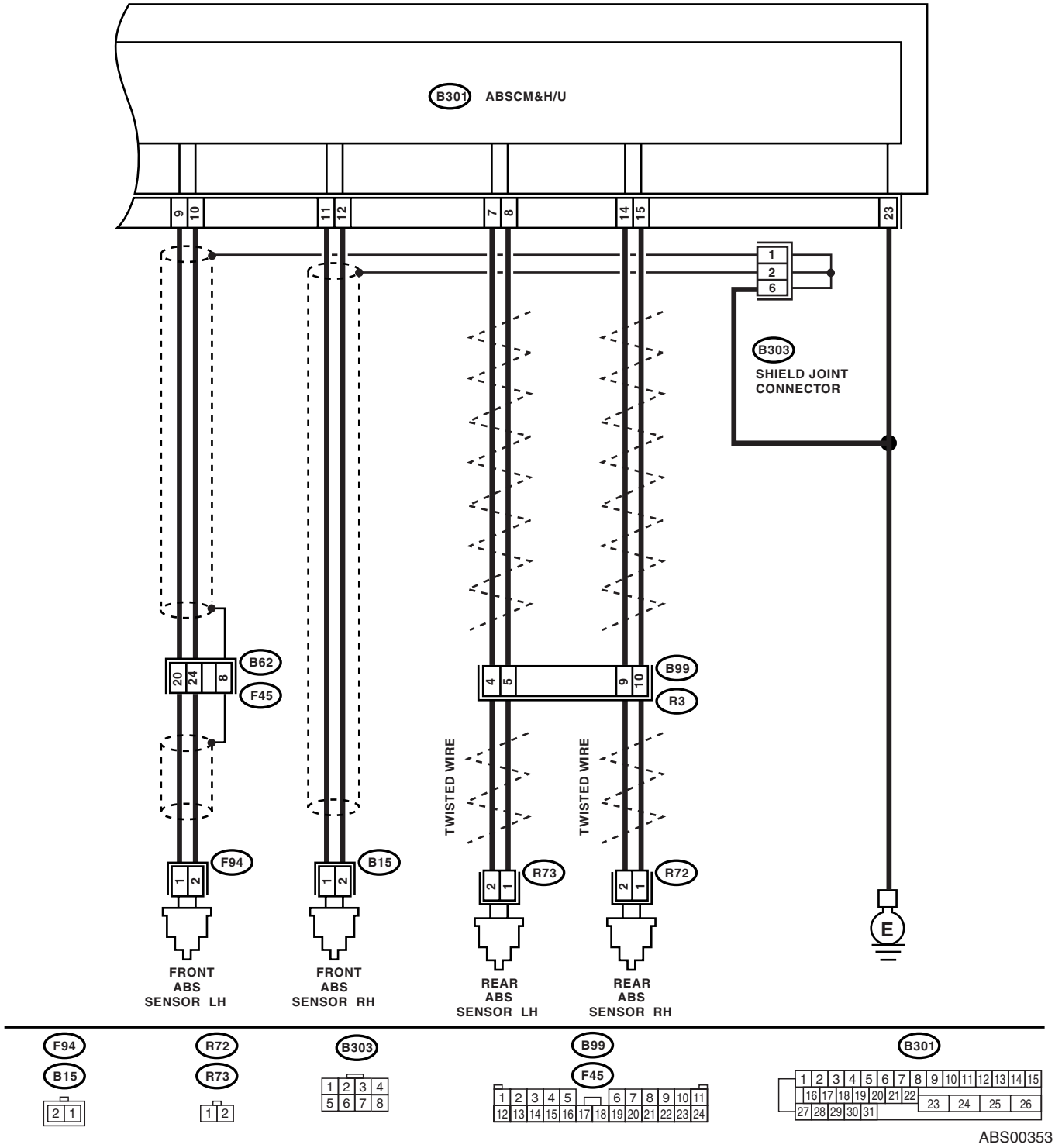
DIAGNOSIS:

- Faulty ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:



ABS00353

Diagnostics Procedure with Subaru Select Monitor

	Step	Check	Yes	No
1	**CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR.** 1) Select "Current data display & Save" on the Subaru Select Monitor. 2) Read the ABS wheel speed sensor output corresponding to faulty system in the Subaru Select Monitor data display mode.	Does the speed indicated on display change in response to speedometer reading during acceleration/deceleration when the steering wheel is in straight-ahead position?	Go to step **2.**	Go to step **8.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step **3.**
3	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or wireless transmitter properly installed?	Go to step **4.**	Properly install the car telephone or wireless transmitter.
4	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from sensor harness.	Go to step **5.**
5	**CHECK SHIELD CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Measure the resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 22*** ***(B303) No. 2 — Chassis ground:*** ***DTC 24*** ***(B303) No. 1 — Chassis ground:*** NOTE: If the DTC is 26, 28: Go to YES.	Is the resistance less than 0.5 Ω?	Go to step **6.**	Repair the shield harness.
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary noise interference.
8	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step **9.**	Tighten the ABS wheel speed sensor installation bolts securely.
9	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **10.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
10	**PREPARE OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **11.**	Go to step **12.**

	Step	Check	Yes	No
11	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Raise all four wheels off ground. 2) Turn the ignition switch to OFF. 3) Connect the oscilloscope to the connector. 4) Turn the ignition switch to ON. 5) Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS(diag)-16, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABSCM&H/U sometimes stores DTC 29 or DTC 56. ***Connector & terminal*** ***DTC 22*** ***(B15) No. 1 (+) — No. 2 (–):*** ***DTC 24*** ***(B62) No. 20 (+) — No. 24 (–):*** ***DTC 26*** ***(B99) No. 10 (+) — No. 9 (–):*** ***DTC 28*** ***(B99) No. 5 (+) — No. 4 (–):***	Is an oscilloscope pattern smooth, as shown in the figure?	Go to step **15.**	Go to step **12.**
12	**CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.** Remove the disc rotor or drum from hub in accordance with DTC.	Is the ABS wheel speed sensor piece or tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **13.**
13	**CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.**	Are there broken or damaged in the ABS wheel speed sensor piece or tone wheel?	Go to step **14.**	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.> and Front: <Ref. to ABS-18, Front Tone Wheel.> Rear: <Ref. to ABS-19, Rear Tone Wheel.>
14	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **15.**	Replace the tone wheel. Front: <Ref. to ABS-18, Front Tone Wheel.> Rear: <Ref. to ABS-19, Rear Tone Wheel.>

	Step	Check	Yes	No
15	**CHECK RESISTANCE OF ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABS wheel speed sensor. 3) Measure the resistance between ABS wheel speed sensor connector terminals while shaking the harness lightly. ***Terminals*** ***Front RH No. 1 — No. 2:*** ***Front LH No. 1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:***	Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **16.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.>
16	**CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR.** Measure the resistance between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **17.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.>
17	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS WHEEL SPEED SENSOR.** 1) Connect the connector to ABS wheel speed sensor. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance at ABSCM&H/U connector terminals. ***Connector & terminal*** ***DTC 22*** ***(B301) No. 11 — No. 12:*** ***DTC 24*** ***(B301) No. 9 — No. 10:*** ***DTC 26*** ***(B301) No. 14 — No. 15:*** ***DTC 28*** ***(B301) No. 7 — No. 8:***	Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **18.**	Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.
18	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 22*** ***(B301) No. 11 — Chassis ground:*** ***DTC 24*** ***(B301) No. 9 — Chassis ground:*** ***DTC 26*** ***(B301) No. 14 — Chassis ground:*** ***DTC 28*** ***(B301) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **19.**	Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.
19	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** Measure the resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(B301) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **20.**	Repair the ABSCM&H/U ground harness.
20	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step **21.**

	Step	Check	Yes	No
21	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or the wireless transmitter properly installed?	Go to step **22.**	Properly install the car telephone or wireless transmitter.
22	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from sensor harness.	Go to step **23.**
23	**CHECK SHIELD CIRCUIT.** 1) Connect all connectors. 2) Measure the resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 22*** ***(B303) No. 2 — Chassis ground:*** ***DTC 24*** ***(B303) No. 1 — Chassis ground:*** NOTE: If the DTC is 26, 28: Go to YES.	Is the resistance less than 0.5 Ω?	Go to step **24.**	Repair the shield harness.
24	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **25.**
25	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary noise interference. NOTE: Although the ABS warning light remains illuminating at this point, this is a normal condition. Vehicle must be driven at approx. 12 km/h (7.46 MPH) or faster to turn off ABS warning light. Make sure that the ABS warning light goes off after driving vehicle.

K: DTC 29 ABNORMAL ABS WHEEL SPEED SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR

DIAGNOSIS:

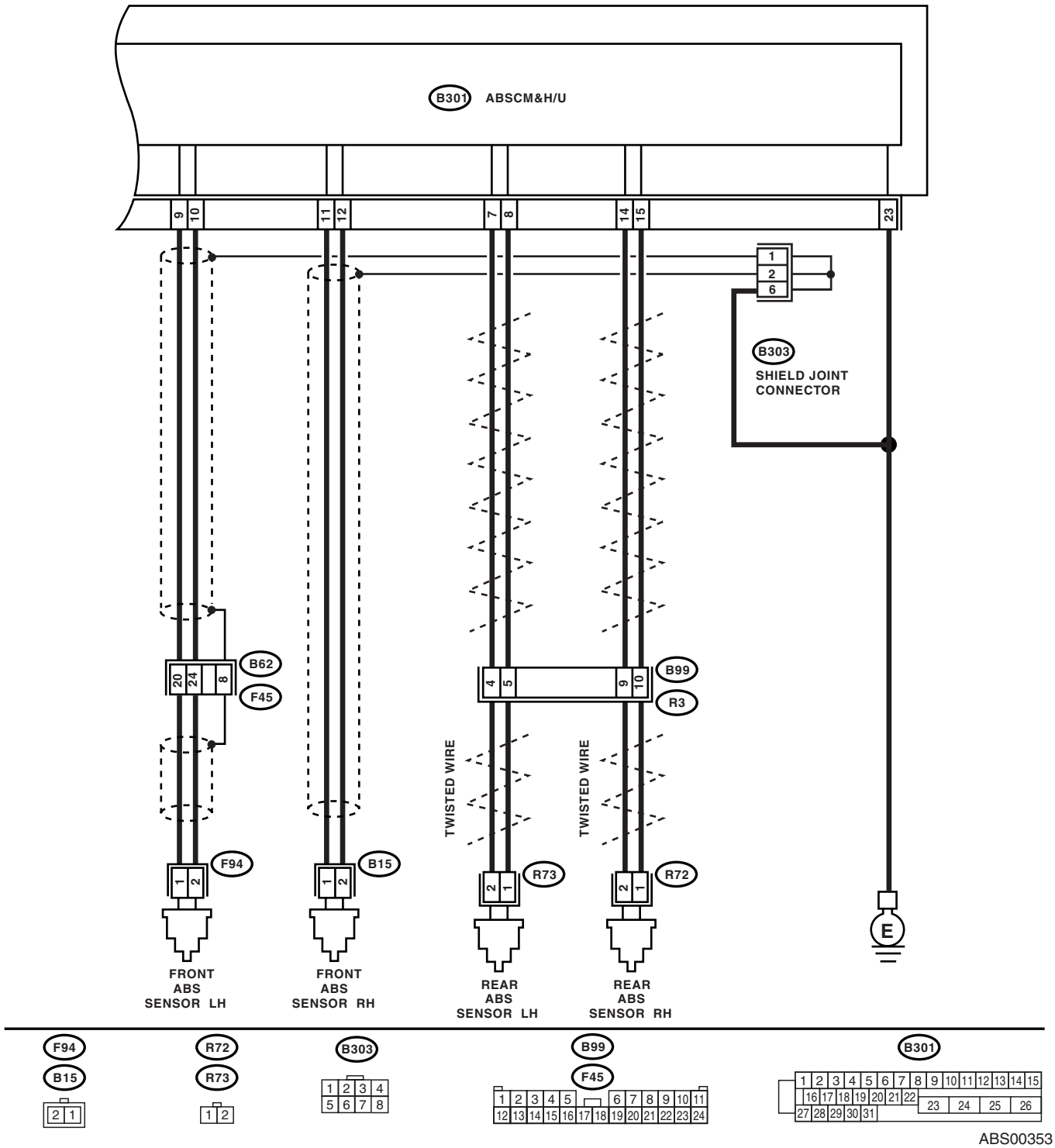
- Faulty ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates.

WIRING DIAGRAM:



ABS00353

	Step	Check	Yes	No
1	**CHECK IF THE WHEELS HAVE TURNED FREELY FOR A LONG TIME.**	Is the wheels have been turned freely for more than one minute, such as when vehicle is jacked-up, under full-lock cornering or the tires not in contact with road surface?	Go to step **2.**	The ABS is normal. Erase the DTC. NOTE: When the wheels turn freely for a long time, such as when vehicle is towed or jacked-up, or when steering wheel is continuously turned all way, this DTC may sometimes occur.
2	**CHECK TIRE SPECIFICATIONS.** Turn the ignition switch to OFF.	Are the tire specifications correct?	Go to step **3.**	Replace the tire.
3	**CHECK WEAR OF TIRE.**	Is the tire worn excessively?	Replace the tire.	Go to step **4.**
4	**CHECK TIRE PRESSURE.**	Is the tire pressure correct?	Go to step **5.**	Adjust the tire pressure.
5	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step **6.**	Tighten the ABS wheel speed sensor installation bolts securely.
6	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **7.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
7	**PREPARE OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **8.**	Go to step **9.**
8	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Raise all four wheels off ground. 2) Turn the ignition switch to OFF. 3) Connect the oscilloscope to the connector. 4) Turn the ignition switch to ON. 5) Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS(diag)-16, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, ABSCM& H/U sometimes stores the DTC 29. ***Connector & terminal*** ***Front RH*** ***(B15) No. 1 (+) — No. 2 (–):*** ***Front LH*** ***(B62) No. 20 (+) — No. 24 (–):*** ***Rear RH*** ***(B99) No. 10 (+) — No. 9 (–):*** ***Rear LH*** ***(B99) No. 5 (+) — No. 4 (–):***	Is an oscilloscope pattern smooth, as shown in the figure?	Go to step **12.**	Go to step **9.**
9	**CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.** Remove the disc rotor or drum from hub.	Is the ABS wheel speed sensor piece or tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **10.**

	Step	Check	Yes	No
10	**CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.**	Are there broken or damaged teeth in the ABS wheel speed sensor piece or tone wheel?	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to ABS-12, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-15, Rear ABS Wheel Speed Sensor.> and Front: <Ref. to ABS-18, Front Tone Wheel.> Rear: <Ref. to ABS-19, Rear Tone Wheel.>	Go to step **11.**
11	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **12.**	Replace the tone wheel. Front: <Ref. to ABS-18, Front Tone Wheel.> Rear: <Ref. to ABS-19, Rear Tone Wheel.>
12	**CHECK ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

L: DTC 31 FRONT RIGHT INLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS(diag)-98, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostics Procedure with Subaru Select Monitor.>

M: DTC 33 FRONT LEFT INLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS(diag)-98, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostics Procedure with Subaru Select Monitor.>

N: DTC 35 REAR RIGHT INLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 37. <Ref. to ABS(diag)-98, DTC 37 REAR LEFT INLET VALVE MALFUNCTION, Diagnostics Procedure with Subaru Select Monitor.>

O: DTC 37 REAR LEFT INLET VALVE MALFUNCTION

DIAGNOSIS:

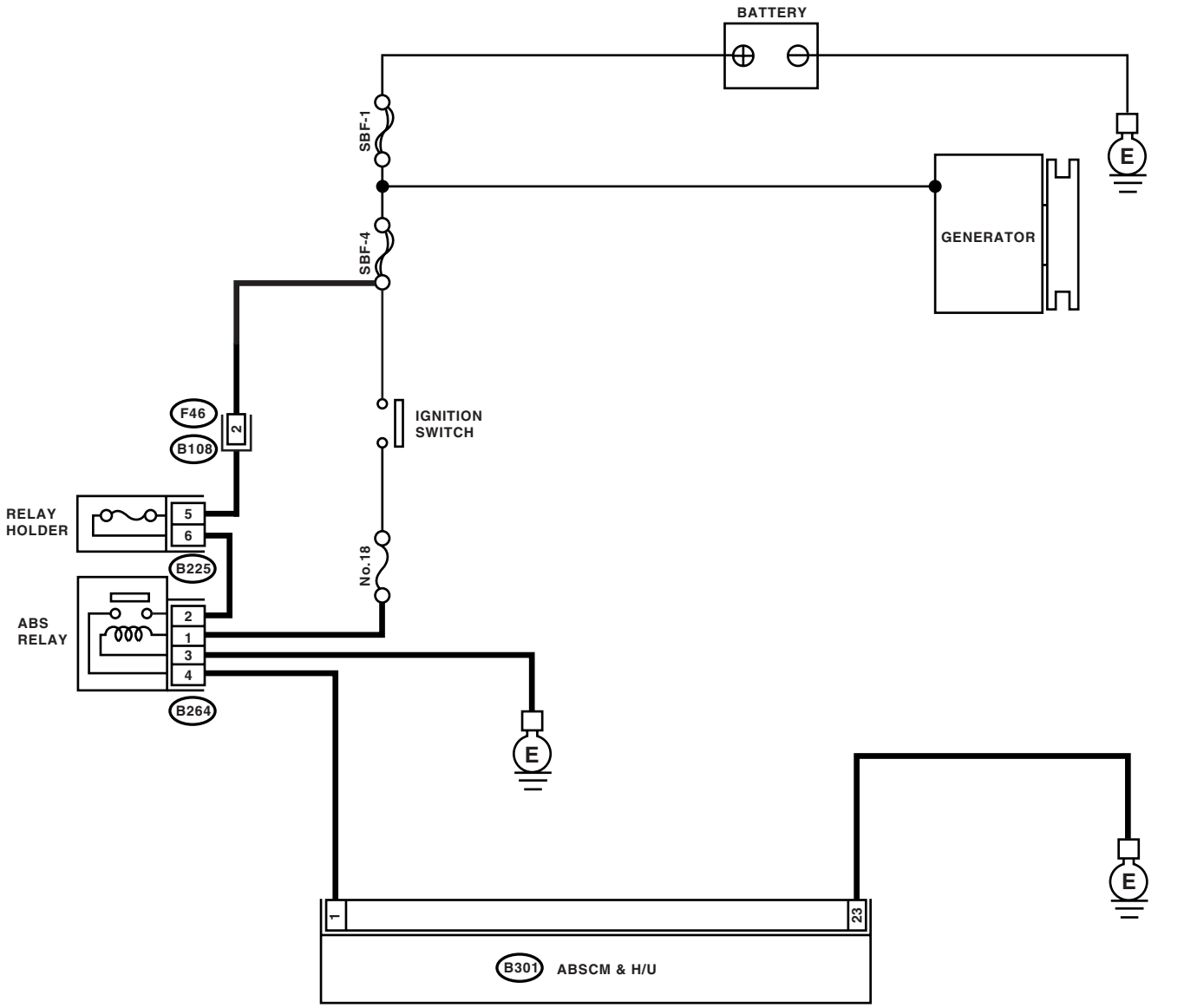
- Faulty harness/connector
- Faulty inlet solenoid valve

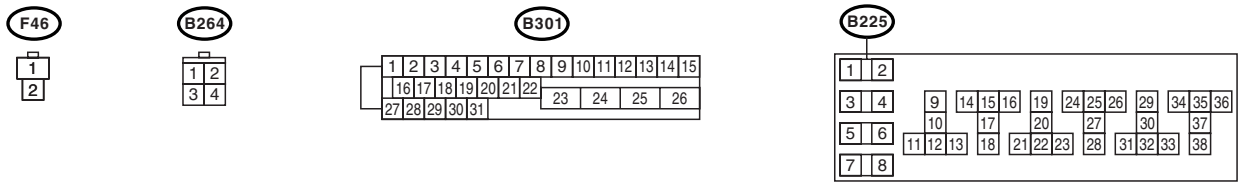
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates.

WIRING DIAGRAM:





ABS00322

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 1 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

P: DTC 32 FRONT RIGHT OUTLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS(diag)-100, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostics Procedure with Subaru Select Monitor.>

Q: DTC 34 FRONT LEFT OUTLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS(diag)-100, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostics Procedure with Subaru Select Monitor.>

R: DTC 36 REAR RIGHT OUTLET VALVE MALFUNCTION

NOTE:
For the diagnostic procedure, refer to DTC 38. <Ref. to ABS(diag)-100, DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION, Diagnostics Procedure with Subaru Select Monitor.>

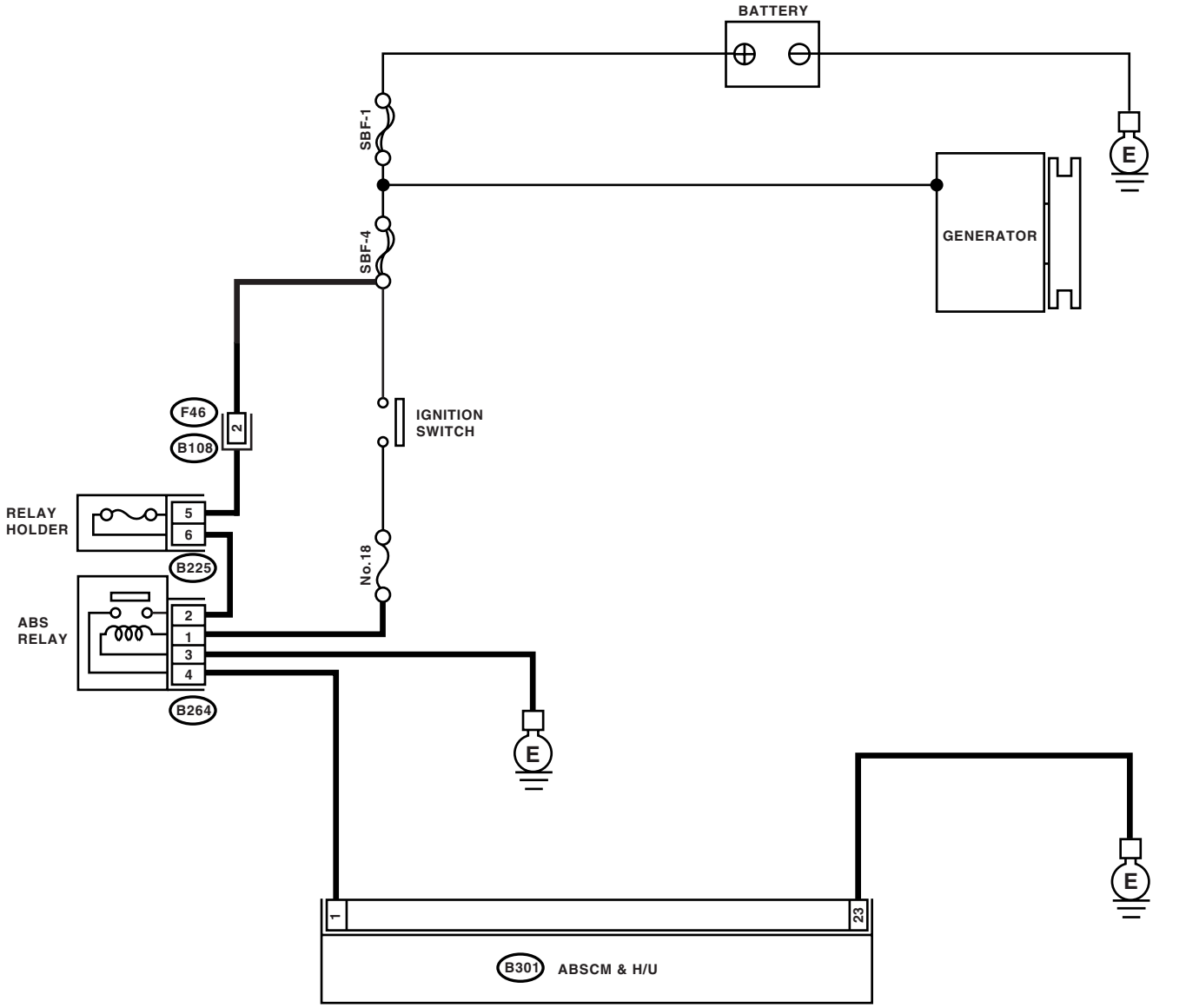
S: DTC 38 REAR LEFT OUTLET VALVE MALFUNCTION

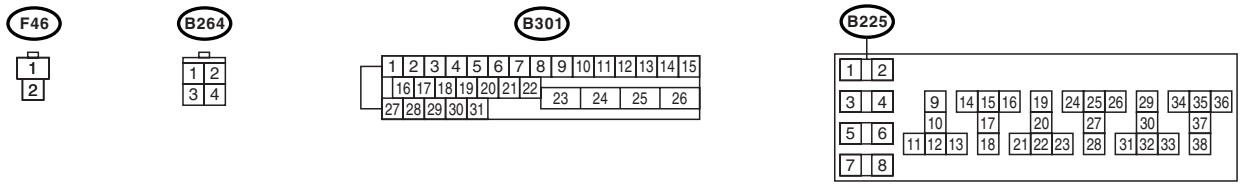
DIAGNOSIS:
- Faulty harness/connector
- Faulty outlet solenoid valve

TROUBLE SYMPTOM:
- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates.

WIRING DIAGRAM:





ABS00322

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 1 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

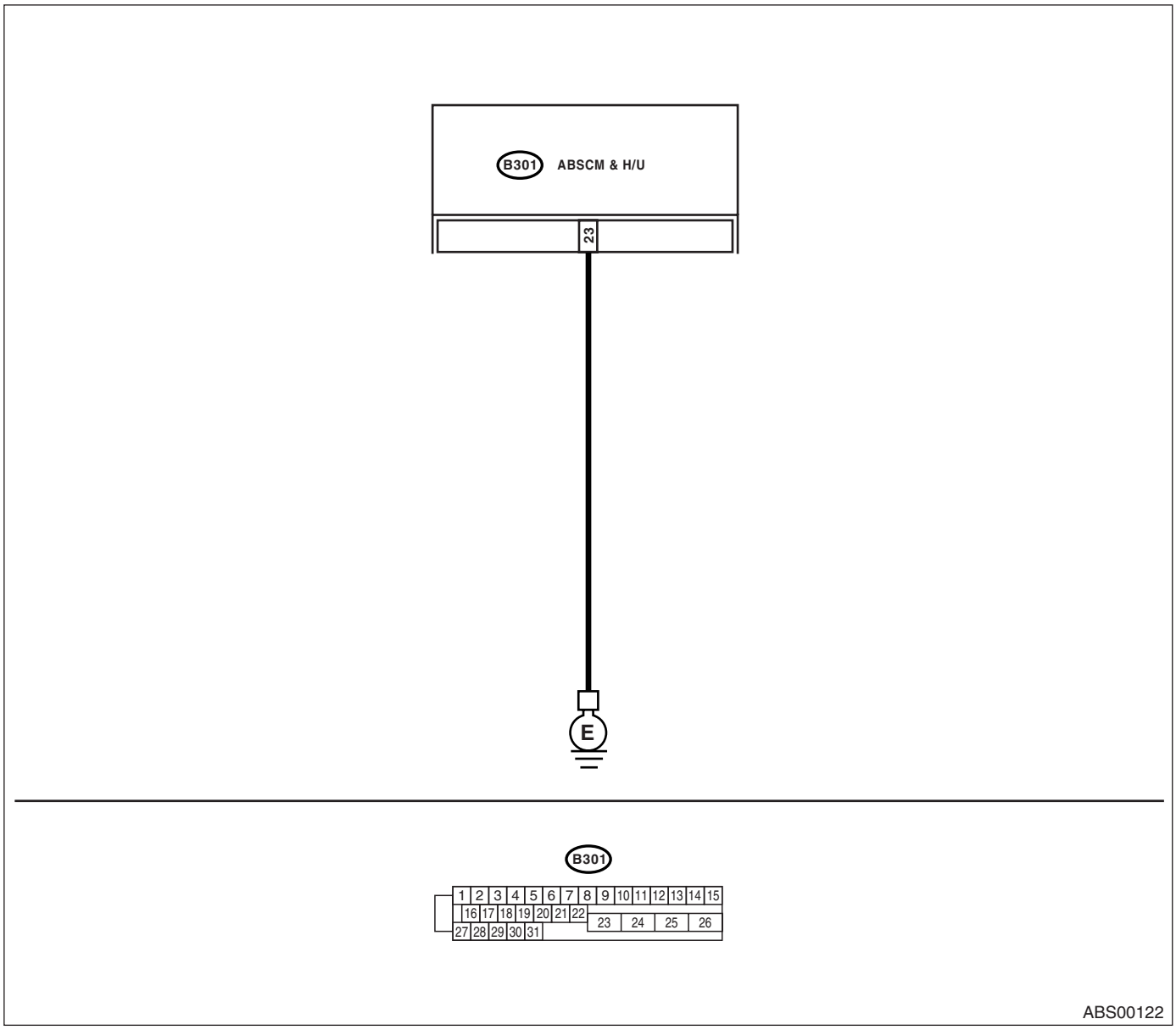
T: DTC 41 ABS CONTROL MODULE MALFUNCTION

DIAGNOSIS:
Faulty ABSCM&H/U

TROUBLE SYMPTOM:
- ABS does not operate.
- EBD does not operate.

NOTE:
In addition to the ABS warning light, brake warning light illuminates.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(B301) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **2.**	Repair the ABSCM&H/U ground harness.
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between battery, ignition switch and ABSCM&H/U?	Repair the connector.	Go to step **3.**
3	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or wireless transmitter properly installed?	Go to step **4.**	Properly install the car telephone or wireless transmitter.
4	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from sensor harness.	Go to step **5.**
5	**CHECK ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

U: DTC 42 POWER SUPPLY VOLTAGE TOO LOW

DIAGNOSIS:

Power source voltage of the ABSCM&H/U is low.

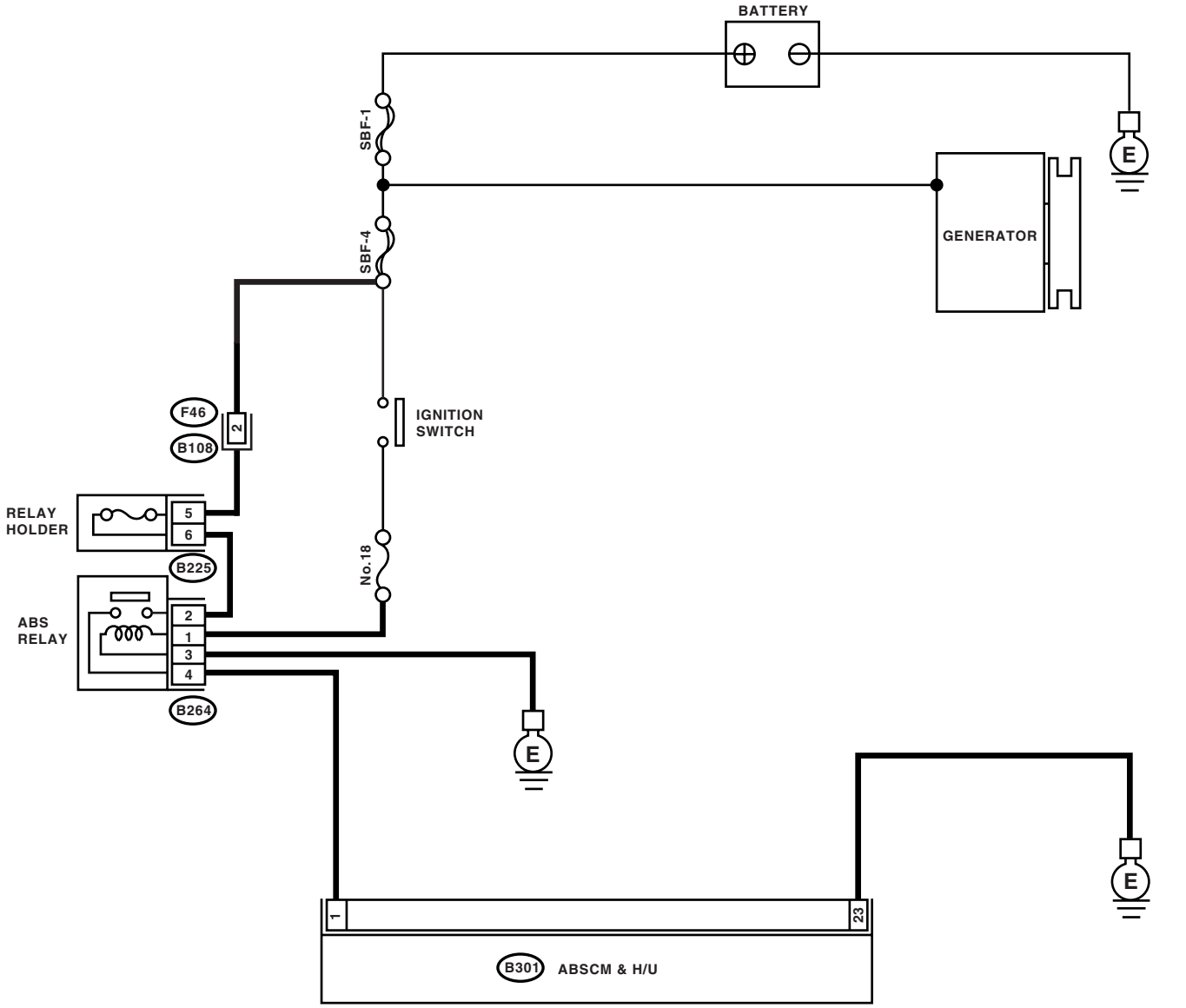
TROUBLE SYMPTOM:

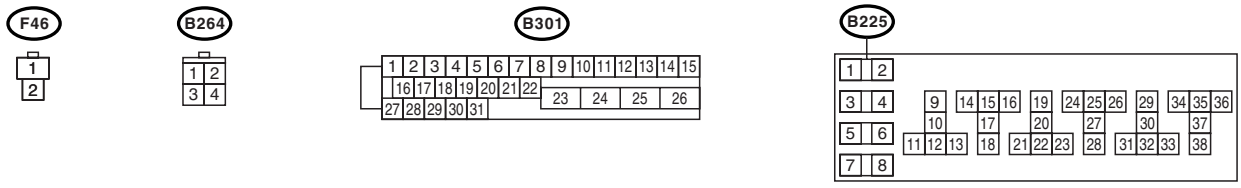
- ABS does not operate.
- EBD does not operate.

NOTE:

In addition to the ABS warning light, brake warning light illuminates temporarily. Both warning lights go off on the recovery of voltage.

WIRING DIAGRAM:





ABS00322

	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start the engine. 2) Idle after warm-up. 3) Measure the voltage between generator B terminal and chassis ground. ***Terminals*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage 10 — 17 V?	Go to step **2.**	Repair the generator. <Ref. to SC(H4SO)-14, Generator.>
2	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Are the positive and negative battery terminals tightly clamped?	Go to step **3.**	Tighten the clamp of terminal.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Disconnect the connector from ABSCM&H/U. 2) Run the engine at idle. 3) Operate the electric load applying devices, such as the headlight, A/C, and defogger. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 1 (+) — Chassis ground (−):***	Is the voltage 10 — 17 V?	Go to step **4.**	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **5.**	Repair the ABSCM&H/U ground harness.
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

V: DTC 42 POWER SUPPLY VOLTAGE TOO HIGH

DIAGNOSIS:

Power source voltage of the ABSCM&H/U is high.

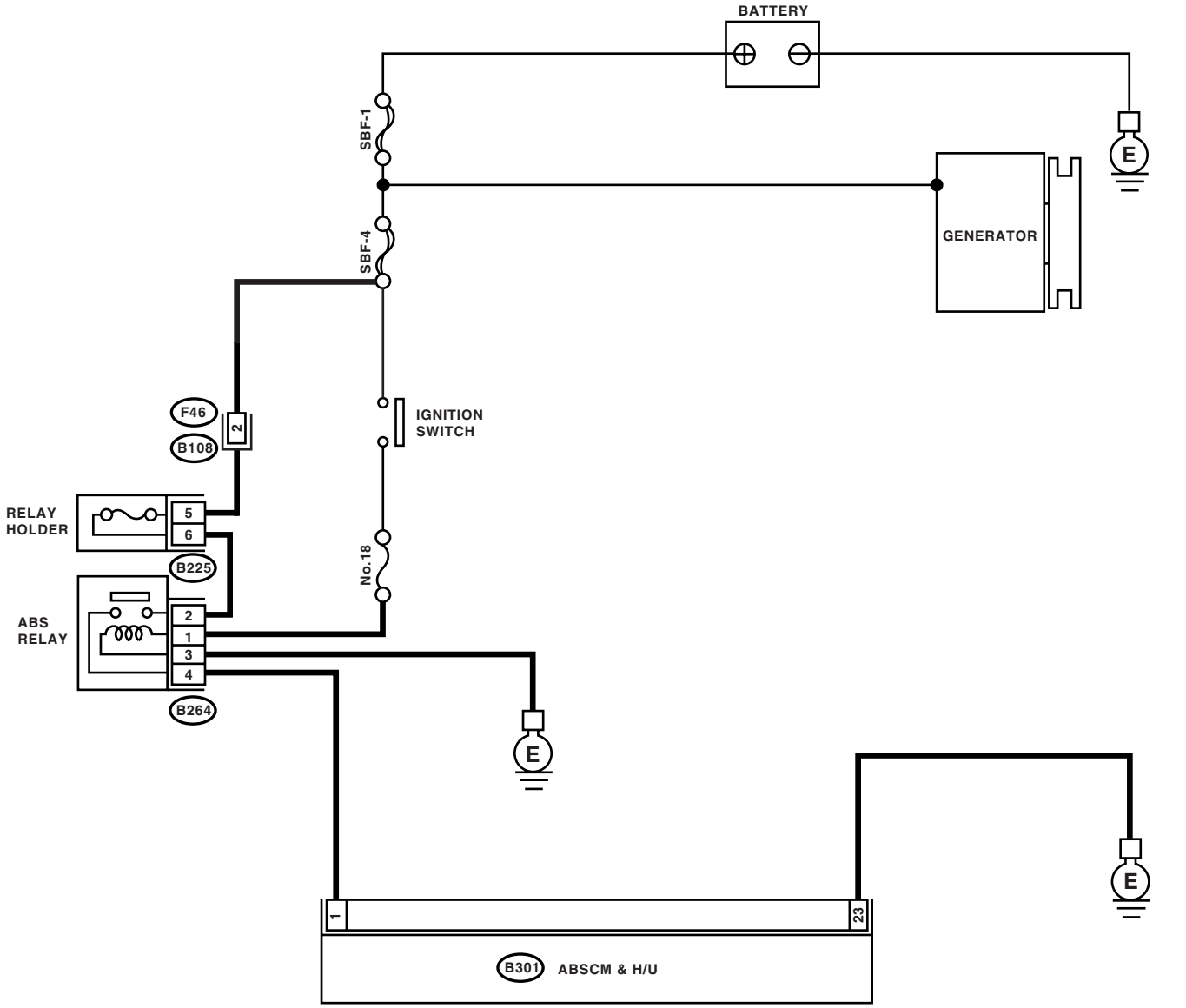
TROUBLE SYMPTOM:

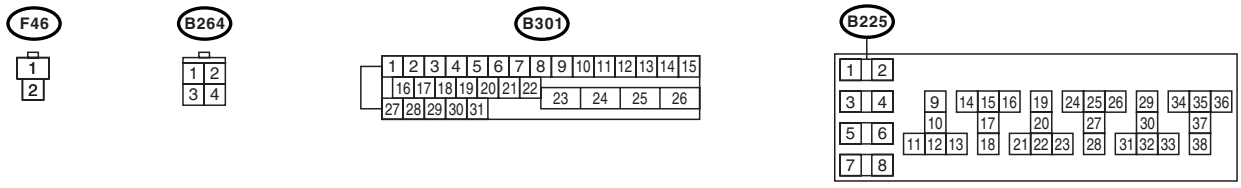
- ABS does not operate.
- EBD does not operate.

NOTE:

In addition to the ABS warning light, brake warning light illuminates temporarily. Both warning lights go off on the recovery of voltage.

WIRING DIAGRAM:



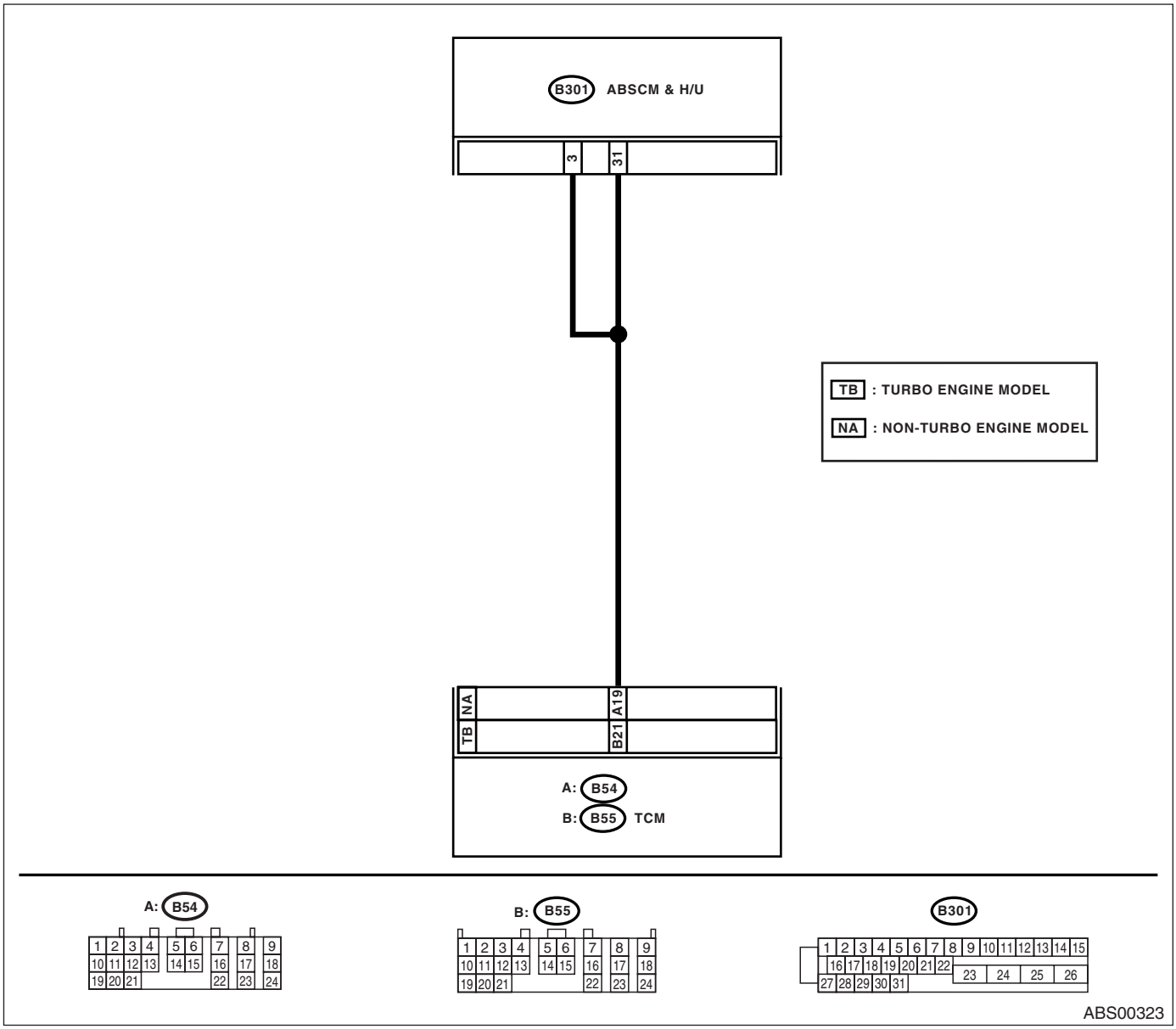


ABS00322

	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start the engine. 2) Idle after warm-up. 3) Measure the voltage between generator B terminal and chassis ground. ***Terminals*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage 10 — 17 V?	Go to step **2.**	Repair the generator. <Ref. to SC(H4SO)-14, Generator.>
2	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Are the positive and negative battery terminals tightly clamped?	Go to step **3.**	Tighten the clamp of terminal.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Disconnect the connector from ABSCM&H/U. 2) Run the engine at idle. 3) Operate the electric load applying devices, such as the headlight, A/C, and defogger. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 1 (+) — Chassis ground (−):***	Is the voltage 10 and 17 V?	Go to step **4.**	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **5.**	Repair the ABSCM&H/U ground harness.
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

W: DTC 44 ABS-AT CONTROL (NON CONTROLLED)

DIAGNOSIS:
Combination of AT control faults
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:

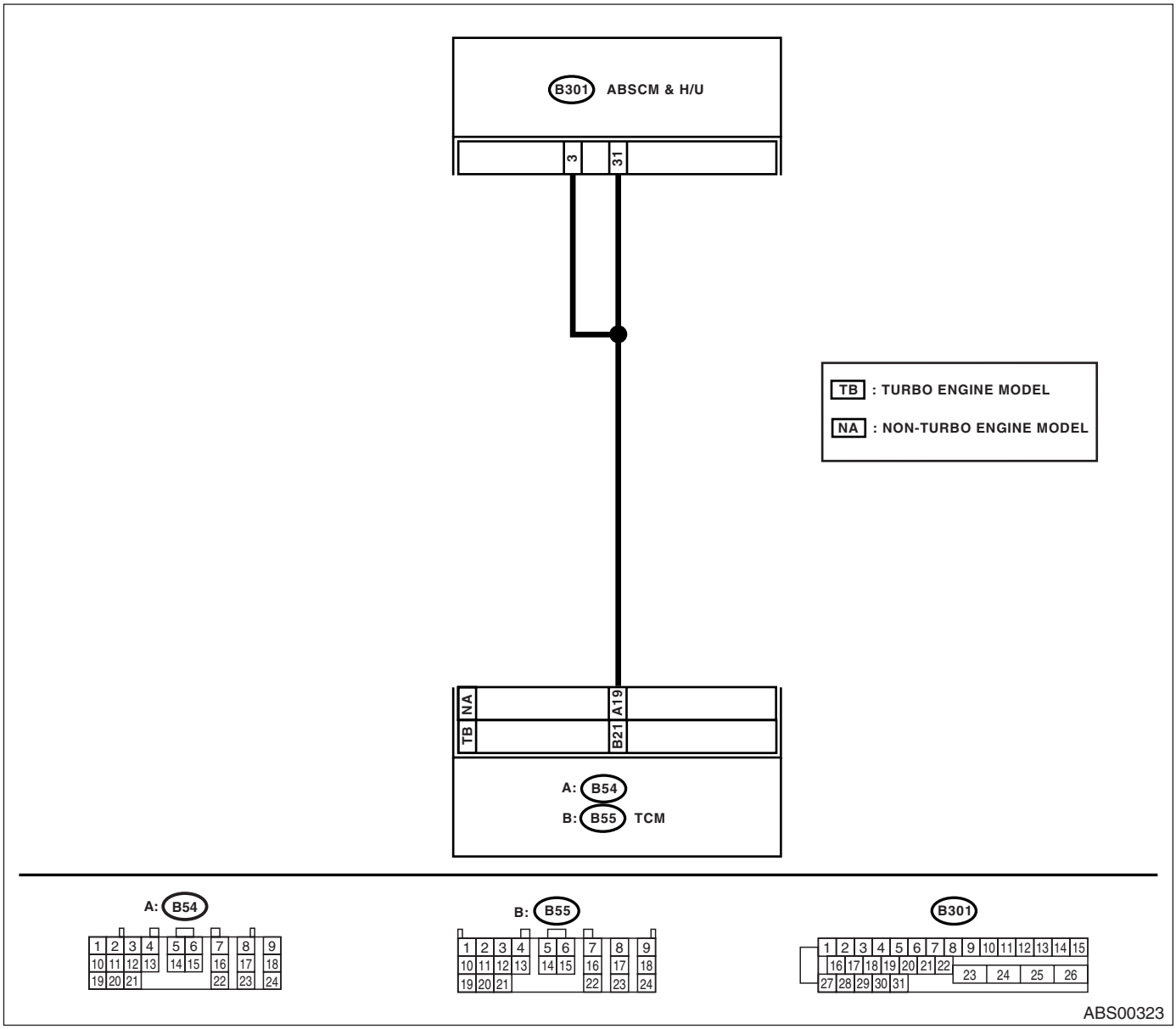


Step		Check	Yes	No
1	**CHECK SPECIFICATIONS OF THE ABSCM&H/U.** Check specifications of mark on ABSCM&H/U. ***CU: AT*** ***CV: MT (Except STi model)*** ***CY: MT (STi model)***	Does the vehicle specification and ABSCM&H/U specification match?	Go to step **2.**	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

	Step	Check	Yes	No
2	**CHECK GROUND SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the two connectors from TCM. 3) Disconnect the connector from ABSCM&H/U. 4) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the harness between TCM and ABSCM&H/U.
3	**CHECK TCM.** 1) Connect all connectors to TCM. 2) Turn the ignition switch to ON. 3) Measure the voltage between TCM connector terminal and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B54) No. 19 (+) — Chassis ground (−):*** ***Turbo model*** ***(B55) No. 21 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **5.**	Go to step **4.**
4	**CHECK AT.**	Is the AT functioning normally?	Replace the TCM.	Repair the AT.
5	**CHECK OPEN CIRCUIT OF HARNESS.** Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 3 (+) — Chassis ground (−):*** ***(B301) No. 31 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **6.**	Repair the harness/connector between TCM and ABSCM&H/U.
6	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between TCM and ABSCM&H/U?	Repair the connector.	Go to step **7.**
7	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **8.**
8	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

X: DTC 44 ABS-AT CONTROL (CONTROLLED)

DIAGNOSIS:
Combination of AT control faults
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect all connectors from TCM. 3) Disconnect the connector from ABSCM& H/U. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 3 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **2.**	Repair the harness between TCM and ABSCM&H/U.

	Step	Check	Yes	No
2	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 3 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **3.**	Repair the harness between TCM and ABSCM&H/U.
3	**CHECK OPEN CIRCUIT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Connect all connectors to TCM. 3) Turn the ignition switch to ON. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 3 (+) — Chassis ground (−):*** ***(B301) No. 31 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **4.**	Repair the harness/connector between TCM and ABSCM&H/U.
4	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connectors between TCM and ABSCM&H/U?	Repair the connector.	Go to step **5.**
5	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

Y: DTC 51 VALVE RELAY MALFUNCTION

DIAGNOSIS:

Faulty valve relay

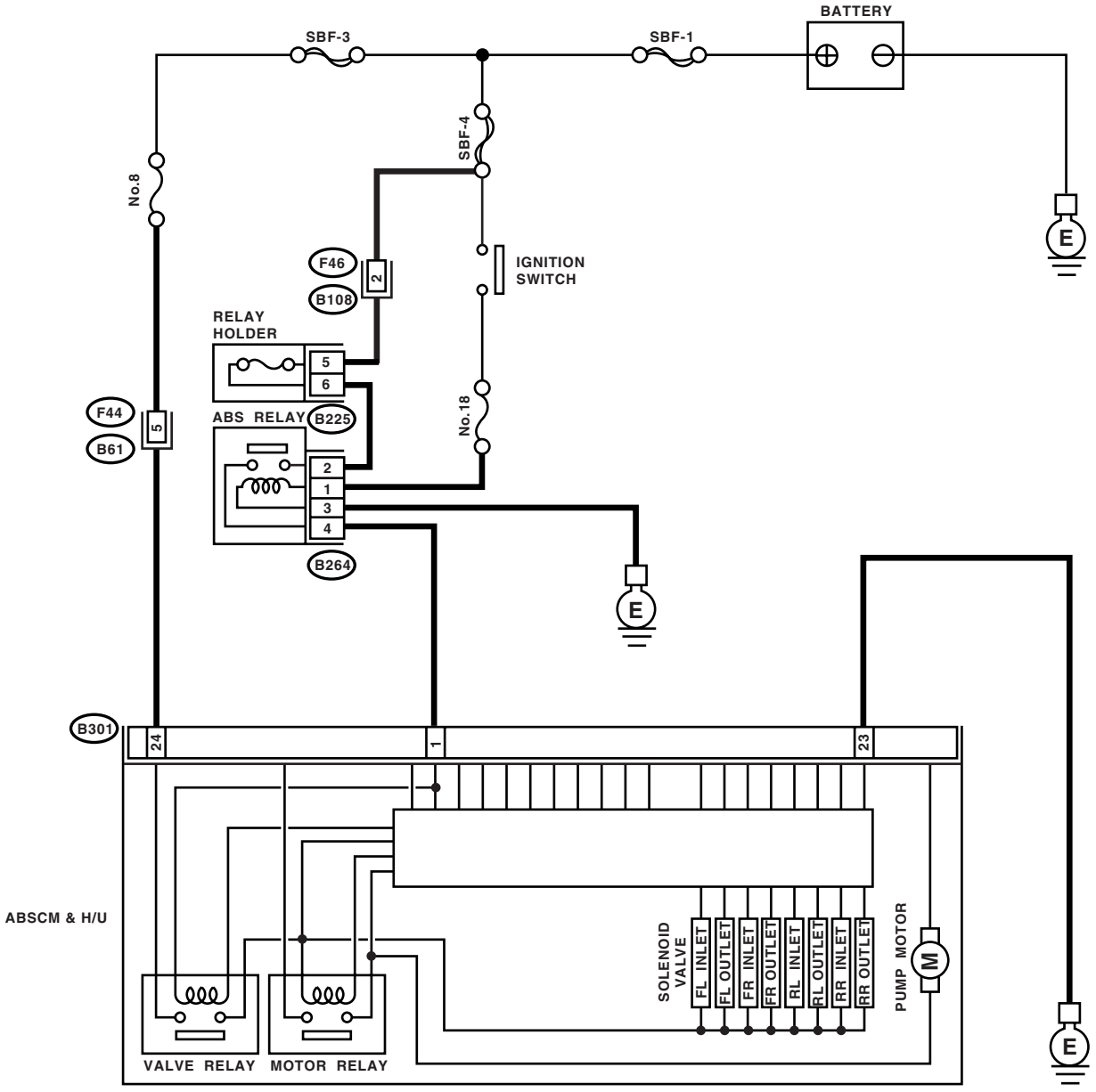
TROUBLE SYMPTOM:

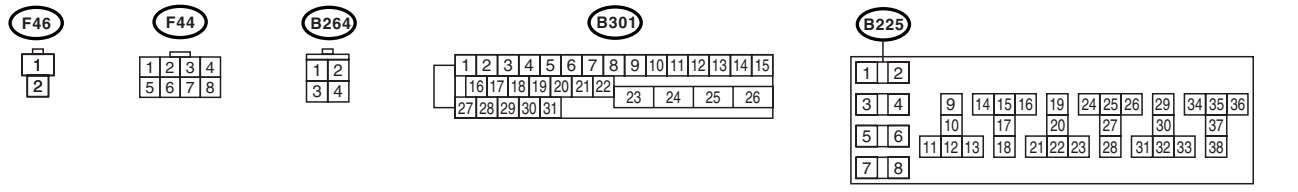
- ABS does not operate.
- EBD does not operate.

NOTE:

In addition to the ABS warning light, brake warning light illuminates.

WIRING DIAGRAM:



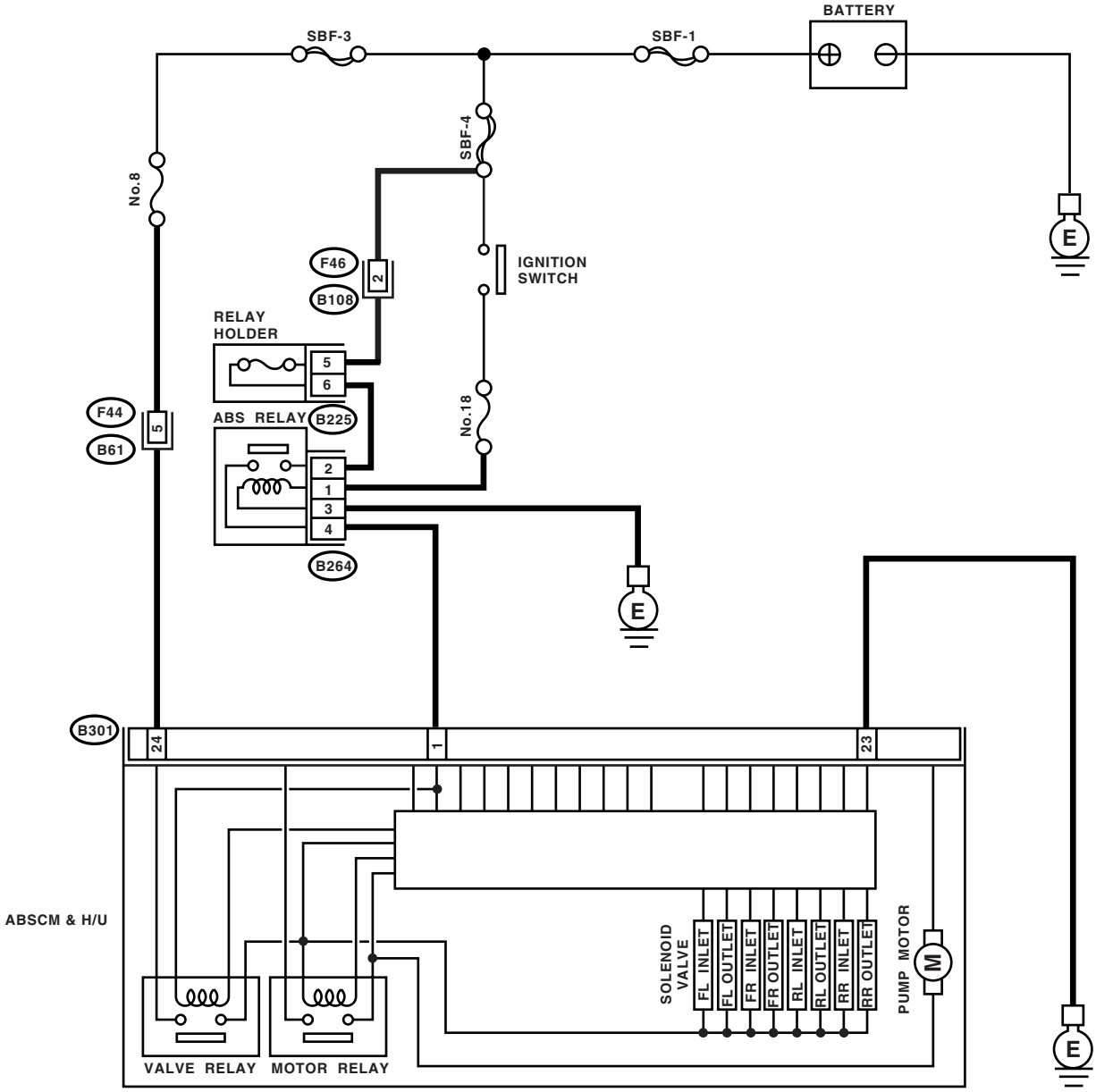


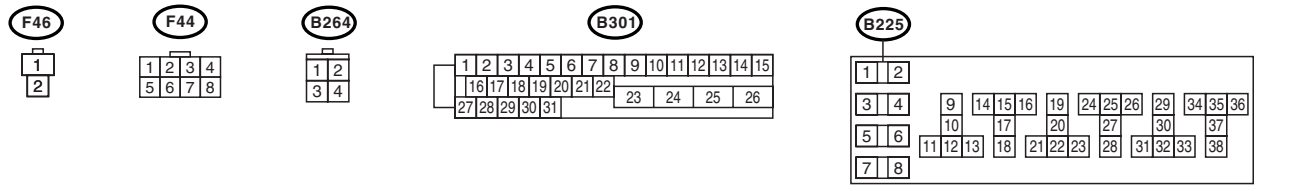
ABS00377

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 1 (+) — Chassis ground (–):*** ***(B301) No. 24 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the harness connector between battery and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

Z: DTC 51 VALVE RELAY ON FAILURE

DIAGNOSIS:
Faulty valve relay
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:





ABS00377

	Step	Check	Yes	No
1	**CHECK VALVE RELAY IN ABSCM&H/U.** 1) Disconnect the connector from ABSCM&H/U. 2) Measure the resistance between ABSCM&H/U terminals. ***Terminals*** ***No. 23 — No. 24:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **3.**
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

AA:DTC 52 OPEN CIRCUIT IN MOTOR RELAY CIRCUIT

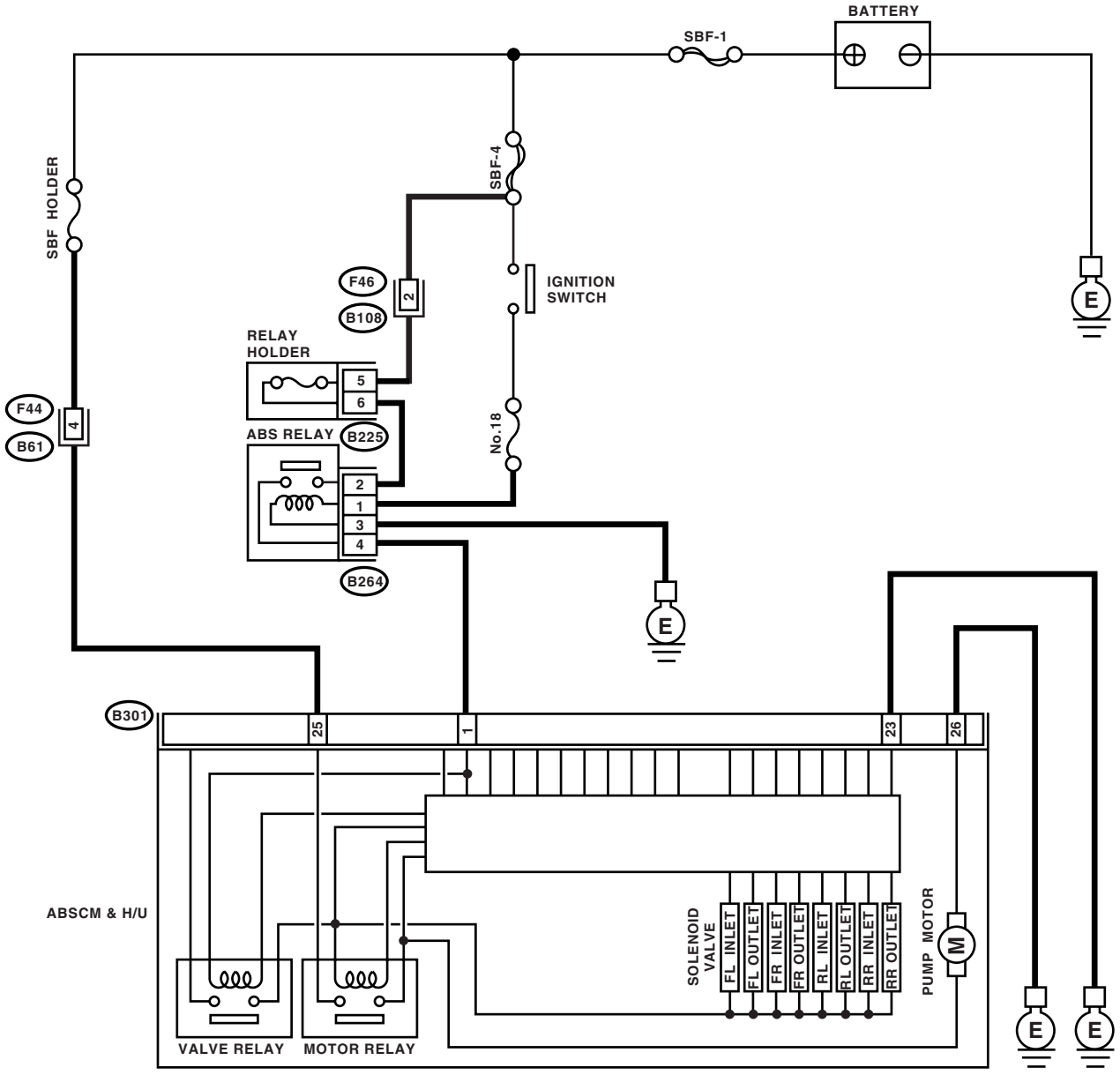
DIAGNOSIS:

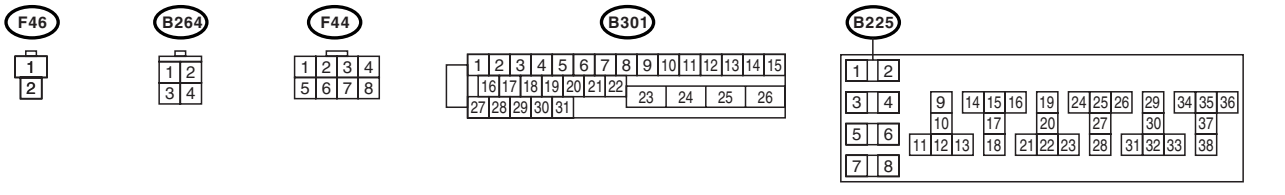
- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:





ABS00325

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 25 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the harness/connector between battery and ABSCM&H/U and check fuse SBF8.
2	**CHECK GROUND CIRCUIT OF MOTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 26 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK MOTOR OPERATION.** Operate the sequence control. <Ref. to ABS-9, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate sequence control.	Can motor revolution noise (buzz) be heard when carrying out the check sequence?	Go to step **4.**	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **5.**
5	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

AB:DTC 52 MOTOR RELAY ON FAILURE

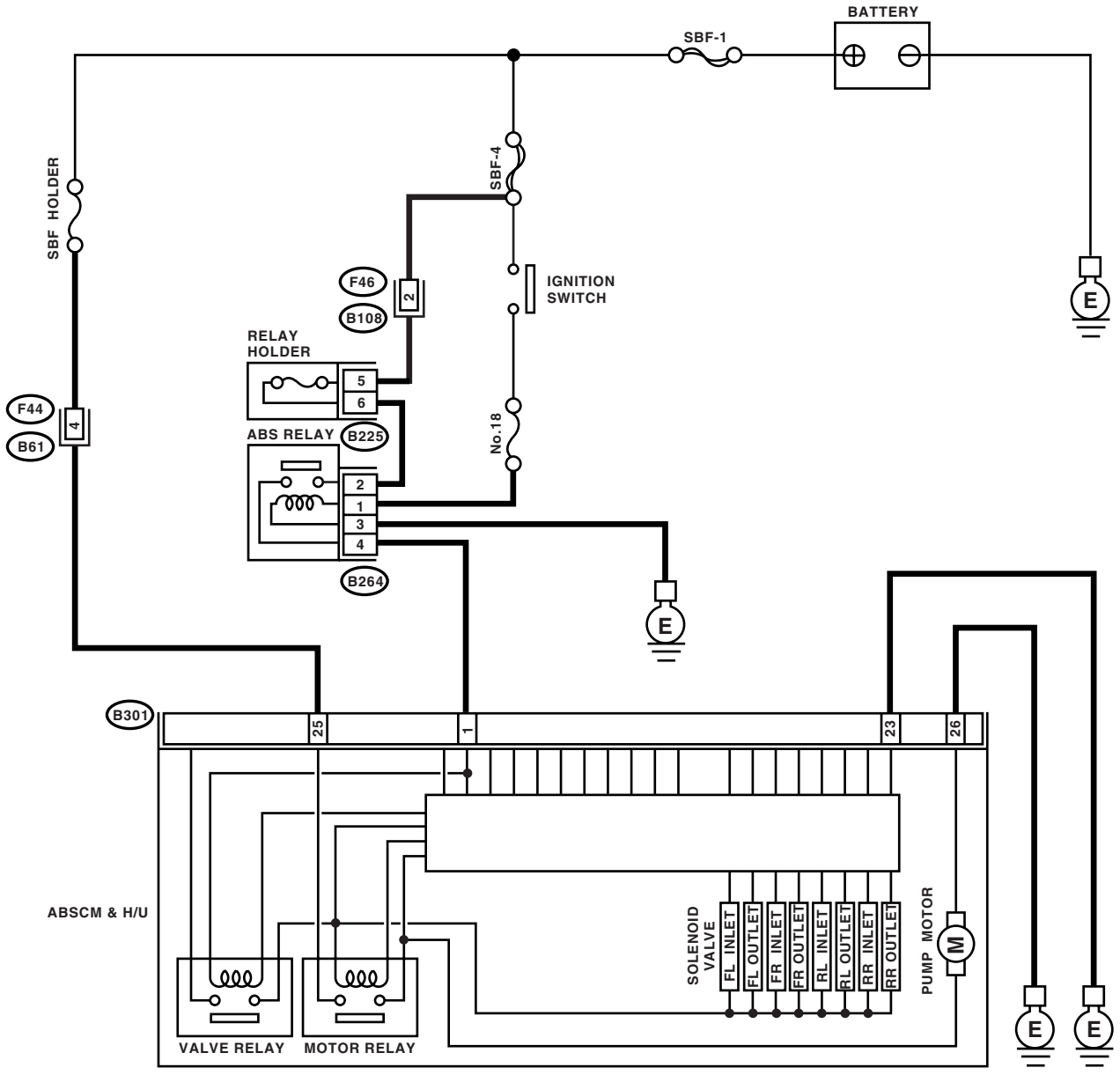
DIAGNOSIS:

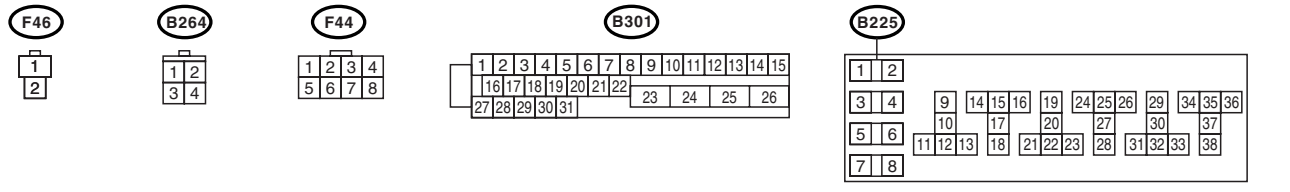
- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:





ABS00325

	Step	Check	Yes	No
1	**CHECK MOTOR RELAY IN ABSCM&H/U.** 1) Disconnect the connector from ABSCM&H/U. 2) Measure the resistance between ABSCM&H/U terminals. ***Terminals*** ***No. 25 — No. 26:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2	**CHECK MOTOR OPERATION.** Operate the sequence control. <Ref. to ABS-9, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate sequence control.	Can motor revolution noise (buzz) be heard when carrying out the sequence control?	Go to step **3.**	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
3	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact. NOTE: Although the ABS warning light remains illuminating at this point, this is a normal condition. Vehicle must be driven at approx. 12 km/h (7.46 MPH) or faster to turn off ABS warning light. Make sure that the ABS warning light goes off after driving vehicle.

AC:DTC 52 MOTOR MALFUNCTION

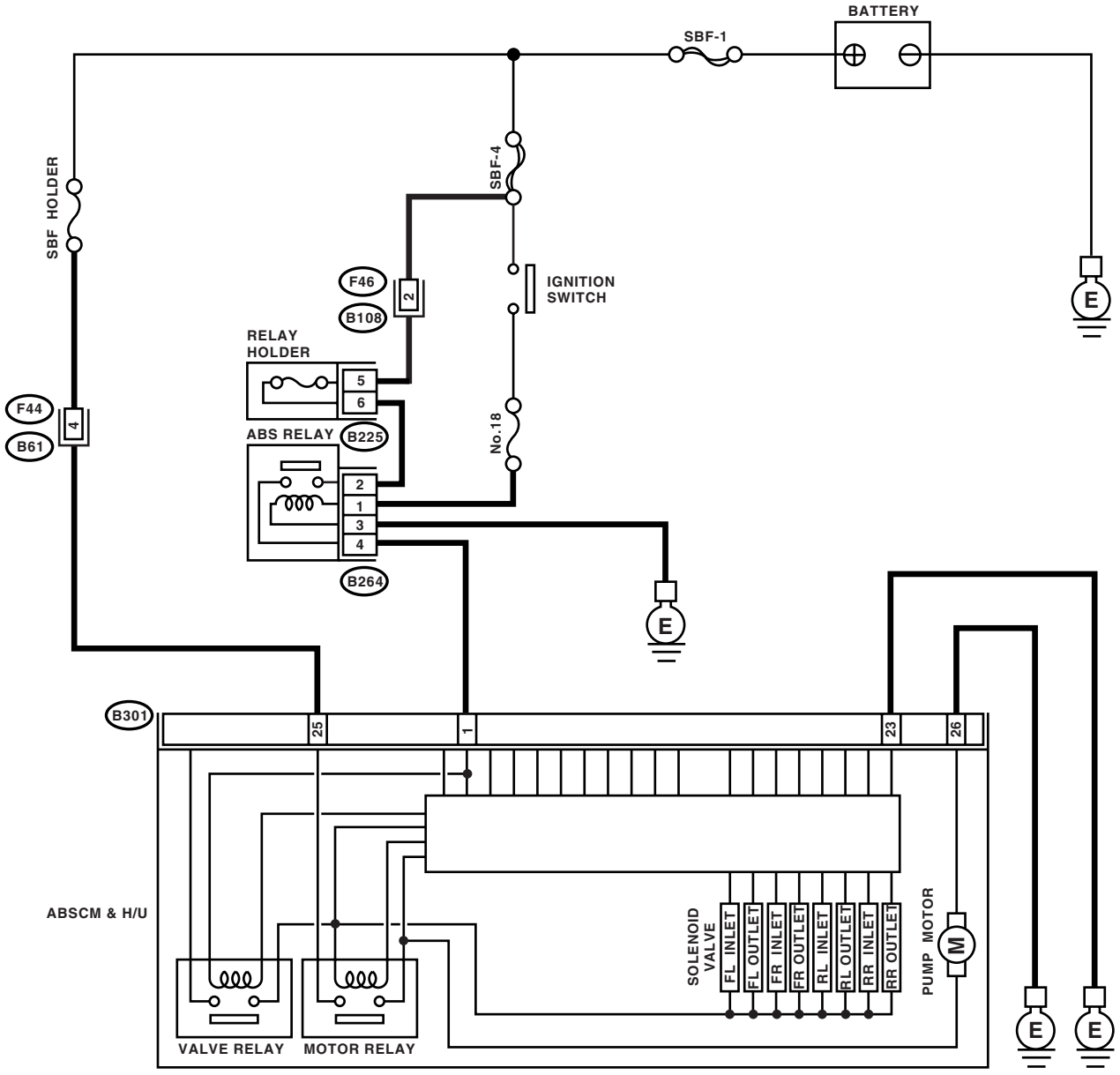
DIAGNOSIS:

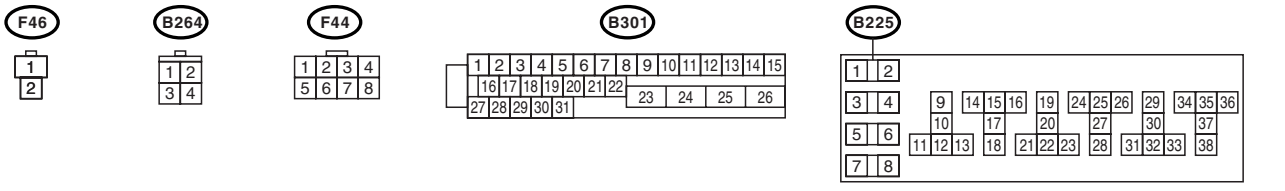
- Faulty motor
- Faulty motor relay
- Faulty harness connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:



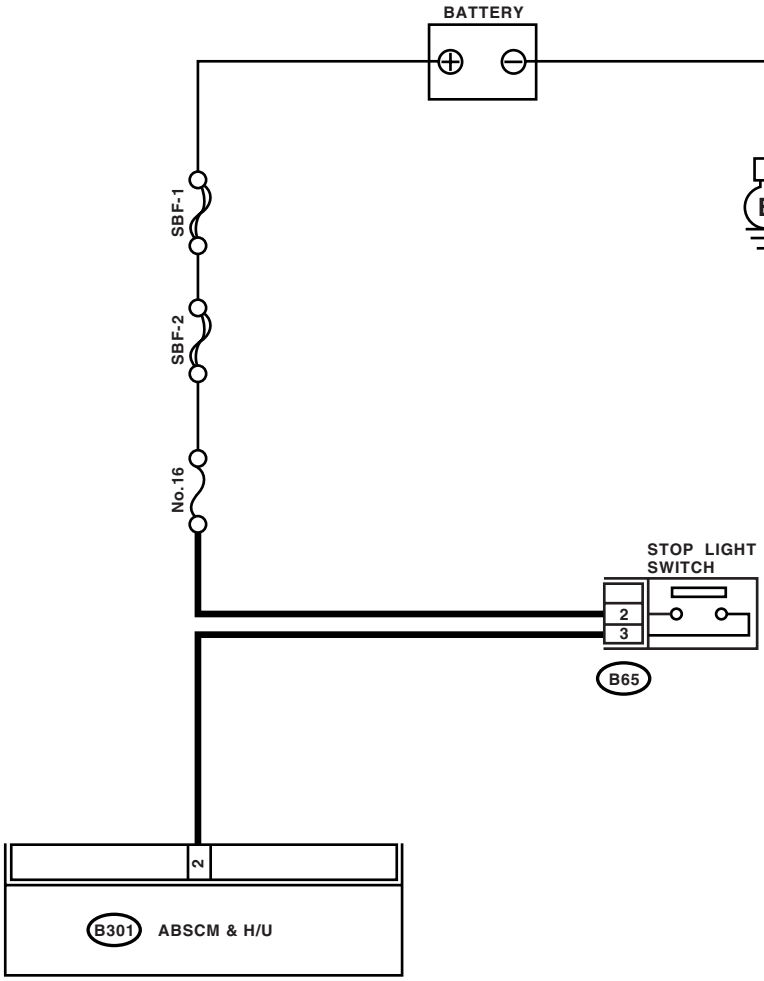


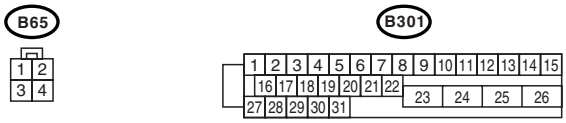
ABS00325

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 25 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the harness/connector between battery and ABSCM&H/U and check fuse SBF8.
2	**CHECK GROUND CIRCUIT OF MOTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 26 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Run the engine at idle. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 1 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **4.**	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 23 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **5.**	Repair the ABSCM&H/U ground harness.
5	**CHECK MOTOR OPERATION.** Operate the sequence control. <Ref. to ABS-9, ABS Sequence Control.> NOTE: Use the diagnosis connector to operate sequence control.	Can motor revolution noise (buzz) be heard when carrying out the sequence control?	Go to step **6.**	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **7.**
7	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **8.**
8	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

AD:DTC 54 STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION

DIAGNOSIS:
Faulty stop light switch
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:



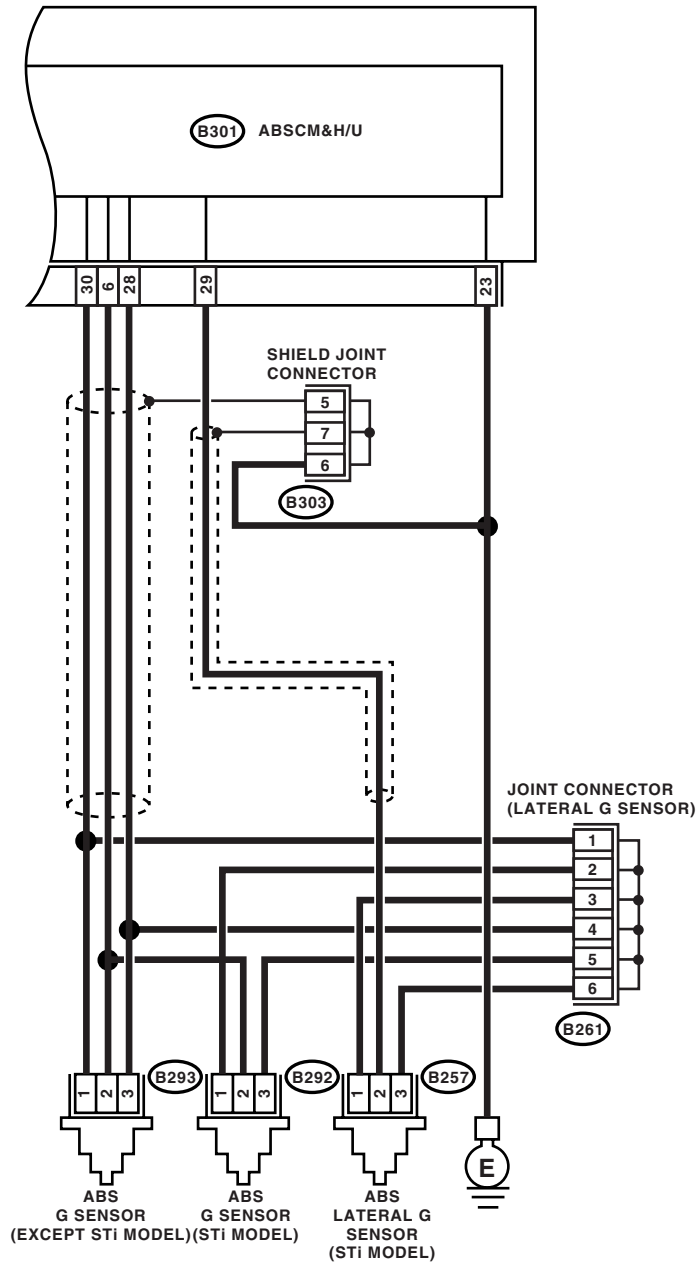


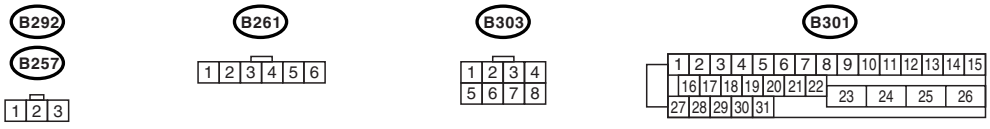
ABS00378

	Step	Check	Yes	No
1	**CHECK OUTPUT OF STOP LIGHT SWITCH USING SUBARU SELECT MONITOR.** 1) Select “Current data display & Save” on the Subaru Select Monitor. 2) Release the brake pedal. 3) Read the stop light switch output in Subaru Select Monitor data display.	Is the reading indicated on monitor display less than 1.5 V?	Go to step **2.**	Go to step **3.**
2	**CHECK OUTPUT OF STOP LIGHT SWITCH USING SUBARU SELECT MONITOR.** 1) Depress the brake pedal. 2) Read the stop light switch output in Subaru Select Monitor data display.	Is the reading indicated on monitor display 10 — 15 V?	Go to step **5.**	Go to step **3.**
3	**CHECK IF STOP LIGHTS COME ON.** Depress the brake pedal.	Do the stop lights turn on?	Go to step **4.**	Repair the stop lights circuit.
4	**CHECK OPEN CIRCUIT IN HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Depress the brake pedal. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 2 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **5.**	Repair the harness between stop light switch and ABSCM&H/U connector.
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between stop light switch and ABSCM&H/U?	Go to step **6.**	Repair the connector.
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

AE:DTC 56 OPEN OR SHORT CIRCUIT IN G SENSOR CIRCUIT

DIAGNOSIS:
Faulty G sensor output voltage
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:





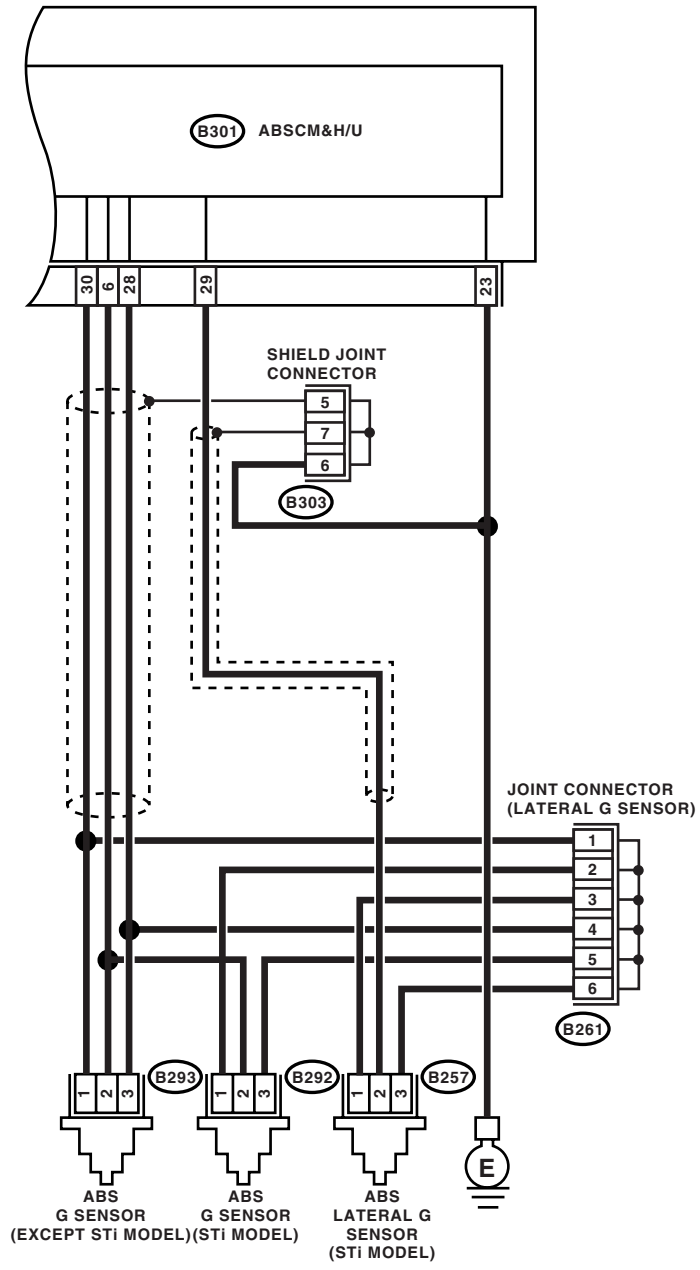
ABS00368

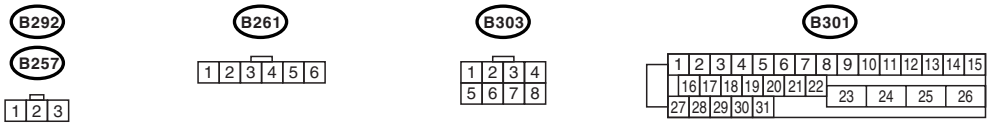
	Step	Check	Yes	No
1	**CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR.** 1) Select "Current data display & Save" on the Subaru Select Monitor. 2) Read the G sensor output in Subaru Select Monitor data display.	Is the G sensor output on monitor display 2.1 — 2.5 V when G sensor is in horizontal position?	Go to step **2.**	Go to step **5.**
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step **3.**
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
5	**CHECK INPUT VOLTAGE OF G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the G sensor from vehicle. (Do not disconnect connector.) 4) Turn the ignition switch to ON. 5) Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 1 (+) — No. 3 (–):***	Is the voltage 4.75 — 5.25 V?	Go to step **6.**	Repair the harness/connector between G sensor and ABSCM&H/U.
6	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(B301) No. 6 — No. 28:***	Is the resistance 5.0 — 5.6 kΩ?	Go to step **7.**	Repair the harness/connector between G sensor and ABSCM&H/U.
7	**CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS.** 1) Disconnect the connector from G sensor. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the harness between G sensor and ABSCM&H/U.
8	**CHECK G SENSOR.** 1) Connect the connector to G sensor. 2) Connect the connector to ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 2.1 — 2.5 V when G sensor is in horizontal position?	Go to step **9.**	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
9	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 3.7 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step **10.**	Replace the G sensor. <Ref. to ABS-20, G Sensor.>

	Step	Check	Yes	No
10	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 0.5 — 0.9 V when G sensor is inclined backwards to 90°?	Go to step **11.**	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
11	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step **12.**
12	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

AF:DTC 56 BATTERY SHORT IN G SENSOR CIRCUIT

DIAGNOSIS:
Faulty G sensor output voltage
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:





ABS00368

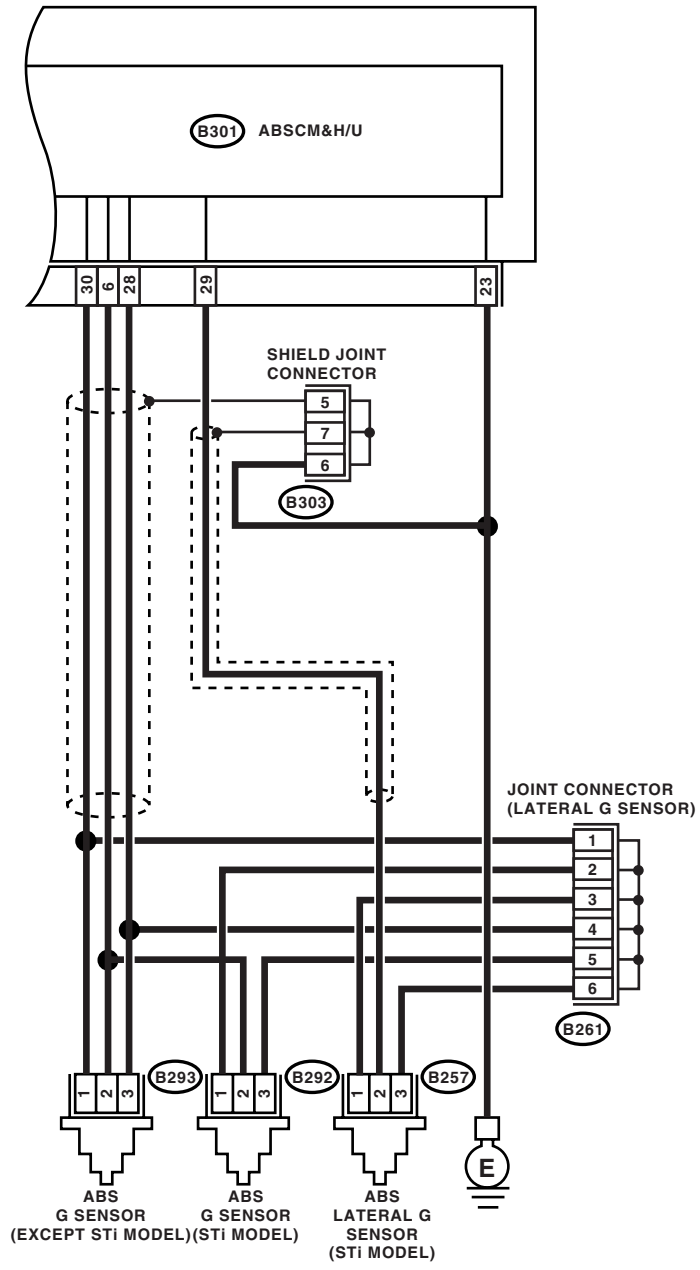
	Step	Check	Yes	No
1	**CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR.** 1) Select “Current data display & Save” on the Subaru Select Monitor. 2) Read the G sensor output in Subaru Select Monitor data display.	Is the voltage 2.1 — 2.5 V when G sensor is in horizontal position?	Go to step **2.**	Go to step **5.**
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step **3.**
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
5	**CHECK FREEZE FRAME DATA.** 1) Select “Freeze frame data” on the Subaru Select Monitor. 2) Read front right wheel speed on the Subaru Select Monitor display.	Is the front right wheel speed on monitor display 0 km/h (0 MPH)?	Go to step **6.**	Go to step **16.**
6	**CHECK FREEZE FRAME DATA.** Read front left wheel speed on the Subaru Select Monitor display.	Is the front left wheel speed on monitor display 0 km/h (0 MPH)?	Go to step **7.**	Go to step **16.**
7	**CHECK FREEZE FRAME DATA.** Read rear right wheel speed on the Subaru Select Monitor display.	Is the rear right wheel speed on monitor display 0 km/h (0 MPH)?	Go to step **8.**	Go to step **16.**
8	**CHECK FREEZE FRAME DATA.** Read rear left wheel speed on the Subaru Select Monitor display.	Is the rear left wheel speed on monitor display 0 km/h (0 MPH)?	Go to step **9.**	Go to step **16.**
9	**CHECK FREEZE FRAME DATA.** Read G sensor output on the Subaru Select Monitor display.	Is the G sensor output on monitor display more than 3.65 V?	Go to step **10.**	Go to step **16.**
10	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(B301) No. 6 — No. 28:***	Is the resistance 4.3 — 4.9 kΩ?	Go to step **11.**	Repair the harness/connector between G sensor and ABSCM&H/U.
11	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Disconnect the connector from G sensor. 4) Disconnect the connector from ABSCM&H/U. 5) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 6 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **12.**	Repair the harness between G sensor and ABSCM&H/U.

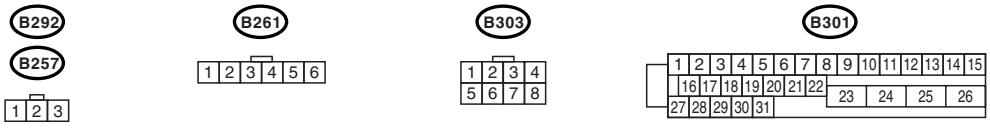
	Step	Check	Yes	No
12	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 6 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **13.**	Repair the harness between G sensor and ABSCM&H/U.
13	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step **14.**
14	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **15.**
15	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
16	**CHECK INPUT VOLTAGE OF G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the G sensor from vehicle. (Do not disconnect connector.) 4) Turn the ignition switch to ON. 5) Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 1 (+) — No. 3 (−):***	Is the voltage 4.75 — 5.25 V?	Go to step **17.**	Repair the harness/connector between G sensor and ABSCM&H/U.
17	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(B301) No. 6 — No. 28:***	Is the resistance 5.0 — 5.6 kΩ?	Go to step **18.**	Repair the harness/connector between G sensor and ABSCM&H/U.
18	**CHECK G SENSOR.** 1) Connect the connector to G sensor. 2) Connect the connector to ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 2.1 — 2.5 V when G sensor is in horizontal position?	Go to step **19.**	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
19	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 3.7 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step **20.**	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
20	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 0.5 — 0.9 V when G sensor is inclined backwards to 90°?	Go to step **21.**	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
21	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step **22.**

	Step	Check	Yes	No
22	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **23.**
23	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

AG:DTC 56 ABNORMAL G SENSOR HIGH μ OUTPUT

DIAGNOSIS:
Faulty G sensor output voltage
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:





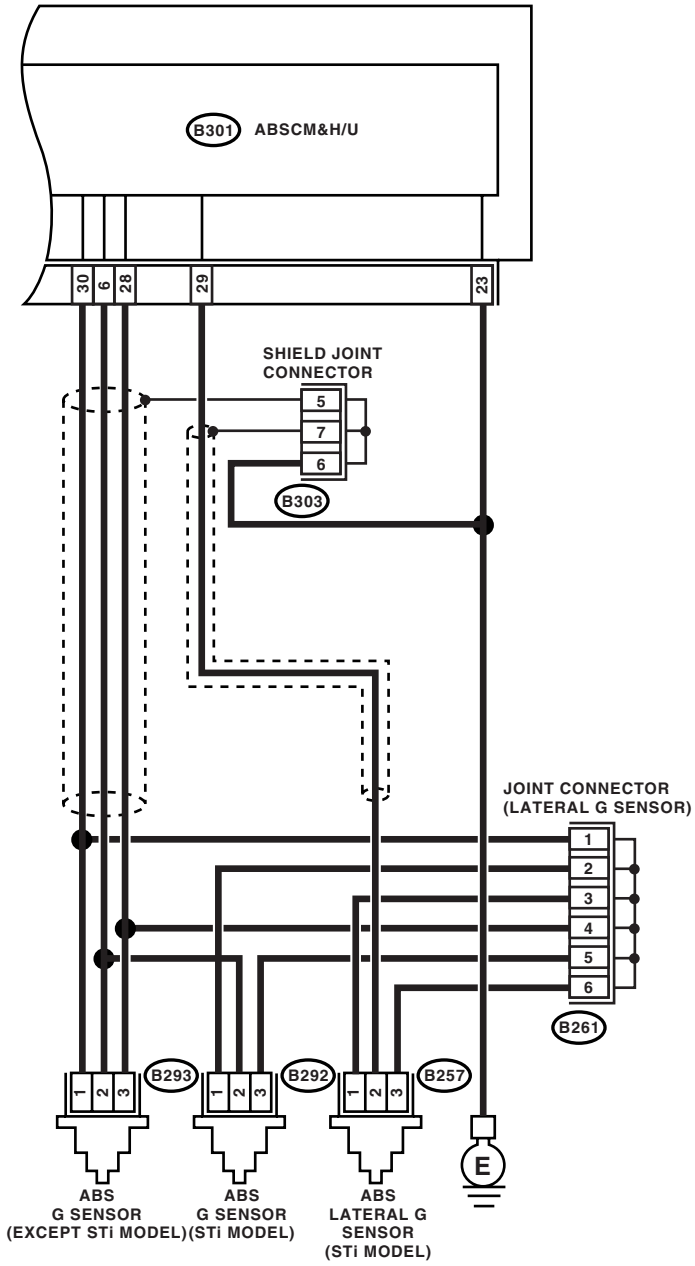
ABS00368

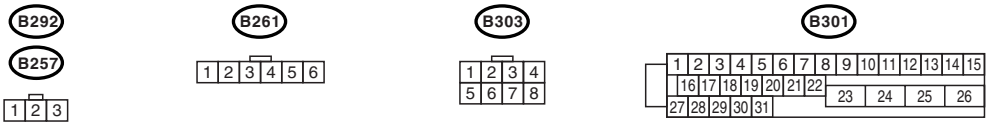
	Step	Check	Yes	No
1	**CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR.** 1) Select "Current data display & Save" on the Subaru Select Monitor. 2) Read G sensor output on the Subaru Select Monitor display.	Is the voltage 2.1 — 2.5 V when G sensor is in horizontal position?	Go to step **2.**	Go to step **6.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step **3.**
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
5	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(B301) No. 6 — No. 28:***	Is the resistance 5.0 — 5.6 kΩ?	Go to step **6.**	Repair the harness/connector between G sensor and ABSCM&H/U.
6	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 28 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the harness between G sensor and ABSCM&H/U. Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	**CHECK G SENSOR.** 1) Remove the console box. 2) Remove the G sensor from vehicle. 3) Connect the connector to G sensor. 4) Connect the connector to ABSCM&H/U. 5) Turn the ignition switch to ON. 6) Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 2.1 — 2.5 V when G sensor is in horizontal position?	Go to step **8.**	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
8	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 3.7 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step **9.**	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
9	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 0.5 — 0.9 V when G sensor is inclined backwards to 90°?	Go to step **10.**	Replace the G sensor. <Ref. to ABS-20, G Sensor.>

	Step	Check	Yes	No
10	**CHECK ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **11.**
11	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

AH:DTC 56 DETECTION OF G SENSOR STICK

DIAGNOSIS:
Faulty G sensor output voltage
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:





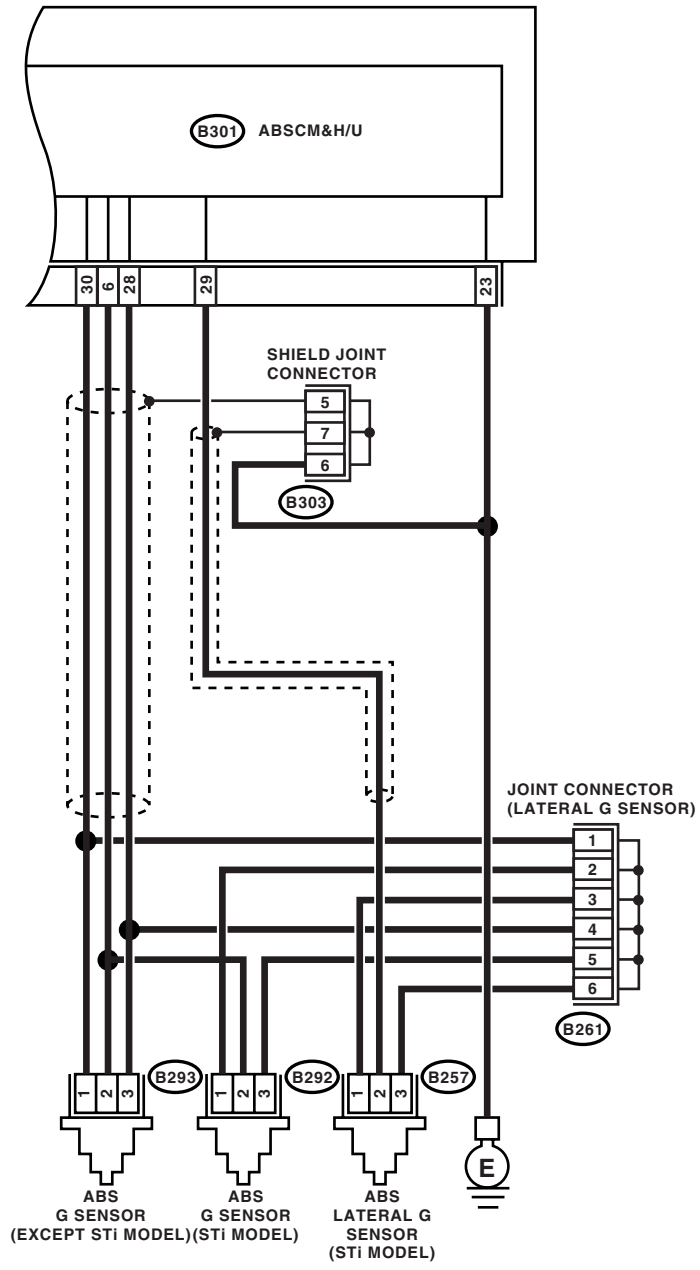
ABS00368

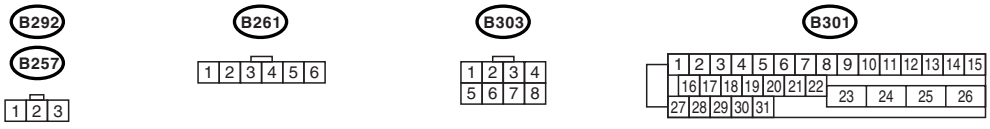
	Step	Check	Yes	No
1	**CHECK ALL FOUR WHEELS FOR FREE TURNING.**	Have the wheels been turned freely such as when vehicle is lifted up, or operated on a rolling road?	The ABS is normal. Erase the DTC.	Go to step **2.**
2	**CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR.** 1) Select “Current data display & Save” on the Subaru Select Monitor. 2) Read the Subaru Select Monitor display.	Is the G sensor output on monitor display 2.1 — 2.5 V when the vehicle is in horizontal position?	Go to step **3.**	Go to step **8.**
3	**CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the G sensor from vehicle. (Do not disconnect the connector.) 4) Turn the ignition switch to ON. 5) Select “Current data display & Save” on the Subaru Select Monitor. 6) Read the Subaru Select Monitor display.	Is the voltage 3.7 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step **4.**	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
4	**CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR.** Read the Subaru Select Monitor display.	Is the voltage 0.5 — 0.9 V when G sensor is inclined backwards to 90°?	Go to step **5.**	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
5	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
8	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(B301) No. 6 — No. 28:***	Is the resistance 5.0 — 5.6 kΩ?	Go to step **9.**	Repair the harness/connector between G sensor and ABSCM&H/U.
9	**CHECK G SENSOR.** 1) Remove the console box. 2) Remove the G sensor from vehicle. 3) Connect the connector to G sensor. 4) Connect the connector to ABSCM&H/U. 5) Turn the ignition switch to ON. 6) Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (−):***	Is the voltage 2.1 — 2.5 V when G sensor is in horizontal position?	Go to step **10.**	Replace the G sensor. <Ref. to ABS-20, G Sensor.>

	Step	Check	Yes	No
10	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 3.7 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step **11.**	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
11	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 0.5 — 0.9 V when G sensor is inclined backwards to 90°?	Go to step **12.**	Replace the G sensor. <Ref. to ABS-20, G Sensor.>
12	**CHECK ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

AI: DTC 73 OPEN OR SHORT CIRCUIT IN LATERAL G SENSOR CIRCUIT

DIAGNOSIS:
Faulty Lateral G sensor output voltage
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:





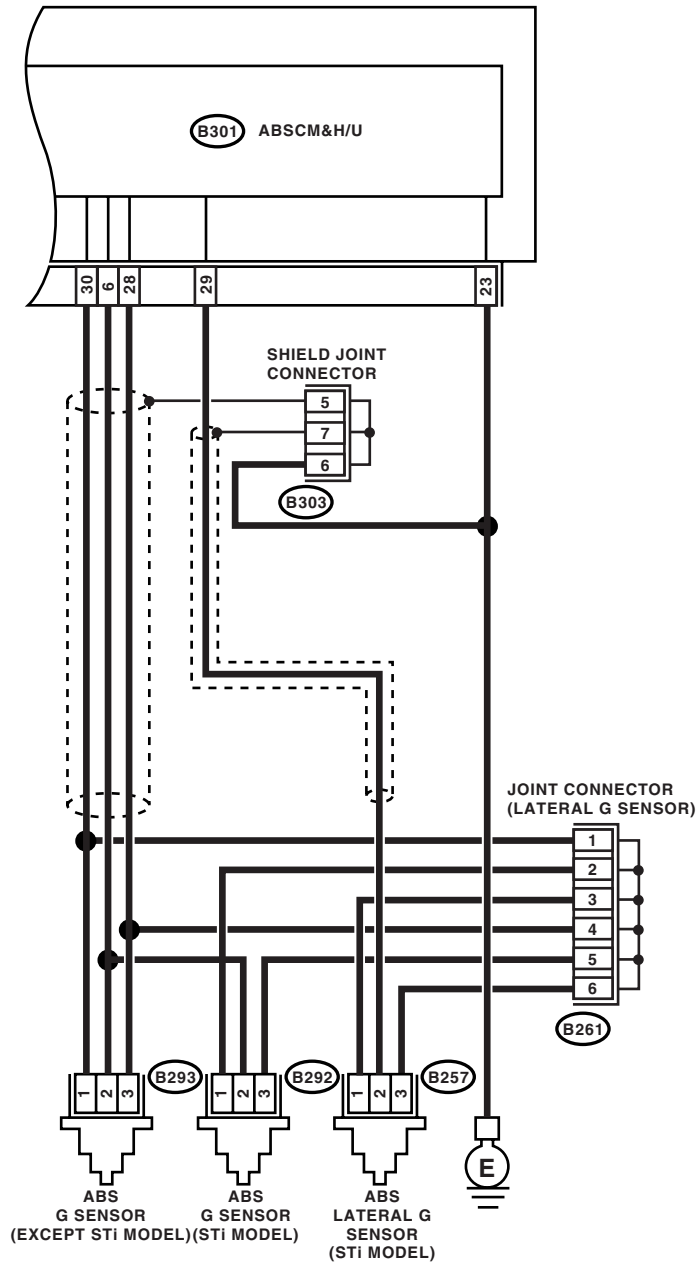
ABS00368

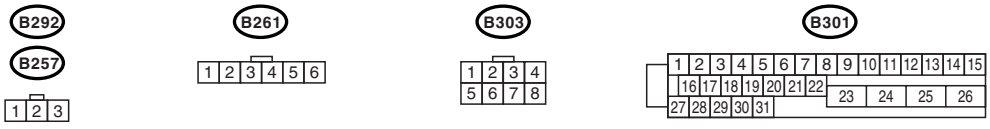
	Step	Check	Yes	No
1	**CHECK OUTPUT OF LATERAL G SENSOR USING SUBARU SELECT MONITOR.** 1) Select "Current data display & Save" on the Subaru Select Monitor. 2) Read the lateral G sensor output in Subaru Select Monitor data display.	Is the lateral G sensor output on monitor display 2.3 — 2.7 V when lateral G sensor is in horizontal position?	Go to step **2.**	Go to step **5.**
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step **3.**
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
5	**CHECK INPUT VOLTAGE OF LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the lateral G sensor from vehicle. (Do not disconnect connector.) 4) Turn the ignition switch to ON. 5) Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 1 (+) — No. 3 (−):***	Is the voltage 4.75 — 5.25 V?	Go to step **6.**	Repair the harness/connector between lateral G sensor and ABSCM&H/U.
6	**CHECK OPEN CIRCUIT IN LATERAL G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(B301) No. 28 — No. 30:***	Is the resistance 5.0 — 5.6 kΩ?	Go to step **7.**	Repair the harness/connector between lateral G sensor and ABSCM&H/U.
7	**CHECK GROUND SHORT IN LATERAL G SENSOR OUTPUT HARNESS.** 1) Disconnect the connector from lateral G sensor. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 29 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the harness between lateral G sensor and ABSCM&H/U.
8	**CHECK LATERAL G SENSOR.** 1) Connect the connector to lateral G sensor. 2) Connect the connector to ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (−):***	Is the voltage 2.1 — 2.5 V when lateral G sensor is in horizontal position?	Go to step **9.**	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>

	Step	Check	Yes	No
9	**CHECK LATERAL G SENSOR.** Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (–):***	Is the voltage 3.7 — 4.1 V when lateral G sensor is inclined right to 90°?	Go to step **10.**	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>
10	**CHECK LATERAL G SENSOR.** Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (–):***	Is the voltage 0.5 — 0.9 V when lateral G sensor is inclined left to 90°?	Go to step **11.**	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>
11	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step **12.**
12	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

AJ:DTC 73 BATTERY SHORT IN LATERAL G SENSOR CIRCUIT

DIAGNOSIS:
Faulty Lateral G sensor output voltage
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:





ABS00368

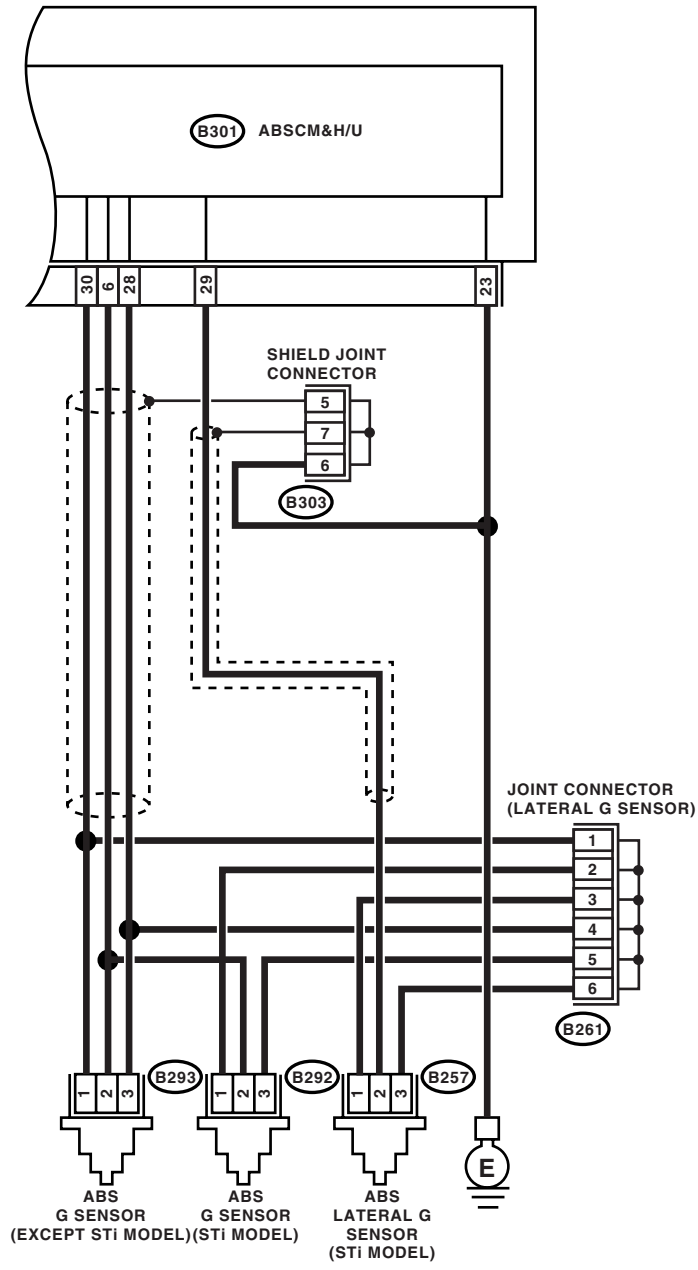
	Step	Check	Yes	No
1	**CHECK OUTPUT OF LATERAL G SENSOR USING SUBARU SELECT MONITOR.** 1) Select “Current data display & Save” on the Subaru Select Monitor. 2) Read the lateral G sensor output in Subaru Select Monitor data display.	Is the voltage 2.3 — 2.7 V when lateral G sensor is in horizontal position?	Go to step **2.**	Go to step **5.**
2	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step **3.**
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
5	**CHECK FREEZE FRAME DATA.** 1) Select “Freeze frame data” on the Subaru Select Monitor. 2) Read front right wheel speed on the Subaru Select Monitor display.	Is the front right wheel speed on monitor display 0 km/h (0 MPH)?	Go to step **6.**	Go to step **16.**
6	**CHECK FREEZE FRAME DATA.** Read front left wheel speed on the Subaru Select Monitor display.	Is the front left wheel speed on monitor display 0 km/h (0 MPH)?	Go to step **7.**	Go to step **16.**
7	**CHECK FREEZE FRAME DATA.** Read rear right wheel speed on the Subaru Select Monitor display.	Is the rear right wheel speed on monitor display 0 km/h (0 MPH)?	Go to step **8.**	Go to step **16.**
8	**CHECK FREEZE FRAME DATA.** Read rear left wheel speed on the Subaru Select Monitor display.	Is the rear left wheel speed on monitor display 0 km/h (0 MPH)?	Go to step **9.**	Go to step **16.**
9	**CHECK FREEZE FRAME DATA.** Read lateral G sensor output on the Subaru Select Monitor display.	Is the lateral G sensor output on monitor display more than 3.65 V?	Go to step **10.**	Go to step **16.**
10	**CHECK OPEN CIRCUIT IN LATERAL G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(B301) No. 29 — No. 28:***	Is the resistance 4.3 — 4.9 kΩ?	Go to step **11.**	Repair the harness/connector between Lateral G sensor and ABSCM&H/U.
11	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Disconnect the connector from lateral G sensor. 4) Disconnect the connector from ABSCM&H/U. 5) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 29 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **12.**	Repair the harness between lateral G sensor and ABSCM&H/U.

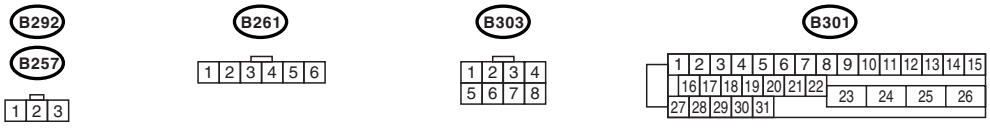
	Step	Check	Yes	No
12	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 29 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **13.**	Repair the harness between lateral G sensor and ABSCM&H/U.
13	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step **14.**
14	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **15.**
15	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
16	**CHECK INPUT VOLTAGE OF LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the lateral G sensor from vehicle. (Do not disconnect connector.) 4) Turn the ignition switch to ON. 5) Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 1 (+) — No. 3 (−):***	Is the voltage 4.75 — 5.25 V?	Go to step **17.**	Repair the harness/connector between Lateral G sensor and ABSCM&H/U.
17	**CHECK OPEN CIRCUIT IN LATERAL G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(B301) No. 29 — No. 28:***	Is the resistance 5.0 — 5.6 kΩ?	Go to step **18.**	Repair the harness/connector between lateral G sensor and ABSCM&H/U.
18	**CHECK LATERAL G SENSOR.** 1) Connect the connector to lateral G sensor. 2) Connect the connector to ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (−):***	Is the voltage 2.1 — 2.5 V when lateral G sensor is in horizontal position?	Go to step **19.**	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>
19	**CHECK LATERAL G SENSOR.** Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (−):***	Is the voltage 3.3 — 3.7 V when lateral G sensor is inclined right to 90°?	Go to step **20.**	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>
20	**CHECK LATERAL G SENSOR.** Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (−):***	Is the voltage 0.5 — 0.9 V when lateral G sensor is inclined left to 90°?	Go to step **21.**	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>

	Step	Check	Yes	No
21	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step **22.**
22	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **23.**
23	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

AK:DTC 73 ABNORMAL LATERAL G SENSOR HIGH μ OUTPUT

DIAGNOSIS:
Faulty Lateral G sensor output voltage
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:





ABS00368

	Step	Check	Yes	No
1	**CHECK OUTPUT OF LATERAL G SENSOR USING SUBARU SELECT MONITOR.** 1) Select “Current data display & Save” on the Subaru Select Monitor. 2) Read Lateral G sensor output on the Subaru Select Monitor display.	Is the voltage 2.3 — 2.7 V when Lateral G sensor is in horizontal position?	Go to step **2.**	Go to step **6.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step **3.**
3	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **4.**
4	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
5	**CHECK OPEN CIRCUIT IN LATERAL G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(B301) No. 29 — No. 28:***	Is the resistance 5.0 — 5.6 kΩ?	Go to step **6.**	Repair the harness/connector between lateral G sensor and ABSCM&H/U.
6	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(B301) No. 28 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the harness between lateral G sensor and ABSCM&H/U. Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	**CHECK LATERAL G SENSOR.** 1) Remove the console box. 2) Remove the lateral G sensor from vehicle. 3) Connect the connector to lateral G sensor. 4) Connect the connector to ABSCM&H/U. 5) Turn the ignition switch to ON. 6) Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (−):***	Is the voltage 2.1 — 2.5 V when lateral G sensor is in horizontal position?	Go to step **8.**	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>
8	**CHECK LATERAL G SENSOR.** Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (−):***	Is the voltage 3.3 — 3.7 V when lateral G sensor is inclined right to 90°?	Go to step **9.**	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>

	Step	Check	Yes	No
9	**CHECK LATERAL G SENSOR.** Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal (B257) No. 2 (+) — No. 3 (−):***	Is the voltage 0.5 — 0.9 V when lateral G sensor is inclined left to 90°?	Go to step **10.**	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>
10	**CHECK ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **11.**
11	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

AL:DTC 73 DETECTION OF LATERAL G SENSOR STICK

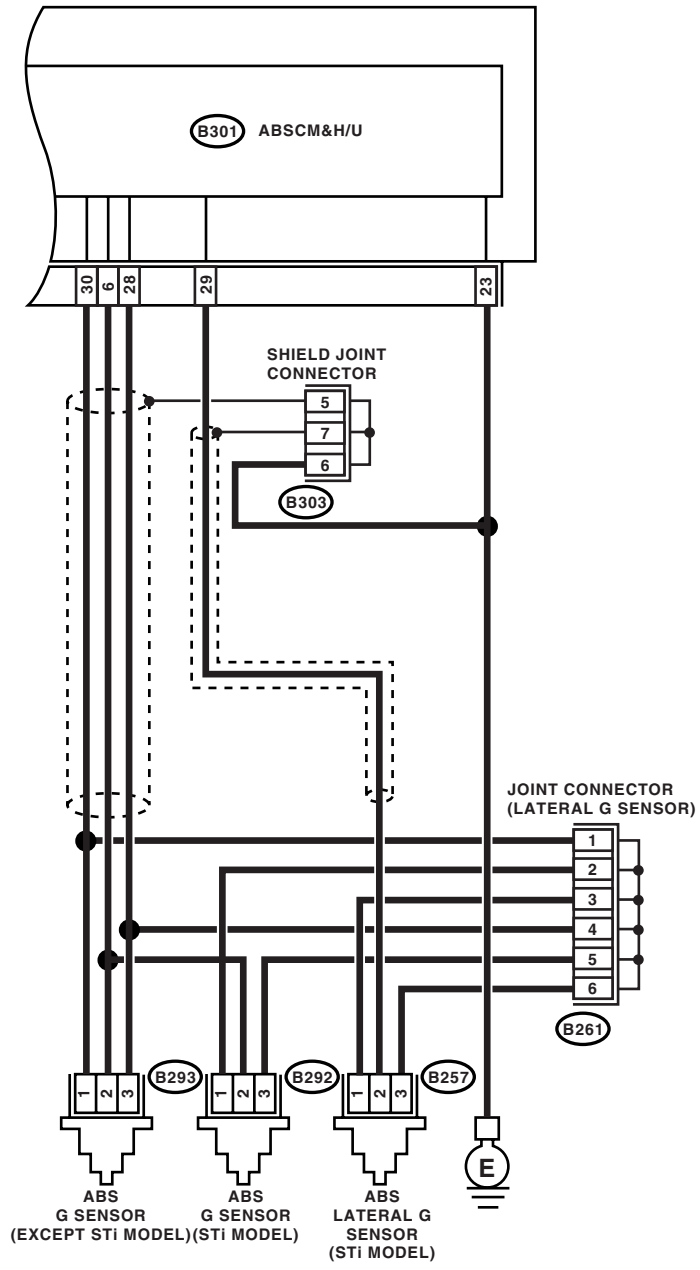
DIAGNOSIS:

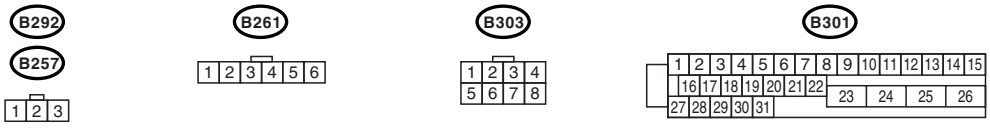
Faulty Lateral G sensor output voltage

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:





ABS00368

	Step	Check	Yes	No
1	**CHECK ALL FOUR WHEELS FOR FREE TURNING.**	Have the wheels been turned freely such as when vehicle is lifted up, or operated on a rolling road?	The ABS is normal. Erase the DTC.	Go to step **2.**
2	**CHECK OUTPUT OF LATERAL G SENSOR USING SUBARU SELECT MONITOR.** 1) Select "Current data display & Save" on the Subaru Select Monitor. 2) Read the Subaru Select Monitor display.	Is the lateral G sensor output on monitor display 2.3 — 2.7 V when the vehicle is in horizontal position?	Go to step **3.**	Go to step **8.**
3	**CHECK OUTPUT OF LATERAL G SENSOR USING SUBARU SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the lateral G sensor from vehicle. (Do not disconnect the connector.) 4) Turn the ignition switch to ON. 5) Select "Current data display & Save" on the Subaru Select Monitor. 6) Read the Subaru Select Monitor display.	Is the voltage 3.7 — 4.1 V when lateral G sensor is inclined right to 90°?	Go to step **4.**	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>
4	**CHECK OUTPUT OF LATERAL G SENSOR USING SUBARU SELECT MONITOR.** Read the Subaru Select Monitor display.	Is the voltage 0.5 — 0.9 V when lateral G sensor is inclined left to 90°?	Go to step **5.**	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>
5	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and lateral G sensor?	Repair the connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
8	**CHECK OPEN CIRCUIT IN LATERAL G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***(B301) No. 29 — No. 28:***	Is the resistance 5.0 — 5.6 kΩ?	Go to step **9.**	Repair the harness/connector between lateral G sensor and ABSCM&H/U.
9	**CHECK LATERAL G SENSOR.** 1) Remove the console box. 2) Remove the lateral G sensor from vehicle. 3) Connect the connector to lateral G sensor. 4) Connect the connector to ABSCM&H/U. 5) Turn the ignition switch to ON. 6) Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (−):***	Is the voltage 2.1 — 2.5 V when lateral G sensor is in horizontal position?	Go to step **10.**	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>

	Step	Check	Yes	No
10	**CHECK LATERAL G SENSOR.** Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (–):***	Is the voltage 3.3 — 3.7 V when lateral G sensor is inclined right to 90°?	Go to step **11.**	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>
11	**CHECK LATERAL G SENSOR.** Measure the voltage between lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 2 (+) — No. 3 (–):***	Is the voltage 0.5 — 0.9 V when lateral G sensor is inclined left to 90°?	Go to step **12.**	Replace the lateral G sensor. <Ref. to ABS-22, Lateral G Sensor.>
12	**CHECK ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DTC APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

14.General Diagnostics Table

A: INSPECTION

Symptom		Probable faulty units/parts
Vehicle instability during braking	Vehicle pulls to either side.	• ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Brake (caliper & piston, pads) • Wheel alignment • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Road surface (uneven, camber)
	Vehicle spins.	• ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Brake (pads) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections
Poor braking	Long braking/stopping distance	• ABSCM&H/U (solenoid valve) • Brake (pads) • Air in brake line • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections
	Wheel locks.	• ABSCM&H/U (solenoid valve, motor) • ABS wheel speed sensor • Incorrect wiring or piping connections
	Brake dragging	• ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Master cylinder • Brake (caliper & piston) • Parking brake • Axle & wheels • Brake pedal play
	Long brake pedal stroke	• Air in brake line • Brake pedal play
	Vehicle pitching	• Suspension play or fatigue (reduced damping) • Incorrect wiring or piping connections • Road surface (uneven)
	Unstable or uneven braking	• ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Brake (caliper & piston, pads) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Road surface (uneven)
Vibration and/or noise (while driving on slippery roads)	Excessive pedal vibration	• Incorrect wiring or piping connections • Road surface (uneven)
	Noise from ABSCM&H/U	• ABSCM&H/U (mount bushing) • ABS wheel speed sensor • Brake piping
	Noise from front of vehicle	• ABSCM&H/U (mount bushing) • ABS wheel speed sensor • Master cylinder • Brake (caliper & piston, pads, rotor) • Brake piping • Brake booster & check valve • Suspension play or fatigue
	Noise from rear of vehicle	• ABS wheel speed sensor • Brake (caliper & piston, pads, rotor) • Parking brake • Brake piping • Suspension play or fatigue

BRAKE

BR

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1. General Description

A: SPECIFICATIONS

Model		Other models	WRX	STi
Front disc brake	Size	15 inch type	16 inch type	17 inch type
	Type	Disc (Floating type, ventilated)	Disc (Fixed type, ventilated)	
	Effective disc diameter	228 mm (8.98 in)	255 mm (10.04 in)	268 mm (10.55 in)
	Disc thickness × Outer diameter	24 × 277 mm (0.94 × 10.91 in)	24 × 294 mm (0.94 × 11.57 in)	30 × 326 mm (1.18 × 12.83 in)
	Effective cylinder diameter	42.8 mm (1.685 in) × 2	40.4 mm (1.591 in) × 4	40.0 mm × 2, 46.0 mm × 2 (1.575 in × 2, 1.811 in × 2)
	Pad dimensions (length × width × thickness)	117.8 × 50.5 × 11.0 mm (4.638 × 1.988 × 0.433 in)	116.0 × 47.7 × 10.0 mm (4.567 × 1.878 × 0.394 in)	129.8 × 60.5 × 9.2 mm (5.110 × 2.382 × 0.362 in)
	Clearance adjustment	Automatic adjustment		
Rear disc brake	Size	14 inch type		17 inch type
	Type	Disc (Floating type)		Disc (Fixed type, ventilated)
	Effective disc diameter	230 mm (9.06 in)		268 mm (10.55 in)
	Disc thickness × Outer diameter	10 × 266 mm (0.39 × 10.47 in)		20 × 316 mm (0.79 × 12.44 in)
	Effective cylinder diameter	38.1 mm (1.500 in)		36.0 mm (1.417 in)
	Pad dimensions (length × width × thickness)	89.4 × 33.7 × 9.0 mm (3.520 × 1.327 × 0.354 in)		74.8 × 45.0 × 9.0 mm (2.945 × 1.772 × 0.354 in)
	Clearance adjustment	Automatic adjustment		
Master cylinder	Type	Tandem		
	Effective diameter	26.99 mm (1-1/16 in)		
	Reservoir type	Sealed type		
	Brake fluid reservoir capacity	205 cm^3 (12.51 cu in)		
Brake booster	Type	Vacuum suspended		
	Effective diameter	205 + 230 mm (8.07 + 9.06 in)		
Brake line		Dual circuit system		
Brake fluid **CAUTION:** **• Avoid mixing brake fluid of different brands to prevent the fluid performance from degrading.** **• When brake fluid is supplemented, be careful not to allow any dust into the reservoir.** **• Use fresh DOT3 brake fluid when replacing or refilling the fluid.**		FMVSS No. 116, DOT3		

NOTE:
Refer to “PB section” for parking brake SPECIFICATIONS. <Ref. to PB-2, SPECIFICATIONS, General Description.>

ITEM			STANDARD	SERVICE LIMIT
Front brake	Pad thickness	15	11 mm (0.43 in)	1.5 mm (0.059 in)
		16	11 mm (0.43 in)	1.5 mm (0.059 in)
		17	9.2 mm (0.362 in)	1.2 mm (0.047 in)
	Disc thickness	Except 17	24 mm (0.94 in)	22 mm (0.87 in)
		17	30 mm (1.18 in)	28 mm (1.10 in)
	Disc runout		—	0.075 mm (0.0030 in)
Rear brake (Disc type)	Pad thickness	14	9.0 mm (0.354 in)	1.5 mm (0.059 in)
		17	9.0 mm (0.354 in)	1.2 mm (0.047 in)
	Disc thickness	14	10 mm (0.39 in)	8.5 mm (0.335 in)
		17	20 mm (0.79 in)	18 mm (0.71 in)
	Disc runout		—	0.07 mm (0.0028 in)
Rear brake (Disc type parking)	Inside diameter		170 mm (6.69 in)	171 mm (6.73 in)
	Lining thickness		3.2 mm (0.126 in)	1.5 mm (0.059 in)
Parking brake	Lever stroke		7 to 8 notches/196 N (20 kgf, 44 lb)	

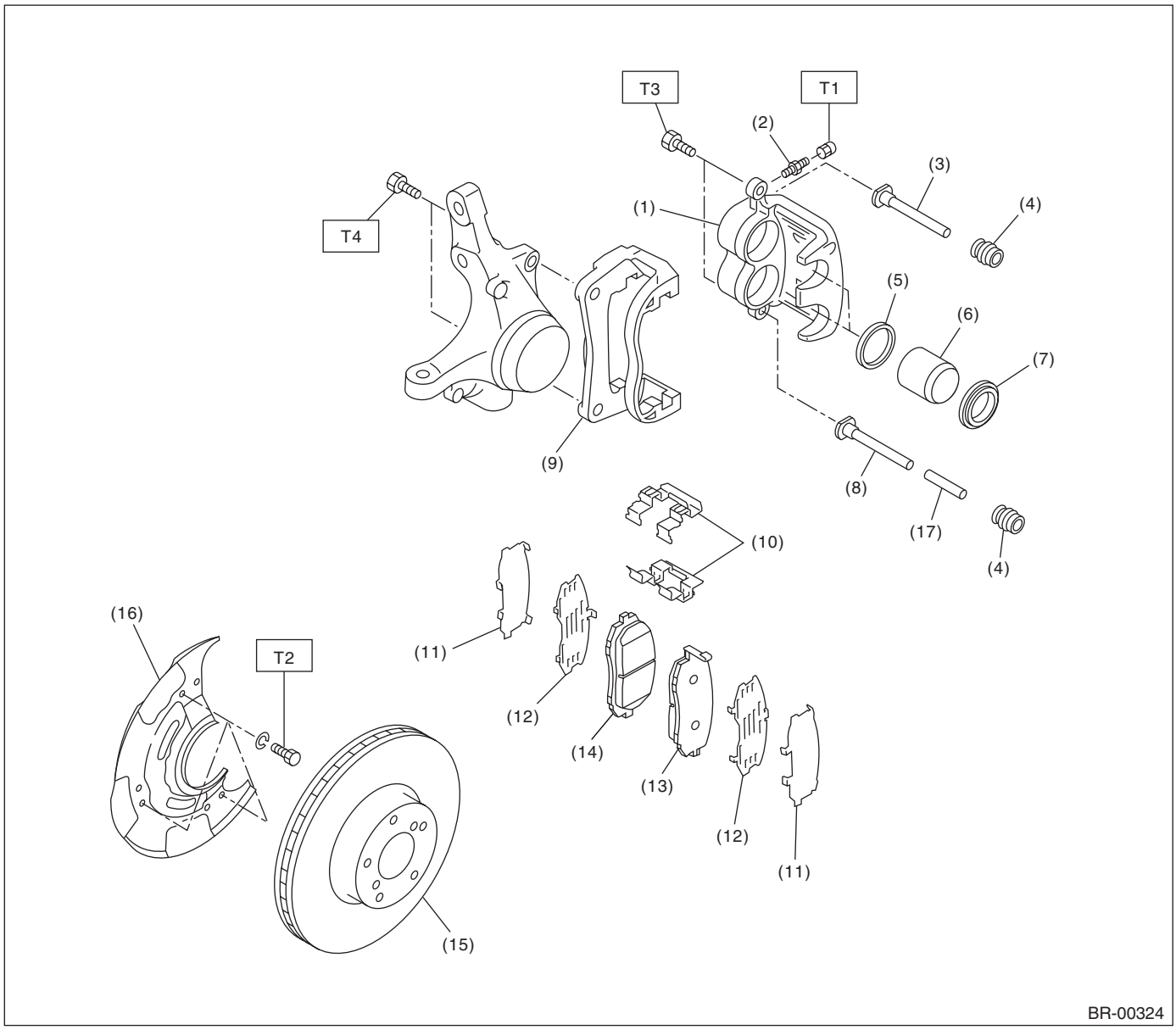
		Brake pedal force	Fluid pressure		
			Other models	WRX	STi
Brake booster	Brake fluid pressure without engine running	147 N (15 kgf, 33 lb)	588 kPa (6 kg/cm^2, 85 psi)		
		294 N (30 kgf, 66 lb)	1,471 kPa (15 kg/cm^2, 213 psi)		
	Brake fluid pressure with engine running and vacuum at 66.7 kPa (500 mmHg, 19.69 inHg)	147 N (15 kgf, 33 lb)	5,296 kPa (54 kg/cm^2, 768 psi)	4,707 kPa (48 kg/cm^2, 683 psi)	4,021 kPa (41 kg/cm^2, 583 psi)
		294 N (30 kgf, 66 lb)	9,120 kPa (93 kg/cm^2, 1,323 psi)		8,336 kPa (85 kg/cm^2, 1,209 psi)

Brake pedal	Free play	1 — 3 mm (0.04 — 0.12 in) [Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lb).]

B: COMPONENT

1. FRONT DISC BRAKE

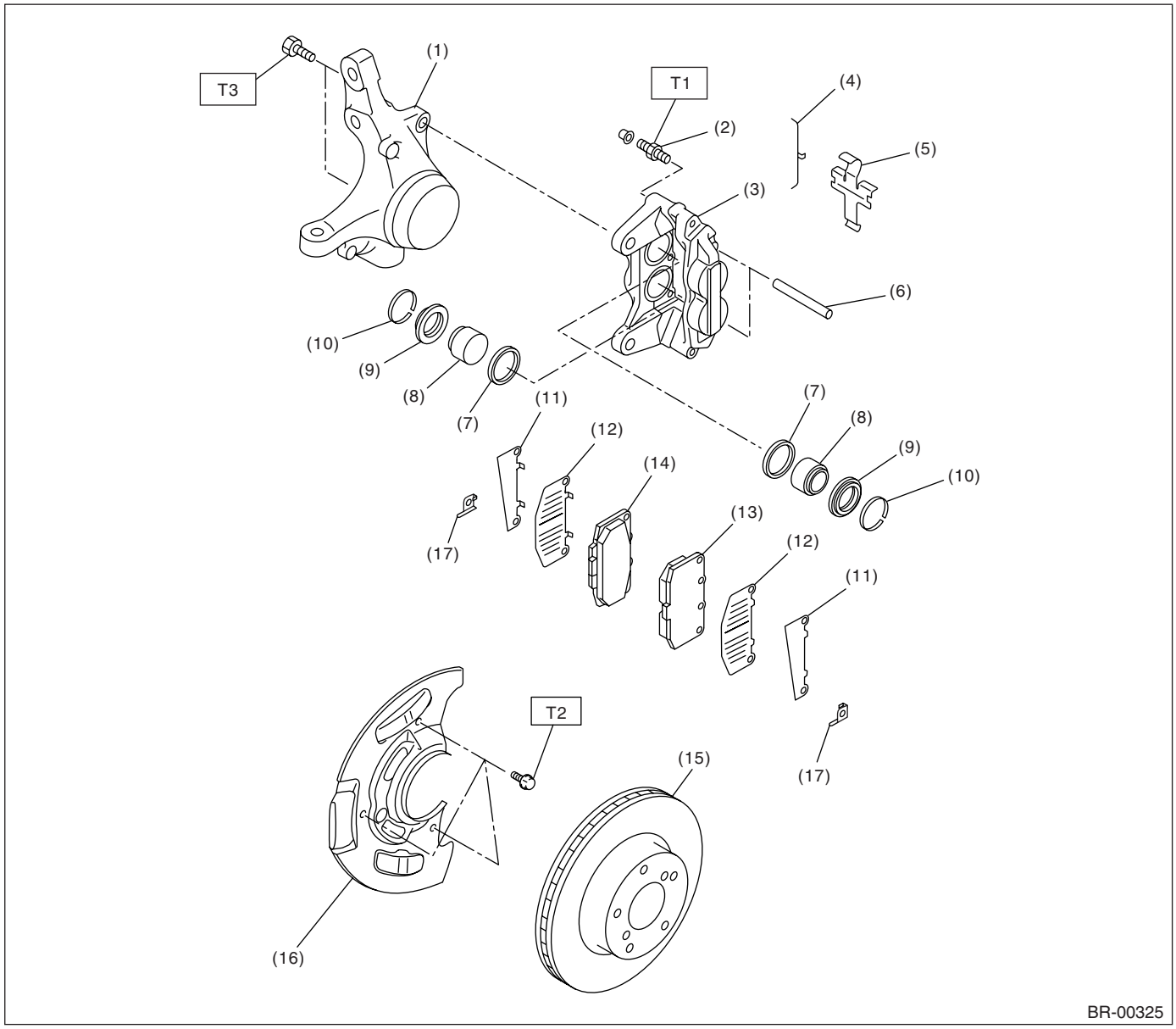
• 15 INCH TYPE



(1) Caliper body
(2) Air bleeder screw
(3) Guide pin (Green)
(4) Pin boot
(5) Piston seal
(6) Piston
(7) Piston boot
(8) Lock pin (Yellow)
(9) Support
(10) Pad clip
(11) Outer shim
(12) Inner shim
(13) Pad (Outside)
(14) Pad (Inside)
(15) Disc rotor
(16) Disc cover
(17) Bushing

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 27 (2.8, 19.9)
T3: 37 (3.8, 27.5)
T4: 80 (8.2, 59)

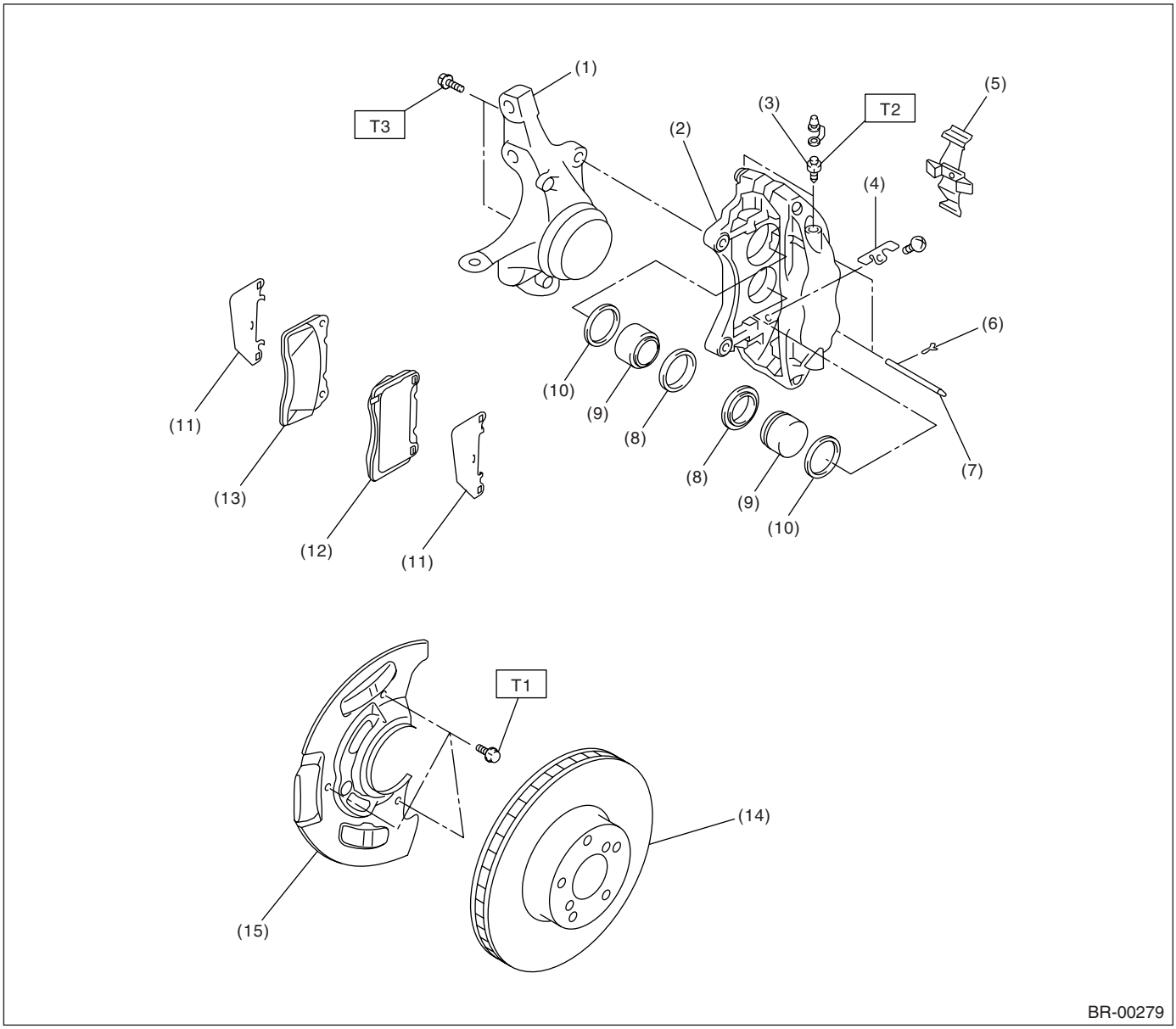
• 16 INCH TYPE



(1) Housing
(2) Air bleeder screw
(3) Caliper body
(4) M clip
(5) Cross spring
(6) Pad pin
(7) Piston seal
(8) Piston
(9) Piston boot
(10) Boot ring
(11) Outer shim
(12) Inner shim
(13) Pad (Outside)
(14) Pad (Inside)
(15) Disc rotor
(16) Disc cover
(17) Spacer

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)
T3: 80 (8.2, 59)

• 17 INCH TYPE

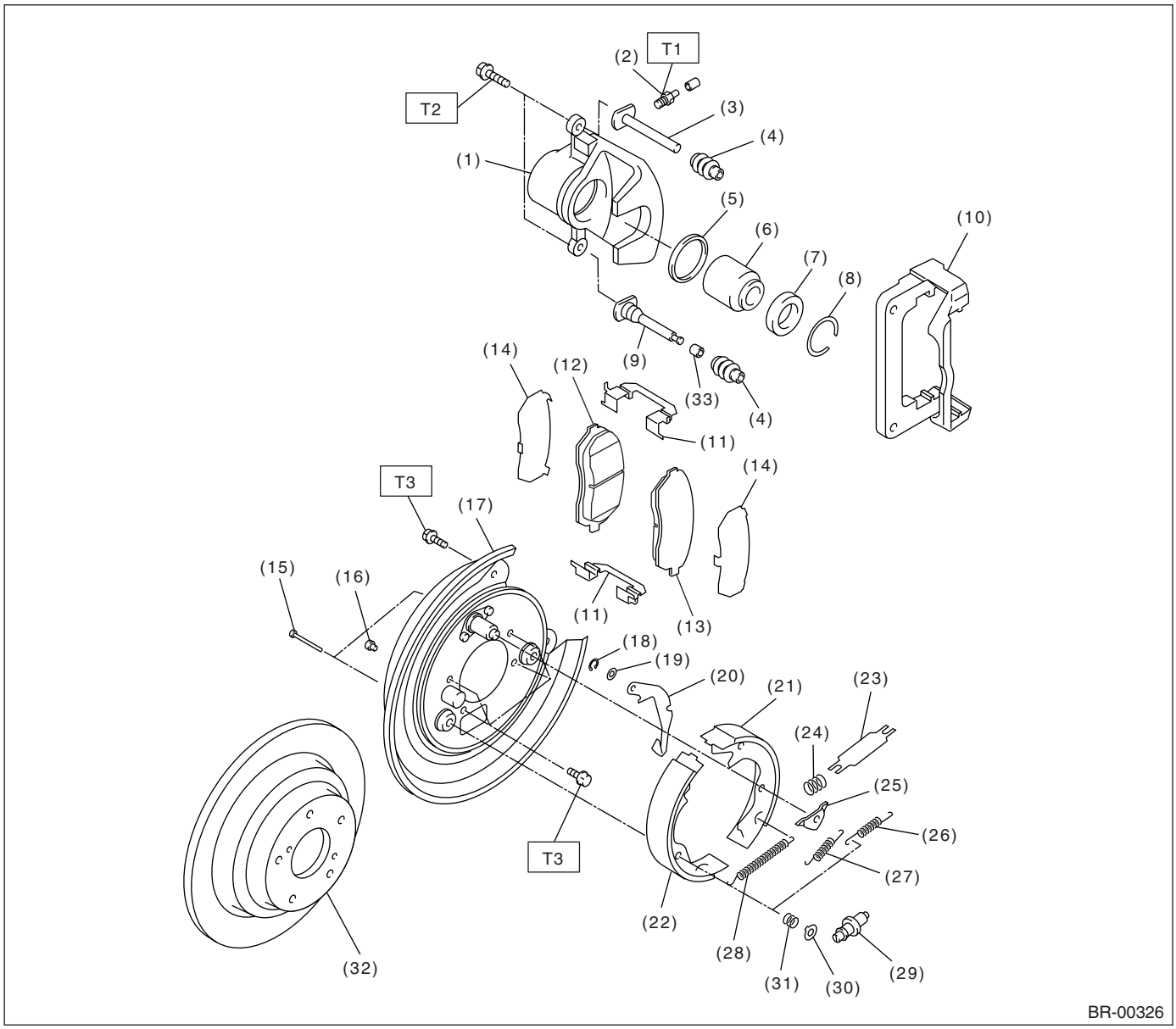


(1) Housing
(2) Caliper body
(3) Air bleeder screw
(4) Guide plate
(5) Cross spring
(6) Clip
(7) Pad pin
(8) Piston boot
(9) Piston
(10) Piston seal
(11) Pad shim
(12) Pad (Outside)
(13) Pad (Inside)
(14) Disc rotor
(15) Disc cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 18 (1.8, 13.0)
T2: 20 (2.0, 14.5)
T3: 155 (15.8, 114.3)

2. REAR DISC BRAKE

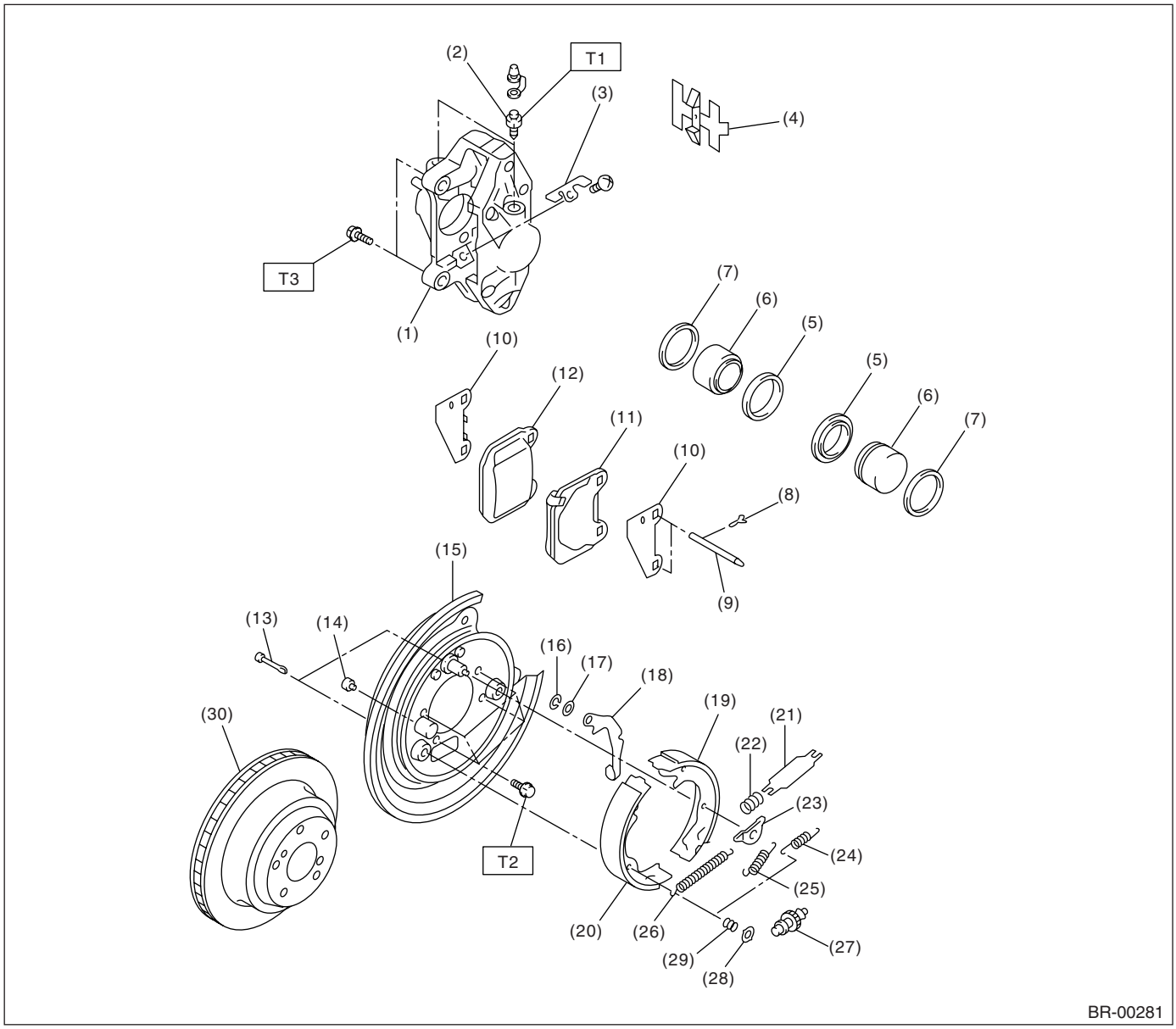
• 14 INCH TYPE



(1) Caliper body
(2) Air bleeder screw
(3) Guide pin (Green)
(4) Pin boot
(5) Piston seal
(6) Piston
(7) Piston boot
(8) Boot ring
(9) Lock pin (Yellow)
(10) Support
(11) Pad clip
(12) Inner pad
(13) Outer pad
(14) Shim
(15) Shoe hold-down pin
(16) Cover
(17) Back plate
(18) Retainer
(19) Spring washer
(20) Parking brake lever
(21) Parking brake shoe (Secondary)
(22) Parking brake shoe (Primary)
(23) Strut
(24) Strut shoe spring
(25) Shoe guide plate
(26) Secondary shoe return spring
(27) Primary shoe return spring
(28) Adjusting spring
(29) Adjuster
(30) Shoe hold-down cup
(31) Shoe hold-down spring
(32) Disc rotor
(33) Bushing

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 37 (3.8, 27.5)
T3: 52 (5.3, 38.3)

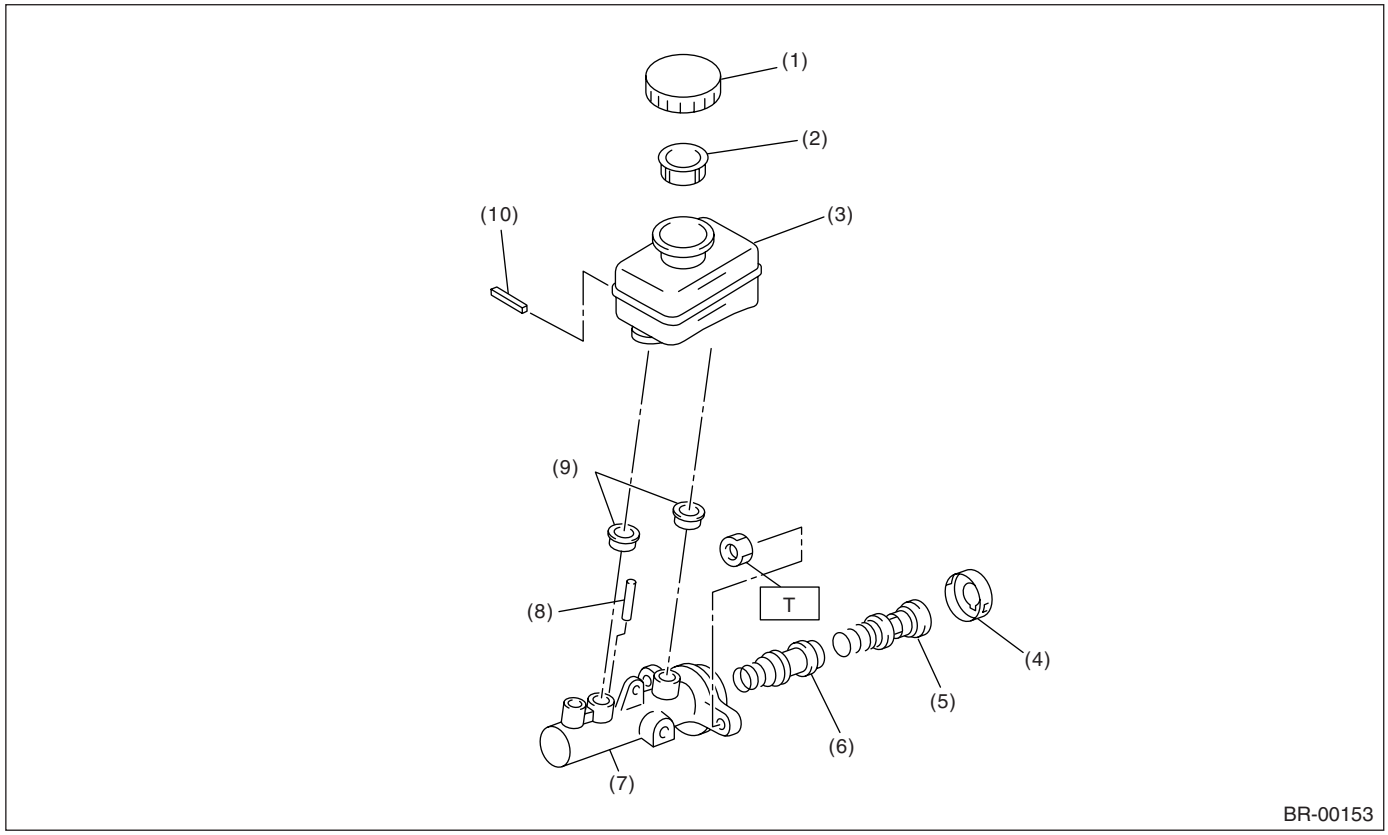
• 17 INCH TYPE



(1) Caliper body
(2) Air bleeder screw
(3) Guide plate
(4) Cross spring
(5) Piston boot
(6) Piston
(7) Piston seal
(8) Clip
(9) Pad pin
(10) Pad shim
(11) Pad (Outside)
(12) Pad (Inside)
(13) Shoe hold-down pin
(14) Cover
(15) Back plate
(16) Retainer
(17) Spring washer
(18) Parking brake lever
(19) Parking brake shoe (Secondary)
(20) Parking brake shoe (Primary)
(21) Strut
(22) Strut shoe spring
(23) Shoe guide plate
(24) Secondary shoe return spring
(25) Primary shoe return spring
(26) Adjusting spring
(27) Adjuster
(28) Shoe hold-down cup
(29) Shoe hold-down spring
(30) Disc rotor

Tightening torque: N·m (kgf-m, ft-lb)
T1: 20 (2.0, 14.5)
T2: 52 (5.3, 38.3)
T3: 65 (6.6, 47.9)

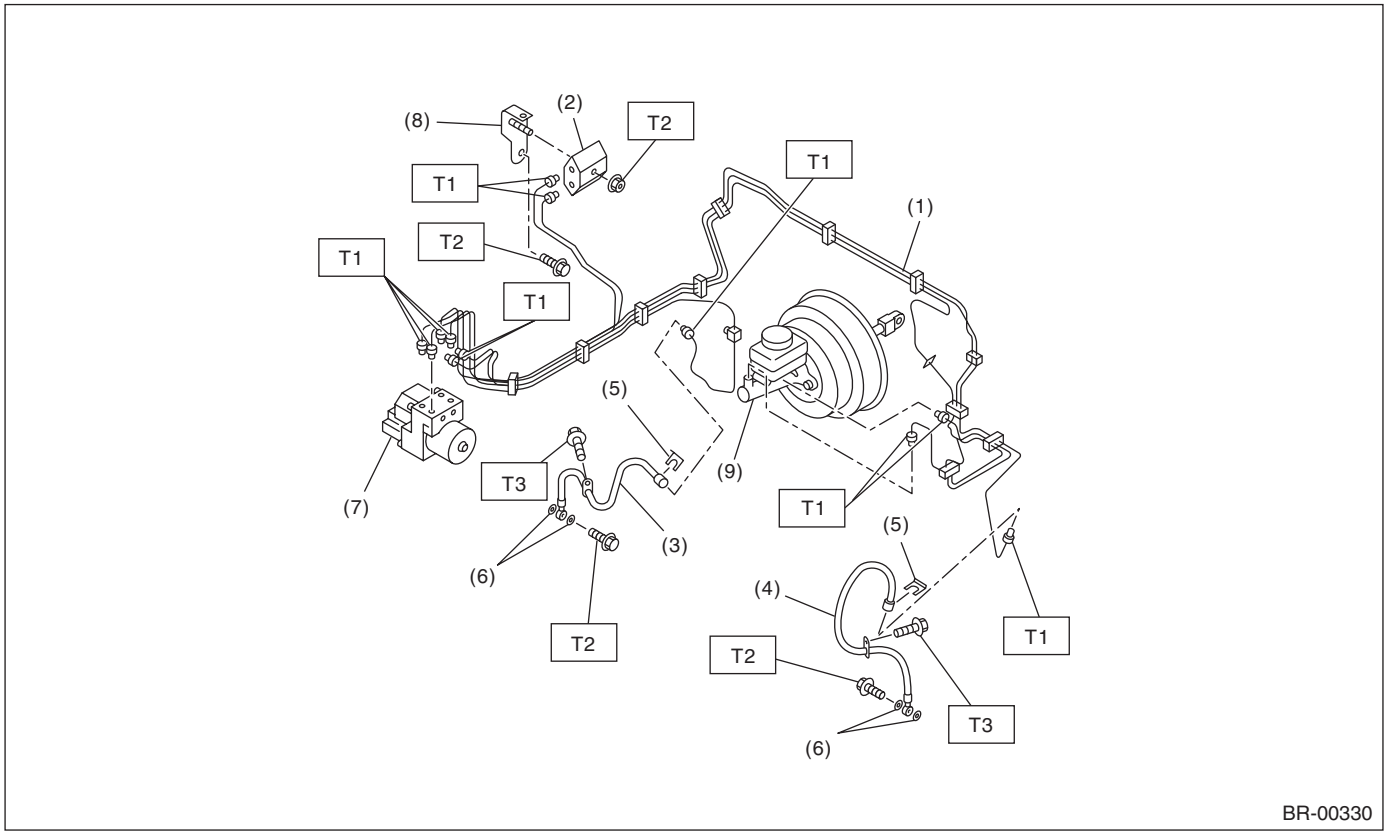
3. MASTER CYLINDER



(1) Cap
(2) Filter
(3) Reservoir tank
(4) Piston retainer
(5) Primary piston
(6) Secondary piston
(7) Cylinder body
(8) Cylinder pin
(9) Seal
(10) Pin

Tightening torque: N·m (kgf-m, ft-lb)
T1: 15 (1.5, 10.8)

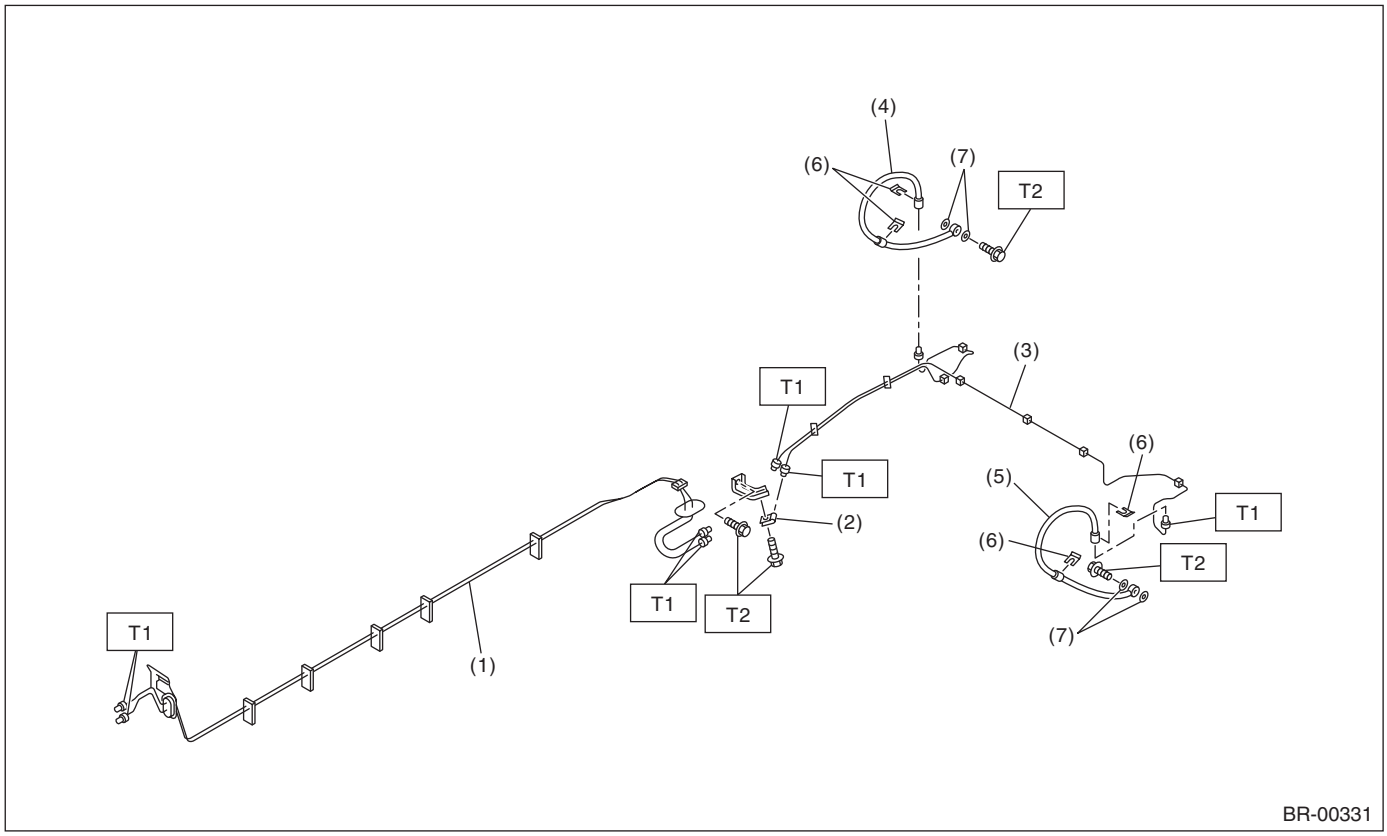
4. FRONT BRAKE PIPES AND HOSE



(1) Front brake pipe assembly
(2) Two-way connector
(3) Front brake hose RH
(4) Front brake hose LH
(5) Clamp
(6) Gasket
(7) ABS control module and hydraulic control unit (ABSCM&H/U)
(8) Bracket
(9) Master cylinder

Tightening torque: N·m (kgf-m, ft-lb)
T1: 15 (1.5, 10.8)
T2: 18 (1.8, 13.0)
T3: 32 (3.3, 23.6)

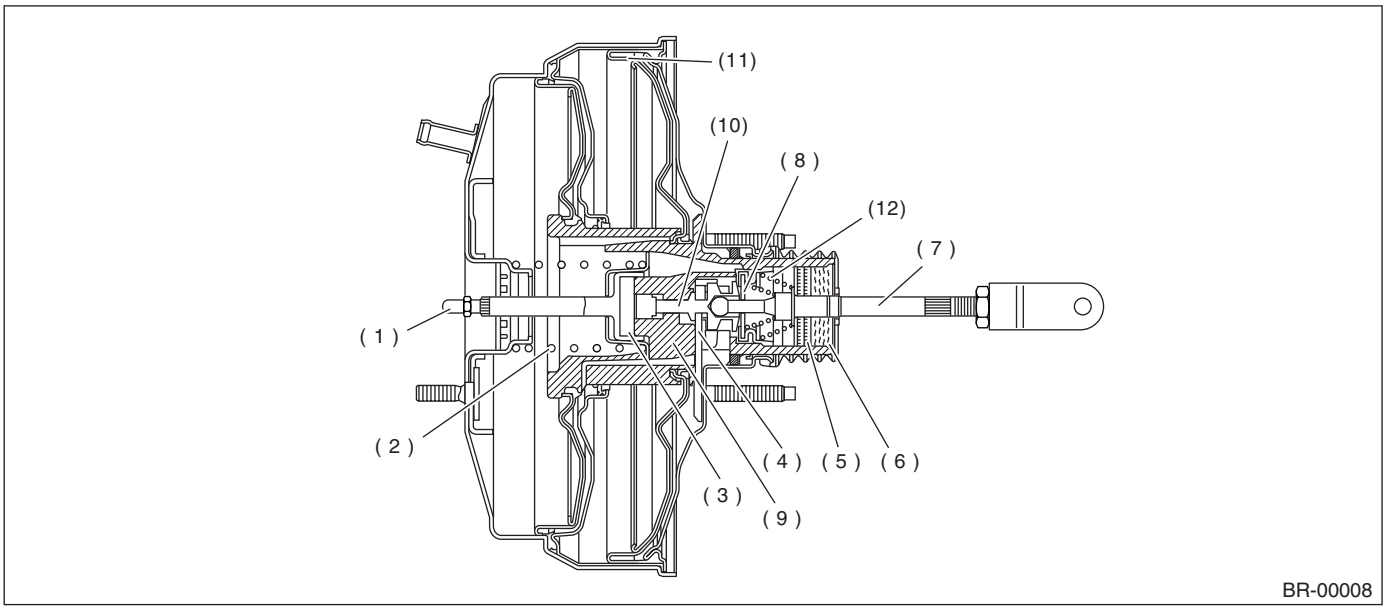
5. CENTER AND REAR BRAKE PIPES AND HOSES



(1) Center brake pipe assembly
(2) Two-way connector
(3) Rear brake pipe assembly
(4) Rear brake hose RH
(5) Rear brake hose LH
(6) Clamp
(7) Gasket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 15 (1.5, 10.8)
T2: 18 (1.8, 13.0)

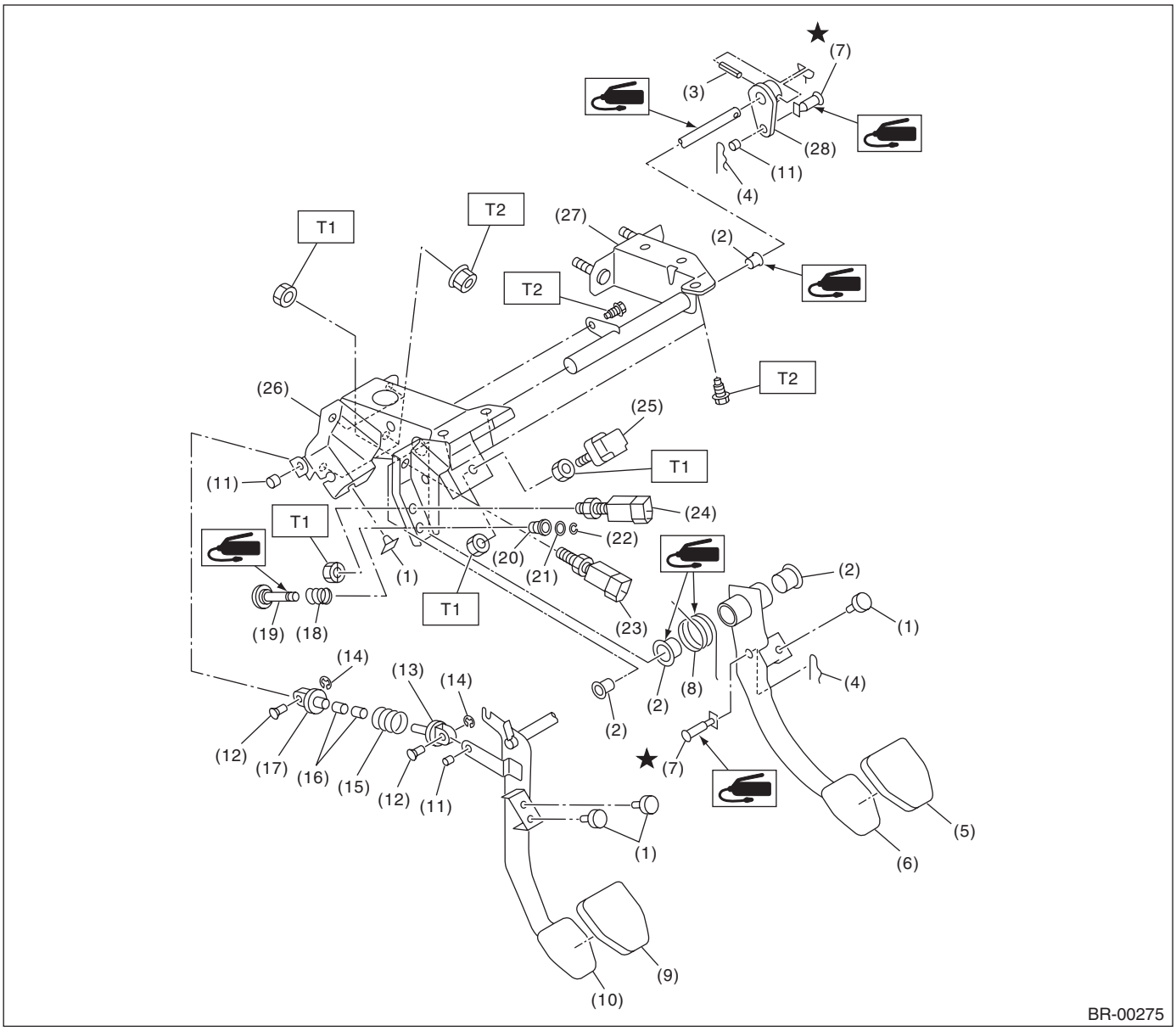
6. BRAKE BOOSTER



(1) Push rod
(2) Return spring
(3) Reaction disc
(4) Key
(5) Filter
(6) Silencer
(7) Operating rod
(8) Poppet valve
(9) Valve body
(10) Plunger valve
(11) Diaphragm plate
(12) Valve return spring

7. BRAKE PEDAL

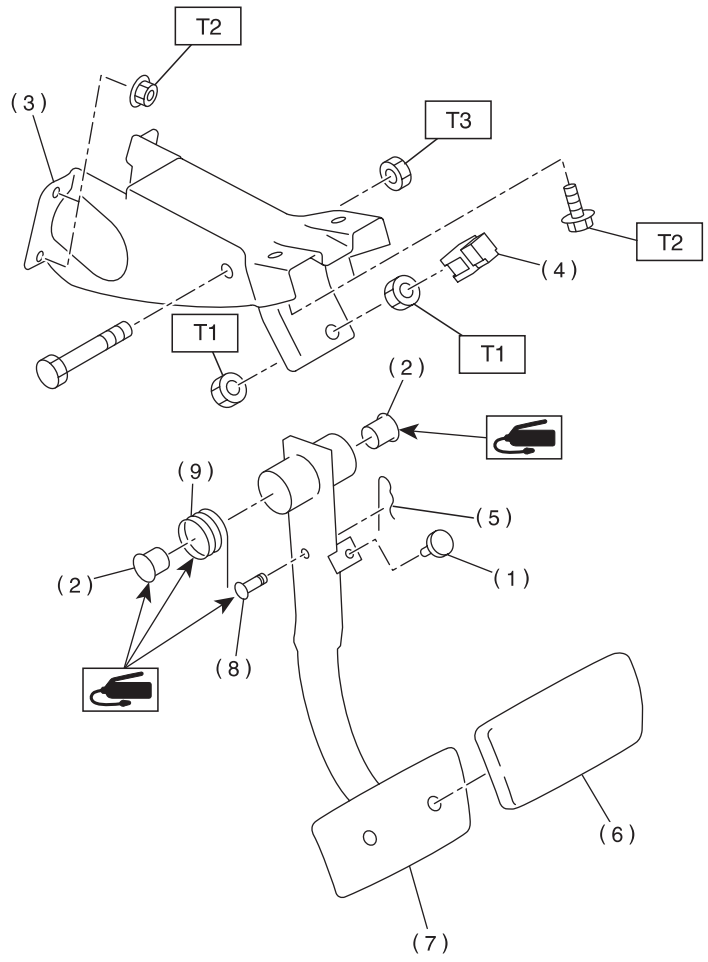
• MT MODEL



(1) Stopper
(2) Bushing
(3) Spring pin
(4) Snap pin
(5) Brake pedal pad
(6) Brake pedal
(7) Clevis pin
(8) Brake pedal spring
(9) Clutch pedal pad
(10) Clutch pedal
(11) Bushing C
(12) Clutch clevis pin
(13) Assist rod A
(14) Clip
(15) Assist spring
(16) Assist bushing
(17) Assist rod B
(18) Spring S
(19) Rod S
(20) Bushing S
(21) O-ring
(22) Clip
(23) Clutch switch (Starter interlock)
(24) Clutch switch (With cruise control)
(25) Stop light switch
(26) Pedal bracket
(27) Clutch master cylinder bracket
(28) Lever

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)

• AT MODEL



BR-00139

(1) Stopper
(2) Bushing
(3) Pedal bracket
(4) Stop light switch
(5) Snap pin
(6) Brake pedal pad
(7) Brake pedal
(8) Clevis pin
(9) Brake pedal spring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)
T3: 29 (3.0, 21.7)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

D: PREPARATION TOOL

1. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
SNAP RING PLIERS	Used for removing and installing snap ring.

2. Front Brake Pad

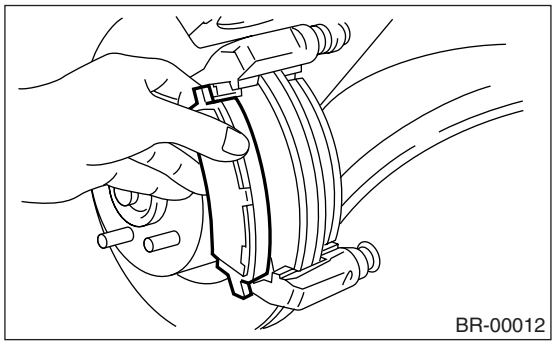
A: REMOVAL

1. 15 INCH TYPE

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the front wheel.
4) Remove the lower caliper bolt.
5) Raise the caliper body upward and support it.

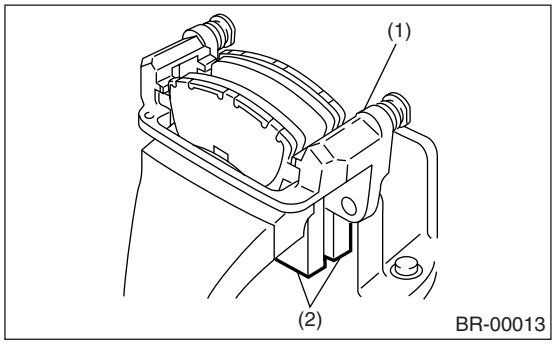
NOTE:
Do not disconnect the brake hose from caliper body.

6) Remove the pad.



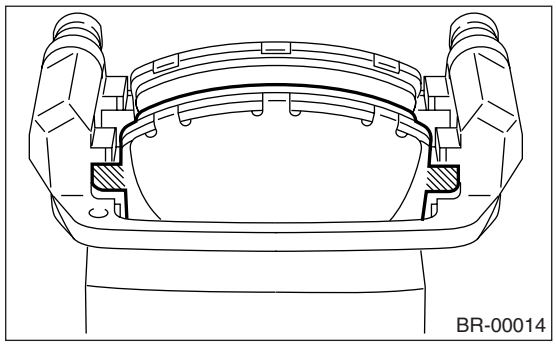
NOTE:
If the brake pad is difficult to remove, proceed as follows:

(1) Remove the caliper body from support.
(2) Remove the support.
(3) Place a support in a vise between wooden blocks.



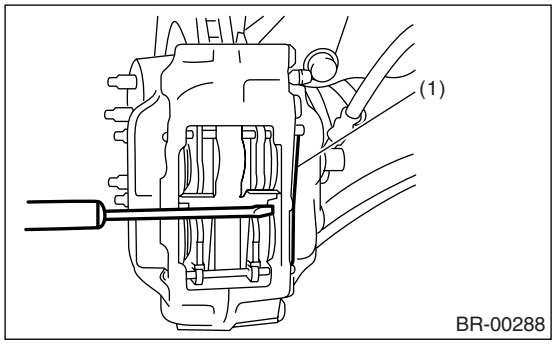
(1) Support
(2) Wooden blocks

(4) Attach a rod of less than 12 mm (0.47 in) dia. to the shaded area of brake pad, and strike the rod with a hammer to drive brake pad out of place.



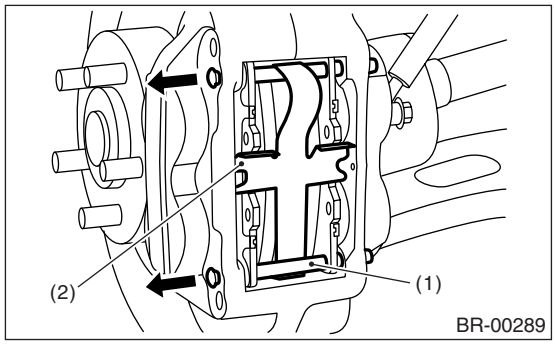
2. 16 INCH TYPE

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the front wheel.
4) Remove the M clip.



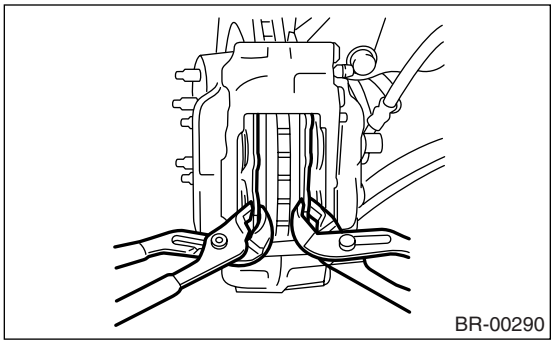
(1) M clip

5) Remove the pad pins, then remove the cross spring.

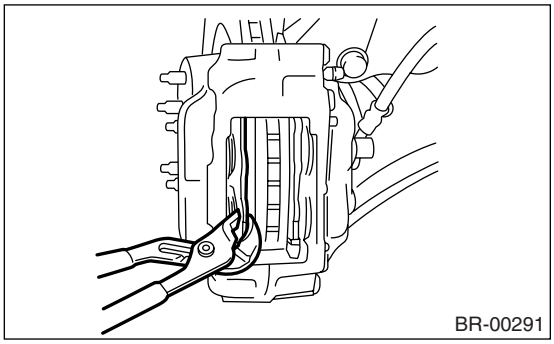


(1) Pad pin
(2) Cross spring

6) Use a wrench to expand the pads, and then push the piston back.

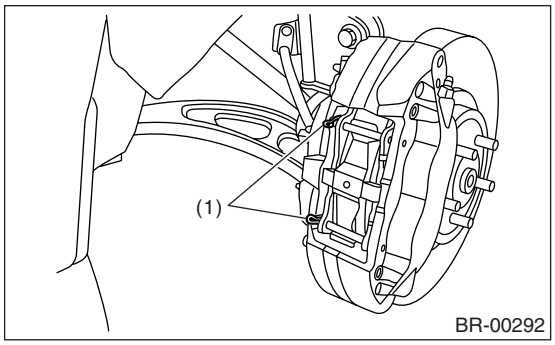


7) Remove the pad.



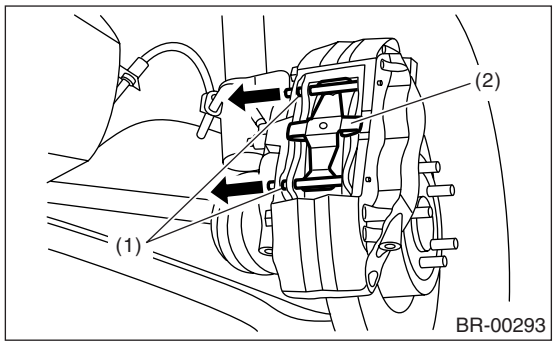
3. 17 INCH TYPE

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the front wheel.
4) Remove the clip.



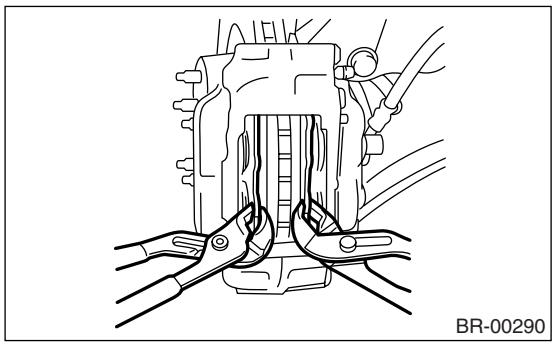
(1) Clip

5) Remove the pad pins and cross spring.

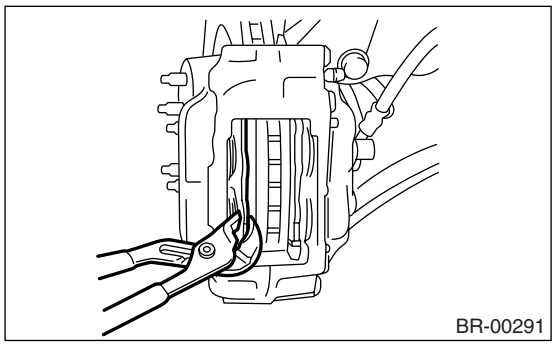


(1) Pad pin
(2) Cross spring

6) Use a wrench to expand the pads, and then push the piston back.



7) Remove the pad.

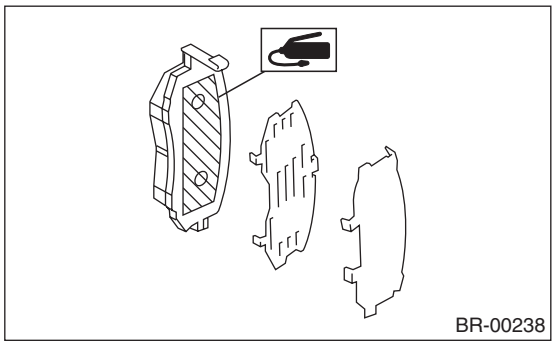


B: INSTALLATION

1. 15 INCH TYPE

1) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.

2) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad inner shim.



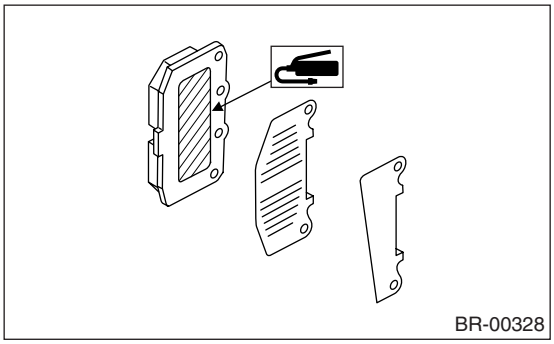
3) Install the pads on support.
4) Install the caliper body on support.

Tightening torque:
37 N·m (3.8 kgf-m, 27.5 ft-lb)

NOTE:
If it is difficult to push the piston during pad replacement, loosen the air bleeder to facilitate work.

2. 16 INCH TYPE

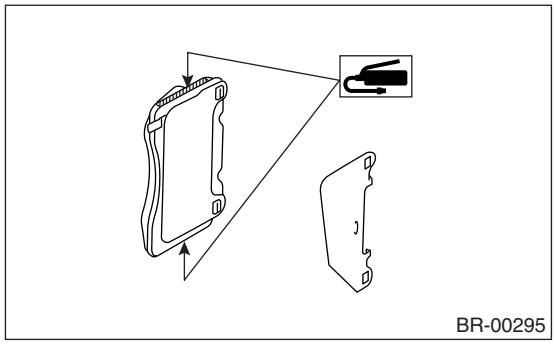
1) Apply thin coat of Molykote AS880N (Part No.K0777YA010) to the frictional portion between pad and pad inner shim.



2) Install the pads on caliper body.
3) Install the pad pins on caliper body.
4) Install the M clip.
5) Install the cross spring.

3. 17 INCH TYPE

1) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad shim.

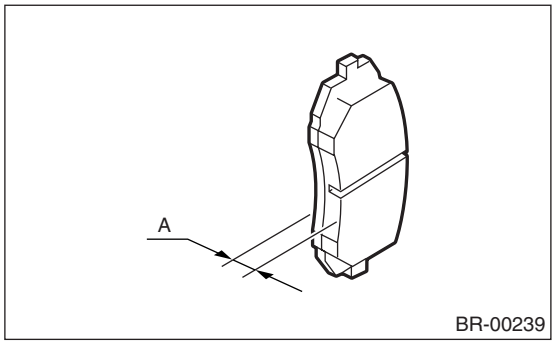


2) Install the pads on caliper body.
3) Install the cross spring.
4) Install the pad pins.
5) Install the clip.

C: INSPECTION

1. 15 INCH TYPE

Check the pad thickness A.

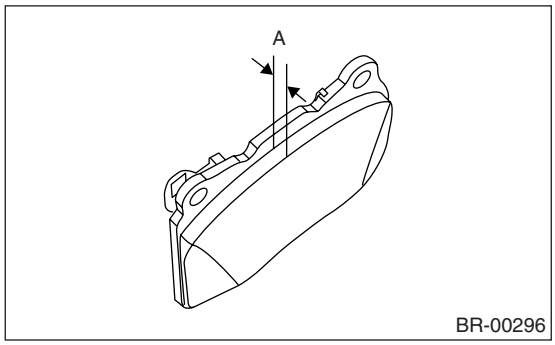


Pad thickness	Standard value	11 mm (0.43 in)
	Wear limit	1.5 mm (0.059 in)

NOTE:
• Always replace the pads for both right and left wheels at the same time.
• Also replace the pad clips if they are twisted or worn.
• A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
• Replace the pad if there is oil or grease on it.

2. 16 INCH TYPE

Check the pad thickness A.

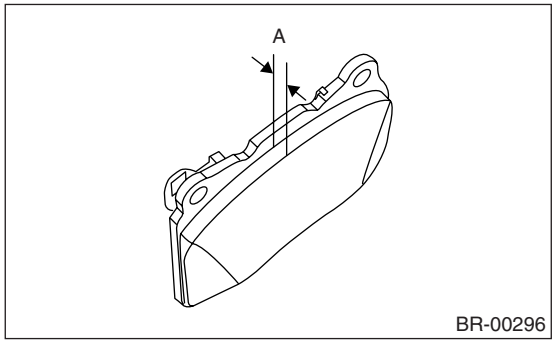


Pad thickness	Standard value	11 mm (0.43 in)
	Wear limit	1.5 mm (0.59 in)

NOTE:
• Always replace the pads for both right and left wheels at the same time.
• Also replace the pad clips if they are twisted or worn.
• A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
• Replace the pad if there is oil or grease on it.

3. 17 INCH TYPE

Check the pad thickness A.



Pad thickness	Standard value	9.2 mm (0.362 in)
	Wear limit	1.2 mm (0.047 in)

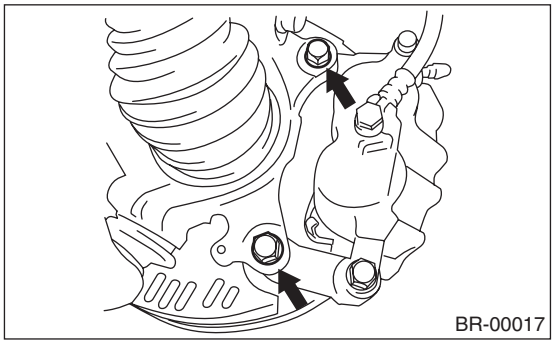
NOTE:
• Always replace the pads for both right and left wheels at the same time.
• Also replace the pad clips if they are twisted or worn.
• A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
• Replace the pad if there is oil or grease on it.

3. Front Disc Rotor

A: REMOVAL

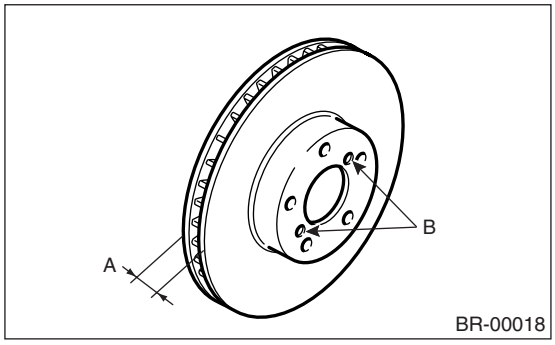
1. 15 INCH TYPE

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the front wheel.
4) Remove the caliper body and support from housing, and suspend it from strut using a wire.



5) Remove the disc rotor.

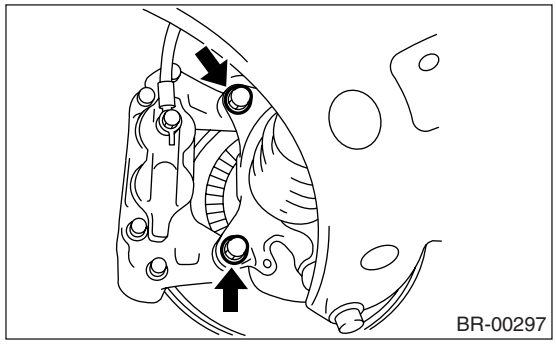
NOTE:
If the disc rotor seizes up within the hub, drive the disc rotor out by installing an 8-mm bolt in holes (B) on rotor.



6) Clean mud and foreign particles from the caliper body assembly and support.

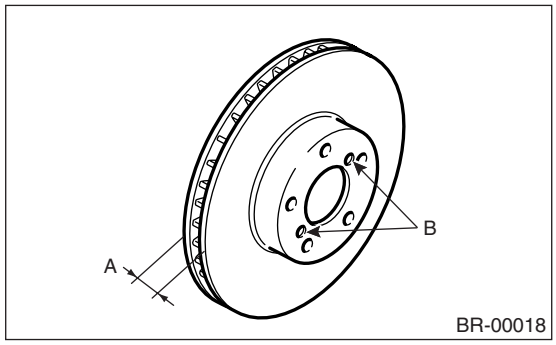
2. 16 INCH AND 17 INCH TYPE

1) Set the vehicle on a lift.
2) Loosen the wheel nut.
3) Lift-up the vehicle, and then remove the front wheel.
4) Remove the caliper body from housing and suspend from strut using a wire.



5) Remove the disc rotor from hub.

NOTE:
If the disc rotor seizes up within the hub, drive the disc rotor out by installing an 8-mm bolt in holes B on rotor.



6) Clean mud and foreign particles from the caliper body assembly and support.

B: INSTALLATION

1) Install the disc rotor.
2) Install the caliper body and support to housing.

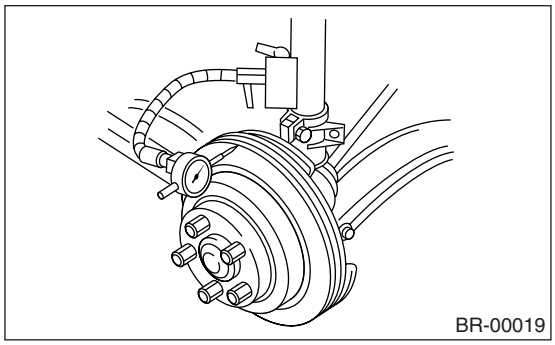
Tightening torque:
Except 17 inch type:
80 N·m (8.2 kgf-m, 59 ft-lb)
17 inch type:
155 N·m (15.8 kgf-m, 114.3 ft-lb)

3) Install the wheel.

C: INSPECTION

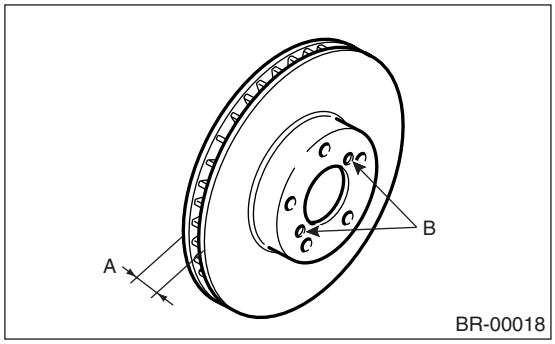
1) Check bearing axial end play and hub runout before disc rotor runout limit inspection. <Ref. to DS-21, INSPECTION, Front Axle.>
2) Secure the disc rotor by tightening five wheel nuts.

3) Set a dial gauge 10 mm (0.39 in) inward of rotor outer perimeter. Turn the disc rotor to check runout. If the disc rotor runout exceeds the service limit, resurface the disc rotor. After resurfacing, check disc rotor thickness as in step 4.



Disc rotor runout limit:
0.075 mm (0.0030 in)

4) Set a micrometer 10 mm (0.39 in) inward of the rotor outer perimeter, and then measure the disc rotor thickness. If the thickness of disc rotor exceeds the service limit, replace with a new disc rotor.



		Standard value	Service limit	Disc outer dia.
Disc rotor thickness A	15″	24 mm (0.94 in)	22 mm (0.87 in)	277 mm (10.91 in)
	16″	24 mm (0.94 in)	22 mm (0.87 in)	294 mm (11.57 in)
	17″	30 mm (1.18 in)	28 mm (1.10 in)	326 mm (12.83 in)

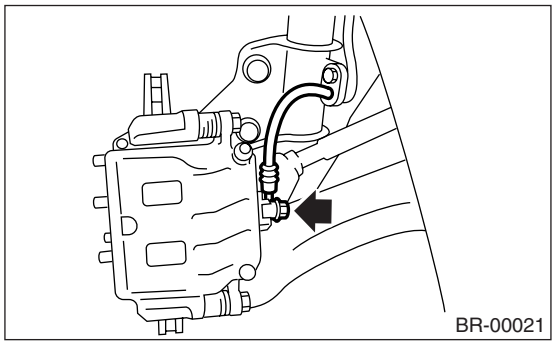
4. Front Disc Brake Assembly

A: REMOVAL

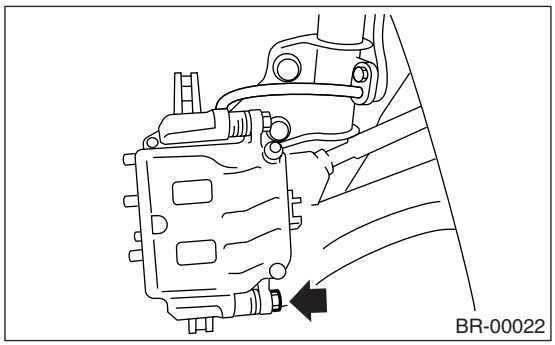
1. 15 INCH TYPE

CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the front wheel.
4) Remove the union bolt, and then disconnect the brake hose from caliper body assembly.

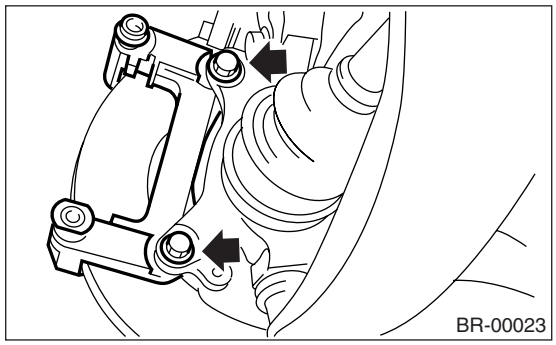


5) Remove the bolt securing lock pin to caliper body.



6) Raise the caliper body, and then move it toward vehicle center to separate it from support.
7) Remove the support from housing.

NOTE:
Remove the support only when replacing it or the rotor. It need not be removed when servicing the caliper body assembly.

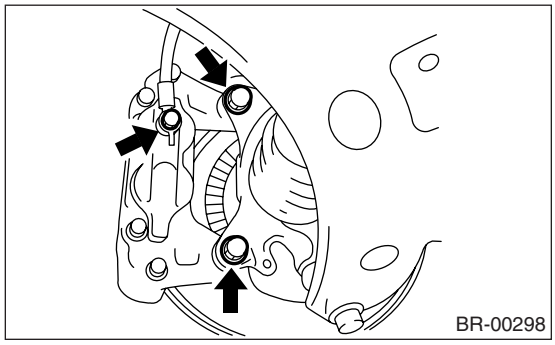


8) Clean mud and foreign particles from the caliper body assembly and support.

2. 16 INCH TYPE

CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the front wheel.
4) Remove the union bolt, and then disconnect the brake hose from caliper body assembly.
5) Remove the caliper body from housing.



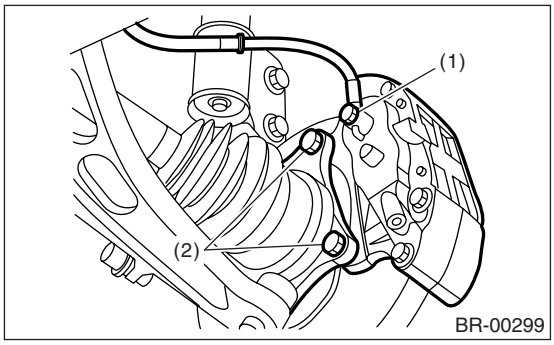
6) Clean mud and foreign particles from the caliper body assembly and support.

3. 17 INCH TYPE

CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the front wheel.

4) Remove the brake pads from caliper body. <Ref. to BR-17, 17 INCH TYPE, REMOVAL, Front Brake Pad.>.
5) Remove the union bolt and brake hose from caliper body assembly.
6) Remove two installation bolts from housing.



(1) Union bolt
(2) Installation bolt

7) Clean mud and foreign particles from the caliper body assembly.

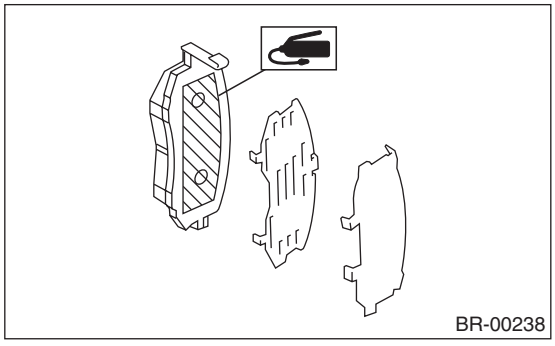
B: INSTALLATION

1. 15 INCH TYPE

1) Install the support on housing.

Tightening torque:
80 N·m (8.2 kgf-m, 59 ft-lb)

2) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
3) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and inner shim.



4) Install the pads on support.
5) Install the caliper body on support.

Tightening torque:
37 N·m (3.8 kgf-m, 27.5 ft-lb)

6) Replace the brake hose gaskets with new ones, and then connect the brake hose.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

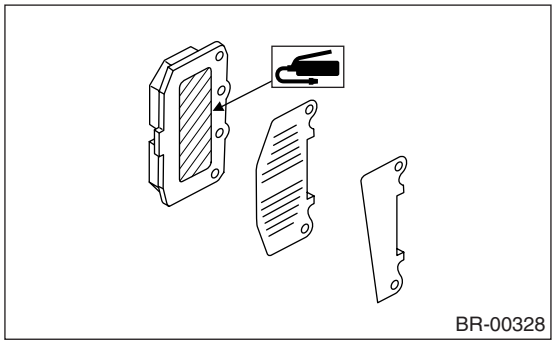
7) Bleed air from the brake system.

2. 16 INCH TYPE

1) Install the caliper body on housing.

Tightening torque:
80 N·m (8.2 kgf-m, 59 ft-lb)

2) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad inner shim.



3) Install the pads on caliper body.
4) Install the pad pins and cross spring on caliper body.
5) Install the M clip.
6) Replace the brake hose gaskets with new ones, and then connect the brake hose.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

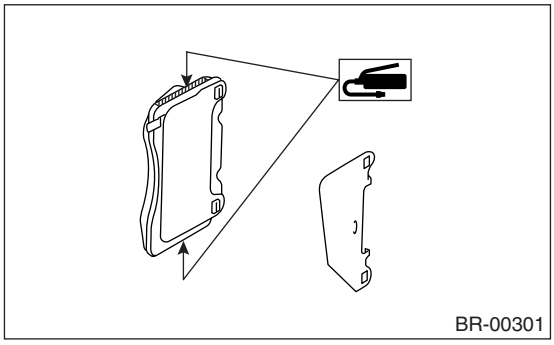
7) Bleed air from the brake system.

3. 17 INCH TYPE

1) Install the caliper body assembly on housing.

Tightening torque:
155 N·m (15.8 kgf-m, 114.3 ft-lb)

2) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad shim.



3) Install the pads on caliper body.
4) Install the cross spring.
5) Install the pad pins.
6) Install the clip.
7) Replace the brake hose gaskets with new ones, and then connect the brake hose.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

8) Bleed air from the brake system.

C: DISASSEMBLY

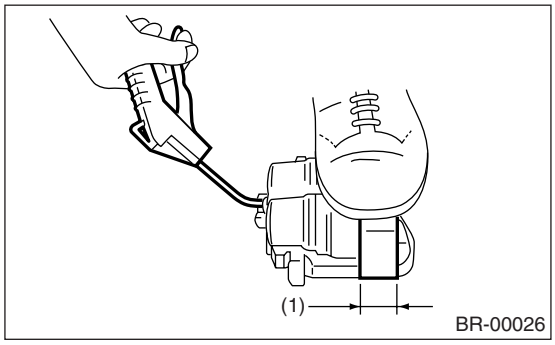
1. 15 INCH TYPE

1) Clean mud and foreign particles from the caliper body assembly and support.

CAUTION:
Be careful not to allow foreign particles to enter the brake hose connector.

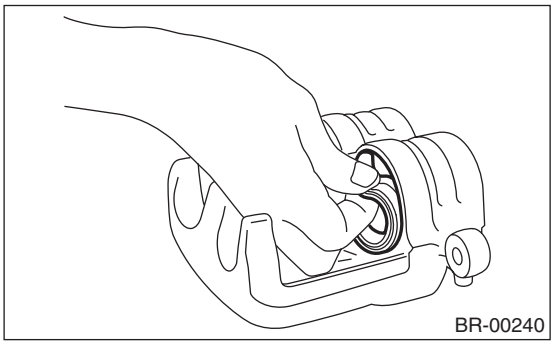
2) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.

3) Gradually supply compressed air via the installation hole of brake hose to force the piston out.



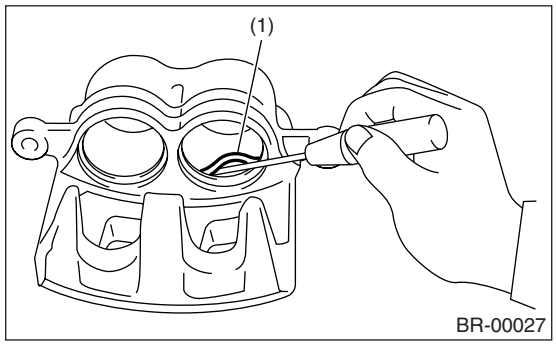
(1) Place a 30 mm (1.18 in) wide wooden block here.

4) Remove the piston boot.



5) Remove the piston seal from caliper body cylinder.

CAUTION:
Do not damage the cylinder and piston seal groove.



(1) Piston seal

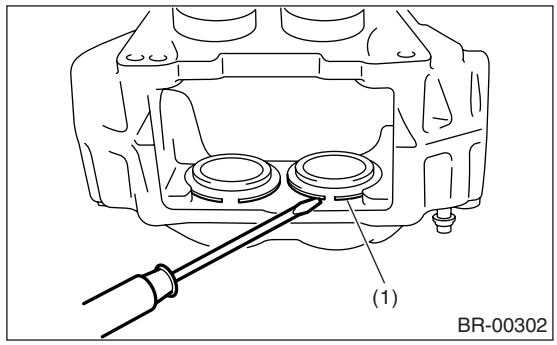
6) Remove the guide pin and boot from caliper body.

2. 16 INCH TYPE

1) Clean mud and foreign particles from the caliper body assembly.

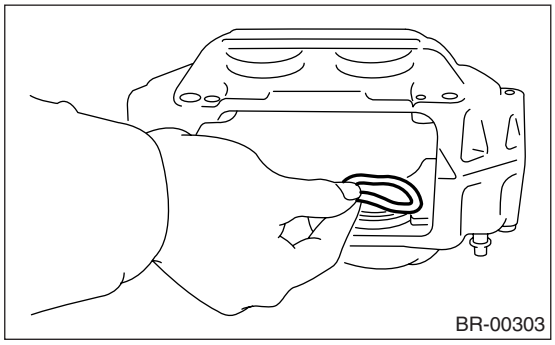
CAUTION:
Be careful not to allow foreign particles to enter the brake hose connector.

2) Using a standard screwdriver, remove the boot ring from piston.



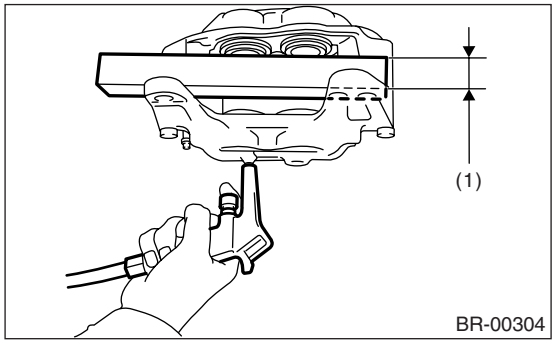
(1) Boot ring

3) Remove the boot from piston end.



4) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.

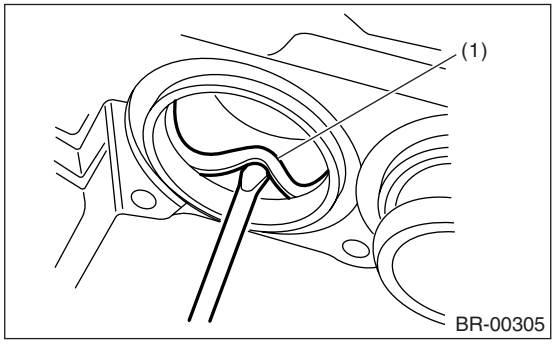
5) Gradually supply compressed air via the installation hole of brake hose to force the piston out.



(1) Place a 30 mm (1.18 in) wide wooden block here.

6) Remove the piston seal from caliper body cylinder.

CAUTION:
Do not damage the cylinder and piston seal groove.



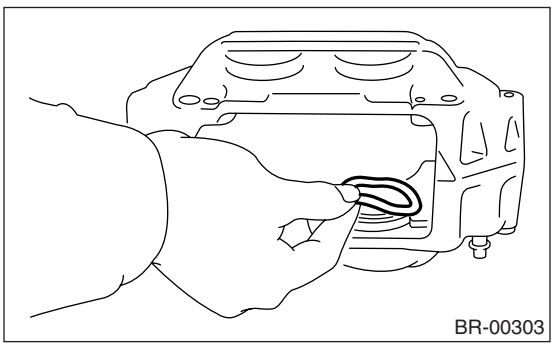
(1) Piston seal

3. 17 INCH TYPE

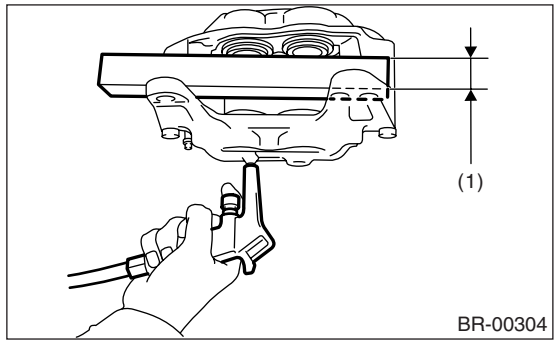
1) Clean mud and foreign particles from the caliper body assembly.

CAUTION:
Be careful not to allow foreign particles to enter the brake hose connector.

2) Remove the piston boots from each piston end.



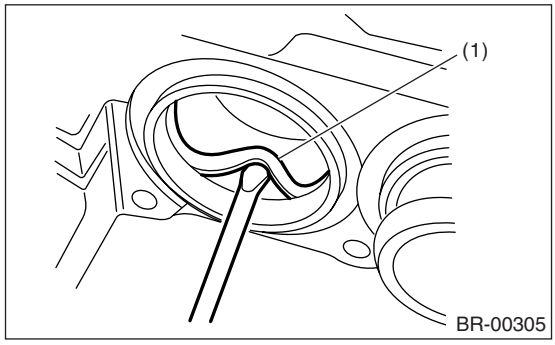
3) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.
4) Gradually supply compressed air via the installation hole of brake hose to force the piston out.



(1) Place a 30 mm (1.18 in) wide wooden block here.

5) Remove the piston seal from caliper body cylinder.

CAUTION:
Do not damage the cylinder and piston seal groove.



(1) Piston seal

D: ASSEMBLY

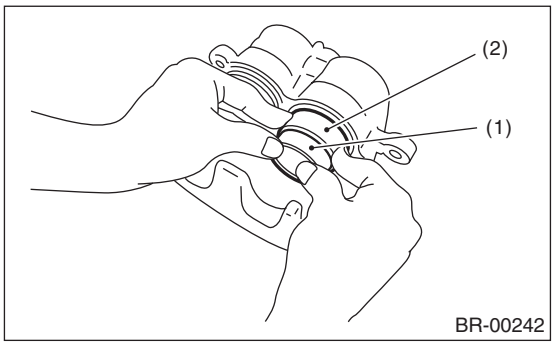
1. 15 INCH TYPE

1) Clean the caliper body interior using brake fluid.
2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
4) Apply a coat of specified grease to the boot and install the piston boot to the groove on ends of cylinder.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)

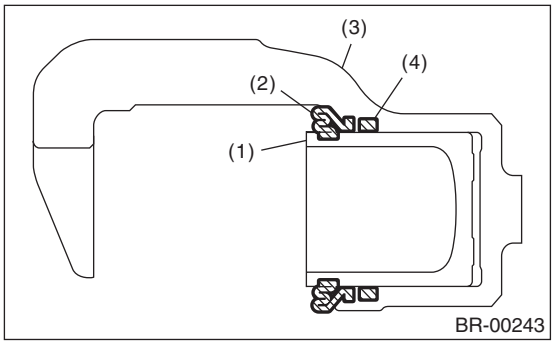
5) Insert the piston into cylinder.

CAUTION:
Do not force the piston into cylinder.



(1) Piston
(2) Piston boot

6) Position the boot in grooves on cylinder and piston.

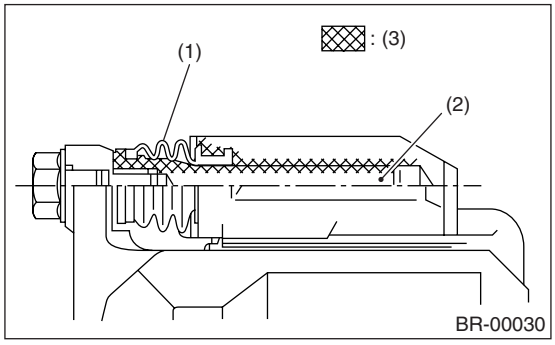


(1) Piston
(2) Piston boot
(3) Caliper body
(4) Piston seal

7) Apply a coat of specified grease to the lock pin and guide pin outer surface, cylinder inner surface, and boot grooves.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)

8) Install the lock and guide pin boot on support.



(1) Pin boot
(2) Lock pin or guide pin
(3) Apply grease.

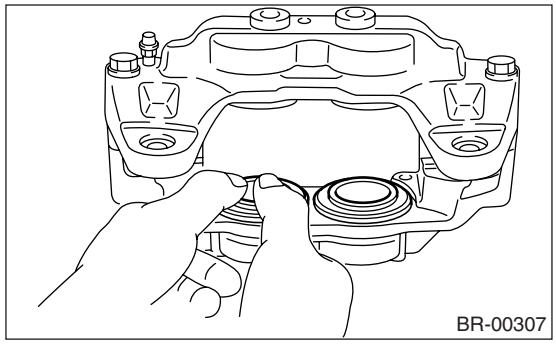
2. 16 INCH TYPE

1) Clean the caliper body interior using brake fluid.
2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
4) Apply a coat of specified grease to the boot and fit in groove on ends of cylinder and piston.

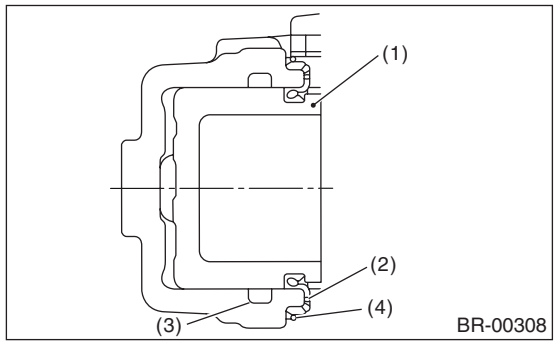
Grease:
NIGLUBE RX-2 (Part No. K0779GA102)

5) Insert the piston into cylinder.

CAUTION:
Do not force the piston into cylinder.



6) Position the boot in grooves on cylinder and piston.



(1) Piston
(2) Piston boot
(3) Piston seal
(4) Boot ring

7) Install the boot ring. Be careful not scratch the boot.

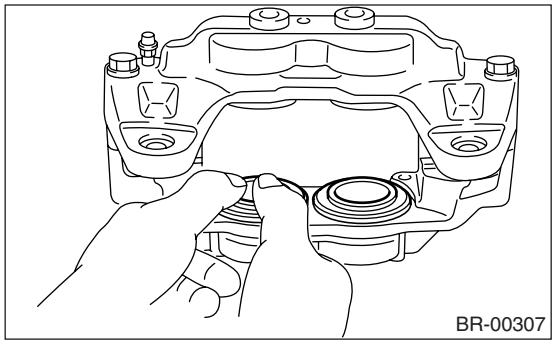
3. 17 INCH TYPE

1) Clean the caliper body interior using brake fluid.
2) Apply a coat of brake fluid to the piston seal, and then install the piston seal in groove on caliper body.
3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
4) Apply a coat of specified grease to the boot and install it in the groove on piston.

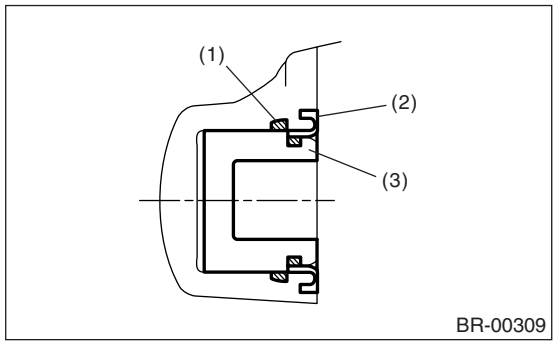
Grease:
NIGLUBE RX-2 (Part No. K0779GA102)

5) Insert the piston into cylinder.

CAUTION:
Do not force the piston into cylinder.



6) Position the boot in grooves on cylinder and piston.



(1) Piston seal
(2) Piston boot
(3) Piston

E: INSPECTION

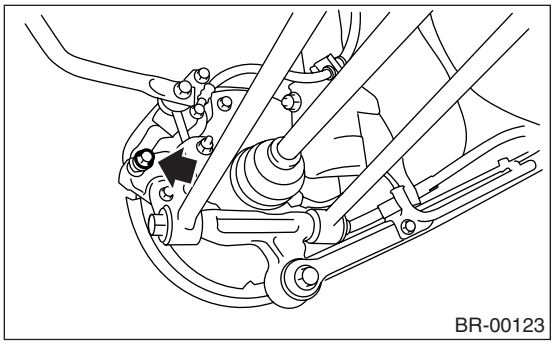
1) Repair or replace the faulty parts.
2) Check the caliper body and piston for uneven wear, damage or rust.
3) Check the rubber parts for damage or deterioration.

5. Rear Brake Pad

A: REMOVAL

1. 14 INCH TYPE

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the rear wheel.
4) Remove the lower caliper bolt.

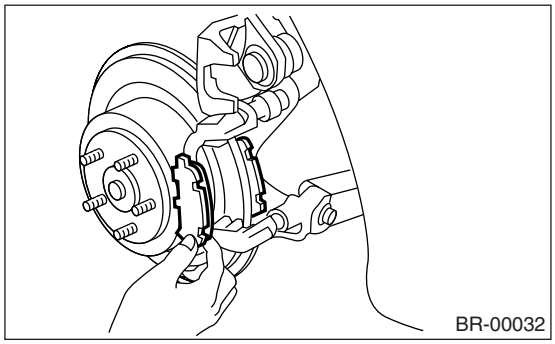


5) Raise the caliper body upward and support it.

NOTE:
Do not disconnect the brake hose from caliper body.

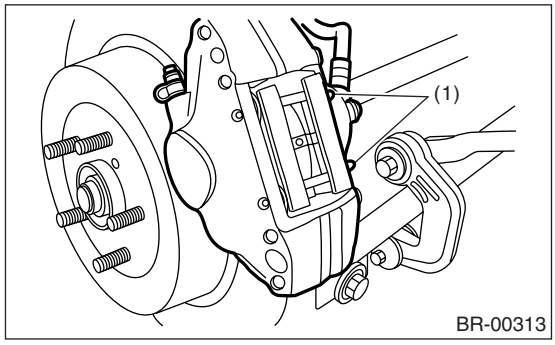
6) Remove the pad.

NOTE:
If the brake pad is difficult to remove, use the same procedure as for front disc brake pad.
<Ref. to BR-16, REMOVAL, Front Brake Pad.>



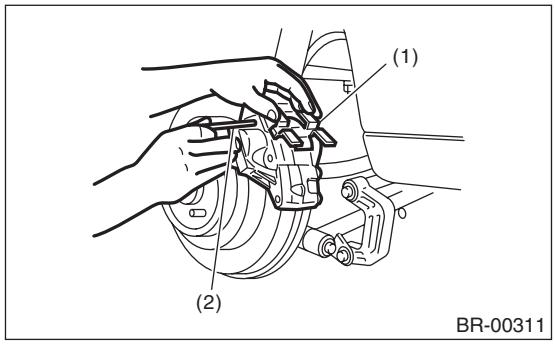
2. 17 INCH TYPE

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the rear wheel.
4) Remove the clip.



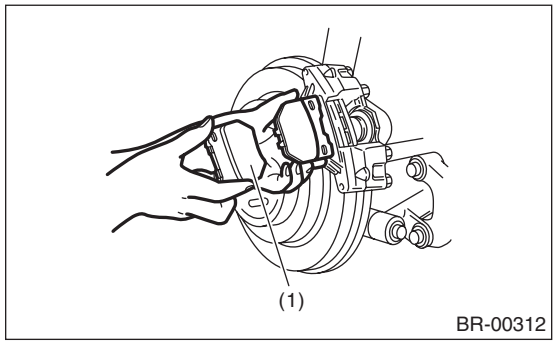
(1) Clip

5) Remove the pad pins and cross spring.



(1) Cross spring
(2) Pad pin

6) Expand the pads and push piston back.
7) Remove the pad.



(1) Rear brake pad

B: INSTALLATION

1. 14 INCH TYPE

1) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
2) Install the pad on support.
3) Install the caliper body on support.

Tightening torque:
37 N·m (3.8 kgf-m, 27.5 ft-lb)

NOTE:
If it is difficult to push the piston during pad replacement, loosen air bleeder to facilitate work.

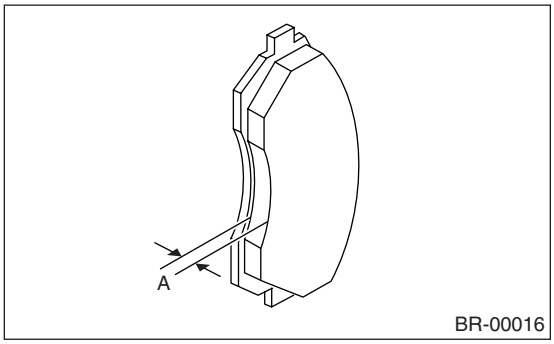
2. 17 INCH TYPE

1) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to frictional portion between pad and pad inner shim.
2) Install the pads on caliper body.
3) Install the cross spring and pad pins.
4) Install the Clip.

C: INSPECTION

1. 14 INCH TYPE

Check pad thickness A.

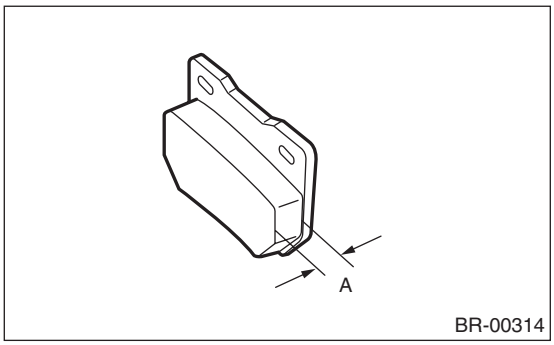


Pad thickness	Standard value	9.0 mm (0.354 in)
	Wear limit	1.5 mm (0.059 in)

NOTE:
• Always replace the pads for both right and left wheels at the same time.
• Also replace the pad clips if they are twisted or worn.
• A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
• Replace the pad if there is oil or grease on it.

2. 17 INCH TYPE

Check the pad thickness A.



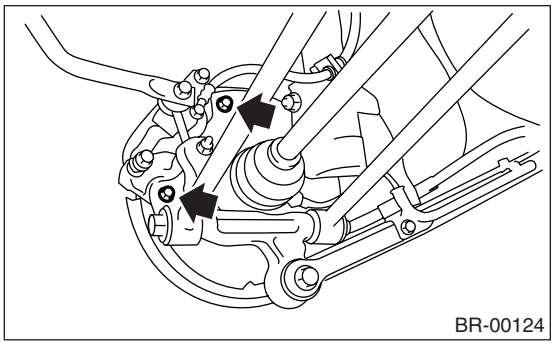
Pad thickness	Standard value	9.0 mm (0.354 in)
	Wear limit	1.2 mm (0.047 in)

NOTE:
• Always replace the pads for both right and left wheels at the same time.
• Also replace the pad clips if they are twisted or worn.
• A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
• Replace the pad if there is oil or grease on it.

6. Rear Disc Rotor

A: REMOVAL

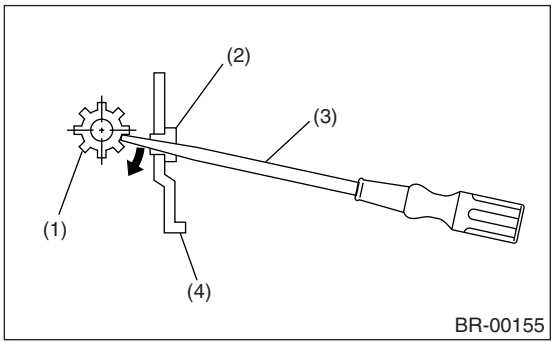
1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the wheels.
4) Pull down and release the parking brake.
5) Remove the two mounting bolts, and then remove the disc brake assembly.


BR-00124

6) Suspend the disc brake assembly so that hose is not stretched.
7) Remove the disc rotor.

NOTE:
If the disc rotor is difficult to remove try following two methods in order.

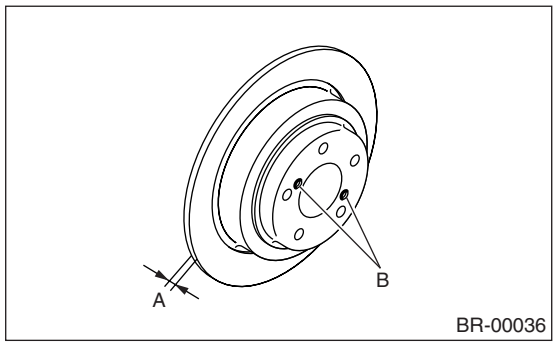
(1) Turn the adjusting screw using a flat tip screwdriver until brake shoe gets away enough from the disc rotor.



BR-00155

(1) Adjusting screw
(2) Cover
(3) Flat tip screwdriver
(4) Back plate

(2) If the disc rotor seizes up within hub, drive the disc rotor out by installing an 8-mm bolt in holes B on rotor.



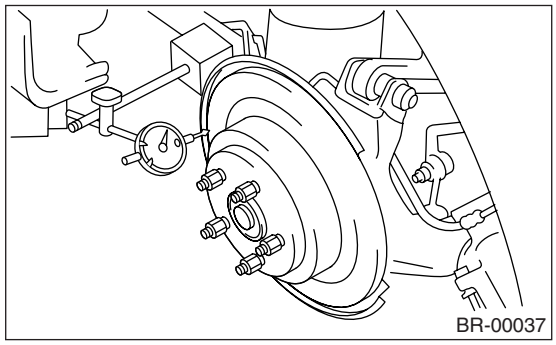
BR-00036

B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the parking brake. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

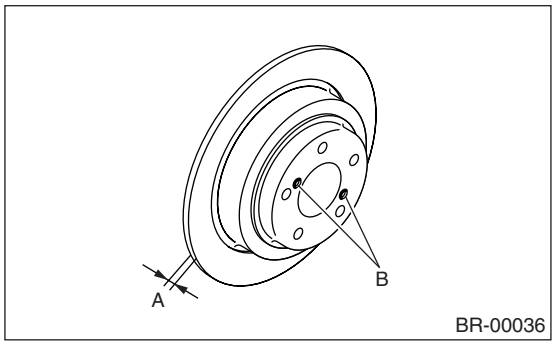
C: INSPECTION

1) Check bearing axial end play and hub runout before disc rotor runout limit inspection. <Ref. to DS-26, INSPECTION, Rear Axle.>
2) Secure the disc rotor by tightening five wheel nuts.
3) Set a dial gauge 10 mm (0.39 in) inward of rotor outer perimeter. Turn the disc rotor to check runout. If the disc rotor runout exceeds the service limit, resurface the disc rotor. After resurfacing, check disc rotor thickness as in step 4.


BR-00037

Disc rotor runout limit:
0.070 mm (0.0027 in)

4) Set a micrometer 10 mm (0.39 in) inward of the rotor outer perimeter, and then measure the disc rotor thickness. If the thickness of disc rotor exceeds the service limit, replace with a new disc rotor.



		Standard value	Service limit	Disc outer dia.
Disc rotor thickness A	14″	10 mm (0.39 in)	8.5 mm (0.335 in)	266 mm (10.47 in)
	17″	20 mm (0.79 in)	18 mm (0.71 in)	316 mm (12.44 in)

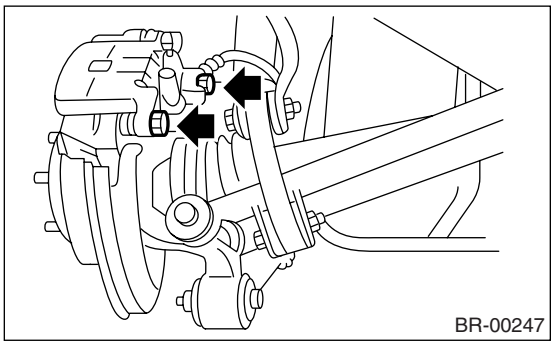
7. Rear Disc Brake Assembly

A: REMOVAL

1. 14 INCH TYPE

CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the wheels.
4) Disconnect the brake hose from caliper body assembly.
5) Remove the bolt securing lock pin to caliper body.


BR-00247

6) Raise the caliper body and move it toward vehicle center to separate it from support.
7) Remove the support from housing.

NOTE:
Remove the support only when replacing it or the rotor. It need not be removed when servicing the caliper body assembly.

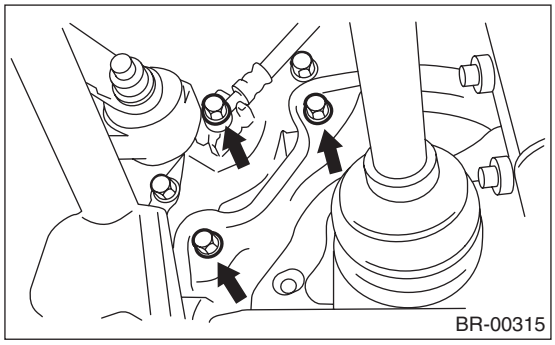
8) Clean mud and foreign particles from the caliper body assembly and support.

CAUTION:
Be careful not to allow foreign particles to enter brake hose connector.

2. 17 INCH TYPE

CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the wheels.
4) Remove the brake pads from caliper body. <Ref. to BR-28, 17 INCH TYPE, REMOVAL, Rear Brake Pad.>
5) Disconnect the brake hose from caliper body.
6) Remove the caliper body from housing.


BR-00315

7) Clean mud and foreign particles from the caliper body.

CAUTION:
Be careful not to allow foreign particles to enter brake hose connector.

B: INSTALLATION

1. 14 INCH TYPE

1) Install the support on housing.

Tightening torque:
52 N·m (5.3 kgf-m, 38.3 ft-lb)

2) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
3) Install the pads on support.
4) Install the caliper body on support.

Tightening torque:
37 N·m (3.8 kgf-m, 27.5 ft-lb)

5) Replace the brake hose gaskets with new ones, and then connect the brake hose.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

6) Bleed air from the brake system.

2. 17 INCH TYPE

1) Install the caliper body on housing.

Tightening torque:
65 N·m (6.6 kgf-m, 47.9 ft-lb)

2) Install the pads on caliper body.
3) Replace the brake hose gaskets with new ones, and then connect the brake hose.

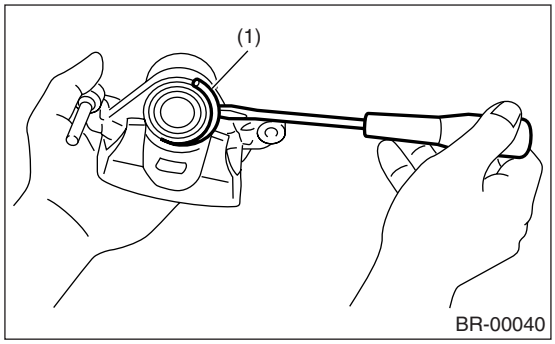
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

4) Bleed air from the brake system.

C: DISASSEMBLY

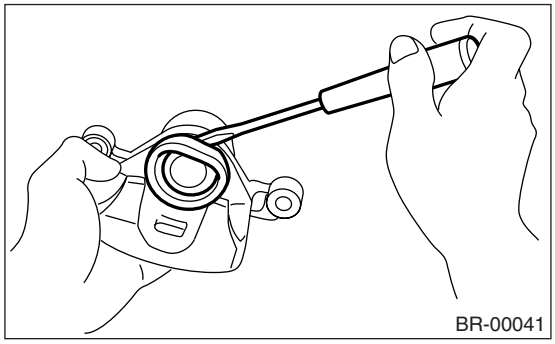
1. 14 INCH TYPE

1) Remove the boot ring.

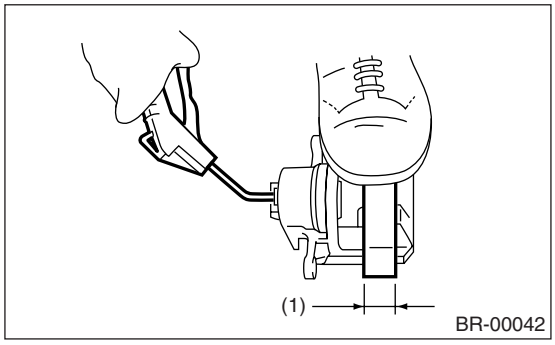


(1) Boot ring

2) Remove the piston boot.



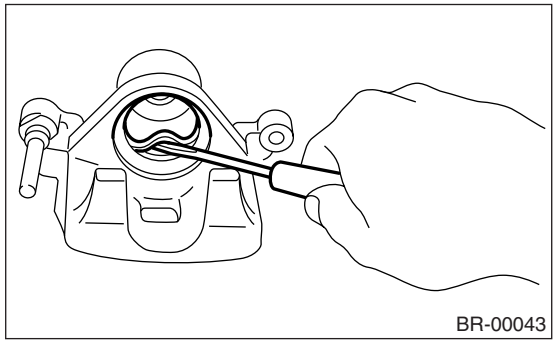
3) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.
4) Gradually supply compressed air via the installation hole of brake hose to force the piston out.



(1) Place a 30 mm (1.18 in) wide wooden block here.

5) Remove the piston seal from caliper body cylinder.

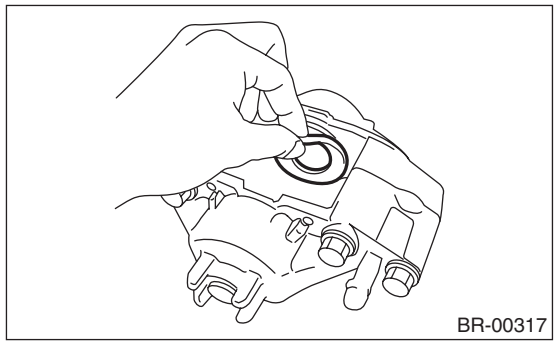
CAUTION:
Do not damage the cylinder and piston seal groove.



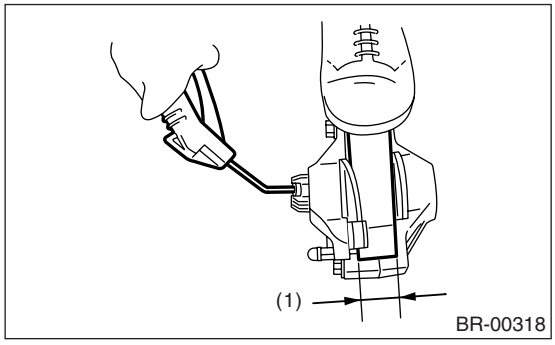
6) Remove the lock pin sleeve and boot from caliper body.
7) Remove the guide pin boot.

2. 17 INCH TYPE

1) Remove the piston boot from piston end.



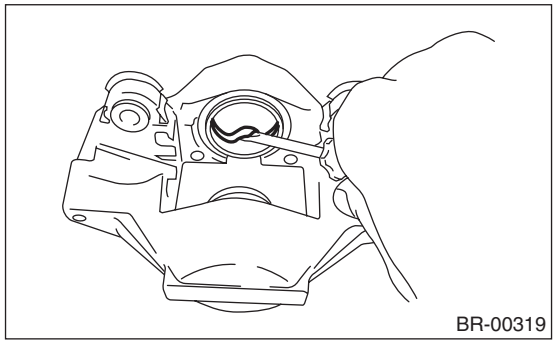
2) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and avoid being damaged.
3) Gradually supply compressed air via the installation hole of brake hose to force the piston out.



(1) Place a 20 mm (0.79 in) wide wooden block here.

4) Remove the piston seal from caliper body cylinder.

CAUTION:
Do not damage the cylinder and piston seal groove.



D: ASSEMBLY

1. 14 INCH TYPE

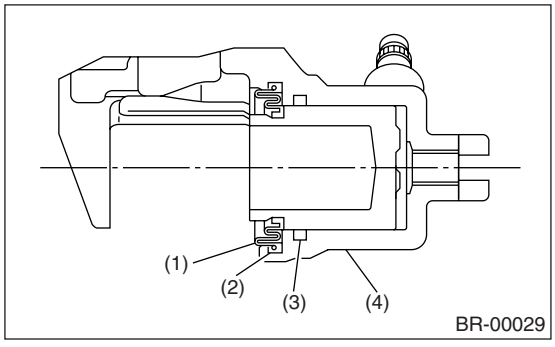
1) Clean the caliper body interior using brake fluid.
2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
4) Insert the piston into cylinder.

CAUTION:
Do not force piston into cylinder.

5) Apply a coat of specified grease to the boot and fit in groove on ends of cylinder and piston.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)

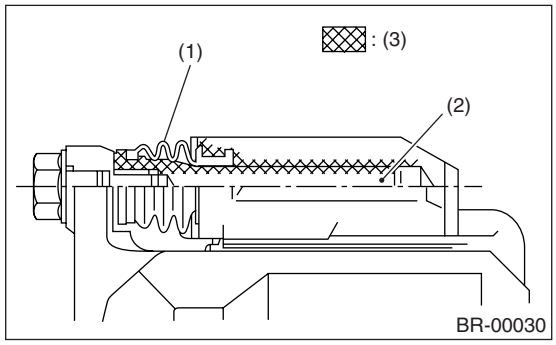
6) Install the piston boot to caliper body, and then attach boot ring.



(1) Piston boot
(2) Boot ring
(3) Piston seal
(4) Caliper body

7) Apply a coat of specified grease to the guide pin, outer surface, sleeve outer surface, cylinder inner surface, and boot grooves.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)



(1) Pin boot
(2) Lock pin or guide pin
(3) Apply grease.

8) Install the guide pin boot on support.
9) Install the lock pin boot on support, and then insert the lock pin sleeve into place.

2. 17 INCH TYPE

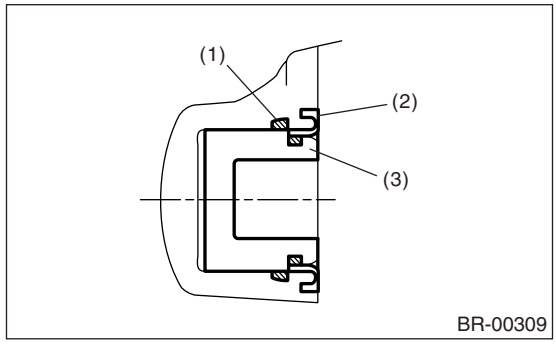
1) Clean the caliper body interior using brake fluid.
2) Apply a coat of brake fluid to the piston seal and install the piston seal in groove on caliper body.
3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
4) Apply a coat of specified grease to the boot and install it in the groove on piston.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)

5) Insert the piston into cylinder.

CAUTION:
Do not force the piston into cylinder.

6) Position the boot in grooves on cylinder and piston.



(1) Piston seal
(2) Piston boot
(3) Piston

E: INSPECTION

1) Repair or replace the faulty parts.
2) Check the caliper body and piston for uneven wear, damage or rust.
3) Check the rubber parts for damage or deterioration.

8. Master Cylinder

A: REMOVAL

CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Thoroughly drain brake fluid from reservoir tank.
2) Disconnect the fluid level indicator harness connector.
3) Remove the brake pipes from master cylinder.
4) Remove the master cylinder mounting nuts, and take out master cylinder from brake booster.

B: INSTALLATION

1) To install the master cylinder to body, reverse the sequence of removal procedure.

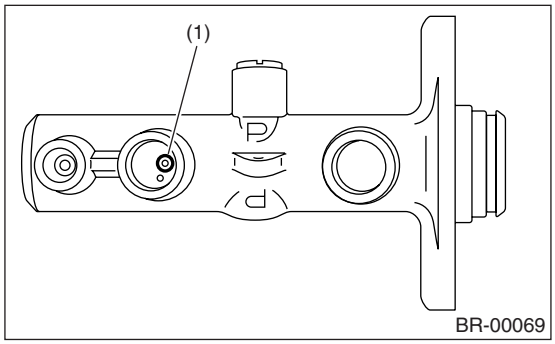
Tightening torque:
Master cylinder mounting nut
14 N·m (1.4 kgf-m, 10.1 ft-lb)
Piping flare nut
15 N·m (1.5 kgf-m, 10.8 ft-lb)

CAUTION:
Be sure to use recommended brake fluid.

2) Bleed air from the brake system. <Ref. to BR-44, PROCEDURE, Air Bleeding.>

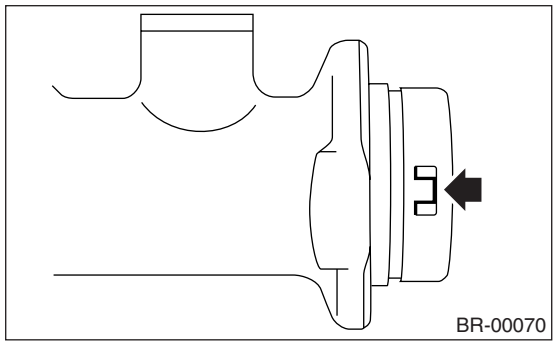
C: DISASSEMBLY

1) Remove mud and dirt from the surface of brake master cylinder.
2) Secure the master cylinder on a vise.
3) Remove the pin which secures reservoir tank to master cylinder, and then remove the reservoir tank and grommet.
4) Remove the cylinder pin with magnetic pick-up tool while pushing in primary piston by screwdriver which wrapped with tape.



(1) Cylinder pin (straight pin)

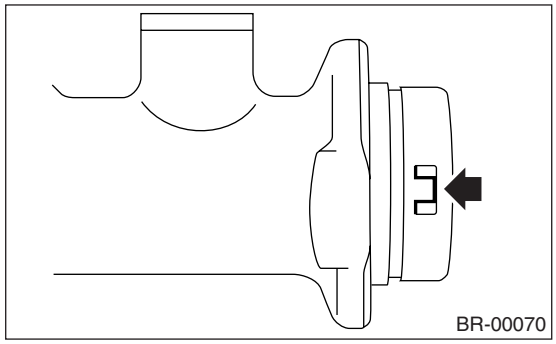
5) Pry up the pawl, and then remove the piston retainer. Hold piston retainer tight, because the piston may jump out from master cylinder.



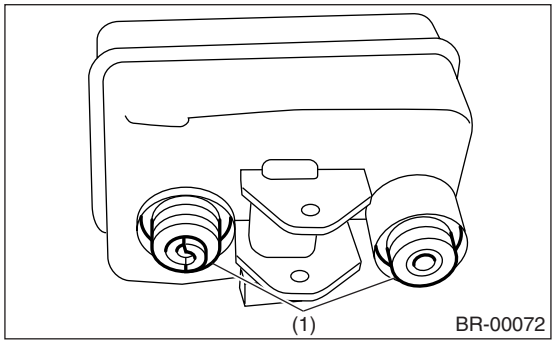
6) Extract the primary piston assembly and secondary piston assembly straight out, while taking care not to scratch the inner surface of cylinder.
7) Use brake fluid to wash the inside wall of cylinder, and piston assembly. If any damage, deformation, wear, rust, and other faults are found, replace the faulty part.

D: ASSEMBLY

1) Apply recommended brake fluid to the inside wall of cylinder, and to outer surface of the piston assembly.
2) Ensure that the inside wall of cylinder, and piston assembly are free from dirt when assembling. Install the primary piston assembly and secondary piston assembly, while taking care not to damage, scratch, or dent the cylinder inside wall, and piston assembly.
3) Install the cylinder pin while pushing in primary piston by screwdriver which wrapped with tape.
4) Install the piston retainer, and then secure it by pressing the pawl.



5) Install the seal to reservoir tank.



(1) Seal

6) Install the reservoir tank to master cylinder and secure with pin.

E: INSPECTION

If any damage, deformation, wear, swelling, rust, and other faults are found on the primary piston assembly, secondary piston assembly, supply the valve stopper, or gasket, replace the faulty part.

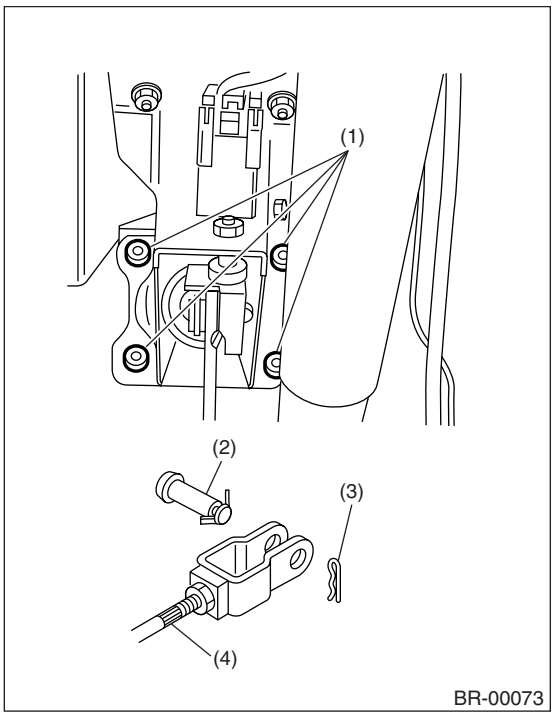
NOTE:

- The primary and secondary pistons must be replaced as complete assemblies.
- The service limit of clearance between each piston and the master cylinder inner dia. is 0.11 mm (0.0043 in).

9. Brake Booster

A: REMOVAL

1) Remove or disconnect the following parts at engine compartment.
   (1) Disconnect the connector for brake fluid level indicator.
   (2) Remove the brake pipes from master cylinder.
   (3) Remove the master cylinder installing nuts.
   (4) Disconnect the vacuum hose from brake booster.
2) Remove the following parts from pedal bracket.
   (1) Snap pin and clevis pin
   (2) Four brake booster installing nuts

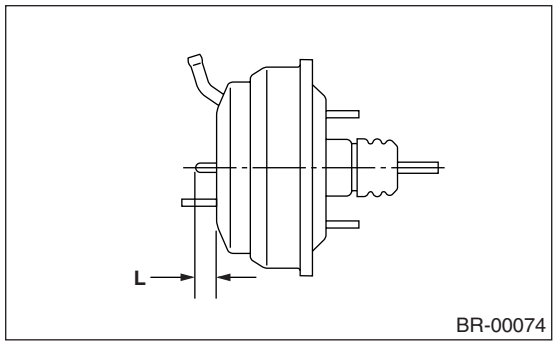


(1) Nuts
(2) Clevis pin
(3) Snap pin
(4) Operating rod

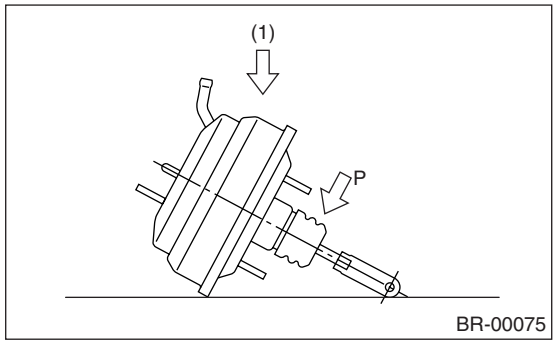
3) Remove the brake booster while shunning brake pipes.

NOTE:
• Be careful not to drop the brake booster. The brake booster should be discarded if it has been dropped.
• Use special care when handling the operating rod.
If excessive force is applied to the operating rod, sufficient to cause a change in the angle in excess of ±3°, it may result in damage to the power piston cylinder.
• Use care when placing the brake booster on floor.
• Do not change the push rod length. If it has been changed, reset the projected length “L” to standard length.

Standard L
10.05 mm (0.40 in)



CAUTION:
If external force is applied from above when the brake booster is placed in this position, the resin portion as indicated by “P”, may be damaged.



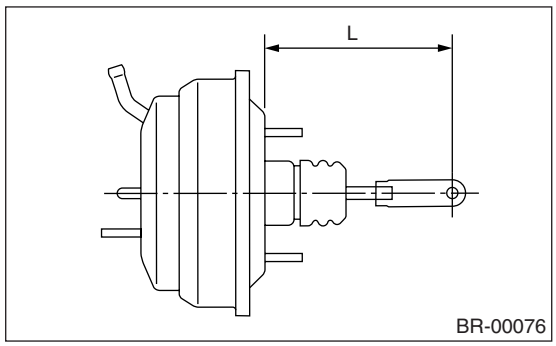
(1) Force

B: INSTALLATION

1) Adjust the operating rod of brake booster.

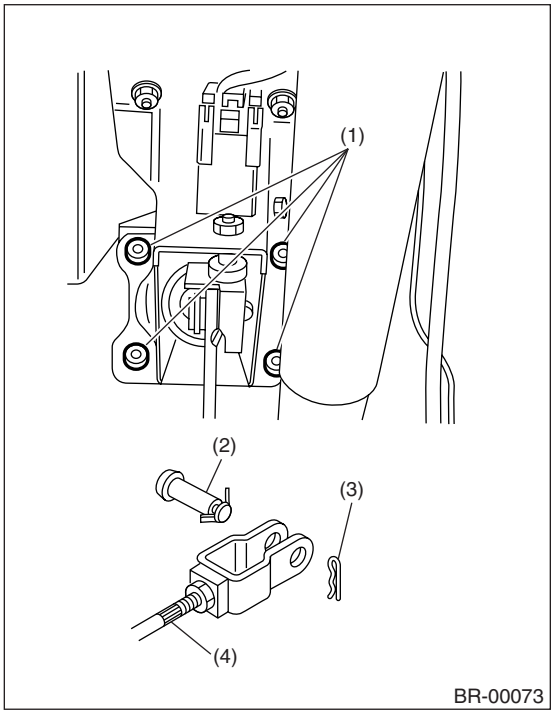
Standard L
144.6 mm (5.69 in)

If it is not within specified value, adjust it by adjusting the brake booster operating rod.



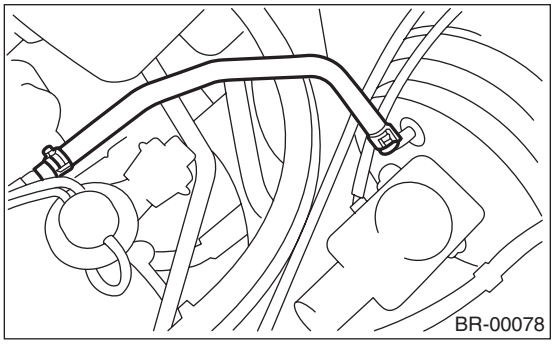
2) Mount the brake booster in position.

3) Connect the operating rod to brake pedal with clevis pin and snap pin.



(1) Nuts
(2) Clevis pin
(3) Snap pin
(4) Operating rod

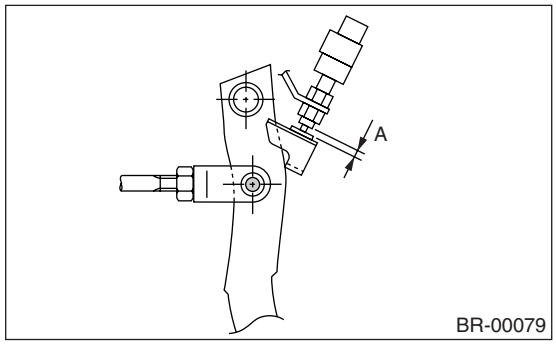
4) Connect the vacuum hose to brake booster.



5) Mount the master cylinder onto brake booster.
6) Connect the brake pipes to master cylinder.
7) Connect the electric connector for brake fluid level indicator.
8) Measure the clearance between threaded end of stop light switch and stopper.If it is not within specified value, adjust it by adjusting the position of stop light switch. <Ref. to BR-53, ADJUSTMENT, Stop Light Switch.>
If it is not within specified value, adjust it by adjusting the position of stop light switch.

CAUTION:
Be careful not to rotate the stop light switch.

Stop light switch clearance: A
0.3 mm (0.012 in)



9) Apply grease to operating rod connecting pin to prevent it from wearing.
10) Bleed air from the brake system.

Tightening torque (Air bleeder screw):
Except for 17 inch type:
8 N·m (0.8 kgf-m, 5.8 ft-lb)
17 inch type:
20 N·m (2.0 kgf-m, 14.5 ft-lb)

11) Conduct road tests to ensure brakes do not drag.

C: INSPECTION

1. OPERATION CHECK (WITHOUT GAUGES)

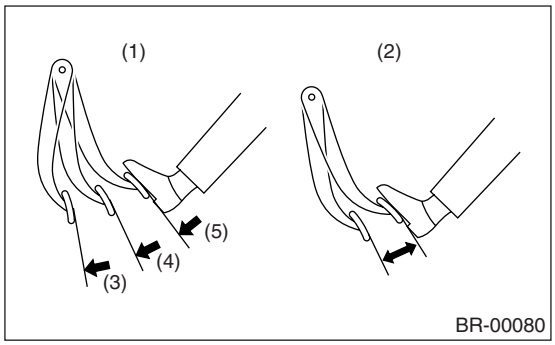
CAUTION:
When checking operation, be sure to securely apply the parking brake.

• Checking without gauges

This method cannot determine the exact portion which has failed, but it can provide a rough understanding of the nature of failure if checking is conducted in accordance with the following procedures.

• Air tightness check

Start the engine, and run it for 1 to 2 minutes, then turn it off. Depress the brake pedal several times applying same pedal force as that used in ordinary braking operations. The pedal stroke should be greatest on 1st depression, and it should become smaller with each successive depression. If no change occurs in the pedal height while in a depressed state, the brake booster is faulty.

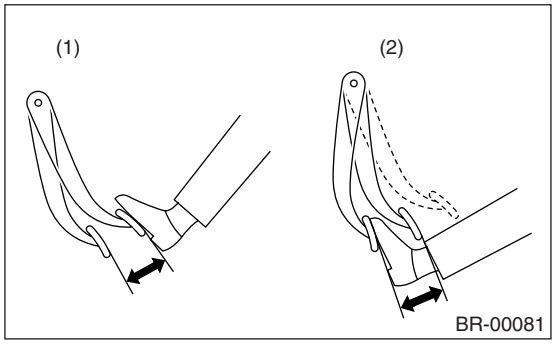


(1) OK
(2) NOT OK
(3) 1st
(4) 2nd
(5) 3rd

NOTE:
• In the event of defective operation, inspect the condition of check valve and vacuum hose.
• Replace them if faulty and conduct the test again.
• If no improvement is observed, check precisely with gauges.

• Operation check

1) With the engine off, depress the brake pedal several times applying same pedal force and make sure that pedal height does not vary with each depression of pedal.



(1) When engine is stopped
(2) When engine is started

2) With the brake pedal depressed, start the engine.

3) As the engine starts, the brake pedal should move slightly toward the floor. If no change occurs in the pedal height, the brake booster is faulty.

NOTE:
If faulty, check precisely with gauges.

• Loaded air tightness check

Depress the brake pedal while engine is running, and turn off the engine while pedal is still depressed. Keep the pedal depressed for 30 seconds; if no change occurs in the pedal height, the brake booster is functioning normally; if the pedal height increases, it is faulty.

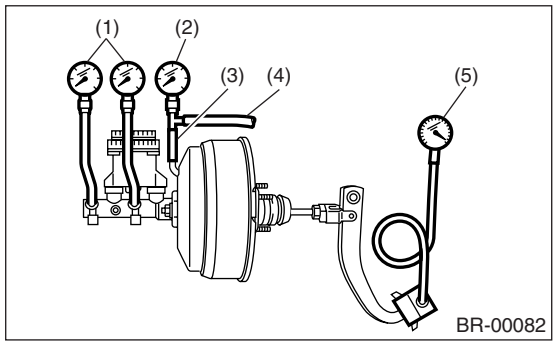
NOTE:
If faulty, check precisely with gauges.

2. OPERATION CHECK (WITH GAUGES)

CAUTION:
When checking operation, be sure to securely apply the parking brake.

• Checking with gauges

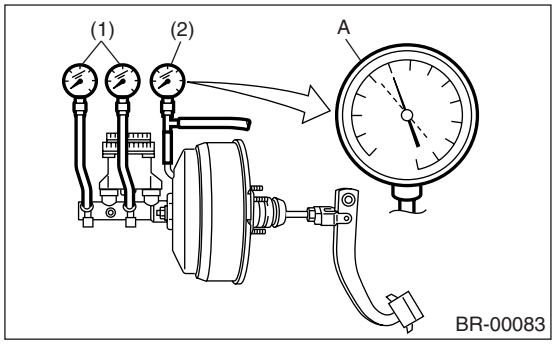
Connect gauges as shown in the figure. After bleeding air from pressure gauges, proceed to each check.



(1) Pressure gauge
(2) Vacuum gauge
(3) Adapter hose
(4) Vacuum hose
(5) Pedal force gauge

• Air tightness check

1) Start the engine and keep it running until a vacuum of 66.7 kPa (500 mmHg, 19.69 inHg) = point A is indicated on vacuum gauge. Do not depress the brake pedal.



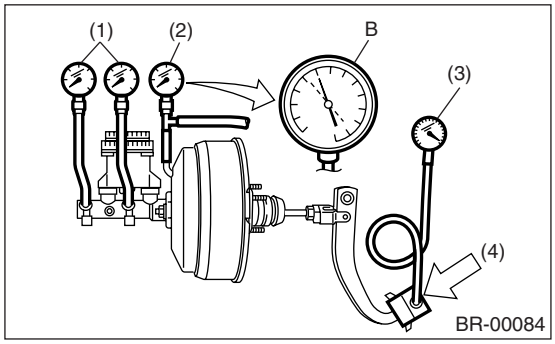
(1) Pressure gauge
(2) Vacuum gauge

2) Stop the engine and watch the gauge. If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping engine, the brake booster is functioning properly.
If defective, the cause may be one of those listed below.

- Check valve malfunction
- Leak from vacuum hose
- Leak from the shell jointed portion or stud bolt welded portion
- Damaged diaphragm
- Leak from valve body seal and bearing portion
- Leak from plate and seal assembly portion
- Leak from poppet valve assembly portion

• Loaded air tightness check

1) Start the engine and depress brake pedal with pedal force of 196 N (20 kgf, 44 lb). Keep the engine running until a vacuum of 66.7 kPa (500 mmHg, 19.69 inHg) = point B is indicated on vacuum gauge while the pedal is still depressed.



(1) Pressure gauge
(2) Vacuum gauge
(3) Pedal force gauge
(4) Depress

2) Stop the engine and watch vacuum gauge.
If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping engine, the brake booster is functioning properly.
If defective, refer to “AIR TIGHTNESS CHECK”.
<Ref. to BR-39, INSPECTION, Brake Booster.>
3) If any fault is found on brake booster, replace the brake booster with a new one.

• Lack of boosting action check

Turn off the engine, and set the vacuum gauge reading at “0”. Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the standard value listed.

Brake pedal force		147 N (15 kgf, 33 lb)	294 N (30 kgf, 66 lb)
Fluid pressure	15″	588 kPa (6 kg/cm^2, 85 psi)	1,471 kPa (15 kg/cm^2, 213 psi)
	16″		
	17″		

• Boosting action check

Set the vacuum gauge reading at 66.7 kPa (500 mmHg, 19.69 inHg) by running engine. Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the standard value listed.

Brake pedal force		147 N (15 kgf, 33 lb)	294 N (30 kgf, 66 lb)
Fluid pressure	15″	5,296 kPa (54 kg/cm^2, 768 psi)	9,120 kPa (93 kg/cm^2, 1,323 psi)
	16″	4,707 kPa (48 kg/cm^2, 683 psi)	
	17″	4,021 kPa (41 kg/cm^2, 583 psi)	8,336 kPa (85 kg/cm^2, 1,209 psi)

10.Brake Fluid

A: INSPECTION

1) Check that the brake fluid level remains between “MIN” and “MAX”. If out of the specified range, refill or drain fluid. If the fluid level becomes close to “MIN”, refill the fluid.
2) Check the fluid for discoloration. If the fluid color has excessively changed, drain the fluid and refill with new fluid.

B: REPLACEMENT

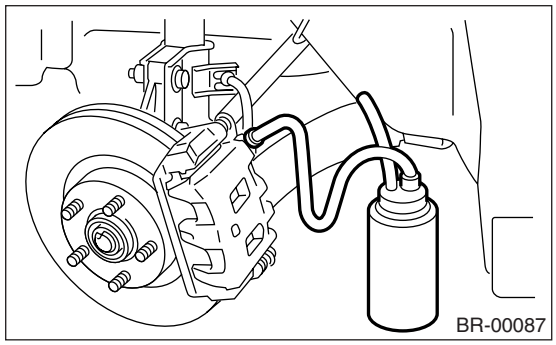
CAUTION:
• To always maintain the brake fluid characteristics, replace the brake fluid according to maintenance schedule or earlier than that when used in severe condition.
• The FMVSS No. 116, fresh DOT3 brake fluid must be used.
• Cover the bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
• Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.
• Avoid mixing different brands of brake fluid to prevent degrading the quality of fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.

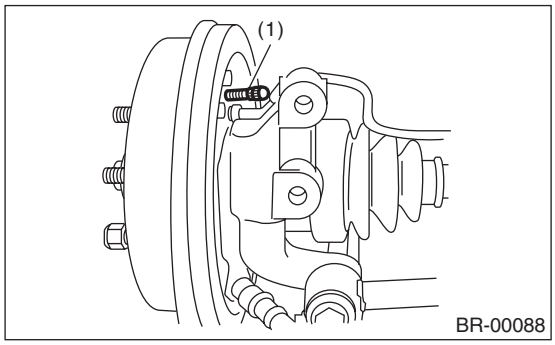
NOTE:
• During bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
• The brake pedal operating must be very slow.
• For convenience and safety, two people should do the work.
• The amount of brake fluid required is approx. 500 mℓ (16.9 US fl oz, 17.6 Imp fl oz) for total brake system.

1) Either lift-up the vehicle and place a safety stand under it, or lift-up vehicle.
2) Remove both front and rear wheels.
3) Draw out the brake fluid from master cylinder with syringe.
4) Refill the reservoir tank with recommended brake fluid.

Recommended brake fluid:
FMVSS No. 116, fresh DOT3 brake fluid

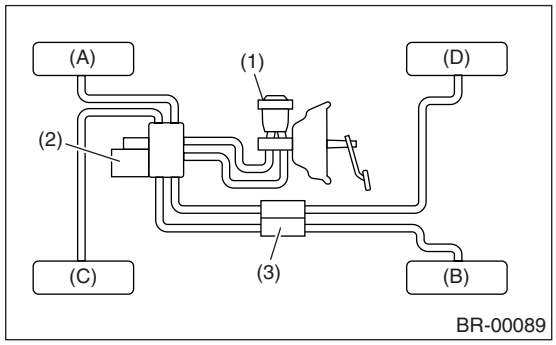
5) Install one end of a vinyl tube onto the air bleeder and insert the other end of the tube into a container to collect the brake fluid.





(1) Air bleeder screw

CAUTION:
Brake fluid replacement sequence; (A) Front right → (B) Rear left → (C) Front left → (D) Rear right



(1) Master cylinder
(2) Hydraulic unit
(3) Proportioning valve

6) Instruct your co-worker to depress the brake pedal slowly two or three times and then hold it depressed.
7) Loosen the bleeder screw approx. 1/4 turn until a small amount of brake fluid drains into container, and then quickly tighten the screw.

8) Release the brake pedal slowly. Repeat steps 6) through 8) until there are no air bubbles in the drained brake fluid and new fluid flows through vinyl tube.

NOTE:
Add brake fluid as necessary while performing air bleed operation, in order to prevent the tank from running short of brake fluid.

9) After completing the bleeding operation, hold brake pedal depressed and tighten screw and install bleeder cap.

Tightening torque (Bleeder screw):
Except for 17 inch type:
8 N·m (0.8 kgf-m, 5.8 ft-lb)
17 inch type:
20 N·m (2.0 kgf-m, 14.5 ft-lb)

10) Bleed air from each wheel cylinder using the same procedures as described in steps 6) through 8) above.

11) Depress the brake pedal with a force of approx. 294 N (30 kg, 66 lb) and hold it there for approx. 20 seconds. At this time check for mix in air and pedal height change. Visually inspect the bleeder screws and brake pipe joints to make sure that there is no fluid leakage.

12) Install the wheels, and drive the vehicle for a short distance between 2 to 3 km (1 to 2 miles) to make sure that brakes are operating properly.

11.Air Bleeding

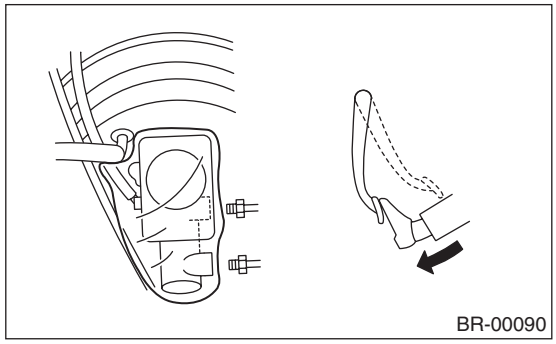
A: PROCEDURE

CAUTION:
• The FMVSS No. 116, fresh DOT3 brake fluid must be used.
• Cover the bleeder with waste cloth when loosening it to prevent brake fluid from being splashed over surrounding parts.
• Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.
• Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.

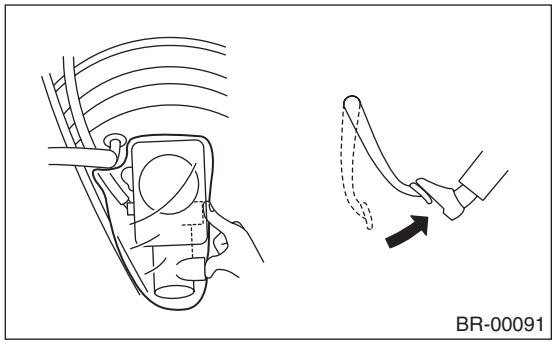
1. MASTER CYLINDER

NOTE:
• If the master cylinder is disassembled or reservoir tank is empty, bleed the master cylinder.
• During the bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
• The brake pedal operating must be very slow.
• For convenience and safety, two people should do the work.

1) Loosen the wheel nuts, jack-up the vehicle, support it with safety stands, and remove the wheel.
2) Disconnect the brake line at primary and secondary sides.
3) Put a plastic bag cover on master cylinder.
4) Carefully depress and hold the brake pedal.


BR-00090

5) Close the outlet plug with your finger, and then release the brake pedal.


BR-00091

6) Repeat step 4) and 5) until the brake fluid is completely bled from outlet plug.
7) Remove the plastic bag.
8) Install the brake pipes to master cylinder.

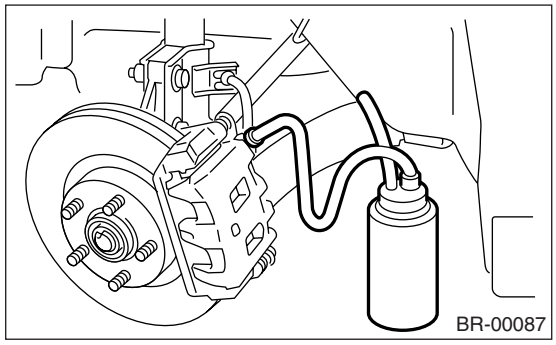
Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

9) Bleed air from the brake line. <Ref. to BR-44, BRAKE LINE, PROCEDURE, Air Bleeding.>

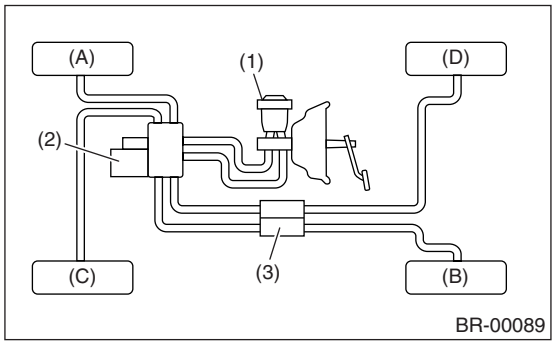
2. BRAKE LINE

NOTE:
• During the bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
• The brake pedal operating must be very slow.
• For convenience and safety, two people should do the work.

1) Make sure that there is no leak from the joints and connections of brake system.
2) Fit one end of vinyl tube into the air bleeder and put the other end into a brake fluid container.


BR-00087

CAUTION:
Brake fluid replacement sequence; (A) Front right → (B) Rear left → (C) Front left → (D) Rear right



(1) Master cylinder
(2) Hydraulic unit
(3) Proportioning valve

3) Slowly depress the brake pedal and keep it depressed. Then, open the air bleeder to discharge air together with the fluid.
Release the air bleeder for 1 to 2 seconds.
Next, with the bleeder closed, slowly release the brake pedal.
Repeat these steps until there are no more air bubbles in the vinyl tube.
Allow 3 to 4 seconds between two brake pedal operations.

CAUTION:
Cover the bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.

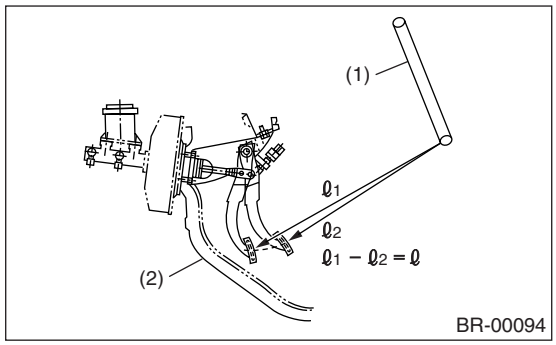
NOTE:
The brake pedal operating must be very slow.

4) Tighten the air bleeder securely when no air bubbles are visible.

Air bleeder tightening torque:
Except for 17 inch type:
8 N·m (0.8 kgf-m, 5.8 ft-lb)
17 inch type:
20 N·m (2.0 kgf-m, 14.5 ft-lb)

5) Perform these steps for the brakes connecting to secondary chamber of master cylinder, first, and then for the ones connecting to primary chamber. With all procedures completed, fully depress the brake pedal and keep it in that position for approx. 20 seconds to make sure that there is no leak evident in the entire system.

6) Check the pedal stroke.
While the engine is idling, depress the brake pedal with a 490 N (50 kgf, 110 lb) load and measure the distance between brake pedal and steering wheel. With the brake pedal released, measure the distance between pedal and steering wheel again. The difference between the two measurements must not be more than specified.



(1) Steering wheel
(2) Toe board

Specified pedal stroke
WRX AT model: 105 mm (4.13 in)
Except WRX AT model: 90 mm (3.54 in)
When depressing brake pedal with a 490 N (50 kgf, 110 lbf) load.

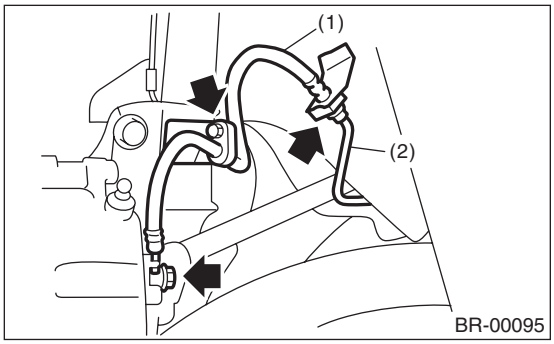
7) If the distance is more than the specifications, there is a possibility that air is in the brake line. Bleed the brake line until pedal stroke meets the specification.
8) Operate the hydraulic control unit in the sequence control mode. <Ref. to ABS-9, ABS Sequence Control.>
9) Recheck the pedal stroke.
10) If the distance is more than specifications, there is a possibility air is in the inside of hydraulic unit. Repeat above steps 2) to 9) above until pedal stroke meets the specification.
11) Add brake fluid to the required level (MAX. level) of reservoir tank.
12) As a final step, test run the vehicle at low speed and apply brakes relatively hard 2 to 3 times to ensure that brakes provide normal braking action on all four wheels without dragging and uneven braking.

12.Brake Hose

A: REMOVAL

1. FRONT BRAKE HOSE

1) Separate the brake pipe from brake hose.
(Always use the flare nut wrench and be careful not to deform the flare nut.)
2) Pull out the clamp to remove brake hose.
3) Remove the bolt at strut and union bolt.



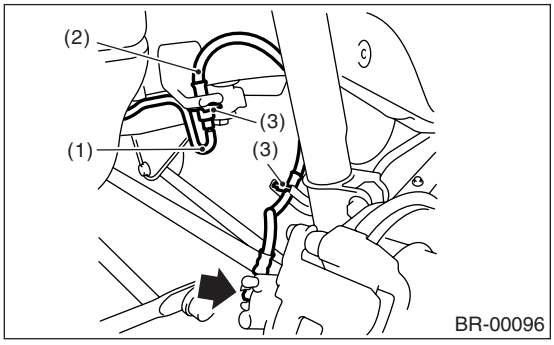
(1) Brake hose
(2) Brake pipe

2. REAR BRAKE HOSE

1) Separate the brake pipe from brake hose.

NOTE:
Always use the flare nut wrench and be careful not to deform the flare nut.

2) Remove the clamp and union bolt.



(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp

B: INSTALLATION

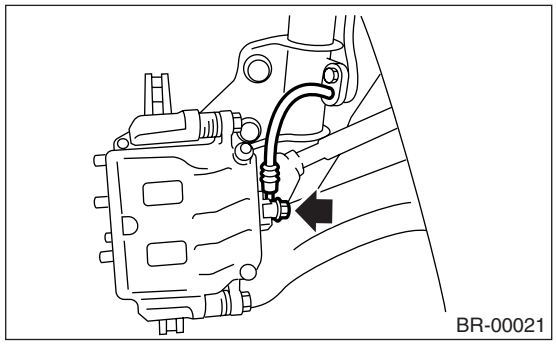
1. FRONT BRAKE HOSE

1) Secure the brake hose to strut.

Tightening torque:
32 N·m (3.3 kgf-m, 23.6 ft-lb)

2) Install the brake hose to caliper using a new gasket.

Tightening torque (Union bolt):
18 N·m (1.8 kgf-m, 13.0 ft-lb)



3) Position the disc in straight-forward direction and route brake hose through hole in bracket on wheel apron side.

CAUTION:
Be sure brake hose is not twisted.

4) Temporarily tighten the flare nut to connect brake pipe and hose.
5) Fix the brake hose with clamp at wheel apron bracket.
6) While holding the hexagonal part of brake hose fitting with a wrench, tighten the flare nut to the specified torque.

Tightening torque (Brake pipe flare nut):
15 N·m (1.5 kgf-m, 10.8 ft-lb)

7) Bleed air from the brake system.

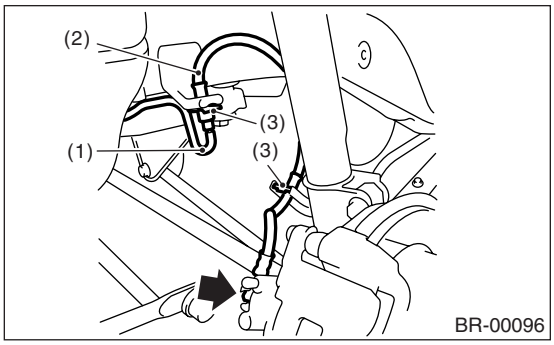
2. REAR BRAKE HOSE

1) Pass the brake hose through hole of bracket, and then lightly tighten the flare nut to connect brake pipe.
2) Insert the clamp upward to fix brake hose.
3) Install the brake hose to caliper using a new gasket.

Tightening torque (Union bolt):
18 N·m (1.8 kgf-m, 13.0 ft-lb)

4) While holding the hexagonal part of brake hose fitting with a wrench, tighten the flare nut to the specified torque.

Tightening torque (Brake pipe flare nut):
15 N·m (1.5 kgf-m, 10.8 ft-lb)



(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp

5) Bleed air from the brake system.

C: INSPECTION

Ensure there are no cracks, breakage, or damage on the hoses. Check the joints for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace the hose.

13.Brake Pipe

A: REMOVAL

NOTE:
Airbag system wiring harness is routed near the center brake pipe.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the center brake pipe.
• When removing the brake pipe, make sure that it is not bent.

B: INSTALLATION

NOTE:
Airbag system wiring harness is routed near the center brake pipe.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the center brake pipe.
• When installing the brake pipe, make sure that it is not bent.
• After installing the brake pipe and hose, bleed the air.
• After installing the brake hose, make sure that it does not touch the tire or suspension assembly, etc.

Brake pipe tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

C: INSPECTION

Ensure there are no cracks, breakage, or damage on pipes. Check the joints for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace the pipe.

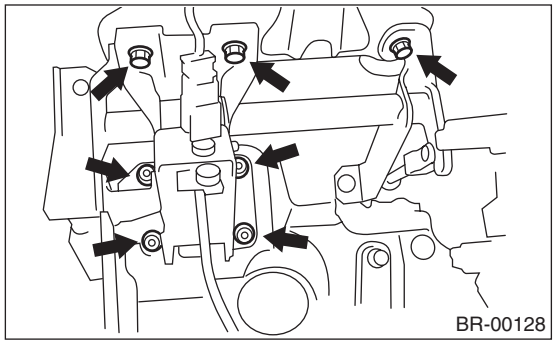
NOTE:
Use a mirror when inspecting low-visible part or back side.

14.Brake Pedal

A: REMOVAL

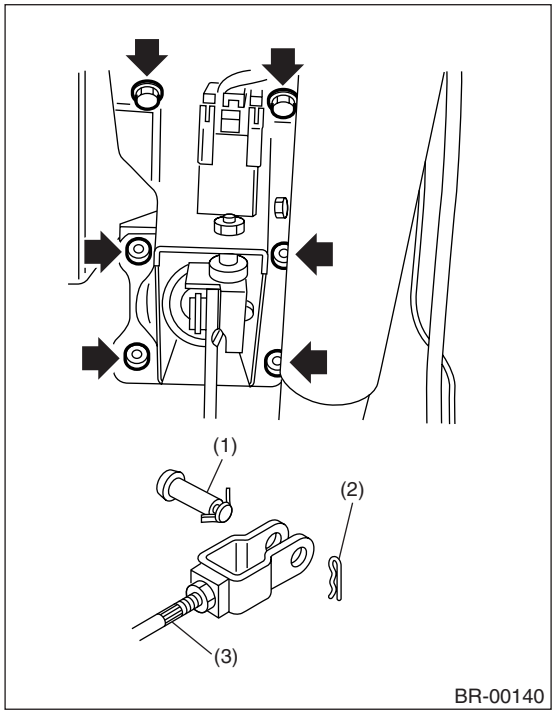
1. MT MODEL

1) Remove the steering shaft.
2) Disconnect the connectors (for stop light switch, etc.) from pedal bracket.
3) Remove the clevis pin which secures the lever to push rod.
4) Remove the nut which secures the clutch master cylinder.
5) Remove the accelerator pedal.
6) Remove the bolts and nuts which the secure pedal bracket.



2. AT MODEL

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover from instrument panel.
3) Remove the clevis pin which secures the brake pedal to brake booster operating rod. Also disconnect the stop light switch connector.
4) Remove the four bolts and four nuts which secure the brake pedal to pedal.



(1) Clevis pin
(2) Snap pin
(3) Operating rod

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
• If the cable clamp is damaged, replace it with a new one.
• Never fail to cover the outer cable end with boot.
• Be careful not to kink the accelerator cable.
• Always use new clevis pins.

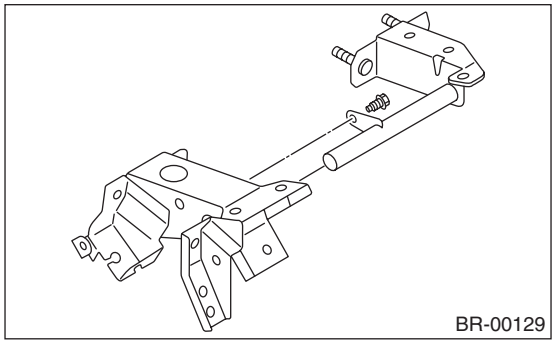
2) Adjust the clutch pedal <Ref. to CL-26, ADJUSTMENT, Clutch Pedal.>
3) Inspect the brake pedal after installation <Ref. to BR-51, INSPECTION, Brake Pedal.>

C: DISASSEMBLY

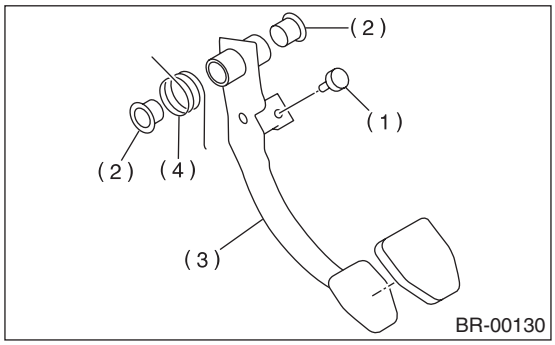
1. MT MODEL

1) Remove the brake switch.
<Ref. to BR-52, REMOVAL, Stop Light Switch.>
2) Remove the clutch pedal.
<Ref. to CL-25, DISASSEMBLY, Clutch Pedal.>

3) Remove the clutch master cylinder bracket.



4) Remove the bushing, spring and stopper.

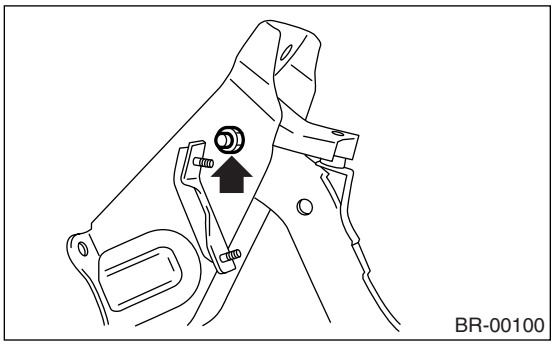


(1) Stopper
(2) Bushing
(3) Brake pedal
(4) Brake pedal spring

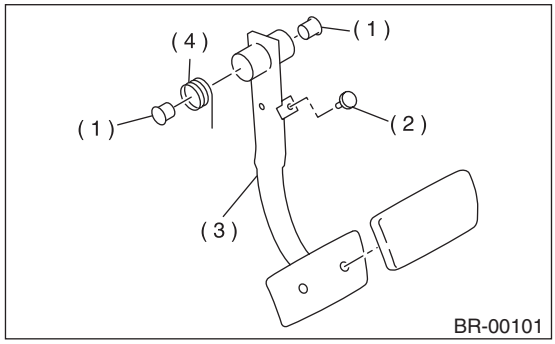
5) Remove the brake pedal pad.

2. AT MODEL

1) Remove the brake switch.
2) Unbolt, and then remove the brake pedal.



3) Remove the bushing, spacer and spring.



(1) Plug
(2) Stopper
(3) Brake pedal
(4) Brake pedal spring

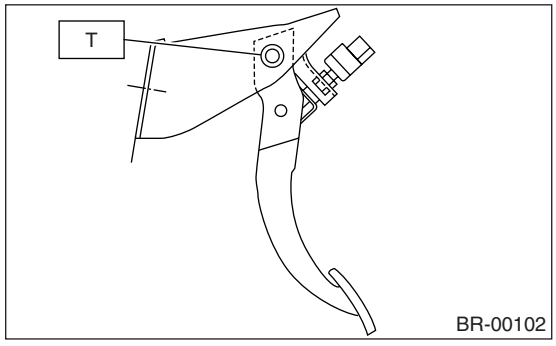
4) Remove the brake pedal pad.

D: ASSEMBLY

1) Attach the stop light switch, etc. to pedal bracket temporarily.
2) Clean the inside of bores of clutch pedal and brake pedal, apply grease, and set the bushings into bores.
3) Align bores of the pedal bracket, clutch pedal and brake pedal, attach the brake pedal return spring and clutch pedal effort reducing spring (model with hill holder), and then install the pedal bolt.

NOTE:
Clean up the inside of bushings and apply grease before installing spacer.

Tightening torque:
T: 29 N·m (3.0 kgf-m, 21.7 ft-lb)



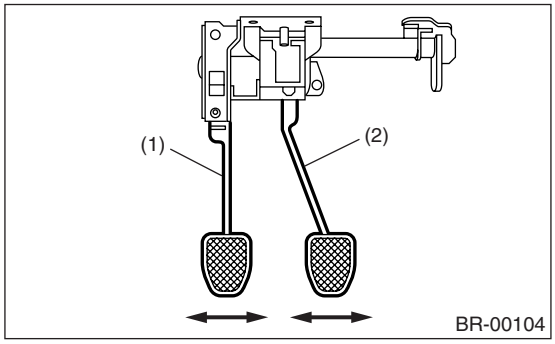
4) Adjust the stop light switch position after installing the brake pedal to vehicle.

E: INSPECTION

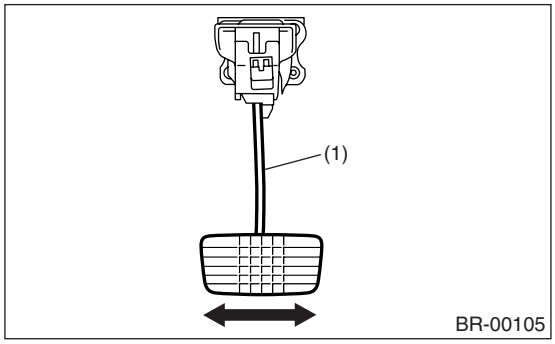
1) Move the brake and clutch pedal pads in the lateral direction with a force of approx. 10 N (1 kgf, 2 lb) to ensure pedal deflection is in specified range.

CAUTION:
If excessive deflection is noted, replace the bushings with new ones.

Deflection of brake and clutch pedal:
Service limit
5.0 mm (0.197 in) or less



(1) Clutch pedal
(2) Brake pedal

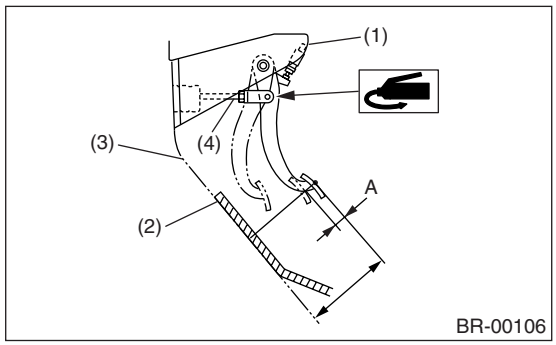


(1) Brake pedal

2) Check the position of pedal pad.

Pedal height: L
148 mm (5.83 in)

Brake pedal free play: A
1 — 3 mm (0.04 — 0.12 in) [Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lb).]



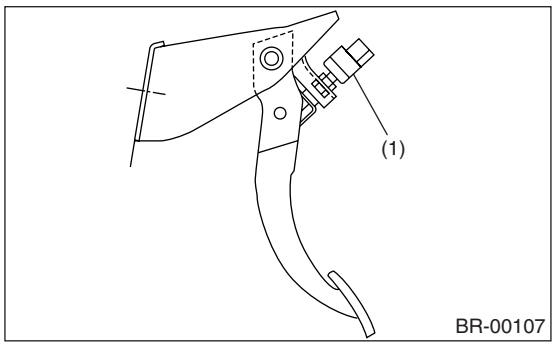
(1) Stop light switch
(2) Mat
(3) Toe board
(4) Brake booster operating rod

3) If it is not within specified value, adjust it by adjusting the brake booster operating rod length.

15.Stop Light Switch

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Disconnect the stop light switch connector.
3) Loosen nuts, and unscrew stop light switch to remove.

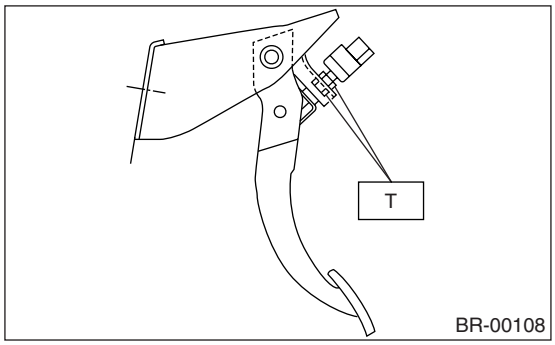


(1) Stop light switch

B: INSTALLATION

1) Screw the stop light switch onto a bracket and secure it temporarily with a nut.
2) Adjust the stop light switch position, and then tighten the nut.
<Ref. to BR-53, ADJUSTMENT, Stop Light Switch.>

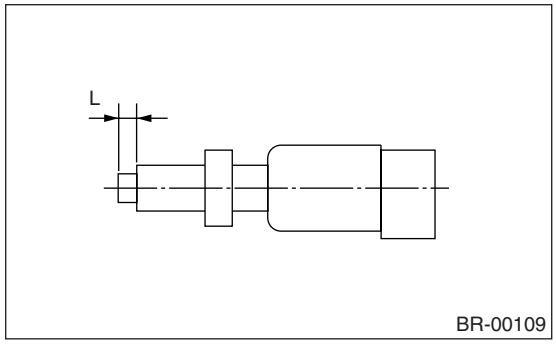
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



C: INSPECTION

1) If the stop light switch does not operate properly (or if it does not stop at the specified position), replace with a new one.

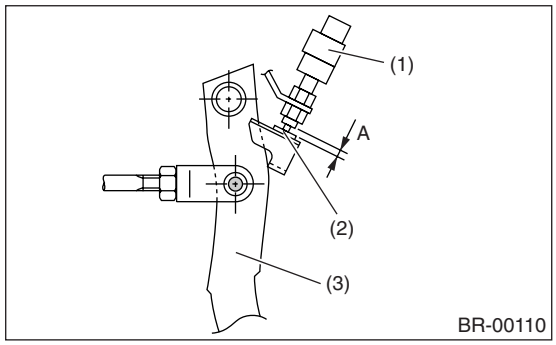
Specified position: L
2 mm (0.079 in)



2) Measure the clearance between threaded end of stop light switch and stopper.

CAUTION:
Be careful not to rotate stop light switch.

Stop light switch clearance: A
0.3 mm (0.012 in)



(1) Stop light switch
(2) Stopper
(3) Brake pedal

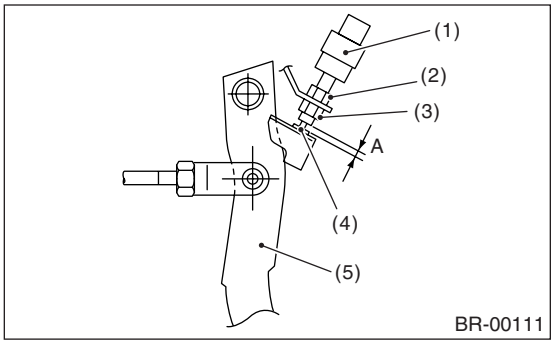
3) If it is not within specified value, adjust it by adjusting position of stop light switch.

CAUTION:
Be careful not to rotate the stop light switch.

D: ADJUSTMENT

Loosen the lock nut, and adjust the stop light switch position until the clearance between threaded end of stop light switch and stopper (A) becomes 0.3 mm (0.012 in). Then, tighten the lock nut.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



(1) Stop light switch
(2) Lock nut A
(3) Lock nut B
(4) Stopper
(5) Brake pedal

NOTE:
Tighten the lock nut B until the clearance between threaded end of stop light switch and stopper becomes 0 mm (0 in). Hold the stop light switch to prevent turning, and then loosen the lock nut B approx. 60°. The clearance (A) will become 0.3 mm (0.012 in).

16.General Diagnostics

A: INSPECTION

	Trouble and possible cause	Corrective action
1. Insufficient braking	(1) Fluid leakage from the hydraulic mechanism	Repair or replace (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose).
	(2) Entry of air into the hydraulic mechanism	Bleed the air.
	(3) Excessively wide shoe clearance	Adjust the clearance.
	(4) Wear, deteriorated surface material, adhering water or fluid on the lining	Replace, grind or clean.
	(5) Improper operation of master cylinder, disc caliper, brake booster or check valve	Correct or replace.
2. Unstable or uneven braking	(1) Fluid on the lining, drum or rotor	Eliminate cause of fluid leakage, clean, or replace.
	(2) Drum or rotor eccentricity	Correct or replace the drum or rotor.
	(3) Worn brake drum, or damage to the drum caused by sand	Correct by grinding, or replace.
	(4) Improper lining contact, deteriorated surface material, improper inferior material, or wear	Correct by grinding, or replace.
	(5) Deformed back plate	Correct or replace.
	(6) Improper tire inflation	Inflate to correct pressure.
	(7) Disordered wheel alignment	Adjust alignment.
	(8) Loosened back plate or the support installing bolts	Retighten.
	(9) Loosened wheel bearing	Retighten to normal tightening torque or replace.
	(10) Trouble in the hydraulic system	Replace the cylinder, brake pipe or hose.
	(11) Uneven effect of the parking brake	Check, adjust, or replace the rear brake and cable system.
3. Excessive pedal stroke	(1) Entry of air into the hydraulic mechanism	Bleed the air.
	(2) Excessive play in the master cylinder push rod	Adjust.
	(3) Fluid leakage from the hydraulic mechanism	Repair or replace (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose).
	(4) Improperly adjusted shoe clearance	Adjust.
	(5) Improper lining contact or worn lining	Correct or replace.
4. Brake dragging or improper brake return	(1) Insufficient pedal play	Adjust play.
	(2) Improper master cylinder return	Clean or replace the cylinder.
	(3) Clogged hydraulic system	Replace.
	(4) Improper return or adjustment of parking brake	Correct or adjust.
	(5) Weakened spring tension or breakage of shoe return spring	Replace the spring.
	(6) Excessively narrow shoe clearance	Adjust the clearance.
	(7) Improper disc caliper operation	Correct or replace.
	(8) Wheel bearing faulty	Replace the wheel bearing.
5. Brake noise (1) (creak sound)	(1) Hardened or deteriorated lining	Replace the shoe assembly or pad.
	(2) Worn lining	Replace the shoe assembly or pad.
	(3) Loosened back plate or the support installing bolts	Retighten.
	(4) Loose wheel bearing	Retighten to normal tightening torque.
	(5) Dirty drum or rotor	Clean the drum or rotor, or clean and replace the brake assembly.
6. Brake noise (2) (hissing sound)	(1) Worn lining	Replace the shoe assembly or pad.
	(2) Improper installed shoe or pad	Correct or replace the shoe assembly or pad.
	(3) Loose or bent drum or rotor	Retighten or replace.

	Trouble and possible cause	Corrective action
7. Brake noise (3) (click sound)	In the case of the disc brake:	
	(1) Excessively worn pad or the support	Replace the pad or the support.
	In the case of the drum brake:	
	(1) Excessively worn shoe ridge	Replace the back plate.
	(2) Lack of oil on the shoe ridge surface and anchor	Add more grease.

PARKING BRAKE

PB

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4. Parking Brake Assembly (Rear Disc Brake) 6
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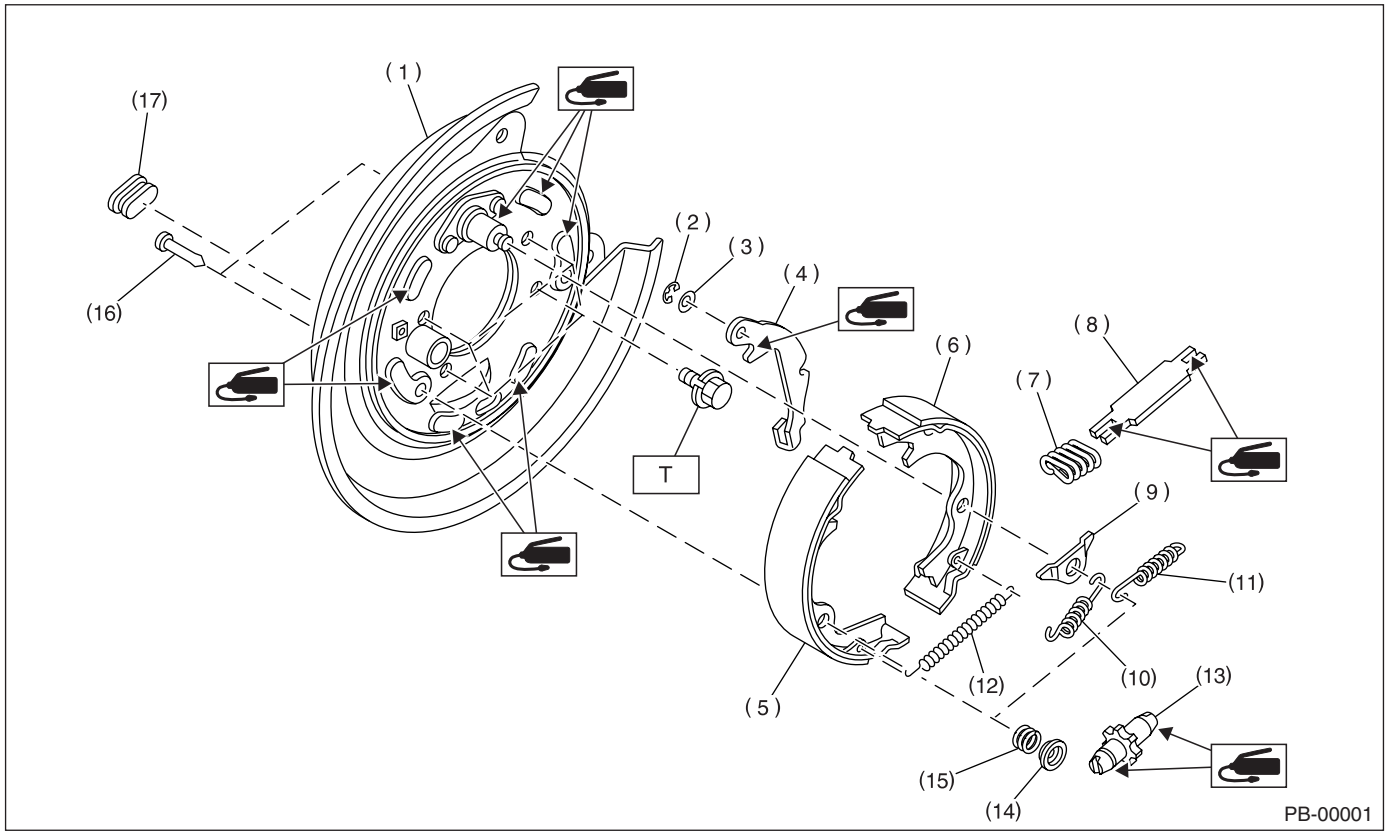
1. General Description

A: SPECIFICATIONS

Model		Except STi model	STi model
Type		Mechanical on rear brakes, drum in disc	
Effective drum diameter	mm (in)	170 (6.69)	190 (7.48)
Lining dimensions (length × width × thickness)	mm (in)	162.6 × 30.0 × 3.2 (6.40 × 1.181 × 0.126)	182.3 × 30.0 × 3.2 (7.18 × 1.181 × 0.126)
Clearance adjustment		Manual adjustment	
Lever stroke	notches/N (kgf, lb)	7 to 8/196 (20, 44)	

B: COMPONENT

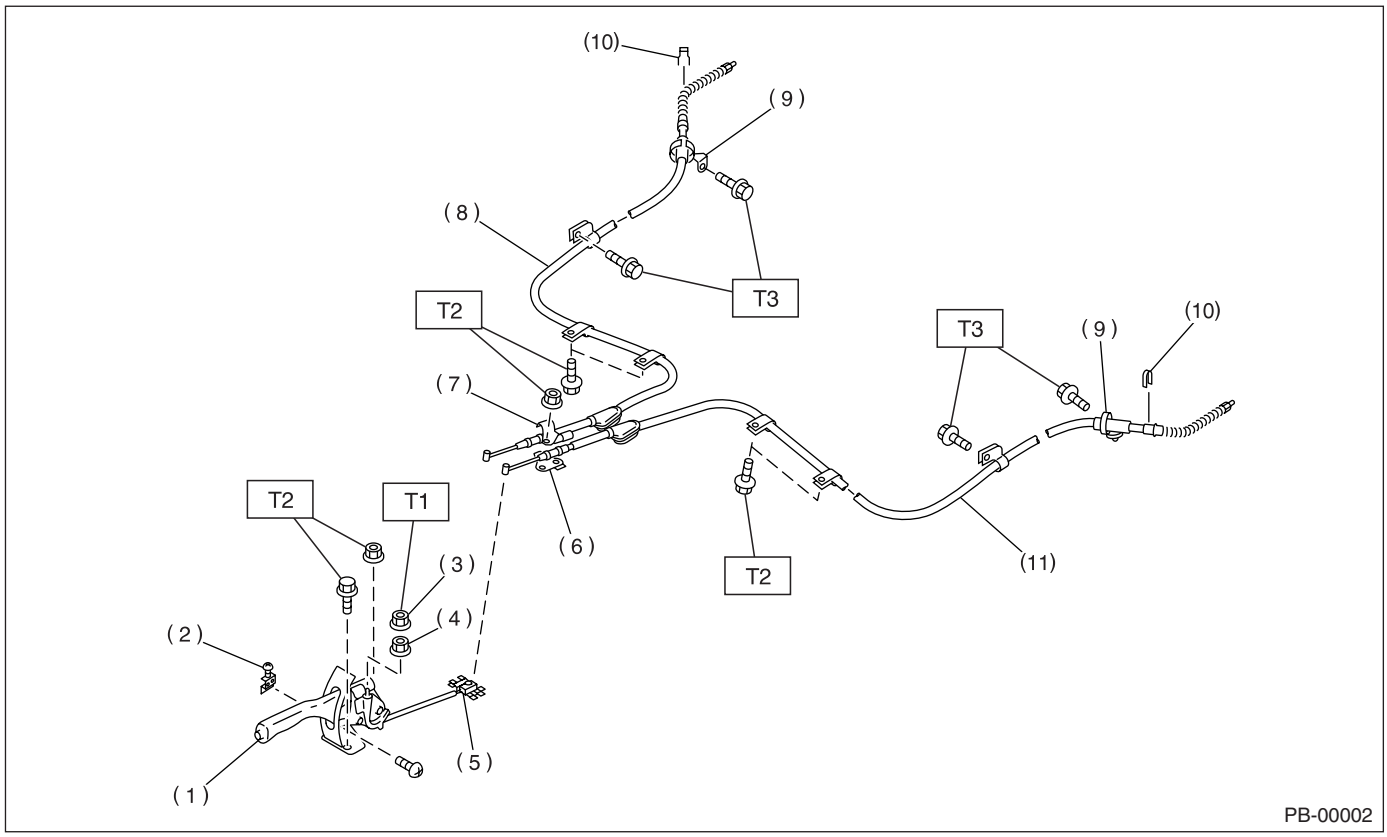
1. PARKING BRAKE (REAR DISC BRAKE)



(1) Back plate
(2) Retainer
(3) Spring washer
(4) Lever
(5) Parking brake shoe (Primary)
(6) Parking brake shoe (Secondary)
(7) Strut spring
(8) Strut
(9) Shoe guide plate
(10) Primary return spring
(11) Secondary return spring
(12) Adjusting spring
(13) Adjuster
(14) Shoe hold-down cup
(15) Shoe hold-down spring
(16) Shoe hold-down pin
(17) Adjusting hole cover

Tightening torque: N·m (kgf-m, ft-lb)
T: 53 (5.4, 39.1)

2. PARKING BRAKE CABLE



(1) Parking brake lever
(2) Parking brake switch
(3) Lock nut
(4) Adjusting nut
(5) Equalizer
(6) Bracket
(7) Clamp
(8) Parking brake cable RH
(9) Cable guide
(10) Clamp (Rear disc brake model)
(11) Parking brake cable LH

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5.9 (0.6, 4.3)
T2: 18 (1.8, 13.0)
T3: 32 (3.3, 23.6)

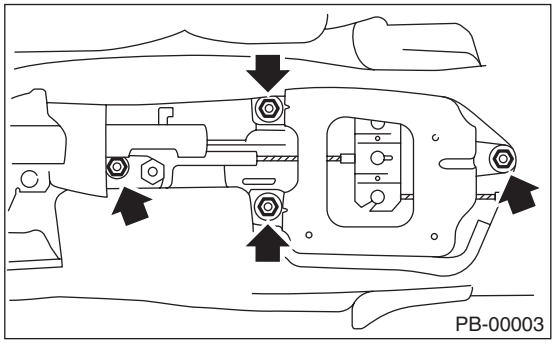
C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Keep grease etc. away from parking brake shoes.

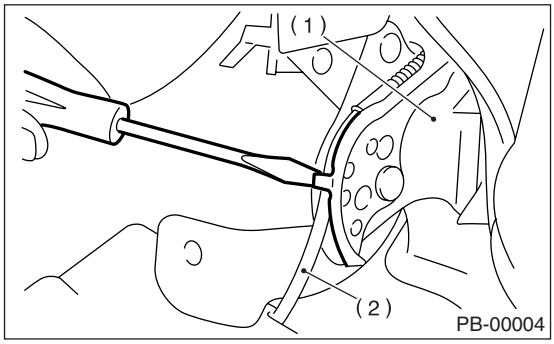
2. Parking Brake Lever

A: REMOVAL

1) Lift up the vehicle.
2) Remove the rear wheel.
3) Remove the rear seat cushion.
4) Remove the console box.
5) Loosen the parking cable adjusting nut and console bracket.
6) Disconnect the connector of parking brake switch.
7) Remove the parking brake lever.



8) Unbend the parking brake lever pawls and remove cable.



(1) Parking brake lever
(2) Cable

B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:
Parking brake lever;
18 N·m (1.8 kgf-m, 13.0 ft-lb)
Adjusting nut;
5.9 N·m (0.6 kgf-m, 4.3 ft-lb)

2) Be sure to adjust the lever stroke. <Ref. to PB-4, ADJUSTMENT, Parking Brake Lever.>

C: INSPECTION

While pulling the parking brake lever upward, count the notches.

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)

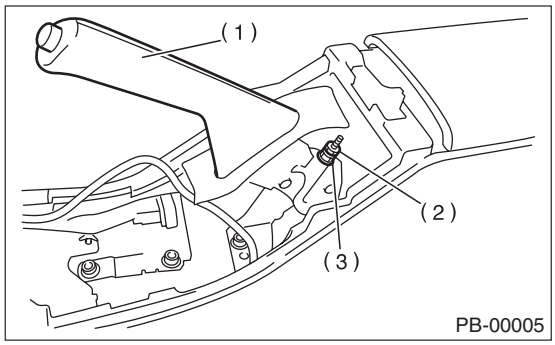
If not as specified, adjust the parking brake. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

D: ADJUSTMENT

1) Remove the console cover.
2) Forcibly pull the parking brake lever 3 to 5 times.
3) Adjust the parking brake lever by turning adjuster until parking brake lever stroke is set at 7 to 8 notches with operating force of 196 N (20 kgf, 44 lb).
4) Tighten the lock nut.

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)

Tightening torque (Lock nut):
5.9 N·m (0.6 kgf-m, 4.3 ft-lb)



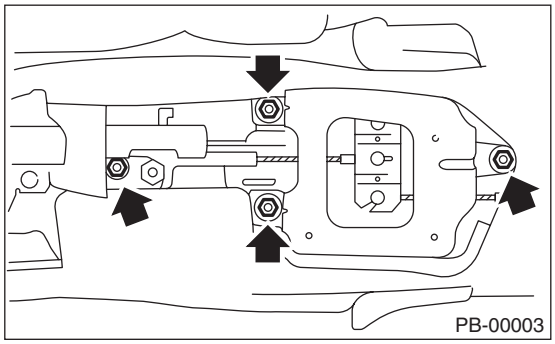
(1) Parking brake lever
(2) Lock nut
(3) Adjusting nut

5) Install the console cover.

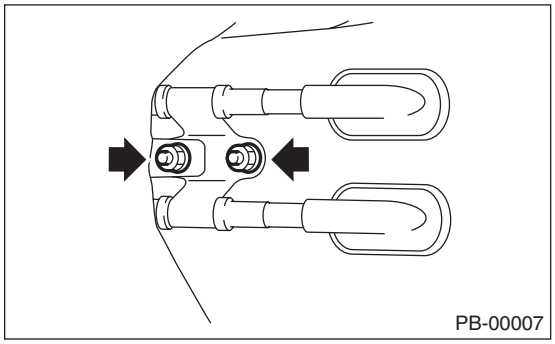
3. Parking Brake Cable

A: REMOVAL

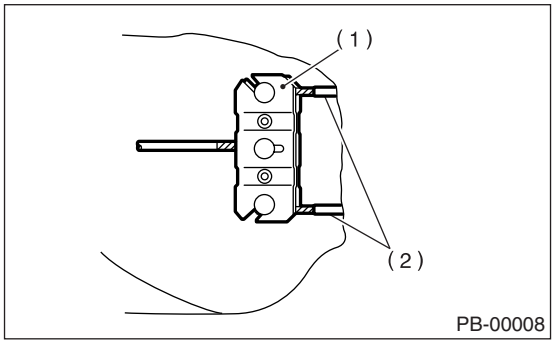
1) Lift up the vehicle.
2) Remove the rear wheels.
3) Remove the rear seat cushion.
4) Remove the console box.
5) Loosen the parking cable adjusting nut and console bracket.
6) Remove the parking brake lever.



7) Roll up the floor mat and remove clamps.

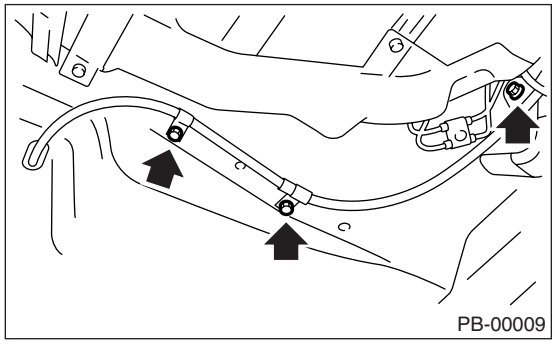


8) Remove the equalizer cover.
9) Remove the inner cable end from equalizer.



(1) Equalizer
(2) Inner cable end

10) Remove the parking brake cable from rear brake. <Ref. to PB-6, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>
11) Remove the clamp from rear brake.
12) Remove the bolt and bracket from trailing link bracket.
13) Remove the bolt and clamp from rear floor.



14) Detach the grommet from rear floor.
15) Remove the cable assembly from cabin by forcibly pulling it backward.
16) Detach the parking brake cable from cable guide at rear trailing link.

B: INSTALLATION

1) Install the (new) parking brake assembly in the reverse order of removal.

NOTE:
Be sure to pass the cable through cable guide inside the tunnel.

2) Be sure to adjust the lever stroke. <Ref. to PB-4, ADJUSTMENT, Parking Brake Lever.>

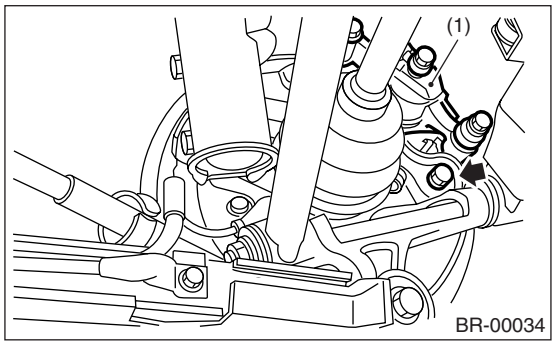
C: INSPECTION

Check the removed cable and replace it if damaged, rusty or malfunctioning.
1) Check for smooth operation of the cable.
2) Check the inner cable for damage and rust.
3) Check the outer cable for damage, bends and cracks.
4) Check the boot for damage, cracks and deterioration.

4. Parking Brake Assembly (Rear Disc Brake)

A: REMOVAL

1) Pull down and release the parking brake.
2) Remove the two mounting bolts and remove the brake caliper assembly.

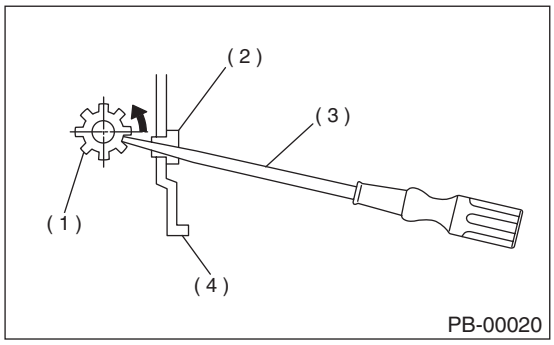


(1) Brake caliper assembly

3) Suspend the brake caliper assembly so that the hose is not stretched.
4) Remove the disc rotor.

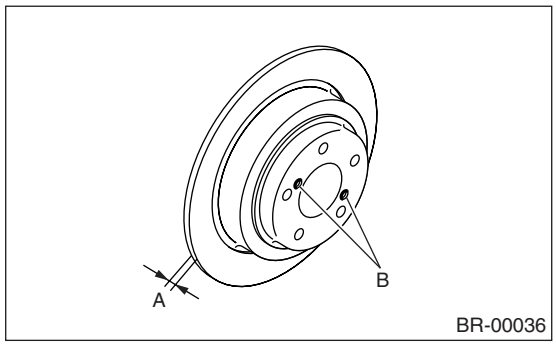
NOTE:
If the disc rotor is difficult to remove, try the two following methods in order.

(1) Turn the adjusting screw using a flat tip screwdriver until brake shoe gets away enough from the disc rotor.

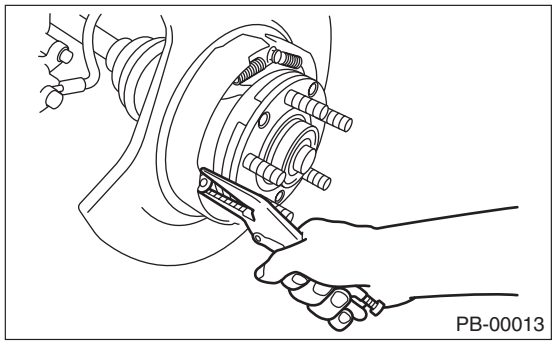


(1) Adjusting screw
(2) Adjusting hole cover (rubber)
(3) Flat tip screwdriver
(4) Back plate

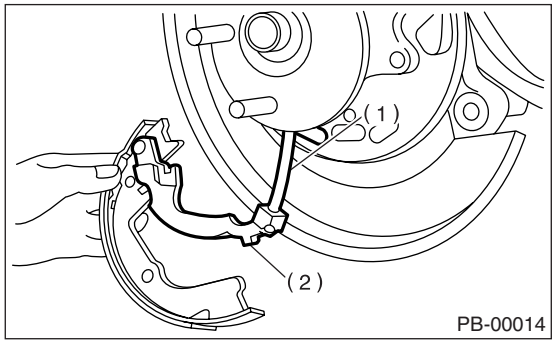
(2) If the disc rotor seizes up within hub, drive the disc rotor out by installing two 8-mm bolts in holes B on rotor.



5) Remove the shoe return spring from parking brake assembly.
6) Remove the front shoe hold-down spring and pin with pliers.



7) Remove the strut and strut spring.
8) Remove the adjuster assembly from parking brake assembly.
9) Remove the brake shoe.
10) Remove the rear shoe hold-down spring and pin with pliers.
11) Remove the parking brake cable from parking brake lever.



(1) Parking brake cable
(2) Parking brake lever

12) Using a standard screwdriver, raise the retainer. Remove the parking brake lever and washer from brake shoe.

B: INSTALLATION

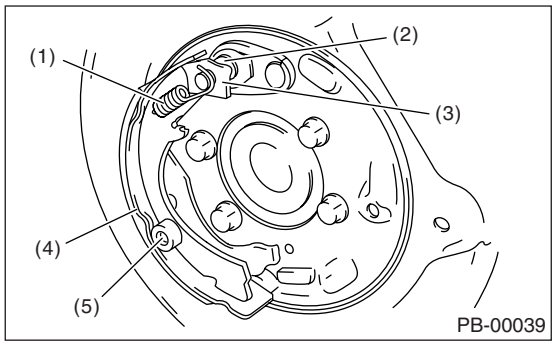
CAUTION:
Be sure the lining surface is free from oil and grease contamination.

1) Apply brake grease to the following places.

Brake grease:
Brake Grease (Part No. 003602002)

- Six contact surfaces of shoe rim and back plate packing
- Contact surface of shoe wave and anchor pin
- Contact surface of lever and strut
- Contact surface of shoe wave and adjuster assembly
- Contact surface of shoe wave and strut
- Contact surface of lever and shoe wave

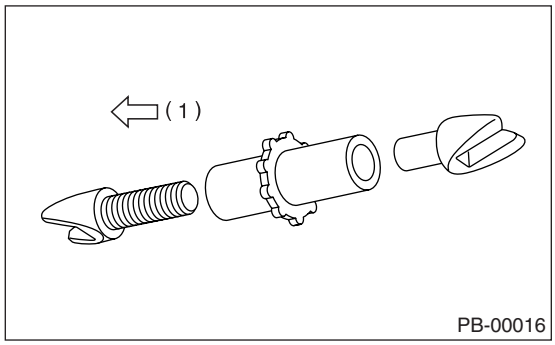
2) Insert the primary side brake shoe into anchor pin groove.
3) Secure the brake shoe with shoe hold-down pin and cup.
4) Install the plate to anchor pin, and then assemble the primary return spring to anchor pin.



(1) Primary return spring
(2) Anchor pin
(3) Plate
(4) Primary shoe
(5) Shoe hold-down pin & cup

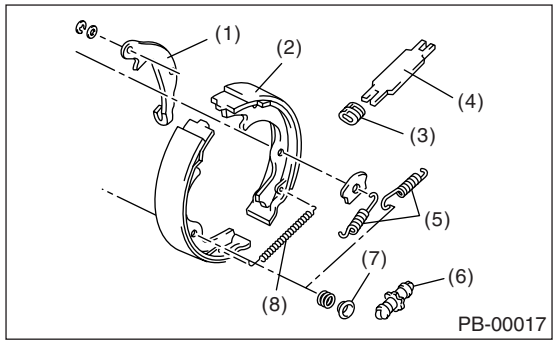
5) Install the parking brake cable to parking brake lever.
6) Assemble the strut and adjuster, and then secure the secondary side brake shoe with shoe hold-down pin & cup.

NOTE:
- Install the strut spring of both right and left wheels facing vehicle front.
- Install the adjuster assembly with screw on left side.



(1) Left

7) Install the secondary return spring and adjusting spring.



(1) Lever
(2) Secondary brake shoe
(3) Strut spring
(4) Strut
(5) Return spring
(6) Adjuster
(7) Shoe hold-down cup
(8) Adjusting spring

8) Adjust the parking brakes. <Ref. to PB-8, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>
9) Drive the vehicle for parking brake lining “break-in”.
(1) Drive the vehicle at about 35 km/h (22 MPH).
(2) With the parking brake release button pushed in, pull the parking brake lever gently.
(3) Drive the vehicle for about 200 meter (0.12 mile) in this condition.
(4) Wait 5 to 10 minutes for the parking brake to cool down. Repeat this procedure once more.
(5) After breaking-in, re-adjust the parking brakes.

C: INSPECTION

1) Measure the brake disc rotor inside diameter. If the disc is scored or worn, replace the brake disc rotor.

Disc rotor inside diameter:
Standard
Except STi model 170 mm (6.69 in)
STi model 190 mm (7.48 in)
Service limit
Except STi model 171 mm (6.73 in)
STi model 191 mm (7.52 in)

2) Measure the lining thickness. If it exceeds the limit, replace the shoe assembly.

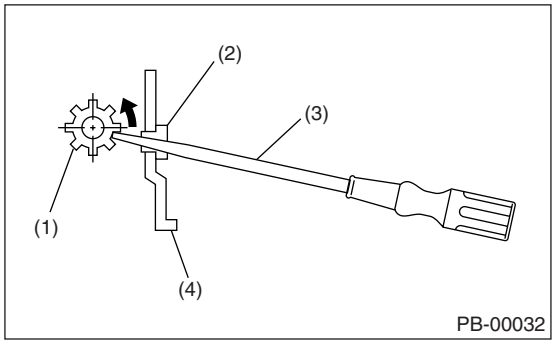
Lining thickness:
Standard
3.2 mm (0.126 in)
Service limit
1.5 mm (0.059 in)

NOTE:
Replace the right and left brake shoes at the same time.

D: ADJUSTMENT

1. SHOE CLEARANCE

1) Remove the adjusting hole cover from back plate.
2) Turn the adjusting screw using a flat tip screwdriver until brake shoe is in close contact with disc rotor.

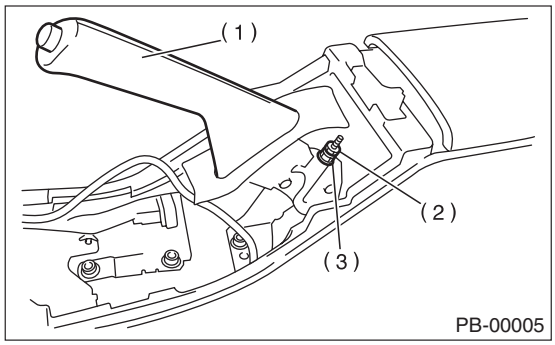


(1) Adjusting screw
(2) Adjusting hole cover (rubber)
(3) Flat tip screwdriver
(4) Back plate

3) Turn back (downward) the adjusting screw 3 or 4 notches.
4) Install the adjusting hole cover to back plate.

2. LEVER STROKE

1) Remove the console box lid.
2) Forcibly pull the parking brake lever 3 to 5 times.
3) Adjust the parking brake lever by turning adjuster until parking brake lever stroke is set at 7 to 8 notches with operating force of 196 N (20 kgf, 44 lb).



(1) Parking brake lever
(2) Lock nut
(3) Adjusting nut

4) Tighten the lock nut.
5) Install the console box lid.

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)

Tightening torque (Lock nut):
5.9 N·m (0.6 kgf-m, 4.3 ft-lb)

5. General Diagnostic Table

A: INSPECTION

Symptom	Possible cause	Remedy
Brake drag	Parking brake lever is maladjusted.	Adjustment.
	Parking brake cable does not move.	Repair or replace.
	Parking brake shoe clearance is maladjusted.	Adjustment.
	Return spring is faulty.	Replace.
Noise from brake	Return spring is faulty.	Replace.
	Shoe hold-down spring is faulty.	Replace.

POWER ASSISTED SYSTEM (POWER STEERING)

PS

		Page
1.	General Description	2
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1. General Description

A: SPECIFICATIONS

Model			NON-TURBO		TURBO	
			Others	SEDAN and OUTBACK	WRX	STi
Whole system	Minimum turning radius m (ft)		5.1 (16.7)	5.4 (17.7)		
	Steering angle (Inside-Outside)		37.3° — 32.4°	34.5° — 30.3°		
	Steering wheel diameter mm (in)		385 (15.16)			375 (14.76)
	Overall gear ratio (Turns, lock to lock Gear box)		3.2	3.0		2.7
Gearbox	Type		Rack and pinion, Integral			
	Backlash		0 (Automatically adjustable)			
	Valve (Power steering system)		Rotary valve			
Pump (Power steering system)	Type		Vane pump			
	Oil tank		Installed on body			
	Output cm^3 (cu in)/rev.		7.8 (0.476)		7.2 (0.439)	
	Relief pressure kPa (kg/cm^2, psi)		6,767 — 7,453 (69 — 76, 981 — 1,081)		7,350 — 8,036 (75 — 82, 1,067 — 1,165)	
	Hydraulic fluid control		Dropping in response to increased engine revolutions			
	Hydraulic fluid ℓ (US qt, Imp qt)/min		1,000 rpm: 7 (7.4, 6.2) 3,000 rpm: 5 (5.3, 4.4)		7.5 (7.9, 6.6)*1 7 (7.4, 6.2)*2	
	Range of revolution rpm		700 — 9,000			
	Revolving direction		Clockwise			
Working fluid (Power steering system)	Name		ATF DEXRON III			
	Capacity ℓ (US qt, Imp qt)	Oil tank	0.3 (0.3, 0.3)			
		Total	0.7 (0.7, 0.6)			

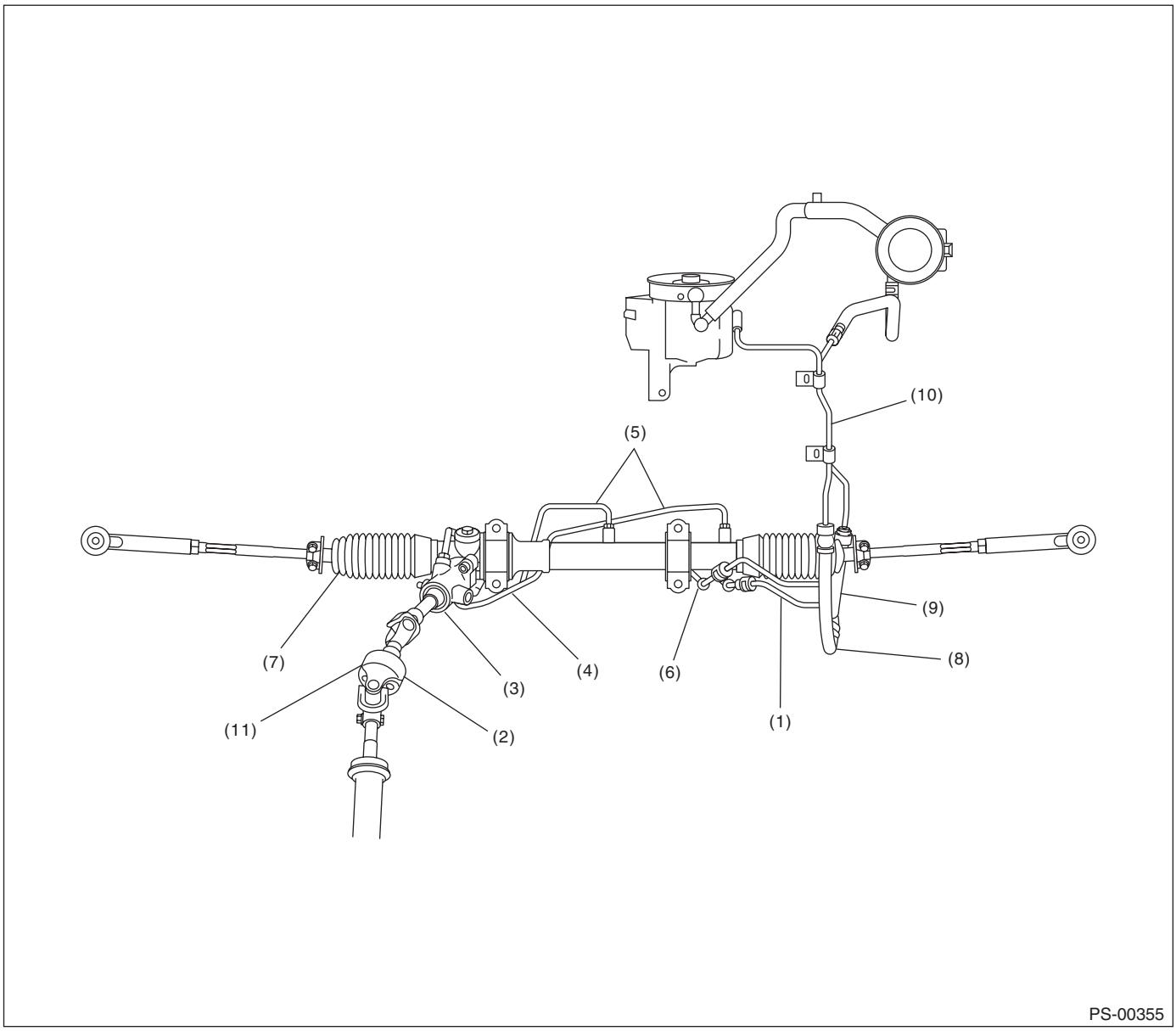
*1: With maximum load.
*2: With no load.

Steering wheel	Free play		mm (in)	17 (0.67)
Turning angle	Inner tire & wheel	TURBO, OUTBACK, NON-TURBO SEDAN		34.5°±1.5°
		Except TURBO, OUTBACK, NON-TURBO SEDAN		37.3°±1.5°
	Outer tire & wheel	TURBO, OUTBACK, NON-TURBO SEDAN		30.3°±1.5°
		Except TURBO, OUTBACK, NON-TURBO SEDAN		32.4°±1.5°
Steering shaft	Clearance between steering wheel and column cover		mm (in)	4.0 (0.16)
Steering gear-box (Power steering system)	Sliding resistance		N (kgf, lb)	400 (41, 90) or less
	Rack shaft play in radial direction	Right-turn steering	mm (in)	0.19 (0.0075) or less
		Left-turn steering	mm (in)	Horizontal movement: 0.15 (0.0059) or less Vertical movement: 0.3 (0.012) or less
	Input shaft play	In radial direction	mm (in)	0.18 (0.0071) or less
		In axial direction	mm (in)	0.5 (0.020) or less
	Turning resistance		N (kgf, lb)	Maximum allowable value: Less than 10.5 (1.1, 2.4) Difference between right and left sliding resistance: Less than 20%
Oil pump (Power steering system)	Pulley shaft	Radial play	mm (in)	0.4 (0.016) or less
		Axial play	mm (in)	0.9 (0.035) or less
	Pulley	Ditch deflection	mm (in)	1.0 (0.039) or less
		Resistance to rotation	N (kgf, lb)	9.22 (0.94, 2.07) or less
	Regular pressure (Unloaded)		kPa (kg/cm^2, psi)	981 (10, 142) or less
Steering wheel effort (Power steering system)	At standstill with engine idling on a concrete road		N (kgf, lb)	31.4 (3.2, 7.1) or less
	At standstill with engine stalled on a concrete road		N (kgf, lb)	294.2 (30, 66.2) or less

Recommended power steering fluid	Manufacturer
ATF DEXRON III or equivalent	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

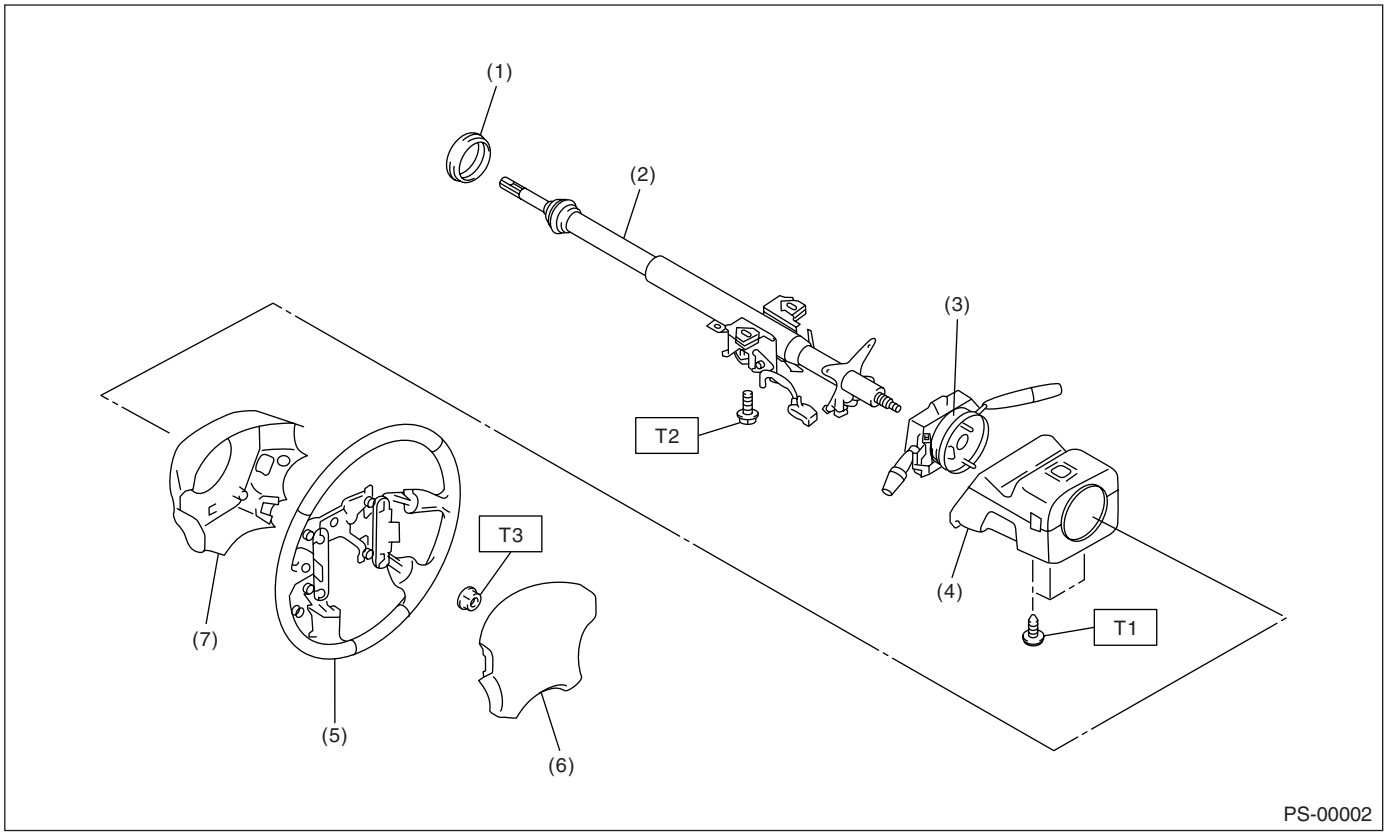
CAUTION:
This table lists various clearances that must be correctly adjusted to ensure the normal vehicle driving without interfering noise, or any other faults.

Location	Minimum allowance
(1) Crossmember — Pipe	5 mm (0.20 in)
(2) DOJ — Shaft or joint	14 mm (0.55 in)
(3) DOJ — Valve housing	11 mm (0.43 in)
(4) Pipe — Pipe	2 mm (0.08 in)
(5) Stabilizer — Pipe	5 mm (0.20 in)
(6) Exhaust pipe — Pipe	11 mm (0.43 in)
(7) Exhaust pipe — Gearbox bolt	15 mm (0.59 in)
(8) Side frame — Hose A and B	10 mm (0.39 in)
(9) Cruise control pump — Hose A and B	15 mm (0.59 in)
(10) Pipe portion of hose A — Pipe portion of hose B	1.5 mm (0.059 in)
(11) AT cooling hose — Joint	20 mm (0.79 in)


(10)
(5)
(9)
(8)
(7)
(3)
(4)
(6)
(11)
(2)
(1)
PS-00355

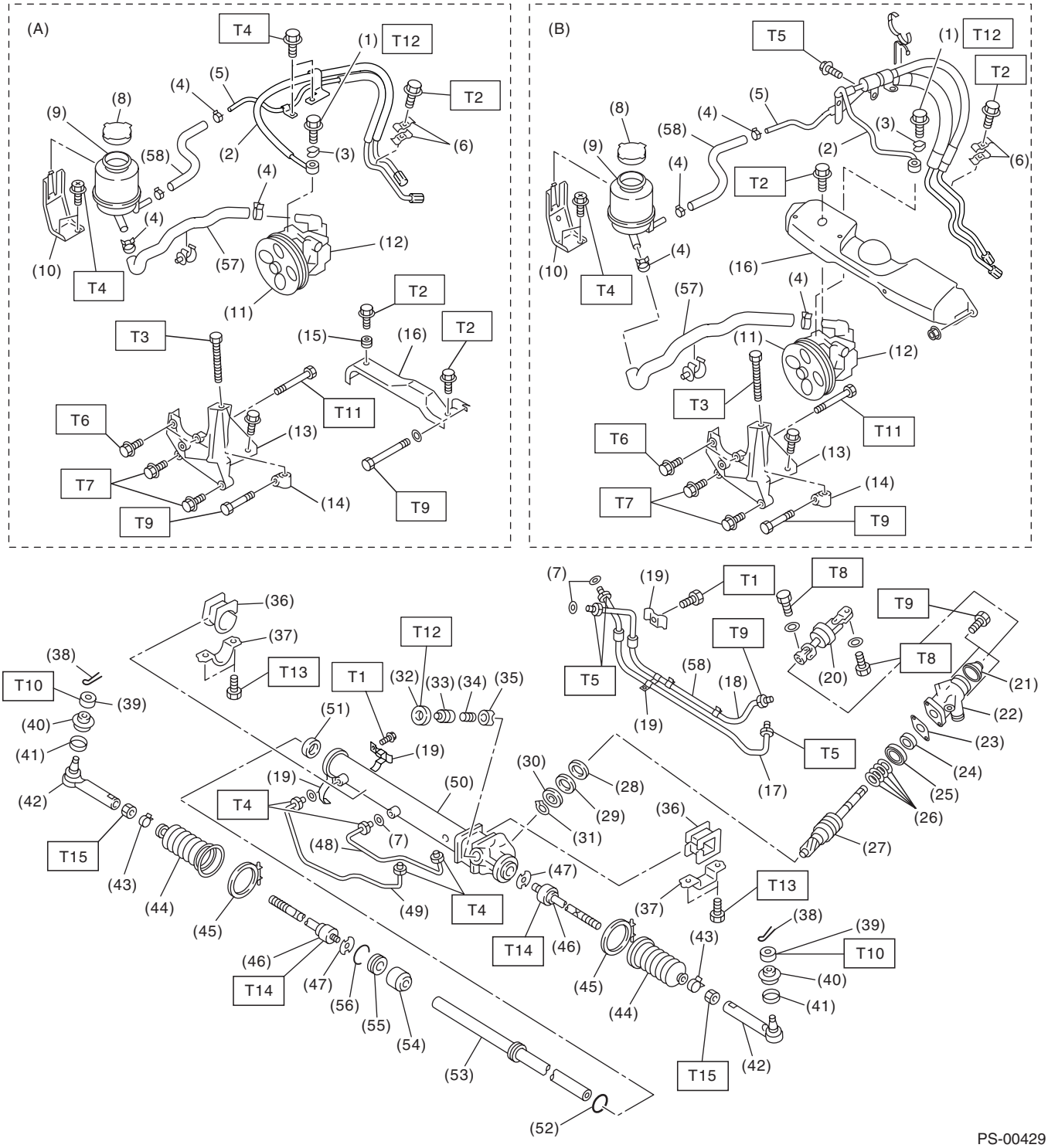
B: COMPONENT

1. STEERING WHEEL AND COLUMN



(1)	Bushing	(5)	Steering wheel	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Steering shaft	(6)	Airbag module	***T1: 1.2 (0.12, 0.9)***
(3)	Steering roll connector	(7)	Steering wheel lower cover	***T2: 25 (2.5, 18.1)***
(4)	Column cover			***T3: 45 (4.6, 33.2)***

2. POWER ASSISTED SYSTEM



(A) NON-TURBO MODEL
(B) TURBO MODEL

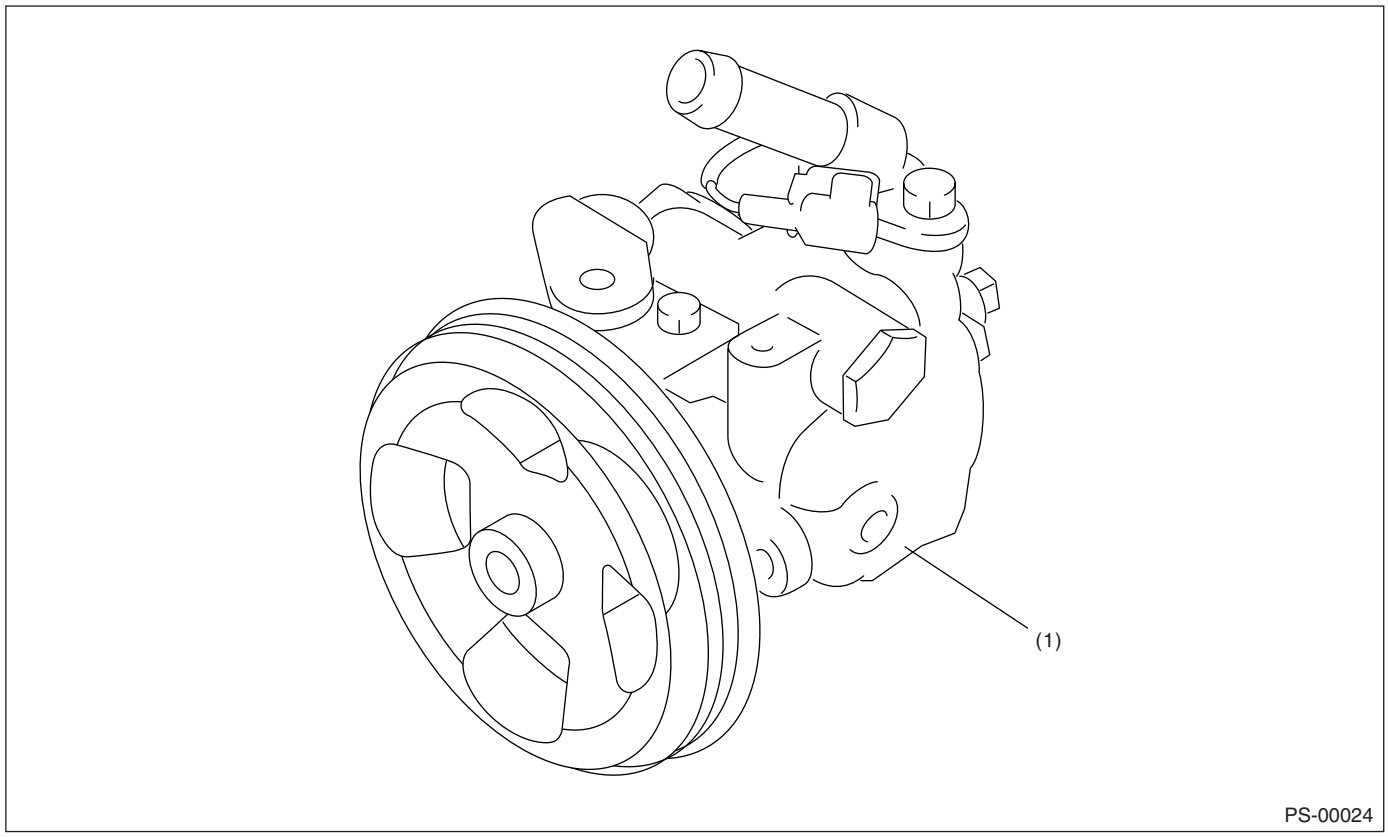
(1) Eye bolt
(2) Pipe C
(3) Gasket
(4) Clip
(5) Pipe D
(6) Clamp E
(7) O-ring
(8) Cap
(9) Reservoir tank
(10) Reservoir tank bracket
(11) Pulley
(12) Oil pump
(13) Bracket
(14) Belt tension nut
(15) Bush
(16) Belt cover
(17) Pipe E
(18) Pipe F
(19) Clamp plate
(20) Universal joint
(21) Dust seal
(22) Valve housing
(23) Gasket
(24) Oil seal
(25) Ball bearing
(26) Seal ring
(27) Pinion and valve ASSY
(28) Oil seal
(29) Back-up washer
(30) Ball bearing
(31) Snap ring
(32) Lock nut
(33) Adjusting screw
(34) Spring
(35) Sleeve
(36) Adapter
(37) Clamp
(38) Cotter pin
(39) Castle nut
(40) Dust cover
(41) Clip
(42) Tie-rod end
(43) Clip
(44) Boot
(45) Band
(46) Tie-rod
(47) Lock washer
(48) Pipe B
(49) Pipe A
(50) Steering body
(51) Oil seal
(52) Piston ring
(53) Rack
(54) Rack bushing
(55) Rack stopper
(56) Circlip
(57) Suction hose
(58) Hose

Tightening torque: N·m (kgf-m, ft-lb)

T1:	***6 (0.6, 4.3)***
T2:	***7.4 (0.75, 5.4)***
T3:	***8 (0.8, 5.8)***
T4:	***13 (1.3, 9.4)***
T5:	***15 (1.5, 10.8)***
T6:	***15.7 (1.6, 11.6)***
T7:	***22 (2.2, 15.9)***
T8:	***24 (2.4, 17.4)***
T9:	***25 (2.5, 18.1)***
T10:	***27 (2.75, 19.9)***
T11:	***37.3 (3.8, 27.5)***
T12:	***39 (4.0, 28.9)***
T13:	***59 (6.0, 43.4)***
T14:	***78 (8.0, 57.9)***
T15:	***83 (8.5, 61.5)***

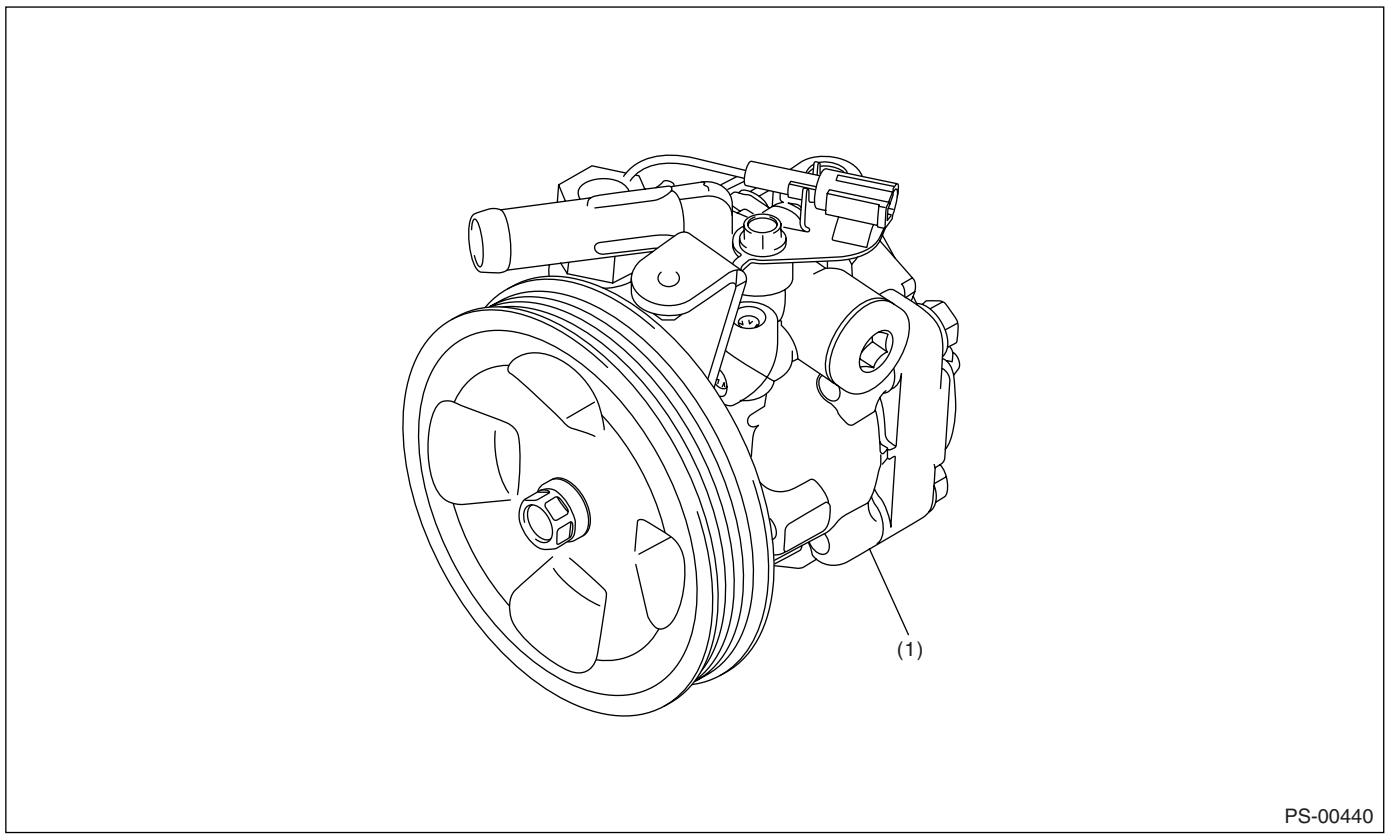
3. OIL PUMP

• EXCEPT DOHC TURBO MODEL



(1) Oil pump ASSY

• DOHC TURBO MODEL



(1) Oil pump ASSY

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use SUBARU genuine power steering fluid, grease etc. or the equivalent. Do not mix steering fluid, grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

D: PREPARATION TOOL

1. SPECIAL TOOLS

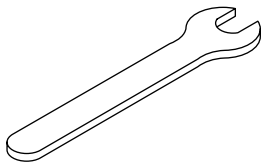
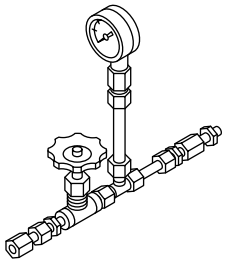
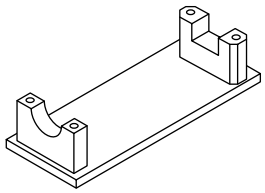
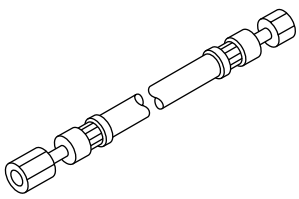
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925700000	925700000	WRENCH	• Used for removing and installing tie-rod. • Apply this tool to rack.
 ST-925711000	925711000	PRESSURE GAUGE	Used for measuring oil pump pressure.
 ST-926200000	926200000	STAND	Used when inspecting characteristic of gearbox assembly and disassembling it.
 ST34099AC010	34099AC010	ADAPTER HOSE A	Used with PRESSURE GAUGE (925711000).

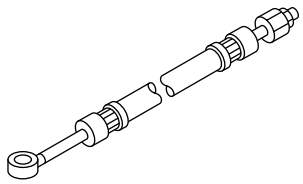
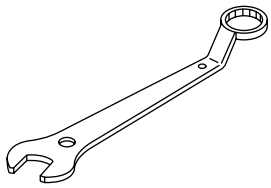
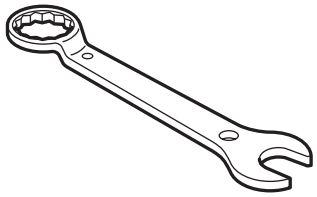
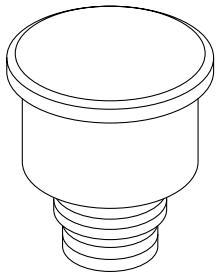
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34099AC020	34099AC020	ADAPTER HOSE B	Used with PRESSURE GAUGE (925711000).
 ST-926230000	926230000	SPANNER	For the lock nut when adjusting backlash of gear-box.
 ST34099PA100	34099PA100	SPANNER	Used for measuring the rotating resistance of gear-box assembly.
 ST34199AE040	34199AE040	OIL CHARGE GUIDE	Used for charging power steering fluid.

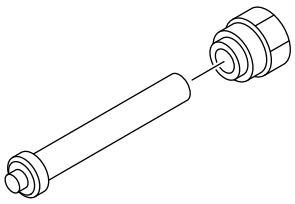
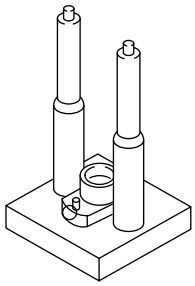
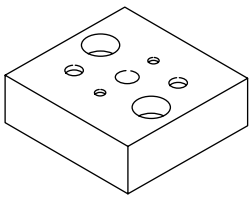
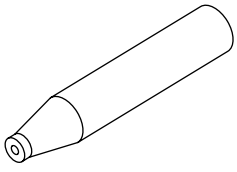
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926420000	926420000	PLUG	When oil leaks from pinion side of gearbox assembly, remove pipe B from valve housing, attach this tool and check oil leaking points.
 ST-926370000	926370000	INSTALLER A	• Used for installing valve assembly into valve housing assembly. • Used with STAND BASE (34099FA100).
 ST34099FA100	34099FA100	STAND BASE	Used for assembling power steering gearbox.
 ST-926390001	926390001	COVER & REMOVER ASSY	Used for assembling rack assembly.

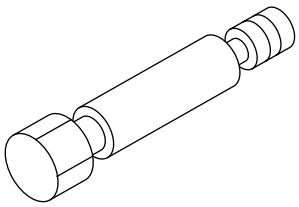
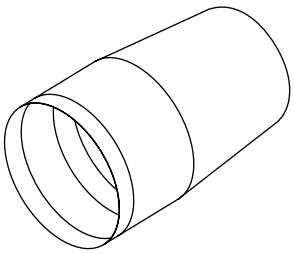
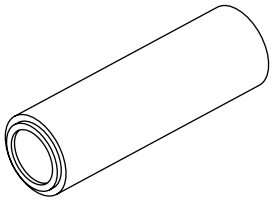
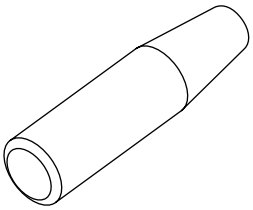
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926400000	926400000	GUIDE	• Right side of rack when installing rack bush. • Used with GUIDE (927660000).
 ST-927660000	927660000	GUIDE	• Right side of rack when installing rack bush. • Used with GUIDE (926400000).
 ST-927620000	927620000	INSTALLER B	• Used for installing oil seal of valve housing. • Used with INSTALLER A (926360000).
 ST-926360000	926360000	INSTALLER A	• Used as a guide to install oil seal. • Used with INSTALLER B (927620000).

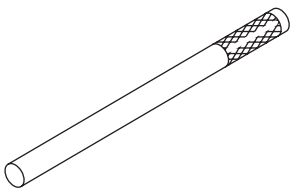
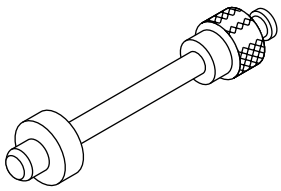
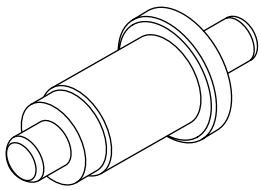
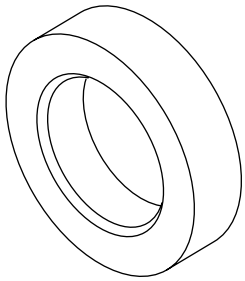
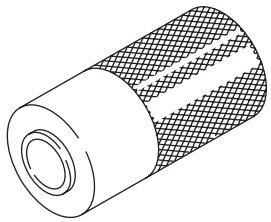
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AE050	34199AE050	OIL SEAL REMOVER	Used for removing oil seal.
 ST34099FA110	34099FA110	INSTALLER	Used for installing oil seal.
 ST34099FA120	34099FA120	INSTALLER AND REMOVER SEAL	• Used for installing valve housing oil seal. • Used with INSTALLER SEAL. (34099FA130) • Used for installing valve housing ball bearing. • Used for removing oil seal and ball bearing from valve housing.
 ST34099FA130	34099FA130	INSTALLER SEAL	• Used for installing valve housing oil seal. • Used with INSTALLER AND REMOVER SEAL (34099FA120).

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927640000	927640000	INSTALLER B	Used for ball bearing into housing.

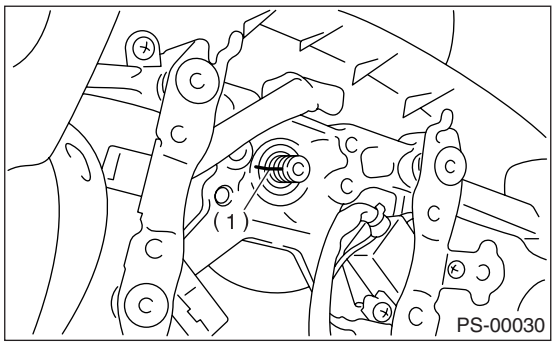
2. Steering Wheel

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Set the tires to straight-ahead position.
3) Remove the airbag module. <Ref. to AB-12, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to "Airbag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

4) Make matching marks on the steering wheel and steering shaft.



(1) Matching mark

5) Remove the steering wheel nut, and then draw out the steering wheel from shaft using steering puller.

B: INSTALLATION

WARNING:
Always refer to "Airbag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

1) Align the center of roll connector. <Ref. to AB-18, ADJUSTMENT, Roll Connector.>
2) Install in the reverse order of removal.

NOTE:
Align matching marks on the steering wheel and steering shaft.

Tightening torque:
45 N·m (4.6 kgf-m, 33.2 ft-lb)

Column cover-to-steering wheel clearance:
2 — 4 mm (0.08 — 0.16 in)

CAUTION:
Insert the roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage.

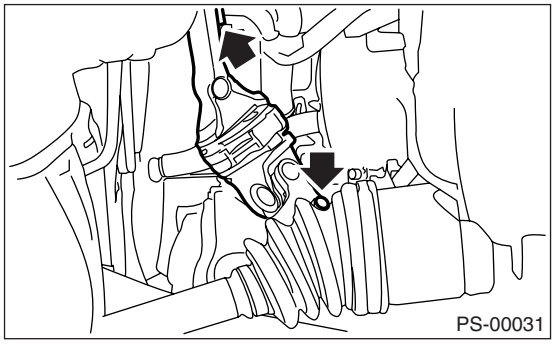
C: INSPECTION

1) Check the steering wheel for deformation. If the deformation is excessive, replace steering wheel.
2) Check the splines on steering wheel for damage. If the damage is excessive, replace steering wheel.

3. Universal Joint

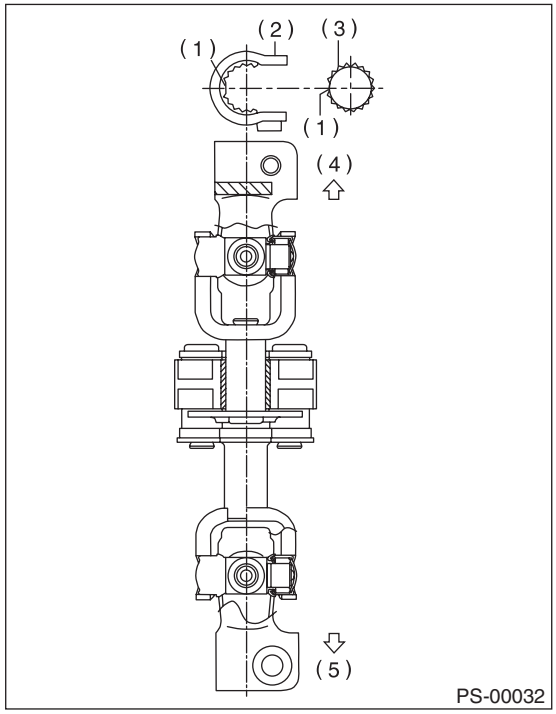
A: REMOVAL

1) Remove the steering wheel. <Ref. to PS-16, REMOVAL, Steering Wheel.>
2) Make matching mark on the universal joint.
3) Remove the universal joint bolts, and then remove the universal joint.



B: INSTALLATION

1) Align the cutout at serrated section of the column shaft and yoke, and then insert the universal joint into column shaft.



(1) Cutout
(2) Yoke
(3) Column shaft
(4) Column shaft side
(5) Gearbox side

2) Align the matching marks, and then insert the universal joint to serrated section of gear box assembly.
3) Tighten the bolt.

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

CAUTION:
Excessively large tightening torque of the universal joint bolts may lead to heavy steering wheel operation.

Standard clearance between gearbox to DOJ:
Over 14 mm (0.55 in)

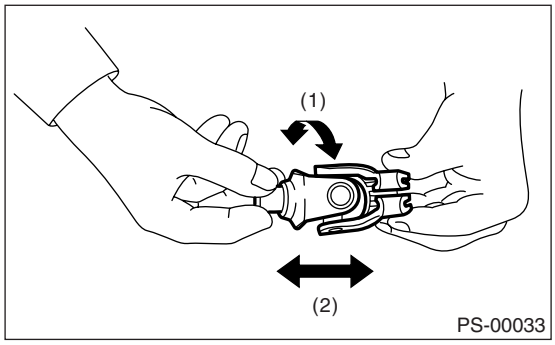
4) Align the center of roll connector. <Ref. to AB-18, ADJUSTMENT, Roll Connector.>
5) Install the steering wheel and airbag module. <Ref. to PS-16, INSTALLATION, Steering Wheel.>

WARNING:
Always refer to "Airbag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

C: INSPECTION

Check for wear, damage, or any other faults. If necessary, replace.

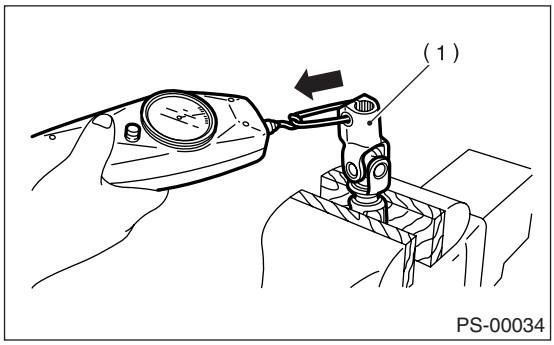
Service limit:
Universal joint play; 0 mm (0 in)
Maximum swing torque; 0.3 N (0.03 kgf, 0.07 lb)



(1) Swing torque
(2) Play

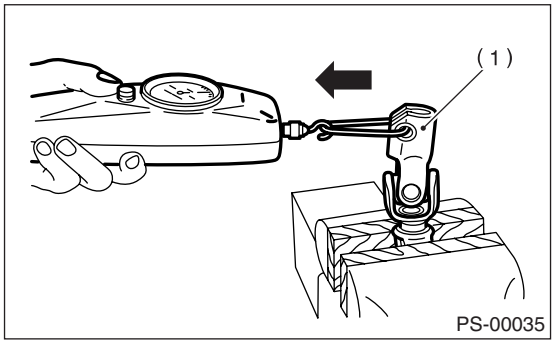
Measurement of folding torque of universal joint is as shown in the figures.

Service limit:
Maximum load; 3.8 N (0.39 kgf, 0.86 lb) or less



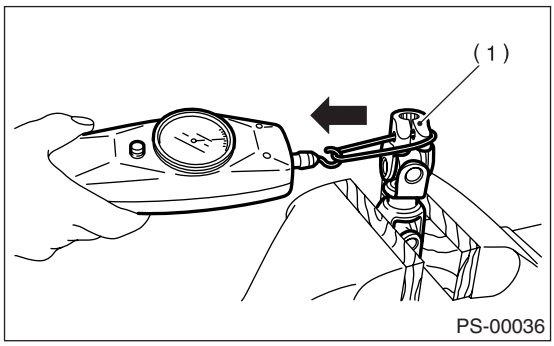
(1) Yoke (gearbox side)

Service limit:
Maximum load; 3.8 N (0.39 kgf, 0.86 lb) or less



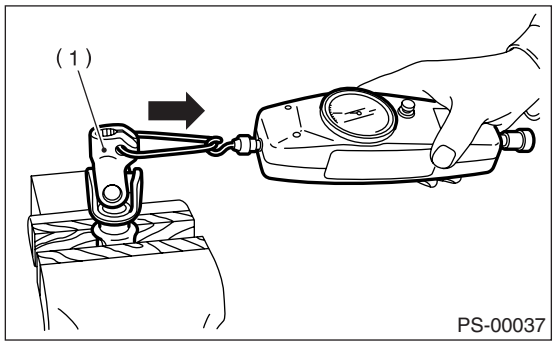
(1) Yoke (gearbox side)

Service limit:
Maximum load; 7.3 N (0.74 kgf, 1.64 lb) or less



(1) Yoke (Steering column side)

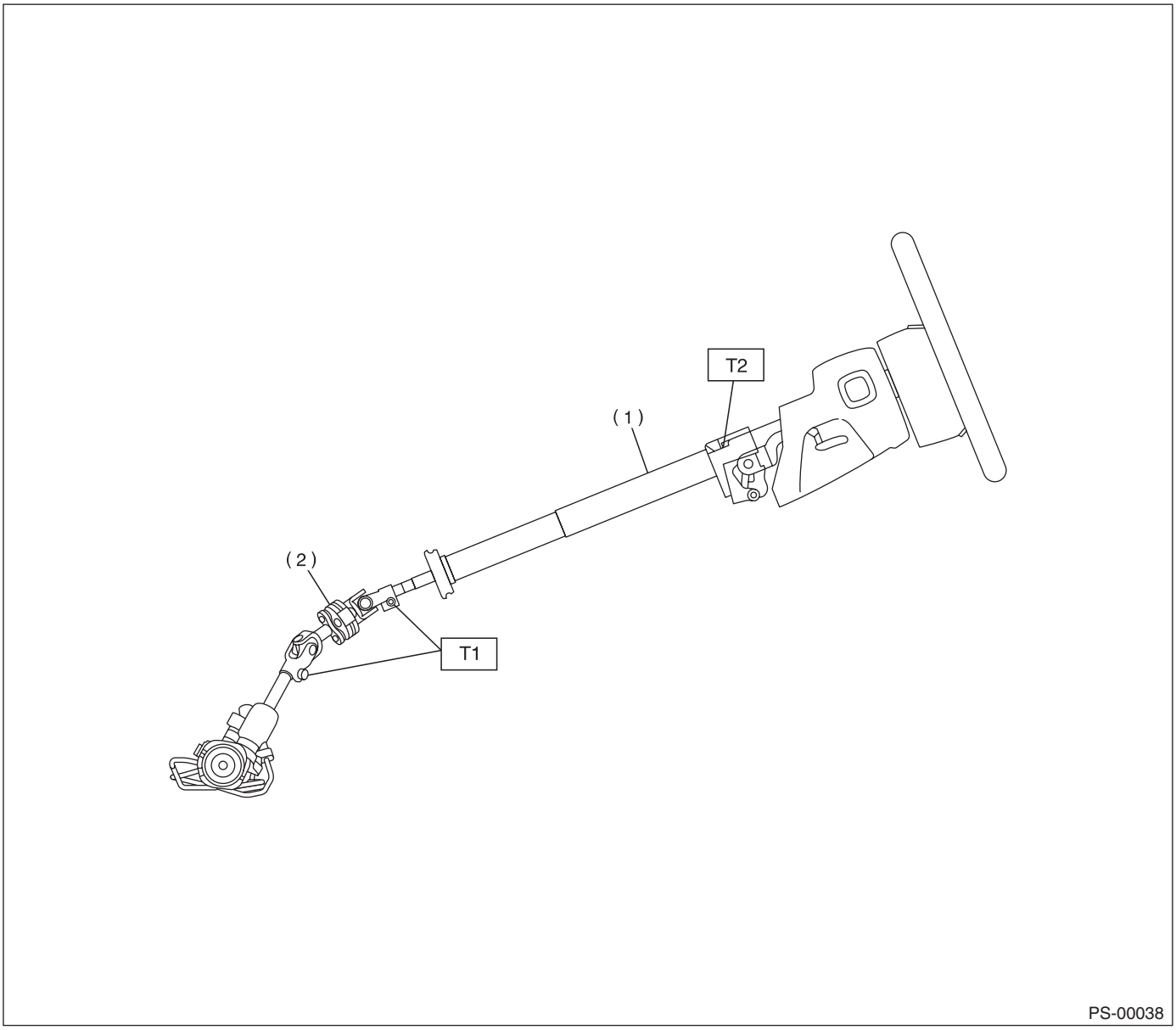
Service limit:
Maximum load; 7.3 N (0.74 kgf, 1.64 lb) or less



(1) Yoke (Steering column side)

4. Tilt Steering Column

A: REMOVAL



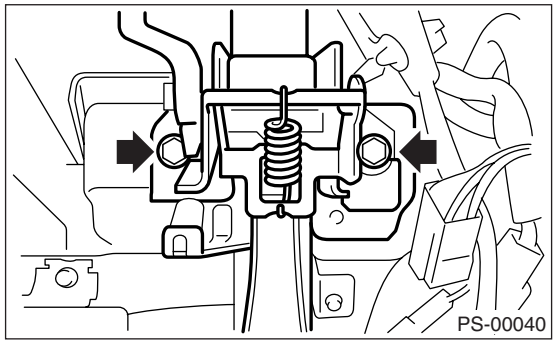
(1) Tilt steering column
(2) Universal joint

Tightening torque: N·m (kgf-m , ft-lb)
T1: 24 (2.4, 17.4)
T2: 25 (2.5, 18.1)

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Remove the airbag module. <Ref. to AB-12, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to "Airbag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

4) Remove the steering wheel. <Ref. to PS-16, REMOVAL, Steering Wheel.>
5) Remove the universal joint. <Ref. to PS-17, REMOVAL, Universal Joint.>
6) Remove the trim panel under instrument panel.
7) Remove the steering column lower cover.
8) Remove all connectors from steering column.
9) Remove the two bolts under instrument panel securing steering column.

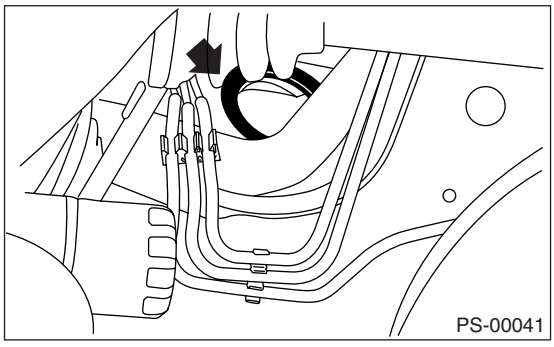

PS-00040

10) Pull out the steering shaft assembly from hole on toe board.

CAUTION:
• Be sure to remove the universal joint before removing the steering shaft assembly installing bolts when removing the steering shaft assembly or when lowering it for servicing of other parts.
• Do not loosen the tilt lever when the steering column is not secured to the vehicle.

B: INSTALLATION

1) Set the grommet to toe board.


PS-00041

2) Insert the end of steering shaft into toe board grommet.
3) With the tilt lever secured, tighten the steering shaft mounting bolts under instrument panel.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

4) Connect all connectors under instrument panel.
5) Connect the airbag system connector at harness spool.

NOTE:
Make sure to apply double lock.

6) Install the lower column cover with tilt lever held in the lowered position.
7) Install the universal joint. <Ref. to PS-17, INSTALLATION, Universal Joint.>
8) Align center of roll connector. <Ref. to AB-18, ADJUSTMENT, Roll Connector.>
9) Install the steering wheel. <Ref. to PS-16, INSTALLATION, Steering Wheel.>

CAUTION:
Insert the roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage.

10) Install the airbag module to steering wheel.

WARNING:
Always refer to "Airbag System" before performing the service operation. <Ref. to AB-3, CAUTION, General Description.>

C: DISASSEMBLY

Remove the two screws securing upper steering column covers, and two screws securing combination switch, and then remove the related parts.

D: ASSEMBLY

1) Insert the combination switch to upper column shaft, and then install the upper column cover. Then route the ignition key harness and combination switch harness between column cover mounting bosses.

Tightening torque:
1.2 N·m (0.12 kgf-m, 0.9 ft-lb)

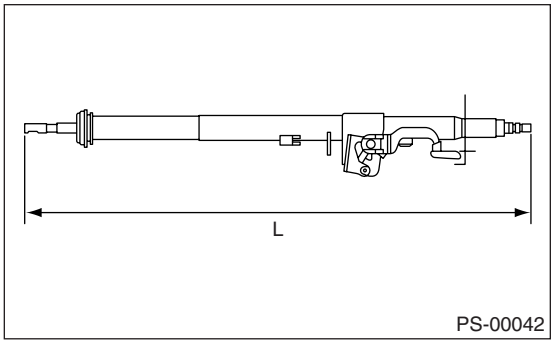
CAUTION:
Do not overtighten the screw.

E: INSPECTION

1. BASIC INSPECTION

Measure overall length of the steering column. If not as specified, replace.

Standard value:
Overall length L
Except STi model
825.7±1.5 mm (32.51±0.059 in)
STi model
818.7±1.5 mm (32.23±0.059 in)



2. AIRBAG MODEL INSPECTION

WARNING:
For airbag inspection procedures, refer to "Airbag System". <Ref. to AB-3, CAUTION, General Description.>

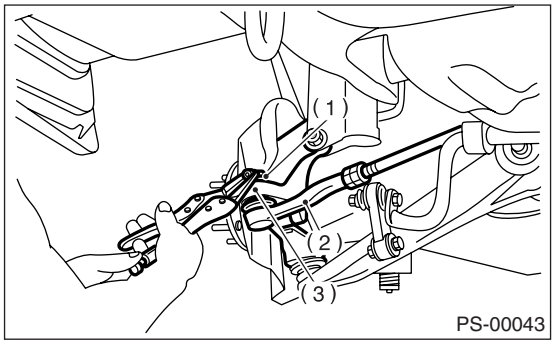
5. Steering Gearbox

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Loosen the front wheel nut.
4) Lift-up the vehicle, and then remove the front wheels.
5) Remove the under cover.
6) Remove the sub frame. <Ref. to FS-25, REMOVAL, Sub Frame.>
7) Remove the front exhaust pipe assembly. (Non-turbo model)
<Ref. to EX(H4SO)-4, REMOVAL, Front Exhaust Pipe.>

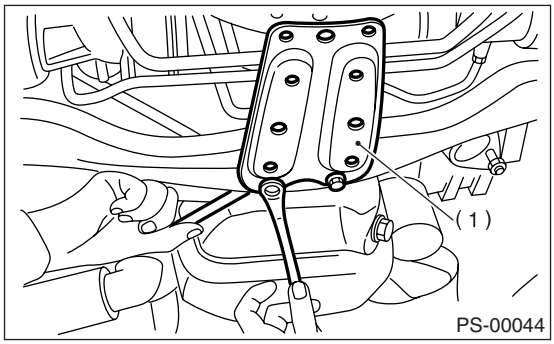
WARNING:
Be careful, the exhaust pipe is hot.

8) Using a puller, remove the tie-rod end from knuckle arm after pulling off cotter pin and removing castle nut.



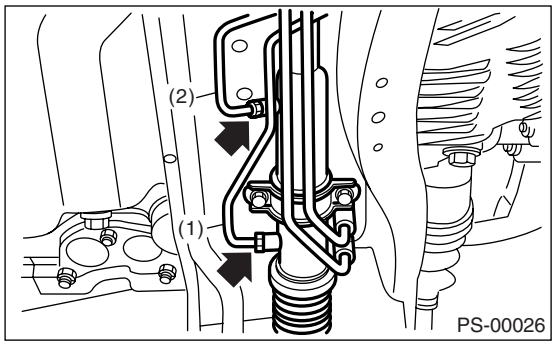
(1) Castle nut
(2) Tie-rod end
(3) Knuckle arm

9) Remove the jack-up plate and front stabilizer.



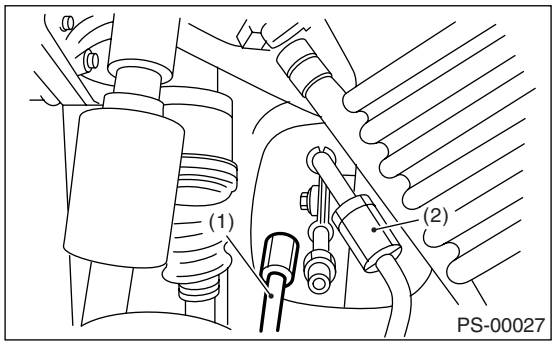
(1) Jack-up plate

10) Remove the one pipe joint at center of gearbox, and connect vinyl hose to pipe and joint. Discharge fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.



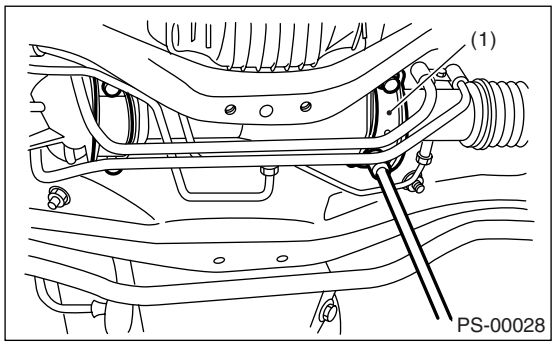
(1) Pipe A
(2) Pipe B

11) Remove the universal joint. <Ref. to PS-17, REMOVAL, Universal Joint.>
12) Disconnect the lower pipe C from gear box first, and upper pipe D second.



(1) Pipe C
(2) Pipe D

13) Remove the clamp bolts securing the gearbox to crossmember, and then remove the gearbox.



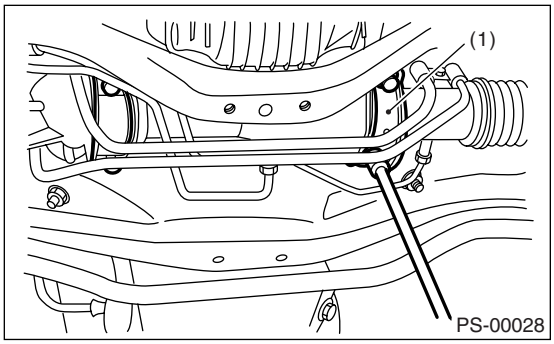
(1) Clamp

B: INSTALLATION

1) Insert the gearbox into crossmember, being careful not to damage the gearbox boot.

2) Tighten the gearbox to crossmember bracket via clamp with bolts to specified torque.

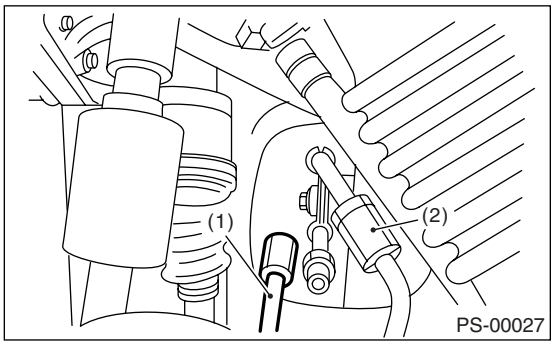
Tightening torque:
59 N·m (6.0 kgf-m, 43.4 ft-lb)



(1) Clamp

3) Connect the pipe D first to gear box, and pipe C second.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)



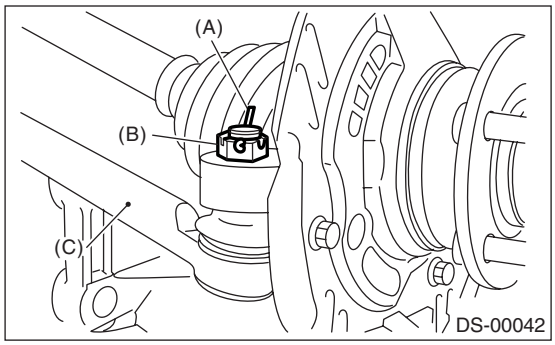
(1) Pipe C
(2) Pipe D

4) Install the universal joint. <Ref. to PS-17, INSTALLATION, Universal Joint.>
5) Connect the tie-rod end and knuckle arm, and tighten with castle nut.

Castle nut tightening torque:
27 N·m (2.75 kgf-m, 19.9 ft-lb)

CAUTION:
When connecting, do not hit the cap at bottom of tie-rod end with hammer.

6) After tightening the castle nut to specified torque, tighten it further within 60° until cotter pin hole is aligned with the slot in nut, and then bend the cotter pin to lock.



(A) Cotter pin
(B) Castle nut
(C) Tie-rod end

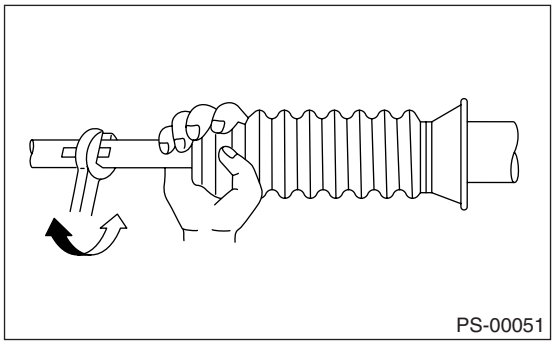
7) Install the front stabilizer to vehicle. <Ref. to FS-23, INSTALLATION, Front Stabilizer.>
8) Install the front exhaust pipe assembly.
9) Install the sub frame. <Ref. to FS-25, INSTALLATION, Sub Frame.>
10) Install the under cover. <Ref. to EI-22, INSTALLATION, Front Under Cover.>
11) Align the center of roll connector. <Ref. to AB-18, ADJUSTMENT, Roll Connector.>
12) Install the steering wheel. <Ref. to PS-16, INSTALLATION, Steering Wheel.>
13) Install the front wheels.
14) Tighten the wheel nuts to specified torque.

Tightening torque:
90 N·m (9.1 kgf-m, 65.8 ft-lb)

15) Connect the battery ground cable to battery.
16) Pour fluid into the oil tank, and bleed air.
<Ref. to PS-52, Power Steering Fluid.>
17) Check for fluid leaks.
18) Install the jack-up plate.
19) Lower the vehicle.
20) Check the fluid level in oil tank.
21) After adjusting the toe-in and steering angle, tighten the lock nut on tie-rod end.

Tightening torque:
83 N·m (8.5 kgf-m, 61.5 ft-lb)

NOTE:
When adjusting the toe-in, hold boot as shown to prevent it from being rotated or twisted. If twisted, straighten it.



C: DISASSEMBLY

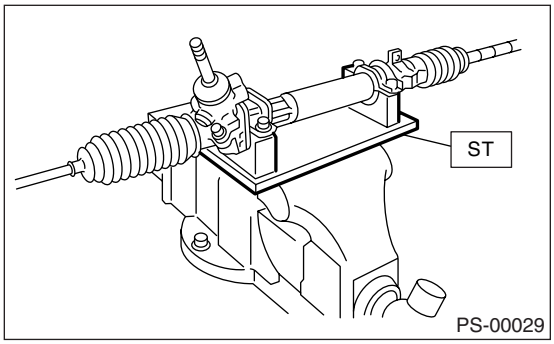
1. RACK HOUSING ASSEMBLY

1) Disconnect the four pipes from gearbox.

NOTE:
Remove the pipes E and F as a single unit being fixed at clamp plate.

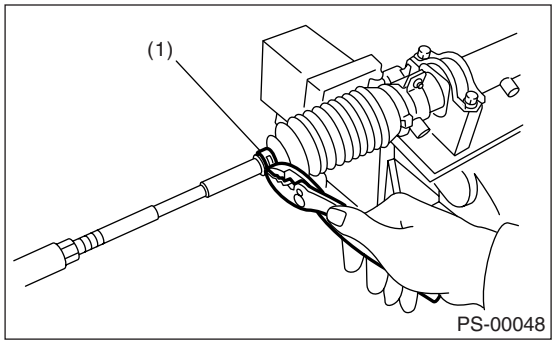
2) Secure the gearbox removed from vehicle in vice using ST.
ST 926200000 STAND

CAUTION:
Secure the gearbox in a vise using ST as shown. Do not attempt to secure it without this ST.



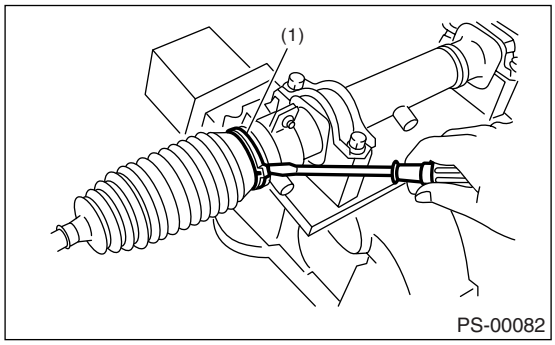
3) Remove the tie-rod end and lock nut from gearbox.

4) Remove the small clip from boot using pliers, and then move the boot to tie-rod end side.



(1) Clip

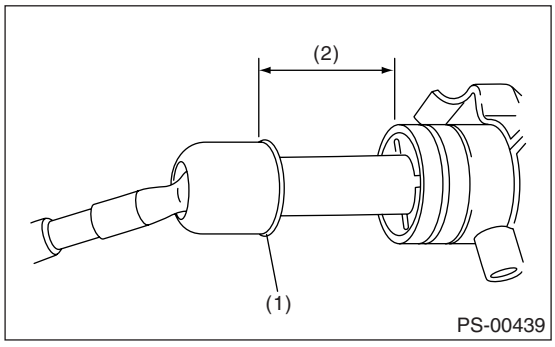
5) Using a flat tip screwdriver, remove the band from boot.



(1) Band

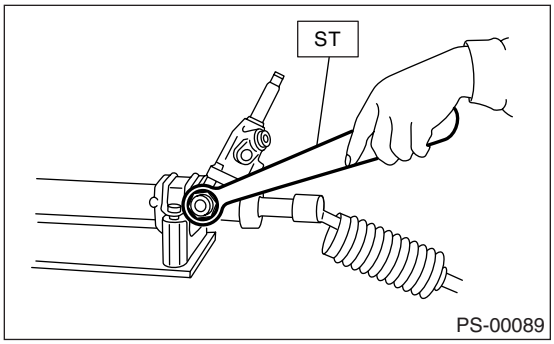
6) Extend the rack approx. 40 mm (1.57 in) out. Unlock the lock washer on both side of tie-rod end using a flat tip screwdriver.

CAUTION:
Be careful not to scratch the rack surface as oil leaks may result.

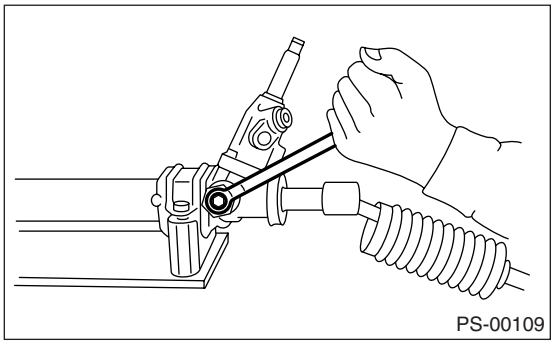


(1) Lock washer
(2) Approx. 40 mm (1.57 in)

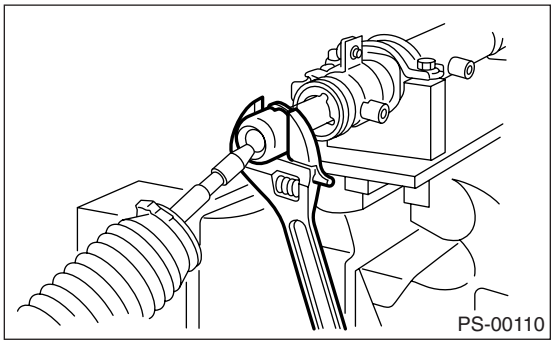
7) Using the ST, loosen the lock nut.
ST 926230000 SPANNER



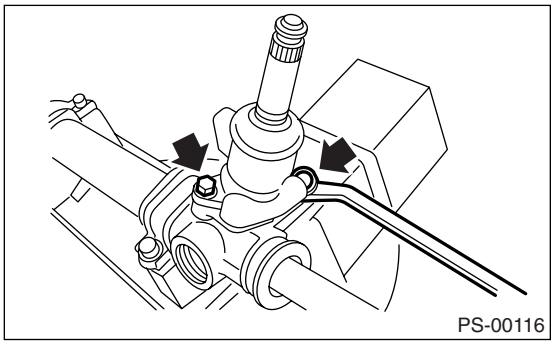
8) Tighten the adjusting screw until it no longer tightens.



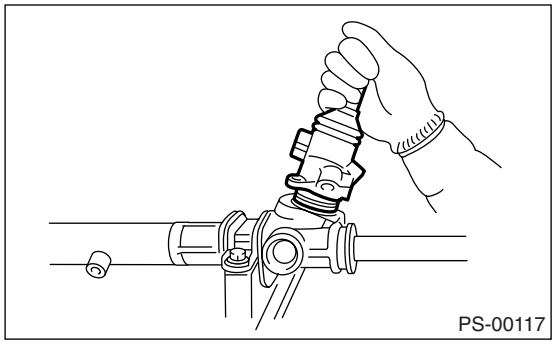
9) Using a wrench [32 mm (1.26 in) width across flats] or adjustable wrench, remove the tie-rod.



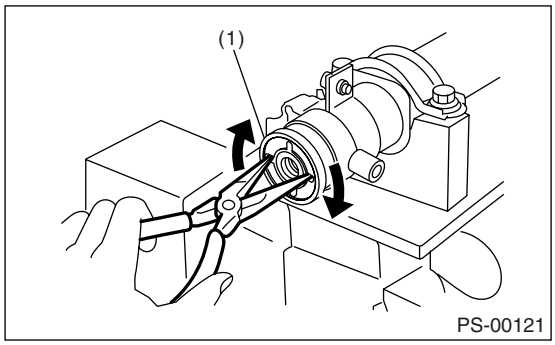
10) Loosen the adjusting screw, and then remove the spring and sleeve.
11) Remove the two bolts securing valve assembly.



12) Carefully draw out the input shaft, and then remove the valve assembly.



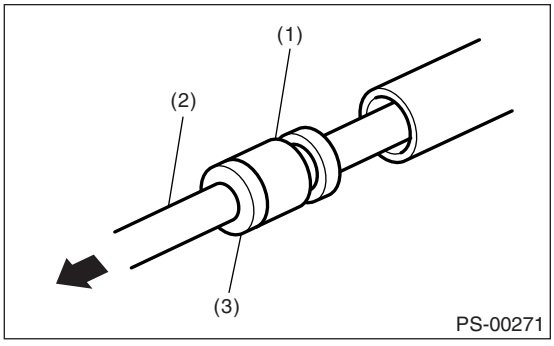
13) Using a sharp pointed pliers, rotate the rack stopper in direction of the arrow until end of the circlip comes out of stopper. Rotate the circlip in opposite direction and pull it out.



(1) Rack stopper

14) Pull the rack assembly from cylinder side, and draw out the rack bushing and rack stopper together with the rack assembly.

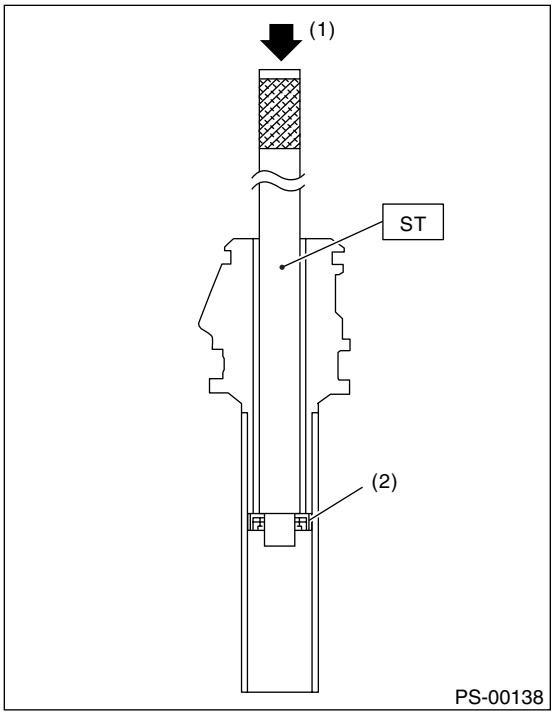
CAUTION:
Be careful not to contact the rack to inner wall of cylinder when drawing out. Any scratch on the cylinder inner wall will cause oil leakage.



(1) Rack bushing
(2) Rack assembly
(3) Rack stopper

15) Remove the rack bushing and rack stopper from rack assembly.
16) Remove the oil seal from rack.

17) Insert the ST from pinion housing side, and then remove the oil seal using a press.
ST 34199AE050 REMOVER



(1) Press
(2) Oil seal

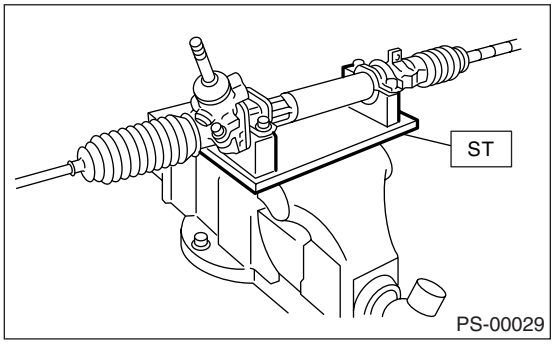
2. CONTROL VALVE

1) Disconnect the four pipes from gearbox.

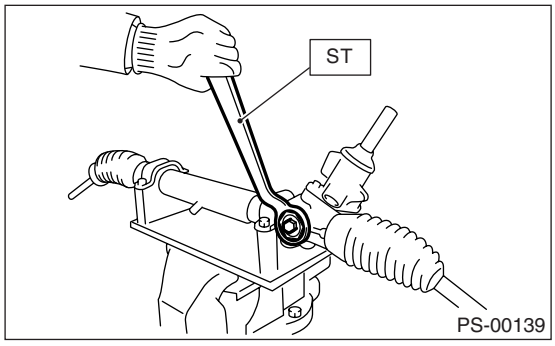
NOTE:
Remove the pipes E and F as a single unit being fixed at clamp plate.

2) Secure the gearbox removed from the vehicle in vise using ST.
ST 926200000 STAND

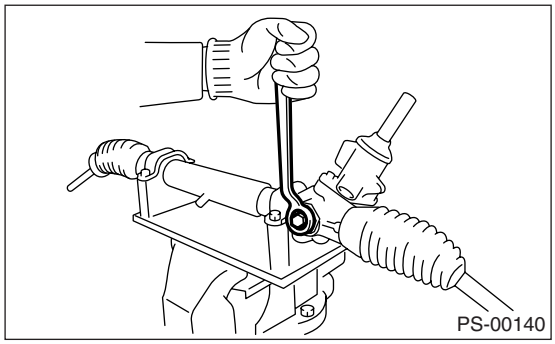
CAUTION:
Secure the gearbox in a vise using ST as shown. Do not attempt to secure it without this ST.



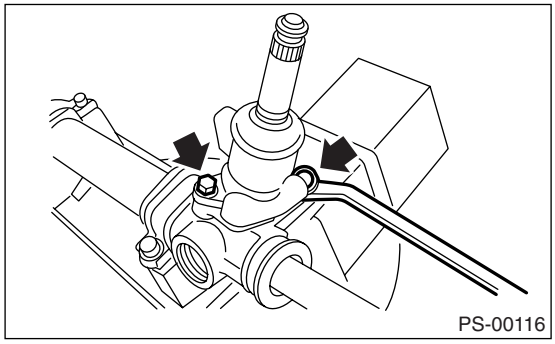
3) Using the ST, loosen the lock nut.
ST 926230000 SPANNER



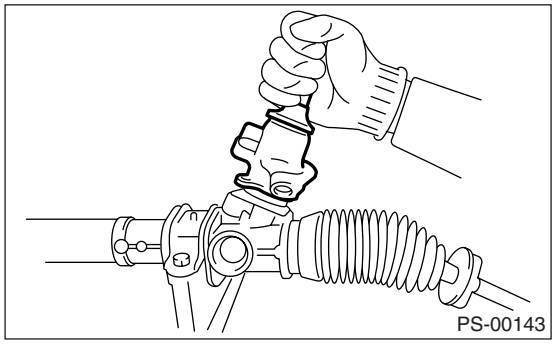
4) Tighten the adjusting screw until it no longer tightens.



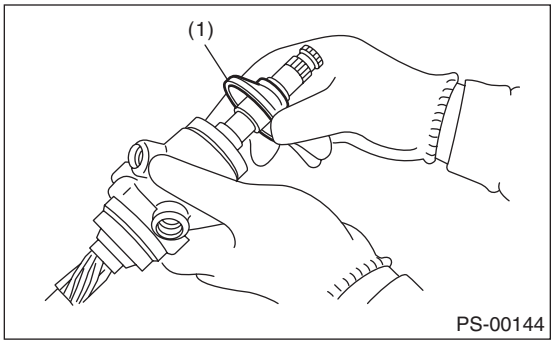
5) Loosen the adjusting screw, and then remove the spring and sleeve.
6) Remove the two bolts securing valve assembly.



7) Carefully draw out the input shaft, and then remove the valve assembly.

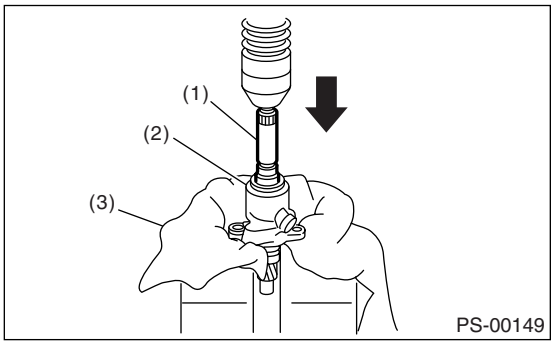


8) Slide the dust cover out.



(1) Dust cover

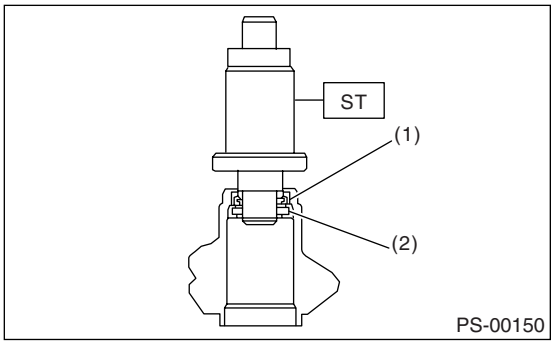
9) Using a press remove the pinion and valve assembly from valve housing.



(1) Valve assembly
(2) Valve housing
(3) Cloth

10) Using the ST and press, remove the dust seal, oil seal and special bearing from valve housing.
ST 34099FA120 INSTALLER & REMOVER SEAL

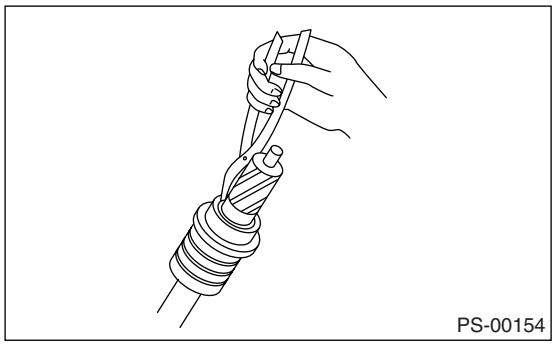
CAUTION:
• Do not apply force to the end surface of valve housing.
• Do not reuse the oil seal after removal.



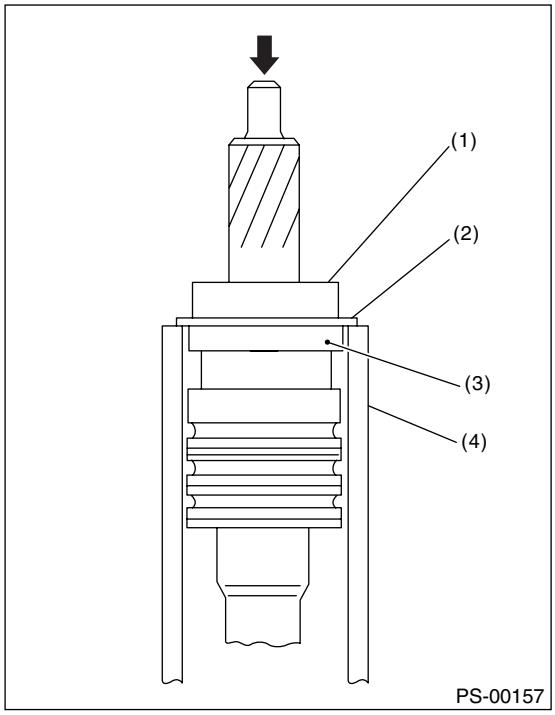
(1) Oil seal
(2) Special bearing

11) Remove the snap ring using snap ring pliers.

CAUTION:
Be careful not to scratch the pinion and valve assembly.



12) Press out the bearing together with the back up washer using pipe of I.D. 38.5 to 39.5 mm (1.516 to 1.555 in) and press.



(1) Bearing
(2) Backing washer
(3) Oil seal
(4) Pipe

13) Remove the oil seal.

D: ASSEMBLY

1. RACK HOUSING ASSEMBLY

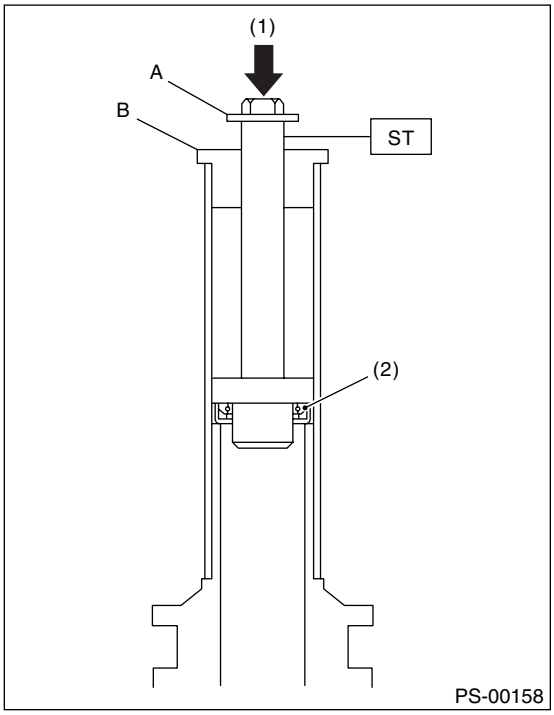
CAUTION:
Use only SUBARU genuine grease for the gearbox.

Specified grease for gearbox:
VALIANT GREASE M2 (Part No. 003608001)

1) Apply power steering fluid to a new oil seal.

2) Install the oil seal in correct position as shown in the figure. Push the oil seal using a press until portion A of ST contacts face of B.
ST 34099FA110 INSTALLER

CAUTION:
Be careful not to damage or scratch the cylinder inner wall.



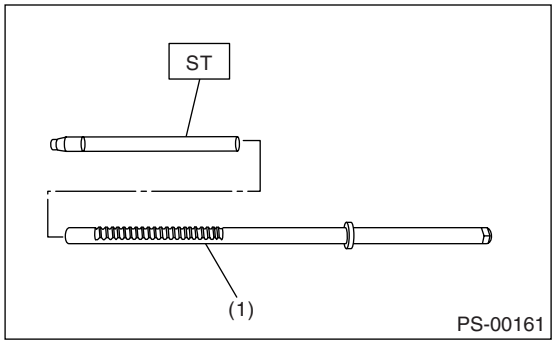
(1) Press
(2) Oil seal

3) Fix the rack housing in vise using ST.
ST 926200000 STAND

NOTE:
• When fixing the rack housing in vise, be sure to use this special tool. Do not fix rack housing in vise using pad such as aluminum plates, etc.
• When using the old rack housing, be sure to clean and remove rust before assembling. Check pinion housing bushing carefully.

4) Fit the ST over toothed portion of rack assembly, and check for binding or irregular insertion. If any deformation is noted on flats at the end of rack, shape by using file, and wash with cleaning fluid.

ST 926390001 COVER & REMOVER



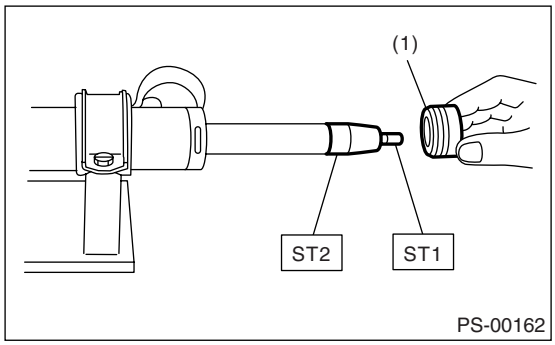
(1) Rack assembly

5) Apply genuine grease to the teeth of thoroughly washed rack assembly, and then fit the ST over the toothed portion.

CAUTION:
• Be careful not to block the air passage with grease. Remove excessive grease.
• After fitting cover, check the air passage hole for clogging. If clogged, open by removing grease from the hole.

6) Before inserting the rack assembly, apply a coat of specified power steering fluid to the surfaces of ST and rack piston.
7) Insert the rack assembly into rack housing from cylinder side, and then remove the ST after it has passed completely through oil seal.
8) Fit the ST1 and ST2 over the end of rack, and then install a new rack bushing.
ST1 926400000 GUIDE
ST2 927660000 GUIDE

CAUTION:
• If burrs or nicks are found on this guide and rack shaft portion, remove by filing.
• Dip the rack bushing in specified power steering fluid before installing, and pay attention not to damage O-ring and oil seal.

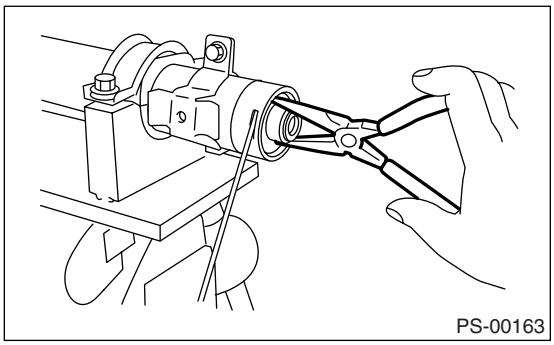


(1) Rack bushing assembly

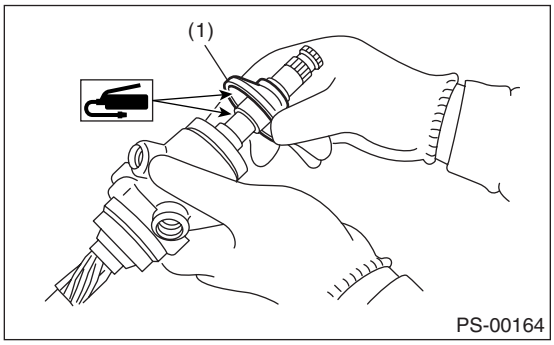
9) Insert the rack stopper into the cylinder tube until internal groove (on cylinder side) is aligned with external groove (on rack stopper). Turn the rack stopper with ST so that the rack stopper hole is seen through cylinder slits.
10) Insert the rack stopper into the rack housing, and then wrap a new circlip using a sharp pointed pliers to secure the rack stopper in position.

CAUTION:
Be careful not to scratch the rack while winding circlip.

NOTE:
Rotate the wrench another 90 to 180° after end of circlip has been wrapped in.


PS-00163

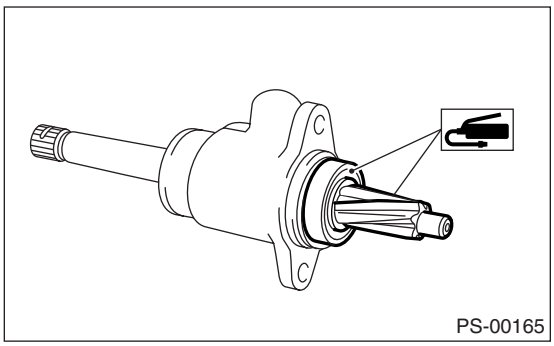
11) Apply genuine grease to dust cover, and then install the dust cover to valve assembly.



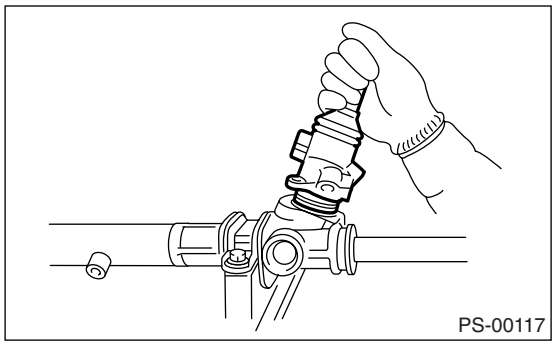
PS-00164

(1) Dust cover

12) Apply genuine grease to the pinion gear and bearing of valve assembly.


PS-00165

13) Install a new gasket on valve assembly. Insert the valve assembly into place while facing rack teeth toward pinion.


PS-00117

14) Tighten the bolts alternately to secure valve assembly.

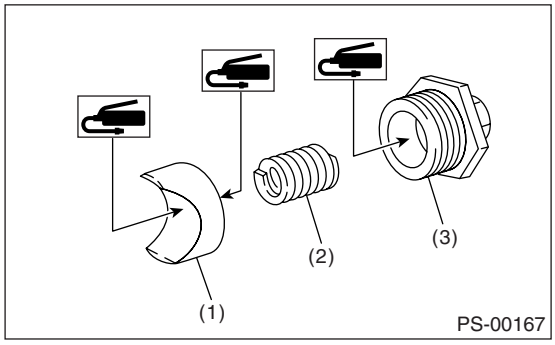
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

CAUTION:
Be sure to alternately tighten the bolts.

15) Temporarily install the rack, and then operate it from lock to lock two or three times to make it fit in. Remove the grease blocking air vent hole.

CAUTION:
If operating the rack from lock to lock without installing tie-rod, it may damage the oil seal. Always install the tie-rods LH and RH.

16) Apply a coat of grease to the sliding surface of sleeve and seating surface of spring, and then insert sleeve into steering body.
Charge the adjusting screw with grease, and then insert the spring into adjusting screw and install on steering body.



PS-00167

(1) Sleeve
(2) Spring
(3) Adjusting screw

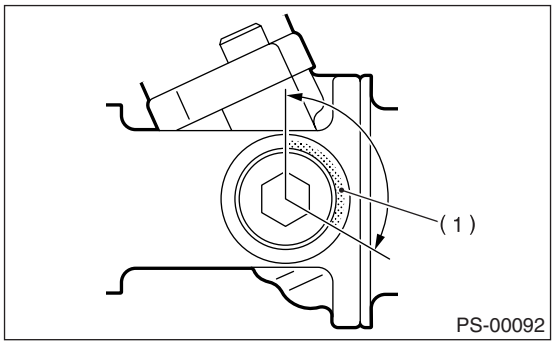
17) Tighten the adjusting screw to specified torque.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

18) After tightening to the specified tightening torque, loosen it by 25°.
19) Remove the tie-rod.

20) Verify that play is within specified value. <Ref. to PS-36, SERVICE LIMIT, INSPECTION, Steering Gearbox.>
21) Loosen the adjusting screw, and then apply liquid gasket to at least 1/3 of the entire perimeter of adjusting screw thread.

Liquid gasket:
THREE BOND 1141



(1) Apply liquid gasket to at least 1/3 of entire perimeter.

22) Tighten the adjusting screw to specified torque.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

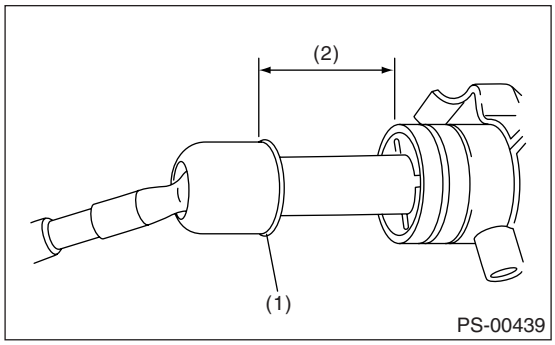
23) After tightening to the specified tightening torque, loosen it by 25°.
24) Install the lock nut. While holding the adjusting screw with a wrench, tighten lock nut using ST.
ST 926230000 SPANNER

Tightening torque (Lock nut):
39 N·m (4.0 kgf-m, 28.9 ft-lb)

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

25) Extend the rack approx. 40 mm (1.57 in) beyond side of steering body.
26) Install the tie-rod and a new lock washer into rack.

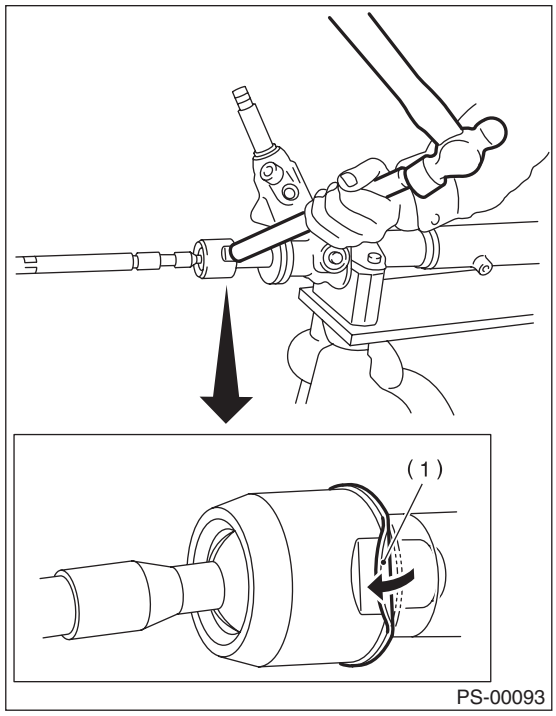
Tightening torque:
78 N·m (8.0 kgf-m, 57.9 ft-lb)



(1) Lock washer
(2) Approx. 40 mm (1.57 in)

27) Bend the lock washer.

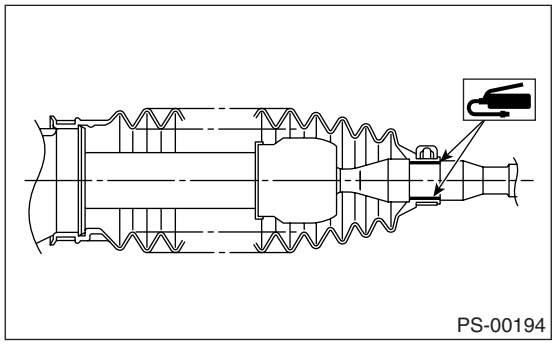
CAUTION:
Be careful not to scratch the rack when bending lock washer.



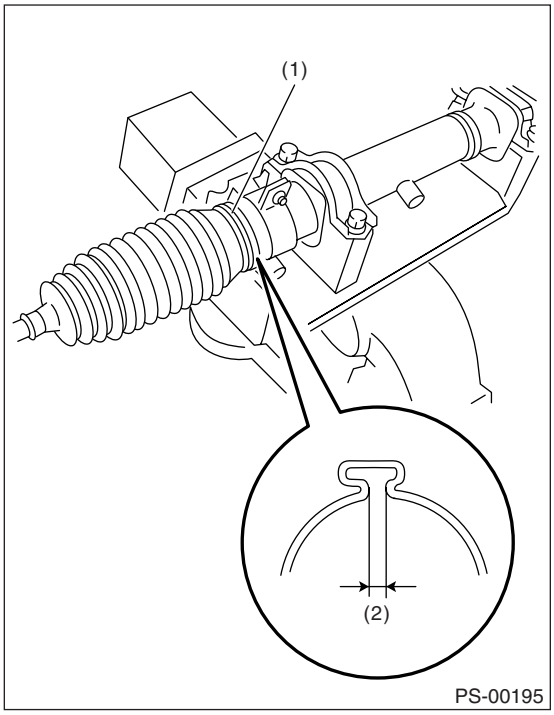
(1) Lock washer

28) Apply a coat of grease to the tie-rod groove, and then install the boot to housing.

NOTE:
Make sure that the boot is installed without unusual inflation or deflation.

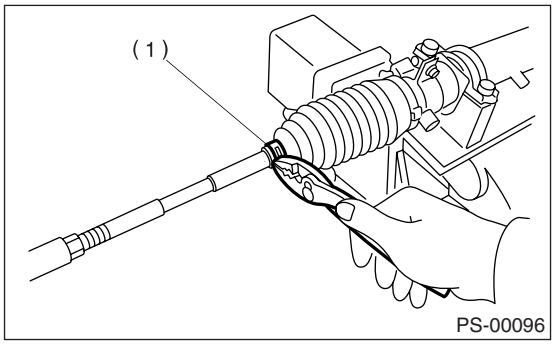


29) Install a new boot band. Using band clamp pliers, caulk the boot band until caulking part clearance is 2 mm (0.079 in) or less.



(1) Boot band
(2) 2 mm (0.079 in) or less

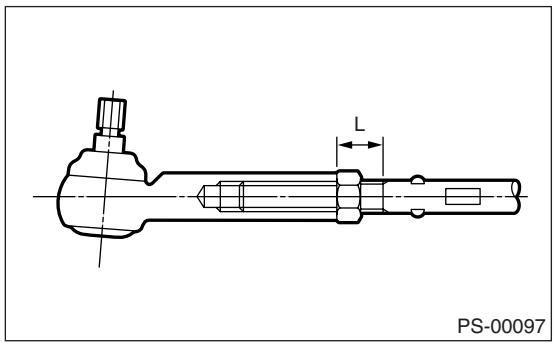
30) Fix the boot end with clip (small).



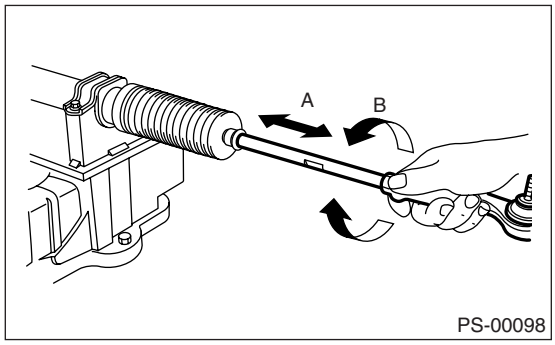
(1) Clip

31) After installing, check the boot end is positioned into groove on tie-rod.
32) If the tie-rod end was removed, screw in the lock nut and tie-rod end to screwed portion of tie-rod, and then tighten the lock nut temporarily in a position as shown in the figure.

Installed tie-rod length: L
Sedan:
25 mm (0.98 in)
Wagon:
15 mm (0.59 in)



33) Inspect the gearbox as follows:
"A" Holding the tie-rod end, repeat lock to lock two or three times as quickly as possible.
"B" Holding the tie-rod end, turn it slowly at a radius one or two times as large as possible.
After all, make sure that the boot is installed in specified position without deflation.



34) Remove the gearbox from ST.
ST 926200000 STAND
35) Install the four pipes on gearbox.
(1) Connect the pipe A and B to four pipe joints of gearbox.

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

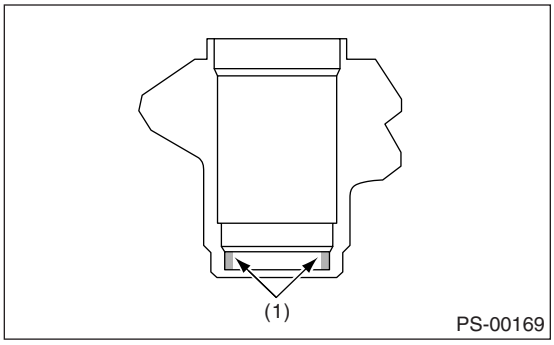
(2) Connect the pipe E and F to gearbox.

Tightening torque:
Pipe E: 15 N·m (1.5 kgf-m, 10.8 ft-lb)
Pipe F: 25 N·m (2.5 kgf-m, 18.1 ft-lb)

2. CONTROL VALVE ASSEMBLY

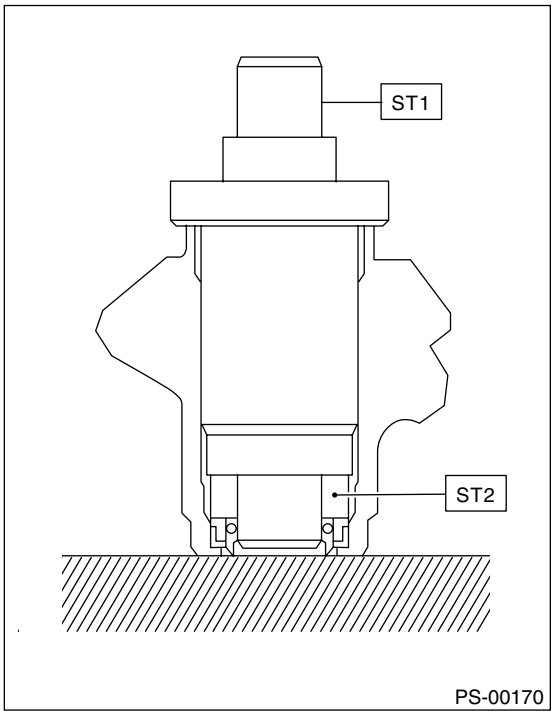
Specified steering grease:
VALIANT GREASE M2 (Part No. 003608001)

1) Clean all parts and tools before reassembling.
2) Apply a coat of specified power steering fluid to the inner wall of valve housing.

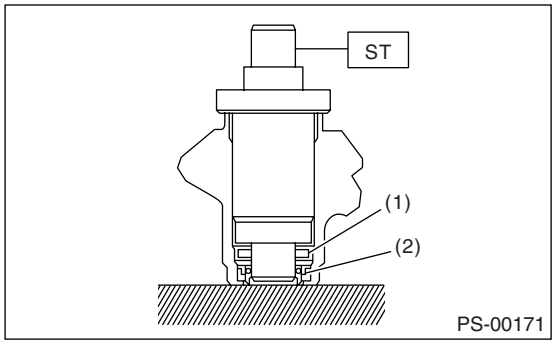


(1) Apply fluid.

3) Attach the ST2 to ST1.
ST1 34099FA120 INSTALLER & REMOVER SEAL
ST2 34099FA130 INSTALLER SEAL
4) To avoid scratching the oil seal, apply a coat of grease to the contact surface of installer and oil seal.
5) Verify the oil seal direction.
Attach the oil seal to installer and position in valve housing before pressing into place.
6) Press the oil seal into place using a press.

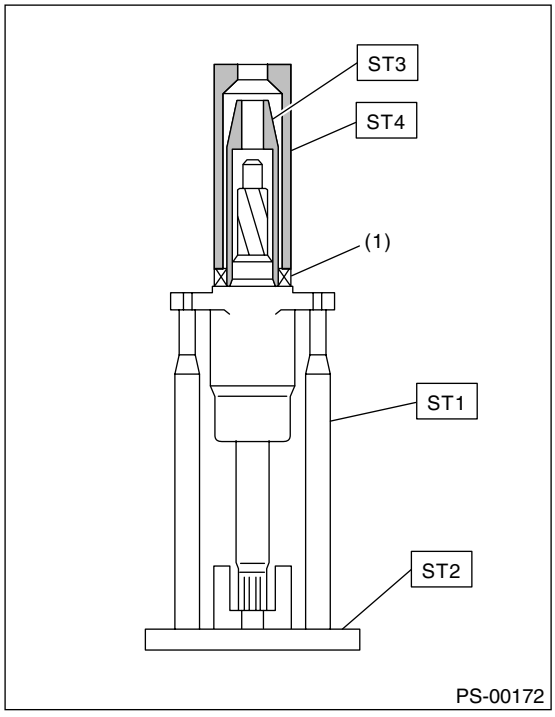


7) Attach the bearing to ST, and then position in value housing. Using the ST and press, install the special bearing in valve housing.
ST 34099FA120 INSTALLER & REMOVER SEAL



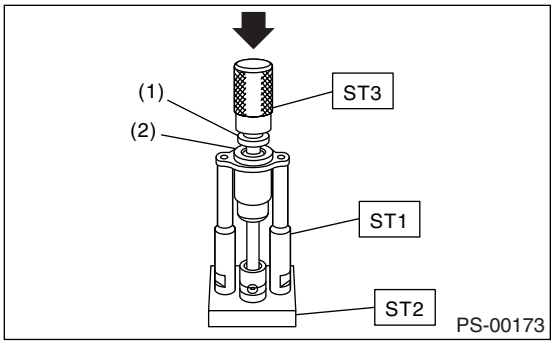
(1) Special bearing
(2) Oil seal

8) Put vinyl tape around the pinion shaft splines to protect oil seal from damage.
9) Fit the pinion and valve assembly into valve housing.
10) Secure the valve assembly to ST1 and ST2.
ST1 926370000 INSTALLER A
ST2 34099FA100 STAND BASE
11) Apply specified power steering fluid to oil seal and ST3.
12) Install the ST3 to pinion, and then insert the oil seal. Press the oil seal using a press until ST4 contacts face end of valve housing.
ST3 926360000 INSTALLER A
ST4 927620000 INSTALLER B



(1) Oil seal

13) Remove the ST3, and then fit the back-up washer.
14) Force-fit the ball bearing using ST3.
ST1 926370000 INSTALLER A
ST2 34099FA100 STAND BASE
ST3 927640000 INSTALLER B



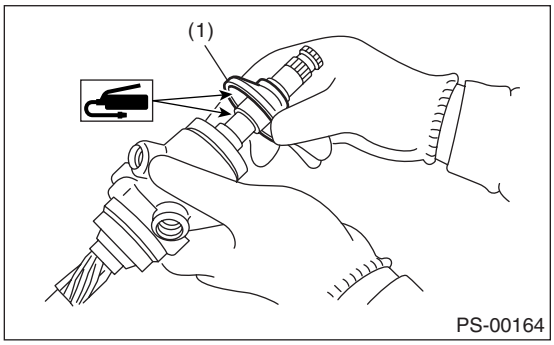
(1) Ball bearing
(2) Back-up washer

NOTE:
Be careful not to tilt the ball bearing during installation.

15) Install the snap ring using snap ring pliers.

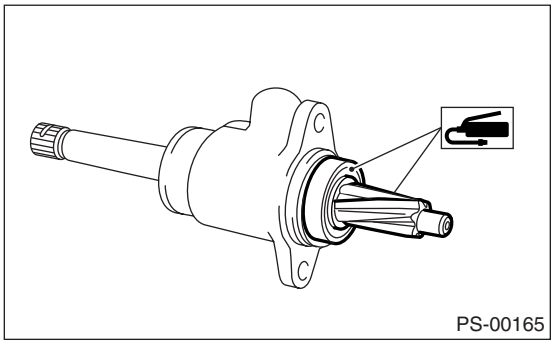
NOTE:
Rotate the snap ring to check for proper installation.

16) Apply the specified grease to dust cover.
17) Install the dust cover on valve assembly.

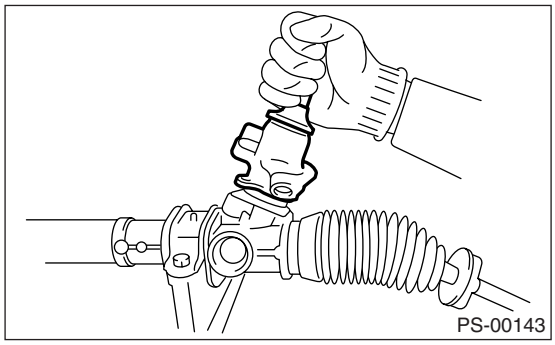


(1) Dust cover

18) Apply genuine grease to the pinion gear and bearing of valve assembly.



19) Install a new gasket on valve assembly. Insert the valve assembly into place while facing rack teeth toward pinion.

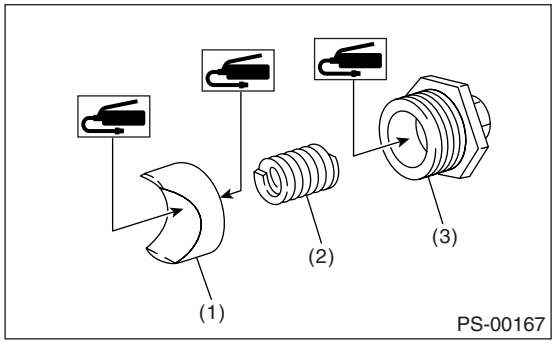


20) Tighten the bolts alternately to secure valve assembly.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

CAUTION:
Be sure to alternately tighten the bolts.

21) Apply a coat of grease to the sliding surface of sleeve and seating surface of spring, and then insert sleeve into steering body.
Charge the adjusting screw with grease, and then insert the spring into adjusting screw and install on steering body.



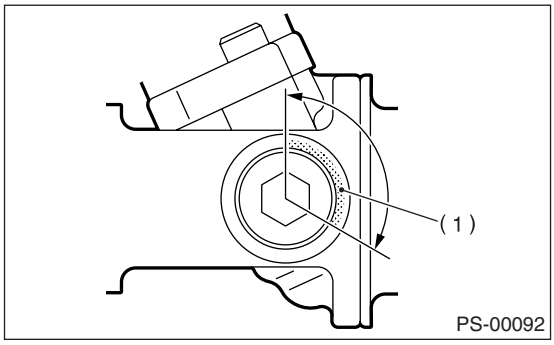
(1) Sleeve
(2) Spring
(3) Adjusting screw

22) Tighten the adjusting screw to specified torque.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

23) After tightening to the specified tightening torque, loosen it by 25°.
24) Verify that play is within specified value. <Ref. to PS-36, SERVICE LIMIT, INSPECTION, Steering Gearbox.>
25) Loosen the adjusting screw, and then apply liquid gasket to at least 1/3 of the entire perimeter of adjusting screw thread.

Liquid gasket:
THREE BOND 1141



(1) Apply liquid gasket to at least 1/3 of entire perimeter.

26) Tighten the adjusting screw to specified torque.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

27) After tightening to the specified tightening torque, loosen it by 25°.
28) Install the lock nut. While holding the adjusting screw with a wrench, tighten lock nut using ST.
ST 926230000 SPANNER

Tightening torque (Lock nut):
39 N·m (4.0 kgf-m, 28.9 ft-lb)

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

29) Remove the gearbox from ST.
30) Install the four pipes on gearbox.
(1) Connect the pipe A and B to the gearbox.

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

(2) Connect the pipe E and F to gearbox.

Tightening torque:
Pipe E: 15 N·m (1.5 kgf-m, 10.8 ft-lb)
Pipe F: 25 N·m (2.5 kgf-m, 18.1 ft-lb)

E: INSPECTION

1. BASIC INSPECTION

1) Clean all disassembled parts, and check for wear, damage, or any other faults, then repair or replace as necessary.
2) When disassembling, check the inside of gearbox for water. If any water is found, carefully check the boot for damage, input shaft dust seal, adjusting screw and boot clips for poor sealing. If faulty, replace with new parts.

No.	Parts	Inspection	Corrective action
1	Input shaft	(1) Bend of input shaft (2) Damage on serration	If the bend or damage is excessive, replace the entire gearbox.
2	Dust seal	(1) Crack or damage (2) Wear	If the outer wall slips, the lip is worn out or damage is found, replace it with a new one.
3	Rack and pinion	Poor mating of rack with pinion	(1) Adjust the backlash properly. By measuring the turning torque of gearbox and sliding resistance of rack, check if rack and pinion engage uniformly and smoothly with each other. (Refer to “Service limit”.) (2) Keeping the rack pulled out all the way so that all teeth emerge, check teeth for damage. Even if abnormality is found in either (1) or (2), replace the entire gearbox.
4	Gearbox unit	(1) Bend of rack shaft (2) Bend of cylinder portion (3) Crack or damage on cast iron portion	Replace the gearbox with a new one.
		(4) Wear or damage on rack bush	If the free play of rack shaft in radial direction is out of the specified range, replace the gearbox with a new one. (Refer to “Service limit”.)
		(5) Wear on input shaft bearing	If the free plays of input shaft in radial and axial directions are out of the specified ranges, replace the gearbox with a new one. (Refer to “Service limit”.)
5	Boot	Crack, damage or deterioration	Replace.
6	Tie-rod	(1) Looseness of ball joint (2) Bend of tie-rod	Replace.
7	Tie-rod end	Damage or deterioration on dust seal	Replace.
8	Adjusting screw spring	Deterioration	Replace.
9	Boot clip	Deterioration	Replace.
10	Sleeve	Damage	Replace.
11	Pipes	(1) Damage to flared surface (2) Damage to flare nut (3) Damage to pipe	Replace.

2. SERVICE LIMIT

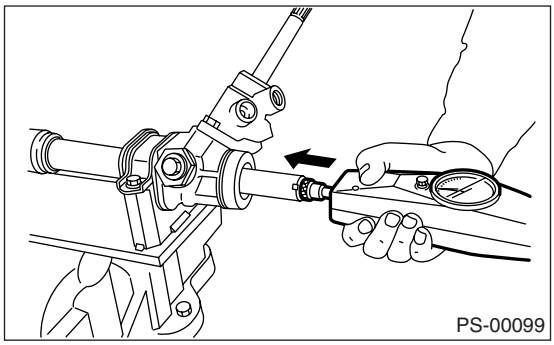
Make a measurement as follows. If it exceeds the specified service limit, adjust or replace.

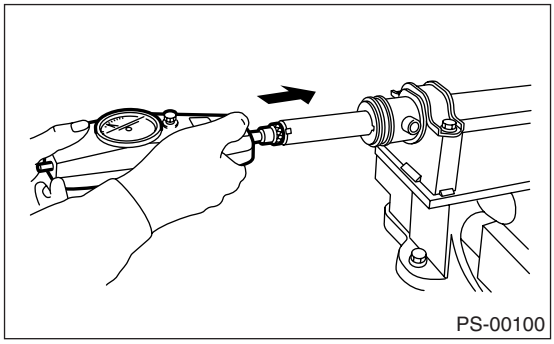
NOTE:
When making a measurement, vise the gearbox by using ST. Never vise the gearbox by inserting aluminum plates, etc. between vise and gearbox.

ST 926200000 STAND

Sliding resistance of rack shaft:

Service limit
400 N (41 kgf, 90 lb) or less


PS-00099

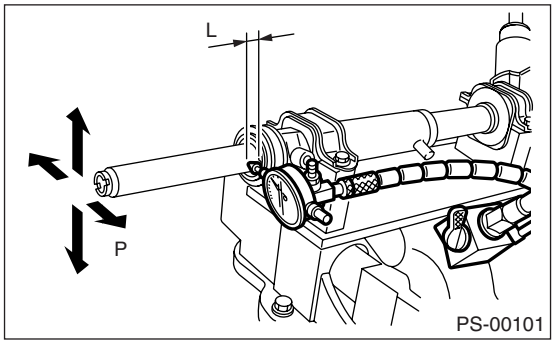

PS-00100

3. RACK SHAFT PLAY IN RADIAL DIRECTION

Right-turn steering:

Service limit
0.19 mm (0.0075 in) or less

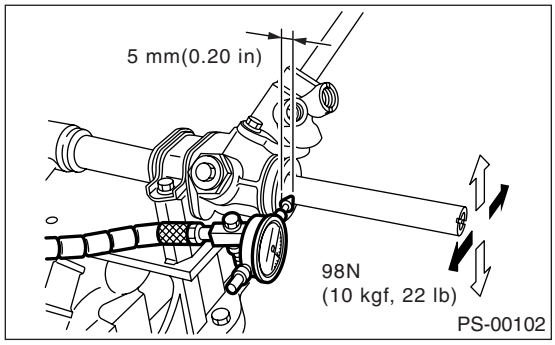
On condition
L: 5 mm (0.20 in)
P: 122.6 N (12.5 kgf, 27.6 lb)



PS-00101

Left-turn steering:

Service limit
Direction ⇦ ⇨
0.3 mm (0.012 in) or less
Direction ⬅ ➡
0.15 mm (0.0059 in) or less



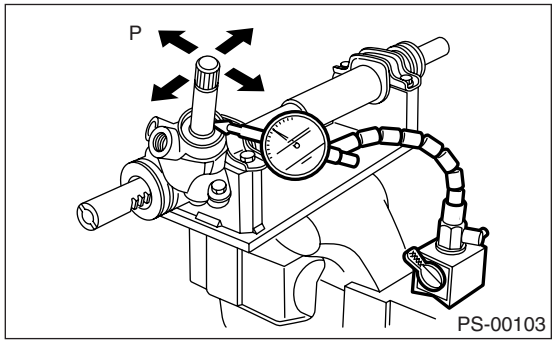
PS-00102

4. INPUT SHAFT PLAY

In radial direction:

Service limit
0.18 mm (0.0071 in) or less

On condition
P: 98 N (10 kgf, 22 lb)

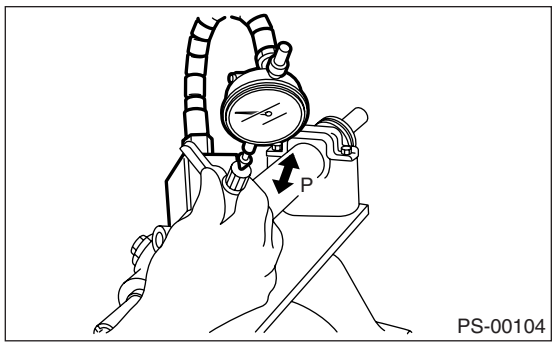


PS-00103

In axial direction:

Service limit
0.5 mm (0.020 in) or less

On condition
P: 20 — 49 N (2 — 5 kgf, 4 — 11 lb)

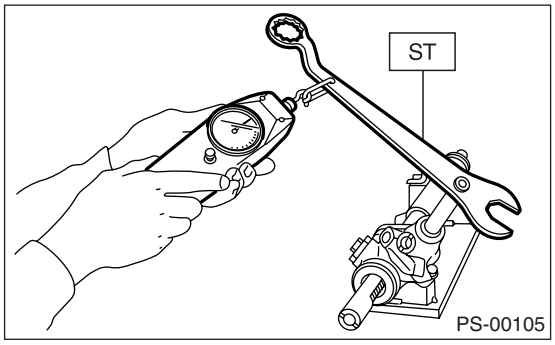


PS-00104

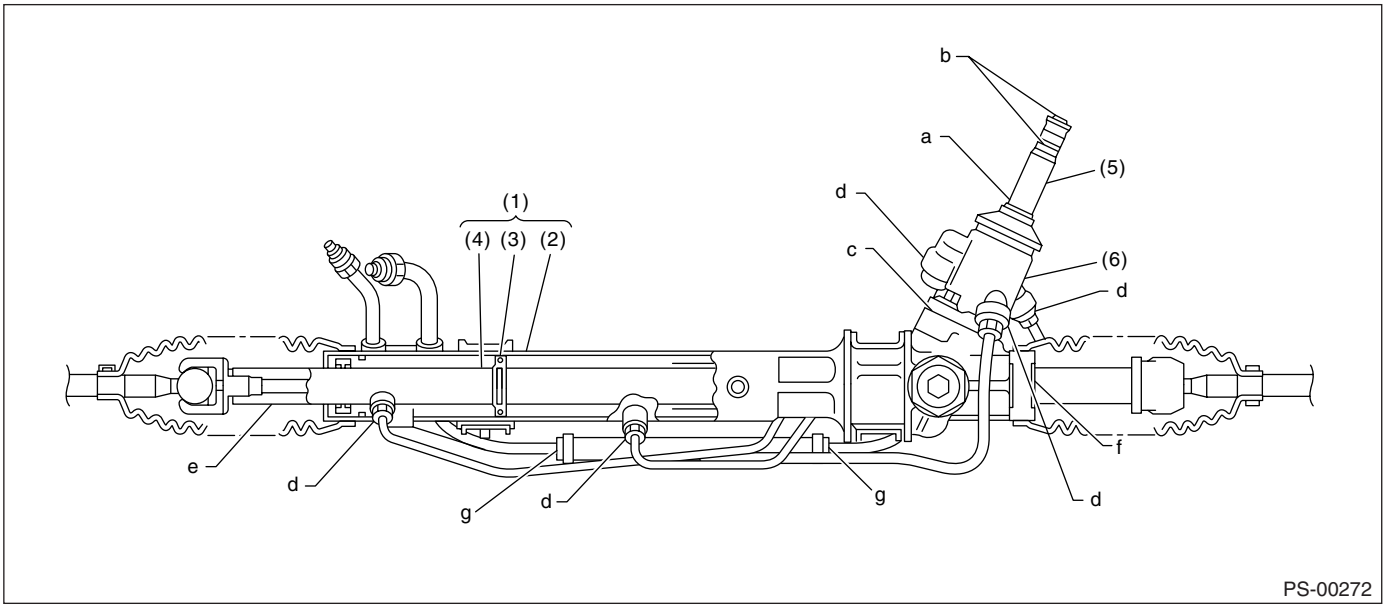
5. TURNING RESISTANCE OF GEARBOX

Using the ST, measure the gearbox turning resistance.
ST 34099PA100 SPANNER

Service limit
Maximum allowable resistance
10.5 N (1.1 kgf, 2.4 lb) or less
Difference between right and left turning resistance: Less than 20%



6. OIL LEAKING



(1) Power cylinder
(2) Cylinder
(3) Rack piston
(4) Rack axle
(5) Input shaft
(6) Valve housing

1) Lift up the vehicle.
2) Even if the location of the leak can be easily found by observing the leaking condition, it is necessary to thoroughly remove the fluid from the suspected portion and turn the steering wheel from lock to lock about thirty to forty times with engine running, then make comparison of the suspected portion between immediately after and several hours after this operation.
3) Inspect leakage from “a”.
The oil seal is damaged. Replace the valve assembly with a new one.
4) Inspect leakage from “b”.
The torsion bar O-ring is damaged. Replace the valve assembly with a new one.
5) Inspect leakage from “c”.
The oil seal is damaged. Replace the valve assembly or oil seal with a new one.
6) Inspect leakage from “d”.
The pipe is damaged. Replace the faulty pipe or O-ring.

7) Inspect leakage from “g”.
The hose is damaged. Replace the hose with a new one.
8) If leak is other than a, b, c, d, or g, and if oil is leaking from the gearbox, move the right and left boots toward tie-rod end side, respectively, with the gearbox mounted to the vehicle, and remove fluid from the surrounding portions. Then, turn the steering wheel from lock to lock thirty to forty times with the engine running, then make comparison of the leaked portion immediately after and several hours after this operation.
(1) Leakage from “e”
The cylinder seal is damaged. Replace the rack bush with a new one.
(2) Leakage from “f”
There are two possible causes. Take the following step first. Remove the pipe assembly B from the valve housing, and close the circuit with ST.
ST 926420000 PLUG
Turn the steering wheel from lock to lock thirty to forty times with the engine running, then make comparison of the leaked portion between immediately after and several hours after this operation.
- If leakage from “f” is noted again:

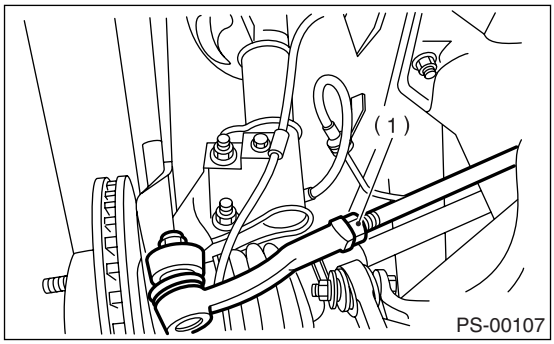
The oil seal of pinion and valve assembly is damaged. Replace the pinion and valve assembly with a new one. Or replace the oil seal and parts that are damaged during disassembly with new ones.
- If oil stops leaking from “f”:

The oil seal of rack housing is damaged. Replace the oil seal and the parts that are damaged during disassembly with new ones.

F: ADJUSTMENT

1) Adjust the front toe. <Ref. to FS-10, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

Standard of front toe:
IN 3 — OUT 3 mm (IN 0.12 — OUT 0.12 in)



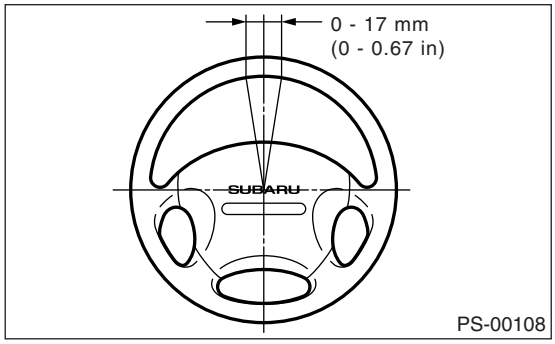
(1) Lock nut

2) Adjust the steering angle of wheels.

Standard of steering angle:

Model	TURBO, SEDAN and OUTBACK	Others
Inner wheel	34.5°±1.5°	37.3°±1.5°
Outer wheel	30.3°±1.5°	32.4°±1.5°

3) If the steering wheel spokes are not horizontal when wheels are set in the straight ahead position, and error is more than 5° on the periphery of steering wheel, correctly re-install the steering wheel.

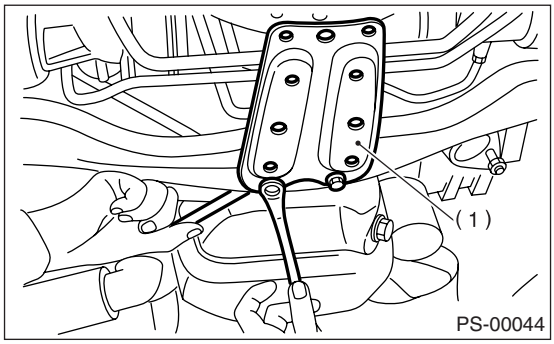


4) If the steering wheel spokes are not horizontal with vehicle set in the straight ahead position after this adjustment, correct it by turning the right and left tie-rods in opposite direction by same angle.

6. Pipe Assembly

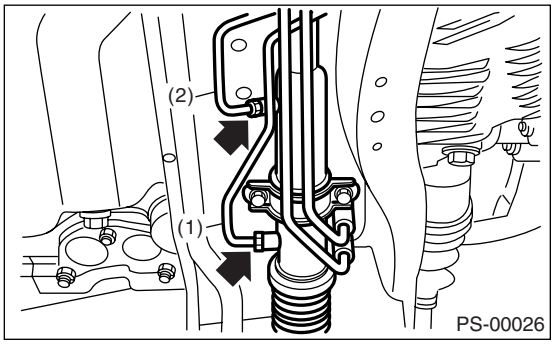
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and then remove the jack-up plate.



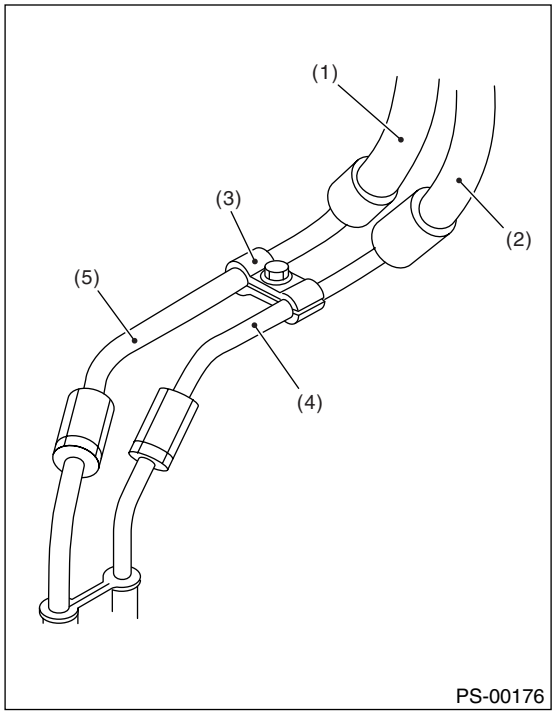
(1) Jack-up plate

3) Remove the one pipe joint at the center of gear-box, and then connect the vinyl hose to pipe and joint. Discharge fluid by turning steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.



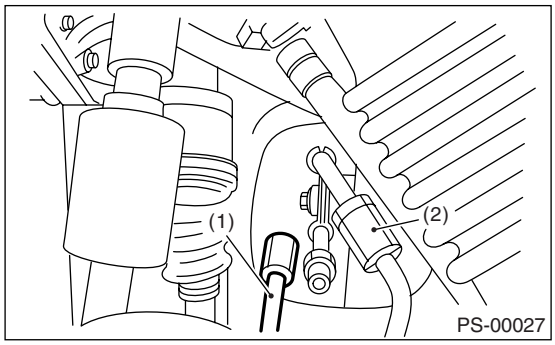
(1) Pipe A
(2) Pipe B

4) Remove the clamp E from pipes C and D.



(1) Return hose
(2) Pressure hose
(3) Clamp E
(4) Pipe C
(5) Pipe D

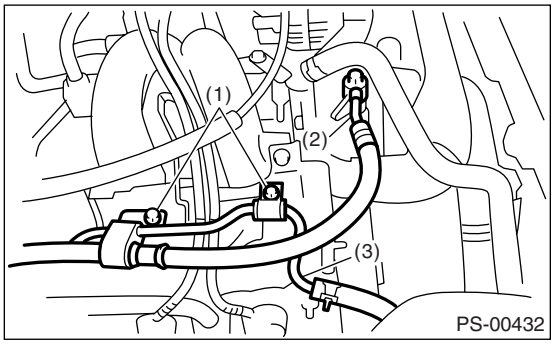
5) Disconnect the pipe C and D from gear box.



(1) Pipe C
(2) Pipe D

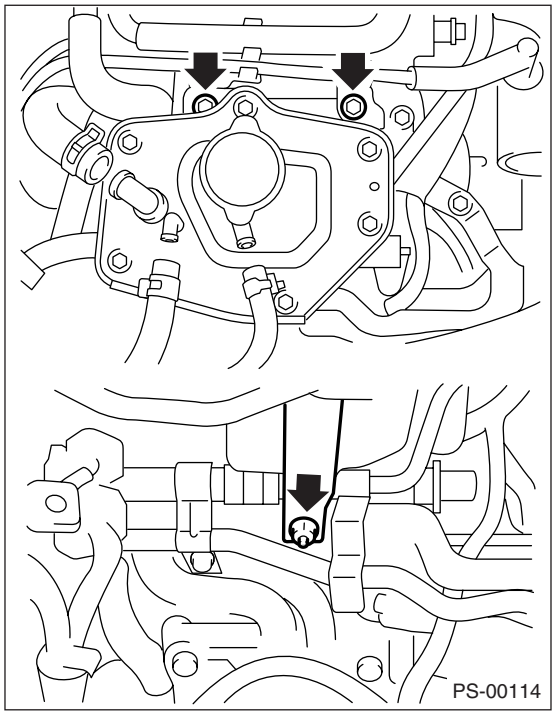
6) NON-TURBO MODEL
(1) Remove the air intake duct. <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
(2) Remove the bolt A.
(3) Disconnect the pipe C from oil pump. Disconnect the pipe D from return hose.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



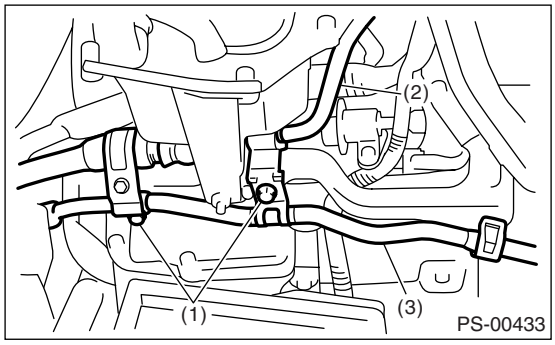
(1) Bolt A
(2) Pipe C
(3) Pipe D

7) TURBO MODEL
(1) Remove the air cleaner.
<Ref. to IN(H4DOTC)-7, REMOVAL, Air Cleaner.>
(2) Remove the coolant filler tank.



(3) Remove the two bolts fixing pipe C and D.
(4) Disconnect the pipe C from oil pump. Disconnect the pipe D from return hose.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



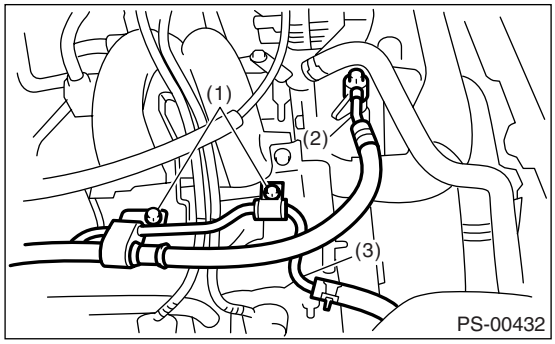
(1) Bolt
(2) Pipe C
(3) Pipe D

B: INSTALLATION

1) Temporarily tighten the two bolts fixing pipe C and D. (bolt A)

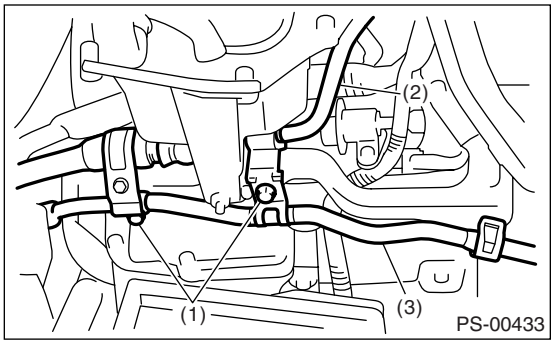
NOTE:
Visually check that the hose between tank and pipe D is free from bending or twisting.

• NON-TURBO MODEL



(1) Bolt A
(2) Pipe C
(3) Pipe D

• TURBO MODEL



(1) Bolt A
(2) Pipe C
(3) Pipe D

(1) Connect the pipe D to oil tank.
(2) Using a new gasket, connect the pipe C to oil pump.

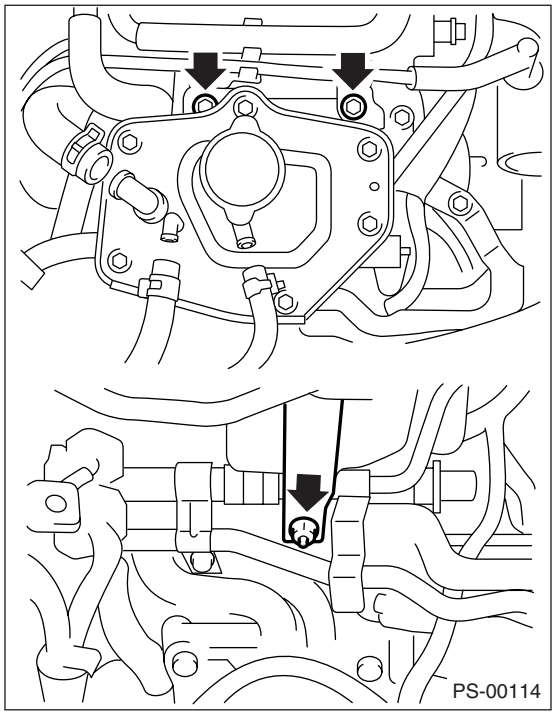
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

(3) Tighten the two bolts fixing pipe C and D. (bolt A)

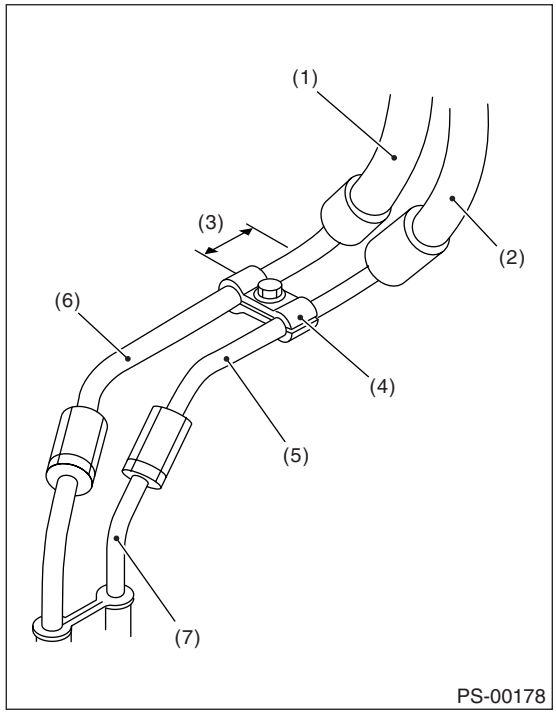
Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

2) Install the coolant filler tank. (Turbo model)

Tightening torque:
T1: 19 N·m (1.9 kgf-m, 13.7 ft-lb)
T2: 21 N·m (2.1 kgf-m, 15.2 ft-lb)



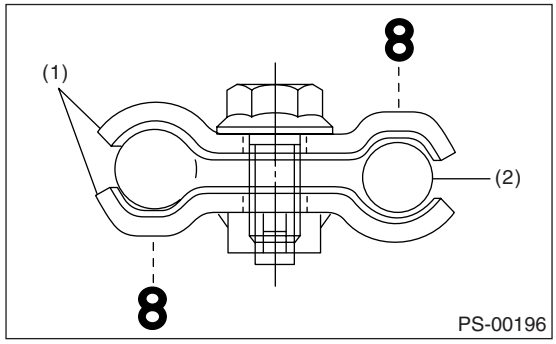
3) Temporarily connect the pipe C and D to gear box.



(1) Return hose
(2) Pressure hose
(3) Approx. 30 mm (1.18 in)
(4) Clamp E
(5) Pipe C
(6) Pipe D
(7) Pipe (Gear box side)

4) Temporarily install the clamp E on pipes C and D.

NOTE:
Ensure the letter “8” on each clamp are diagonally opposite each other as shown in the figure.



(1) Clamp E
(2) Pipe C

5) Tighten the clamp E firmly.

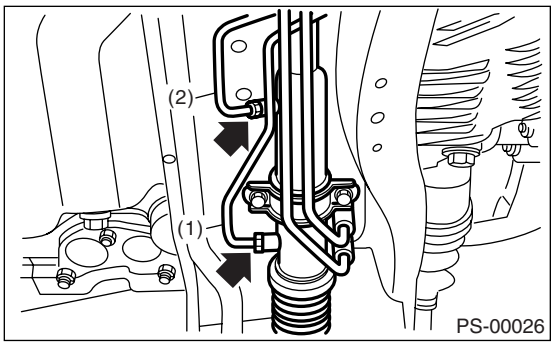
Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

6) Tighten the joint nut.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

7) Connect the pipes A and B to four pipe joints of gearbox. Connect the upper pipe B first, and lower pipe A second.

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

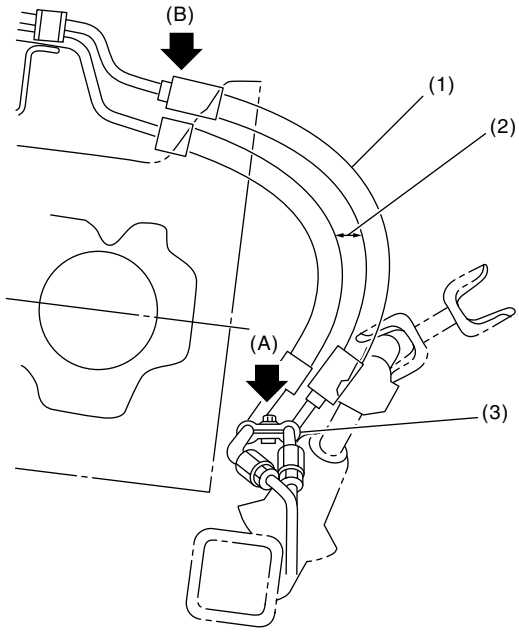


(1) Pipe A
(2) Pipe B

8) Install the jack-up plate.
9) Install the air intake duct. <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Duct.>
10) Install the air intake duct, air cleaner upper cover and air intake boot.
<Ref. to IN(H4DOTC)-7, INSTALLATION, Air Cleaner.> and <Ref. to IN(H4SO)-6, INSTALLATION, Air Intake Duct.>
11) Connect the battery ground cable to battery.
12) Feed the specified fluid.

CAUTION:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

13) Finally check clearance between pipes and/or hoses, as shown above.
If cruise control actuator-to-power steering hose clearance is less than 10 mm (0.39 in), move the portion (A) secured by clamp to other portion, or bend portion (B) to adjust.



(1) High pressure hose
(2) No interference is allowed between hoses.
(3) Clearance between crossmember and pipe: 3 — 8 mm (0.12 — 0.31 in)

C: INSPECTION

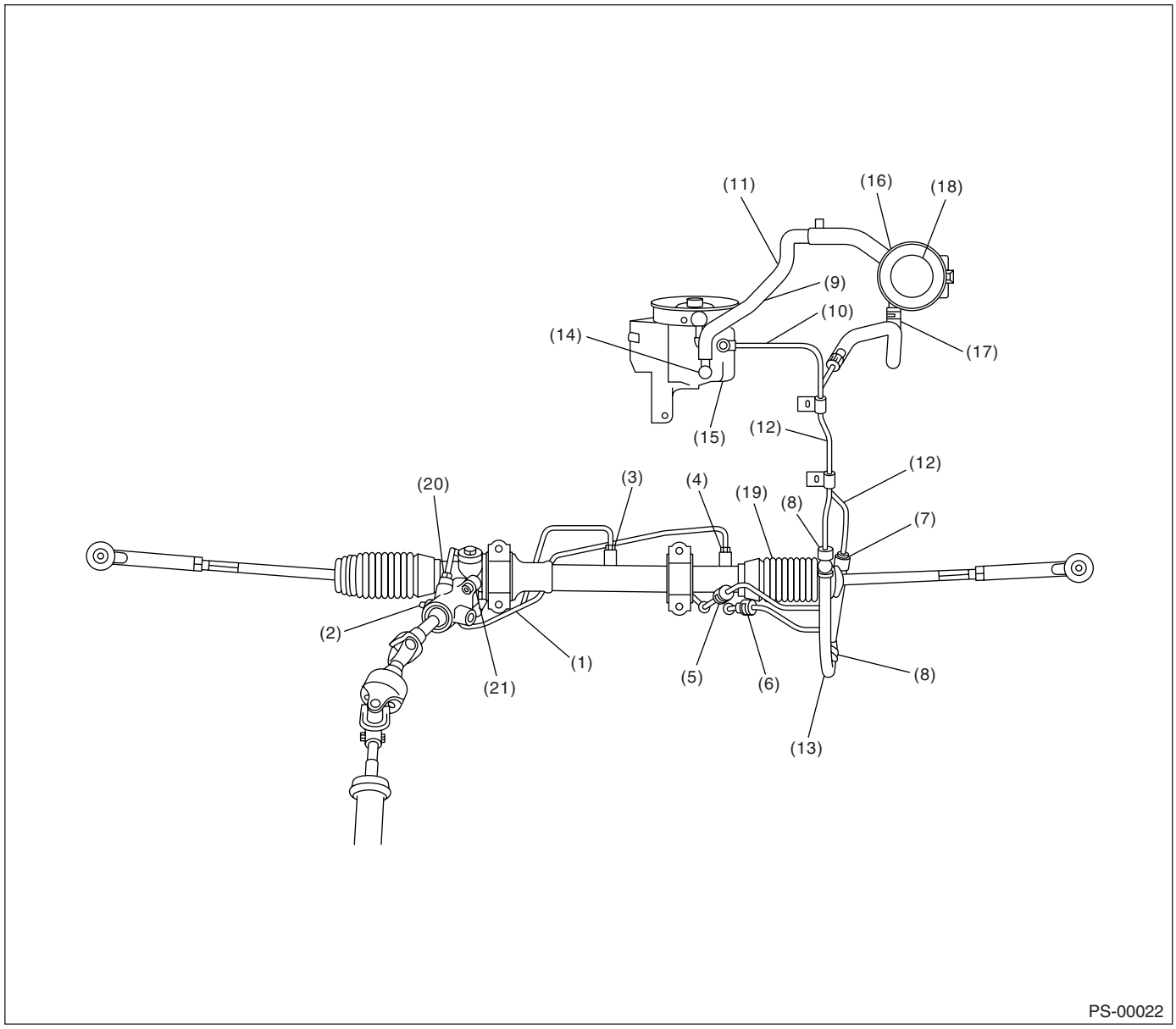
Check all disassembled parts for wear, damage or other abnormalities. Repair or replace faulty parts as required.

Part name	Inspection	Remedy
Pipe	• O-ring fitting surface for damage • Nut for damage • Pipe for damage	Replace with a new one.
Clamp	• Clamps for weak clamping force	Replace with a new one.
Hose	• Flared surface for damage • Flare nut for damage • Outer surface for cracks • Outer surface for wear • Clip for damage • End coupling or adapter for degradation	Replace with a new one.

CAUTION:
Although the surface layer materials of rubber hoses have excellent weathering resistance, heat resistance and resistance for low temperature brittleness, they are likely to be damaged chemically by brake fluid, battery electrolyte, engine oil and automatic transmission fluid and their service lives are to be very shortened. It is very important to keep the hoses free from before mentioned fluids and to wipe out immediately when the hoses are adhered with the fluids.
Since the resistances for heat or low temperature brittleness are gradually declining according to time accumulation of hot or cold conditions for the hoses and their service lives are shortening accordingly, it is necessary to perform the careful inspection frequently when the vehicle is used in hot weather areas, cold weather area and a driving condition in which many steering operations are required in short time.
Particularly, continuous work of relief valve over 5 seconds causes to reduce service lives of the hoses, the oil pump, the fluid, etc. due to over heat.

Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Instruct the customers.
	Malfunction of relief valve	Replace the oil pump.
	Poor cold characteristic of fluid	Replace the fluid.
Forced out return hose	Poor connection	Correct.
	Poor holding of clip	Retighten.
	Poor cold characteristic of fluid	Replace the fluid.
Fluid bleeding out of hose slightly	Wrong layout, tensioned	Replace the hose.
	Excessive play of engine due to deterioration of engine mounting rubber	Replace the defective parts.
	Improper stop position of pitching stopper	Replace the defective parts.
Crack on hose	Excessive holding time of relief status	Replace. Instruct customer.
	Excessive tightening torque for return hose clip	Replace.
	Power steering fluid, brake fluid, engine oil, electrolyte adhere on the hose surface	Replace. Pay attention on service work.
	Too many times use in extremely cold weather	Replace. Instruct the customers.

NOTE:
It is likely that although one judges fluid leakage, there is actually no leakage. This is because the fluid spilt during the last maintenance was not completely wiped off. Be sure to wipe off spilt fluid thoroughly after maintenance.


(11)
(16)
(18)
(9)
(10)
(14)
(17)
(15)
(12)
(12)
(20)
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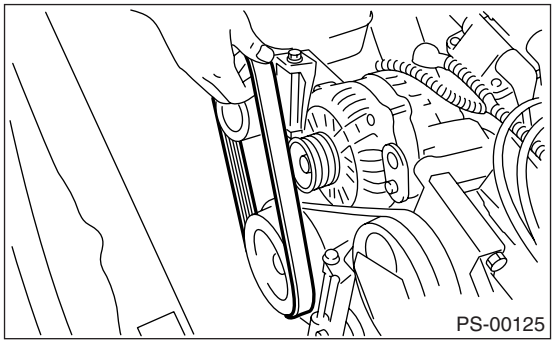
(19)
(8)
(7)
(2)
(1)
(21)
(5)
(6)
(8)
(13)
PS-00022

Fluid leaking area	Possible cause	Corrective action
Leakage from connecting portions of pipes and hoses, numbered with (1) through (10) in figure	Insufficient tightening of flare nut, catching dirt or the like, damage to flare or flare nut or eye bolt	Loosen and retighten, if ineffective, replace.
	Poor insertion of hose, poor clamping	Retighten or replace the clamp.
	Damaged O-ring or gasket	Replace the O-ring or gasket pipe or hose with new one, if ineffective, replace gearbox also.
Leakage from hose (11), (12) and (13) in figure	Crack or damage in hose	Replace with a new one.
	Crack or damage in hose hardware	Replace with a new one.
Leakage from surrounding of cast iron portion of oil pump (14) and (15) in figure	Damaged O-ring	Replace the oil pump.
	Damaged gasket	Replace the oil pump.
Leakage from oil tank (16) and (17) in figure	Crack in oil tank	Replace the oil tank.
Leakage from filler neck (18)	Damaged cap packing	Replace the cap.
	Crack in root of filler neck	Replace the oil tank.
	High fluid level	Adjust the fluid level.
Leakage from surrounding of power cylinder of gearbox (19) in figure	Damaged oil seal	Replace the oil seal.
Leakage from control valve of gear-box (20) and (21) in figure	Damaged packing or oil seal	Replace the problem parts.
	Damage in control valve	Replace the control valve.

7. Oil Pump

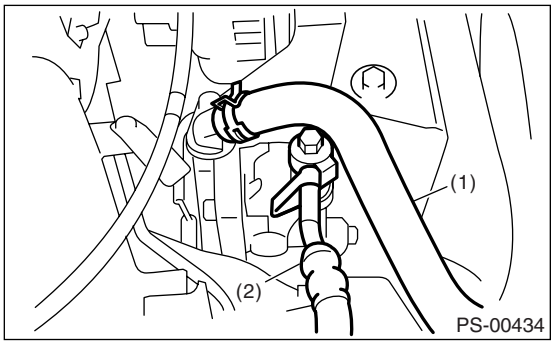
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the pulley belt cover.
3) Loosen the belt tension adjusting bolt and generator securing bolt, and then remove the power steering pump V-belt.



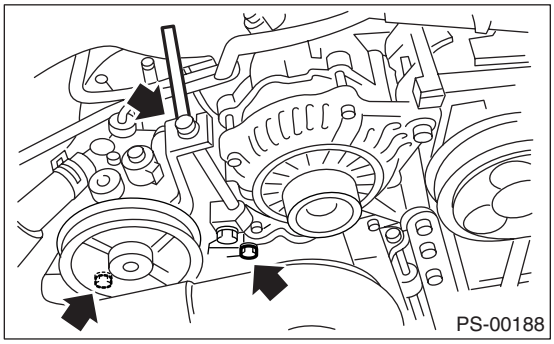
4) Disconnect the connector from power steering pump switch.
5) Disconnect the pipe C and suction hose from oil pump.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose, cover the open ends of them with a clean cloth.



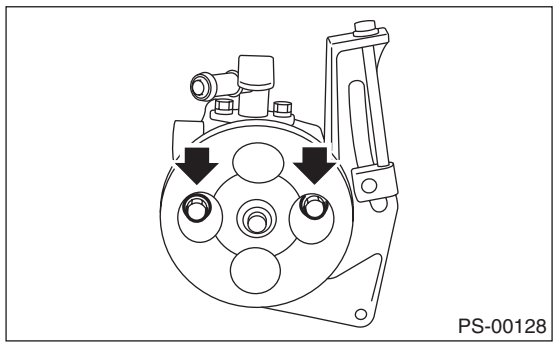
(1) Suction hose
(2) Pipe C

6) Remove the bolts which install the power steering pump bracket.

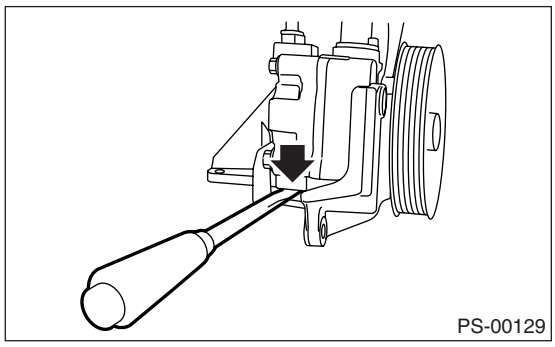


7) Place the oil pump bracket in a vise, remove the two bolts from front side of oil pump.

CAUTION:
Do not place the oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



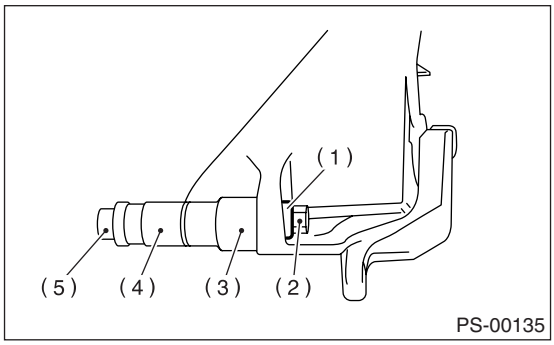
8) Remove the bolt from the rear side of oil pump.
9) Disassemble the oil pump and bracket by inserting a flat tip screwdriver as shown in the figure.



B: INSTALLATION

1) Install the oil pump to bracket.
(1) Place the oil pump bracket in a vise. Tighten the bushing using a 12.7 mm (1/2″) type 14 mm and 21 mm box wrench until it is in contact with the oil pump mounting surface.

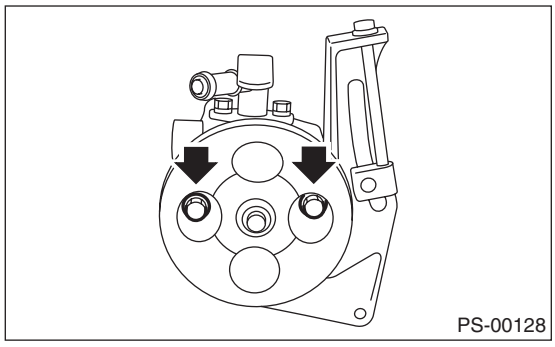
CAUTION:
Do not place the oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



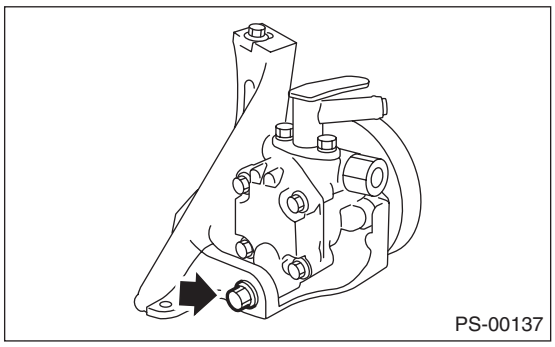
(1) Bush
(2) Nut
(3) 21 mm
(4) 14 mm
(5) Bolt

(2) Tighten the bolts which install the oil pump to bracket.

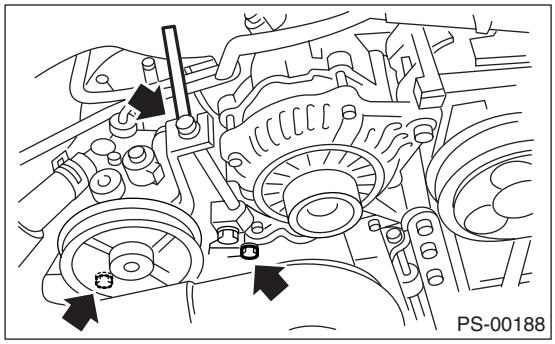
Tightening torque:
15.7 (1.6 kgf-m, 11.6 ft-lb)



Tightening torque:
37.3 (3.8 kgf-m, 27.5 ft-lb)



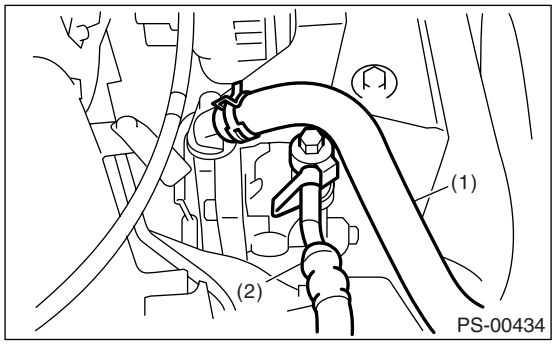
2) Tighten the bolts which install the power steering pump bracket.



3) Interconnect the pipe C and suction hose.

Tightening torque:
Eye bolt
39 N·m (4.0 kgf-m, 28.9 ft-lb)

CAUTION:
If a hose is twisted at this step, the hose may come into contact with some other parts.



(1) Suction hose
(2) Pipe C

4) Connect the connector to power steering pump switch.
5) Install the pulley belt to oil pump.
6) Check the pulley belt tension.
<Ref. to ME(H4SO)-40, INSPECTION, V-belt.>
7) Tighten the bolt of belt tension.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

8) Install the pulley belt cover.
9) Connect the battery ground cable to battery.
10) Feed the specified power steering fluid. <Ref. to PS-52, Power Steering Fluid.>

CAUTION:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

C: INSPECTION

1. BASIC INSPECTION

Perform the following inspection procedures and repair or replace defective parts.

No.	Parts	Inspection	Corrective action
1	Oil pump (Exterior)	(1) Crack, damage or oil leakage	Replace the oil pump with a new one.
		(2) Play of pulley shaft	Measure the radial play and axial play. If any of these exceeds the service limit, replace the oil pump with a new one.
2	Pulley	(1) Damage	Replace it with a new one.
		(2) Bend	Measure the V ditch deflection. If it exceeds the service limit, replace the pulley with a new one.
3	Oil pump (Interior)	(1) Defect or burning of vane pump	Check the resistance to rotation of pulley. If it is past the service limit, replace the oil pump with a new one.
		(2) Bend in the shaft or damage to bearing	Oil pump emits a noise that is markedly different in tone and loudness from a sound of a new oil pump when turning with a string put around its pulley, replace the oil pump with a new one.
4	O-ring	Crack or deterioration	Replace it with a new one.
5	Bracket	Crack	Replace it with a new one.

2. SERVICE LIMIT

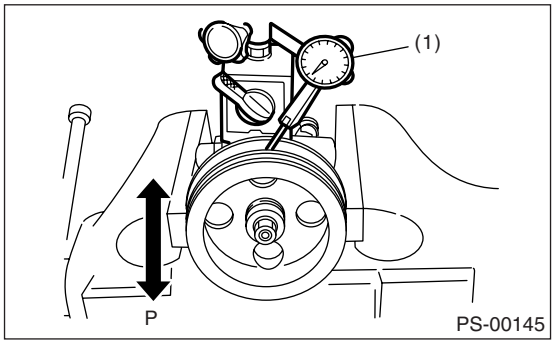
Make a measurement as follows. If it exceeds the specified service limit, replace the parts with new ones.

CAUTION:
• Fix the oil pump on a vise to make a measurement. At this time, hold the oil pump with least possible force between two wood pieces.
• Do not set outside of flow control valve or pulley on a vise; otherwise outside or pulley might be deformed. Select properly sized wood pieces.

1) Play of the pulley shaft

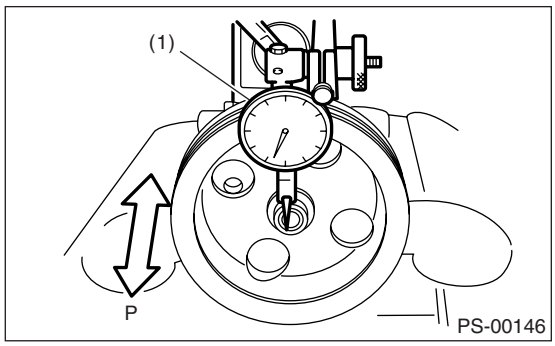
Condition:
P: When applying the force of 9.8 N (1.0 kgf, 2.2 lb)

Service limit:
Radial play (Direction ⟷)
0.4 mm (0.016 in) or less



(1) Dial indicator

Axial play (Direction ⟺)
0.9 mm (0.035 in) or less

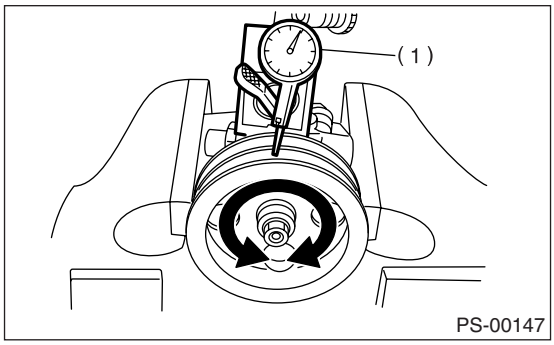


(1) Dial indicator

2) Ditch deflection of pulley

Service limit:
1.0 mm (0.039 in) or less

NOTE:
Read the value for one surface of V ditch, and then the value for another off the dial.

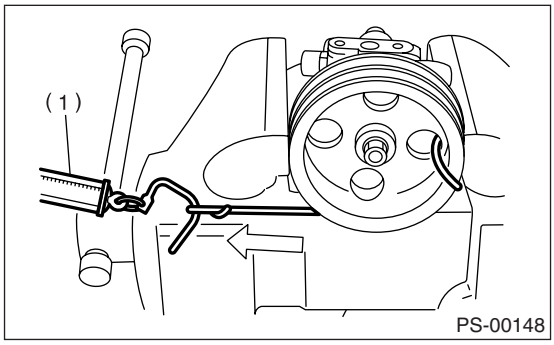


(1) Dial indicator

3) Resistance to rotation of pulley

Service limit:
Maximum load; 9.22 N (0.94 kgf, 2.07 lb) or less

NOTE:
• A rather higher value may be indicated when pulley starts turning.
• Measure the load during rotation and make a judgment.



(1) Spring balance

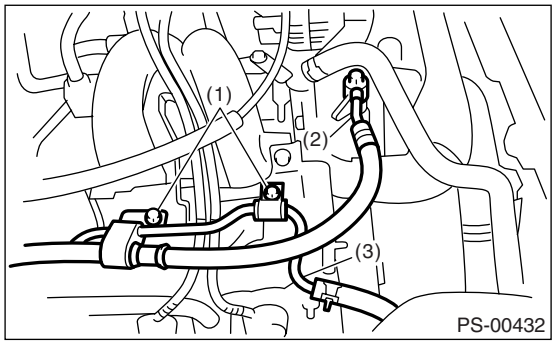
3. HYDRAULIC PRESSURE

NOTE:
• Be sure to complete all items aforementioned in "INSPECTION", prior to measuring hydraulic pressure. Otherwise, pressure can not be measured correctly. <Ref. to PS-53, INSPECTION, General Diagnostic Table.>
• Do not leave the valve of pressure gauge closed or hold the steering wheel at stop end for 5 seconds or more in any case, as the oil pump may be damaged due to long keep of these conditions.
• Put a cotton cloth waste at a place where fluid drops before the pressure gauge is installed. Wipe off split fluid thoroughly after the measurement.

1) REGULAR PRESSURE MEASUREMENT
(1) Connect the ST1, ST2 and ST3.

ST1 92511000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A

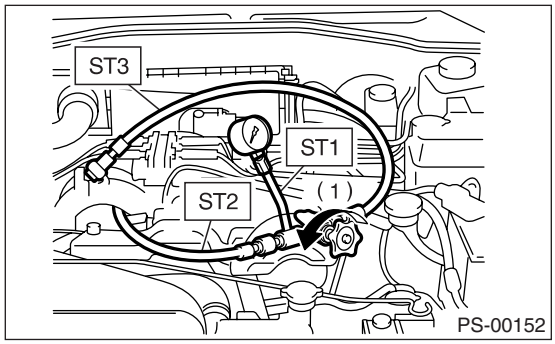
(2) Remove the air intake duct.
(3) Disconnect the pipe C from the pump.
(4) Using the gasket (Part No. 34621AC021) and bolt (Part No. 34620AC010), install the ST2 to the pump instead of pipe C.



(1) Bolt A
(2) Pipe C
(3) Pipe D

(5) Install the ST3 to end of pipe C removed from pump.
(6) Replenish power steering fluid up to the specified level.
(7) Open the valve, and start the engine.
(8) Measure the regular pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



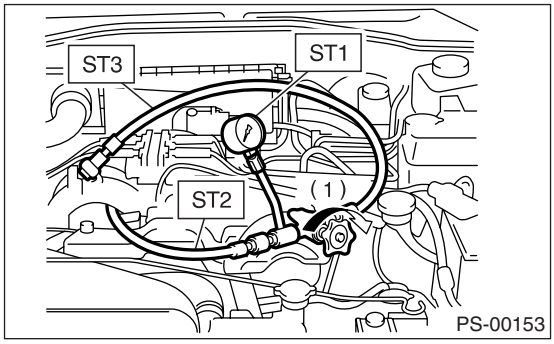
Service limit:
981 kPa (10 kg/cm^2, 142 psi) or less

(9) If it is not within the specified value, replace the troubled part caused by the following symptoms; pipe or hose clogged, leaks from fluid line, and mix of foreign objects in fluid line.

2) Measure the relief pressure.
(1) Using the STs, measure the relief pressure.
(2) Close the valve.
(3) Measure the relief pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B

ST3 34099AC010 ADAPTER HOSE A



Service limit:

Non-turbo model:

6,767 — 7,453 kPa (69 — 76 kg/cm^2, 981 — 1,081 psi)

Turbo model:

7,350 — 8,036 kPa (75 — 82 kg/cm^2, 1,067 — 1,165 psi)

(4) If it is not within the specified value, replace the oil pump.

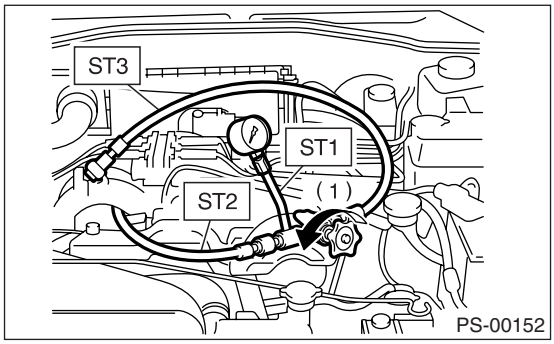
3) Measure the working pressure.

(1) Using the STs, measure the working pressure.

(2) Open the valve.

(3) Measure the working pressure of control valve by turning wheel from stop to stop.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



Service limit:

Non-turbo model:

6,767 — 7,453 kPa (69 — 76 kg/cm^2, 981 — 1,081 psi)

Turbo model:

7,350 — 8,036 kPa (75 — 82 kg/cm^2, 1,067 — 1,165 psi)

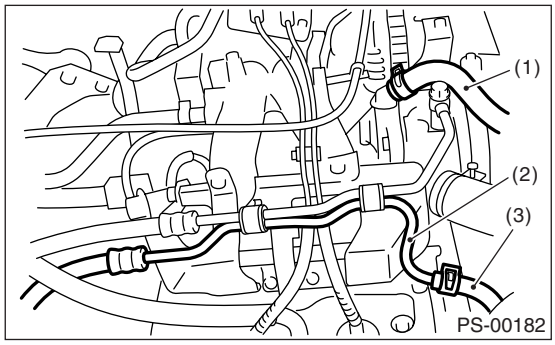
(4) If it is within the specified value, measure the steering effort. <Ref. to PS-56, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.> If it is not within specified value, replace the control valve itself or control valve and pinion as a single unit with new ones.

8. Reservoir Tank

A: REMOVAL

1) Remove the air intake duct. <Ref. to IN(H4SO)-6, REMOVAL, Air Intake Duct.>
2) Drain fluid from the reservoir tank.
3) Disconnect the pipe D from return hose and suction hose from oil pump.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.

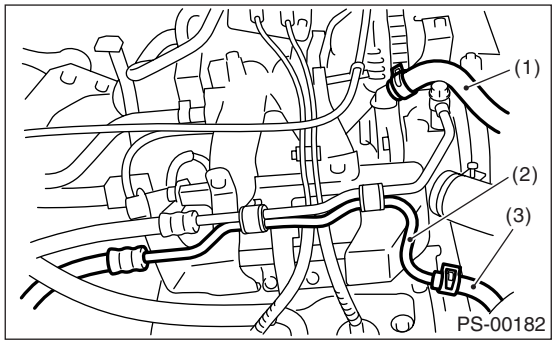


(1) Suction hose
(2) Pipe D
(3) Return hose

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

B: INSTALLATION

1) Install the reservoir tank to bracket.
2) Connect the pipes D to return hose and suction hose to oil pump.



(1) Suction hose
(2) Pipe D
(3) Return hose

3) Feed the power steering fluid to the specified level. <Ref. to PS-52, Power Steering Fluid.>

C: INSPECTION

Check the reservoir tank for cracks, breakage, or damage. If any cracks, breakage, or damage is found, replace the reservoir tank.

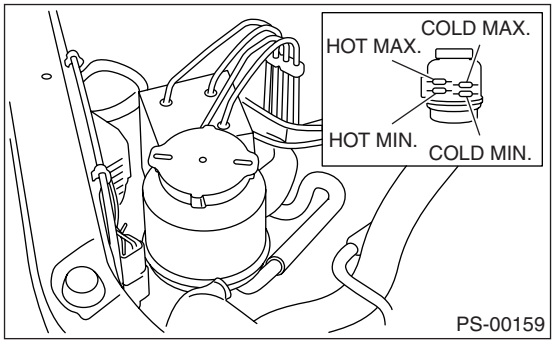
9. Power Steering Fluid

A: SPECIFICATION

Recommended power steering fluid	Manufacturer
ATF DEXRON III or equivalent	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

B: INSPECTION

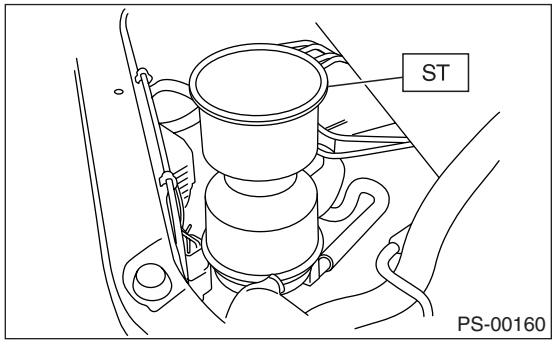
1) Check the power steering fluid for deterioration or contamination. If the fluid is highly deteriorated or contaminated, drain it and refill with new fluid.
2) Check the joints and units for oil leakage. If any oil leaks are found, repair or replace the applicable part.
3) Inspect the fluid level on flat and level surface with engine "OFF" by indicator of reservoir tank.
If the level is at MIN. point or below, add fluid to keep the level in the specified range of the indicator. If at MAX. point or above, drain fluid by using a syringe or the like.
(1) Check at power steering fluid temperature 20°C (68°F); read the fluid level on the "COLD" side.
(2) Check at power steering fluid temperature 80°C (176°F); read the fluid level on the "HOT" side.



C: REPLACEMENT

1) Lift up the vehicle.
2) Remove the jack up plate.
3) Remove the pipe joint in center of gear box, and then install the vinyl hose to pipe and joint. Drain the fluid while turning steering wheel.
4) Set the ST on top of reservoir tank and fill it about half way with the specified fluid.

ST 34199AE040 OIL CHARGE



5) Continue to turn the steering wheel slowly from lock to lock until bubbles stop appearing on oil surface while keeping the fluid at that level.
6) If turning the steering wheel in low fluid level condition, air will be sucked in pipe. In this case, leave it about half an hour and then do the step 5) again.
7) Lift up the vehicle, start the engine and let it idle.
8) Continue to turn the steering wheel slowly from lock to lock again until bubbles stop appearing on oil surface while keeping the fluid at that level.
It is normal that bubbles stop appearing after three times turning of steering wheel from lock to lock.
9) In case the bubbles do not stop appearing in the tank, leave it about half an hour and then do the step 4) all over again.
10) Lower the vehicle, and then idle the engine.
11) Continue to turn the steering wheel from lock to lock until bubbles stop appearing and change of the fluid level is within 3 mm (0.12 in).
12) In case the following happens, leave it about half an hour and then do step 8) to 11) again.
(1) The fluid level changes over 3 mm (0.12 in).
(2) Bubbles remain on the upper surface of the fluid.
(3) Grinding noise is generated from oil pump.
13) Check the fluid leakage after turning steering wheel from lock to lock with engine running.

10.General Diagnostic Table

A: INSPECTION

Trouble	Possible cause	Corrective action
• Heavy steering effort in all ranges • Heavy steering effort at stand still • Steering wheel surges when turning.	1. Pulley belt • Unequal length of pulley belts • Adhesion of oil and grease • Loose or damage of pulley belt • Poor uniformity of pulley belt cross section • Pulley belt touches to pulley bottom • Poor revolution of pulleys (except oil pump pulley) • Poor revolution of oil pump pulley	Adjust or replace.
	2. Tire and wheel • Improper tires out of specification • Improper wheels out of specification • Tires not properly inflated *1	Replace or reinflate.
	3. Fluid • Low fluid level • Aeration • Dust mix • Deterioration of fluid • Poor warming-up of fluid *2	Refill, bleed air, replace or instruct the customer.
	4. Idle speed • Lower idle speed • Excessive drop of idle speed at start or at turning steering wheel *3	Adjust or instruct the customer.
	5. Measure hydraulic pressure.<Ref. to PS-48, INSPECTION, Oil Pump.>	Replace the problem parts.
	6. Measure steering effort.<Ref. to PS-53, INSPECTION, General Diagnostic Table.>	Adjust or replace.
• Vehicle leads to one side or the other. • Poor return of steering wheel to center • Steering wheel surges when turning.	1. Fluid line • Folded hose • Flattened pipe	Reform or replace.
	2. Tire and wheel • Flat tire • Mix use of different tires • Mix use of different wheels • Abnormal wear of tire • Unbalance of remained grooves • Unbalance of tire pressure	Adjust, fix or replace.
	3. Front alignment • Improper or unbalance caster • Improper or unbalance toe-in • Loose connection of suspension	Adjust or retighten.
	4. Others • Damaged joint assembly • Unbalanced height • One-sided weight	Replace, adjust or instruct the customer.
	5. Measure steering effort.<Ref. to PS-53, INSPECTION, General Diagnostic Table.>	Adjust or replace.

*1 If tires and/or wheels are wider, the load to power steering system is the more. Accordingly, in a condition, for example before fluid warms-up, relief valve may work before maximum turning angle. In this case, steering effort may be heavy. When measured hydraulic pressure is normal, there is no abnormal thing.
*2 In cold weather, steering effort may be heavy due to increased flow resistance of cold fluid. After warming-up engine, turn steering wheel from stop to stop several times to warm-up fluid. Then if steering effort reduces normally, there is no abnormal thing.
*3 In cold weather or with insufficient warm-up of engine, steering effort may be heavy due to excessive drop of idling when turning steering wheel. In this case, it is recommended to start the vehicle with increasing engine speed than usual. Then if steering effort reduces normally, there is no abnormal thing.

1. NOISE AND VIBRATION

CAUTION:
Don't keep the relief valve operated over 5 seconds at any time or inner parts of the oil pump may be damaged due to rapid increase of fluid temperature.

NOTE:
• Grinding noise may be heard immediately after the engine start in extremely cold condition. In this case, if the noise goes off during warm-up there is no abnormal function in the system. This is due to the fluid characteristic in extremely cold condition.
• Oil pump makes whine or growl noise slightly due to its mechanism. Even if the noise can be heard when steering wheel is turned at stand still there is no abnormal function in the system provided that the noise eliminates when the vehicle is running.
• When turning the steering wheel with service brake and/or parking brake applied, the noise is generated by creaking between disk and pads. However this does not indicate abnormal function in system.
• There may be a little vibration around the steering devices when turning steering wheel at standstill, even though the component parts have no defects.
Hydraulic systems are likely to generate this kind of vibration as well as working noise and fluid noise because of combined conditions, i.e., road surface and tire surface, engine speed and turning speed of steering wheel, fluid temperature and braking condition.
This phenomena does not indicate there is some abnormal function in the system.
The vibration can be known when steering wheel is turned repeatedly at various speeds from slow to rapid step by step with parking brake applied on concrete road and in "D" range for automatic transmission vehicle.

Trouble	Possible cause	Corrective action
Hiss noise (continuous) While engine is running.	Relief valve emits operating sound when steering wheel is completely turned in either direction. (Don't keep this condition over 5 seconds.)	Normal
	Relief valve emits operating sound when steering wheel is not turned. This means that the relief valve is faulty.	Defective Replace the oil pump.
Rattling noise (intermittent) While engine is running.	Interference with adjacent parts	Check the clearance. Correct if necessary. <Ref. to PS-43, INSPECTION, Pipe Assembly.>
	Loosened installation of oil pump, oil tank, pump bracket, gearbox or crossmember	Retighten.
	Loosened installation of oil pump pulley or other pulley(s)	Retighten.
	Loosened linkage or play of steering or suspension Loosened tightening of joint or steering column	Retighten or replace.
	Sound generates from the inside of gearbox or oil pump.	Replace the faulty parts of gearbox or oil pump.
Knocking When turning steering wheel in both direction with small angle repeatedly at engine ON or OFF.	Excessive backlash Loosened lock nut for adjusting backlash	Adjust and retighten.
	Loosened tightening or play of tie-rod, or tie-rod end	Retighten or replace.
Grinding noise (continuous) While engine is running.	Vane pump aeration	Inspect and retighten the fluid line connection. Refill fluid and vent air.
	Vane pump seizing	Replace the oil pump.
	Pulley bearing seizing of oil pump	Replace the oil pump.
	Folded hose, flat pipe	Replace.
Squeal, squeak (intermittent or continuous) While engine is running.	Maladjustment of pulley belt Damaged or charged pulley belt Unequal length of pulley belts	Adjust or replace. (Replace two belts as a set.)
	Run out or soilage of V-groove surface of oil pump pulley	Clean or replace.

Trouble	Possible cause	Corrective action
Sizzling noise (continuous) While engine is running.	Fluid aeration	Fix the wrong part causing aeration. Replace the fluid and vent air.
	Damaged pipe of gearbox	Replace the pipe.
	Abnormal inside of hose or pipe Flat hose or pipe	Rectify or replace.
	Abnormal inside of oil tank	Replace.
	Removed oil tank cap	Install the cap.
Whistle (continuous) While engine is running.	Abnormal pipe of gearbox or abnormal inside of hose	Replace the faulty parts of gearbox or hose.
Whine or growl (continuous or intermittent) While engine is running with/ without steering turned.	Loosened installation of oil pump, oil pump bracket	Retighten.
	Abnormal inside of oil pump, hose	Replace the oil pump, hose, if the noise can be heard when running as well as stand still.
	Torque converter growl, air conditioner compression growl	Remove the power steering pulley belt and confirm.
Creaking noise (intermittent) While engine is running with steering turned.	Abnormal inside of gearbox	Replace the faulty parts of gearbox.
	Abnormal bearing for steering shaft	Apply grease or replace.
	Generates when turning steering wheel with brake (service or parking) applied.	If the noise goes off when brake is released, it is normal.
Vibration While engine is running with/ without steering turned.	Too low engine speed	Adjust and instruct customers.
	Vane pump aeration	Fix the wrong part. Vent air.
	Damaged valve in oil pump, gearbox	Replace the oil pump, faulty parts of gearbox.
	Looseness of play of steering, suspension parts	Retighten.

2. MEASUREMENT OF STEERING EFFORT

	Step	Check	Yes	No
1	**CHECK STEERING EFFORT.** 1) Stop the vehicle on a concrete road. 2) Start the engine. 3) Idle the engine. 4) Install the spring scale on the steering wheel. 5) Pull the spring scale at an right angle to steering wheel, and measure both right and left steering wheel effort. NOTE: When turning the steering more quickly than necessary from a direction to the other direction at an engine speed over 2,000 rpm, steering effort may be heavy. This is caused by flow characteristic of oil pump and is not a problem.	Is the steering effort less than 31.4 N (3.2 kgf, 7.1 lb)?	Go to step **2.**	Adjust the backlash.
2	**CHECK STEERING EFFORT.** 1) Stop the engine. 2) Pull the spring scale at an right angle to the steering wheel, and measure both right and left steering wheel effort.	Is the steering effort less than 294.2 N (30 kgf, 66.2 lb)?	Go to step **3.**	Perform adjustment.
3	**CHECK STEERING WHEEL EFFORT.** 1) Remove the universal joint. 2) Measure the steering wheel effort.	Is the maximum steering effort less than 2.26 N (0.23 kgf, 0.51 lb)?	Go to step **4.**	Check, adjust and replace if necessary.
4	**CHECK STEERING WHEEL EFFORT.** Measure the steering wheel effort.	Is the difference of steering effort between clockwise and counterclockwise less than 20%?	Go to step **5.**	Check, adjust and replace if necessary.
5	**CHECK UNIVERSAL JOINT.** Measure the folding torque of the joint (yoke of steering column side). <Ref. to PS-17, INSPECTION, Universal Joint.>	Is the folding torque less than 7.3 N (0.74 kgf, 1.64 lb)?	Go to step **6.**	Replace with new one.
6	**CHECK UNIVERSAL JOINT.** Measure the folding torque of the joint (yoke of gearbox side). <Ref. to PS-17, INSPECTION, Universal Joint.>	Is the folding torque less than 3.8 N (0.39 kgf, 0.86 lb)?	Go to step **7.**	Replace with new one.
7	**CHECK FRONT WHEEL.** Check the front wheel.	Are the front wheels for unsteady revolution or rattling and brake for dragging?	Inspect, readjust and replace if necessary.	Go to step **8.**
8	**CHECK TIE-ROD ENDS.** Remove the tie-rod ends.	Are the tie-rod ends of suspension for unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step **9.**
9	**CHECK BALL JOINT.** Remove the ball joint.	Are the ball joints of suspension for unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step **10.**
10	**CHECK GEARBOX.** Measure the rotating of gearbox. <Ref. to PS-37, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox.>	Is the rotating resistance of gear box less than 10.5 N (1.1 kgf, 2.4 lb)? Is the difference between clockwise and counterclockwise 20%?	Go to step **11.**	Readjust the backlash, and if ineffective, replace the faulty parts.
11	**CHECK GEARBOX.** Measure the sliding of gearbox. <Ref. to PS-36, SERVICE LIMIT, INSPECTION, Steering Gearbox.>	Is the sliding resistance of gear box less than 400 N (41 kgf, 90 lb)? Is the difference between right and left 20%?	Steering effort is normal.	Readjust the backlash, and if ineffective, replace the faulty parts.

BODY SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

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

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)	AC
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)	AC(diag)
AIRBAG SYSTEM	AB
AIRBAG SYSTEM (DIAGNOSTICS)	AB(diag)
SEAT BELT SYSTEM	SB
LIGHTING SYSTEM	LI
WIPER AND WASHER SYSTEMS	WW
ENTERTAINMENT	ET
COMMUNICATION SYSTEM	COM
GLASS/WINDOWS/MIRRORS	GW
BODY STRUCTURE	BS
INSTRUMENTATION/DRIVER INFO	IDI
SEATS	SE
SECURITY AND LOCKS	SL
SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)	SR
EXTERIOR/INTERIOR TRIM	EI
EXTERIOR BODY PANELS	EB

BODY SECTION

CRUISE CONTROL SYSTEM	CC
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC(diag)
CRUISE CONTROL SYSTEM	CC(STi)
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC(STi)(diag)
OPTION PARTS	OP

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

AC

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1. General Description

A: SPECIFICATIONS

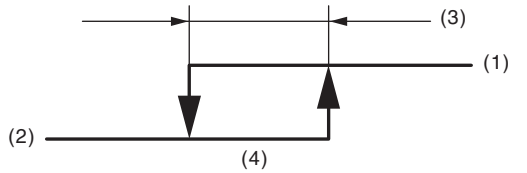
1. HEATER SYSTEM

Item		Specifications	Condition
Heating capacity		5.0 kW (4,300 kcal/h, 17,062 BTU/h) or more	• Mode selector switch: HEAT • Temperature control switch: FULL HOT • Temperature difference between hot water and inlet air: 65°C (149°F) • Hot water flow rate: 360 ℓ (95.1 US gal, 79.2 Imp gal)/h
Air flow rate		280 m^3 (9,888 cu ft)/h	Heat mode (FRESH), FULL HOT at 12.5 V
Max air flow rate		450 m^3 (15,892 cu ft)/h	• Temperature control switch: FULL COLD • Blower fan speed: 4th position • Mode selector lever: RECIRC
Heater core size (height × length × width)		163.9 × 200 × 25.0 mm (6.45 × 7.87 × 0.984 in)	—
Blower motor	Type	Magnet motor 200 W or less	at 12 V
	Fan type and size (diameter × width)	Sirocco fan type 150 × 75 mm (5.91 × 2.95 in)	—

2. A/C SYSTEM

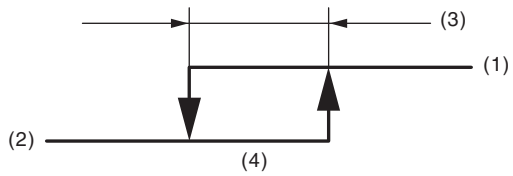
• AUTO A/C MODEL

Item		Specifications
Type of air conditioner		Reheat air-mix type
Cooling capacity		5.1 kW (4,385 kcal/h, 17,402 BTU/h)
Refrigerant		HFC-134a (CH_2FCF_3) [0.5±0.05 kg (0.99±0.11 lb)]
Compressor	Type	Vane rotary, fix volume (CR-14)
	Discharge	144 cm^3 (8.79 cu in)/rev
	Max. permissible speed	7,000 rpm
Magnet clutch	Type	Dry, single-disc type
	Power consumption	47 W
	Type of belt	V-belt 4 PK
	Pulley dia. (effective dia.)	125 mm (4.92 in)
	Pulley ratio	1.064
Condenser	Type	Corrugated fin (Sub cool type)
	Core face area	0.21 m^2 (2.26 sq ft)
	Core thickness	16 mm (0.63 in)
	Radiation area	5.34 m^2 (57.48 sq ft)
Receiver drier	Effective inner capacity	250 cm^3 (15.26 cu in)
Expansion valve	Type	Internal equalizing
Evaporator	Type	Single tank
	Dimensions (W × H × T)	255 × 200 × 48 mm (10 × 7.87 × 1.89 in)
Blower fan	Fan type	Sirocco fan
	Outer diameter × width	150 × 75 mm (5.91 × 2.95 in)
	Power consumption	200 W

Item			Specifications
Condenser fan (Sub fan)		Motor type	Magnet
		Power consumption	120 W
		Fan outer diameter	320 mm (12.6 in)
Radiator fan (Main fan)		Motor type	Magnet
		Power consumption	120 W
		Fan outer diameter	320 mm (12.6 in)
Idling speed (A/C ON)		MPFI model	850±100 rpm
Dual switch (Pressure switch)	Low-pressure switch operating pressure	ON → OFF	278±29 kPa (2.83±0.3 kg/cm^2, 40.3±4.2 psi)
		OFF → ON	$287^{+39}/_{-25}$ kPa ($2.9^{+0.4}/_{-0.25}$ kg/cm^2, $42^{+5.7}/_{-3.6}$ psi)
	High-pressure switch operating pressure	ON → OFF	2,800±100 kPa (29±1 kg/cm^2, 406±15 psi)
		Difference	600±200 kPa (6.12±2 kg/cm^2, 87±29 psi)
Thermo control amplifier working temperature (Evaporator outlet air)		 AC-00601 (1) ON (2) OFF (3) 2.5±0.5°C (36.5±0.9°F) (4) 1.5±0.5°C (35±0.9°F)	

• MANUAL A/C MODEL

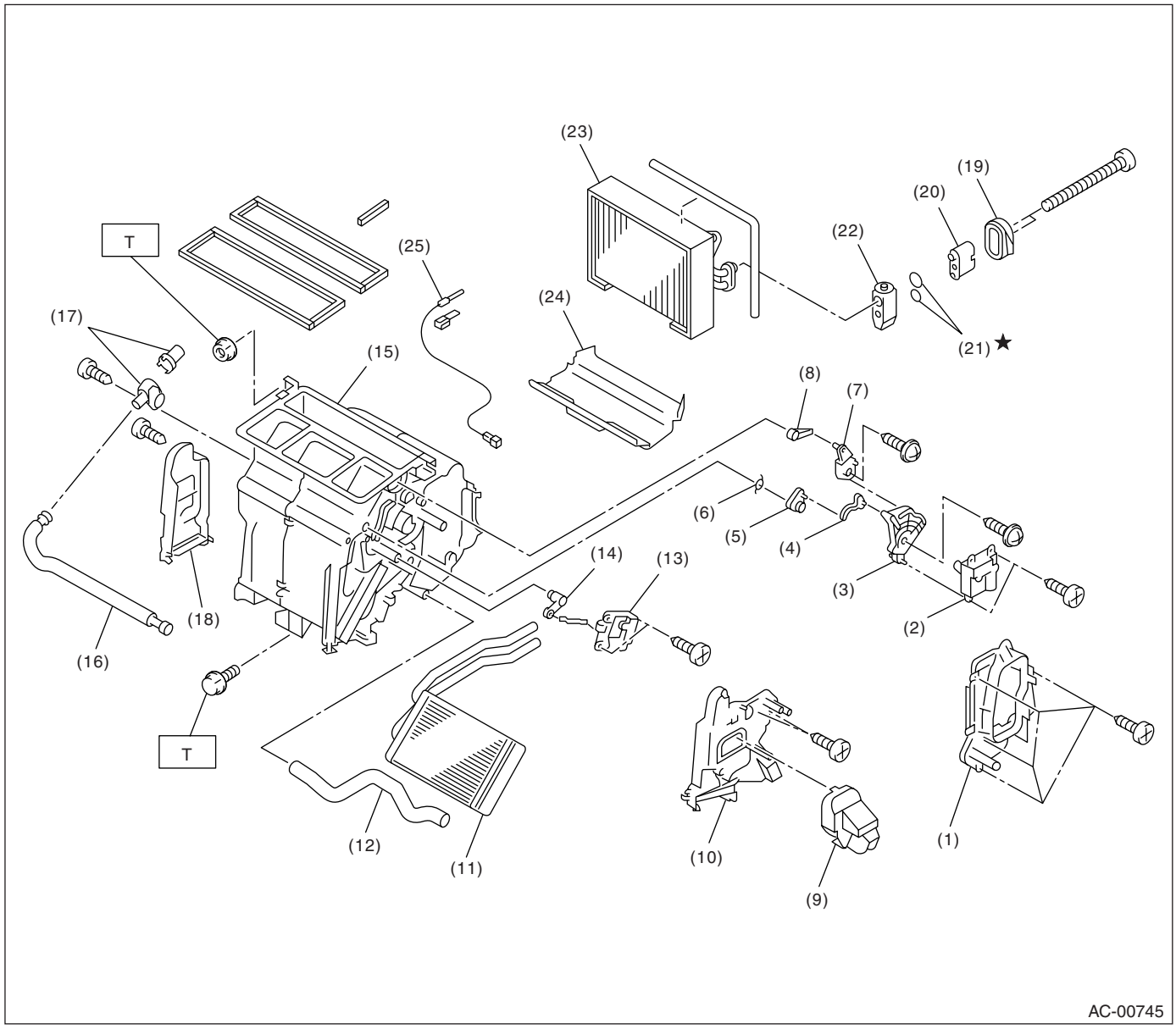
Item		Specifications
Type of air conditioner		Reheat air-mix type
Cooling capacity		5.1 kW (4,385 kcal/h, 17,402 BTU/h)
Refrigerant		HFC-134a (CH_2FCF_3) [0.5±0.05 kg (1.10±0.11 lb)]
Compressor	Type	Vane rotary, fix volume (CR-14)
	Discharge	144 cm^3 (8.79 cu in)/rev
	Max. permissible speed	7,000 rpm
Magnet clutch	Type	Dry, single-disc type
	Power consumption	47 W
	Type of belt	V-belt 4 PK
	Pulley dia. (effective dia.)	125 mm (4.92 in)
	Pulley ratio	1.064
Condenser	Type	Corrugated fin (Sub cool type)
	Core face area	0.21 m^2 (2.26 sq ft)
	Core thickness	16 mm (0.63 in)
	Radiation area	5.34 m^2 (57.48 sq ft)
Receiver drier	Effective inner capacity	250 cm^3 (15.26 cu in)
Expansion valve	Type	Externally equalizing

Item			Specifications
Evaporator		Type	Single tank
		Dimensions (W × H × T)	255 × 200 × 48 mm (10 × 7.87 × 1.89 in)
Blower fan		Fan type	Sirocco fan
		Outer diameter × width	150 × 75 mm (5.91 × 2.95 in)
		Power consumption	200 W
Condenser fan (Sub fan)		Motor type	Magnet
		Power consumption	120 W (Turbo model), 70 W (Non-turbo model)
		Fan outer diameter	320 mm (12.6 in)
Radiator fan (Main fan)		Motor type	Magnet
		Power consumption	120 W (Turbo model), 70 W (Non-turbo model)
		Fan outer diameter	320 mm (12.6 in)
Idle speed (A/C ON)		MPFI model	850±100 rpm
Dual switch (Pressure switch)	Low-pressure switch operating pressure	ON → OFF	278±29 kPa (2.83±0.3 kg/cm^2, 40.3±4.2 psi)
		OFF → ON	$287^{+39}/_{-25}$ kPa ($2.9^{+0.4}/_{-0.25}$ kg/cm^2, $42^{+5.7}/_{-3.6}$ psi)
	High-pressure switch operating pressure	ON → OFF	2,800±100 kPa (29±1 kg/cm^2, 406±15 psi)
		Difference	600±200 kPa (6.12±2 kg/cm^2, 87±29 psi)
Thermo control amplifier working temperature (Evaporator outlet air)			 AC-00601 (1) ON (2) OFF (3) 1.5±0.5°C (35±0.9°F) (4) 3.0±0.5°C (37±0.9°F)

B: COMPONENT

1. HEATER COOLING UNIT

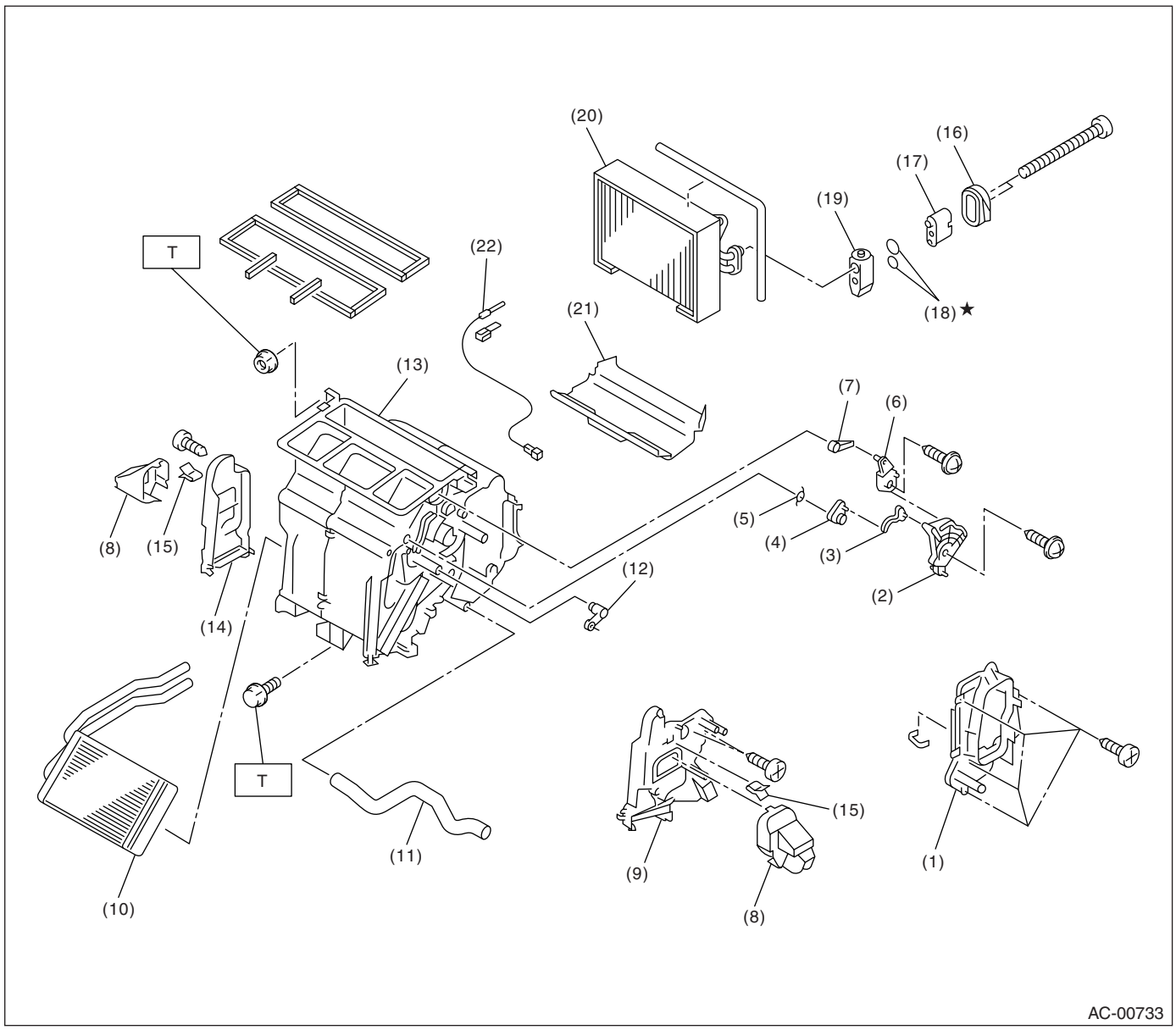
• AUTO A/C MODEL



(1) Unit cover
(2) Mode actuator
(3) Side link
(4) Mode actuator lever
(5) Foot lever
(6) Spring
(7) Mode actuator link
(8) Defroster lever
(9) Foot nozzle
(10) Unit duct cover
(11) Heater core
(12) Drain hose
(13) Mix actuator
(14) Mix actuator lever
(15) Unit assembly
(16) Aspirator hose
(17) Aspirator
(18) Foot duct
(19) Packing
(20) Cooling unit block
(21) O-ring
(22) Expansion valve
(23) Evaporator
(24) Evaporator cover
(25) Thermistor

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.4 (0.75, 5.4)

• MANUAL A/C MODEL

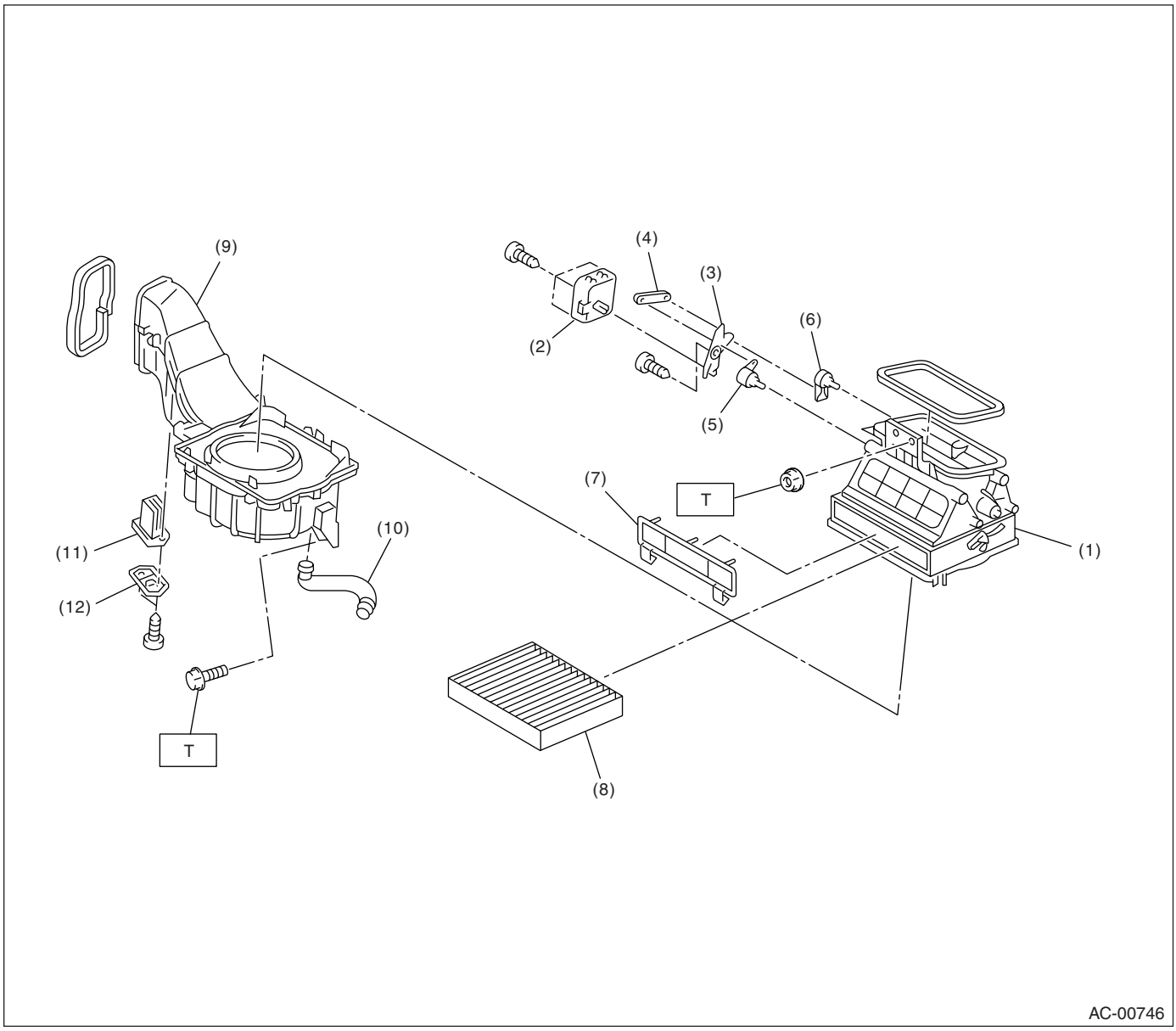


(1) Unit cover
(2) Side link
(3) Mode lever
(4) Foot lever
(5) Spring
(6) Mode link
(7) Defroster lever
(8) Foot nozzle
(9) Unit duct cover
(10) Heater core
(11) Drain hose
(12) Mix lever
(13) Unit assembly
(14) Foot duct
(15) Clip
(16) Packing
(17) Cooling unit block
(18) O-ring
(19) Expansion valve
(20) Evaporator
(21) Evaporator cover
(22) Thermistor

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.4 (0.75, 5.4)

2. BLOWER MOTOR UNIT

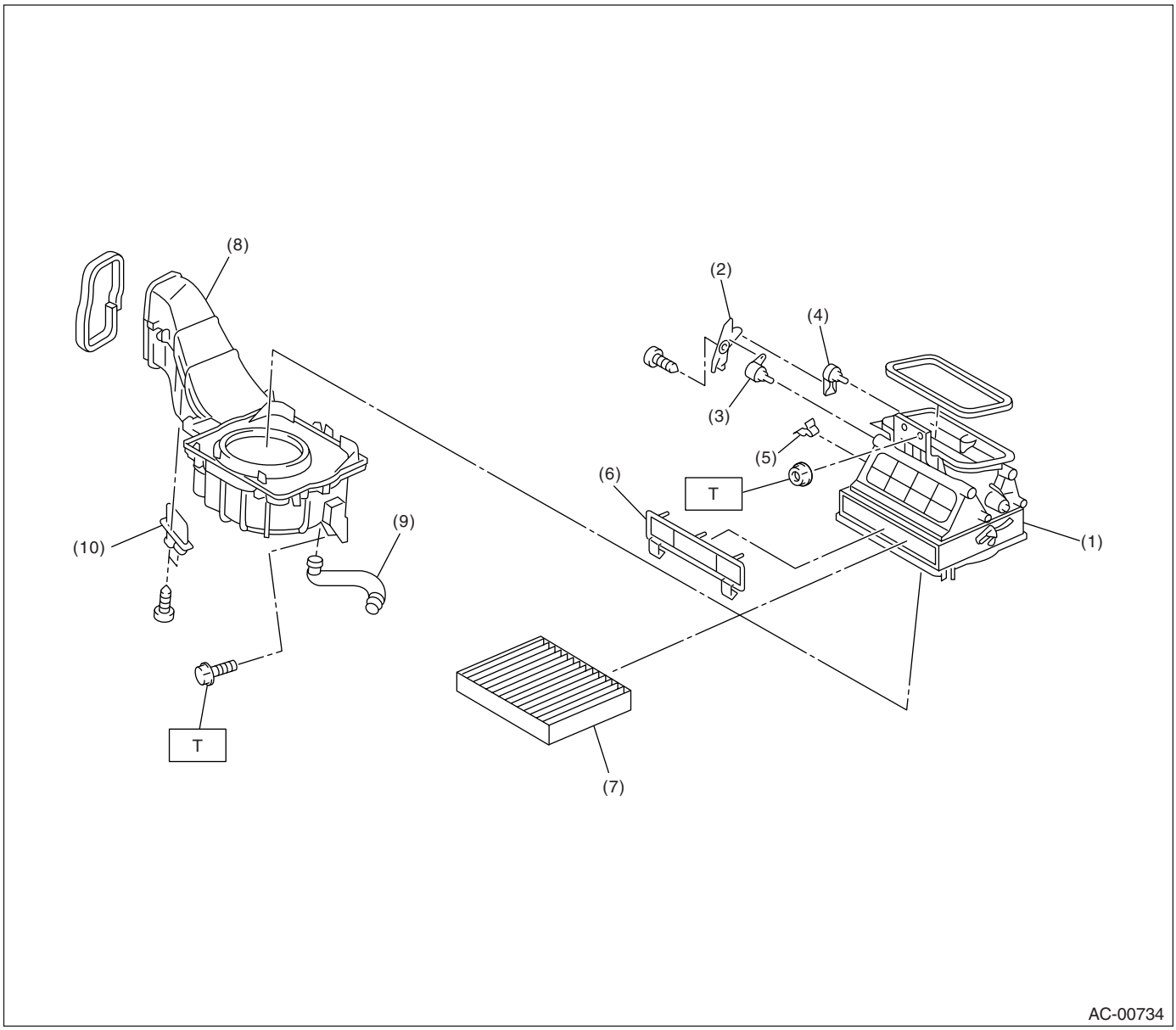
• AUTO A/C MODEL



(1) Upper case
(2) Servo motor
(3) Blower link
(4) Blower link lever A
(5) Blower link lever B
(6) Blower link lever C
(7) Filter cover
(8) Filter
(9) Blower motor assembly
(10) Hose
(11) Power transistor
(12) Power transistor cover

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.4 (0.75, 5.4)

• MANUAL A/C MODEL

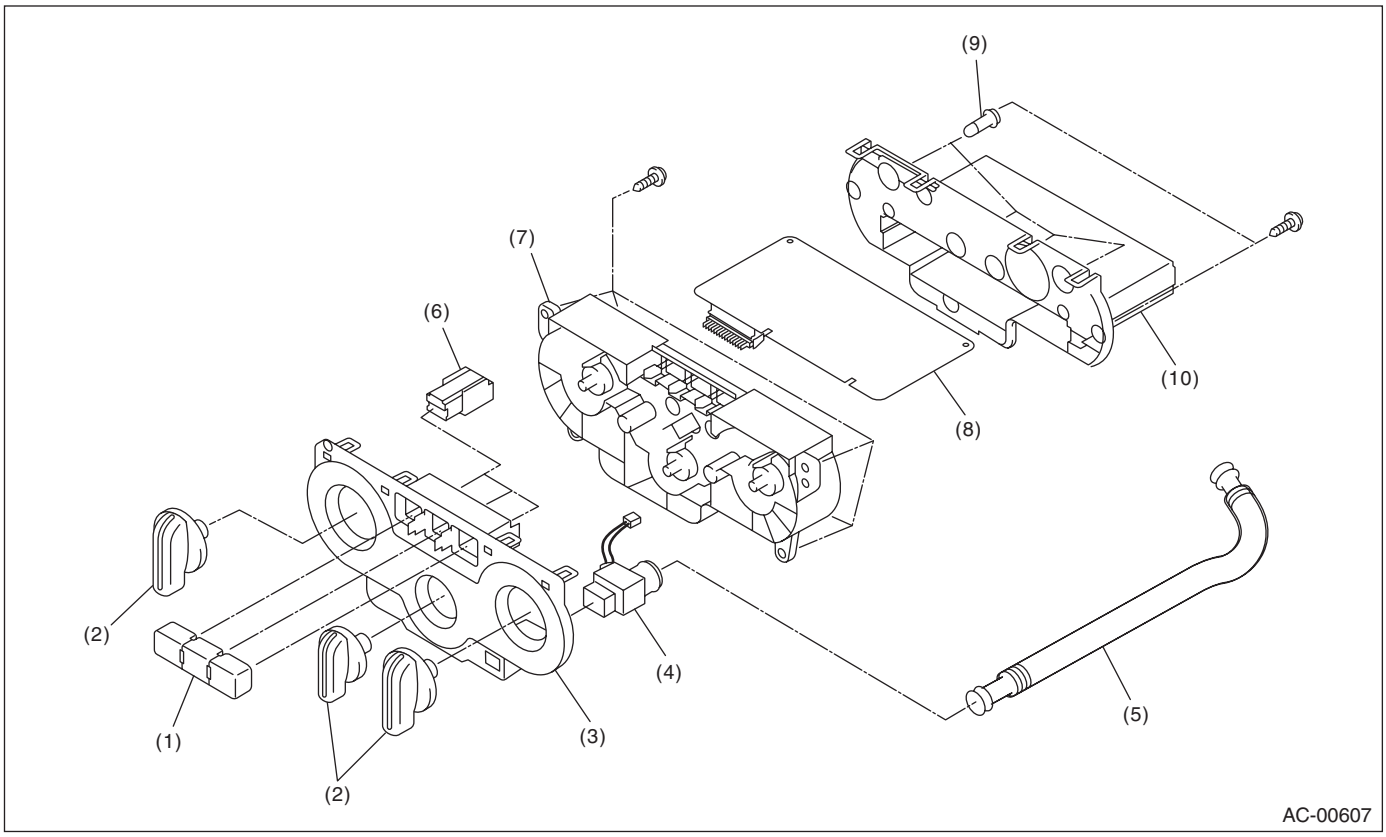


(1) Upper case
(2) Blower link
(3) Blower link lever A
(4) Blower link lever B
(5) Clip
(6) Filter cover
(7) Filter
(8) Blower motor assembly
(9) Hose
(10) Blower resistor

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.4 (0.75, 5.4)

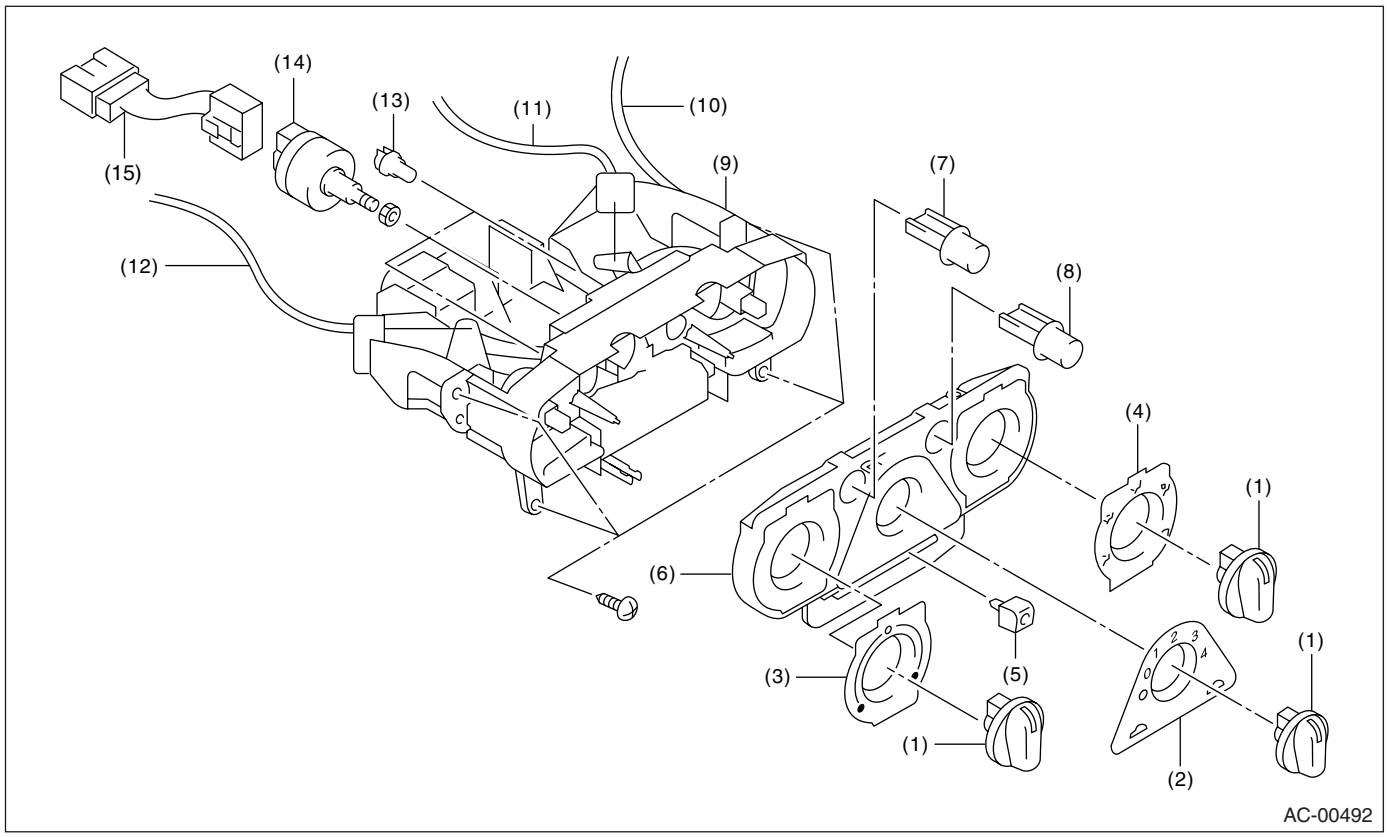
3. CONTROL UNIT

• AUTO A/C MODEL



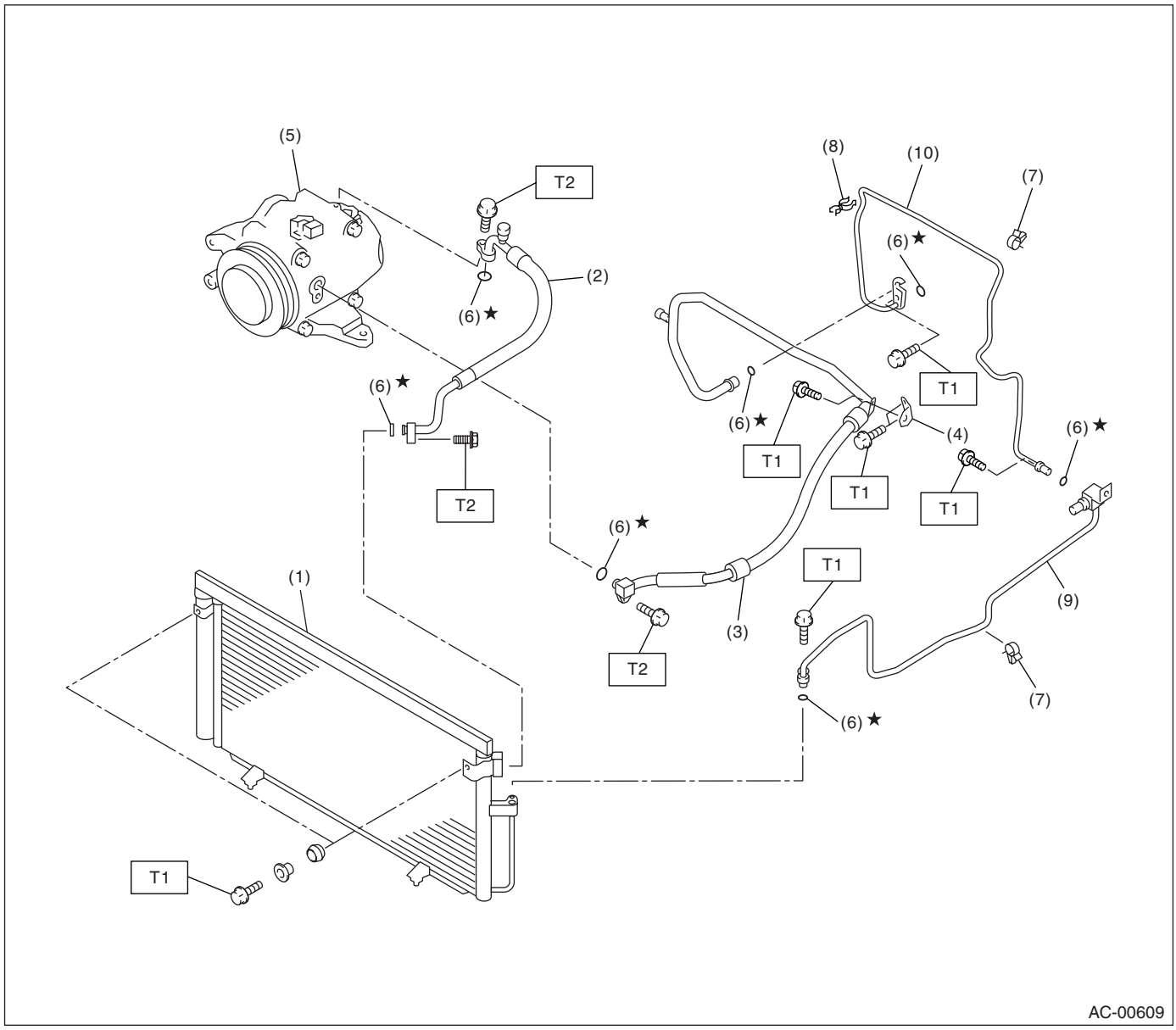
(1) Switch
(2) Control lever
(3) Control panel
(4) In-vehicle sensor
(5) Aspirator hose
(6) Switch assembly
(7) Control base
(8) Electronic control unit
(9) Bulb
(10) Control case

• MANUAL A/C MODEL



(1)	Dial	(6)	Heater control panel	(11)	Mode cable
(2)	Fan control plate	(7)	A/C switch	(12)	Temperature cable
(3)	Temperature control plate	(8)	Rear window defogger switch	(13)	Bulb
(4)	Mode control plate	(9)	Heater control base	(14)	Fan switch ASSY
(5)	FRESH/RECIRC switching knob	(10)	Intake cable	(15)	Harness

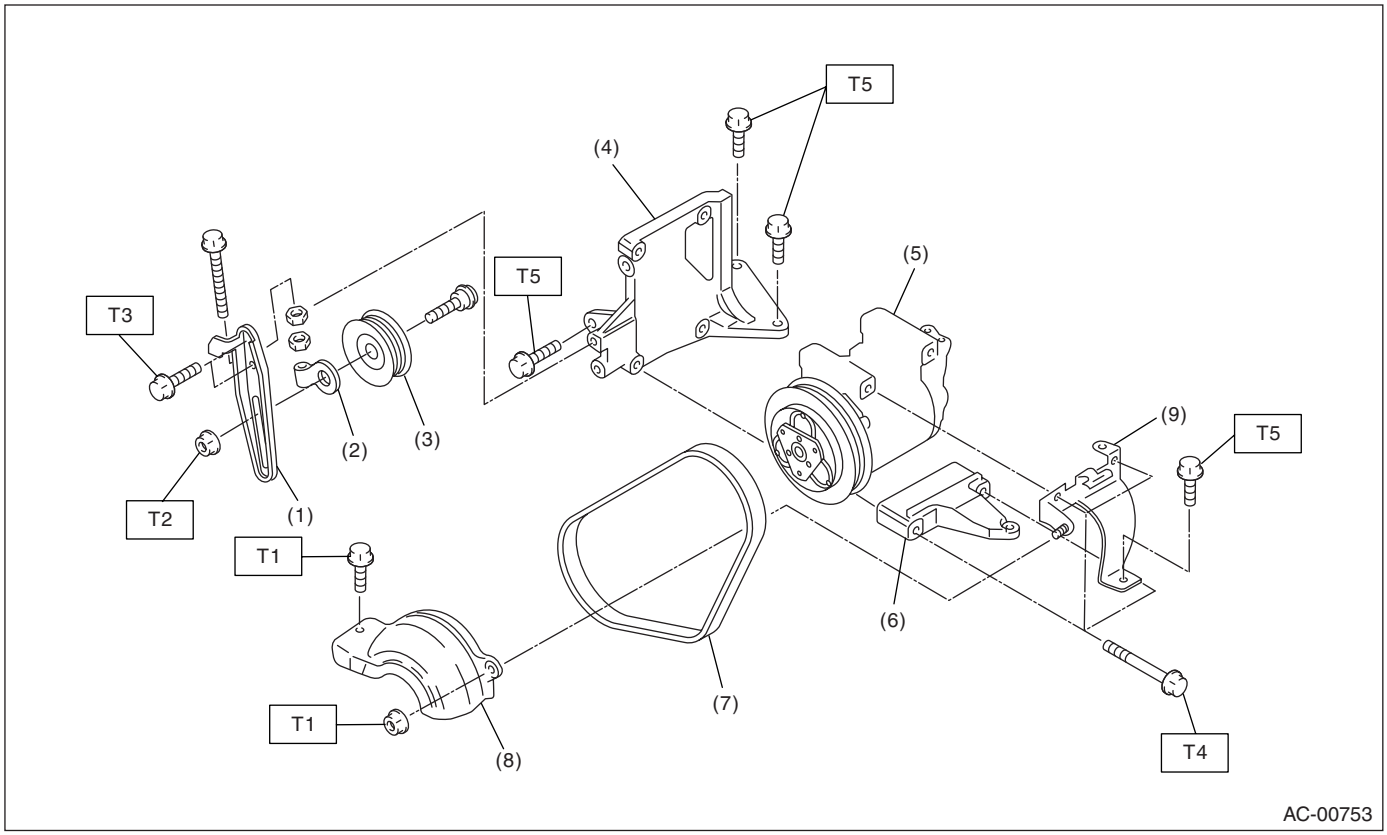
4. AIR CONDITIONING UNIT



(1)	Condenser	(6)	O-ring
(2)	Hose (High-pressure)	(7)	Clamp A
(3)	Hose (Low-pressure)	(8)	Clamp B
(4)	Bracket	(9)	Tube (To condenser)
(5)	Compressor	(10)	Tube (To evaporator)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.4)
T2: 15 (1.5, 10.8)

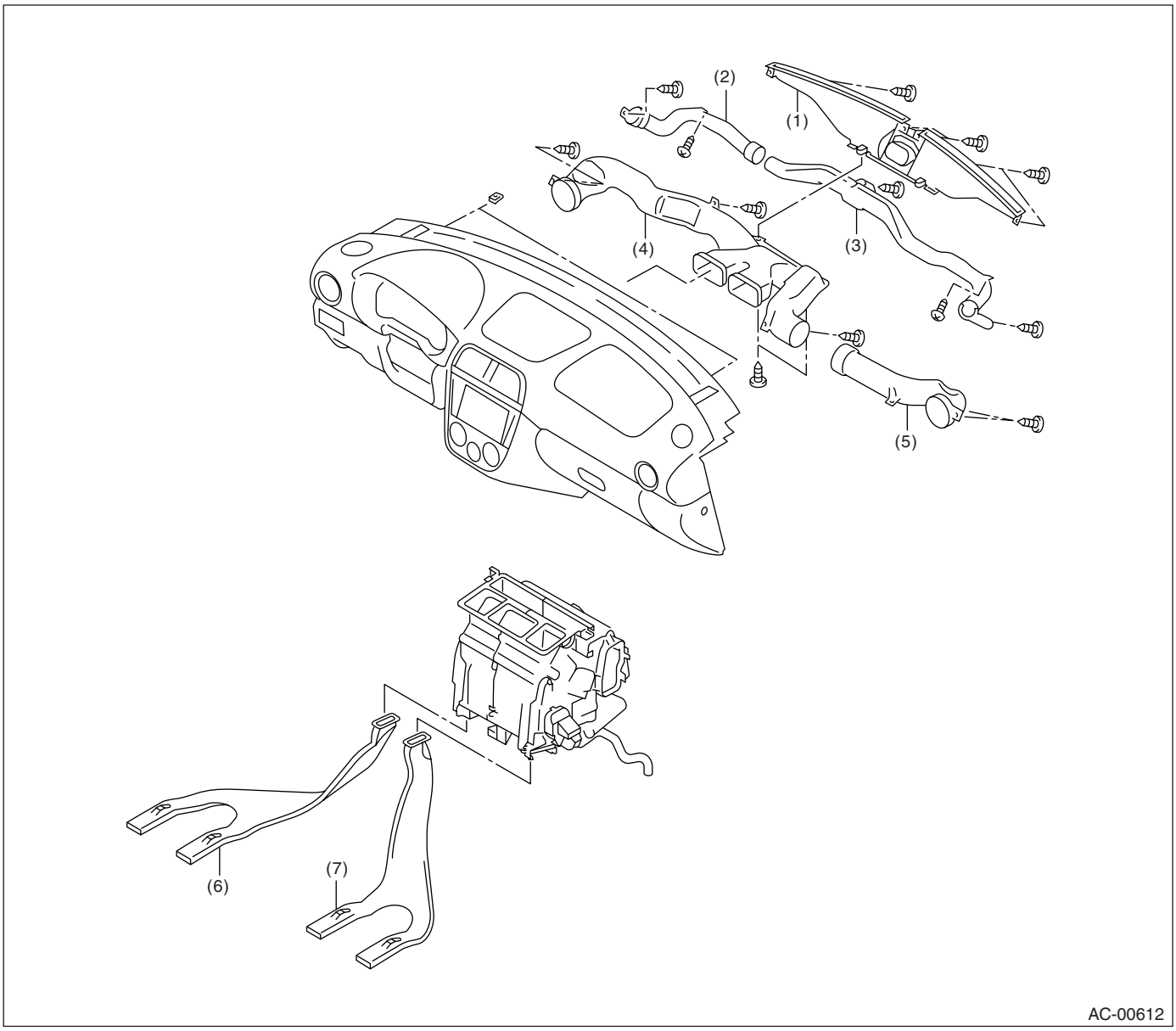
5. COMPRESSOR



(1) Idler pulley bracket
(2) Idler pulley adjuster
(3) Idler pulley
(4) Compressor upper bracket
(5) Compressor
(6) Compressor lower bracket
(7) V-belt
(8) Compressor belt cover
(9) Compressor belt cover bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.4)
T2: 22.6 (2.3, 16.6)
T3: 23.0 (2.35, 17.0)
T4: 28.9 (2.95, 21.3)
T5: 35 (3.6, 26)

6. HEATER DUCT

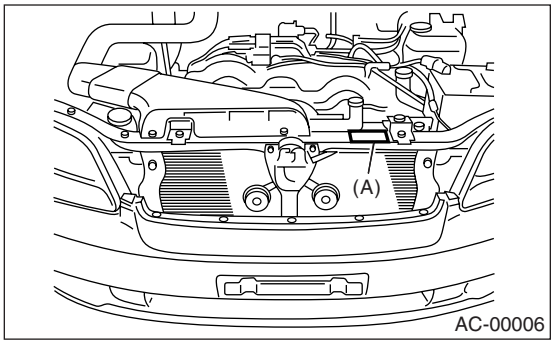


(1) Front defroster nozzle
(2) Side defroster duct (LH)
(3) Side defroster duct (RH)
(4) Side ventilation duct (LH)
(5) Side ventilation duct (RH)
(6) Rear heater duct (LH)
(7) Rear heater duct (RH)

C: CAUTION

1. HFC-134a A/C SYSTEM

• Unlike the old conventional CFC-12 system components, the cooling system components for the HFC-134a system such as the refrigerant and compressor oil are incompatible.
• Vehicles with the HFC-134a system can be identified by the label (A) attached to the vehicle.
Before maintenance, check which A/C system is installed in the vehicle.



2. COMPRESSOR OIL

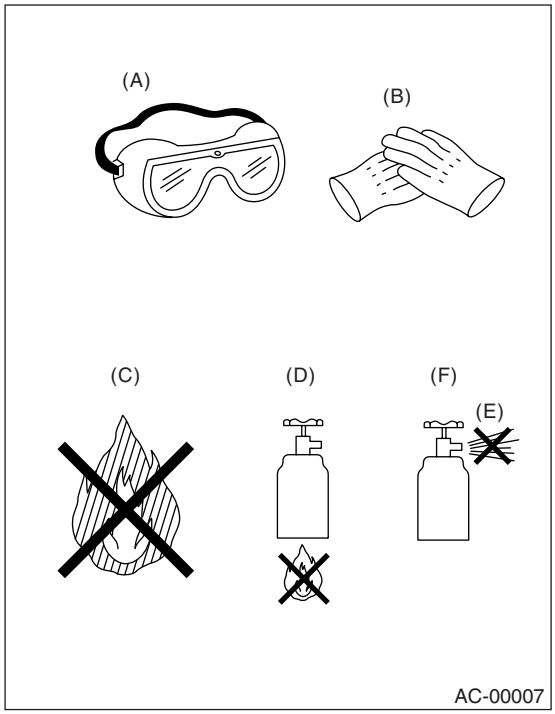
• HFC-134a compressor oil has no compatibility with that for R12 system.
• Use only the manufacturer-authorized compressor oil for the HFC-134a system; only use DH-PR.
• Do not mix multiple compressor oils.
If CFC-12 compressor oil is used in a HFC-134a A/C system, the compressor may become stuck due to poor lubrication, or the refrigerant may leak due to swelling of rubber parts.
On the other hand, if HFC-134a compressor oil is used in a CFC-12 A/C system, the durability of the A/C system will be lowered.
• HFC-134a compressor oil is very hygroscopic. When replacing or installing/removing A/C parts, immediately isolate the oil from the atmosphere using a plug or tape. In order to avoid moisture, store the oil in a container with its cap tightly closed.

3. REFRIGERANT

• The CFC-12 refrigerant cannot be used in the HFC-134a A/C system. The HFC-134a refrigerant, also, cannot be used in the CFC-12 A/C system.
• If an incorrect or no refrigerant is used, poor lubrication will result and the compressor itself may be damaged.

4. HANDLING OF REFRIGERANT

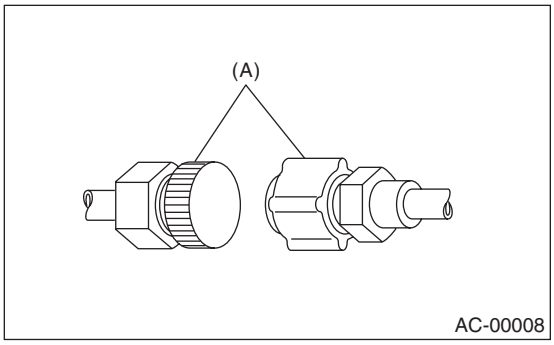
• The refrigerant boils at approx. –30°C (–22°F). When handling it, be sure to wear safety goggles and protective gloves. Direct contact of the refrigerant with skin may cause frostbite.
If the refrigerant gets into your eye, avoid rubbing your eyes with your hands. Wash your eye with plenty of water, and receive medical treatment from an eye doctor.
• Do not heat a service can. If a service can is directly heated, or put into boiling water, the inside pressure will become extremely high. This may cause the can to explode. If a service can must be warmed up, use hot water in 40°C (104°F) max.
• Do not drop or impact a service can. (Observe the precautions and operation procedure described on the refrigerant can.)
• When the engine is running, do not open the high-pressure valve of the manifold gauge. The high-pressure gas will back-flow resulting in an explosion of the can.
• Provide good ventilation and do not work in a closed area.
• In order to prevent global warning, avoid releasing HFC-134a into the atmosphere. Using a refrigerant recovery system, discharge and reuse it.



(A) Goggles
(B) Gloves
(C) Avoid open flame
(D) No direct heat on container
(E) Do not discharge
(F) Loosen

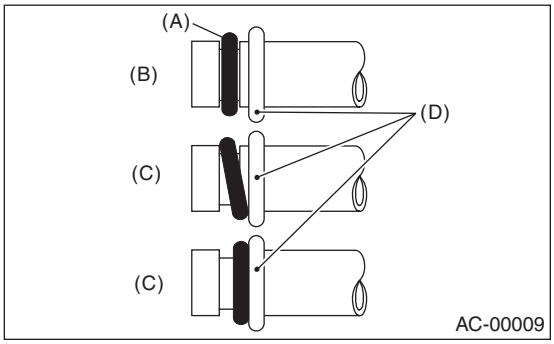
5. O-RING CONNECTIONS

- Use new O-rings.
- In order to keep the O-rings free of lint which will cause a refrigerant gas leak, perform operations without gloves and shop cloths.
- Apply the compressor oil to the O-rings to avoid sticking, then install them.
- Use a torque wrench to tighten the O-ring fittings: Over-tightening will damage the O-ring and tube end distortion.
- If the operation is interrupted before completing a pipe connection, recap the tubes, components, and fittings with a plug or tape to prevent contamination from entering.



(A) Seal

- Visually check the surfaces and mating surfaces of O-rings, threads, and connecting points. If a failure is found, replace the applicable parts.
- Install the O-rings at right angle to the tube beards.

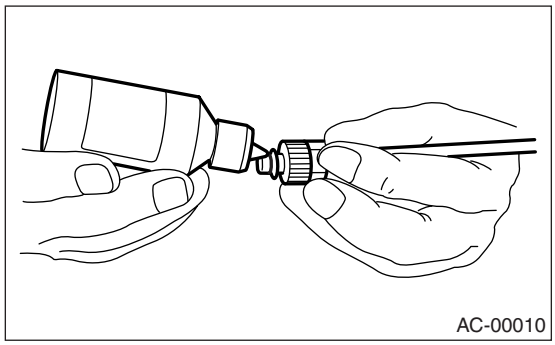


(A) O-ring
(B) OK
(C) NG
(D) Bead

- Use the oil specified in the service manual to lubricate the O-rings.

Apply the oil to the top and sides of the O-rings before installation.

Apply the oil to the area including the O-rings and tube beads.

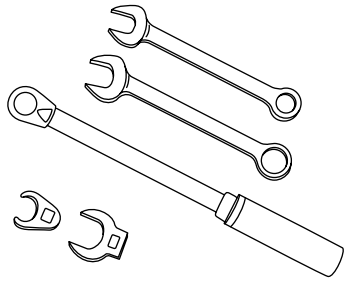
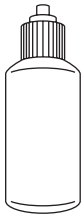
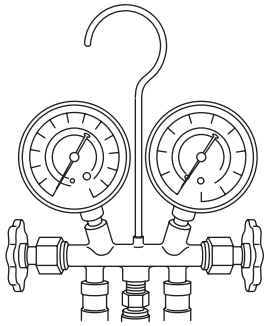
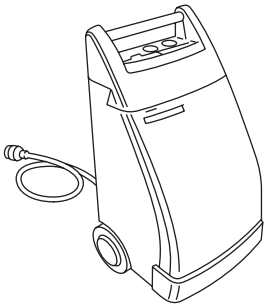


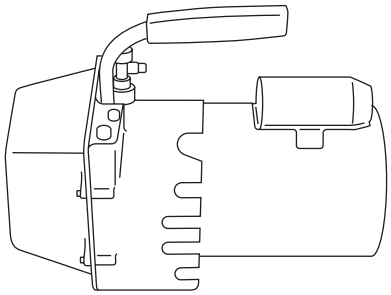
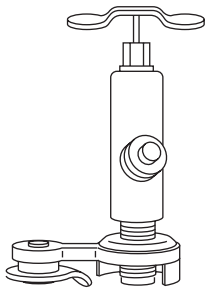
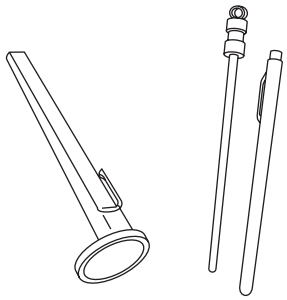
- After tightening, use a clean shop cloth to remove excess oil from the connections and any oil which may have run on the vehicle body or other parts.
- If any leakage is suspected after tightening, do not retighten the connections, Disconnect the connections, remove the O-rings, and check the O-rings, threads, and connections.

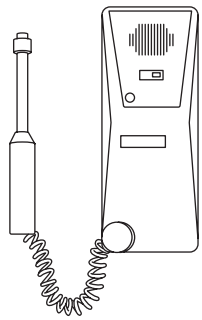
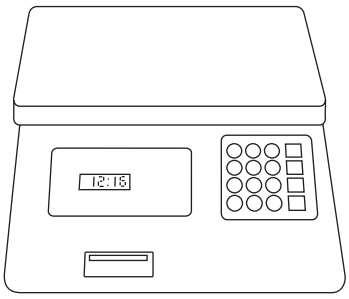
D: PREPARATION TOOL

CAUTION:
When working on vehicles with the HFC-134a system, only use HFC-134a specified tools and parts. Do not mix with CFC-12 tools and parts. If HFC-134a and CFC-12 refrigerant or compressor oil is mixed, poor lubrication will result and the compressor itself may be destroyed.
In order to help prevent mixing HFC-134a and CFC-12 parts and liquid, the tool and screw type and the type of service valves used are different. The gas leak detectors for the HFC-134a and CFC-12 systems must also not be interchanged.

	HFC-134a	CFC-12
Tool & screw type	Millimeter size	Inch size
Valve type	Quick joint type	Screw-in type

Description	Tools and Equipment
 AC-00213	Wrench Various **WRENCHES** will be required to service any A/C system. A 7 to 40 N·m (0.7 to 4.1 kgf-m, 5 to 30 ft-lb) torque wrench with various crow-foot wrenches will be needed. Open end or flare nut wrenches will be needed for back-up on the tube and hose fittings.
 AC-00012	Applicator bottle A small **APPLICATOR BOTTLE** is recommended to apply refrigerant oil to the various parts. They can be obtained at a hardware or drug store.
 AC-00013	Manifold gauge set A **MANIFOLD GAUGE SET** (with hoses) can be obtained from either a commercial refrigeration supply house or from an auto shop equipment supplier.
 AC-00014	Refrigerant recovery system A **REFRIGERANT RECOVERY SYSTEM** is used for the recovery and reuse of A/C system refrigerant after contaminants and moisture have been removed from the refrigerant.

Description	Tools and Equipment
AC-00015	Syringe A graduated plastic **SYRINGE** will be needed to add oil back into the system. The syringe can be found at a pharmacy or drug store.
 AC-00016	Vacuum pump A **VACUUM PUMP** (in good working condition) is necessary, and may be obtained from either a commercial refrigeration supply house or an automotive equipment supplier.
 AC-00017	Can tap A **CAN TAP** for the 397 g (14 oz) can is available from an auto supply store.
 AC-00018	Thermometer Pocket **THERMOMETERS** are available from either industrial hardware store or commercial refrigeration supply houses.

Description	Tools and Equipment
 AC-00019	Electronic leak detector An **ELECTRONIC LEAK DETECTOR** can be obtained from either a specialty tool supply or an A/C equipment supplier.
 AC-00020	Weight scale A **WEIGHT SCALE** such as an electronic charging scale or a bathroom scale with digital display will be needed if a 13.6 kg (30 lb) refrigerant container is used.

2. Refrigerant Pressure with Manifold Gauge Set

A: PROCEDURE

1) Place the vehicle in the shade and windless condition.
2) Connect the manifold gauge set.
3) Open the front windows and close all doors.
4) Open the front hood.
5) Increase the engine to 1,500 rpm.
6) Turn ON the A/C switch.
7) Turn the temperature control switch to MAX COOL.
8) Put in RECIRC position.
9) Turn the blower control switch to HI.
10) Read the gauge.

Standard:
Low pressure: 127 — 196 kPa (1.3 — 2.0 kg/cm^2, 18 — 28 psi)
High pressure: 1,471 — 1, 667 kPa (15 — 17 kg/cm^2, 213 — 242 psi)
Ambient temperature: 30 — 35°C (86 — 95°F)

B: INSPECTION

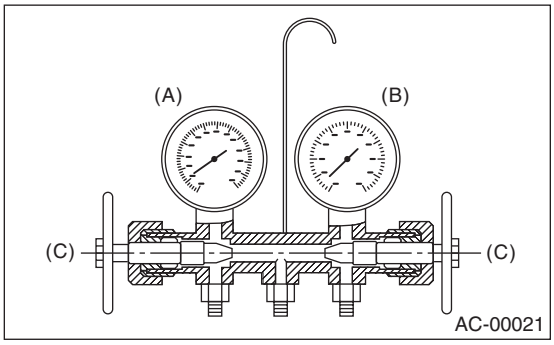
Symptom	Probable cause	Repair order
High-pressure side is unusually high.	• Defective condenser fan motor • Clogged condenser fin • Too much refrigerant • Air inside the system • Defective receiver dryer	• Replace the fan motor. • Clean the condenser fin. • Discharge refrigerant. • Replace the receiver dryer. • After revacuating the receiver dryer, charge appropriate amount of refrigerant.
High-pressure side is unusually low.	• Defective compressor • Not enough refrigerant • Clogged expansion valve • Expansion valve frozen temporarily by moisture	• Replace the compressor. • Check for leaks. • Replace the expansion valve. • Fully evacuate the expansion valve.
Low-pressure side is unusually high.	• Defective compressor • Defective expansion valve • Too much refrigerant	• Replace the compressor. • Replace the expansion valve. • Discharge refrigerant.
Low-pressure side is unusually low.	• Not enough refrigerant • Clogged expansion valve • Expansion valve frozen temporarily by moisture • Saturated receiver dryer	• Check for leaks. • Replace the expansion valve. • Replace the receiver dryer.

3. Refrigerant Recovery Procedure

A: PROCEDURE

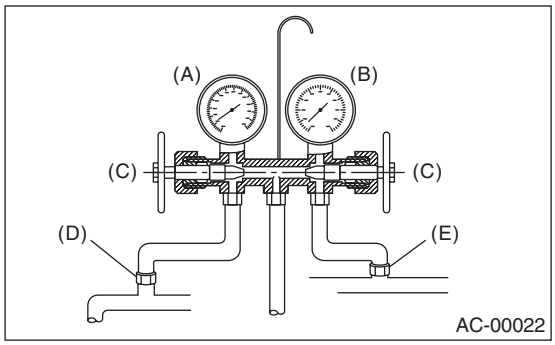
CAUTION:
• During operation, be sure to wear safety goggles and protective gloves.
• Connect the refrigerant recovery system with the manifold gauge set to discharge the refrigerant from the A/C system and reuse it.
• When reusing the discharged refrigerant, keep service cans on hand. Because the discharge rate with the recovery system is approx. 90%, service cans are necessary to charge the refrigerant.
• Follow the detailed operation procedure described in the operation manual attached to the refrigerant recovery system.

1) Perform the compressor oil return operation. <Ref. to AC-25, PROCEDURE, Compressor Oil.>
2) Stop the engine.
3) Make sure the valves on low-/high-pressure sides of manifold gauge set are fully closed.



(A) Low-pressure gauge (Compound pressure gauge)
(B) High-pressure gauge
(C) Close

4) Install the low-/high-pressure hoses to the service ports on the low-/high-pressure sides of the vehicle respectively.



(A) Low-pressure gauge (Compound pressure gauge)
(B) High-pressure gauge
(C) Close
(D) Low-pressure side service port
(E) High-pressure side service port

5) Connect the center hose to the refrigerant recovery system.
6) Follow the operation manual to activate the refrigerant recovery system.

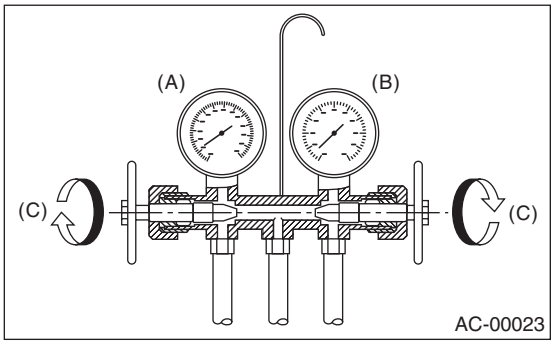
4. Refrigerant Charging Procedure

A: PROCEDURE

CAUTION:
• During operation, be sure to wear safety goggles and protective gloves.
• Before charging the refrigerant, evacuate the system to remove small amounts of moisture remaining in the system.
The moisture in the system can be completely evacuated only under the minimum vacuum level. The minimum vacuum level affects the temperature in the system.
• The list below shows the vacuum values necessary to boil water in various temperature. In addition, the vacuum levels indicated on the gauge are approx. 3.3 kPa (25 mmHg, 0.98 inHg) lower than those measured at 304.8 m (1,000 ft) above sea level.

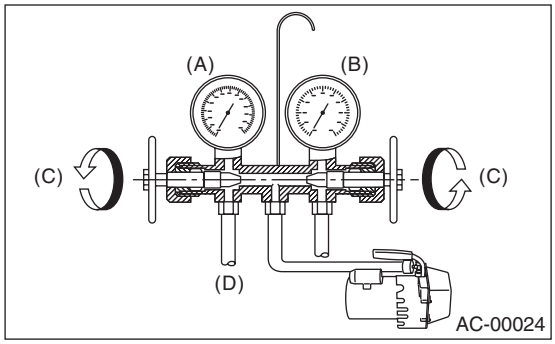
Vacuum level required to boil water (at sea level)	
Temperature	Vacuum
1.7°C (35°F)	100.9 kPa (757 mmHg, 29.8 inHg)
7.2°C (45°F)	100.5 kPa (754 mmHg, 29.7 inHg)
12.8°C (55°F)	99.8 kPa (749 mmHg, 29.5 inHg)
18.3°C (65°F)	99.2 kPa (744 mmHg, 29.3 inHg)
23.9°C (75°F)	98.5 kPa (739 mmHg, 29.1 inHg)
29.4°C (85°F)	97.2 kPa (729 mmHg, 28.7 inHg)
35°C (95°F)	95.8 kPa (719 mmHg, 28.3 inHg)

1) Close the valves on low-/high-pressure sides of the manifold gauge.



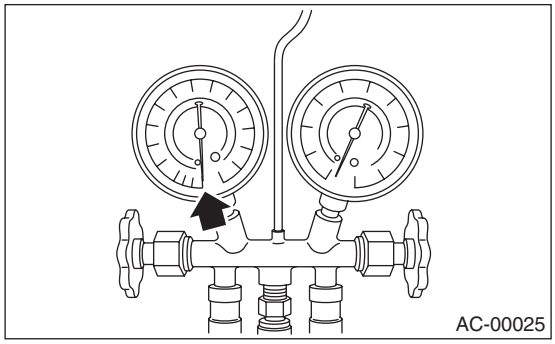
(A) Low-pressure gauge (Compound pressure gauge)
(B) High-pressure gauge
(C) Close

2) Install the low-/high-pressure hoses to the corresponding service ports on the vehicle respectively.
3) Connect the center hose of the manifold gauge set with the vacuum pump.
4) Carefully open the valves on the low-/high-pressure sides to activate the vacuum pump.

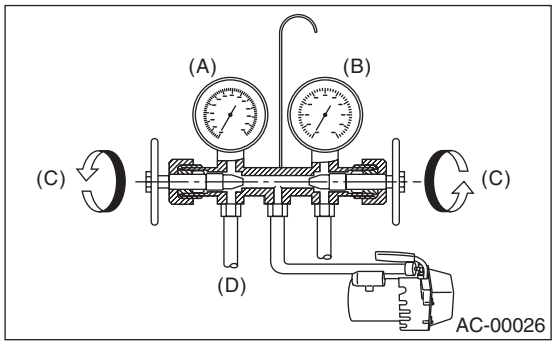


(A) Low-pressure gauge (Compound pressure gauge)
(B) High-pressure gauge
(C) Slowly open
(D) Vacuum pump turn on

5) After the low-pressure gauge reaches 100.0 kPa (750 mmHg, 29.5 inHg) or higher, evacuate the system for approx. 15 minutes (Continue evacuation).

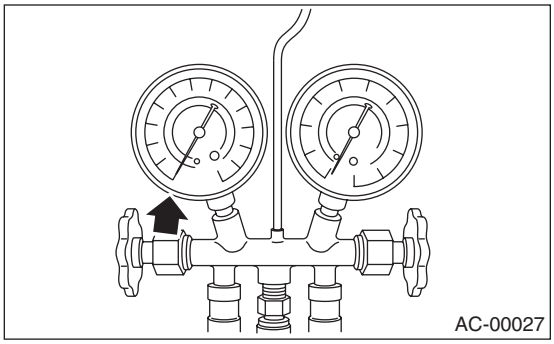


6) After 15 minutes of evacuation, if the reading shows 100.0 kPa (750 mmHg, 29.5 inHg) or higher, close the valves on the both sides to stop the vacuum pump.

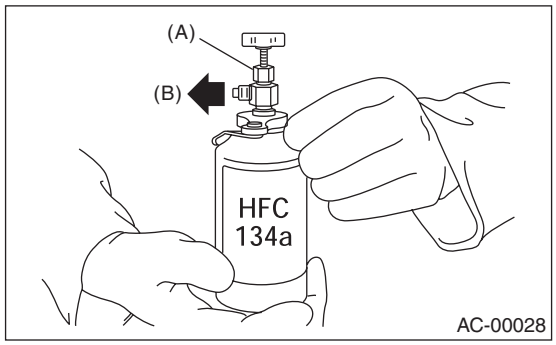


(A) Low-pressure gauge (Compound pressure gauge)
(B) High-pressure gauge
(C) Close
(D) Vacuum pump turn off

7) Note the low-pressure gauge reading.

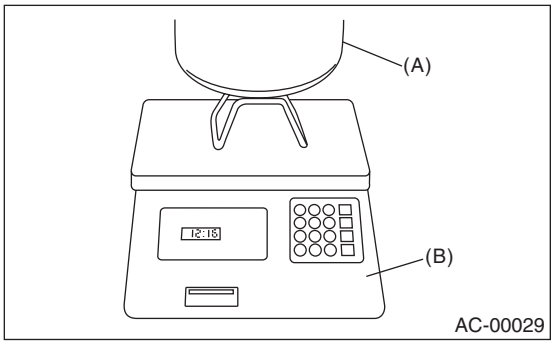


8) Leave it at least 5 minutes, and then check the low-pressure gauge reading for any changes.
When a gauge indicator shows near to zero point, this is a sign of leakage. Check pipe connector points, repair them, make sure there is no leakage by air bleeding.
9) Following the can tap operation manual instructions, install it to the refrigerant can.



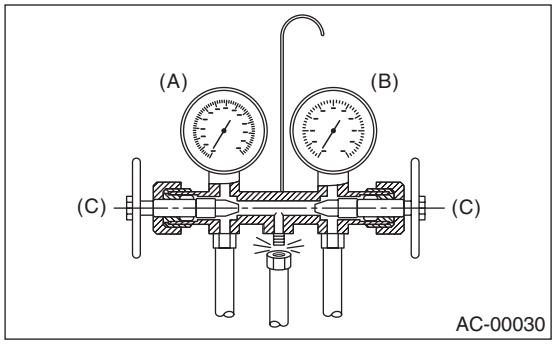
(A) Tap valve
(B) Center manifold hose

10) Disconnect the center manifold hose from the vacuum pump, and connect the hose to the tap valve.
11) When a 13.6 kg (30 lb) refrigerant container is used, measure the refrigerant amount in use using a weighting scale.



(A) Refrigerant container (HFC-134a)
(B) Weight scale

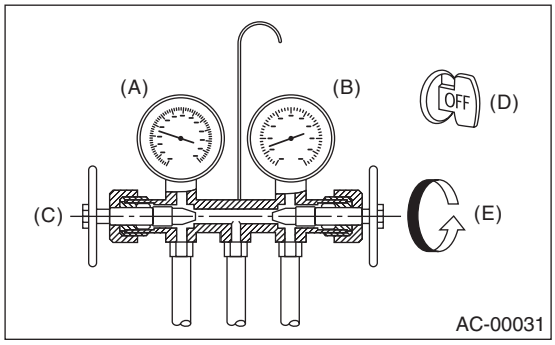
12) Confirm that all the 3 hoses are tightly connected to the manifold gauge set.



(A) Low-pressure gauge (Compound pressure gauge)
(B) High-pressure gauge
(C) Close

13) Open the valve on the HFC-134a source.
14) Loosen the center hose connection on the manifold gauge set (if applicable, press a purge valve on the manifold gauge set) only for a couple of seconds to allow the air in the center hose to escape by the refrigerant.
15) Carefully open the high-pressure valve with the engine stopping.

CAUTION:
Do not open the low-pressure valve.



(A) Low-pressure gauge (Compound pressure gauge)
(B) High-pressure gauge
(C) Close
(D) Ignition switch OFF
(E) Slowly open

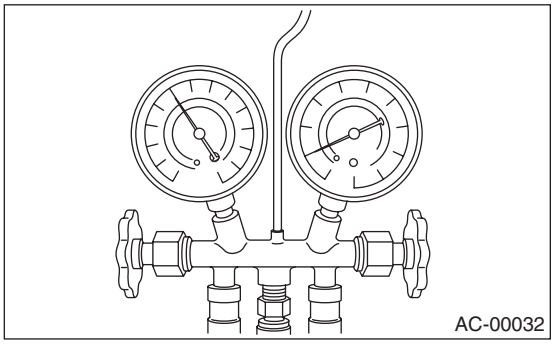
CAUTION:
Never run the engine during charging from the high-pressure side.

16) Close the high-pressure valve when the low-pressure gauge reaches 98 kPa (1 kg/cm^2, 14 psi).
Using a leak tester, check the system for leaks.
If any leakage is found after the refrigerant recovery is completed, repair the applicable area.

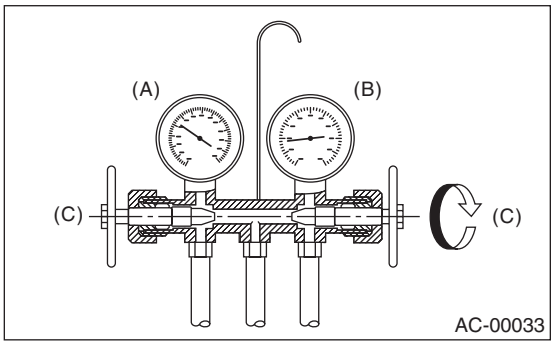
17) After confirming that there are no leaks with the leak test, charge the required amount of refrigerant.

CAUTION:
Never run the engine during charging from the high-pressure side.

18) Close the high-pressure valve when;
• the readings of low-/high-pressure gauges become almost equal, after the charging speed is reduced,
• the HFC-134a source becomes empty, or the system is filled with the gas.



19) If the HFC-134a source is empty, close the high-pressure valve, close the valve on the can tap, and replace the HFC-134a source with a new one to restart the operation.

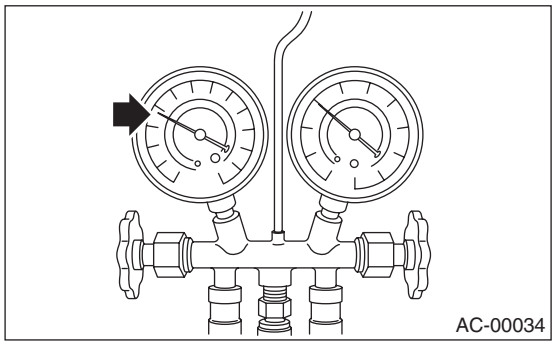


(A) Low-pressure gauge (Compound pressure gauge)
(B) High-pressure gauge
(C) Close

20) Confirm that both the low-/high-pressure valves can be closed. Start the engine with the A/C switch OFF.
21) Quickly repeat ON-OFF cycles a few times to prevent initial compressor damage.
22) Set up the vehicle to the following status:
• A/C switch ON
• Engine running at 1,500 rpm
• Blower speed setting to “HI”
• Temperature setting to “MAX COOL”
• Air inlet setting to “RECIRC”
• Windows open

23) While reading the low-pressure gauge, carefully open the low-pressure valve with the refrigerant source connected and the service hose purged.

CAUTION:
Never open the high-pressure valve with the engine running. Doing so may result in a reflow of high-pressure gas and refrigerant can’s explosion.



24) Adjust the refrigerant flow to maintain the pressure on the low-pressure side at 276 kPa (2.81 kg/cm^2, 40 psi) max.
25) After the system is fully charged, close the low-pressure valve.
26) Close the valve on the refrigerant source.

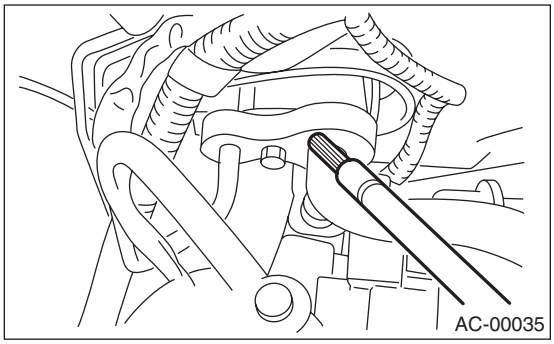
Refrigerant amount		
Refrigerant	Minimum	Maximum
HFC-134a	450 g (0.99 lb)	550 g (1.21 lb)

27) Disconnect the hose from the service port, and install the service port cap.

5. Refrigerant Leak Check

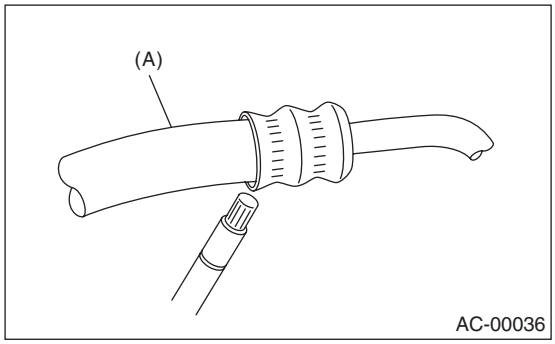
A: INSPECTION

1) Operate the A/C system for approx. 10 minutes, and confirm that the high-pressure side shows at least 690 kPa (7.03 kg/cm^2, 100 psi). Then stop the engine to start the leak test.
2) Starting from the connection between the high-pressure pipe and evaporator, check the system for leaks along the high-pressure side through the compressor. The following items must be checked thoroughly.
3) Check the joint and seam between the pressure switch (dual pressure switch) and high-pressure pipe.
4) Check the connections between the condenser and pipes, and welded joints on the condenser.
The leak tester may detect the oil on the condenser fins as a leak.
5) Check the joint between the compressor and hoses.
6) Check the machined area of compressor and other joints on the compressor.
7) Check the compressor shaft seal at the area near the center of compressor clutch pulley.
Some shaft seals show a slight amount of leakage about 3 g (0.1 oz) per year. This is not a problem.
8) Starting from the connection between the low-pressure pipe and evaporator, check the system for leakage along the low-pressure side through the compressor. The following items must be checked thoroughly.
- Connection between two parts
- Connection between the pipe and plate



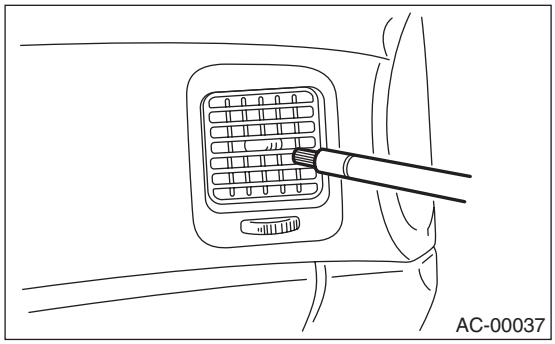
9) Visually check the rubber area of the flexible hose for cracks.
Check the entire length of the flexible hose, especially the connection with the metal hose end.

CAUTION:
Carefully check the external surface of hoses and tubes at approx. 25 mm (0.98 in) per second.

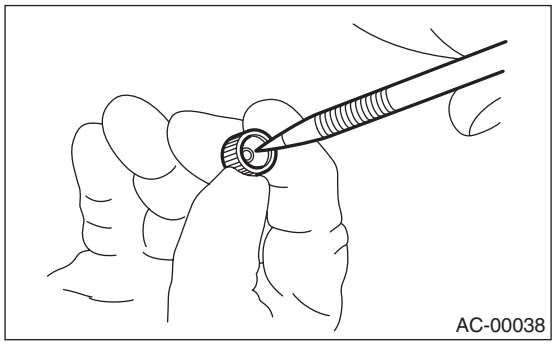


(A) Flexible hose

10) Disconnect the drain hose from the heater case, and check the hose end for at least 10 seconds.
After the test is finished, reconnect the drain hose.
11) Turn the ignition key to ON position, and run the blower at high speed for 1 minute. Stop the blower to check the ventilation grille on the instrument panel. While moving the tester closer to the grille, run the blower for 1 or 2 seconds, then stop it. Check the grille at that point for at least 10 seconds.



12) Check the valve in the service port.
13) Visually check the rubber seal in service port cap.



6. Compressor Oil

A: PROCEDURE

NOTE:
Before making repairs, conduct the oil return operation to return the compressor oil in circulation with the refrigerant to compressor.

1) Increase engine to 1,500 rpm.
2) Turn the A/C switch to ON.
3) Turn the temperature control switch to MAX COOL.
4) Put in RECIRC position.
5) Turn the blower control switch to HI.
6) Leave in this condition for 10 minutes.

B: REPLACEMENT

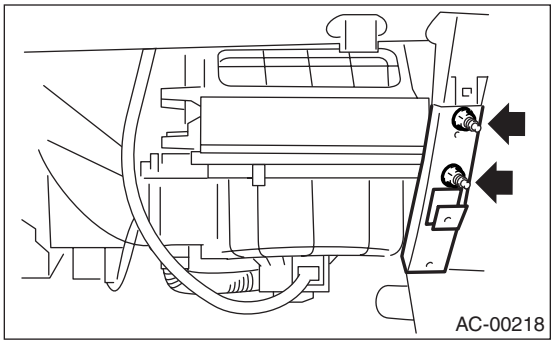
NOTE:
• If a component is replaced, add an appropriate amount of compressor oil.
• When replacing the compressor, the new compressor will already have the specified amount of oil in it. Install the new compressor after removing the same amount of oil that is remaining in the compressor removed.

Replacement parts	Amount of oil replenishment
Evaporator	114 m ℓ (3.9 US fl oz, 4.0 Imp fl oz)
Condenser	7 m ℓ (0.24 US fl oz, 0.25 Imp fl oz)
Hose	1 m ℓ (0.03 US fl oz, 0.04 Imp fl oz)

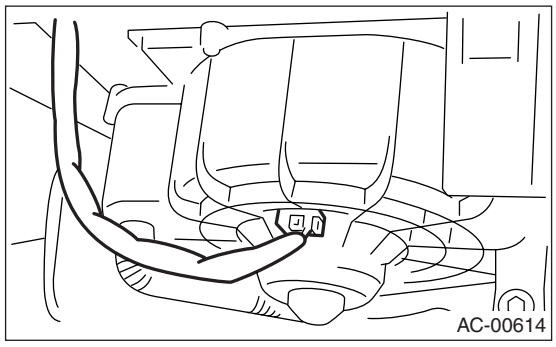
7. Blower Motor Unit Assembly

A: REMOVAL

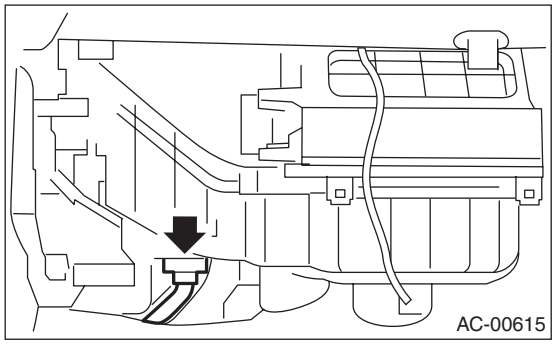
1) Disconnect the ground cable from battery.
2) Remove the glove box. <Ref. to EI-41, REMOVAL, Glove Box.>
3) Loosen the nut to remove the support beam stay.


AC-00218

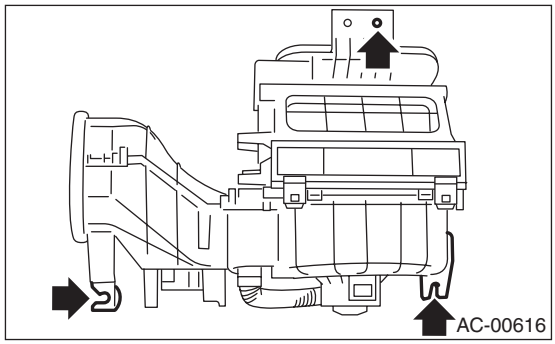
4) Disconnect the blower motor connector.


AC-00614

5) Disconnect the power transistor or blower resistor connector.


AC-00615

6) Loosen the bolt and nut to remove the blower motor unit assembly.


AC-00616

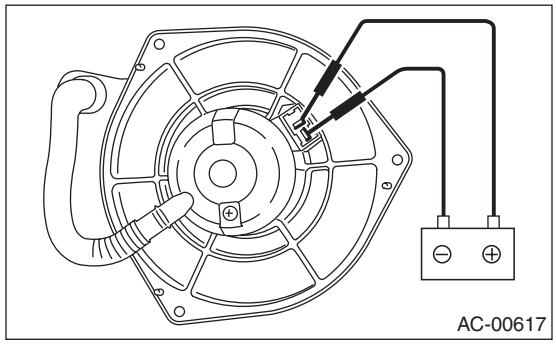
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to AC-5, HEATER COOLING UNIT, COMPONENT, General Description.> and <Ref. to AC-7, BLOWER MOTOR UNIT, COMPONENT, General Description.>

C: INSPECTION

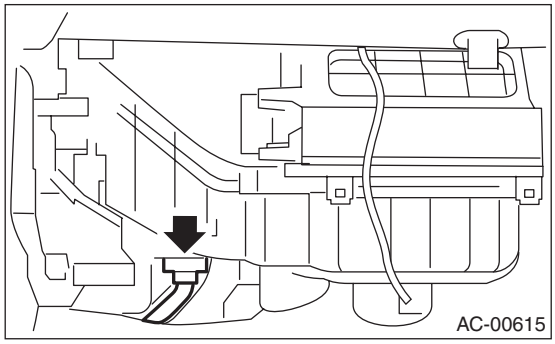
Connect the motor connector terminal 1 from the battery to the positive (+) lead and terminal 2 to the negative (–) lead. Make sure the motor runs smoothly.


AC-00617

8. Power Transistor (Auto A/C Model)

A: REMOVAL

1) Remove the glove box. <Ref. to EI-41, REMOVAL, Glove Box.>
2) Disconnect the power transistor connector.
3) Loosen the two screws to remove the power transistor.



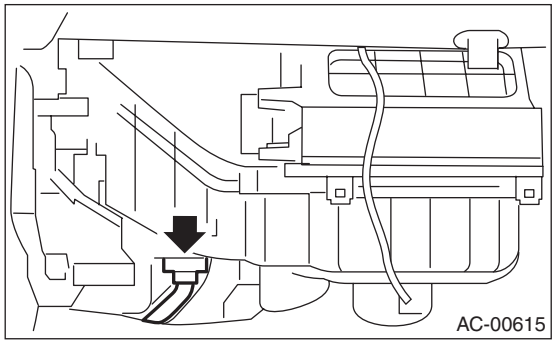
B: INSTALLATION

Install in the reverse order of removal.

9. Blower Resistor (Manual A/C Model)

A: REMOVAL

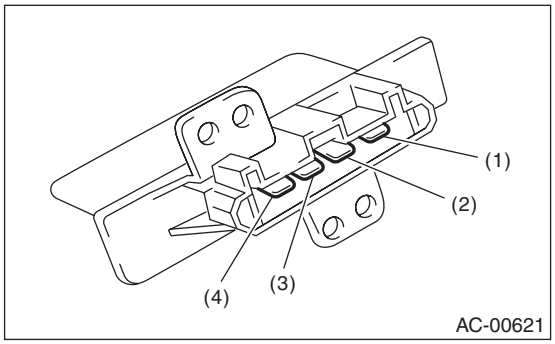
1) Remove the glove box. <Ref. to EI-41, REMOVAL, Glove Box.>
2) Disconnect the blower resistor connector.
3) Loosen the two screws to remove the blower resistor.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION



Measure the blower resistor resistance.

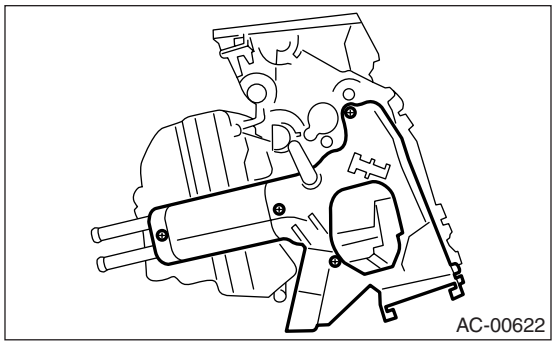
Terminal No.	Standard
3 and 1	Approx. 0.51 Ω
3 and 2	Approx. 2.70 Ω
3 and 4	Approx. 1.43 Ω

If NG, replace the blower resistor.

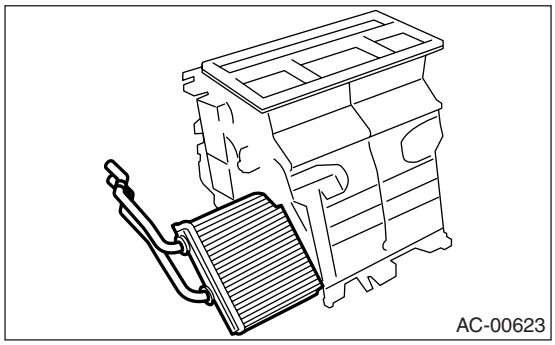
10.Heater Core

A: REMOVAL

1) Remove the heater and cooling unit. <Ref. to AC-34, REMOVAL, Heater and Cooling Unit.>
2) Loosen the screws to remove the heater core cover.



3) Remove the heater core.



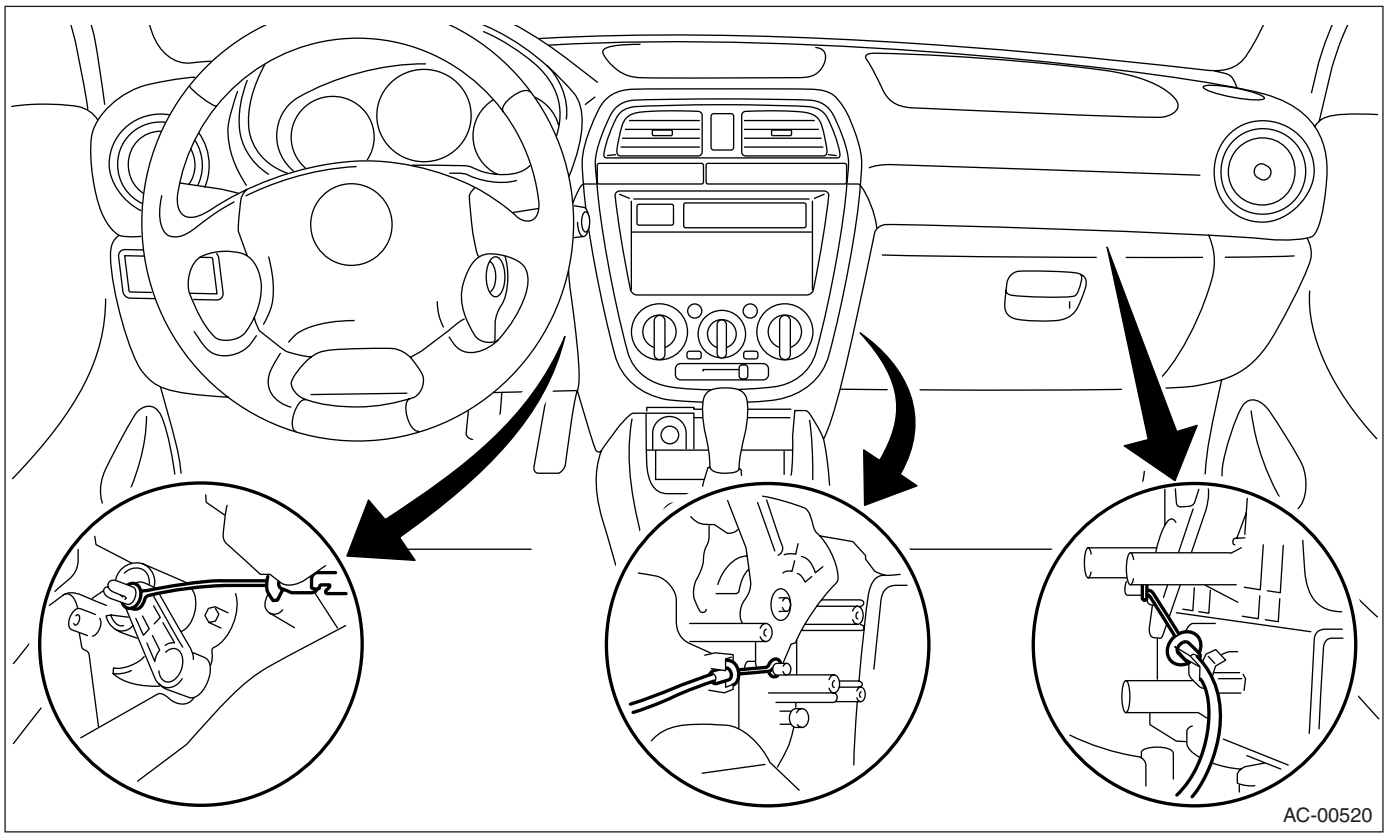
B: INSTALLATION

Install in the reverse order of removal.

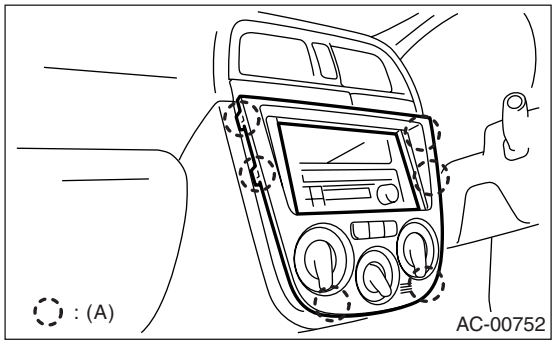
11.Control Unit (Manual A/C Model)

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the glove box. <Ref. to EI-41, REMOVAL, Glove Box.>
3) Remove the lower panel. <Ref. to EI-45, Instrument Panel Assembly.>
4) Remove the control wires.

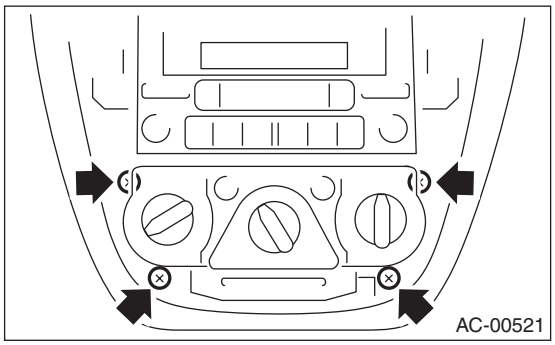


5) Remove the center console panel.



(A) Clip

6) Remove four screws.



7) Pull out the control unit and disconnect connectors.

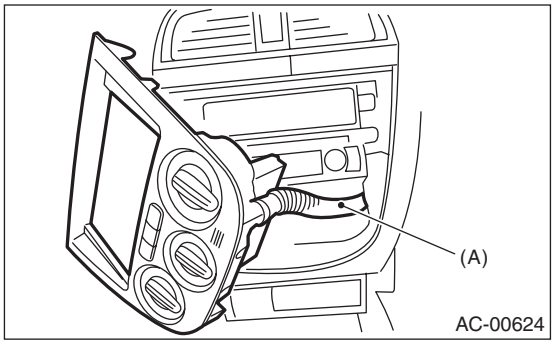
B: INSTALLATION

Install in the reverse order of removal.

12.Control Unit (Auto A/C Model)

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the center console panel.
3) Disconnect the connector and aspirator hose (A).



B: INSTALLATION

Install in the reverse order of removal.

13.Compressor

A: INSPECTION

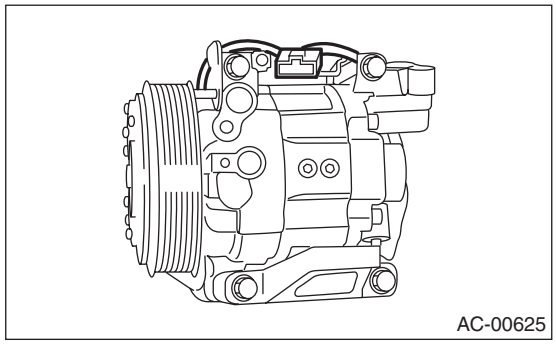
1. MAGNETIC CLUTCH CLEARANCE

1) Check the clearance of the entire circumference around the drive plate and pulley.

Standard:
0.45±0.15 mm (0.0177±0.0059 in)

2. MAGNETIC CLUTCH OPERATION

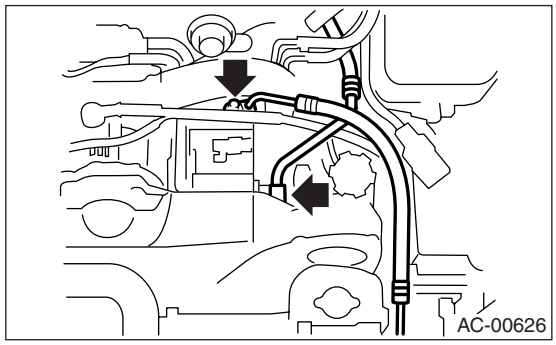
1) Disconnect the compressor connector.
2) Connect the battery positive (+) terminal to the terminal of compressor connector.


AC-00625

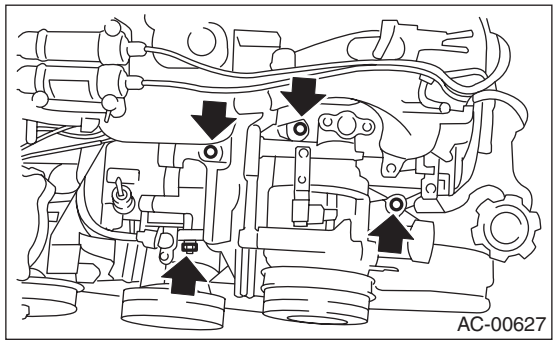
3) Make sure the magnet clutch engages.
If NG, replace the compressor.

B: REMOVAL

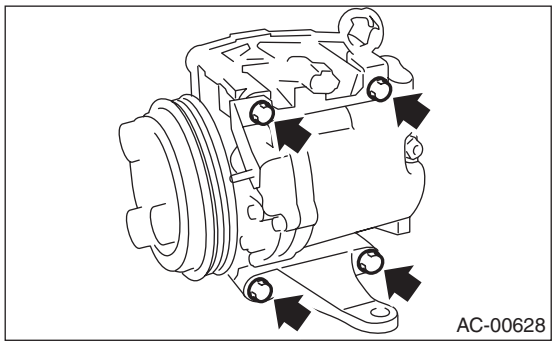
1) Perform the compressor oil return operation. <Ref. to AC-25, PROCEDURE, Compressor Oil.>
2) Turn the A/C switch OFF and stop the engine.
3) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-20, PROCEDURE, Refrigerant Recovery Procedure.>
4) Disconnect the ground cable from battery.
5) Remove the V-belt. <Ref. to ME(H4SO)-39, REMOVAL, V-belt.> or <Ref. to ME(H4DOTC)-42, REMOVAL, V-belt.>
6) Remove the generator. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>
7) Remove the low-pressure hose and high-pressure hose.


AC-00626

8) Disconnect the compressor harness from body harness.
9) Loosen the bolts to remove the compressor bracket.


AC-00627

10) Remove the bolts, and then separate the compressor and bracket.


AC-00628

C: INSTALLATION

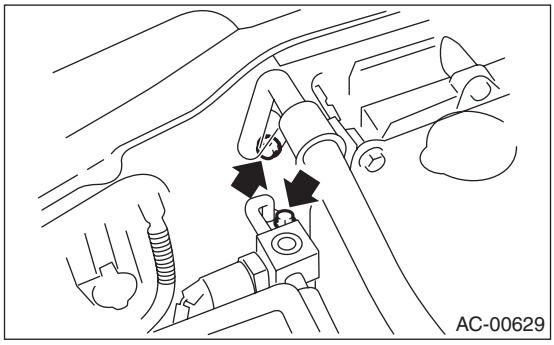
1) Install in the reverse order of removal.
2) Replace the O-rings on low-/high-pressure hoses with new ones, then apply compressor oil.
3) When replacing compressor, adjust amount of compressor oil. <Ref. to AC-25, PROCEDURE, Compressor Oil.>
4) Charge refrigerant. <Ref. to AC-21, PROCEDURE, Refrigerant Charging Procedure.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to AC-11, AIR CONDITIONING UNIT, COMPONENT, General Description.> and <Ref. to AC-12, COMPRESSOR, COMPONENT, General Description.>

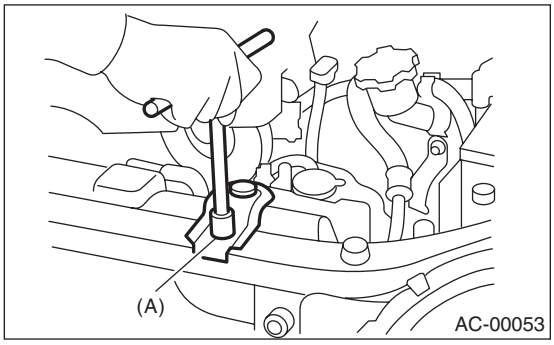
14.Condenser

A: REMOVAL

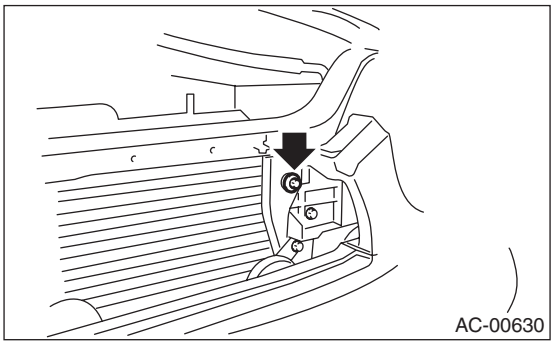
1) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-20, PROCEDURE, Refrigerant Recovery Procedure.>
2) Disconnect the ground cable from battery.
3) Disconnect the pressure hose and pipe from condenser.



4) Remove the radiator bracket (A).



5) Remove the two bolts. While lifting the condenser, pull it out through the space between radiator and radiator panel.

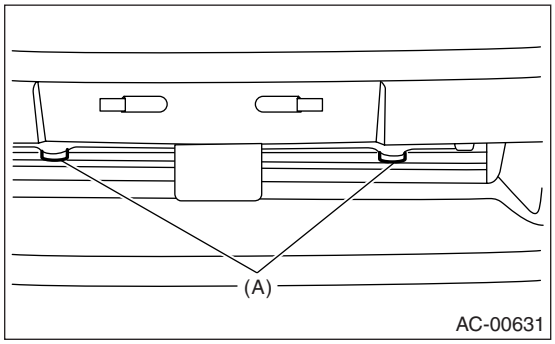


CAUTION:
• Be careful not to damage the condenser fins. If a damaged fin is found, repair it using a thin screwdriver.
• If the condenser is replaced, add appropriate amount of compressor oil to the compressor. <Ref. to AC-25, REPLACEMENT, Compressor Oil.>

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
Replace the O-rings on hoses or pipes with new ones, and then apply compressor oil. Confirm that lower guide of condenser (A) has been fitted into holes on radiator panel.



2) Charge refrigerant. <Ref. to AC-21, PROCEDURE, Refrigerant Charging Procedure.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to AC-11, AIR CONDITIONING UNIT, COMPONENT, General Description.> and <Ref. to CO(H4SO)-4, RADIATOR AND RADIATOR FAN, COMPONENT, General Description.>

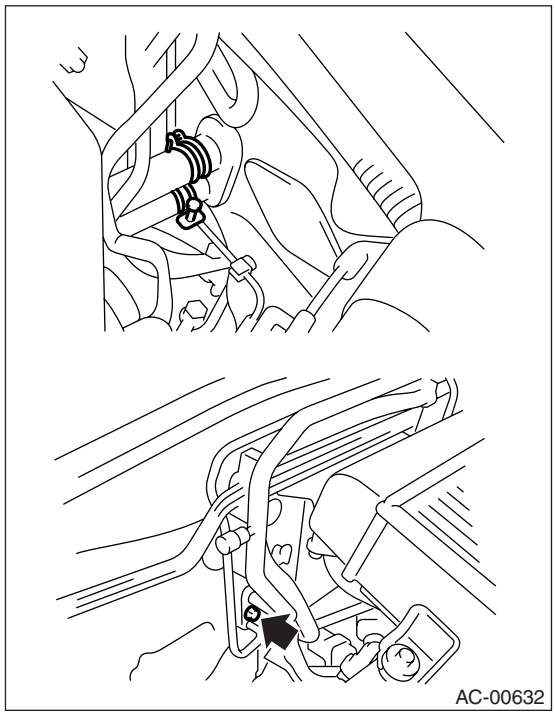
C: INSPECTION

1) Confirm that no dust or insects are found on the condenser fins. Air-blow or flush fins with water as needed.
2) Confirm that no oil leaks from condenser. If a failure is found, replace the condenser with a new one.

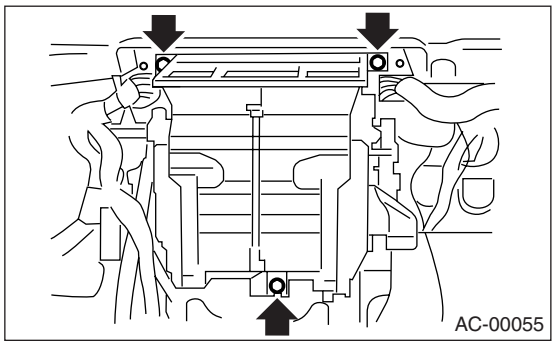
15.Heater and Cooling Unit

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-20, PROCEDURE, Refrigerant Recovery Procedure.>
3) Drain LLC from the radiator.
4) Remove the bolt securing expansion valve and pipe in engine compartment. Release the heater hose clamps in engine compartment to remove the hoses.


AC-00632

5) Remove the instrument panel. <Ref. to EI-45, REMOVAL, Instrument Panel Assembly.>
6) Remove the support beam.
7) Remove the blower motor unit assembly. <Ref. to AC-26, REMOVAL, Blower Motor Unit Assembly.>
8) Disconnect the servo motor connectors.
9) Loosen the bolt and nuts to remove the heater and cooling unit.


AC-00055

B: INSTALLATION

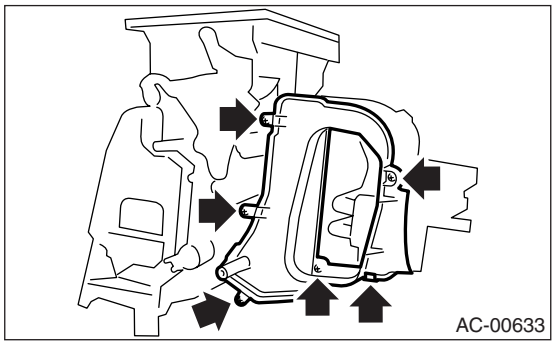
1) Install in the reverse order of removal.
2) Charge refrigerant. <Ref. to AC-21, PROCEDURE, Refrigerant Charging Procedure.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to AC-5, HEATER COOLING UNIT, COMPONENT, General Description.>

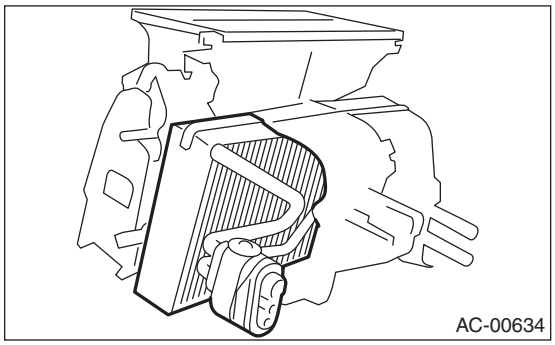
16.Evaporator

A: REMOVAL

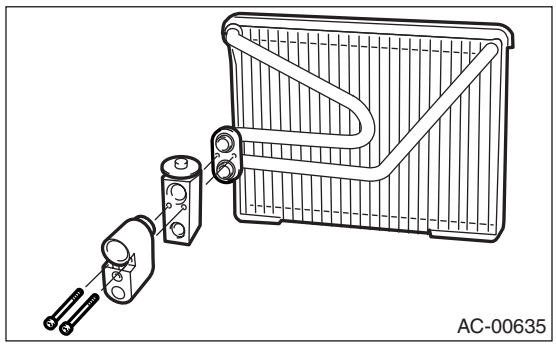
1) Remove the heater and cooling unit. <Ref. to AC-34, REMOVAL, Heater and Cooling Unit.>
2) Loosen the screws and clip to remove the evaporator cover.



3) Remove the evaporator.



4) Loosen the two bolts to remove the expansion valve.



CAUTION:
If the evaporator is replaced, add appropriate amount of compressor oil to evaporator. <Ref. to AC-25, REPLACEMENT, Compressor Oil.>

B: INSTALLATION

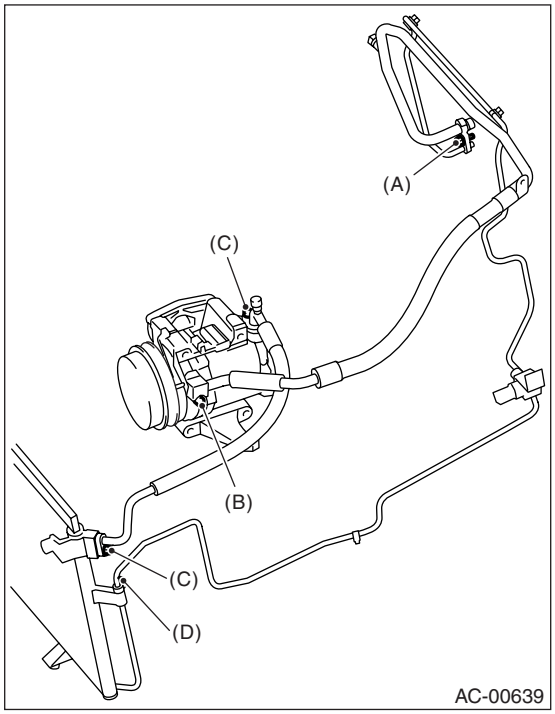
Install in the reverse order of removal.

17.Hose and Tube

A: REMOVAL

CAUTION:
• When disconnecting/connecting hoses, do not apply excessive force to them. Confirm that no torsion and excessive tension exists after installing.
• Seal the disconnected hose with a plug or vinyl tape to prevent contamination from entering.

1) Disconnect the ground cable from battery.
2) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-20, PROCEDURE, Refrigerant Recovery Procedure.>
3) Remove the evaporator unit mounting bolt (A).
4) Remove the low-pressure hose attaching bolts (B).
5) Disconnect the low-pressure hose from evaporator unit.
6) Disconnect the low-pressure hose from compressor.
7) Remove the low-pressure hose from vehicle.
8) Remove the high-pressure hose attaching bolts (C).
9) Disconnect the high-pressure hose from compressor.
10) Disconnect the high-pressure hose from condenser.
11) Remove the high-pressure hose from vehicle.
12) Remove the high-pressure tube attaching bolt (D).
13) Remove the high-pressure tube from vehicle.



B: INSTALLATION

CAUTION:
• When disconnecting/connecting hoses, do not apply an excessive force to them. Confirm that no torsion and excessive tension exists after installing.
• Seal the disconnected hose with a plug or vinyl tape to prevent contamination from entering.

1) Install in the reverse order of removal.
2) Charge refrigerant. <Ref. to AC-21, PROCEDURE, Refrigerant Charging Procedure.>

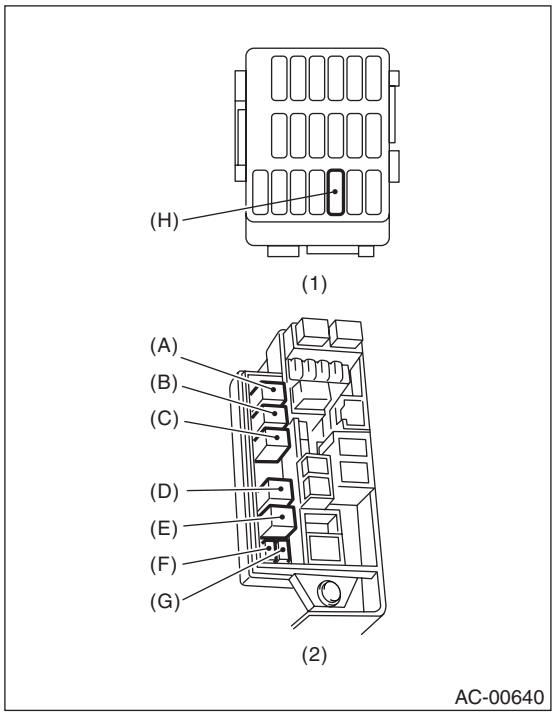
Tightening torque:
Refer to COMPONENT in General Description. <Ref. to AC-11, AIR CONDITIONING UNIT, COMPONENT, General Description.>

C: INSPECTION

NOTE:
If cracking, damage, or swelling is found on a hose, replace it with a new one.

18.Relay and Fuse

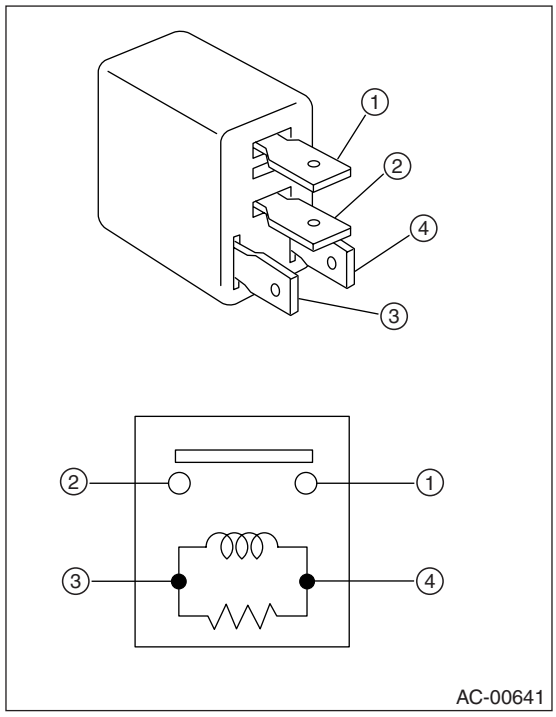
A: LOCATION



(1) Joint box
(2) Main fuse box

Main Fan Relay 1	A
Main Fan Relay 2	B
Sub Fan Relay 2	C
Sub Fan Relay 1	E
A/C Relay	D
Main Fan Fuse	F
Sub Fan Fuse	G
A/C Fuse	H

B: INSPECTION

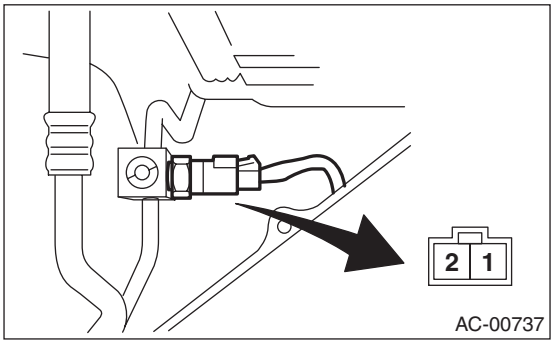


(3) — (4): Continuity exists.
(1) — (2): No continuity
While applying battery voltage to the terminal between (3) and (4), check continuity between (1) and (2).
If no continuity exists, replace the relay with a new one.

19.Pressure Switch (Dual Switch)

A: INSPECTION

1) Connect the manifold gauge to the service valve on high-pressure side.
2) Remove the pressure switch harness connector. Using a circuit tester, inspect the ON-OFF operation of pressure switch.

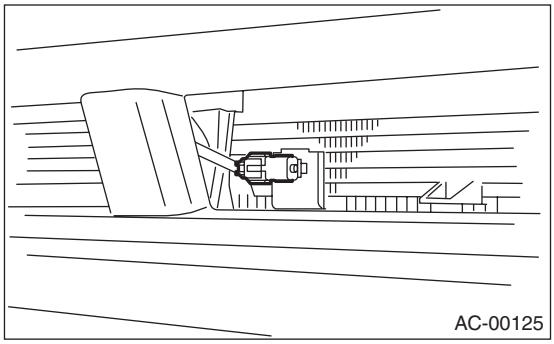


	Terminal No.	Operation	Standard kPa (kg/cm^2, psi)
High and low pressure switch	1 and 2	Turns OFF.	Increasing to 2,800±100 (29±1, 406±15)
			Decreasing to 278±29 (2.83±0.3, 40.3±4.2)
		Turns ON.	Increasing to $287^{+39}/_{-25}$ ($2.9^{+0.4}/_{-0.25}$, $42^{+5.7}/_{-3.6}$)
			Decreasing to 2,200±200 (22.4±2, 319±29)

20.Ambient Sensor (Auto A/C Model)

A: REMOVAL

1) Open the hood.
2) Disconnect the ground cable from battery.
3) Disconnect the ambient sensor connector.
4) Remove the ambient sensor from radiator lower panel.



B: INSTALLATION

Install in the reverse order of removal.

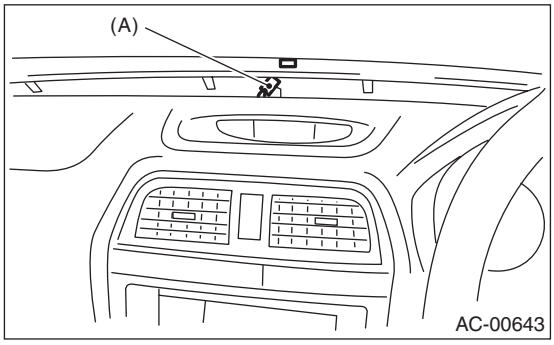
C: INSPECTION

<Ref. to AC(diag)-24, AMBIENT SENSOR, Diagnostic Procedure for Sensors.>

21.Sunload Sensor (Auto A/C Model)

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front defroster grille.
3) Disconnect the sunload sensor connector (A).



CAUTION:
Be careful not to damage the sensors and interior trims when removing them.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

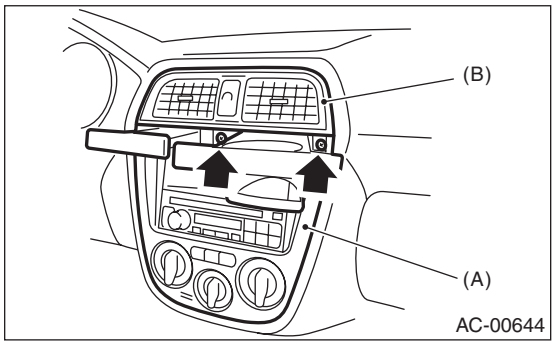
<Ref. to AC(diag)-28, SUNLOAD SENSOR, Diagnostic Procedure for Sensors.>

22.Air Vent Grille

A: REMOVAL

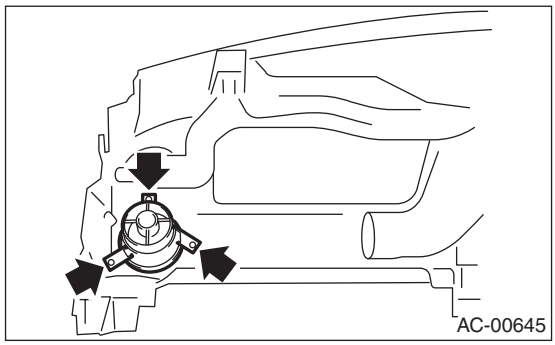
1. CENTER GRILLE

1) Disconnect the ground cable from battery.
2) Remove the center console panel (A).
3) Loosen the two screws to remove the center air vent grille (B).



2. SIDE GRILLE

1) Disconnect the ground cable from battery.
2) Remove the heater vent duct. <Ref. to AC-43, REMOVAL, Heater Vent Duct.>
3) Loosen the screws to remove the side air vent grille.



B: INSTALLATION

Install in the reverse order of removal.

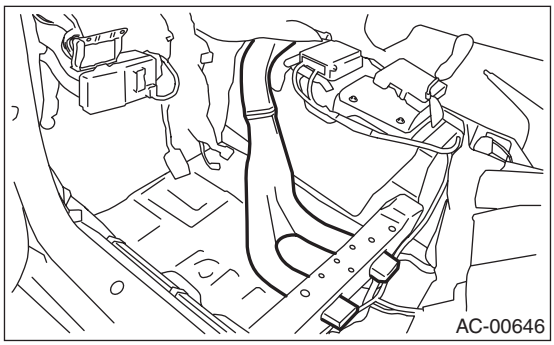
C: INSPECTION

The direction and amount of air should be adjusted smoothly.
The adjustment should be kept in each position.

23.Heater Duct

A: REMOVAL

1) Remove the front seat. <Ref. to SE-6, REMOVAL, Front Seat.>
2) Remove the front side sill cover.
3) Pull off the floor mat to remove the heater duct.



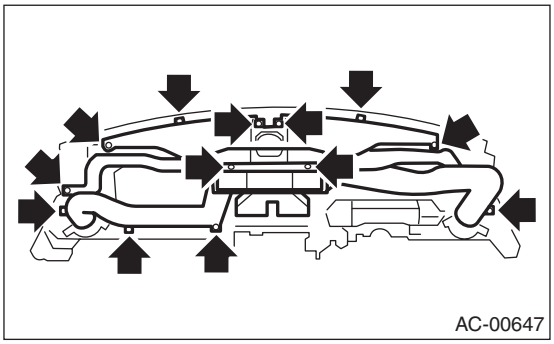
B: INSTALLATION

Install in the reverse order of removal.

24.Heater Vent Duct

A: REMOVAL

1) Remove the instrument panel. <Ref. to EI-45, REMOVAL, Instrument Panel Assembly.>
2) Remove the screws.
3) Remove the heater vent duct.



B: INSTALLATION

Install in the reverse order of removal.

25.General Diagnostic Table

A: INSPECTION

Symptom		Repair order
Blower motor	Doesn't move.	Fuse
		Blower motor relay
		Blower motor
		Blower motor resistor
		Blower switch
		Wire harness
	Strange noise.	Blower motor
Compressor	Doesn't move.	Refrigerant
		Fuse
		Air conditioning relay
		Magnet clutch
		Compressor
		Pressure switch
		A/C switch
		Blower switch
		Wire harness
	Strange noise	V-Belt
		Magnet clutch
		Compressor
Cold air not emitted.		Refrigerant
		V-Belt
		Magnet clutch
		Compressor
		Pressure switch
		A/C switch
		Blower switch
		Wire harness
		Heater duct
		Heater vent duct
Warm air not emitted.		Engine coolant
		Blower switch
		Heater core
Temperature of air from vents does not change.		Engine coolant
		Air mix actuator (Auto A/C)
		Wire harness (Auto A/C)
		Temperature cable (Manual A/C)
Unable to switch blow vents.		Mode actuator (Auto A/C)
		Air flow switch (Auto A/C)
		Wire harness (Auto A/C)
		Mode cable (Manual A/C)
Unable to switch suction vents.		Air inlet select switch (Auto A/C)
		FRESH/RECIRC actuator (Auto A/C)
		Wire harness (Auto A/C)
		Intake cable (Manual A/C)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

AC(diag)

		Page
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2.	General Description	3
3.	Electrical Components Location	5
4.	A/C Control Module I/O Signal	7
5.	Diagnostics Chart for Self-diagnosis	8
6.	Diagnostics for A/C System Malfunction	11
7.	Diagnostic Procedure for Actuators	18
8.	Diagnostic Procedure for Sensors	24
9.	Symptom Related Diagnostic	30

1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**START INSPECTIONS.** 1) Perform the pre-inspection. <Ref. to AC(diag)-3, INSPECTION, General Description.> 2) Perform the self-diagnosis. <Ref. to AC(diag)-8, OPERATION, Diagnostics Chart for Self-diagnosis.>	Does the self-diagnosis operate?	Go to step **2.**	<Ref. to AC(diag)-11, A/C AND/OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE, Diagnostics for A/C System Malfunction.>
2	**CONFIRM MALFUNCTION PART.** Confirm the malfunction part with self-diagnosis.	Can the malfunction part be confirmed?	Repair the malfunction part according to each diagnostics chart.	Go to step **3.**
3	**CHECK COMPARTMENT TEMPERATURE.** 1) Turn the A/C switch ON. 2) Set the temperature at maximum cold position. 3) Check the compartment temperature changes.	Is the compartment temperature changed?	Go to step **4.**	<Ref. to AC(diag)-15, COMPARTMENT TEMPERATURE IS NOT CHANGED OR A/C SYSTEM DOES NOT RESPOND QUICKLY, Diagnostics for A/C System Malfunction.>
4	**CHECK A/C SYSTEM RESPONSE.** Change the temperature setting, and check the response of A/C system.	Does the A/C system respond quickly?	A/C system is OK.	<Ref. to AC(diag)-15, COMPARTMENT TEMPERATURE IS NOT CHANGED OR A/C SYSTEM DOES NOT RESPOND QUICKLY, Diagnostics for A/C System Malfunction.>

2. General Description

A: CAUTION

1) Never connect the battery in reverse polarity.
The Auto A/C control module will be destroyed instantly.
2) Do not disconnect the battery cables while the engine is running.
A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as A/C control module.
3) Before disconnecting the connectors of each sensor and the A/C control module, be sure to turn off the ignition switch.
Otherwise, the Auto A/C control module may be damaged.
4) Every Auto A/C-related part is a precision part. Do not drop them.
5) Airbag system wiring harness is routed near the A/C control panel (A/C control module) and junction box.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the A/C control panel (A/C control module) and junction box.

B: INSPECTION

Before performing diagnosis, check the following items which might affect A/C system problems.

1. BATTERY

1) Measure the battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V

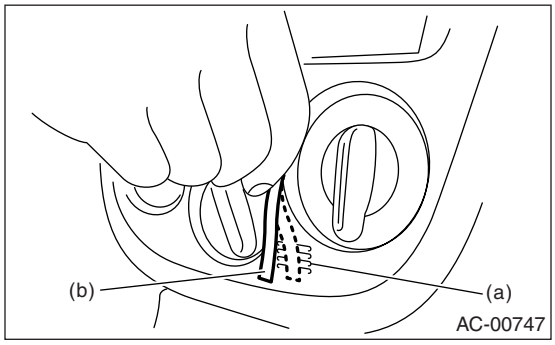
Specific gravity: Above 1.260

2) Check the condition of the fuses for A/C system power supply and other fuses.
3) Check the condition of the harnesses and harness connectors connection.

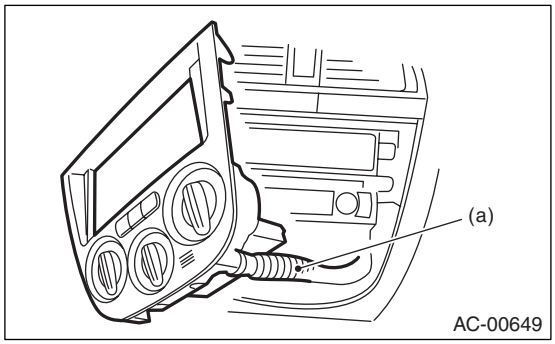
2. ASPIRATOR HOSE

1) Turn the ignition switch to ON and push the A/C switch.
2) Turn the temperature control dial to maximum hot position.
3) Turn the air flow control dial to “DEF” position.
4) Turn the fan speed control dial to 4th position.
5) Firmly hold a thin paper (b) in front of the in-vehicle sensor suction port (a) for the auto A/C control unit and check that the paper moves towards the port indicating that air is being sucked into the port.

NOTE:
Ensure the paper does not get sucked into the port.

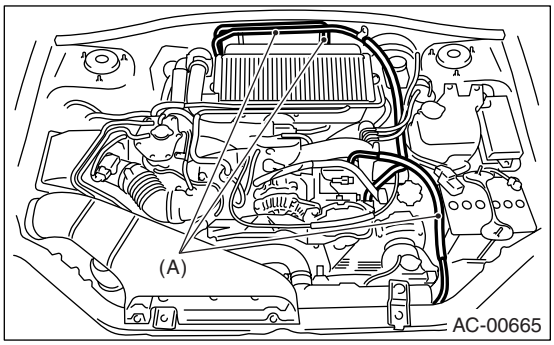


6) If the paper does not move at all, remove the auto A/C control unit <Ref. to AC-31, REMOVAL, Control Unit (Auto A/C Model).> and check for improper connection of the aspirator hose (a), auto A/C control unit and heater unit, and secure as necessary.



3. REFRIGERANT LINE

Check the connection for refrigerant line (A) and high-pressure pipe.



4. CONTROL LINKAGE

1) Check the state of mode door linkage.
2) Check the state of air mix door linkage.
3) Check the state of intake door linkage.

5. CONTROL SWITCHES

Start and warm up the engine completely.
1) Inspection using switches.

No.	Point to check	Switch operation	Judgement standard
1	Fan speed control dial	OFF position	A/C switch LED goes out. • Fan speed: OFF • Compressor: OFF
		Fan speed control dial 1st → 2nd → 3rd → 4th	Fan speed changes 1st → 2nd → 3rd → 4th
2	Fan speed control dial and temperature control dial	A. Fan speed control dial auto position. B. Temperature control dial maximum cold position	• Outlet air: Cool • Fan speed: 4th • Compressor: ON
		C. Turn the temperature control dial from maximum cold position to maximum hot position gradually.	• Outlet air: Cool → Hot • Fan speed: AUTO • Compressor: ON
		D. Temperature control dial maximum hot position	• Outlet air: Hot • Fan speed: 4th • Compressor: ON
3	Air flow control dial	Air flow control dial VENT → BI-LEVEL → HEAT → DEF/HEAT → DEF	Air flow outlet changes from VENT → BI-LEVEL → HEAT → DEF/HEAT → DEF.
4	FRESH/RECIRC switch	FRESH/RECIRC switch ON	Changes from RECIRC → FRESH, or FRESH → RECIRC.

2) Compressor operation inspection

No.	Point to check	Switch operation	Judgement standard
1	Compressor	A. A/C switch ON B. Fan speed control dial 1st-4th	Compressor: ON

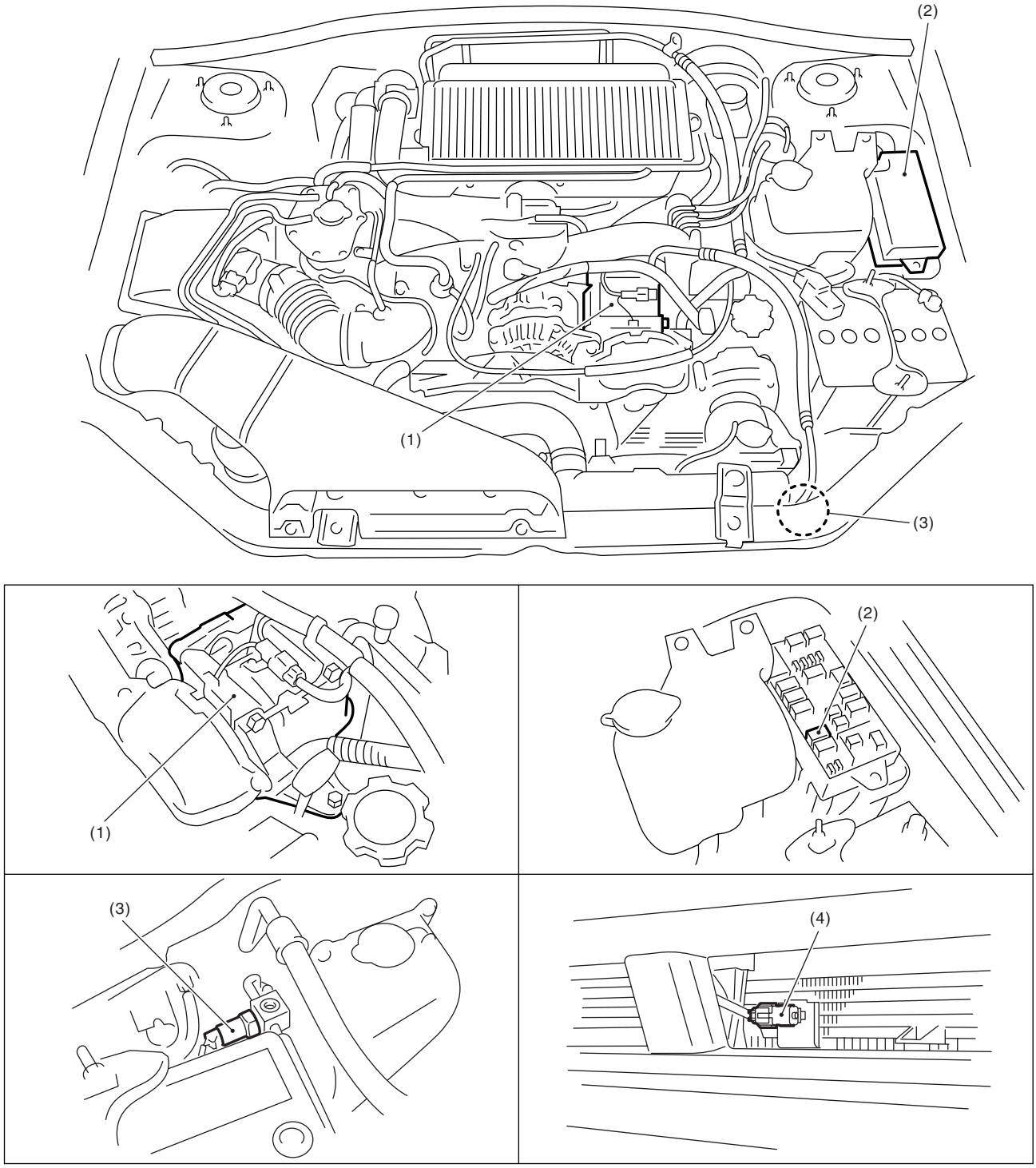
3) Illumination control inspection

No.	Point to check	Switch operation	Judgement standard
1	Illumination	Lighting switch ON	Illumination light illuminates.

3. Electrical Components Location

A: LOCATION

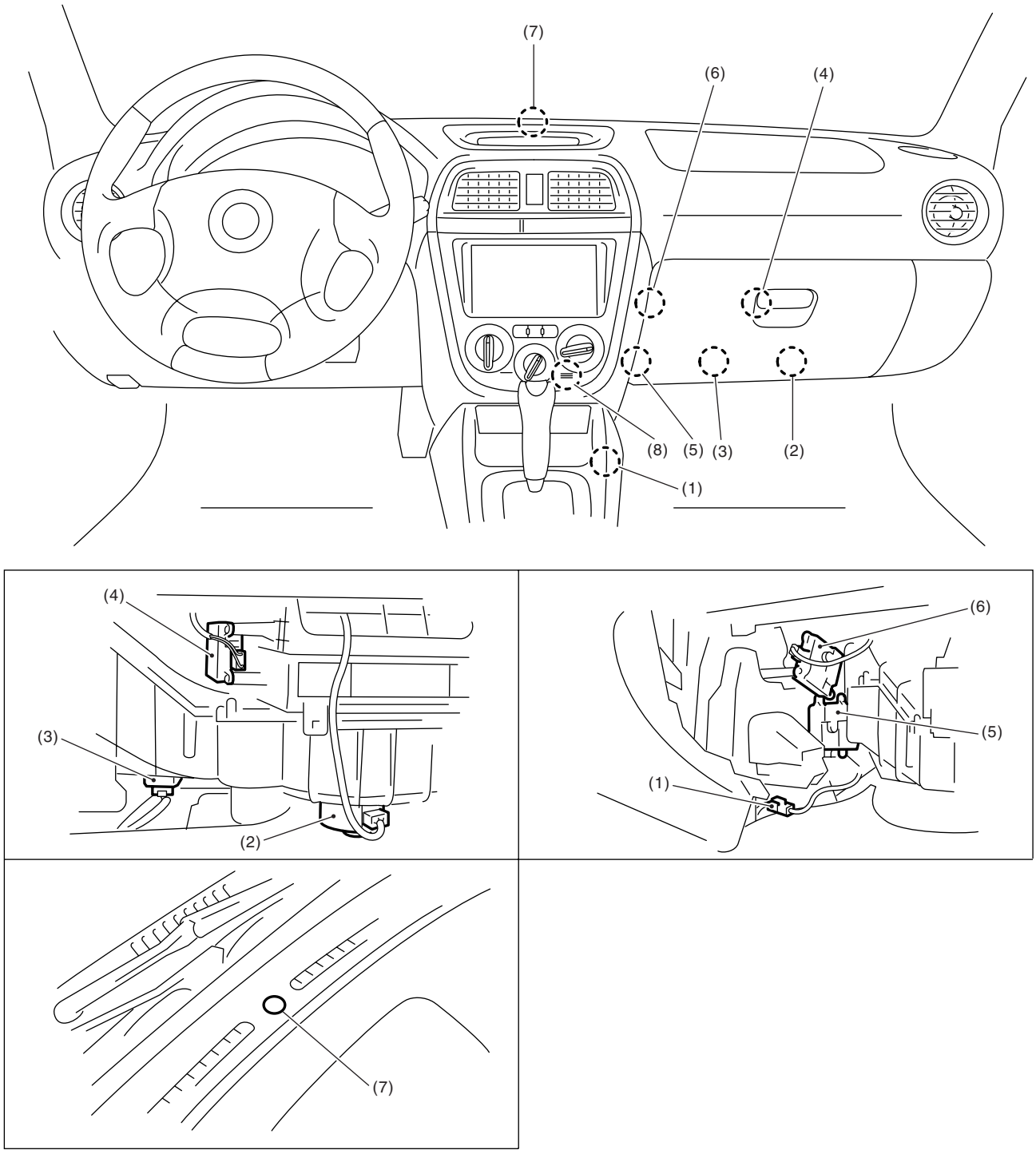
1. ENGINE COMPARTMENT



AC-00666

(1) A/C compressor
(2) A/C relay
(3) Pressure switch
(4) Ambient sensor

2. PASSENGER COMPARTMENT

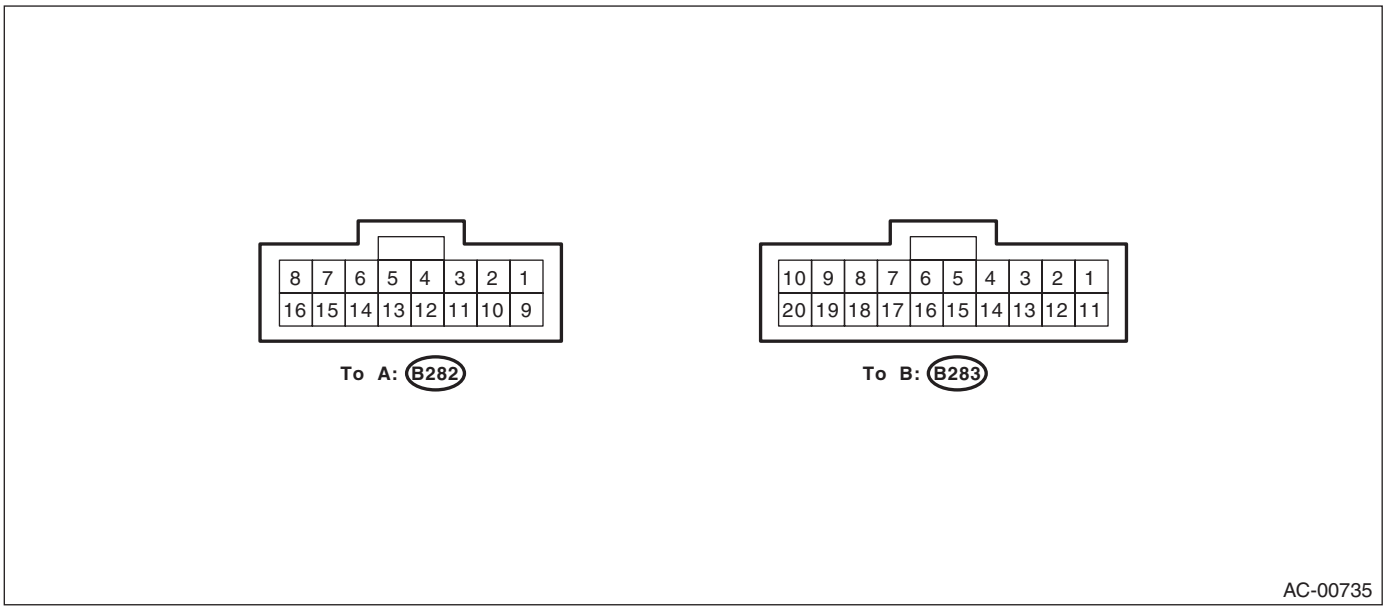


AC-00667

(1) Evaporator sensor
(2) Blower motor
(3) Blower motor resistor
(4) Intake door actuator
(5) Air mix door actuator
(6) Mode door actuator
(7) Sunload sensor
(8) In-vehicle sensor (built-in Auto A/C control module)

4. A/C Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



Content	Connector & Terminal No.	Signal (V)
Battery power supply (Memory back-up)	B1 — B12	Battery voltage, 13 — 14 (engine running)
IGN power supply	A8 — B12	Battery voltage (ignition switch ON), 13 — 14 (engine running)
ACC power supply	B2 — B12	Battery voltage, 0 (engine cranking), Battery voltage (engine running)
A/C control module ground circuit	B12 — chassis ground	0 (ignition switch ON) — circuit constantly grounded to chassis
Sensor ground circuit	B17 — chassis ground	0 (ignition switch ON) — circuit constantly grounded to chassis
Ambient sensor	B9 — B17	Approx. 5 (disconnect connector, and ignition switch ON)
Evaporator sensor	B7 — B17	
Thermometer	B15 — B12	
Sunload sensor	B16 — B17	Approx. 5 (disconnect connector, and ignition switch ON)
Air mix door actuator	B5 — B1	Battery voltage (ignition switch ON)
Air mix door actuator P.B.R.	A4 — B17	LAN connection
Mode door actuator	B6 — B17	Battery voltage (ignition switch ON)
Mode door actuator P.B.R.	A12 — B17	LAN connection
Intake door FRS voltage	A15 — A7	Battery voltage (FRESH/RECIRC switch OFF)
Intake door CIRC voltage	A7 — A15	Battery voltage (FRESH/RECIRC switch ON)
Blower fan relay	B14 — body	Battery voltage (ignition switch ON)
A/C relay	B3 — B12	0 (ignition and A/C switches ON) Battery voltage (A/C switch OFF)
Illumination control signal	B10 — B20	Battery voltage (ignition and lighting switches ON)
Rear window defogger	A 13 — B12	0 (ignition switch ON, rear window defogger switch ON)

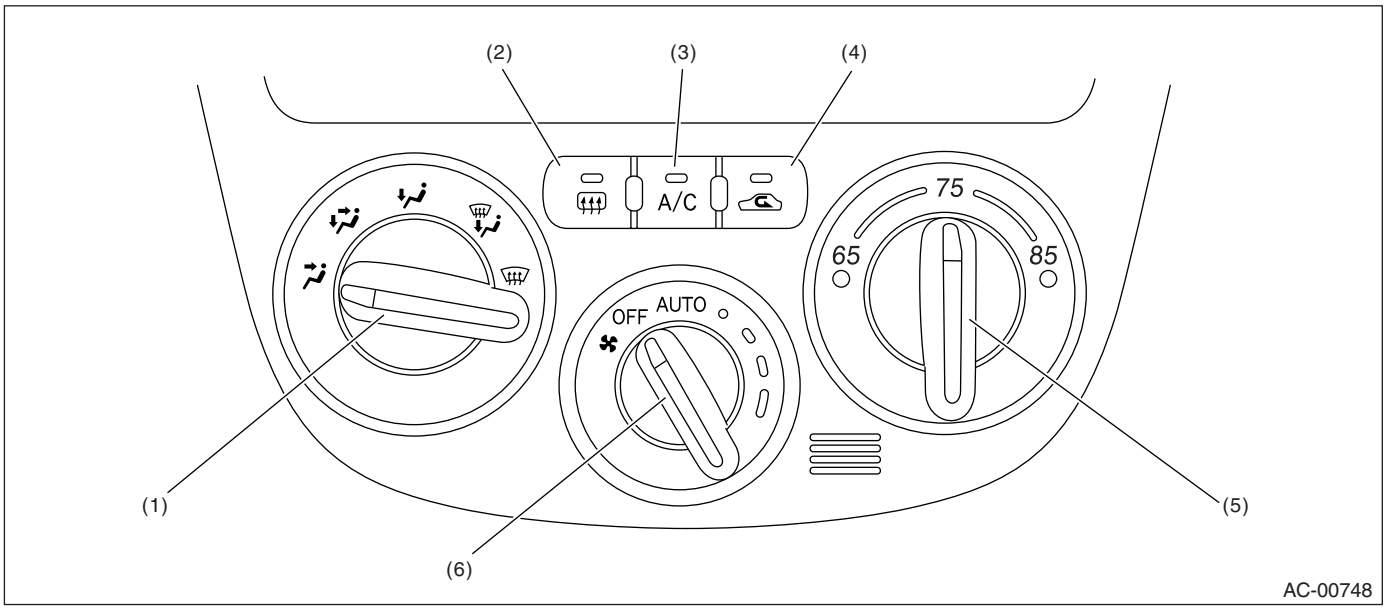
B: WIRING DIAGRAM

1. AIR CONDITIONER AUTO A/C MODEL

<Ref. to WI-36, WIRING DIAGRAM, Air Conditioning System.>

5. Diagnostics Chart for Self-diagnosis

A: OPERATION



(1) Air flow control dial
(2) Rear window defogger switch
(3) A/C switch
(4) FRESH/RECIRC switch
(5) Temperature control dial
(6) Fan speed control dial

	Step	Check	Yes	No
1	**SELECT CONTROL PANEL TO SELF-DIAGNOSIS MODE.** 1) Turn the fan speed control dial to OFF position. 2) Start the engine and press the rear window defogger switch for at least 5 seconds. The rear window defogger switch must be pressed within 10 seconds after starting engine.	Does the self-diagnosis mode operate?	Go to step **2.**	<Ref. to AC(diag)-11, A/C AND/OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE, Diagnostics for A/C System Malfunction.>
2	**CHECK LED ILLUMINATION.** Make sure that all switch LED blink on control panel.	Do all LED illuminate or blink?	Go to step **3.**	Check the switch LED.
3	**CHECK SENSORS MALFUNCTION.** 1) Turn the fan speed control dial to AUTO position. 2) If the system has trouble for each sensor, rear window defogger switch LED is turned off. 3) If the system has no trouble, rear window defogger switch LED is illuminated.	Does the rear window defogger switch LED illuminate?	Go to step **5.**	Go to step **4.**
4	**CONFIRM MALFUNCTIONING SENSOR.** 1) Turn the fan speed control dial to 1st position. 2) Turn the air flow control dial to each mode position, check each switch LED illumination according to sensor check table. <Ref. to AC(diag)-10, SENSOR CHECK TABLE, OPERATION, Diagnostics Chart for Self-diagnosis.>	Do FRESH/RECIRC and A/C switch LED illuminate when turning the dial to each mode position?	Go to step **5.**	Repair the malfunctioning sensor. <Ref. to AC(diag)-24, Diagnostic Procedure for Sensors.>

	Step	Check	Yes	No
5	**CHECK MODE DOOR POSITION SIGNAL.** 1) Turn the fan speed control dial to 2nd position. 2) If the system has trouble for mode door position signal, rear window defogger switch LED is turned off. 3) If the system has no trouble, rear window defogger switch LED is illuminated.	Does the rear window defogger switch LED illuminate?	Go to step **6.**	Check the mode door actuator circuit. <Ref. to AC(diag)-20, MODE DOOR ACTUATOR, Diagnostic Procedure for Actuators.>
6	**CHECK BLOWER FAN OPERATION.** 1) Turn the fan speed control dial to 3rd position. 2) Turn the temperature control dial, check that blower fan speed changes depending on set temperature.	Does the blower fan speed change?	Go to step **7.**	Check the blower motor circuit. <Ref. to AC(diag)-13, BLOWER MOTOR IS NOT ROTATED, Diagnostics for A/C System Malfunction.>
7	**CHECK OPERATION OF EACH ACTUATOR, BLOWER FAN AND COMPRESSOR CLUTCH.** 1) Turn the fan speed control dial to 4th position. 2) Select the operating mode by turning air flow control dial. 3) Check the operation of each mode according to operating mode table. <Ref. to AC(diag)-10, OPERATING MODE TABLE, OPERATION, Diagnostics Chart for Self-diagnosis.> • Air inlet: • Air outlet: • Air mix door: • Blower fan: • A/C compressor:	Does the operation of each mode match to operating mode table?	Push the A/C switch or turn the ignition switch to OFF, and finish the self-diagnosis.	Repair the malfunction part according to each diagnostics chart.

1. SENSOR CHECK TABLE

NOTE:
When the sunload sensor is checked indoors or in the shade, open circuit might be indicated. Always check the sunload sensor at a place where sun shines directly on it.

Air flow control dial position	Checked sensor	No trouble	Short circuit	Open circuit
VENT	Ambient sensor	A/C switch LED and FRESH/RECIRC switch LED illuminate	A/C switch LED illuminate	FRESH/RECIRC switch LED illuminate
BI-LEVEL	In-vehicle sensor	A/C switch LED and FRESH/RECIRC switch LED illuminate	A/C switch LED illuminate	FRESH/RECIRC switch LED illuminate
HEAT	Evaporator sensor	A/C switch LED and FRESH/RECIRC switch LED illuminate	A/C switch LED illuminate	FRESH/RECIRC switch LED illuminate
DEF/HEAT	Sunload sensor	A/C switch LED and FRESH/RECIRC switch LED illuminate	A/C switch LED illuminate	FRESH/RECIRC switch LED illuminate
DEF	Air mix door motor (Potentio balance resistor)	A/C switch LED and FRESH/RECIRC switch LED illuminate	A/C switch LED illuminate	

2. OPERATING MODE TABLE

Operation	Air flow control dial position				
	VENT	BI-LEVEL	HEAT	DEF/HEAT	DEF
Air outlet	VENT	BI-LEVEL	HEAT	DEF/HEAT	DEF
Air inlet	RECIRC	RECIRC	RECIRC	FRESH	FRESH
Air mix door	FULL COOL	FULL COOL	FULL HOT	FULL HOT	FULL COOL
Blower fan	5V	5V	8V	10V	Power supply voltage
A/C compressor	ON	OFF	OFF	ON	ON

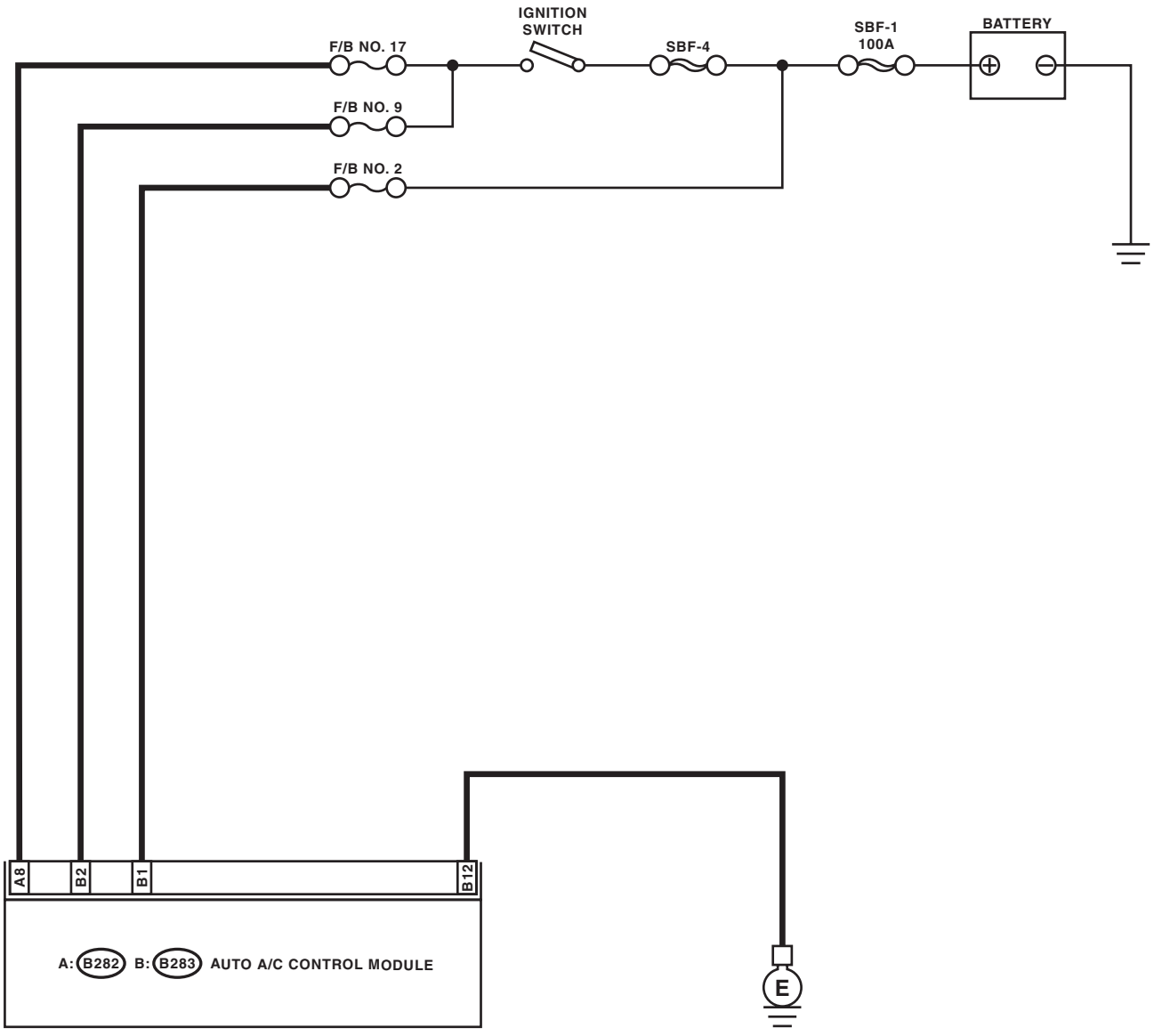
6. Diagnostics for A/C System Malfunction

A: A/C AND/OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE

TROUBLE SYMPTOM:

- “Set” temperature is not indicated on the display, switch LEDs are faulty and switches do not operate.
- Self-diagnosis system does not operate.

WIRING DIAGRAM:



AC-00669

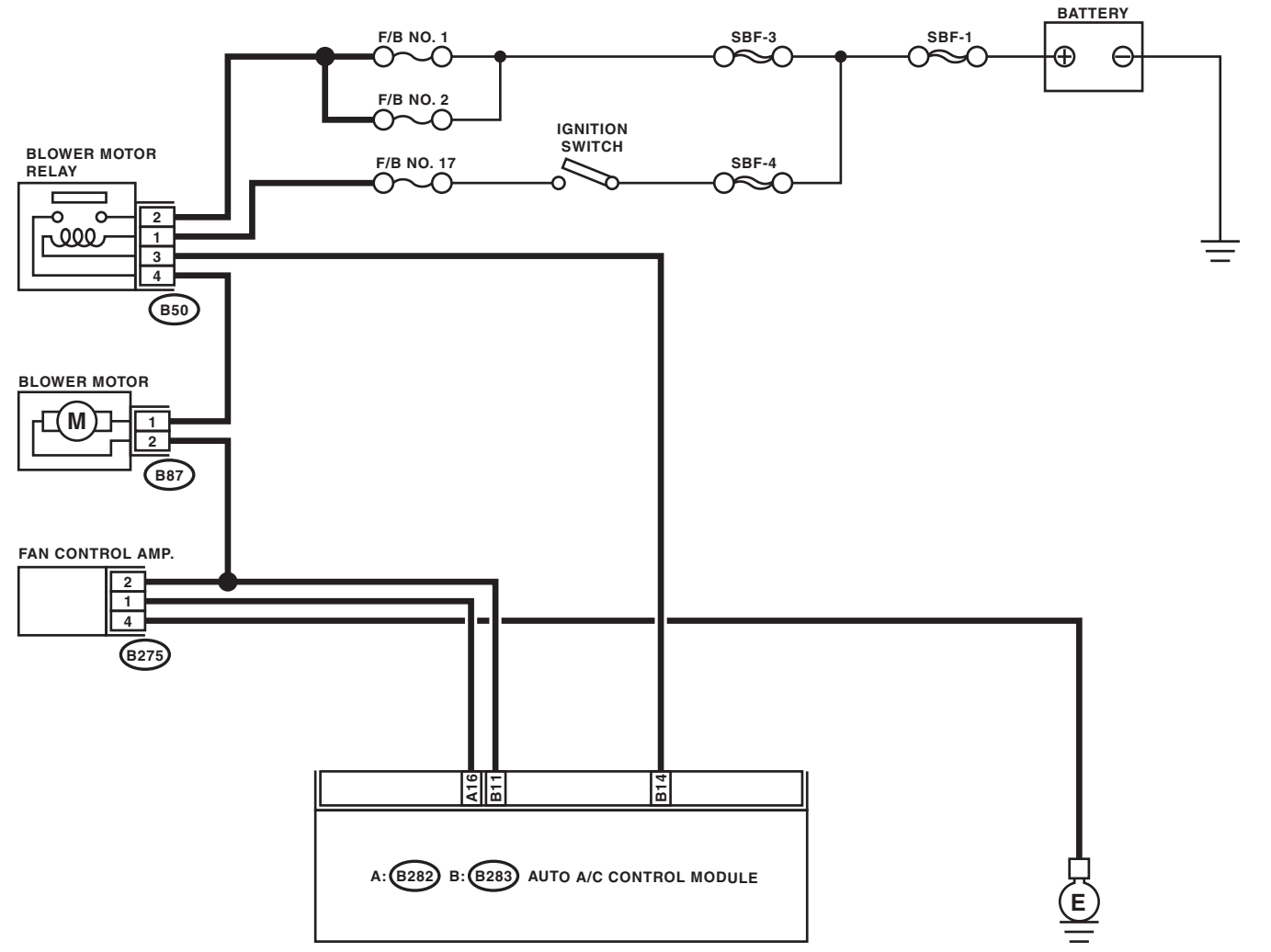
	Step	Check	Yes	No
1	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 2 from main fuse box. 3) Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Go to step **2.**
2	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuses No. 9 and No. 17 from fuse & relay box. 3) Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Go to step **3.**
3	**CHECK A/C CONTROL MODULE POWER CIRCUIT.** 1) Pull out the A/C control module connector. 2) Measure the voltage between A/C control module connector terminal and chassis ground when turning ignition switch to OFF. ***Connector & terminal*** ***(B283) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair the short circuit in harness for power supply line.
4	**CHECK A/C CONTROL MODULE POWER CIRCUIT.** Measure the voltage between A/C control module connector terminal and chassis ground when turning the ignition switch to ACC. ***Connector & terminal*** ***(B283) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **5.**	Repair the short circuit in harness for power supply line.
5	**CHECK A/C CONTROL MODULE POWER CIRCUIT.** Measure the voltage between A/C control module connector terminal and chassis ground when turning the ignition switch to ON. ***Connector & terminal*** ***(B282) No. 8 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Repair the short circuit in harness for power supply line.
6	**CHECK A/C CONTROL MODULE GROUND CIRCUIT.** Measure the resistance of harness between A/C control module and chassis ground. ***Connector & terminal*** ***(B283) No. 12 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **7.**	Repair the short circuit in harness for ground line.
7	**CHECK POOR CONTACT.** Check poor contact in A/C control module connector.	Is there poor contact in connector?	Repair the connector.	Replace the A/C control module.

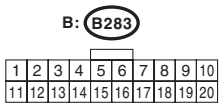
B: BLOWER MOTOR IS NOT ROTATED

TROUBLE SYMPTOM:

- Blower motor is not rotated.
- Blower motor is not rotated in “HI”.

WIRING DIAGRAM:



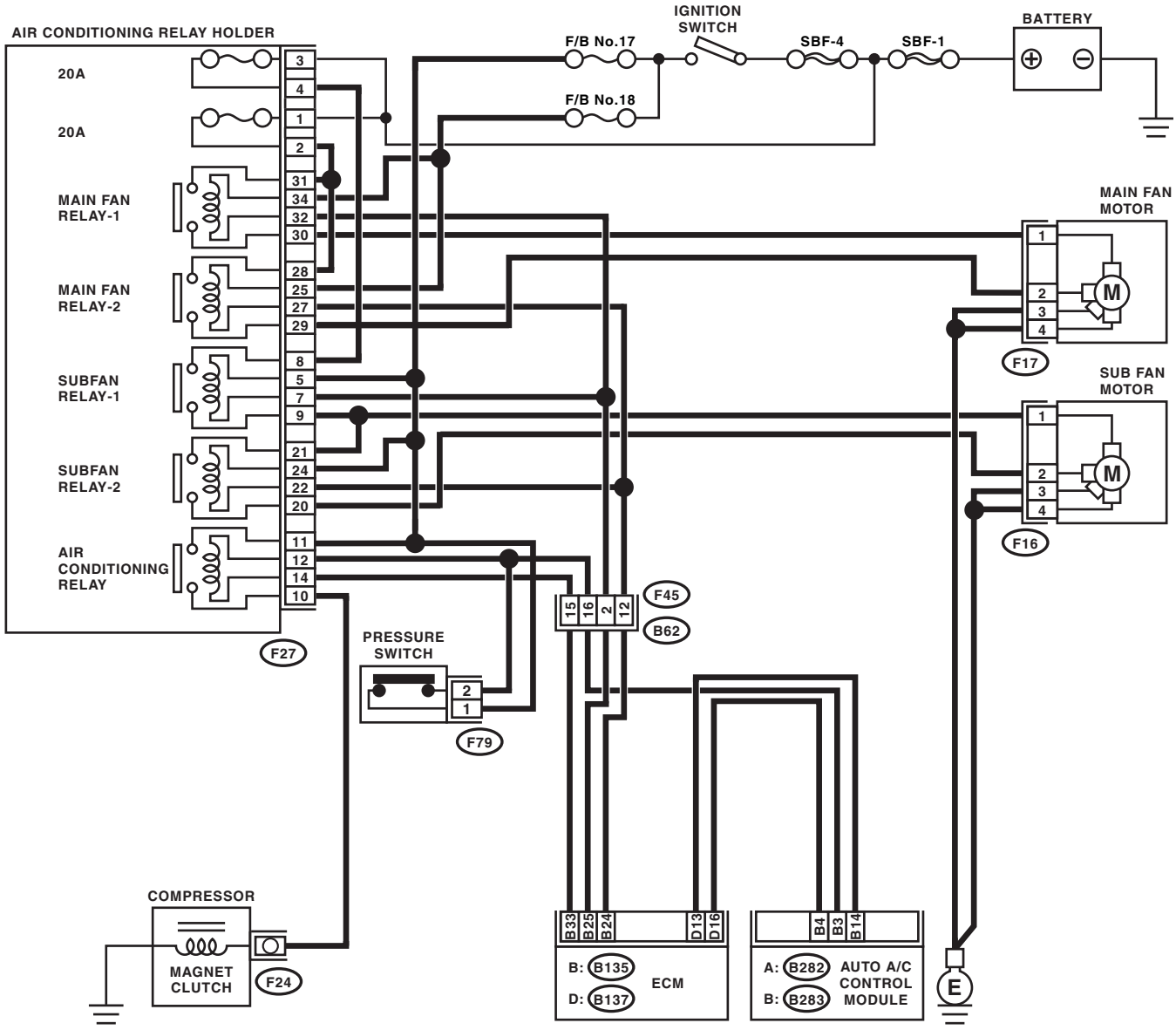


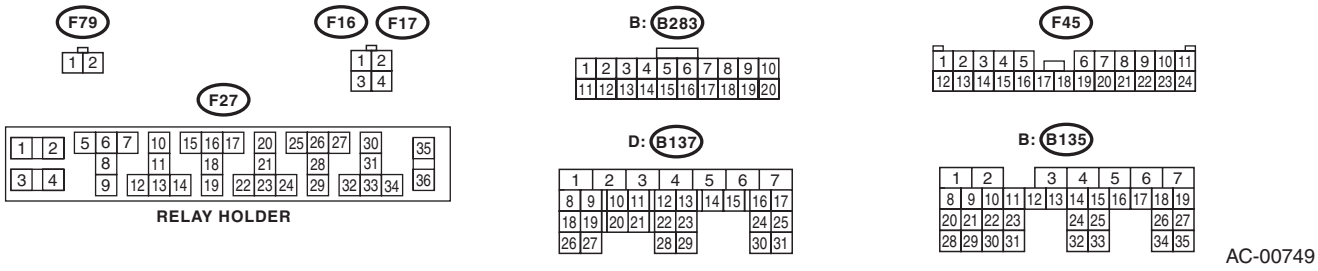
AC-00670

	Step	Check	Yes	No
1	**CHECK FUSE.** 1) Remove the No. 1, No. 2 and No. 17 fuses in fuse & relay box. 2) Check the condition of fuses.	Are any of the fuses blown-out?	Replace the fuse.	Go to step **2.**
2	**CHECK POWER SUPPLY TO BLOWER FAN MOTOR.** 1) Turn the ignition switch to ON. 2) Turn the blower switch to ON. 3) Measure the voltage between blower fan motor and chassis ground. ***Connector & terminal*** ***(B87) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Repair the open circuit in harness for blower fan motor power supply line.
3	**CHECK BLOWER FAN MOTOR RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the blower fan motor relay. 3) Connect the battery positive (+) terminal to No. 1 terminal and negative (–) terminal to No. 3 terminal of blower fan motor connector. 4) Measure the resistance between No. 2 and No. 4 terminals. ***Terminals*** ***No. 2 — No. 4:***	Is the resistance less than 1 Ω?	Go to step **4.**	Replace the blower fan motor relay.
4	**CHECK BLOWER FAN MOTOR.** 1) Disconnect the connector from blower fan motor. 2) Connect the battery positive (+) terminal to No. 1 terminal and negative (–) terminal to No. 2 terminal of blower fan motor connector. 3) Make sure that the blower fan motor is operated.	Does the blower fan motor operate?	Go to step **5.**	Replace the blower fan motor.
5	**CHECK POOR CONTACT.** Check poor contact in A/C control module connector.	Is there poor contact in connector?	Repair the connector.	Replace the A/C control module.

C: COMPARTMENT TEMPERATURE IS NOT CHANGED OR A/C SYSTEM DOES NOT RESPOND QUICKLY

WIRING DIAGRAM:





AC-00749

Step		Check	Yes	No
1	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the No. 2 fuse in main fuse box. 3) Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK POWER SUPPLY TO MAGNET CLUTCH OF A/C COMPRESSOR.** 1) Start the engine, and turn A/C switch to ON. 2) Set the temperature control dial to maximum cold position. 3) Measure the voltage between magnet clutch connector and chassis ground. ***Connector & terminal*** ***(F24) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Repair the open circuit in harness for power supply line of the A/C compressor.
3	**CHECK SIGNAL VOLTAGE TO A/C RELAY.** 1) Turn the ignition switch to ON. 2) Turn the A/C switch to ON. 3) Measure the signal voltage between A/C relay and chassis ground. ***Connector & terminal*** ***(F27) No. 14 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Repair the open circuit in harness for A/C relay signal circuit.
4	**CHECK A/C RELAY.** 1) Remove the A/C relay in main fuse box. 2) Check the A/C relay. <Ref. to AC-37, INSPECTION, Relay and Fuse.>	Is the operation of the relay OK?	Go to step **5.**	Replace the A/C relay.
5	**CHECK OPERATION OF MAIN FAN MOTOR.** 1) Start the engine. 2) Turn the A/C switch to ON. 3) Check the operation of main fan motor.	Does the radiator main fan operate?	Go to step **10.**	Go to step **6.**
6	**CHECK POWER SUPPLY TO MAIN FAN MOTOR.** **CAUTION:** **Be careful not to overheat the engine during repair.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from main fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 95°C (203°F). 4) Stop the engine and turn ignition switch to ON. 5) Measure the voltage between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 1, 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **7.**	Repair the open circuit in harness for power supply circuit.
7	**CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between main fan motor connector and chassis ground. ***Connector & terminal*** ***(F17) No. 3, 4 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between main fan motor connector and chassis ground.
8	**CHECK POOR CONTACT.** Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair the poor contact in main fan motor connector.	Go to step **9.**
9	**CHECK MAIN FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 1 and 2, and negative (–) terminal to terminal No. 3 and 4.	Does the main fan rotate?	Repair the poor contact in main fan motor connector.	Replace the main fan motor with a new one.
10	**CHECK OPERATION OF SUB FAN MOTOR.** Check the operation of sub fan motor.	Does the radiator sub fan operate?	Go to step **15.**	Go to step **11.**

	Step	Check	Yes	No
11	**CHECK POWER SUPPLY TO SUB FAN MOTOR.** **CAUTION:** **Be careful not to overheat the engine during repair.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from sub fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 100°C (212°F). 4) Stop the engine and turn the ignition switch to ON. 5) Measure the voltage between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 1, 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **12.**	Repair the open circuit in harness for power supply circuit.
12	**CHECK GROUND CIRCUIT OF SUB FAN MOTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 3, 4 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **13.**	Repair the open circuit in harness between sub fan motor connector and chassis ground.
13	**CHECK POOR CONTACT.** Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair the poor contact in sub fan motor connector.	Go to step **14.**
14	**CHECK SUB FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 1 and 2, and negative (–) terminal to terminal No. 3 and 4.	Does the sub fan rotate?	Repair the poor contact in sub fan motor connector.	Replace the sub fan motor with a new one.
15	**CHECK EACH SENSOR AND POTENTIOMETER.** Check the sensors and potentiometer for proper operation using the self-diagnostic function. <Ref. to AC(diag)-8, Diagnostics Chart for Self-diagnosis.>	Is the operation of each sensor and potentiometer normal?	Go to step **16.**	Check the sensor and circuit. <Ref. to AC(diag)-24, Diagnostic Procedure for Sensors.>
16	**CHECK CONNECTION OF ASPIRATOR DUCT.** Make sure the connection of aspirator duct is correct.	Is the connection of aspirator duct correct?	Repair the aspirator duct connection.	Go to step **17.**
17	**CHECK EACH ACTUATOR.** Check the actuators for proper operation using the self-diagnostic function. <Ref. to AC(diag)-8, Diagnostics Chart for Self-diagnosis.>	Is the operation of each actuator normal?	Go to step **18.**	Check the actuator and circuit. <Ref. to AC(diag)-18, Diagnostic Procedure for Actuators.>
18	**CHECK POOR CONTACT.** Check poor contact in A/C control module connector.	Is there poor contact in connector?	Repair the connector.	Replace the A/C control module.

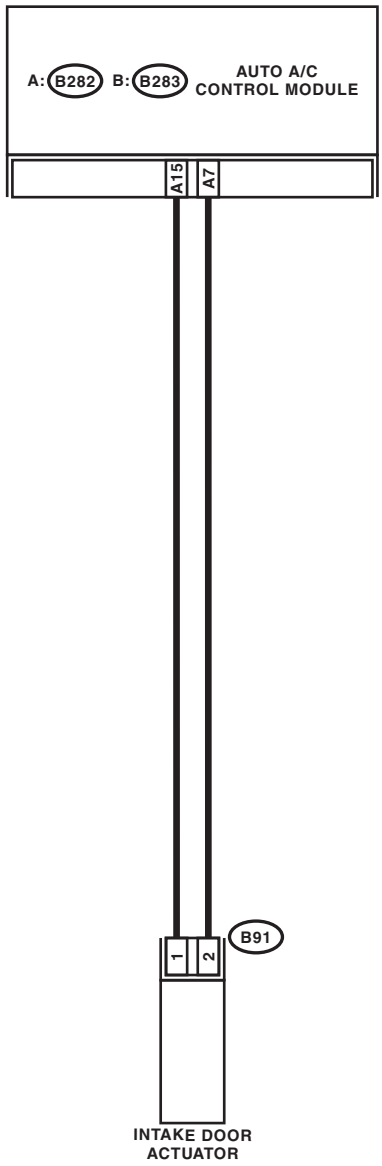
7. Diagnostic Procedure for Actuators

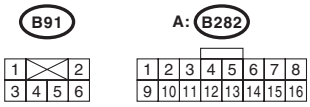
A: INTAKE DOOR ACTUATOR

TROUBLE SYMPTOM:

FRESH/RECIRC mode is not changed.

WIRING DIAGRAM:





AC-00675

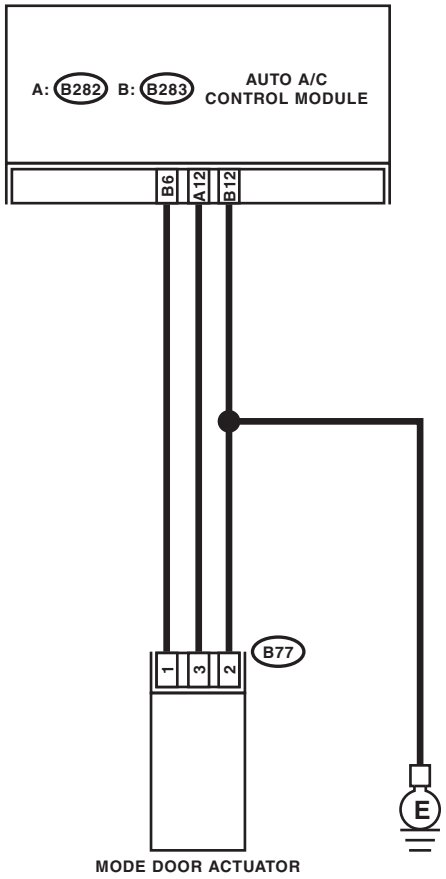
	Step	Check	Yes	No
1	**CHECK FUSE.** 1) Remove the No. 17 fuse in fuse & relay box. 2) Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Go to step **2.**
2	**CHECK SIGNAL VOLTAGE.** 1) Change the air intake to RECIRC by pushing FRESH/RECIRC switch. 2) Measure the voltage between A/C control module and chassis ground. ***Connector & terminal*** ***(B282) No. 15 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **3.**	Repair the short circuit in harness for power supply line.
3	**CHECK SIGNAL VOLTAGE.** 1) Change the air intake to FRESH with pushing FRESH/RECIRC switch. 2) Measure the voltage between A/C control module and chassis ground. ***Connector & terminal*** ***(B282) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **4.**	Repair the short circuit in harness for power supply line.
4	**CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND FRESH/RECIRC ACTUATOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from A/C control module and intake door actuator. 3) Measure the resistance of harness between A/C control module and intake door actuator. ***Connector & terminal*** ***(B282) No. 15 — (B91) No. 1:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit in harness between A/C control module and intake door actuator.
5	**CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND FRESH/RECIRC ACTUATOR.** Measure the resistance of harness between A/C control module and intake door actuator. ***Connector & terminal*** ***(B282) No. 7 — (B91) No. 2:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between A/C control module and intake door actuator.
6	**CHECK POOR CONTACT.** Check poor contact in A/C control module connector.	Is there poor contact in connector?	Repair the connector.	Replace the A/C control module.

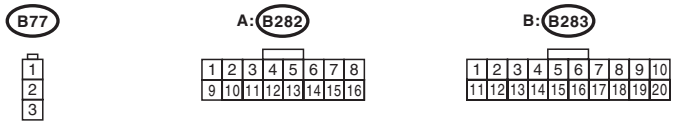
B: MODE DOOR ACTUATOR

TROUBLE SYMPTOM:

Air flow outlet is not changed.

WIRING DIAGRAM:





AC-00676

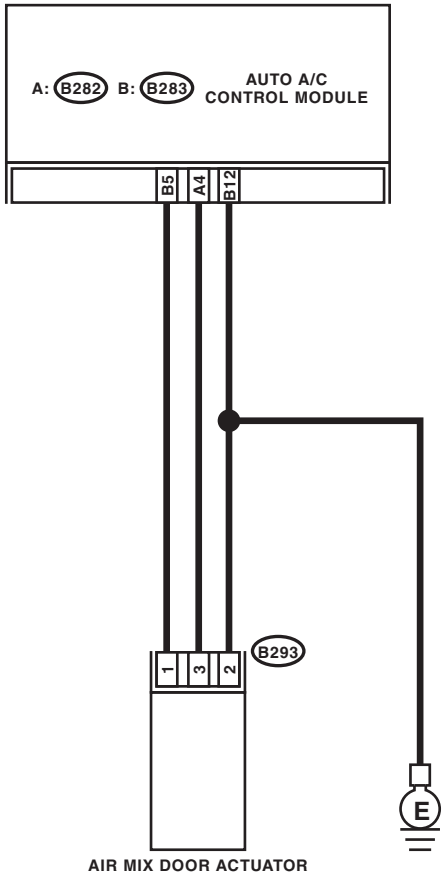
	Step	Check	Yes	No
1	**CHECK POWER SUPPLY FOR AUTO A/C CONTROL MODULE SIDE.** 1) Turn the ignition switch to ON. 2) Turn the A/C switch to ON. 3) Measure the voltage between auto A/C control module harness connector terminal and chassis ground. ***Connector & terminal*** ***(B283) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Replace the auto A/C control module.
2	**CHECK POWER SUPPLY FOR ACTUATOR SIDE.** Measure the voltage between mode door actuator harness connector terminal and chassis ground. ***Connector & terminal*** ***(B77) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Repair the open circuit in harness between auto A/C control module and mode door actuator.
3	**CHECK SIGNAL FOR AUTO A/C CONTROL MODULE SIDE.** Measure the voltage between auto A/C control module harness connector terminal and chassis ground with oscilloscope. ***Connector & terminal*** ***(B282) No. 12 (+) — Chassis ground (–):***	Is the voltage approx. 5.5 V?	Go to step **4.**	Replace the auto A/C control module.
4	**CHECK SIGNAL FOR ACTUATOR SIDE.** Measure the voltage between mode door actuator harness connector terminal and chassis ground. ***Connector & terminal*** ***(B77) No. 3 (+) — Chassis ground (–):***	Is the voltage approx. 5.5 V?	Go to step **5.**	Repair the open circuit in harness between auto A/C control module and mode door actuator.
5	**CHECK GROUND CIRCUIT OF ACTUATOR.** 1) Turn the ignition switch and A/C switch to OFF. 2) Measure the resistance between mode door actuator harness connector terminal and chassis ground. ***Connector & terminal*** ***(B77) No. 2 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between mode door actuator and chassis ground.
6	**CHECK POOR CONTACT.** Check poor contact in auto A/C control module connector.	Is there poor contact in connector?	Repair the connector.	Replace the A/C control module.

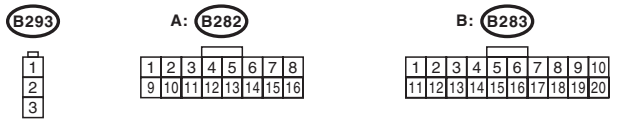
C: AIR MIX DOOR ACTUATOR

TROUBLE SYMPTOM:

Outlet air temperature is not changed.

WIRING DIAGRAM:





AC-00677

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY FOR AUTO A/C CONTROL MODULE SIDE.** 1) Turn the ignition switch to ON. 2) Turn the A/C switch to ON. 3) Measure the voltage between auto A/C control module harness connector terminal and chassis ground. ***Connector & terminal*** ***(B283) No. 5 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Replace the auto A/C control module.
2	**CHECK POWER SUPPLY FOR ACTUATOR SIDE.** Measure the voltage between air mix door actuator harness connector terminal and chassis ground. ***Connector & terminal*** ***(B293) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Repair the open circuit in harness between auto A/C control module and air mix door actuator.
3	**CHECK SIGNAL FOR AUTO A/C CONTROL MODULE SIDE.** Measure the voltage between auto A/C control module harness connector terminal and chassis ground with oscilloscope. ***Connector & terminal*** ***(B282) No. 4 (+) — Chassis ground (−):***	Is the voltage approx. 5.5 V?	Go to step **4.**	Replace the auto A/C control module.
4	**CHECK SIGNAL FOR ACTUATOR SIDE.** Measure the voltage between air mix door actuator harness connector terminal and chassis ground with oscilloscope. ***Connector & terminal*** ***(B293) No. 3 (+) — Chassis ground (−):***	Is the voltage approx. 5.5 V?	Go to step **5.**	Repair the open circuit in harness between auto A/C control module and air mix door actuator.
5	**CHECK GROUND CIRCUIT OF ACTUATOR.** 1) Turn the ignition switch and A/C switch to OFF. 2) Measure the resistance between air mix door actuator harness connector terminal and chassis ground. ***Connector & terminal*** ***(B293) No. 2 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between air mix door actuator and chassis ground.
6	**CHECK POOR CONTACT.** Check poor contact in auto A/C control module connector.	Is there poor contact in connector?	Repair the connector.	Replace the A/C control module.

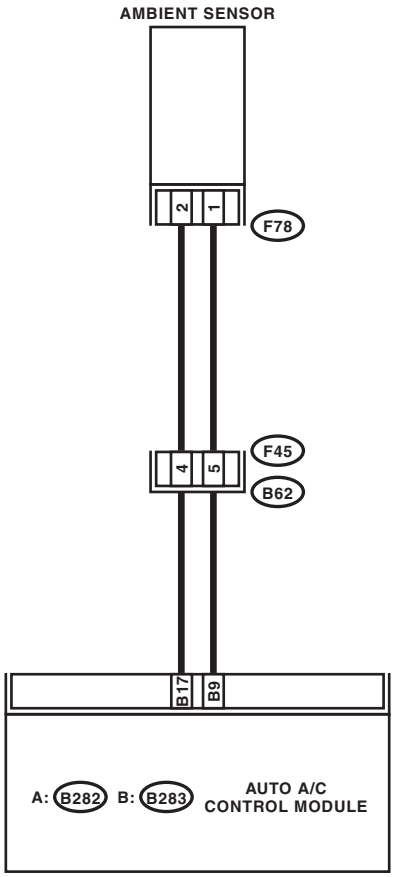
8. Diagnostic Procedure for Sensors

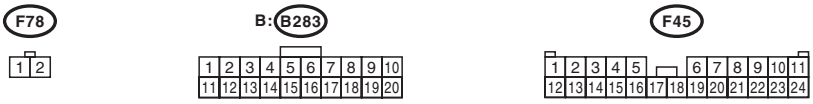
A: AMBIENT SENSOR

TROUBLE SYMPTOM:

Fan speed is not switched when the fan speed control dial is in AUTO position.

WIRING DIAGRAM:





AC-00750

	Step	Check	Yes	No
1	**CHECK AMBIENT SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ambient sensor. 3) Measure the resistance between connector terminals of ambient sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance approx. 2.2 kΩ at 25°C (77°F)?	Go to step **2.**	Replace the ambient sensor.
2	**CHECK INPUT SIGNALS FOR AMBIENT SENSOR.** 1) Turn the ignition ON. 2) Measure the voltage between (F78) connector terminals. ***Connector & terminal*** ***(F78) No. 1 (+) — No. 2 (–):***	Is the voltage approx. 5 V?	Go to step **6.**	Go to step **3.**
3	**CHECK OUTPUT SIGNALS FROM A/C CONTROL MODULE.** 1) Turn the ignition switch to OFF. 2) Pull out the A/C control unit. 3) Disconnect the connector from ambient sensor. 4) Turn the ignition switch to ON. 5) Measure the voltage between connector terminals of A/C control module. ***Connector & terminal*** ***(B283) No. 9 (+) — No. 17 (–):***	Is the voltage approx. 5 V?	Go to step **4.**	Go to step **6.**
4	**CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND AMBIENT SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from A/C control module. 3) Measure the resistance of harness between A/C control module and ambient sensor. ***Connector & terminal*** ***(F78) No. 1 — (B283) No. 9:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit in harness between A/C control module and ambient sensor.
5	**CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND AMBIENT SENSOR.** Measure the resistance of harness between A/C control module and ambient sensor. ***Connector & terminal*** ***(F78) No. 2 — (B283) No. 17:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between A/C control module and ambient sensor.
6	**CHECK POOR CONTACT.** Check poor contact in A/C control module connector.	Is there poor contact in connector?	Repair the connector.	Replace the A/C control module.

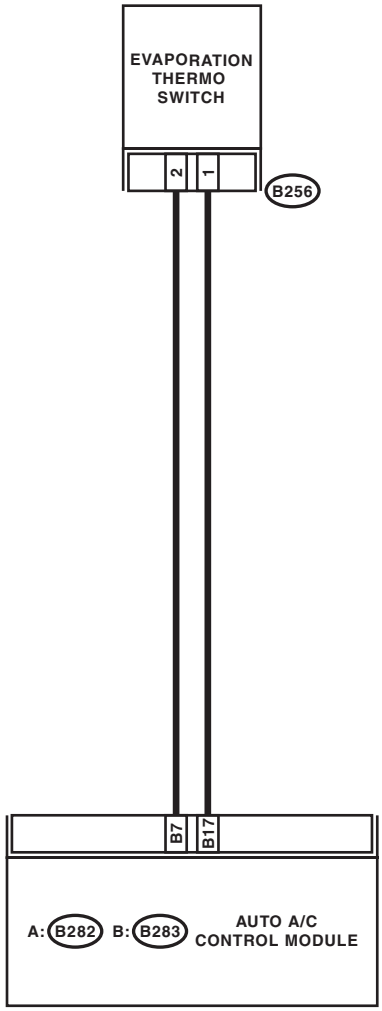
B: IN-VEHICLE SENSOR

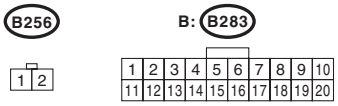
TROUBLE SYMPTOM:

- When turning the AUTO switch to ON, blower fan speed, outlet port and inlet port is not changed.
- If the switch LED indicates that the sensor is malfunctioning, replace the A/C control module. The in-vehicle sensor is built into the A/C control module and cannot be replaced as a single unit.

C: EVAPORATOR SENSOR

WIRING DIAGRAM:





AC-00679

	Step	Check	Yes	No
1	**CHECK EVAPORATOR SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the glove box. 3) Disconnect the connector from evaporator sensor. 4) Measure the resistance between connector terminals of evaporator sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance approx. 3.3 kΩ at 20°C (68°F)?	Go to step **2.**	Replace the evaporator sensor.
2	**CHECK INPUT SIGNALS FOR EVAPORATOR SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between (B256) connector terminal and chassis ground. ***Connector & terminal*** ***(B256) No. 2 (+) — Chassis ground (−):***	Is the voltage approx. 5 V?	Go to step **6.**	Go to step **3.**
3	**CHECK OUTPUT SIGNALS FROM A/C CONTROL MODULE.** 1) Turn the ignition switch to OFF. 2) Pull out the A/C control module. 3) Turn the ignition switch to ON. 4) Measure the voltage between A/C control module connector terminals. ***Connector & terminal*** ***(B283) No. 7 (+) — No. 17 (−):***	Is the voltage approx. 5 V?	Go to step **4.**	Go to step **6.**
4	**CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND EVAPORATOR SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from A/C control module. 3) Measure the resistance of harness between A/C control module and evaporator sensor. ***Connector & terminal*** ***(B256) No. 2 — (B283) No. 7:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit in harness between A/C control module and evaporator sensor.
5	**CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND EVAPORATOR SENSOR.** Measure the resistance of harness between A/C control module and evaporator sensor. ***Connector & terminal*** ***(B256) No. 1 — (B283) No. 17:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between A/C control module and evaporator sensor.
6	**CHECK POOR CONTACT.** Check poor contact in A/C control module connector.	Is there poor contact in connector?	Repair the connector.	Replace the A/C control module.

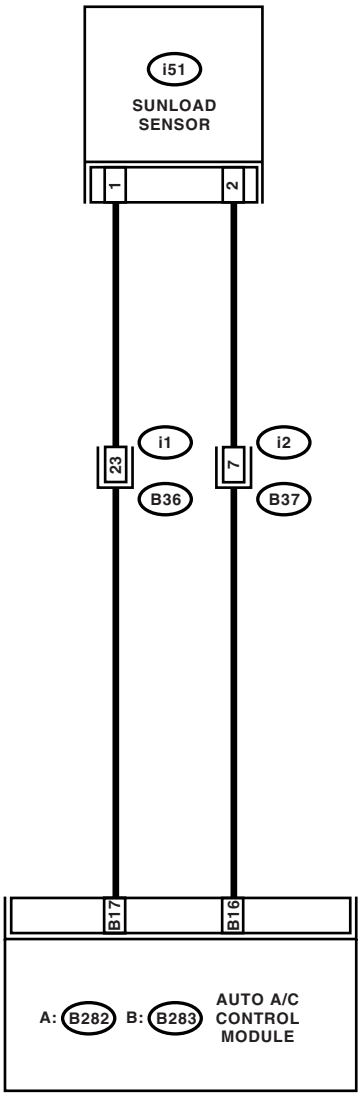
D: SUNLOAD SENSOR

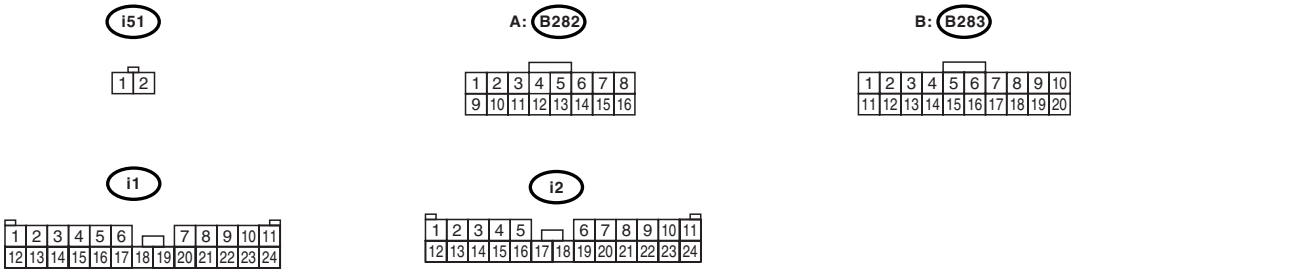
TROUBLE SYMPTOM:

- Sensor identified that sunlight is at maximum. Then, A/C system is controlled to COOL side.
- Sensor identified that sunlight is at minimum. Then, A/C system is controlled to HOT side.

NOTE:
When the sunload sensor is checked indoors or in the shade, open circuit might be indicated. Always check the sunload sensor at a place where sun shines directly on it.

WIRING DIAGRAM:





AC-00751

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE TO SUNLOAD SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the input voltage to sunload sensor. ***Connector & terminal*** ***(i51) No. 2 (+) — Chassis ground (−):***	Is the voltage approx. 5 V?	Go to step **3.**	Go to step **2.**
2	**CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND SUNLOAD SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from A/C control module. 3) Measure the resistance of harness between A/C control module and sunload sensor. ***Connector & terminal*** ***(i51) No. 2 — (B283) No. 16:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the harness between A/C control module and sunload sensor.
3	**CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND SUNLOAD SENSOR.** Measure the resistance of harness between A/C control module and sunload sensor. ***Connector & terminal*** ***(i51) No. 1 — (B283) No. 17:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the harness between A/C control module and sunload sensor.
4	**CHECK THE INPUT VOLTAGE TO A/C CONTROL MODULE.** 1) Connect the A/C control module connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between A/C control module connector terminals. ***Connector & terminal*** ***(B283) No. 16 (+) — (B283) No. 17 (−):***	Is the voltage approx. 2.5 V?	Go to step **5.**	Replace the sunload sensor.
5	**CHECK POOR CONTACT.** Check poor contact in A/C control module connector.	Is there poor contact in connector?	Repair the connector.	Replace the A/C control module.

9. Symptom Related Diagnostic

A: GENERAL DIAGNOSTICS TABLE

Symptom / Component parts	A/C system fails to operate.	Burned-out fuse.	Illumination does not dim at night.	Blower motor does not rotate or rotates erroneously.	A/C does not change from "Fresh" to "Recirc" or vise versa.	Air outlet cannot be switched.	Compartment temperature does not increase (No hot air is discharged).	Compartment temperature does not decrease (No cool air is discharged).	Compartment temperature is higher than or lower than the set value.	Compartment temperature does not quickly respond to the set value.	Condenser fan does not operate during A/C operation.
Fuses (M/B No. 5, F/B No. 17)	○	○	○	○							
Poor connector contacts	○	○	○	○	○	○	○	○			
Ground	○			○							
A/C control module	○		○	○	○	○	○	○	○		
Air mix door actuator and potentiometer (including links)							○	○	○	○	
Mode door actuator and potentiometer (including links)						○					
Intake door actuator and potentiometer (including links)					○						
Blower fan motor	○			○							
Blower fan relay	○			○							
A/C relay	○							○			
Magnet clutch	○							○			
Radiator fan motors (Main and sub)								○			○
Radiator fan relays (Main and sub)								○			○
Sensors (In-vehicle, ambient, water temperature, evaporator, sunload, etc.)	○ (Evaporator sensor)						○	○	○	○	
In-vehicle sensor aspirator duct							○	○	○	○	

AC-00681

AIRBAG SYSTEM

AB

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6.	Side Airbag Module	14
7.	Airbag Control Module	16
8.	Side Airbag Sensor	17
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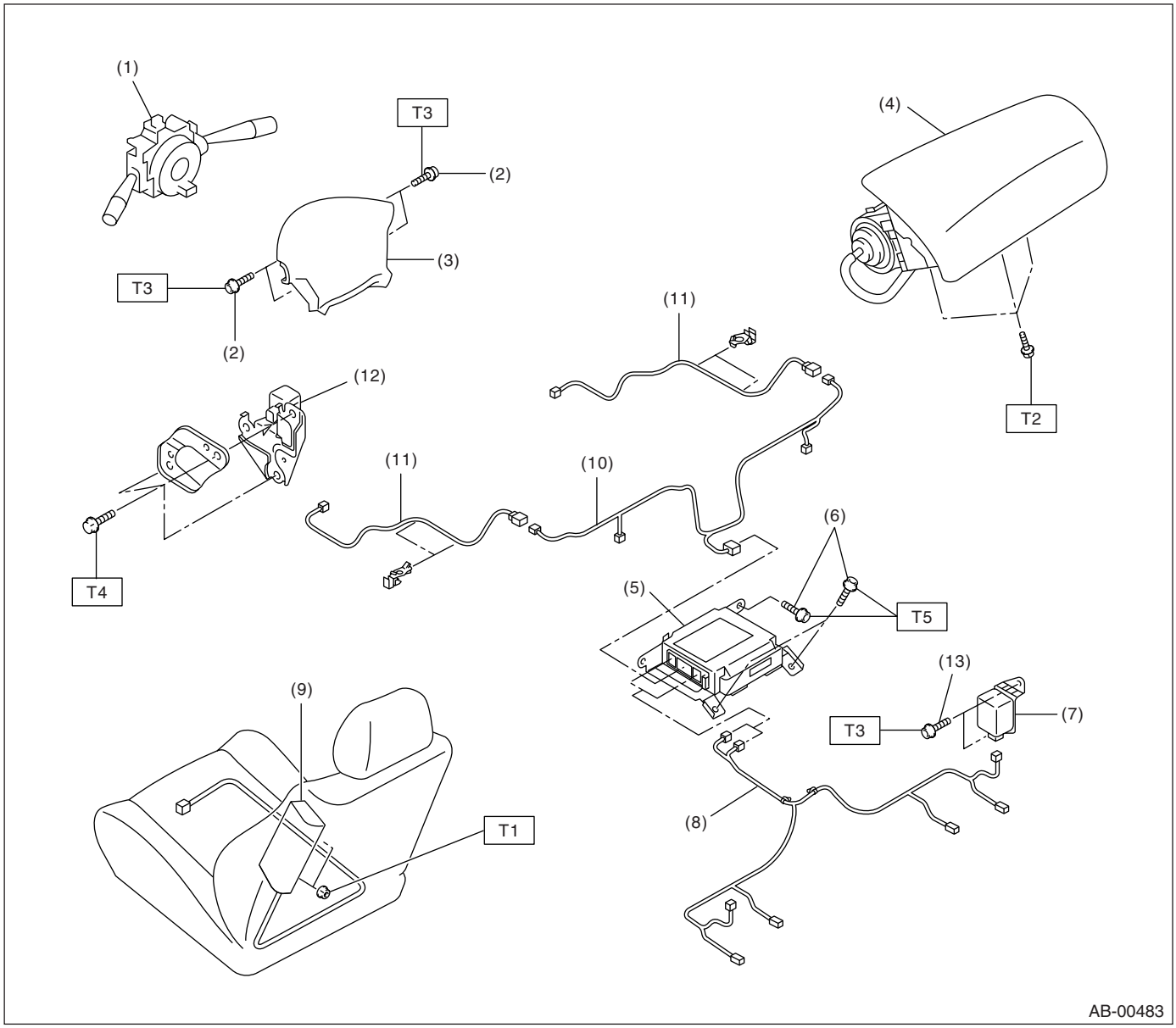
1. General Description

A: COMPONENT

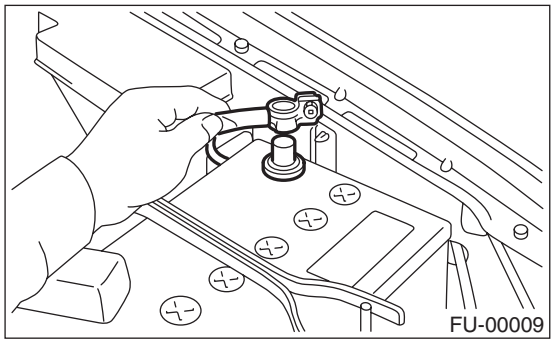
1. SRS AIRBAG



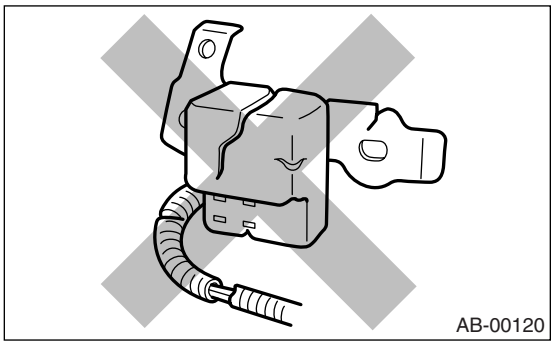
(1)	Combination switch ASSY with roll connector	(6)	Hexagon head bolt (exclusive use)	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	TORX® bolt T30	(7)	Side airbag sensor	***T1: 5.9 (0.59, 4.4)***
(3)	Airbag module ASSY (Driver's side)	(8)	Side airbag harness	***T2: 7.4 (0.75, 5.4)***
(4)	Airbag module ASSY (Passenger's side)	(9)	Side airbag module	***T3: 10 (1.0, 7.2)***
(5)	Airbag control module	(10)	Airbag main harness	***T4: 20 (2.0, 14.5)***
		(11)	Front sub sensor harness	***T5: 25 (2.5, 18.1)***
		(12)	Front sub sensor	
		(13)	TORX® bolt T30	

B: CAUTION

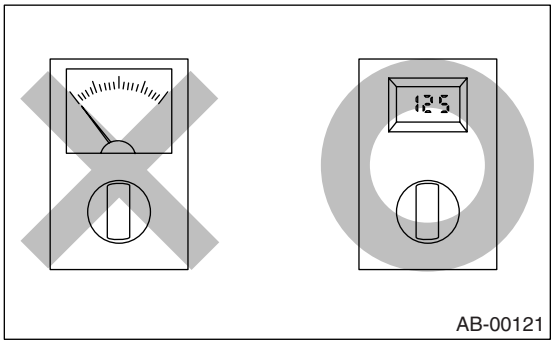
• When servicing a vehicle, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
• The airbag system is fitted with a backup power source. If the airbag system is serviced within 20 seconds after the ground cable is disconnected, it may inflate.



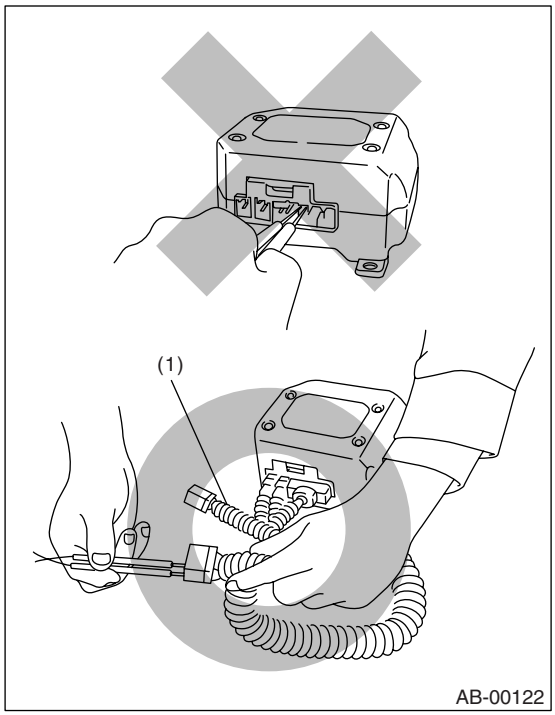
• If the airbag warning light illuminates, repair the vehicle immediately. Airbag or pretensioner may inflate incorrectly, or not inflate in collision.
• If sensors, airbag module, airbag control module, pretensioner, and harness are deformed or damaged, replace them with new genuine parts.



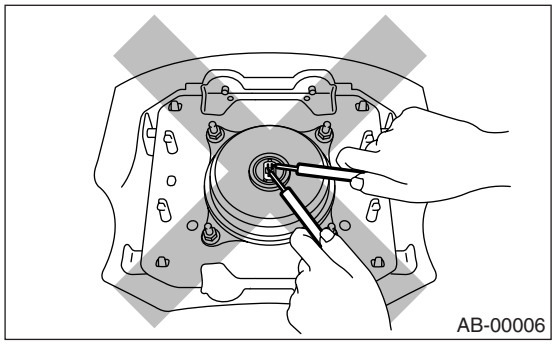
• When checking the airbag system, be sure to use a digital circuit tester.
Infinitesimal electric current in an analog circuit tester may cause the airbag to activate erroneously.



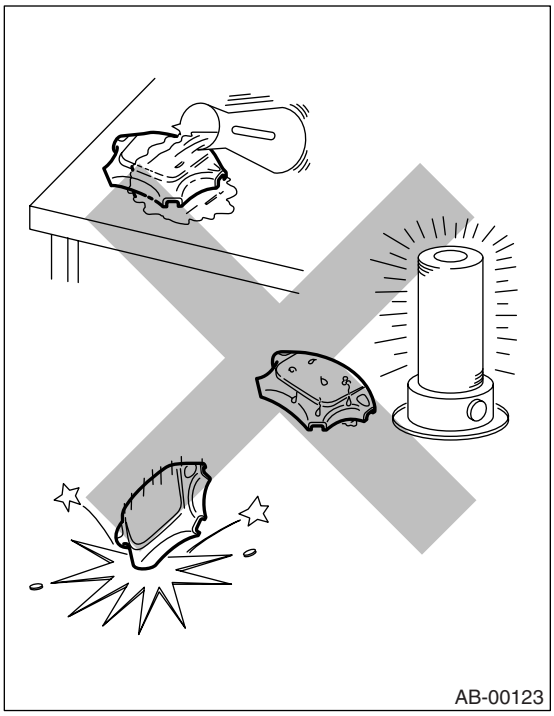
• When checking, use a test harness (1). Do not directly apply the tester probe to any connector terminal of the airbag. Damage to the connector terminal may cause the airbag to activate erroneously.



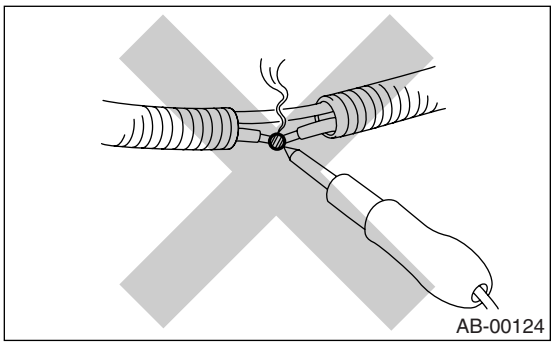
• Do not check continuity of either of the airbag modules for driver, passenger or side, or pretensioner.



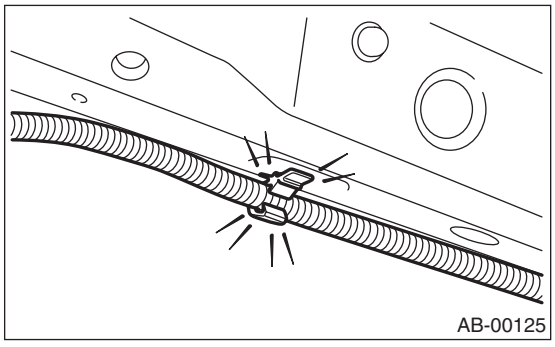
• Do not drop the airbag modulator parts, subject them to high temperature over 93°C (199°F), or let water, oil, or grease get on them; otherwise, the internal parts may be damaged and reliability greatly lowered.



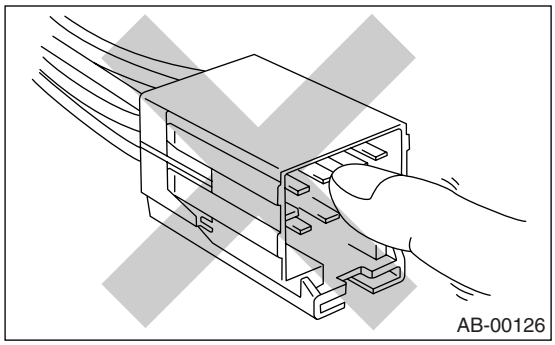
• If any damage, opening, or rust is found on the airbag system wire harness, do not attempt to repair using soldering equipment. Be sure to replace the faulty harness with a new genuine part.



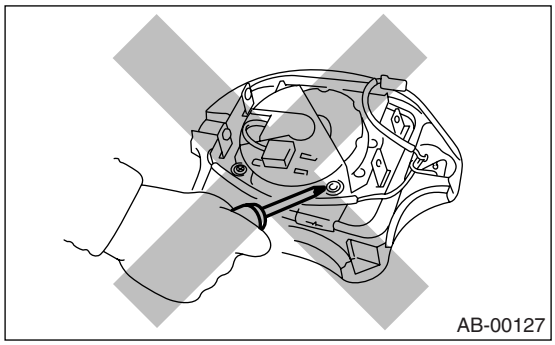
• Install the wire harness securely with the specified clips to avoid interference or tangled up with other parts.



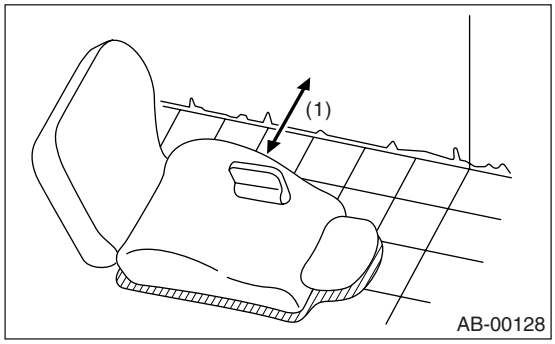
• Do not allow water or oil to come in contact with the connector terminals. Do not touch the connector terminals.



• Either of the airbag modules for driver, passenger or side, or pretensioner must not be disassembled.



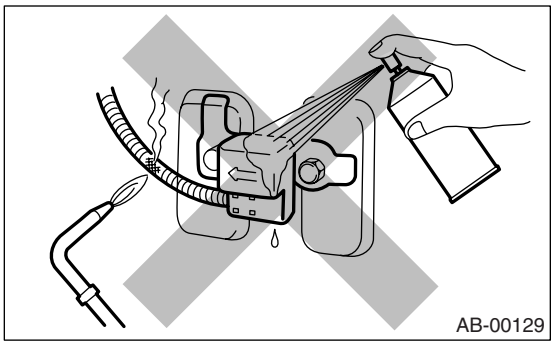
• The removed front seat with the airbag module must be kept at least 200 mm (8 in) away from walls and other objects.



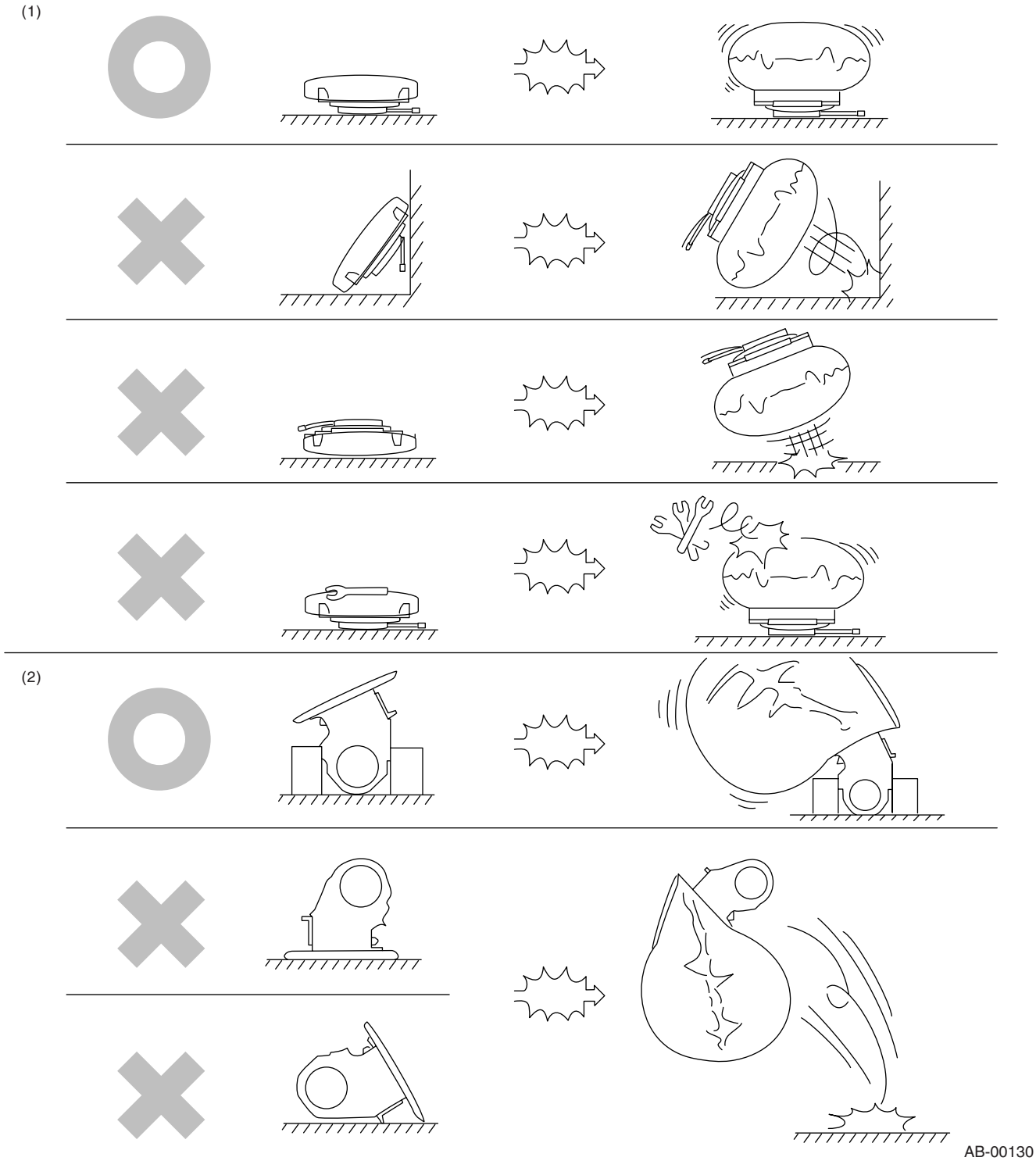
(1) More than 200 mm (8 in)

• Do not use the airbag or pretensioner parts from other vehicles. Always replace defective parts with new parts.
• Never reuse a deployed airbag or pretensioner.
• When painting or performing sheet metal work on the front part of the vehicle, including the front wheel apron, front fender, and front side frame, remove the front sub sensors and wire harness of the airbag system.

• When painting or performing sheet metal work on the side of the vehicle, including the side sill, center pillar, and front and rear doors, remove the side airbag sensors and wire harness of the airbag system.



• When storing a removed airbag module, do not place any objects on it or pile airbag modules on top of each other. If the airbag inflates for some reason when it is placed with its pad side facing downward or under any object, a serious accident may result.



(1) Driver's airbag module (2) Passenger's airbag module

C: PREPARATION TOOL

1. GENERAL TOOL

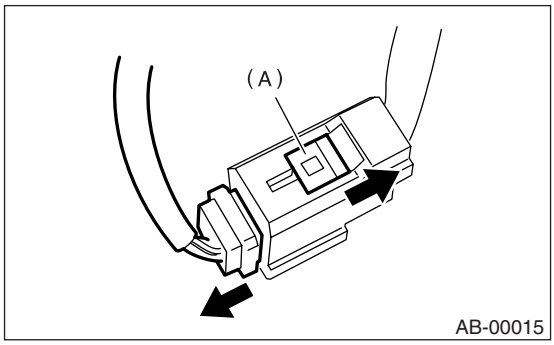
TOOL NAME	REMARKS
TORX® T30	Used for removal/installation of driver's airbag module, side airbag sensor.

2. Airbag Connector

A: PROCEDURE

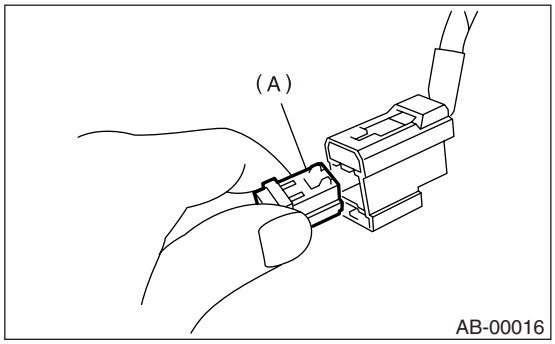
1. POWER SUPPLY

1) How to disconnect:
(1) Move the slide lock (A) in the direction of the arrow.
(2) Pull the female connector in the direction of the arrow with slide lock (A) moved.



CAUTION:
When pulling, be sure to hold onto the connector and not the wire.

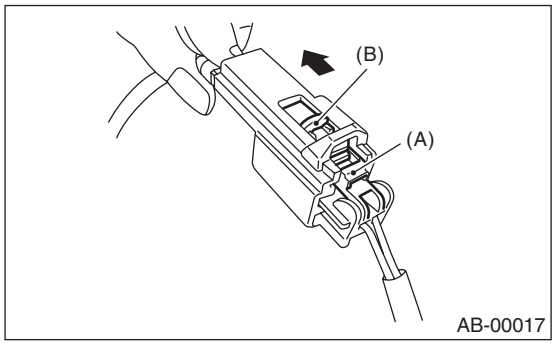
2) How to connect:
Holding the connector (A), and push it in carefully until a connecting sound is heard.



CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

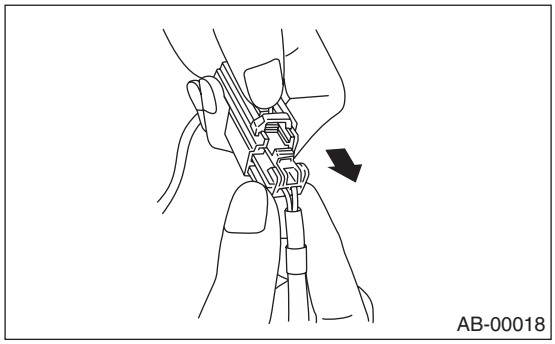
2. DRIVER'S AIRBAG (BETWEEN AIRBAG HARNESS AND ROLL CONNECTOR), PASSENGER'S AIRBAG AND SIDE AIRBAG

1) How to disconnect:
(1) Push the lock arm (A).
(2) With the lock arm (A) pushed in, move the slide lock (B) in the direction of the arrow.



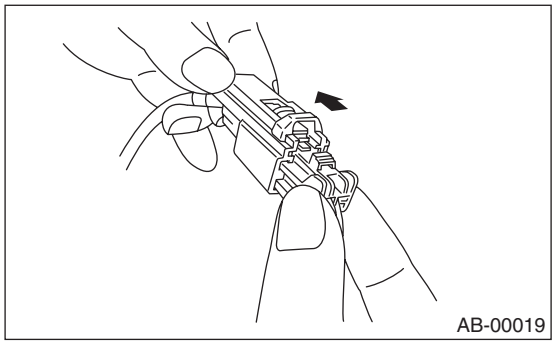
(3) With the slide lock (B) pulled, remove the lock arm (A) to its original position, and then pull in the direction of the arrow and separate the connector.

CAUTION:
When pulling, be sure to hold onto the connector and not the wire.



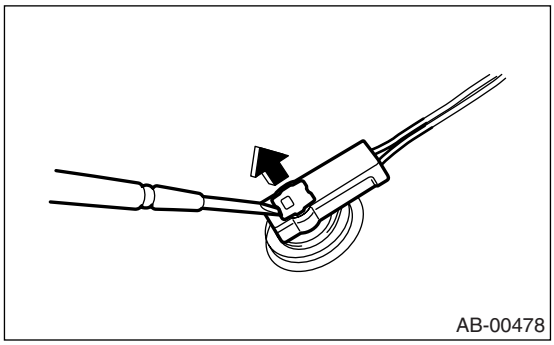
2) How to connect:
Holding the connector, and push it in carefully until a connecting sound is heard.

CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

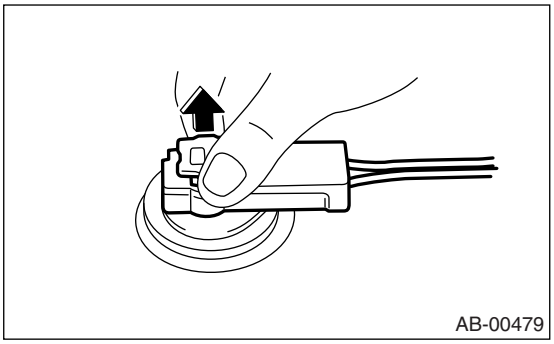


3. DRIVER'S AIRBAG MODULE AND PRE-TENSIONER

1) How to disconnect:
(1) Using a flat tip screwdriver, pry the push lock upward to unlock.

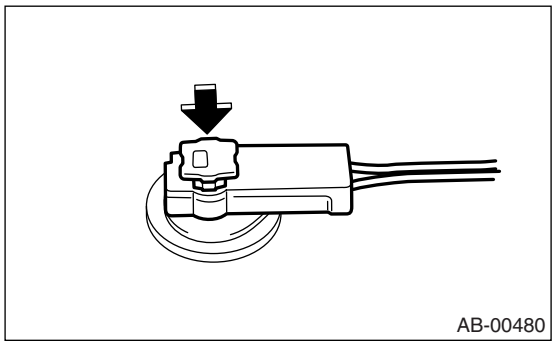


(2) Pull the connector to disconnect from driver's side airbag module assembly.



2) How to connect:
Connect the connector in reverse order of disconnecting. At this time, be sure to insert the connector in until connecting sound is heard.

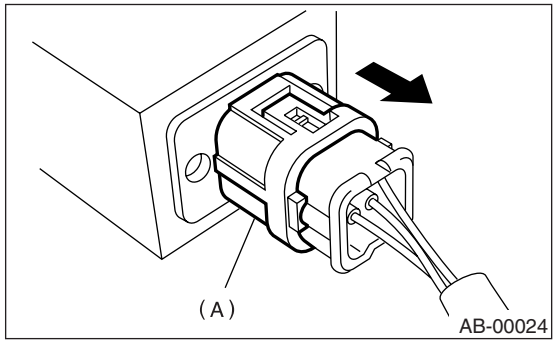
CAUTION:
• Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.
• At this time, be sure to insert the push lock in.



4. FRONT SUB-SENSOR AND SIDE AIRBAG SENSOR

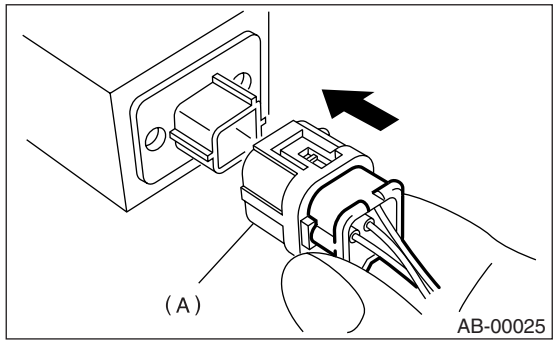
1) How to disconnect:
Holding outer part (A), pull it in the direction of the arrow.

CAUTION:
When pulling, be sure to hold onto the connector and not the wire.



2) How to connect:
Holding the connector, and push it in carefully until a connecting sound is heard.

CAUTION:
• Outer (A) moves back, and so do not put your hand on the outer part.
• Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.



3. Inspection Locations After a Collision

A: REPLACEMENT

When airbag system is deployed, replace the following parts.

1. FRONT COLLISION

1) Driver's airbag module
2) Passenger's airbag module
3) Driver's seat belt (pretensioner)
4) Passenger's seat belt (pretensioner)
5) Airbag control module
6) Front sub-sensor
7) Roll connector

2. SIDE COLLISION

1) Airbag control module
2) Side airbag module (operating side seat bag)
3) Side airbag sensor (operating side)

3. INSPECTION OF OTHER PARTS

Check for the following parts, replace the damaged parts with new ones.
1) Steering wheel and steering shaft
Check the steering wheel and steering shaft for mounting condition and deflection of axial and radical, upward and downward direction. Check the steering shaft for deflection of axial and radical direction with tilt lever released. (After a collision, absorbing part of steering shaft may inflate.)
2) Check the direct type connector of driver's airbag module, pretensioner, etc. for damage, and also check each harness for pinch and connector damage. If damage is found, replace the harness as a unit.

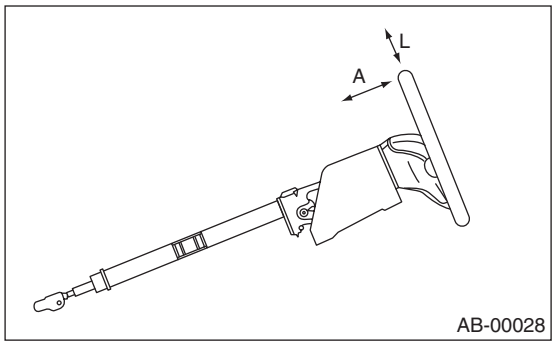
B: INSPECTION

If the vehicle is involved in a collision on any side, even if it is a slight collision, be sure to check the following system parts.

1. DRIVER'S AIRBAG MODULE

1) Check for the following, and replace damaged parts with new parts.
• Airbag module is cracked or deformed.
• Harness and/or connector is cracked, deformed or open. Lead wire is exposed.
• The module surface is fouled with grease, oil, water or cleaning solvent.
2) When installing a new driver's airbag module, check the following. If necessary, install a new airbag module and steering wheel.
• The steering wheel is in the way, making it difficult to install the airbag module.
• The clearance between the driver's airbag module and steering wheel is not constant.
• The steering wheel deformation in axial and radial directions exceed limits.

Specifications:
Height deflection A
Less than 6 mm (0.24 in)
O.D. deflection L
Less than 17 mm (0.67 in)



2. PASSENGER'S AIRBAG MODULE

Check for the following, and replace damaged parts with new parts.
• Airbag module is cracked or deformed.
• Harness and/or connector is cracked, deformed or open. Lead wire is exposed.
• Mounting bracket is cracked or deformed.

3. SIDE AIRBAG MODULE

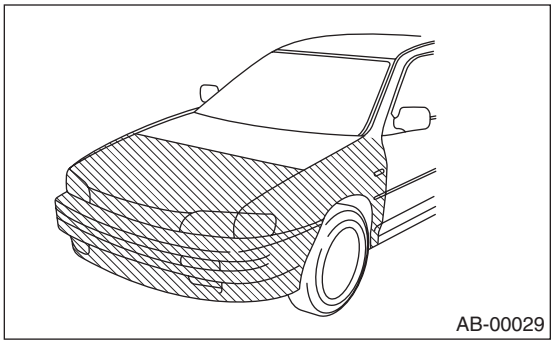
Check for the following, and replace damaged parts with new parts.
• Front seat is damaged or deformed.
• Harness and/or connector is cracked, deformed or open.
• Lead wire is exposed.

4. AIRBAG CONTROL MODULE

Check for the following, and replace damaged parts with new parts.
• Control module is cracked or deformed.
• Mounting bracket is cracked or deformed.
• Connector is scratched or deformed.
• Airbag is deployed.
• Side airbag is deployed.

5. FRONT SUB SENSOR

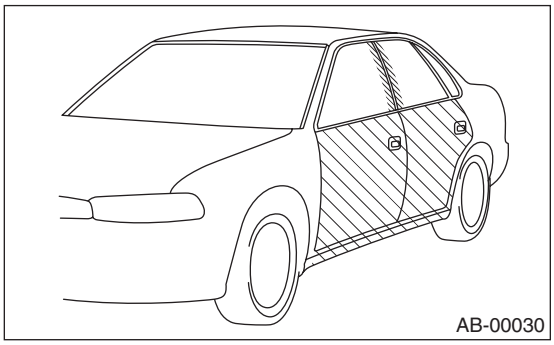
If the front section of vehicle as shown in the figure is damaged:



Check for the following, and replace damaged parts with new parts.
- Front sub sensor is cracked or deformed.
- Mounting bracket is cracked or deformed.
- Connector is scratched or cracked.
- Airbag is deployed.

6. SIDE AIRBAG SENSOR

If the side section of vehicle as shown in the figure is damaged:



Check for the following, and replace damaged parts with new parts.
- Side airbag sensor is cracked or deformed.
- Mounting bracket is cracked or deformed.
- Connector is scratched or cracked.
- Side airbag is deployed. (operating side)

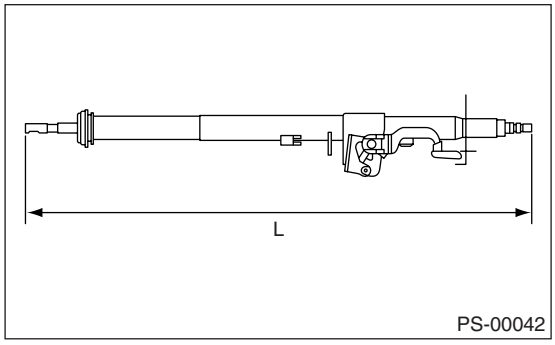
7. ROLL CONNECTOR

Check for the following, and replace damaged parts with new parts.
- Combination switch or steering roll connector is cracked or deformed.

8. STEERING SHAFT

Check for the following, and replace damaged parts with new parts.
- Overall length of steering column should be within specifications.

Specifications:
Overall length L
Except for STi model:
825.7±1.5 mm (32.5±0.06 in)
STi model:
818.7±1.5 mm (32.23±0.06 in)



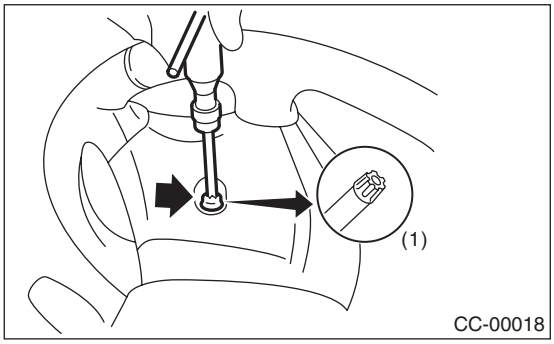
If necessary, replace it with a new part.

4. Driver's Airbag Module

A: REMOVAL

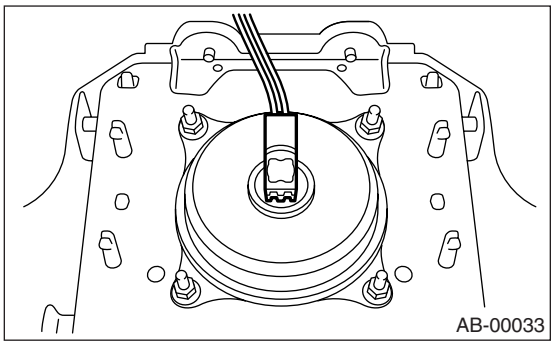
CAUTION:
Refer to "CAUTION" in General Description before handing the airbag module. <Ref. to AB-3, CAUTION, General Description.>

1) Position the front wheels straight ahead. (After moving the vehicle more than 5 m (16 ft) with front wheels positioned straight ahead, make sure that the vehicle moves straight ahead).
2) Turn the ignition switch to OFF.
3) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
4) Using the TORX® BIT T30, remove the two TORX® bolts on side of steering wheel.



(1) TORX® BIT T30

5) Disconnect the airbag connector on the back of airbag module, and then remove the airbag module.



6) Refer to "CAUTION" for handling of a removed airbag module. <Ref. to AB-3, CAUTION, General Description.>

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Do not allow harness and connectors to interfere or get tangled up with other parts.

Tightening torque:
Refer to "COMPONENT" in "General Description" <Ref. to AB-2, SRS AIRBAG, COMPONENT, General Description.>

C: INSPECTION

CAUTION:
Refer to "CAUTION" in General Description before handing the airbag module. <Ref. to AB-3, CAUTION, General Description.>

Check for the following, and replace damaged parts with new parts.

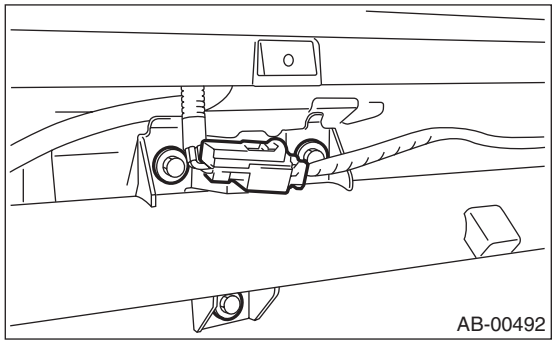
- Airbag module, harness, connector, and mounting bracket are damaged. <Ref. to AB-10, DRIVER'S AIRBAG MODULE, INSPECTION, Inspection Locations After a Collision.>

5. Passenger's Airbag Module

A: REMOVAL

CAUTION:
Refer to "CAUTION" in General Description before handing the airbag module. <Ref. to AB-3, CAUTION, General Description.>

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Remove the glove box. <Ref. to EI-41, REMOVAL, Glove Box.>
4) Detach the airbag connector from support beam bracket, and then disconnect the airbag connector.



5) Remove the three bolts, and then carefully remove the airbag module.
6) Refer to "CAUTION" for handling of a removed airbag module. <Ref. to AB-3, CAUTION, General Description.>

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Do not allow harness and connectors to interfere or get tangled up with other parts.

Tightening torque:
Refer to "COMPONENT" in "General Description" <Ref. to AB-2, SRS AIRBAG, COMPONENT, General Description.>

C: INSPECTION

CAUTION:
Refer to "CAUTION" in General Description before handing the airbag module. <Ref. to AB-3, CAUTION, General Description.>

Check for the following, and replace damaged parts with new parts.

• Airbag module, harness, connector, and mounting bracket are damaged. <Ref. to AB-10, PASSENGER'S AIRBAG MODULE, INSPECTION, Inspection Locations After a Collision.>

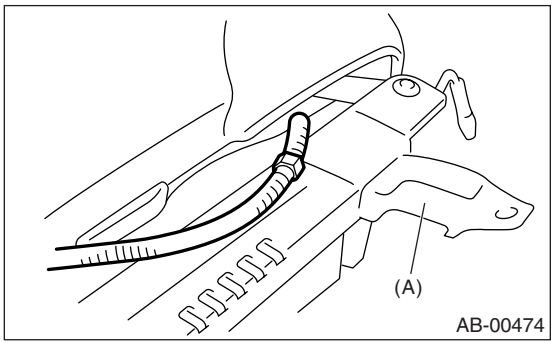
6. Side Airbag Module

A: REMOVAL

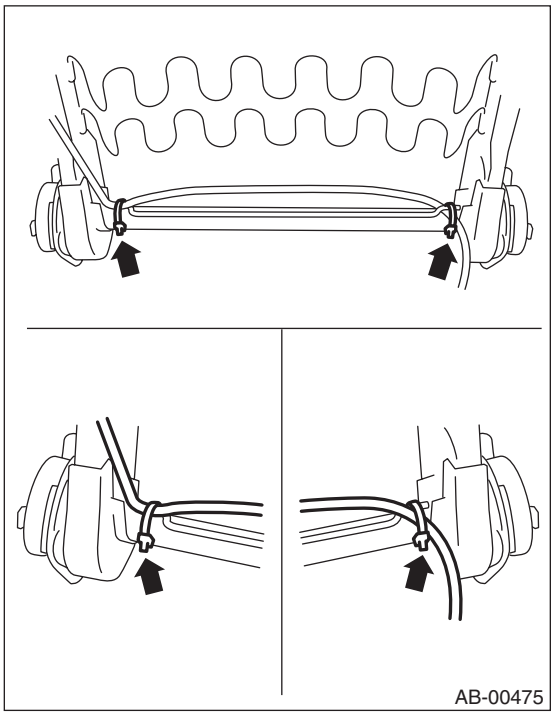
CAUTION:
Before working on the airbag module, refer to the "CAUTION" in General Description. <Ref. to AB-3, CAUTION, General Description.>

NOTE:
Remove the passenger's side by referring to driver's side.

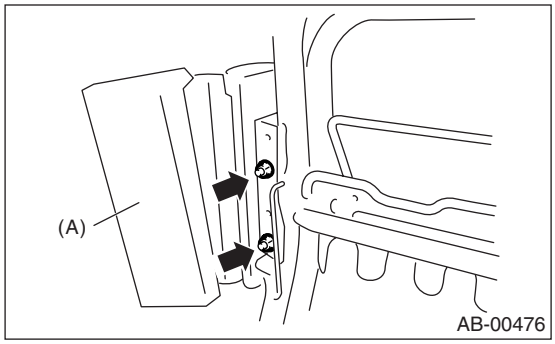
1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Remove the front seat from the vehicle. <Ref. to SE-6, REMOVAL, Front Seat.>
4) Remove the clip, and then remove the side airbag harness from slide rail IN (A) and reverse side of seat cushion assembly.



5) Remove the backrest cover. <Ref. to SE-6, DISASSEMBLY, Front Seat.>
6) Remove the side airbag harness from backrest frame assembly.



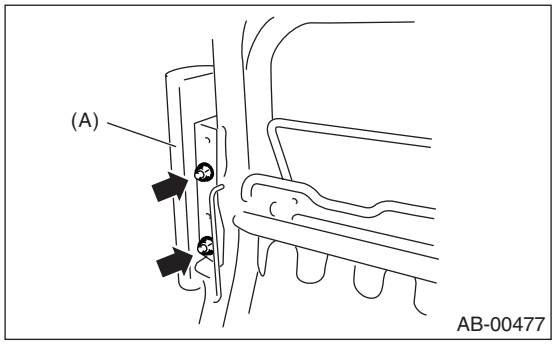
7) Remove the side airbag module (A) from backrest frame assembly.



B: INSTALLATION

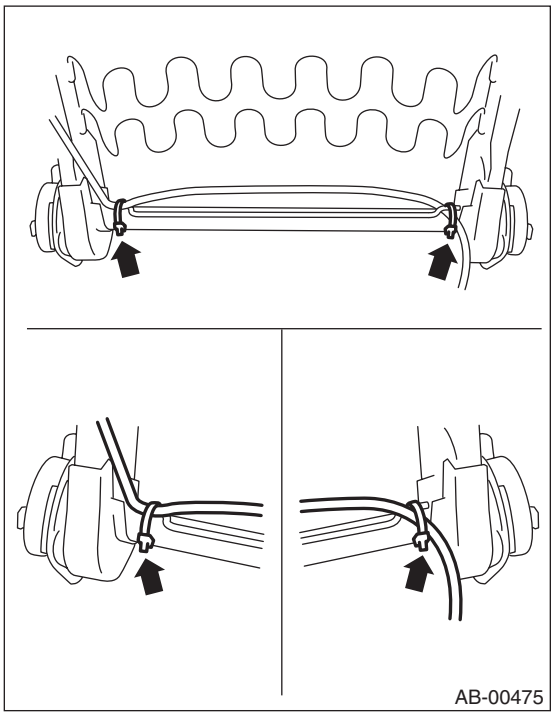
1) Ensure there are no foreign particles on side airbag module.
2) Install the side airbag module (A) to backrest frame assembly.

Tightening torque:
5.9 N·m (0.59 kgf-m, 4.4 ft-lb)

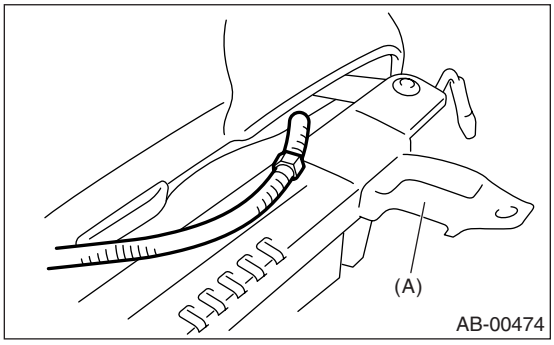


3) Install the side airbag harness to backrest frame assembly.

NOTE:
Secure the harness to its original position of seat.



4) Install the backrest cover. <Ref. to SE-15, ASSEMBLY, Front Seat.>
5) Install the side airbag harness to slide rail IN (A).



6) Recline the seat or slide it backward and forward. Check there is no contact between seat backrest assembly, cushion cover assembly and side airbag harness.

C: INSPECTION

CAUTION:
Before working on the airbag module, refer to the "CAUTION" in General Description. <Ref. to AB-3, CAUTION, General Description.>

Perform the inspection of following items, and replace the damaged parts with new ones. <Ref. to AB-10, SIDE AIRBAG MODULE, INSPECTION, Inspection Locations After a Collision.>
1) With side clash (when side airbag is deployed)

<Replacement parts>
- Side airbag module assembly
- Backrest pad assembly
- Backrest frame assembly
- Backrest cover assembly

<Other replacement parts, which found to be damaged by visual check>
- Headrest assembly
- Bush
- Slide rail OUT
- Slide rail IN
- Seat hinge cover
- Seat lifter lever
- Reclining lever
- Side airbag harness and connector (body side)

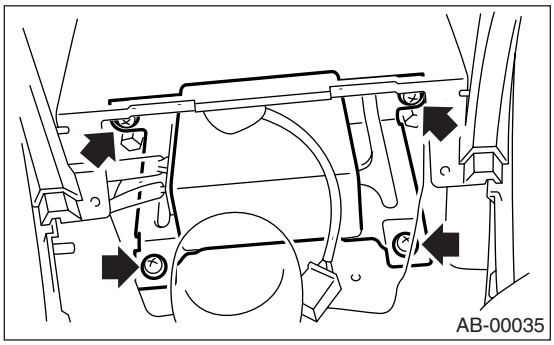
2) With side clash (when side airbag is not deployed)
Check the seat and airbag module visually, and then replace them with new ones if damaged or cracked.
Specially inspect the damage of airbag module body, installing bracket, harness connector.
3) Without side clash (dirt and damage of cover)
Replace the corresponding part with a new one.

7. Airbag Control Module

A: REMOVAL

CAUTION:
• Do not disassemble the airbag control module.
• If the airbag control module is deformed or if water damage is suspected, replace the airbag control module with a new genuine part.
• Do not drop the airbag control module.
• After removal, keep the airbag control module on a dry, clean surface away from moisture, heat, and dust.

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Remove the console cover. <Ref. to EI-44, REMOVAL, Console Box.>
4) Remove the center console panel. <Ref. to EI-45, REMOVAL, Instrument Panel Assembly.>
5) Disconnect the connector from airbag control module.
6) Remove the four bolts.



B: INSTALLATION

CAUTION:
Use new hexagon head bolts (for airbag control module only) during reassembly.

Install in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" in "General Description" <Ref. to AB-2, SRS AIRBAG, COMPONENT, General Description.>

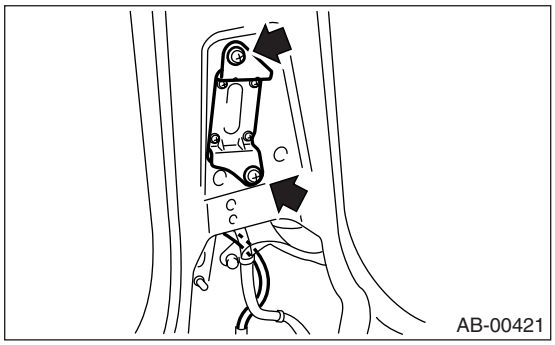
C: INSPECTION

Check for the following, and replace damaged parts with new parts.
• Control module, connector, and mounting bracket are damaged.
• Airbag is deployed.
• Side airbag is deployed.

8. Side Airbag Sensor

A: REMOVAL

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Remove the outer belt (FRONT). <Ref. to SB-8, FRONT INNER BELT, REMOVAL, Front Seat Belt.>
4) Detach the side airbag sensor, and then disconnect the airbag connector.



B: INSTALLATION

CAUTION:
Use new TORX® bolts T30 when reassembling.

Install in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" in "General Description" <Ref. to AB-2, SRS AIRBAG, COMPONENT, General Description.>

C: INSPECTION

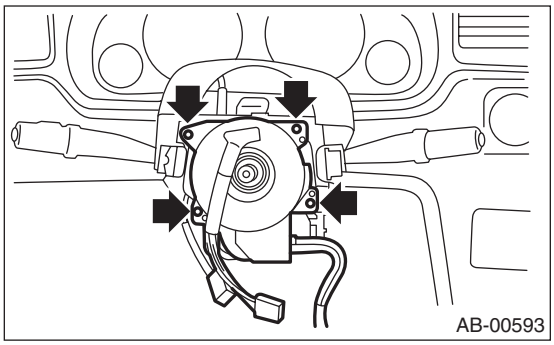
Check for the following, and replace damaged parts with new parts.

- Bracket connector for side airbag sensor is damaged.
- Side airbag is deployed.

9. Roll Connector

A: REMOVAL

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Remove the driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.>
4) Remove the steering wheel. <Ref. to PS-16, REMOVAL, Steering Wheel.>
5) Remove the steering column cover.
6) Remove the screws, and then remove the roll connector.



B: INSTALLATION

1) Install in the reverse order of removal.
2) Before installing the steering wheel, be sure the direction of roll connector is adjusted with steering. <Ref. to AB-18, ADJUSTMENT, Roll Connector.>

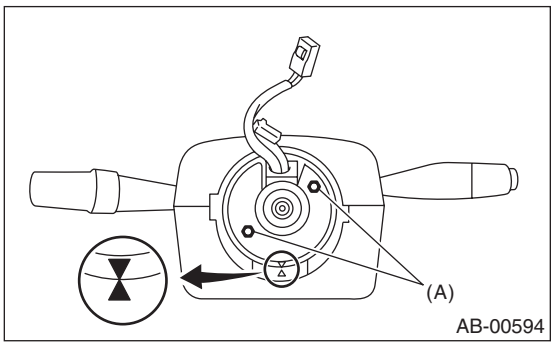
C: INSPECTION

Check for the following, and replace damaged parts with new parts.

- Combination switch and roll connector is cracked or deformed.

D: ADJUSTMENT

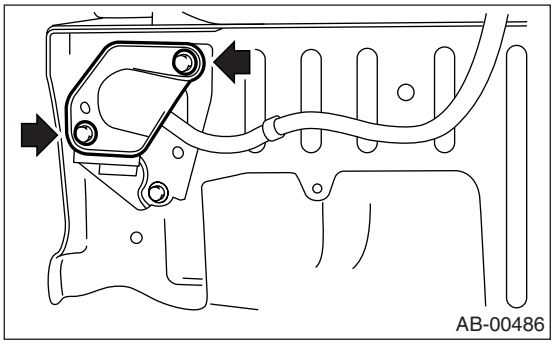
1) Check that the front wheels are positioned in straight ahead direction.
2) Turn the roll connector pin (A) clockwise until it stops.
3) Turn the roll connector pin (A) counterclockwise approx. 2.65 turns until "▲" marks are aligned.



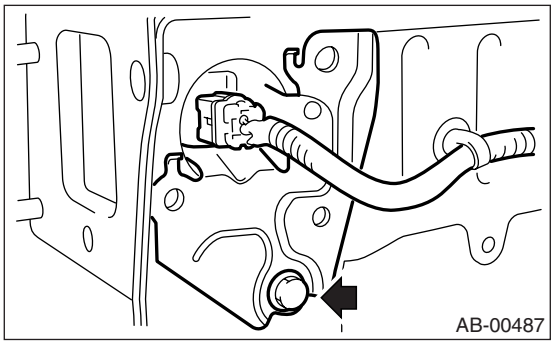
10.Front Sub Sensor

A: REMOVAL

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Remove the front bumper. <Ref. to EI-23, REMOVAL, Front Bumper.>
4) Loosen the two bolts to remove the sensor cover.



5) Remove the bolt, and then detach the front sub sensor.
6) Disconnect the connector from front sub sensor.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" in "General Description" <Ref. to AB-2, SRS AIRBAG, COMPONENT, General Description.>

C: INSPECTION

Check for the following, and replace damaged parts with new parts.

- Front sub sensor, mounting bracket, and connector are damaged.
- Airbag is deployed.

AIRBAG SYSTEM (DIAGNOSTICS)

AB(diag)

		Page
1.	Basic Diagnostic Procedure	2
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5.	Airbag Control Module I/O Signal	18
6.	Airbag Connector	21
7.	Airbag Warning Light Illumination Pattern	23
8.	Read Diagnostic Trouble Code (DTC)	24
9.	Inspection Mode	25
10.	Clear Memory Mode	26
11.	Airbag Warning Light Failure	27
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13.	Diagnostic Procedure with Diagnostic Trouble Code (DTC)	34

1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**READ DTC.** <Ref. to AB(diag)-24, Read Diagnostic Trouble Code (DTC).>	Is the normal code being detected?	Finish the diagnosis.	Go to step **2.**
2	**READ DTC.** <Ref. to AB(diag)-24, Read Diagnostic Trouble Code (DTC).>	Is the DTC being detected?	Go to step **3.**	Go to “Airbag Warning Light Failure”. <Ref. to AB(diag)-27, Airbag Warning Light Failure.>
3	**PERFORM THE DIAGNOSIS.** 1) Judge the possible cause from “List of Diagnostic Trouble Code (DTC)”. <Ref. to AB(diag)-32, List of Diagnostic Trouble Code (DTC).> 2) Inspect using “Diagnostic Chart with Diagnostic Trouble Code (DTC)”. 3) Repair the cause of the trouble. 4) Perform the clear memory mode. <Ref. to AB(diag)-26, Clear Memory Mode.> 5) Perform the inspection mode. <Ref. to AB(diag)-25, Inspection Mode.> 6) Read any DTC again.	Is the DTC being detected?	Perform the procedure 1) to 5) in step 3.	Finish the diagnosis.

2. Check List for Interview

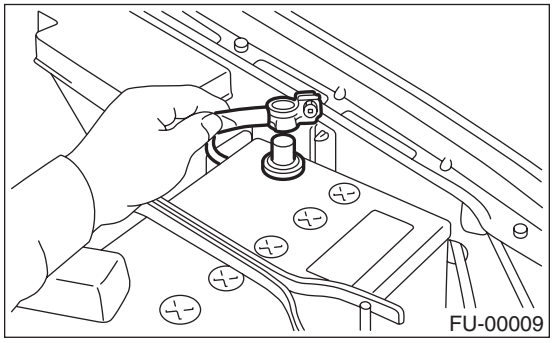
A: CHECK

Customer's Name		Inspector's Name	
Date Vehicle Brought In	/ /	Registration No.	
Odometer Reading	km Miles	VIN	
Date Problem Occurred	/ /	Registration Year	/ /
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Other:		
Temperature	°C (°F)		
Road Condition	❑ Level road ❑ Uphill ❑ Downhill ❑ Rough road ❑ Others:		
Vehicle Operation	❑ Starting ❑ Idling ❑ Driving (❑ Constant Speed ❑ Acceleration ❑ Deceleration ❑ Steering wheel turn ❑ Other:)		
Details of Problem			
Check Airbag Warning Light	❑ Remains ON ❑ Remains OFF		
Check DTC	❑ Normal Code ❑ DTC: (Code:)		

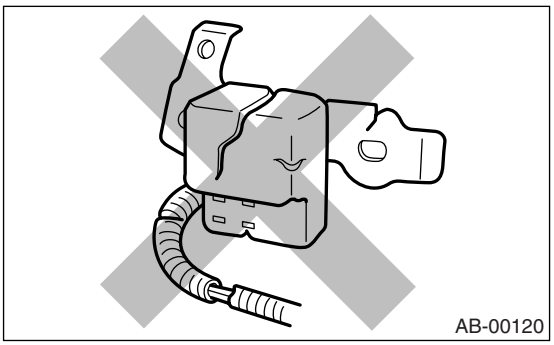
3. General Description

A: CAUTION

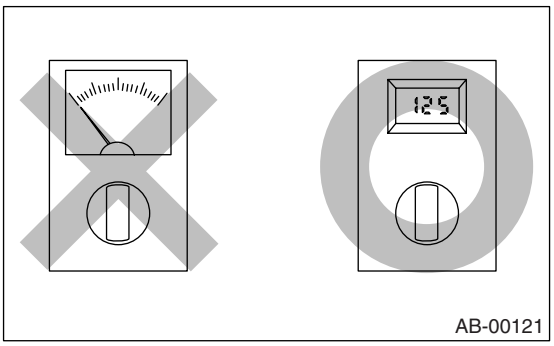
• When servicing a vehicle, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
• The airbag system is fitted with a backup power source. If the airbag system is serviced within 20 seconds after the ground cable is disconnected, it may inflate.



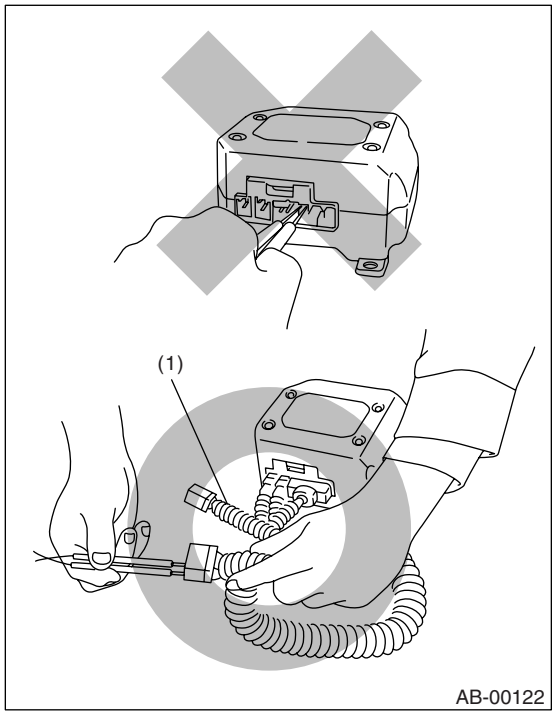
• If sensors, airbag module, airbag control module, pretensioner, and harness are deformed or damaged, replace them with new genuine parts.



• Do not use the airbag system and pretensioners on other vehicles. When replacing parts, be sure to replace them with new parts.
• When checking the airbag system, be sure to use a digital circuit tester. Use of an analog circuit tester may cause the airbag to activate erroneously.

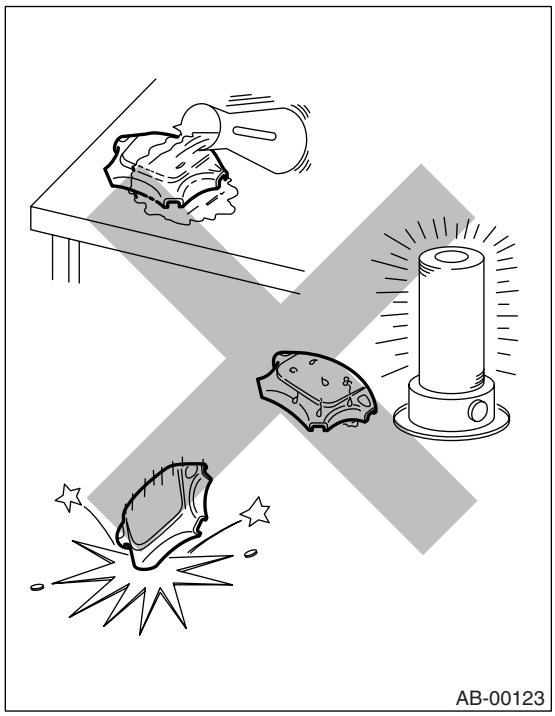


• When checking, use a test harness. Do not directly apply the tester probe to any connector terminal of the airbag.

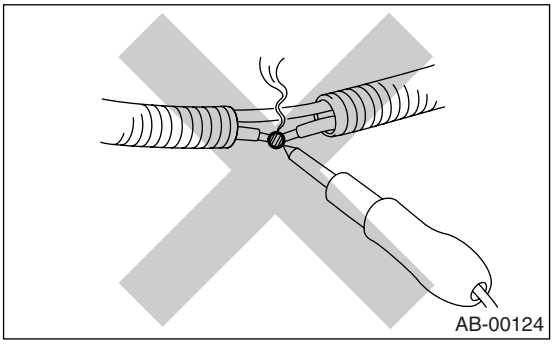


(1) Test harness

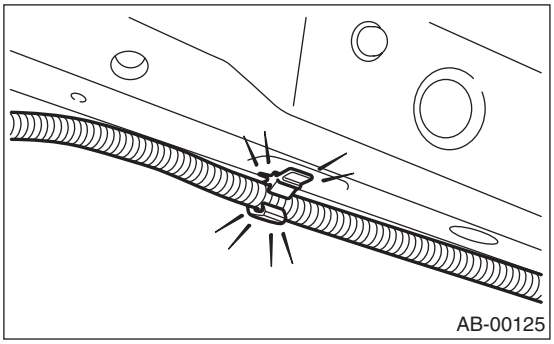
• Do not drop the airbag modulator parts, subject them to high temperature over 93°C (199°F), or let water, oil, or grease get on them; otherwise, the internal parts may be damaged and may be reliability greatly lowered.



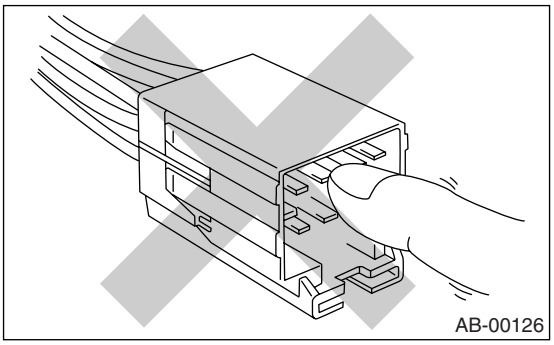
• If any damage, opening, or rust is found on the airbag system wire harness, do not attempt to repair using soldering equipment. Be sure to replace the faulty harness with a new genuine part.



• Install the wire harness securely with the specified clips to avoid interference or tangled up with other parts.

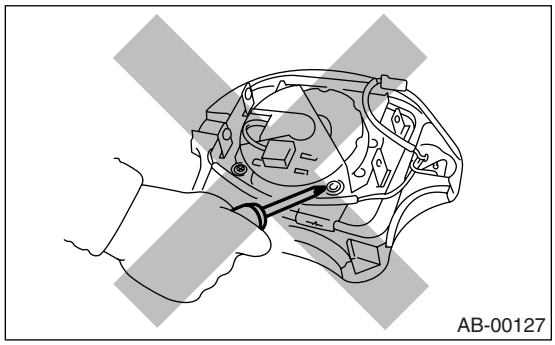


• Do not allow water or oil to come in contact with the connector terminals. Do not touch the connector terminals.

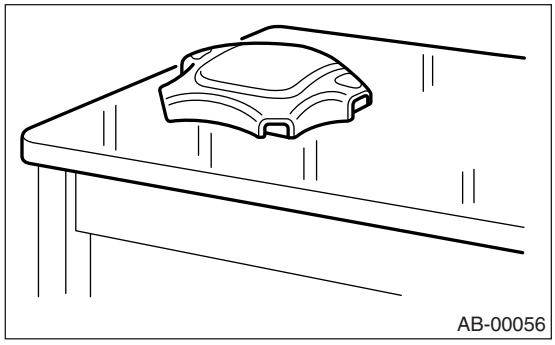


• Either of the airbag modules for driver, passenger or side, or pretensioner must not be disassembled.

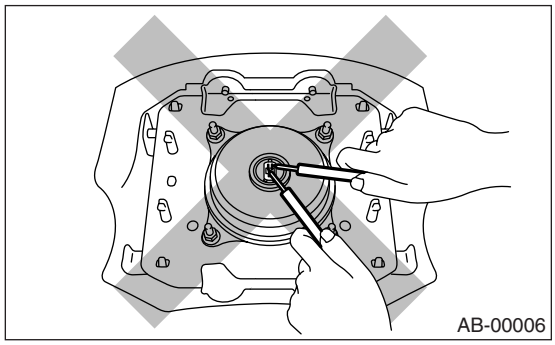
• The airbag module cannot be used again if once inflated.



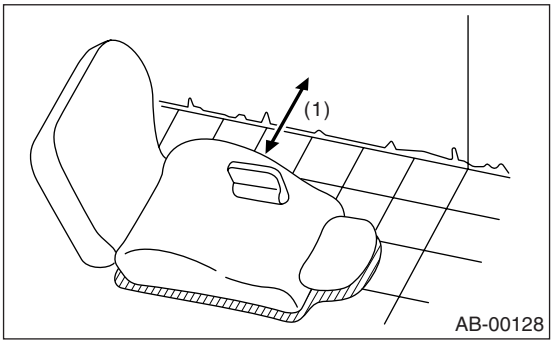
• After removal, keep the airbag module with the pad facing upward on a dry, clean, and flat surface away from heat and light sources, and moisture and dust.



• Do not check continuity of either of the airbag modules for driver, passenger or side, or pretensioner.

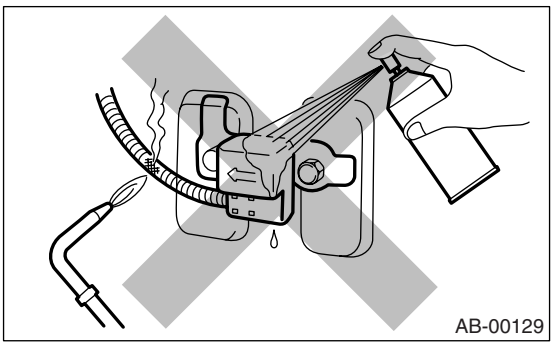


• The removed front seat with the airbag module must be kept at least 200 mm (8 in) away from walls and other objects.



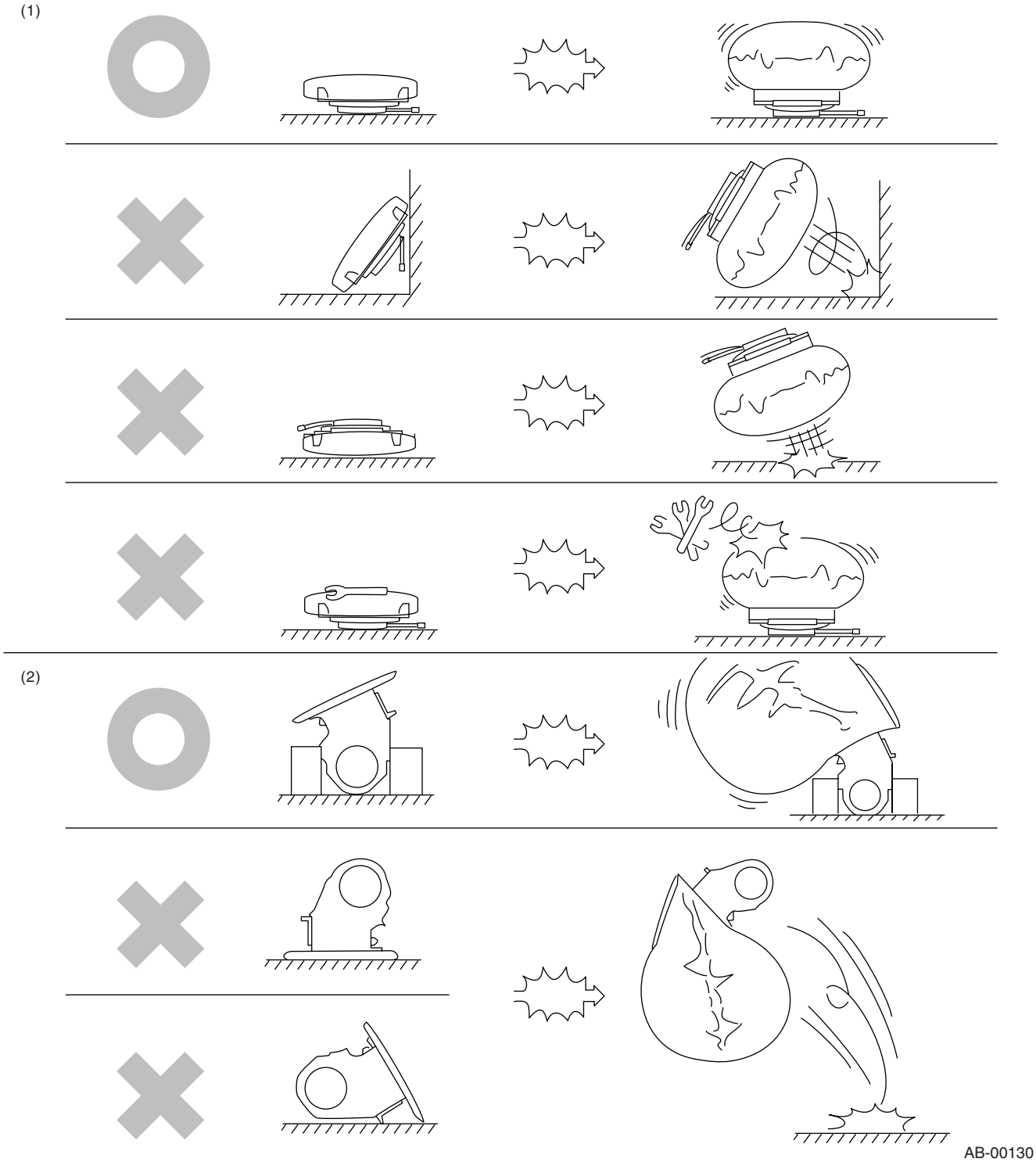
(1) More than 200 mm (8 in)

• When painting or performing sheet metal work on the front part of the vehicle, including the front wheel apron, front fender, and front side frame, remove the front sub sensors and wire harness of the airbag system.
• When painting or performing sheet metal work on the side of the vehicle, including the side sill, center pillar, and front and rear doors, remove the side airbag sensors and wire harness of the airbag system.



• Do not discard undeployed airbag modules. They could easily cause a serious accident if accidentally deployed.

• When storing a removed airbag module, do not place any objects on it or pile airbag modules on top of each other. If the airbag inflates for some reason when it is placed with its pad side facing downward or under any object, a serious accident may result.



(1) Driver side airbag module (2) Passenger side airbag module

B: INSPECTION

Before diagnosing, check the following items that might be related to the engine problem:

1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

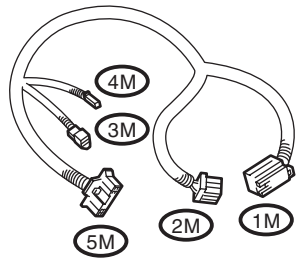
Standard voltage: 12 V

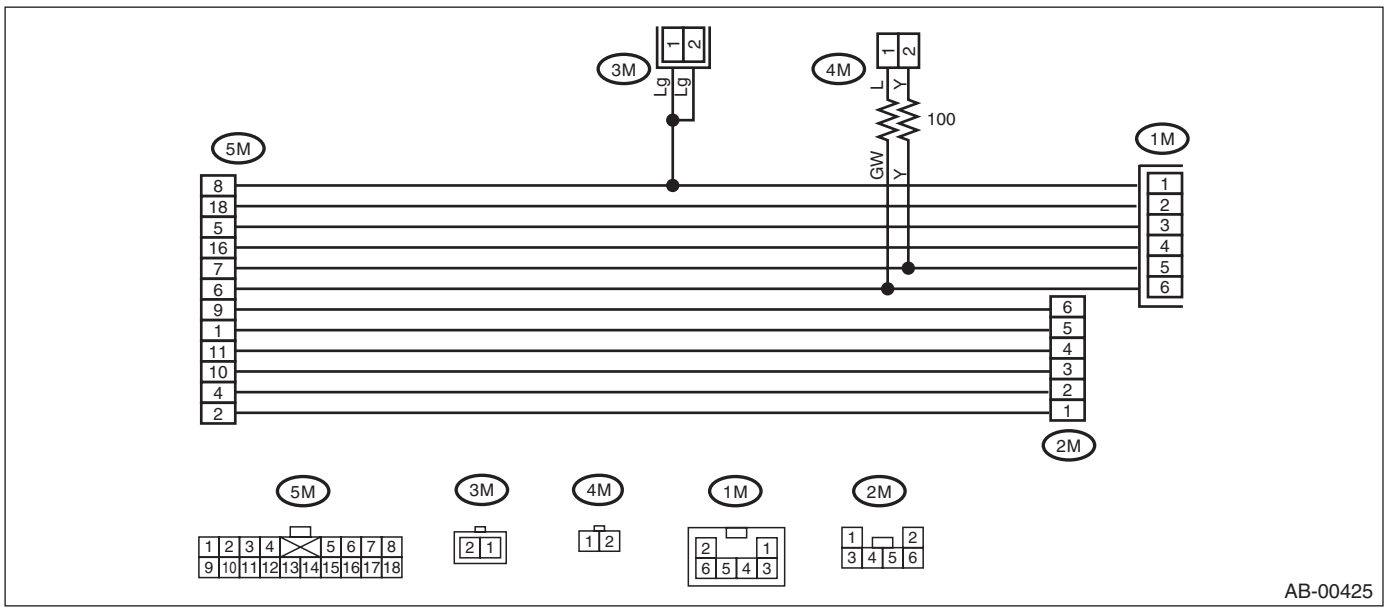
Specific gravity: Above 1.260

C: PREPARATION TOOL

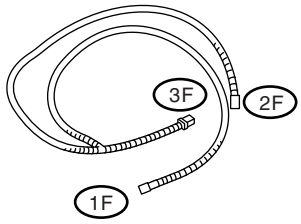
1. SPECIAL TOOLS

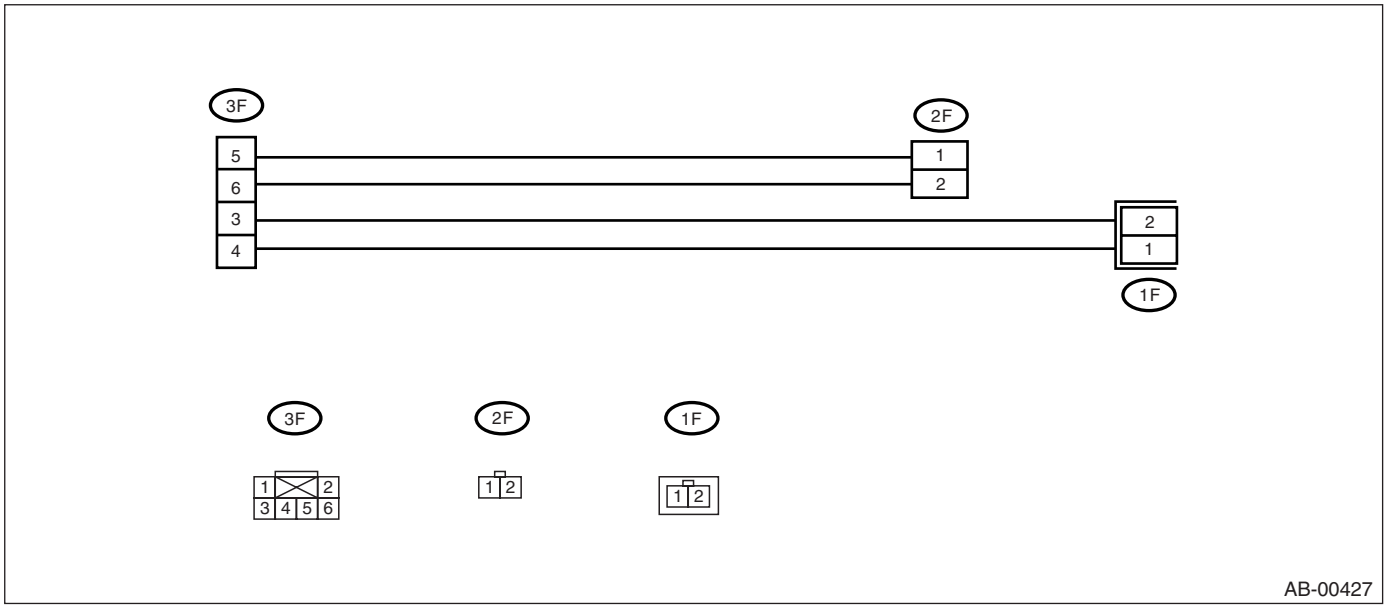
• TEST HARNESS M

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299FE020	98299FE020	TEST HARNESS M	• Used when measuring voltage, resistance of airbag system. • Used with test harness T (98299SA060).

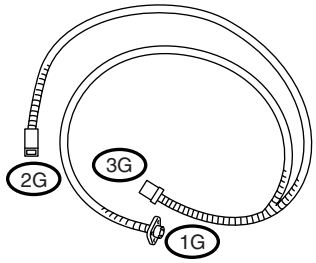


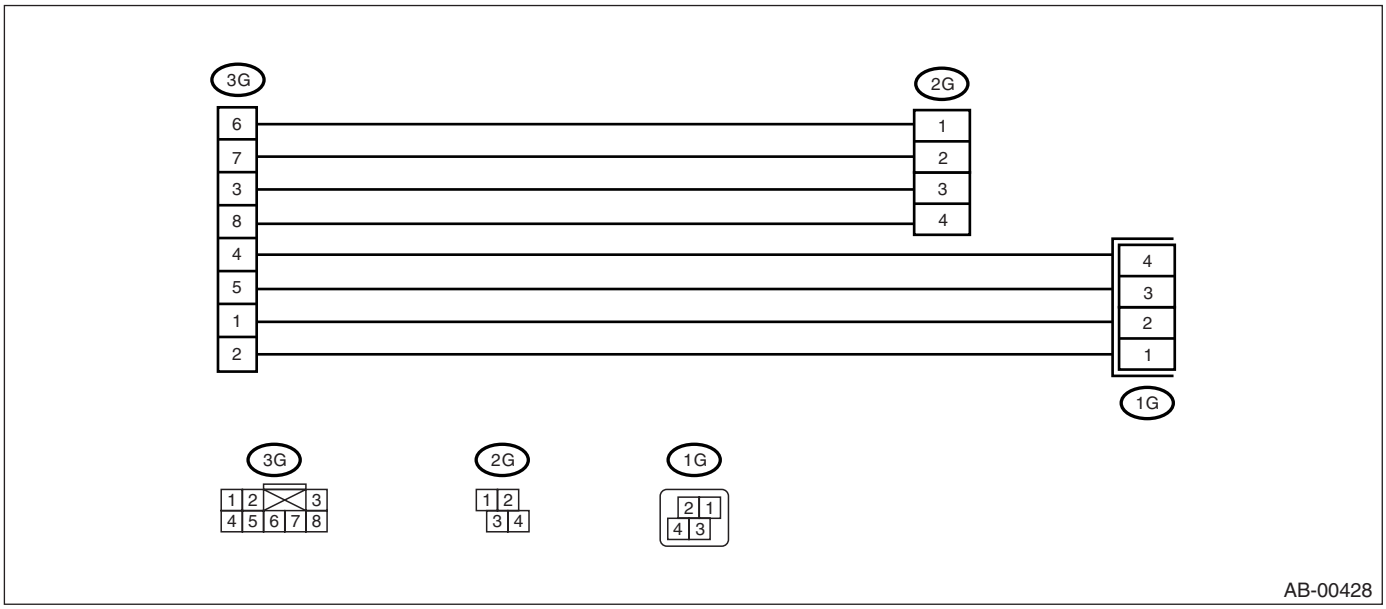
• TEST HARNESS F

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299FC010	98299FC010	TEST HARNESS F	Used when measuring voltage, resistance of air-bag module harness.



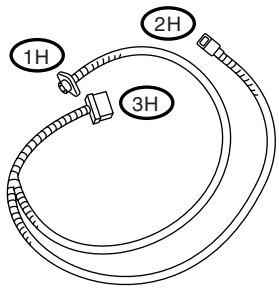
• TEST HARNESS G

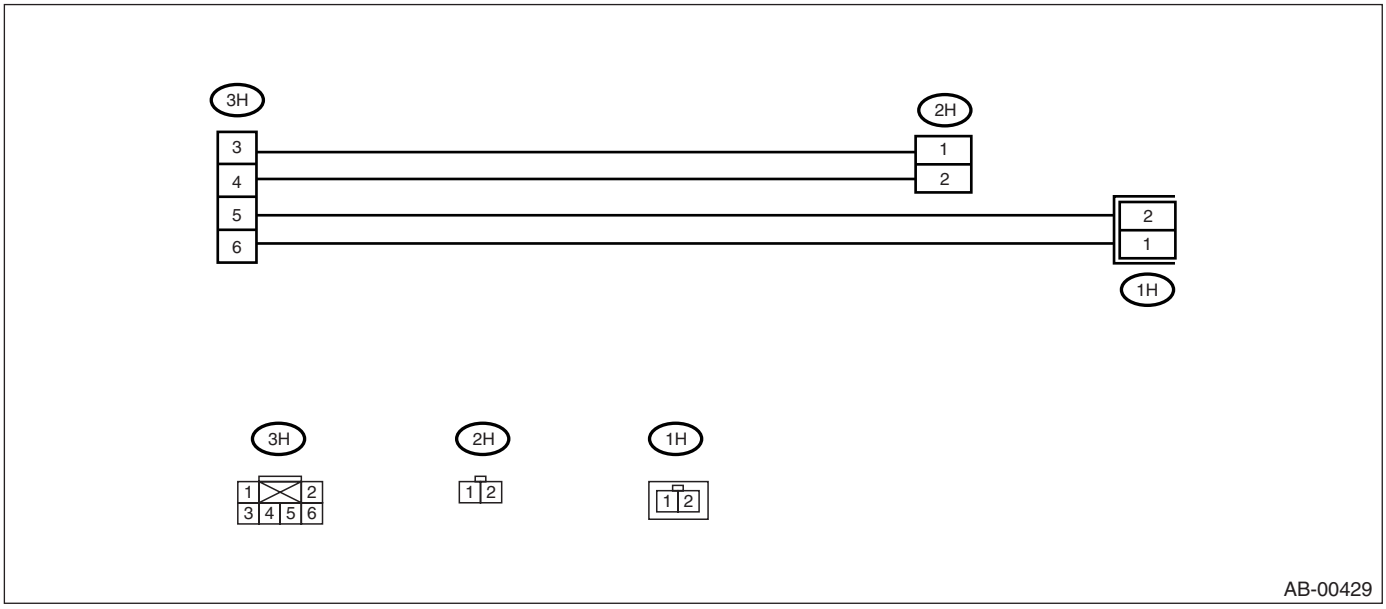
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299FC020	98299FC020	TEST HARNESS G	Used when measuring voltage, resistance of side airbag sensor.



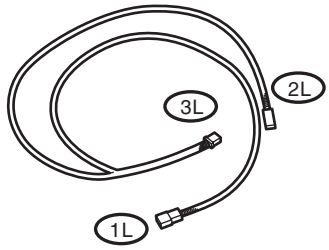
AB-00428

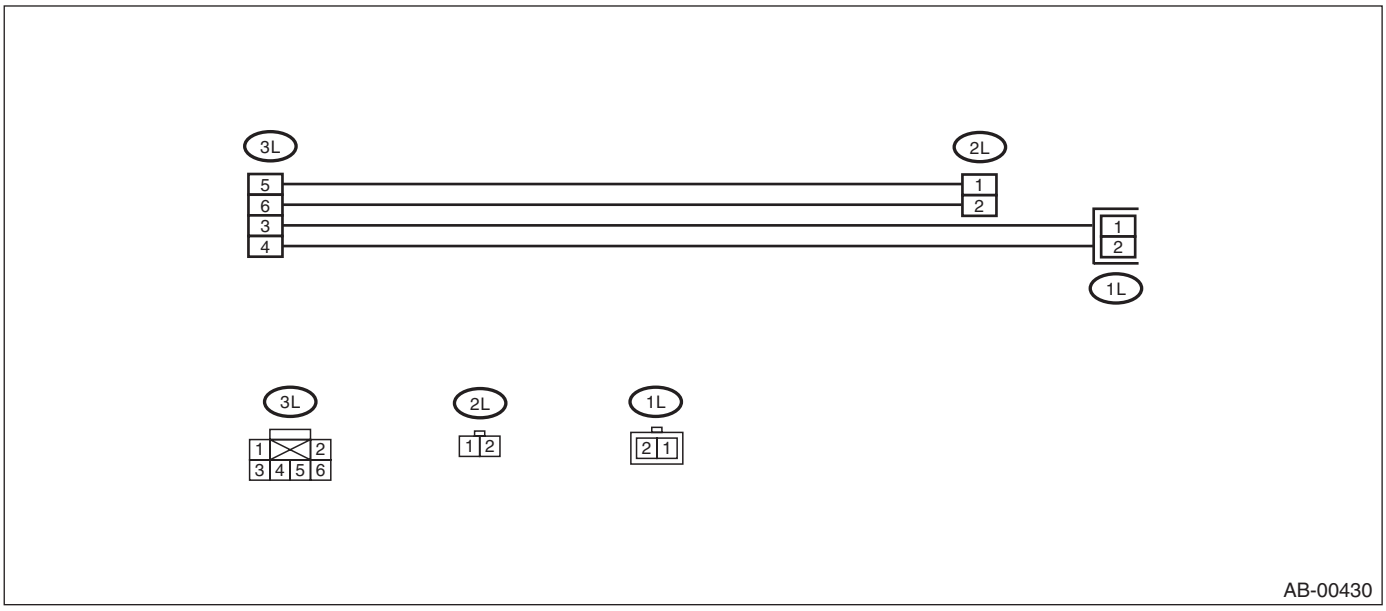
• TEST HARNESS H

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299FA030	98299FA030	TEST HARNESS H	Used when measuring voltage, resistance of front sub-sensor.

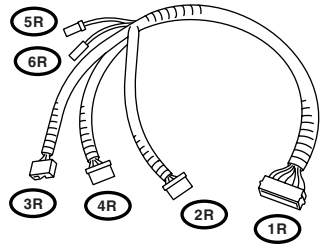


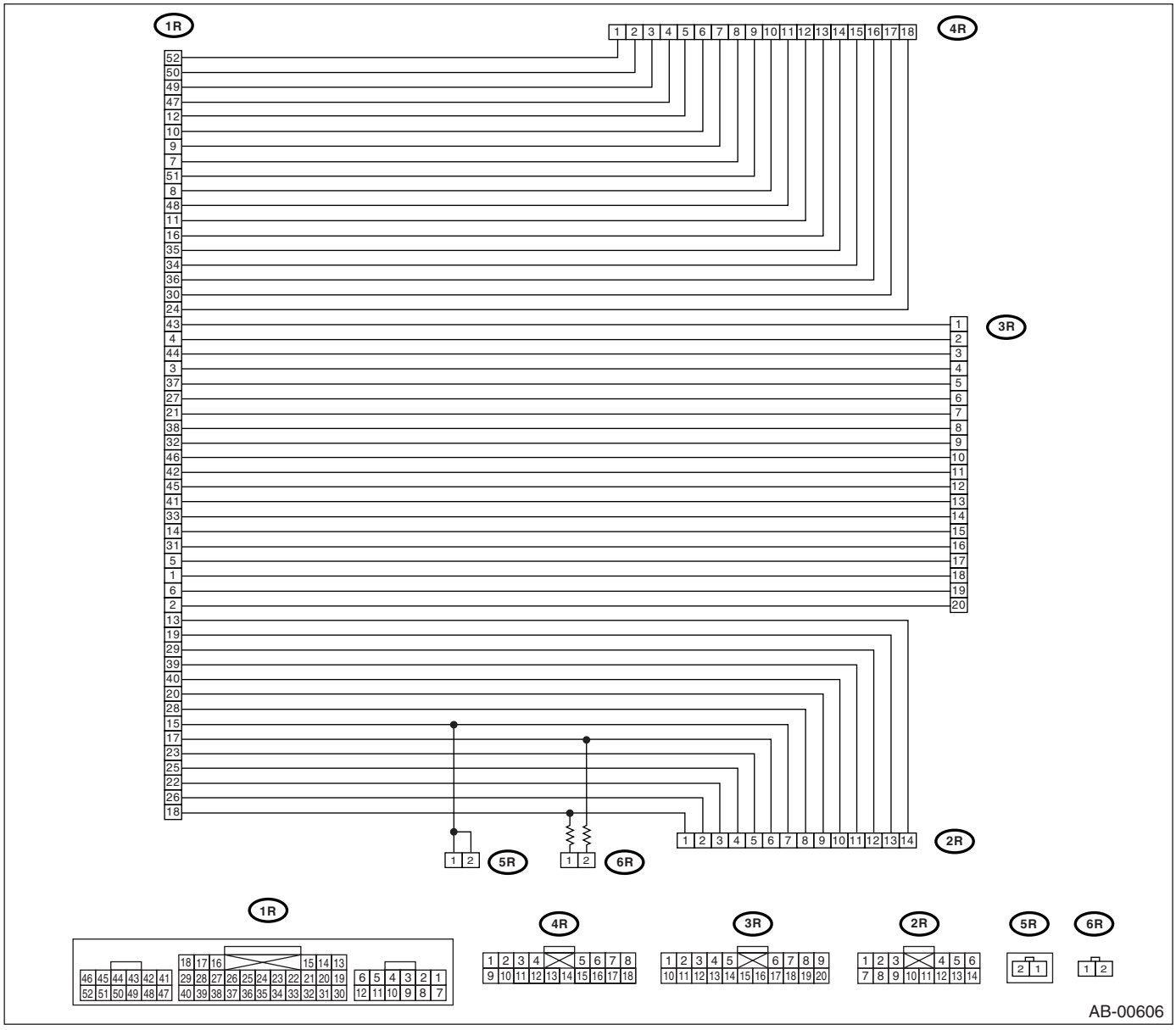
• TEST HARNESS L

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299FE000	98299FE000	TEST HARNESS L	Used when measuring voltage, resistance of seat belt pretensioner.

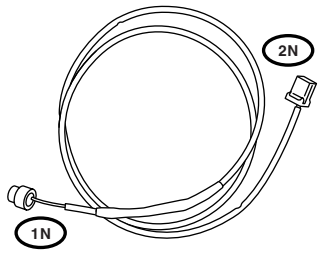


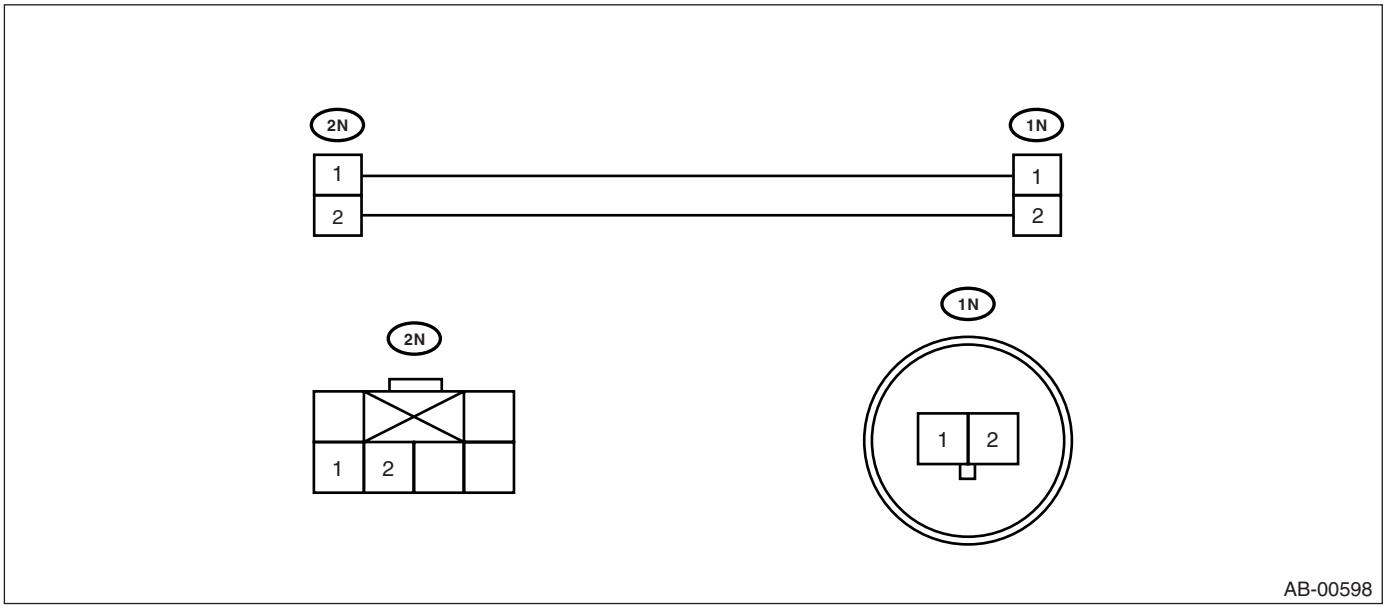
• TEST HARNESS R

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299FE030	98299FE030	TEST HARNESS R	Used when measuring voltage, resistance of air-bag control module.



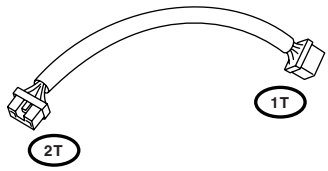
• TEST HARNESS N

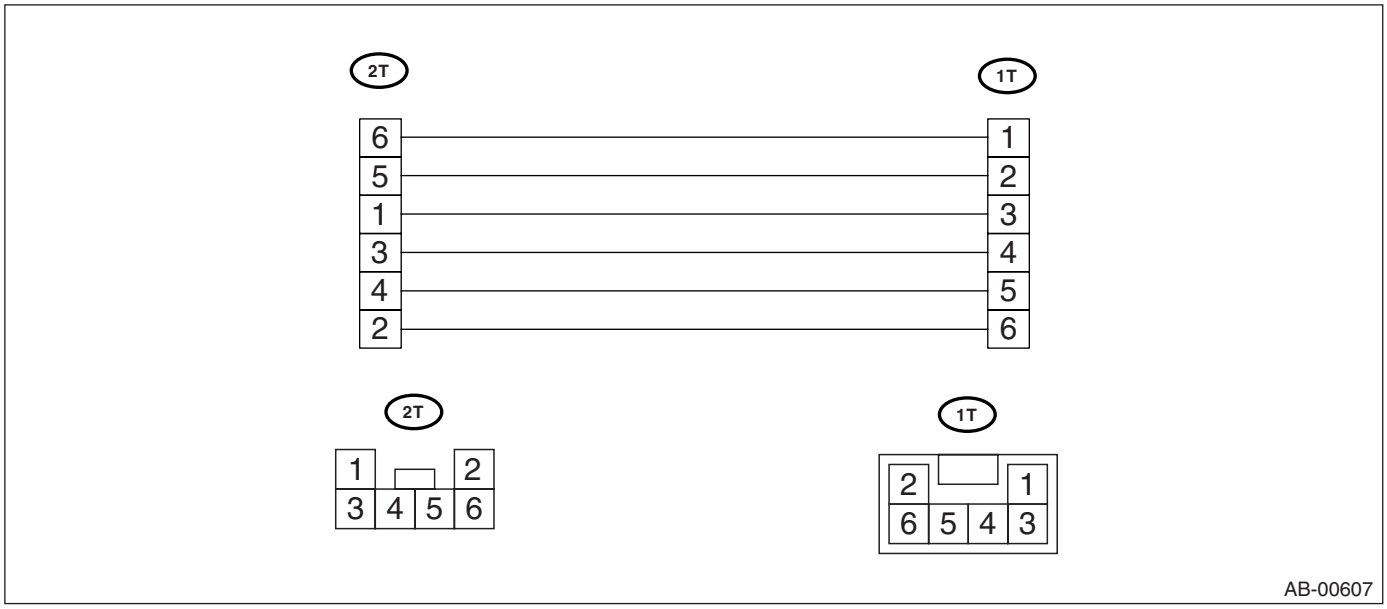
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299SA000	98299SA000	TEST HARNESS N	Used when measuring voltage, resistance of driver's airbag module and seat belt pretensioner.



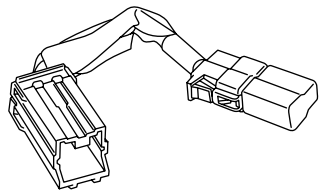
AB-00598

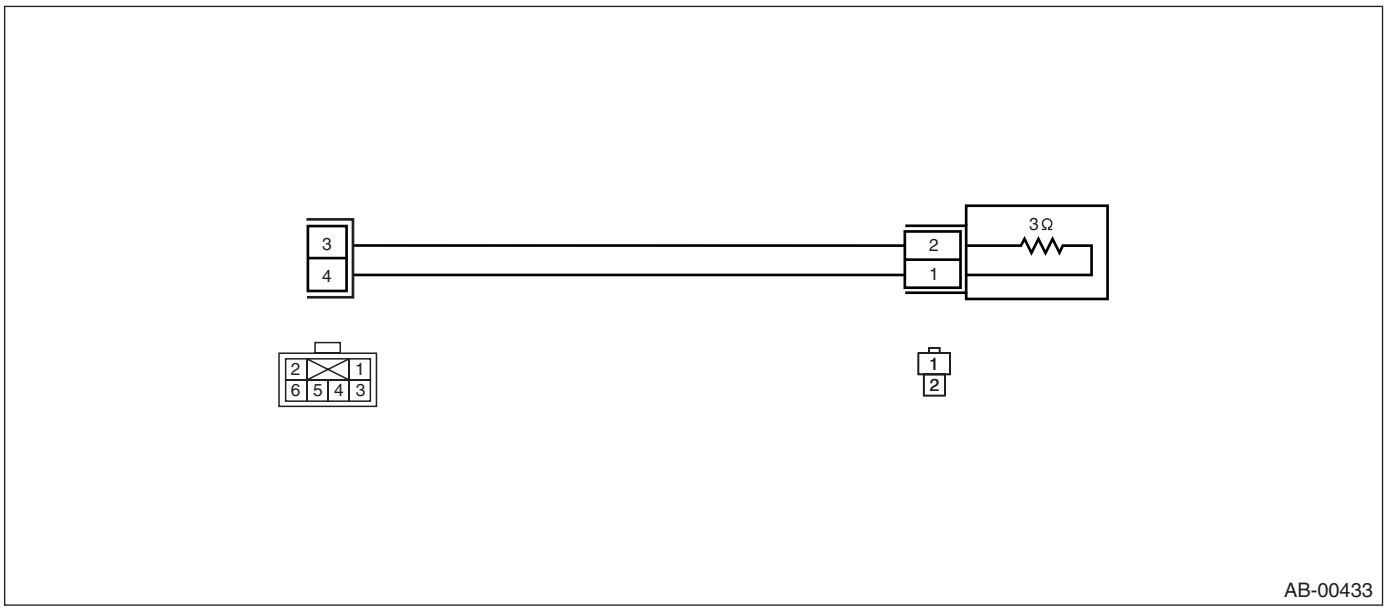
• TEST HARNESS T

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299SA060	98299SA060	TEST HARNESS T	• Used when measuring voltage, resistance of airbag system. • Used with test harness M (98299FE020).



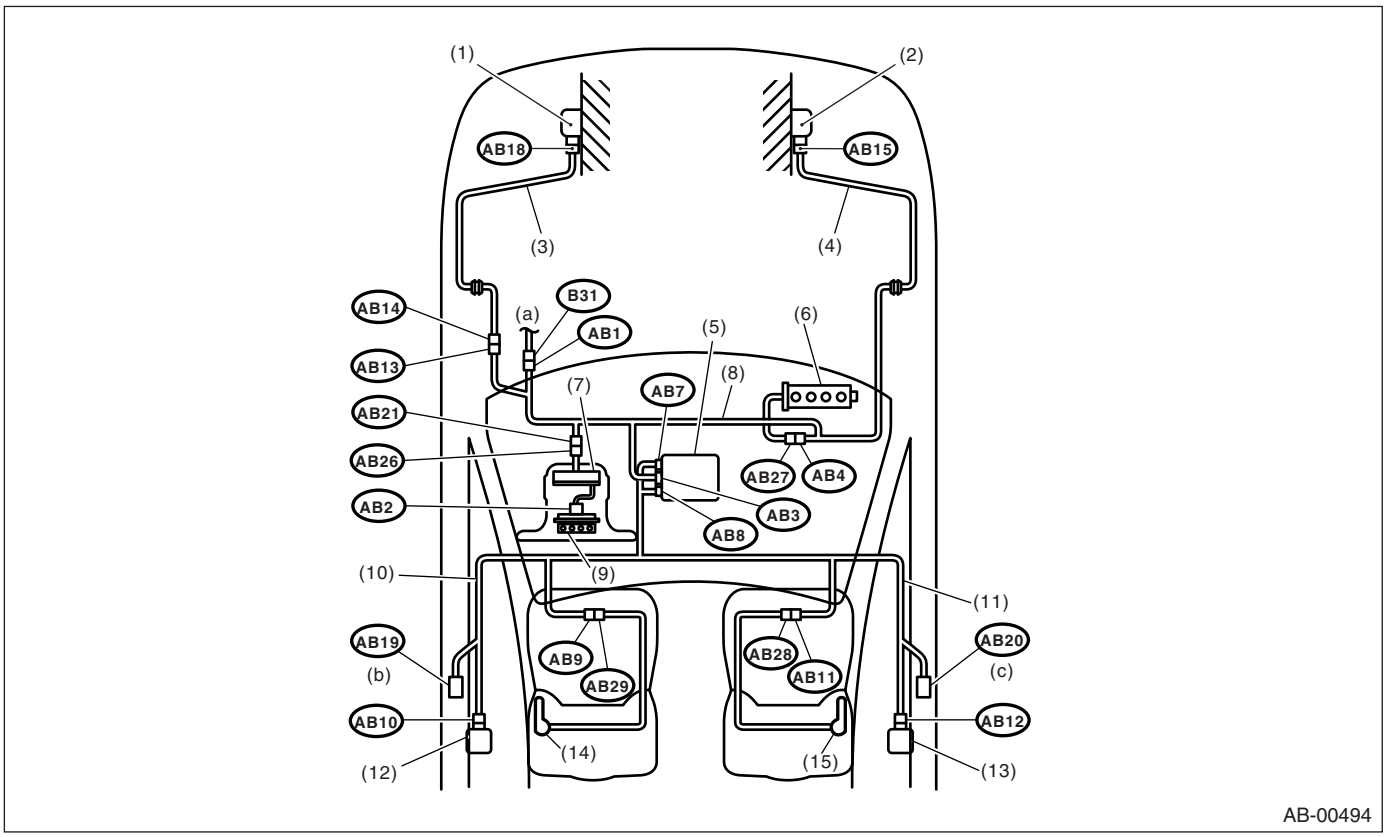
• AIRBAG RESISTOR

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299PA040	98299PA040	AIRBAG RESISTOR	Used in replacement of airbag module which resistance value is same as airbag module.



4. Electrical Components Location

A: LOCATION



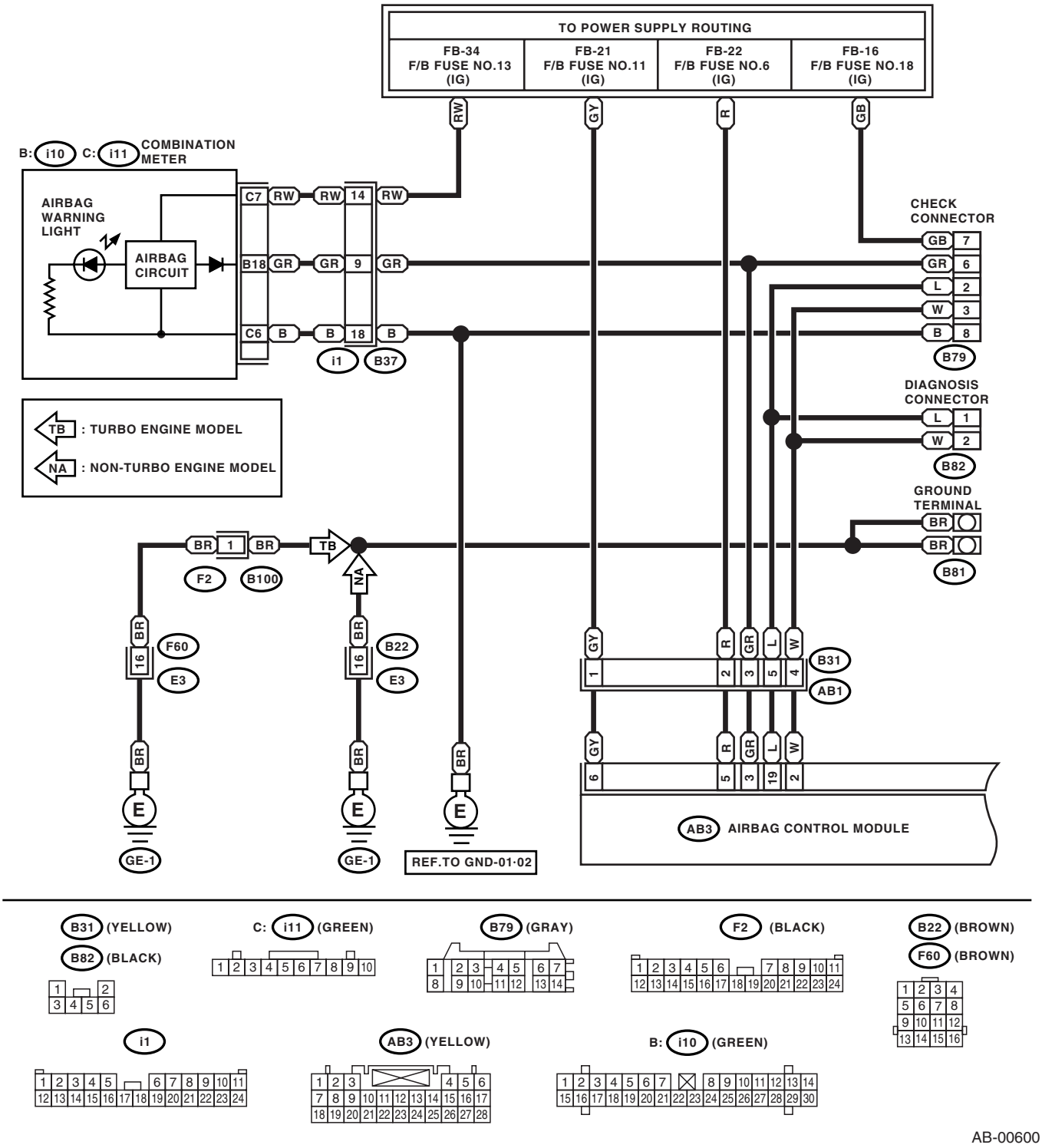
(1) Front sub sensor (LH)
(2) Front sub sensor (RH)
(3) Front sub sensor harness (LH)
(4) Front sub sensor harness (RH)
(5) Airbag control module with built-in safety and electric sensor
(6) Passenger's airbag inflator
(7) Roll connector
(8) Airbag main harness
(9) Driver's airbag inflator
(10) Side airbag harness (LH)
(11) Side airbag harness (RH)
(12) Side airbag sensor (LH)
(13) Side airbag sensor (RH)
(14) Side airbag inflator (LH)
(15) Side airbag inflator (RH)
(a) To body harness
(b) To seat belt pretensioner (LH)
(c) To seat belt pretensioner (RH)

Connector No.	(AB1)	(AB2)	(AB3)	(AB4)	(AB7)	(AB8)	(AB9)	(AB10)	(AB11)	(AB12)	(AB13)	(AB14)
Pole	6	2	28	4	12	12	2	4	2	4	2	2
Color	Yellow	Black	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Male/Female	Male	Female	Female	Female	Female	Female	Female	Female	Female	Female	Female	Male

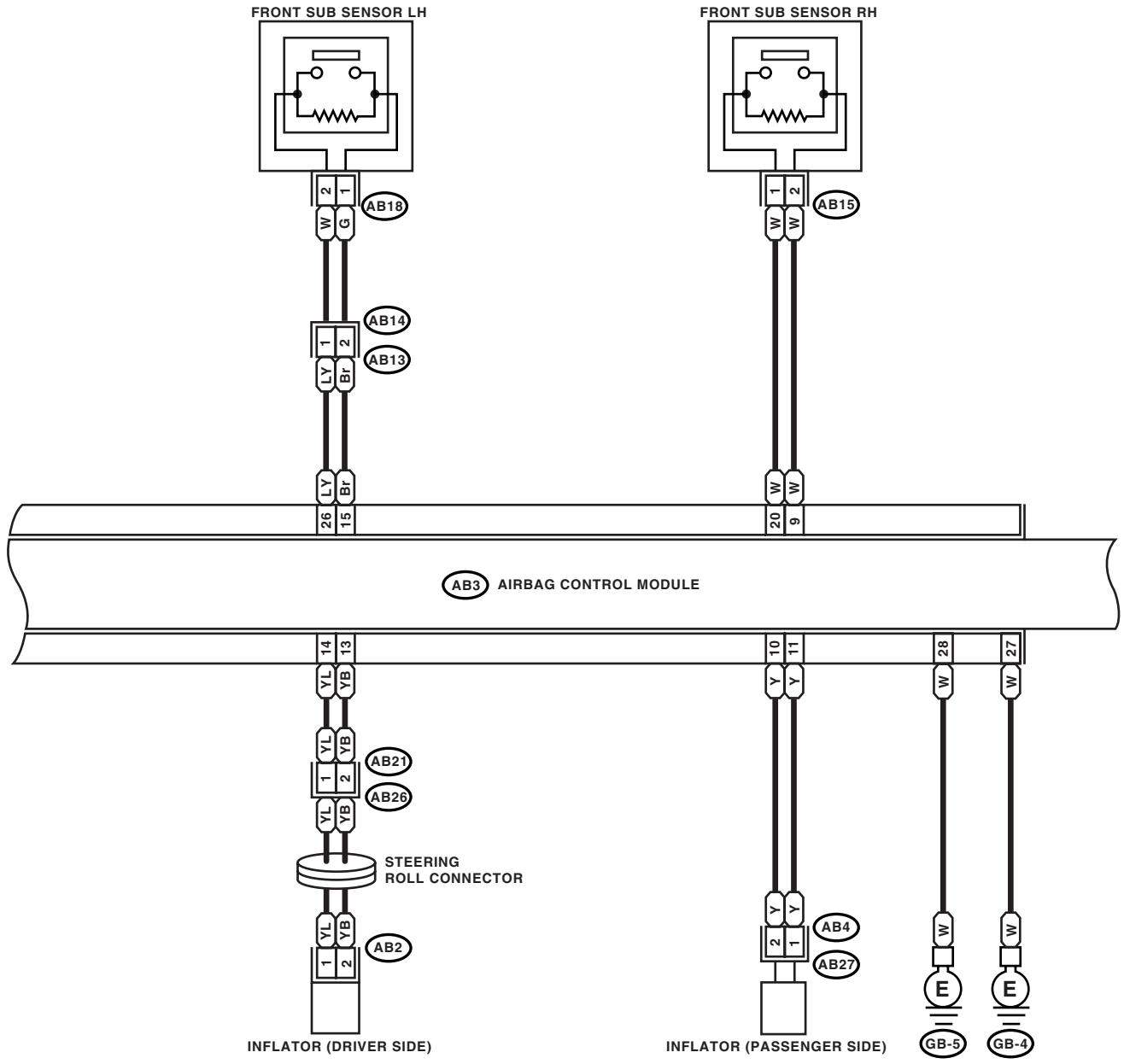
Connector No.	(AB15)	(AB18)	(AB19)	(AB20)	(AB21)	(AB26)	(AB27)	(AB28)	(AB29)			
Pole	2	2	2	2	2	2	2	2	2			
Color	Yellow	Yellow	Black	Black	Yellow	Yellow	Yellow	Yellow	Yellow			
Male/Female	Female	Female	Female	Female	Female	Male	Male	Male	Male			

5. Airbag Control Module I/O Signal

A: WIRING DIAGRAM



AB-00600



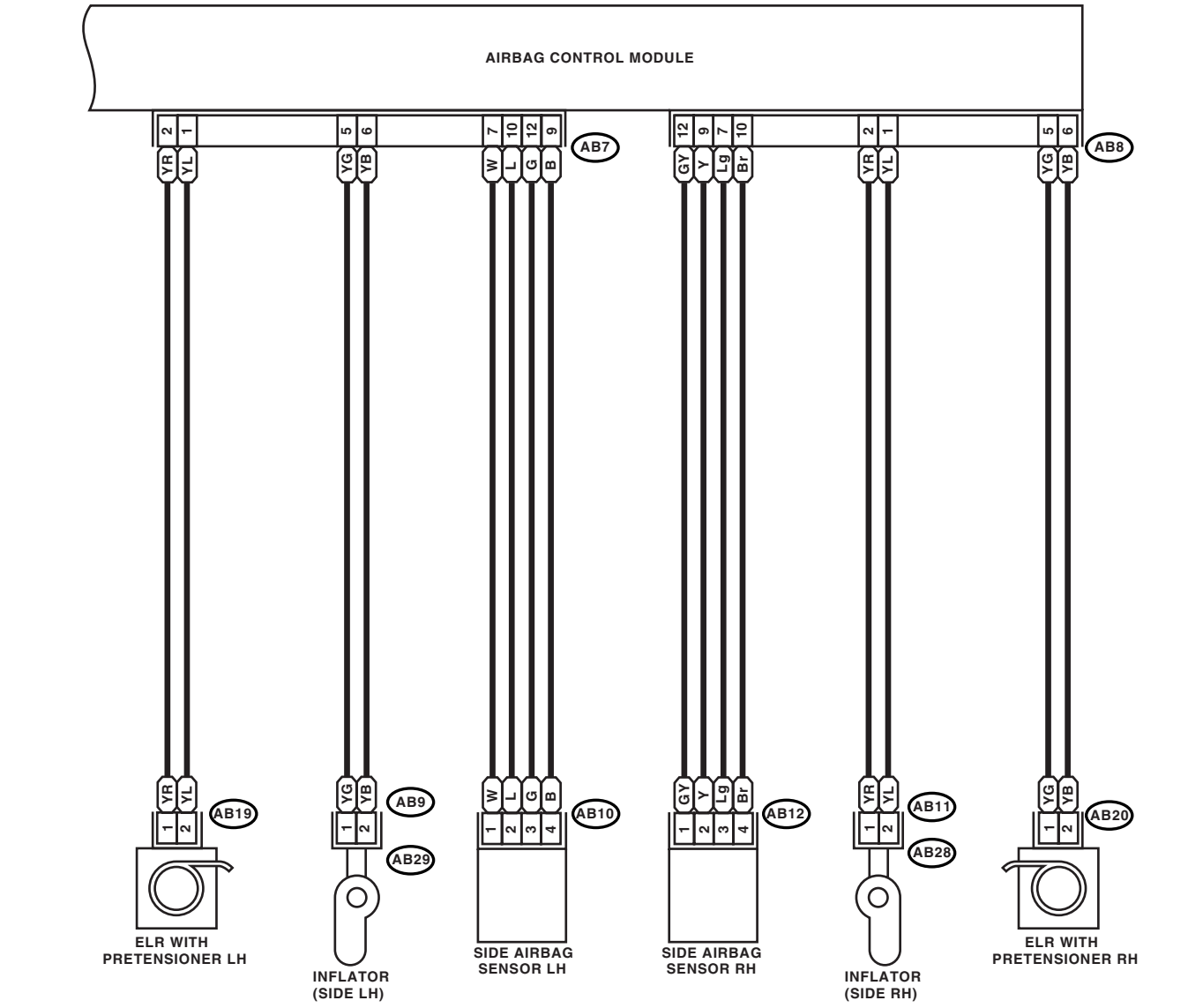
AB4 (YELLOW)
AB13 (YELLOW)
AB21 (YELLOW)

AB15 (YELLOW)
AB18 (YELLOW)

AB3 (YELLOW)

AB2

AB-00614


AIRBAG CONTROL MODULE
AB7
AB8
YR
YL
YG
YB
W
L
G
B
GY
Y
Lg
Br
AB19
AB9
AB29
AB10
AB12
AB11
AB28
AB20
ELR WITH PRETENSIONER LH
INFLATOR (SIDE LH)
SIDE AIRBAG SENSOR LH
SIDE AIRBAG SENSOR RH
INFLATOR (SIDE RH)
ELR WITH PRETENSIONER RH
AB9 (YELLOW)
AB11 (YELLOW)
AB10 (YELLOW)
AB12 (YELLOW)
AB7 (YELLOW)
AB8 (YELLOW)
AB19
AB20

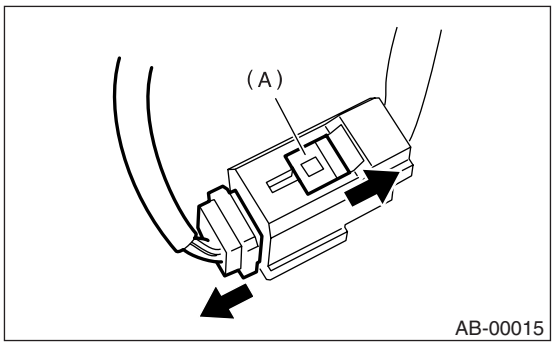
AB-00615

6. Airbag Connector

A: PROCEDURE

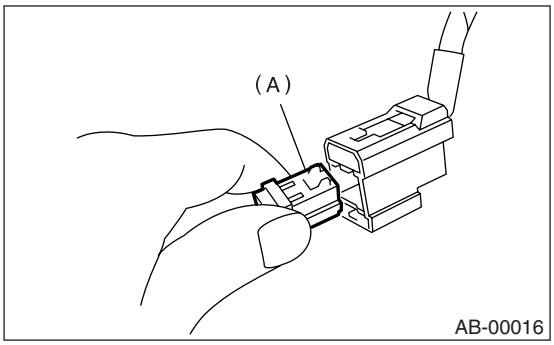
1. POWER SUPPLY

1) How to disconnect:
(1) Move the slide lock (A) in the direction of the arrow.
(2) Pull the female connector in the direction of the arrow with slide lock (A) moved.



CAUTION:
When pulling, be sure to hold onto the connector and not the wire.

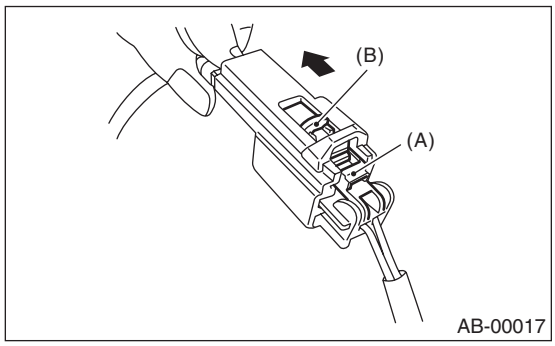
2) How to connect:
Holding the connector (A), and push it in carefully until a connecting sound is heard.



CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

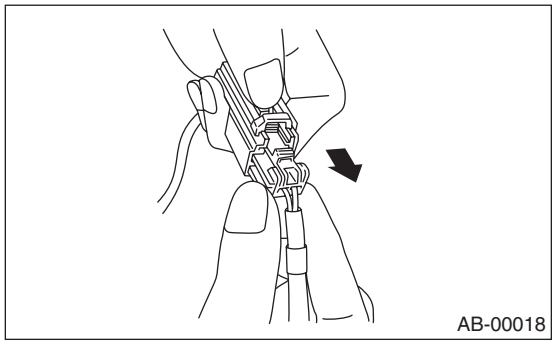
2. DRIVER'S AIRBAG (BETWEEN AIRBAG MAIN HARNESS AND ROLL CONNECTOR), PASSENGER'S AIRBAG AND SIDE AIRBAG

1) How to disconnect:
(1) Push the lock arm (A).
(2) With the lock arm (A) pushed in, move the slide lock (B) in the direction of the arrow.



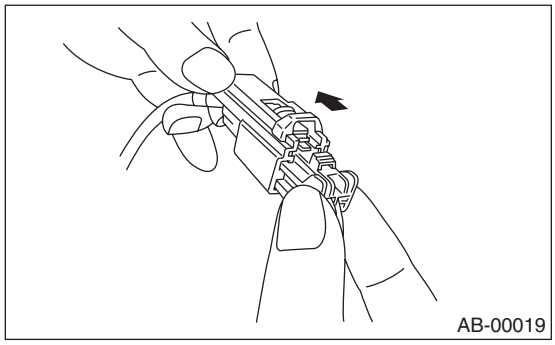
(3) With the slide lock (B) pulled, remove the lock arm (A) to its original position, and then pull in the direction of the arrow and separate the connector.

CAUTION:
When pulling, be sure to hold onto the connector and not the wire.



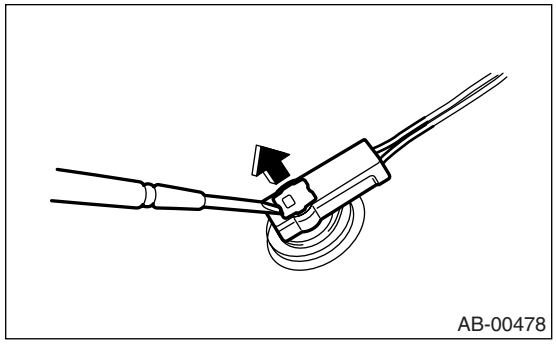
2) How to connect:
Holding the connector, and push it in carefully until a connecting sound is heard.

CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

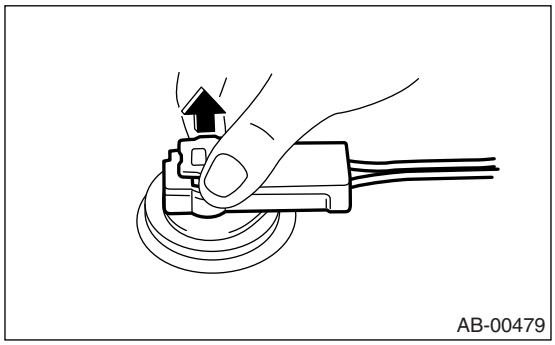


3. DRIVER'S AIRBAG MODULE AND PRETENSIONER

1) How to disconnect:
(1) Using a flat tip screwdriver, pry the push lock upward to unlock.

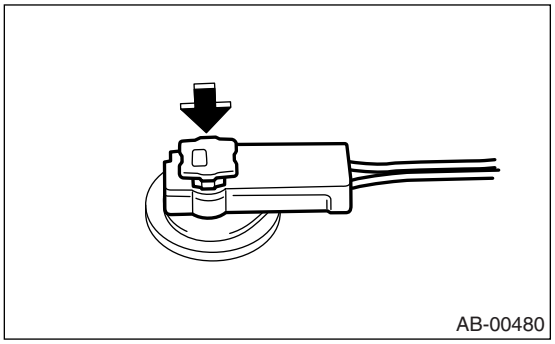


(2) Pull the connector to disconnect from driver's side airbag module assembly or retractor assembly.



2) How to connect:
Connect the connector in reverse order of disconnecting. At this time, be sure to insert the connector in until connecting sound is heard.

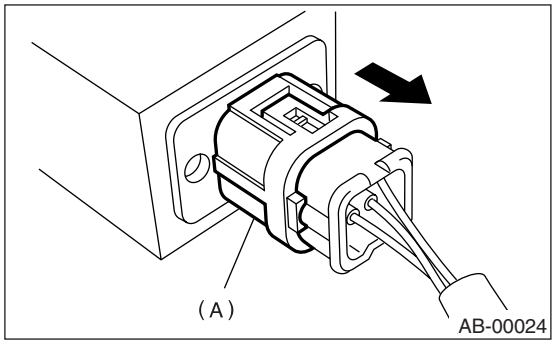
CAUTION:
• Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.
• Be sure to push the push lock in securely.



4. FRONT SUB-SENSOR AND SIDE AIRBAG SENSOR

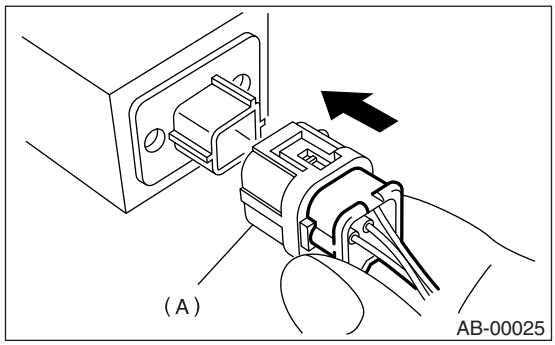
1) How to disconnect:
Holding outer part (A), pull it in the direction of the arrow.

CAUTION:
When pulling, be sure to hold onto the connector and not the wire.



2) How to connect:
Holding the connector, and push it in carefully until a connecting sound is heard.

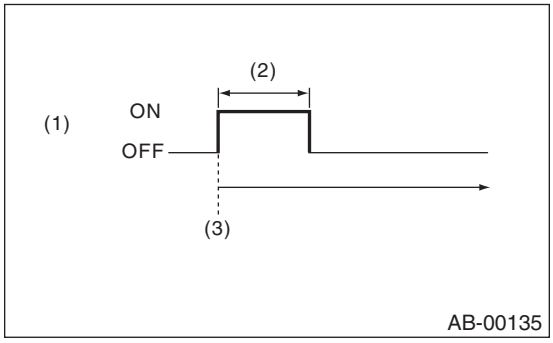
CAUTION:
• Outer (A) moves back, and so do not put your hand on the outer part.
• Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.



7. Airbag Warning Light Illumination Pattern

A: INSPECTION

Keep the ignition switch to ON, and confirm that the airbag warning light remains off after being turned on for approx. 6 seconds.

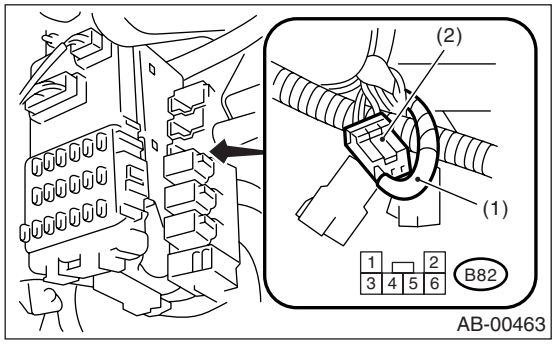


(1) Airbag warning light
(2) Approx. 6 seconds
(3) Ignition switch ON

8. Read Diagnostic Trouble Code (DTC)

A: OPERATION

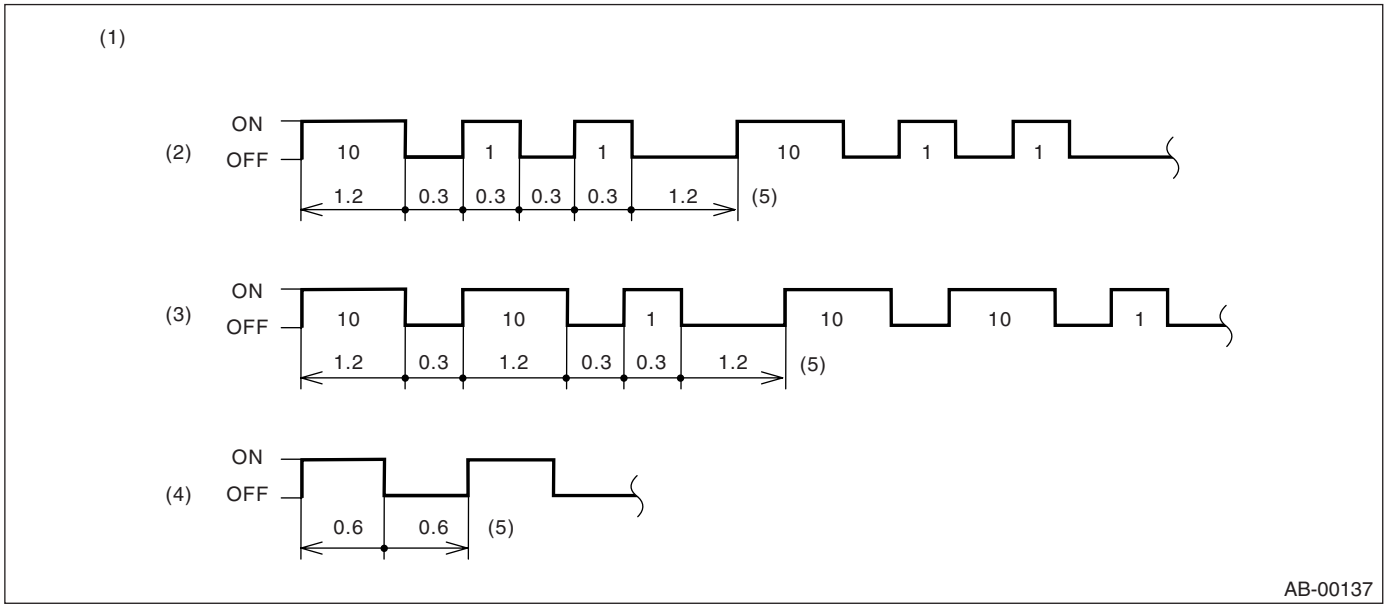
1) Turn the ignition switch to ON.
2) Connect the ground terminal to diagnosis connector terminal No. 1 in the instrument panel lower cover area.



(1) Diagnosis connector
(2) Ground terminal

3) Read the DTC by identifying the way airbag warning light flashes.
The airbag warning light flashes a code corresponding to the faulty parts.
The long segment (1.2 sec on) indicates a “ten”, and the short segment (0.3 sec on) indicates a “one”.

NOTE:
• “List of Diagnostic Trouble Code (DTC)” <Ref. to AB(diag)-32, List of Diagnostic Trouble Code (DTC).>
• “Airbag Warning Light Failure” <Ref. to AB(diag)-27, Airbag Warning Light Failure.>



(1) Example
(2) Flashing code 12:
(3) Flashing code 21:
(4) Flashing normal code:
(5) Sec.

4) Turn the ignition switch to OFF, and disconnect the ground terminal from the diagnosis connector terminal No. 1.
5) Wind tape around the ground terminal and return it to its original position.

9. Inspection Mode

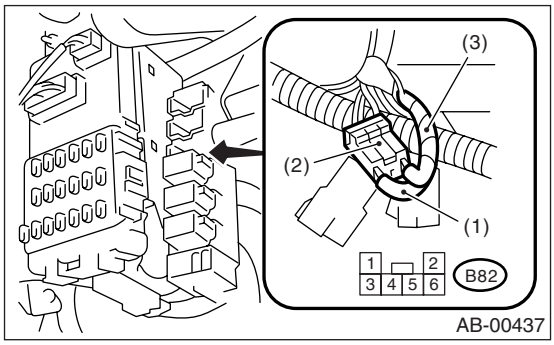
A: PROCEDURE

Recreate the circumstance by referring to the conditions described in the checklist.

10.Clear Memory Mode

A: OPERATION

1) Turn the ignition switch to ON.
2) Connect the ground terminal (ground terminal “A”) to diagnosis connector terminal No. 1 in the instrument panel lower cover area.



(1) Diagnosis connector
(2) Ground terminal “B”
(3) Ground terminal “A”

3) While the warning light flashes, connect another diagnosis terminal (ground terminal “B”) to diagnosis connector terminal No. 2.
4) Once the memory is erased, the warning light returns to the normal flash rate (0.6 sec on). The failure to recover the normal flash rate indicates that trouble parts still remain. Having repaired such parts, erase the memory again and confirm that the normal flash rate has returned.
5) When the memory has been cleared, disconnect the ground terminal from the diagnosis connector.
6) Wind tape around the ground terminal and return it to its original position.

11.Airbag Warning Light Failure

A: AIRBAG WARNING LIGHT REMAINS ON.

DIAGNOSIS:

- Airbag warning light unit is faulty.
- Airbag control module to airbag warning light circuit is shorted or open.
- Grounding circuit is faulty.
- Airbag control module is faulty.
- (AB1) and (B31) are not connected properly.
- (AB3) is not connected properly to the airbag control module.

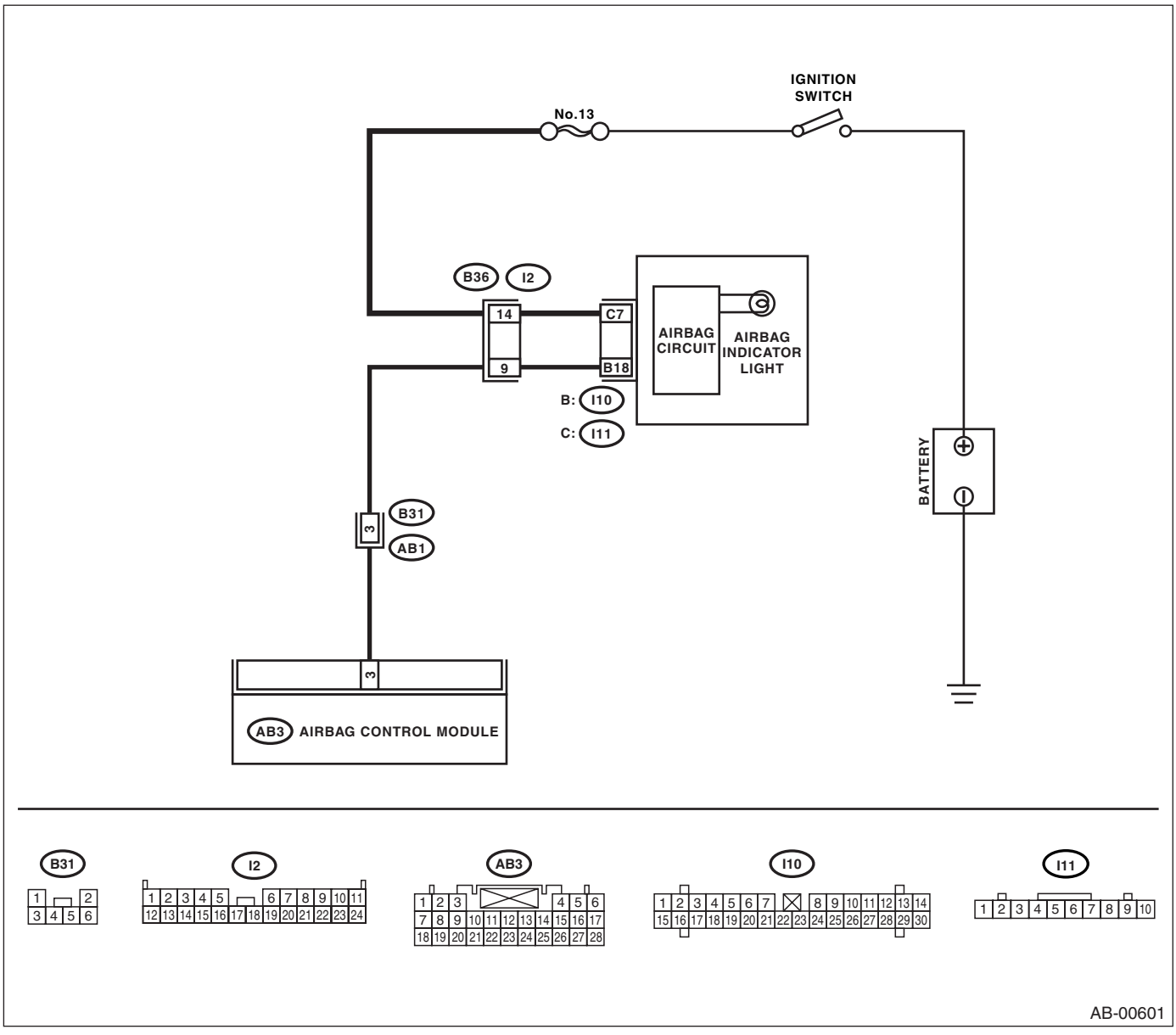
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, seat belt pretensioner roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

WIRING DIAGRAM:



Airbag Warning Light Failure

	Step	Check	Yes	No
1	**CHECK POOR CONTACT IN CONNECTORS (AB1) AND (B31).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the side sill cover. (Driver's side) 3) Confirm that firm contact is secured between connectors (AB1) and (B31).	Is the poor contact in connectors (AB1) and (B31)?	Repair the body harness or replace the body harness with airbag main harness.	Go to step **2.**
2	**CHECK AIRBAG WARNING LIGHT.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Connect the connector (1T) in test harness T to the body harness connector (B31). 3) Connect the connector (1M) in test harness M to the connector (2T) in test harness T. 4) Connect the battery ground cable and turn the ignition switch to ON. 5) Connect two connectors, (3M) and (4M) in test harness M.	Is the airbag warning light turned off?	Go to step **4.**	Go to step **3.**
3	**CHECK BODY HARNESS.** Check the body harness. NOTE: After problem has been eliminated, disconnect the connectors (3M) and (4M).	Is the anything unusual to body harness?	Repair the body harness.	Replace the combination meter printed circuit. <Ref. to IDI-10, Combination Meter Assembly.>
4	**CHECK POOR CONTACT.** Confirm that firm contact is secured between the airbag control module and the connector (AB3). <Ref. to AB-16, Airbag Control Module.>	Is the poor contact in connector (AB3)?	Replace the body harness with airbag main harness or replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Go to step **5.**
5	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Connect the connector (AB1) to (B31). 3) Disconnect the connectors (AB26) and (AB21). 4) Remove the glove box and disconnect the connectors (AB27) and (AB4). 5) Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R. <Ref. to AB-16, Airbag Control Module.> 6) Connect the battery ground cable and turn the ignition switch to ON. 7) Connect the connectors (5R) and (6R) in test harness R. NOTE: After problem has been eliminated, disconnect the connectors (5R) and (6R).	Is the airbag warning light turned off?	Go to step **6.**	Replace the body harness with airbag main harness.

	Step	Check	Yes	No
6	**CHECK GROUNDING CIRCUIT.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB3) from the airbag control module. 3) Connect the connector (1R) in test harness R to body harness connector (AB3). 4) Measure the resistance between connector (2R) in test harness R and the chassis ground. ***Connector & terminal*** ***(2R) No. 10 — Chassis ground:*** ***(2R) No. 11 — Chassis ground:***	Is the resistance less than 10 Ω?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Repair the body-grounding circuit.

B: AIRBAG WARNING LIGHT REMAINS OFF.

DIAGNOSIS:

- Fuse No. 13 (in fuse box) is blown.
- Body harness circuit is open.
- Airbag warning light is faulty.
- Airbag main harness is faulty.
- Airbag control module is faulty.

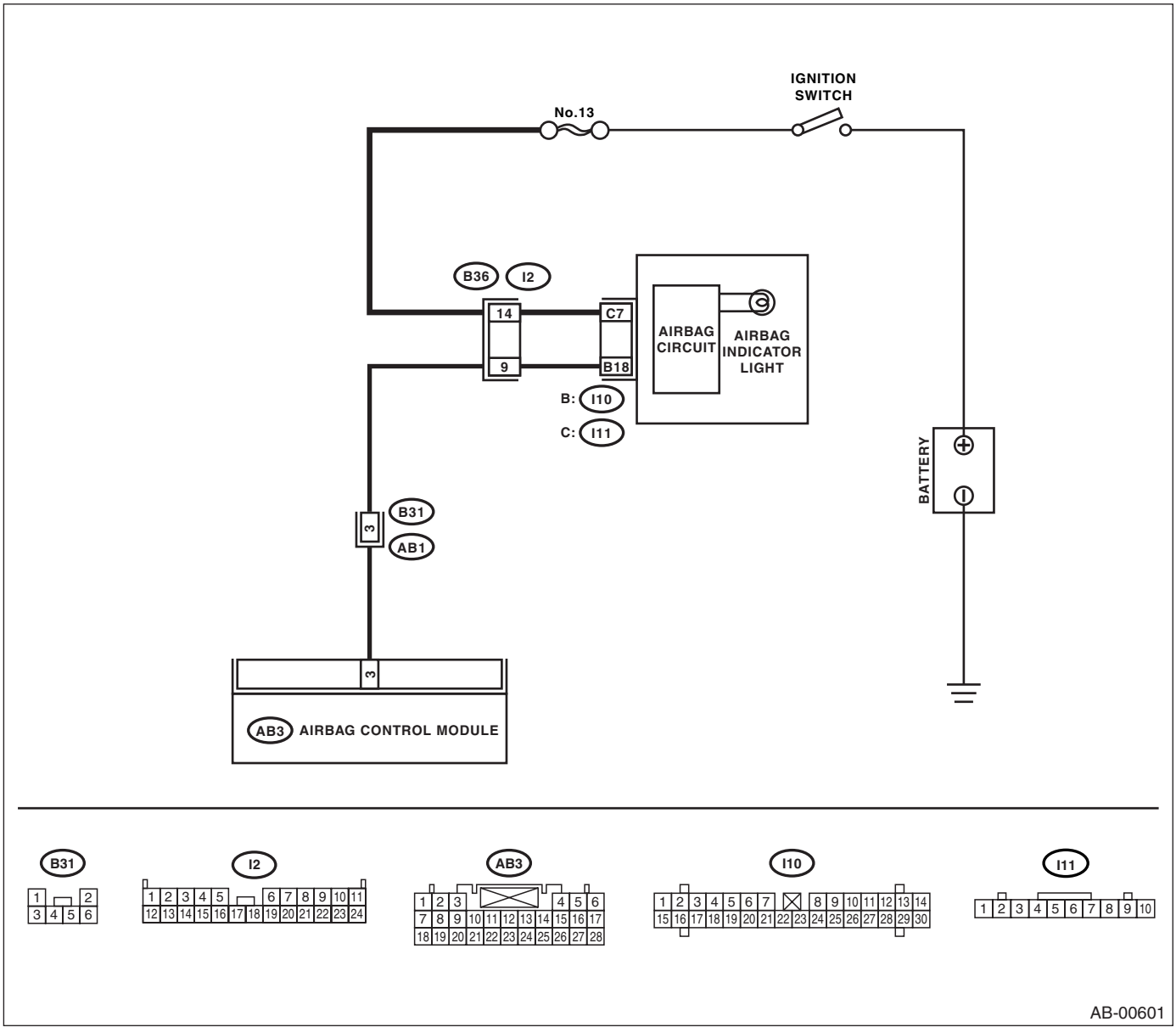
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, seat belt pretensioner roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK COMBINATION METER.** Turn the ignition switch to ON, and confirm that warning lights equipped in the combination meter are turned on.	Do the warning lights not for airbag turn on?	Go to step **2.**	Repair the combination meter power supply. <Ref. to IDI-3, Combination Meter System.>
2	**CHECK FUSE NO. 13 (IN MAIN FUSE BOX).** Remove the fuse No. 13 and perform visual inspection.	Is the fuse No. 13 (in main fuse box) blown out?	Replace the fuse No. 13. If fuse No. 13 is blown out again, go to step 3.	Go to step **3.**
3	**CHECK AIRBAG WARNING LIGHT CIRCUIT (IN COMBINATION METER).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB1) from (B31). 3) Connect the battery ground cable and turn the ignition switch to ON.	Is the airbag warning light turned on?	Go to step **4.**	Replace the airbag warning light bulb or combination meter printed circuit. <Ref. to IDI-10, Combination Meter Assembly.>
4	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Connect the connector (AB1) to (B31). 3) Disconnect the connector (AB3) from the airbag control module. <Ref. to AB-16, Airbag Control Module.> 4) Connect the battery ground cable and turn the ignition switch to ON.	Is the airbag warning light turned on?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with airbag main harness.

12.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Memory function	Contents of diagnosis	Index No.
11	Provided.	• Airbag main harness circuit is open, shorted or shorted to ground. • Airbag module harness (driver) circuit is open, shorted or shorted to ground. • Roll connector circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Driver's airbag module is faulty.	<Ref. to AB(diag)-34, DTC 11, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
12	Provided.	• Airbag main harness circuit is open, shorted or shorted to ground. • Airbag module harness (passenger) circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Passenger's airbag module is faulty.	<Ref. to AB(diag)-36, DTC 12, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
15	Provided.	• Airbag main harness circuit (driver) is shorted to power supply. • Airbag module harness (driver) is shorted to power supply. • Roll connector is shorted to power supply. • Airbag control module is faulty. • Driver's airbag module is faulty.	<Ref. to AB(diag)-38, DTC 15, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
16	Provided.	• Airbag main harness circuit (passenger) is shorted to power supply. • Airbag module harness (passenger) is shorted to power supply. • Airbag control module is faulty. • Passenger's airbag module is faulty.	<Ref. to AB(diag)-40, DTC 16, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
21	Provided.	Airbag control module is faulty.	<Ref. to AB(diag)-41, DTC 21, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	Provided.	Front airbag module and seat belt pretensioner (LH/RH) are inflated.	<Ref. to AB(diag)-42, DTC 22, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	Not provided.	(AB3), (AB7) and (AB8) are not connected properly to air-bag control module.	<Ref. to AB(diag)-43, DTC 23, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	Not provided.	• Airbag control module is faulty. • Airbag main harness circuit is open. • Fuse No. 11 (in joint box) is blown. • Body harness circuit is open.	<Ref. to AB(diag)-44, DTC 24, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25	Provided.	• Airbag control module is faulty. • Airbag main harness circuit is open. • Fuse No. 6 (in joint box) is blown. • Body harness circuit is open.	<Ref. to AB(diag)-46, DTC 25, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	Provided.	• Front sub-sensor harness (RH) circuit is shorted. • Front sub-sensor harness (RH) circuit is open. • Front sub-sensor (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-48, DTC 31, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
32	Provided.	• Front sub-sensor harness (LH) circuit is shorted. • Front sub-sensor harness (LH) circuit is open. • Front sub-sensor (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-50, DTC 32, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Memory function	Contents of diagnosis	Index No.
41	Provided.	• Side airbag harness (RH) is faulty. • Side airbag module (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-53, DTC 41, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
42	Provided.	• Side airbag harness (LH) is faulty. • Side airbag module (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-55, DTC 42, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
45	Provided.	• Side airbag harness (RH) is shorted to power supply. • Airbag control module is faulty.	<Ref. to AB(diag)-57, DTC 45, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
46	Provided.	• Side airbag harness (LH) is shorted to power supply. • Airbag control module is faulty.	<Ref. to AB(diag)-59, DTC 46, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
51	Provided.	• Side airbag sensor (RH) is faulty. • Side airbag harness (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-61, DTC 51, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
52	Provided.	• Side airbag sensor (LH) is faulty. • Side airbag harness (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-63, DTC 52, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
53	Provided.	Side airbag sensor (RH) is faulty.	<Ref. to AB(diag)-64, DTC 53, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
54	Provided.	Side airbag sensor (LH) is faulty.	<Ref. to AB(diag)-64, DTC 54, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
55	Provided.	Side airbag module is inflated.	<Ref. to AB(diag)-64, DTC 55, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
61	Provided.	• Seat belt pretensioner (RH) circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Pretensioner is faulty. • Pretensioner harness is faulty.	<Ref. to AB(diag)-65, DTC 61, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
62	Provided.	• Seat belt pretensioner (LH) circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Pretensioner is faulty. • Pretensioner harness is faulty.	<Ref. to AB(diag)-67, DTC 62, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
65	Provided.	• Seat belt pretensioner (RH) circuit is shorted to power supply. • Pretensioner is faulty. • Pretensioner harness is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-69, DTC 65, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
66	Provided.	Seat belt pretensioner (LH) circuit is shorted to power supply. • Pretensioner is faulty. • Pretensioner harness is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-71, DTC 66, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

13.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC 11

DIAGNOSIS:

- Airbag main harness circuit is open, shorted or shorted to ground.
- Airbag module harness (Driver) circuit is open, shorted or shorted to ground.
- Roll connector circuit is open, shorted or shorted to ground.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

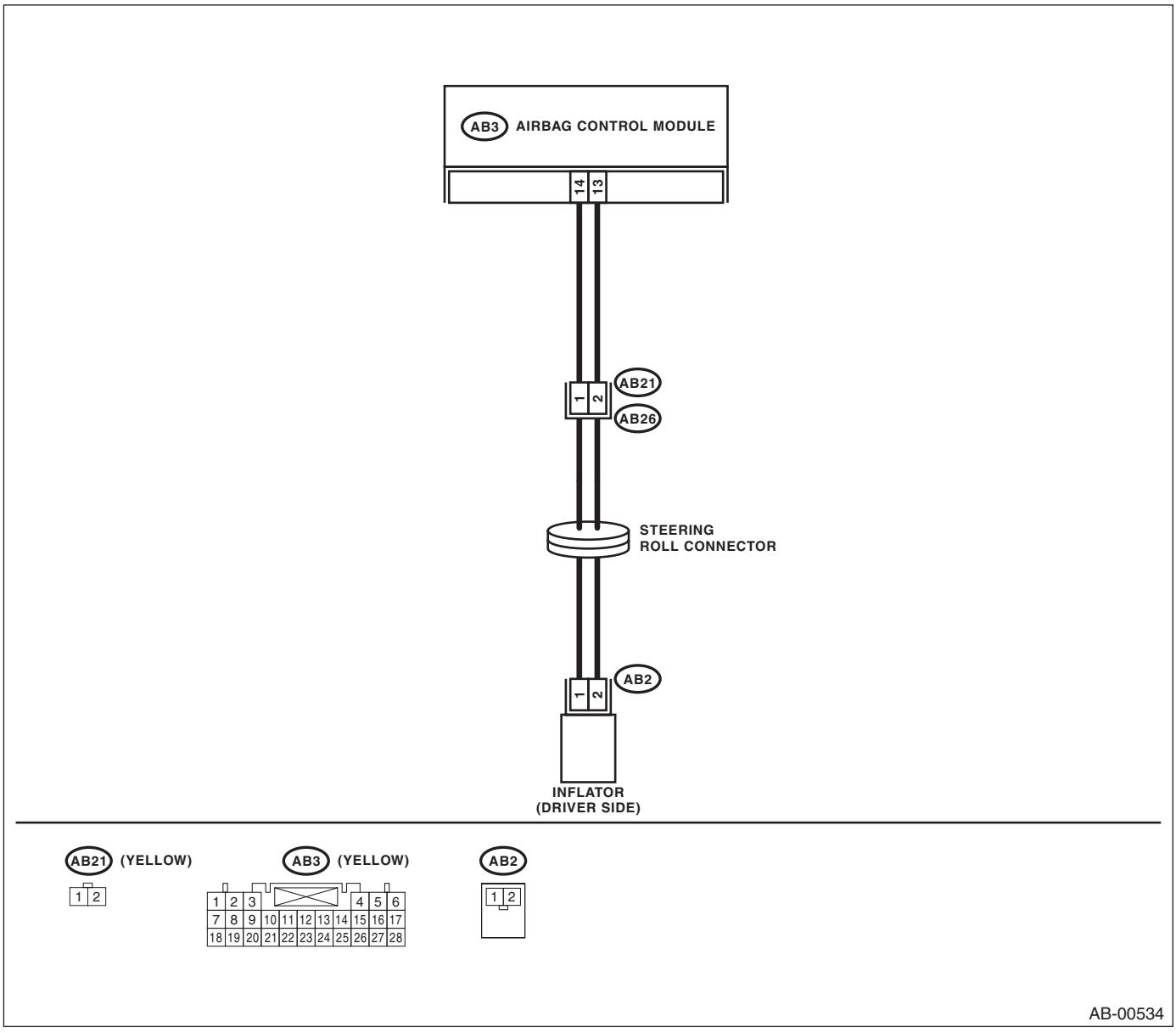
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, seat belt pretensioner roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DRIVER'S AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.> 3) Connect the connector (1N) in test harness N to connector (AB2). 4) Connect the airbag resistor to connector (2N) in test harness N. 5) Connect the battery ground cable and turn the ignition switch to ON.	Does the airbag warning light operate properly?	Replace the driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.>	Go to step **2.**
2	**CHECK ROLL CONNECTOR.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 second. 2) Disconnect the test harness N from the connector (AB2). 3) Remove the instrument panel lower cover, disconnect the connector (AB26) from (AB21) and connect the connector (1F) in test harness F to connector (AB21). 4) Connect the airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable and turn the ignition switch to ON.	Does the airbag warning light operate properly?	Replace the roll connector. <Ref. to AB-18, Roll Connector.>	Go to step **3.**
3	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch to OFF, disconnect the ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connector (3F) in test harness F. 3) Remove the glove box, and disconnect connectors (AB27) and (AB4). <Ref. to AB-13, Passenger's Airbag Module.> 4) Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R. <Ref. to AB-16, Airbag Control Module.> 5) Measure the resistance between connector (2R) in test harness R and the connector (3F) in test harness F. ***Connector & terminal*** ***(2R) No. 2 — (3F) No. 3:*** ***(2R) No. 4 — (3F) No. 4:***	Is the resistance less than 10 Ω?	Go to step **4.**	Replace the body harness with airbag main harness.
4	**CHECK AIRBAG MAIN HARNESS.** Measure the resistance of the connector (2R) in test harness R. ***Connector & terminal*** ***(2R) No. 2 — (2R) No. 4:*** ***(2R) No. 4 — Chassis ground:*** ***(2R) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with airbag main harness.

B: DTC 12

DIAGNOSIS:

- Airbag main harness circuit is open, shorted or shorted to ground.
- Airbag module harness (Passenger) circuit is open, shorted or shorted to ground.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

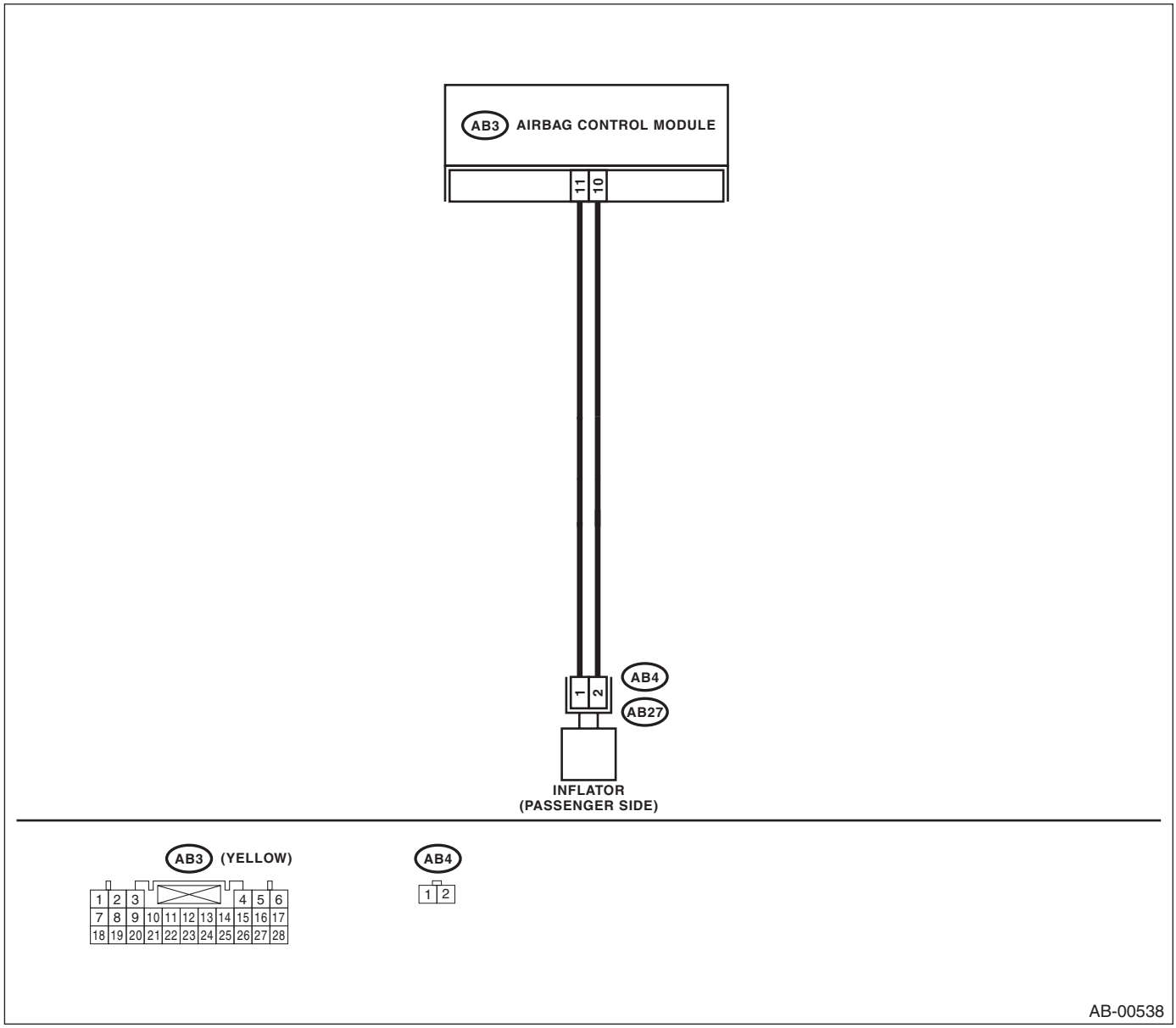
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, seat belt pretensioner roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK PASSENGER'S AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the glove box. 3) Disconnect the connector (AB27) from (AB4). 4) Connect the connector (1F) in test harness F to connector (AB4). 5) Connect the airbag resistor to connector (3F) in test harness F. 6) Connect the battery ground cable and turn the ignition switch to ON.	Does the airbag warning light operate properly?	Replace the passenger airbag module. <Ref. to AB-13, Passenger's Airbag Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connector (3F) in test harness F. 3) Remove the instrument panel lower cover and disconnect the connector (AB26) from (AB21). 4) Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R. <Ref. to AB-16, Airbag Control Module.> 5) Measure the resistance between connector (2R) in test harness R and the connector (3F) in test harness F. ***Connector & terminal*** ***(2R) No. 3 — (3F) No. 4:*** ***(2R) No. 5 — (3F) No. 3:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the body harness with airbag main harness.
3	**CHECK AIRBAG MAIN HARNESS.** Measure the resistance of the connector (2R) in test harness R. ***Connector & terminal*** ***(2R) No. 3 — (2R) No. 5:*** ***(2R) No. 3 — Chassis ground:*** ***(2R) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with airbag main harness.

C: DTC 15

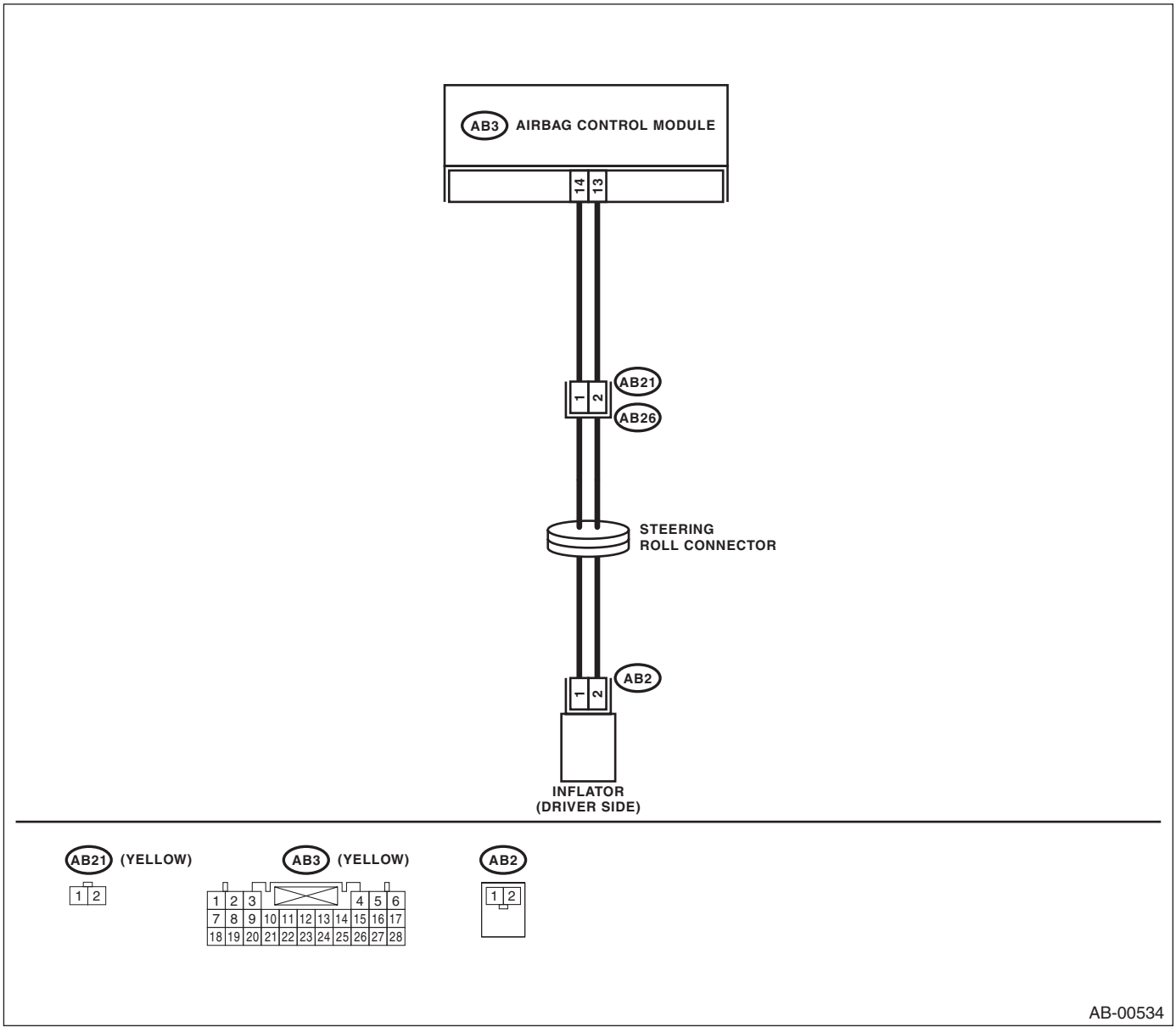
DIAGNOSIS:

- Airbag main harness circuit (Driver) is shorted to the power supply.
- Airbag module harness (Driver) is shorted to the power supply.
- Roll connector is shorted to the power supply.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
• Before replacing the airbag module, seat belt pretensioner roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DRIVER'S AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.> 3) Connect the connector (AB2) to connector (1N) in test harness N. 4) Connect the airbag resistor to connector (2N) in test harness N. 5) Connect the battery ground cable and turn the ignition switch to ON.	Does the airbag warning light operate properly?	Replace the driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.>	Go to step **2.**
2	**CHECK ROLL CONNECTOR.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the test harness N from the connector (AB2). 3) Remove the instrument panel lower cover panel and disconnect the connector (AB26) from (AB21). 4) Connect the connector (1F) in test harness F to connector (AB21). 5) Connect the airbag resistor to connector (3F) in test harness F. 6) Connect the battery ground cable and turn the ignition switch to ON.	Does the airbag warning light operate properly?	Replace the roll connector. <Ref. to AB-18, Roll Connector.>	Go to step **3.**
3	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connector (3F) in test harness F. 3) Remove the glove box, and disconnect the connectors (AB27) and (AB4). 4) Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R. <Ref. to AB-16, Airbag Control Module.> 5) Connect the battery ground cable and turn the ignition switch to ON. (engine OFF) 6) Measure the voltage between connector (2R) in test harness R and the chassis ground. ***Connector & terminal*** ***(2R) No. 4 (+) — Chassis ground (−):*** ***(2R) No. 2 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with airbag main harness.

D: DTC 16

DIAGNOSIS:

- Airbag main harness circuit (Passenger) is shorted to the power supply.
- Airbag module harness (Passenger) is shorted to the power supply.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

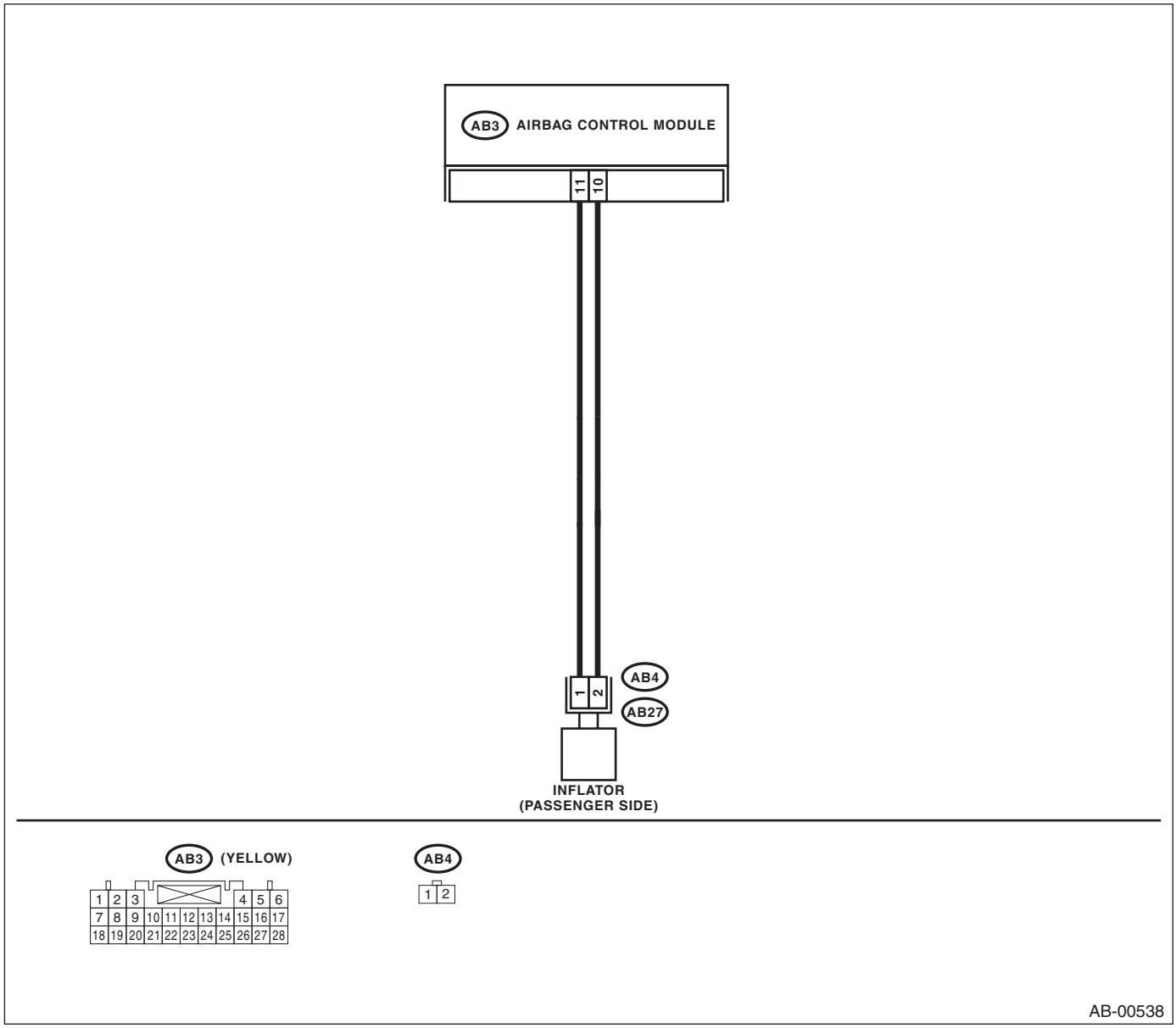
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, seat belt pretensioner roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK PASSENGER'S AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the glove box. 3) Disconnect the connector (AB27) from (AB4) 4) Connect the connector (1F) in test harness F to connector (AB4). 5) Connect the airbag resistor to connector (3F) in test harness F. 6) Connect the battery ground cable and turn the ignition switch to ON.	Does the airbag warning light operate properly?	Replace the passenger airbag module. <Ref. to AB-13, Passenger's Airbag Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connector (3F) in test harness F. 3) Remove the instrument panel lower cover and disconnect the connector (AB26) from (AB21). 4) Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R. <Ref. to AB-16, Airbag Control Module.> 5) Measure the voltage between connector (2R) in test harness R and the chassis ground. ***Connector & terminal*** ***(2R) No. 3 (+) — Chassis ground (−):*** ***(2R) No. 5 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with airbag main harness.

E: DTC 21

DIAGNOSIS:

Airbag control module is faulty.

CAUTION:

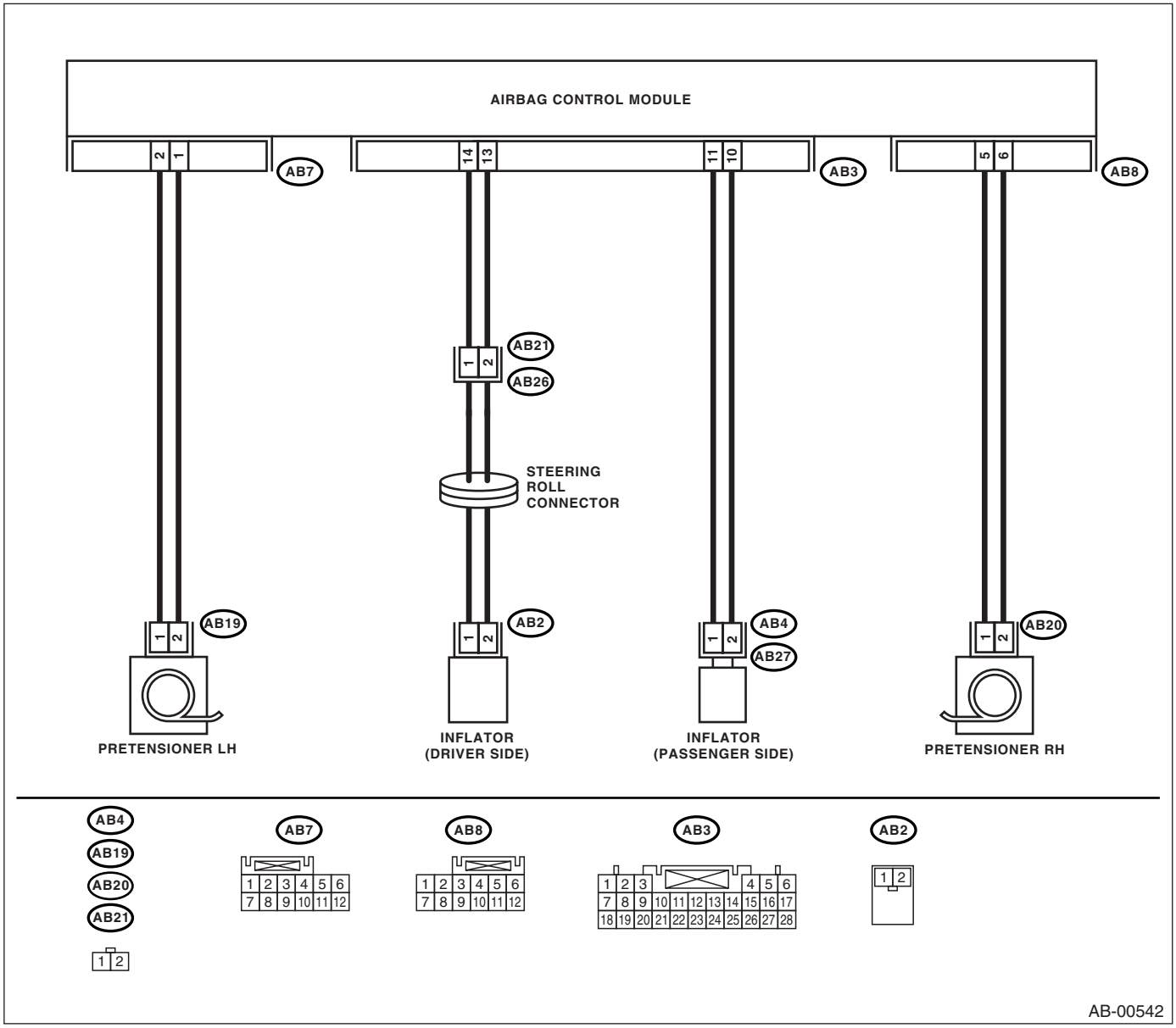
• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, seat belt pretensioner roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

	Step	Check	Yes	No
1	**CHECK IF DTC 21 IS INDICATED.** Read the DTC. <Ref. to AB(diag)-24, Read Diagnostic Trouble Code (DTC).>	Is the airbag warning light DTC 21 indicated?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Perform clear memory. <Ref. to AB(diag)-26, Clear Memory Mode.>

F: DTC 22

WIRING DIAGRAM:



This code is indicated when the front airbag and the pretensioner are in operation.
Once this code is indicated, memory is not erasable; therefore replace the following parts.

- Airbag control module. <Ref. to AB-16, Airbag Control Module.>
- Driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.>
- Passenger's airbag module. <Ref. to AB-13, Passenger's Airbag Module.>
- Front sub-sensor of both sides. <Ref. to AB-19, Front Sub Sensor.>
- Front seat belt outer with pretensioner of both sides. <Ref. to SB-8, Front Seat Belt.>

G: DTC 23

DIAGNOSIS:

(AB3), (AB7) and (AB8) are not connected properly to airbag control module.

CAUTION:

Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

	Step	Check	Yes	No
1	**CHECK POOR CONTACT IN CONNECTORS (AB3), (AB7) AND (AB8).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connectors (AB3), (AB7) and (AB8) from the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Check if rust or damage appear on the harness connector and the control module connector.	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.> Replace the body harness with airbag main harness. Replace the body harness with side airbag harness.	Go to step **2.**
2	**CHECK POOR CONTACT IN CONNECTORS (AB3), (AB7) AND (AB8).** 1) Ensure that connectors are firmly reconnected. 2) Connect the battery ground cable and turn the ignition switch to ON.	Does the airbag warning light operate properly?	Finish the diagnosis.	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>

H: DTC 24

DIAGNOSIS:

- Airbag control module is faulty.
- Airbag main harness circuit is open.
- Fuse No, 11 (in joint box) is blown.
- Body harness circuit is open.

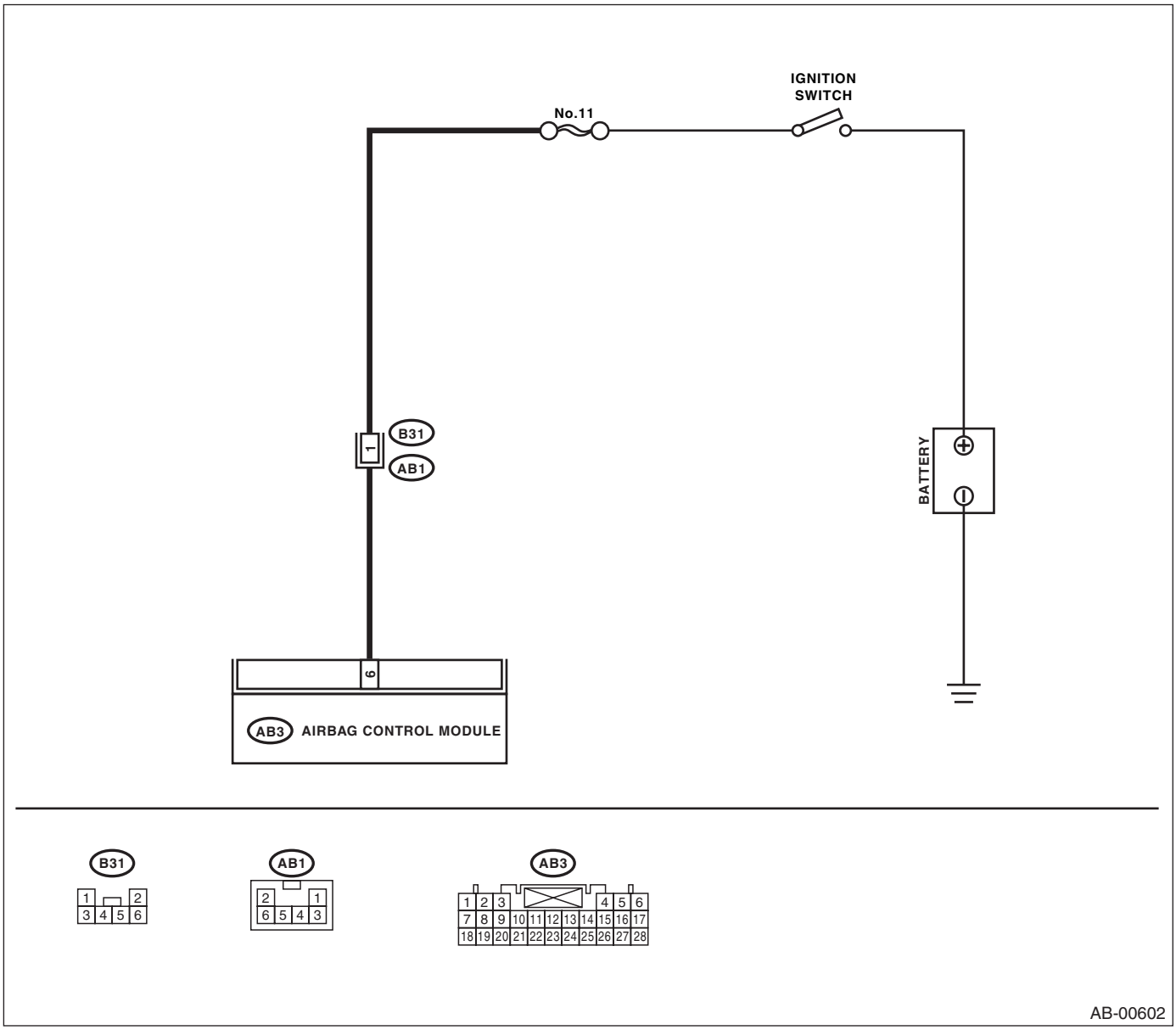
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, seat belt pretensioner roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK AIRBAG CONTROL MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB3) from the airbag control module. <Ref. to AB-16, Airbag Control Module.> 3) Connect the connector (1R) in test harness R to connector (AB3). 4) Connect the battery ground cable and turn the ignition switch to ON. 5) Measure the voltage between connector (2R) in test harness R and chassis ground. ***Connector & terminal*** ***(2R) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1) While checking control module, turn the ignition switch to OFF and disconnect the battery ground cable. Wait more than 20 seconds before operation. 2) Disconnect the airbag connector (AB1) from the body harness (B31). 3) Connect the connector (2M) in test harness M to connector (AB1). 4) Measure the resistance between connector (5M) in test harness M and the connector (2R) in test harness R. ***Connector & terminal*** ***(5M) No. 2 — (2R) No. 1:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the body harness with airbag main harness.
3	**CHECK AIRBAG MAIN HARNESS.** Measure the following resistance with the above-mentioned condition maintained. ***Connector & terminal*** ***(5M) No. 2 — Chassis ground:*** ***(2R) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the body harness with airbag main harness.
4	**CHECK FUSE NO. 11 (IN JOINT BOX).** 1) Confirm that the ignition switch is turned OFF. 2) Remove the fuse No. 11 (in joint box) and perform visual inspection.	Is the fuse No. 11 blown out?	Replace the fuse No. 11. If fuse No. 11 is blown out again, repair the body harness.	Repair the body harness.

I: DTC 25

DIAGNOSIS:

- Airbag control module is faulty.
- Airbag main harness circuit is open.
- Fuse No. 6 (in joint box) is blown.
- Body harness circuit is open.

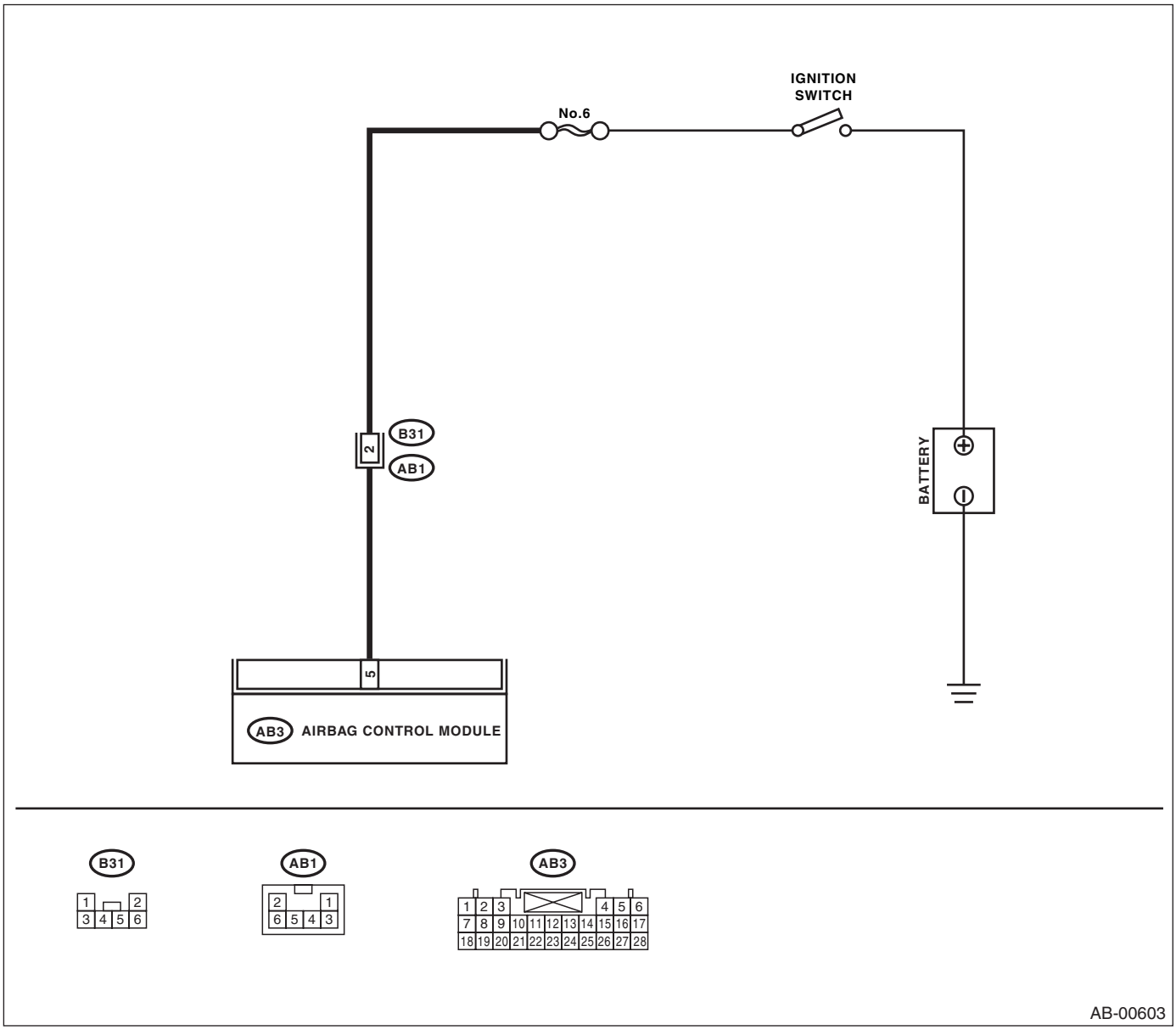
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, seat belt pretensioner roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK AIRBAG CONTROL MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB3) from airbag control module. <Ref. to AB-16, Airbag Control Module.> 3) Connect the connector (1R) in test harness R to connector (AB3). 4) Connect the battery ground cable, and turn the ignition switch to ON. 5) Measure the voltage between the connector (2R) in test harness R and the chassis ground. ***Connector & terminal*** ***(2R) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1) While checking control module, turn the ignition switch to OFF and disconnect the battery ground cable. Wait more than 20 seconds before operation. 2) Disconnect the airbag connector (AB1) from the body harness (B31). 3) Connect the connector (2M) in test harness M to the airbag connector (AB1). 4) Measure the resistance between the connector (5M) in test harness M and the connector (2R) in test harness R. ***Connector & terminal*** ***(5M) No. 4 — (2R) No. 6:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the body harness with airbag main harness.
3	**CHECK AIRBAG MAIN HARNESS.** Measure the following resistance with the above-mentioned condition maintained. ***Connector & terminal*** ***(5M) No. 4 — Chassis ground:*** ***(2R) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the body harness with airbag main harness.
4	**CHECK FUSE NO. 6 (IN JOINT BOX).** 1) Confirm that the ignition switch is turned OFF. 2) Remove the No. 6 fuse (in joint box) and perform visual inspection.	Is the fuse No. 6 blown out?	Replace the fuse No. 6. If fuse No. 6 is blown out again, repair the body harness.	Repair the body harness.

J: DTC 31

DIAGNOSIS:

- Front sub-sensor harness (RH) circuit is shorted.
- Front sub-sensor harness (RH) circuit is open.
- Front sub-sensor (RH) is faulty.
- Airbag control module is faulty.

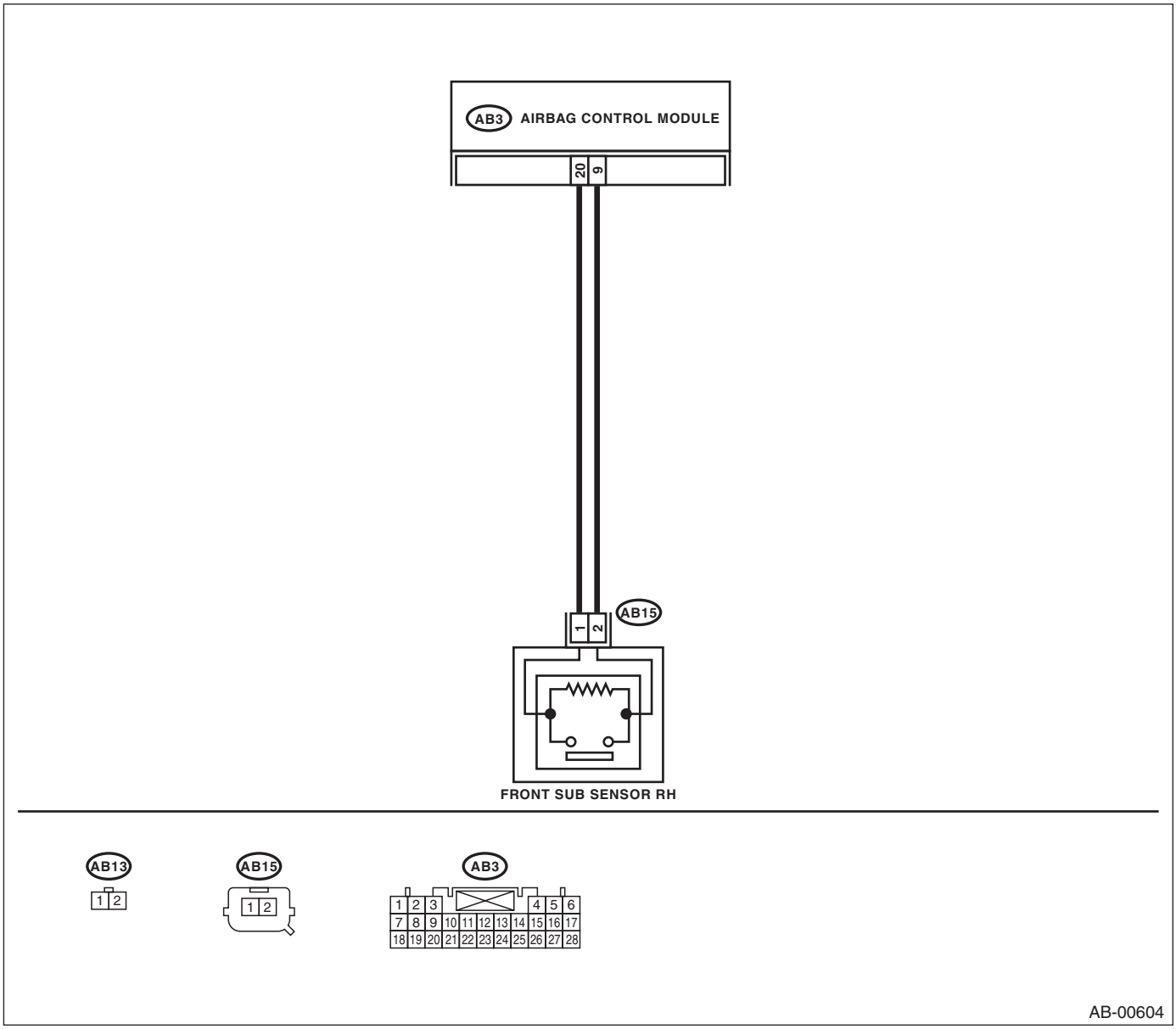
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, seat belt pretensioner roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT SUB-SENSOR (RH) AND FRONT SUB-SENSOR HARNESS (RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R. <Ref. to AB-16, Airbag Control Module.> 3) Measure the resistance of the connector (3R) in test harness R. ***Connector & terminal*** ***(3R) No. 7 — (3R) No. 9:***	Is the resistance 750 Ω — 1 kΩ?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Go to step **2.**
2	**CHECK FRONT SUB-SENSOR (RH) AND FRONT SUB-SENSOR HARNESS (RH).** Measure the resistance between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 7 — Chassis ground:*** ***(3R) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Go to step **3.**
3	**CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (RH).** 1) Disconnect the connector (AB15) from the front sub-sensor. <Ref. to AB-19, Front Sub Sensor.> 2) Connect the connector (1H) in test harness H to connector (AB15). 3) Measure the resistance between connector (3R) in test harness R and connector (3H) in test harness H. ***Connector & terminal*** ***(3R) No. 7 — (3H) No. 6:*** ***(3R) No. 9 — (3H) No. 5:***	Is the resistance less than 10 Ω?	Go to step **4.**	Replace the body harness with airbag main harness.
4	**CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (RH).** Measure the resistance between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 7 — Chassis ground:*** ***(3R) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Finish the diagnosis.	Replace the front sub-sensor (RH). <Ref. to AB-19, Front Sub Sensor.>

K: DTC 32

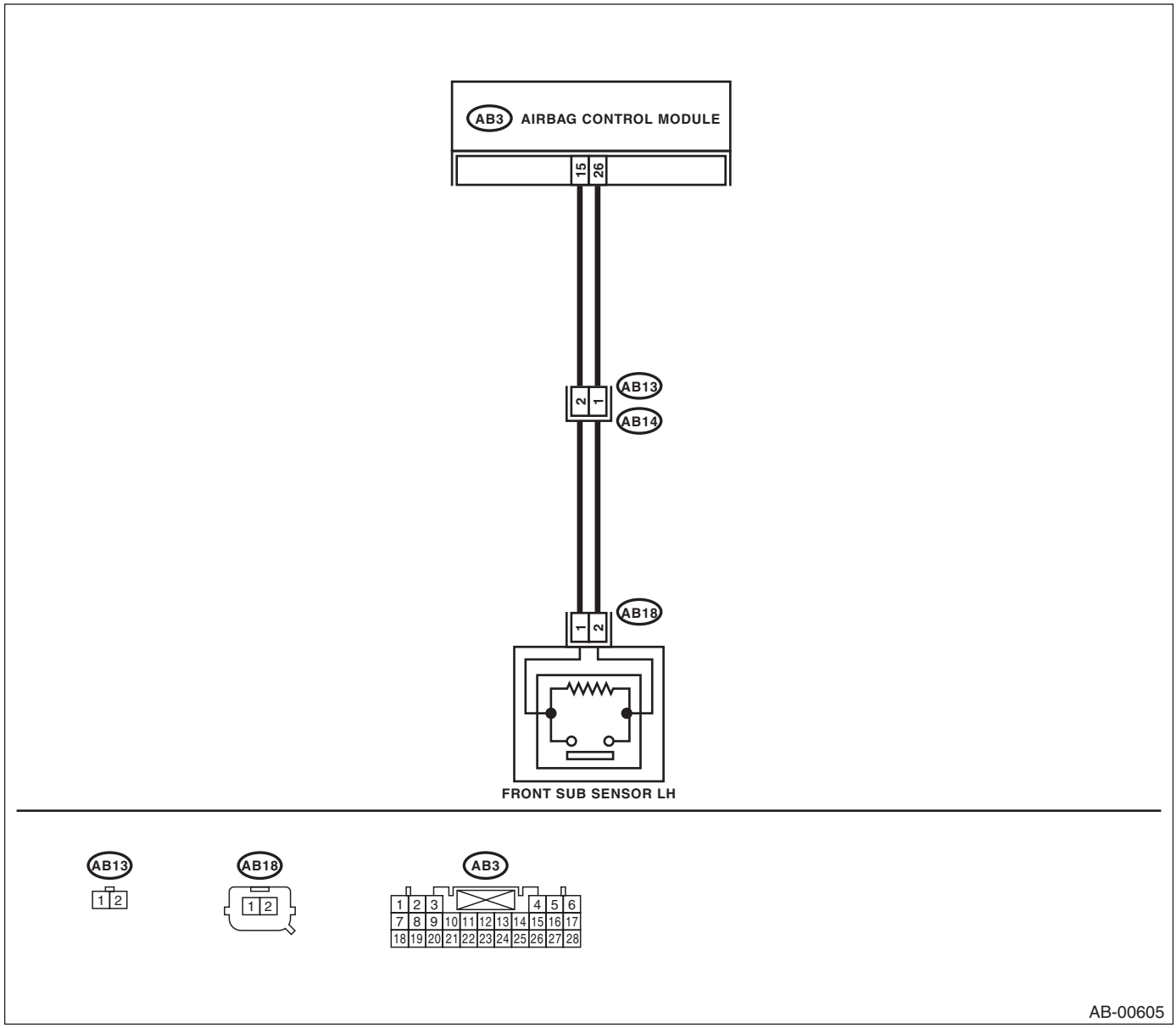
DIAGNOSIS:

- Front sub-sensor harness (LH) circuit is shorted.
- Front sub-sensor harness (LH) circuit is open.
- Front sub-sensor (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
• Before replacing the airbag module, seat belt pretensioner roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



AB-00605

	Step	Check	Yes	No
1	**CHECK FRONT SUB-SENSOR (LH) AND FRONT SUB-SENSOR HARNESS (LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB3) from the airbag control module, and connect connector (1R) in the test harness R to connector (AB3). <Ref. to AB-16, Airbag Control Module.> 3) Measure the resistance of the connector (3R) in the test harness R. ***Connector & terminal*** ***(3R) No. 8 — (3R) No. 6:***	Is the resistance 750 Ω — 1 kΩ?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Go to step **2.**
2	**CHECK FRONT SUB-SENSOR (LH) AND FRONT SUB-SENSOR HARNESS (LH).** Measure the resistance between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 8 — Chassis ground:*** ***(3R) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Go to step **3.**
3	**CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (LH).** 1) Disconnect the connector (AB18) from the front sub-sensor. <Ref. to AB-19, Front Sub Sensor.> 2) Connect the connector (1H) in test harness H to connector (AB18). 3) Measure the resistance between connector (3R) in test harness R and connector (3H) in test harness H. ***Connector & terminal*** ***(3R) No. 6 — (3H) No. 5:*** ***(3R) No. 8 — (3H) No. 6:***	Is the resistance less than 10 Ω?	Go to step **4.**	Go to step **5.**
4	**CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (LH).** Measure the resistance between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 6 — Chassis ground:*** ***(3R) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Go to step **5.**
5	**CHECK AIRBAG MAIN HARNESS.** 1) Disconnect the connector (AB13) from (AB14), and connect the connector (1F) in test harness F to (AB13). 2) Measure the resistance between connector (3R) in test harness R and connector (3F) in test harness F. ***Connector & terminal*** ***(3R) No. 6 — (3F) No. 3:*** ***(3R) No. 8 — (3F) No. 4:***	Is the resistance less than 10 Ω?	Go to step **6.**	Replace the body harness with airbag main harness.
6	**CHECK AIRBAG MAIN HARNESS.** Measure the resistance between connector (3R) in the test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 6 — Chassis ground:*** ***(3R) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Replace the body harness with airbag main harness.

	Step	Check	Yes	No
7	**CHECK FRONT SUB-SENSOR HARNESS (LH).** 1) Connect the connector (2F) in test harness F to connector (AB14). 2) Measure the resistance between connector (3H) in test harness H and connector (3F) in test harness F. ***Connector & terminal*** ***(3F) No. 5 — (3H) No. 5:*** ***(3F) No. 6 — (3H) No. 6:***	Is the resistance less than 10 Ω?	Go to step **8.**	Replace the body harness with front sub-sensor harness (LH).
8	**CHECK FRONT SUB-SENSOR HARNESS (LH).** Measure the resistance between connector (3F) in test harness F and the chassis ground. ***Connector & terminal*** ***(3F) No. 5 — Chassis ground:*** ***(3F) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Replace the body harness with front sub-sensor harness (LH).
9	**CHECK FRONT SUB-SENSOR (LH).** 1) Connect the connector (2H) in test harness H to front sub-sensor (LH). 2) Measure the resistance of the connector (3H) in test harness H. ***Connector & terminal*** ***(3H) No. 3 — (3H) No. 4:***	Is the resistance 750 Ω — 1 kΩ?	Go to step **10.**	Replace the front sub-sensor (LH). <Ref. to AB-19, Front Sub Sensor.>
10	**CHECK FRONT SUB-SENSOR (LH).** Measure the resistance between connector (3H) in test harness H and the chassis ground. ***Connector & terminal*** ***(3H) No. 3 — Chassis ground:*** ***(3H) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Finish the diagnosis.	Replace the front sub-sensor (LH). <Ref. to AB-19, Front Sub Sensor.>

L: DTC 41

DIAGNOSIS:

- Side airbag harness (RH) is faulty.
- Side airbag module (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

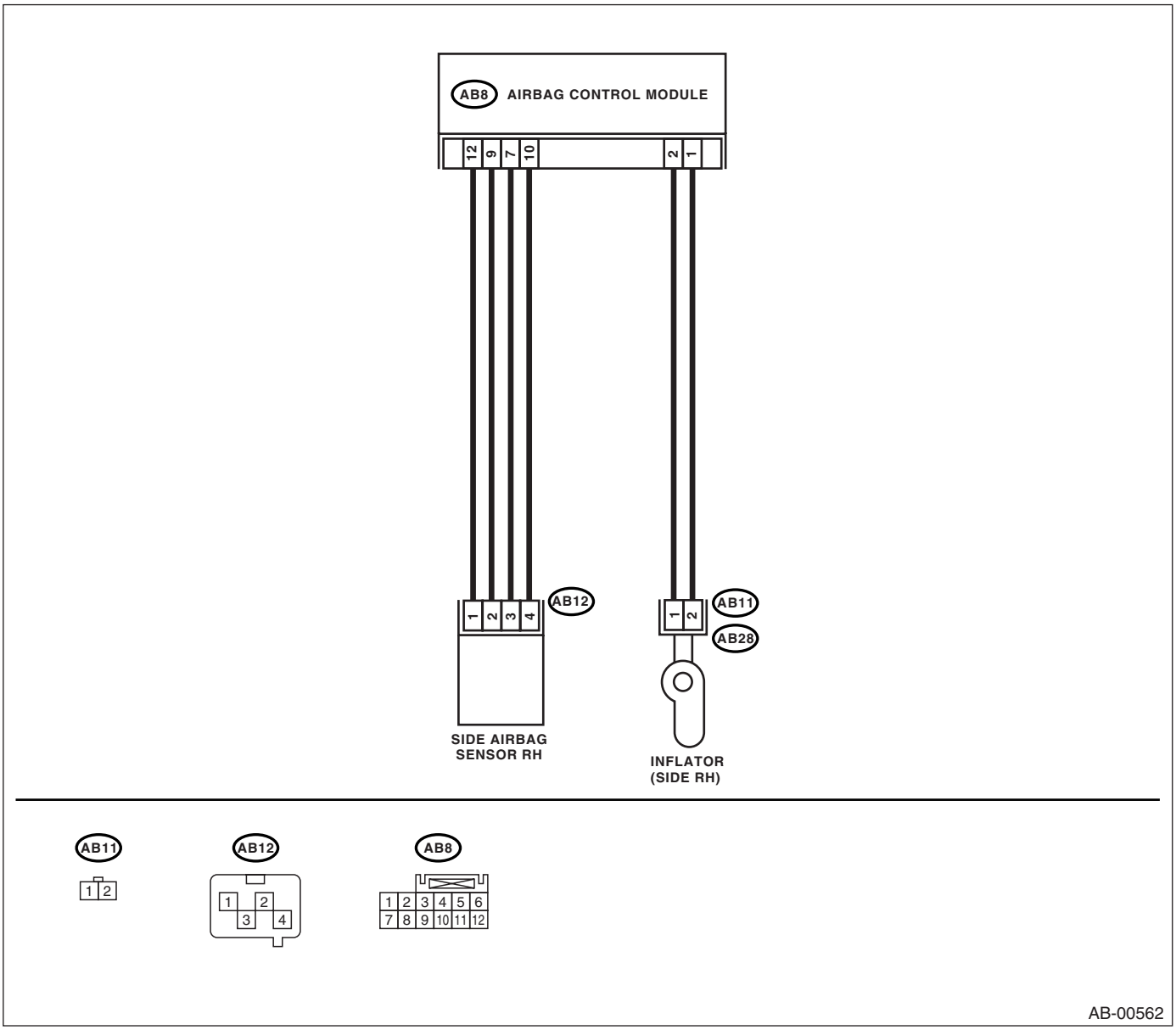
• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, seat belt pretensioner roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SIDE AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB20) from the seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.> 3) Disconnect the connector (AB28) from (AB11), and connect the connector (1F) in test harness F to (AB11). 4) Connect the airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable, and turn the ignition switch to ON.	Does the airbag warning light operate properly?	Replace the side airbag module (RH). <Ref. to AB-14, REMOVAL, Side Airbag Module.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from test harness F. 3) Disconnect the connector (AB8) from air bag control module. <Ref. to AB-16, Airbag Control Module.> 4) Connect the connector (1R) in test harness R to connector (AB8). 5) Measure the resistance between connector (3R) in test harness R and connector (3F) in test harness F. ***Connector & terminal*** ***(3R) No. 20 — (3F) No. 4:*** ***(3R) No. 18 — (3F) No. 3:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the side airbag harness along with the body harness.
3	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance of the connector (3R) in test harness R. ***Connector & terminal*** ***(3R) No. 20 — (3R) No. 18:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the side airbag harness along with the body harness.
4	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance of the connector (3F) in test harness F. ***Connector & terminal*** ***(3F) No. 3 — (3F) No. 4:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Replace the side airbag harness along with the body harness.
5	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance between connector (3F) in test harness F and the chassis ground. ***Connector & terminal*** ***(3F) No. 3 — Chassis ground:*** ***(3F) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Replace the side airbag harness along with the body harness.
6	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 20 — Chassis ground:*** ***(3R) No. 18 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the side airbag harness along with the body harness.

M: DTC 42

DIAGNOSIS:

- Side airbag harness (LH) is faulty.
- Side airbag module (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

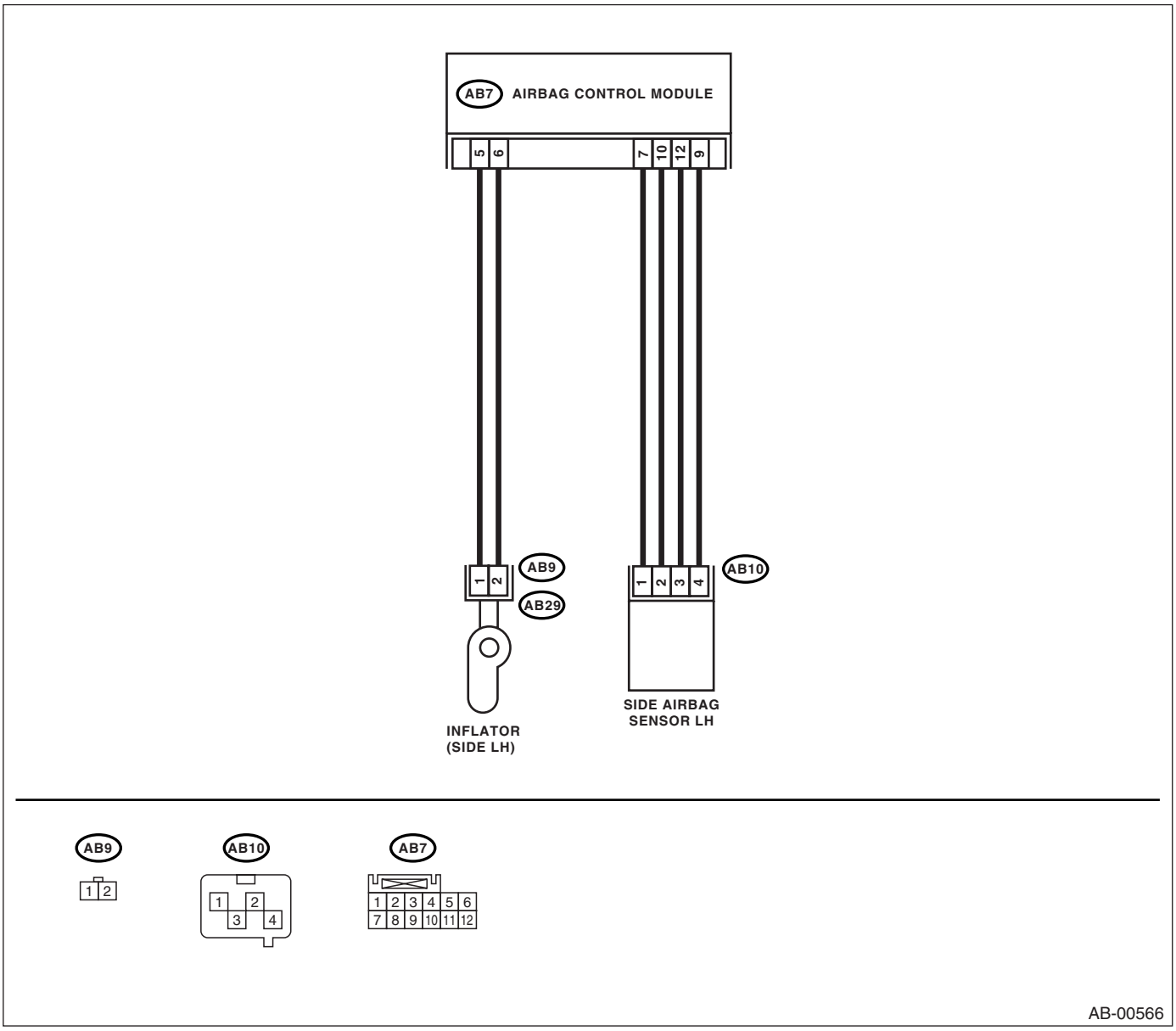
• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, seat belt pretensioner roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SIDE AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB19) from the seat belt pretensioner (LH). <Ref. to SB-8, Front Seat Belt.> 3) Disconnect the connector (AB29) from (AB9), and connect the connector (1F) in test harness F to (AB9). 4) Connect the airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable, and turn the ignition switch to ON.	Does the airbag warning light operate properly?	Replace the side airbag module (LH). <Ref. to AB-14, REMOVAL, Side Airbag Module.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (LH).** 1) Turn ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the test harness. 3) Disconnect the connector (AB7) from the airbag control module. <Ref. to AB-16, Airbag Control Module.> 4) Connect the connector (1R) in test harness R to connector (AB7). 5) Measure the resistance between connector (3R) in test harness R and connector (3F) in test harness F. ***Connector & terminal*** ***(3R) No. 12 — (3F) No. 3:*** ***(3R) No. 10 — (3F) No. 4:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the side airbag harness along with the body harness.
3	**CHECK SIDE AIRBAG HARNESS (LH).** Measure the resistance of the connector (3R) in test harness R. ***Connector & terminal*** ***(3R) No. 12 — (3R) No. 10:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the side airbag harness along with the body harness.
4	**CHECK SIDE AIRBAG HARNESS (LH).** Measure the resistance of the connector (3F) in test harness F. ***Connector & terminal*** ***(3F) No. 3 — (3F) No. 4:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Replace the side airbag harness along with the body harness.
5	**CHECK SIDE AIRBAG HARNESS (LH).** Measure the resistance between connector (3F) in test harness F and the chassis ground. ***Connector & terminal*** ***(3F) No. 3 — Chassis ground:*** ***(3F) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Replace the side airbag harness along with the body harness.
6	**CHECK SIDE AIRBAG HARNESS (LH).** Measure the resistance between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 12 — Chassis ground:*** ***(3R) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the side airbag harness along with the body harness.

N: DTC 45

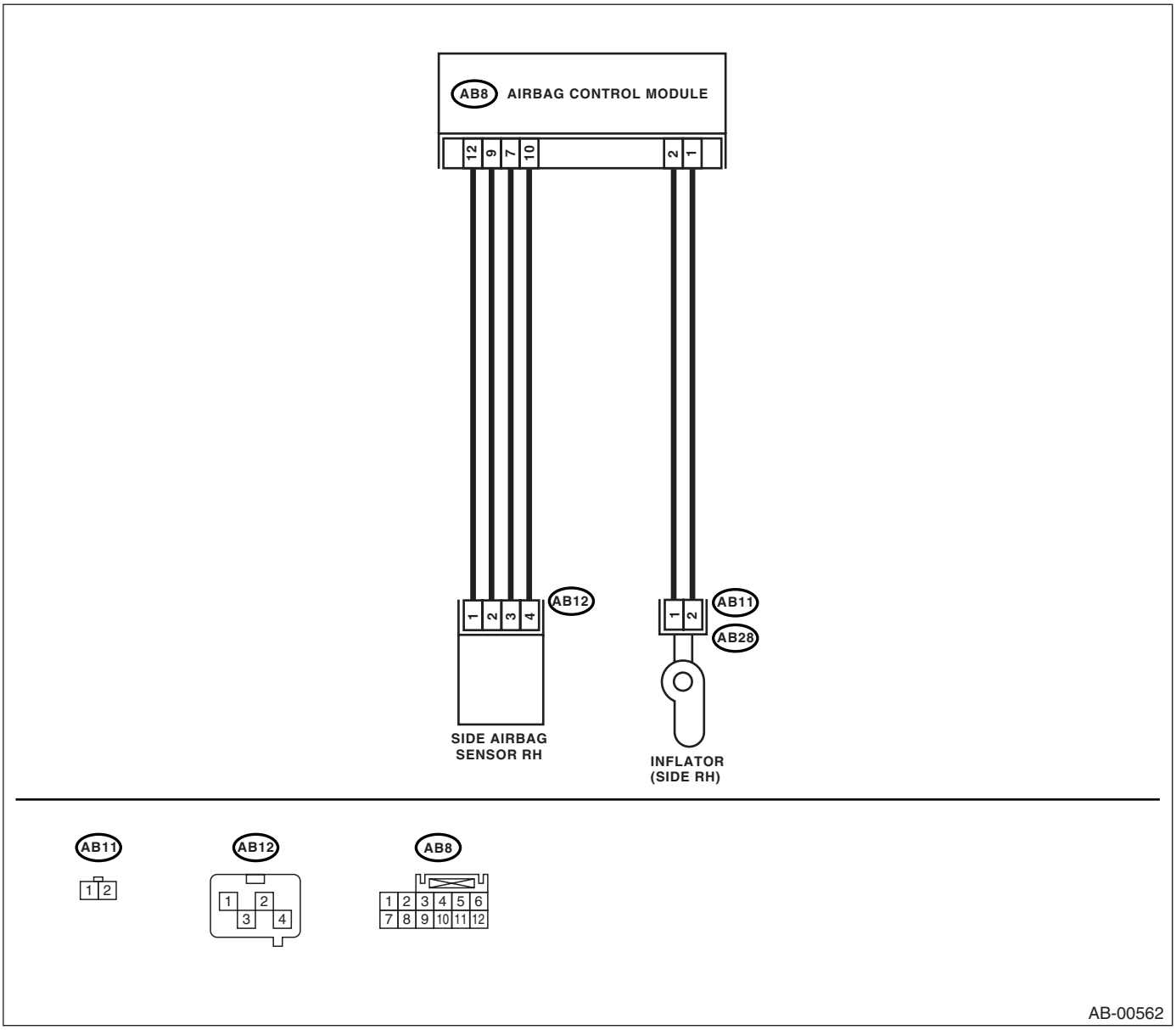
DIAGNOSIS:

- Side airbag harness (RH) is shorted to power supply.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
• Before replacing the airbag module, seat belt pretensioner roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.
• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SIDE AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB20) from the seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.> 3) Disconnect the connector (AB28) from (AB11), and connect the connector (1F) in test harness F to (AB11). 4) Connect the airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable, and turn the ignition switch to ON.	Does the airbag warning light operate properly?	Replace the side airbag module (RH). <Ref. to AB-14, REMOVAL, Side Airbag Module.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the test harness. 3) Disconnect the connector (AB8) from the airbag control module. <Ref. to AB-16, Airbag Control Module.> 4) Connect the connector (1R) in test harness R to connector (AB8). 5) Connect the battery ground cable, and turn the ignition switch to ON. 6) Measure the voltage between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 20 (+) — Chassis ground (–):*** ***(3R) No. 18 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the side airbag harness along with the body harness.

O: DTC 46

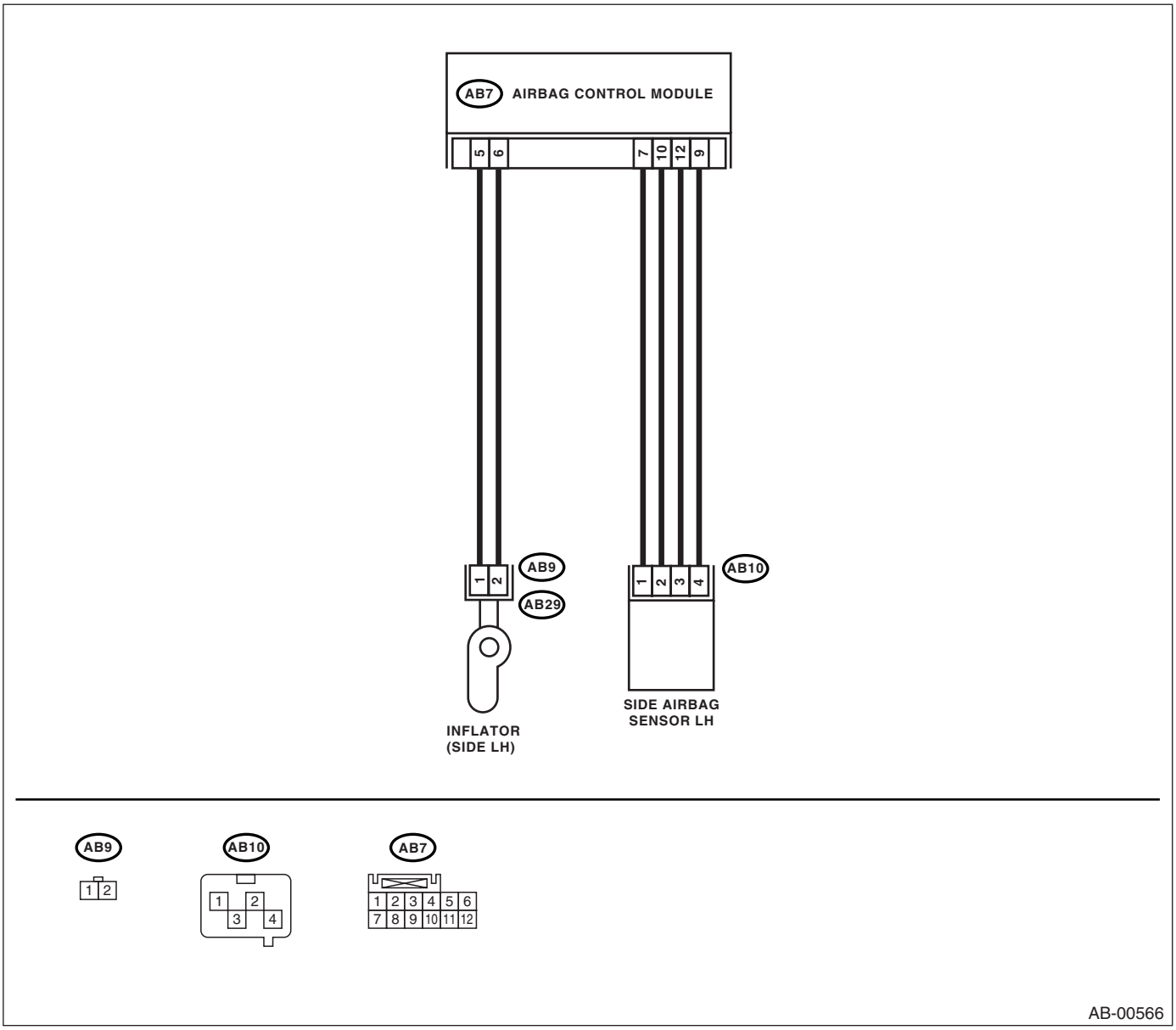
DIAGNOSIS:

- Side airbag harness (LH) is shorted to power supply.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
• Before replacing the airbag module, seat belt pretensioner roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.
• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.
• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SIDE AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB19) from the seat belt pretensioner (LH). <Ref. to SB-8, Front Seat Belt.> 3) Disconnect the connector (AB29) from (AB9), and connect the connector (1F) in test harness F to (AB9). 4) Connect the airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable and turn the ignition switch to ON.	Does the airbag warning light operate properly?	Replace the side airbag module (LH). <Ref. to AB-14, REMOVAL, Side Airbag Module.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the test harness. 3) Disconnect the connector (AB7) from the airbag control module. <Ref. to AB-16, Airbag Control Module.> 4) Connect the connector (1R) in test harness R to connector (AB7). 5) Connect the battery ground cable, and turn the ignition switch to ON. 6) Measure the voltage between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 12 (+) — Chassis ground (–):*** ***(3R) No. 10 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the side airbag harness along with the body harness.

P: DTC 51

DIAGNOSIS:

- Side airbag sensor (RH) is faulty.
- Side airbag harness (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

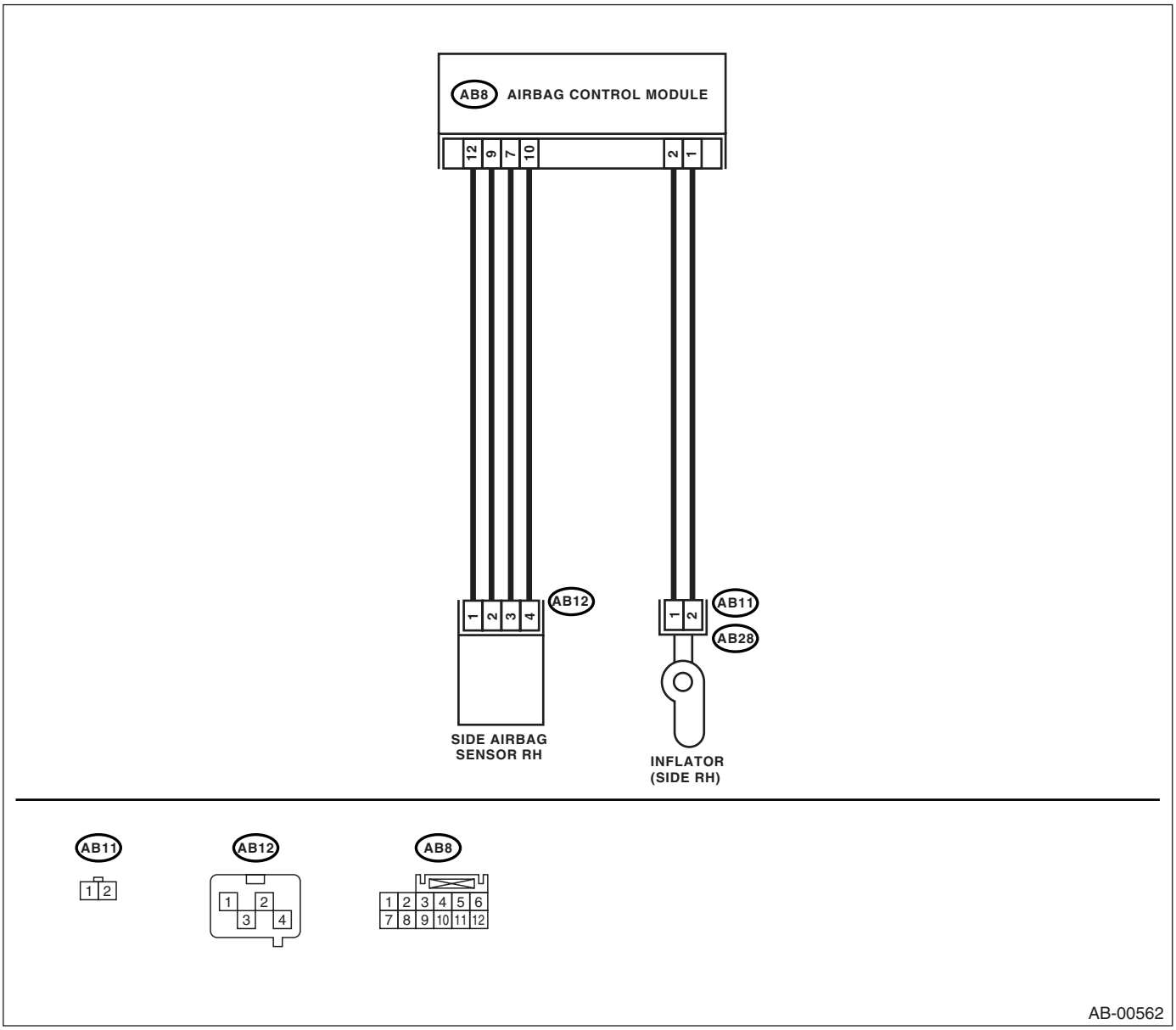
• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, seat belt pretensioner roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SIDE AIRBAG HARNESS (RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB20) from the seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.> 3) Disconnect the connector (AB28) from (AB11). 4) Disconnect the connector (AB8) from the airbag control module. <Ref. to AB-16, Airbag Control Module.> 5) Connect the connector (1R) in test harness R to the connector (AB8). 6) Disconnect the connector (AB12) from the side airbag sensor (RH), and connect the connector (1G) in test harness G to connector (AB12). 7) Measure the resistance between connector (4R) in test harness R and connector (3G) in test harness G. ***Connector & terminal*** ***(4R) No. 5 — (3G) No. 2:*** ***(4R) No. 7 — (3G) No. 1:*** ***(4R) No. 8 — (3G) No. 5:*** ***(4R) No. 6 — (3G) No. 4:***	Is the resistance less than 10 Ω?	Go to step **2.**	Replace the body harness with side airbag harness.
2	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance between connector (4R) in test harness R and the chassis ground. ***Connector & terminal*** ***(4R) No. 5 — Chassis ground:*** ***(4R) No. 7 — Chassis ground:*** ***(4R) No. 8 — Chassis ground:*** ***(4R) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the side airbag sensor (RH). <Ref. to AB-17, Side Airbag Sensor.> When sensor replacement is not OK, replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with side airbag harness.

Q: DTC 52

DIAGNOSIS:

- Side airbag sensor (LH) is faulty.
- Side airbag harness (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

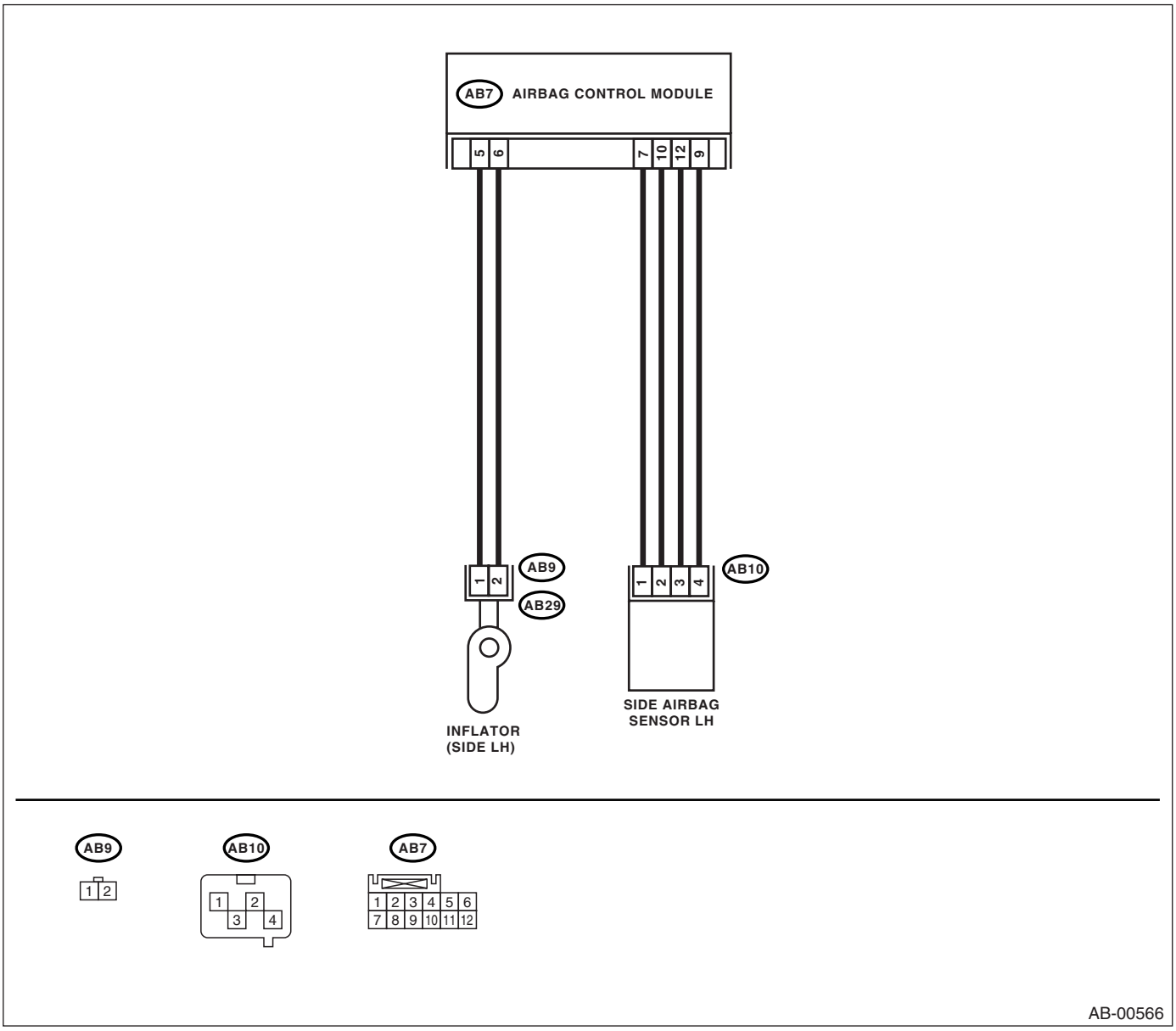
• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, seat belt pretensioner roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SIDE AIRBAG HARNESS (LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB19) from the seat belt pretensioner (LH). <Ref. to SB-8, Front Seat Belt.> 3) Disconnect the connector (AB29) from (AB9). 4) Disconnect the connector (AB7) from the airbag control module. <Ref. to AB-16, Airbag Control Module.> 5) Connect the connector (1R) in test harness R to connector (AB7). 6) Disconnect the connector (AB10) from the side airbag sensor (LH), and connect the connector (1G) in test harness G to connector (AB10). 7) Measure the resistance between connector (4R) in test harness R and connector (3G) in test harness G. ***Connector & terminal*** ***(4R) No. 3 — (3G) No. 4:*** ***(4R) No. 1 — (3G) No. 5:*** ***(4R) No. 2 — (3G) No. 1:*** ***(4R) No. 4 — (3G) No. 2:***	Is the resistance less than 10 Ω?	Go to step **2.**	Replace the body harness with side airbag harness.
2	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance between connector (4R) in test harness R and the chassis ground. ***Connector & terminal*** ***(4R) No. 3 — Chassis ground:*** ***(4R) No. 1 — Chassis ground:*** ***(4R) No. 2 — Chassis ground:*** ***(4R) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the side airbag sensor (LH). <Ref. to AB-17, Side Airbag Sensor.> When sensor replacement is not OK, replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with side airbag harness.

R: DTC 53

DIAGNOSIS:

Side airbag sensor (RH) is faulty.

When Code 53 is displayed, the circuit within the side airbag sensor (RH) is faulty. Replace the side airbag sensor (RH).

<Ref. to AB-17, Side Airbag Sensor.>

S: DTC 54

DIAGNOSIS:

Side airbag sensor (LH) is faulty.

When Code 53 is displayed, the circuit within the side airbag sensor (LH) is faulty. Replace the side airbag sensor (LH).

<Ref. to AB-17, Side Airbag Sensor.>

T: DTC 55

This code is displayed when the side airbag is deployed.

When this code is displayed, the memory cannot be erased. Replace the following parts.

- Airbag control module. <Ref. to AB-16, Airbag Control Module.>
- Front seat with side airbag module. (Operating side) <Ref. to SE-6, Front Seat.>
- Side airbag sensor. (Operating side) <Ref. to AB-17, Side Airbag Sensor.>

U: DTC 61

DIAGNOSIS:

- Seat belt pretensioner (RH) circuit is open, shorted or shorted to ground.
- Airbag control module is faulty.
- Pretensioner is faulty.
- Pretensioner harness is faulty.

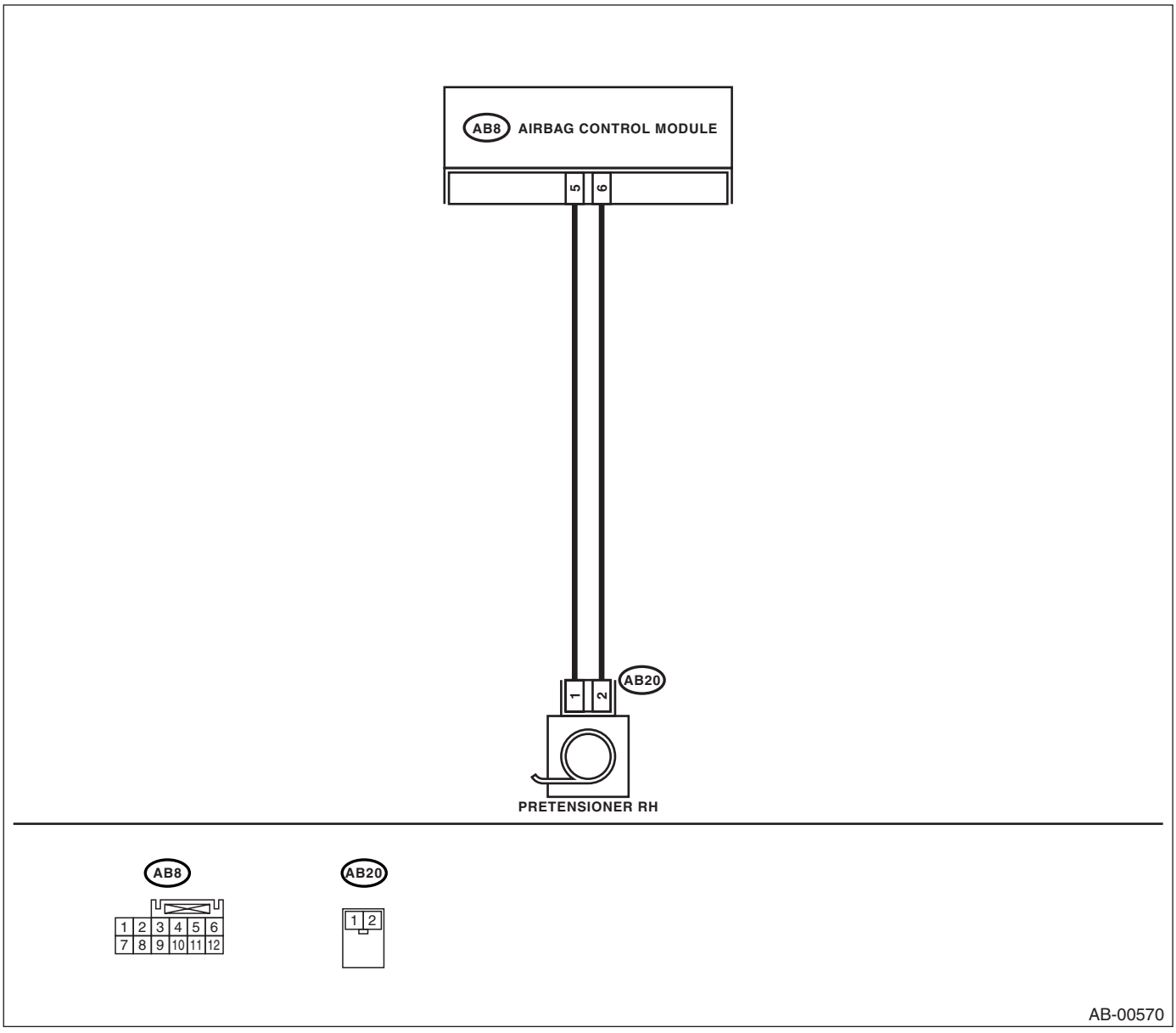
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, seat belt pretensioner roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SEAT BELT PRETENSIONER.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB20) from the seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.> 3) Connect the connector (1N) in test harness N to (AB20). 4) Connect the airbag resistor to connector (2N) in test harness N. 5) Connect the battery ground cable and turn the ignition switch to ON.	Does the airbag warning light operate properly?	Replace the seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the test harness. 3) Disconnect the connector (AB28) from (AB11). 4) Disconnect the connectors (AB7) and (AB8) from the airbag control module. <Ref. to AB-16, Airbag Control Module.> 5) Connect the connector (1R) in test harness R to connector (AB8). 6) Measure the resistance between connector (3R) in test harness R and connector (2N) in test harness N. ***Connector & terminal*** ***(3R) No. 19 — (2N) No. 1:*** ***(3R) No. 17 — (2N) No. 2:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the body harness with side airbag harness.
3	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance of the connector (3R) in test harness R. ***Connector & terminal*** ***(3R) No. 17 — (3R) No. 19:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the body harness with side airbag harness.
4	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 17 — Chassis ground:*** ***(3R) No. 19 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with side airbag harness.

V: DTC 62

DIAGNOSIS:

- Seat belt pretensioner (LH) circuit is open, shorted or shorted to ground.
- Airbag control module is faulty.
- Pretensioner is faulty.
- Pretensioner harness is faulty.

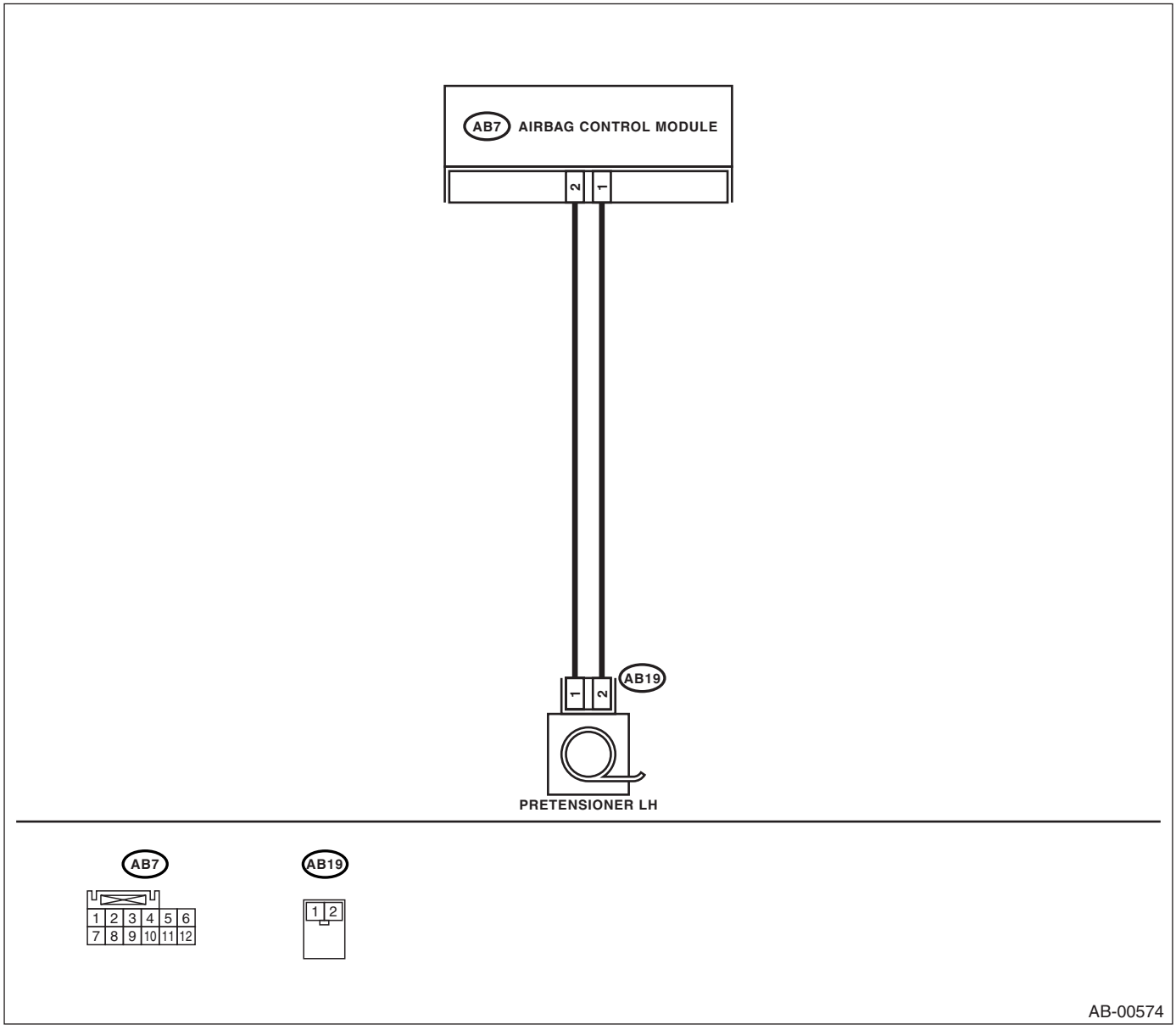
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, seat belt pretensioner roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SEAT BELT PRETENSIONER.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB19) from the seat belt pretensioner (LH). <Ref. to SB-8, Front Seat Belt.> 3) Connect the connector (1N) in test harness N to (AB19). 4) Connect the airbag resistor to the connector (2N) in test harness N. 5) Connect the battery ground cable and turn the ignition switch to ON.	Does the airbag warning light operate properly?	Replace the seat belt pretensioner (LH). <Ref. to SB-8, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the test harness. 3) Disconnect the connector (AB29) from (AB9). 4) Disconnect the connectors (AB7) and (AB8) from the airbag control module. <Ref. to AB-16, Airbag Control Module.> 5) Connect the connector (1R) in test harness R to the connector (AB7). 6) Measure the resistance between connector (3R) in test harness R and the connector (2N) in test harness N. ***Connector & terminal*** ***(3R) No. 11 — (2N) No. 2:*** ***(3R) No. 13 — (2N) No. 1:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the body harness with side airbag harness.
3	**CHECK SIDE AIRBAG HARNESS (LH).** Measure the resistance of the connector (3R) in test harness R. ***Connector & terminal*** ***(3R) No. 11 — (3R) No. 13:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the body harness with side airbag harness.
4	**CHECK SIDE AIRBAG HARNESS (LH).** Measure the resistance between the connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 11 — Chassis ground:*** ***(3R) No. 13 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with side airbag harness.

W: DTC 65

DIAGNOSIS:

- Seat belt pretensioner (RH) circuit is shorted to the power supply.
- Pretensioner is faulty.
- Pretensioner harness is faulty.
- Airbag control module is faulty.

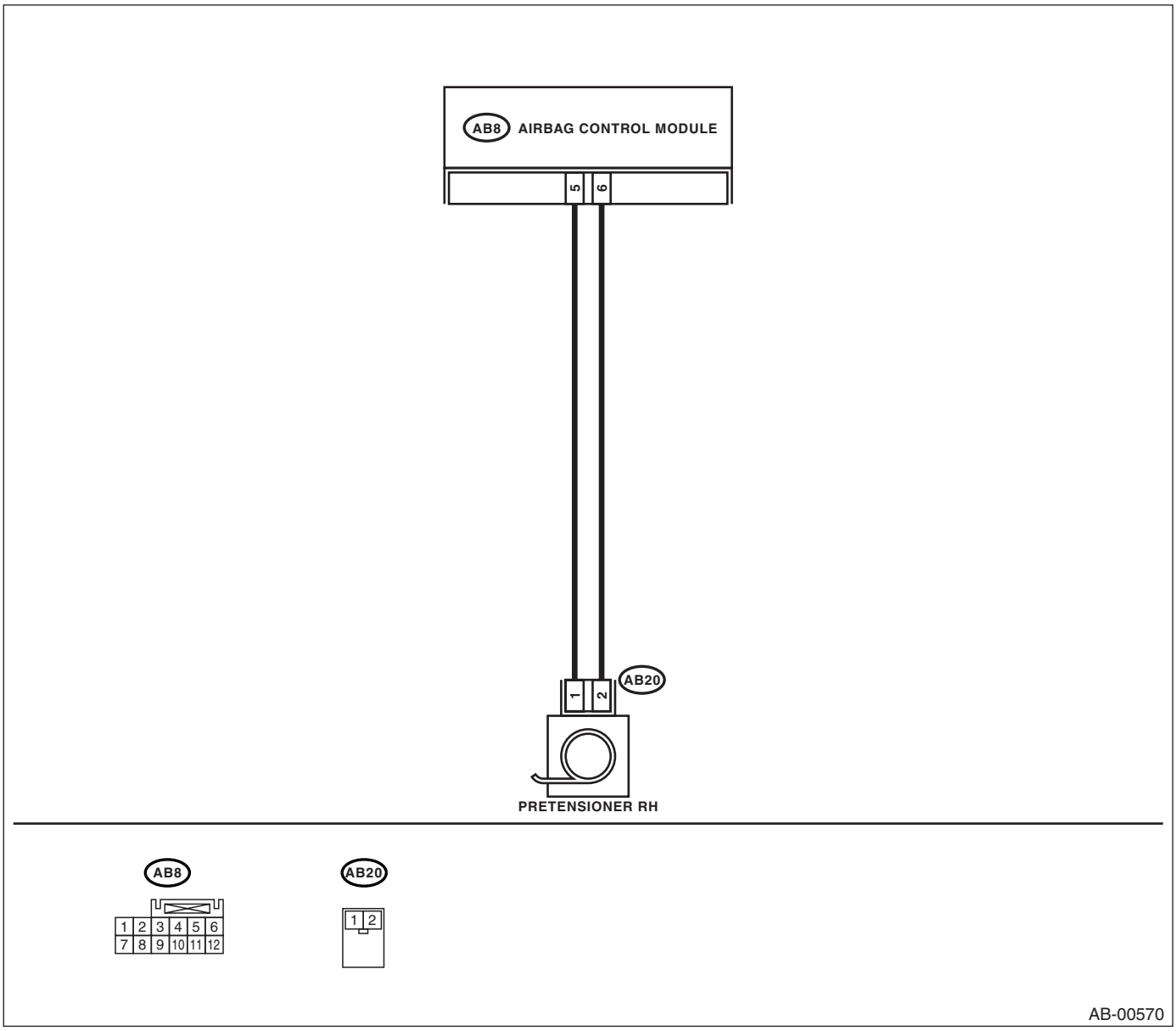
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, seat belt pretensioner roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SEAT BELT PRETENSIONER.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB20) from the seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.> 3) Connect the connector (1N) in test harness N to (AB20). 4) Connect the airbag resistor to connector (2N) in test harness N. 5) Connect the battery ground cable, and turn the ignition switch to ON.	Does the airbag warning light operate properly?	Replace the seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the test harness. 3) Disconnect the connector (AB28) from (AB11). 4) Disconnect the connectors (AB7) and (AB8) from the airbag control module. <Ref. to AB-16, Airbag Control Module.> 5) Connect the connector (1R) in test harness R to the connector (AB8). 6) Connect the battery ground cable and turn the ignition switch to ON. 7) Measure the voltage between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 17 (+) — Chassis ground (−):*** ***(3R) No. 19 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with side airbag harness.

X: DTC 66

DIAGNOSIS:

- Seat belt pretensioner (LH) circuit is shorted to the power supply.
- Pretensioner is faulty.
- Pretensioner harness is faulty.
- Airbag control module is faulty.

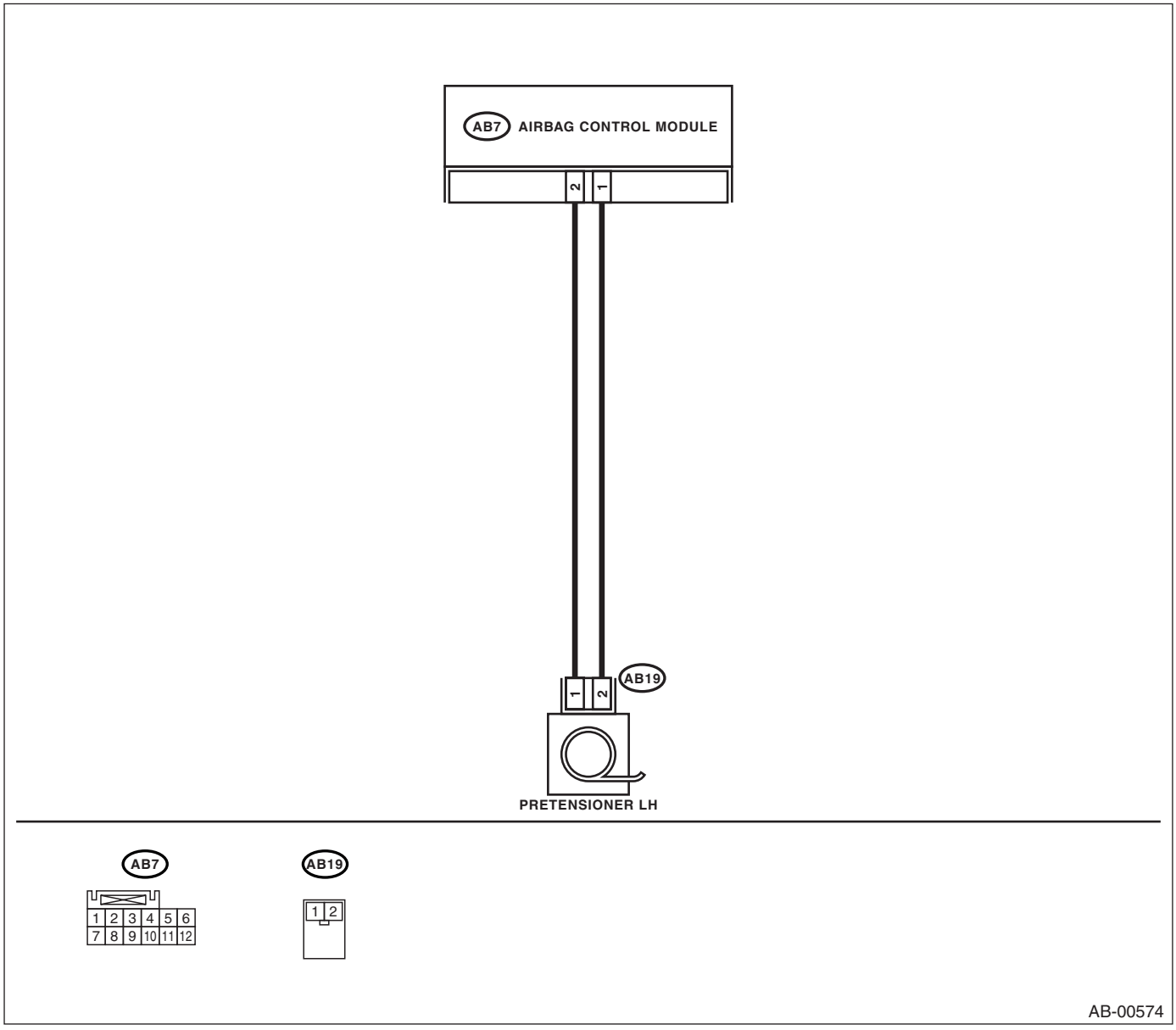
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• Before replacing the airbag module, seat belt pretensioner roll connector, control module and the sensor, reconnect each part and confirm that the warning light operates properly.

• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SEAT BELT PRETENSIONER.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB19) from the seat belt pretensioner (LH). <Ref. to SB-8, Front Seat Belt.> 3) Connect the connector (1N) in test harness N to (AB19). 4) Connect the airbag resistor to the connector (2N) in test harness N. 5) Connect the battery ground cable and turn the ignition switch to ON.	Does the airbag warning light operate properly?	Replace the seat belt pretensioner (LH). <Ref. to SB-8, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the test harness. 3) Disconnect the connector (AB29) from (AB9). 4) Disconnect the connectors (AB7) and (AB8) from the airbag control module. <Ref. to AB-16, Airbag Control Module.> 5) Connect the connector (1R) in test harness R to the connector (AB7). 6) Connect the battery ground cable and turn the ignition switch to ON. 7) Measure the voltage between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 11 (+) — Chassis ground (−):*** ***(3R) No. 13 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-16, Airbag Control Module.>	Replace the body harness with side airbag harness.

SEAT BELT SYSTEM

SB

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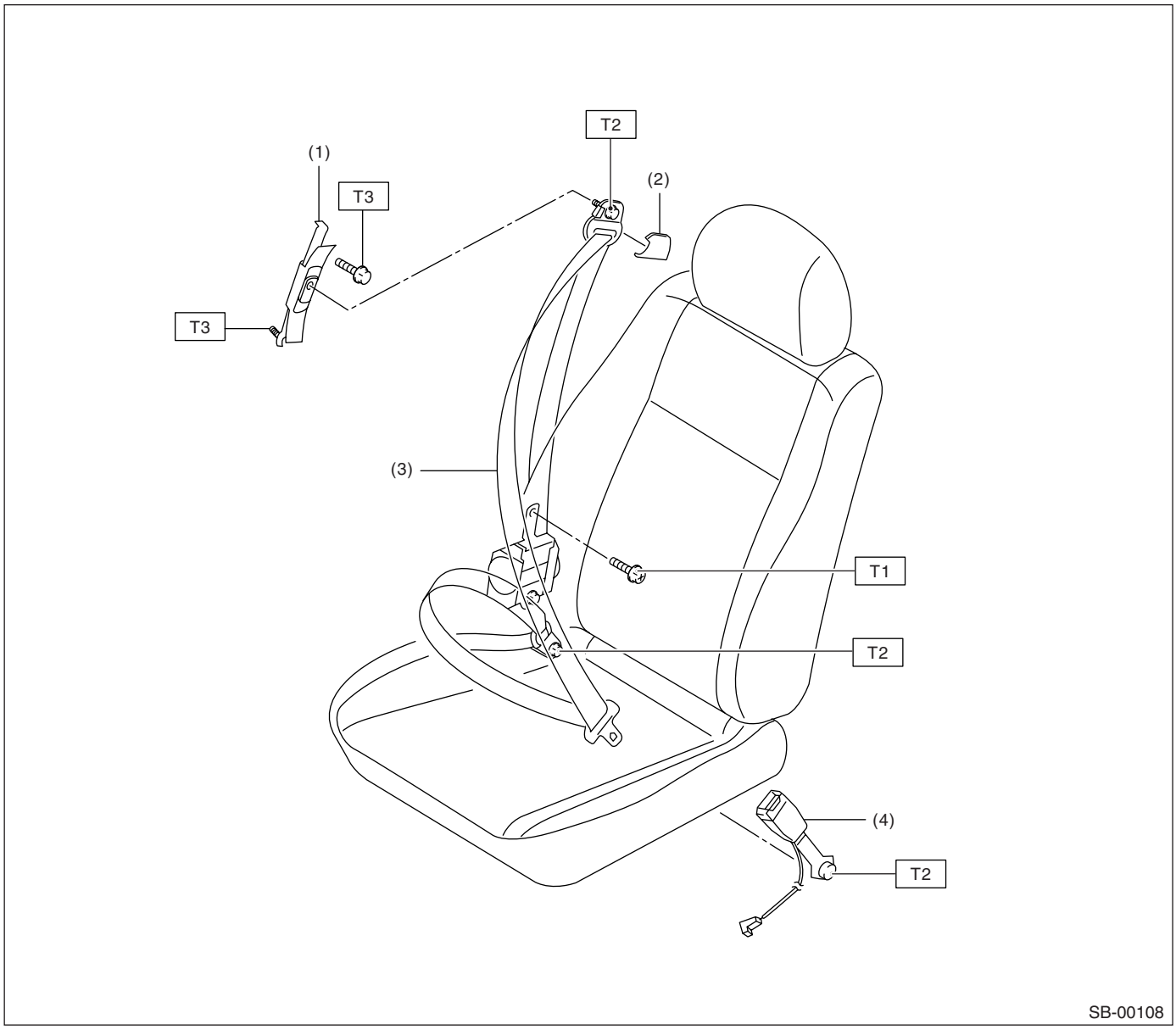
3. Inspection Locations After a Collision 7
4. Front Seat Belt 8
5. Rear Seat Belt 10

1. General Description

A: COMPONENT

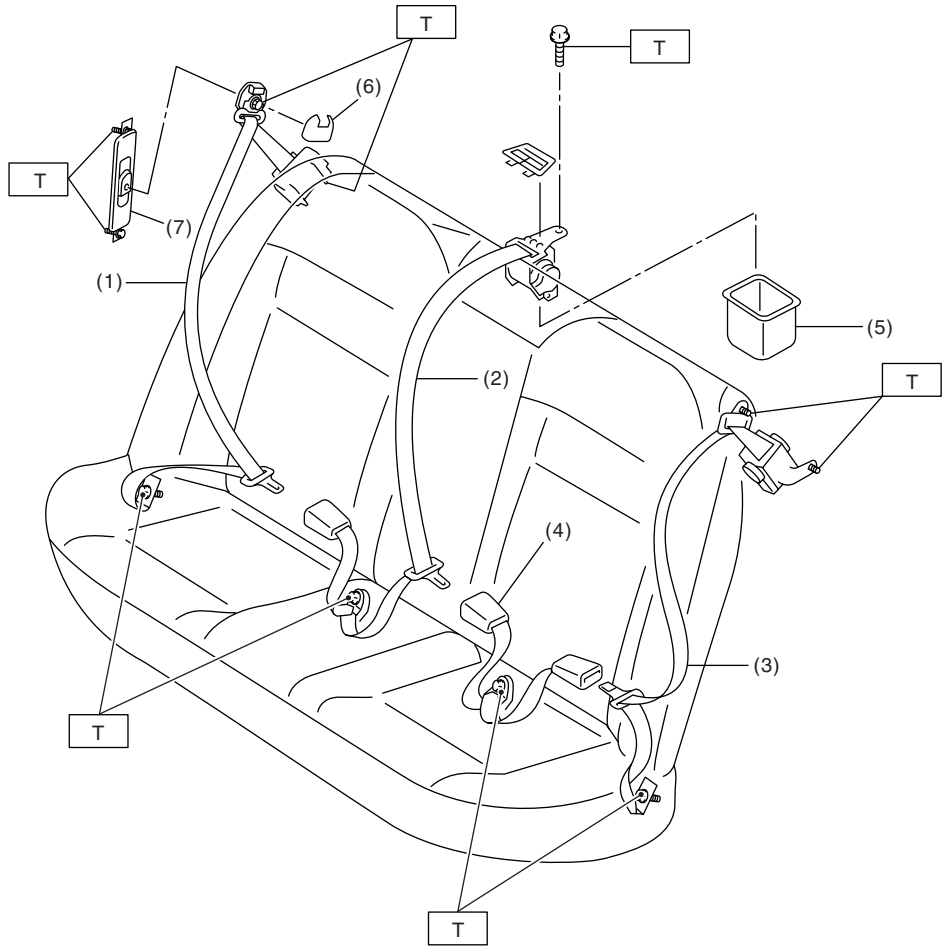
1. FRONT SEAT BELT



(1) Adjuster anchor ASSY
(2) Anchor cover
(3) Outer belt ASSY
(4) Inner belt ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 30 (3.1, 22)
T3: 53 (5.4, 39)

2. REAR SEAT BELT (SEDAN MODEL)

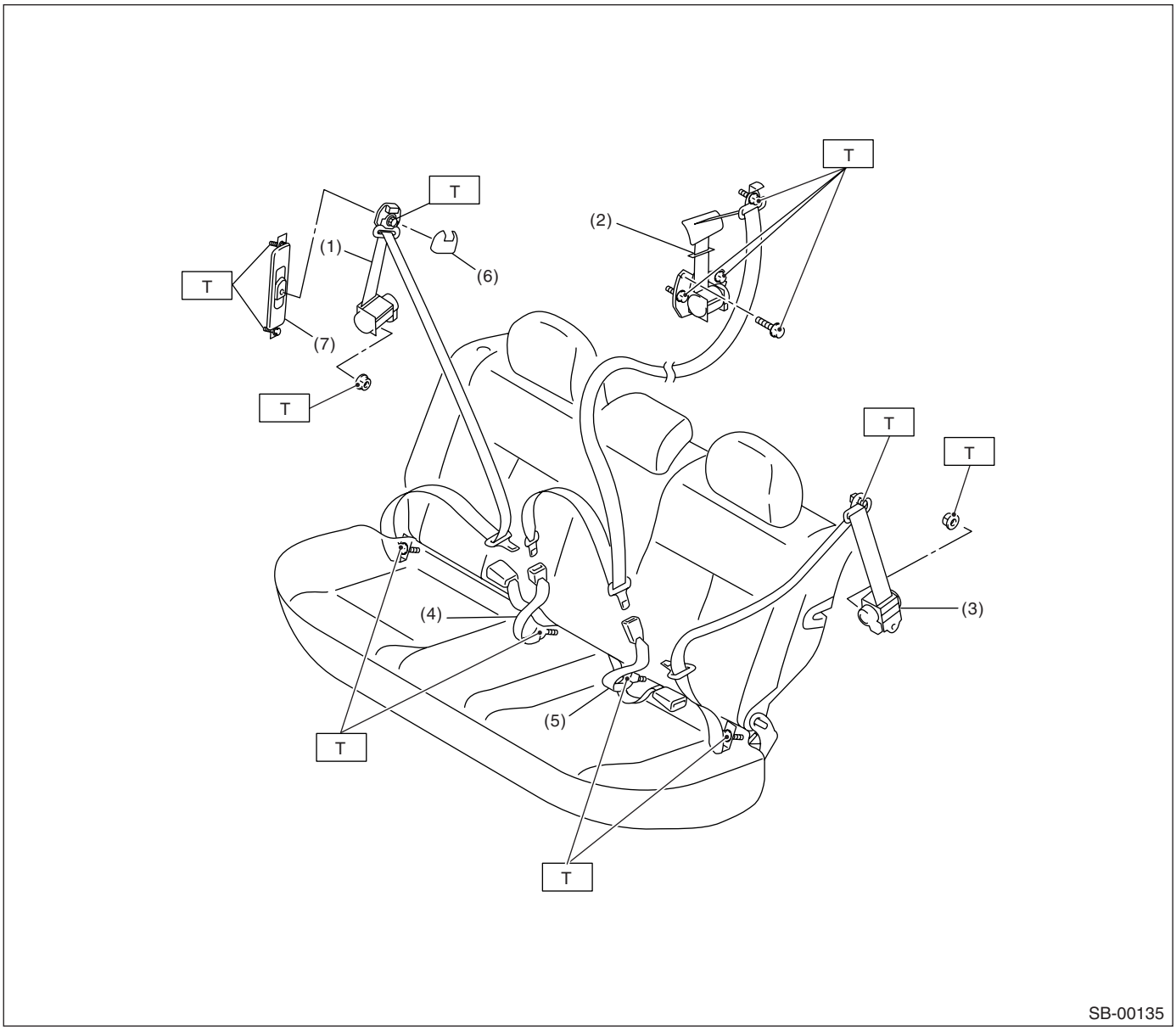


SB-00142

(1) Outer seat belt RH ASSY
(2) Shoulder seat belt CTR ASSY
(3) Outer seat belt LH ASSY
(4) Center seat belt LH ASSY
(5) Case center ELR
(6) Anchor cover
(7) Adjustable anchor ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T: 30 (3.1, 22)

3. REAR SEAT BELT (WAGON MODEL)



SB-00135

(1) Outer seat belt RH ASSY
(2) Shoulder seat belt CTR ASSY
(3) Outer seat belt LH ASSY
(4) Center seat belt RH ASSY
(5) Center seat belt LH ASSY
(6) Anchor cover
(7) Adjustable anchor ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T: 30 (3.1, 22)

B: CAUTION

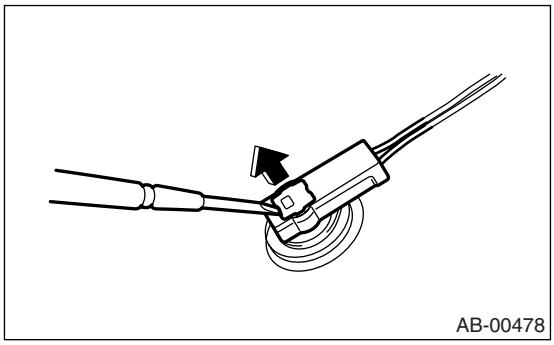
• Before starting, turn the ignition switch to OFF, disconnect the battery ground cable and wait for 20 seconds or more.
• The pretensioner system has a backup power source. The pretensioner might deploy if you do not wait for 20 seconds or more before starting work.
• Do not drop or apply any impact to the pretensioner.
• If oil, grease, or water gets on the pretensioner, wipe it off immediately with a dry cloth.
• Do not expose the pretensioner to high temperature or flame.
• Do not allow current to flow through or voltage to reach the pretensioner. Do not use a circuit tester to check resistance of the pretensioner.
• Do not disassemble or attempt to repair the pretensioner. If it is dented, cracked, or deformed, replace it with a new one.
• Do not use the airbag or pretensioner parts from other vehicles. Always replace parts with new parts.
• When handling a seat belt with a deployed pretensioner, wear gloves and goggles. Wash your hands afterwards.
• Do not re-use a seat belt with a deployed pretensioner again.
• If the material gets in your eyes or on your skin during deployment, wash it away with clean water, and then consult a doctor.

2. Pretensioner Connector

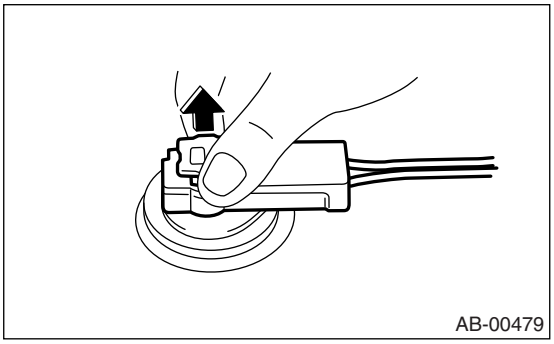
A: OPERATION

1) How to disconnect:

(1) Using a flat tip screwdriver, pry the push lock upward to unlock.



(2) Pull the connector to disconnect from retractor assembly.



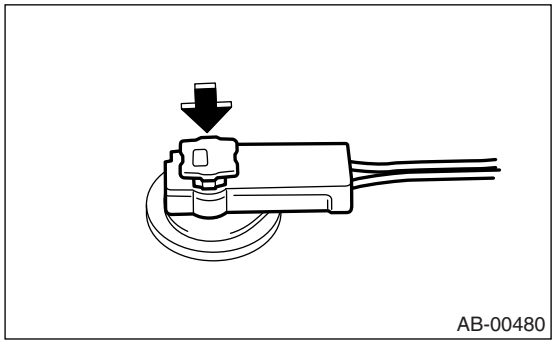
2) How to connect:

Connect the connector in reverse order of disconnecting. At this time, be sure to insert the connector in until connecting sound is heard.

CAUTION:

• Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

• At this time, be sure to insert the push lock in.



3. Inspection Locations After a Collision

A: INSPECTION

Check for the following, and then replace with new parts if necessary.

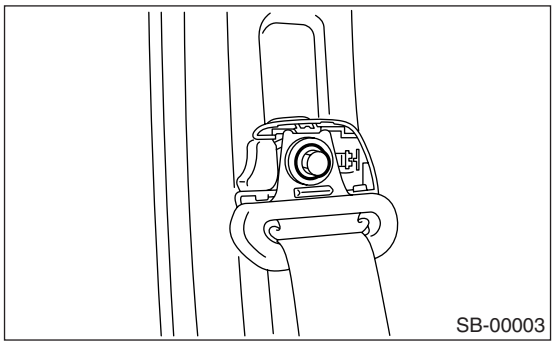
- Center pillar lower garnish is discolored or cracked.
- Wire harness and/or connector is damaged.

4. Front Seat Belt

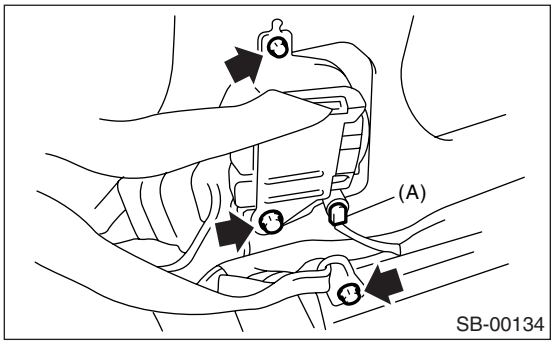
A: REMOVAL

1. FRONT OUTER BELT

1) Turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
2) Fold backrest all the way forward, and then move front seat all the way forward.
3) Remove the center pillar lower trim. <Ref. to EI-49, REMOVAL, Lower Inner Trim.>
4) Remove the anchor cover. Loosen the shoulder anchor bolt, and then detach the shoulder anchor from center pillar.

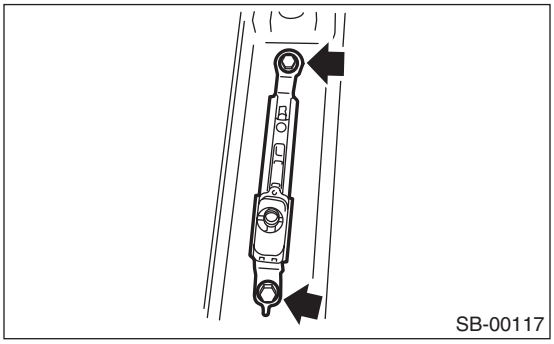

SB-00003

5) Turn over the floor mat to disconnect the connector (A) of pretensioner, and then loosen the three bolts to remove the front outer belt.



SB-00134

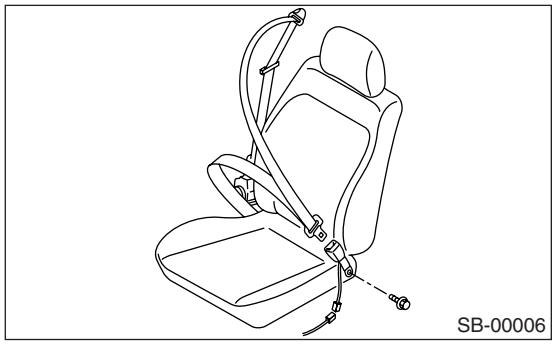
6) Remove the center pillar upper trim. <Ref. to EI-48, REMOVAL, Upper Inner Trim.>
7) Remove the two bolts and adjustable anchor assembly.


SB-00117

CAUTION:
• Do not drop or apply any impact to the pretensioner.
• Pretensioner and bracket should be treated as an assembly. Do not attempt to disassemble it.

2. FRONT INNER BELT

1) Turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
2) Remove the console box. <Ref. to EI-44, REMOVAL, Console Box.>
3) Disconnect the seat belt warning light connector under the seat.
4) Remove the clip of harness from seat rail.
5) Remove the anchor bolt, and then remove the inner belt.


SB-00006

B: INSTALLATION

1. FRONT OUTER BELT

Install in the reverse order of removal.

CAUTION:
• Parts on right and left are not identical. Before installation, make sure the correct part is used.
• Be careful not to twist the seat belts during installation.

Tightening torque:
<Ref. to SB-2, FRONT SEAT BELT, COMPONENT, General Description.>

2. FRONT INNER BELT

Install in the reverse order of removal.

Tightening torque:
<Ref. to SB-2, FRONT SEAT BELT, COMPONENT, General Description.>

C: INSPECTION

1. FRONT OUTER BELT

Check for the following, and replace with new parts if necessary.
• Pretensioner is cracked or deformed.

- Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

2. FRONT INNER BELT

Check for the following, and replace with new parts if necessary.

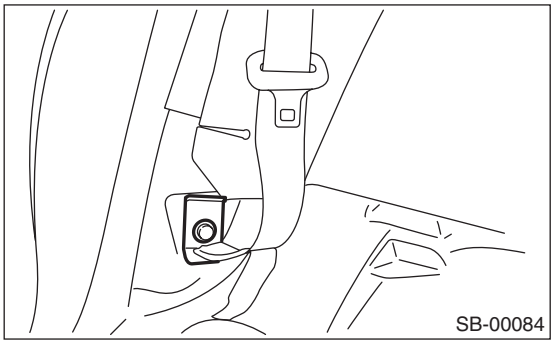
- Inner belt is deformed or damaged.
- Seat belt buckle is engaged improperly.

5. Rear Seat Belt

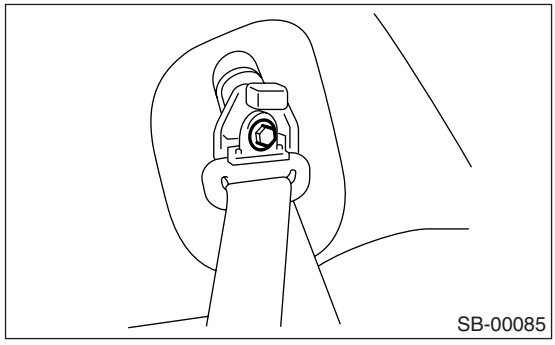
A: REMOVAL

1. OUTER BELT RH AND LH (SEDAN MODEL)

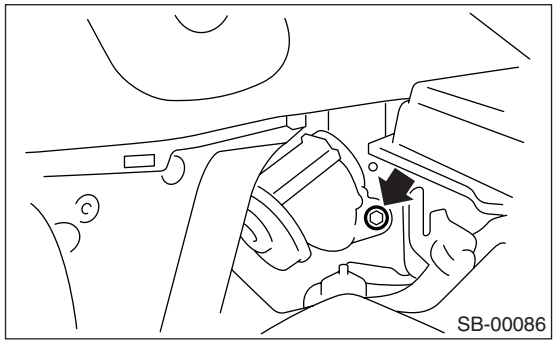
1) Remove the rear seat. <Ref. to SE-16, REMOVAL, Rear Seat.>
2) Remove the side sill rear lower cover. <Ref. to EI-49, REMOVAL, Lower Inner Trim.>
3) Remove the seat belt lower anchor bolt.


SB-00084

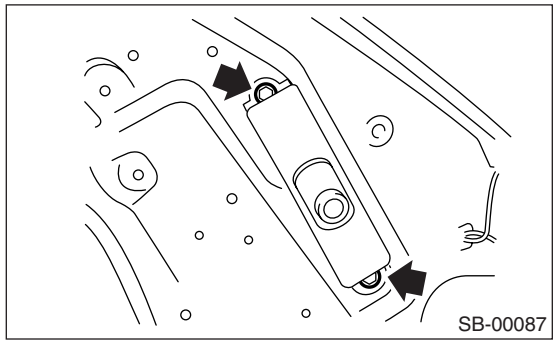
4) Remove the anchor cover. Remove the bolt and shoulder anchor from pillar.


SB-00085

5) Remove the quarter pillar trim. <Ref. to EI-50, REMOVAL, Rear Quarter Trim.>
6) Remove the bolts, and then detach the seat belt.

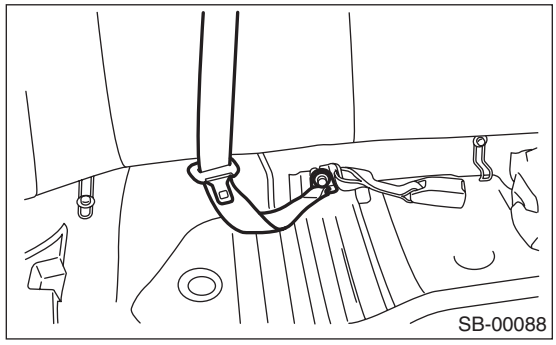

SB-00086

7) Remove the two bolts and adjustable anchor ASSY.

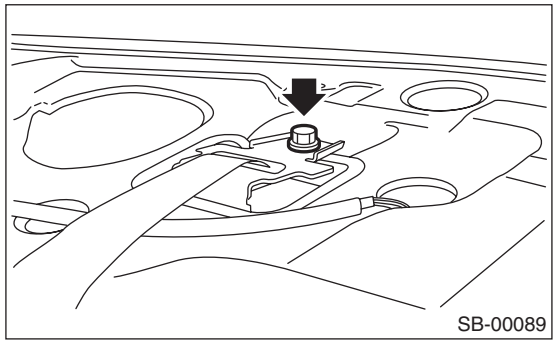

SB-00087

2. SHOULDER BELT CTR (SEDAN MODEL)

1) Remove the rear seat. <Ref. to SE-16, REMOVAL, Rear Seat.>
2) Remove the seat belt lower anchor bolt.

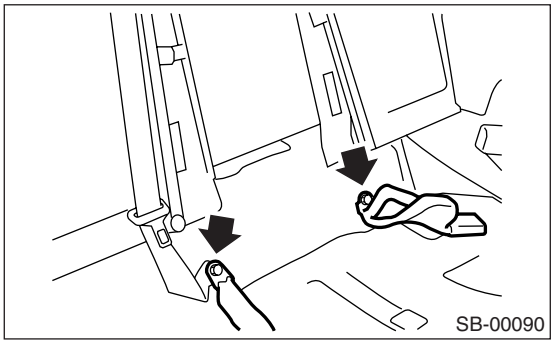

SB-00088

3) Remove the quarter pillar trim. <Ref. to EI-50, REMOVAL, Rear Quarter Trim.>
4) Remove the rear shelf trim. <Ref. to EI-55, REMOVAL, Rear Shelf Trim.>
5) Remove the bolts, and then detach the seat belt.


SB-00089

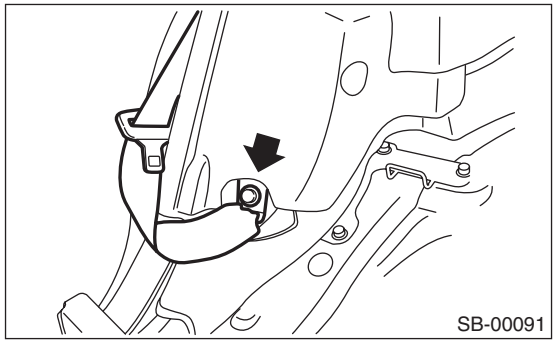
3. CENTER BELT (SEDAN MODEL)

1) Remove the rear cushion. <Ref. to SE-16, REMOVAL, Rear Seat.>
2) Remove the bolts, and then detach the inner belt.

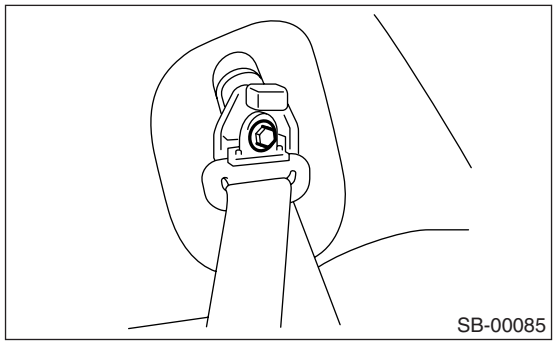


4. OUTER BELT RH AND LH (WAGON MODEL)

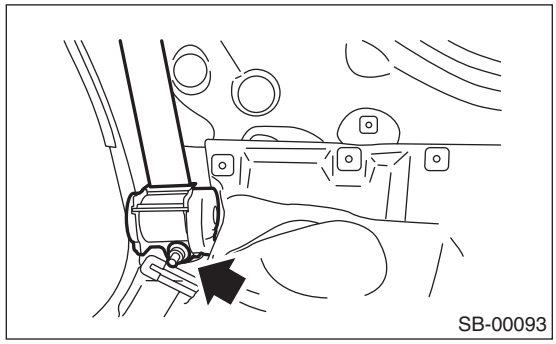
1) Remove the luggage floor mat. <Ref. to EI-58, REMOVAL, Luggage Floor Mat.>
2) Remove the rear seat. <Ref. to SE-16, REMOVAL, Rear Seat.>
3) Remove the side sill rear lower cover. <Ref. to EI-49, REMOVAL, Lower Inner Trim.>
4) Remove the seat belt lower anchor bolt.



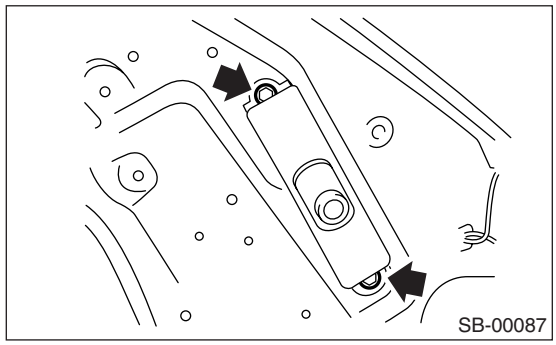
5) Remove the anchor cover. Remove the bolt and shoulder anchor from pillar.



6) Remove the rear quarter trim. <Ref. to EI-50, REMOVAL, Rear Quarter Trim.>
7) Remove the bolts, and then detach the outer belt side.

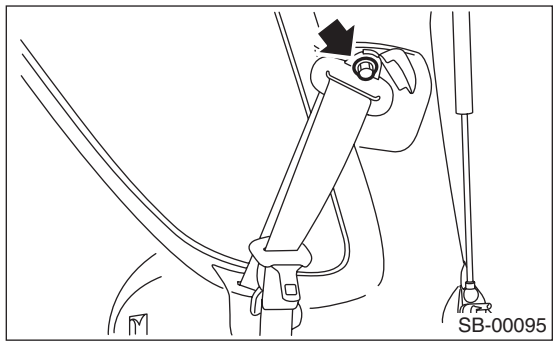


8) Remove the two bolts and adjustable anchor ASSY.



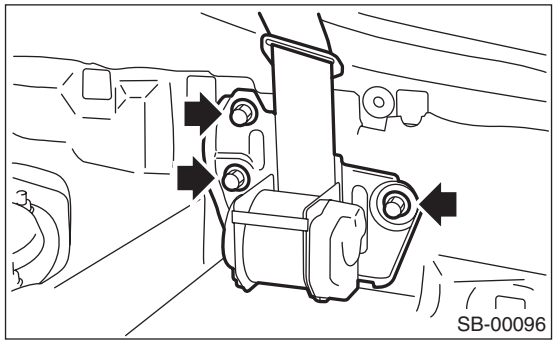
5. SHOULDER BELT CTR (WAGON MODEL)

1) Remove the shoulder anchor bolt, and then detach the shoulder anchor from quarter pillar.



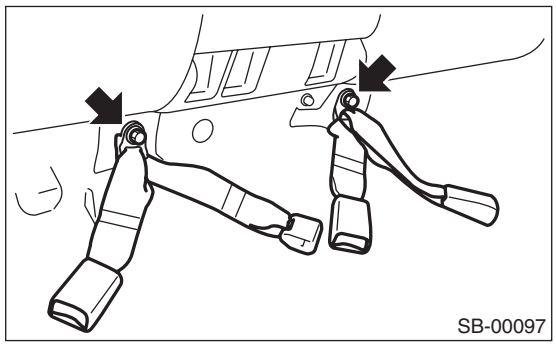
2) Remove the quarter trim. <Ref. to EI-50, REMOVAL, Rear Quarter Trim.>

3) Remove the three bolts, and then detach the outer belt center.



6. CENTER BELT (WAGON MODEL)

1) Remove the rear cushion.
2) Remove the bolt, and then detach the inner belt.



B: INSTALLATION

1. OUTER BELT RH AND LH (SEDAN MODEL)

Install in the reverse order of removal.

CAUTION:
• During installation, make sure that the seat belts are not twisted.
• After installation, make sure that the seat belts can be smoothly extended and wound.

2. SHOULDER BELT CTR (SEDAN MODEL)

Install in the reverse order of removal.

CAUTION:
• During installation, make sure that the seat belts are not twisted.
• After installation, make sure that the seat belts can be smoothly extended and wound.

3. CENTER BELT (SEDAN MODEL)

Install in the reverse order of removal.

CAUTION:
During installation, make sure that the seat belts are not twisted.

4. OUTER BELT RH AND LH (WAGON MODEL)

Install in the reverse order of removal.

CAUTION:
• During installation, make sure that the seat belts are not twisted.
• After installation, make sure that the seat belts can be smoothly extended and wound.

5. SHOULDER BELT CTR (WAGON MODEL)

Install in the reverse order of removal.

CAUTION:
• During installation, make sure that the seat belts are not twisted.
• After installation, make sure that the seat belts are smoothly extended and wound.

6. CENTER BELT (WAGON MODEL)

Install in the reverse order of removal.

CAUTION:
During installation, make sure that the seat belts are not twisted.

C: INSPECTION

1. OUTER BELT RH AND LH (SEDAN MODEL)

Check for the following, and replace with new parts if necessary.
• Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

2. SHOULDER BELT CTR (SEDAN MODEL)

Check for the following, and replace with new parts if necessary.
• Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

3. CENTER BELT (SEDAN MODEL)

Check for the following, and replace with new parts if necessary.
• Inner belt is deformed or damaged.
• Seat belt buckle is engaged improperly.

4. OUTER BELT RH AND LH (WAGON MODEL)

Check for the following, and replace with new parts if necessary.
• Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

5. SHOULDER BELT CTR (WAGON MODEL)

Check for the following, and replace with new parts if necessary.
- Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

6. CENTER BELT (WAGON MODEL)

Check for the following, and replace with new parts if necessary.
- Inner belt is deformed or damaged.
- Seat belt buckle is engaged improperly.

LIGHTING SYSTEM

LI

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26.	Trunk Room Light	29
27.	Glove Box Light	30

1. General Description

A: SPECIFICATIONS

Headlight			12 V — 55 W/60 W (Halogen)
			D2R 35W (HID)
Front turn signal light			12 V — 21 W
Clearance/Parking/Front side marker light			12 V — 5 W
Front fog light			12 V — 55 W
Rear combination light	Sedan	Tail/Stop/Rear side marker light	12 V — 5/21 W
		Tail light	12 V — 5/21 W
		Stop light	12 V — 21 W
	Wagon	Tail/Stop/Rear side marker light	12 V — 5/21 W
	Turn signal light		12 V — 21 W
	Back-up light		12 V — 21 W
License plate light			12 V — 5 W
High-mounted stop light	Sedan	Standard type	12 V — 21 W
		Rear spoiler built-in type	12 V — 1.2 W (LED)
	Wagon		12 V — 13 W
Room light			12 V — 8 W
Spot light			12 V — 8 W
Luggage room light			12 V — 13 W
Trunk room light			12 V — 5 W
Glove box light			12 V — 1.4 W

B: PRECAUTIONS

- Before disassembling or reassembling parts, always disconnect the battery ground cable. When replacing radio, control module, and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
- Reassemble in reverse order of disassembly, unless otherwise indicated.
- Adjust parts to the given specifications.
- Connect the connectors and hoses securely during reassembly.
- After reassembly, make sure functional parts operate smoothly.

WARNING:

- **Airbag system wiring harness is routed near electrical parts and switches. All airbag system wiring harnesses and connectors are yellow. Do not use electric test equipment on these circuits.**
- **Be careful not to damage the airbag system wiring harness when servicing electrical parts and switches.**

C: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Headlight and Tail Light System

A: WIRING DIAGRAM

1. HALOGEN TYPE HEADLIGHT

<Ref. to WI-133, WIRING DIAGRAM, Headlight System.>

2. HID TYPE HEADLIGHT

<Ref. to WI-133, WIRING DIAGRAM, Headlight System.>

3. CLEARANCE LIGHT AND ILLUMINATION LIGHT

<Ref. to WI-125, WIRING DIAGRAM, Clearance Light and Illumination Light System.>

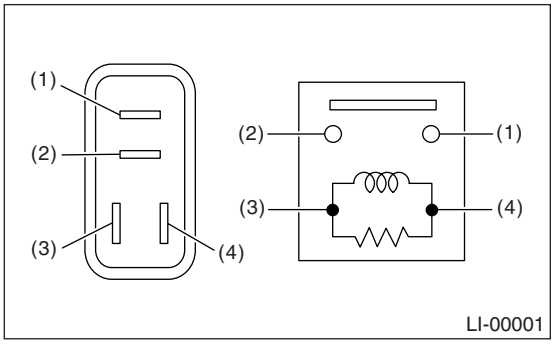
B: INSPECTION

1. HEADLIGHT SWITCH

<Ref. to LI-9, INSPECTION, Combination Switch (Light).>

2. HEADLIGHT RELAY

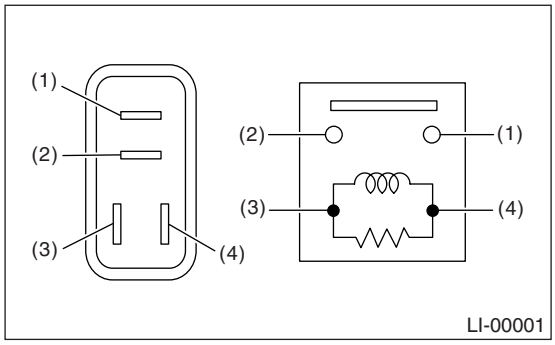
Measure the headlight relay resistance between terminals when connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.



Current	Terminal No.	Standard
Flow	1 and 2	Less than 1 Ω
No flow		More than 1 MΩ

3. TAIL AND ILLUMINATION RELAY

Measure the tail and illumination relay resistance between terminals when connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.



Current	Terminal No.	Standard
Flow	1 and 2	Less than 1 Ω
No flow		More than 1 MΩ

3. Front Fog Light System

A: WIRING DIAGRAM

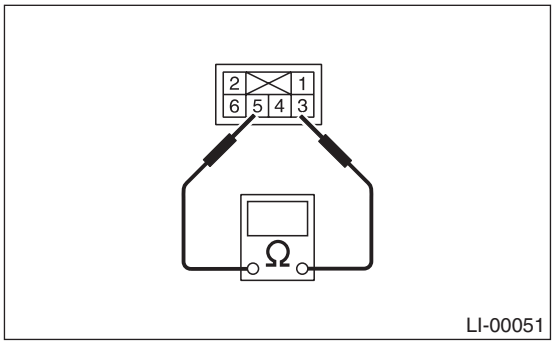
1. FRONT FOG LIGHT

<Ref. to WI-131, WIRING DIAGRAM, Front Fog Light System.>

B: INSPECTION

1. FRONT FOG LIGHT SWITCH

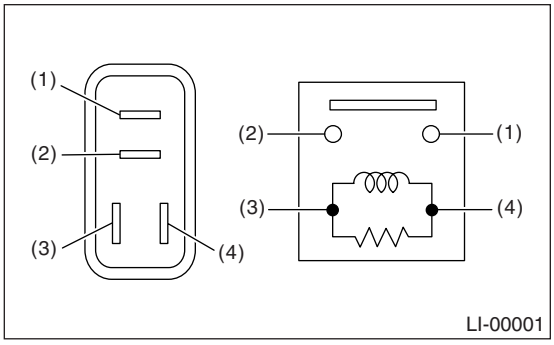
Measure the front fog light switch resistance.



Switch position	Terminal No.	Standard
OFF	3 and 5	More than 1 MΩ
ON		Less than 1 Ω

2. FRONT FOG LIGHT RELAY

Measure the front fog light relay resistance between terminals when connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.



Current	Terminal No.	Standard
Flow	1 and 2	Less than 1 Ω
No flow		More than 1 MΩ

4. Turn Signal and Hazard Light System

A: WIRING DIAGRAM

1. TURN SIGNAL LIGHT AND HAZARD LIGHT

<Ref. to WI-140, WIRING DIAGRAM, Turn Signal Light and Hazard Light System.>

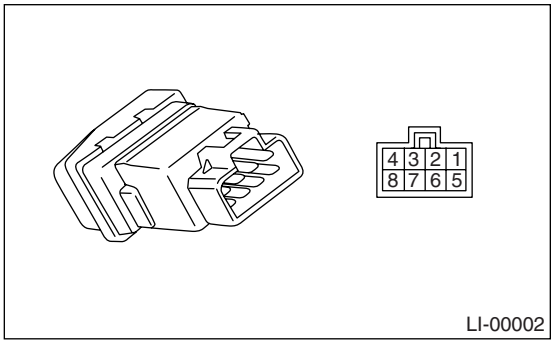
B: INSPECTION

1. TURN SIGNAL SWITCH

<Ref. to LI-9, INSPECTION, Combination Switch (Light).>

2. HAZARD SWITCH

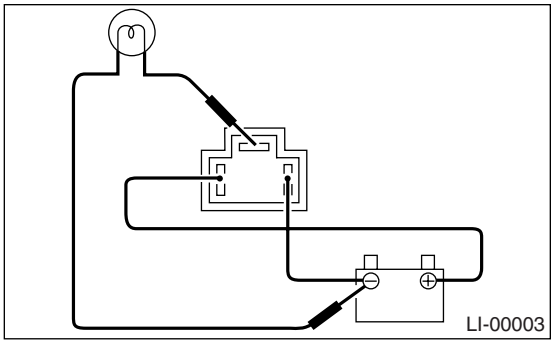
Measure the hazard switch resistance.



Switch position	Terminal No.	Standard
OFF	6 and 7	Less than 1 Ω
ON	1, 3 and 4	Less than 1 Ω
	7 and 8	Less than 1 Ω

3. TURN SIGNAL AND HAZARD MODULE

Connect the battery and turn signal light bulb to the module, as shown in the figure. The module is properly functioning if it blinks when power is supplied to the circuit.



5. Back-up Light System

A: WIRING DIAGRAM

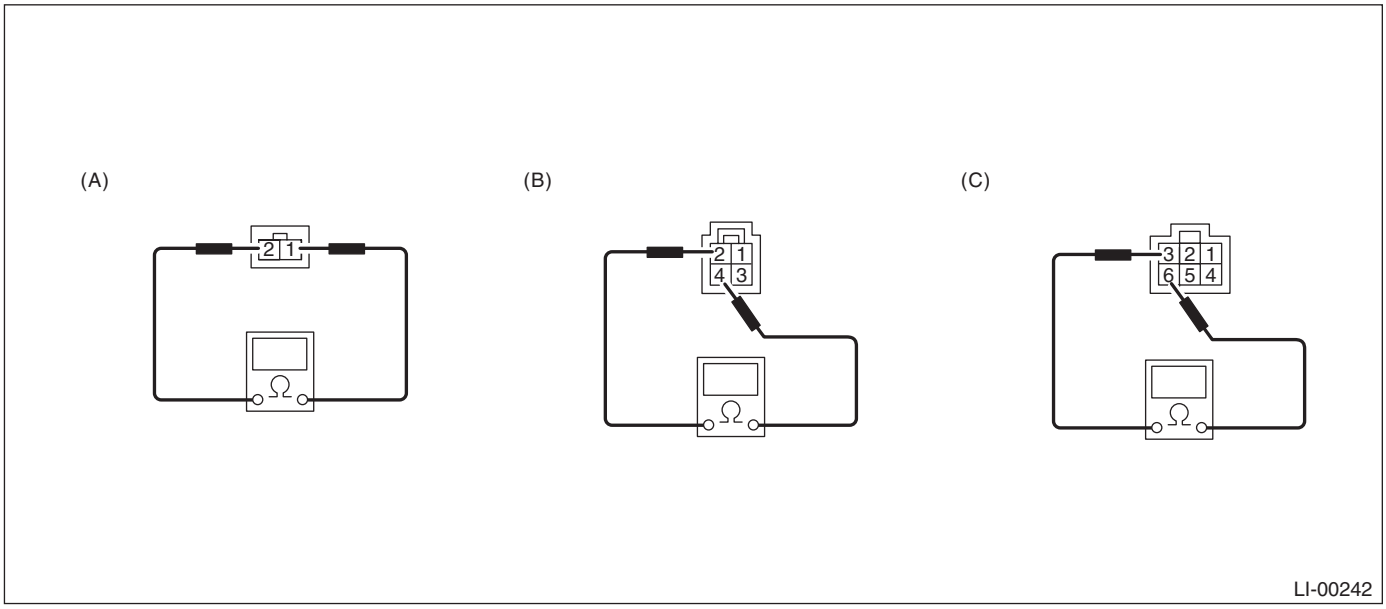
1. BACK-UP LIGHT

<Ref. to WI-124, WIRING DIAGRAM, Back-up Light System.>

B: INSPECTION

1. BACK-UP LIGHT SWITCH (MT MODEL)

Measure the back-up light switch resistance.

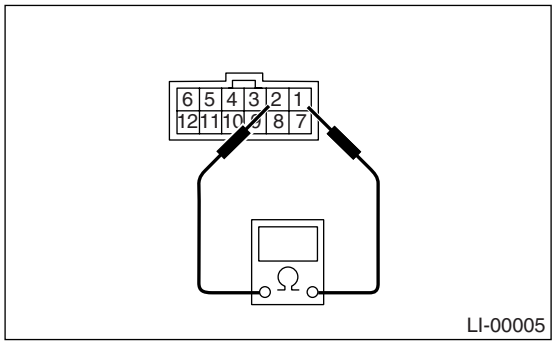


(A) Non-turbo model (B) Turbo model (Except STi model) (C) Turbo model (STi model)

Switch position	Terminal No.	Standard
When shift lever is set in reverse position	Turbo model (Except STi model): 2 and 4 Turbo model (STi model): 3 and 6 Non-turbo model: 1 and 2	Less than 1 Ω
Other positions		More than 1 MΩ

2. INHIBITOR SWITCH (AT MODEL)

Measure the inhibitor switch resistance.



Switch position	Terminal No.	Standard
When select lever is set in “R” range	1 and 2	Less than 1 Ω
Other positions		More than 1 MΩ

6. Stop Light System

A: WIRING DIAGRAM

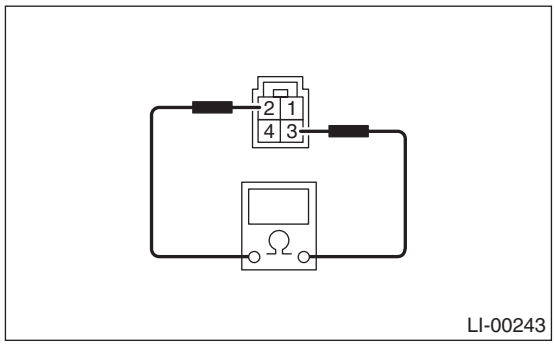
1. STOP LIGHT

<Ref. to WI-139, WIRING DIAGRAM, Stop Light System.>

B: INSPECTION

1. STOP LIGHT SWITCH

Measure the stop light switch resistance.



Switch position	Terminal No.	Standard
When brake pedal is depressed	2 and 3	Less than 1 Ω
When brake pedal is released		More than 1 MΩ

7. Interior Light System

A: WIRING DIAGRAM

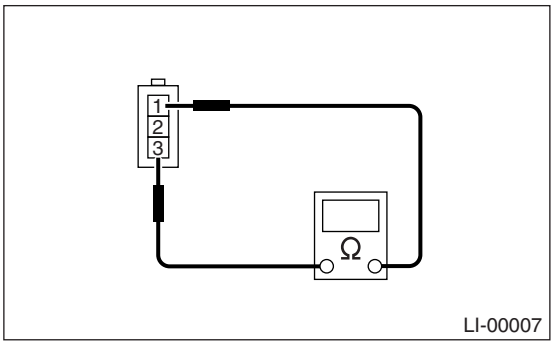
1. INTERIOR LIGHT

<Ref. to WI-137, WIRING DIAGRAM, In Compartment Light System.>

B: INSPECTION

1. DOOR SWITCH

Measure the door switch resistance.



Switch position	Terminal No.	Standard
When door is opened	1 and 3	Less than 1 Ω
When door is closed		More than 1 MΩ

2. REAR GATE LATCH SWITCH

Measure the rear gate latch switch resistance.

Switch position	Terminal No.	Standard
When rear gate is opened	1 and 2	Less than 1 Ω
When rear gate is closed		More than 1 MΩ

3. TRUNK ROOM LIGHT SWITCH

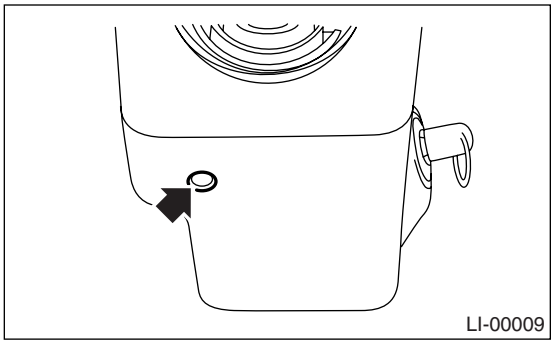
Measure the trunk room light switch resistance.

Switch position	Terminal No.	Standard
When trunk lid is opened	1 and 2	Less than 1 Ω
When trunk lid is closed		More than 1 MΩ

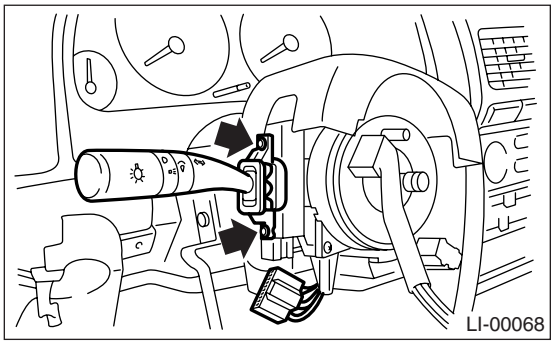
8. Combination Switch (Light)

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover. <Ref. to EI-45, REMOVAL, Instrument Panel Assembly.>
3) Remove the screws which secure the upper column cover to lower column cover.



4) Disconnect the connector from combination switch.
5) Remove the screws which secure the switch, and then remove the switch.

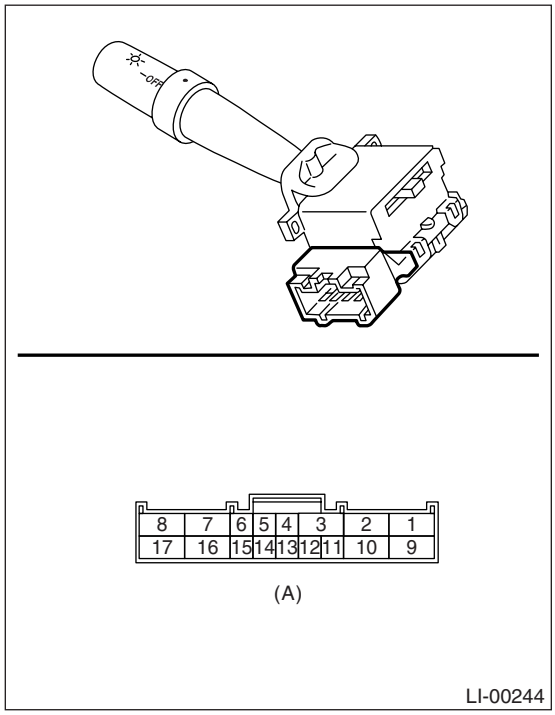


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the combination switch resistance.



(A) Lighting and turn signal switch connector

1. LIGHTING SWITCH

Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
Tail	14 and 16	Less than 1 Ω
Head	13, 14 and 16	Less than 1 Ω

2. DIMMER AND PASSING SWITCH

Switch position	Terminal No.	Standard
Passing	7, 8 and 16	Less than 1 Ω
Low beam	16 and 17	Less than 1 Ω
High beam	7 and 16	Less than 1 Ω

3. TURN SIGNAL SWITCH

Switch position	Terminal No.	Standard
Left	1 and 2	Less than 1 Ω
Neutral	—	More than 1 MΩ
Right	2 and 3	Less than 1 Ω

9. Headlight Beam Leveler System

A: WIRING DIAGRAM

1. HEADLIGHT BEAM LEVELER

<Ref. to WI-119, WIRING DIAGRAM, Headlight Beam Leveler System.>

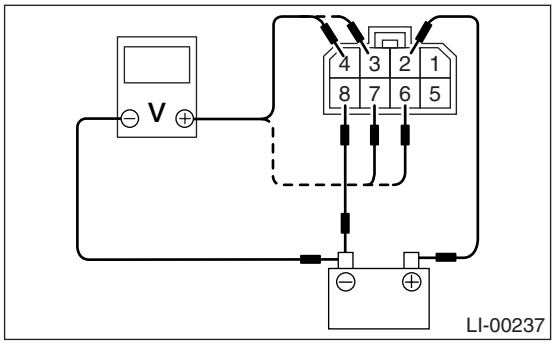
B: INSPECTION

1. HEADLIGHT BEAM LEVELER ACTUATOR

1) Turn on the headlights.
2) Confirm the headlight beam level is lowered by changing the switch position to 0 - 1 - 2 - 3.

2. HEADLIGHT BEAM LEVELER SWITCH

Connect the battery, headlight beam leveler switch connector and circuit tester as shown in the figure. Measure the voltage at each switch position.

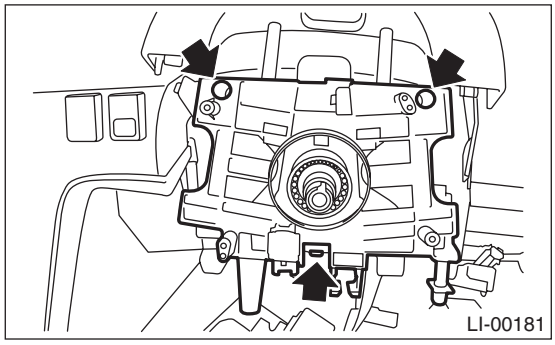


Switch position	Terminal No.	Standard
0	7 (+) and battery (–)	Battery voltage
1	6 (+) and battery (–)	Battery voltage
2	3 (+) and battery (–)	Battery voltage
3	4 (+) and battery (–)	Battery voltage

10.Combination Base Switch Assembly

A: REMOVAL

1) Remove the driver's airbag module. <Ref. to AB-12, REMOVAL, Driver's Airbag Module.>
2) Remove the steering wheel. <Ref. to PS-16, REMOVAL, Steering Wheel.>
3) Remove the steering column cover.
4) Remove the combination switch. <Ref. to LI-9, REMOVAL, Combination Switch (Light).> and <Ref. to WW-6, REMOVAL, Combination Switch (Wiper).>
5) Loosen the four screws and remove the roll connector.
6) Loosen the three screws.



7) Disconnect the connector and remove the combination base switch assembly.

B: INSTALLATION

1) Install in the reverse order of removal.
2) Align the attaching direction of roll connector with the steering wheel, before installation of steering wheel. <Ref. to AB-18, ADJUSTMENT, Roll Connector.>

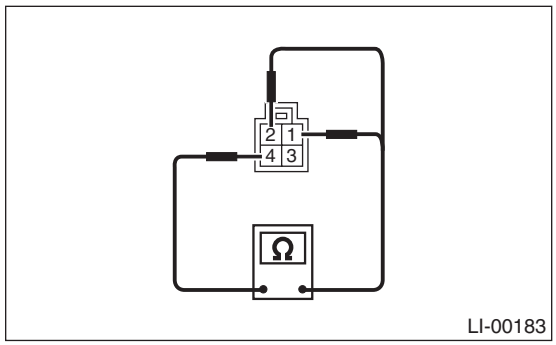
C: INSPECTION

1. COMBINATION BASE SWITCH ASSEMBLY

Perform the inspection for the following items and replace with a new one, if any damage is found.
- Crack or deformation of combination base switch assembly or roll connector

2. PARKING SWITCH

Measure the parking switch resistance.

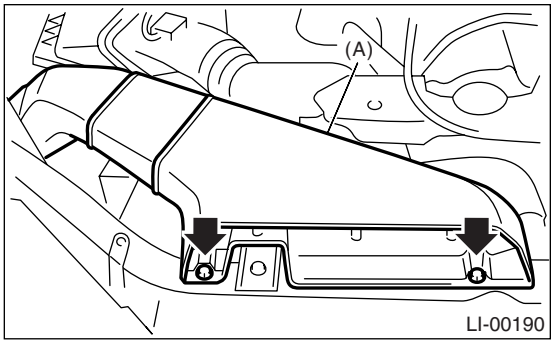


Switch position	Terminal No.	Standard
OFF	2 and 4	Less than 1 Ω
ON	1 and 4	Less than 1 Ω

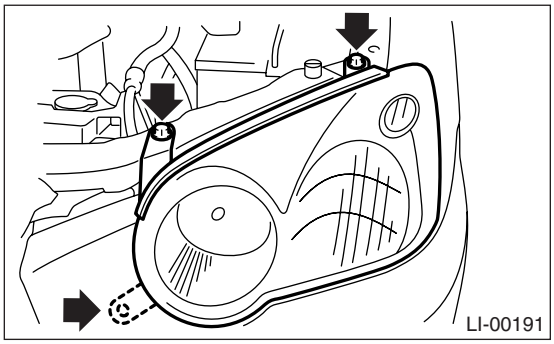
11.Headlight Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the duct (A) (when right side headlight is removed).



3) Remove the front grille and bumper upper clips. <Ref. to EI-19, REMOVAL, Front Grille.>
4) Disconnect each harness connector.
5) Remove the three bolts and disengage the clips, and then detach the headlight assembly.



B: INSTALLATION

Install in the reverse order of removal.

C: ADJUSTMENT

1. HEADLIGHT AIMING

CAUTION:
Turn off the light before adjusting headlight aiming. If the light is necessary to check aiming, do not turn on for more than 2 minutes.

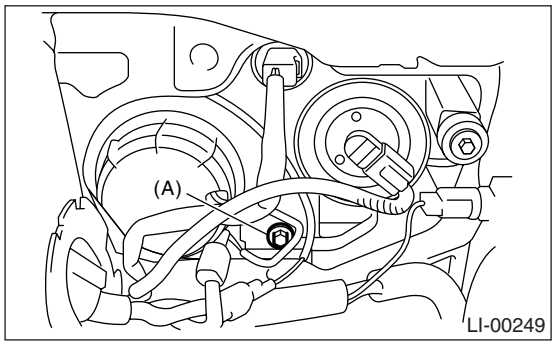
NOTE:
Before checking the headlight aiming, be sure of the following:

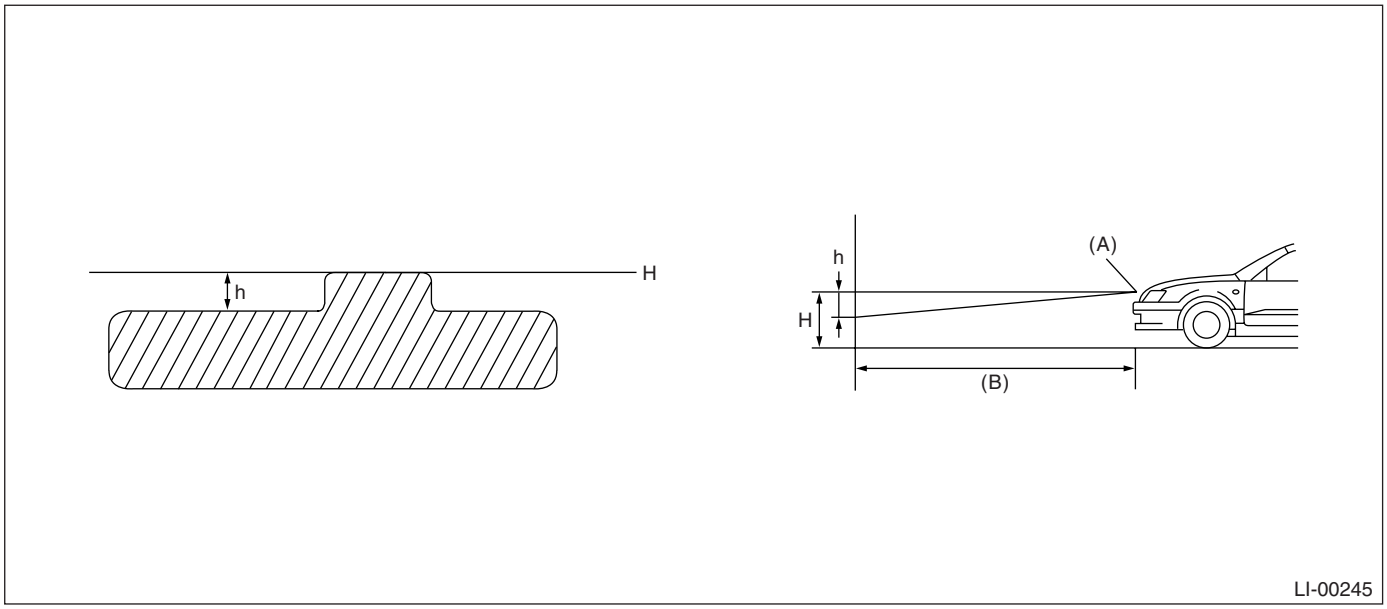
- The area around the headlight has not sustained any accident, damage or other type of deformation.
- Vehicle is parked on level ground.
- The inflation pressure of tires is correct.
- Vehicle's gas tank is fully charged.
- Bounce the vehicle several times to normalize the suspension.
- Make certain that someone is seated in the driver's seat.

Turn the headlights on and then adjust the low beam pattern to the following positions on the screen.

NOTE:

- Position the headlight beam leveler switch to "0".
- Rotate the adjusting screw (A) to adjust aim.





(A) Bulb center marking (B) 3 m (10 ft)

H mm (in)				h mm (in) at 3 m (10 ft)
Sedan		Wagon		
STi	RS, WRX	TS, WRX	OUTBACK	
629 (24.76)	639 (25.16)	639 (25.16)	649 (25.55)	21 (0.83)

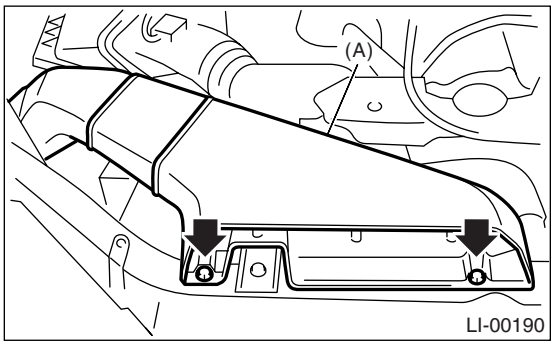
12.Headlight Bulb

A: REMOVAL

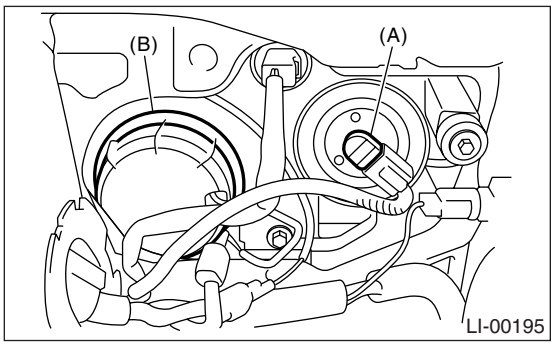
1. HIGH BEAM AND HALOGEN TYPE LOW BEAM

CAUTION:
• Because the tungsten halogen bulb operates at a high temperature, dirt and oil on the bulb surface reduces the bulb's service life. Hold the flange portion when replacing the bulb. Never touch the glass portion.
• Do not leave the headlight without a bulb for a long time. Dust, moisture, etc. entering the headlight may affect its performance.

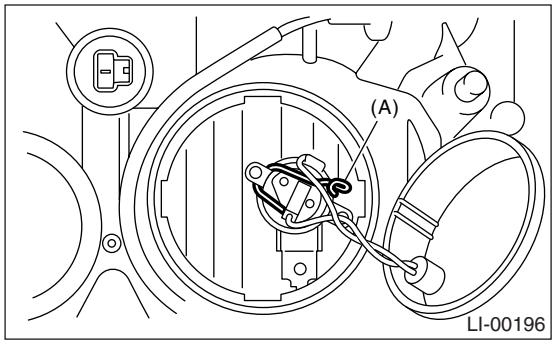
1) Disconnect the ground cable from battery.
2) Remove the air intake duct (A) (when right side headlight bulb is removed).



3) Disconnect the harness connector.
4) Remove the bulb ASSY (A): high beam. To remove the low beam, remove the back cover (B), and then go to Step 5.



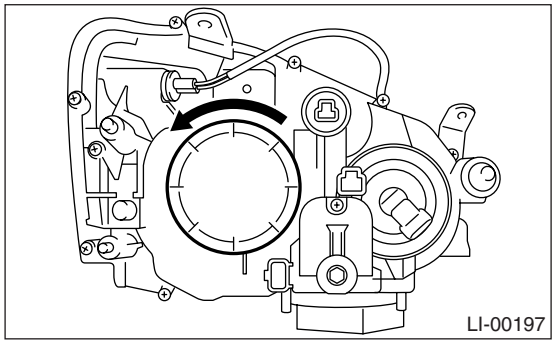
5) Remove the light bulb retaining spring (A) to remove the bulb.



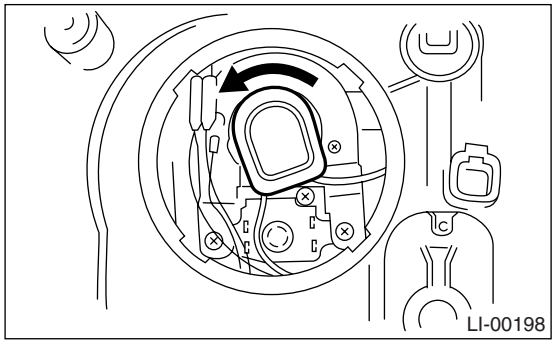
2. HID TYPE LOW BEAM

CAUTION:
• Do not operate with wet hands.
• As the lightening circuit uses high voltage, be sure to confirm that the power supply is turned off before operation.
• When replacing the bulb, hold the flange portion and never touch the glass portion.
• Do not leave the headlight without a bulb for a long time. Dust, and moisture, etc. entering the headlight may affect its performance.

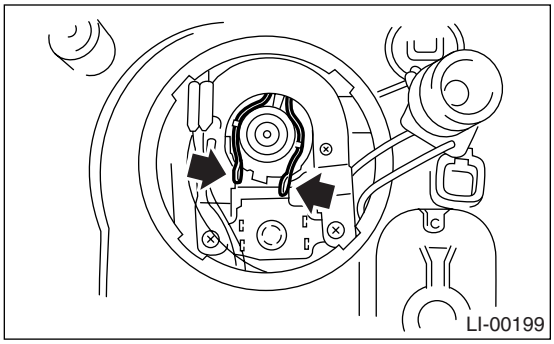
1) Remove the ground cable from battery.
2) Remove the headlight assembly. <Ref. to LI-14, HID TYPE LOW BEAM, REMOVAL, Headlight Bulb.>
3) Remove the back cover.



4) Disconnect the harness connector.



5) Remove the light bulb retaining spring, and then remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Attach the rubber cap with letters TOP on the top so the drain hole will be on the lower side.

C: INSPECTION

1. HALOGEN TYPE

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

2. HID TYPE

CAUTION:
- **Do not operate with wet hands.**
- **Do not touch the harness, inner headlight, or any metallic portion of the headlight when the light is illuminated (when the lighting switch is turned on).**
- **When performing a lighting test, make sure that the headlight is mounted on the vehicle, and the power supply is connected to the connector on the vehicle's side.**

1) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
2) Use a normal HID bulb for headlight lighting test.
3) If the headlight does not illuminate, replace the bulb with a new one. <Ref. to LI-15, DISPOSAL, Headlight Bulb.>

D: DISPOSAL

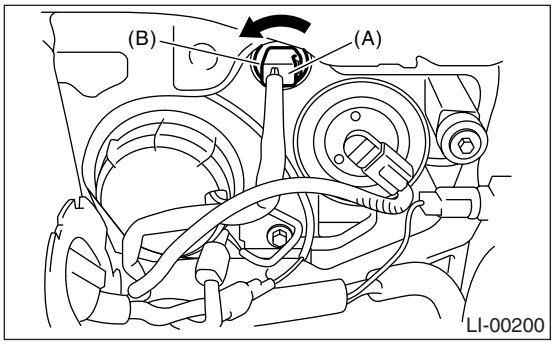
1. HID TYPE

CAUTION:
HID type light bulb contains mercury. Dispose the bulb according to regional regulation and contact SOA Service Center.

13.Front Turn Signal Light Bulb

A: REMOVAL

Disconnect the harness connector (A), and then turn the socket (B) and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

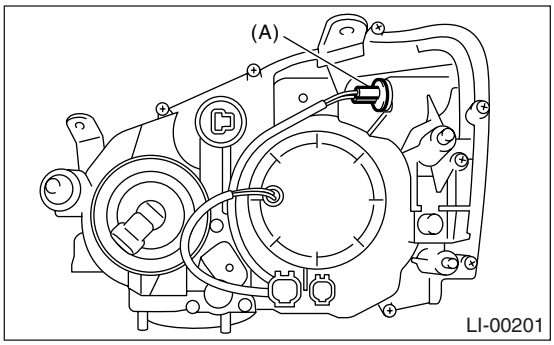
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

14. Clearance/Parking/Front Side Marker Light Bulb

A: REMOVAL

1) Remove the headlight assembly. <Ref. to LI-12, REMOVAL, Headlight Assembly.>
2) Turn the socket (A) and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

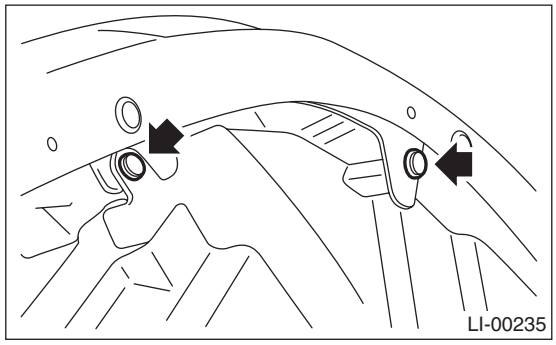
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

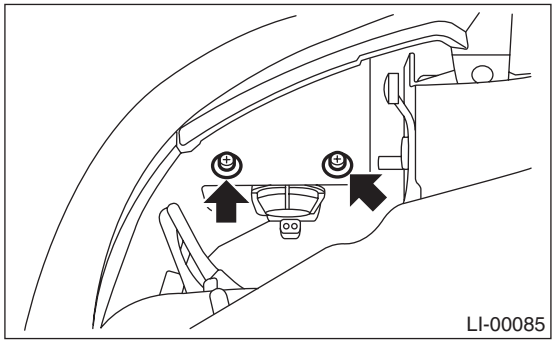
15.Front Fog Light Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Disengage two clips, and then turn over the lower mad guard.



3) Disconnect the harness connector.
4) Remove the mounting bolts, and then remove the fog light assembly.



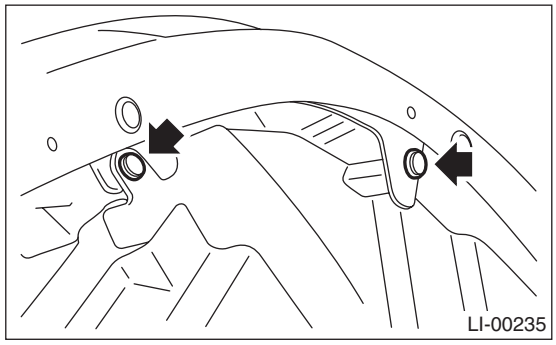
B: INSTALLATION

Install in the reverse order of removal.

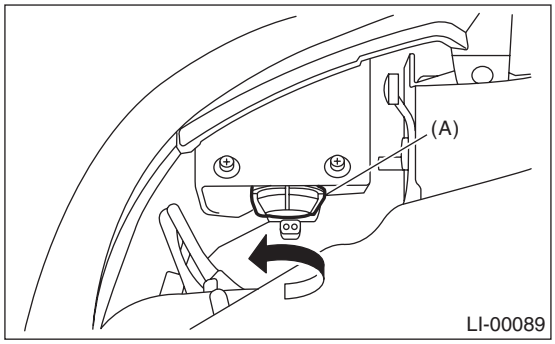
16.Front Fog Light Bulb

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove two clips, and then turn over the lower mad guard.



3) Remove the harness connector.
4) Remove the back cover (A).



5) Remove the spring retainer, and then detach the fog light bulb.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

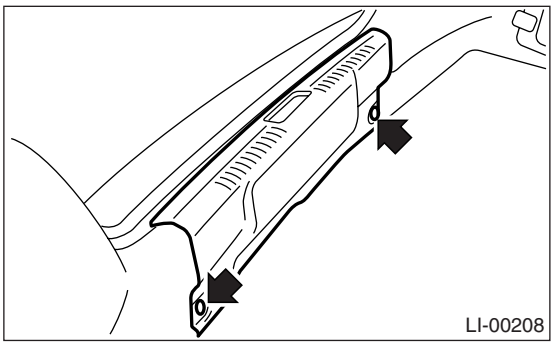
1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

17. Rear Combination Light Assembly

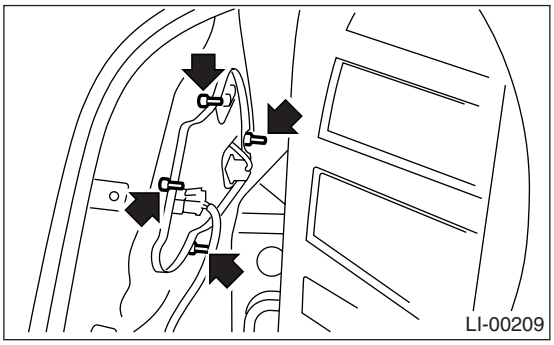
A: REMOVAL

1. SEDAN

1) Disconnect the ground cable from battery.
2) Remove the clips, and then detach the trunk rear trim.

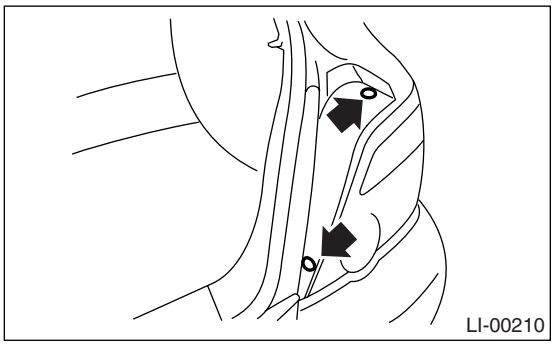


3) Remove the trunk side trim of rear portion.
4) Remove the four nuts, and then detach the rear combination light while disconnecting connector.

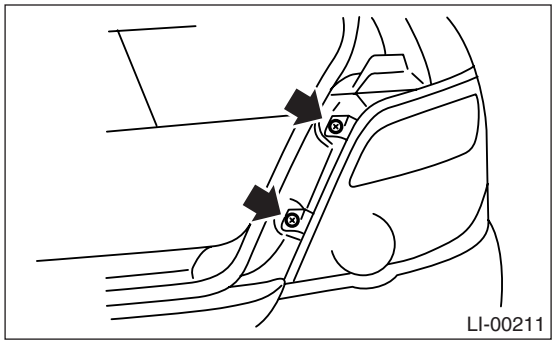


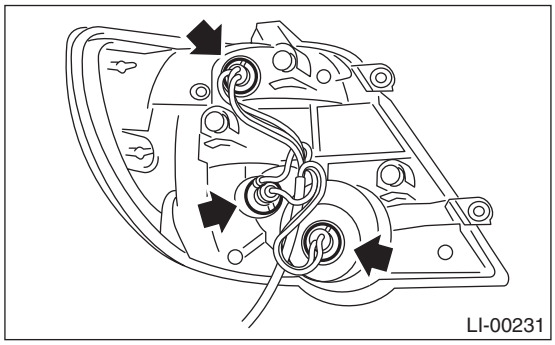
2. WAGON

1) Disconnect the ground cable from battery.
2) Remove the clips, and then detach the rear combination light covers.



3) Remove two bolts, and then remove the rear combination light while disconnecting connector.





B: INSTALLATION

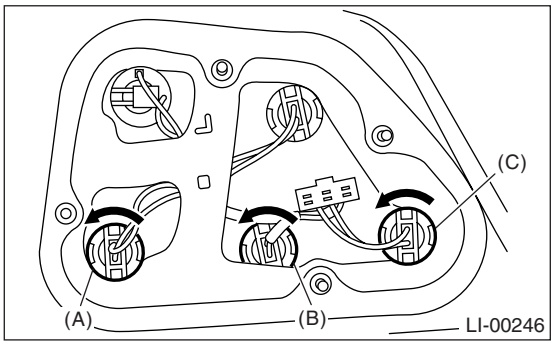
Install in the reverse order of removal.

18. Tail/Rear Side Marker/Stop Light Bulb

A: REMOVAL

1. SEDAN

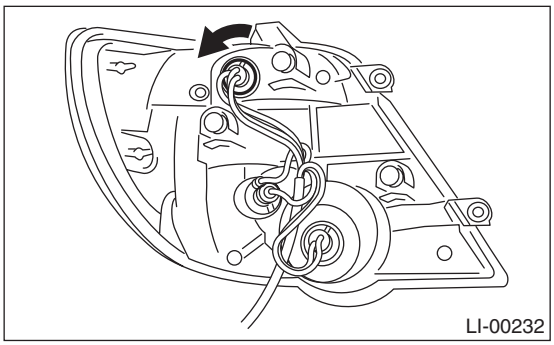
1) Remove the trunk side trim of rear portion.
2) Turn the socket and remove the bulb.



(A) Stop/tail light
(B) Tail light
(C) Stop light

2. WAGON

1) Remove the rear combination light assembly. <Ref. to LI-20, WAGON, REMOVAL, Rear Combination Light Assembly.>
2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

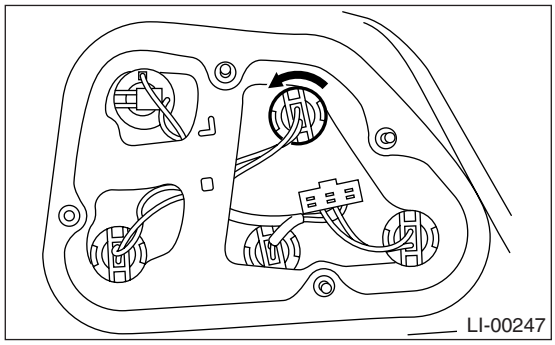
1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

19.Back-up Light Bulb

A: REMOVAL

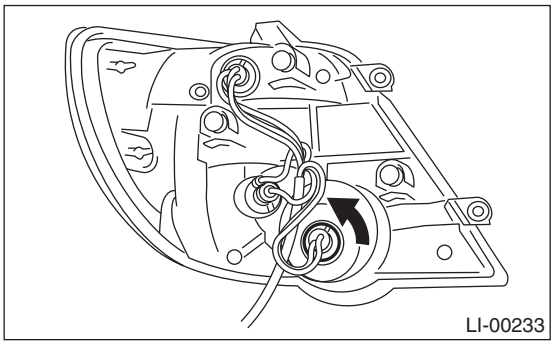
1. SEDAN

1) Remove the trunk side trim of rear portion.
2) Turn the socket and remove the bulb.



2. WAGON

1) Remove the rear combination light assembly. <Ref. to LI-20, WAGON, REMOVAL, Rear Combination Light Assembly.>
2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

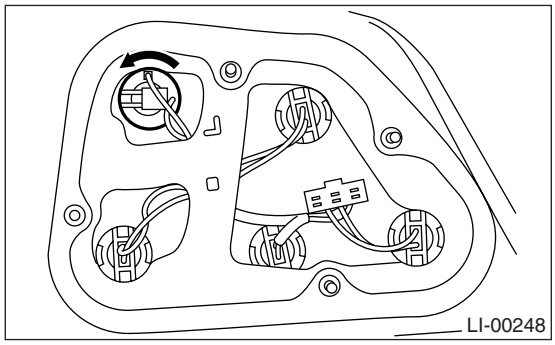
1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

20.Rear Turn Signal Light Bulb

A: REMOVAL

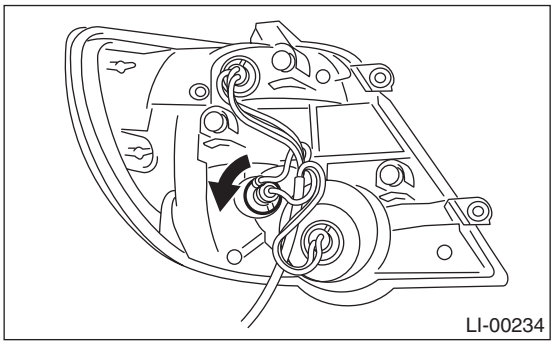
1. SEDAN

1) Remove the trunk side trim of rear portion.
2) Turn the socket and remove the bulb.



2. WAGON

1) Remove the rear combination light assembly. <Ref. to LI-20, WAGON, REMOVAL, Rear Combination Light Assembly.>
2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

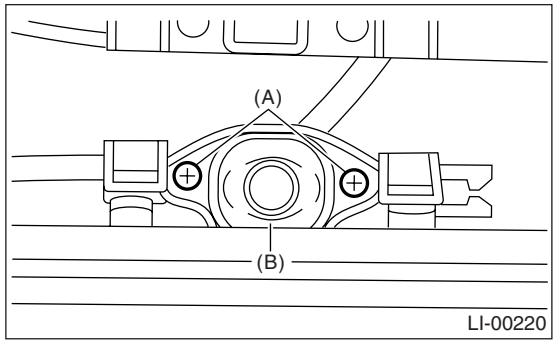
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

21.License Plate Light

A: REMOVAL

1) Remove the license plate light mounting screw (A), and then remove the lens (B).



2) Remove the bulb.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

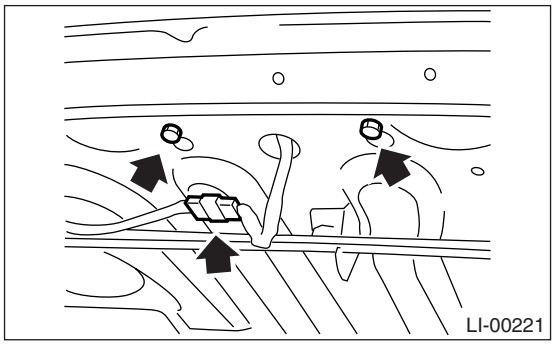
1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

22.High-mounted Stop Light

A: REMOVAL

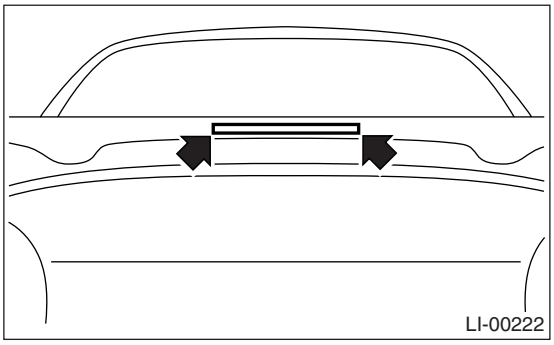
1. SEDAN (STANDARD TYPE)

1) Disconnect the ground cable from battery.
2) Disconnect the connector of high-mounted stop light from body harness.
3) Remove the bolts, then detach the high-mounted stop light assembly.



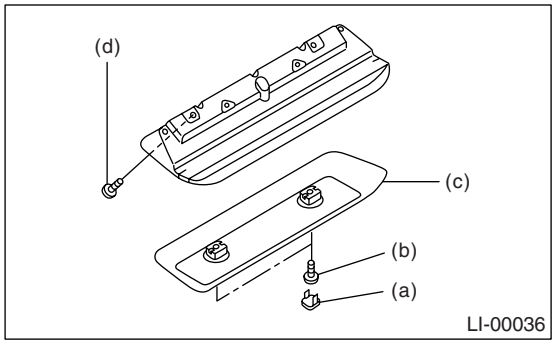
2. SEDAN (REAR SPOILER BUILT-IN TYPE)

1) Disconnect the ground cable from battery.
2) Remove the bolts, then detach the high-mounted stop light assembly.
3) Disconnect the connector of high-mounted stop light from body harness.



3. WAGON

1) Disconnect the ground cable from battery.
2) Remove the cap (a) by prying on the edge with screwdriver.
3) Remove the screws (b), and then the detach cover (c).
4) Remove screws (d), and then detach the high-mounted stop light while disconnecting connector.



B: INSTALLATION

Install in the reverse order of removal.

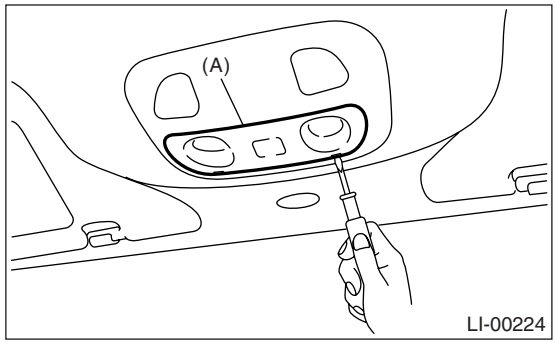
C: INSPECTION

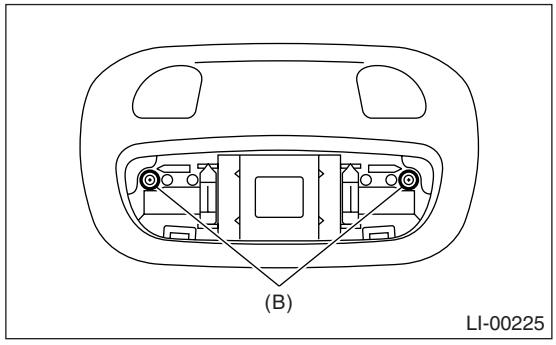
1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

23.Spot Map Light

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the lens (A) and spot map light mounting screw (B).





3) Disconnect the harness connectors and remove the spot map light.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1. SPOT MAP LIGHT BULB

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

2. SPOT MAP LIGHT SWITCH

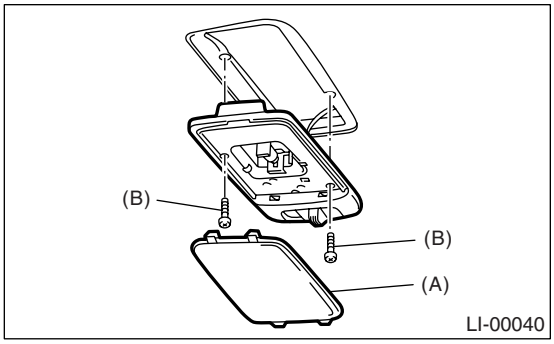
Measure the spot map light resistance.

Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
ON	1 and 2	18±5.4 Ω

24.Room Light

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the lens (A) and room light mounting screws (B).



3) Disconnect the harness connectors and remove the light.

B: INSTALLATION

Install in the reverse order of removal.

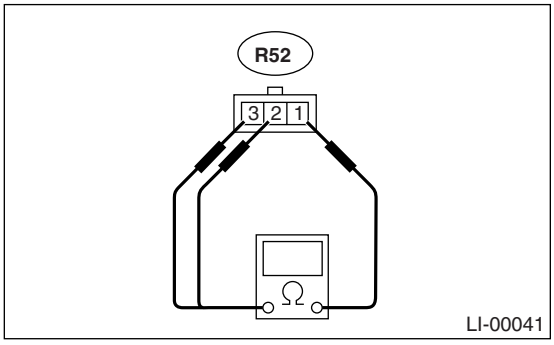
C: INSPECTION

1. ROOM LIGHT BULB

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

2. ROOM LIGHT SWITCH

Measure the room light resistance.

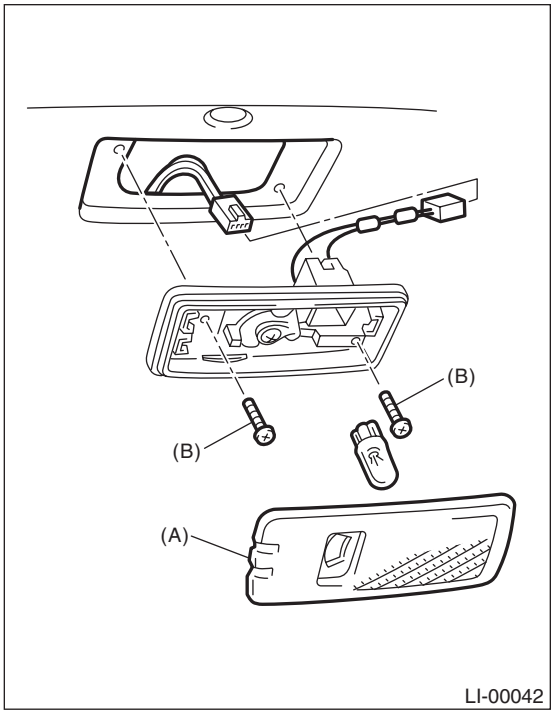


Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
ON	1 and 3	1.5±0.5 Ω
DOOR	1 and 2	1.5±0.5 Ω

25.Luggage Room Light

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the lens (A) and luggage room light mounting screws (B).



3) Disconnect the harness connectors and remove the luggage room light.

B: INSTALLATION

Install in the reverse order of removal.

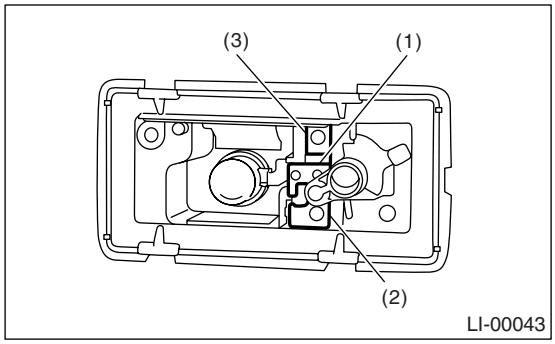
C: INSPECTION

1. LUGGAGE ROOM LIGHT BULB

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

2. LUGGAGE ROOM LIGHT SWITCH

Measure the luggage room light resistance.

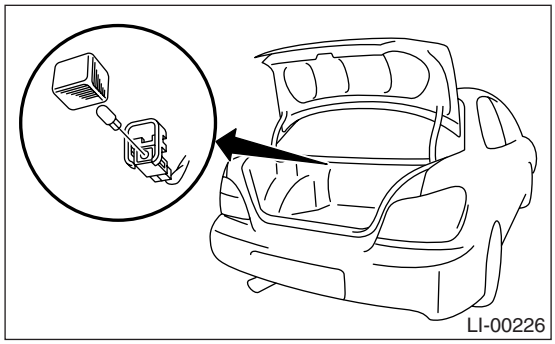


Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
ON	1 and 3	1.5±0.5 Ω
DOOR	1 and 2	1.5±0.5 Ω

26.Trunk Room Light

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Disconnect the harness connectors and remove the trunk room light.



B: INSTALLATION

Install in the reverse order of removal.

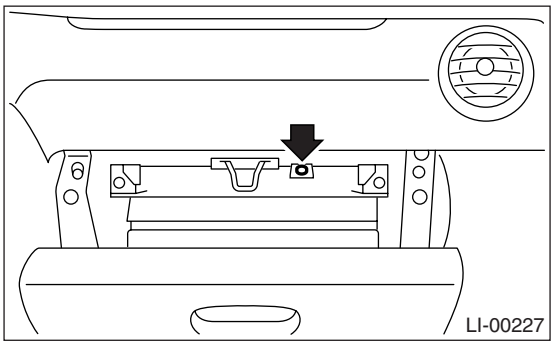
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

27.Glove Box Light

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the glove box. <Ref. to EI-41, REMOVAL, Glove Box.>
3) Disconnect the harness connector.
4) Remove the glove box light.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
3) If NG, replace the bulb with a new one.

WIPER AND WASHER SYSTEMS

WW

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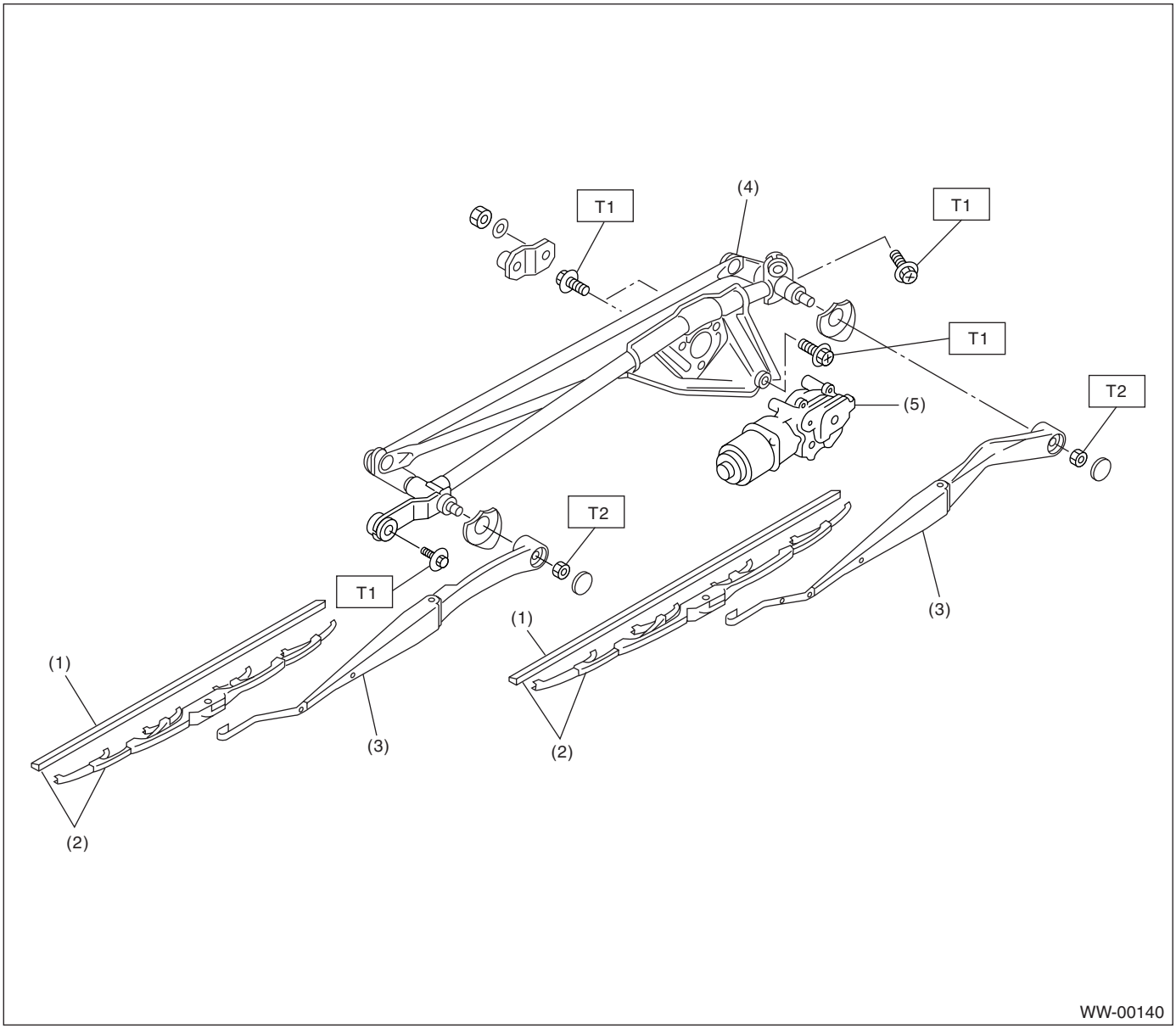
1. General Description

A: SPECIFICATIONS

Front wiper motor	Input	12 V — 72 W or less
Rear wiper motor	Input	12 V — 42 W or less
Front washer motor	Pump type	Centrifugal
	Input	12 V — 36 W or less
Rear washer motor	Pump type	Centrifugal
	Input	12 V — 36 W or less

B: COMPONENT

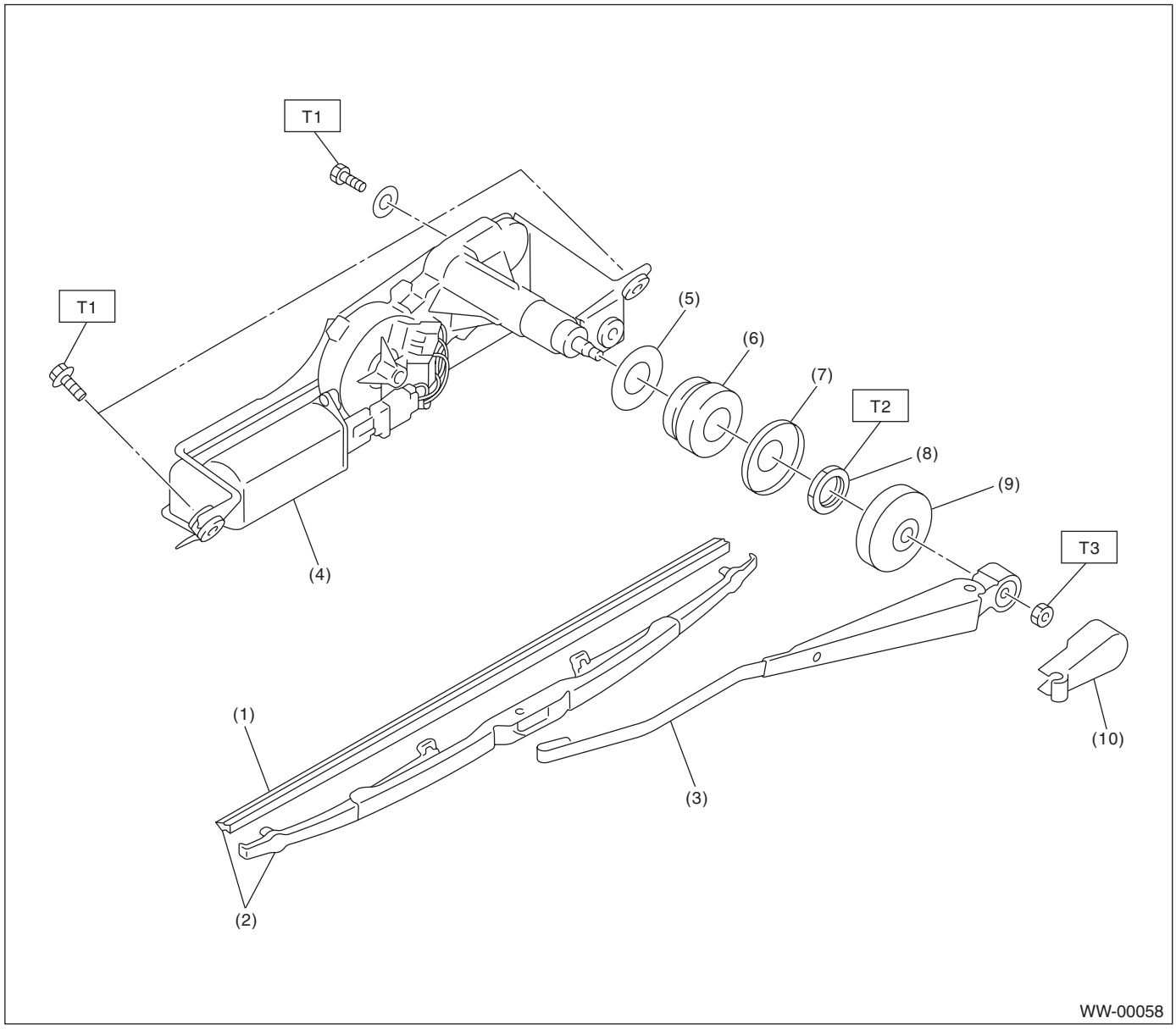
1. FRONT WIPER



(1) Wiper rubber
(2) Wiper blade ASSY
(3) Wiper arm
(4) Wiper link
(5) Wiper motor

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.0 (0.61, 4.4)
T2: 20 (2.0, 14.5)

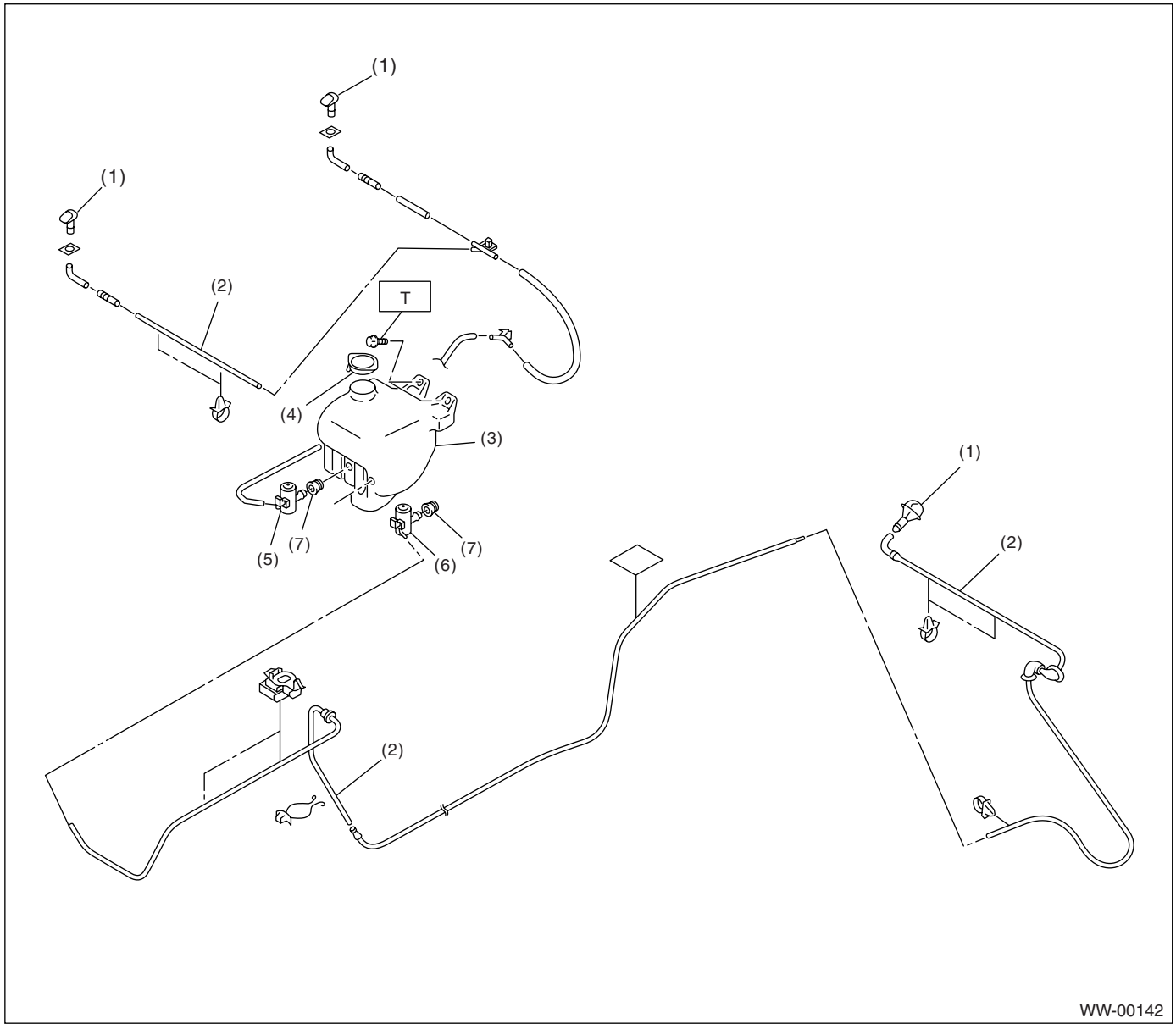
2. REAR WIPER



(1) Wiper rubber
(2) Wiper blade ASSY
(3) Wiper arm
(4) Wiper motor
(5) Spacer A
(6) Cushion
(7) Spacer B
(8) Nut
(9) Cap
(10) Wiper arm cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.0 (0.61, 4.4)
T2: 7.5 (0.76, 5.5)
T3: 8.0 (0.82, 5.9)

3. WASHER TANK



(1) Washer nozzle
(2) Washer hose
(3) Washer tank
(4) Washer tank cap
(5) Front washer motor
(6) Rear washer motor
(7) Grommet

Tightening torque: N·m (kgf-m, ft-lb)
T: 6.0 (0.61, 4.4)

C: CAUTION

- Reconnect the connectors and hoses securely. After reconnecting, confirm that each function operates normally.
- Be careful that wiring harnesses of airbag system pass near electrical parts and switches.
- Wiring harnesses and connectors of all airbag system are yellow color. Do not use a tester on these circuits.
- Care must be taken when installing the piping hose so that no bending, jamming, etc. are caused.
- If even a little oil or grease such as silicon oil gets in the tank and washer passages, an oil film easily forms on the glass, causing the wiper to chatter and judder. Therefore, be careful not to let this happen.

2. Wiper and Washer System

A: WIRING DIAGRAM

1. WIPER AND WASHER (FRONT)

<Ref. to WI-163, WIRING DIAGRAM, Wiper and Washer System (Front).>

2. WIPER AND WASHER (REAR)

<Ref. to WI-164, WIRING DIAGRAM, Wiper and Washer System (Rear).>

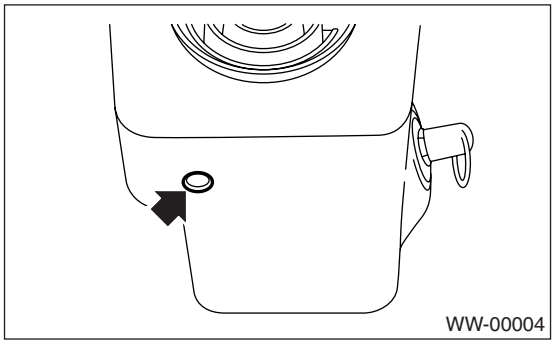
B: INSPECTION

Symptom	Repair order
Wiper and washers do not operate.	(1) Wiper fuse (F/B No. 14, 15) (2) Combination switch (3) Wiper motor (4) Wiring harness
Wipers do not operate in LO or HI.	(1) Combination switch (2) Wiper motor (3) Wiring harness
Wipers do not operate in INT.	(1) Combination switch (2) Wiper motor (3) Wiring harness
Washer motor does not operate.	(1) Washer switch (2) Washer motor (3) Wiring harness
Wipers do not operate when washer switch is ON.	(1) Washer motor (2) Wiring harness
Washer fluid spray does not operate.	(1) Washer motor (2) Washer hose and nozzle

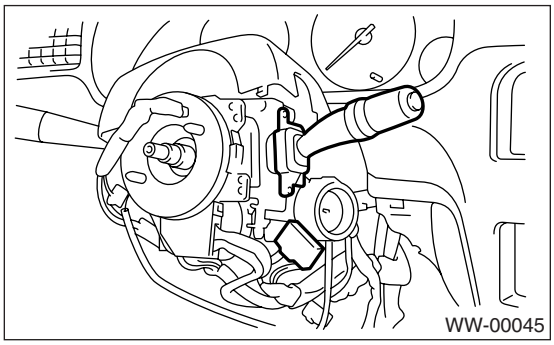
3. Combination Switch (Wiper)

A: REMOVAL

1) Loosen the screw to remove steering column cover.



2) Disconnect the connectors from combination switches.
3) Loosen the screw to remove combination switch.

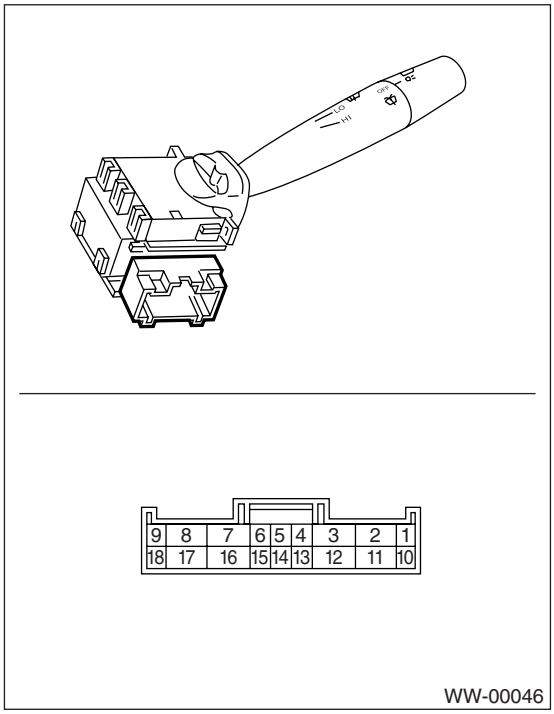


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

• Inspect the continuity between each connector terminal.



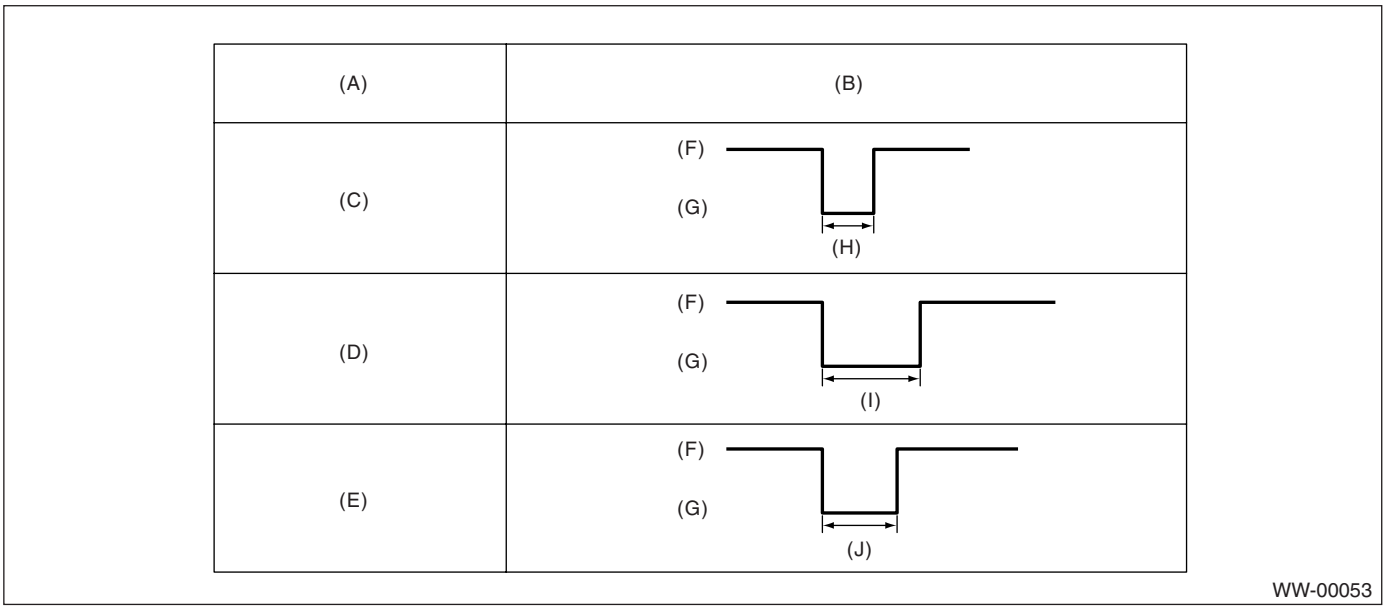
	Switch position	Terminal No.	Standard
FRONT	OFF	7 and 16	Less than 1 Ω
	INT	7 and 16	Less than 1 Ω
	LO	7 and 17	Less than 1 Ω
	HI	8 and 17	Less than 1 Ω
	Washer ON	2 and 11	Less than 1 Ω
REAR	Washer ON	2 and 10 10 and 12 2 and 12	Less than 1 Ω
	OFF	—	More than 1 MΩ
	ON	2 and 10	Less than 1 Ω
	Washer ON	2 and 10 10 and 12 2 and 12	Less than 1 Ω

If continuity is not as specified, replace the switch.

• Intermittent operation inspection

1) Turn the wiper switch to INT.
2) Adjust the intermittent control switch to MAX.
3) Apply battery voltage to switch terminals 16 and 2.
4) Inspect the voltage of combination switch terminals.

Terminals
No. 7 — No. 2:



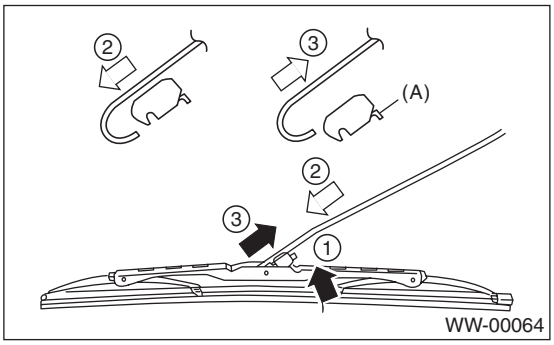
(A) Switch position
(B) Voltage
(C) MIN.
(D) MAX.
(E) Non variable type
(F) 12 V
(G) 0 V
(H) Approx. 2 sec.
(I) 16±6 sec.
(J) 3±1 sec.

If operation is not as specified, replace the switch.

4. Wiper Blade

A: REMOVAL

While pushing the locking clip (A) up, pull out the blade from arm to arrow direction.



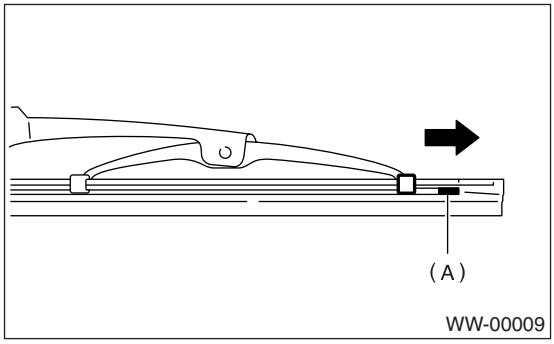
B: INSTALLATION

1) Install in the reverse order of removal.
2) Confirm that the clip is locked securely.

C: DISASSEMBLY

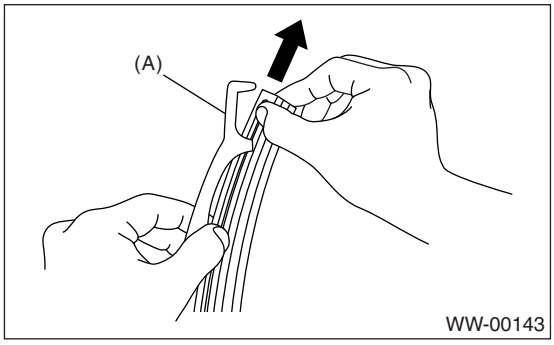
1. METAL TYPE

Pull on the side (A) of wiper rubber stopper, and then remove the rubber from blade assembly.



2. RESIN TYPE

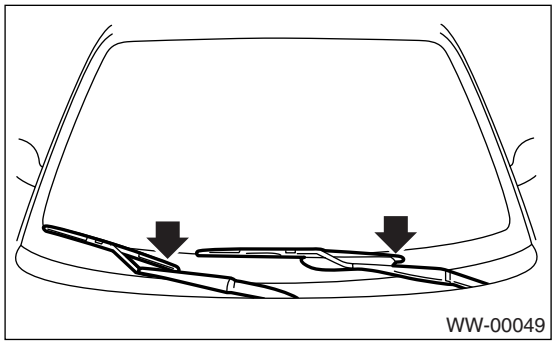
Pull the wiper rubber top slightly from the stopper (A) and pull it out fully.



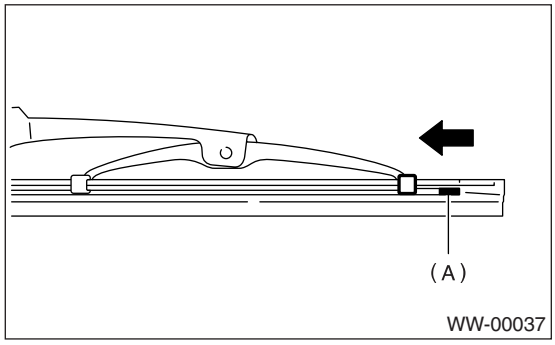
D: ASSEMBLY

1. METAL TYPE

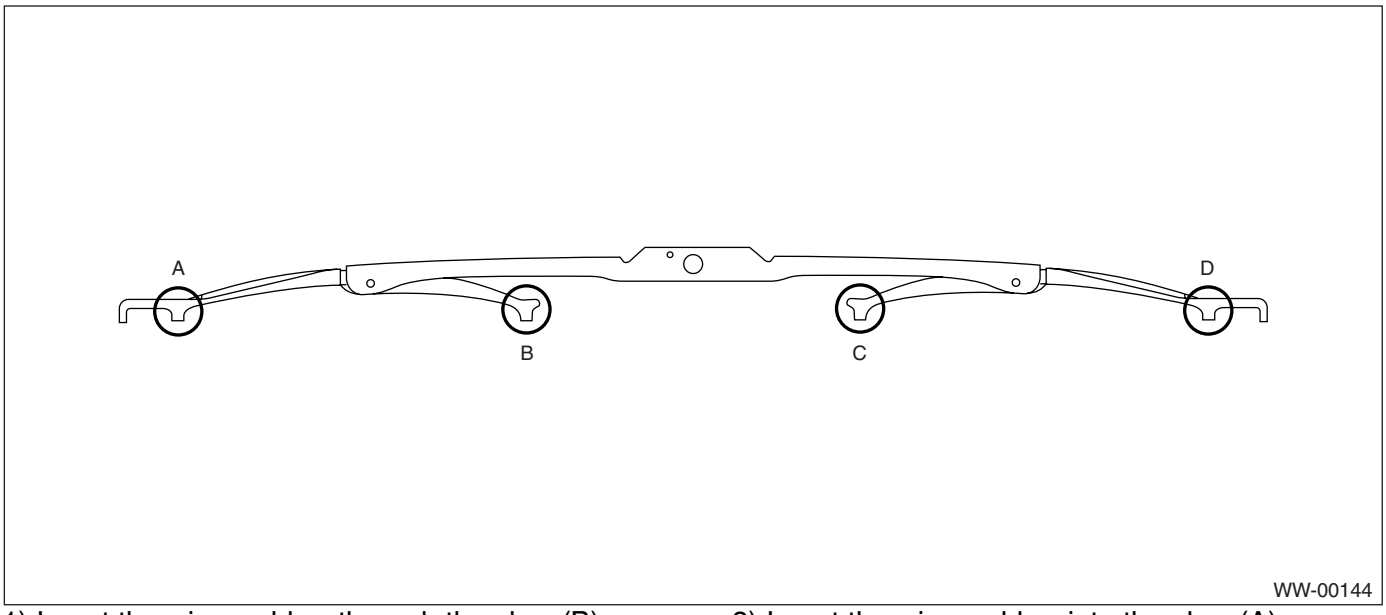
1) Insert the wiper rubber onto blade so that the stopper is in the position shown.



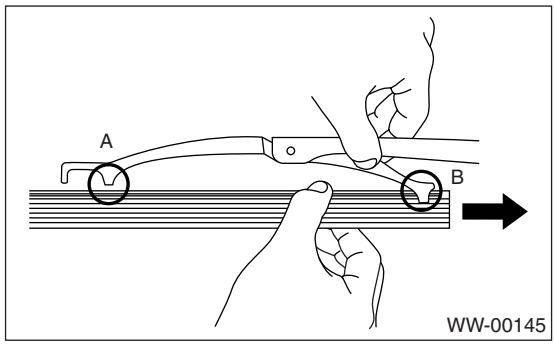
2) Make sure the wiper rubber is securely fastened to the pull stopper (A).



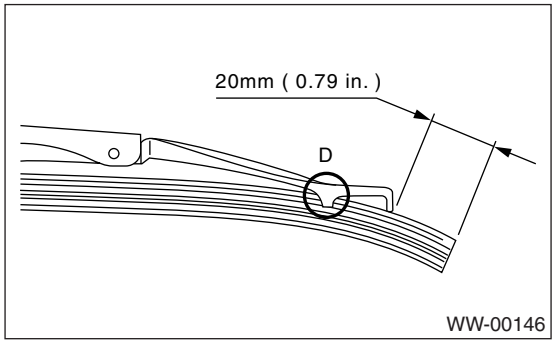
2. RESIN TYPE



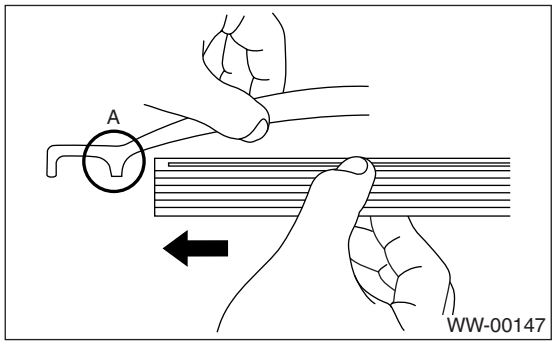
1) Insert the wiper rubber through the claw (B).



2) Insert the wiper rubber top until it protrudes about 20 mm (0.79 in) from the stopper (D).



3) Insert the wiper rubber into the claw (A).



E: INSPECTION

1) When the wiper does not perform well, inspect the following:

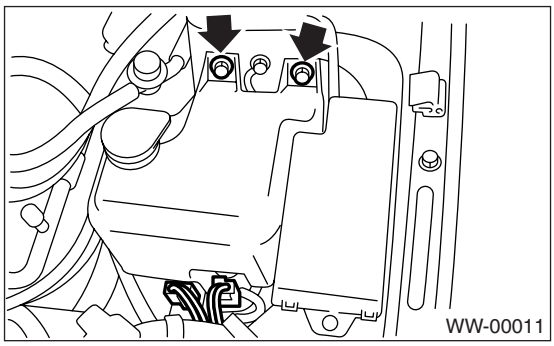
- Make sure the movable part of the blade assembly moves smoothly.
- Make sure the wiper rubber is not deformed or damaged.

2) Replace them with new parts if damaged.

5. Washer Tank and Motor

A: REMOVAL

1) Open the hood.
2) Disconnect the ground cable from battery.
3) Remove the two bolts, hose and connector, and then remove the tank.



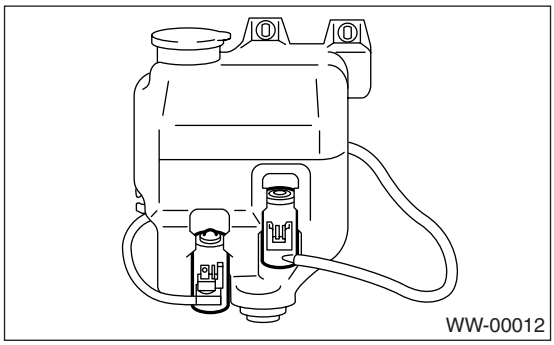
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
6.0 N·m (0.61 kgf-m, 4.4 ft-lb)

C: DISASSEMBLY

Pull out the washer motor from tank.

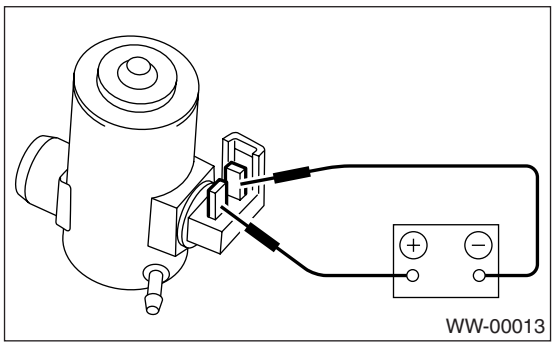


D: ASSEMBLY

1) Assemble in the reverse order of disassembly.
2) Confirm that water does not leak from installation area of motor.

E: INSPECTION

Apply battery voltage to the connector terminal of the washer motor and make sure the motor operates.



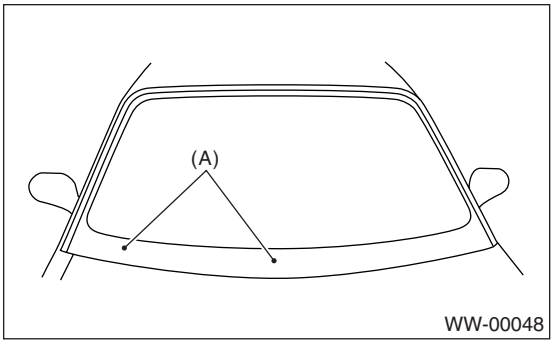
6. Front Wiper Arm

A: REMOVAL

1) Open the hood.
2) Remove the cap.
3) Loosen the nut to remove arm.

B: INSTALLATION

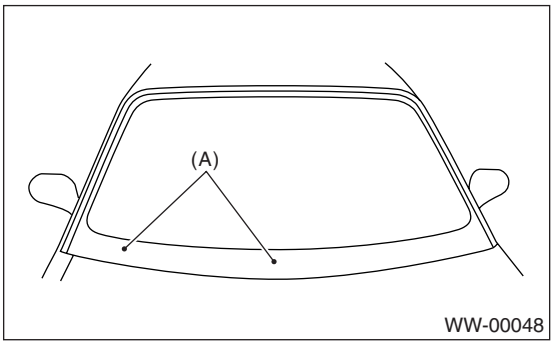
1) Install in the reverse order of removal.
2) Operate the wiper once.
3) Align the wiper blade to the ceramic print point mark (A) of front window panel.



Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to WW-2, FRONT WIPER, COMPONENT, General Description.>

C: ADJUSTMENT

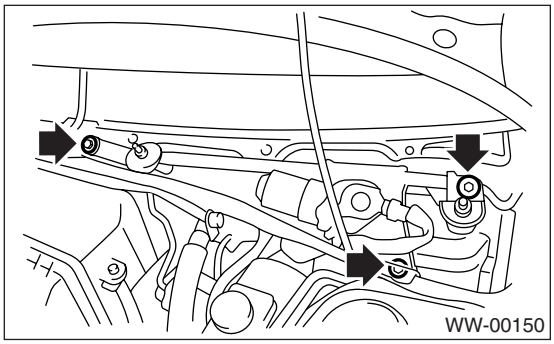
Operate the wiper once. Align the wiper blade to the ceramic print point mark (A) of front window panel.



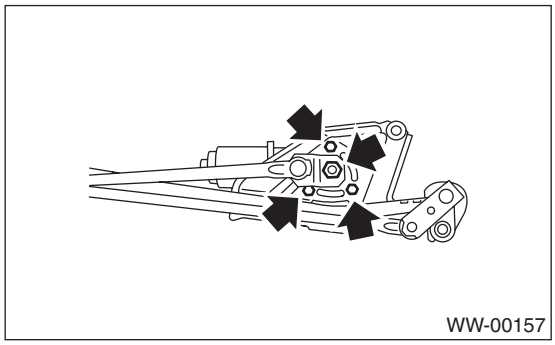
7. Front Wiper Motor and Link

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the cowl panel. <Ref. to EI-33, REMOVAL, Cowl Panel.>
3) Disconnect the connector of motor.
4) Loosen the bolts to remove wiper link.

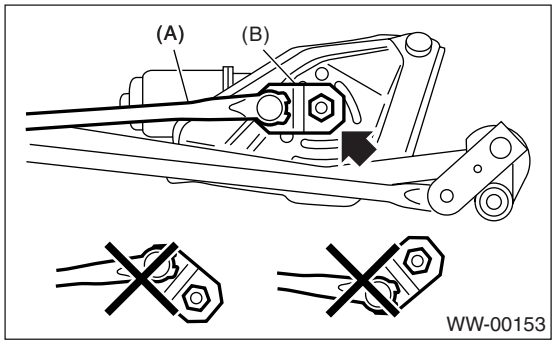


5) Loosen the bolts and nuts to remove motor.



B: INSTALLATION

1) Connect the battery ground cable to battery.
2) To confirm that the motor is at auto stop position, connect the harness to motor and turn the wiper switch ON/OFF once.
3) Disconnect the ground cable from battery.
4) Tighten the nut where rod (A) and link plate (B) is aligned in a straight line.

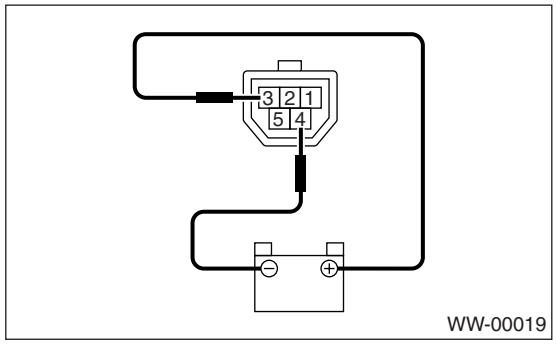


5) Install in the reverse order of removal.

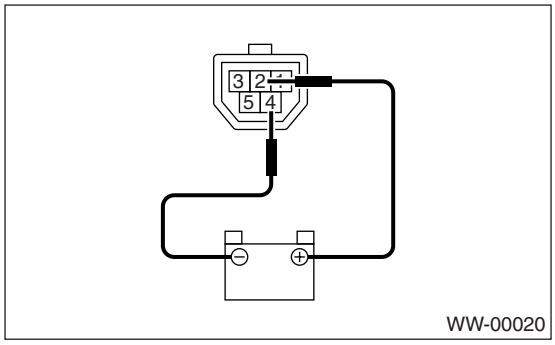
Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to WW-2, FRONT WIPER, COMPONENT, General Description.>

C: INSPECTION

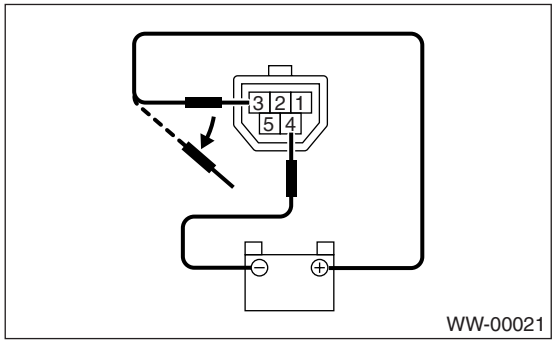
1) When the battery is connected to the terminal of connectors, confirm that the motor operates at low speed.



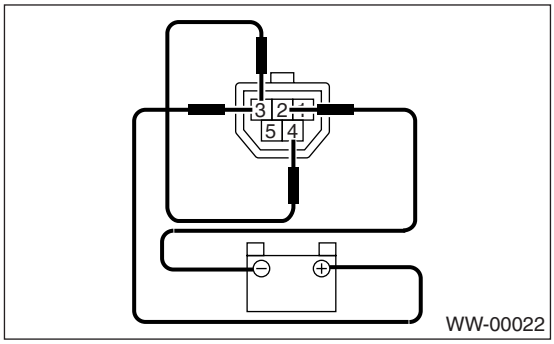
2) When the battery is connected to the terminal of connectors, confirm that the motor operates at high speed.



3) Connect the battery to terminals of connector, and then remove the terminal connection with motor rotated at low speed, and stop the wiper motor through operation.



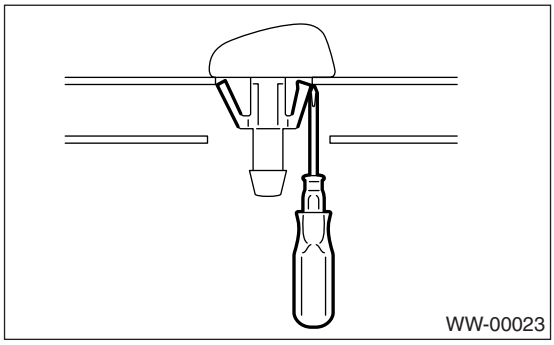
4) Connect the battery and confirm that the motor stops at automatic stop position after the motor operates at low speed again.



8. Front Washer Nozzle

A: REMOVAL

1) Remove the washer hose from the washer nozzle.
2) Open the clips on the underside of the hood with a thin screwdriver or other tool, and remove the washer nozzle.



B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the position of the washer liquid sprayer. <Ref. to WW-14, ADJUSTMENT, Front Washer Nozzle.>

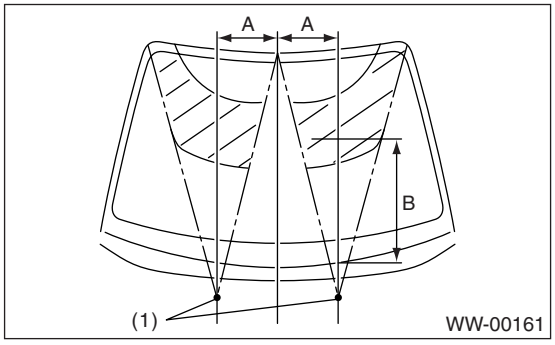
C: INSPECTION

- Make sure the nozzle and hose are not clogged.
- Make sure the hose is not bent.

D: ADJUSTMENT

1) Turn the wiper switch to OFF position.
2) When the vehicle stops, adjust the washer injection position as shown in the figure.

Injection position:
A: 257 mm (10.12 in)
B: 512 mm (20.16 in)

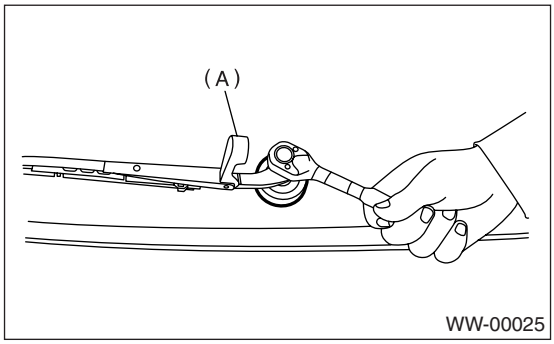


(1) Nozzle

9. Rear Wiper Arm

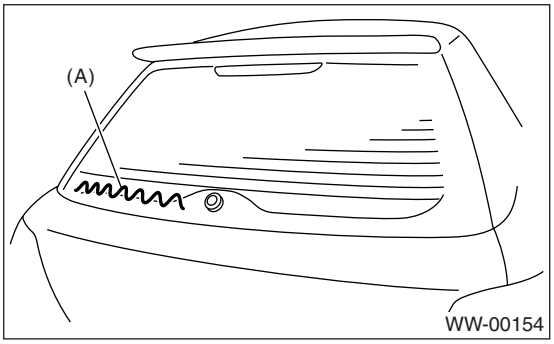
A: REMOVAL

1) Raise the wiper arm cover (A).
2) Loosen the nut to remove wiper arm.



B: INSTALLATION

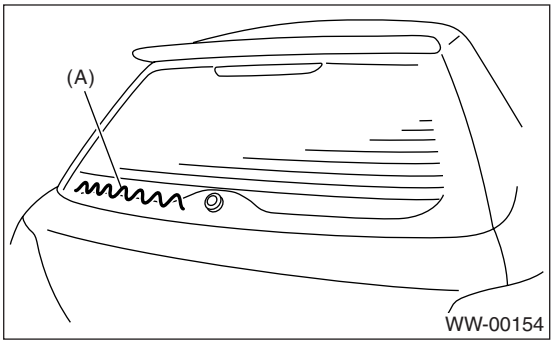
1) Install in the reverse order of removal.
2) Operate the rear wiper once.
3) Align the blade to rear defogger heat wire (A).



Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to WW-3, REAR WIPER, COMPONENT, General Description.>

C: ADJUSTMENT

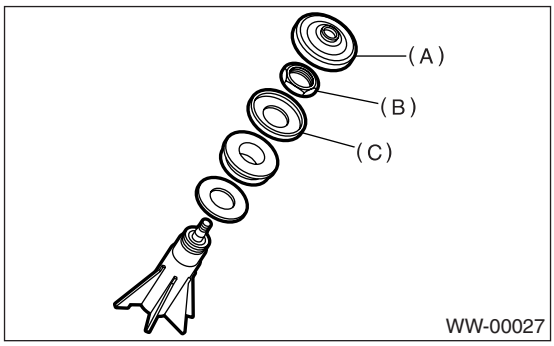
1) Operate the rear wiper once.
2) Align the blade to rear defogger heat wire (A).



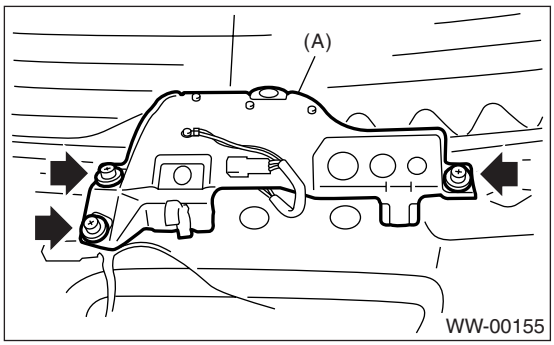
10.Rear Wiper Motor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear wiper arm.
3) Remove the cap (A), nut (B) and spacer (C) from rear wiper shaft.

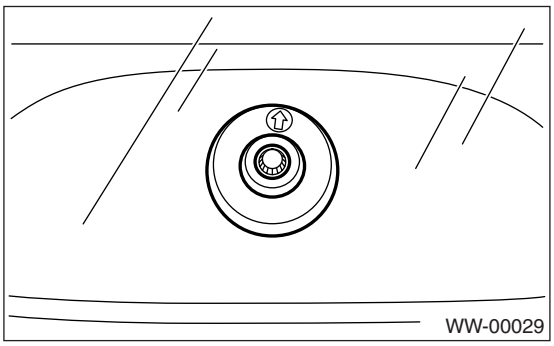


4) Remove the rear gate lower trim. <Ref. to EI-54, REMOVAL, Rear Gate Trim.>
5) Unclip the clip of harness, and then disconnect the connector of wiper motor.
6) Loosen the bolts to remove the wiper motor assembly (A).



B: INSTALLATION

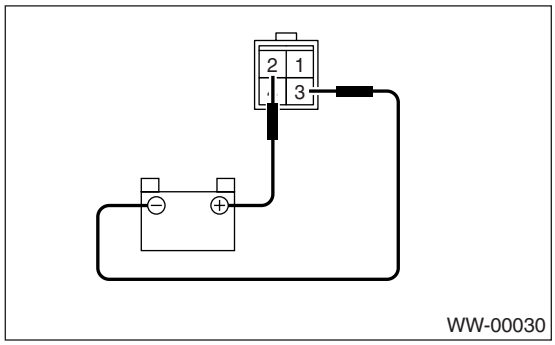
1) Install in the reverse order of removal.
2) Install the rear wiper cushion with the arrow mark facing up, as shown in the figure.



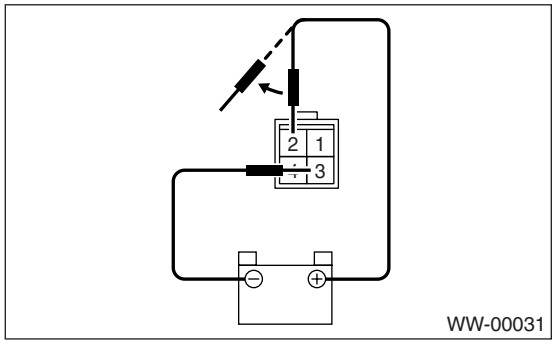
Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to WW-3, REAR WIPER, COMPONENT, General Description.>

C: INSPECTION

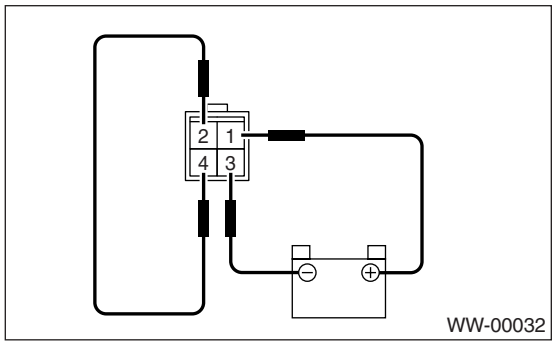
1) Connect the battery to wiper motor connector and confirm that the wiper motor operates.



2) Connect the battery to terminal of connector, and then remove the terminal connections with motor rotated, and stop the wiper motor through operation.



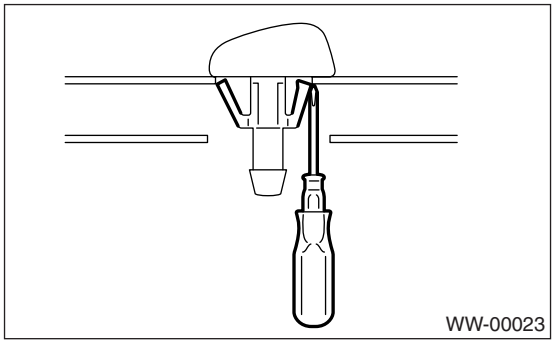
3) Connect the battery and confirm that the motor stops at automatic stop position after the motor operates at low speed again.



11.Rear Washer

A: REMOVAL

1) Remove the high-mount stop light. <Ref. to LI-25, REMOVAL, High-mounted Stop Light.>
2) Remove the washer hose from washer nozzle.
3) Open the clips on the underside of hood with a thin screwdriver or other tool, and then remove the washer nozzle.



B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the position of the washer liquid sprayer. <Ref. to WW-17, ADJUSTMENT, Rear Washer.>

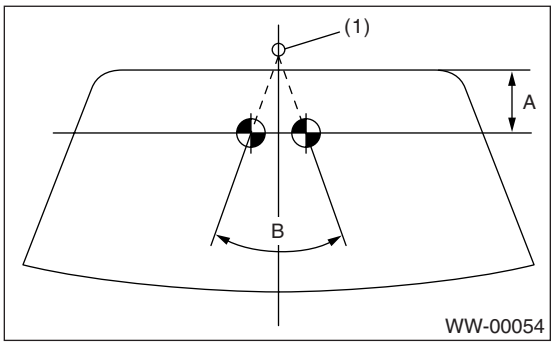
C: INSPECTION

- Make sure the nozzle and hose are not clogged.
- Make sure the hose is not bent.

D: ADJUSTMENT

1) Turn the wiper switch to OFF position.
2) When the vehicle stops, adjust the washer injection position as shown in the figure.

Injection position:
A: 39 mm (1.54 in)
B: 72°

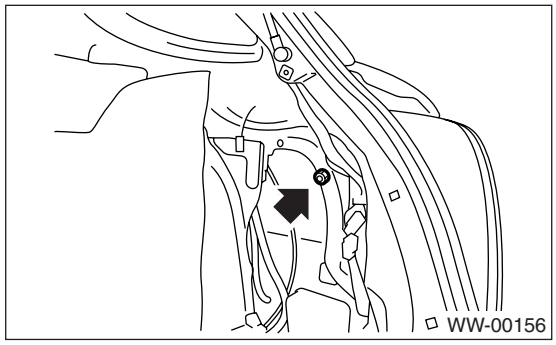


(1) Nozzle

12. Wiper Control Relay (Wagon Model)

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the right quarter lower trim. <Ref. to EI-50, REMOVAL, Rear Quarter Trim.>
3) Loosen the nut to remove control unit.

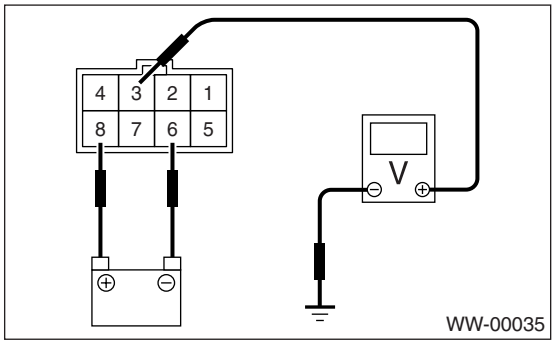


B: INSTALLATION

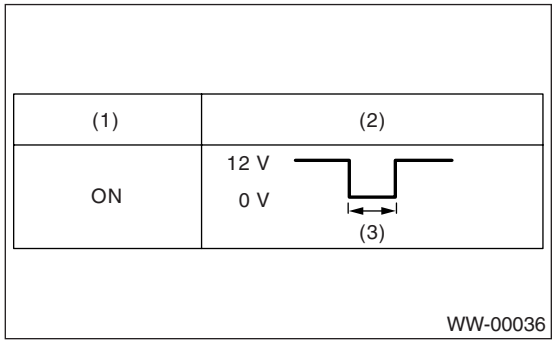
Install in the reverse order of removal.

C: INSPECTION

1) Disconnect the connector from wiper control relay.
2) Connect the positive (+) lead from the battery to terminal 8 and the negative (−) lead to terminal 6. Connect the positive (+) lead from the voltmeter to terminal 3 and the negative (−) lead to ground.



3) Measure the voltage when the wiper relay is operated.



(1) Switch position
(2) Voltage
(3) 9±2 sec.

If operation is not as specified, replace the switch.

ENTERTAINMENT

ET

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1. General Description

A: CAUTION

• Before disassembling or reassembling parts, always disconnect the battery ground cable. When replacing radio, control module, and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
• Reassemble in reverse order of disassembly, unless otherwise indicated.
• Adjust parts to the given specifications.
• Connect the connectors and hoses securely during reassembly.
• After reassembly, make sure functional parts operate smoothly.

B: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.
Conductive Silver Composition (DUPONT No. 4817 or equivalent)	Used for repairing antenna wire.

2. Radio System

A: WIRING DIAGRAM

<Ref. to WI-59, WIRING DIAGRAM, Audio System.>

B: INSPECTION

Symptom	Repair order
No power coming in. (No display and no sound from speakers)	(1) Check the fuse and power supply for radio. (2) Check the radio ground. (3) Remove the radio for repair.
A specific speaker does not operate.	(1) Check the speaker. (2) Check the output circuit between radio and speaker.
Radio generates noise with engine running.	(1) Check the radio ground. (2) Check the generator. (3) Check the ignition coil. (4) Remove the radio for repair.
AM and FM modes are weak or noisy.	(1) Check the antenna. (2) Check the antenna amplifier. (3) Check the noise suppressor. (4) Check the radio ground. (5) Remove the radio for repair.

3. Front Accessory Power Supply Socket System

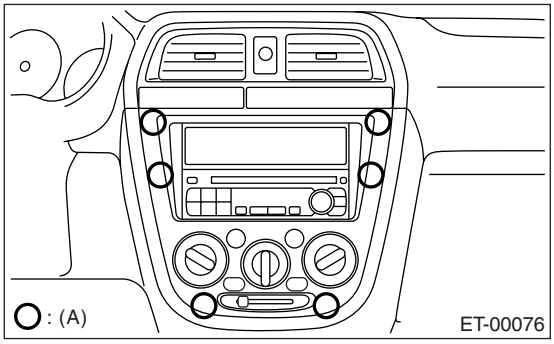
A: WIRING DIAGRAM

<Ref. to WI-118, WIRING DIAGRAM, Front Accessory Power Supply System.>

4. Radio Body

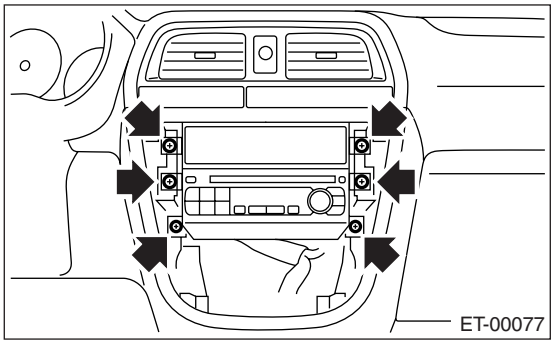
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the center panel while disconnecting connector.



(A) Hook pawl

3) Remove the fitting screws, and slightly pull out the radio from center console.



4) Disconnect the harness connectors and antenna feeder cord.

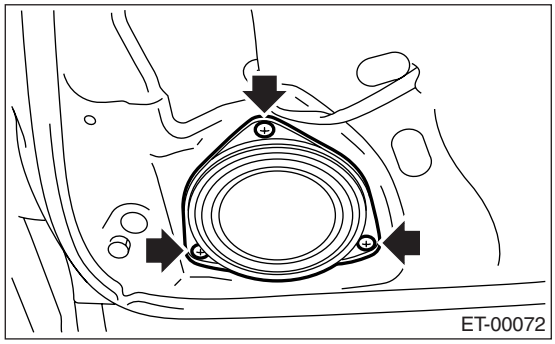
B: INSTALLATION

Install in the reverse order of removal.

5. Front Speaker

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front door trim. <Ref. to EI-39, REMOVAL, Front Door Trim.>
3) Remove the front speaker mounting screws.



4) Disconnect the harness connector and remove front speaker.

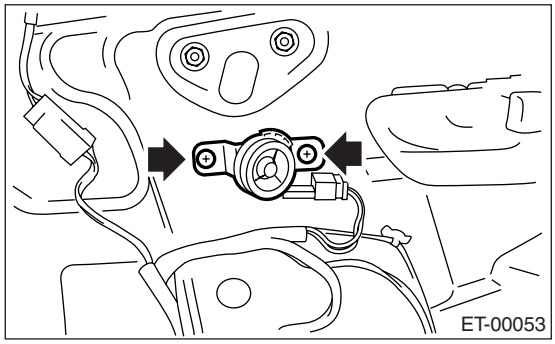
B: INSTALLATION

Install in the reverse order of removal.

6. Tweeter

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front door trim. <Ref. to EI-39, REMOVAL, Front Door Trim.>
3) Remove the tweeter mounting screws.



4) Disconnect the harness connector and remove tweeter.

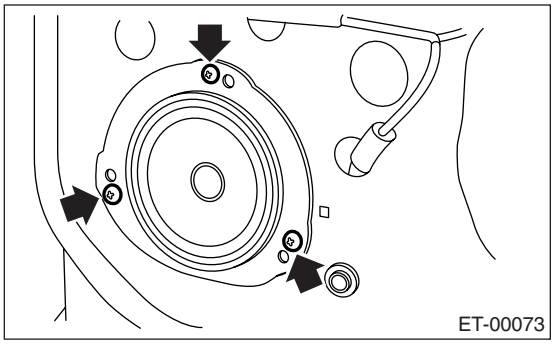
B: INSTALLATION

Install in the reverse order of removal.

7. Rear Speaker

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear door trim. <Ref. to EI-40, REMOVAL, Rear Door Trim.>
3) Remove the rear speaker mounting screws.



4) Disconnect the harness connector and remove rear speaker.

B: INSTALLATION

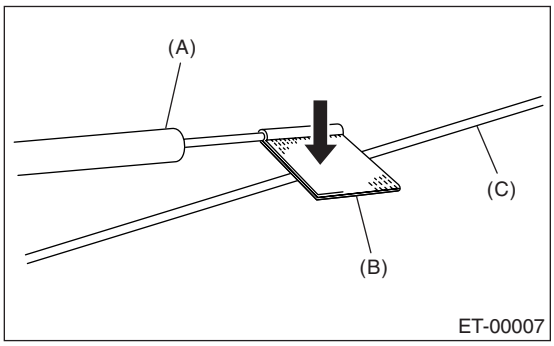
Install in the reverse order of removal.

8. Antenna

A: INSPECTION

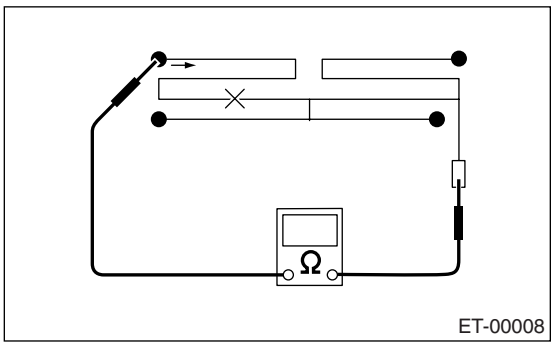
Measure the resistance between antenna terminal and each antenna wire.
If an antenna wire is OK, resistance will be less than 1 Ω. If an antenna wire is broken, the resistance will be more than 1 MΩ.

NOTE:
When checking the continuity, wind a piece of aluminum foil around the tip of tester probe, and then press the aluminum foil against wire with your finger.



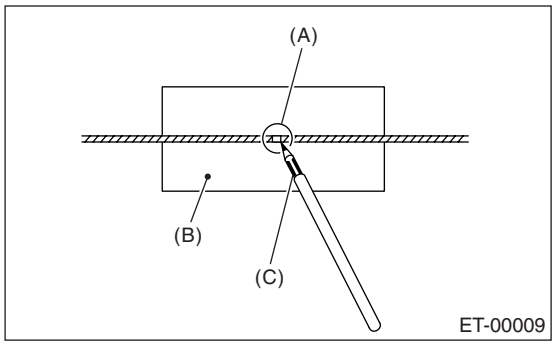
(A) Tester probe
(B) Aluminum foil
(C) Antenna wire

To locate the broken point, move the probe along antenna wire.



B: REPAIR

1) Clean the antenna wire and surrounding area with a cloth dampened by alcohol.
2) Paste a thin masking film on the glass along broken wire.
3) Deposit conductive silver composition (DUPONT No. 4817) on the broken portion with a drawing pen.



(A) Broken portion
(B) Masking film
(C) Conductive silver composition

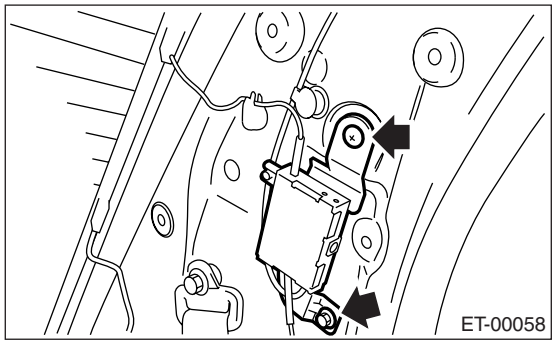
4) Dry out the deposited portion.
5) After repair has been completed, measure the resistance in repaired wire.

9. Antenna Amplifier

A: REMOVAL

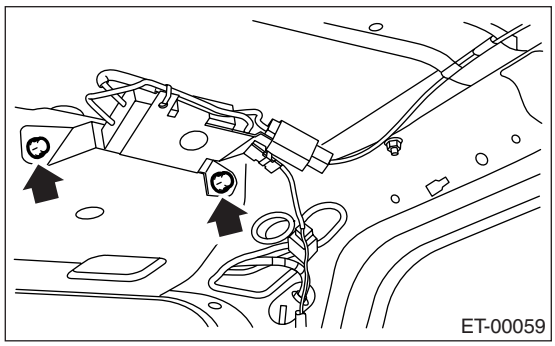
1. SEDAN

1) Disconnect the ground cable from battery.
2) Remove the rear pillar upper trim. <Ref. to EI-50, SEDAN MODEL, REMOVAL, Rear Quarter Trim.>
3) Disconnect the harness connector and terminal.
4) Remove the mounting screws and detach antenna amplifier.



2. WAGON

1) Disconnect the ground cable from battery.
2) Remove the rear quarter upper trim and roof trim. <Ref. to EI-52, WAGON MODEL, REMOVAL, Roof Trim.>
3) Disconnect the harness connector and terminal.
4) Remove the mounting screws and detach the antenna amplifier.



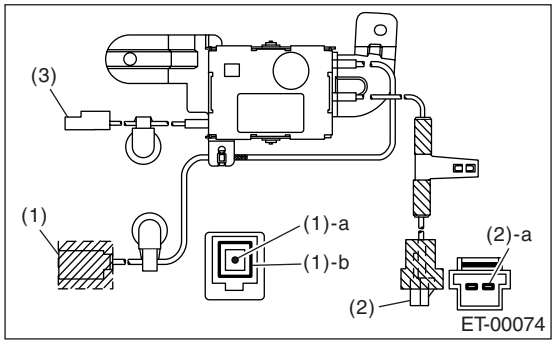
B: INSTALLATION

Install in the reverse order of removal.

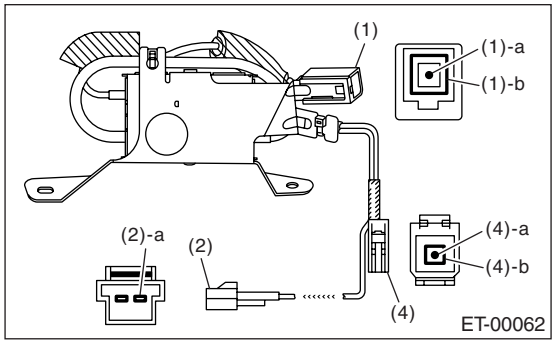
C: INSPECTION

Measure the antenna amplifier resistance.

- SEDAN



- WAGON



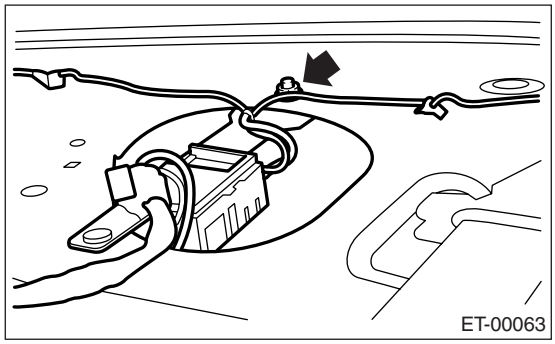
Terminal No.	Standard
1-a and Amplifier body	More than 100 kΩ
1-b and Amplifier body	Less than 1 Ω
2-a and Amplifier body	More than 100 kΩ
3 and Amplifier body	More than 100 kΩ
4-a and Amplifier body	More than 100 kΩ
4-b and Amplifier body	Less than 1 Ω

10.Noise Suppressor

A: REMOVAL

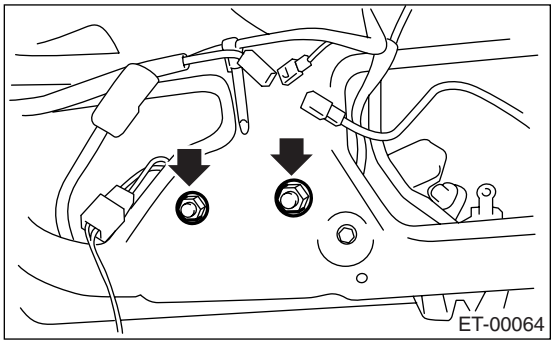
1. SEDAN

1) Disconnect the ground cable from battery.
2) Remove the rear pillar upper trim. <Ref. to EI-50, SEDAN MODEL, REMOVAL, Rear Quarter Trim.>
3) Remove the rear shelf trim. <Ref. to EI-55, REMOVAL, Rear Shelf Trim.>
4) Disconnect the feeder cord connector from antenna amplifier.
5) Disconnect the harness connector of noise suppressor from terminal on glass antenna.
6) Remove the harness clip.
7) Remove the mounting nut and detach the noise suppressor.



2. WAGON

1) Disconnect the ground cable from battery.
2) Remove the rear gate trim. <Ref. to EI-54, REMOVAL, Rear Gate Trim.>
3) Disconnect the connector from noise suppressor.
4) Remove the mounting nut and detach the noise suppressor.



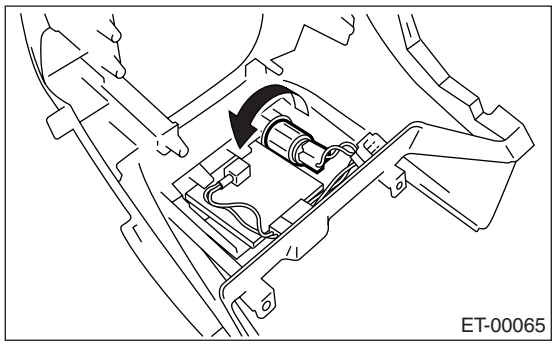
B: INSTALLATION

Install in the reverse order of removal.

11.Front Accessory Power Supply Socket

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the center panel. <Ref. to ET-5, REMOVAL, Radio Body.>
3) Disconnect the harness connectors and remove front accessory power supply socket.



B: INSTALLATION

Install in the reverse order of removal.

COMMUNICATION SYSTEM

COM

Page

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2. Horn System 3
3. Horn 4
4. Horn Switch 5

1. General Description

A: CAUTION

• Before disassembling or reassembling parts, always disconnect the battery ground cable. When replacing radio, control module, and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
• Reassemble in reverse order of disassembly, unless otherwise indicated.
• Adjust parts to the given specifications.
• Connect the connectors and hoses securely during reassembly.
• After reassembly, make sure functional parts operate smoothly.

B: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Horn System

A: WIRING DIAGRAM

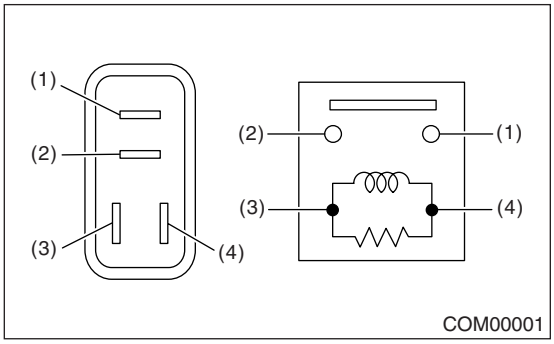
1. HORN

<Ref. to WI-120, WIRING DIAGRAM, Horn System.>

B: INSPECTION

1. HORN RELAY

Measure the horn relay resistance between terminals (indicated in table below) when connecting the terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground cable.

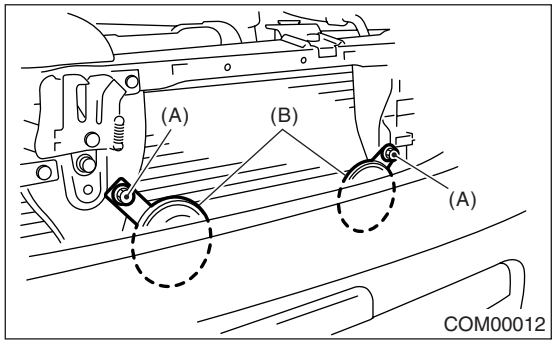


Current	Terminal No.	Standard
Flow	1 and 2	Less than 1 Ω
No Flow		More than 1 MΩ

3. Horn

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the horn bracket mounting bolt (A).
3) Disconnect the harness connector and remove the horn assembly (B).

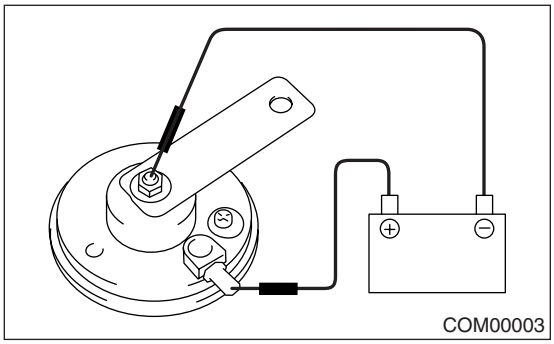


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

With 12 V direct current supplied between horn terminal and case ground, check that the horn sounds properly.

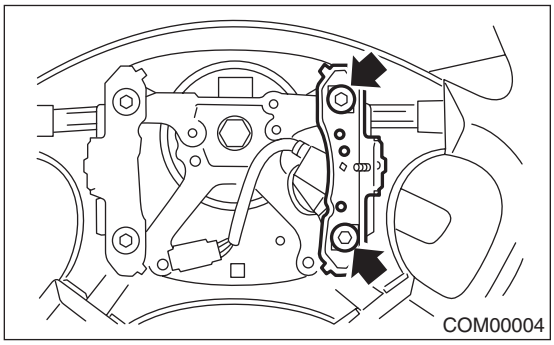


4. Horn Switch

A: REMOVAL

WARNING:
Before servicing, be sure to read the notes in AB section for proper handling of driver airbag module. <Ref. to AB-3, CAUTION, General Description.>

1) Disconnect the ground cable from battery.
2) Remove the driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.>
3) Remove the horn switch from steering wheel as shown in the figure.

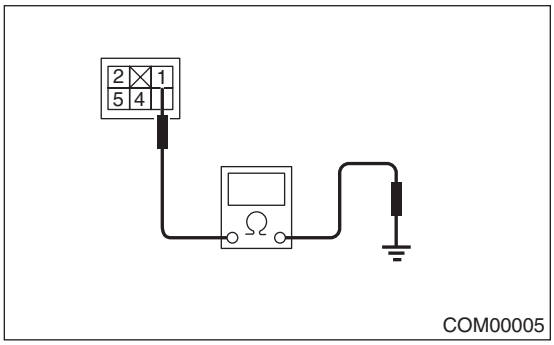


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the horn switch resistance.



Switch position	Terminal No.	Resistance
When horn switch is pushed.	1 and Body ground	Less than 1 Ω
When horn switch is not pushed.		More than 1 MΩ

GLASS/WINDOWS/MIRRORS

GW

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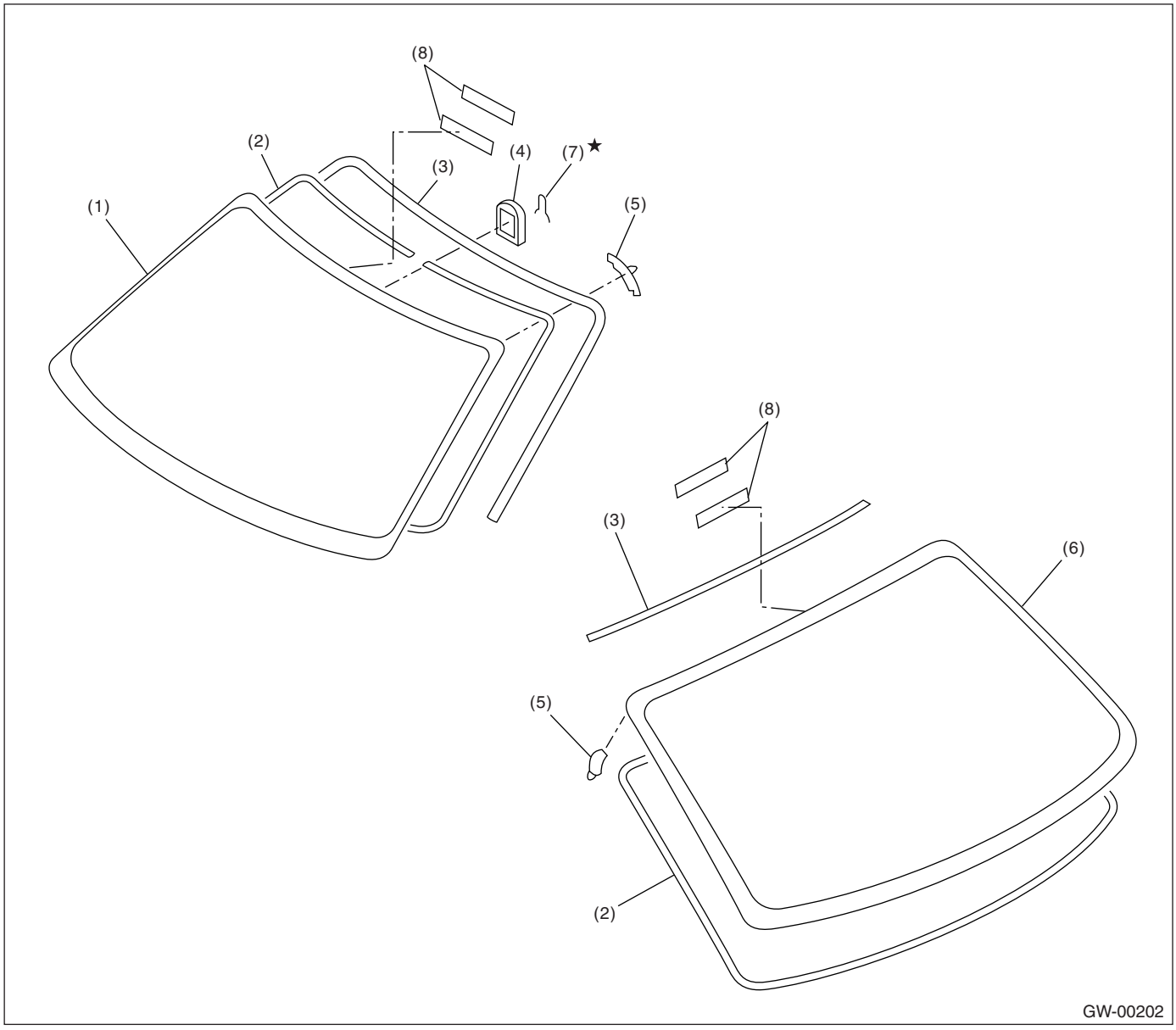
1. General Description

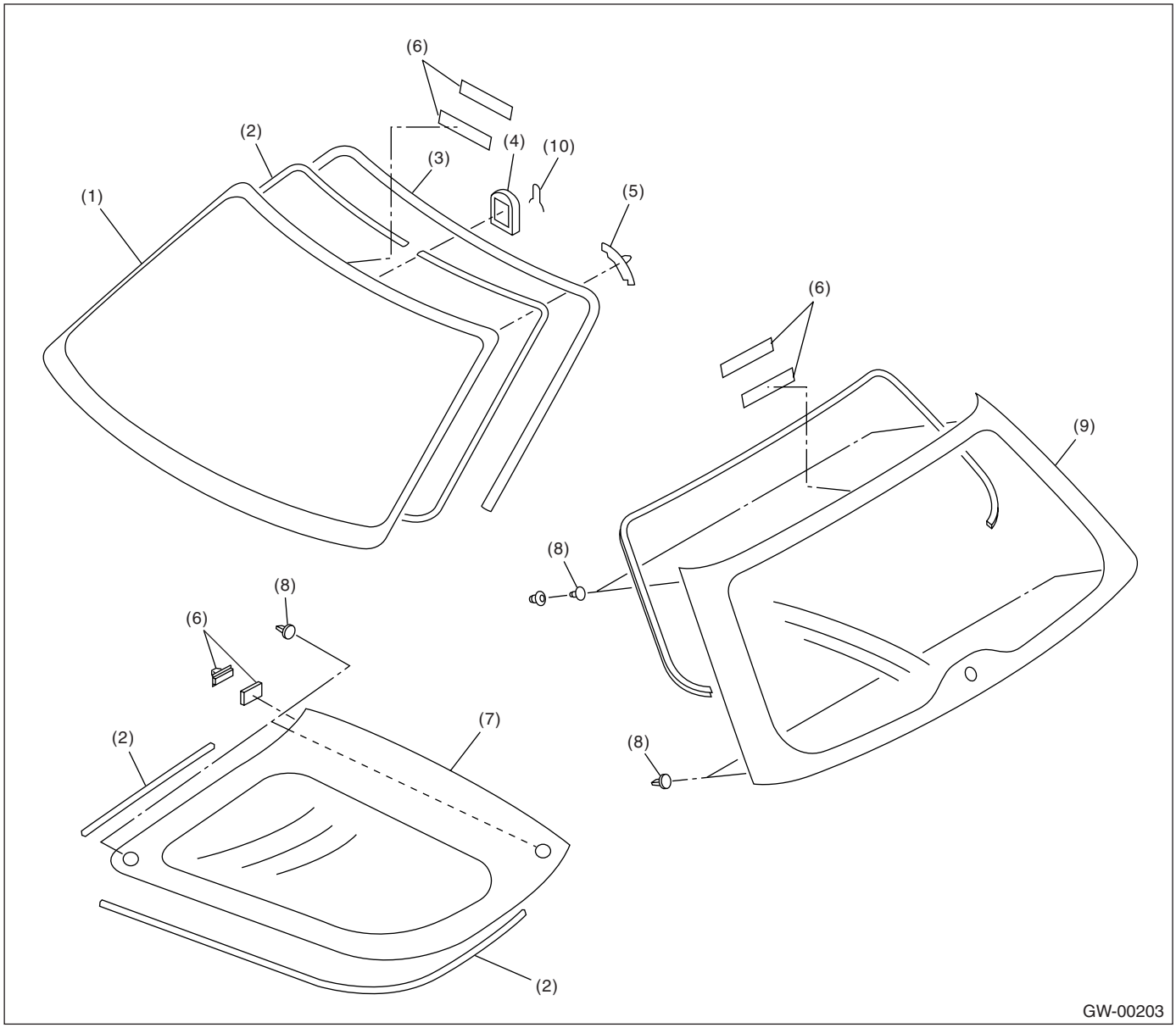
A: COMPONENT

1. FIXED GLASS (SEDAN MODEL)



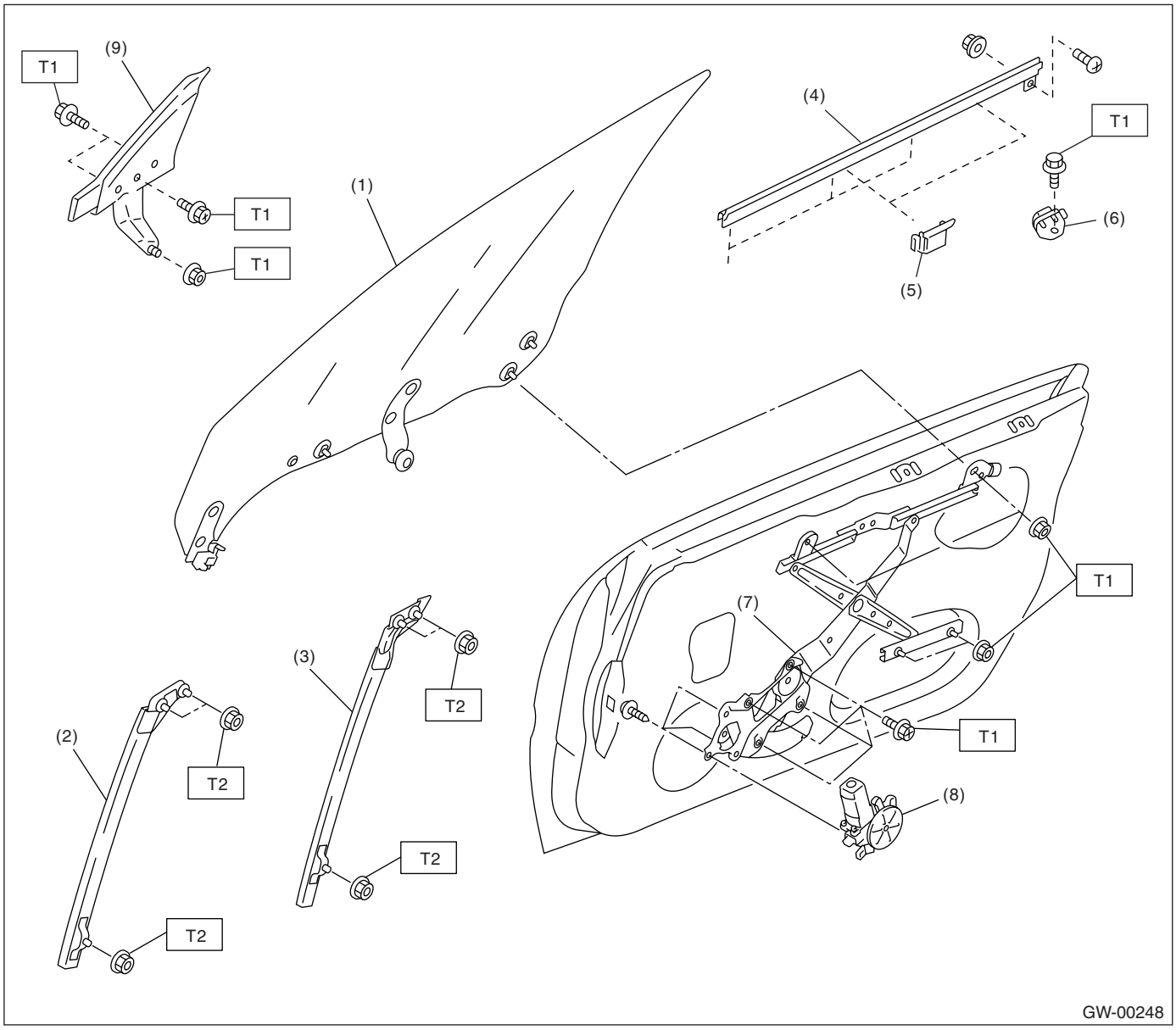
(1) Windshield glass
(2) Dam rubber
(3) Molding
(4) Rearview mirror mount
(5) Locate pin
(6) Rear window glass
(7) Spring
(8) Fastener

2. FIXED GLASS (WAGON MODEL)



(1) Windshield glass
(2) Dam rubber
(3) Molding
(4) Rearview mirror mount
(5) Locate pin
(6) Fastener
(7) Rear quarter glass
(8) Locate pin
(9) Glass
(10) Spring

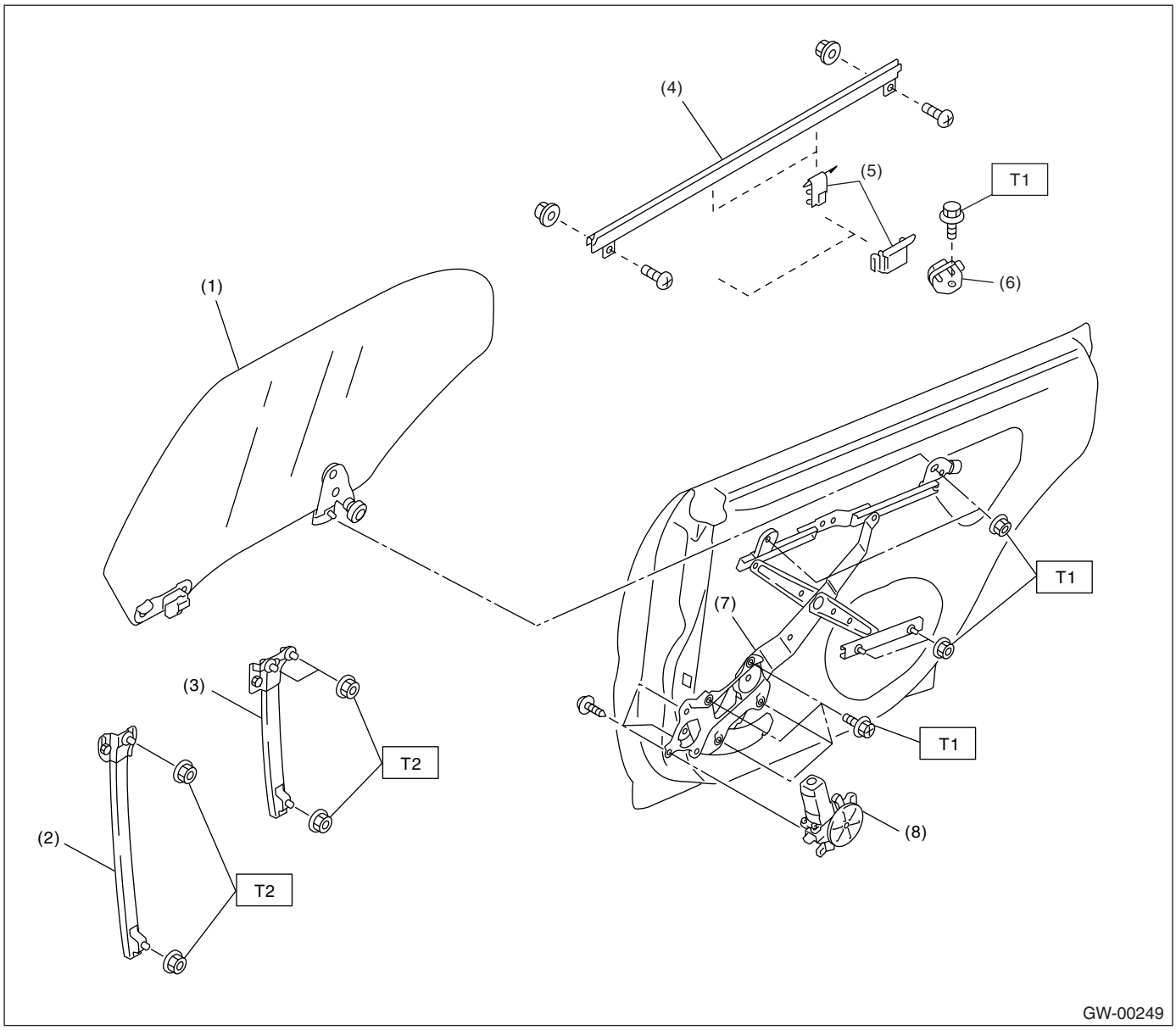
3. FRONT DOOR GLASS



(1) Glass
(2) Door sash (Front)
(3) Door sash (Rear)
(4) Weather strip
(5) Stabilizer (Outer)
(6) Stabilizer (Inner)
(7) Regulator ASSY
(8) Motor ASSY
(9) Mirror gusset

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.5)
T2: 13.7 (1.4, 10.1)

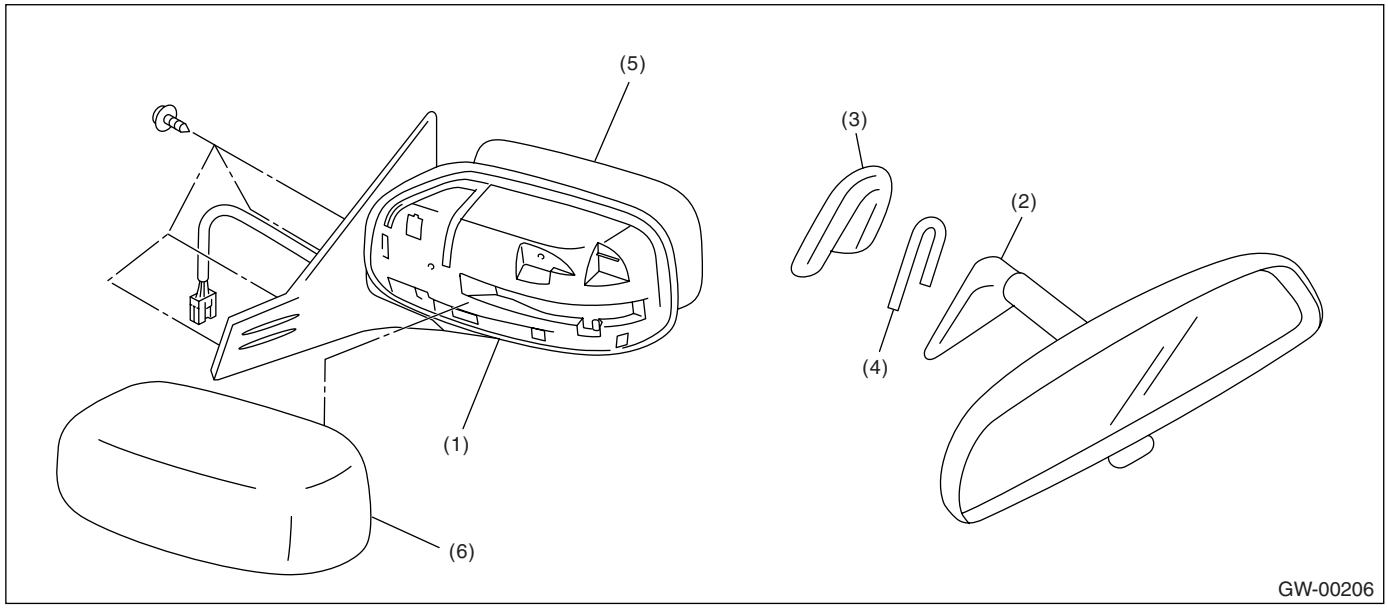
4. REAR DOOR GLASS



(1) Glass
(2) Door sash (Front)
(3) Door sash (Rear)
(4) Weather strip
(5) Stabilizer (Outer)
(6) Stabilizer (Inner)
(7) Regulator ASSY
(8) Motor ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.5)
T2: 13.7 (1.4, 10.1)

5. MIRRORS



(1) Outer mirror
(2) Inner rearview mirror
(3) Mount
(4) Spring
(5) Mirror
(6) Scalp cap

B: CAUTION

- When the electrical connectors are disconnected, always conduct an operational check after connecting them again.
- Avoid impact and damage to glass.

C: PREPARATION TOOL

TOOL NAME	REMARKS
Circuit Tester	Used for checking voltage and continuity.
Piano Wire	Used for window glass removal.
Windshield Knife	Used for window glass removal.

2. Power Window System

A: WIRING DIAGRAM

<Ref. to WI-145, Power Window System.>

B: INSPECTION

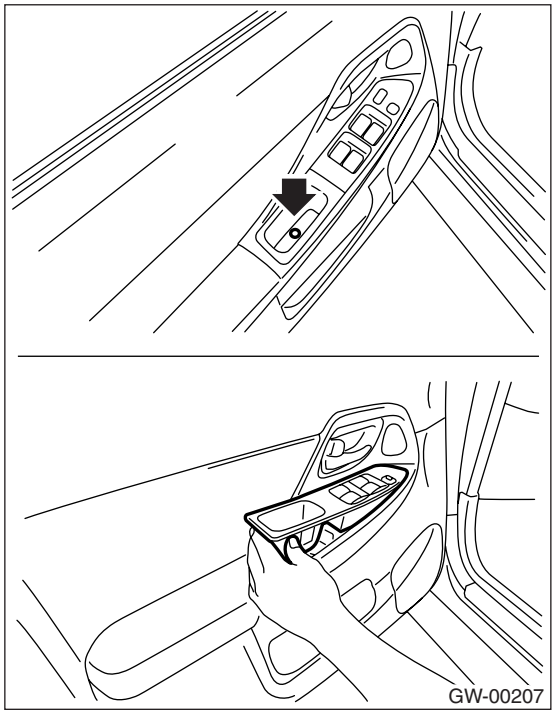
Symptom	Repair order
All power windows do not operate.	(1) Fuse (SBF-6) (2) Power window circuit breaker (3) Power window relay (4) Wiring harness
One window does not operate.	(1) Power window main switch (2) Power window sub switch (3) Power window motor (4) Wiring harness
“Window Lock” does not operate.	(1) Power window main switch

3. Power Window Control Switch

A: REMOVAL

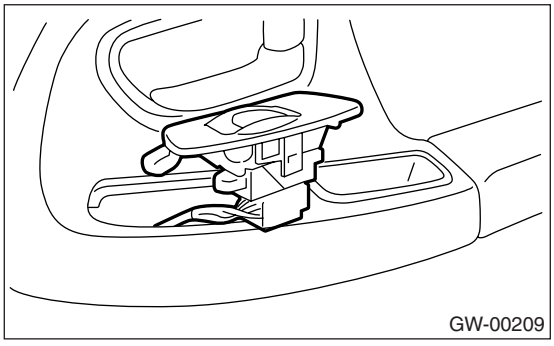
1. MAIN SWITCH

1) Disconnect the ground cable from battery.
2) Loosen the screw to remove the power window main switch.
3) Disconnect the connector.



2. SUB-SWITCH

1) Disconnect the ground cable from battery.
2) Remove the switch panel.
3) Disconnect the connector.



B: INSTALLATION

1. MAIN SWITCH

Install in the reverse order of removal.

2. SUB- SWITCH

Install in the reverse order of removal.

C: INSPECTION

1. MAIN SWITCH

Measure the switch resistance.

	Switch position	Terminal No.	Standard
Driver's side	AUTO UP	13 and 2, 1 and 5	Less than 1 Ω
	UP	13 and 2, 1 and 5	Less than 1 Ω
	OFF	1 and 2 1 and 5 2 and 5	Less than 1 Ω
	DOWN	13 and 1, 2 and 5	Less than 1 Ω
	AUTO DOWN	13 and 1, 2 and 5	Less than 1 Ω
Front passenger's side	UP	13 and 7, 6 and 5	Less than 1 Ω
	OFF	5 and 6 5 and 7 6 and 7	Less than 1 Ω
	DOWN	13 and 6, 7 and 5	Less than 1 Ω
Rear LH	UP	10 and 13, 9 and 5	Less than 1 Ω
	OFF	5 and 11 5 and 10 11 and 10	Less than 1 Ω
	DOWN	13 and 11, 10 and 5	Less than 1 Ω
Rear RH	UP	13 and 16, 15 and 5	Less than 1 Ω
	OFF	5 and 15 5 and 16 15 and 16	Less than 1 Ω
	DOWN	13 and 15, 16 and 5	Less than 1 Ω

If NG, replace the main switch.

2. SUB-SWITCH

Measure the switch resistance.

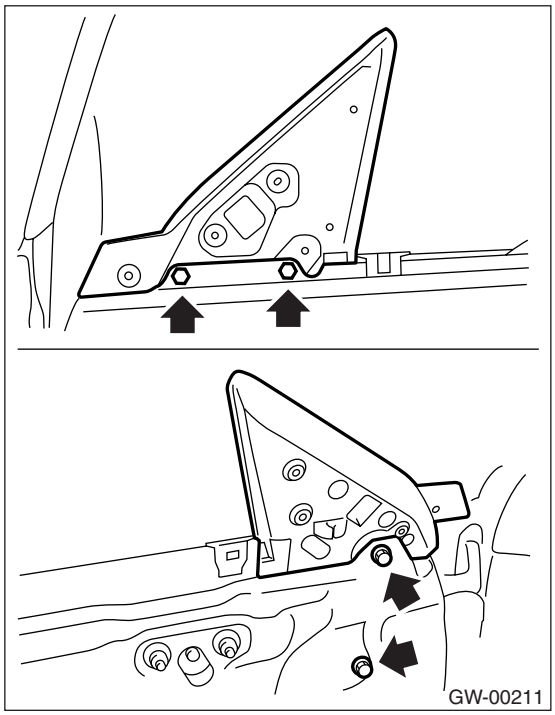
	Switch position	Terminal No.	Standard
Front passenger's side & rear	UP	8 and 5, 6 and 7	Less than 1 Ω
	OFF	4 and 5, 6 and 7	Less than 1 Ω
	DOWN	8 and 7, 4 and 5	Less than 1 Ω

If NG, replace the sub-switch.

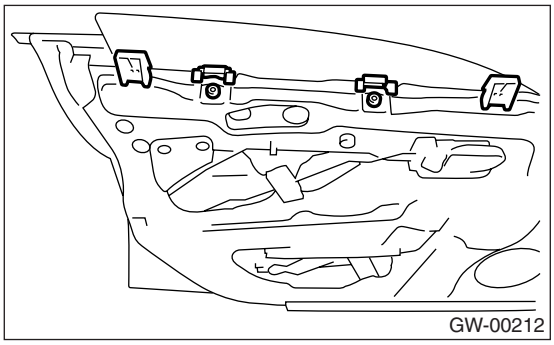
4. Front Door Glass

A: REMOVAL

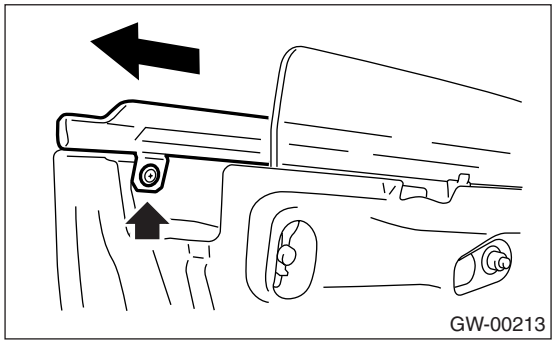
1) Remove the front door trim. <Ref. to EI-39, REMOVAL, Front Door Trim.>
2) Remove the sealing cover. <Ref. to EB-16, REMOVAL, Front Sealing Cover.>
3) Remove the outer mirror assembly. <Ref. to GW-17, REMOVAL, Outer Mirror Assembly.>
4) Remove the gusset.



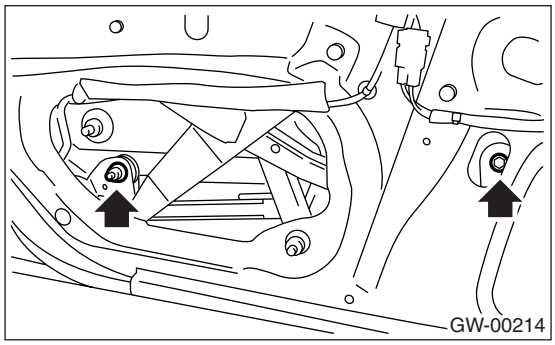
5) Remove the stabilizers and trim hooks.



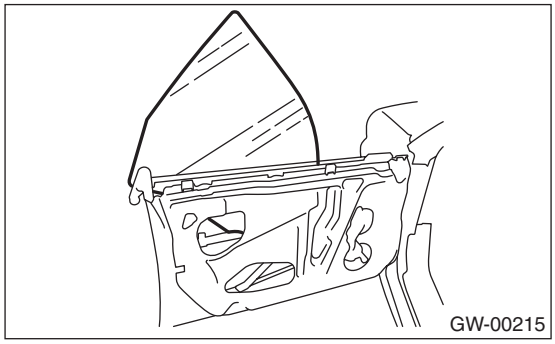
6) Remove the rear end of door weather strip and weather strip outer.



7) Operate the power window switch to move the glass to position shown in the figure, and then remove the two nuts from service holes.



8) Take out the door glass.



CAUTION:
• Do not turn the regulator in closing direction after removal of the glass. Otherwise gear may be disengaged.
• Avoid impact and damage to the glass.

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
Make sure the glass stay is placed securely in sash.

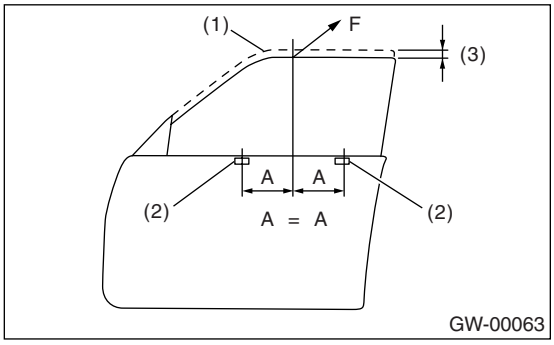
2) Adjust the front door glass. <Ref. to GW-11, ADJUSTMENT, Front Door Glass.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to GW-4, FRONT DOOR GLASS, COMPONENT, General Description.>

C: ADJUSTMENT

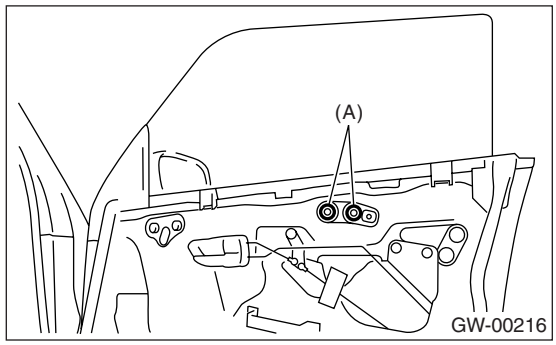
NOTE:
Before adjustment, ensure that all adjusting bolts of stabilizer, upper stopper, and sash are loosened and door glass is raised so that it is in contact with weather strip.

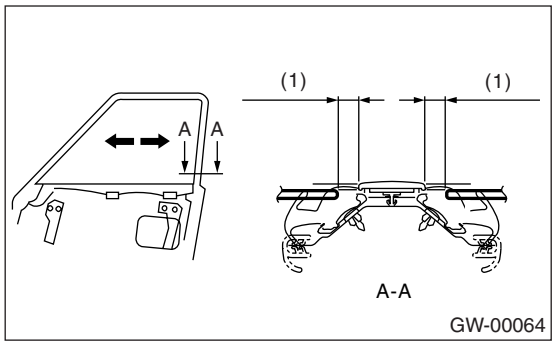
1) Temporarily tighten one adjusting bolt on one side of rear sash at the midpoint of slotted hole in the inner panel.
2) Temporarily tighten the regulator B-channel in a position at the top of slotted hole.
3) Lower the door glass 10 to 15 mm (0.39 to 0.59 in) from fully closed position. While applying outward pressure of 45.0±5.0 N (4.5±0.5 kgf, 9.9±1.1 lb) (F) to upper edge of glass above midpoint of two outer stabilizers, press the inner stabilizer at pressure of 30±5 N (3.0±0.5 kgf, 6.6±1.1 lb) to the glass, then secure it.



(1) Full close position
(2) Stabilizer
(3) 10 — 15 mm (0.39 — 0.59 in)

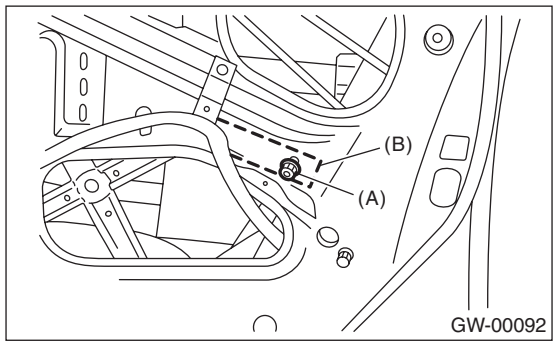
4) For adjustment of clearance between front glass and center pillar cover, loosen the nuts (A), and move the glass sash back and forward until clearance becomes the value shown.



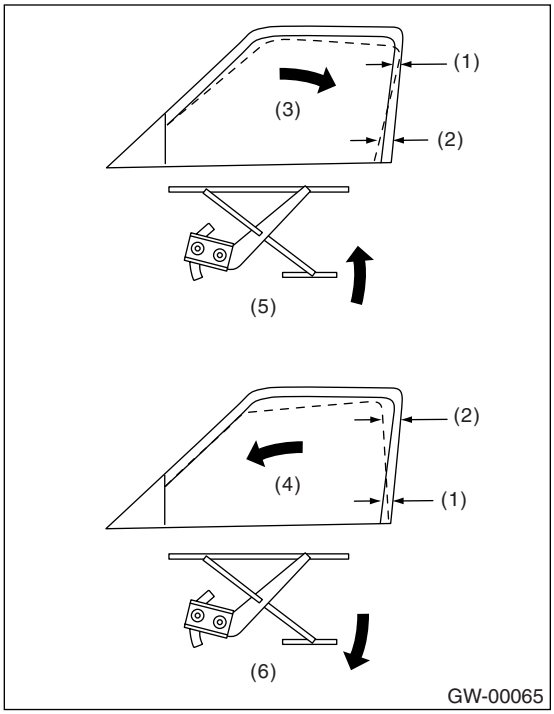


(1) 12 mm (0.472 in)

5) For adjustment of upper and lower ends of center pillar, loosen the adjusting nut (A) of B-channel (B).

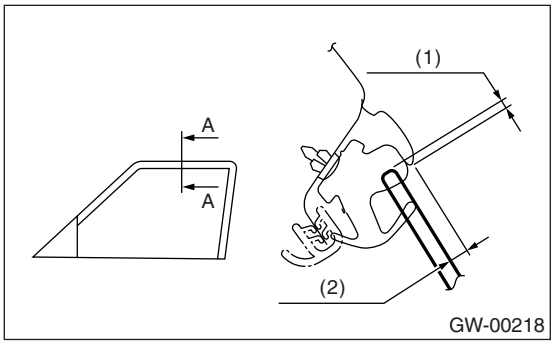


6) Adjust so that the upper and lower ends of center pillar are the same size.



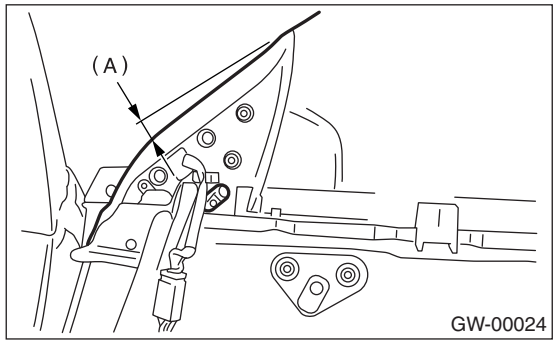
(1) Narrow
(2) Wide
(3) Glass tilts too far rearward
(4) Glass tilts too far forward
(5) Raise B channel
(6) Lower B channel

7) For glass stroke adjustment, close the door, raise glass until positional relationship between glass and weather strip becomes as shown. And secure the glass so that the upper stopper lightly touches the glass holder.



(1) 2 — 3 mm (0.079 — 0.118 in)
(2) 6 mm (0.236 in)

For preventing wind noise, adjust the glass at the position where tip of gusset is raised up a little.

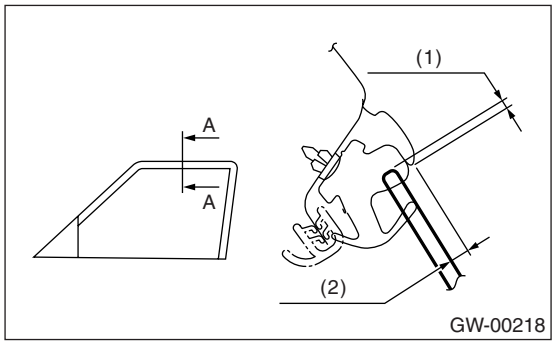


(A) 0 — 1.5 mm (0 — 0.059 in)

8) After stabilizer adjustment, carry out the glass crimp adjustment. First, visually ensure positional relationship between retainer & molding and glass of the roof side, and then begin with rear sash adjustment. Adjust two adjusting bolts alternately step by step to obtain dimensions shown below (cross-section A).

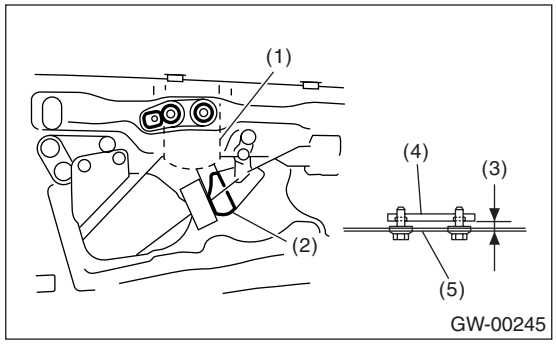
NOTE:
If two nuts are loosened at the same time, sash moves back and forth. Therefore, when one nut is adjusted, leave the other secured.

9) Make the same adjustment of two adjusting bolts of rear sash.



(1) 2 — 3 mm (0.079 — 0.118 in)
(2) 6 mm (0.236 in)

NOTE:
Do not tilt the sash bracket to inner panel during adjustment. Otherwise smooth regulator operation cannot be achieved.



(1) Sash bracket
(2) Rear sash
(3) Adjust a line parallel
(4) Sash
(5) Inner panel

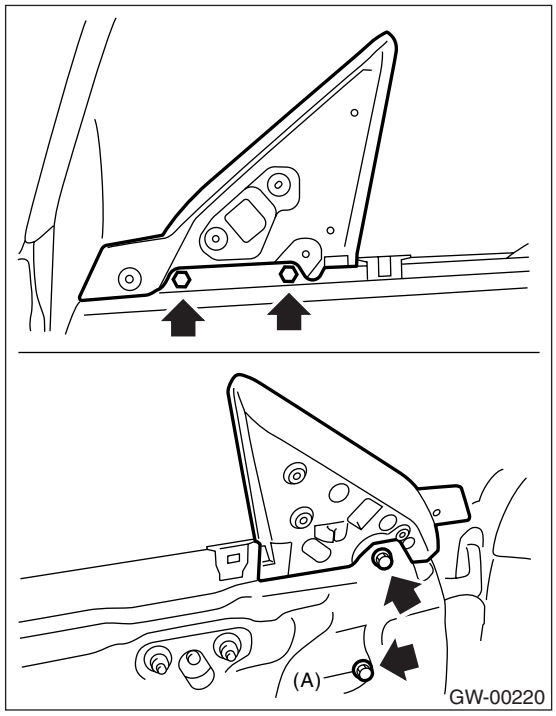
10) Make adjustment of front sash in the same manner as that of rear sash.

NOTE:
Although front and rear sashes must, as a rule, be adjusted in the same manner, in some door installation, the adjustment in a different manner may be required. However, adjustment of one sash to the maximum amount and the other to the minimum amount is not permitted. Such adjustment may result in application of excessive load to regulator.

11) After adjustments, tighten the nuts.

12) After adjustment to glass, close the door. If there is a gap between outer lip of gusset and glass surface, adjust the gap with adjusting bolt (A) in lower fitting part of the gusset to prevent generation of wind noise.

13) During adjustments, loosen the other three clamping bolts.

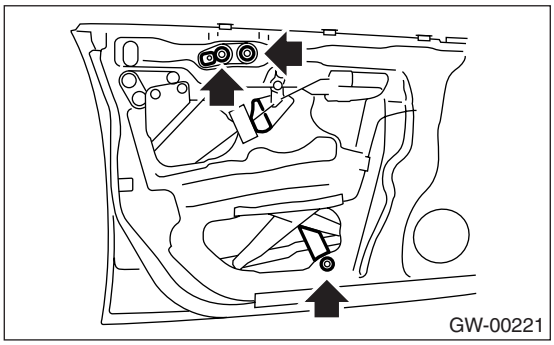


14) After adjustment, tighten the bolts and nuts.

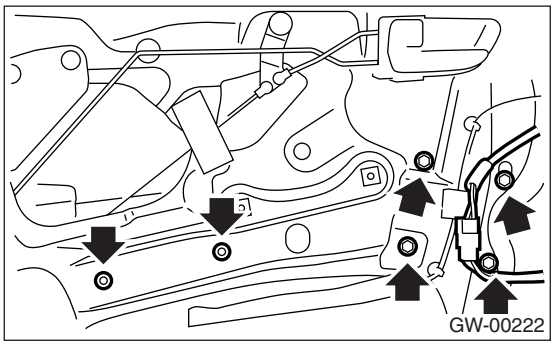
5. Front Regulator and Motor Assembly

A: REMOVAL

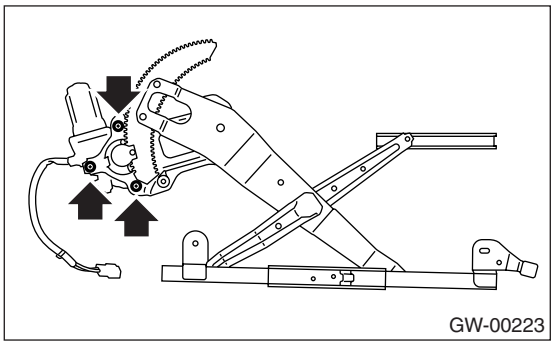
1) Remove the door glass. <Ref. to GW-10, REMOVAL, Front Door Glass.>
2) Loosen the nuts to remove the rear sash.



3) Disconnect the motor connector.
4) Loosen the four bolts and two nuts to remove the regulator assembly.



5) Loosen the screw to remove motor assembly.



B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the front door glass. <Ref. to GW-11, ADJUSTMENT, Front Door Glass.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to GW-4, FRONT DOOR GLASS, COMPONENT, General Description.>

C: INSPECTION

1) Make sure the power window motor rotates properly when battery voltage is applied to the terminals of motor connector.
2) Change polarity of battery connections to terminals to ensure the motor rotates in reverse direction.

6. Remote Control Mirror System

A: WIRING DIAGRAM

<Ref. to WI-154, Remote Controlled Rearview Mirror System.>

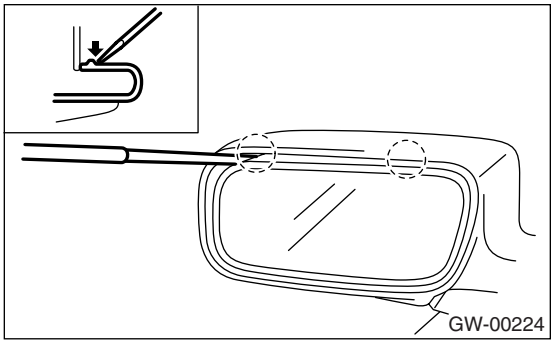
B: INSPECTION

Symptom	Repair order
All functions do not operate.	(1) Fuse (F/B No. 1) (F/B No. 4) (F/B No. 19) (2) Mirror switch (3) Wiring harness
One side of the mirror motor does not operate.	(1) Mirror switch (2) Mirror motor (3) Wiring harness
Mirror heater does not operate.	(1) Mirror switch (2) Mirror heater (3) Wiring harness

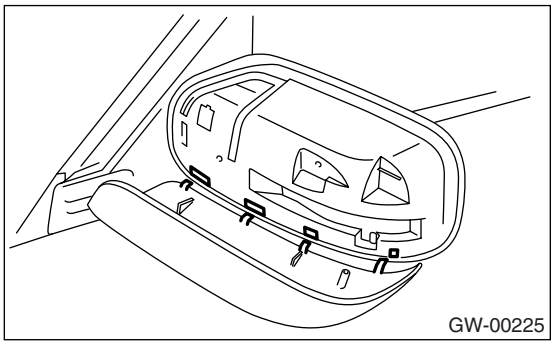
7. Scalp Cap

A: REPLACEMENT

1) Turn the rearview mirror downward.
2) Insert a thin screw driver, push the clip part of scalp cap, and remove the scalp cap.



3) Insert the claw at the bottom of scalp cap into door mirror.

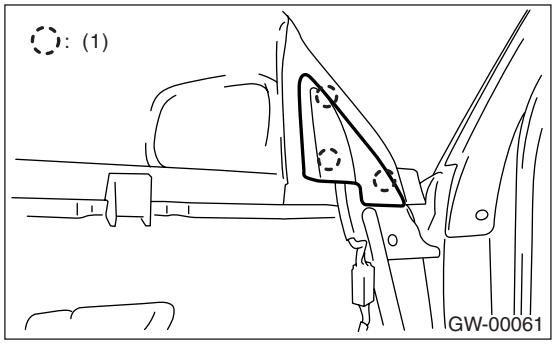


4) Install the scalp cap securely.

8. Outer Mirror Assembly

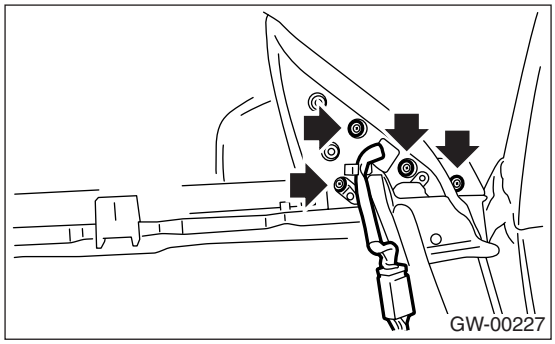
A: REMOVAL

1) Remove the scalp cap. <Ref. to GW-16, REPLACEMENT, Scalp Cap.>
2) Remove the door trim. <Ref. to EI-39, REMOVAL, Front Door Trim.>
3) Remove the mirror gusset cover.



(1) Hook

4) Disconnect the mirror connector.
5) Loosen the screws to remove the mirror assembly.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Check to ensure that the rearview mirror moves properly when battery voltage is applied to terminals.

Mirror heater not-equipped model:

Switch position	Terminal No.
OFF	—
UP	4 (+) and 6 (–)
DOWN	6 (+) and 4 (–)
LEFT	5 (+) and 6 (–)
RIGHT	6 (+) and 5 (–)

If NG, replace the mirror.

Mirror heater equipped model:

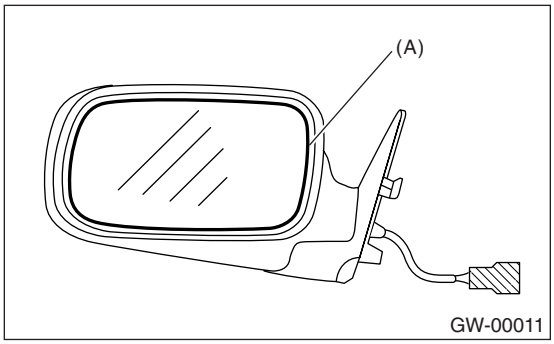
Switch position	Terminal No.
OFF	—
UP	6 (+) and 8 (–)
DOWN	8 (+) and 6 (–)
LEFT	7 (+) and 8 (–)
RIGHT	8 (+) and 7 (–)

If NG, replace the mirror.

9. Outer Mirror

A: REPLACEMENT

1) Remove the outer mirror assembly. <Ref. to GW-17, REMOVAL, Outer Mirror Assembly.>
2) Warm the area around the mirror holder (A) with a hair drier until the edges of the mirror holder become soft (about 2 or 3 minutes with a 1,000 W drier.)
3) Use a flat tip screwdriver without sharp edges to lift the mirror out of the mirror holder (A).
4) Disconnect the mirror heater connector from back of mirror. (model with mirror heater)



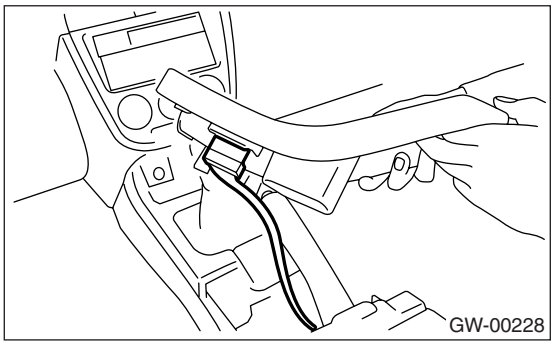
5) Warm the area around the mirror holder with a hair drier until the edges of the mirror holder become soft (about 2 or 3 minutes with a 1,000 W drier.)
6) Remove the backing of the new double-stick tape, and push the mirror in to install it.

NOTE:
Unless the mirror holder is warmed sufficiently, the mirror holder edges may be damaged or the mirror cracked.

10. Remote Control Mirror Switch

A: REMOVAL

1) Remove the console cover.
2) Disconnect the connector.



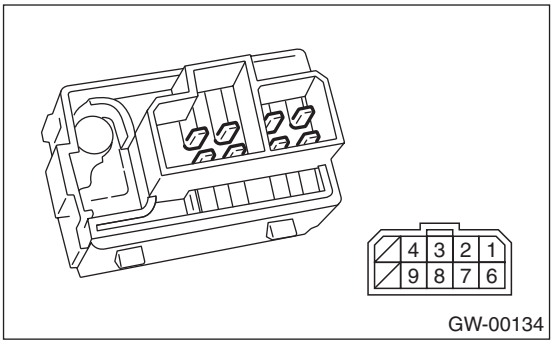
3) Remove the remote control mirror switch from console cover.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Move the rearview mirror switch to each position and check continuity between terminals.



Change over switch right position:

Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
UP	4 and 6, 2 and 1	Less than 1 Ω
DOWN	6 and 2, 4 and 1	Less than 1 Ω
LEFT	4 and 8, 2 and 1	Less than 1 Ω
RIGHT	8 and 2, 4 and 1	Less than 1 Ω

Change over switch left position:

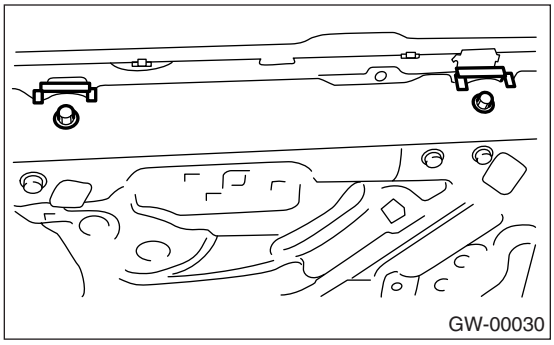
Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
UP	4 and 7, 2 and 1	Less than 1 Ω
DOWN	7 and 2, 4 and 1	Less than 1 Ω
LEFT	4 and 9, 2 and 1	Less than 1 Ω
RIGHT	9 and 2, 4 and 1	Less than 1 Ω

If NG, replace the switch.

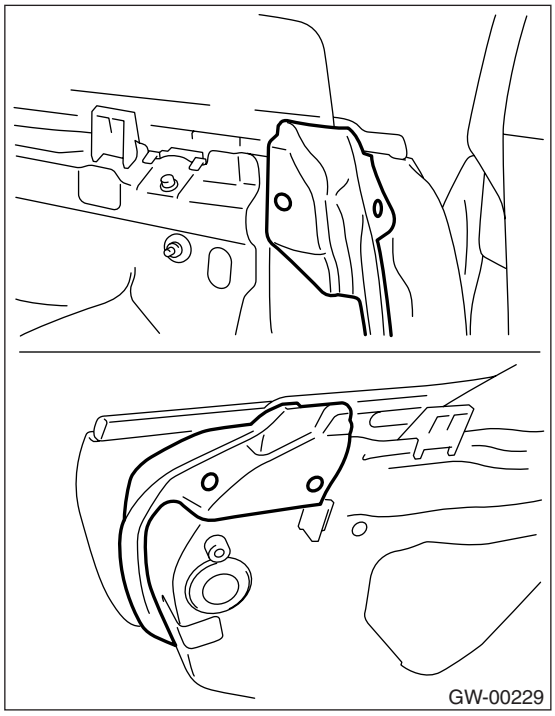
11.Rear Door Glass

A: REMOVAL

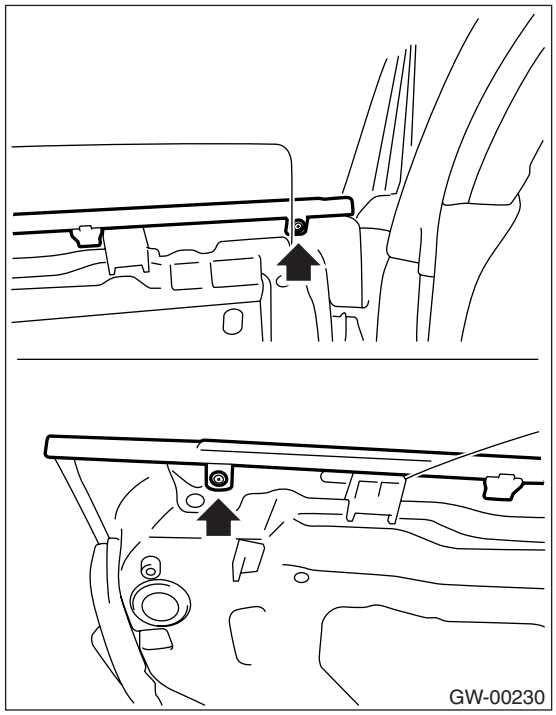
1) Remove the rear door trim. <Ref. to EI-40, REMOVAL, Rear Door Trim.>
2) Remove the sealing cover. <Ref. to EB-18, REMOVAL, Rear Sealing Cover.>
3) Remove the stabilizer and trim hook.


GW-00030

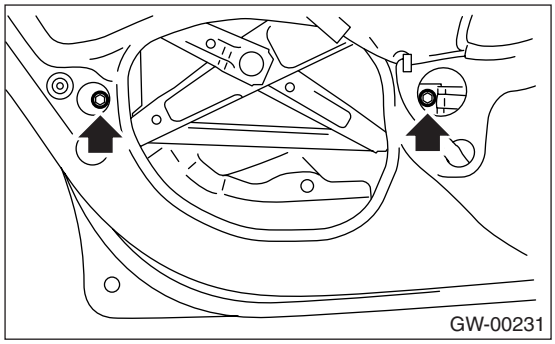
4) Remove the front end and rear end of door weather strip.


GW-00229

5) Loosen the two screws to remove the weather strip outer.


GW-00230

6) Operate the power window switch to move the glass to position shown in the figure, and then remove two nuts from service holes.


GW-00231

7) Loosen the two rear sash installation nuts, and then move the rear sash backward.
8) Remove the glass.

CAUTION:
Avoid impact and damage to the glass.

B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
Make sure the glass stay is placed securely in sash.

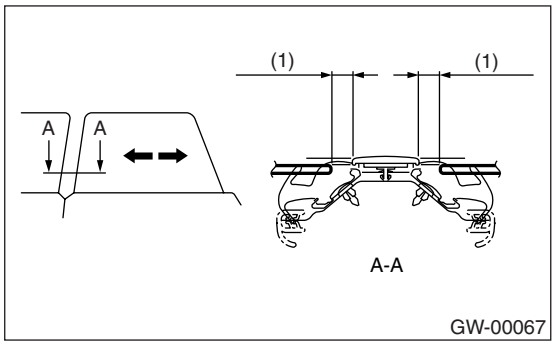
2) Adjust the rear door glass. <Ref. to GW-21, ADJUSTMENT, Rear Door Glass.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to GW-5, REAR DOOR GLASS, COMPONENT, General Description.>

C: ADJUSTMENT

NOTE:
The rear door glass, as a rule, should be adjusted in the same manner as front door glass, although they are different in dimension. Special notes for the rear glass are given below.

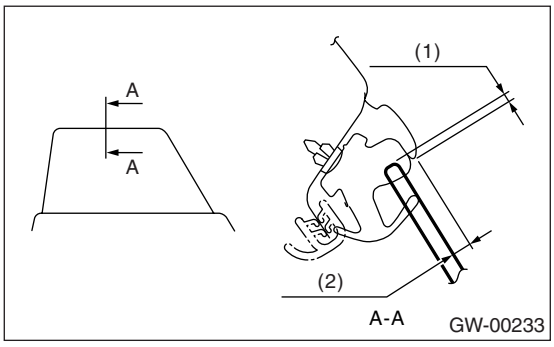
1) Adjust the glass position using the following dimensions as a guide line.



(1) 12 mm (0.472 in)

NOTE:
• If the dimensions are smaller than the given dimensions, glass may get caught in weather strip during lifting/lowering operation. In the worst case, it may cause the glass not to be opened fully.
• After adjustment, move the glass up and down to check whether it is caught.

2) Adjust the contact degree of glass using the following dimensions as a guide line.



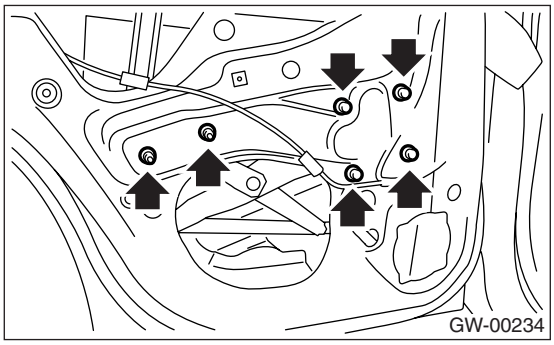
(1) 2 — 3 mm (0.079 — 0.118 in)
(2) 6 mm (0.236 in)

NOTE:
• If the contact degree of rear glass is higher than necessary, glass may get caught in weather strip of center pillar corner, resulting in early wear of weather strip. Be careful when adjusting.
• After adjustment, move the glass up and down to check whether it is caught.

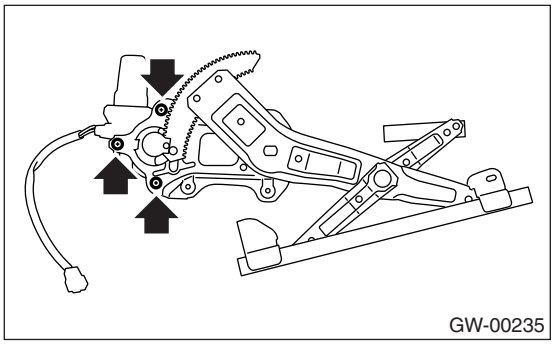
12. Rear Regulator and Motor Assembly

A: REMOVAL

1) Remove the rear door glass. <Ref. to GW-20, REMOVAL, Rear Door Glass.>
2) Remove the front sash.
3) Disconnect the motor connector.
4) Loosen the four bolts and two nuts to remove regulator assembly.



5) Loosen the screws to remove motor assembly.



B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the rear door glass. <Ref. to GW-21, ADJUSTMENT, Rear Door Glass.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to GW-5, REAR DOOR GLASS, COMPONENT, General Description.>

C: INSPECTION

1) Make sure that the power window motor rotates properly when battery voltage is applied to terminals of motor connector.
2) Change polarity of battery connections to terminals to ensure that the motor rotates in reverse direction.

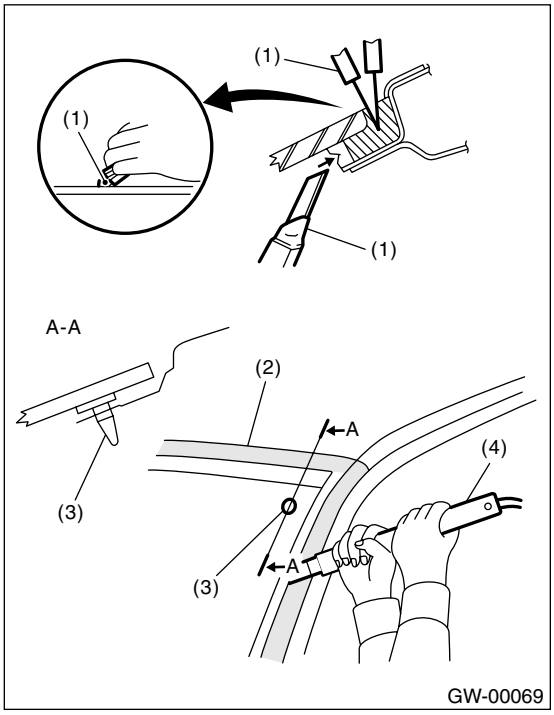
13.Windshield Glass

A: REMOVAL

1. USING WINDSHIELD KNIFE

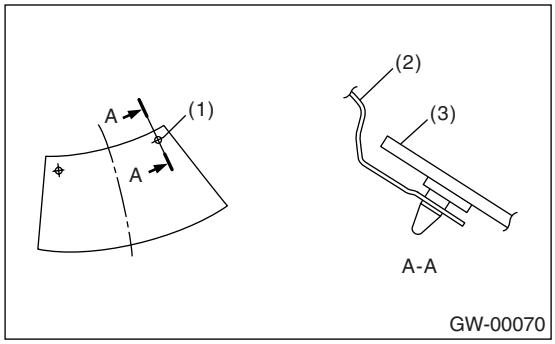
1) Remove the cowl panel. <Ref. to EI-33, REMOVAL, Cowl Panel.>
2) Remove the glass molding.
3) Tape the body side of the circumference of windshield glass for protection.
4) Apply sufficient amount of soapy water to the adhesive layer.
5) Insert the windshield knife into the adhesive layer.
6) While holding the knife edge and windshield glass edge at a right angle, move the windshield knife in parallel to the windshield glass edge along face and edge of windshield glass to cut the adhesive layer.

NOTE:
• Do not twist the windshield knife.
• Cutting of adhesive layer shall be started with wider gap between windshield glass and body.



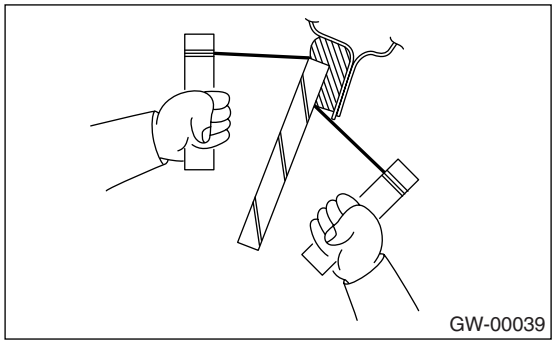
(1) Putty knife
(2) Protective tape
(3) Matching pin
(4) Windshield knife

• Because the matching pins are bonded to corners of glass, use piano wire to cut the pin.



2. USING PIANO WIRE

1) Remove the cowl panel. <Ref. to EI-33, REMOVAL, Cowl Panel.>
2) Remove the roof molding and upper front molding.
3) Tape the body side of circumference of windshield glass for protection.
4) Make a hole in adhesive layer using a drill or knife.
5) Pass the piano wire through hole, and attach securely both the piano wire ends to pieces of wood.



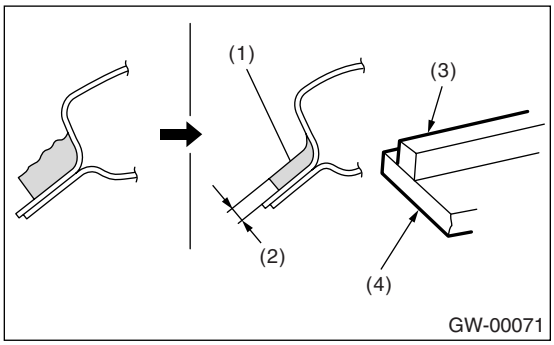
6) Pull the wire ends alternately to cut off the adhesive layer.

CAUTION:
• Do not tightly pull the piano wire against the windshield glass edge.
• Be careful not to damage the interior and exterior parts.
• When removal is made with area close to instrument panel, place a protection plate over it. Pay particular attention to the removal.
• Do not cross piano wires. Otherwise they may be cut.

B: INSTALLATION

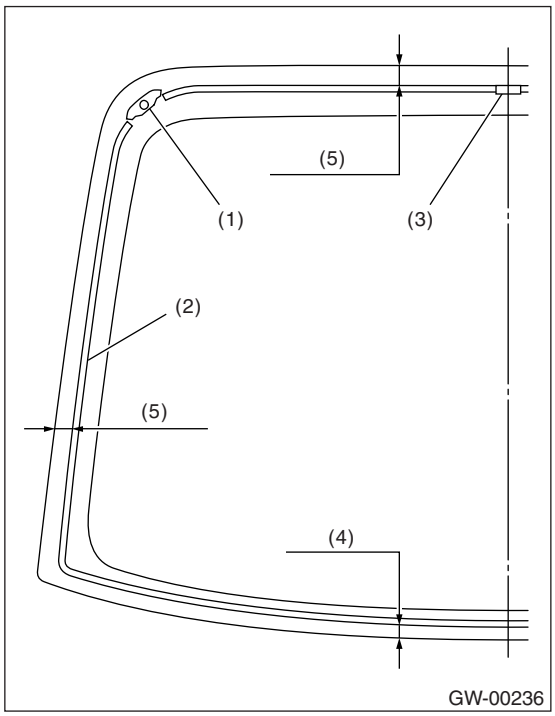
1) Clean the external circumference of windshield glass with alcohol or white gasoline.
2) Remove the adhesive layer on the body using cutter knife to obtain smooth face 2 mm (0.08 in) thick.

CAUTION:
Be careful not to damage the body and paint surface.



(1) Adhesive
(2) 2 mm (0.08 in)
(3) Dam rubber
(4) Glass

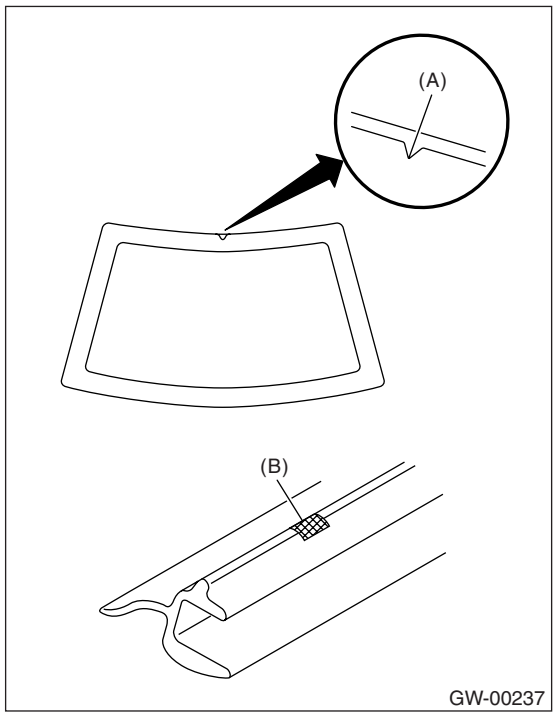
3) Clean the body with alcohol or white gasoline to remove thoroughly chips, dusts, and dirt from body face.
4) Place the glass on body aligning the matching pin of glass side with the hole of body side.
5) Adjust the glass position to make uniform clearance between body and glass in four corners.



(1) Matching pin
(2) Dam rubber
(3) Fastener
(4) 15 mm (0.591 in)
(5) 11 mm (0.433 in)

6) Remove the glass temporarily from body.

7) Fit the mark (B) on molding to the notch (A) of glass side, and install the molding to the whole glass edge.



8) Apply two kinds of primer to the adhesive layer of glass using sponge.

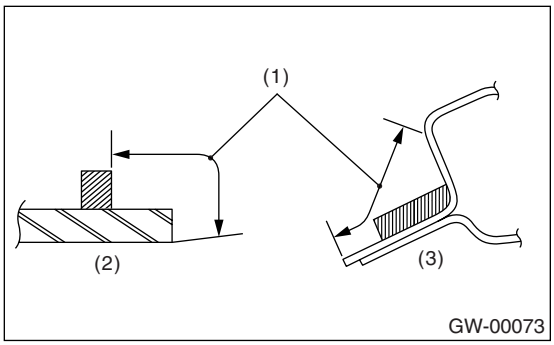
Glass primer:
ESSEX U-401 (for undercoat) and ESSEX U-402 (for overcoat) or equivalent

9) Apply primer to adhesive layer of body.

Painted surface primer:
ESSEX U-413 or equivalent

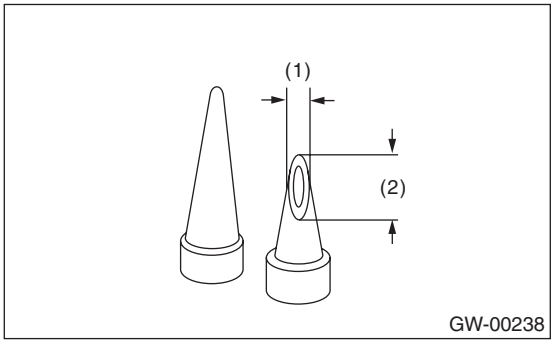
NOTE:
• Primer once attached to painted surface of the body and internal trim is hard to wipe off. Mask the circumference of such areas.
• Let the primer dry for about ten minutes before installing the glass.

• Do not touch the surface coated with primer.



(1) Application of primer
(2) Glass side
(3) Body side

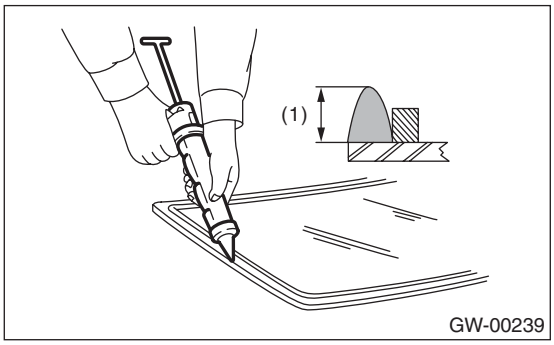
10) Cut off the cartridge nozzle tip as shown and set it in sealant gun.



(1) 10 mm (0.39 in)
(2) 15 mm (0.59 in)

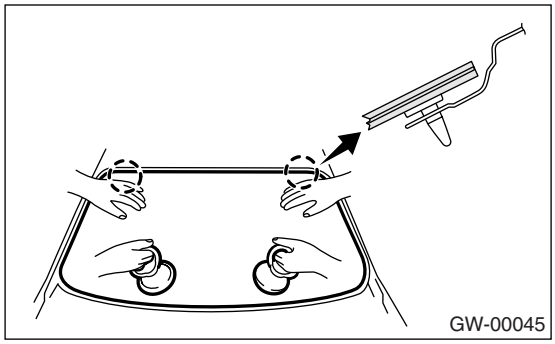
11) Apply adhesive to the glass end surface as shown.

Adhesive:
ESSEX U-400HV or equivalent



(1) 12 — 15 mm (0.47 — 0.59 in)

12) Fit the matching pins using suction rubber cup to install the windshield glass.



13) Lightly press the windshield glass for tight fit.
14) Make flush the adhesive surface jutted out using spatula.
15) After completion of all work, allow the vehicle to stand for about 24 hours.

NOTE:
• When the door is opened/closed after glass is bonded, always lower the door glass and then open/close it carefully.
• Move the vehicle slowly.
• For minimum drying time and time the vehicle must be left standing before driving after bonding, follow the instructions or instruction manual from adhesive manufacturer.

16) After curing of adhesive, pour water on external surface of vehicle to check that there are no water leaks.

NOTE:
When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

17) Install the cowl panel. <Ref. to EI-33, INSTALLATION, Cowl Panel.>

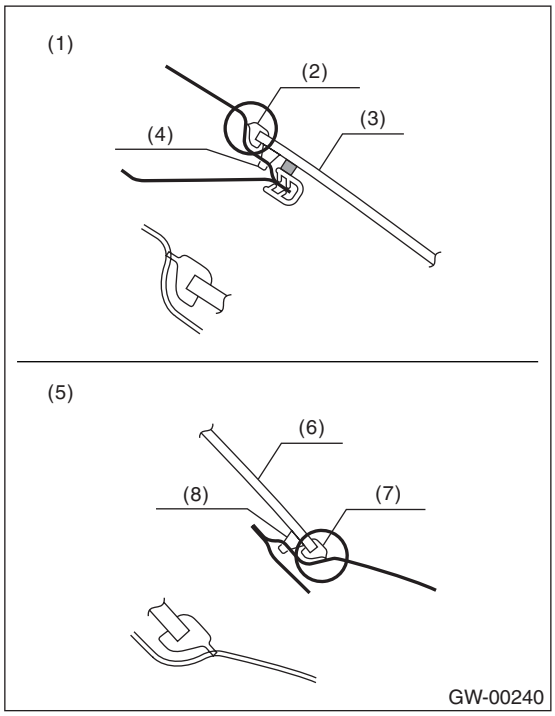
14.Rear Gate Glass

A: REMOVAL

1) Remove the rear wiper motor. <Ref. to WW-16, REMOVAL, Rear Wiper Motor.>
2) Disconnect the electrical connector from rear defogger terminal.
3) Remove the glass in the same procedure as for windshield glass. <Ref. to GW-23, REMOVAL, Windshield Glass.>

B: INSTALLATION

1) Apply adhesive in the same procedure as for windshield glass. <Ref. to GW-23, INSTALLATION, Windshield Glass.>
2) Insert the glass clip pin into the rear gate hole, and after pushing on the area around the clip pin to secure it, push lightly all around the area to seal it.
3) About one hour after installation, conduct a water leak test.



(1) Upper side
(2) Molding
(3) Glass
(4) Adhesive
(5) Lower side
(6) Glass
(7) Molding
(8) Adhesive

4) After completion of all work, allow the vehicle to stand for about 24 hours.

NOTE:
• When the door is opened/closed after glass is bonded, always lower the door glass and then open/close it carefully.
• Move the vehicle slowly.
• For minimum drying time and time the vehicle must be left standing before driving after bonding, follow the instructions or instruction manual from adhesive manufacturer.
• When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

5) Connect the rear defogger terminals.
6) Install the rear wiper. <Ref. to WW-16, INSTALLATION, Rear Wiper Motor.>

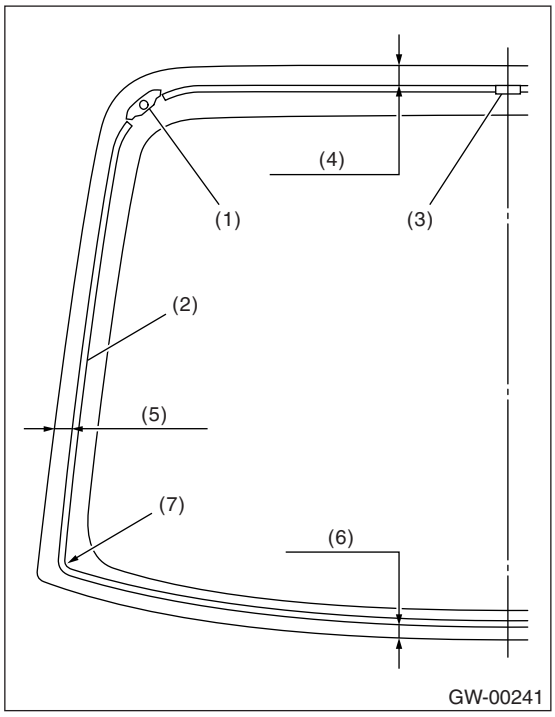
15.Rear Window Glass

A: REMOVAL

1) Disconnect the electrical connectors from rear defogger terminals.
2) Remove the glass in the same procedure as for windshield glass. <Ref. to GW-23, REMOVAL, Windshield Glass.>

B: INSTALLATION

1) Bond the dam rubber and matching pin.



(1) Matching pin
(2) Dam rubber
(3) Fastener
(4) 14.5 mm (0.571 in)
(5) 8 mm (0.315 in)
(6) 22 mm (0.866 in)
(7) R20

2) Install the glass in the same procedure as for windshield glass. <Ref. to GW-23, INSTALLATION, Windshield Glass.>
3) Connect the rear defogger terminals.
4) After completion of all work, allow the vehicle to stand for about 24 hours.

NOTE:
• When the door is opened/closed after glass is bonded, always lower the door glass and then open/close door carefully.
• Move the vehicle slowly.
• For minimum drying time and time the vehicle must be left standing before driving after bonding, follow the instructions or instruction manual from adhesive manufacturer.

5) After curing of adhesive, pour water on external surface of vehicle to check that there are no water leaks.

NOTE:
When a vehicle is returned to user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

16.Rear Window Defogger System

A: WIRING DIAGRAM

<Ref. to WI-153, Rear Window Defogger System.>

B: INSPECTION

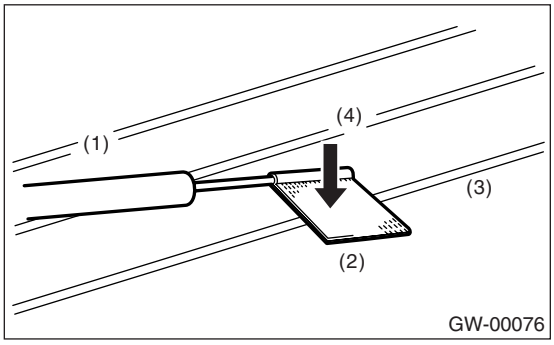
Symptom	Repair order
Rear window defogger does not operate.	(1) Fuse (M/B No. 1) (F/B No. 17) (2) Rear defogger relay (3) Rear defogger timer (4) Defogger switch (5) Rear defogger condenser (6) Defogger wire (7) Wiring harness

17.Rear Window Defogger

A: INSPECTION

CAUTION:
When wiping stain on glass off with cloth, use a dry and soft cloth and move it in the direction of heat wire extension to avoid damage to heat wire.

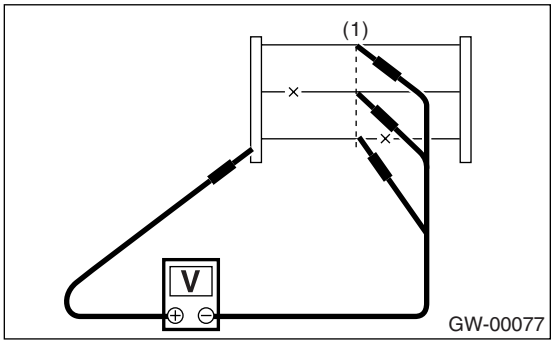
1) Turn the ignition switch to ON.
2) Turn the defogger switch to ON.
3) Wrap the tips of tester pins with aluminum foil to avoid damage to heat wire.



(1) Tester probe
(2) Aluminum foil
(3) Heat wire
(4) Press

4) Measure the voltage at wire center with DC voltmeter.

Standard voltage:
Approx. 6 V



(1) Wire center

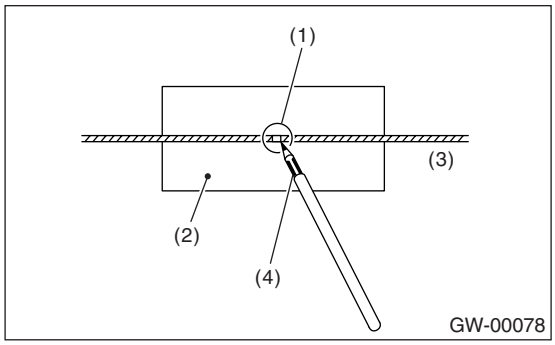
Voltage	Criteria
Approx. 6 V	OK
Approx. 12 V or 0 V	Broken

NOTE:
• If the measured value is 12 volts, heat wire is open between wire center and positive (+) end.
• If zero volt, heat wire is open between wire center and ground.

5) Apply positive lead of voltmeter to positive terminal of voltmeter, and then move the negative lead along the wire up to negative terminal end. If voltage changes from zero to several volts during movement of lead, heat wire is open at the voltage change point.

B: REPAIR

1) Clean the broken portion with alcohol or white gasoline.
2) Mask both side of wire with thin film.
3) Apply conductive silver composition (DUPONT No. 4817) to broken portion.



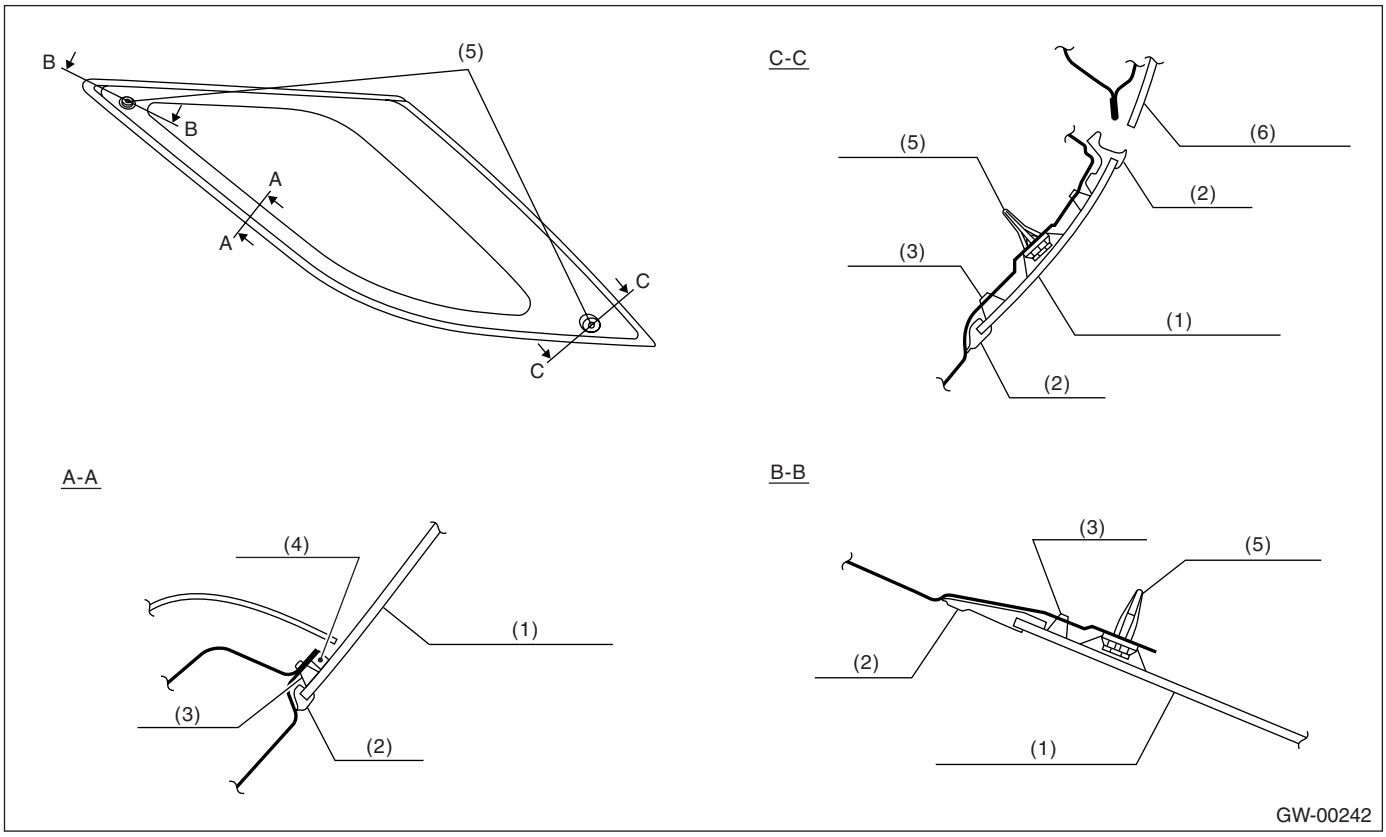
(1) Broken portion
(2) Masking thin film
(3) Broken wire
(4) Conductive silver composition (DUPONT No. 4817)

4) After repair, check the wire.

18.Rear Quarter Glass

A: REMOVAL

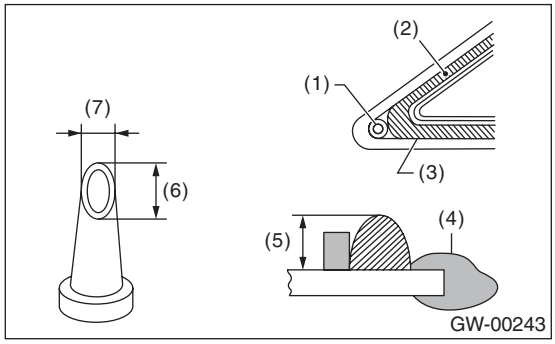
Remove the glass in the same procedure as for windshield glass. <Ref. to GW-23, REMOVAL, Windshield Glass.>



(1) Rear quarter glass
(2) Molding
(3) Adhesive
(4) Dam rubber
(5) Matching pin
(6) Rear gate glass

B: INSTALLATION

1) Cut off the nozzle tip as shown in the figure.



(1) Matching pin
(2) Dam rubber
(3) Adhesive
(4) Molding
(5) 12 — 15 mm (0.47 — 0.59 in)
(6) 15 mm (0.59 in)
(7) 10 mm (0.39 in)

2) Install the glass in the same procedure as for windshield glass. <Ref. to GW-23, INSTALLATION, Windshield Glass.>

3) After completion of all work, allow the vehicle to stand for about 24 hours.

NOTE:
- When the door is opened/closed after glass is bonded, always lower the door glass and then open/close it carefully.
- Move the vehicle slowly.
- For minimum drying time and time the vehicle must be left standing before driving after bonding, follow the instructions or instruction manual from adhesive manufacturer.

4) After curing of adhesive, pour water on external surface of vehicle to check that there are no water leaks.

NOTE:
When a vehicle is returned to user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

19.Roof Window Glass

A: REMOVAL

<Ref. to SR-5, REMOVAL, Sunroof Lid.>

B: INSTALLATION

<Ref. to SR-5, INSTALLATION, Sunroof Lid.>

C: ADJUSTMENT

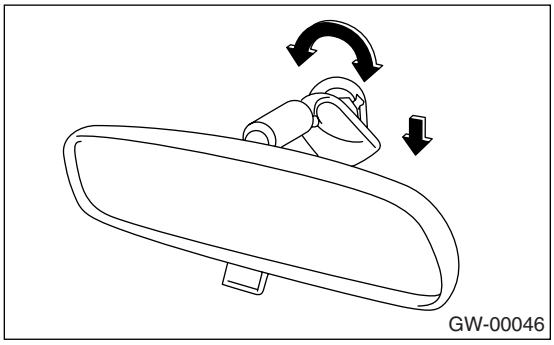
<Ref. to SR-5, ADJUSTMENT, Sunroof Lid.>

20.Inner Rearview Mirror

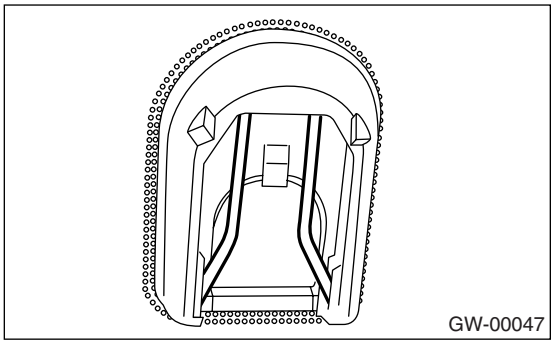
A: REMOVAL

NOTE:
The spring cannot be reused. Prepare a new spring before removal.

1) Turn the mirror base 90° clockwise or counter-clockwise to remove it.



2) Remove the spring from mirror base.



CAUTION:
Be careful not to damage the mirror surface.

3) If the mirror base is damaged, remove the mirror base using piano wire or spatula, etc.

CAUTION:
Be careful not to damage the windshield glass.

B: INSTALLATION

1) If removing the mirror base, remove the remaining adhesive thoroughly, and then fit the mirror base to mark on windshield glass to install.

Adhesive:
REPAIR KIT IN MR (Part No. 65029FC000) or equivalent

2) Verify that the mirror base is adhered securely, and then install the spring.
3) Install in the reverse order of removal.

C: INSPECTION

Make sure the mirror is not damaged.
Make sure the spring is not deteriorated.

BODY STRUCTURE

BS

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1. General Description 2
2. Datum Points 3
3. Datum Dimensions 11

1. General Description

A: PREPARATION TOOL

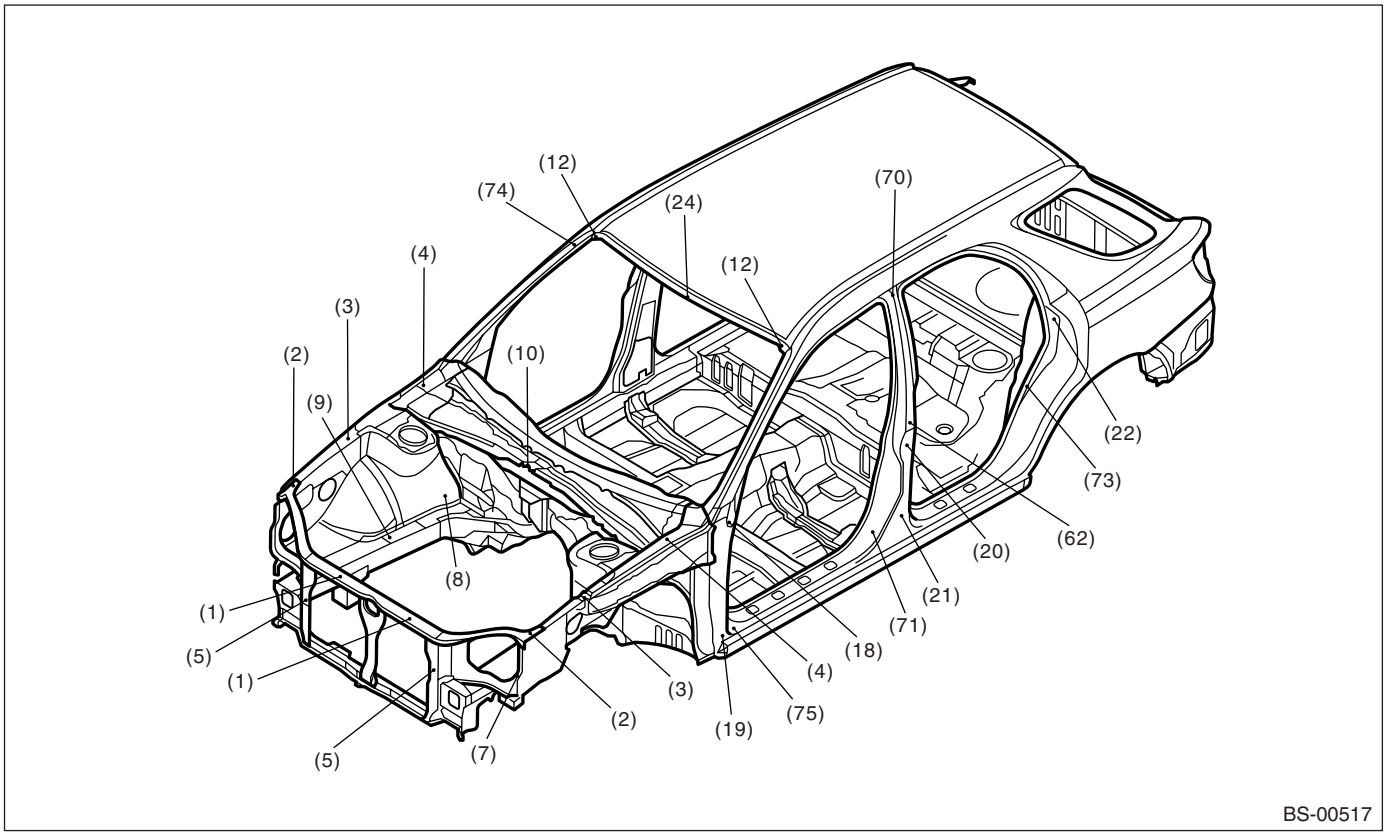
TOOL NAME	REMARKS
Tram tracking gauge	Used for measuring dimension.
Tape measure	Used for measuring dimension.

2. Datum Points

A: LOCATION

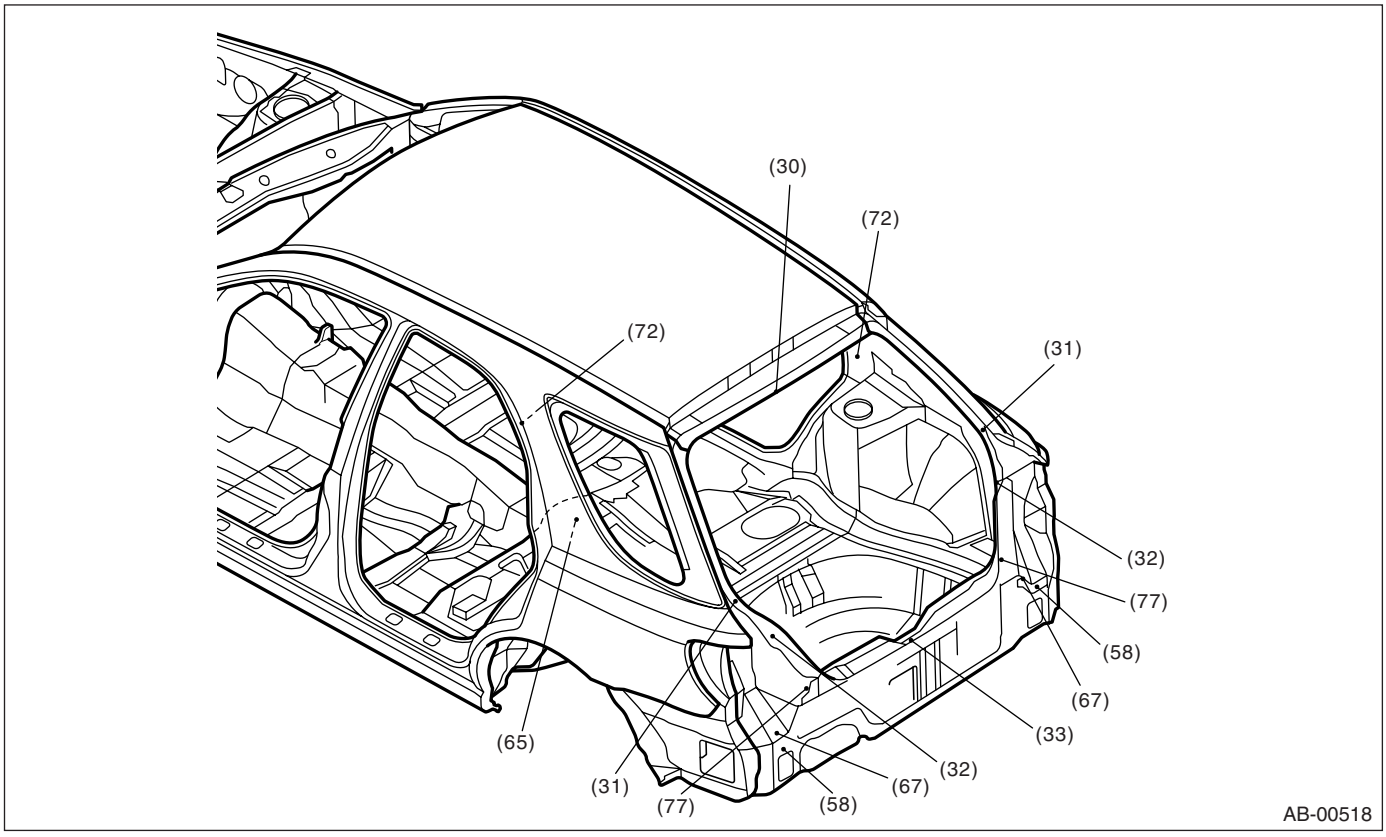
NOTE:
- Datum points are specified for body repair.
- Guide holes, locators, and indents are provided to facilitate panel replacement and to increase alignment accuracy.
- Both right and left reference points are symmetrical.

1. WAGON MODEL/SEDAN MODEL



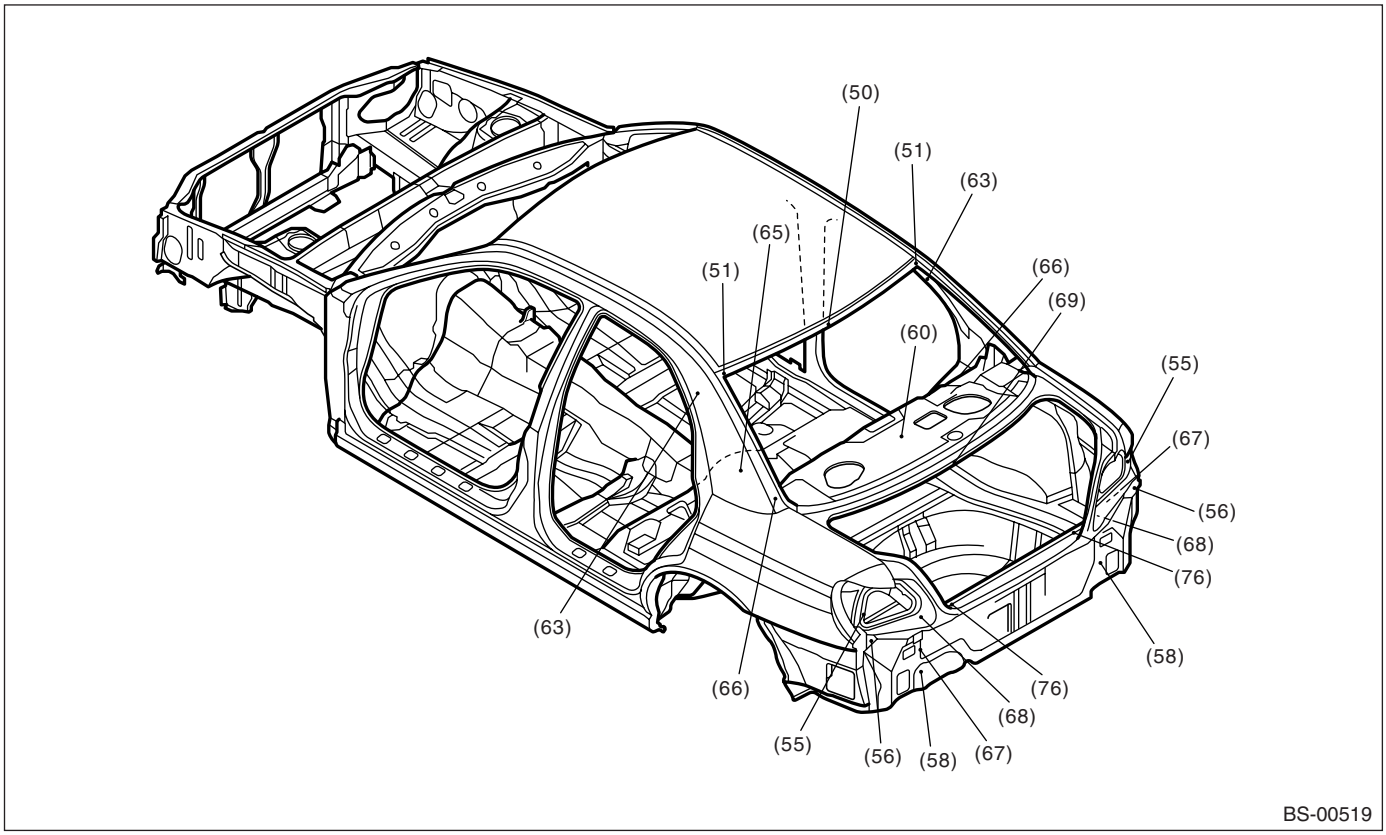
(1) Radiator attaching hole 12 mm (0.47 in) dia. (Symmetrical)
(2) Fender attaching hole 7 mm (0.28 in) dia. (Symmetrical)
(3) Fender attaching hole 10 mm (0.39 in) dia. (Symmetrical)
(4) Hood hinge attaching hole 12 mm (0.47 in) dia. (Symmetrical)
(5) Radiator panel side gauge hole 20 mm (0.79 in) dia. (Symmetrical)
(7) Fender attaching hole 9 mm (0.35 in) dia. (Symmetrical)
(8) Gauge hole 12 mm (0.47 in) dia. (Symmetrical)
(9) Front suspension crossmember attaching hole 12.4 mm (0.488 in) dia. (Symmetrical)
(10) Cowl panel attaching hole 6 mm (0.24 in) dia. (Vehicle center)
(12) Front glass attaching hole RH 6.5 mm (0.256 in) dia. LH 6.5 × 10 mm (0.256 × 0.39 in) dia.
(18) Fender attaching hole 12 mm (0.47 in) dia. (Symmetrical)
(19) Fender attaching hole 12 mm (0.47 in) dia. (Symmetrical)
(20) Outer panel center pillar gauge hole 12 mm (0.47 in) dia. (Symmetrical)
(21) Outer panel center pillar gauge hole 12 mm (0.47 in) dia. (Symmetrical)
(22) Weather strip patch attaching hole 5.2 mm (0.205 in) dia. (Symmetrical)
(24) Roof panel repair locator hollow
(62) Belt anchor attaching hole 11 mm (0.43 in) dia. (Symmetrical)
(70) Trim clip attaching hole 8.5 mm (0.335 in) dia. (Symmetrical)
(71) Harness clip attaching hole 7 mm (0.28 in) dia. (Symmetrical)
(73) Harness clip attaching hole 7 mm (0.28 in) dia. (Symmetrical)
(74) Trim clip attaching hole 10 mm (0.39 in) dia. (Symmetrical)
(75) Insulator attaching hole 8 mm (0.31 in) dia. (Symmetrical)

2. WAGON MODEL (REAR)



(30) Child anchor attaching hole 11 mm (0.43 in) dia.
(31) Washer hose attaching hole LH 7 mm (0.28 in) dia.
(32) Rear combination light mounting hole 7 mm (0.28 in) dia. (Symmetrical)
(33) Two striker attaching hole 15 mm (0.59 in) dia.
(58) Rear bumper plate nut attaching hole 11 mm (0.43 in) dia. (Symmetrical)
(65) Floor mat clip attaching hole 8 mm (0.31 in) dia.
(67) Gusset floor rear side gauge hole 11.5 mm (0.453 in) dia. (Symmetrical)
(72) Trim upper clip attaching hole 8.5 mm (0.335 in) dia. (Symmetrical)
(77) Harness clip attaching hole 7 mm (0.28 in) dia. (Symmetrical)

3. SEDAN MODEL (REAR)



(50) Repair locator hollow (Vehicle center)

(51) Glass attaching hole RH 6.5 mm (0.256 in) dia. LH 6.5 × 10 mm (0.256 × 0.39 in) dia.

(55) Rear combination light mounting hole 8 mm (0.31 in) dia. (Symmetrical)

(56) Bumper attaching hole 7 mm (0.28 in) dia. (Symmetrical)

(58) Rear bumper attaching hole 11 mm (0.43 in) dia. (Symmetrical)

(60) Choke coil harness attaching hole 5.4 mm (0.213 in) dia.

(63) Feeder line fixing hole 7 mm (0.28 in) dia. (Symmetrical)

(65) Floor mat clip attaching hole 8 mm (0.31 in) dia.

(66) Bulkhead rear gauge hole 10 mm (0.39 in) dia. (Symmetrical)

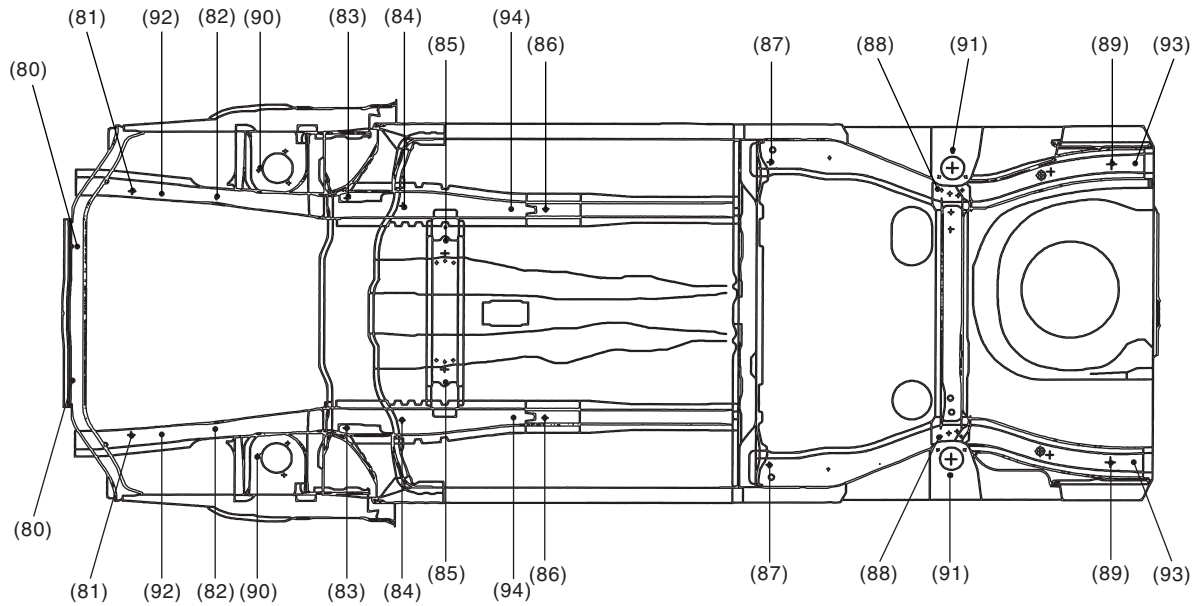
(67) Gusset floor rear side gauge hole 11.5 mm (0.453 in) dia. (Symmetrical)

(68) Rear skirt inner side gauge hole 10 mm (0.39 in) dia. (Symmetrical)

(69) Rear panel (reinforcement) repair locator hollow (Vehicle center)

(76) Press location hole 15 mm (0.59 in) dia. (Symmetrical)

4. UNDERBODY



(80) Radiator lower frame gauge hole 12 mm (0.47 in) dia. (Symmetrical)

(81) Side frame gauge hole 20 mm (0.79 in) dia. (Symmetrical)

(82) Front crossmember attaching hole 12.4 mm (0.488 in) dia. (Symmetrical)

(83) Suspension attaching hole 17 mm (0.67 in) dia. (Symmetrical)

(84) Side frame gauge hole 20 mm (0.79 in) dia. (Symmetrical)

(85) Transmission mount attaching hole 14 mm (0.55 in) dia.

(86) Side frame gauge hole 18 mm (0.71 in) dia. (Symmetrical)

(87) Rear differential attaching hole 16 mm (0.63 in) dia. (Symmetrical)

(88) Rear suspension attaching hole 16 mm (0.63 in) dia. (Symmetrical)

(89) Rear side frame gauge hole 15 mm (0.59 in) dia. (Symmetrical)

(90) Strut mount attaching hole 9.5 mm (0.374 in) dia. (Symmetrical)

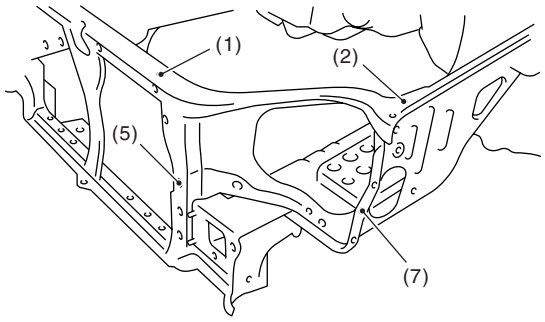
(91) Strut mount attaching hole 10 mm (0.39 in) dia. (Symmetrical)

(92) Sub frame attaching hole 16 mm (0.63 in) dia. (Symmetrical)

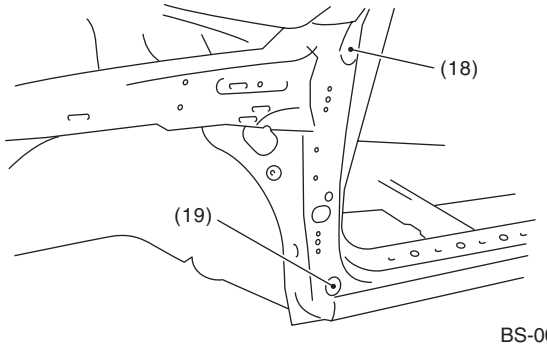
(93) Bumper beam attaching hole RH 15 mm (0.59 in) dia. LH 19 × 15 mm (0.75 × 0.59 in) dia.

(94) Side frame gauge hole 15 mm (0.59 in) dia. (Symmetrical)

Datum Points



BS-00521



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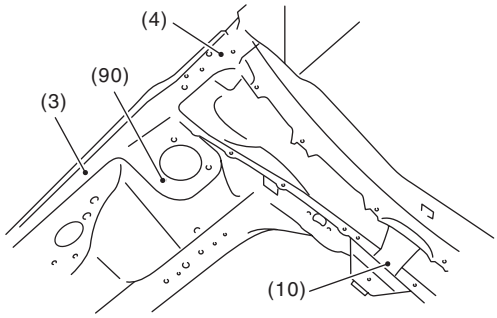

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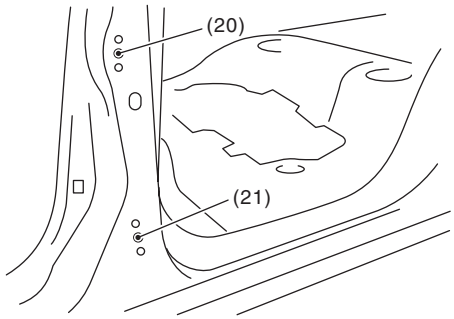

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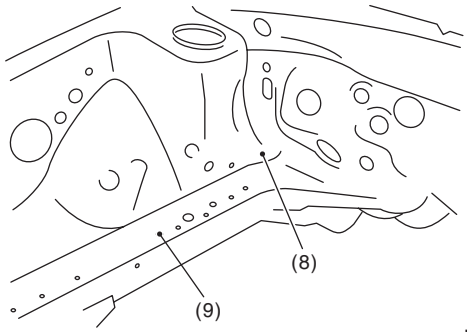
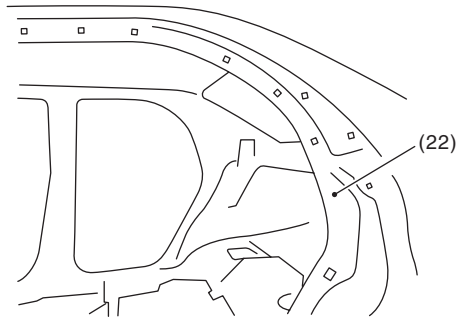


BS-00523



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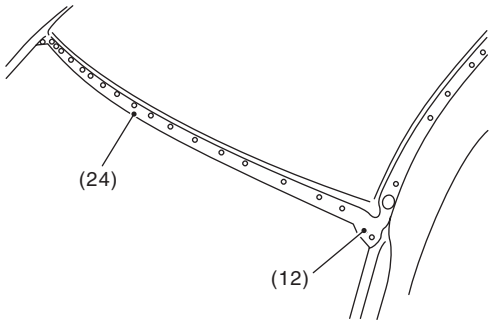
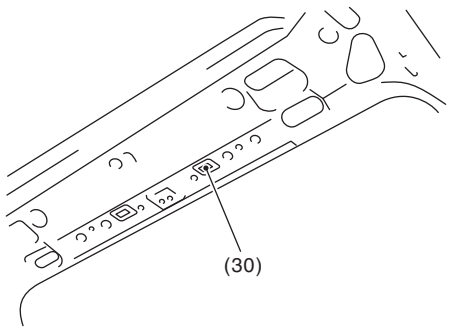


BS-00524

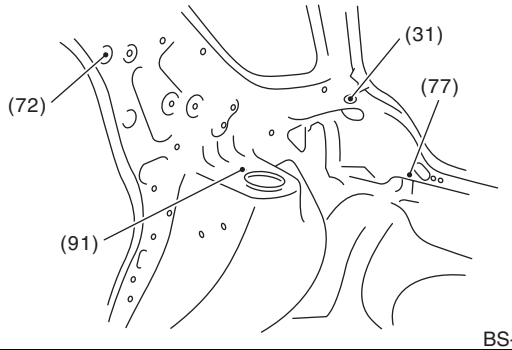
WAGON MODEL



BS-00527

Datum Points

WAGON MODEL



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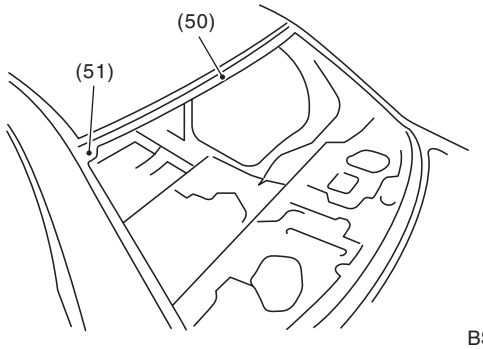
SEDAN MODEL



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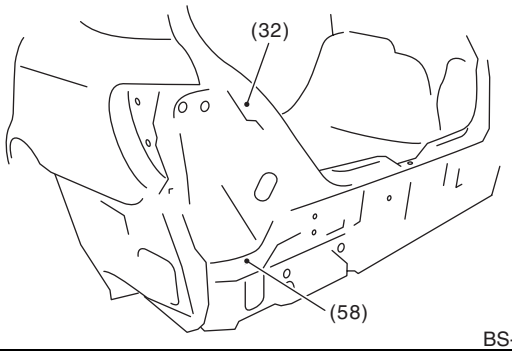

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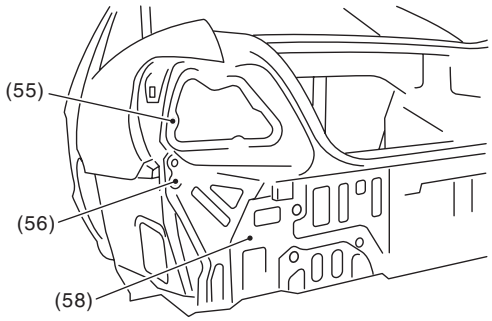

BS-00533

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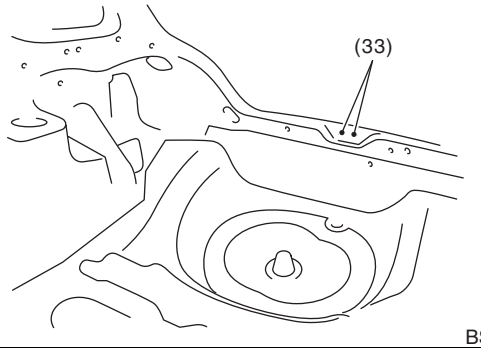
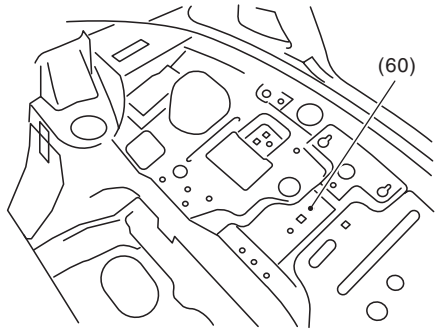


BS-00530

SEDAN MODEL



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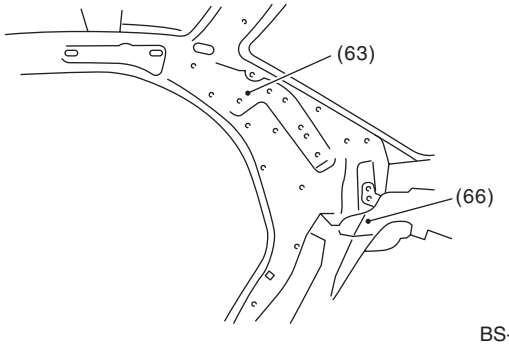
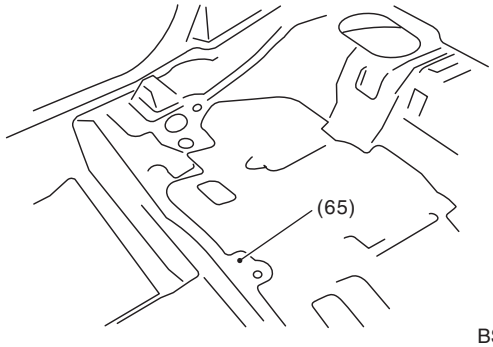
SEDAN MODEL

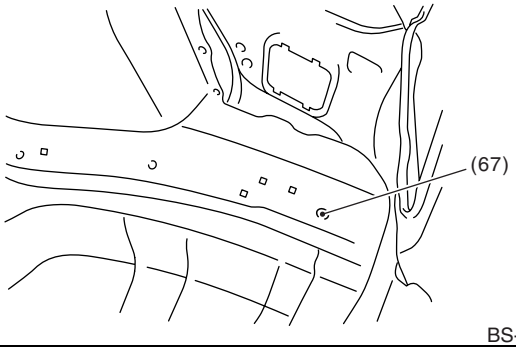


BS-00531



BS-00535

Datum Points



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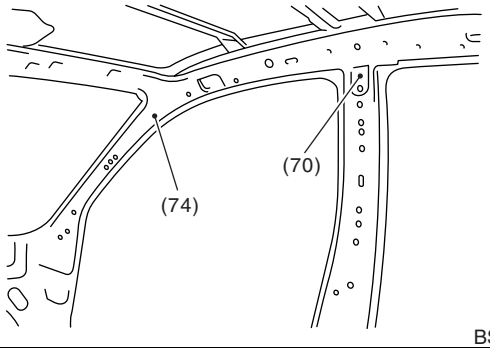
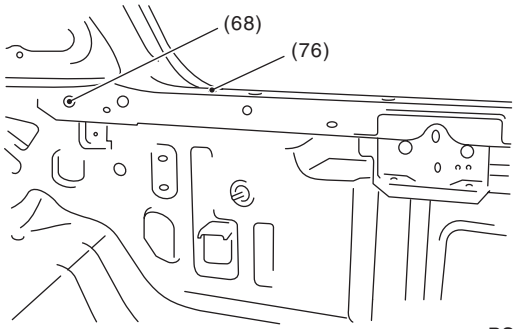
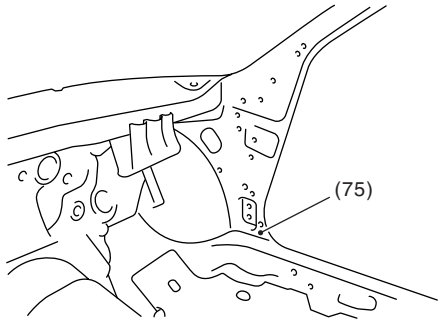


BS-00540

SEDAN MODEL

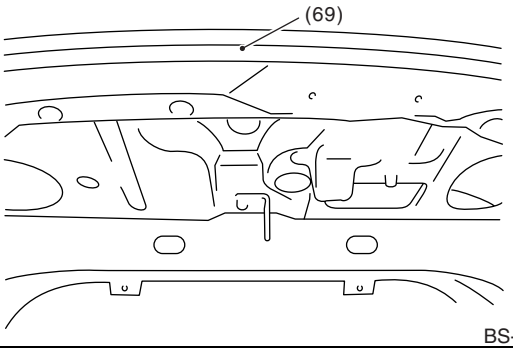


BS-00537



BS-00541

SEDAN MODEL



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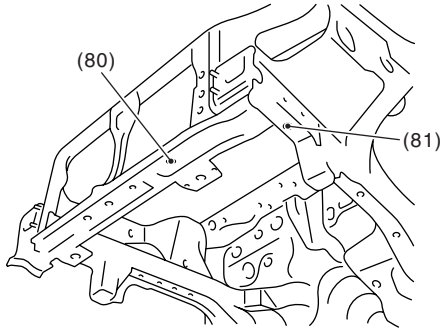
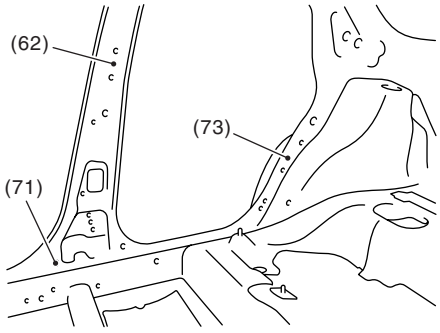


BS-00542



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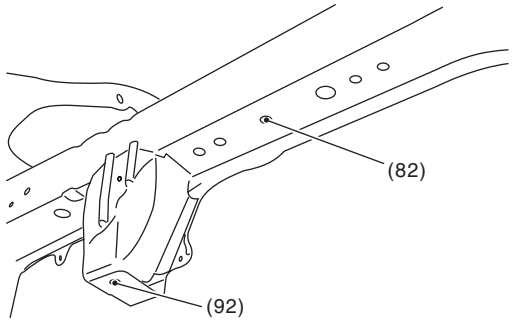
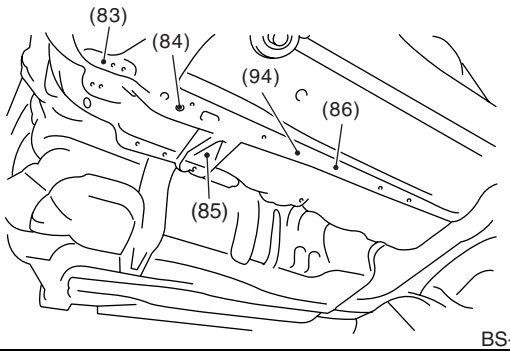
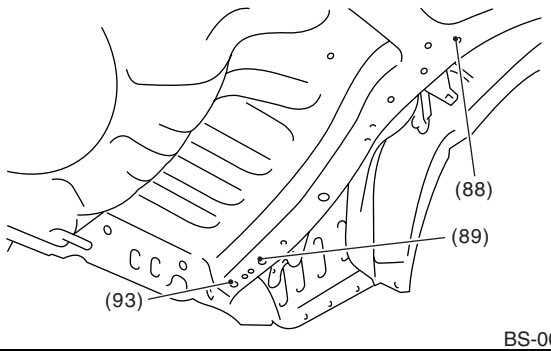


BS-00543

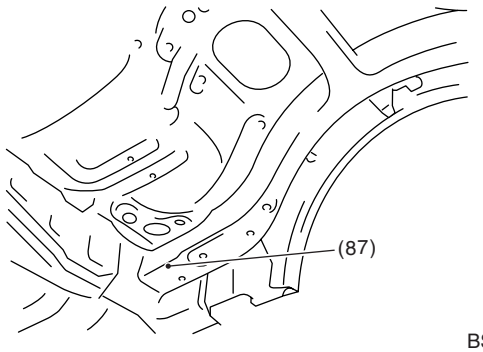
Datum Points



BS-00544



BS-00546



BS-00545

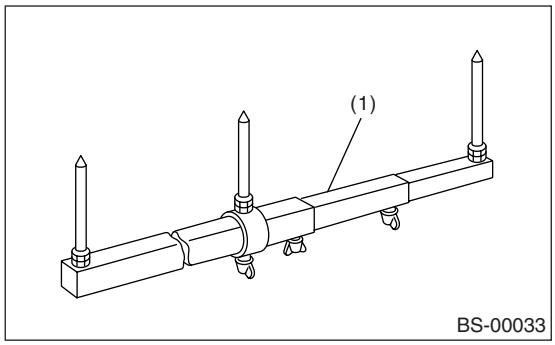
3. Datum Dimensions

A: MEASUREMENT

Refer to LOCATION for details on measurement points. <Ref. to BS-3, LOCATION, Datum Points.>

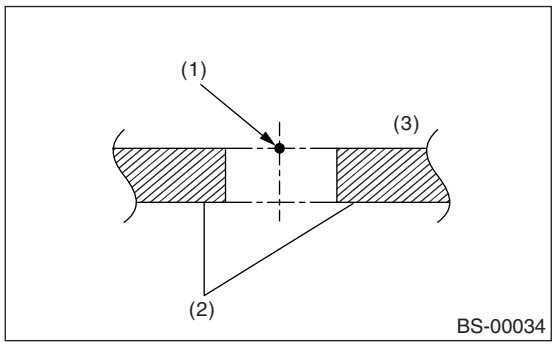
NOTE:

- Using a tram tracking gauge, measure all the dimensions.
- When using a tape measure, carefully measure dimensions without letting the tape measure sag or twist.
- Measure the linear dimensions between cores of holes.
- Suffixes “RH” and “LH” indicate right-hand and left-hand.



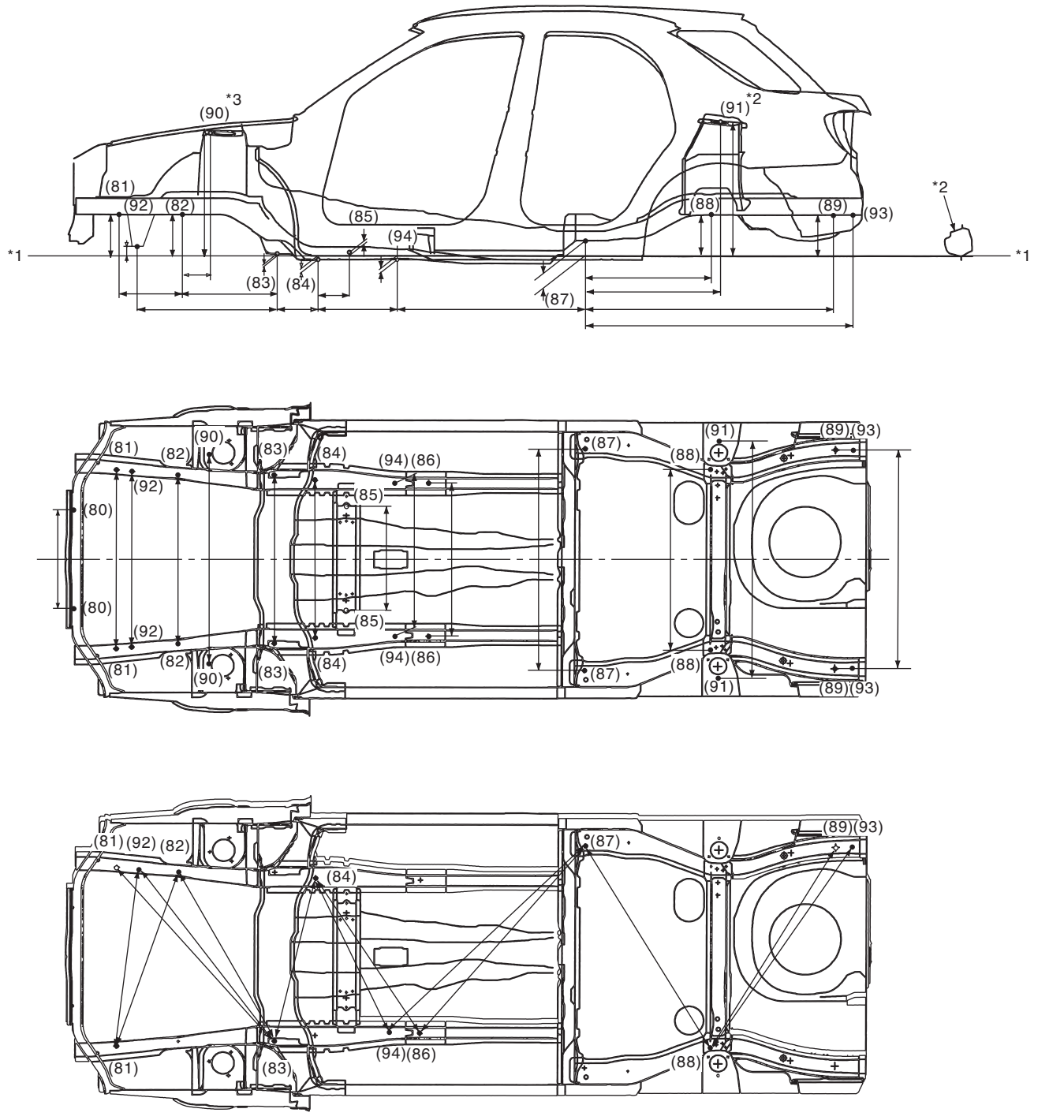
(1) Tram tracking gauge

- Measure at the center of the circle around the outside of the body panel.



(1) Datum point
(2) Body panel
(3) Outside

1. CENTER STRUCTURE



BS-00633

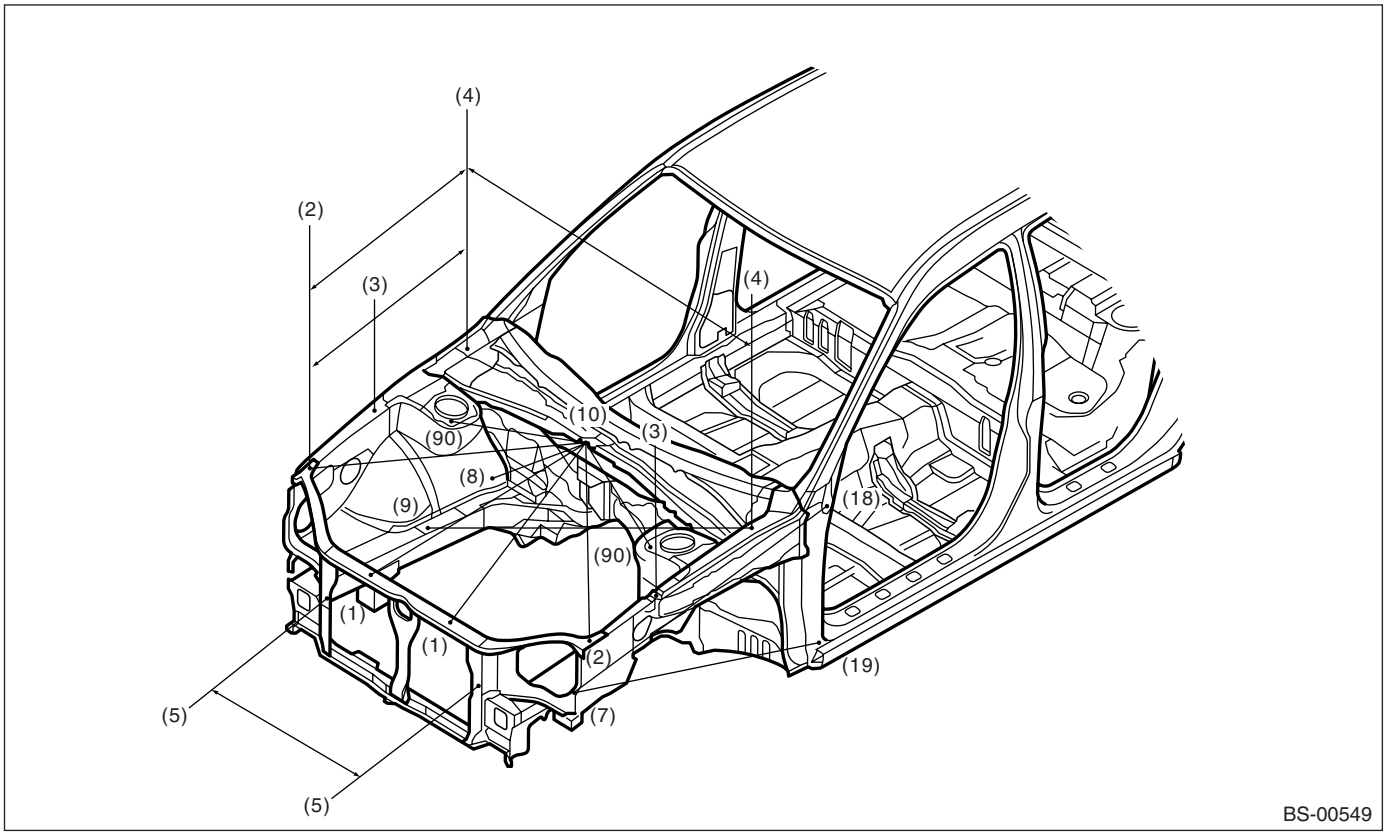
*1: Standard line
*2: Side sill
*3: Upper surface

Datum Dimensions

Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(81) from standard line	206 (8.11)	(92) RH to (92) LH	906 (35.67)
(92) from standard line	77 (3.03)	(82) RH to (82) LH	860 (33.86)
(82) from standard line	206 (8.11)	(90) RH to (90) LH	1,065 (41.93)
(90) from standard line	620 (24.41)	(83) RH to (83) LH	856 (33.70)
(83) from standard line	8 (0.31)	(84) RH to (84) LH	800 (31.50)
(84) from standard line	20 (0.79)	(85) RH to (85) LH	529 (20.83)
(85) from standard line	13 (0.51)	(94) RH to (94) LH	776 (30.55)
(94) from standard line	12 (0.47)	(86) RH to (86) LH	780 (30.71)
(87) from standard line	76 (2.99)	(87) RH to (87) LH	1,128 (44.41)
(88) from standard line	206 (8.11)	(88) RH to (88) LH	920 (36.22)
(91) from standard line	674 (26.54)	(91) RH to (91) LH	1,205 (47.44)
(89) from standard line	205 (8.07)	(89) RH to (89) LH	1,110 (43.70)
(81) to (82)	317 (12.48)	(93) RH to (93) LH	1,110 (43.70)
(82) to (90)	157 (6.18)	(81) LH to (92) RH	924 (36.38)
(82) to (83)	485 (19.09)	(81) LH to (82) RH	940 (37.01)
(92) to (83)	694 (27.32)	(81) RH to (83) LH	1,209 (47.60)
(83) to (84)	206 (8.11)	(92) RH to (83) LH	1,124 (44.25)
(84) to (85)	159 (6.26)	(82) RH to (83) LH	1,005 (39.57)
(84) to (94)	380 (14.96)	(83) LH to (84) RH	854 (33.62)
(94) to (87)	982 (38.66)	(84) RH to (94) LH	875 (34.45)
(87) to (88)	633 (24.92)	(84) RH to (86) LH	951 (37.44)
(87) to (91)	673 (26.50)	(94) LH to (87) RH	1,371 (53.98)
(87) to (89)	1,258 (49.53)	(86) LH to (87) RH	1,269 (49.96)
(87) to (93)	1,358 (53.46)	(87) RH to (88) LH	1,211 (47.68)
(80) RH to (80) LH	500 (19.69)	(88) LH to (89) RH	1,192 (46.93)
(81) RH to (81) LH	910 (35.83)	(88) LH to (93) RH	1,247 (49.09)

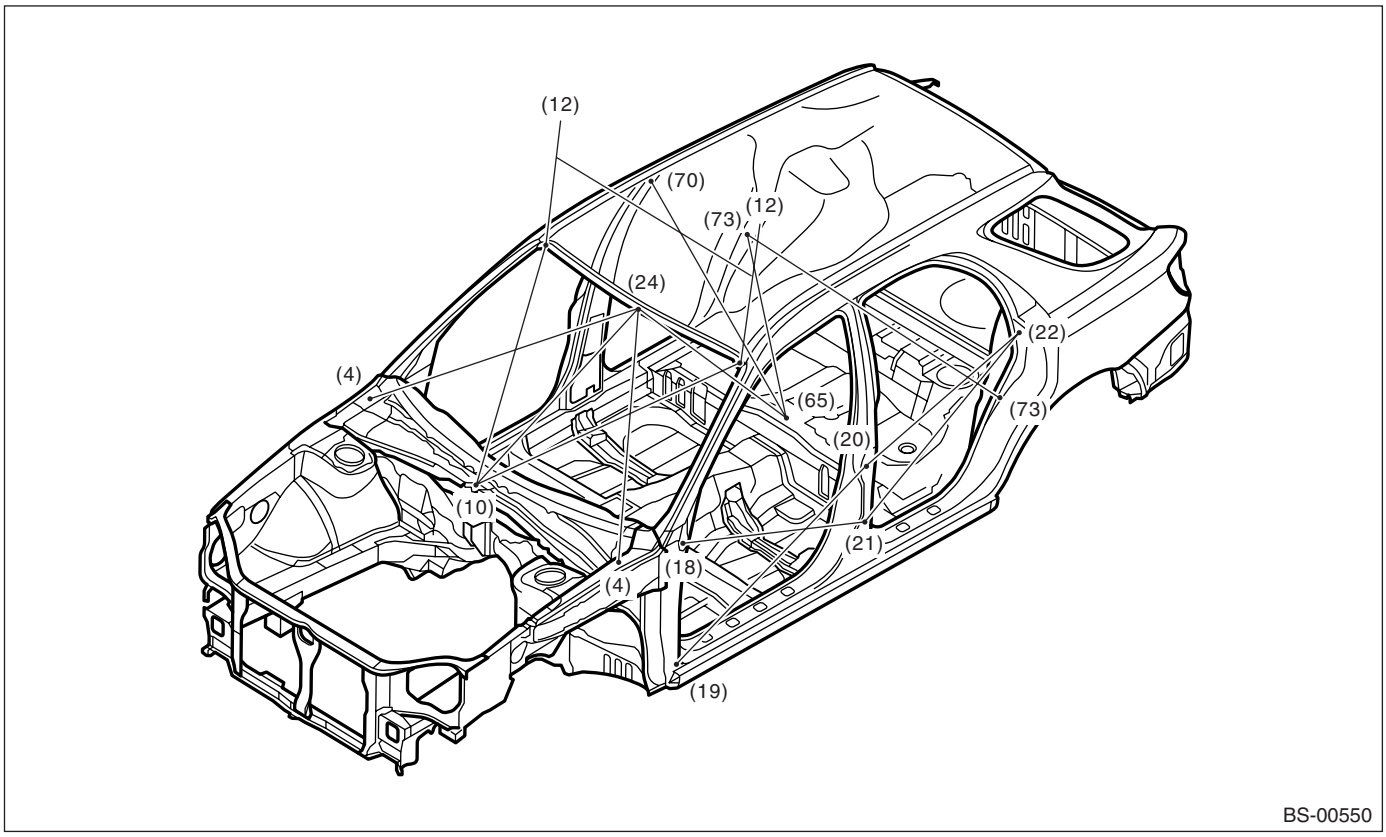
2. WAGON MODEL/SEDAN MODEL (FRONT STRUCTURE)



Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(10) to (1) RH	912 (35.91)	(2) RH to (2) LH	1,341 (52.80)
(10) to (1) LH	912 (35.91)	(5) RH to (5) LH	720 (28.35)
(10) to (90) RH	566 (22.28)	(7) RH to (18) RH	1,107 (43.58)
(10) to (90) LH	566 (22.28)	(7) LH to (18) LH	1,107 (43.58)
(10) to (8) RH	581 (22.87)	(7) RH to (19) RH	1,105 (43.50)
(10) to (8) LH	581 (22.87)	(7) LH to (19) LH	1,105 (43.50)
(10) to (2) RH	948 (37.32)	(4) RH to (2) LH	1,583 (62.32)
(10) to (2) LH	948 (37.32)	(4) LH to (2) RH	1,583 (62.32)
(4) RH to (2) RH	779 (30.67)	(3) RH to (3) LH	1,396 (54.96)
(4) LH to (2) LH	779 (30.67)	(3) RH to (4) LH	1,470 (57.87)
(4) RH to (3) RH	430 (16.93)	(3) LH to (4) RH	1,470 (57.87)
(4) LH to (3) LH	430 (16.93)	(2) RH to (3) LH	1,412 (55.59)
(90) RH to (90) LH	1,065 (41.93)	(2) LH to (3) RH	1,412 (55.59)
(8) RH to (8) LH	894 (35.20)	(9) RH to (9) LH	860 (33.86)
(8) RH to (4) LH	1,210 (47.64)	(9) RH to (8) LH	931 (36.65)
(8) LH to (4) RH	1,210 (47.64)	(9) LH to (8) RH	931 (36.65)
(3) RH to (2) RH	350 (13.78)	(9) RH to (4) LH	1,280 (50.39)
(3) LH to (2) LH	350 (13.78)	(9) LH to (4) RH	1,280 (50.39)
(4) RH to (4) LH	1,417 (55.79)	—	—

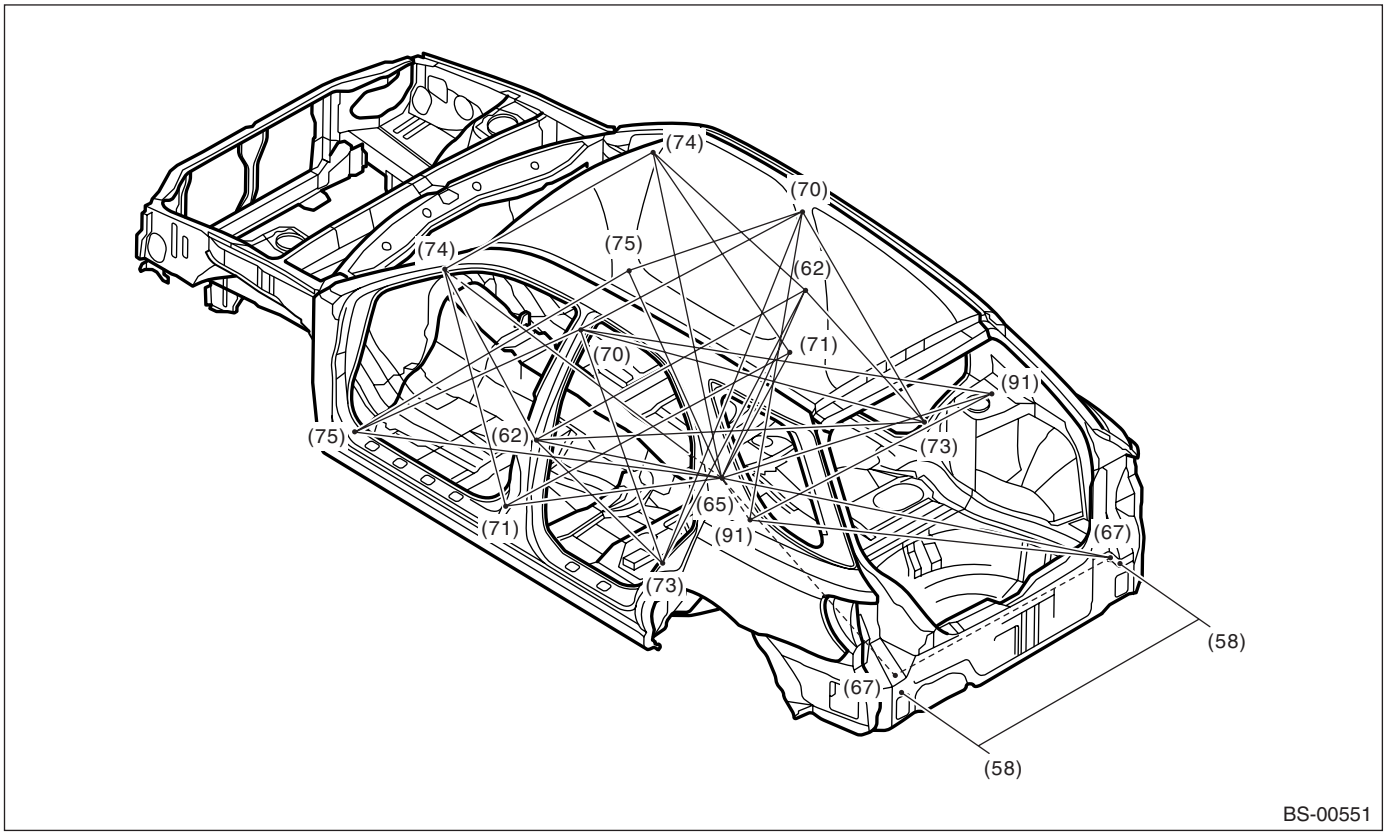
Datum Dimensions



Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(4) RH to (24)	1,127 (44.37) Wagon model	(19) LH to (20) LH	1,089 (42.87)
(4) LH to (24)	1,110 (43.70) Sedan model	(20) RH to (22) RH	869 (34.21)
(10) to (24)	957 (37.68) Wagon model	(20) LH to (22) LH	869 (34.21)
(10) to (24)	935 (36.81) Sedan model	(21) RH to (22) RH	985 (38.78)
(10) to (12) RH	1,122 (44.17) Wagon model	(21) LH to (22) LH	985 (38.78)
(10) to (12) RH	1,106 (43.54) Sedan model	(24) to (65)	1,232 (48.50) Wagon model
(10) to (12) LH	1,122 (44.17) Wagon model	(24) to (65)	1,237 (48.70) Sedan model
(10) to (12) LH	1,106 (43.17) Sedan model	(65) to (70) RH	1,067 (42.01)
(12) RH to (12) LH	1,029 (40.51) Wagon model	(65) to (70) LH	1,067 (42.01)
(12) RH to (12) LH	1,042 (41.02) Sedan model	(65) to (73) RH	830 (32.68)
(18) RH to (21) RH	1,049 (41.30)	(65) to (73) LH	830 (32.68)
(18) LH to (21) LH	1,049 (41.30)	(73) RH to (73) LH	1,394 (54.88)
(19) RH to (20) RH	1,089 (42.87)	—	—

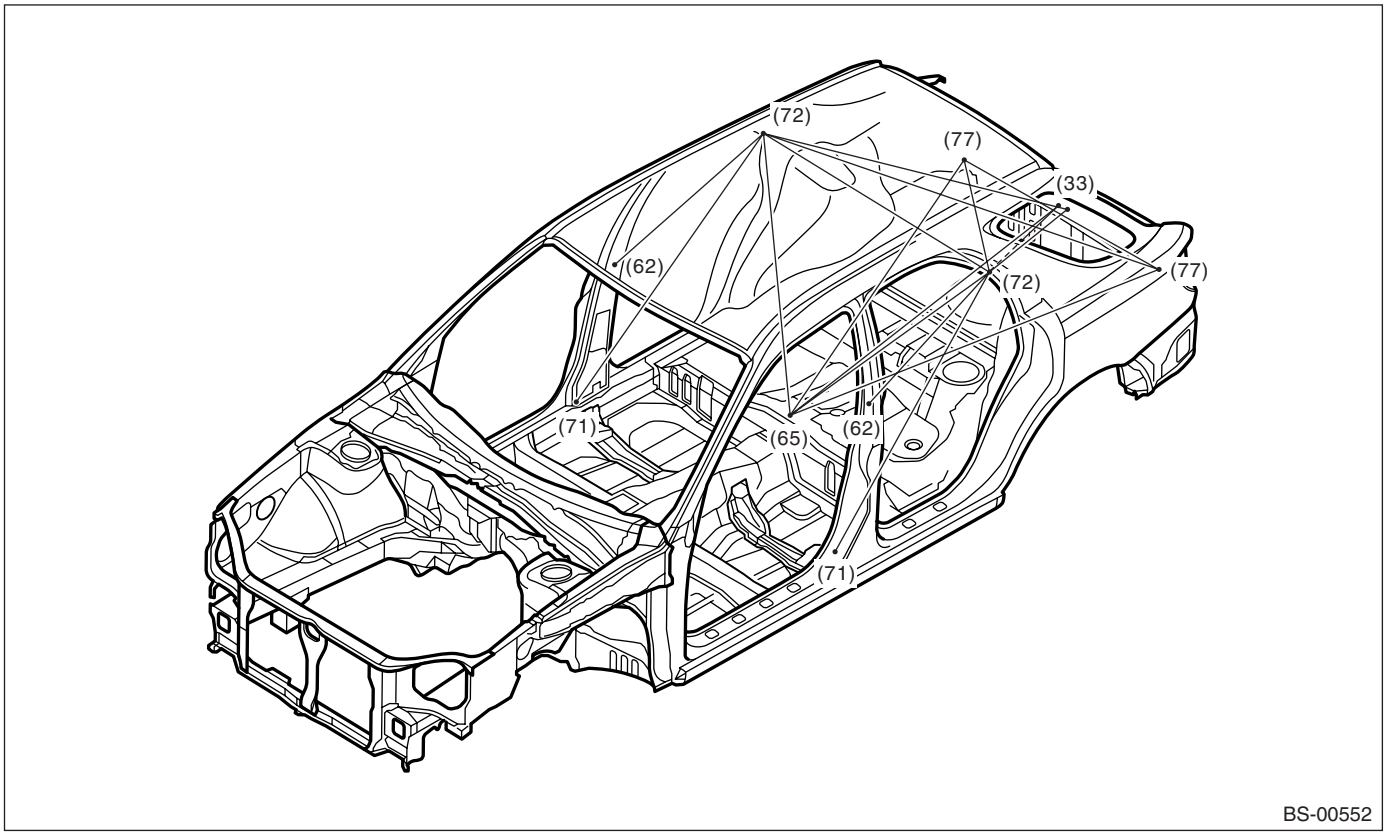
3. WAGON MODEL/SEDAN MODEL (REAR STRUCTURE)



Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(58) RH to (58) LH	1,128 (44.41)	(67) RH to (67) LH	1,110 (43.70)
(62) RH to (62) LH	1,332 (52.44)	(67) RH to (91) LH	1,381 (54.37)
(62) RH to (65)	915 (36.02)	(67) LH to (91) RH	1,381 (54.37)
(62) LH to (65)	915 (36.02)	(70) RH to (70) LH	1,060 (41.73)
(62) RH to (73) RH	762 (30.00)	(70) RH to (73) RH	948 (37.32)
(62) LH to (73) LH	762 (30.00)	(70) LH to (73) LH	948 (37.32)
(62) RH to (73) LH	1,561 (61.46)	(70) RH to (73) LH	1,542 (60.71)
(62) LH to (73) RH	1,561 (61.46)	(70) LH to (73) RH	1,542 (60.71)
(62) RH to (74) RH	592 (23.31) Wagon model	(70) RH to (75) RH	1,443 (56.81)
(62) LH to (74) LH	603 (23.74) Sedan model	(70) LH to (75) LH	1,443 (56.81)
(65) to (67) RH	1,501 (59.09)	(70) RH to (91) LH	1,532 (60.32)
(65) to (67) LH	1,501 (59.09)	(70) LH to (91) RH	1,532 (60.32)
(65) to (71) RH	823 (32.40)	(71) RH to (71) LH	1,361 (53.58)
(65) to (71) LH	823 (32.40)	(71) RH to (74) RH	954 (37.56) Wagon model
(65) to (74) RH	1,275 (50.20) Wagon model	(71) LH to (74) LH	949 (37.36) Sedan model
(65) to (74) LH	1,282 (50.47) Sedan model	(74) RH to (74) LH	1,135 (44.69) Wagon model
(65) to (75) RH	1,450 (57.09)	(74) RH to (74) LH	1,147 (45.16) Sedan model
(65) to (75) LH	1,450 (57.09)	(75) RH to (75) LH	1,399 (55.08)
(65) to (91) RH	1,064 (41.89)	(91) RH to (91) LH	1,205 (47.44)
(65) to (91) LH	1,064 (41.89)	—	—

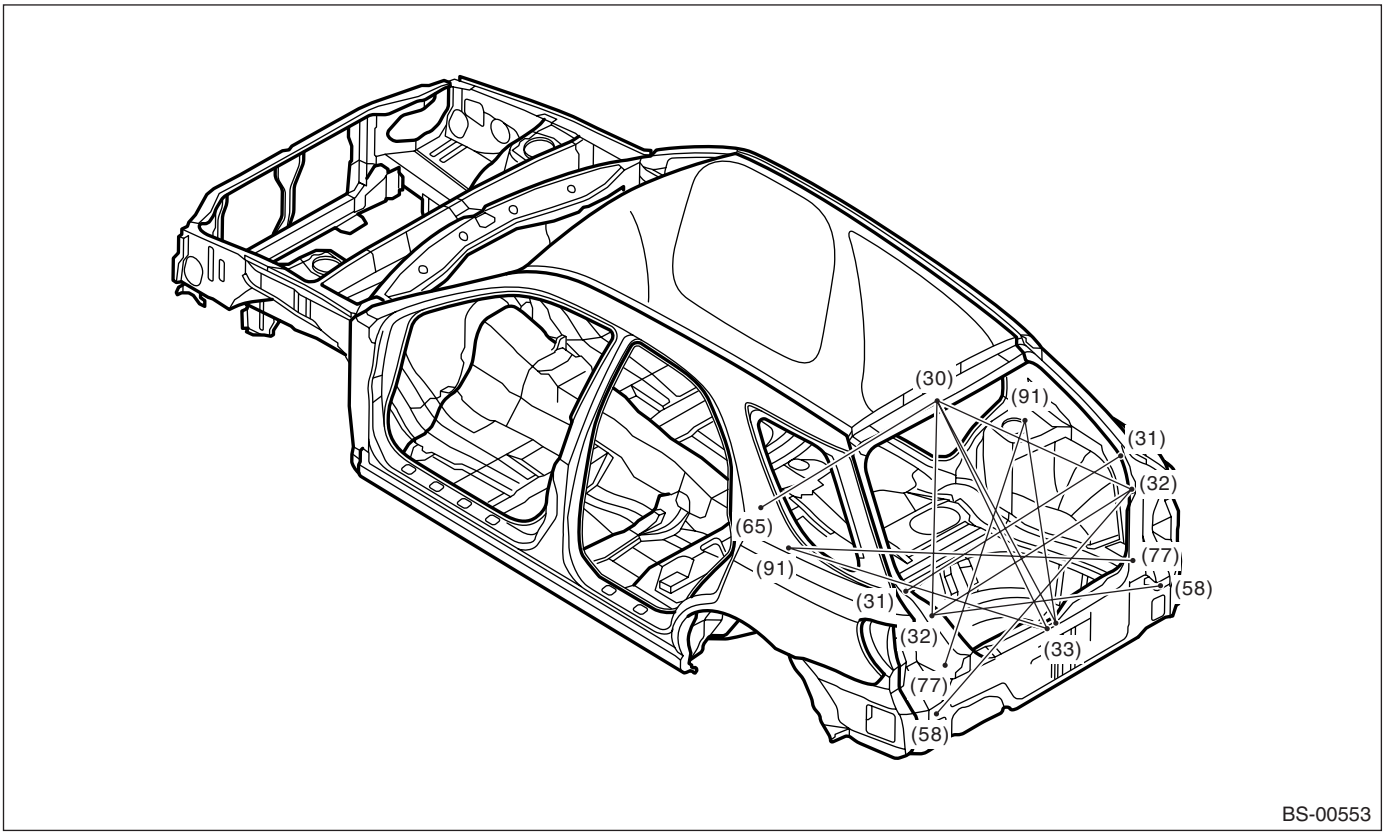
4. WAGON MODEL (FRONT STRUCTURE)



Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(33) RH to (65)	1,534 (60.39)	(65) to (77) RH	1,538 (60.55)
(33) LH to (65)	1,534 (60.39)	(65) to (77) LH	1,538 (60.55)
(33) RH to (72) LH	1,344 (52.91)	(71) RH to (72) RH	1,223 (48.15)
(33) LH to (72) RH	1,344 (52.91)	(71) LH to (72) LH	1,223 (48.15)
(62) RH to (72) RH	732 (28.82)	(72) RH to (72) LH	1,226 (48.27)
(62) LH to (72) LH	732 (28.82)	(72) RH to (77) LH	1,544 (60.79)
(65) to (72) RH	1,076 (42.36)	(72) LH to (77) RH	1,544 (60.79)
(65) to (72) LH	1,076 (42.36)	(77) RH to (77) LH	898 (35.35)

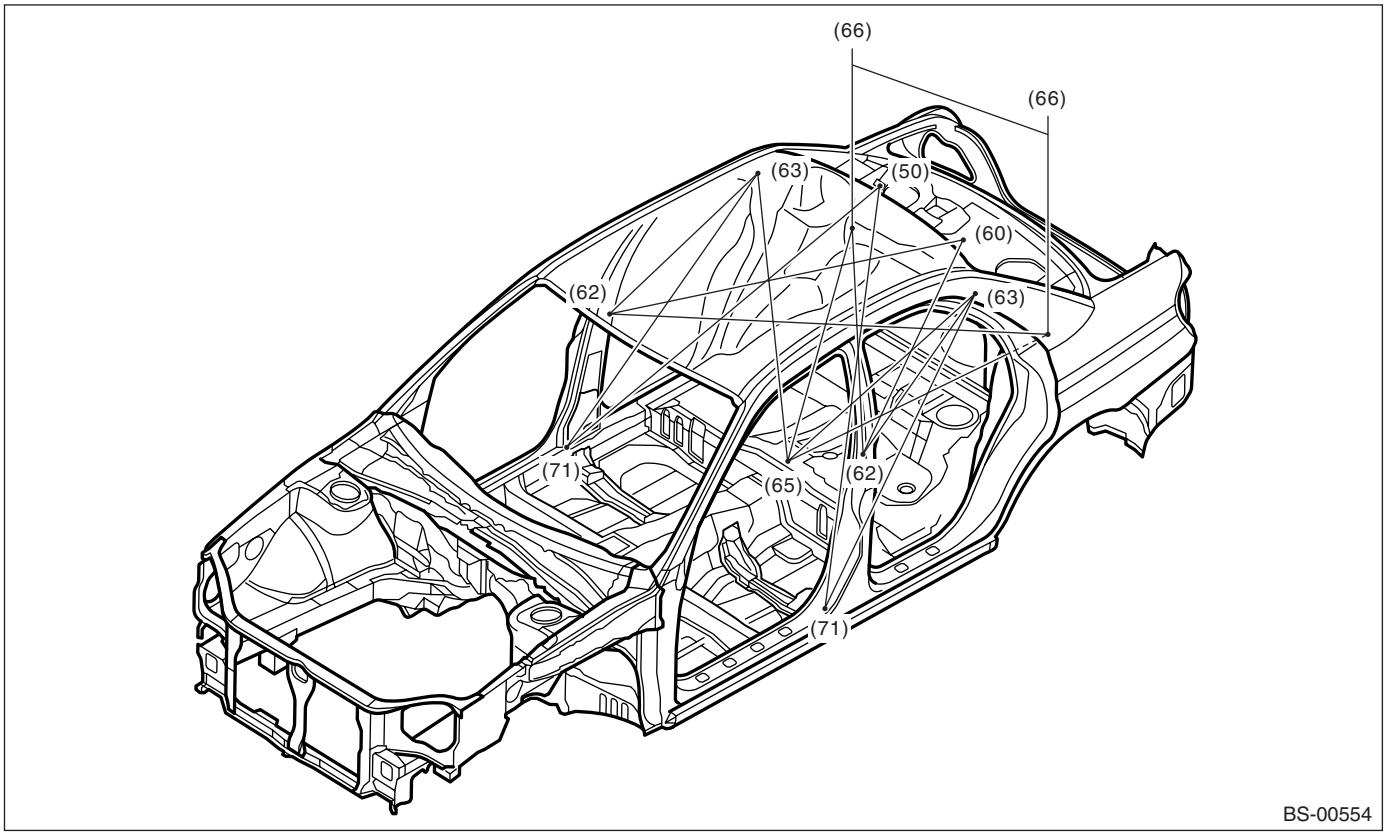
5. WAGON MODEL (REAR STRUCTURE)



Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(30) to (32) RH	850 (33.46)	(32) RH to (58) LH	1,139 (44.84)
(30) to (32) LH	850 (33.46)	(32) LH to (58) RH	1,139 (44.84)
(30) to (33) RH	904 (35.59)	(33) RH to (91) LH	993 (39.09)
(30) to (33) LH	904 (35.59)	(33) LH to (91) LH	993 (39.09)
(30) to (65)	1,292 (50.87)	(77) RH to (91) LH	1,289 (50.75)
(31) RH to (31) LH	1,212 (47.72)	(77) LH to (91) RH	1,289 (50.75)
(32) RH to (32) LH	1,038 (40.87)	—	—

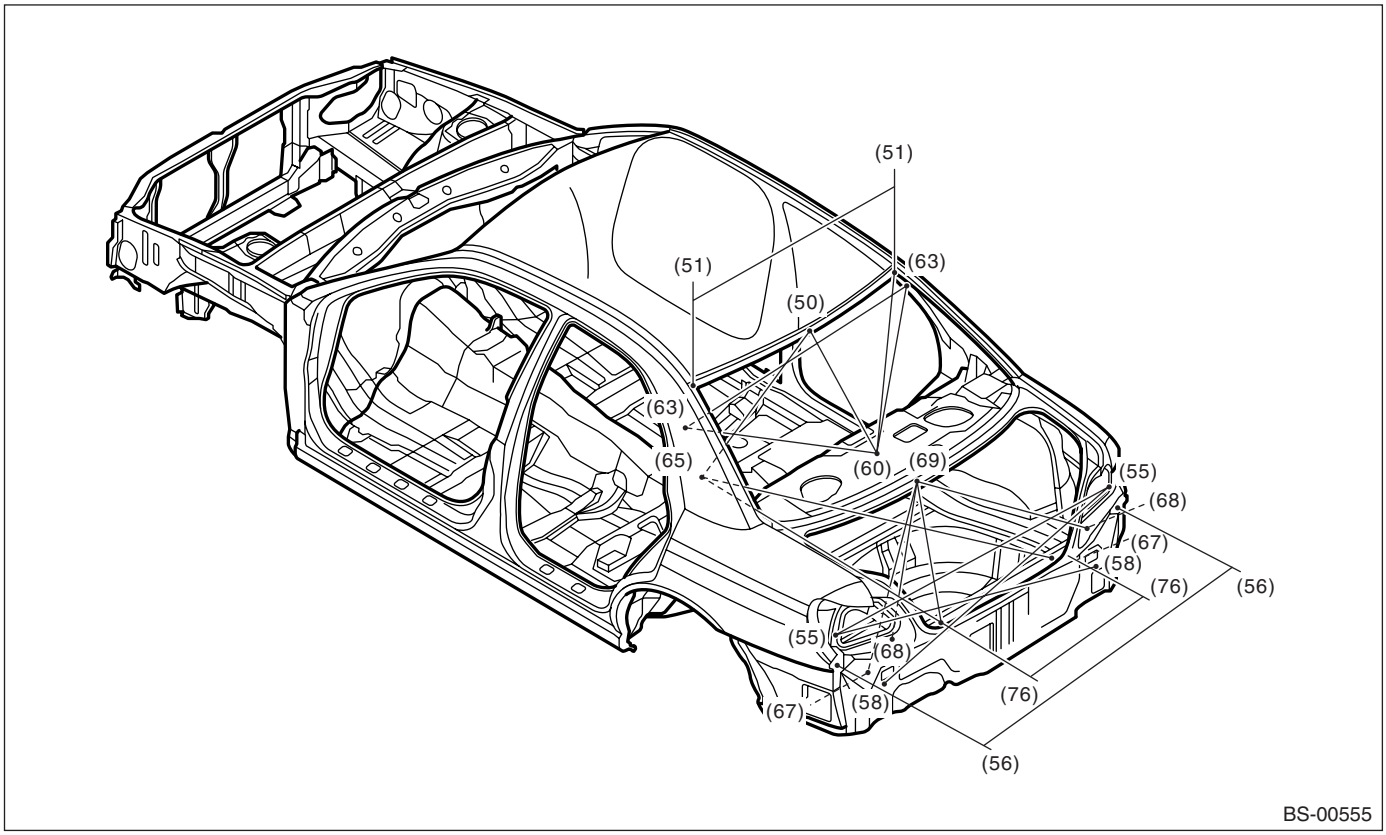
6. SEDAN MODEL (FRONT STRUCTURE)



Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(50) to (71) RH	1,562 (61.50)	(63) RH to (65)	1,118 (44.02)
(50) to (71) LH	1,562 (61.50)	(63) LH to (65)	1,118 (44.02)
(60) to (62) RH	1,338 (52.68)	(63) RH to (71) RH	1,283 (50.51)
(60) to (62) LH	1,338 (52.68)	(63) LH to (71) LH	1,283 (50.51)
(62) RH to (63) RH	773 (30.43)	(65) to (66) RH	956 (37.64)
(62) LH to (63) LH	773 (30.43)	(65) to (66) LH	956 (37.64)
(62) RH to (66) LH	1,449 (57.05)	(66) RH to (66) LH	840 (33.07)
(62) LH to (66) RH	1,449 (57.05)	—	—

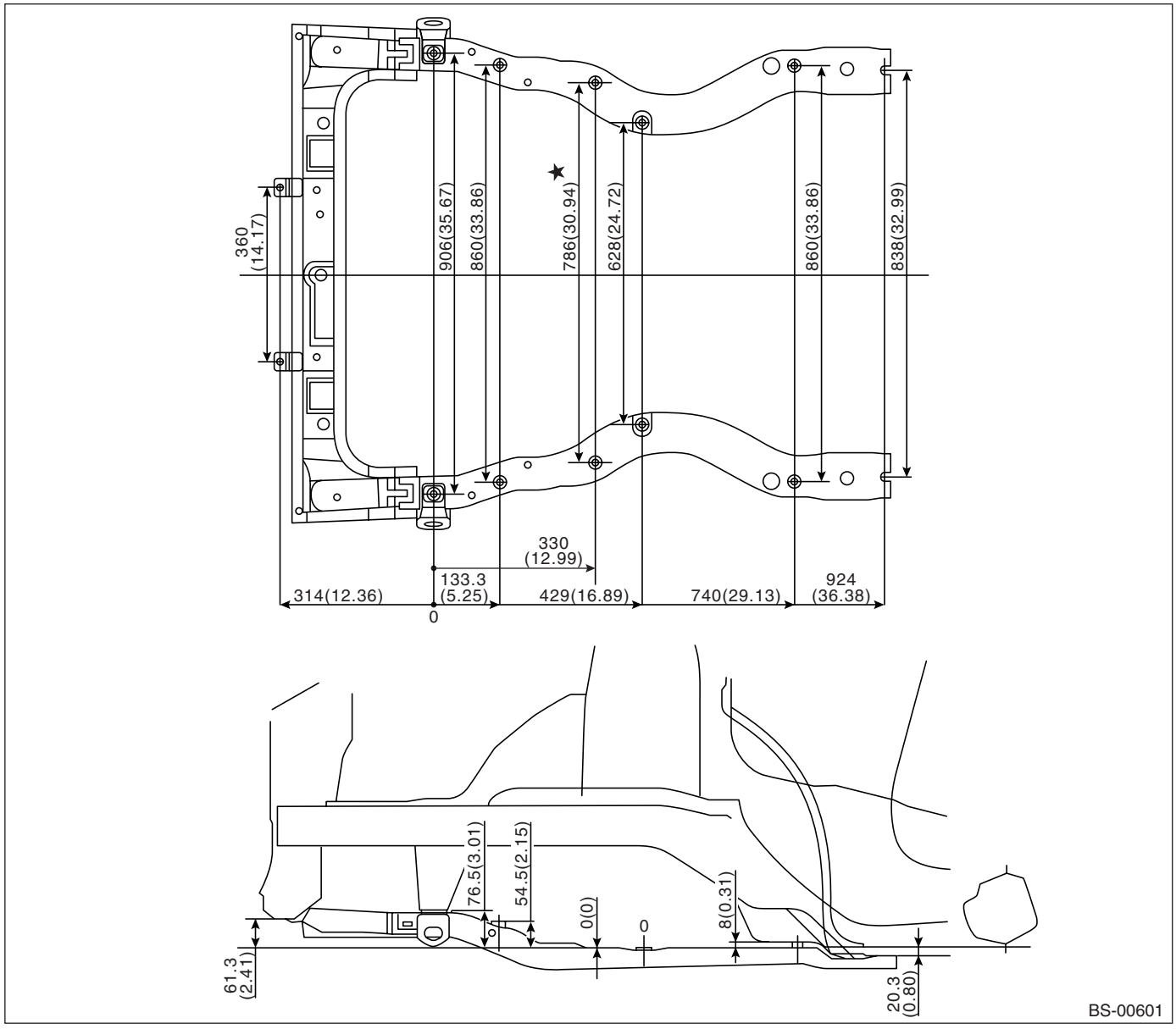
7. SEDAN MODEL (REAR STRUCTURE)



Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(50) to (60)	501 (19.72)	(65) to (76) LH	1,544 (60.79)
(50) to (65)	1,082 (42.60)	(65) to (68) RH	1,581 (62.24)
(51) RH to (51) LH	1,025 (40.35)	(65) to (68) LH	1,581 (62.24)
(51) RH to (60)	734 (28.90)	(67) RH to (69)	784 (30.87)
(55) RH to (55) LH	1,406 (55.35)	(67) LH to (69)	784 (30.87)
(55) RH to (58) LH	1,297 (51.06)	(68) RH to (68) LH	1,020 (40.16)
(55) LH to (58) RH	1,297 (51.06)	(68) RH to (69)	681 (26.81)
(56) RH to (56) LH	1,426 (56.14)	(68) LH to (69)	681 (26.81)
(60) to (63) RH	764 (30.08)	(69) to (76) RH	537 (21.14)
(60) to (63) LH	764 (30.08)	(69) to (76) LH	537 (21.14)
(63) RH to (63) LH	1,183 (46.57)	(76) RH to (76) LH	600 (23.62)
(65) to (76) RH	1,544 (60.79)	—	—

8. SUB FRAME ALIGNMENT



Unit: mm (in)

* : Only for STi model

Horizontal and vertical dimensions are values measured from datum points (0).

INSTRUMENTATION/DRIVER INFO

IDI

		Page
1.	General Description	2
2.	Combination Meter System	3
3.	Combination Meter Assembly	10
4.	Speedometer	14
5.	Tachometer	15
6.	Fuel Gauge	16
7.	Water Temperature Gauge	17
8.	Ambient Sensor	18

1. General Description

A: SPECIFICATIONS

Combination meter	Model	Except STi model	STi model
	Speedometer	Electric pulse type	Stepping motor type
	Temperature gauge	Cross coil type	Stepping motor type
	Fuel gauge	Cross coil type	Stepping motor type
	Tachometer	Electric pulse type	Stepping motor type
	Turn signal indicator light	14 V — 1.4 W	LED
	Charge indicator light	14 V — 1.4 W	LED
	Oil pressure indicator light	LED	
	ABS warning light	LED	
	Malfunction indicator light	LED	
	HI-beam indicator light	14 V — 1.4 W	LED
	Door open warning light	LED	
	Seat belt warning light	LED	
	Brake fluid and parking brake warning light	14 V — 1.4 W	LED
	FWD indicator light	LED	—
	AIRBAG warning light	LED	
	Meter illumination light	14 V — 3 W, 14 V — 2 W	LED
	AT OIL TEMP. warning light	LED	—
	Security indicator light	LED	
	Cruise set indicator light	14 V — 1.4 W	LED
	Cruise indicator light	14 V — 1.4 W	LED
	Low fuel warning light	LED	
	AT select lever position indicator light	14 V — 100 mA	—
	Intercooler water spray warning light	—	LED
	Rear differential oil temperature warning light	—	LED
	Driver's control center differential indicator light	—	LED
	REV indicator light	—	LED
	Headlight indicator light	—	LED
	LCD back light	14 V — 1.4 W	LED

B: CAUTION

- Be careful not to damage the meters and instrument panel.
- Be careful not to damage the meter glasses.
- Make sure that electrical connector is connected securely.
- After installation, make sure that each meter operates normally.
- Use gloves to avoid damage and getting fingerprints on the glass surface and meter surfaces.
- Do not apply excessive force to the printed circuit.
- Do not drop or otherwise apply impact.

C: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Combination Meter System

A: WIRING DIAGRAM

1. COMBINATION METER

<Ref. to WI-63, WIRING DIAGRAM, Combination Meter.>

2. OUTSIDE TEMPERATURE INDICATOR

<Ref. to WI-143, WIRING DIAGRAM, Outside Temperature Display System.>

B: INSPECTION

CAUTION:
When measuring voltage and resistance of the ECM, TCM, or each sensor, use a tapered pin with a diameter of less than 0.64 mm (0.025 in) in order to avoid poor contact. Do not insert the pin more than 2 mm (0.08 in).

1. SYMPTOM CHART

Symptom	Repair order	Reference
Combination meter assembly does not operate.	(1) Power supply (2) Ground circuit	<Ref. to IDI-4, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Combination Meter System.>
Speedometer does not operate.	(1) Vehicle speed sensor (MT model) TCM (AT model) (2) Harness (3) Speedometer	MT model: <Ref. to IDI-4, CHECK VEHICLE SPEED SENSOR, INSPECTION, Combination Meter System.>
		AT model: <Ref. to IDI-5, CHECK TRANSMISSION CONTROL MODULE (TCM), INSPECTION, Combination Meter System.>
Tachometer does not operate.	(1) ECM (2) Harness (3) Tachometer	<Ref. to IDI-6, CHECK ENGINE CONTROL MODULE (ECM), INSPECTION, Combination Meter System.>
Fuel gauge does not operate.	(1) Fuel level sensor (2) Harness (3) Fuel gauge	<Ref. to IDI-6, CHECK FUEL LEVEL SENSOR, INSPECTION, Combination Meter System.>
Water temperature gauge does not operate.	(1) Engine coolant temperature sensor (2) Harness (3) Water temperature gauge	<Ref. to IDI-7, CHECK ENGINE COOLANT TEMPERATURE SENSOR, INSPECTION, Combination Meter System.>
Outside temperature indicator does not operate.	(1) Ambient sensor (2) Harness (3) Combination meter (4) Auto A/C control unit	<Ref. to IDI-8, CHECK OUTSIDE TEMPERATURE INDICATOR, INSPECTION, Combination Meter System.>

2. CHECK POWER SUPPLY AND GROUND CIRCUIT

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY FOR COMBINATION METER.** 1) Remove the combination meter. <Ref. to IDI-10, REMOVAL, Combination Meter Assembly.> 2) Disconnect the combination meter harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i11) No. 7 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open or short between ignition switch and combination meter.
2	**CHECK POWER SUPPLY FOR COMBINATION METER.** Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i11) No. 10 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Check the harness for open or short between fuse and combination meter.
3	**CHECK GROUND CIRCUIT OF COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between combination meter connector and chassis ground. ***Connector & terminal*** ***(i11) No. 6 — Chassis ground:***	Is the resistance less than 10 Ω?	Except STi model: Replace the combination meter printed circuit. STi model: Replace the meter main assembly.	Repair the wiring harness.

3. CHECK VEHICLE SPEED SENSOR

	Step	Check	Yes	No
1	**CHECK VEHICLE SPEED SENSOR.** 1) Lift-up the vehicle and support it with safety stands. 2) Remove the combination meter with harness connector. 3) Drive the vehicle at a speed greater than 20 km/h (12 MPH). **Warning:** **Be careful not to get caught in the running wheels.** 4) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i11) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 1 V ⟷ more than 5 V?	Except STi model: Check the speedometer. <Ref. to IDI-14, REMOVAL, Speedometer.> STi model: Replace the meter main assembly.	Go to step **2.**
2	**CHECK VEHICLE SPEED SENSOR POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the vehicle speed sensor harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between vehicle speed sensor connector and engine ground. ***Connector & terminal*** ***(B17) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Check the harness for open or short between ignition switch and vehicle speed sensor.

	Step	Check	Yes	No
3	**CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ENGINE GROUND.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between vehicle speed sensor connector and engine ground. ***Connector & terminal*** ***(B17) No. 2 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **4.**	Repair the wiring harness.
4	**CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND COMBINATION METER.** 1) Disconnect the connector from combination meter. 2) Measure the resistance between vehicle speed sensor harness connector and combination meter harness connector. ***Connector & terminal*** ***(B17) No. 1 — (i11) No. 2:***	Is the resistance less than 10 Ω?	Replace the vehicle speed sensor.	Repair the wiring harness.

4. CHECK TRANSMISSION CONTROL MODULE (TCM)

	Step	Check	Yes	No
1	**CHECK TCM SIGNAL.** 1) Lift-up the vehicle and support it with safety stands. 2) Drive the vehicle faster than 10 km/h (6 MPH). **Warning:** **Be careful not to get caught in the running wheels.** 3) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Non-turbo model:*** ***(B55) No. 13 (+) — Chassis ground (–):*** ***Turbo model:*** ***(B56) No. 17 (+) — Chassis ground (–):***	Is the voltage less than 1 V ←→ more than 5 V?	Go to step **2.**	Check the TCM. <Ref. to 4AT(diag)-2, Basic Diagnostic Procedure.>
2	**CHECK HARNESS BETWEEN TCM AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and combination meter. 3) Measure the resistance between TCM harness connector and combination meter harness connector. ***Connector & terminal*** ***Non-turbo model:*** ***(B55) No. 13 — (i11) No. 2:*** ***Turbo model:*** ***(B56) No. 17 — (i11) No. 2:***	Is the resistance less than 10 Ω?	Check the speed meter. <Ref. to IDI-14, REMOVAL, Speedometer.>	Repair the wiring harness.

5. CHECK ENGINE CONTROL MODULE (ECM)

	Step	Check	Yes	No
1	**CHECK ECM SIGNAL.** 1) Start the engine. 2) Measure the voltage between ECM connector and engine ground. ***Connector & terminal*** ***Non-turbo model:*** ***(B134) No. 10 (+) — Chassis ground (−):*** ***Turbo model:*** ***(B137) No. 9 (+) — Chassis ground (−):*** ***STi model:*** ***(B134) No. 23 (+) — Chassis ground (−):***	Is the voltage 0 ←→ 14 V or more?	Go to step **2.**	Check the ECM. <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.> or <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.> or <Ref. to EN(STi) section.>
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and combination meter. 3) Measure the resistance between ECM harness connector and combination meter harness connector. ***Connector & terminal*** ***Non-turbo model:*** ***(B134) No. 10 — (i11) No. 5:*** ***Turbo model:*** ***(B137) No. 9 — (i11) No. 5:*** ***STi model:*** ***(B134) No. 23 — (i11) No. 5:***	Is the resistance less than 10 Ω?	Except STi model: Check the tachometer. <Ref. to IDI-15, REMOVAL, Tachometer.> STi model: Replace the meter main assembly.	Repair the wiring harness.

6. CHECK FUEL LEVEL SENSOR

	Step	Check	Yes	No
1	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel level sensor. <Ref. to FU(H4SO)-57, REMOVAL, Fuel Level Sensor.>, <Ref. to FU(H4DOTC)-63, REMOVAL, Fuel Level Sensor.> or <Ref. to FU(STi) section.> 2) Measure the resistance between fuel level sensor terminals when setting the float to FULL and EMPTY position. ***Terminals*** ***No. 2 — No. 3:***	Is the resistance 0.5 to 2.5 Ω (FULL) and 50 to 52 Ω (EMPTY)?	Go to step **2.**	Replace the fuel level sensor.
2	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4SO)-58, REMOVAL, Fuel Sub Level Sensor.>, <Ref. to FU(H4DOTC)-64, REMOVAL, Fuel Sub Level Sensor.> or <Ref. to FU(STi) section.> 2) Measure the resistance between fuel sub level sensor terminals when setting the float to FULL and EMPTY position. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 0.5 to 2.5 Ω (FULL) and 42 to 44 Ω (EMPTY)?	Go to step **3.**	Replace the fuel sub level sensor.

	Step	Check	Yes	No
3	**CHECK HARNESS BETWEEN FUEL SUB LEVEL SENSOR AND COMBINATION METER.** 1) Disconnect the connector from combination meter. 2) Measure the resistance between fuel sub level sensor harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***(R59) No. 1 — (i12) No. 2:***	Is the resistance less than 10 Ω?	Go to step **4.**	Repair the wiring harness.
4	**CHECK HARNESS BETWEEN FUEL LEVEL SENSOR AND FUEL SUB LEVEL SENSOR.** Measure the resistance between fuel level sensor harness connector terminal and fuel sub level sensor harness connector terminal. ***Connector & terminal*** ***(R58) No. 3 — (R59) No. 2:***	Is the resistance less than 10 Ω?	Go to step **5.**	Repair the wiring harness.
5	**CHECK FUEL LEVEL SENSOR GROUND CIRCUIT.** Measure the resistance between fuel level sensor harness connector terminal and chassis ground. ***Connector & terminal*** ***(R58) No. 2 — Chassis ground:***	Is the resistance less than 10 Ω?	Except STi model: Check the fuel gauge. <Ref. to IDI-16, REMOVAL, Fuel Gauge.> STi model: Replace the meter main assembly.	Repair the wiring harness.

7. CHECK ENGINE COOLANT TEMPERATURE SENSOR

	Step	Check	Yes	No
1	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** Check the engine coolant temperature sensor. <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.> or <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.> or <Ref. to EN(STi) section.>	Is the engine coolant temperature sensor OK?	Go to step **2.**	Replace the engine coolant temperature sensor.
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from engine coolant temperature sensor and combination meter. 3) Measure the resistance between engine coolant temperature sensor harness connector and combination meter harness connector. ***Connector & terminal*** ***(E8) No. 3 — (i12) No. 9:***	Is the resistance less than 10 Ω?	Except STi model: Check the water temperature gauge. <Ref. to IDI-17, REMOVAL, Water Temperature Gauge.> STi model: Replace the meter main assembly.	Repair the wiring harness.

8. CHECK OUTSIDE TEMPERATURE INDICATOR

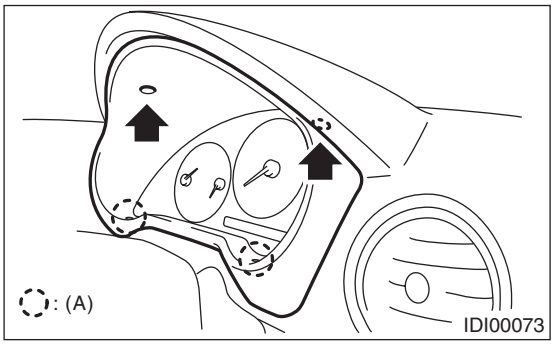
	Step	Check	Yes	No
1	**CHECK AIR CONDITIONER TYPE.**	Is the vehicle equipped with auto A/C?	Go to step **6.**	Go to step **2.**
2	**CHECK POWER SUPPLY FOR AMBIENT SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from combination meter. 3) Turn the ignition switch to ON. 4) Measure the voltage between combination meter terminal and chassis ground. ***Connector & terminal*** ***(i10) No. 11 (+) — Chassis ground (−):***	Is the voltage more than 4 V?	Go to step **3.**	Replace the combination meter printed circuit.
3	**CHECK HARNESS BETWEEN AMBIENT SENSOR AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ambient sensor. 3) Measure the resistance between ambient sensor harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***(F78) No. 1 — (i10) No. 11:*** ***(F78) No. 2 — (i10) No. 8:***	Is the resistance less than 10 Ω?	Go to step **4.**	Repair the wiring harness.
4	**CHECK AMBIENT SENSOR.** 1) Remove the ambient sensor. 2) Check the ambient sensor. <Ref. to IDI-18, INSPECTION, Ambient Sensor.>	Is the ambient sensor OK?	Go to step **5.**	Replace the ambient sensor.
5	**CHECK OUTSIDE TEMPERATURE INDICATOR.** 1) Connect the combination meter harness connector. 2) Connect a resistor (2.2 kΩ) between terminals of ambient sensor harness connector. 3) Turn the ignition switch to ON and check the outside temperature indicator display.	Is the outside temperature indicator indicating 25°C (77°F)?	Repair the poor contact of ambient sensor harness connector.	Replace the combination meter printed circuit.
6	**CHECK POWER SUPPLY FOR COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from auto A/C control module. 3) Turn the ignition switch to ON. 4) Measure the voltage between auto A/C control module terminal and chassis ground. ***Connector & terminal*** ***(B282) No. 11 (+) — chassis ground (−):***	Is the voltage more than 4 V?	Go to step **7.**	Replace the auto A/C control module.
7	**CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from combination meter. 3) Measure the resistance between auto A/C control module harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***(B282) No. 11 — (i10) No. 12:***	Is the resistance less than 10 Ω?	Go to step **8.**	Repair the wiring harness.

	Step	Check	Yes	No
8	**CHECK POWER SUPPLY FOR AMBIENT SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between auto A/C control module terminal and chassis ground. ***Connector & terminal*** ***(B283) No. 9 (+) — chassis ground (−):***	Is the voltage more than 4 V?	Go to step **9.**	Replace the auto A/C control module.
9	**CHECK HARNESS BETWEEN AMBIENT SENSOR AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ambient sensor. 3) Measure the resistance between ambient sensor harness connector terminal, combination meter harness connector terminal and auto A/C control module harness connector terminal. ***Connector & terminal*** ***(F78) No. 1 — (i10) No. 11:*** ***(F78) No. 1 — (B283) No. 9:*** ***(F78) No. 2 — (i10) No. 8:***	Is the resistance less than 10 Ω?	Go to step **10.**	Repair the wiring harness.
10	**CHECK AMBIENT SENSOR.** 1) Remove the ambient sensor. 2) Check the ambient sensor. <Ref. to IDI-18, INSPECTION, Ambient Sensor.>	Is the ambient sensor OK?	Go to step **11.**	Replace the ambient sensor.
11	**CHECK OUTSIDE TEMPERATURE INDICATOR.** 1) Connect the combination meter and auto A/C control module harness connector. 2) Connect a resistor (2.2 kΩ) between terminals of ambient sensor harness connector. 3) Turn the ignition switch to ON and check the outside temperature indicator display.	Is the outside temperature indicator indicating 25°C (77°F)?	Repair the poor contact of ambient sensor harness connector.	Replace the meter main assembly.

3. Combination Meter Assembly

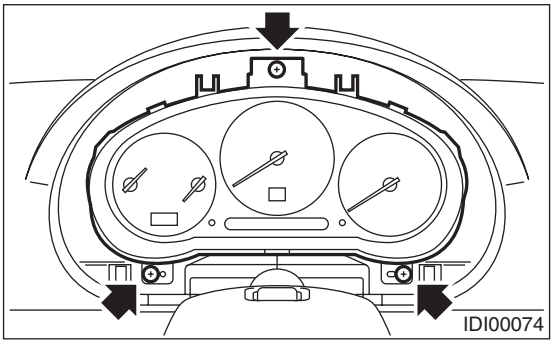
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Set the tilt steering at lowest position.
3) Remove the screws and detach the meter visor.



(A) Hook

4) Remove the screws of combination meter and pull out the meter toward you.



5) Disconnect the connector in the upper area of combination meter to remove the meter.

CAUTION:
• Be careful not to damage the meter or instrument panel.
• Pay particular attention to avoid damaging the meter glass.

B: INSTALLATION

Install in the reverse order of removal.

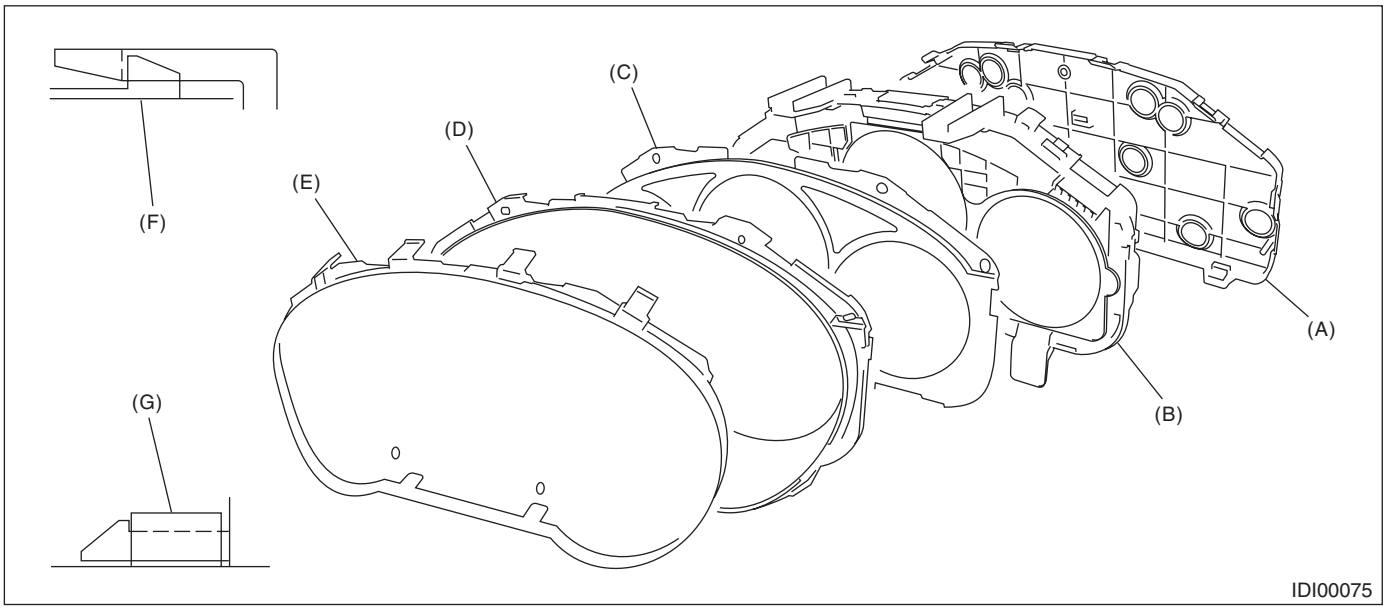
CAUTION:
• Make sure that electrical connector is connected securely.
• Make sure that each meter operates normally.

C: DISASSEMBLY

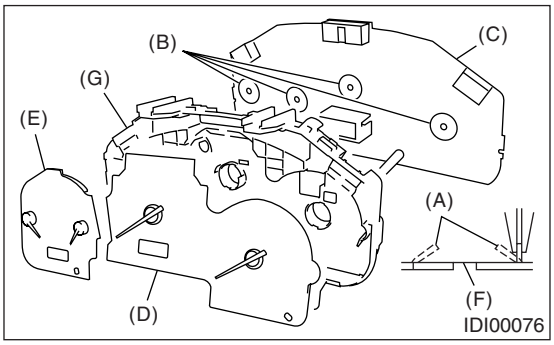
1. EXCEPT STi MODEL

CAUTION:
Use gloves to avoid damage and getting fingerprints on the glass surface and meter surfaces.

1) Disengage the claw (F) to remove the case (B) from back cover (A).
2) Disengage the claw (G) to remove the meter glass (E), reflector (D), and window plate (C) from inner case.



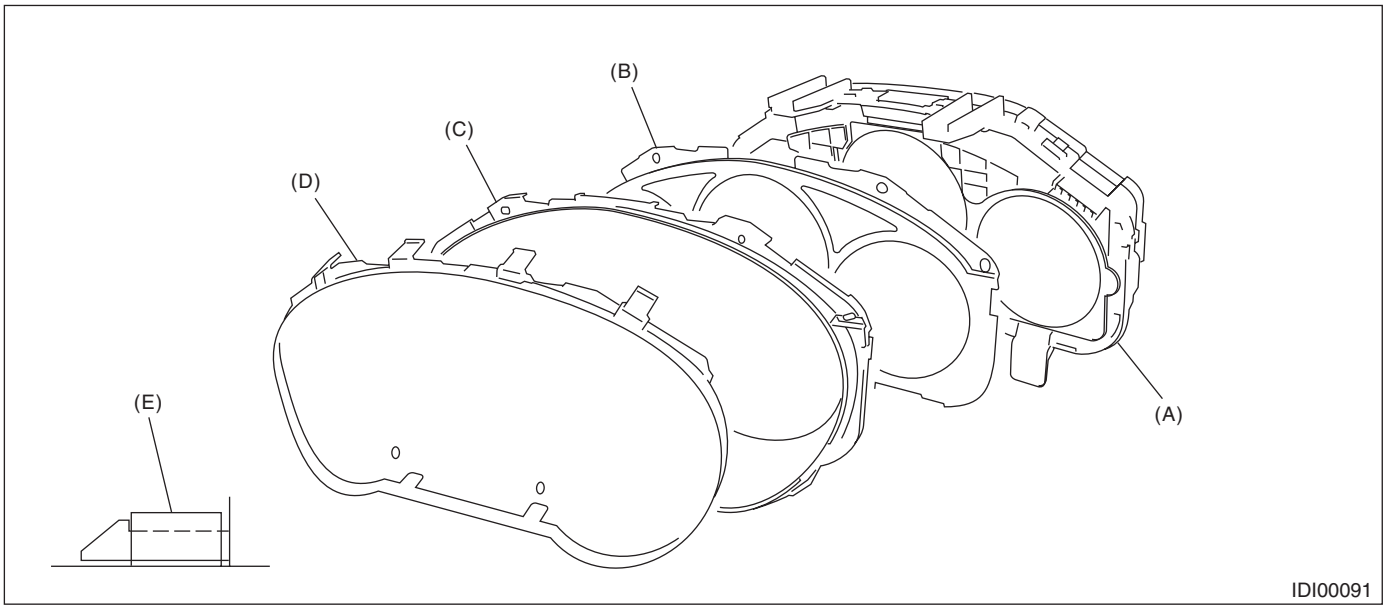
3) Pull up the claw (A) in portion (B) of combination meter printed circuit (C) with combination pliers. Push out the speedometer and tachometer assembly (D) and fuel gauge and water temperature gauge assembly (E) using hole (F).
4) Pull up the claw in center of combination meter printed circuit (C), and remove the printed circuit from case (G).



2. STi MODEL

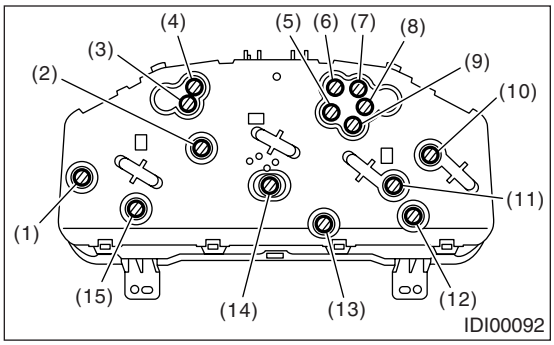
CAUTION:
Use gloves to avoid damage and getting fingerprints on the glass surface and meter surfaces.

Disengage the claw (E) to remove the meter glass (D), reflector (C), and window plate (B) from meter main assembly (A).



3. BULB REPLACEMENT

• EXCEPT STi MODEL



(1) Tachometer (Non-turbo model) or speedometer (Turbo model)
(2) Speedometer and tachometer
(3) Turn signal indicator light (RH)
(4) HI-beam indicator light
(5) Speedometer (Non-turbo model) or tachometer (Turbo model)
(6) Cruise set indicator light
(7) Cruise indicator light
(8) Turn signal indicator light (LH)
(9) Brake fluid and parking brake warning light
(10) Fuel gauge
(11) Temperature gauge
(12) LCD (Outside temperature indicator)
(13) Charge warning light
(14) LCD (Odometer and tripmeter: non-turbo model)
(15) LCD (Odometer and tripmeter: turbo model)

• STi MODEL

Replace the meter main assembly of STi model if it does not function properly, because the warning light and indicator light are made from LED.

D: ASSEMBLY

Assemble in the reverse order of disassembly.

4. Speedometer

A: REMOVAL

NOTE:
Main meter assembly of STi model cannot be disassembled. Do not remove or inspect the speedometer as a single unit.

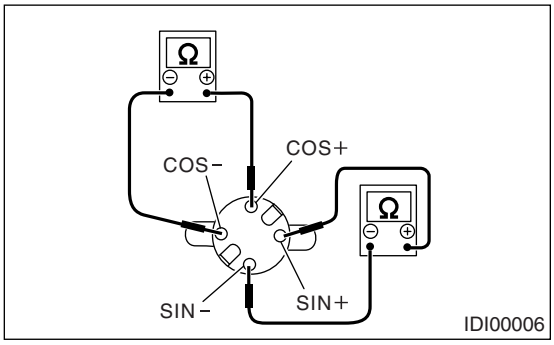
Disassemble the combination meter, and then remove the speedometer and tachometer assembly. <Ref. to IDI-11, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the speedometer resistance.



Terminal	Resistance
Terminals SIN+ and SIN−	200±8 Ω
Terminals COS+ and COS−	200±8 Ω

If NG, replace the speedometer and tachometer assembly.
If OK, replace the combination meter printed circuit.

5. Tachometer

A: REMOVAL

NOTE:
Main meter assembly of STi model cannot be disassembled. Do not remove or inspect the tachometer as a single unit.

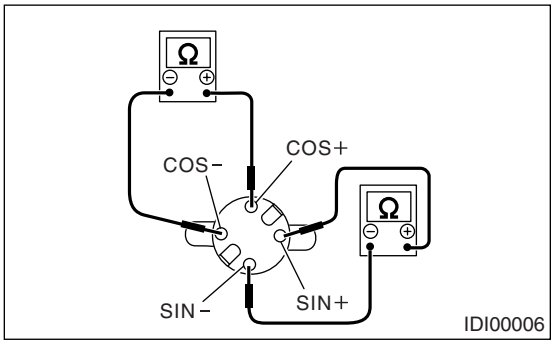
Disassemble the combination meter, and then remove the speedometer and tachometer assembly. <Ref. to IDI-11, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the tachometer resistance.



Terminal	Resistance
Terminals SIN+ and SIN−	200±8 Ω
Terminals COS+ and COS−	200±8 Ω

If NG, replace the speedometer and tachometer assembly.
If OK, replace the combination meter printed circuit.

6. Fuel Gauge

A: REMOVAL

NOTE:
Main meter assembly of STi model cannot be disassembled. Do not remove or inspect the fuel gauge as a single unit.

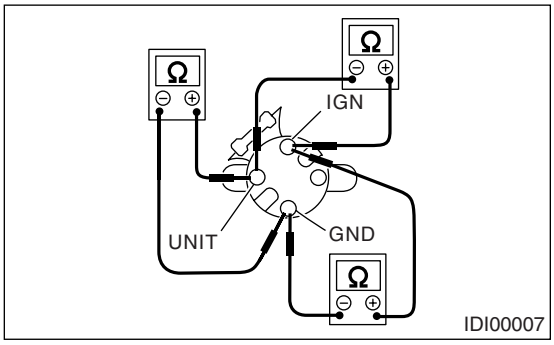
Disassemble the combination meter, and then remove the water temperature gauge and fuel gauge assembly. <Ref. to IDI-11, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the fuel gauge resistance.



Terminal	Resistance
Terminals IGN and GND	170±10 Ω
Terminals IGN and UNIT	35±10 Ω
Terminals UNIT and GND	136±10 Ω

If NG, replace the water temperature gauge and fuel gauge assembly.
If OK, replace the combination meter printed circuit.

7. Water Temperature Gauge

A: REMOVAL

NOTE:
Main meter assembly of STi model cannot be disassembled. Do not remove or inspect the water temperature gauge as a single unit.

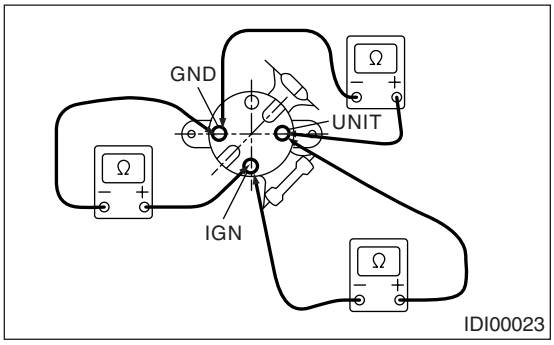
Disassemble the combination meter, and then remove the tachometer and water temperature gauge and fuel gauge assembly. <Ref. to IDI-11, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the water temperature gauge resistance.



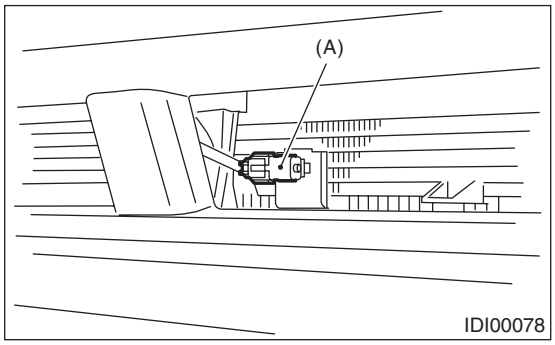
Terminal	Resistance
Terminals IGN and GND	208±10 Ω
Terminals IGN and UNIT	56±10 Ω
Terminals UNIT and GND	264±10 Ω

If NG, replace the water temperature gauge and fuel gauge assembly.
If OK, replace the combination meter printed circuit.

8. Ambient Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Disconnect the ambient sensor connector.
3) Remove the ambient sensor (A) from radiator lower panel.

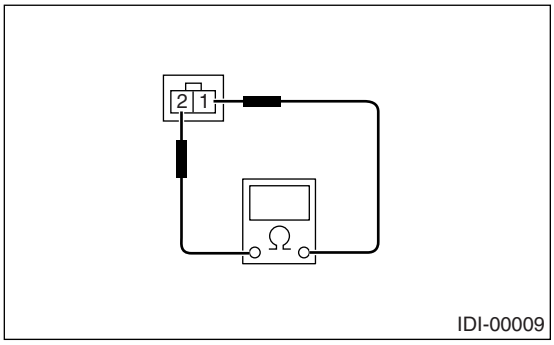


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the ambient sensor resistance.



Terminal	Resistance
1 and 2	2.2 kΩ/25°C (77°F)

If NG, replace the ambient sensor.

SEATS

SE

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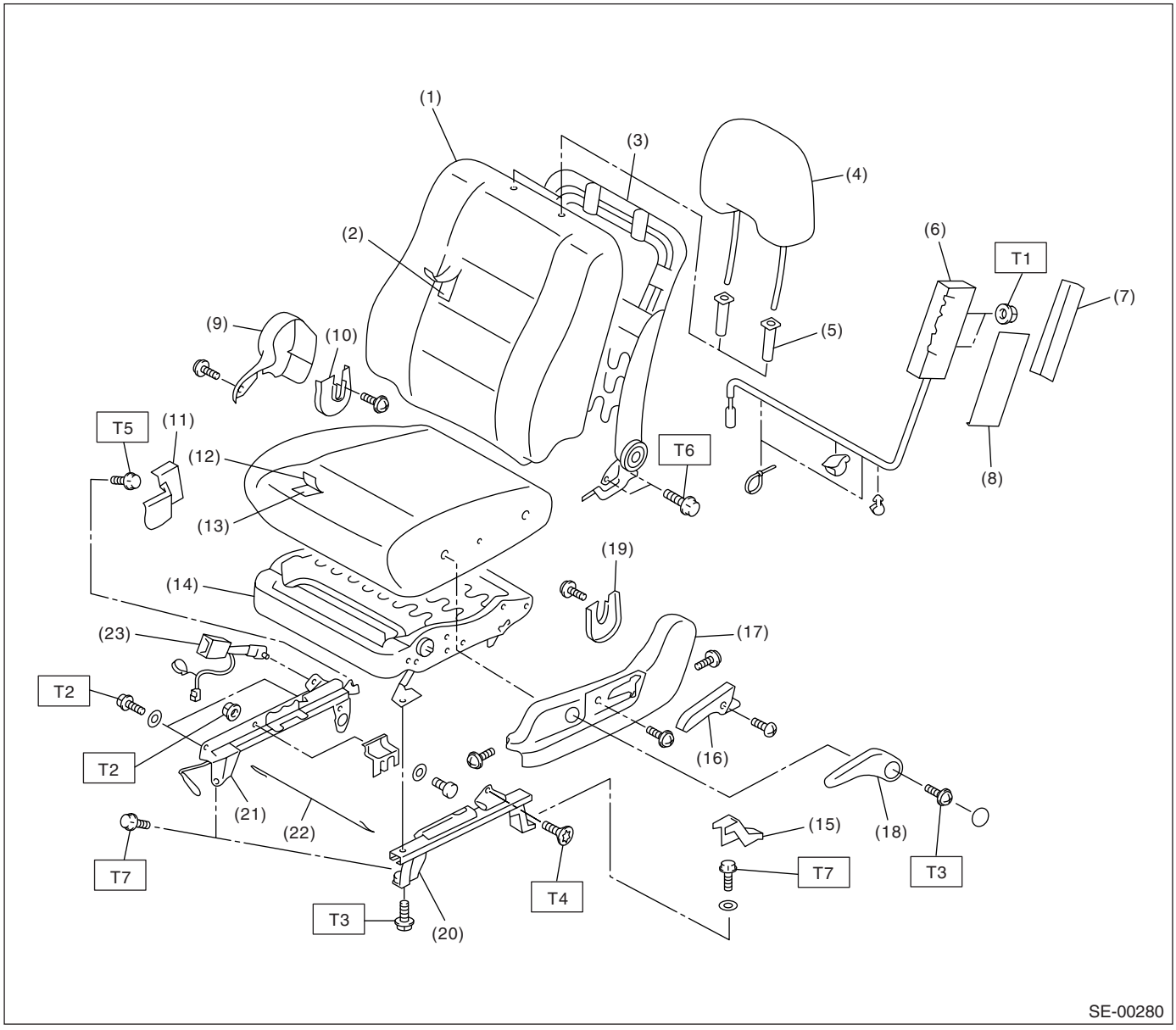
1. General Description 2
2. Front Seat 6
3. Rear Seat 16

1. General Description

A: COMPONENT

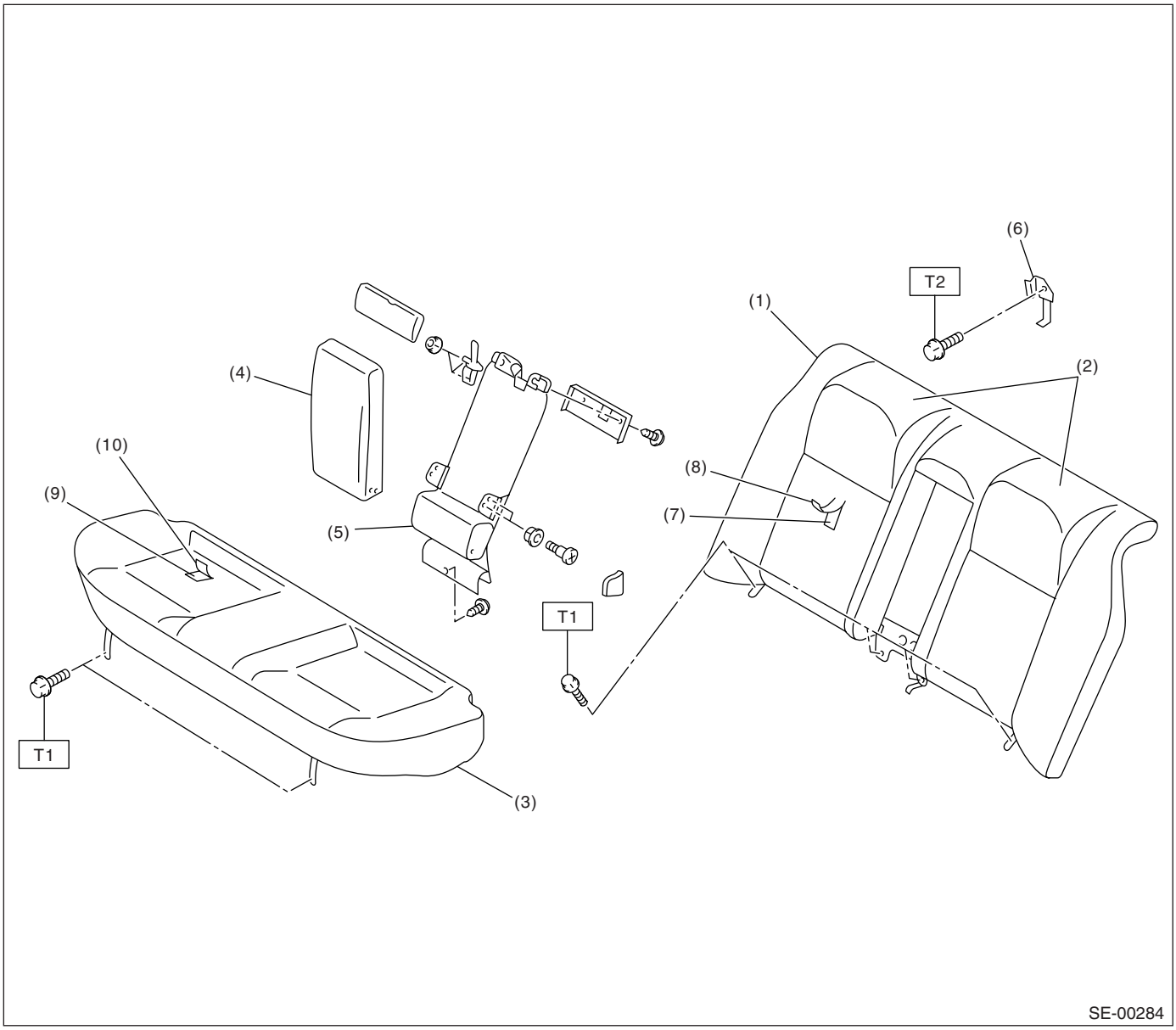
1. FRONT SEAT



(1) Backrest cover
(2) Backrest pad
(3) Backrest frame ASSY
(4) Headrest ASSY
(5) Headrest lock bush
(6) Side airbag module
(7) Support pad (B)
(8) Support pad (A)
(9) Seat hinge inner cover
(10) Seat hinge inner cover RH
(11) Bolt cover RH
(12) Seat cushion cover
(13) Seat cushion pad
(14) Seat cushion frame ASSY
(15) Bolt cover LH
(16) Reclining lever
(17) Seat hinge outer cover
(18) Lifter lever
(19) Seat hinge inner cover LH
(20) Outer slide rail
(21) Inner slide rail
(22) Connecting wire
(23) Inner belt

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5.9 (0.60, 4.35)
T2: 10 (1.02, 7.38)
T3: 17.7 (1.81, 13.1)
T4: 20 (2.04, 14.8)
T5: 30 (3.06, 22.1)
T6: 52 (5.30, 38.4)
T7: 53 (5.40, 39.1)

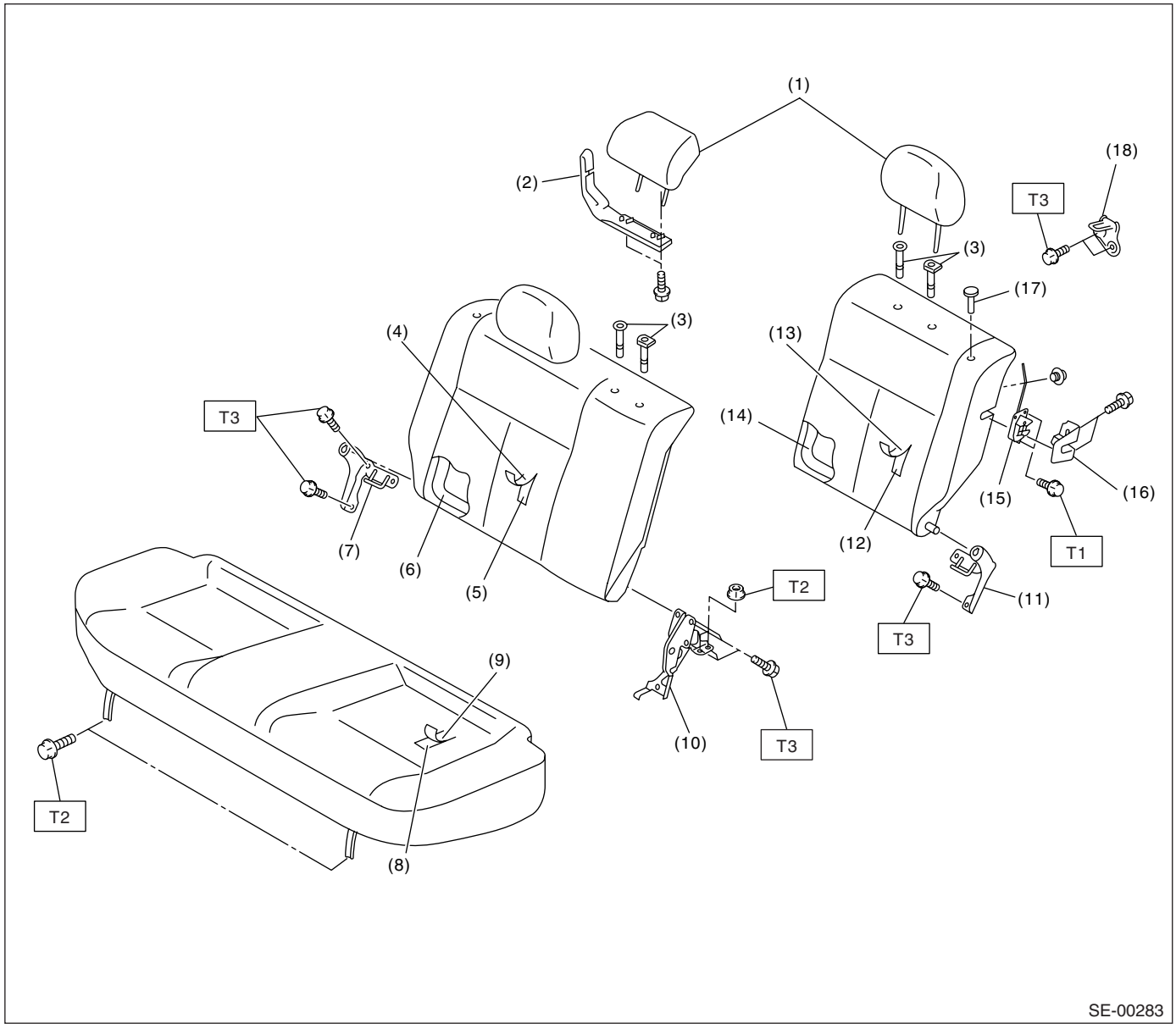
2. REAR SEAT (SEDAN MODEL)



(1)	Backrest	(6)	Hook
(2)	Headrest	(7)	Backrest pad ASSY
(3)	Cushion	(8)	Backrest cover ASSY
(4)	Arm rest	(9)	Rear pad & cushion frame ASSY
(5)	Center through frame	(10)	Rear cushion cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 10 (1.02, 7.38)
T2: 24.5 (2.5, 18.1)

3. REAR SEAT (WAGON MODEL)



(1) Headrest
(2) Seat belt guide
(3) Headrest bush
(4) Backrest cover RH
(5) Backrest pad RH
(6) Backrest frame RH
(7) Hinge ASSY RH
(8) Seat cushion cover
(9) Seat cushion pad
(10) Hinge ASSY CTR
(11) Hinge ASSY LH
(12) Backrest pad LH
(13) Backrest cover LH
(14) Backrest frame LH
(15) Seat back latch
(16) Seat back latch cover
(17) Backrest knob
(18) Striker

Tightening torque: N·m (kgf-m, ft-lb)
T1: 17.7 (1.81, 13.1)
T2: 24.5 (2.5, 18.1)
T3: 33 (3.3, 24.6)

B: CAUTION

When removing the front seat from a side airbag loaded vehicle, follow cautions given in the airbag section.

C: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
Long Nose Pliers	Used for removing hog ring.
Hog Ring Pliers	Used for installing hog ring.
TORX® T30	Used for removing and installing slide rail.

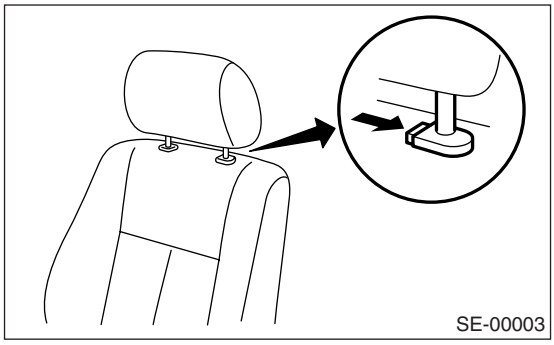
2. Front Seat

A: REMOVAL

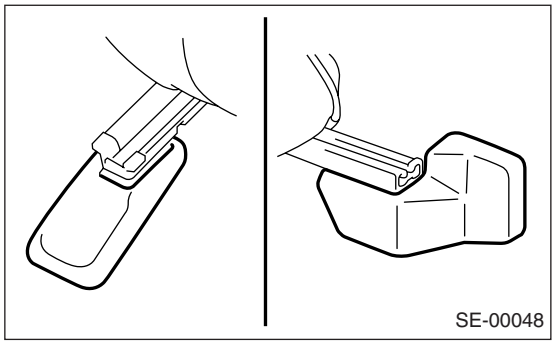
1) Disconnect the ground cable from battery.

CAUTION:
The airbag system is fitted with a backup power source. If the airbag system is serviced within 20 seconds after the ground cable is disconnected, it may inflate.

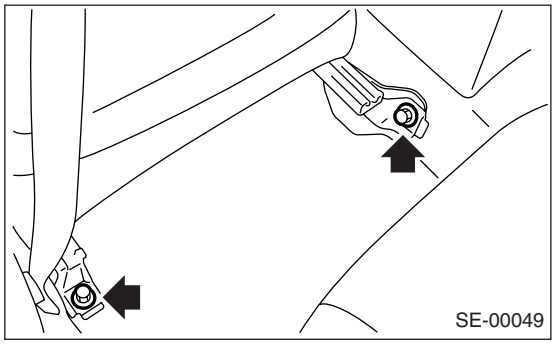
2) While pressing the headrest lock button, remove the headrest.


SE-00003

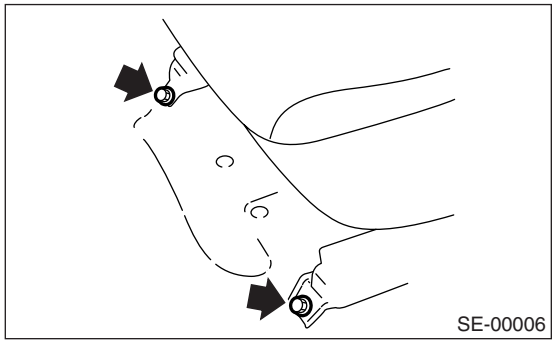
3) Tilt forward the backrest.
4) Move the seat to full front end.
5) Remove the bolt cover at rear end of slide rail.


SE-00048

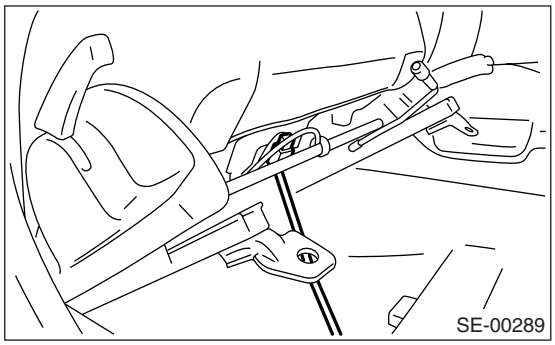
6) Remove the two bolts at rear side of seat rail.


SE-00049

7) Move the seat to full rear end.
8) Remove the two bolts at front side of seat rail.


SE-00006

9) Disconnect the connector under seat.
- Seat belt warning light connector (Driver's seat)
- Side airbag connector (with side airbag)
- Seat heater connector (with seat heater)


SE-00289

10) Remove the front seat from vehicle.

B: INSTALLATION

Install in the reverse order of removal.

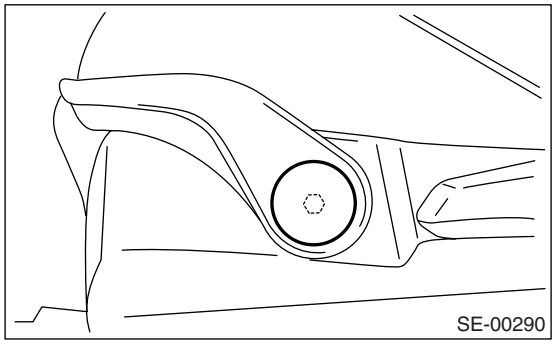
Tightening torque:
Refer to COMPONENT in General Description. <Ref. to SE-2, FRONT SEAT, COMPONENT, General Description.>

C: DISASSEMBLY

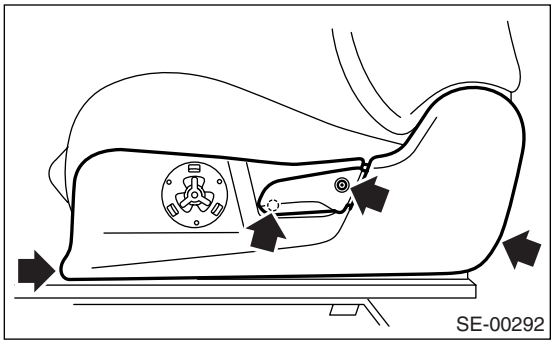
1. DRIVER'S SEAT

• Standard seat

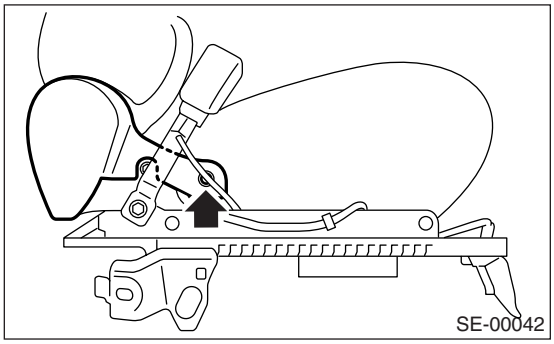
1) Remove the seat from vehicle. <Ref. to SE-6, REMOVAL, Front Seat.>
2) Remove the seat lifter cover using a flat tip screwdriver or equivalent, and then loosen the inside bolt to remove seat lifter lever.


SE-00290

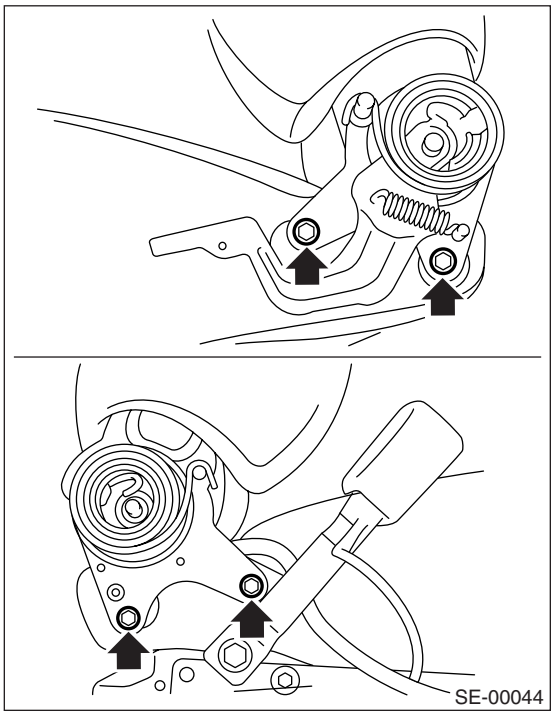
3) Remove the reclining lever and seat hinge outer cover.



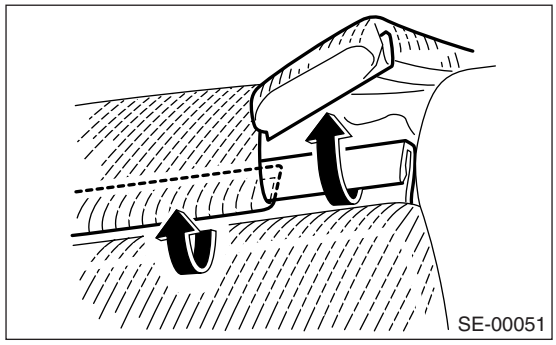
4) Remove the seat hinge inner cover.



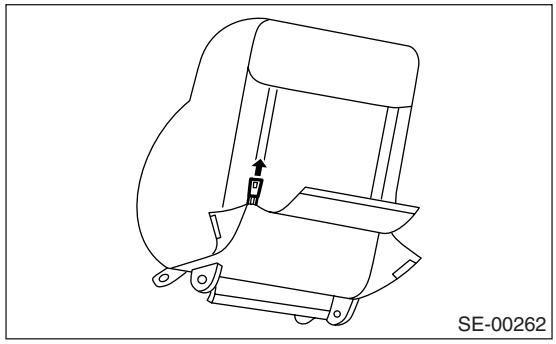
5) Remove two bolts from reclining hinge on each side.



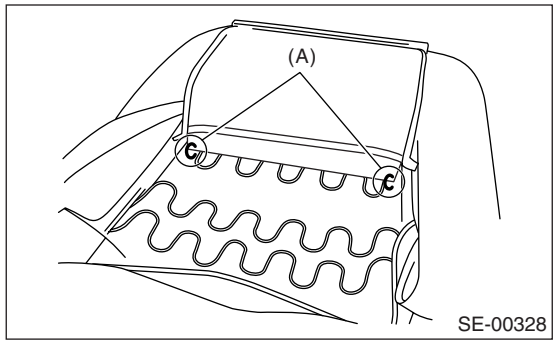
6) Remove the hook at bottom of backrest.



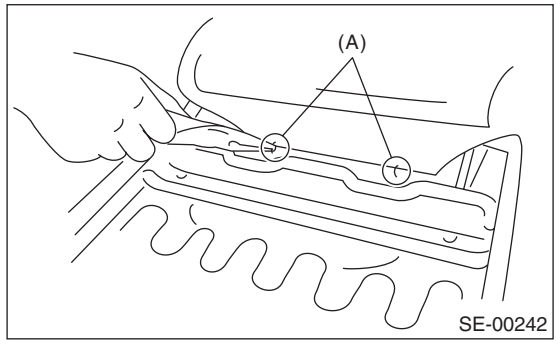
7) Open the zipper behind of backrest.



8) Remove the hog rings (A) of backrest cover.

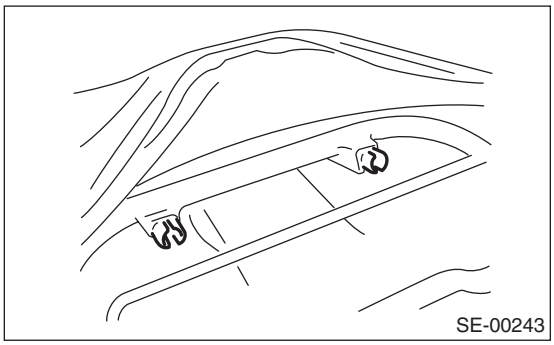


9) Remove the hog rings (A) which secure the backrest cover and backrest pad.

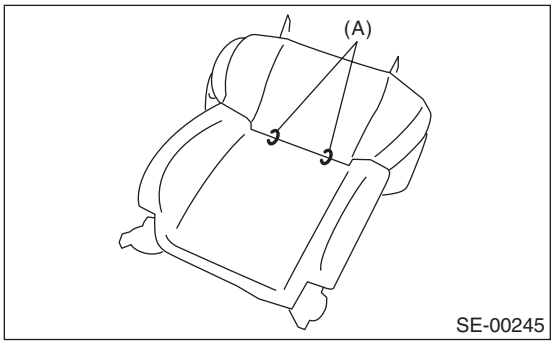


10) Remove the headrest bushes.

NOTE:
Push the headrest bushes to outside of seat from inside, and then remove them.

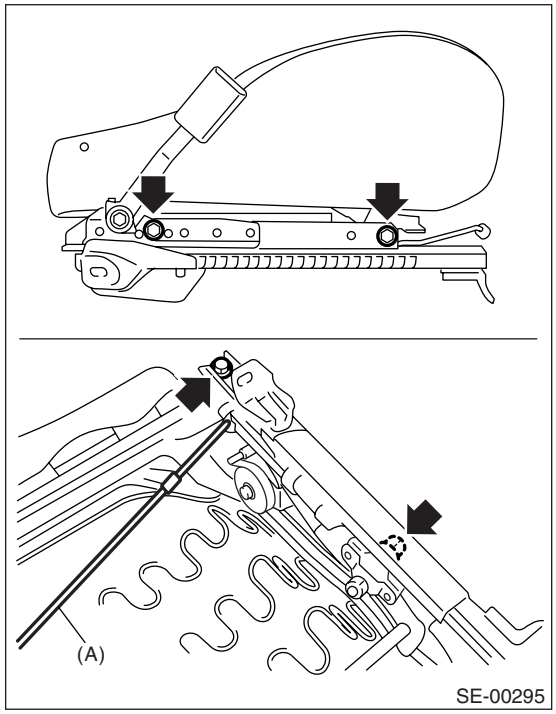

SE-00243

11) Pull out the backrest frame.
12) Remove the hog rings (A) at front of seat back, and then remove the seat back cover from seat back.



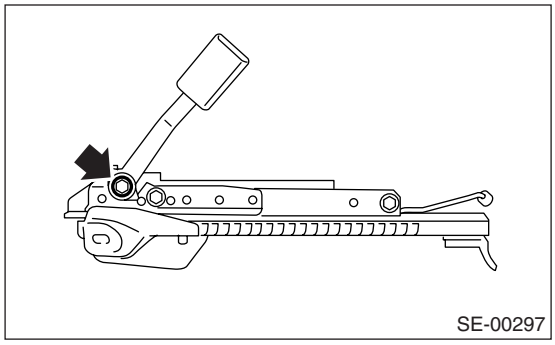
SE-00245

13) Remove the connecting wire (A), and then loosen the bolts and nuts to remove slide rail.

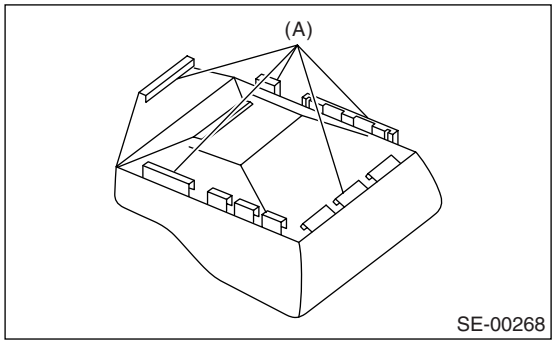


SE-00295

14) Remove the inner belt.

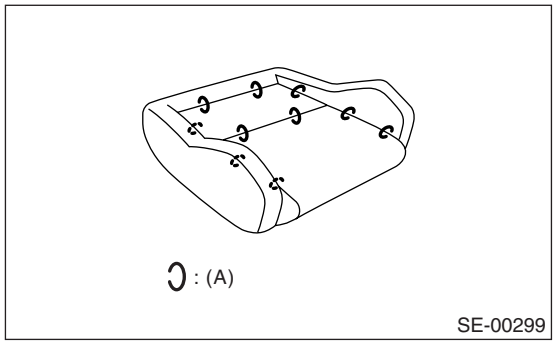

SE-00297

15) Remove the hook (A), and then remove the seat cushion frame.



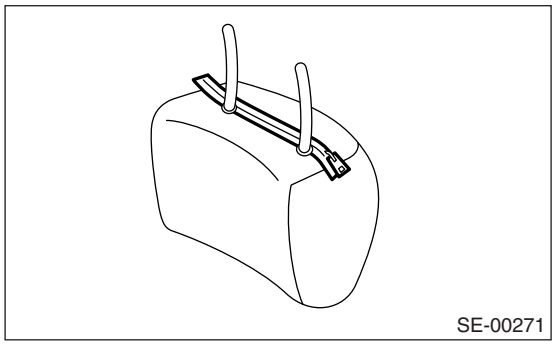
SE-00268

16) Remove the hog rings (A), and then remove the seat cushion cover from seat cushion pad.



SE-00299

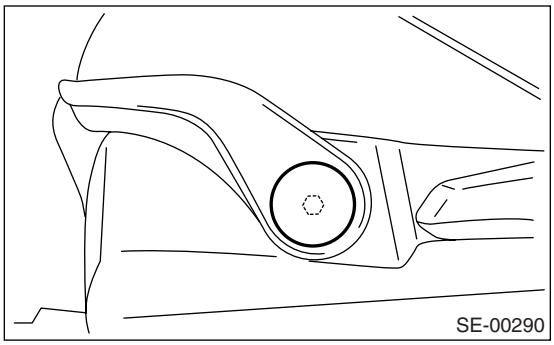
17) Open the zipper at bottom of headrest, and then remove the headrest cover from headrest.


SE-00271

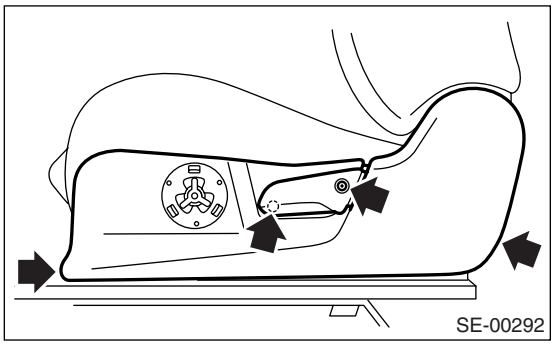
• Bucket type seat

1) Remove the seat from vehicle. <Ref. to SE-6, REMOVAL, Front Seat.>

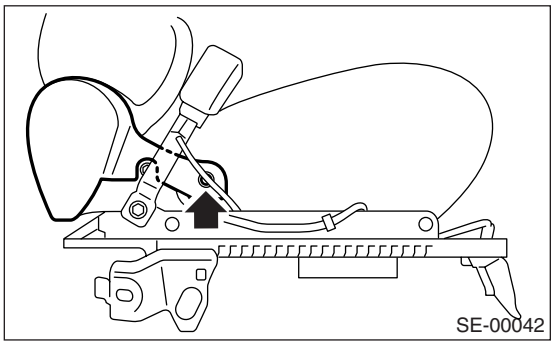
2) Remove the seat lifter cover using a flat tip screwdriver or equivalent, and then loosen inside bolt to remove seat lifter lever.



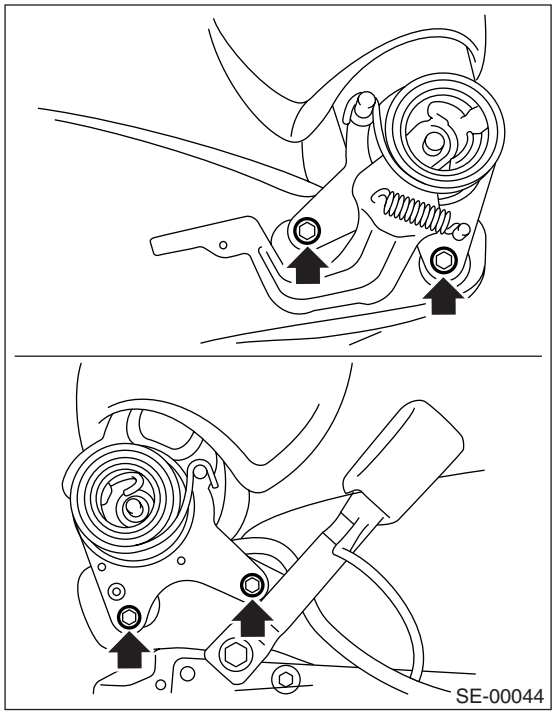
3) Remove the reclining lever and seat hinge outer cover.



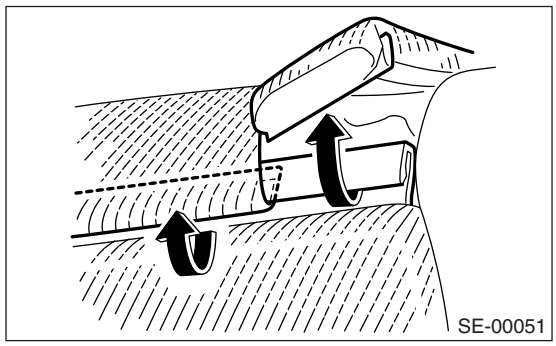
4) Remove the seat hinge inner cover.



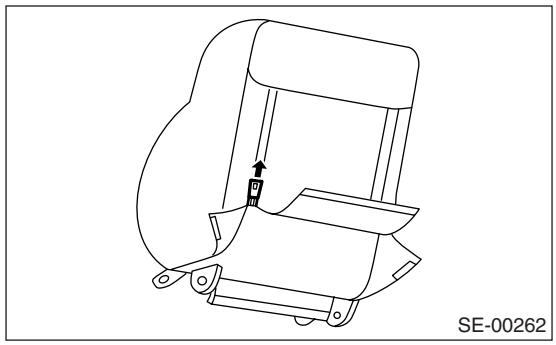
5) Remove two bolts from reclining hinge on each side.



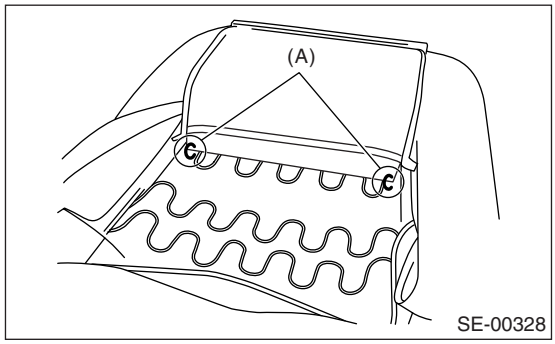
6) Remove the hook at bottom of backrest.



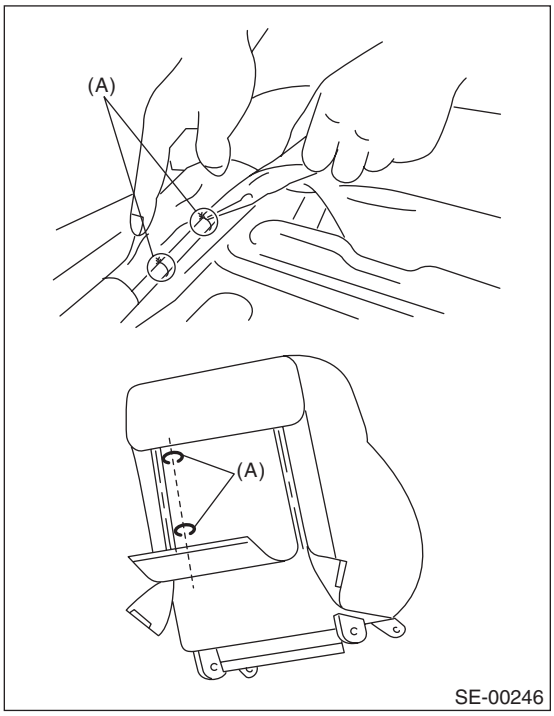
7) Open the zipper behind of backrest. (Side airbag equipped seat)



8) Remove the hog rings (A) of backrest cover. (Side airbag equipped seat)

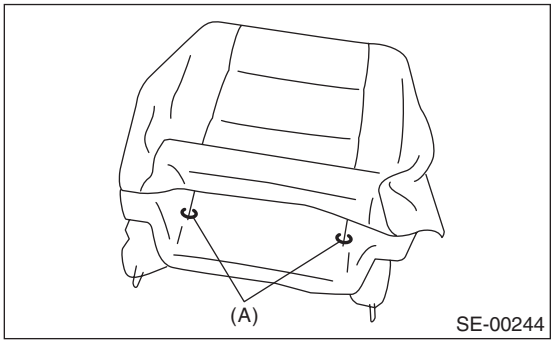


9) Open the zipper behind of backrest cover, and then remove the hog rings (A) at side of inside backrest from backrest frame.

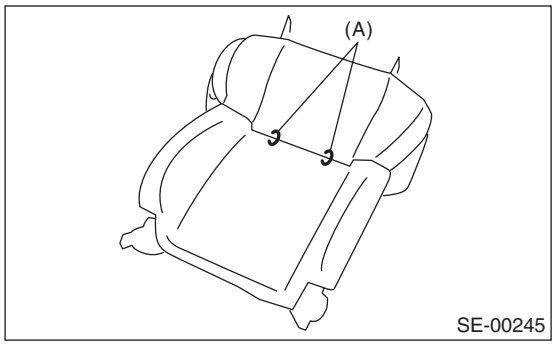


10) Pull out the backrest frame.

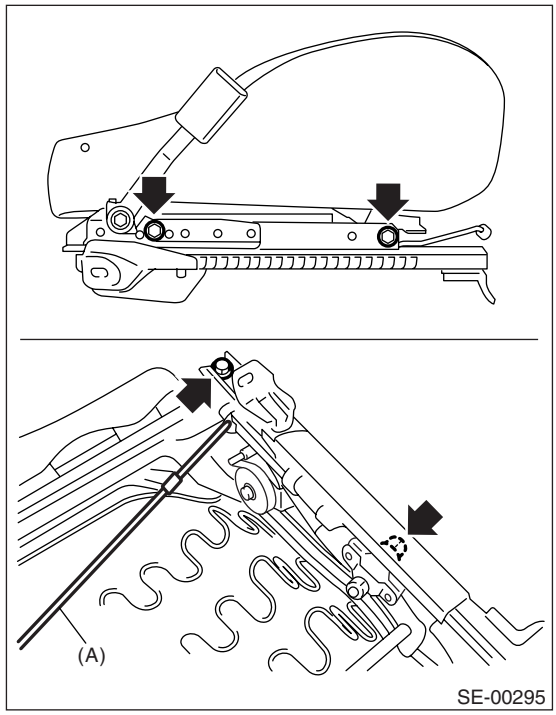
11) Remove the hog rings (A) at bottom of seat back.



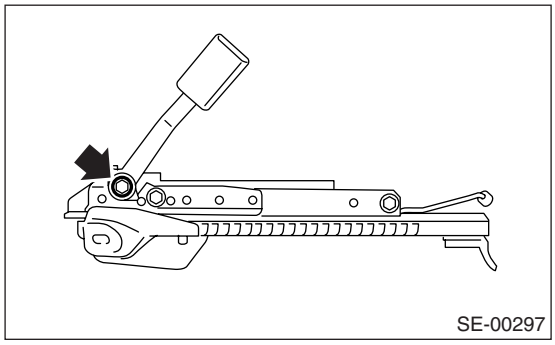
12) Remove the hog rings (A) at front of seat back, and then remove the seat back cover from seat back.



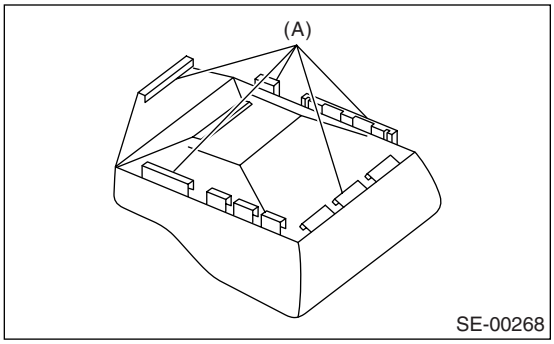
13) Remove the connection wire (A), and then loosen the bolts and nuts to remove slide rail.



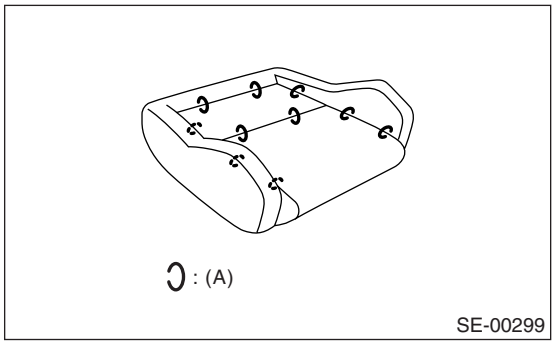
14) Remove the inner belt.



15) Remove the hook (A), and then remove the seat cushion frame.



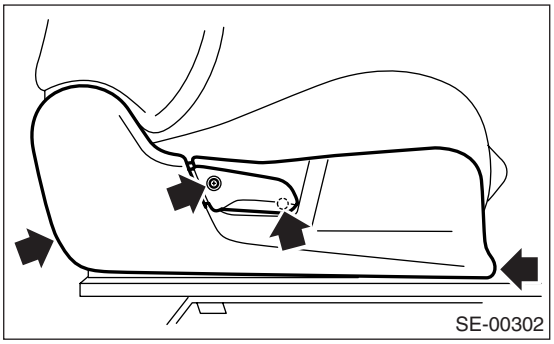
16) Remove the hog rings (A), and then remove the seat cushion cover from seat cushion pad.



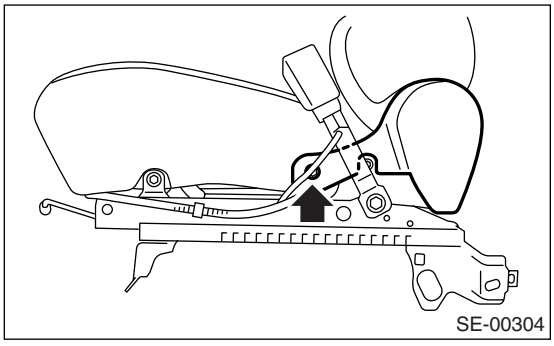
2. PASSENGER'S SEAT

• Standard seat

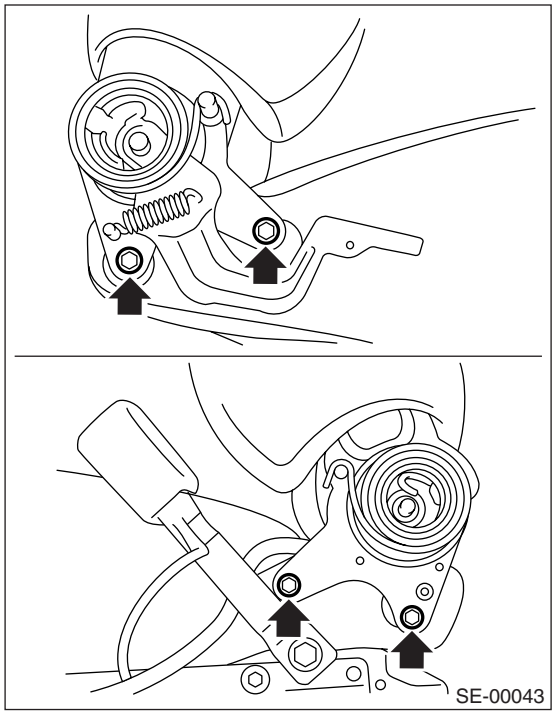
1) Remove the seat from vehicle. <Ref. to SE-6, REMOVAL, Front Seat.>
2) Remove the reclining lever and seat hinge cover outer.



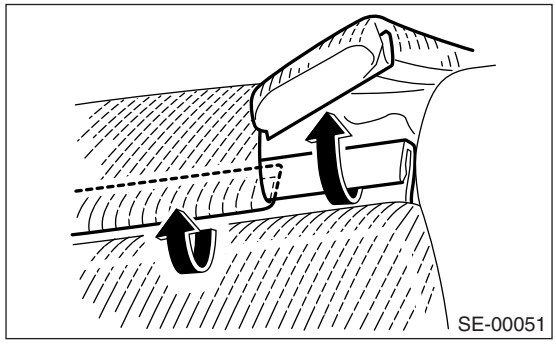
3) Remove the seat hinge cover inner.



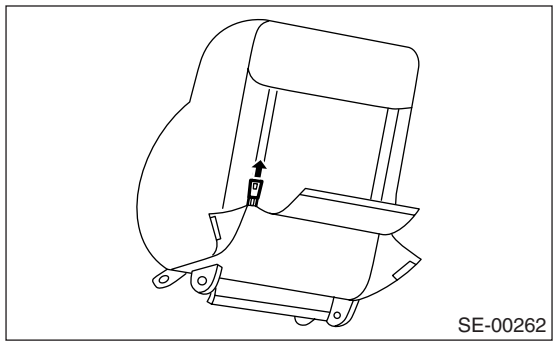
4) Remove the bolts from reclining hinge on each side.



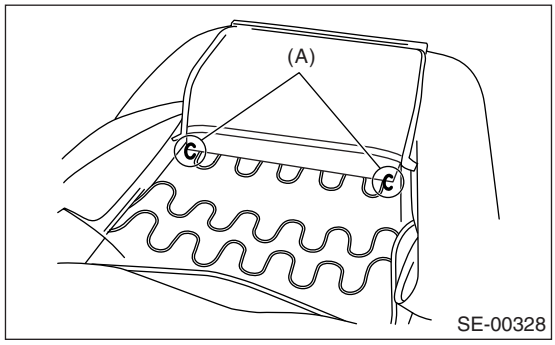
5) Remove the hook at bottom of backrest.



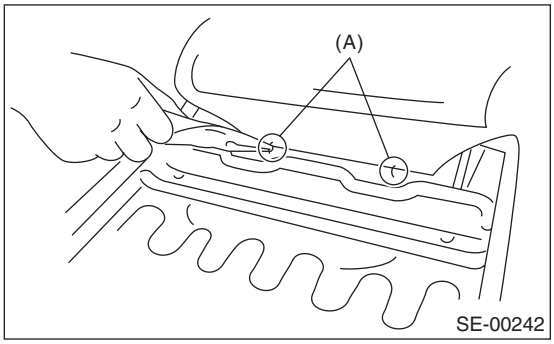
6) Open the zipper behind of backrest.



7) Remove the hog rings (A) of backrest cover.

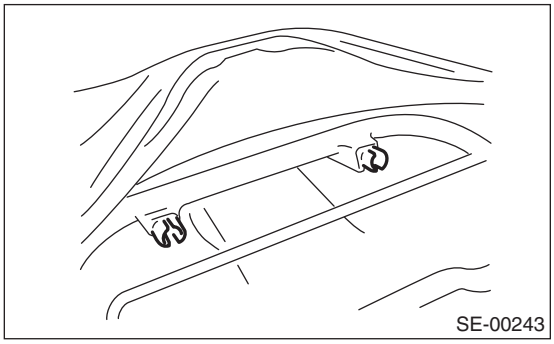


8) Remove the hog rings (A) which secure the backrest cover and backrest pad.

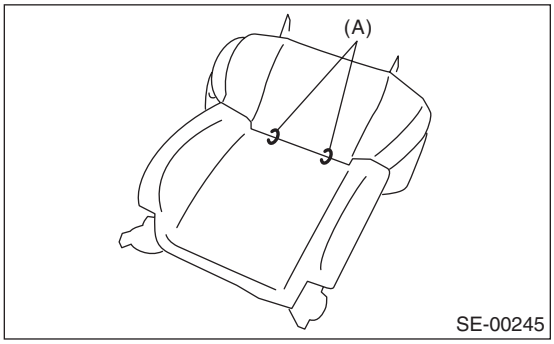


9) Remove the headrest bushes.

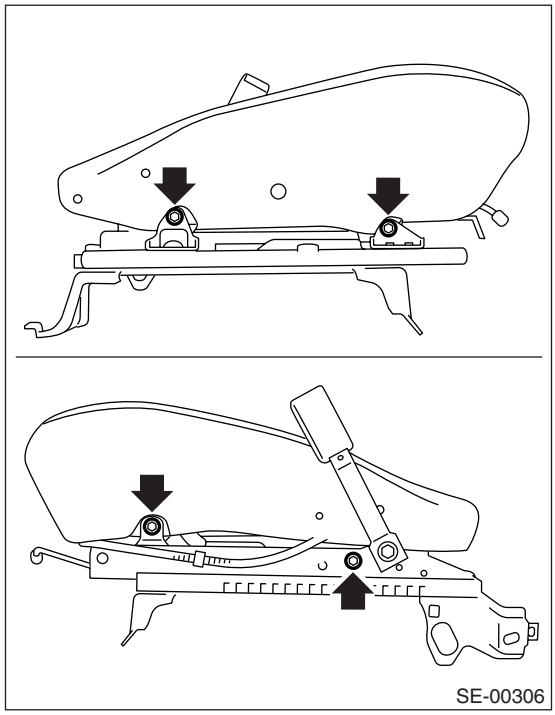
NOTE:
Push the headrest bushes to outside of seat from inside, and then remove them.



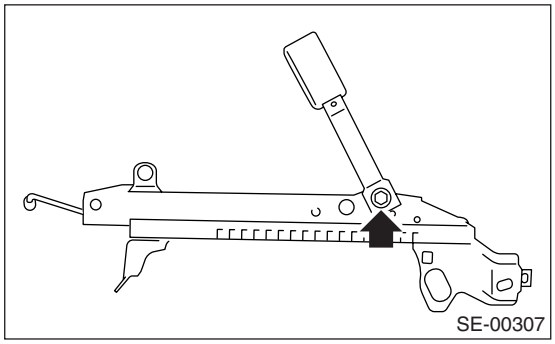
10) Pull out the backrest frame.
11) Remove the hog rings (A) at front of seat back, and then remove the seat back cover from seat back.



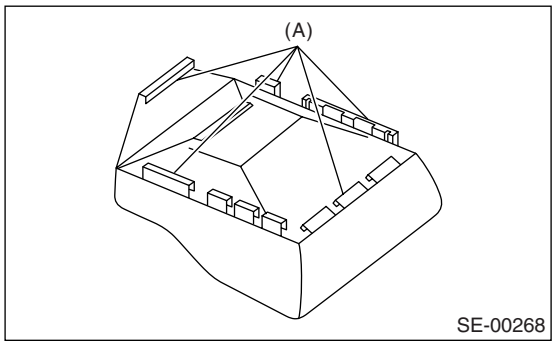
12) Loosen the bolts and nuts to remove the seat cushion from slide rail.



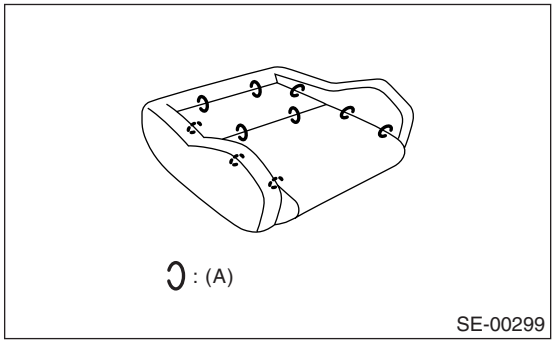
13) Remove the inner belt.



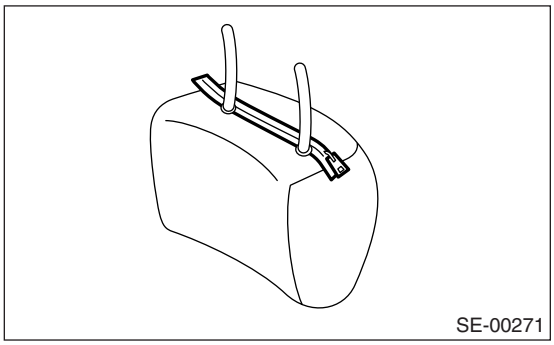
14) Remove the hooks (A), and then remove the seat cushion frame.



15) Remove the hog rings (A), and then remove seat cushion cover from seat cushion pad.

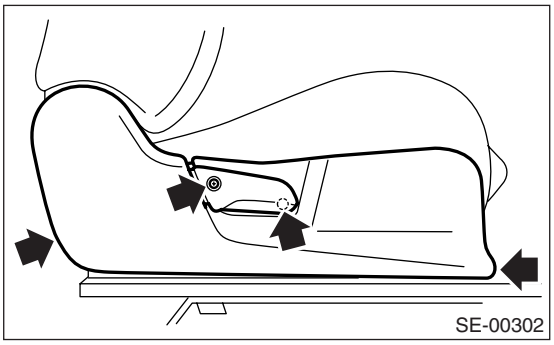


16) Open the zipper at bottom of headrest, and then remove the headrest cover from headrest.

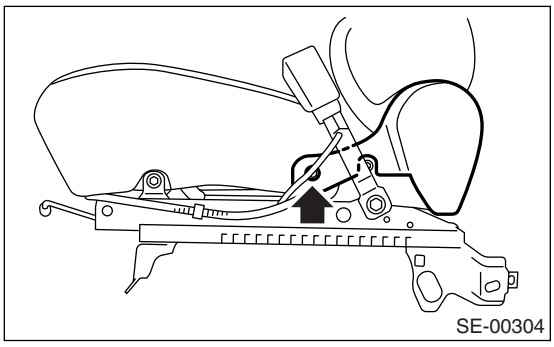


• Bucket type seat

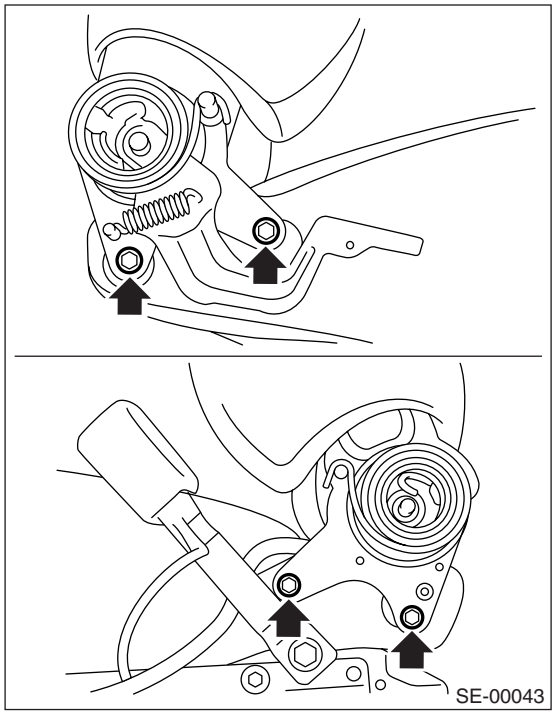
1) Remove the seat from vehicle. <Ref. to SE-6, REMOVAL, Front Seat.>
2) Remove the reclining lever and seat hinge outer cover.



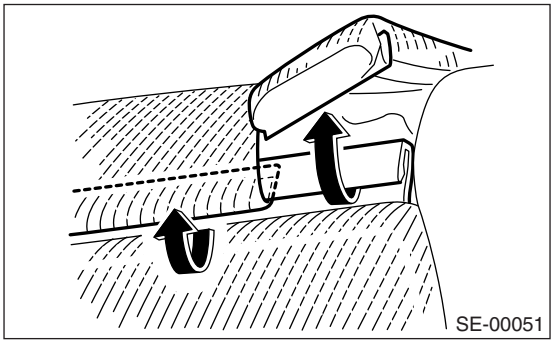
3) Remove the seat hinge inner cover.



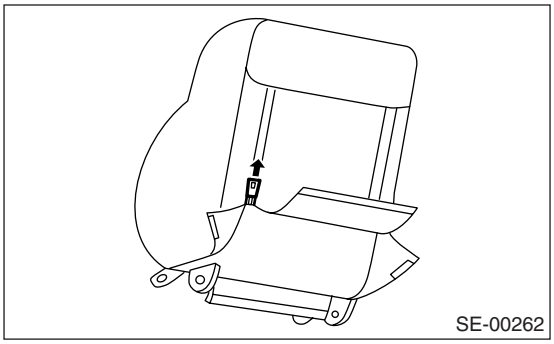
4) Remove two bolts from reclining hinge on each side.



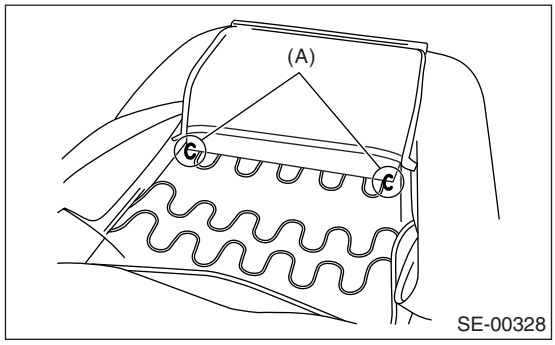
5) Remove the hook at bottom of backrest.



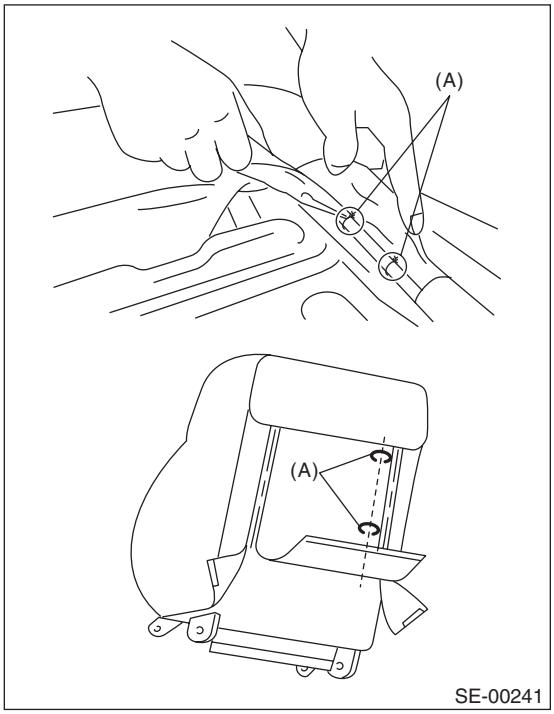
6) Open the zipper behind of backrest.



7) Remove the hog rings (A) of backrest cover.

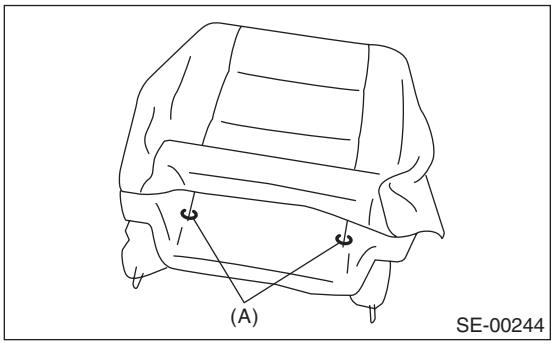


8) Remove the hog rings (A) at side of inside backrest from backrest frame.

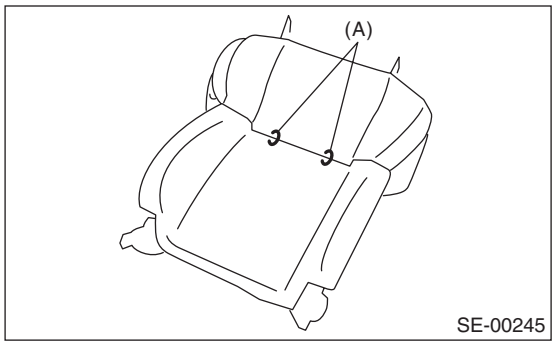


9) Pull out the backrest frame.

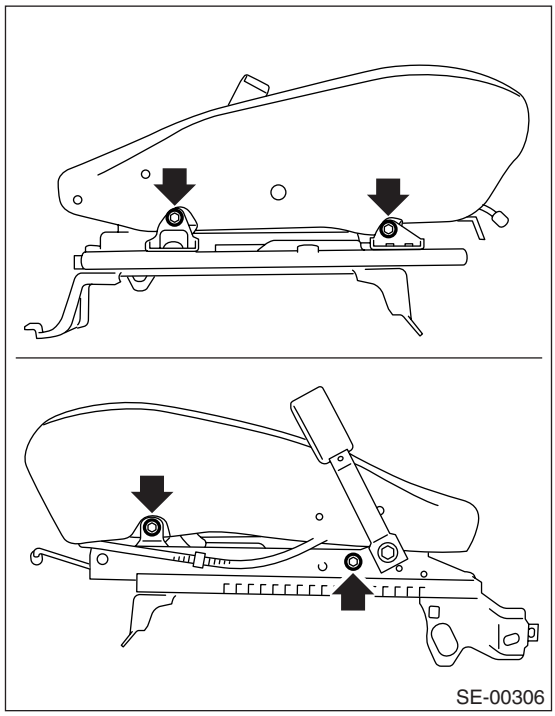
10) Remove the hog rings (A) at bottom of seat back.



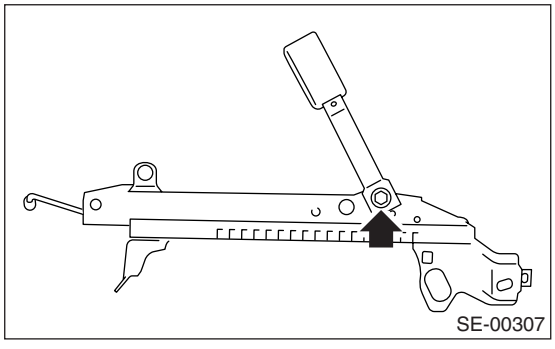
11) Remove the hog rings (A) at front of seat back, and then remove the seat back cover from seat back.



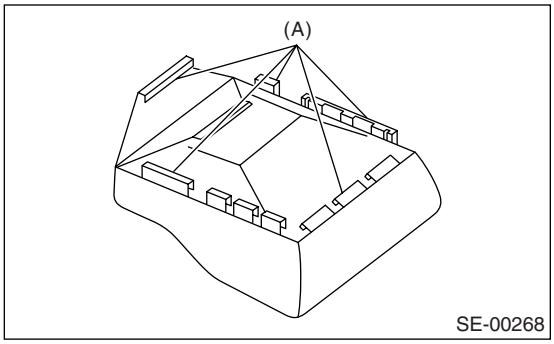
12) Loosen bolts and nuts to remove the seat cushion from slide rail.



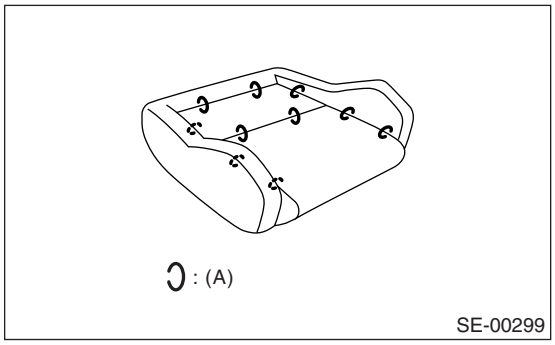
13) Remove the inner belt.



14) Remove the hook of seat cushion cover (A) behind of seat cushion.



15) Remove the hog rings (A), and then remove the seat cushion cover from seat cushion pad.



D: ASSEMBLY

1. DRIVER'S SIDE

Assemble in the reverse order of disassembly.

2. PASSENGER'S SIDE

Assemble in the reverse order of disassembly.

CAUTION:
Because it may cause the side airbag to activate incorrectly, observe the following steps to install the side airbag correctly.
- **Be careful not to dirty or damage the backrest cover.**
- **Always use new hog rings.**
- **Secure the hog ring using hog ring pliers.**
- **Install the hog ring to its original position, and not to twist or wrinkle the backrest cover.**

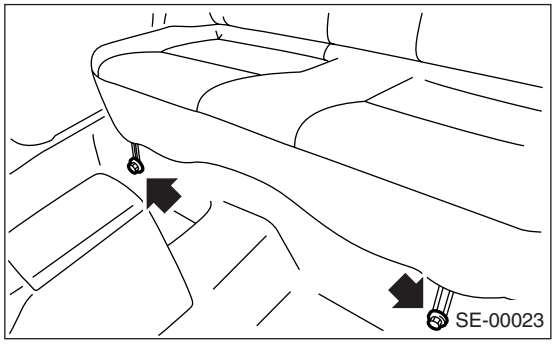
Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to SE-2, FRONT SEAT, COMPONENT, General Description.>

3. Rear Seat

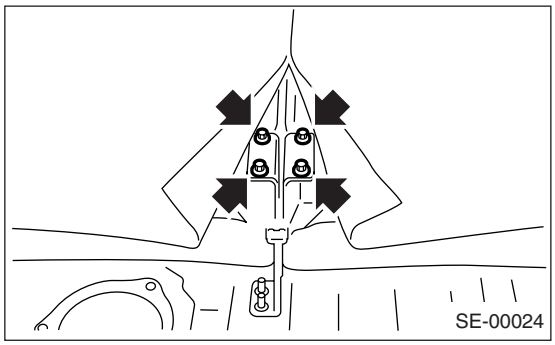
A: REMOVAL

1. WAGON MODEL

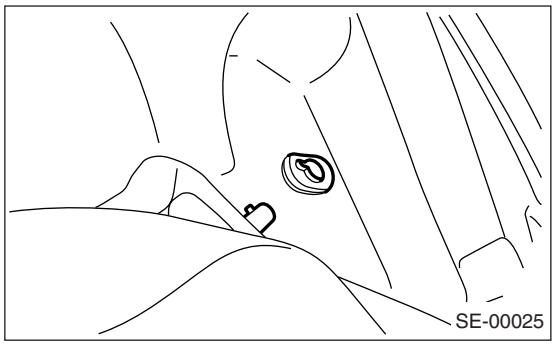
1) Remove the bolts, and then detach the rear seat cushion.



2) Remove the headrest.
3) Remove the luggage floor mat. <Ref. to EI-58, REMOVAL, Luggage Floor Mat.>
4) Turn over the mat to remove the bolts.

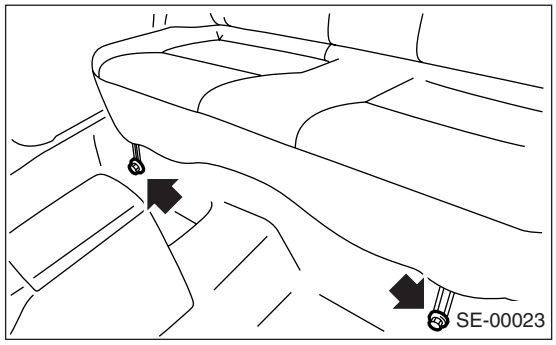


5) Remove the rear seat backrest.

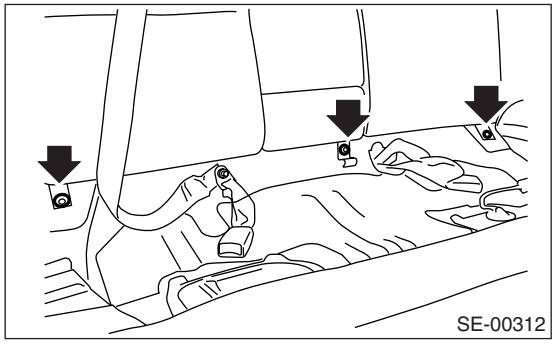


2. SEDAN MODEL

1) Remove the bolts, and then detach the rear seat cushion.



2) Remove the bolts securing lower portion of backrest and then open the center trunk through lid.



3) Lift the rear seat backrest and then remove it.

B: INSTALLATION

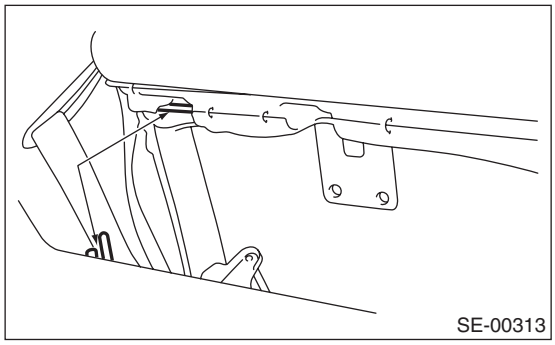
1. WAGON MODEL

Install in the reverse order of removal.

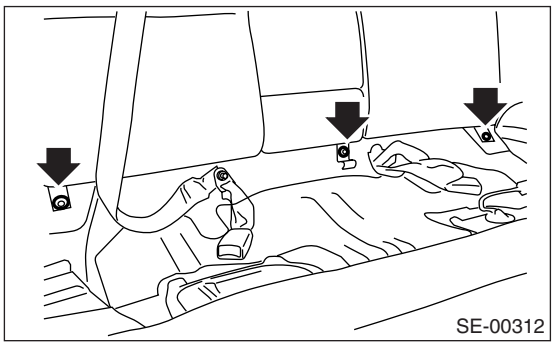
Tightening torque:
Refer to COMPONENT in General Description. <Ref. to SE-4, REAR SEAT (WAGON MODEL), COMPONENT, General Description.>

2. SEDAN MODEL

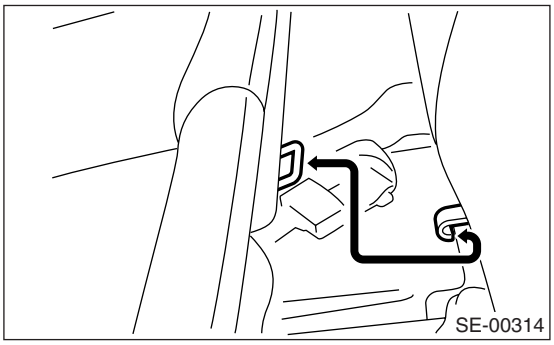
1) Hook and fasten the upper-back side of the rear seat backrest to the body hook.



2) Tighten the bolts.



3) Hook and fasten the seat cushion to the hook on the lower part of the rear seat backrest.

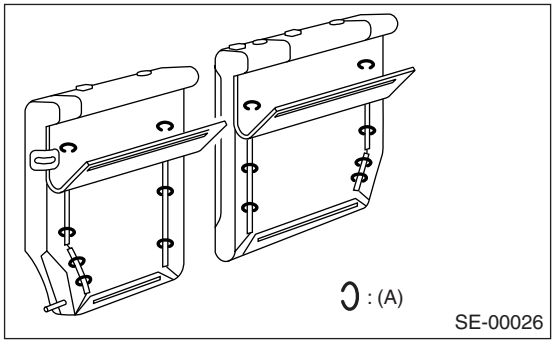


Tightening torque:
Refer to COMPONENT in General Description. <Ref. to SE-4, REAR SEAT (WAGON MODEL), COMPONENT, General Description.>

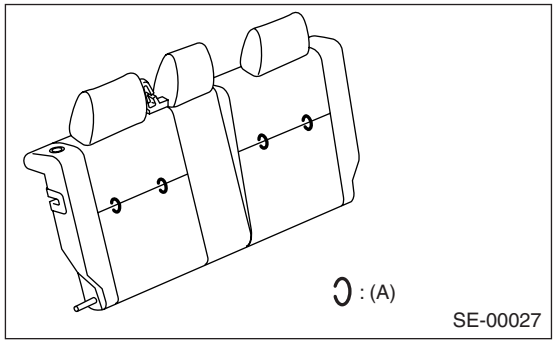
C: DISASSEMBLY

1. WAGON MODEL

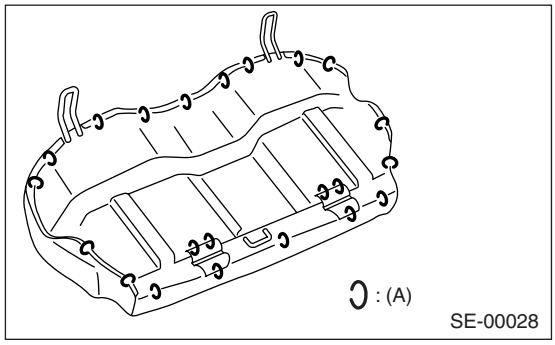
1) Remove the rear seat. <Ref. to SE-16, WAGON MODEL, REMOVAL, Rear Seat.>
2) Remove the hog rings (A) behind of seat backrest.



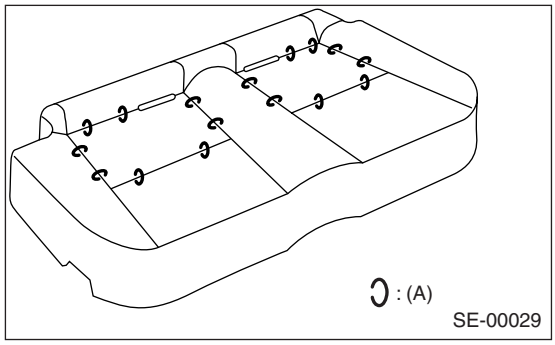
3) Remove the hog rings (A) on front side of cushion pad, and remove the cover.



4) Remove the hog rings (A) behind of seat cushion.

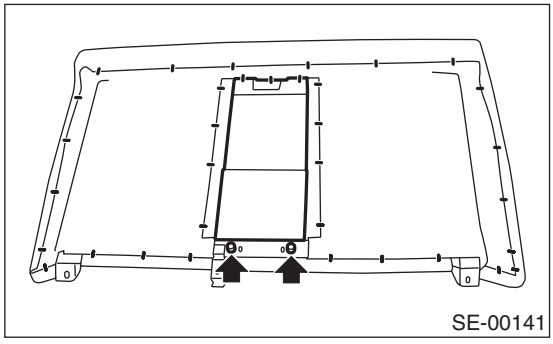


5) Remove the hog rings (A), and then remove the cover.

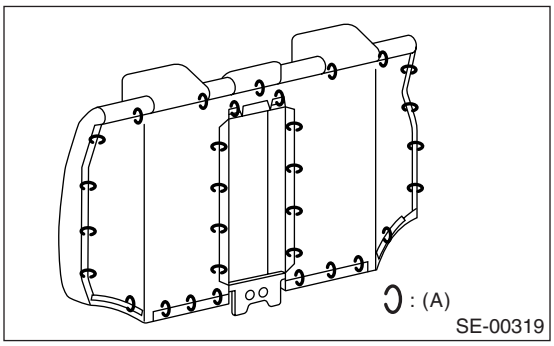


2. SEDAN MODEL

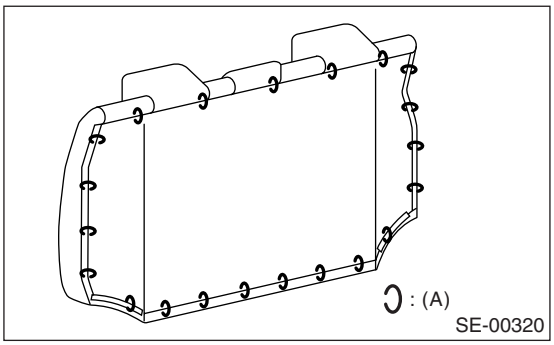
1) Remove the rear seat. <Ref. to SE-16, SEDAN MODEL, REMOVAL, Rear Seat.>
2) Remove two nuts, and then remove the armrest assembly.



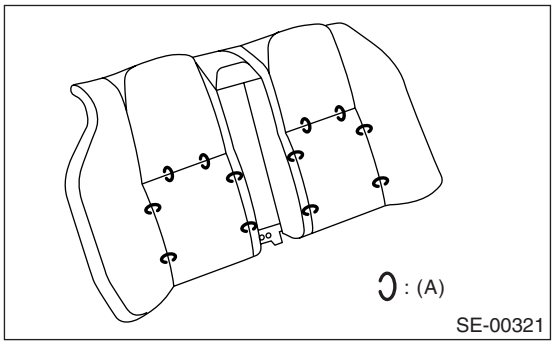
3) Remove the hog rings (A) behind of seat backrest.
• Armrest through type MODEL



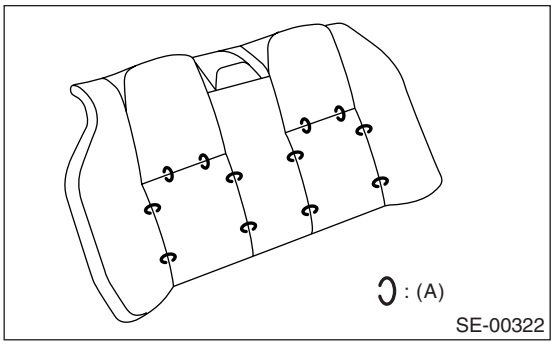
• Unified type MODEL



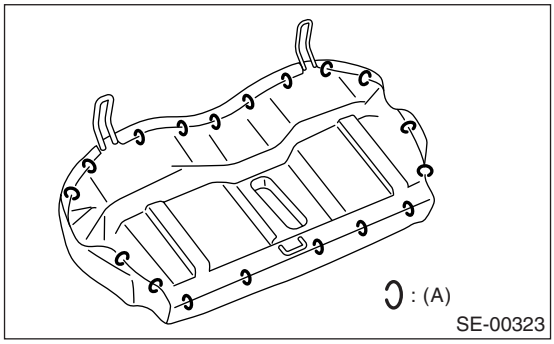
4) Remove the hog rings (A), and then remove the seat cover.
• Armrest through type MODEL



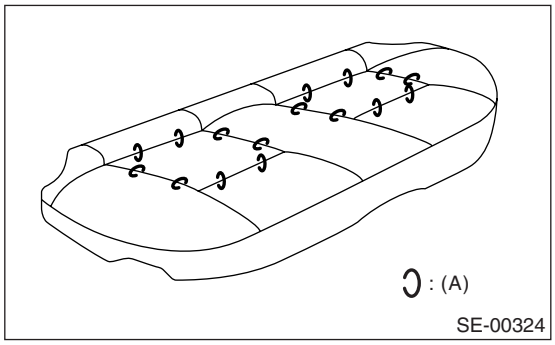
• Unified type MODEL



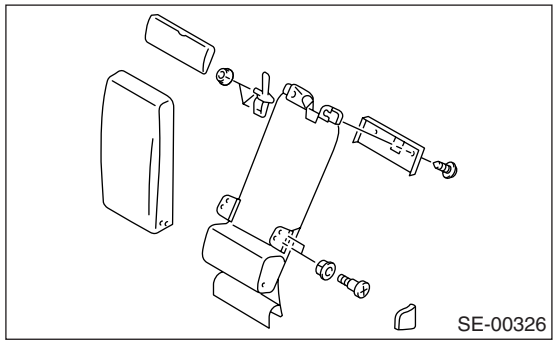
5) Remove the hog rings (A) behind of seat cushion.



6) Remove the hog rings (A), and then remove the seat cover.



7) Remove the nuts and screws, and then disassemble the armrest assembly.



D: ASSEMBLY

1. WAGON MODEL

Assemble in the reverse order of disassembly.

NOTE:
• Do not contaminate or damage the cover.
• While installing the hog rings, prevent the seat from getting wrinkled.

2. SEDAN MODEL

Assemble in the reverse order of disassembly.

NOTE:
• Do not contaminate or damage the cover.
• While installing the hog rings, prevent the seat from getting wrinkled.

SECURITY AND LOCKS

SL

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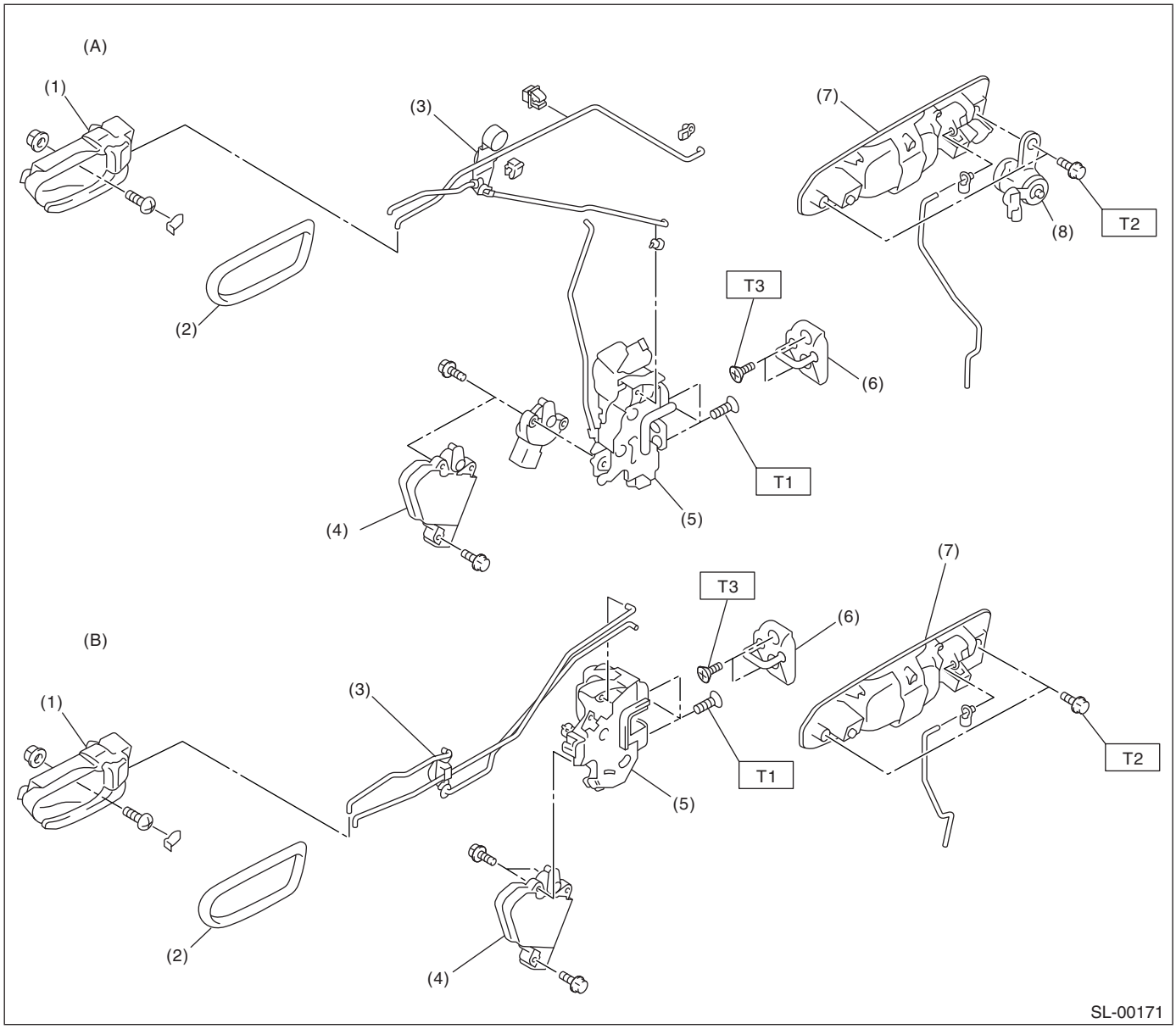
1. General Description

A: COMPONENT

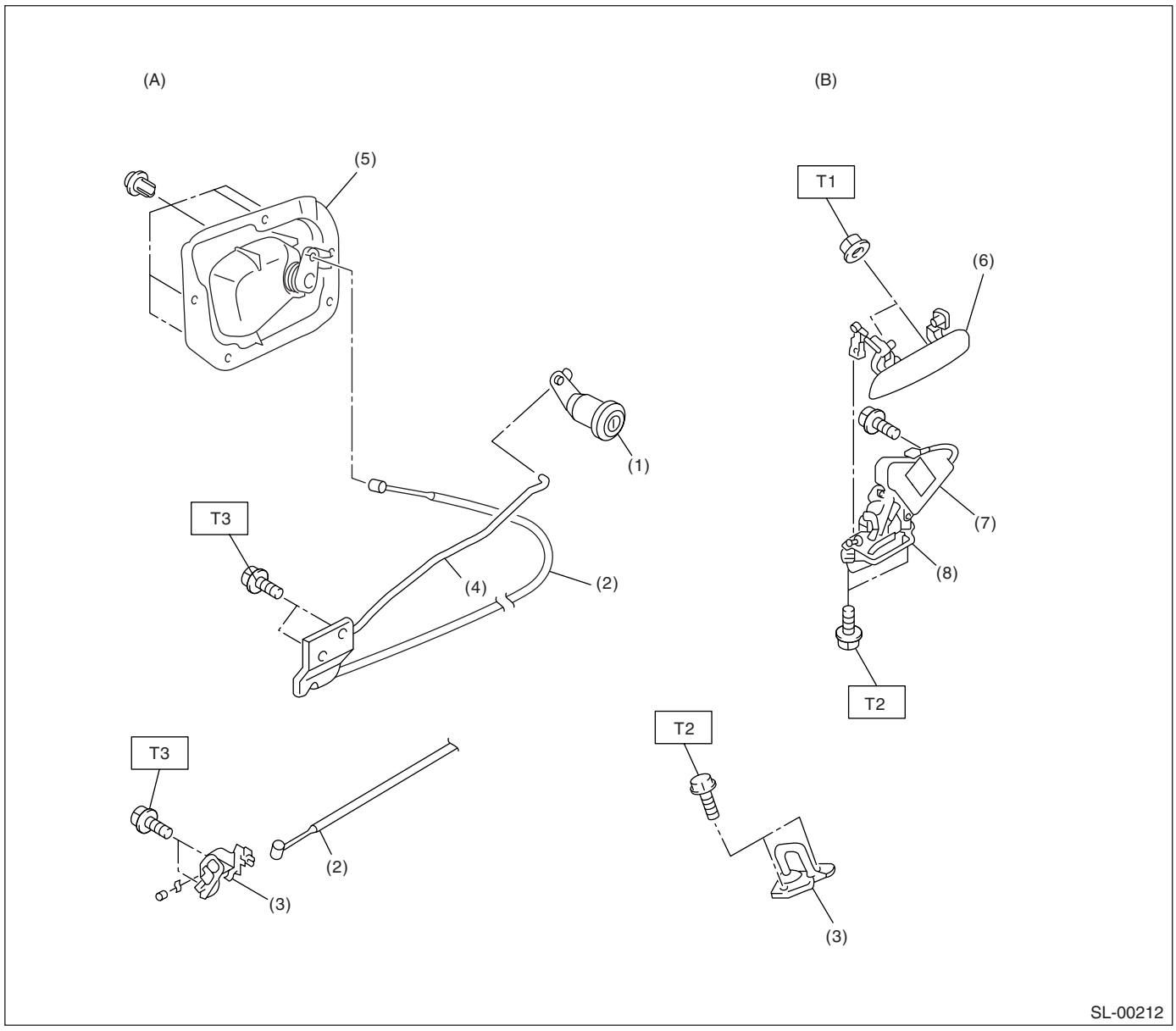
1. DOOR LOCK ASSEMBLY



(A)	Front	(B)	Rear
(1)	Inner remote ASSY	(5)	Door latch
(2)	Inner remote cover	(6)	Striker
(3)	Bell crank	(7)	Door outer handle
(4)	Auto-door lock actuator	(8)	Key cylinder

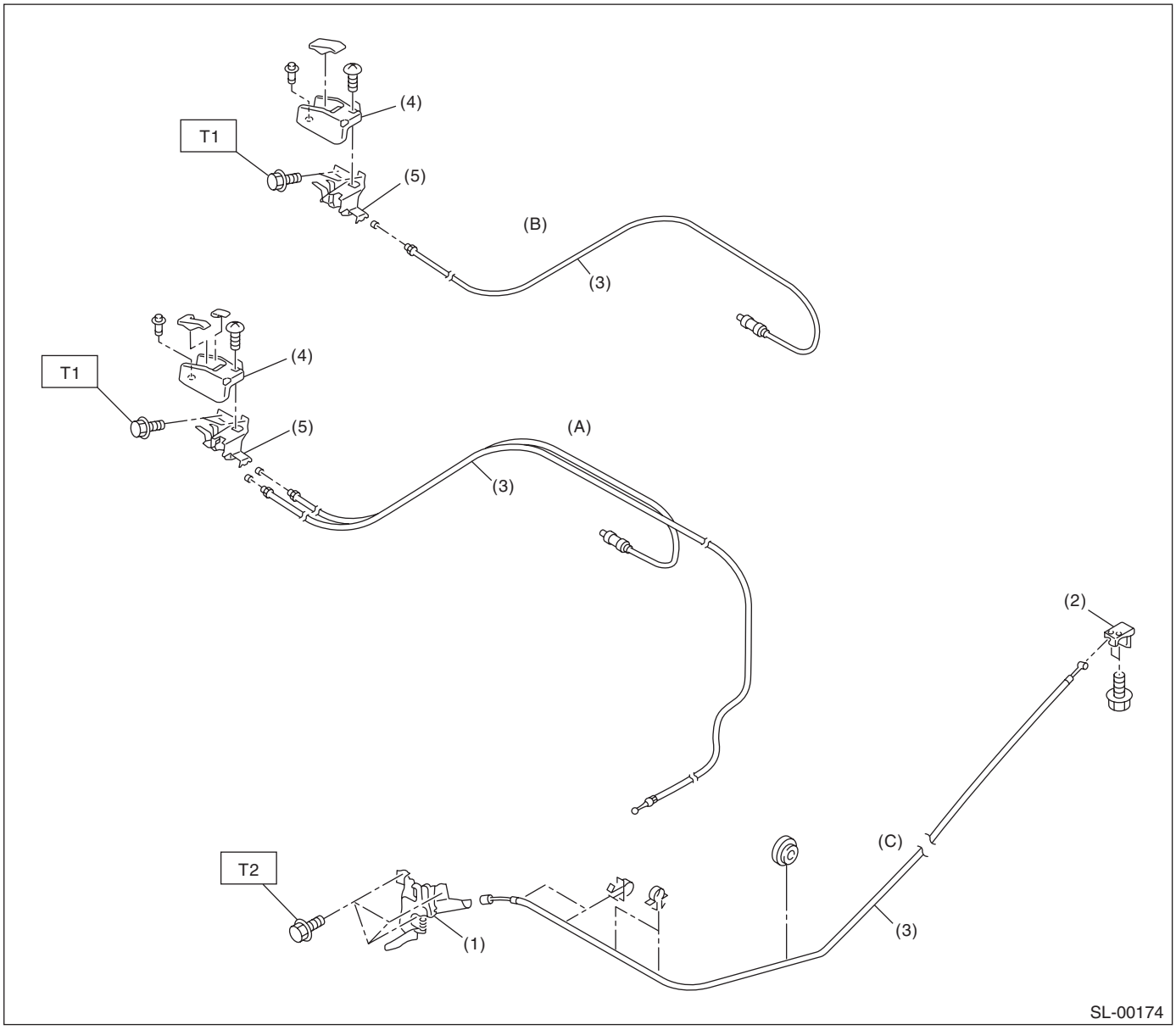
Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 7.4 (0.75, 5.5)
T3: 17.6 (1.8, 13.0)

2. TRUNK LID AND REAR GATE LOCK



(A)	Trunk	(B)	Rear gate	
(1)	Key cylinder	(5)	Trunk lid release handle	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Cable	(6)	Rear gate outer handle	***T1: 4.5 (0.45, 3.3)***
(3)	Striker	(7)	Rear gate actuator	***T2: 25(2.5, 18.4)***
(4)	Trunk lid lock ASSY	(8)	Rear gate latch	***T3: 18 (1.84, 13.3)***

3. HOOD LOCK AND REMOTE OPENERS

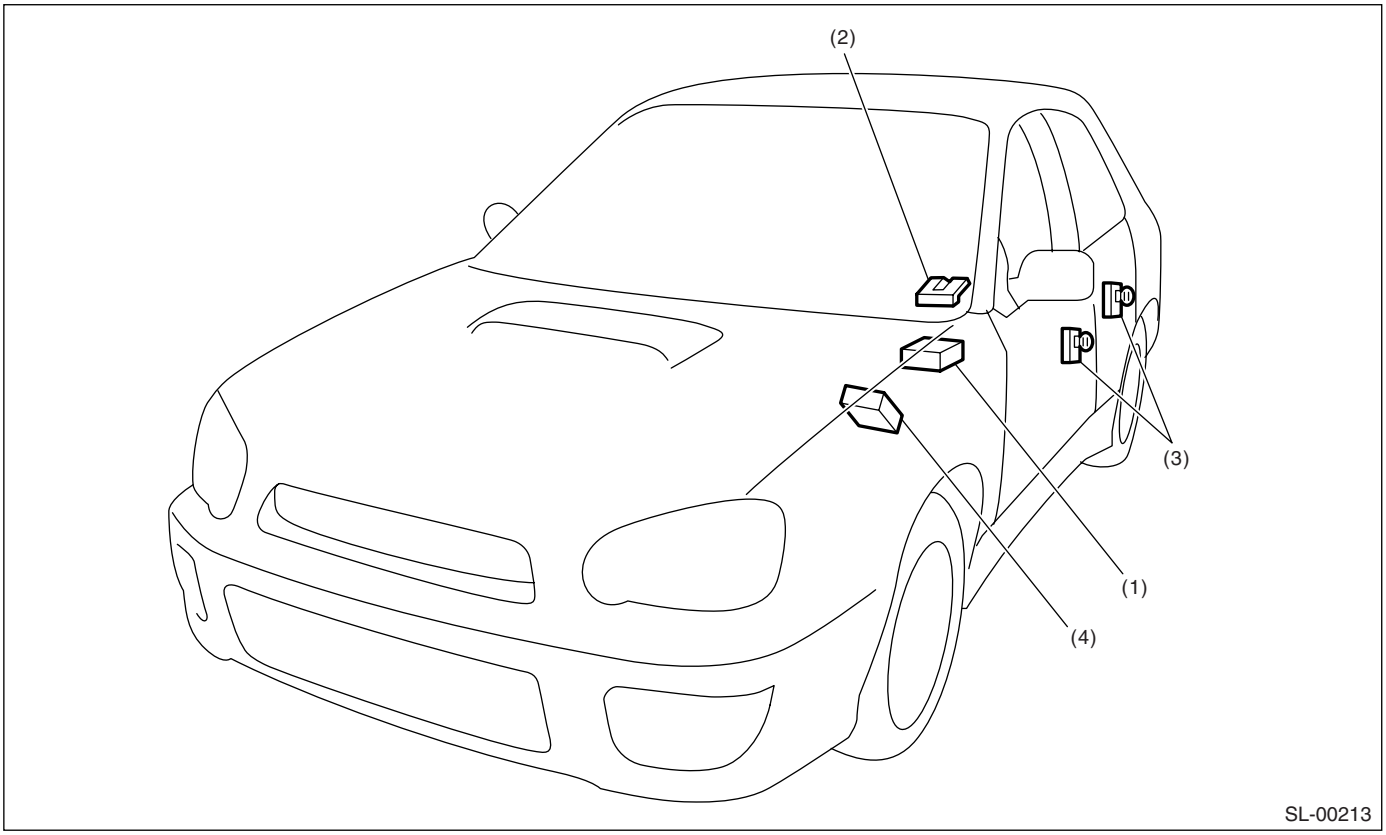


(A) Sedan
(B) Wagon
(C) Hood

(1) Hood lock ASSY
(2) Lever ASSY
(3) Cable
(4) Cover
(5) Pull handle ASSY

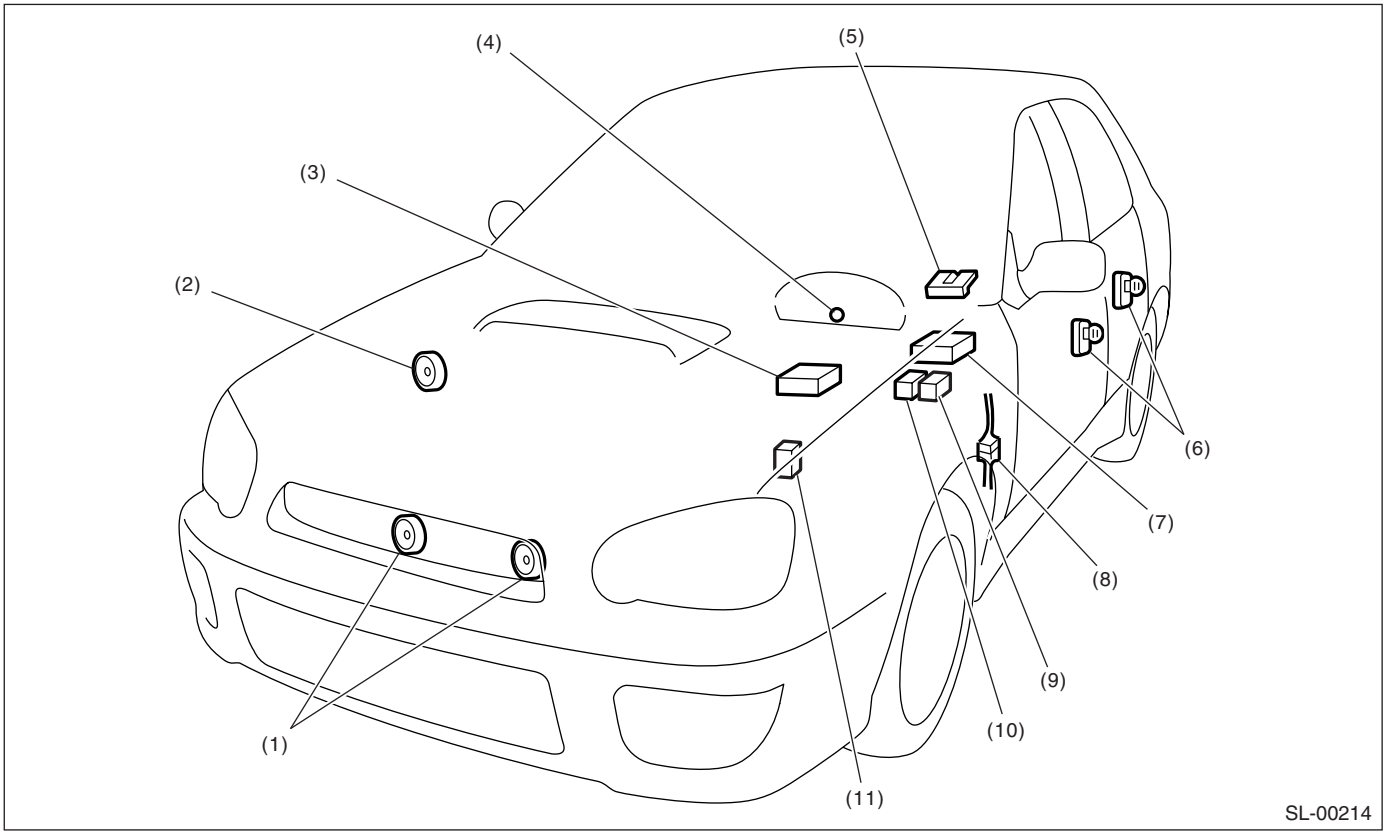
Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 32 (3.3, 23.9)

4. KEYLESS ENTRY SYSTEM



(1) Keyless entry control module
(2) Rear gate latch (Wagon model)
(3) Door switch
(4) Body integrated module

5. SECURITY SYSTEM



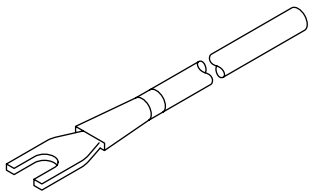
(1) Horn
(2) Security horn
(3) Security control module
(4) Security indicator light (in combination meter)
(5) Trunk room light switch (Sedan), rear gate latch switch (Wagon)
(6) Door switch
(7) Keyless entry control module
(8) Passive arm connector
(9) Security horn relay
(10) Interrupt relay
(11) Horn relay (in main fuse box)

B: CAUTION

• Before disassembling or reassembling parts, always disconnect the ground cable from battery. When repairing radio, control module, etc. which are provided with memory functions, record the memory contents before disconnecting the ground cable from battery. Otherwise, these contents are cancelled upon disconnection.
• Reassemble parts in the reverse order of disassembly procedure unless otherwise indicated.
• Adjust parts to specifications contained in this manual if so designated.
• Connect the connectors and hoses securely during reassembly.
• After reassembly, ensure all functional parts operate smoothly.
• Airbag system wiring harness is routed near the electrical parts and switch.
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equip-

C: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925580000	925580000	PULLER	Used for removing trim clip

2. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.
Drill	Used for replacing ignition key lock.

2. Door Lock Control System

A: WIRING DIAGRAM

1. DOOR LOCK CONTROL

<Ref. to WI-121, WIRING DIAGRAM, Keyless Entry System.>

B: INSPECTION

1. SYMPTOM CHART

Symptom	Repair order	Reference
The door lock control system does not operate.	1. Check the fuse.	<Ref. to SL-8, CHECK FUSE, INSPECTION, Door Lock Control System.>
	2. Check the power supply and ground circuit for the body integrated module.	<Ref. to SL-9, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Door Lock Control System.>
	3. Check the door lock switch and the circuit.	<Ref. to SL-9, CHECK DOOR LOCK SWITCH AND CIRCUIT, INSPECTION, Door Lock Control System.>
	4. Check the door lock actuator and the circuit.	<Ref. to SL-10, CHECK DOOR LOCK ACTUATOR AND CIRCUIT, INSPECTION, Door Lock Control System.>
The door lock switch does not operate.	Check the door lock switch and the circuit.	<Ref. to SL-9, CHECK DOOR LOCK SWITCH AND CIRCUIT, INSPECTION, Door Lock Control System.>
A specific door lock actuator does not operate.	Check the door lock actuator and the circuit.	<Ref. to SL-10, CHECK DOOR LOCK ACTUATOR AND CIRCUIT, INSPECTION, Door Lock Control System.>

2. CHECK FUSE

	Step	Check	Yes	No
1	**CHECK FUSE.** Remove and visually check the fuse No. 2 (in the main fuse box).	In the fuse blown out?	Replace the fuse with a new one.	Check the power supply and ground circuit. <Ref. to SL-9, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Door Lock Control System.>

3. CHECK POWER SUPPLY AND GROUND CIRCUIT

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1) Disconnect the body integrated module harness connector. 2) Measure the voltage between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B280) No. 1, 2 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open circuits or shorts between the body integrated module and the fuse.
2	**CHECK GROUND CIRCUIT.** Measure the resistance between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B280) No. 4, 13 — Chassis ground:***	Is the resistance less than 10 Ω?	The power supply and ground circuit is OK.	Repair the harness.

4. CHECK DOOR LOCK SWITCH AND CIRCUIT

	Step	Check	Yes	No
1	**CHECK DOOR LOCK SWITCH CIRCUIT.** 1) Disconnect the body integrated module harness connector. 2) Measure the resistance between the harness connector terminal and chassis ground when moving the door lock switch to LOCK. ***Connector & terminal*** ***(B281) No. 12 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **2.**	Go to step **3.**
2	**CHECK DOOR LOCK SWITCH CIRCUIT.** Measure the resistance between the harness connector terminal and chassis ground when the door lock switch is moved to UNLOCK. ***Connector & terminal*** ***(B281) No. 11 — Chassis ground:***	Is the resistance less than 10 Ω?	The door lock switch is OK.	Go to step **3.**
3	**CHECK DOOR LOCK SWITCH.** 1) Disconnect the door lock switch harness connector. 2) Measure the resistance between the door lock switch terminals when moving the door lock switch to LOCK. ***Connector & terminal*** ***Driver's side:*** ***(D7) No. 5 — No. 9*** ***Passenger's side:*** ***(D62) No. 4 — No. 5***	Is the resistance less than 10 Ω?	Go to step **4.**	Replace the door lock switch.
4	**CHECK DOOR LOCK SWITCH.** Measure the resistance between the door lock switch terminals when moving the door lock switch to UNLOCK. ***Connector & terminal*** ***Driver's side:*** ***(D7) No. 5 — No. 8*** ***Passenger's side:*** ***(D62) No. 2 — No. 5***	Is the resistance less than 1 Ω?	Check the harness for open circuits or shorts between the body integrated module and the door lock switch.	Replace the door lock switch.

5. CHECK DOOR LOCK ACTUATOR AND CIRCUIT

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL.** Measure the voltage between the harness connector terminal of body integrated module and chassis ground when moving the door lock switch to LOCK. ***Connector & terminal*** ***(B280) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Replace the body integrated module.
2	**CHECK OUTPUT SIGNAL.** Measure the voltage between the harness connector terminal of body integrated module and chassis ground when moving the door lock switch to UNLOCK. ***Connector & terminal*** ***(B280) No. 7 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Replace the body integrated module.
3	**CHECK DOOR LOCK ACTUATOR.** Check the door lock actuator. Front door lock actuator: <Ref. to SL-31, Front Door Lock Actuator.> Rear door lock actuator: <Ref. to SL-35, Rear Door Lock Actuator.> Rear gate latch lock actuator: <Ref. to SL-38, Rear Gate Latch Lock Actuator.>	Is the door lock actuator OK?	Check the harness for open circuits or shorts between the body integrated module and the door lock actuator.	Replace the door lock actuator.

3. Keyless Entry System

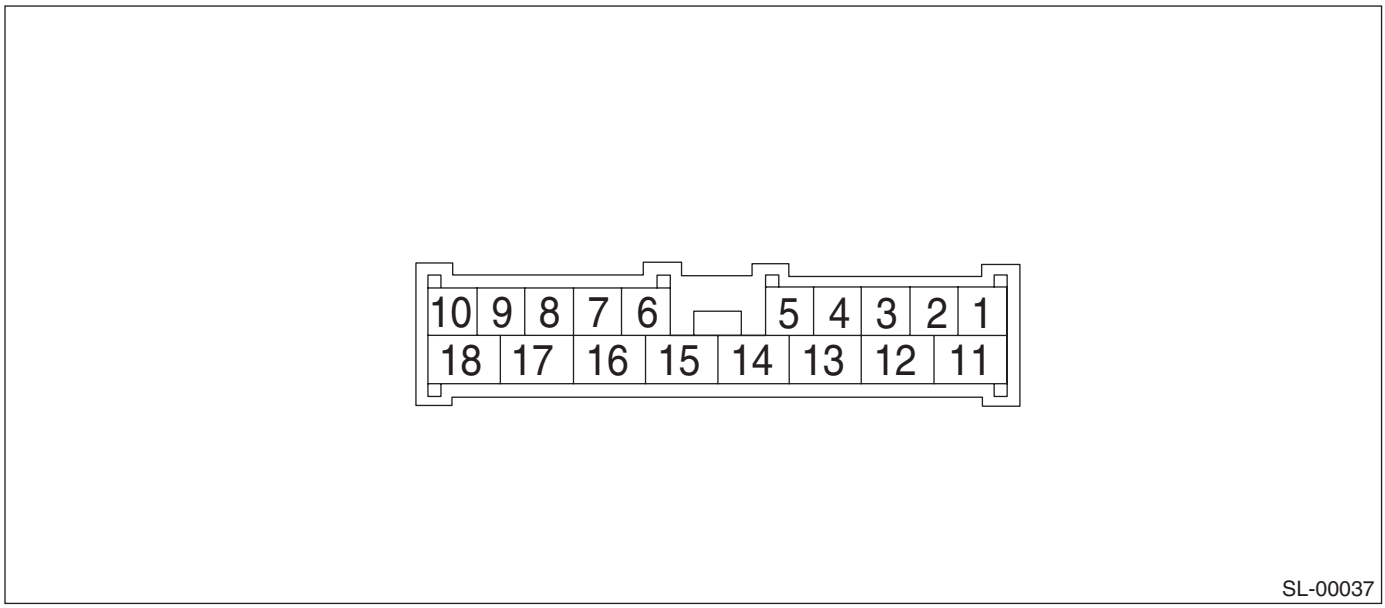
A: WIRING DIAGRAM

1. KEYLESS ENTRY

<Ref. to WI-121, WIRING DIAGRAM, Keyless Entry System.>

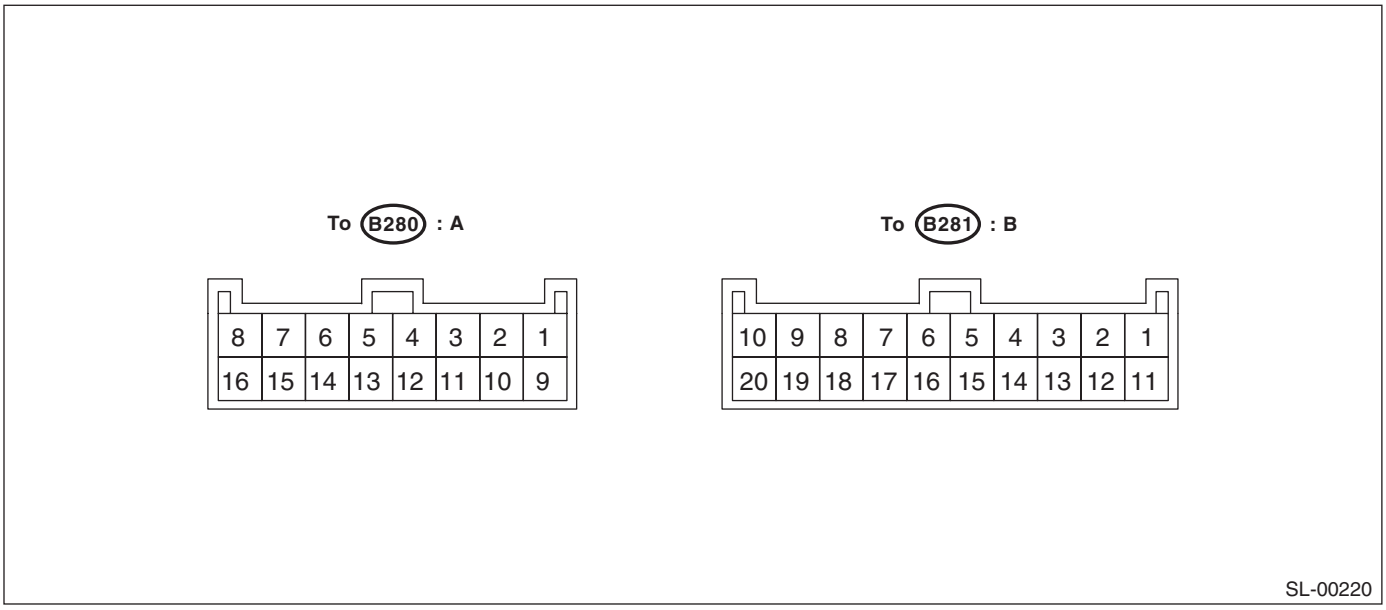
B: ELECTRICAL SPECIFICATION

1. KEYLESS ENTRY CONTROL MODULE



Content	Terminal No.	Measuring condition
Body integrated module	1 (OUTPUT)	Battery voltage is present when pressing the transmitter LOCK/ARM button.
Body integrated module	2 (OUTPUT)	Battery voltage is present when pressing the transmitter UNLOCK/DISARM button.
Security control module	3	—
Security control module	4	—
Door lock switch	5 (INPUT)	0 V is present when operating the door lock switch.
Ignition switch (ON)	6 (INPUT)	Battery voltage is present when ignition switch is turned to ON.
Key warning switch	7 (INPUT)	Battery voltage is present when inserting the key into the ignition switch.
Door unlock switch	8 (INPUT)	0 V is present when operating the door lock switch.
Rear gate latch switch	9 (INPUT)	0 V is present when rear gate is open.
Door switch	10 (INPUT)	0 V is present when any door is open.
Ground	11	0 V is constantly present.
Turn signal light (Left)	12 (OUTPUT)	Battery voltage is present when pressing the transmitter UNLOCK/DISARM or LOCK/ARM button.
Horn relay	13 (OUTPUT)	0 V is present when pressing the transmitter LOCK/ARM button three times within 5 seconds.
Power supply (Back-up)	14	Battery voltage is constantly present.
Power supply (Back-up)	15	Battery voltage is constantly present.
Keyless buzzer	16 (OUTPUT)	0 V is present when pressing the transmitter UNLOCK/DISARM or LOCK/ARM button.
Security control module	17	—
Turn signal light (Left)	18 (OUTPUT)	Battery voltage is present when pressing the transmitter UNLOCK/DISARM or LOCK/ARM button.

2. BODY INTEGRATED MODULE



Content	Terminal No.	Measuring condition
Door switch (Except driver's door)	B7 (INPUT)	0 V is present when any door is open (Except driver's door).
Door switch (Driver's door)	B8 (INPUT)	0 V is present when driver's door is open.
Door unlock switch	B11 (INPUT)	0 V is present when operating the door unlock switch.
Door lock switch	B12 (INPUT)	0 V is present when operating the door lock switch.
Keyless entry control module	B13 (INPUT)	Battery voltage is present when pressing the transmitter LOCK/ARM button.
Keyless entry control module	B14 (INPUT)	Battery voltage is present when pressing the transmitter UNLOCK/DISARM button.
Ignition switch (ON)	B19 (INPUT)	Battery voltage is present when ignition switch is turned to ON.
Key warning switch	B20 (INPUT)	Battery voltage is present when inserting the key into ignition switch.
Power supply	A1	Battery voltage is constantly present.
Power supply	A2	Battery voltage is constantly present.
Ground	A4	0 V is constantly present.
Room light	A5 (OUTPUT)	0 V is present when pressing the transmitter UNLOCK/DISARM button.
Door and rear gate lock actuator	A6 (OUTPUT)	Battery voltage is present when pressing the transmitter LOCK/ARM button.
Door and rear gate lock actuator (Except driver side)	A7 (OUTPUT)	Battery voltage is present when pressing the transmitter UNLOCK/DISARM button two times.
Door lock actuator (Driver side)	A8 (OUTPUT)	Battery voltage is present when pressing the transmitter UNLOCK/DISARM button one time.
Ground	A13	0 V is constantly present.

C: INSPECTION

1. SYMPTOM CHART

Symptom	Repair order	Reference
None of the functions of the keyless entry system operate.	1. Check the transmitter battery and function.	<Ref. to SL-14, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
	2. Check the fuse.	<Ref. to SL-15, CHECK FUSE, INSPECTION, Keyless Entry System.>
	3. Check the keyless entry control module power supply and ground circuit.	<Ref. to SL-15, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Keyless Entry System.>
	4. Replace the keyless entry control module.	<Ref. to SL-51, Keyless Entry Control Module.>
The transmitter cannot be programmed.	1. Check the transmitter battery and function.	<Ref. to SL-14, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
	2. Check the ignition switch circuit.	<Ref. to SL-16, CHECK IGNITION SWITCH CIRCUIT, INSPECTION, Keyless Entry System.>
	3. Check the door switch.	<Ref. to SL-16, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	4. Replace the keyless entry control module.	<Ref. to SL-51, Keyless Entry Control Module.>
The door lock or unlock does not operate. NOTE: If the door lock control system does not operate when using the door lock switch, check the door lock control system. <Ref. to SL-8, INSPECTION, Door Lock Control System.>	1. Check the transmitter battery and function.	<Ref. to SL-14, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
	2. Check the key warning switch.	<Ref. to SL-17, CHECK KEY WARNING SWITCH, INSPECTION, Keyless Entry System.>
	3. Check the door switch.	<Ref. to SL-16, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	4. Check the output signal to body integrated module.	<Ref. to SL-18, CHECK OUTPUT SIGNAL TO BODY INTEGRATED MODULE, INSPECTION, Keyless Entry System.>
	5. Replace the keyless entry control module.	<Ref. to SL-51, Keyless Entry Control Module.>
The panic alarm does not operate.	1. Check the transmitter battery and function.	<Ref. to SL-14, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
	2. Check the horn operation.	<Ref. to SL-19, CHECK HORN OPERATION, INSPECTION, Keyless Entry System.>
	3. Replace the keyless entry control module.	<Ref. to SL-51, Keyless Entry Control Module.>

Symptom	Repair order		Reference
The buzzer chirp and hazard light do not operate.	1. Check the buzzer chirp function.		<Ref. to SL-15, CHECK BUZZER CHIRP SETTING, INSPECTION, Keyless Entry System.>
	2. Check the buzzer and hazard light operation.	Buzzer	<Ref. to SL-19, CHECK KEYLESS BUZZER, INSPECTION, Keyless Entry System.>
		Hazard light	<Ref. to SL-19, CHECK HAZARD LIGHT OPERATION, INSPECTION, Keyless Entry System.>
	3. Replace the keyless entry control module.		<Ref. to SL-51, Keyless Entry Control Module.>
The room light operation do not activate.	1. Check the room light operation.		<Ref. to SL-18, CHECK ROOM LIGHT OPERATION, INSPECTION, Keyless Entry System.>
	2. Replace the keyless entry control module.		<Ref. to SL-51, Keyless Entry Control Module.>
The door warning does not operate.	1. Check the door switch.		<Ref. to SL-16, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	2. Check the buzzer operation.		<Ref. to SL-19, CHECK KEYLESS BUZZER, INSPECTION, Keyless Entry System.>
	3. Replace the keyless entry control module.		<Ref. to SL-51, Keyless Entry Control Module.>

2. CHECK TRANSMITTER BATTERY AND FUNCTION

	Step	Check	Yes	No
1	**CHECK TRANSMITTER BATTERY.** 1) Remove the battery from the transmitter. <Ref. to SL-53, REMOVAL, Keyless Transmitter.> 2) Check the battery voltage. <Ref. to SL-53, INSPECTION, Keyless Transmitter.>	Is the voltage more than 2 V?	Go to step **2.**	Replace the transmitter battery.
2	**CHECK LED OF TRANSMITTER.** 1) Press the LOCK/ARM or UNLOCK/DISARM button six times to synchronize with the keyless entry control module. 2) Press the LOCK/ARM button.	Does the LED blink one time?	Go to step **3.**	Replace the transmitter. <Ref. to SL-53, REPLACEMENT, Keyless Transmitter.>
3	**CHECK LED OF TRANSMITTER.** Keep the LOCK/ARM button pressed.	Does the LED blink one time, and then turn on?	Go to step **4.**	Replace the transmitter. <Ref. to SL-53, REPLACEMENT, Keyless Transmitter.>
4	**CHECK LED OF TRANSMITTER.** Press the UNLOCK/DISARM button.	Does the LED blink one time?	Go to step **5.**	Replace the transmitter. <Ref. to SL-53, REPLACEMENT, Keyless Transmitter.>
5	**CHECK LED OF TRANSMITTER.** Keep the UNLOCK/DISARM button pressed.	Does the LED blink two times?	Transmitter is OK.	Replace the transmitter. <Ref. to SL-53, REPLACEMENT, Keyless Transmitter.>

3. CHECK BUZZER CHIRP SETTING

	Step	Check	Yes	No
1	**CHECK BUZZER CHIRP SETTING.** 1) Check the current setting of the buzzer chirp. 2) Remove the key from the ignition switch. 3) Close all doors and the rear gate. 4) Press the LOCK/ARM or UNLOCK/DISARM button.	Does the buzzer signal chirp?	Buzzer chirp function is OK.	Go to step **2.**
2	**CHECK BUZZER CHIRP SETTING.** 1) Press the UNLOCK/DISARM button once. 2) Press both the LOCK/ARM and UNLOCK/DISARM buttons for more than 2 seconds. 3) Press the LOCK/ARM or UNLOCK/DISARM button.	Does the buzzer signal chirp?	Buzzer chirp function is OK.	Check the transmitter function. <Ref. to SL-14, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>

4. CHECK FUSE

	Step	Check	Yes	No
1	**CHECK FUSE.** Remove and visually check the fuse No. 6 (in the main fuse box) and No. 3 (in the fuse and relay box).	Is the fuse blown out?	Replace the fuse with a new one.	Check the power supply and ground circuit. <Ref. to SL-15, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Keyless Entry System.>

5. CHECK POWER SUPPLY AND GROUND CIRCUIT

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1) Disconnect the keyless entry control module harness connector. 2) Measure the voltage between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 14, No. 15 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open circuits and shorts between the keyless entry control module and fuse.
2	**CHECK GROUND CIRCUIT.** Measure the resistance between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 11 — Chassis ground:***	Is the resistance less than 10 Ω?	The power supply and ground circuit are OK.	Repair the harness.

6. CHECK IGNITION SWITCH CIRCUIT

	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH SIGNAL.** 1) Disconnect the keyless entry control module harness connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Ignition switch circuit is OK.	Check the harness for open circuits and shorts between the keyless entry control module and ignition relay.

7. CHECK DOOR SWITCH

	Step	Check	Yes	No
1	**CHECK DOOR SWITCH CIRCUIT.** Measure the voltage between the keyless entry control module harness connector terminal and chassis ground. ***Connector & terminal*** ***Front and rear side door:*** ***(B176) No. 10 (+) — Chassis ground (–):*** ***Rear gate:*** ***(B176) No. 9 (+) — Chassis ground (–):***	Is the voltage 0 V when each door or rear gate is opened?	Go to step **2.**	Go to step **3.**
2	**CHECK DOOR SWITCH CIRCUIT.** Measure the voltage between the keyless entry control module harness connector terminal and chassis ground. ***Connector & terminal*** ***Front and rear side door:*** ***(B176) No. 10 (+) — Chassis ground (–):*** ***Rear gate:*** ***(B176) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 10 V when each door or rear gate is closed?	The door switch is OK.	Go to step **3.**
3	**CHECK DOOR SWITCH.** 1) Disconnect the door switch harness connector. 2) Measure the resistance between the door switch terminals. ***Terminals*** ***Door switch No. 1 — No. 3:*** ***Rear gate latch switch No. 1 — No. 2:***	Is the resistance more than 1 MΩ when the door switch is depressed?	Go to step **4.**	Replace the door switch.
4	**CHECK DOOR SWITCH.** Measure the resistance between the door switch terminals. ***Terminals*** ***Door switch No. 1 — No. 3:*** ***Rear gate latch switch No. 1 — No. 2:***	Is the resistance less than 1 Ω when the door switch is released?	Check the harness for open circuits and shorts between the body integrated module and door switch.	Replace the door switch.

8. CHECK KEY WARNING SWITCH

	Step	Check	Yes	No
1	**CHECK FUSE.** Remove and visually check the fuse No. 6 (in the main fuse box).	Is the fuse blown out?	Replace the fuse with a new one.	Go to step **2.**
2	**CHECK KEY WARNING SWITCH CIRCUIT.** 1) Disconnect the keyless entry control module harness connector. 2) Insert the key into the ignition switch. (LOCK position) 3) Measure the voltage between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 7 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Go to step **4.**
3	**CHECK KEY WARNING SWITCH CIRCUIT.** 1) Remove the key from the ignition switch. 2) Measure the voltage between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 7 (+) — Chassis ground (−):***	Is the voltage 0 V?	Key warning switch is OK.	Go to step **4.**
4	**CHECK KEY WARNING SWITCH.** 1) Disconnect the key warning switch harness connector. 2) Insert the key into the ignition switch. (LOCK position) 3) Measure the resistance between the key warning switch terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Go to step **5.**	Replace the key warning switch.
5	**CHECK KEY WARNING SWITCH.** 1) Remove the key from the ignition switch. 2) Measure the resistance between the key warning switch terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance more than 1 MΩ?	Check the following: • Harness for open circuits and shorts between the key warning switch and fuse • Harness for open circuits and shorts between the keyless entry control module and key warning switch	Replace the key warning switch.

9. CHECK ROOM LIGHT OPERATION

	Step	Check	Yes	No
1	**CHECK ROOM LIGHT OPERATION.** Make sure the room light illuminates when the room light switch is turned ON.	Does the room light illuminate?	Go to step **2.**	Check the room light circuit.
2	**CHECK HARNESS BETWEEN ROOM LIGHT AND BODY INTEGRATED MODULE.** 1) Disconnect the body integrated module harness connector and room light harness connector. 2) Measure the resistance between the body integrated module harness connector terminal and the room light harness connector terminal. ***Connector & terminal*** ***(B280) No. 5 — (R52) No. 2:***	Is the resistance less than 10 Ω?	The room light operation circuit is OK.	Check the harness for open circuits and/or shorts between the body integrated module and room light.

10.CHECK OUTPUT SIGNAL TO BODY INTEGRATED MODULE

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL.** Measure the voltage between the keyless entry control module harness connector terminal and chassis ground when UNLOCK/DISARM button of transmitter is pressed. ***Connector & terminal*** ***(B176) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Replace the keyless entry control module.
2	**CHECK OUTPUT SIGNAL.** Measure the voltage between the keyless entry control module harness connector terminal and chassis ground when LOCK/ARM button of transmitter is pressed. ***Connector & terminal*** ***(B176) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Replace the keyless entry control module.
3	**CHECK HARNESS BETWEEN KEYLESS ENTRY CONTROL MODULE AND BODY INTEGRATED MODULE.** 1) Disconnect the keyless entry control module harness connector and body integrated module harness connector. 2) Measure the resistance between the keyless entry control module harness connector terminal and body integrated module harness connector terminal. ***Connector & terminal*** ***(B176) No. 2 — (B281) No. 14:*** ***(B176) No. 1 — (B281) No. 13:***	Is the resistance less than 10 Ω?	Replace the body integrated module.	Check the harness for open circuit or shorts between the keyless entry control module and body integrated module.

11.CHECK HORN OPERATION

	Step	Check	Yes	No
1	**CHECK HORN OPERATION.** Make sure the horn sounds when the horn switch is pushed.	Does the horn sound?	Go to step **2.**	Check the horn circuit.
2	**CHECK HORN OPERATION.** 1) Disconnect the keyless entry control module harness connector. 2) Ground the harness connector terminal with a suitable wire. ***Connector & terminal*** ***(B176) No. 13 — Chassis ground:***	Does the horn sound?	Replace the keyless entry control module.	Check the harness for open circuits and/or shorts between the keyless entry control module and horn relay.

12.CHECK HAZARD LIGHT OPERATION

	Step	Check	Yes	No
1	**CHECK HAZARD LIGHT OPERATION.** Make sure the hazard light blinks when hazard switch is turned ON.	Does the hazard light blink?	Go to step **2.**	Check the hazard light circuit.
2	**CHECK OUTPUT SIGNAL.** 1) Remove the key from ignition switch. 2) Close all doors and rear gate. 3) Measure the voltage between keyless entry control module harness connector terminal and chassis ground when LOCK/ARM button of transmitter is pressed. ***Connector & terminal*** ***(B176) No. 12, 18 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Check the harness for open or short between keyless entry control module and turn signal lights.	Replace the keyless entry control module.

13.CHECK KEYLESS BUZZER

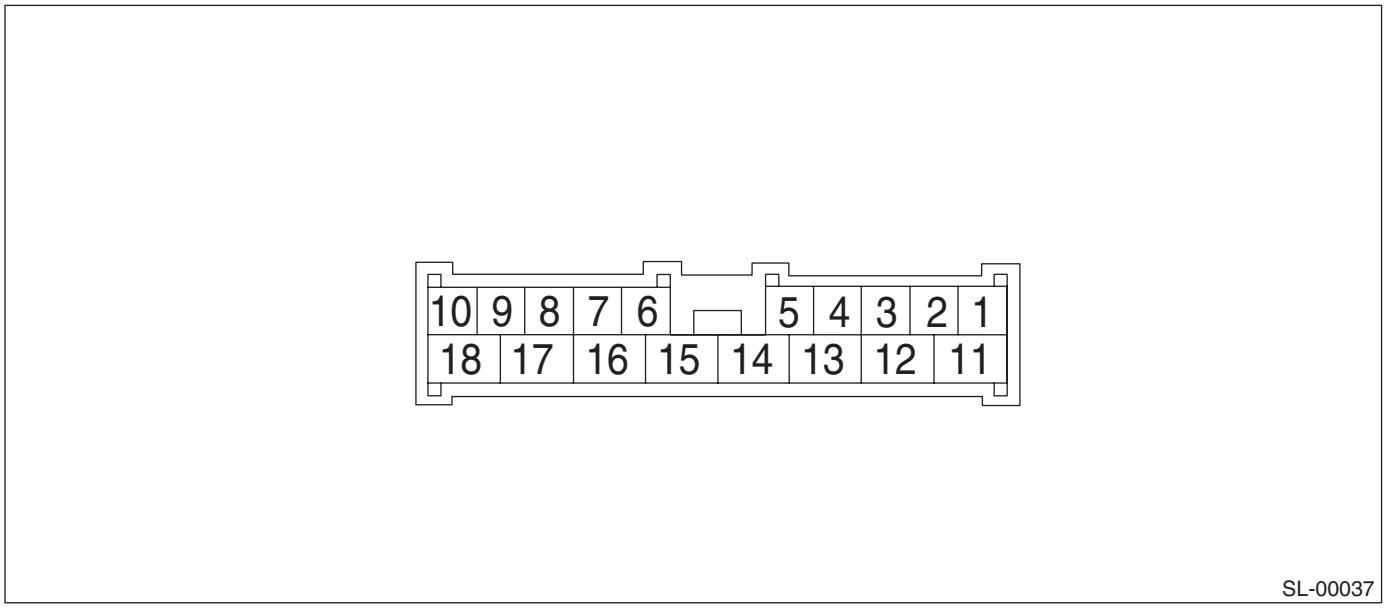
	Step	Check	Yes	No
1	**CHECK FUSE.** Remove and check the fuse No. 2 (located in main fuse box).	Is the fuse blown out?	Replace the fuse with a new one.	Go to step **2.**
2	**CHECK KEYLESS POWER SUPPLY.** 1) Disconnect the connector from keyless buzzer. 2) Measure the voltage between keyless buzzer harness connector and chassis ground. ***Connector & terminal*** ***(F102) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Check the harness for open or short between fuse and keyless buzzer.
3	**CHECK HARNESS BETWEEN KEYLESS BUZZER AND KEYLESS ENTRY CONTROL MODULE.** 1) Disconnect the connector from keyless entry control module. 2) Measure the resistance between keyless buzzer and keyless entry control module. ***Connector & terminal*** ***(F102) No. 1 — (B176) No. 16:***	Is the resistance more than 10 Ω?	Go to step **4.**	Repair the harness between keyless buzzer and keyless entry control module.
4	**CHECK KEYLESS BUZZER.** Make sure that the buzzer sounds when connecting battery positive terminal to No. 2 terminal of keyless buzzer connector and battery ground terminal to No. 1 terminal of keyless buzzer connector.	Does the buzzer sound?	Replace the keyless entry control module.	Replace the keyless buzzer.

4. Security System

A: WIRING DIAGRAM

<Ref. to WI-157, WIRING DIAGRAM, Security System.>

B: ELECTRICAL SPECIFICATION



Content	Terminal No.	Measuring condition
Empty	1	—
Ignition switch (ON)	2 (INPUT)	Battery voltage is present when ignition switch is turned to ON.
Passive arm	3	—
Trunk room light switch (Sedan model)	4 (INPUT)	0 V is present when trunk lid or rear gate is open.
Rear gate latch switch (Wagon model)		
Door switch	5 (INPUT)	0 V is present when any door is open.
Empty	6	—
Keyless entry control module	7	—
Keyless entry control module	8	—
Security indicator light	9 (OUTPUT)	0 V is present when activating the alarm operation.
Keyless entry control module	10	—
Power supply (Back-up)	13	Battery voltage is constantly present.
Ground	14	0 V is constantly present.
Interrupt relay	15 (OUTPUT)	Battery voltage is present when activating the alarm operation.
Security horn relay	16 (INPUT)	Battery voltage is present when activating the alarm operation.
Security horn	17 (OUTPUT)	Battery voltage is present when activating the alarm operation.
Security horn relay	18 (INPUT)	Battery voltage is present when activating the alarm operation.

C: INSPECTION

1. BASIC DIAGNOSTIC PROCEDURE

	Step	Check	Yes	No
1	**CHECK VALET MODE SETTING.** Check the valet mode is set. (Security indicator light blinks two times per a second when the valet mode is set.)	Does the security indicator light blink two times per a second?	Go to step **2.**	Go to step **3.**
2	**RELEASE VALET MODE SETTING.** Release the valet mode setting. 1) Open the driver's door. 2) Push the UNLOCK/DISARM button on transmitter for two seconds or more.	Does the security indicator light blink one time per two seconds?	Go to step **3.**	Go to symptom 1. <Ref. to SL-22, SYMPTOM CHART, INSPECTION, Security System.>
3	**CHECK SECURITY SYSTEM SET OPERATION.** 1) Before starting this diagnosis, open all windows. 2) Remove the key from ignition key cylinder, and then close all doors and rear gate. 3) Press the LOCK/ARM button of transmitter.	Can the security system be set?	Go to step **4.**	Go to symptom 1. <Ref. to SL-22, SYMPTOM CHART, INSPECTION, Security System.>
4	**CHECK SECURITY INDICATOR LIGHT AND HAZARD LIGHT BLINKING.** Check the security indicator light and hazard light blinking.	Do the security indicator light and hazard light blink?	Go to step **5.**	Go to symptom 2. <Ref. to SL-22, SYMPTOM CHART, INSPECTION, Security System.>
5	**CHECK SECURITY ALARM OPERATION.** 1) Unlock all doors using the door lock switch on front door. 2) Open any door, trunk lid or rear gate.	Does the security alarm operate when any door, trunk lid or rear gate is opened?	Go to step **6.**	Go to symptom 3. <Ref. to SL-22, SYMPTOM CHART, INSPECTION, Security System.>
6	**CHECK SECURITY ALARM OPERATION.** Check the security alarm operation.	Does all security alarm (horn, hazard light and security indicator light) operate? And is the starter motor deactivated?	Go to step **7.**	Go to symptom 4. <Ref. to SL-22, SYMPTOM CHART, INSPECTION, Security System.>
7	**CHECK SECURITY ALARM CANCEL OPERATION.** Press the UNLOCK/DISARM button of transmitter.	Do all security alarm (horn and hazard light) stop? And is the starter motor activated?	Go to step **8.**	Go to symptom 5. <Ref. to SL-22, SYMPTOM CHART, INSPECTION, Security System.>
8	**CHECK BATTERY DISCONNECT PROTECTION.** Check the battery disconnect protection. <Ref. to SL-22, CHECK BATTERY DISCONNECT PROTECTION, INSPECTION, Security System.>	Is the battery disconnect protection OK?	Go to step **9.**	Replace the security control module.
9	**PERFORM IMPACT SENSITIVITY TEST.** Perform the impact sensitivity test. <Ref. to SL-46, IMPACT SENSITIVITY TEST, INSPECTION, Security Control Module.>	Is the impact sensitivity properly set?	Press the UNLOCK/DISARM button of transmitter, and finish the diagnosis.	Adjust the impact sensitivity.<Ref. to SL-46, IMPACT SENSITIVITY, ADJUSTMENT, Security Control Module.>

2. CHECK BATTERY DISCONNECT PROTECTION

1) Remove the key from the ignition switch.
2) Close all the doors, trunk lid and rear gate.
3) Open the front hood.
4) Press the LOCK/ARM button of the transmitter.
5) Disconnect the ground cable from the battery.
6) Reconnect the cable to the battery.
7) Check that the security indicator light blinks after reconnecting the battery cable.

If NG, replace the security control module.

3. SYMPTOM CHART

Symptom			Repair order	Reference
1	Security system cannot be set.		1. Check the transmitter function.	<Ref. to SL-14, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
			2. Check the fuse.	<Ref. to SL-23, CHECK FUSE, INSPECTION, Security System.>
			3. Check the security control module power supply and ground circuit.	<Ref. to SL-23, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Security System.>
			4. Check the door switch.	<Ref. to SL-23, CHECK DOOR SWITCH, INSPECTION, Security System.>
			5. Replace the security control module.	<Ref. to SL-46, Security Control Module.>
2	Security indicator light or hazard light does not blink.	Security indicator light	Check the security indicator light circuit.	<Ref. to SL-24, CHECK SECURITY INDICATOR LIGHT CIRCUIT, INSPECTION, Security System.>
		Hazard light	Check the hazard light operation.	<Ref. to SL-26, CHECK HAZARD LIGHT OPERATION, INSPECTION, Security System.>
3	Security system does not alarm when one of the door, trunk lid or rear gate is opened.		Check the door switch.	<Ref. to SL-23, CHECK DOOR SWITCH, INSPECTION, Security System.>
4	Security alarm does not activate.	All functions	Check the door switch.	<Ref. to SL-23, CHECK DOOR SWITCH, INSPECTION, Security System.>
		Security indicator light	Check the security indicator light circuit.	<Ref. to SL-24, CHECK SECURITY INDICATOR LIGHT CIRCUIT, INSPECTION, Security System.>
		Security horn	Check the security horn.	<Ref. to SL-25, CHECK SECURITY HORN, INSPECTION, Security System.>
		Hazard light	Check the hazard light operation.	<Ref. to SL-26, CHECK HAZARD LIGHT OPERATION, INSPECTION, Security System.>
		Starter motor deactivation	Check the interrupt relay circuit.	<Ref. to SL-26, CHECK INTERRUPT RELAY CIRCUIT, INSPECTION, Security System.>
5	Security system cannot be canceled.	Transmitter	Check the transmitter function.	<Ref. to SL-14, CHECK TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
		Ignition switch	Check the ignition switch circuit.	<Ref. to SL-27, CHECK IGNITION SWITCH CIRCUIT, INSPECTION, Security System.>

4. CHECK FUSE

	Step	Check	Yes	No
1	**CHECK FUSE.** Remove and visually check the fuse No. 2 (in main fuse box).	Is the fuse blown out?	Check the power supply and ground circuit. <Ref. to SL-23, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Security System.>	Replace the fuse with a new one.

5. CHECK POWER SUPPLY AND GROUND CIRCUIT

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1) Disconnect the security control module harness connector. 2) Measure the voltage between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B93) No. 13 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open circuits and shorts between the security control module and fuse.
2	**CHECK GROUND CIRCUIT.** Measure the resistance between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B93) No. 14 — Chassis ground:***	Is the resistance less than 10 Ω?	The power supply and ground circuit are OK.	Repair the harness.

6. CHECK DOOR SWITCH

	Step	Check	Yes	No
1	**CHECK DOOR SWITCH CIRCUIT.** Measure the voltage between the security control module harness connector terminal and chassis ground when any door or rear gate is opened. ***Connector & terminal*** ***Front and rear door:*** ***(B93) No. 5 (+) — Chassis ground (–):*** ***Trunk lid or rear gate:*** ***(B93) No. 4 (+) — Chassis ground (–):***	Is the voltage 0 V?	Go to step **2.**	Go to step **3.**
2	**CHECK DOOR SWITCH CIRCUIT.** Measure the voltage between the security control module harness connector terminal and chassis ground when all doors and rear gate are closed. ***Connector & terminal*** ***Front and rear door:*** ***(B93) No. 5 (+) — Chassis ground (–):*** ***Trunk lid or rear gate:*** ***(B93) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	The door switch is OK.	Go to step **3.**

	Step	Check	Yes	No
3	**CHECK DOOR SWITCH.** 1) Disconnect the door switch harness connector. 2) Measure the resistance between the door switch terminals. ***Terminals*** ***Door switch No. 1 — No. 3:*** ***Rear gate latch switch (Wagon model) No. 1 — No. 2:*** ***Trunk room light switch (Sedan model) No. 1 — No. 2:***	Is the resistance more than 1 MΩ when door switch is pushed?	Go to step **4.**	Replace the door switch.
4	**CHECK DOOR SWITCH.** Measure the resistance between the door switch terminals. ***Terminals*** ***Door switch No. 1 — No. 3:*** ***Rear gate latch switch (Wagon model) No. 1 — No. 2:*** ***Trunk room light switch (Sedan model) No. 1 — No. 2:***	Is the resistance less than 1 Ω when door switch is released?	Check the harness for open circuits and shorts between the security control module and door switch.	Replace the door switch.

7. CHECK SECURITY INDICATOR LIGHT CIRCUIT

	Step	Check	Yes	No
1	**CHECK SECURITY INDICATOR LIGHT.** 1) Disconnect the security control module harness connector. 2) Ground the harness connector terminal with a suitable wire. ***Connector & terminal*** ***(B93) No. 9 — Chassis ground:***	Does the security indicator light illuminate?	Replace the security control module.	Go to step **2.**
2	**CHECK POWER SUPPLY FOR SECURITY INDICATOR LIGHT.** 1) Disconnect the connector from the combination meter. 2) Measure the voltage between the combination meter harness connector terminal and chassis ground. ***Connector & terminal*** ***(i11) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Check the harness for open circuits and shorts between the combination meter and the fuse.
3	**CHECK SECURITY INDICATOR LIGHT CIRCUIT.** Measure the resistance between the combination meter harness connector terminal and security control module harness connector terminal. ***Connector & terminal*** ***(i10) No. 6 — (B93) No. 9:***	Is the resistance less than 10 Ω?	Replace the combination meter printed circuit.	Check the harness for open circuits and shorts between the combination meter and security control module.

8. CHECK SECURITY HORN

	Step	Check	Yes	No
1	**CHECK SECURITY HORN RELAY.** Remove and check the security horn relay. <Ref. to SL-49, Security Horn Relay.>	Is the security horn relay OK?	Go to step **2.**	Replace the security horn relay.
2	**CHECK POWER SUPPLY FOR SECURITY HORN RELAY.** Measure the voltage between the security horn relay harness connector terminal and chassis ground. ***Connector & terminal*** ***(B243) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Check the harness for open circuits and shorts between the security horn relay and horn relay.
3	**CHECK POWER SUPPLY FOR SECURITY HORN RELAY.** Measure the voltage between the security horn relay harness connector terminal and chassis ground. ***Connector & terminal*** ***(B243) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Check the harness for open circuits and shorts between the security horn relay and the fuse.
4	**CHECK HARNESS BETWEEN SECURITY HORN RELAY AND SECURITY CONTROL MODULE.** 1) Disconnect the security control module harness connector. 2) Measure the resistance between the security horn relay harness connector terminal and security control module harness connector terminal. ***Connector & terminal*** ***(B243) No. 3 — (B93) No. 18:***	Is the resistance less than 10 Ω?	Go to step **5.**	Check the harness for open circuits and shorts between the security horn relay and security control module.
5	**CHECK HARNESS BETWEEN SECURITY HORN RELAY AND SECURITY CONTROL MODULE.** Measure the resistance between the security horn relay harness connector terminal and security control module harness connector terminal. ***Connector & terminal*** ***(B243) No. 4 — (B93) No. 16:***	Is the resistance less than 10 Ω?	Go to step **6.**	Check the harness for open circuits and shorts between the security horn relay and security control module.
6	**CHECK HARNESS BETWEEN SECURITY CONTROL MODULE AND SECURITY HORN.** 1) Disconnect the security horn harness connector. 2) Measure the resistance between the security control module harness connector terminal and security horn harness connector terminal. ***Connector & terminal*** ***(B93) No. 17 — (B204) No. 1:***	Is the resistance less than 10 Ω?	Go to step **7.**	Check the harness for open circuits and shorts between the security control module and security horn.
7	**CHECK SECURITY HORN.** Remove and check the security horn. <Ref. to SL-48, Security Horn.>	Is the security horn OK?	Replace the security control module.	Replace the security horn.

9. CHECK HAZARD LIGHT OPERATION

	Step	Check	Yes	No
1	**CHECK SECURITY CONTROL MODULE OUTPUT SIGNAL.** 1) Remove the key from the ignition switch. 2) Open the driver's window, and then close all doors and rear gate. 3) Lock all doors with the transmitter or door lock switch to arm the security system. 4) Unlock all doors with the door lock switch. 5) Measure the voltage between the security control module harness connector terminal and chassis ground when any door is open. ***Connector & terminal*** ***(B93) No. 10 — Chassis ground:***	Is the voltage 1 — 4 V?	Go to step **2.**	Replace the security control module.
2	**CHECK HARNESS BETWEEN SECURITY CONTROL MODULE AND KEYLESS ENTRY CONTROL MODULE.** 1) Disconnect the security control module harness connector and keyless entry control module harness connector. 2) Measure the resistance between the security control module harness connector terminal and keyless entry control module harness connector terminal. ***Connector & terminal*** ***(B93) No. 10 — (B176) No. 3:***	Is the resistance less than 10 Ω?	Check the hazard light output of keyless entry control module.<Ref. to SL-19, CHECK HAZARD LIGHT OPERATION, INSPECTION, Keyless Entry System.>	Check the harness for open circuit and shorts between the security control module and keyless entry control module.

10.CHECK INTERRUPT RELAY CIRCUIT

	Step	Check	Yes	No
1	**CHECK INTERRUPT RELAY.** Remove and check the interrupt relay. <Ref. to SL-50, Interrupt Relay.>	Is the interrupt relay OK?	Go to step **2.**	Replace the interrupt relay.
2	**CHECK POWER SUPPLY FOR INTERRUPT RELAY.** Measure the voltage between the interrupt relay harness connector terminal and chassis ground. ***Connector & terminal*** ***(B59) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V when ignition switch is turned to START?	Go to step **3.**	Check the harness for open circuits and shorts between the interrupt relay and ignition switch.
3	**CHECK HARNESS BETWEEN INTERRUPT RELAY AND SECURITY CONTROL MODULE.** 1) Turn the ignition switch to OFF. 2) Disconnect the security control module harness connector. 3) Measure the resistance between the interrupt relay harness connector terminal and security control module harness connector terminal. ***Connector & terminal*** ***(B59) No. 4 — (B93) No. 15:***	Is the resistance less than 10 Ω?	Replace the security control module.	Check the harness for open circuits and shorts between the interrupt relay and security control module.

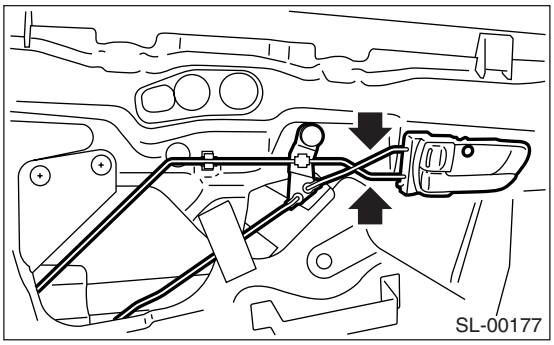
11.CHECK IGNITION SWITCH CIRCUIT

	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH SIGNAL.** 1) Disconnect the security control module harness connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between the harness connector terminal and chassis ground. ***Connector & terminal*** ***(B93) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Ignition switch circuit is OK.	Check the harness for open circuits and shorts between the security control module and ignition switch.

5. Front Inner Remote

A: REMOVAL

1) Remove the door trim. <Ref. to EI-39, REMOVAL, Front Door Trim.>
2) Remove the sealing cover. <Ref. to EB-16, REMOVAL, Front Sealing Cover.>
3) Remove a screw and two rod joints.
4) Remove the front inner remote.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the inner remote works properly after installation.

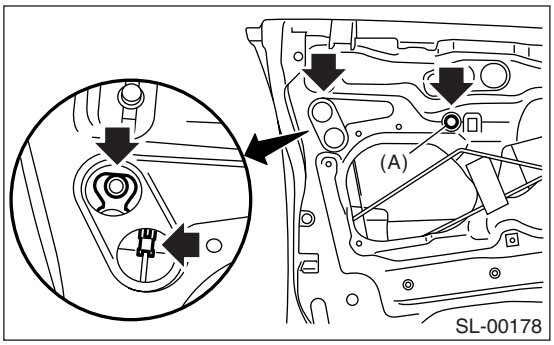
C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.

6. Front Outer Handle

A: REMOVAL

1) Remove the door trim. <Ref. to EI-39, REMOVAL, Front Door Trim.>
2) Remove the sealing cover. <Ref. to EB-16, REMOVAL, Front Sealing Cover.>
3) Remove the bolt (A).
4) Move the front door glass downward. Remove the bolt and rod clamp.
5) Remove the front outer handle.



CAUTION:
Do not use excessive force to remove the handle from door panel. This will deform it.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the outer handle works properly after installation.

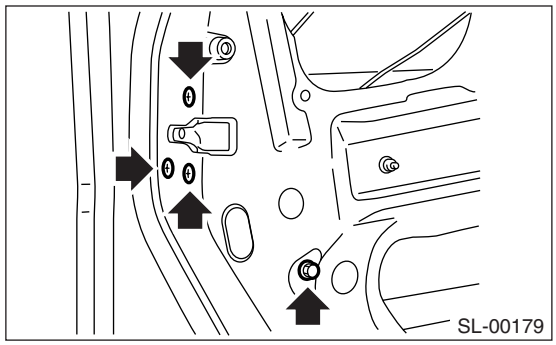
C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.

7. Front Door Latch Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front door trim. <Ref. to EI-39, REMOVAL, Front Door Trim.>
3) Remove the sealing cover. <Ref. to EB-16, REMOVAL, Front Sealing Cover.>
4) Remove the front inner remote. <Ref. to SL-28, REMOVAL, Front Inner Remote.>
5) Remove three screws and a bolt.



6) Remove the front door latch assembly, and then disconnect the connector.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the lock works properly after installation.

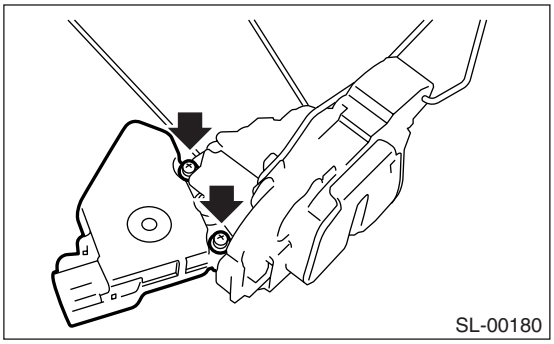
C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.

8. Front Door Lock Actuator

A: REMOVAL

1) Remove the front door latch assembly. <Ref. to SL-30, REMOVAL, Front Door Latch Assembly.>
2) Loosen two screws to remove the front door lock actuator.



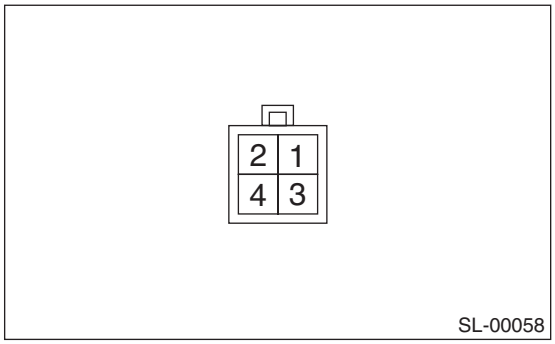
B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the lock works properly after installation.

C: INSPECTION

1) Disconnect the door lock actuator harness connector.
2) Connect the battery to door lock actuator terminals.
If NG, replace the door lock actuator.

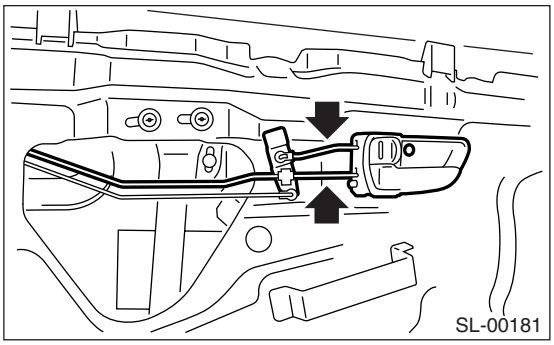


Terminal No.	Actuator operation
No. 3 (+) and No. 1 (–)	Unlocked → Locked
No. 1 (+) and No. 3 (–)	Locked → Unlocked

9. Rear Inner Remote

A: REMOVAL

1) Remove the rear door trim. <Ref. to EI-40, REMOVAL, Rear Door Trim.>
2) Remove the sealing cover. <Ref. to EB-18, REMOVAL, Rear Sealing Cover.>
3) Remove a screw and two rod joints.
4) Remove the inner remote.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the inner remote works properly after installation.

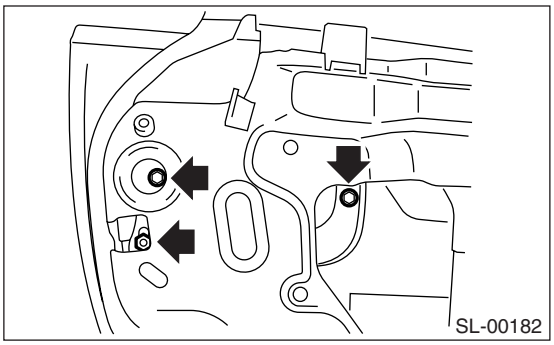
C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.
3) Make sure the child safety lock work properly.

10.Rear Outer Handle

A: REMOVAL

1) Remove the rear door trim. <Ref. to EI-40, REMOVAL, Rear Door Trim.>
2) Remove the sealing cover. <Ref. to EB-18, REMOVAL, Rear Sealing Cover.>
3) Remove the rear inner remote. <Ref. to SL-32, REMOVAL, Rear Inner Remote.>
4) Remove the rear door latch assembly. <Ref. to SL-34, REMOVAL, Rear Door Latch Assembly.>
5) Loosen two bolts and a nut to remove the rear outer handle.



CAUTION:
Do not use excessive force to remove the handle from door panel. This will deform it.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the outer handle works properly after installation.

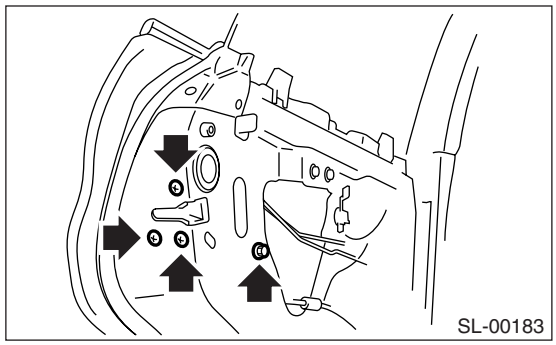
C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.

11.Rear Door Latch Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear door trim. <Ref. to EI-40, REMOVAL, Rear Door Trim.>
3) Remove the sealing cover. <Ref. to EB-18, REMOVAL, Rear Sealing Cover.>
4) Remove the rear inner remote. <Ref. to SL-32, REMOVAL, Rear Inner Remote.>
5) Remove three screws and a bolt.



6) Disconnect the connector, and then remove the rear door latch assembly.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the lock works properly after installation.

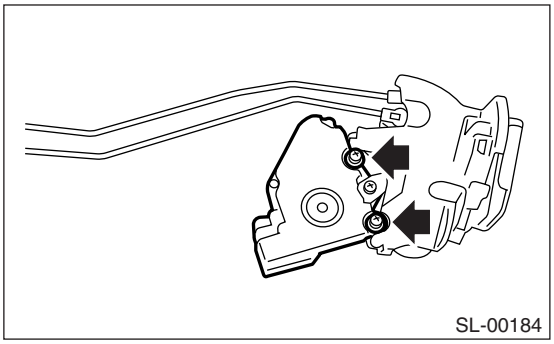
C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.

12.Rear Door Lock Actuator

A: REMOVAL

1) Remove the rear door latch assembly. <Ref. to SL-34, REMOVAL, Rear Door Latch Assembly.>
2) Loosen two screws to remove rear door lock actuator.



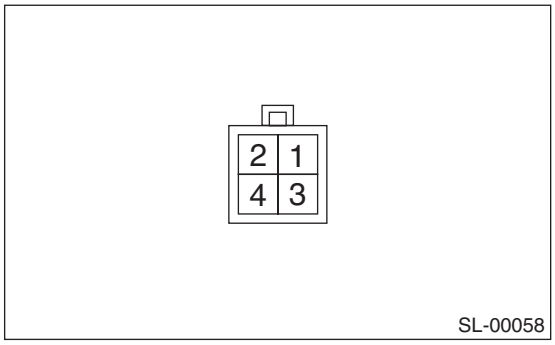
B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the lock works properly after installation.

C: INSPECTION

1) Disconnect the door lock actuator harness connector.
2) Connect the battery to door lock actuator terminals.
If NG, replace the door lock actuator.

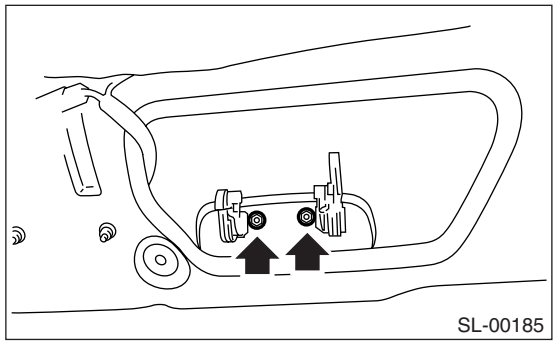


Terminal No.	Actuator operation
No. 3 (+) and No. 1 (–)	Unlocked → Locked
No. 1 (+) and No. 3 (–)	Locked → Unlocked

13.Rear Gate Outer Handle

A: REMOVAL

1) Remove the rear gate trim. <Ref. to EI-54, REMOVAL, Rear Gate Trim.>
2) Remove the rear gate latch assembly. <Ref. to SL-37, REMOVAL, Rear Gate Latch Assembly.>
3) Loosen two nuts to remove the rear gate outer handle.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the outer handle works properly after installation.

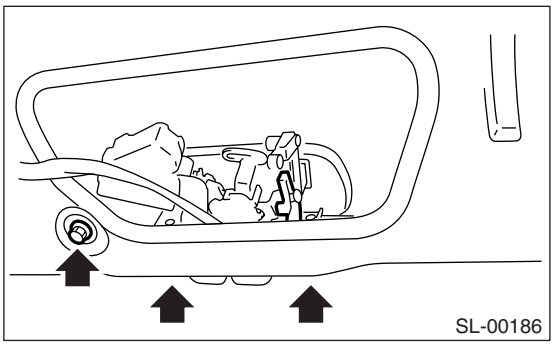
C: INSPECTION

1) Inspect the rod for deformation.
2) Make sure the lever and rod move smoothly.

14.Rear Gate Latch Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear gate trim. <Ref. to EI-54, REMOVAL, Rear Gate Trim.>
3) Remove three bolts.



4) Disconnect the connectors, and then remove the rear gate latch assembly.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the lock works properly after installation.

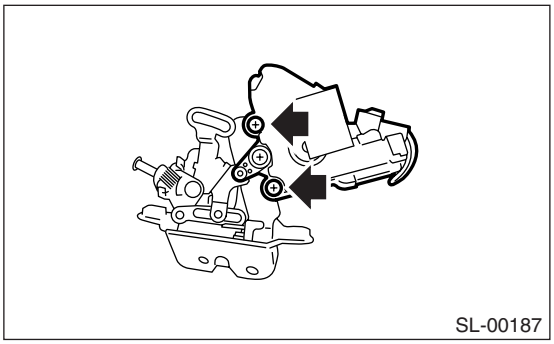
C: INSPECTION

1) Make sure the rod is not deformed.
2) Make sure the lever and rod work smoothly.

15.Rear Gate Latch Lock Actuator

A: REMOVAL

1) Remove the rear gate latch assembly. <Ref. to SL-37, REMOVAL, Rear Gate Latch Assembly.>
2) Loosen two screws to remove the rear gate lock actuator.


SL-00187

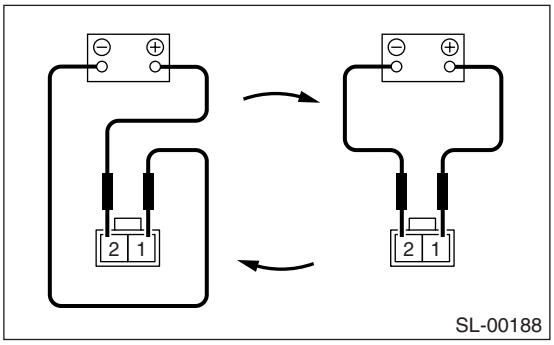
B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the lock works properly after installation.

C: INSPECTION

1) Disconnect the door lock actuator harness connector.
2) Connect the battery to door lock actuator terminals.



SL-00188

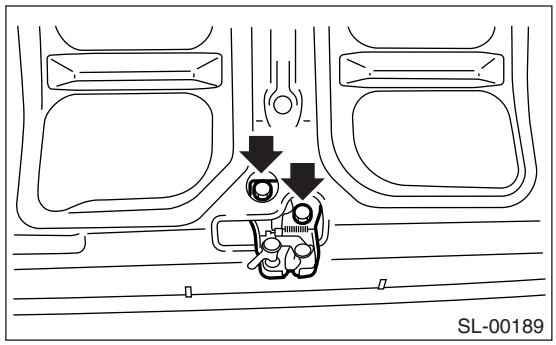
Terminal No.	Actuator operation
No. 1 (+) and No. 2 (–)	Unlocked → Locked
No. 2 (+) and No. 1 (–)	Locked → Unlocked

If NG, replace the rear gate latch lock actuator.

16.Trunk Lid Lock Assembly

A: REMOVAL

1) Remove the trunk lid key cylinder rod clamp.
2) Loosen two bolts to remove the trunk lid lock assembly.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
- Apply grease to parts that rub.
- Make sure the lock works properly after installation.

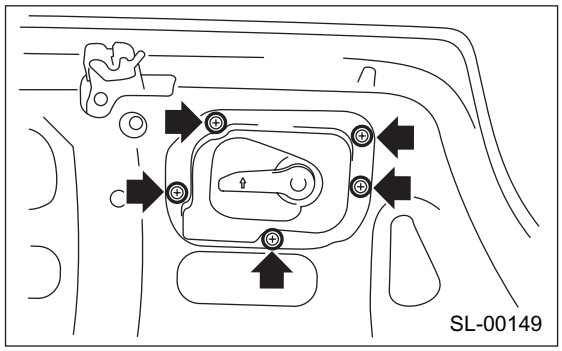
C: INSPECTION

1) Check the striker for bending or abnormal wear.
2) Check the safety lever for improper movement.
3) Check other levers and the spring for rust formation and unsmooth movement.

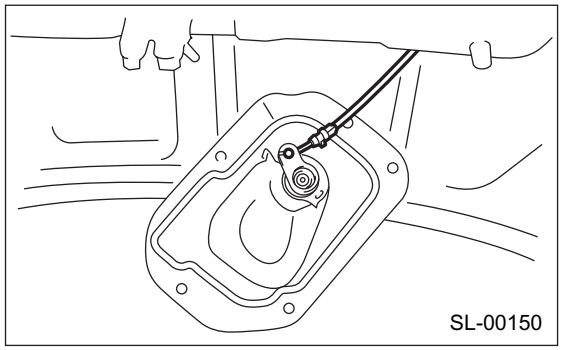
17.Trunk Lid Release Handle

A: REMOVAL

1) Remove the five clips.



2) Remove the cable from trunk lid release handle.



B: INSTALLATION

Install in the reverse order of removal.

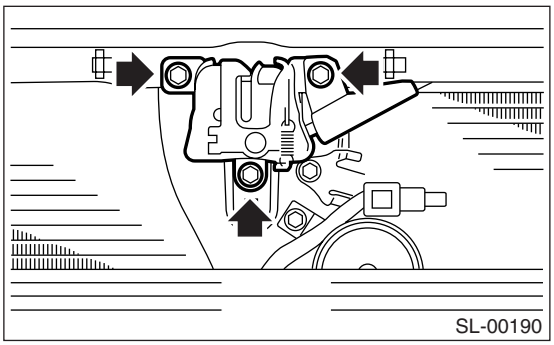
C: INSPECTION

1) Make sure the cable is not deformed.
2) Make sure the lever works smoothly.

18.Front Hood Lock Assembly

A: REMOVAL

1) Open the hood.
2) Remove the bolts. Remove the hood lock assembly.
3) Remove the release cable from lock assembly.



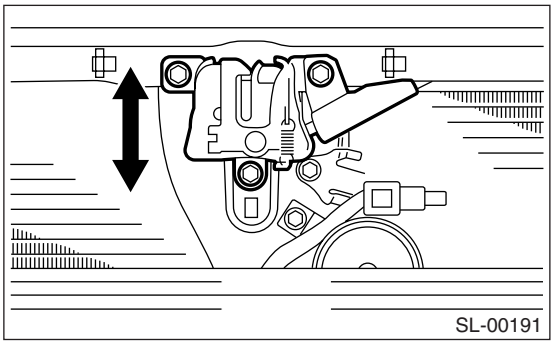
B: INSTALLATION

Install in the reverse order of removal.

NOTE:
- Apply grease to parts that rub.
- Make sure the release cable works properly after installation.

C: ADJUSTMENT

Loosen the bolt. Adjust the lock assembly while moving it up and down.



D: INSPECTION

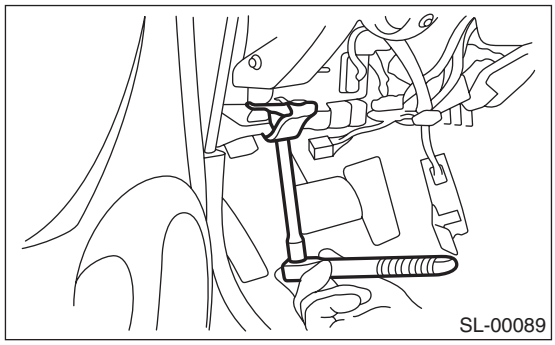
1) Check the striker for bending or abnormal wear.
2) Check the safety lever for improper movement.
3) Check other levers and the spring for rust formation and unsmooth movement.

19.Remote Openers

A: REMOVAL

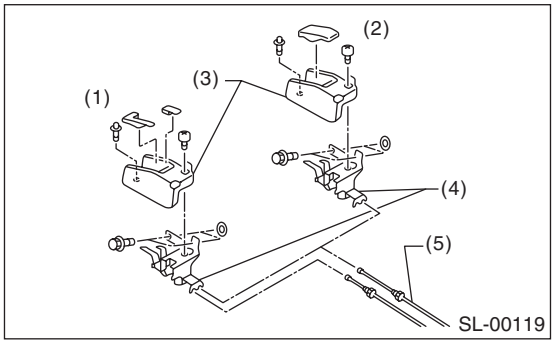
1. HOOD OPENER

1) Remove the release cable from hood lock.
2) Remove the bolt. Remove the opener lever.



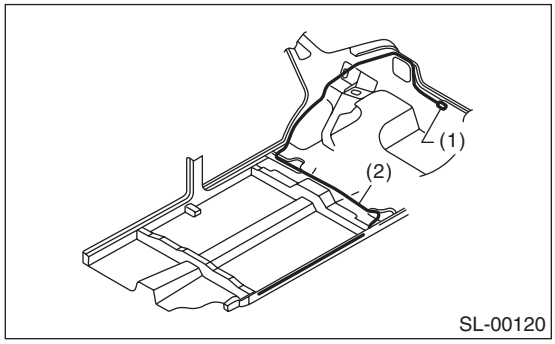
2. TRUNK LID OPENER

1) Remove the rear seat. <Ref. to SE-16, REMOVAL, Rear Seat.>
2) Remove the center pillar lower trim, and remove the side sill cover on passenger side. Remove the rear pillar lower trim. Pull back the floor mat. Remove the clip holding the cable.
3) Remove the bolt. Remove the opener pull handle.



(1) Sedan
(2) Wagon
(3) Cover
(4) Pull handle ASSY
(5) Cable

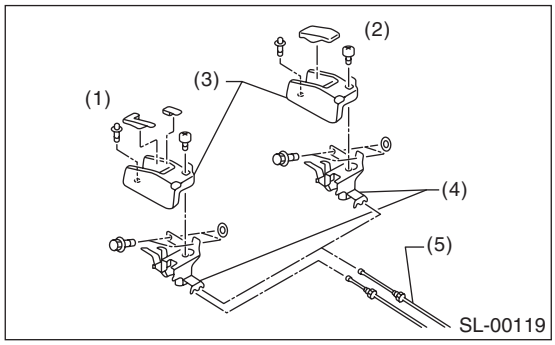
4) Remove the cable from opener pull handle.
5) Remove the striker from trunk lid.
6) Remove the cable from striker.



(1) Striker
(2) Cable

3. FUEL FLAP OPENER

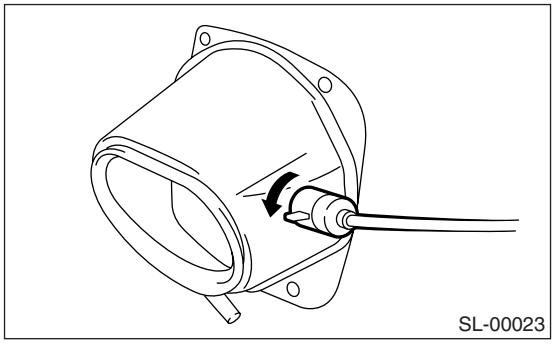
1) Remove the rear seat. <Ref. to SE-16, REMOVAL, Rear Seat.>
2) Remove the center pillar lower trim, and remove the side sill cover on passenger side. Remove the rear pillar lower trim. Pull back the floor mat. Remove the clip holding the cable.
3) Remove the bolt. Remove the opener pull handle.



(1) Sedan
(2) Wagon
(3) Cover
(4) Pull handle ASSY
(5) Cable

4) Remove the cable from opener pull handle.
5) Remove the right rear quarter trim. <Ref. to EI-50, REMOVAL, Rear Quarter Trim.>

6) Rotate the fuel lock inside the quarter panel to left and remove.



B: INSTALLATION

1. HOOD OPENER

Install in the reverse order of removal.

2. TRUNK LID OPENER

Install in the reverse order of removal.

3. FUEL FLAP OPENER

Install in the reverse order of removal.

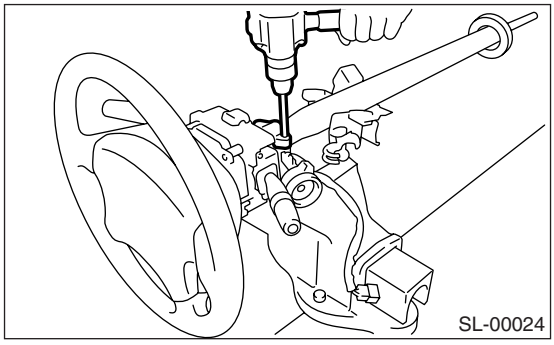
C: INSPECTION

Make sure the fuel flap opens and closes smoothly.

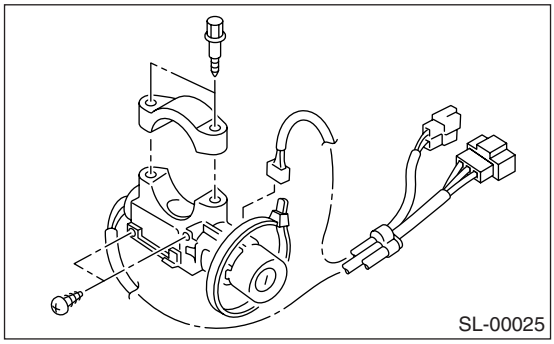
20.Ignition Key Lock

A: REPLACEMENT

1) Remove the ground cable from battery.
2) Remove the steering column. <Ref. to PS-19, REMOVAL, Tilt Steering Column.>
3) Secure the steering column in a vise. Remove the bolt with a drill.



4) Remove the ignition key lock.
5) Use a new torn bolt. Tighten the torn bolt to end of thread.



B: INSPECTION

1) Remove the instrument panel lower cover.
2) Remove the lower column cover.
3) Unfasten the hold-down clip which secures harness and disconnect the connector of ignition switch from body harness.
4) Turn the ignition key plate to each position and check the continuity between terminals of ignition connector.

Switch position	Terminal No.	Standard
LOCK	—	—
ACC	No. 1 and No. 2	Less than 1 Ω
ON	No. 1 and No. 2 No. 1 and No. 4 No. 2 and No. 4	Less than 1 Ω
ST	No. 1 and No. 3 No. 1 and No. 4 No. 3 and No. 4	Less than 1 Ω

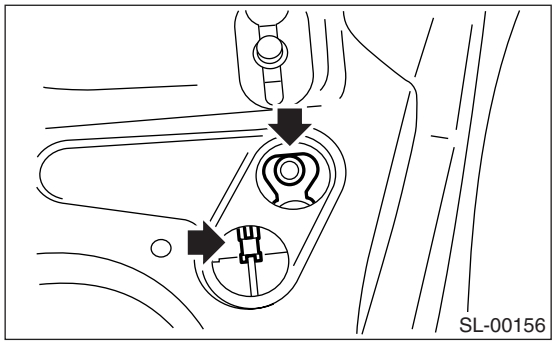
If NG, replace the ignition switch.

21.Key Lock Cylinders

A: REPLACEMENT

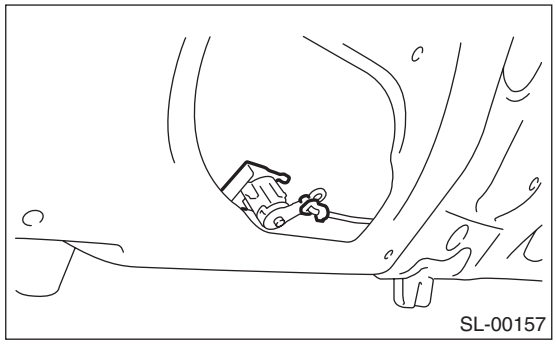
1. FRONT DOOR

1) Remove the door trim. <Ref. to EI-39, REMOVAL, Front Door Trim.>
2) Pull back the sealing cover.
3) Move the front door glass downward.
4) Remove the rod clamp. Remove the bolt. Replace the key cylinder.



2. TRUNK LID

1) Remove the trunk lid release handle. <Ref. to SL-40, Trunk Lid Release Handle.>
2) Remove the rod clamp. Remove the lock plate. Replace the key cylinder.

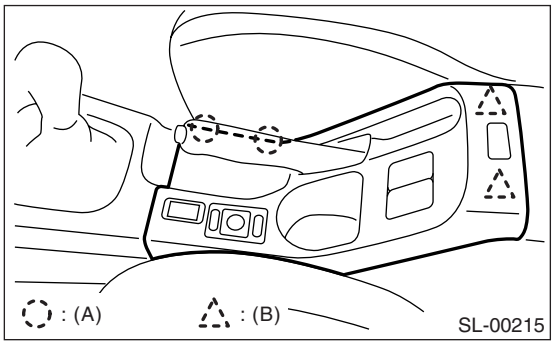


22.Security Control Module

A: REMOVAL

1. EXCEPT STi MODEL

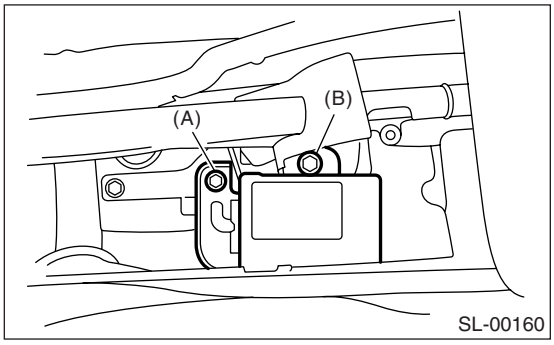
1) Disconnect the ground terminal from battery.
2) Remove the console cover.



(A) Hook pawl
(B) Clip

3) Disconnect the connector from the security control module.
4) Remove bolt (A) and loosen bolt (B).

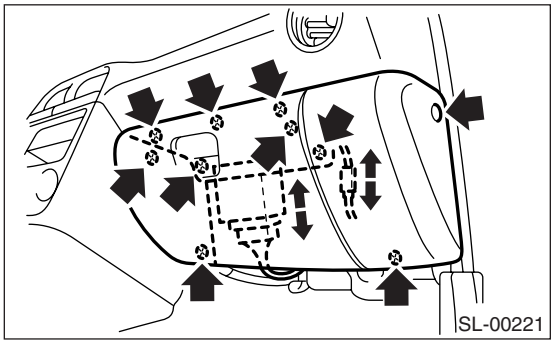
NOTE:
Loosen bolt (B) without completely removing it.



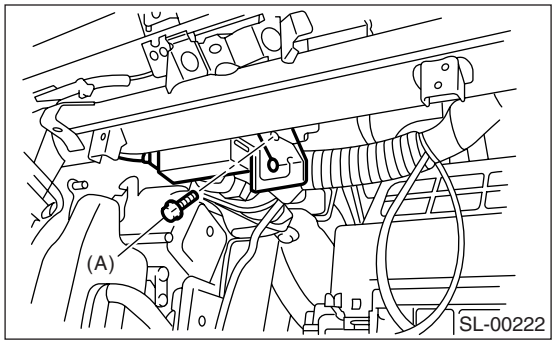
5) Remove the security control module.

2. STi MODEL

1) Disconnect the ground cable from battery.
2) Remove the glove box. <Ref. to EI-41, REMOVAL, Glove Box.>



3) Remove a bolt (A) and disconnect the connector, and then remove the security control module.



B: INSTALLATION

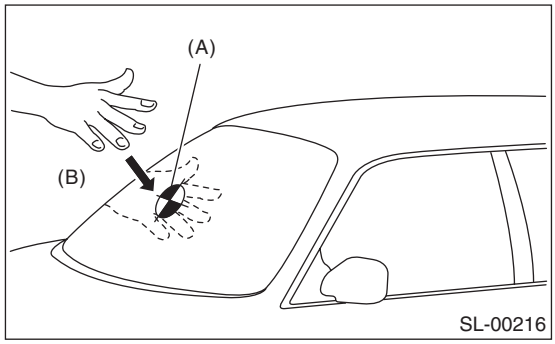
Install in the reverse order of removal.

NOTE:
To install the security control module, tighten the bolts securely so that the bolts do not come loose.

C: INSPECTION

1. IMPACT SENSITIVITY TEST

1) Remove the key from the ignition switch.
2) Close all windows.
3) Close all doors and the rear gate or trunk lid.
4) Cover the hood with a blanket.
5) Press the LOCK/ARM button of the transmitter.
6) Confirm that the security indicator light blinks every 2 seconds.
7) Hit the center of the windshield with your palm and make sure the alarm operates.



(A) Center of windshield
(B) Hit with palm

If NG, adjust the impact sensitivity. <Ref. to SL-46, ADJUSTMENT, Security Control Module.>

D: ADJUSTMENT

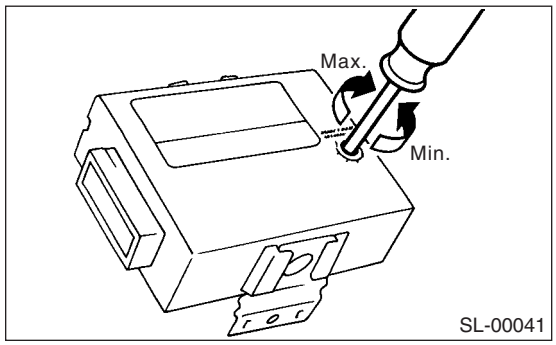
1. IMPACT SENSITIVITY

NOTE:
Before adjustment, make sure the security control module has been securely installed on the bracket.

1) Remove the security control module. <Ref. to SL-46, REMOVAL, Security Control Module.>

2) Adjust the sensitivity adjust screw in the security control module.

NOTE:
After adjusting, be sure to plug the adjust screw hole.

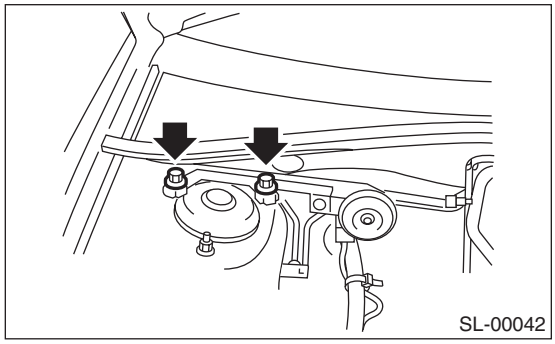


3) Install the security control module.
4) Perform the impact sensitivity test.

23.Security Horn

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the nuts and then detach the security horn while disconnecting the connector.

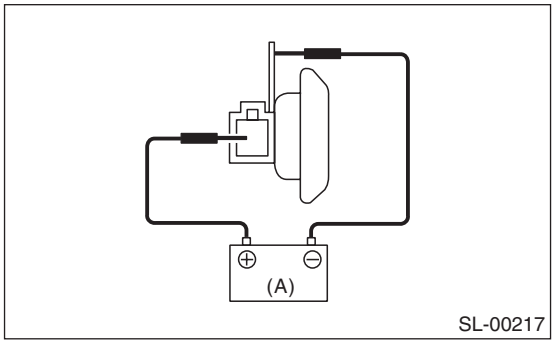


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Connect the battery to the security horn terminal and case ground and make sure the horn sounds properly.



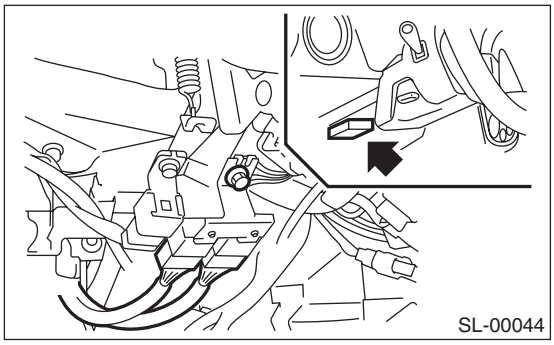
(A) Battery

If NG, replace the security horn.

24.Security Horn Relay

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the mounting bolt and detach the security horn relay (n ear the fuse box).



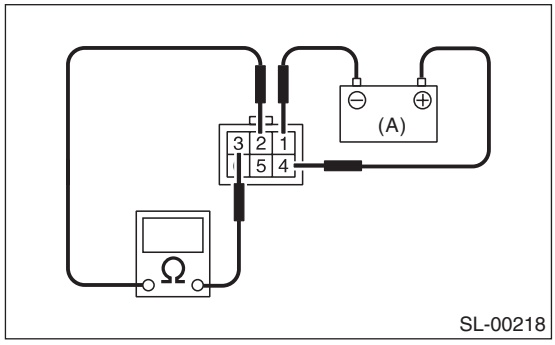
B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the security horn relay resistance between terminals (indicated in the table below) when connecting terminal No. 4 to battery positive terminal and terminal No. 1 to battery ground terminal.

Current	Terminal No.	Standard
Flow	2 and 3	Less than 1 Ω
No flow		More than 1 MΩ



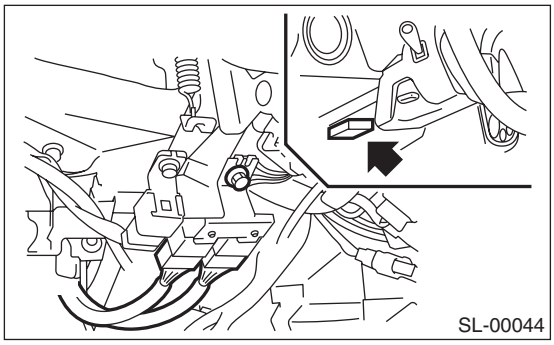
(A) Battery

If NG, replace the security horn relay.

25.Interrupt Relay

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the mounting nuts and detach the interrupt relay (near the fuse box).



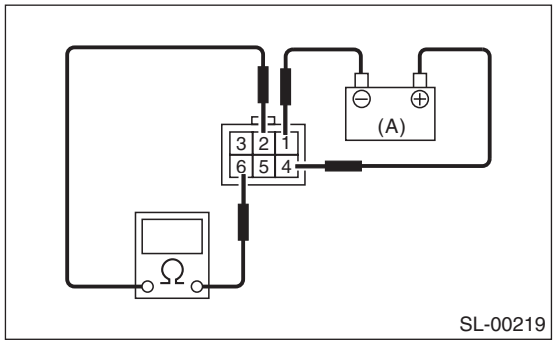
B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the interrupt relay resistance between terminals (indicated in the table below) when connecting terminal No. 4 to battery positive terminal and terminal No. 1 to battery ground terminal.

Current	Terminal No.	Standard
Flow	2 and 6	Less than 1 Ω
No flow		More than 1 MΩ



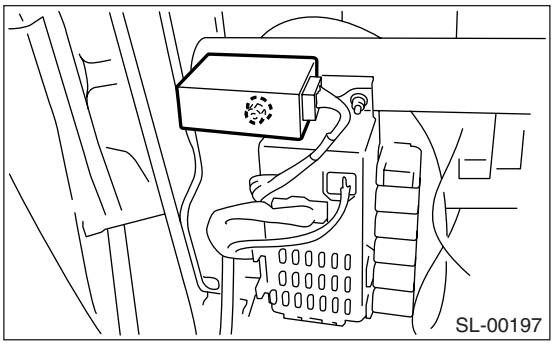
(A) Battery

If NG, replace the interrupt relay.

26. Keyless Entry Control Module

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover. <Ref. to EI-45, REMOVAL, Instrument Panel Assembly.>
3) Remove the nut, and then remove the keyless entry control module while disconnecting connector.



4) Disconnect the keyless entry control module and other electrical control module.

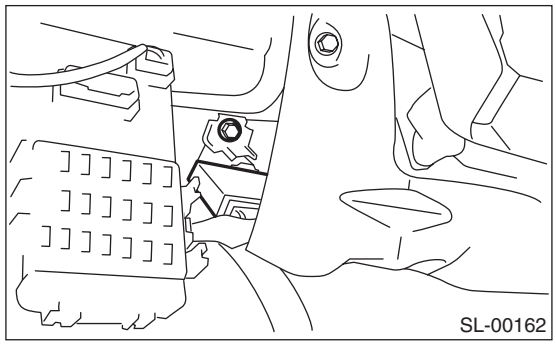
B: INSTALLATION

Install in the reverse order of removal.

27.Body Integrated Module

A: REMOVAL

1) Disconnect the ground terminal from battery.
2) Remove the instrument panel lower cover. <Ref. to EI-45, REMOVAL, Instrument Panel Assembly.>
3) Remove the nut, then remove the body integrated module while disconnecting the connector.



B: INSTALLATION

Install in the reverse order of removal.

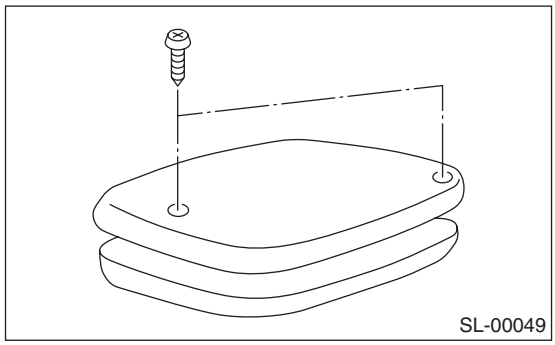
28.Keyless Transmitter

A: REMOVAL

1. TRANSMITTER BATTERY

Remove the screw from transmitter, and then remove the battery.

NOTE:
To prevent static electricity damage to transmitter printed circuit board, touch the steel area of building with hand to discharge the static electricity carried on body or clothes before disassembling transmitter.



B: INSTALLATION

1. TRANSMITTER BATTERY

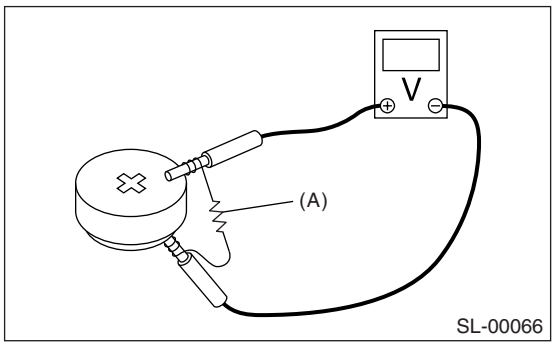
Install in the reverse order of removal.

C: INSPECTION

1. TRANSMITTER BATTERY

Measure the voltage between battery (+) terminal and (−) terminal.

NOTE:
• Battery discharge occurs during measurement. Complete the measurement within 5 seconds.
• During battery voltage measurement, voltage falls more than 1.8 volts in 3 seconds period.



(A) Resistance 47 Ω

Tester connection		Standard
(+)	(−)	
Battery (+) terminal	Battery (−) terminal	2.5 — 3.0 V

If NG, replace the battery. (Use CR1620 or equivalent.)

D: REPLACEMENT

1. TRANSMITTER REGISTRATION

NOTE:
• A maximum of four transmitters can be registered for each individual vehicle.
• When replacing or adding the transmitter (key), registration is also necessary.
• Finish the operation from step 1) through 4) within 45 seconds.

1) Sit on the driver's seat and close all doors and rear gate.
2) Open the driver's door.
3) Close the driver's door.
4) Turn the ignition switch from ON to LOCK ten times within 15 seconds.

NOTE:
Do not start the engine at this time.

5) The horn chirps one time to indicate that the system has entered in the programming mode.
6) Open the driver's door.
7) Close the driver's door.
8) Press any button on the transmitter that you wish to program into the system.
9) Horn will chirp two times to indicate that the transmitter has been programmed.

NOTE:
Repeat steps 6) through 9) for an additional transmitter.

10) Remove the ignition key from the ignition switch.
11) The horn will chirp three times to indicate that the system has exited the programming mode.
12) Check the keyless entry system properly operates by operating each transmitter.

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

SR

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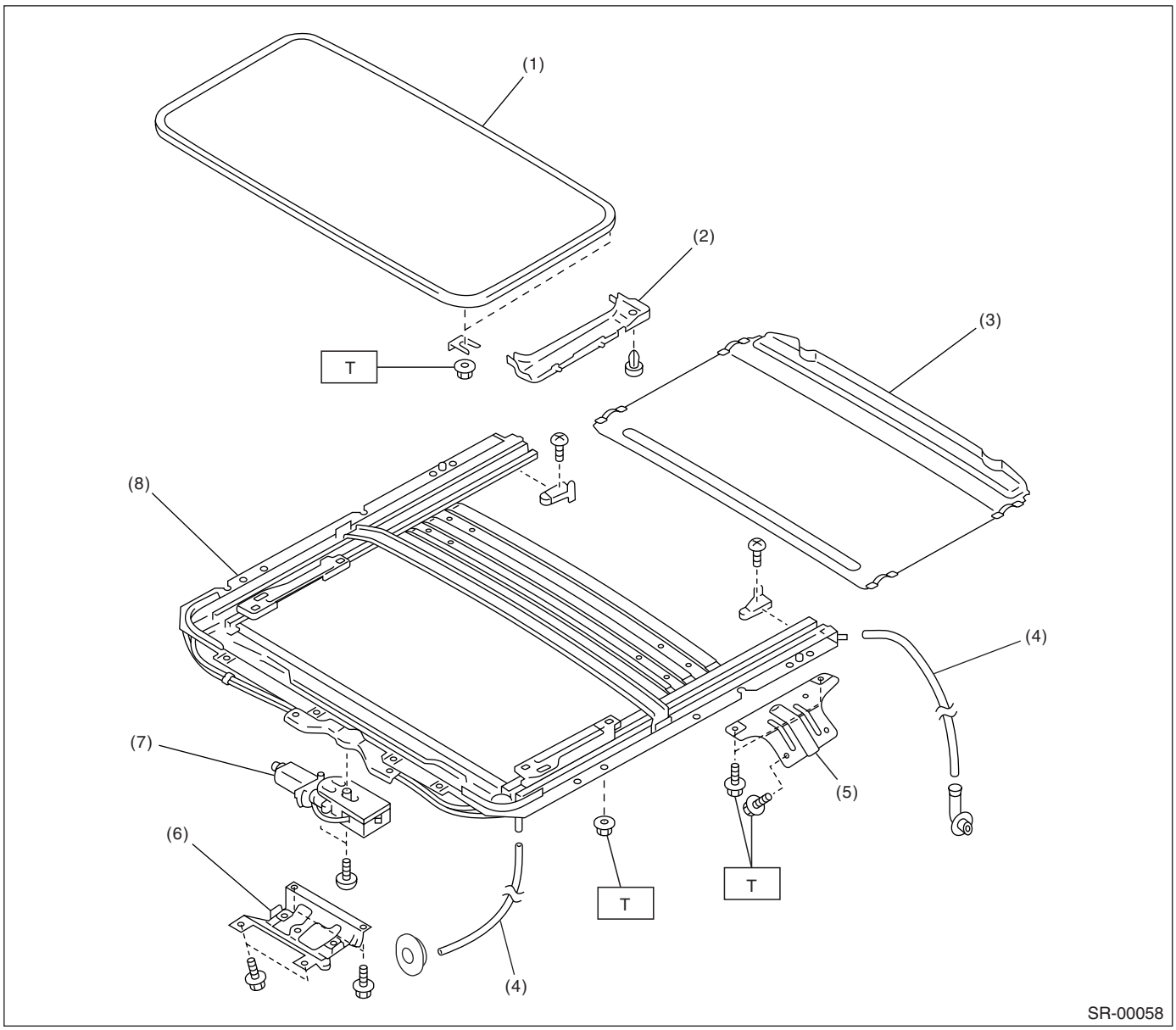
2. Sunroof Control System 4
3. Sunroof Lid 5
4. Sunroof Assembly 6
5. Sunroof Motor 8
6. Sunroof Switch 9

1. General Description

A: COMPONENT



(1) Glass lid
(2) Guide rail cover
(3) Sunshade
(4) Drain tube
(5) Sunroof bracket
(6) Motor cover
(7) Motor ASSY
(8) Frame ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T*: *7.4 (0.75, 5.4)

B: CAUTION

• Before disassembling or reassembling parts, always disconnect battery ground cable. When replacing radio, control module, and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
• Reassemble in reverse order of disassembly, unless otherwise indicated.
• Adjust parts to the given specifications.
• Connect the connectors and hoses securely during reassembly.
• After reassembly, make sure functional parts operate smoothly.

C: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Sunroof Control System

A: WIRING DIAGRAM

1. SUNROOF

<Ref. to WI-162, WIRING DIAGRAM, Sunroof System.>

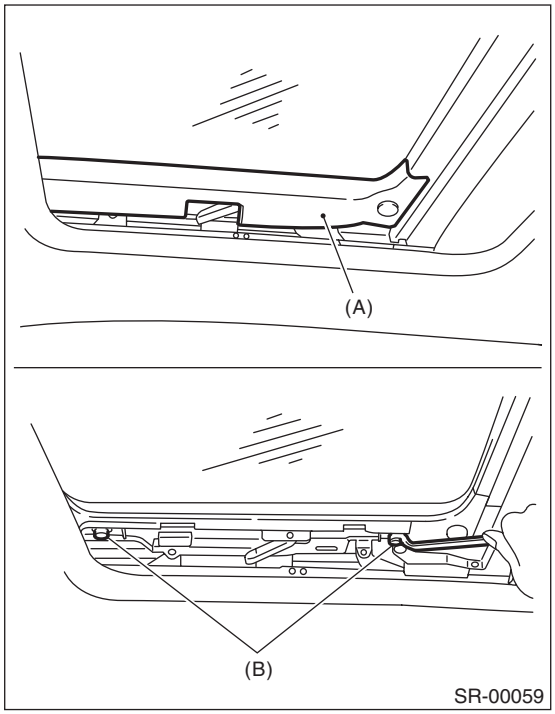
B: INSPECTION

Symptom	Checking order
Water leaks.	(1) Check roof panel and sunroof lid for improper or poor sealing. (2) Check drain tube for clogging. (3) Check sunroof frame seal and body for improper fit.
Booming noise	(1) Check sunroof lid and roof panel for improper clearance. (2) Check sunshade and roof trim for improper clearance.
Abnormal motor noise	(1) Check motor for looseness. (2) Check gears and bearings for wear. (3) Check cables for wear. (4) Check cable pipe for deformities.
Failure of sunroof (Motor operates properly.)	(1) Check guide rail for foreign particles. (2) Check guide rail for improper installation. (3) Check parts for mutual interference. (4) Check cable slider for improper clinching. (5) Check cable for improper installation. (6) Check clutch adjustment nut for improper tightness.
Motor does not rotate or rotates improperly.	(1) Check fuse for blow-out. (2) Check switch for improper function. (3) Check motor for incorrect terminal voltage. (4) Check relay for improper operation. (5) Check poor grounding system. (6) Check harness for open or short and terminals for poor connections. (7) Check limit switch for improper operation.

3. Sunroof Lid

A: REMOVAL

1) Completely close the sunroof lid and open the sunshade.
2) Remove the cover (A) then remove the nuts (B).



3) Remove the sunroof lid carefully.

B: INSTALLATION

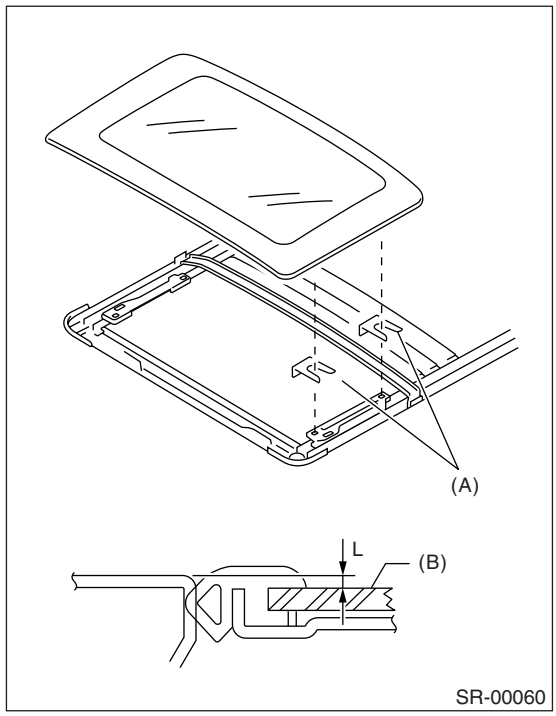
Install in the reverse order of removal.

C: ADJUSTMENT

1. ALIGNMENT OF HEIGHT BETWEEN SUNROOF LID AND ROOF PANEL

Loosen the sunroof lid installation nuts and then adjust the height by adding (max: three pieces) or extracting (min: zero pieces) shims (standard: one piece).

Difference in height between sunroof lid and roof panel: L
L: 2.0±0.5 mm (0.079±0.020 in)

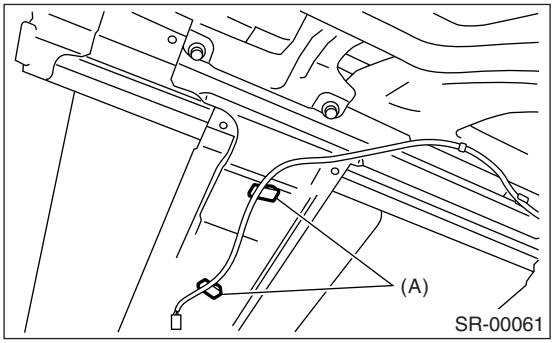


(A) Shim
(B) Sunroof lid

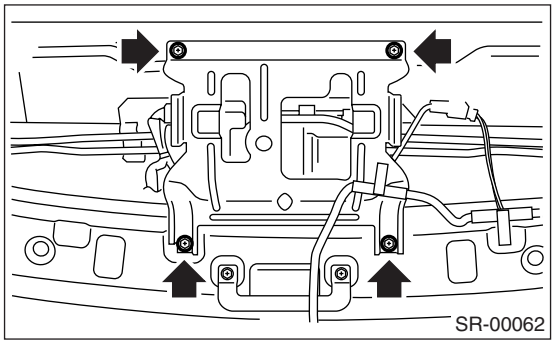
4. Sunroof Assembly

A: REMOVAL

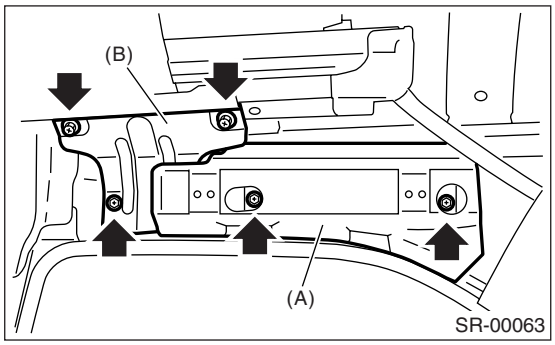
1) Disconnect the ground cable from battery.
2) Remove the roof trim. <Ref. to EI-52, REMOVAL, Roof Trim.>
3) Remove the sunroof lid. <Ref. to SR-5, REMOVAL, Sunroof Lid.>
4) Disconnect the drain tubes from sunroof frame.
5) Remove the room lamp harness clip (A).



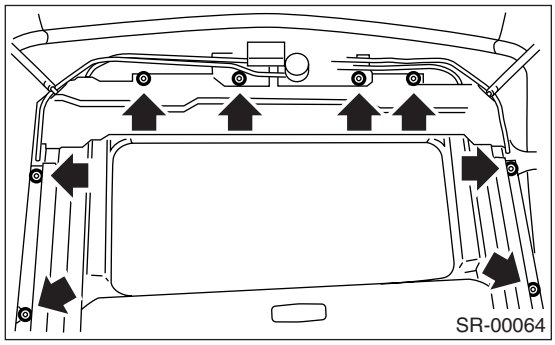
6) Disconnect the sunroof harness connector.
7) Remove the motor cover.



8) Remove the assist grip bracket (A) and sunroof bracket (B).



9) Remove the nuts then detach the sunroof frame.



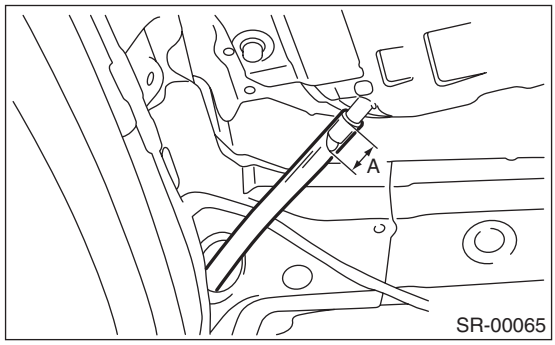
B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Be careful not to snag the harness.

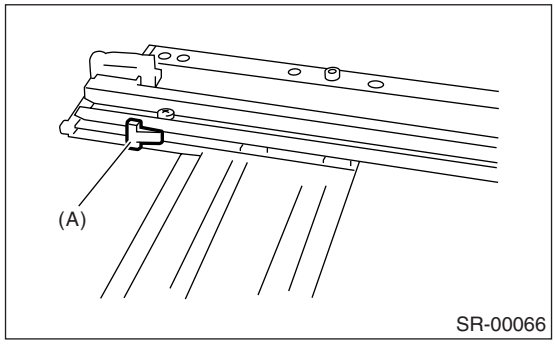
NOTE:
- Make sure to connect the harness connector.
- When installing the drain tube, insert it securely onto drain pipe.

Length A:
15 mm (0.59 in) or more

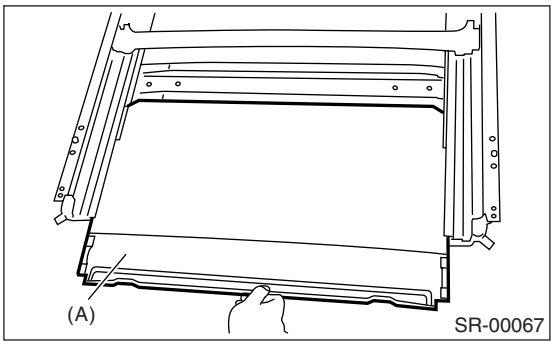


C: DISASSEMBLY

1) Remove the sunroof frame.
2) Remove the rail stoppers (A).



3) Pull out the sunshade (A) from sunroof frame.



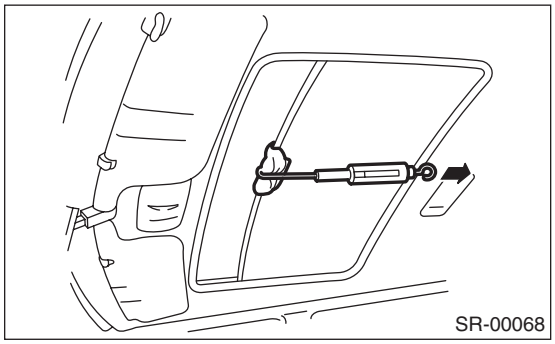
D: ASSEMBLY

Assemble in the reverse order of disassembly.

E: INSPECTION

1. CHECK FOR MOVING LOAD OF SUNSHADE

1) Attach a spring scale to sunshade edge using a cloth.



2) Pull the spring scale back to measure moving load of the sunshade.

Moving load of rear sunshade:
Less than 24.5±4.9 N (2.5±0.5 kgf, 55±1.1 lb)

NOTE:
Moving load is larger at the beginning of pulling a spring scale, so take a scale reading while sunshade sliding smoothly.

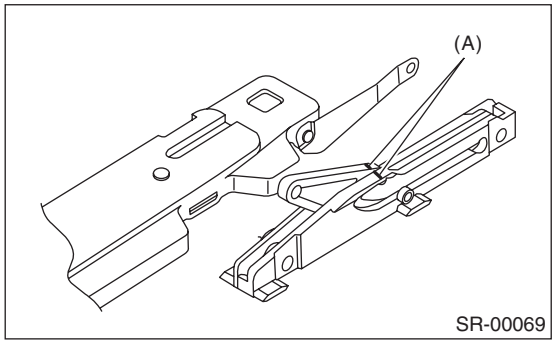
3) If moving load exceeds specifications, check the sunroof lid, sunshade and guide rail assembly for improper installation.

5. Sunroof Motor

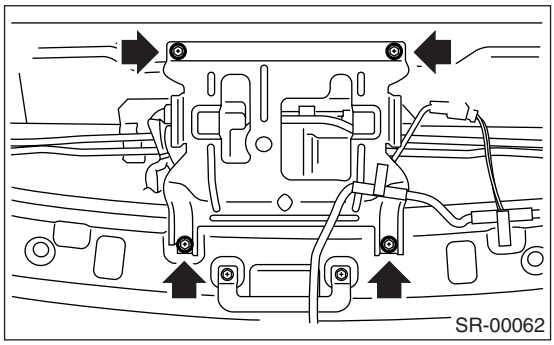
A: REMOVAL

CAUTION:
• When removing the clip, use great care to not damage the roof trim.
• Never rotate the sunroof motor after removing it.

1) Completely close the sunroof.
2) Disconnect the ground cable from battery.
3) Remove the sunroof lid. <Ref. to SR-5, REMOVAL, Sunroof Lid.>
4) Confirm the alignment mark (A) of sunroof bracket link and the guide from sunroof opening. (If the mark does not align, adjust to align the mark.)



5) Remove the roof trim. <Ref. to EI-52, REMOVAL, Roof Trim.>
6) Remove the motor cover.

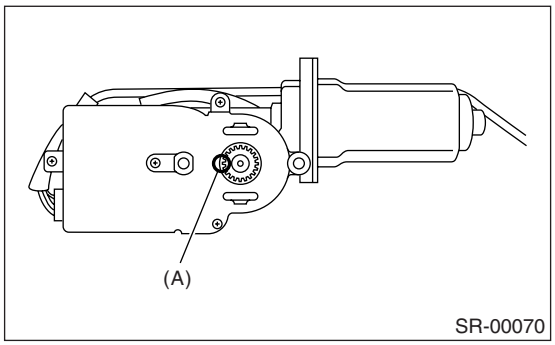


7) Disconnect the harness connector and remove the sunroof motor mounting screw.

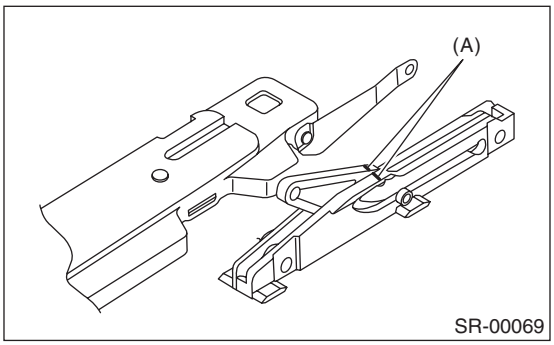
B: INSTALLATION

CAUTION:
Be careful not to move the sunroof cable when installing sunroof motor.

1) Check the alignment mark (A) of sunroof motor.



2) Confirm the alignment mark (A) of sunroof bracket link.



3) Install the sunroof motor.
4) After installing the motor, reconfirm the alignment marks of motor side and sunroof bracket link side.
5) Connect the sunroof motor harness connector and then connect the battery ground cable.
6) Check the sunroof operation with the procedure as shown in the table.

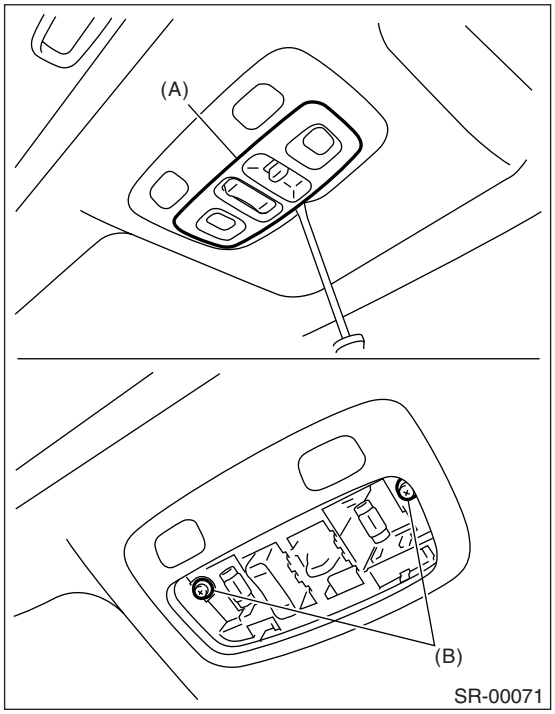
Checking order	Switch position
Completely close sunroof.	Closed
Tilt-up sunroof to most upper position.	Tilt-up
Lower sunroof completely.	Tilt-down
Open sunroof to near the completely open position.	Open
Completely open sunroof.	Open
Close sunroof 150 mm (5.91 in) away from completely closed position.	Closed
Completely close sunroof.	Closed

7) Install the sunroof lid and trims in the reverse order of removal.

6. Sunroof Switch

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the spot light lens (A) and sunroof switch mounting screw (B).



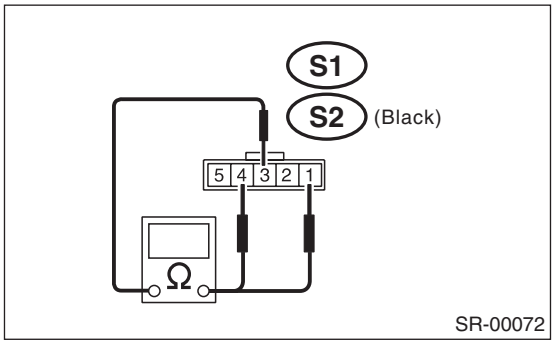
3) Disconnect the harness connectors and remove the sunroof switch.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the sunroof switch resistance.



Switch	Terminal No.	Standard value
Open	S1: 3 and 4	Less than 1 Ω
Close	S1: 1 and 4	Less than 1 Ω
Tilt-up	S2: 3 and 4	Less than 1 Ω
Tilt-down	S2: 1 and 3	Less than 1 Ω

EXTERIOR/INTERIOR TRIM

EI

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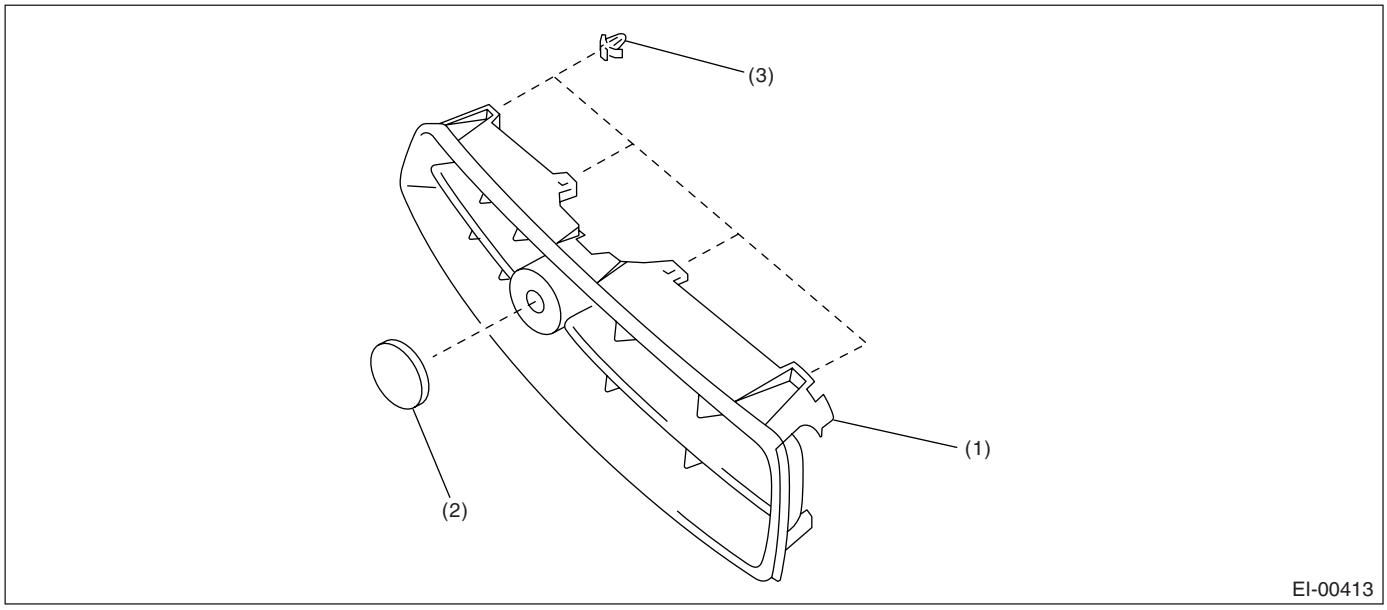
1. General Description

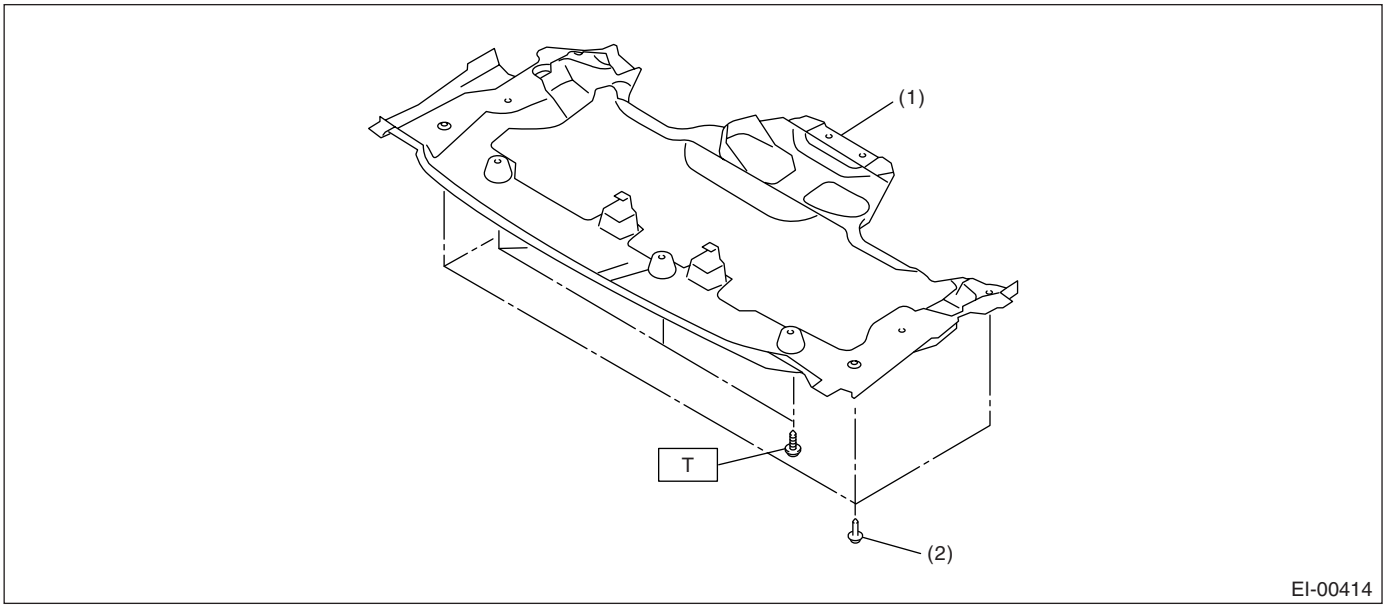
A: COMPONENT

1. FRONT GRILLE



(1) Front grille (2) Front grille emblem (3) Clip

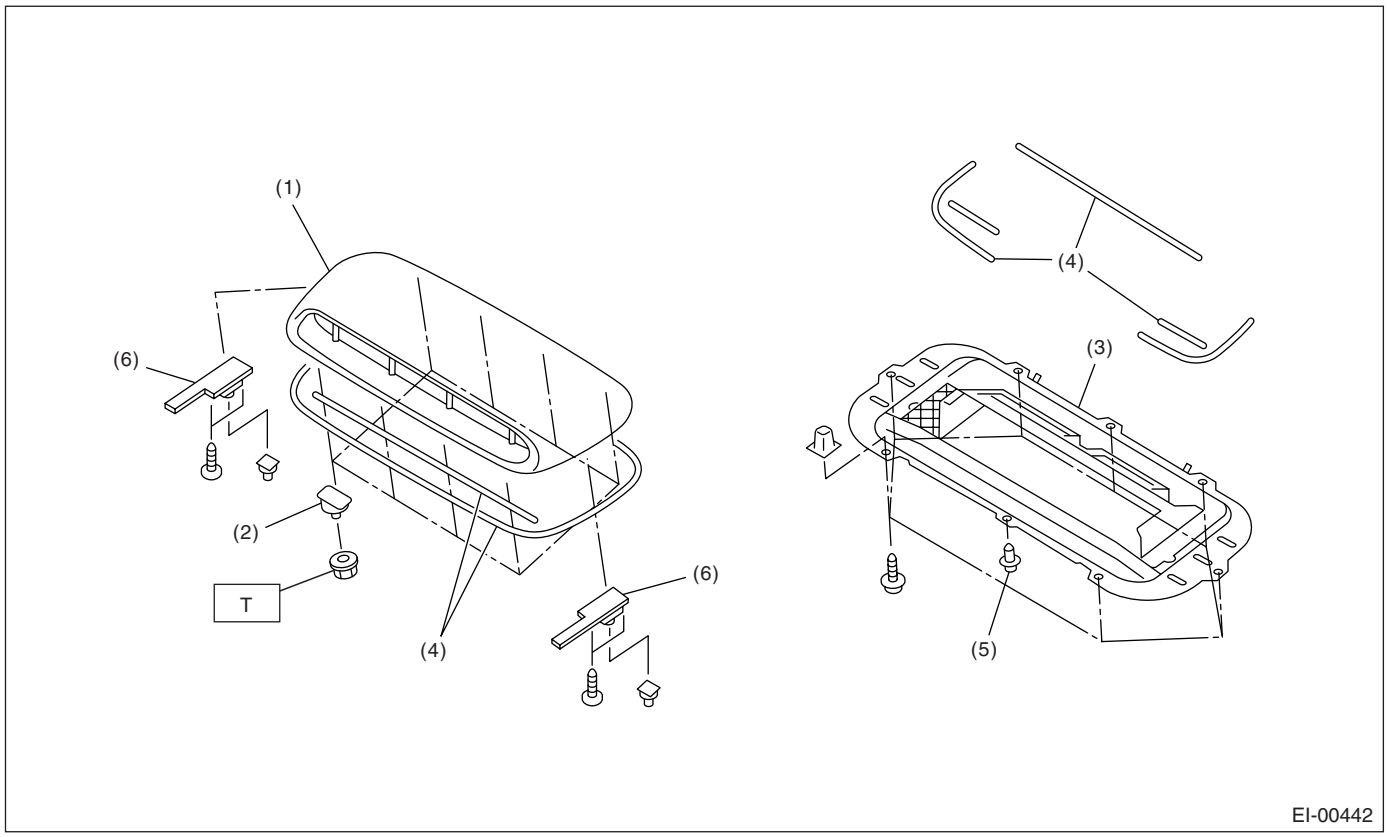
2. UNDER COVER



(1) Under cover (2) Clip (side)

Tightening torque: N·m (kgf-m, ft-lb)
T: 14 (1.42, 10.3)

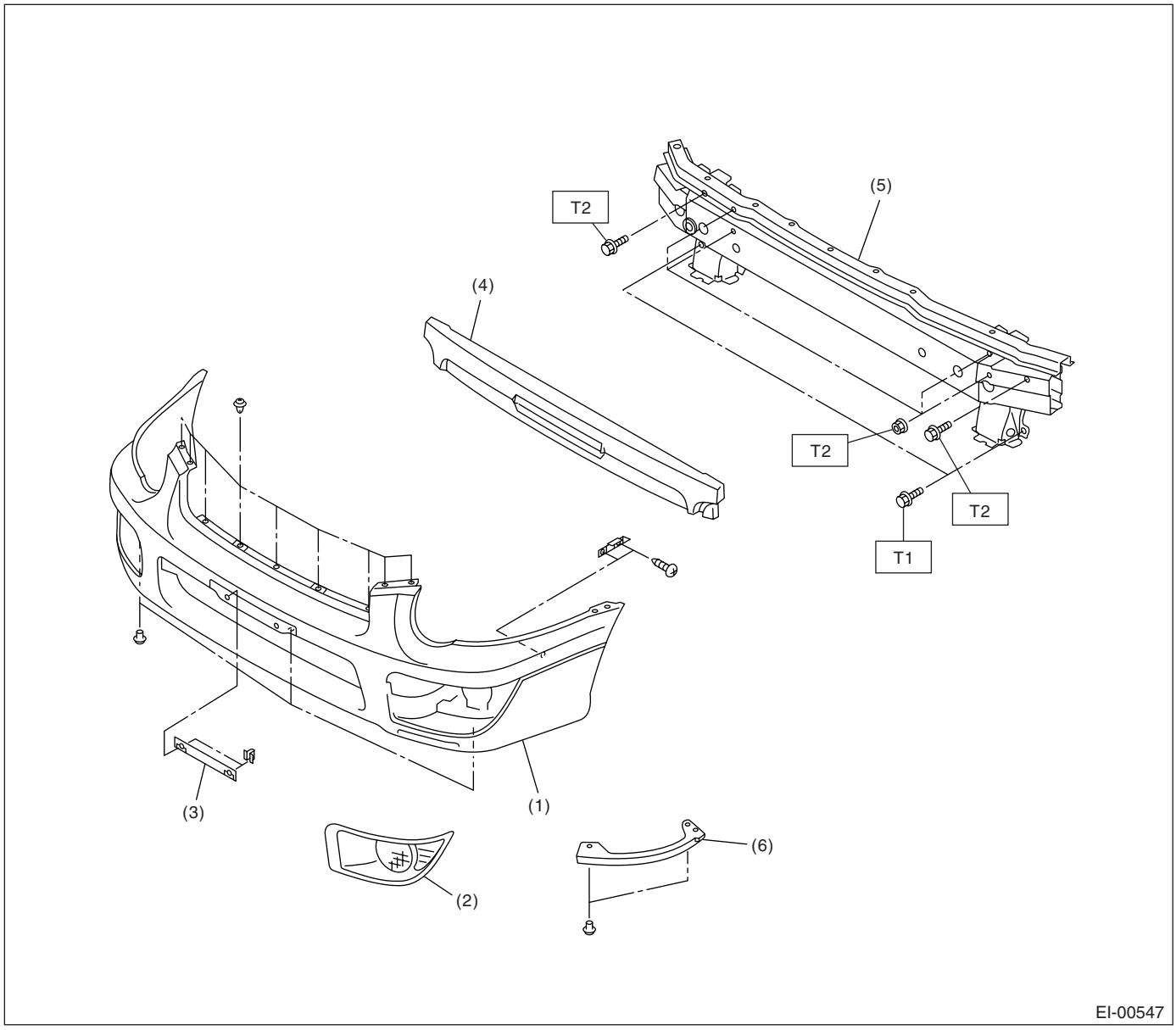
3. HOOD GRILLE



(1) Hood grille
(2) Bolt
(3) Grille duct
(4) Packing
(5) Clip
(6) Side plate

Tightening torque: N·m (kgf-m, ft-lb)
T: 4.5 (0.46, 3.32)

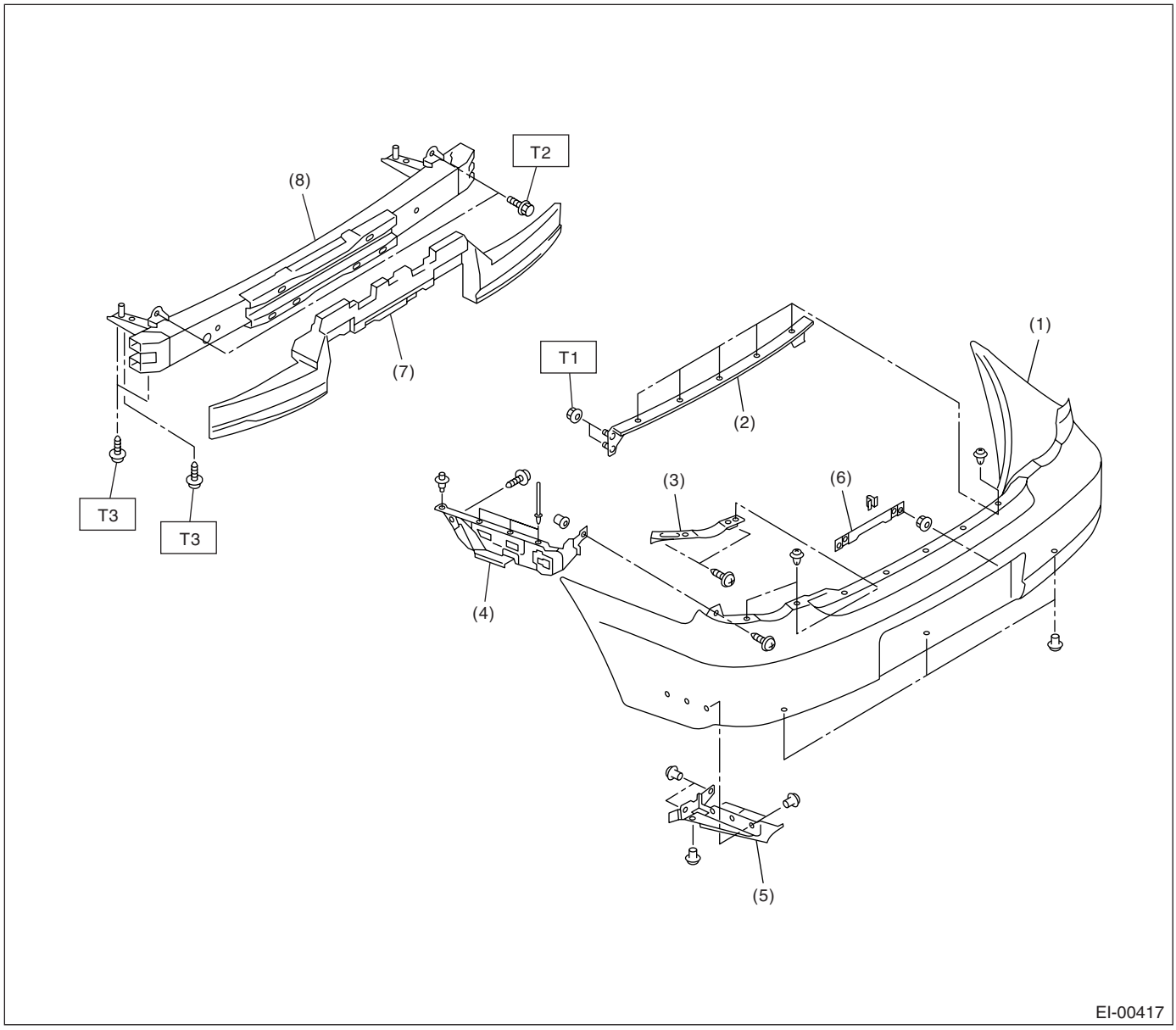
4. FRONT BUMPER



(1) Bumper face
(2) Fog light cover
(3) License plate bracket
(4) Bumper energy absorber
(5) Bumper beam
(6) Bumper extension (wagon turbo model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 32 (3.3, 24)
T2: 69 (7.0, 51)

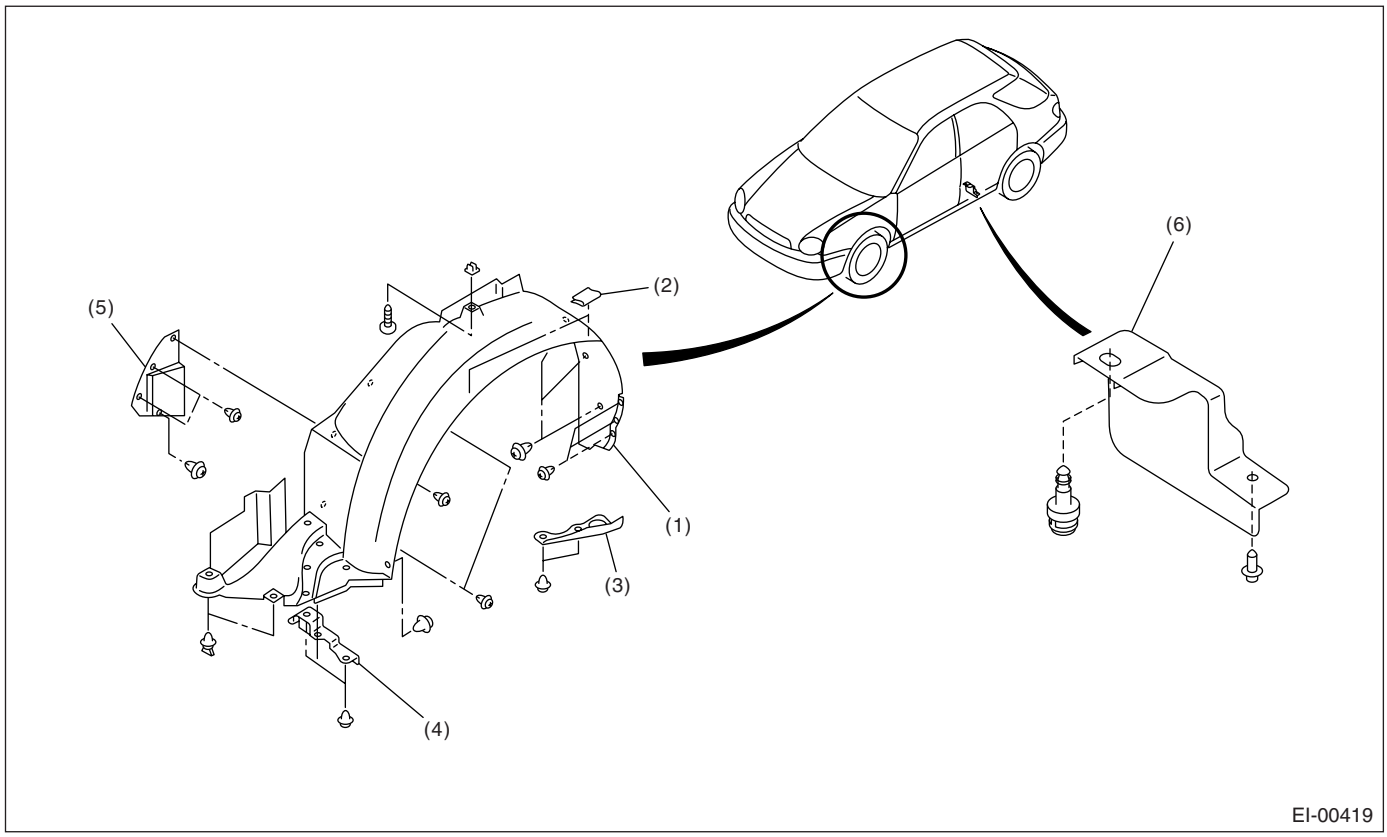
5. REAR BUMPER



(1)	Bumper face	(5)	Bumper side cover	
(2)	Bumper upper beam	(6)	License plate base	
(3)	Bumper upper bracket	(7)	Bumper energy absorber	
(4)	Bumper side bracket	(8)	Bumper back beam	

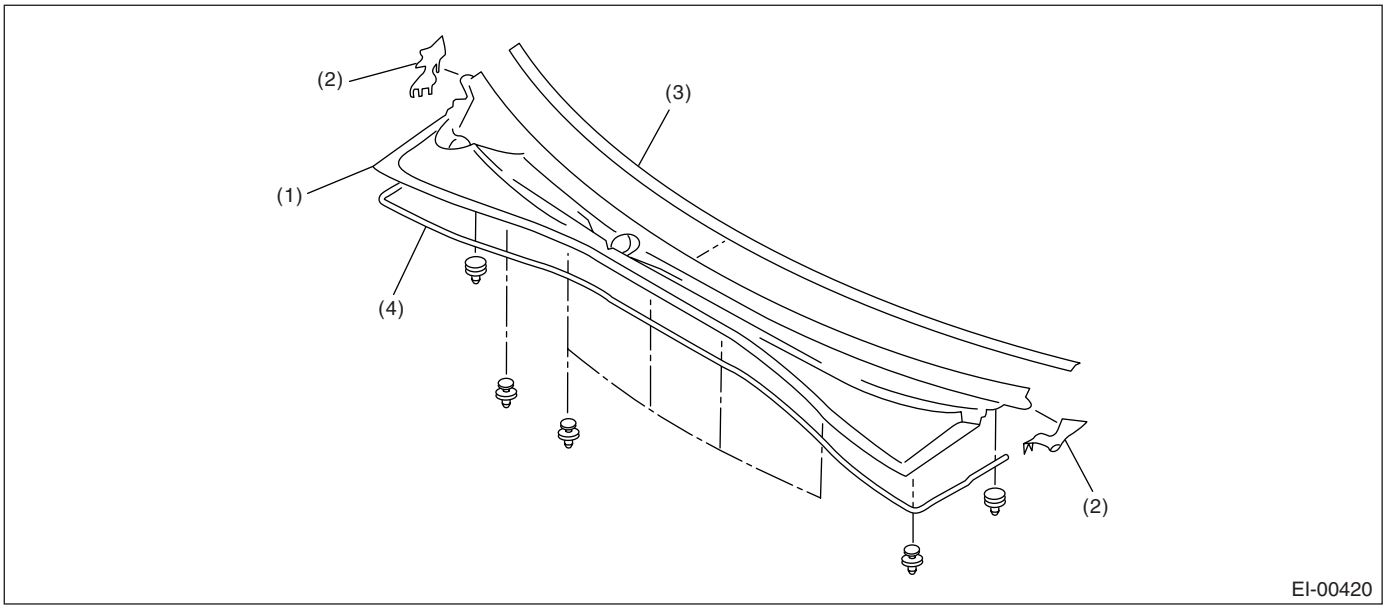
Tightening torque: N·m (kgf-m, ft-lb)
T1: 33 (3.4, 24)
T2: 34 (3.5, 25)
T3: 95 (9.7, 70)

6. MUD GUARD



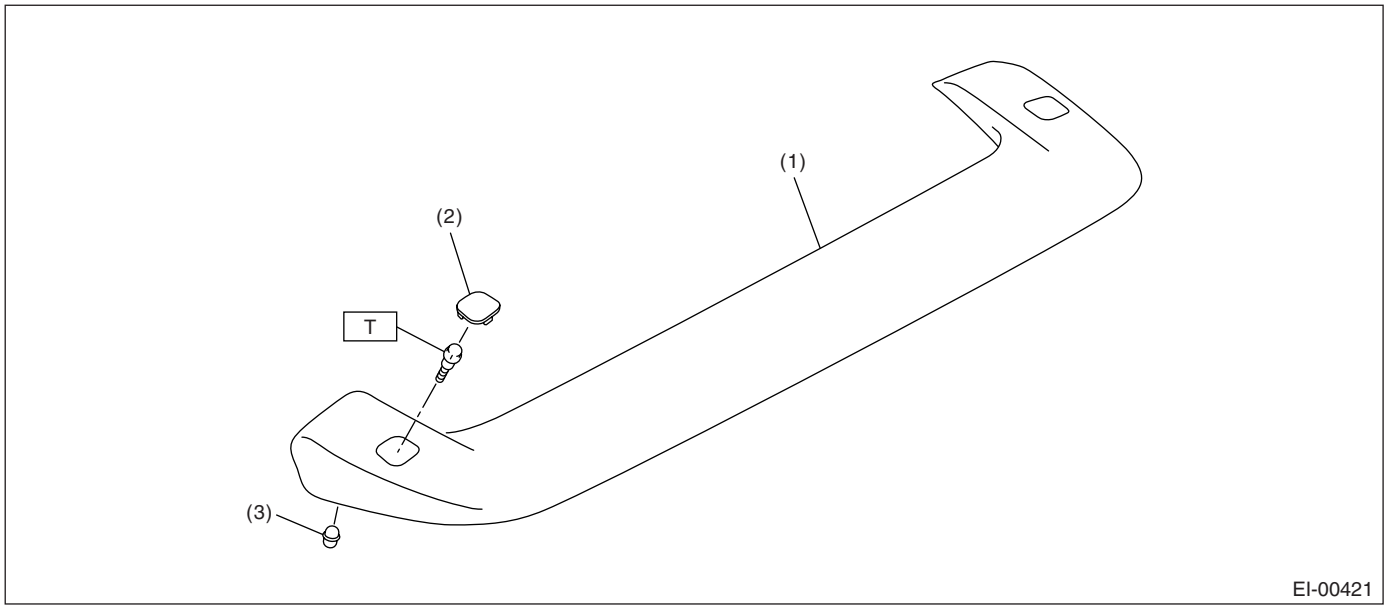
(1) Mud guard
(2) Clip
(3) Sub frame cover
(4) Front air flap plate
(5) Mud guard plate
(6) Rear air flap plate

7. COWL PANEL



(1) Cowl panel
(2) Cowl side panel
(3) Protector
(4) Seal

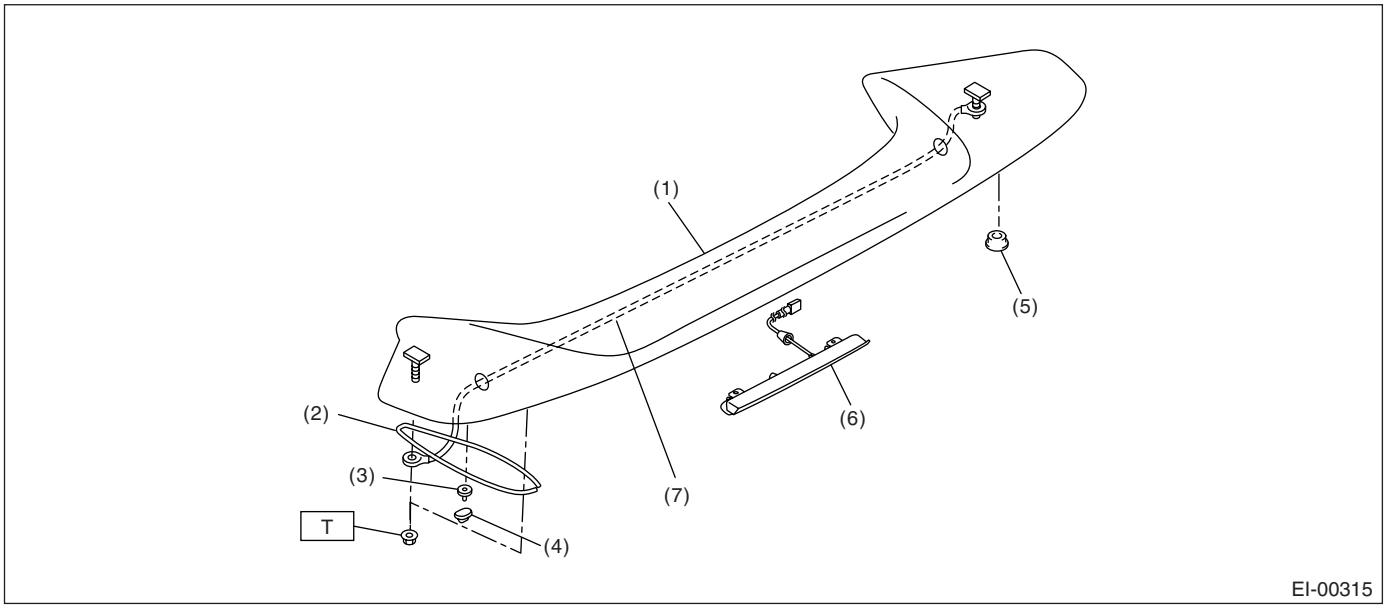
8. ROOF SPOILER



(1) Roof spoiler
(2) Cap
(3) Clip

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.4 (0.75, 5.46)

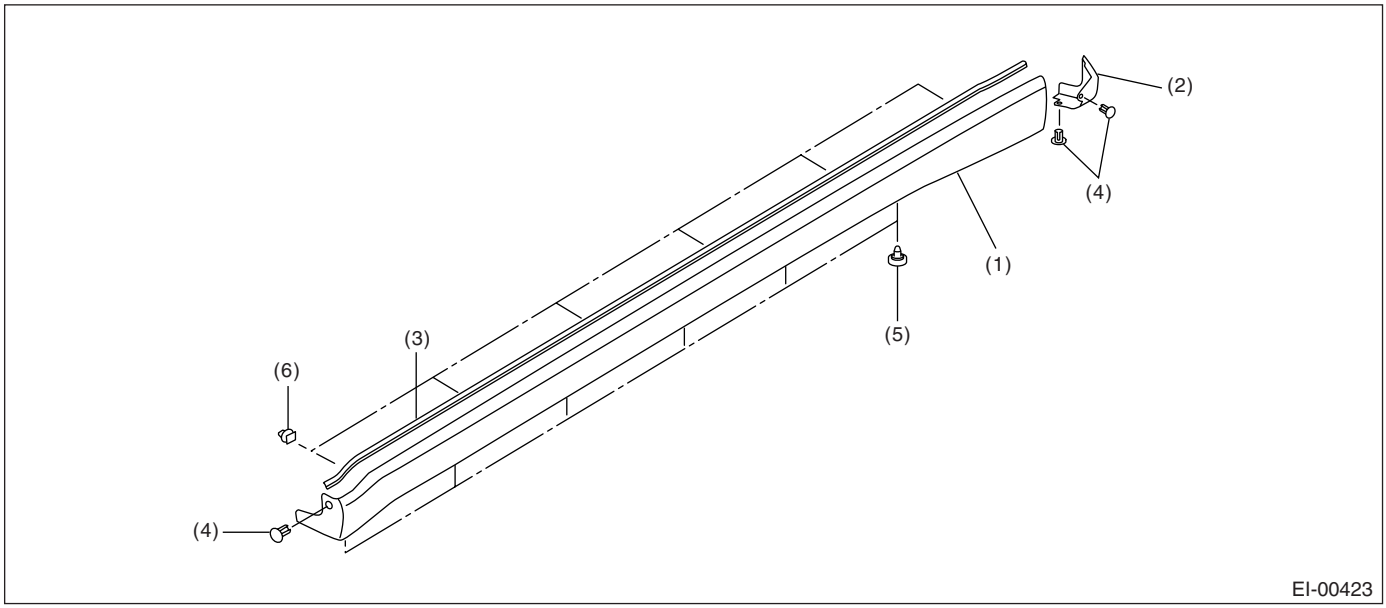
9. REAR SPOILER



(1) Rear spoiler
(2) Protector
(3) Clip
(4) Grommet
(5) Seal (RH)
(6) High mount stop lamp
(7) Retention cable (Inner parts)

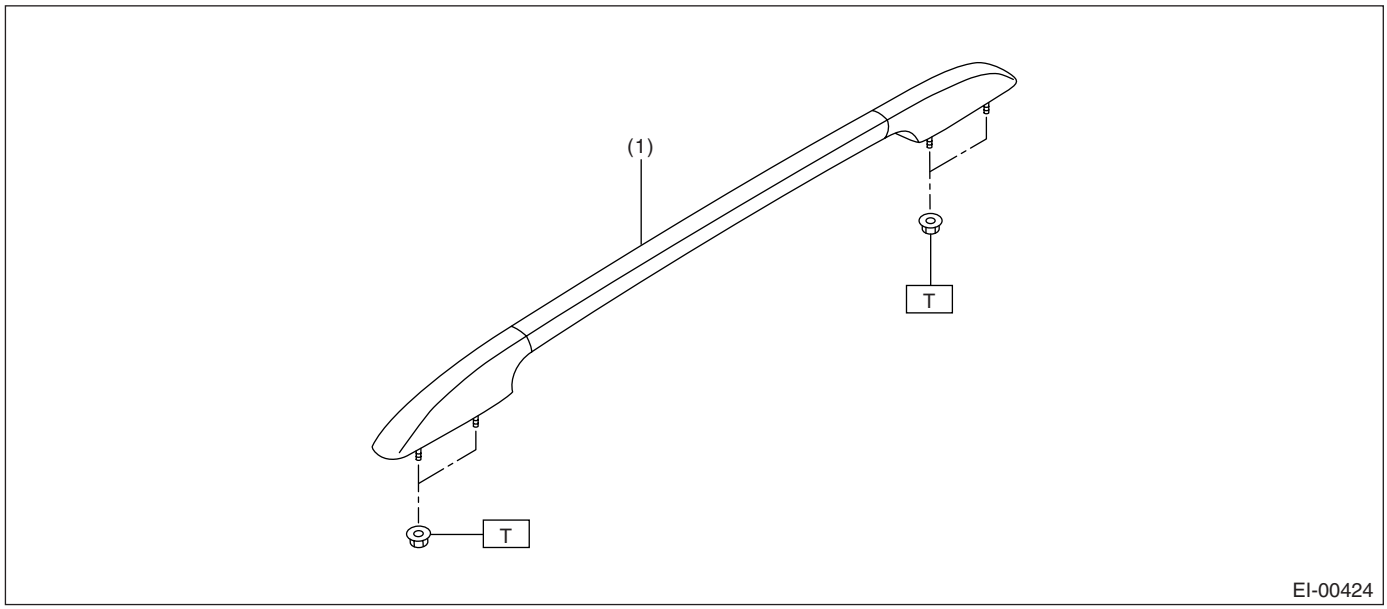
Tightening torque: N·m (kgf-m, ft-lb)
T: 7.4 (0.75, 5.46)

10.SIDE SILL SPOILER



(1) Side sill spoiler
(2) End cover
(3) Protector
(4) Rivet clip
(5) Clip (Side sill spoiler)
(6) Clip

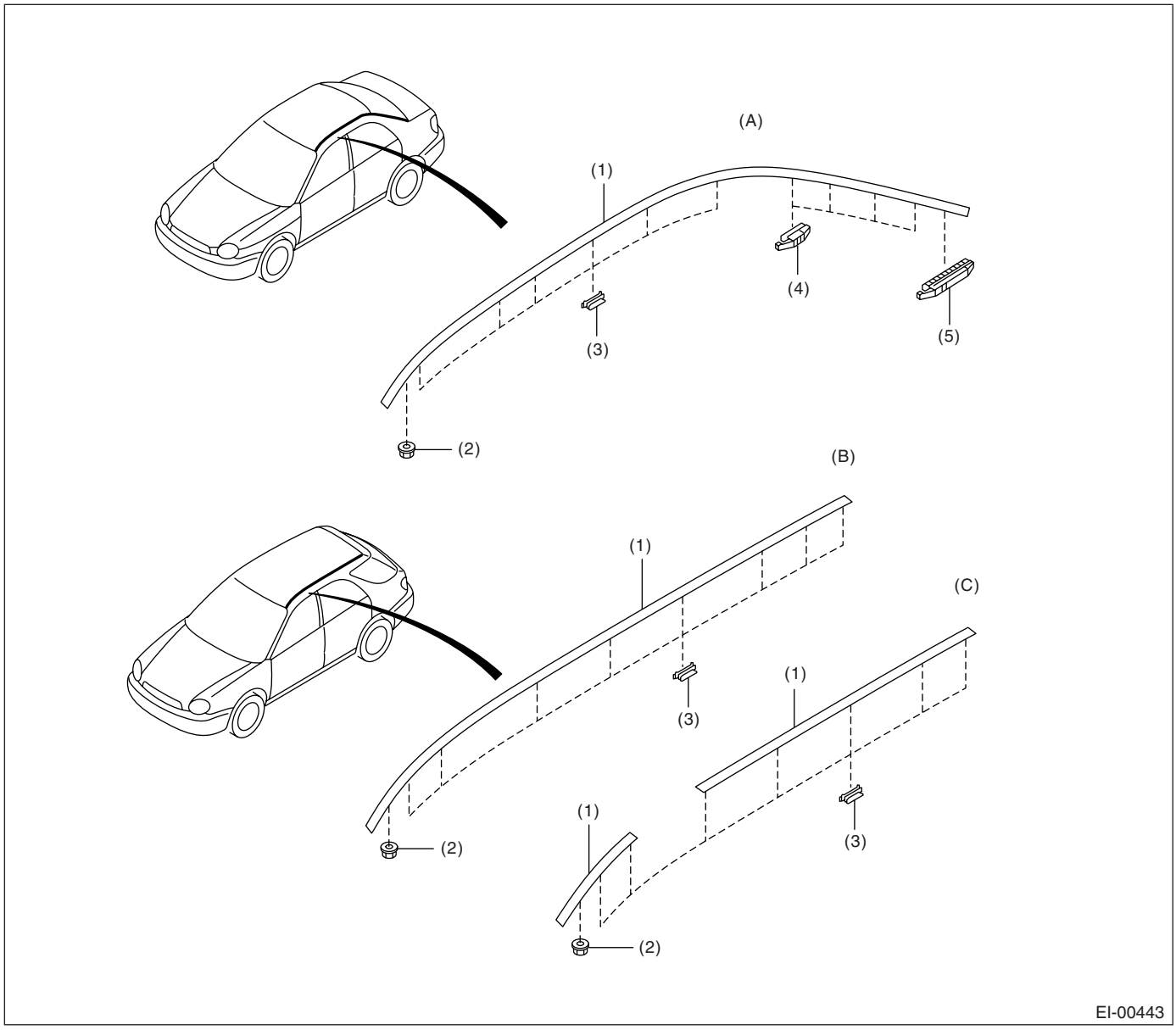
11.ROOF RAIL



(1) Roof rail

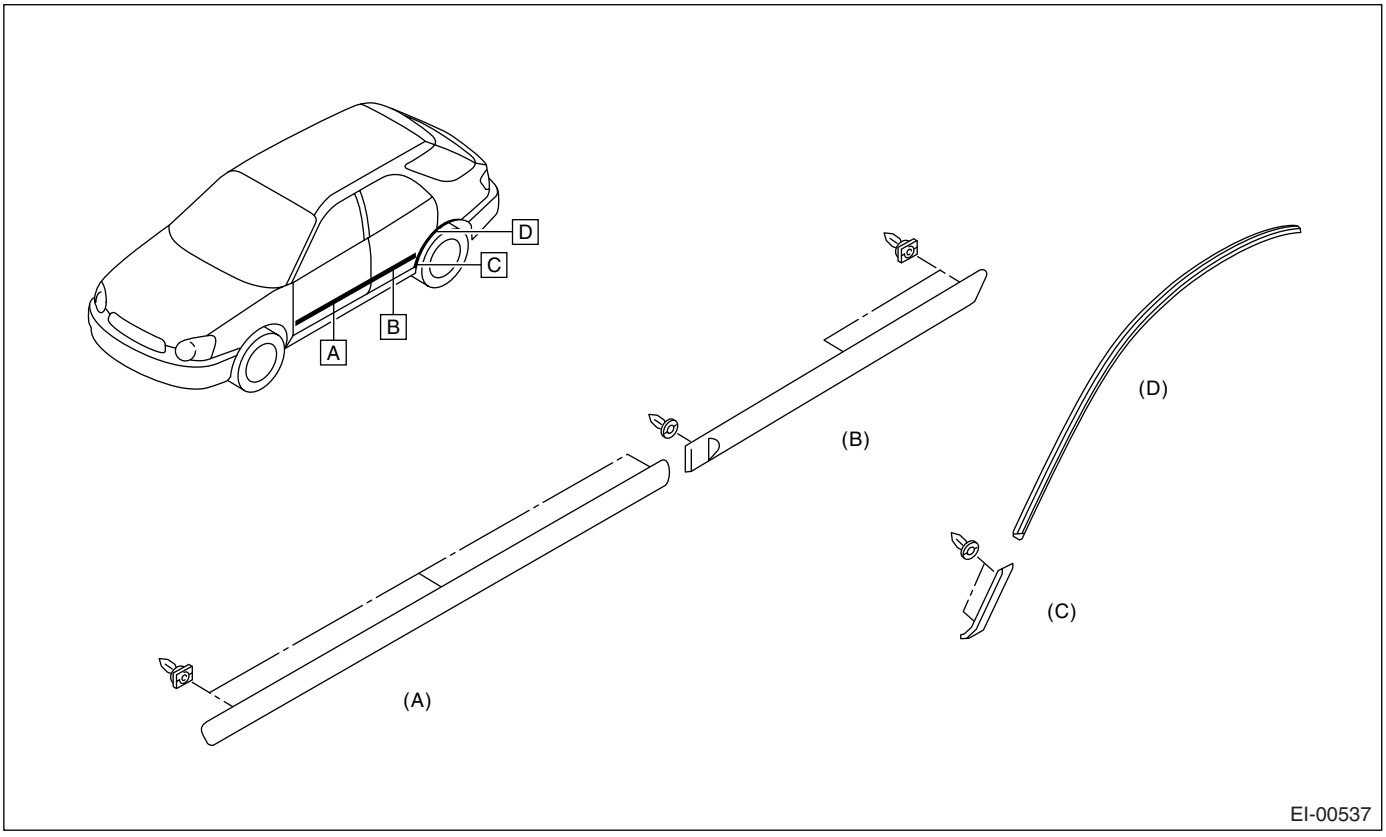
Tightening torque: N·m (kgf-m, ft-lb)
T: 7.4 (0.75, 5.46)

12.ROOF MOLDING



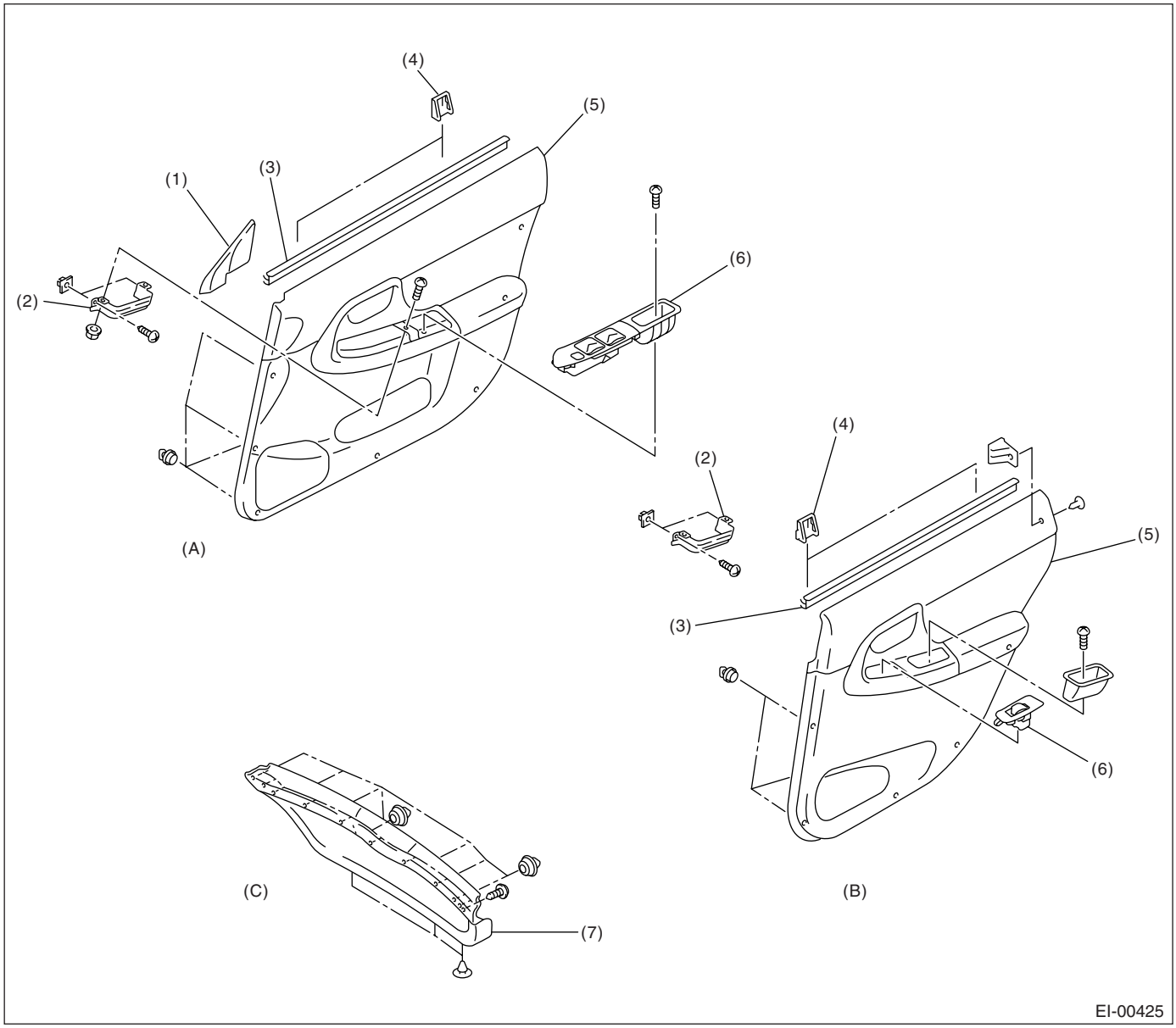
(A)	For sedan model	(B)	For wagon model	(C)	For wagon model (with roof rail)
(1)	Roof molding	(3)	Clip B	(5)	Clip D
(2)	Clip A	(4)	Clip C		

13.PROTECTOR



(A) Front door
(B) Rear door
(C) Rear fender lower
(D) Rear fender upper

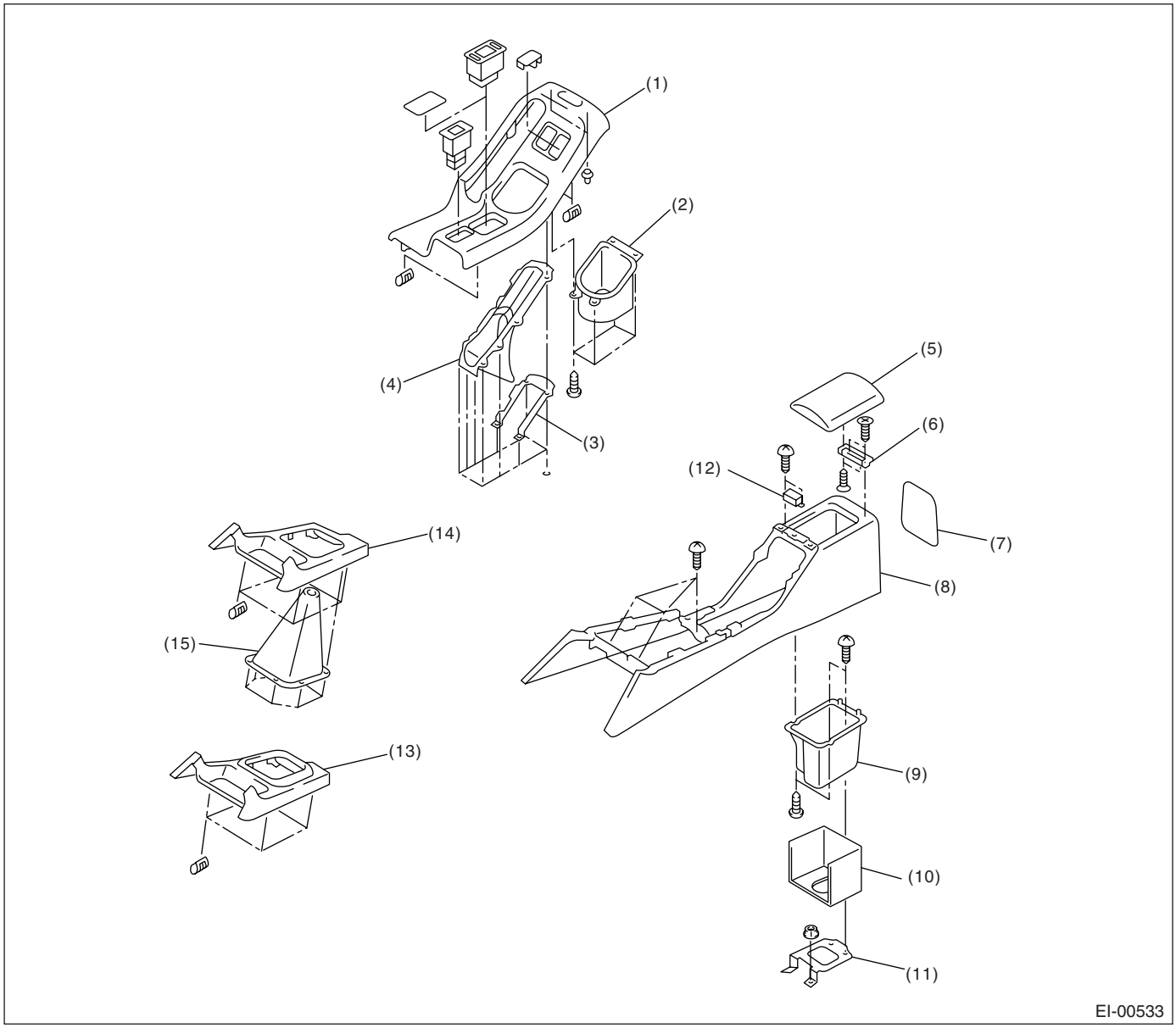
14.DOOR TRIM



(A) Front door trim
(B) Rear door trim
(C) Rear gate trim

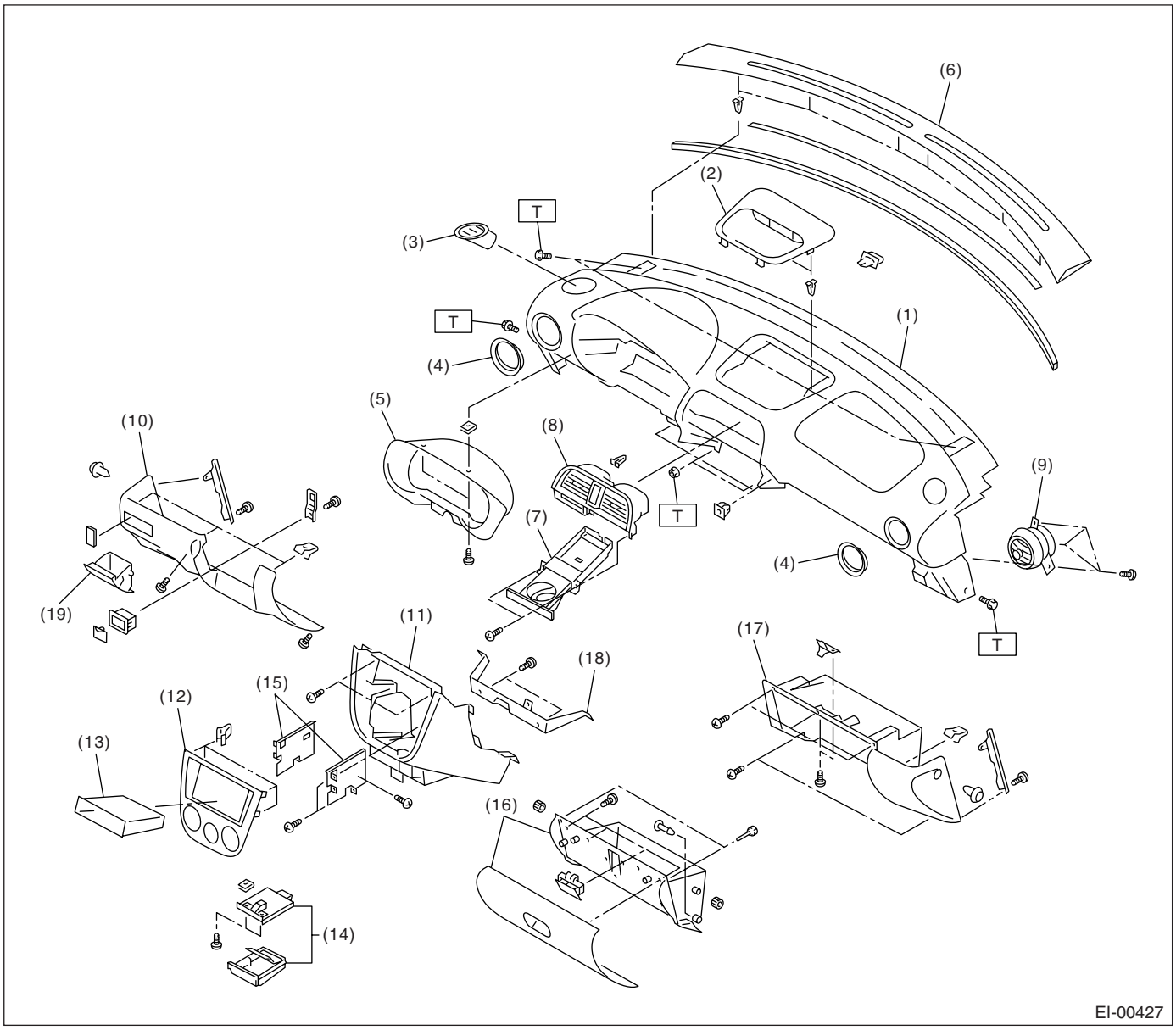
(1) Gusset cover
(2) Bracket
(3) Weather strip upper
(4) Clip
(5) Trim panel
(6) Power window switch cover
(7) Lower trim

15.CONSOLE BOX



(1) Console cover
(2) Cup holder
(3) Bracket
(4) Strip
(5) Upper lid
(6) Lid hinge
(7) Rear lid
(8) Console box
(9) Console pocket
(10) Upper bracket
(11) Lower bracket
(12) Lock
(13) Front cover (AT model)
(14) Front cover (MT model)
(15) Boot

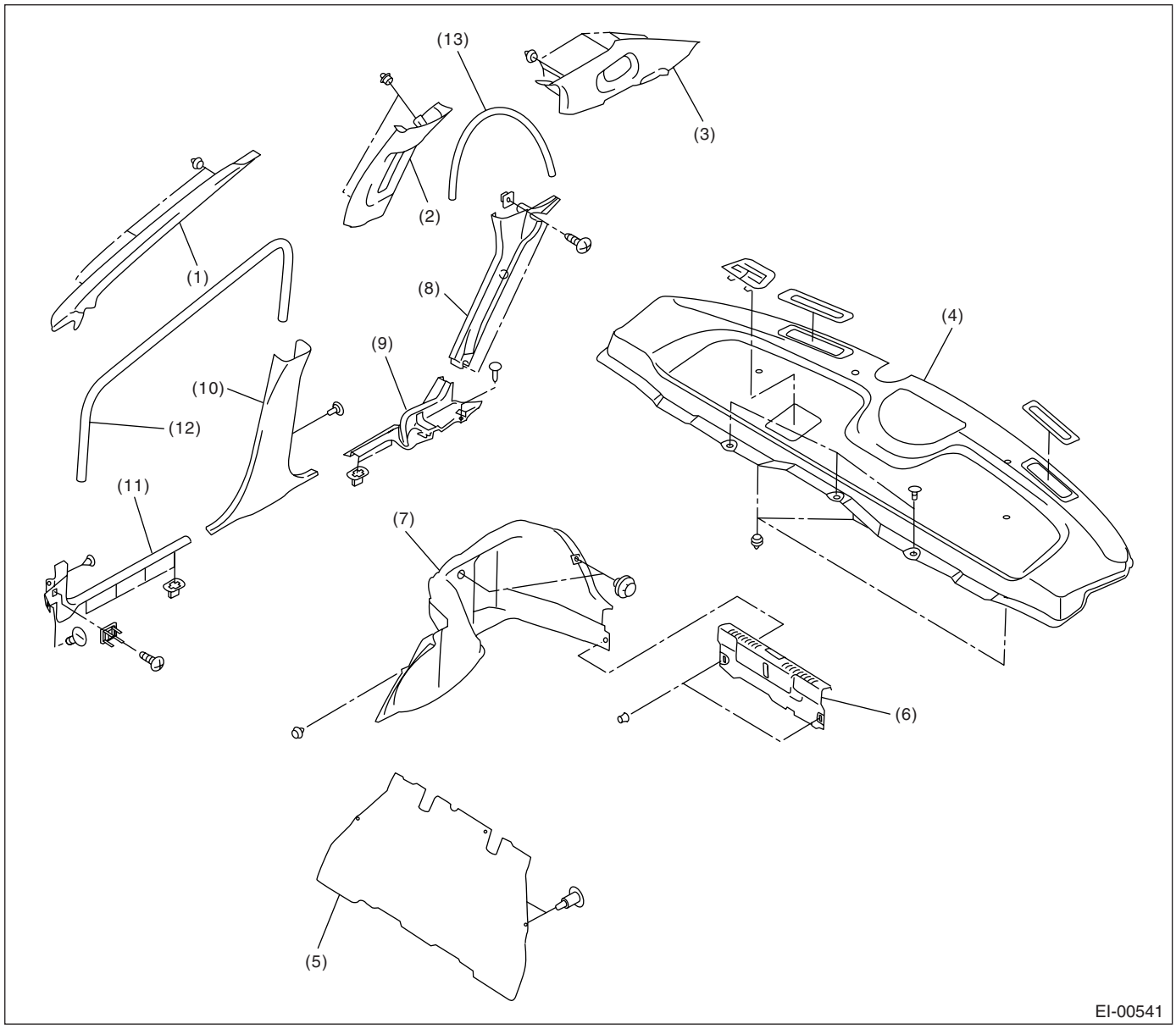
16.INSTRUMENT PANEL



(1) Pad & frame
(2) Center upper panel
(3) Air vent grille (defroster)
(4) Grille cover
(5) Meter visor
(6) Defroster grille
(7) Cup holder
(8) Air vent grille (center)
(9) Air vent grille (side)
(10) Instrument panel lower cover
(11) Console cover
(12) Center panel
(13) Center pocket
(14) Ash tray
(15) Audio bracket
(16) Glove box lid
(17) Glove box panel
(18) Console reinforcement
(19) Coin box

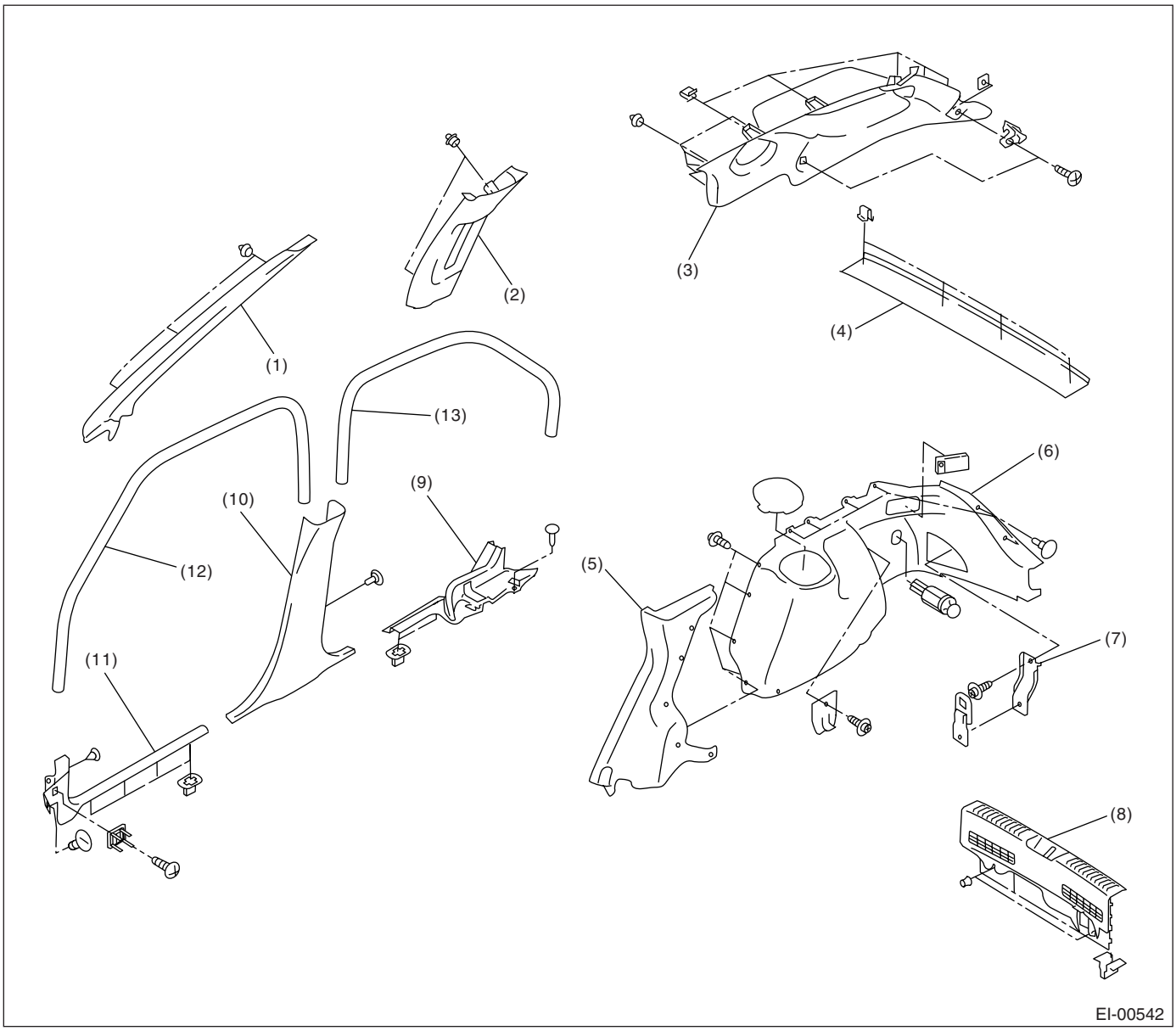
Tightening torque: N·m (kgf-m, ft-lb)
T: 7 (0.71, 5.2)

17.INNER TRIM (SEDAN MODEL)



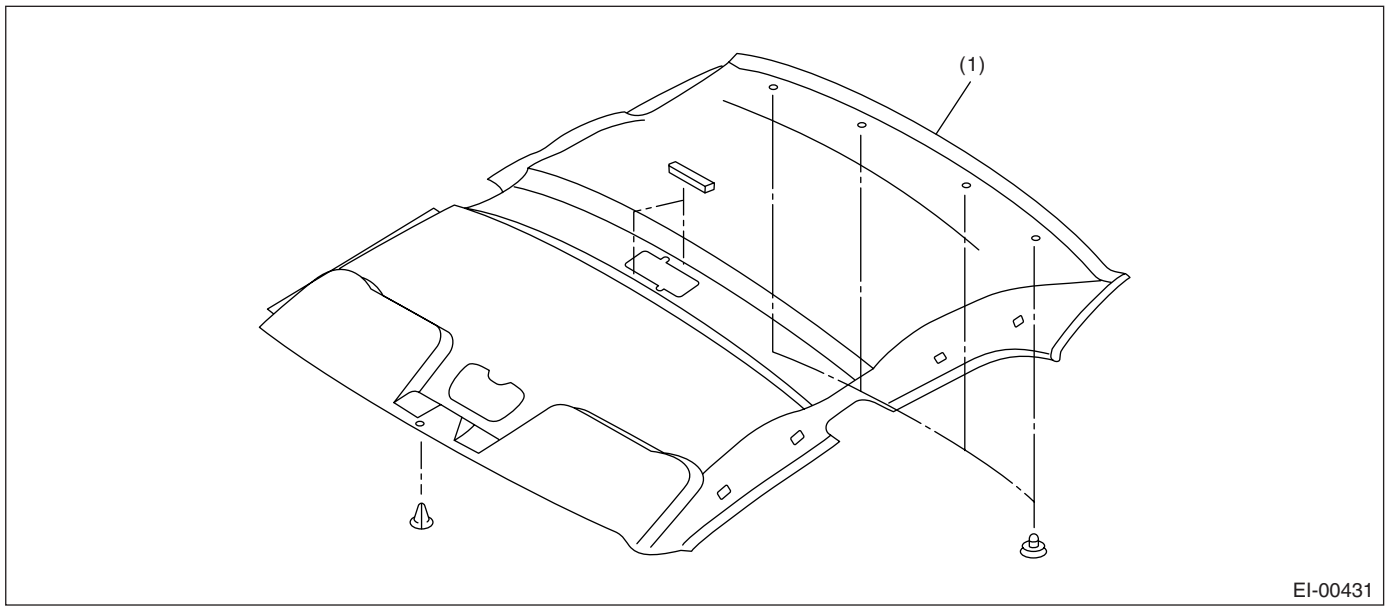
(1) Front pillar upper trim
(2) Center pillar upper trim
(3) Rear pillar upper trim
(4) Rear shelf trim
(5) Rear bulk trim
(6) Trunk rear trim
(7) Trunk side trim
(8) Rear pillar lower trim
(9) Side sill rear cover
(10) Center pillar lower trim
(11) Side sill front cover
(12) Front garnish
(13) Rear garnish

18.INNER TRIM (WAGON MODEL)



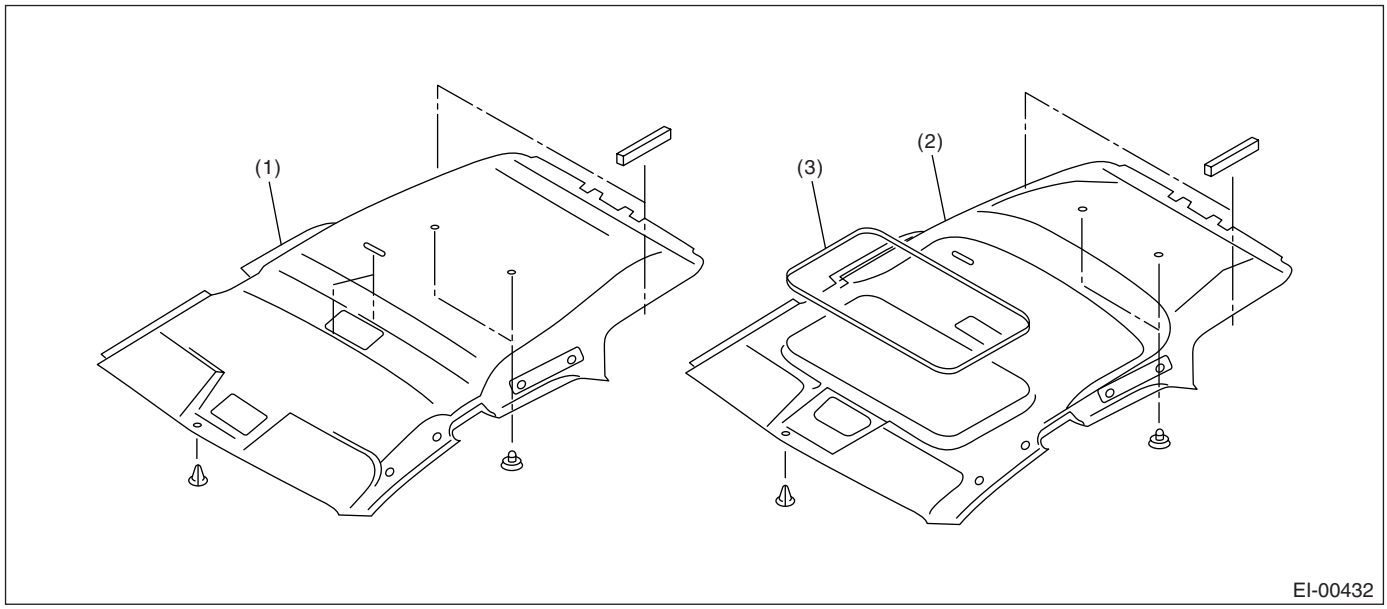
(1) Front pillar upper trim
(2) Center pillar upper trim
(3) Rear pillar upper trim
(4) Rear rail trim
(5) Rear pillar lower trim
(6) Rear quarter lower trim
(7) Hook
(8) Rear skirt trim
(9) Side sill rear cover
(10) Center pillar lower trim
(11) Side sill front cover
(12) Front garnish
(13) Rear garnish

19.ROOF TRIM (SEDAN MODEL)



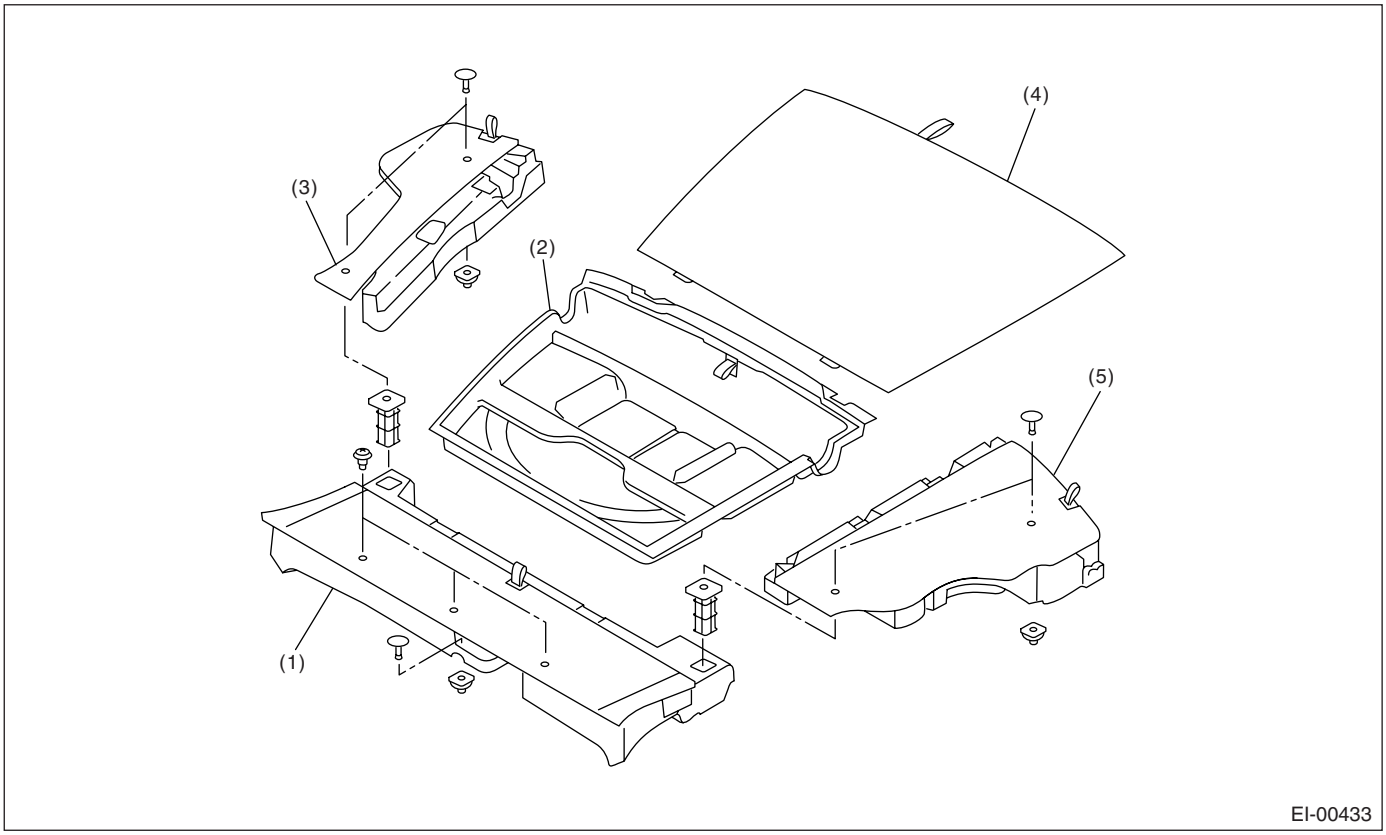
(1) Roof trim

20.ROOF TRIM (WAGON MODEL)



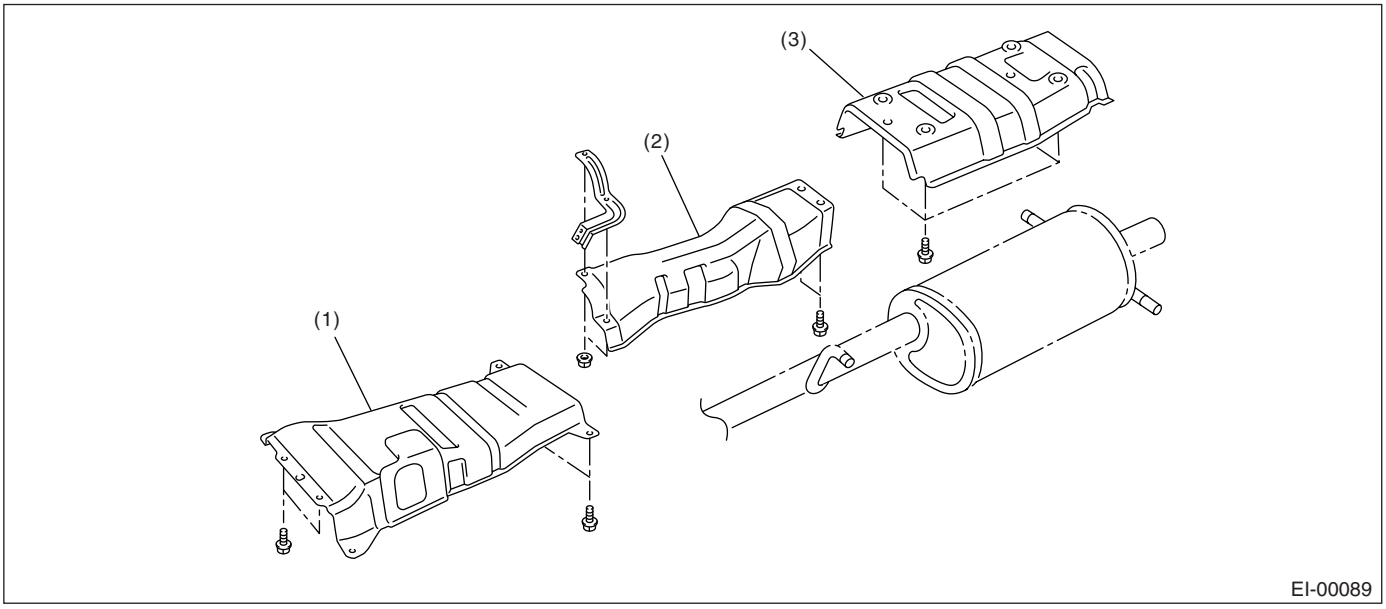
(1) Roof trim (2) Roof trim (Model with sun roof) (3) Sun roof garnish

21.LUGGAGE FLOOR MAT



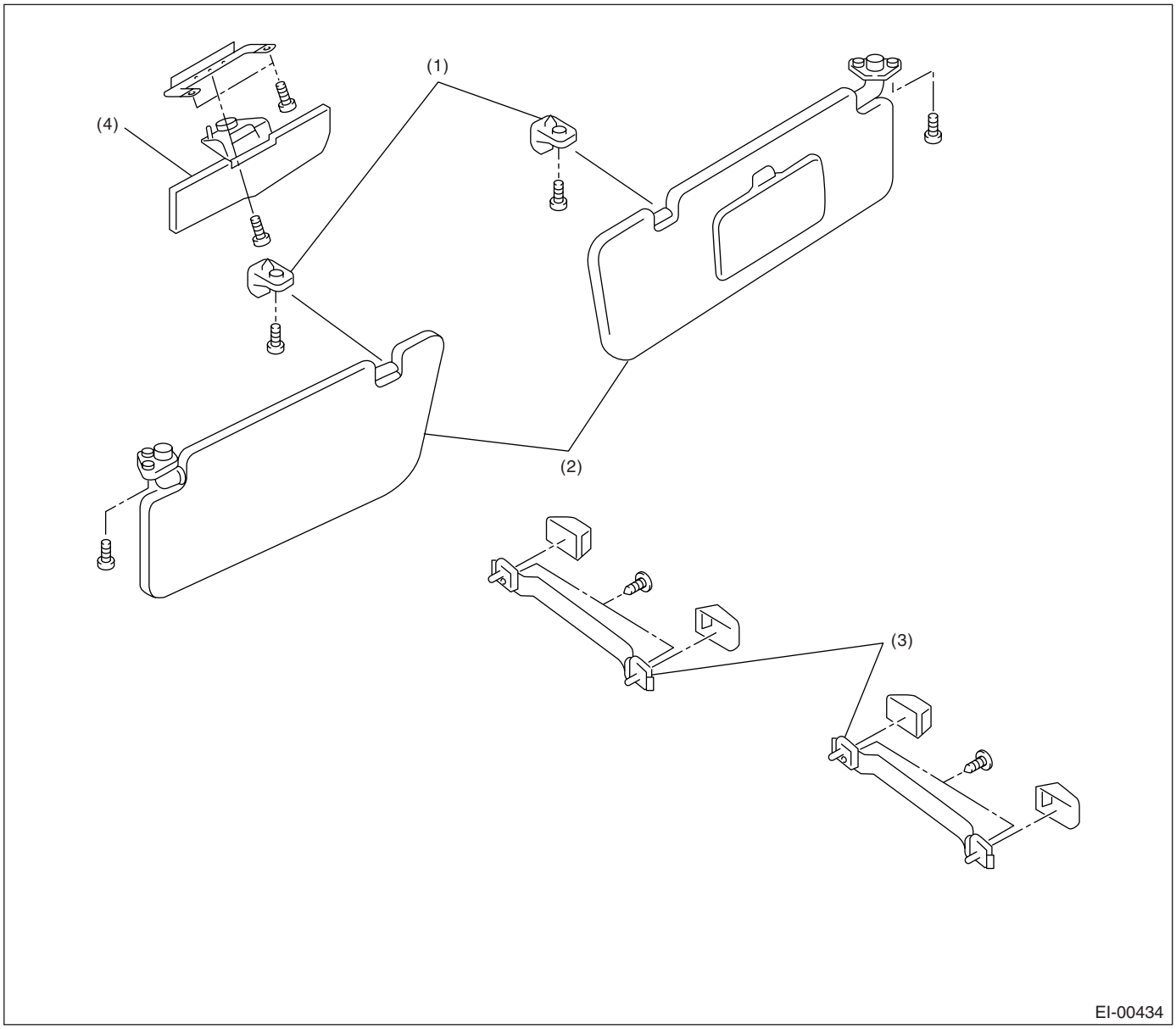
(1) Front floor mat
(2) Floor box
(3) Side floor mat (RH)
(4) Center floor mat
(5) Side floor mat (LH)

22.HEAT SHIELD COVER



(1) Front heat shield cover
(2) Center heat shield cover
(3) Rear heat shield cover

23.INNER ACCESSORIES



(1) Hook
(2) Sun visor
(3) Assist grip
(4) Center visor

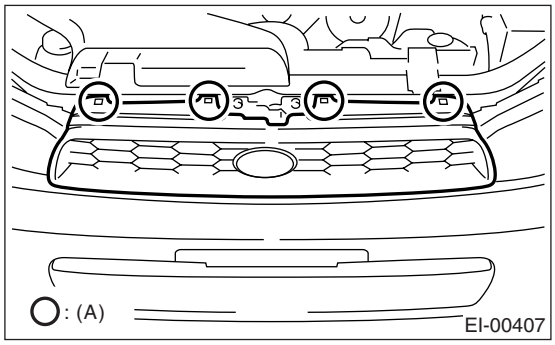
B: PREPARATION TOOL

TOOL NAME	REMARKS
Clip remover	Used for removal of trim.
Clip clamp pliers	Used for removal of various clips and clamps.

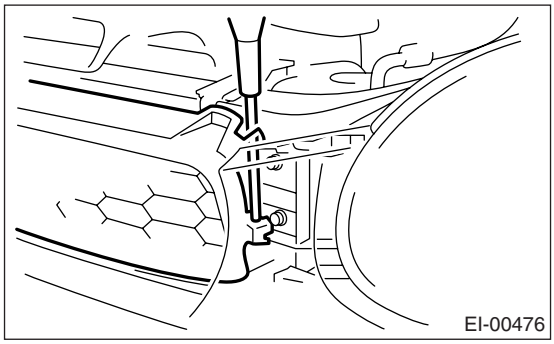
2. Front Grille

A: REMOVAL

1) Open the front hood.
2) Remove the four clips (A).



3) Remove the right and left hooks on the lower side.



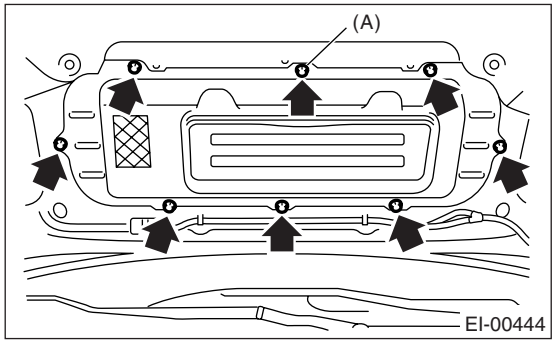
B: INSTALLATION

Install in the reverse order of removal.

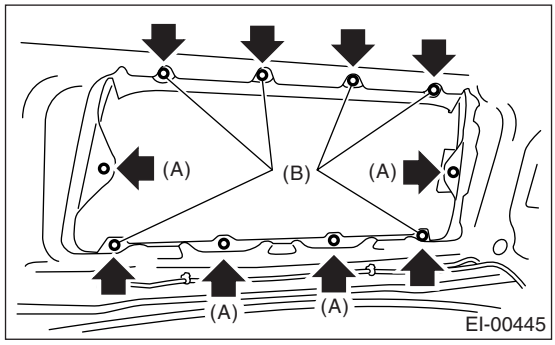
3. Hood Grille

A: REMOVAL

1) Remove the hood insulator.
2) Remove the seven bolts and clip (A) to remove the hood duct.

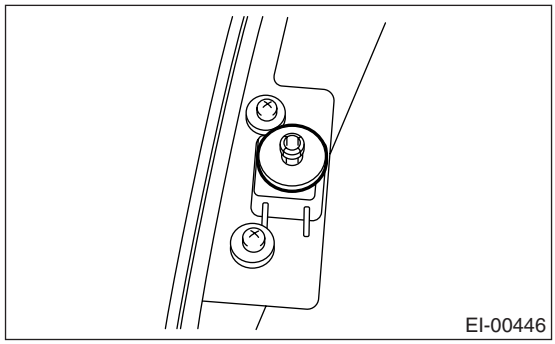


3) Loosen the six nuts (B), remove the four clips (A), and then remove the hood grille.



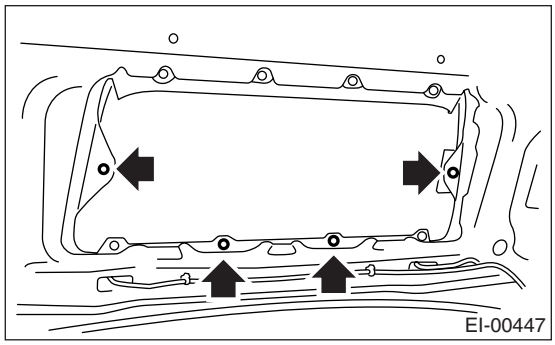
B: INSTALLATION

1) Replace the four clips with new ones.



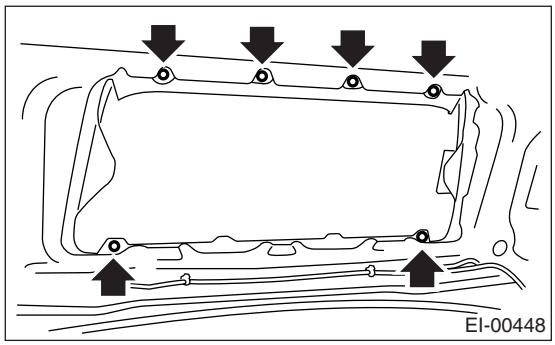
2) Engage the four clips of hood grille to front hood panel.

CAUTION:
Make sure that the anchor portion of each clip is firmly engaged.

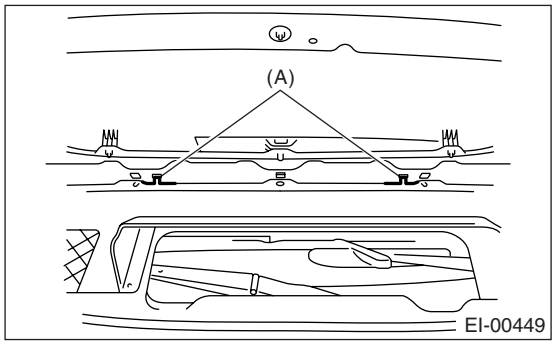


3) Install the five nuts.

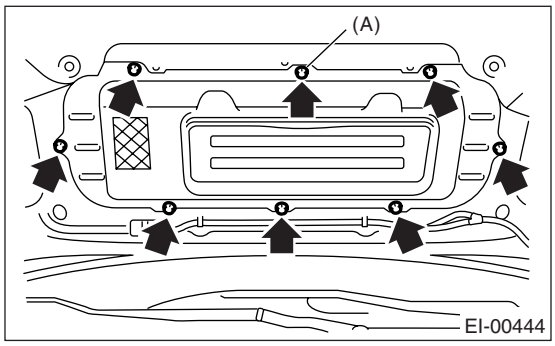
Tightening torque:
4.5 N·m (0.46 kgf-m, 3.32 ft-lb)



4) Catch the two hooks (A) of hood duct to hood holes.



5) Install the hood duct with clip (A) and seven bolts.



6) Install the hood insulator with new clips.

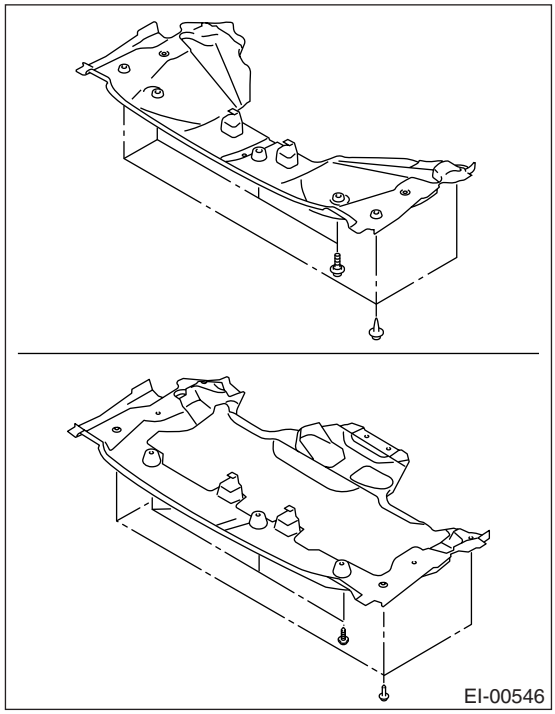
C: INSPECTION

Make sure that the clip is firmly engaged.
Make sure that there is no abnormal gap at whole periphery of hood grille.
Make sure that there is no damage on hood grille.

4. Front Under Cover

A: REMOVAL

1) Lift-up the vehicle.
2) Loosen the bolts and clips to remove the under cover.



B: INSTALLATION

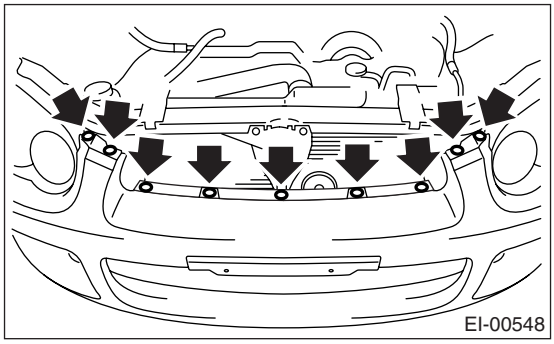
Install in the reverse order of removal.

Tightening torque:
14 N·m (1.42 kgf-m, 10.3 ft-lb)

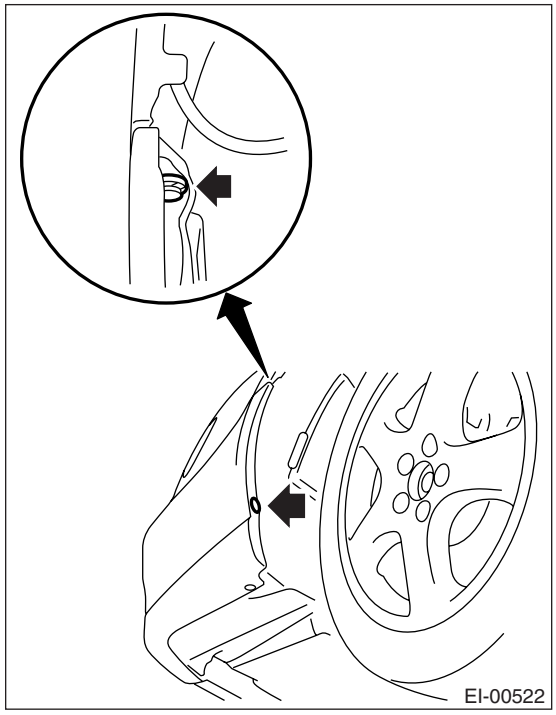
5. Front Bumper

A: REMOVAL

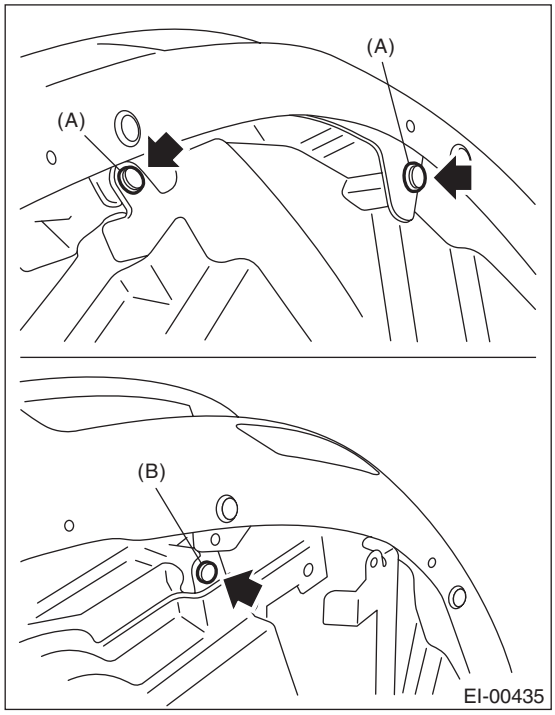
1) Disconnect the ground cable from battery.
2) Remove the front grille. <Ref. to EI-19, REMOVAL, Front Grille.>
3) Remove the nine clips on the upper part of bumper.



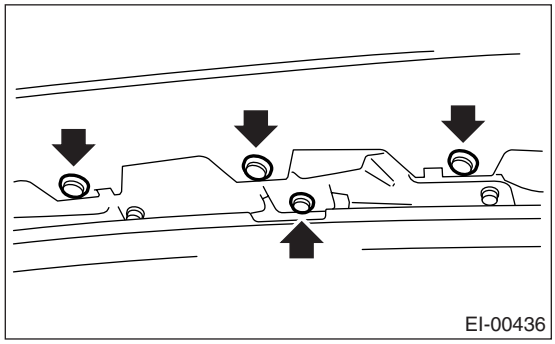
4) Turn over the mud guard, and then remove the clips (A) and (B), which secure the front bumper to fender.



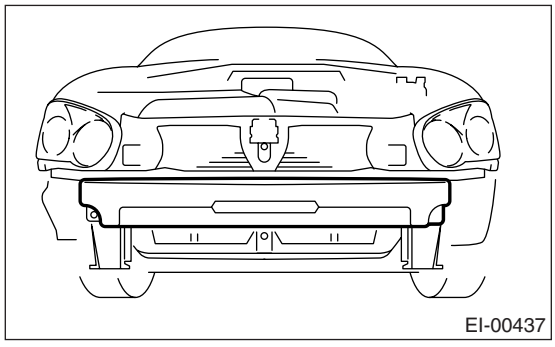
5) Remove the two clips (A), turn over the mud guard, and then remove the clip (B). (Conduct the same procedure on the right side.)



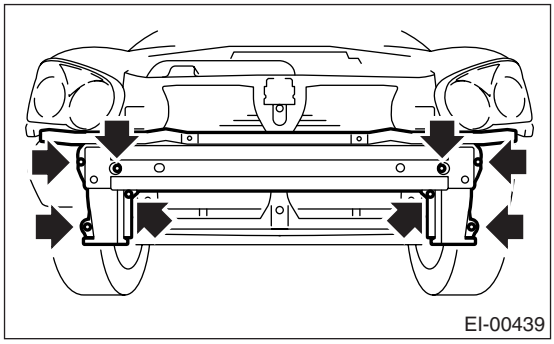
6) Remove the four clips in the center part of bumper.



7) Remove the fog light. <Ref. to LI-18, REMOVAL, Front Fog Light Assembly.>
8) Remove the bumper from body.
9) Remove the energy absorber foam.

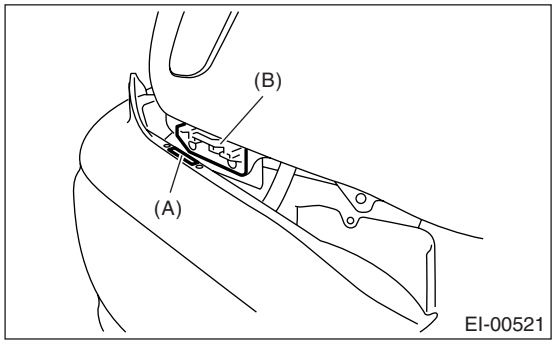


10) Loosen the bolt and nut, and then remove the bumper beam from body.



B: INSTALLATION

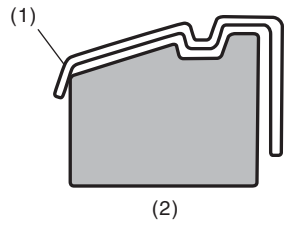
1) Install in the reverse order of removal.
2) Secure the slider (A) to guide plate (B).



Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to EI-4, FRONT BUMPER, COMPONENT, General Description.>

C: REPAIR

1. COATING METHOD FOR PP BUMPER

Process No.	Process name	Job contents	
1	Bumper mounting	Set the bumper on paint worktable if required. Use paint worktable conforming to inner shape of bumper when possible.	 EI-00234 (1) Bumper (2) Set bumper section
2	Masking	Mask specified part (black base) with masking tape. Use masking tape for PP (example, Nichiban No. 533, etc.).	
3	Degreasing, cleaning	Clean all parts to be painted with white gasoline, normal alcohol, etc. to remove dirt, oil, fat, etc.	
4	Primer paint	Apply primer one to all parts to be painted, using air gun. Use primer (clear).	
5	Drying	Dry at normal temperature [10 to 15 min. at 20°C (68°F)]. In half-dried condition, PP primer paint is dissolved by solvent, e.g. thinner, etc. Therefore, if dust or dirt must be removed, use ordinary alcohol, etc.	
6	Top coat paint (I)	Solid color	Metallic color
		Use section (block) paint for top coat. • Paint in use (for each color): Solid paint Hardener PB Thinner T-301 • Mixing ratio: Main agent vs. hardener = 4:1 • Viscosity: 10 — 13 sec/20°C (68°F) • Film thickness: 35 — 45μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)	Use section (block) paint for top coat. • Paint in use (for each color): Metallic paint Hardener PB Thinner T-306 • Mixing ratio: Main agent vs. hardener = 10:1 • Viscosity: 10 — 13 sec/20°C (68°F) • Film thickness: 15 — 20μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)
7	Drying	Not required.	Dry at normal temperature [10 min. or more at 20°C (68°F)]. In half-dried condition, avoid dust, dirt.
8	Top coat paint (II)	Not required.	Apply a clear coat to parts with top coat paint (I), three times, at 5 — 7 minutes intervals. • Paint in use: Metallic paint Hardener PB Thinner T-301 • Mixing ratio: Clear vs. hardener = 6:1 • Viscosity: 14 — 16 sec/20°C (68°F) • Film thickness: 25 — 30μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)
9	Drying	60°C (140°F), 60 min. or 80°C (176°F), 30 min. If higher than 80°C (176°F), PP may be deformed. Keep maximum temperature of 80°C (176°F).	
10	Inspection	Paint check.	
11	Masking removal	Remove the masking in process No. 2.	

2. REPAIR INSTRUCTIONS FOR COLORED PP BUMPER

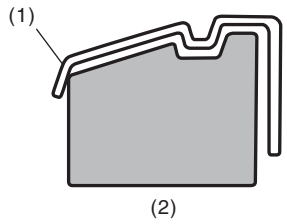
NOTE:
All PP bumpers are provided with a grained surface, and if the surface is damaged, it cannot normally be restored to its former condition. Damage limited to shallow scratches that cause only a change in the lustre of the base material or coating, can be almost fully restored. Before repairing a damaged area, explain this point to the customer and get an understanding about the matter. Repair methods are outlined below, based on a classification of the extent of damage.
1) Minor damage causing only a change in the lustre of the bumper due to a light touch
Almost restorable.

<table>
<tr><th>Process No.</th><th>Process name</th><th colspan="2">Job contents</th></tr>
<tr><td>1</td><td>Cleaning</td><td colspan="2">Clean the area to be repaired using water.</td></tr>
<tr><td>2</td><td>Sanding</td><td colspan="2">Grind the repairing area with #500 sand paper in a “feathering” motion.</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Finish</td><td>Resin section</td><td>Coated section</td></tr>
<tr><td>Repeatedly apply wax to the affected area using a soft cloth (such as flannel). Recommended wax: NITTO KASEI Soft 99 TIRE WAX BLACK, or equivalent.</td><td rowspan="2">Perform either the same operation as for the resin section or process No. 18 and subsequent operations in the “3)” section, depending on the degree and nature of damage.</td></tr>
<tr><td>Polish the waxed area with a clean cloth after 5 to 10 minutes.</td></tr>
</table>

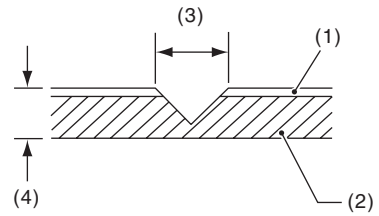
2) Deep damage caused by scratching fences, etc.
A dent cannot be repaired but a whitened or swelled part can be removed.

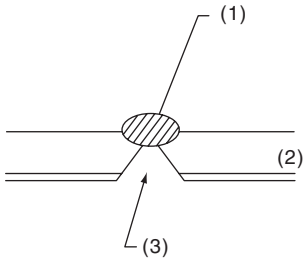
<table>
<tr><th>Process No.</th><th>Process name</th><th colspan="2">Job contents</th></tr>
<tr><td>1</td><td>Cleaning</td><td colspan="2">Clean the damaged area with water.</td></tr>
<tr><td>2</td><td>Removal of damaged area</td><td colspan="2">Cut off protruding area, if any, due to collision, using a putty knife.</td></tr>
<tr><td>3</td><td>Sanding</td><td colspan="2">Grind the affected area with #100 to #500 sand paper.</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Finish</td><td>Resin section</td><td>Coated section</td></tr>
<tr><td>Same as Process No. 3 in the “1)” section.</td><td>Perform Process No. 12 and subsequent operations in the “3)” section.</td></tr>
</table>

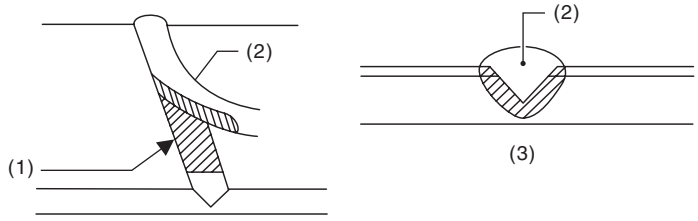
3) Deep damage such as a break or hole that requires filling
Much of the peripheral grained surface must be sacrificed for repair, and the degree of restoration is not really worth the expense. (The surface, however, will become almost flush with adjacent areas.)
Recommended repair kit: PP Part Repair Kit (NRM)

<table>
<tr><th>Process No.</th><th>Process name</th><th colspan="2">Job contents</th></tr>
<tr><td>1</td><td>Bumper removal</td><td colspan="2">Remove the bumper as required.</td></tr>
<tr><td>2</td><td>Part removal</td><td colspan="2">Remove the parts built into bumper as required.</td></tr>
<tr><td>3</td><td>Bumper placement</td><td>Place the bumper on a paint worktable as required.
It is recommended that contour of worktable accommodate internal shape of bumper.</td><td> 

EI-00234
(1) Bumper
(2) Set bumper section</td></tr>
<tr><td>4</td><td>Surface preparation</td><td colspan="2">Remove dust, oil, etc. from areas to be repaired and surrounding areas, using a suitable solvent (NRM No. 900 Precleno, white gasoline, or alcohol).</td></tr>
</table>

<table>
<tr><th>Process No.</th><th>Process name</th><th colspan="2">Job contents</th></tr>
<tr><td>5</td><td>Cutting</td><td>If nature of damage are cracks or holes, cut a guide slit of 20 to 30 mm (0.79 to 1.18 in) in length along the crack or hole up to the bumper's base surface. Then, bevel or "vee-out" the affected area using a knife or grinder.</td><td> 

EI-00235
(1) Paint surface
(2) PP base surface
(3) 20 — 30 mm (0.79 — 1.18 in)
(4) 3 mm (0.12 in)</td></tr>
<tr><td>6</td><td>Sanding (I)</td><td colspan="2">Grind beveled surface with sand paper (#40 to #60) to smooth finish.</td></tr>
<tr><td>7</td><td>Cleaning</td><td colspan="2">Clean the sanded surface with the same solvent as used in Process No. 4.</td></tr>
<tr><td rowspan="2">8</td><td rowspan="2">Temporary welding</td><td colspan="2">Grind the side just opposite the beveled area with sand paper (#40 to #60) and clean using a solvent.
Temporarily spot-weld the side, using a PP welding rod and heater gun.</td></tr>
<tr><td colspan="2"> 

EI-00236
(1) Welded spot (Use heater gun and PP welding rod)
(2) PP base surface
(3) Beveled section
NOTE:
• Do not melt the welding rod until it flows out. This results in reduced strength.
• Leave the welded spot unattended until it cools completely.</td></tr>
<tr><td rowspan="2">9</td><td rowspan="2">Welding</td><td colspan="2">Using a heater gun and PP welding rod, weld the beveled spot while melting the rod and damaged area.</td></tr>
<tr><td colspan="2"> 

EI-00237
(1) Melt hatched area
(2) Welding rod
(3) Section
NOTE:
• Melt the sections indicated by hatched area.
• Do not melt the welding rod until it flows out, in order to provide strength.
• Always keep the heater gun 1 to 2 cm (0.4 to 0.8 in) away from the welding spot.
• Leave the welded spot unattended until it cools completely.</td></tr>
</table>

Process No.	Process name	Job contents	
10	Sanding (II)	Remove excess part of weld with a putty knife. If a drill or disc wheel is used instead of the knife, operate it at a rate lower than 1,500 rpm and grind the excess part little by little. A higher rpm will cause the PP substrate to melt from the heat.	
		EI-00042	
		Sand the welded spot smooth with #240 sand paper.	
11	Masking	Mask the black substrate section using masking tape. Recommended masking tape: Nichiban No. 533 or equivalent	
12	Cleaning/ degreasing	Completely clean the entire coated area, using solvent similar to that used in Process No. 4.	
13	Primer coating	Apply a coat of primer to the repaired surface and its surrounding areas. Mask these areas, if necessary. Recommended primer: Mp/ 364 PP Primer NOTE: Be sure to apply one coat of primer at a spraying pressure of 245 to 343 kPa (2.5 to 3.5 kg/cm^2, 36 to 50 psi) with a spray gun.	
14	Leave unattended.	Leave the repaired area unattended at 20°C (68°F) for 10 to 15 minutes until primer is half-dry. NOTE: If dirt or dust comes in contact with the coated area, wipe it off with a cloth impregnated with alcohol. (Do not use thinner since the coated area tends to melt.)	
15	Primer surfacer coating	Apply a coat of primer surfacer to the repaired area two or three times at an interval of 3 to 5 minutes. Recommended surfacer: • UPS 300 Flex Primer • No. 303 UPS 300 Exclusive hardener • NPS 725 Exclusive Reducer (thinner) • Mixing ratio: 2: 1 (UPS 300: No. 303) • Viscosity: 12 — 14 sec/20°C (68°F) • Coated film thickness: 40 — 50μ	
16	Drying	Allow the coated surface to dry for 60 minutes at 20°C (68°F) [or 30 minutes at 60°C (140°F)].	
17	Sanding (III)	Sand the coated surface and its surrounding areas using #400 sand paper and water.	
18	Cleaning/ degreasing	Same as Process No. 12.	
19	Top coat (I)	Solid color	Metallic color
		Use a “block” coating method. • Recommended paint: Suncryl (SC) No. 307 Flex Hardener SC Reducer (thinner) • Mixing ratio: 3: 1 Suncryl (SC) vs. No. 307 Flex Hardener • Viscosity: 11 — 13 sec/20°C (68°F) • Coated film thickness: 40 — 50μ • Spraying thickness: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)	Use a “block” coating method. • Recommended paint: Suncryl (SC) No. 307 Flex Hardener SC Reducer (thinner) • Mixing ratio: 3: 1 Suncryl (SC) vs. No. 307 Flex Hardener • Viscosity: 11 — 13 sec/20°C (68°F) • Coated film thickness: 20 — 30μ • Spraying thickness: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)

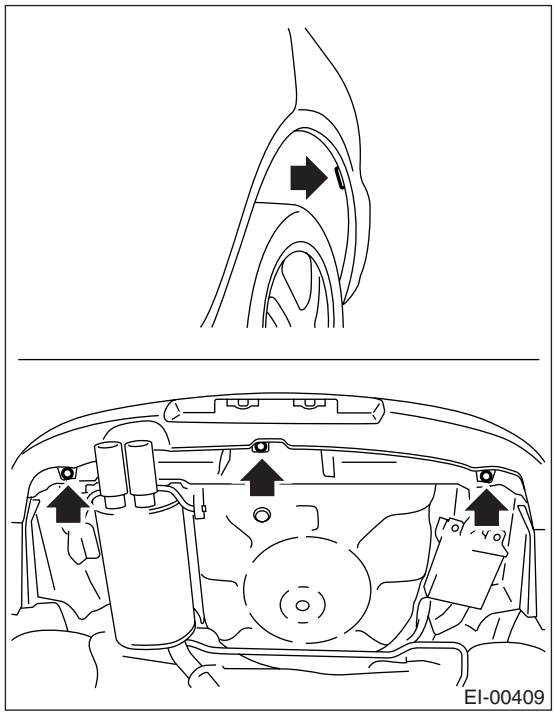
Process No.	Process name	Job contents	
20	Leave unattended.	Not required.	Leave unattended at 20°C (68°F) for at least 10 minutes until the topcoated area is half-dry. NOTE: Be careful to keep dust or dirt from coming in contact with the affected area.
21	Top coat (II)	Not required.	Apply a clear coat three times at an interval of 3 to 5 minutes. • Recommended paint: SC710 Overlay Clear No. 307 Flex Hardener SC Reducer (thinner) • Mixing ratio: 3: 1 Suncryl (SC) vs. No. 307 Flex Hardener • Viscosity: 10 — 13 sec/20°C (68°F) • Coated film thickness: 20 — 30μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm^2, 36 — 50 psi)
22	Drying	Allow the coated surface to dry at 20°C (68°F) for two hours or 60°C (140°F) for 30 minutes. NOTE: Do not allow the temperature to exceed 80°C (176°F) since this will deform the PP substrate.	
23	Inspection	Carefully check the condition of the repaired area.	
24	Masking removal	Remove the masking tape applied in Process No. 11 and 13.	
25	Parts installation	Install the parts on bumper in reverse order of removal.	
26	Bumper installation	Install the bumper.	

6. Rear Bumper

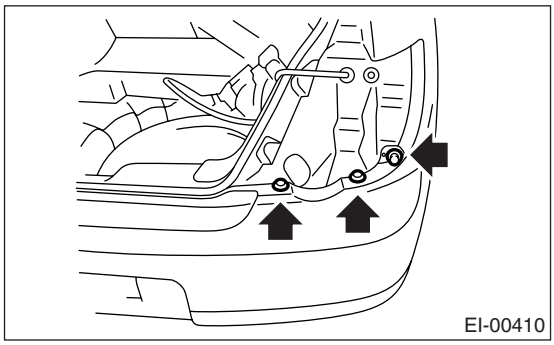
A: REMOVAL

1. WAGON MODEL

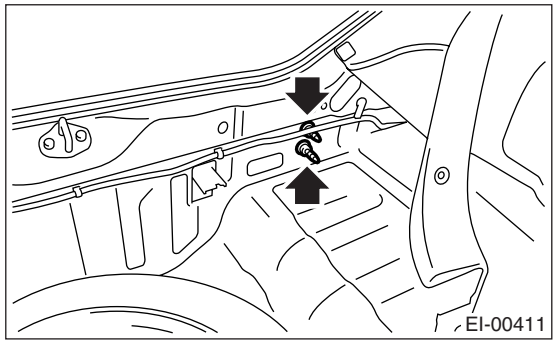
1) Disconnect the ground cable from battery.
2) Remove the bolt inside wheel house (both sides), and the clips on lower side of bumper.



3) Remove the rear combination light assembly. <Ref. to LI-20, REMOVAL, Rear Combination Light Assembly.>
4) Remove the screw and two clips (both sides).

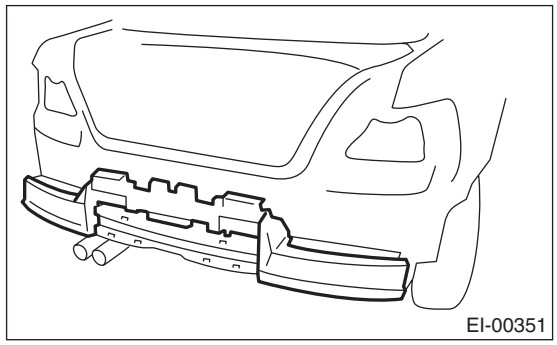


5) Remove the floor box.
6) Remove the rear skirt trim.
7) Turn over the rear quarter lower trims on both sides, and then loosen the four nuts.

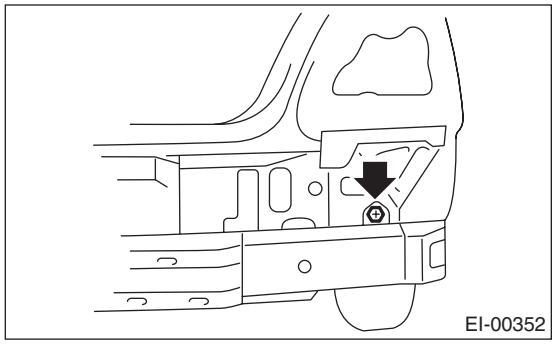


8) Disconnect the license plate light connector, and then remove the rear bumper.
9) Remove the E/A FORM from bumper beam.

CAUTION:
E/A FORM may easily break. Do not apply excessive force to it during removal.

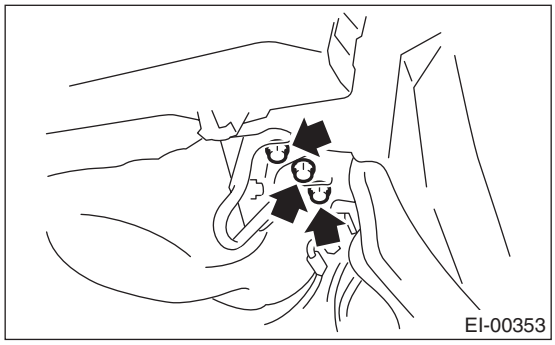


10) Remove the bolt.

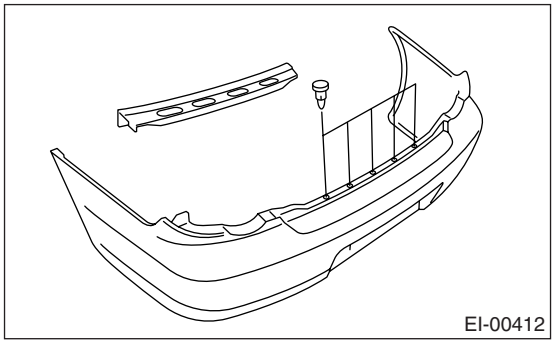


11) Remove the three bolts, then remove the bumper beam.

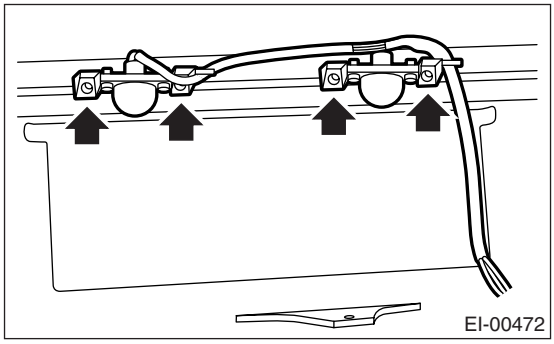
NOTE:
In the case of right side, remove the canister first. Loosen the bolt, and then remove the bumper beam.


EI-00353

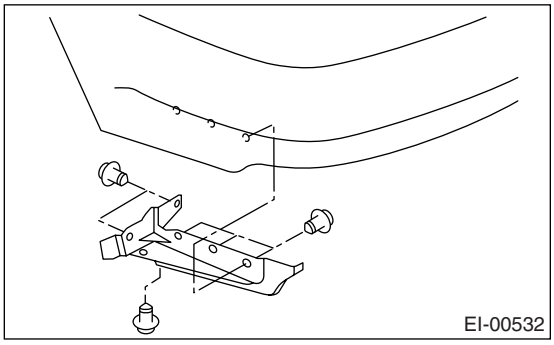
12) Remove the five clips, and then remove the bumper upper beam.


EI-00412

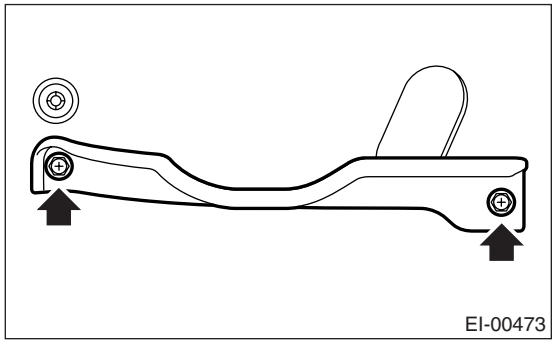
13) Remove the license plate light.


EI-00472

14) Remove the six clips, and then remove the bumper side cover.


EI-00532

15) Remove the upper bracket from body.


EI-00473

2. SEDAN MODEL

Refer to description about removal of rear bumper of wagon model. <Ref. to EI-30, WAGON MODEL, REMOVAL, Rear Bumper.>

B: INSTALLATION

1. WAGON MODEL

Install in the reverse order of removal.

Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to EI-5, REAR BUMPER, COMPONENT, General Description.>

2. SEDAN MODEL

Install in the reverse order of removal.

Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to EI-5, REAR BUMPER, COMPONENT, General Description.>

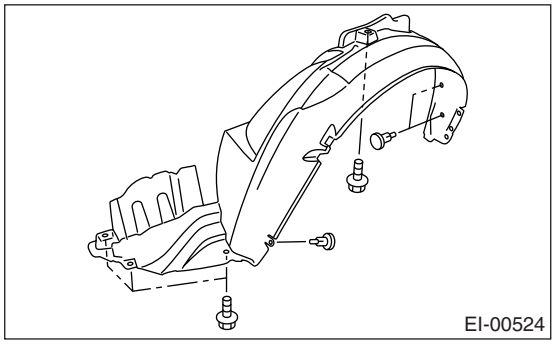
C: REPAIR

Refer to description about repair of front bumper. <Ref. to EI-23, REMOVAL, Front Bumper.>

7. Mud Guard

A: REMOVAL

1) Jack-up the vehicle.
2) Remove the screws and clips to remove mud guard.



B: INSTALLATION

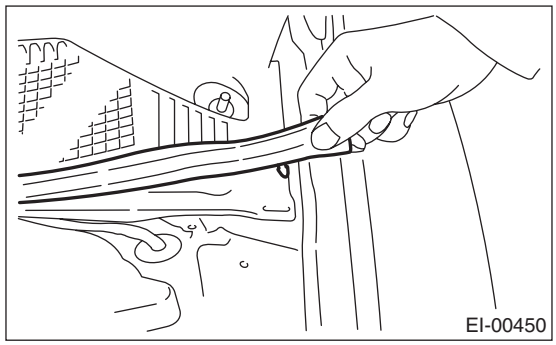
Insert the hook into body, and tighten it with screw and clip.

Tightening torque:
14 N·m (1.42 kgf-m, 10.3 ft-lb)

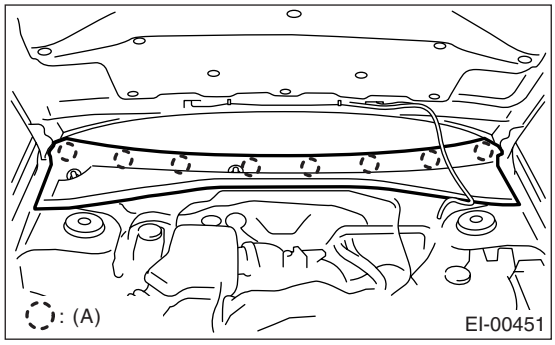
8. Cowl Panel

A: REMOVAL

1) Open the front hood.
2) Remove the wiper arm. <Ref. to WW-11, REMOVAL, Front Wiper Arm.>
3) Remove the front panel seal.



4) Disengage the clips (A) to remove the cowl panel.



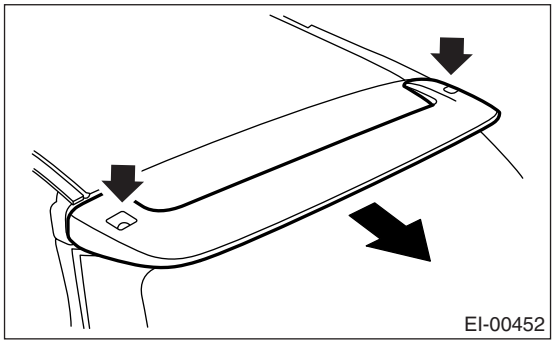
B: INSTALLATION

Install in the reverse order of removal.

9. Roof Spoiler

A: REMOVAL

1) Remove the bolt cap, and then remove the two bolts.
2) Remove the roof spoiler.



B: INSTALLATION

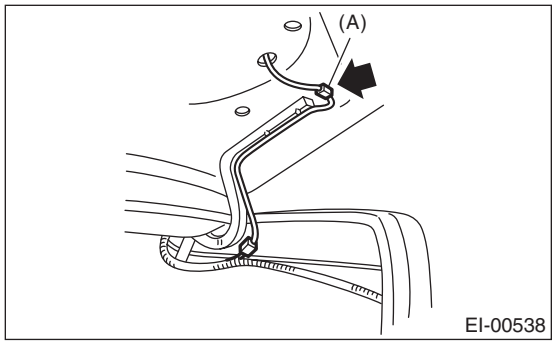
Install in the reverse order of removal.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.46 ft-lb)

10.Rear Spoiler

A: REMOVAL

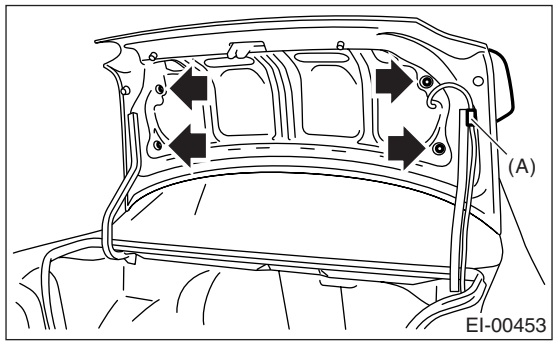
1) Disconnect the ground cable from battery.
2) Open the trunk lid.
3) Remove the electrical connector (A) of high mount stop light.



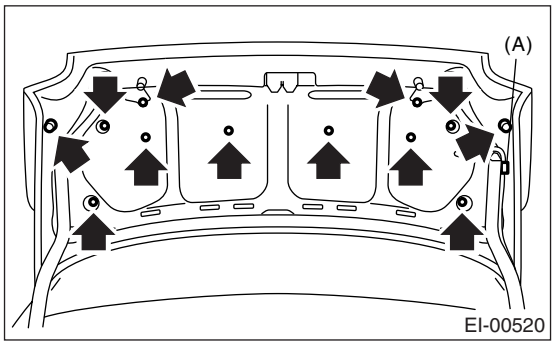
4) Loosen the mounting nut of rear spoiler to remove rear spoiler.

CAUTION:
• When removing the nut, do not drop it into trunk lid.
• Pay attention to avoid damage during removal or installation.

Small-sized rear spoiler: Four tightening positions, two clips



Large-sized rear spoiler: Twelve tightening positions, four clips



B: INSTALLATION

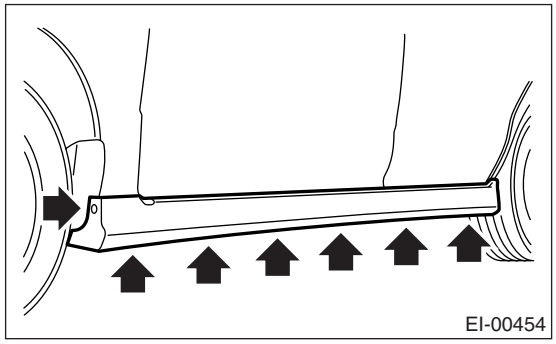
1) Install in the reverse order of removal.
2) Clean the mounting surfaces of trunk lid and spoiler before installation.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.46 ft-lb)

11.Side Sill Spoiler

A: REMOVAL

Remove the clips (one on front fender arch, six on bottom of side sill spoiler), then remove the side spoiler.

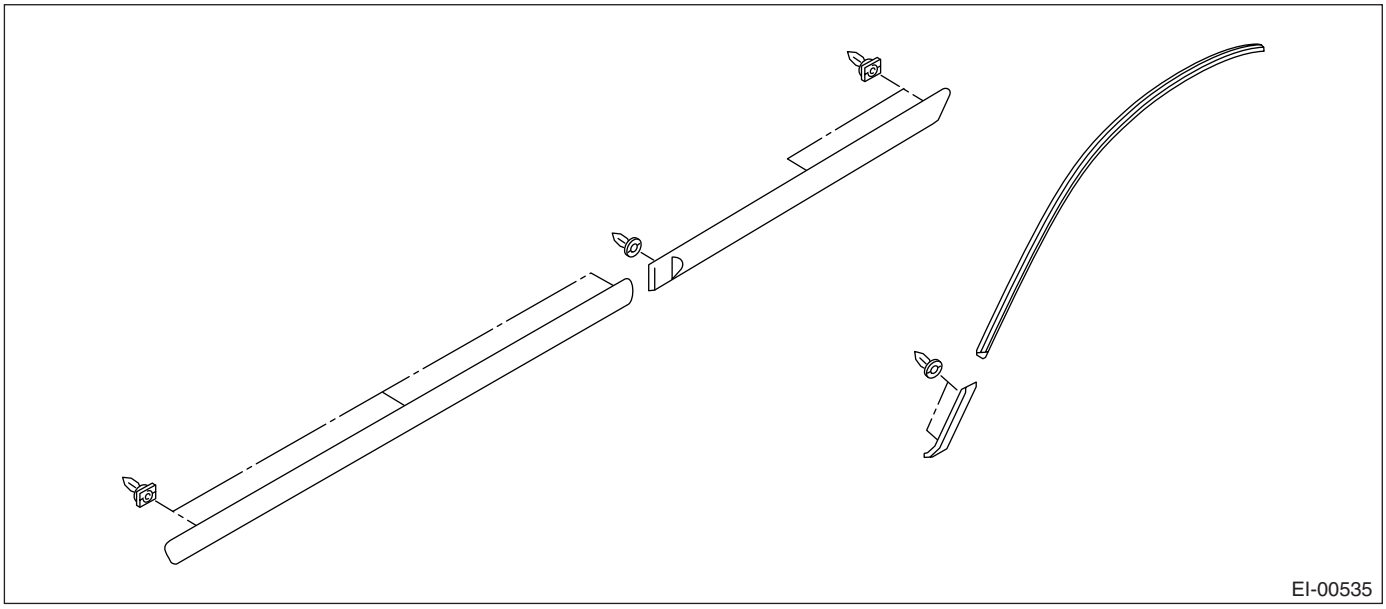


B: INSTALLATION

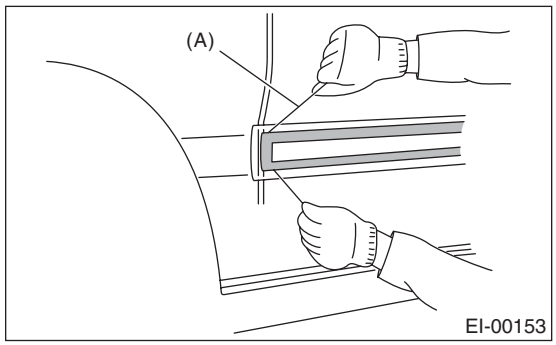
Install in the reverse order of removal.

12.Protector

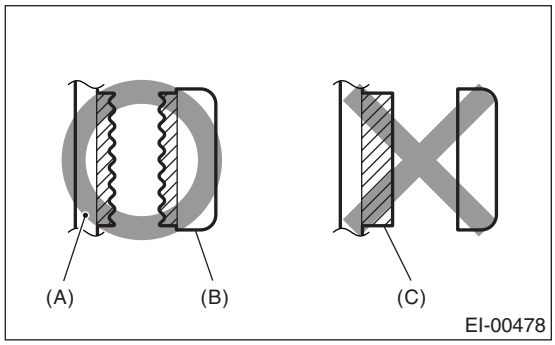
A: REMOVAL



1) Slide in a thin thread (A) of 0.8 mm (0.031 in) diameter or less (fishing line etc.) between body and protector, and then remove the protector detaching double-sided tape. Remove the protector using clip remover.



NOTE:
• To optimize the effect of solvent, slide the thread along the body without removing the double-sided tape on surface of body and spoiler.
• If it is difficult to detach the double-sided tape, warm up to approx. 40°C (104°F).
• If the double-sided tape remains thick on surface due to interfacial peeling, apply the solvent after slicing off the double-sided tape using a cutter.



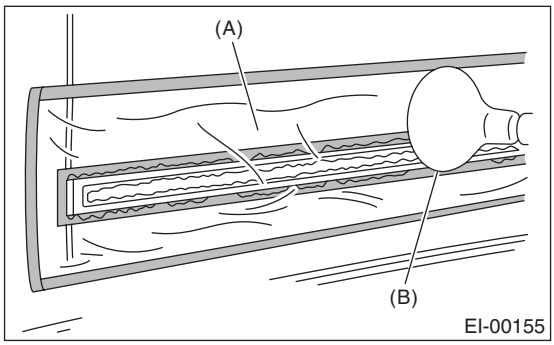
(A) Panel
(B) Spoiler
(C) Double-sided tape

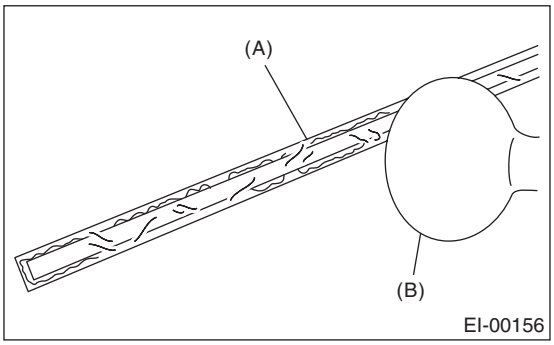
2) Adhere the masking tape around the double-sided tape remaining on surface of body and spoiler.
3) Apply the solvent uniformly on double-sided tape using a brush.

CAUTION:
• Do not use the solvent to body which is repaired with lacquer paint.
• Wipe off immediately when the solvent is touched on surface of body and spoiler.

Solvent:
3M 8907 or equivalent

4) Cover the area where solvent is applied using plastic wrap (A), and then heat the double-sided tape for 5 to 10 minutes in 40 to 60°C (104 to 140°F) using a heat lamp (B).



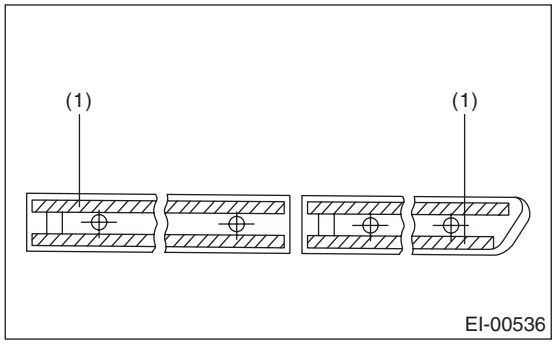


CAUTION:
Do not heat the double-sided tape until the surface becomes white and excessively dried.

5) Remove the double-sided tape using a plastic spatula.
6) After completely removing the double-sided tape, detach the masking tape and clean the surface using a cotton cloth waste damped with white gasoline.

B: INSTALLATION

1) Apply the primer to protector surface where the double-sided tape is adhered, and then adhere the double-sided tape as shown in the figure.



(1) Double-sided tape; thickness: 1.2 mm (0.047 in), width: 5 mm (0.197 in)

Primer:
3M K-500 or equivalent

Double-sided tape:
3M 5531-5 or equivalent

2) Heat the adhering part using a heat lamp.
Body side: 40 — 60°C (104 — 140°F)
Protector side: 20 — 30°C (68 — 86°F)
3) Detach the double-sided tape backing sheet, align to clip position, and then adhere to body using care to avoid air entering.

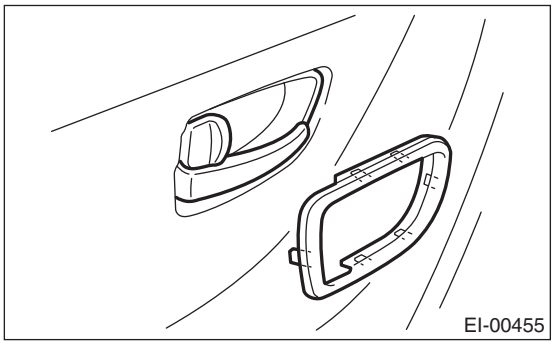
CAUTION:
To keep the adhesion, do not wash the vehicle within 24 hours.

13.Front Door Trim

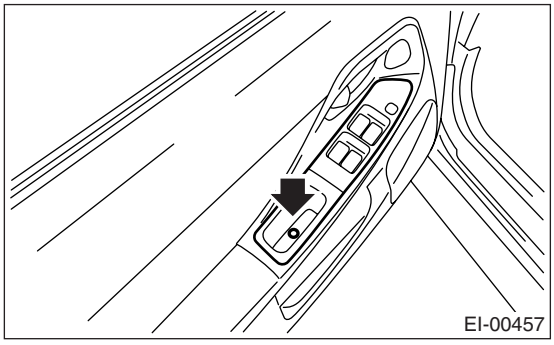
A: REMOVAL

CAUTION:
Do not apply excessive force to the clip. Otherwise the clip may be broken.

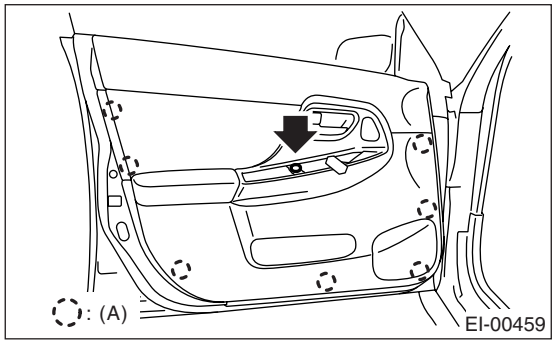
1) Disconnect the ground cable from battery.
2) Pull the inner remote cover toward you to remove upper hook. Pull down it to remove the lower hook. Remove the inner remote cover.



3) Remove the screw.
4) Remove the power window switch assembly and disconnect the harness connector.



5) Remove the screw.
6) Remove the clips (A) of trim panel using clip remover to remove the trim panel.



B: INSTALLATION

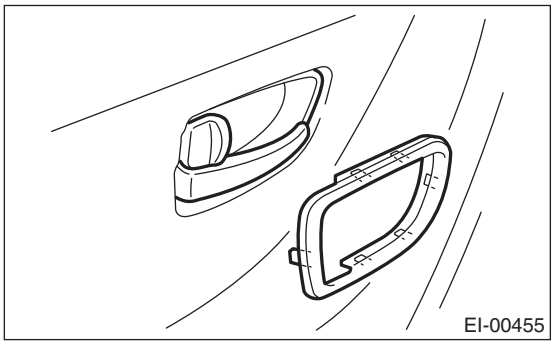
Install in the reverse order of removal.

14.Rear Door Trim

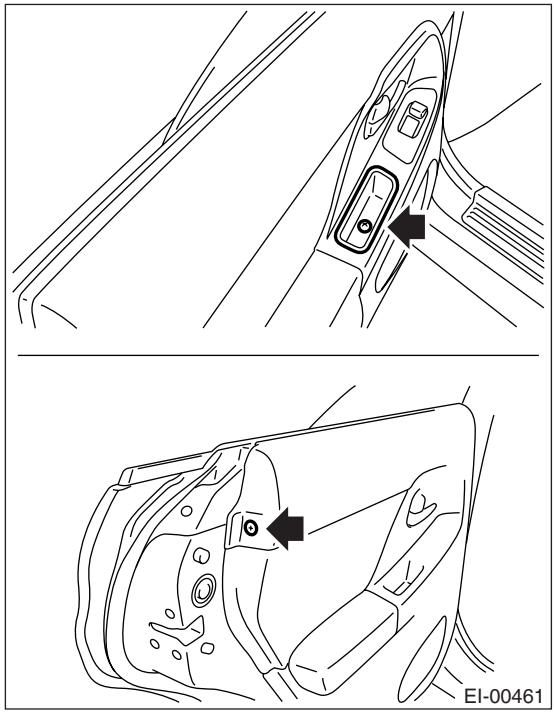
A: REMOVAL

CAUTION:
Do not apply excessive force to the clip. Otherwise the clip may be broken.

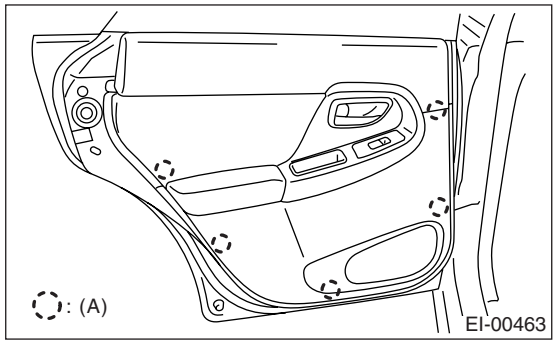
1) Disconnect the ground cable from battery.
2) Pull the inner remote cover toward you to remove the upper hook. Pull it down to remove the lower hook. Remove the inner remote cover.



3) Remove the screw and clip.



4) Remove the clips (A) of trim panel using clip remover to remove the trim panel.
5) Disconnect the power window harness connector.



(A) Clip

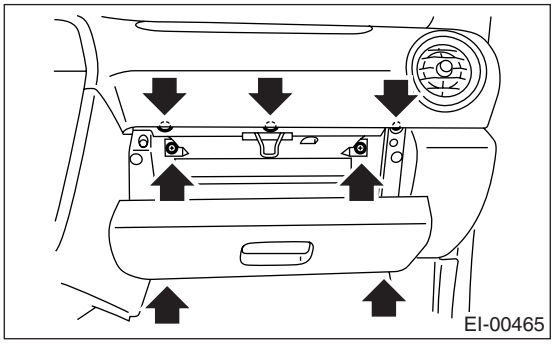
B: INSTALLATION

Install in the reverse order of removal.

15.Glove Box

A: REMOVAL

1) Open the glove box.
2) Loosen the screws to remove the glove box.



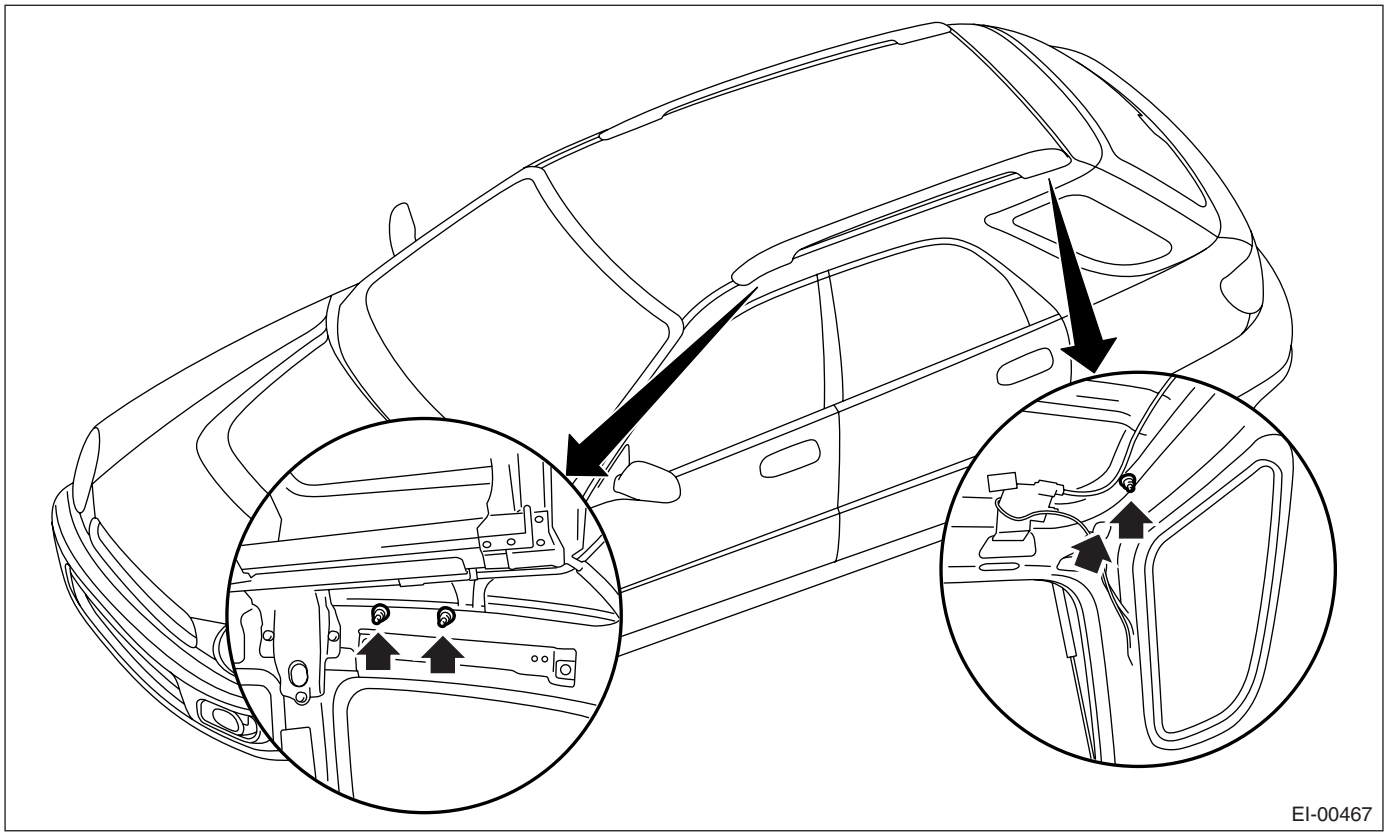
B: INSTALLATION

Install in the reverse order of removal.

16.Roof Rail

A: REMOVAL

1) Remove the roof trim. <Ref. to EI-52, REMOVAL, Roof Trim.>
2) Remove the four mounting nuts, and then detach the roof rail carefully.



B: INSTALLATION

Install in the reverse order of removal.

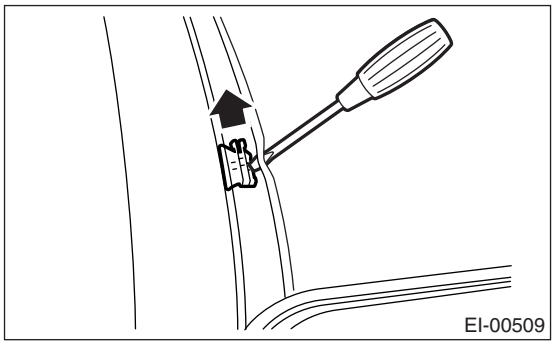
CAUTION:
Be careful not to scratch the body panels with roof rail stud bolts when removing and installing them.

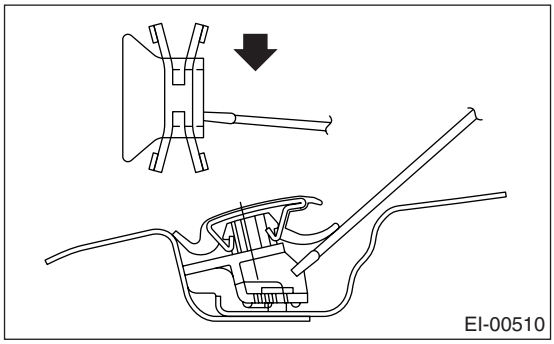
Tightening torque:
7.4 N·m (0.75 kgf-m, 5.46 ft-lb)

17.Roof Molding

A: REMOVAL

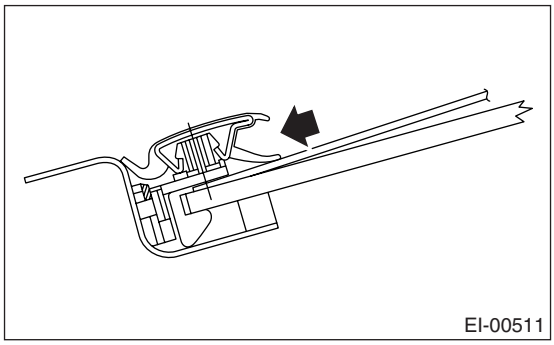
1) Turn over the edge of roof molding, and then remove it by sliding the internal clip using a flat tip screwdriver.
RH: Slide the molding toward the rear side of vehicle.
LH: Slide the molding toward the front side of vehicle.





Sedan model: six clips
Wagon model: eight clips

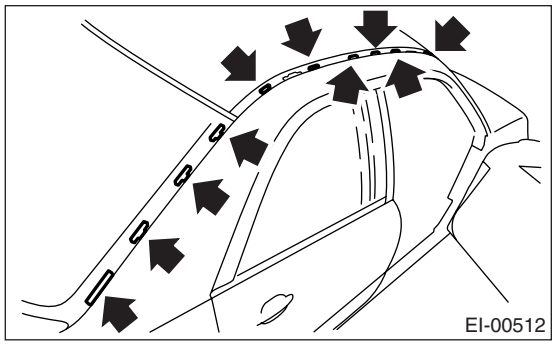
2) For sedan model, remove four clips of rear pillar. Turn over the roof molding on rear glass side, insert a board of about 0.5 mm (0.020 in) thickness into clearance between roof molding and glass, and then remove the claw of internal clip.



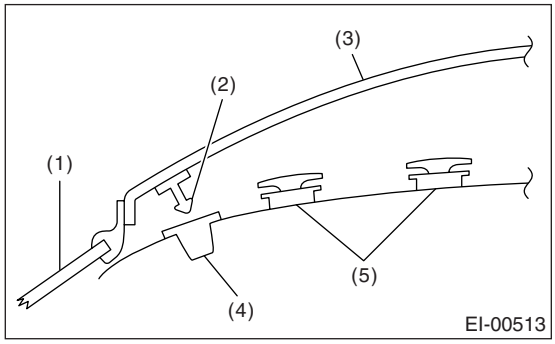
B: INSTALLATION

1) Remove the clip of roof and rear pillar (sedan model) from roof molding, and then install it to body side.

CAUTION:
Make sure to replace the clips broken when removing the roof molding with new ones.



2) Put the front edge of roof molding onto front window molding, and insert the front locating pin into body side cap.



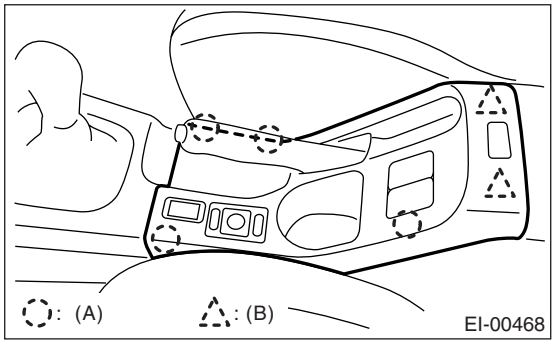
(1) Front window
(2) Locating pin
(3) Roof molding
(4) Cap
(5) Clip (roof)

3) Install the roof molding to body, by pushing the roof molding from above being careful not to deform it.

18.Console Box

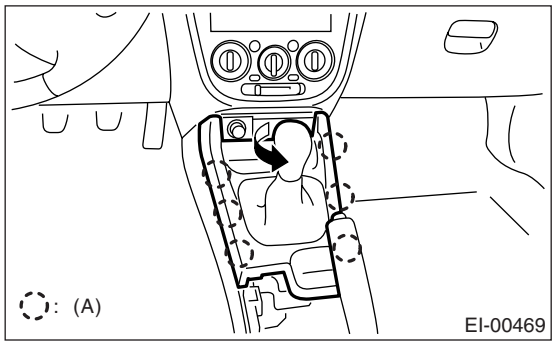
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the console cover.



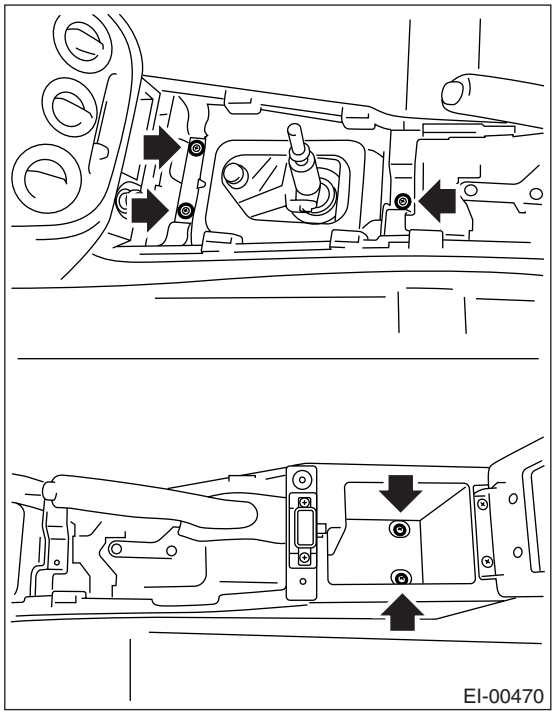
(A) Hook pawl
(B) Clip

3) Remove the shift knob (MT model) and front cover.



(A) Hook pawl

4) Loosen the screws to remove the console box.



B: INSTALLATION

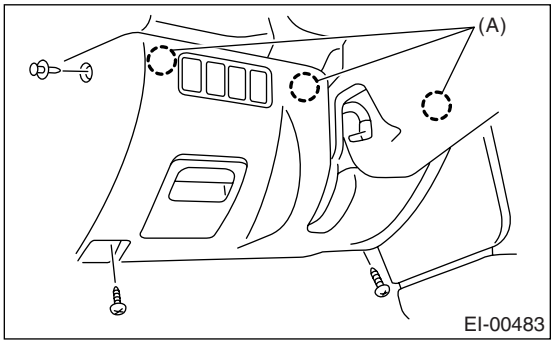
Install in the reverse order of removal.

19.Instrument Panel Assembly

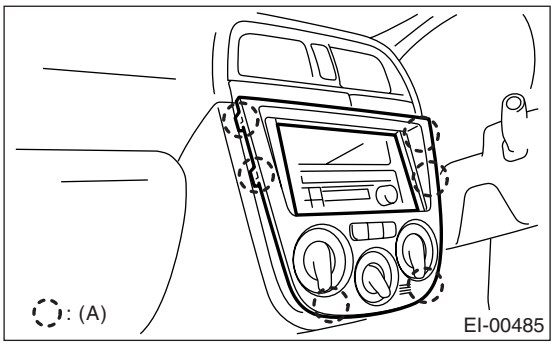
A: REMOVAL

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical equipment on these circuits.
• Be careful not to damage the airbag system harness when servicing the instrument panel.

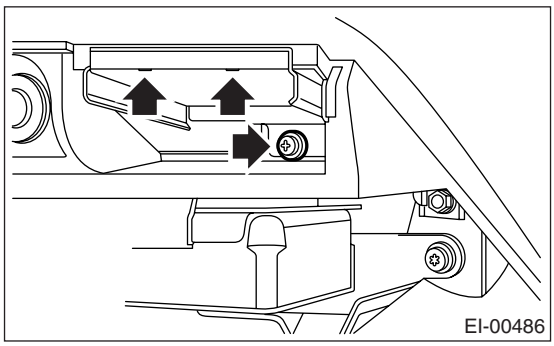
1) Disconnect the ground cable from battery.
2) Loosen the screws, remove the clip (A), disconnect the connectors, and then remove the instrument panel lower cover.



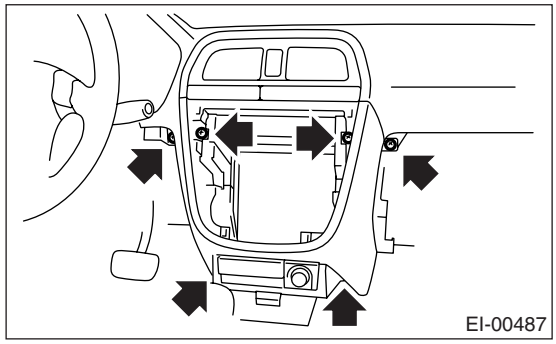
3) Remove the clip (A), and then remove the center console panel.



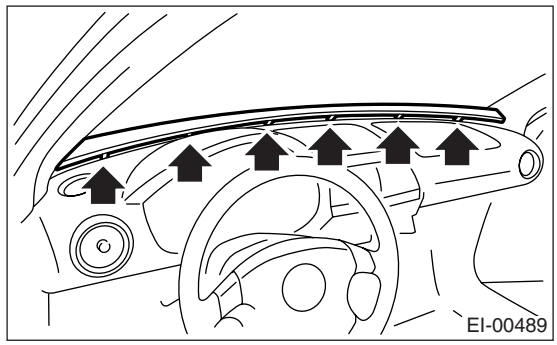
4) Remove the glove box. <Ref. to EI-41, REMOVAL, Glove Box.>
5) Remove the passenger's airbag module. <Ref. to AB-13, Passenger's Airbag Module.>
6) Remove the ashtray, and then remove the three screws.



7) Loosen the four screws and two nuts, and then remove the lower console panel.

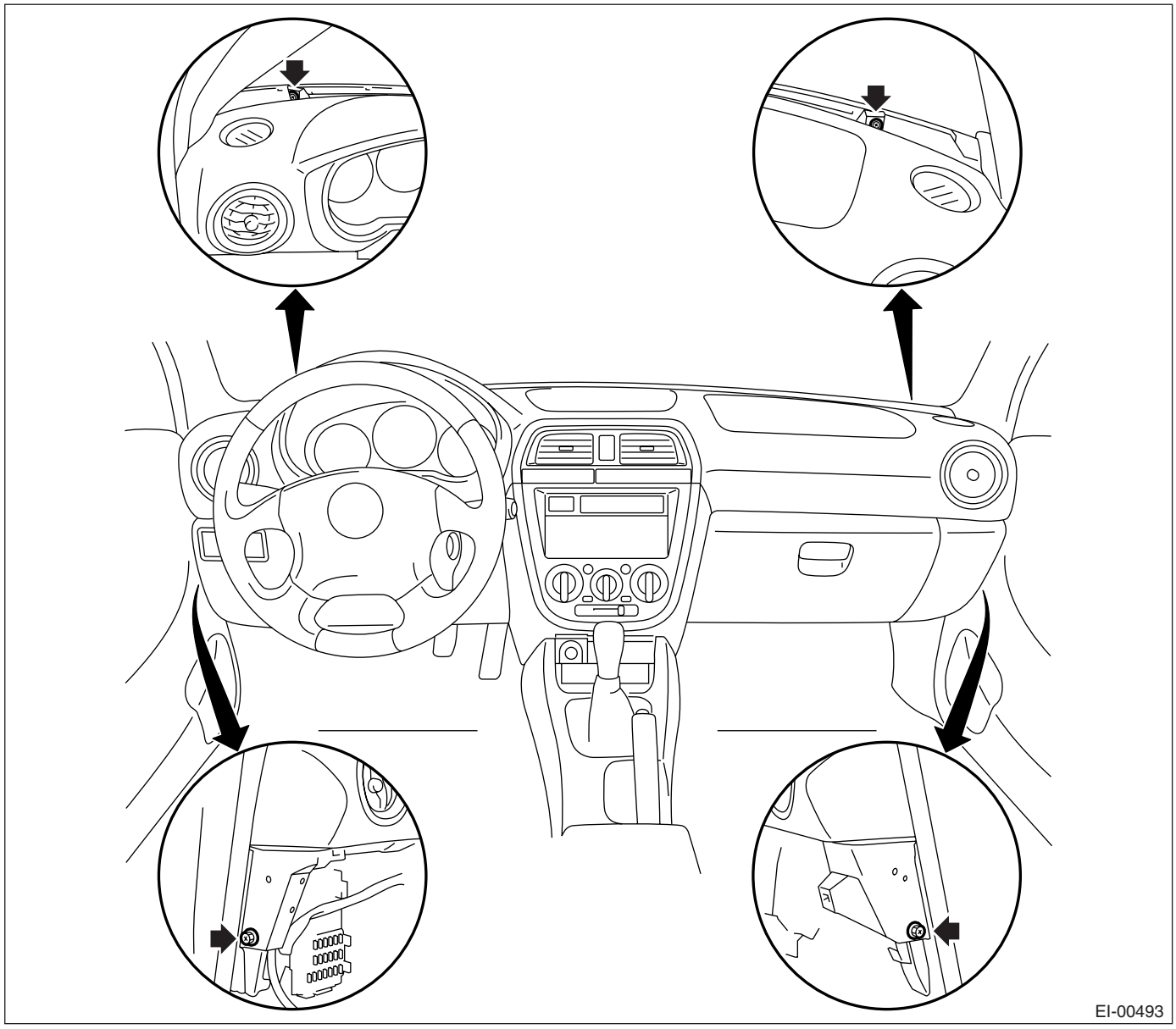


8) Remove the hook, and then remove the defroster panel.



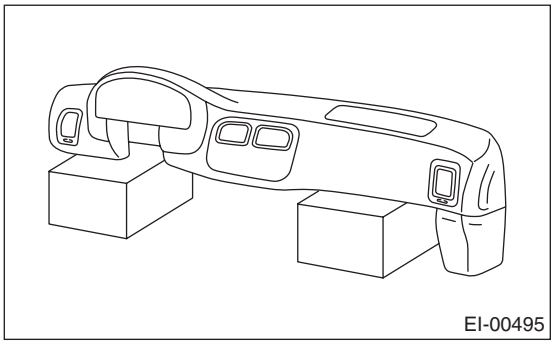
9) Remove the front pillar upper trim. <Ref. to EI-48, REMOVAL, Upper Inner Trim.>
10) Disconnect the two connectors, and then loosen the nuts.

11) Remove the instrument panel installation bolts.



12) Check that all the harness is disconnected, and then remove the instrument panel from vehicle.

NOTE:
• Put alignment marks as necessary, in order to facilitate the reassembly.
• When storing the removed instrument panel, place it standing up on the floor.

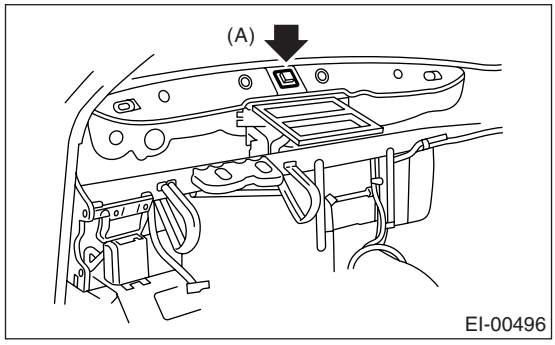

EI-00495

B: INSTALLATION

CAUTION:
• Be careful not to snag the harness.
• Carry out installation checking that the harness is connected correctly.
• When setting the instrument panel into vehicle, do not damage trim panels.

1) Install in the reverse order of removal.

NOTE:
When installing the instrument panel into position, push the hook into grommet (A) on the body panel. After tightening the bolts, recheck the installation.

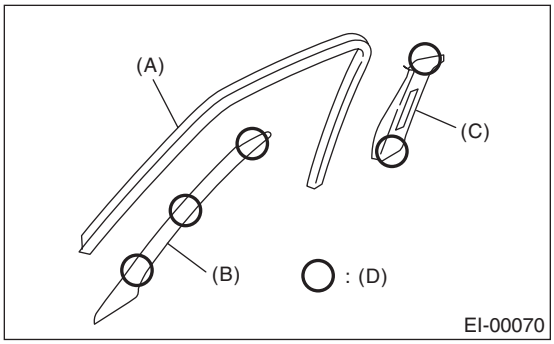


EI-00496

20.Upper Inner Trim

A: REMOVAL

1) Remove the lower inner trim. <Ref. to EI-49, REMOVAL, Lower Inner Trim.>
2) Remove the front molding (A).
3) Remove the front pillar upper trim (B).
4) Detach the front seat belt shoulder anchor, and then remove the center pillar upper trim (C).



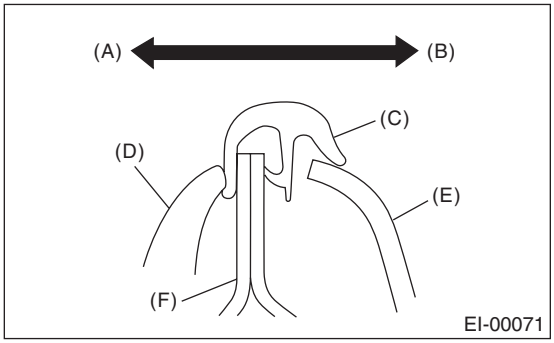
(D) Clip

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Be sure to securely hook the pawls of inner trim panel to body flange.

NOTE:
When installing the center pillar upper trim and front pillar upper trim, be sure to set the front molding as shown in the figure.

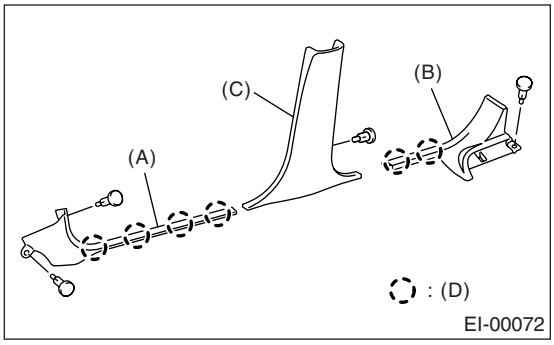


(A) Outside
(B) Inside
(C) Molding
(D) Weather strip
(E) Trim
(F) Body

21.Lower Inner Trim

A: REMOVAL

1) Remove the side sill front cover (A).
2) Remove the rear seat cushion <Ref. to SE-16, REMOVAL, Rear Seat.>, and then remove side sill rear cover (B).
3) Remove the center pillar lower trim (C).



(D) Clip

B: INSTALLATION

Install in the reverse order of removal.

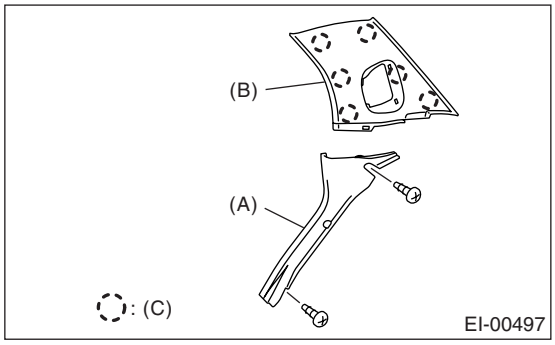
CAUTION:
Be sure to securely hook pawls of inner trim panel to body flange.

22.Rear Quarter Trim

A: REMOVAL

1. SEDAN MODEL

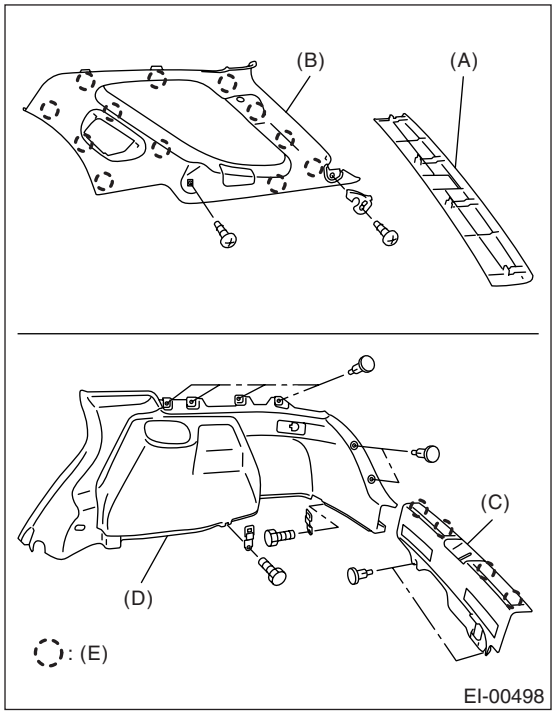
1) Remove the rear seat. <Ref. to SE-16, REMOVAL, Rear Seat.>
2) Remove the side sill rear cover. <Ref. to EI-49, REMOVAL, Lower Inner Trim.>
3) Remove the rear pillar lower cover (A).
4) Remove the seat belt lower anchor bolt, and then remove the rear pillar upper trim (B).



(C) Clip

2. WAGON MODEL

1) Remove the rear seat. <Ref. to SE-16, REMOVAL, Rear Seat.>
2) Remove the side sill rear cover.
3) Remove the rear rail trim (A).
4) Loosen the screws and clips to remove the rear quarter upper trim (B).
5) Remove the rear skirt trim (C).
6) Loosen the bolts and clips to remove the rear quarter lower trim (D).



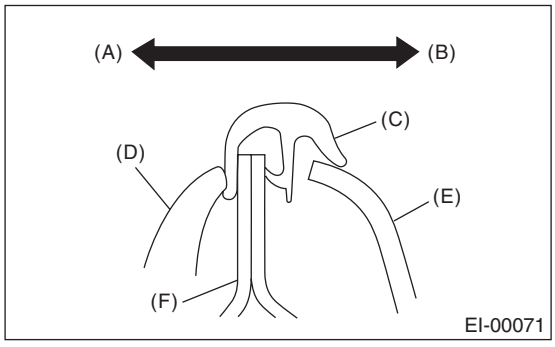
(E) Clip

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Be sure to securely hook the pawls of inner trim panel to body flange.

NOTE:
When installing the rear quarter upper trim, be sure to set the rear molding as shown in the figure.

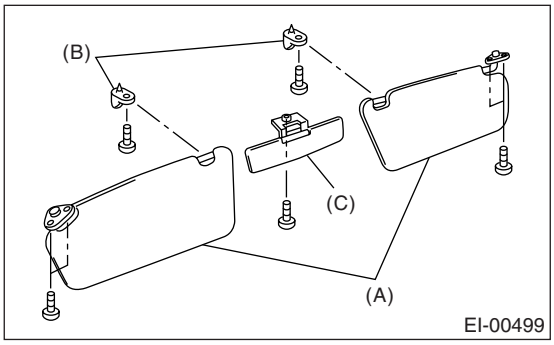


(A) Outside
(B) Inside
(C) Molding
(D) Weather strip
(E) Trim
(F) Body

23.Sun Visor

A: REMOVAL

Remove the mounting screws, and then detach the sun visor (A), hook (B) and center visor (C).



B: INSTALLATION

Install in the reverse order of removal.

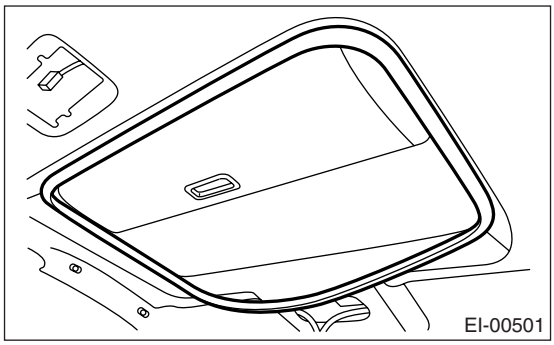
24.Roof Trim

A: REMOVAL

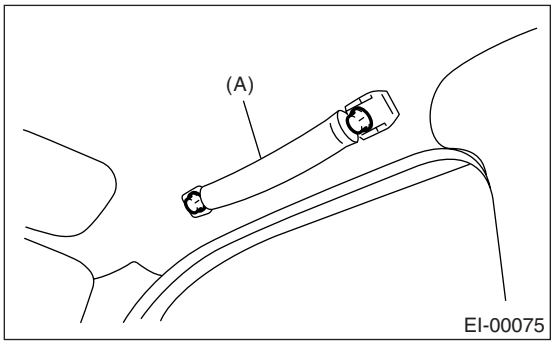
CAUTION:
When removing the clip, use great care not to damage the roof trim.

1. SEDAN MODEL

1) Disconnect the ground cable from battery.
2) Remove the sunroof switch. (Model with sunroof) <Ref. to SR-9, REMOVAL, Sunroof Switch.>
3) Remove the spot map light. <Ref. to LI-26, REMOVAL, Spot Map Light.>
4) Remove the room light. <Ref. to LI-27, REMOVAL, Room Light.>
5) Remove the sun visor and hook on right or left side, or on both sides. <Ref. to EI-51, REMOVAL, Sun Visor.>
6) In the case of models with sunroof, remove the sunroof weather strip.

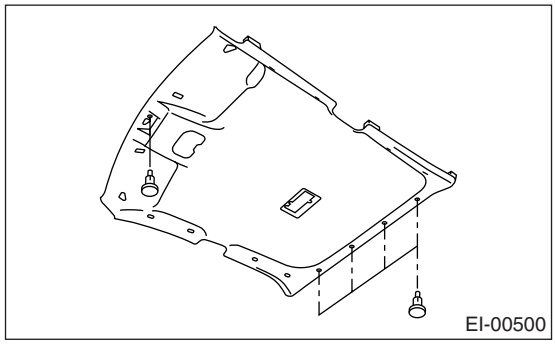

EI-00501

7) Remove the assist-grips (A).



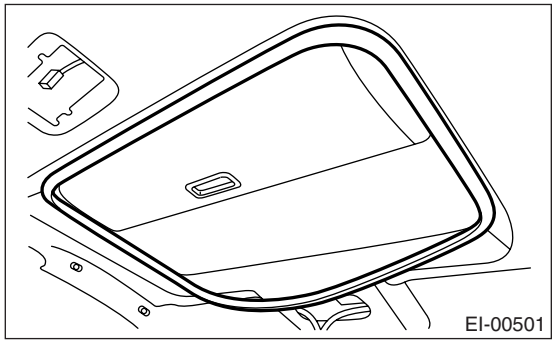
EI-00075

8) Remove the upper inner trim. <Ref. to EI-48, REMOVAL, Upper Inner Trim.>
9) Remove the quarter upper trim. <Ref. to EI-50, SEDAN MODEL, REMOVAL, Rear Quarter Trim.>
10) Remove the clips, and then remove the roof trim.

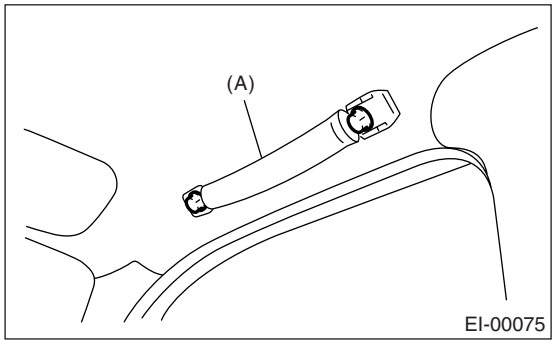

EI-00500

2. WAGON MODEL

1) Disconnect the ground cable from battery.
2) Remove the sunroof switch. (Model with sunroof) <Ref. to SR-9, REMOVAL, Sunroof Switch.>
3) Remove the room light. <Ref. to LI-27, REMOVAL, Room Light.>
4) Remove the sun visor and hook or both sides. <Ref. to EI-51, REMOVAL, Sun Visor.>
5) In case of models with sunroof, remove the sunroof weather strip.


EI-00501

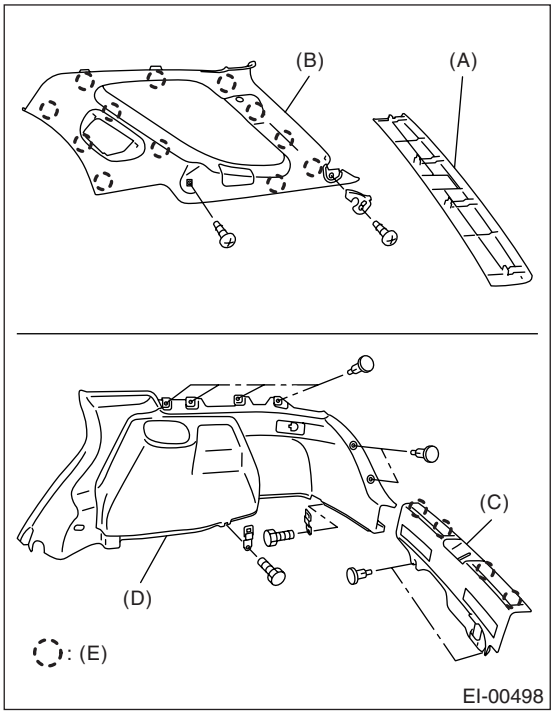
6) Remove the assist-grips (A).



EI-00075

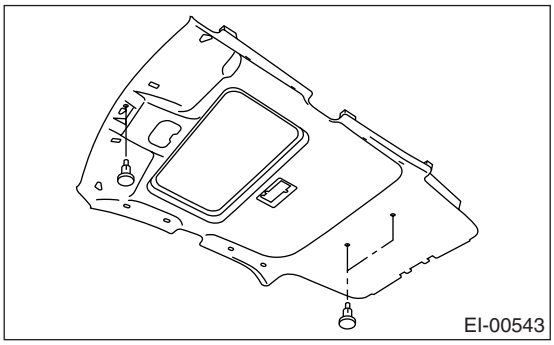
7) Remove the upper inner trim. <Ref. to EI-48, REMOVAL, Upper Inner Trim.>
8) Remove the rear quarter upper trim shown in the figure.
9) Remove the rear rail trim (A).

10) Remove the rear quarter upper trim (B) of both sides.



(E) Clip

11) Remove the clips, and then remove the roof trim.



B: INSTALLATION

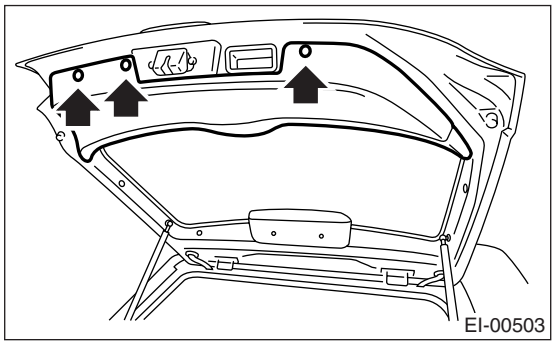
Install in the reverse order of removal.

25.Rear Gate Trim

A: REMOVAL

CAUTION:
Be careful not to damage the clips or their holes.

1) Remove the clips, and then detach the rear gate trim.



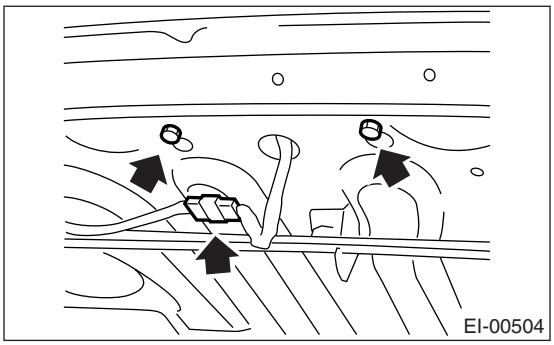
B: INSTALLATION

Install in the reverse order of removal.

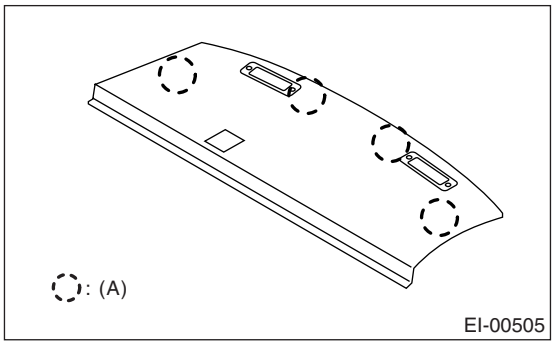
26.Rear Shelf Trim

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the high mount stop light.



3) Remove the rear quarter upper trim. <Ref. to EI-50, REMOVAL, Rear Quarter Trim.>
4) Remove the seat belt center anchor lower bolt.
5) Remove the rear shelf trim.



(A) Clip

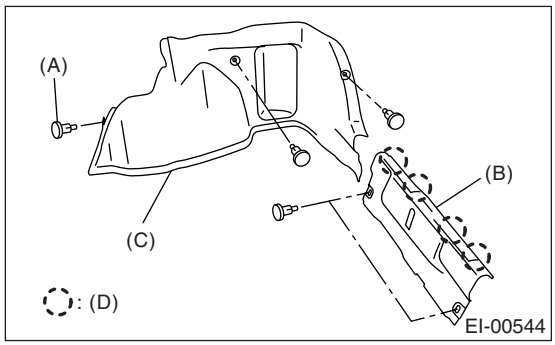
B: INSTALLATION

Install in the reverse order of removal.

27.Trunk Trim

A: REMOVAL

1) Remove the rear seat backrest. <Ref. to SE-16, SEDAN MODEL, REMOVAL, Rear Seat.>
2) Remove the clip (A).
3) Loosen the clips, and then detach the trunk rear trim (B).
4) Loosen the clips to remove the trunk side trim (C).



(D) Clip

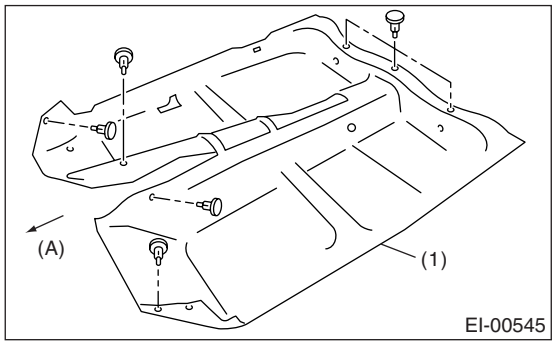
B: INSTALLATION

Install in the reverse order of removal.

28.Floor Mat

A: REMOVAL

1) Remove the front seats. <Ref. to SE-6, REMOVAL, Front Seat.>
2) Remove the rear seat cushion. <Ref. to SE-16, REMOVAL, Rear Seat.>
3) Remove the console box. <Ref. to EI-44, Console Box.>
4) Remove the side sill front cover, side sill rear cover and center pillar lower trim. <Ref. to EI-49, REMOVAL, Lower Inner Trim.>
5) Remove the foot rest.
6) Remove the clips from floor mat.
7) Remove the mat hook.
8) Remove the mat from toe board area.
9) Remove the mat from rear heater duct.
10) Roll the mat, and then take it out of opened rear door.



(A) Front
(1) Floor mat

B: INSTALLATION

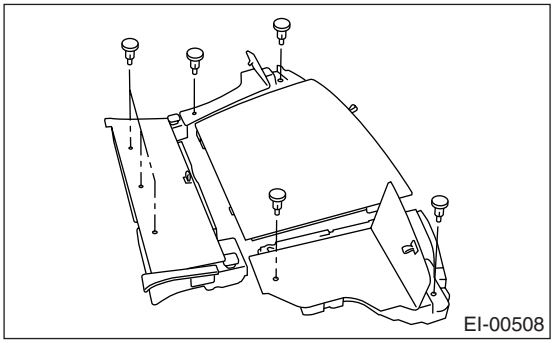
Install in the reverse order of removal.

NOTE:
- Secure the mat firmly with hook and Velcro tape.
- Insert the mat edge firmly into the groove of side sill cover.

29.Luggage Floor Mat

A: REMOVAL

Remove the clips, and then detach the rear floor mats and boxes.



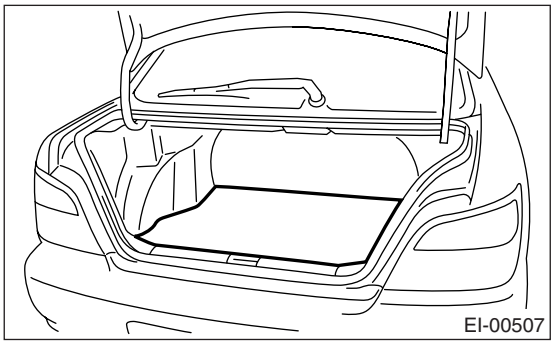
B: INSTALLATION

Install in the reverse order of removal.

30.Trunk Room Mat

A: REMOVAL

Draw out the trunk room mat.



B: INSTALLATION

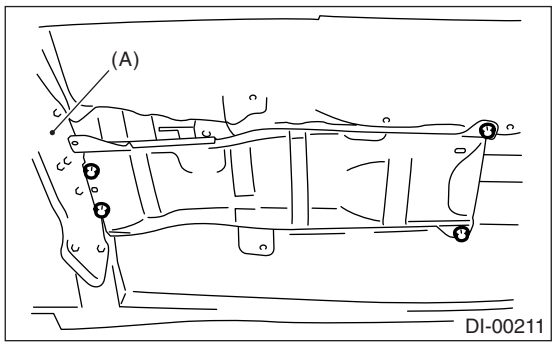
Install in the reverse order of removal.

31.Heat Shield Cover

A: REMOVAL

1. FRONT HEAT SHIELD COVER

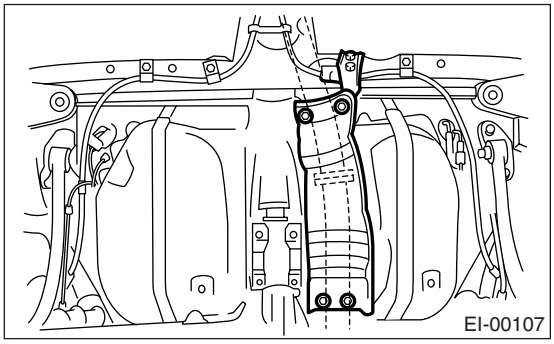
Loosen the four bolts to remove the front heat shield cover.



(A) Transmission mount

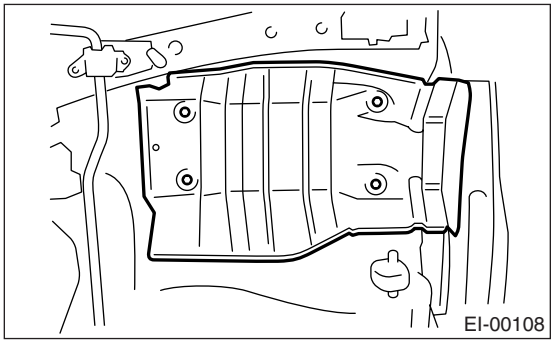
2. CENTER HEAT SHIELD COVER

Loosen the four bolts to remove the center heat shield cover.



3. REAR HEAT SHIELD COVER

1) Remove the muffler. <Ref. to EX(H4SO)-9, REMOVAL, Muffler.>, <Ref. to EX(H4DOTC)-14, REMOVAL, Muffler.>
2) Loosen the four bolts to remove the rear heat shield cover.



B: INSTALLATION

Install in the reverse order of removal.

EXTERIOR BODY PANELS

EB

		Page
1.	General Description	2
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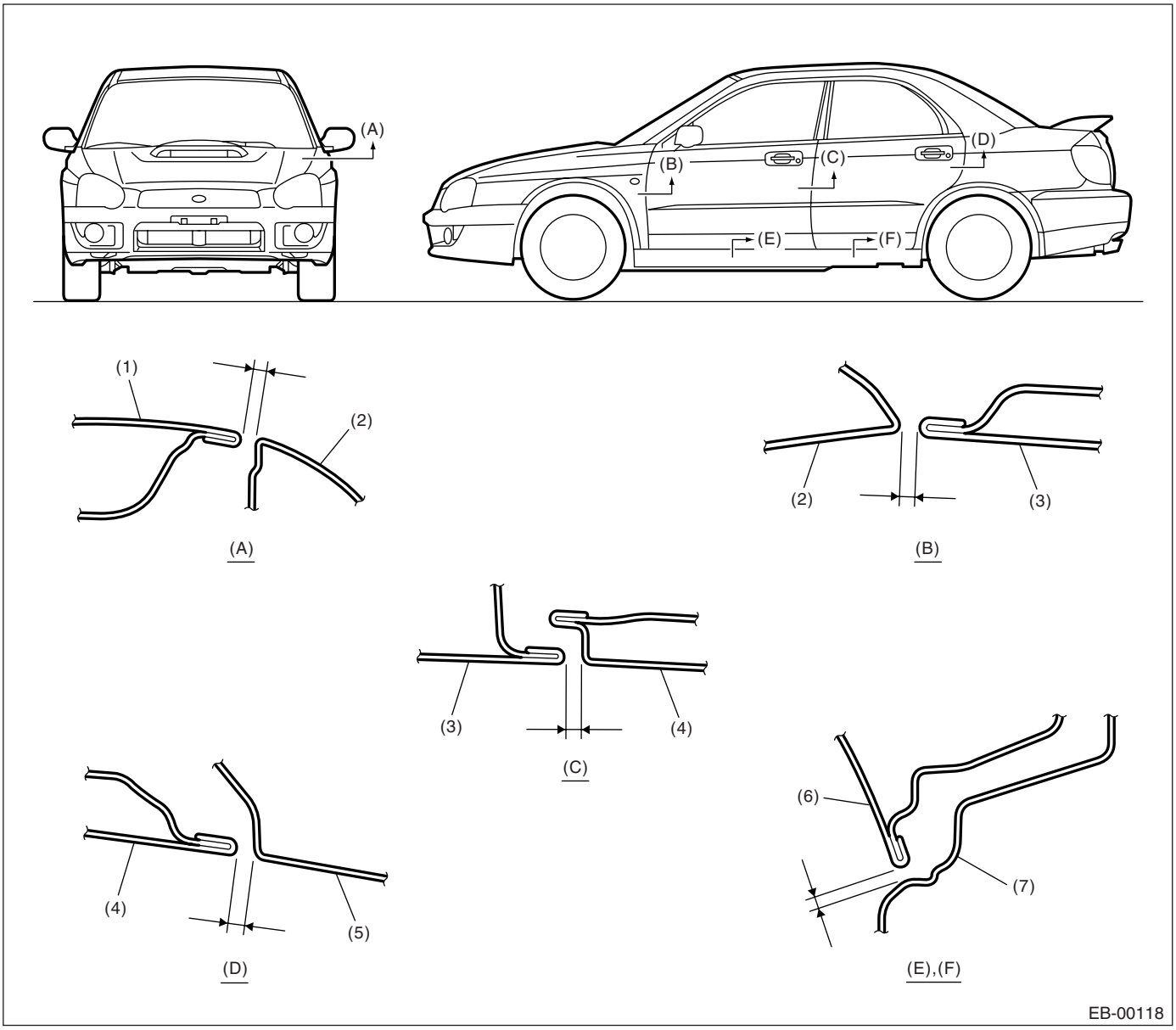
3.	Front Fender Panel	14
4.	Front Door Panel	15
5.	Front Sealing Cover	16
6.	Rear Door Panel	17
7.	Rear Sealing Cover	18
8.	Trunk Lid Panel	19
9.	Rear Gate Panel	20

1. General Description

A: SPECIFICATIONS

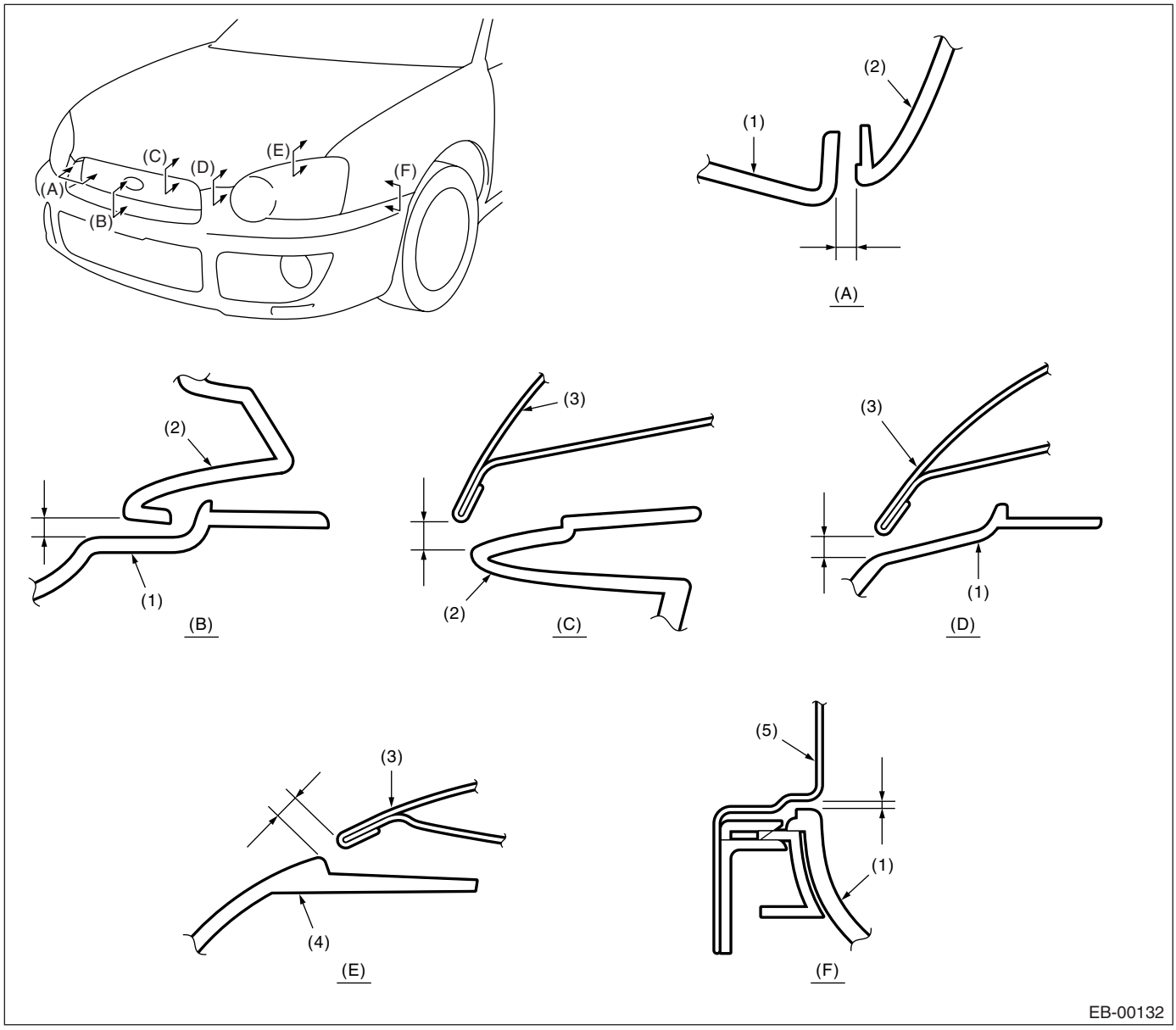
1. SIDE



(1) Front hood panel
(2) Front fender panel
(3) Front door panel
(4) Rear door panel
(5) Rear quarter panel
(6) Door panel
(7) Side sill

Section	Part	Standard
(A)	Front hood panel to Front fender panel	NON-TURBO: 4.0±1.0 mm (0.16±0.04 in) TURBO: 3.7±1.0 mm (0.15±0.04 in)
(B)	Front fender panel to Front door panel	4.7±1.0 mm (0.19±0.04 in)
(C)	Front door panel to Rear door panel	5.1±1.0 mm (0.20±0.04 in)
(D)	Rear door panel to Rear quarter panel	4.6±1.0 mm (0.18±0.04 in)
(E), (F)	Door panel to Side sill	5.9±1.0 mm (0.23±0.04 in)

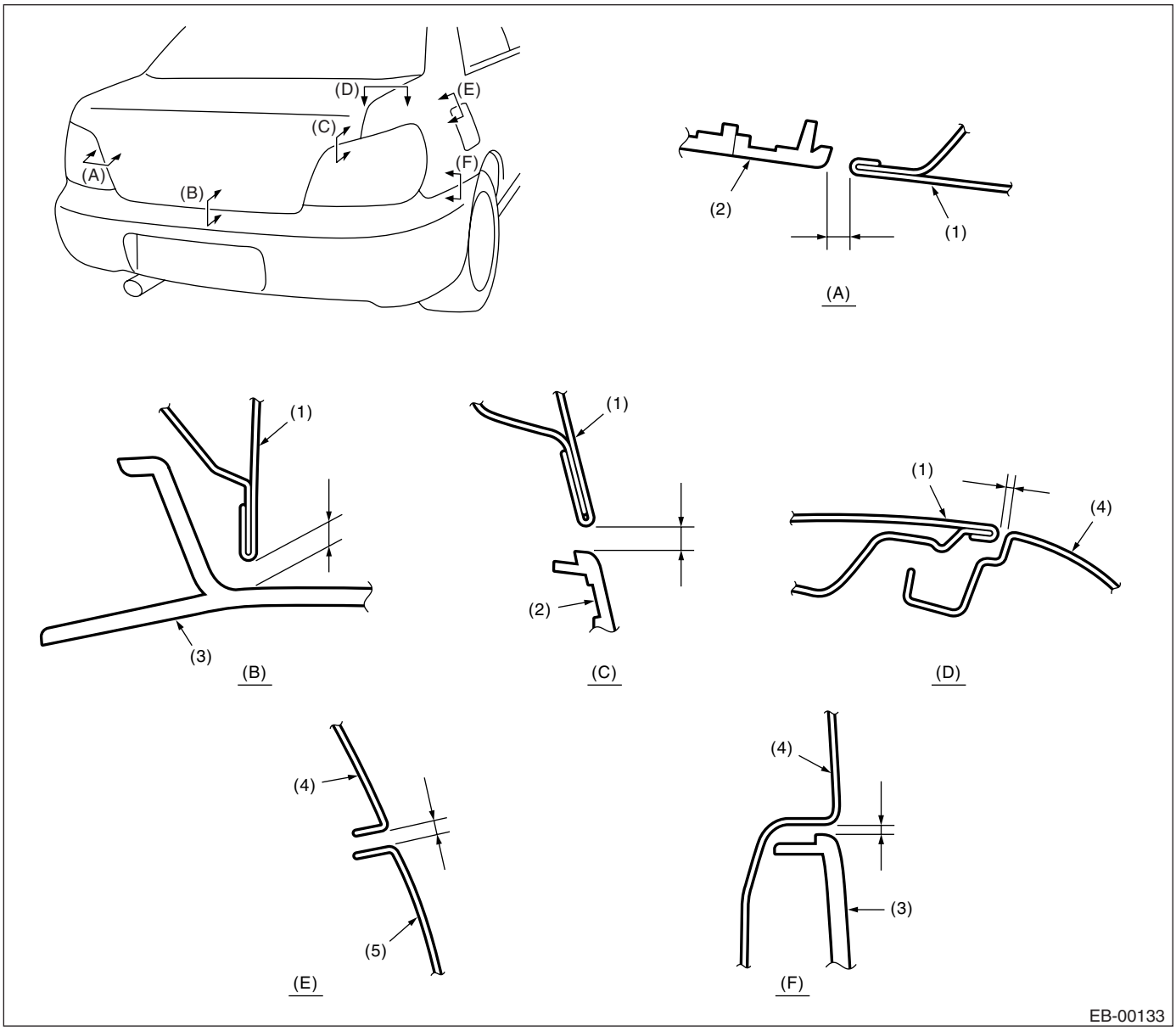
2. FRONT



(1) Front bumper
(2) Front grille
(3) Front hood panel
(4) Headlight
(5) Front fender panel

Section	Part	Standard
(A)	Front bumper to Front grille (Lateral direction)	1.0±0.5 mm (0.04±0.02 in)
(B)	Front bumper to Front grille (Longitudinal direction)	1.0±1.0 mm (0.04±0.04 in)
(C)	Front hood panel to Front grille	Steel: 6.8±1.0 mm (0.27±0.04 in) Aluminum: 6.5±1.0 mm (0.26±0.04 in)
(D)	Front hood panel to Front bumper	6.0±1.0 mm (0.24±0.04 in)
(E)	Front hood panel to Headlight	5.5±1.0 mm (0.22±0.04 in)
(F)	Front fender panel to Front bumper	1.5±0.7 mm (0.06±0.03 in)

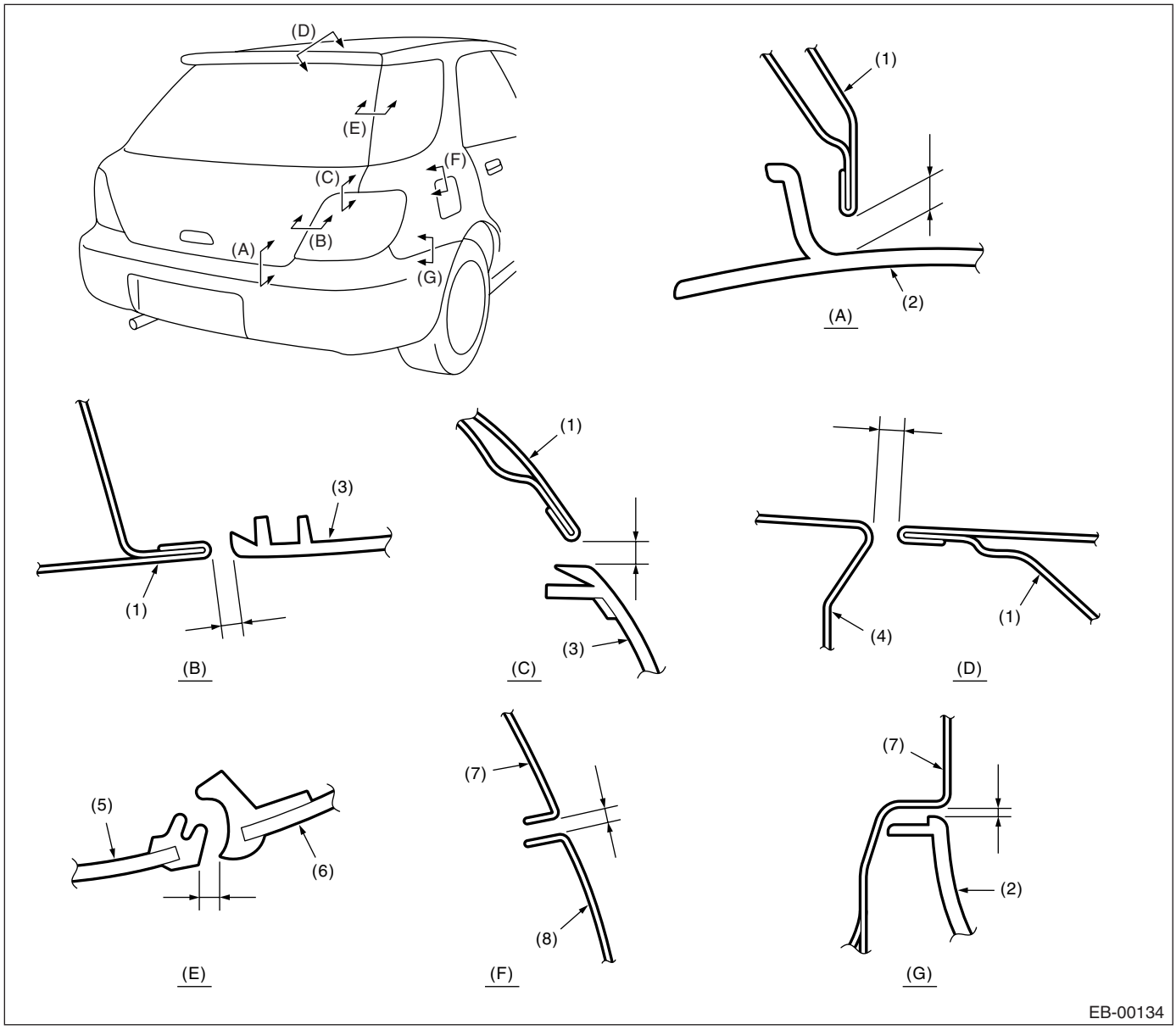
3. REAR (SEDAN MODEL)



(1) Trunk lid panel
(2) Rear combination light
(3) Rear bumper
(4) Rear fender panel
(5) Fuel lid

Section	Part	Standard
(A)	Trunk lid panel to Rear combination light (Lateral direction)	5.0±1.0 mm (0.20±0.04 in)
(B)	Trunk lid panel to Rear bumper	7.0±1.5 mm (0.28±0.06 in)
(C)	Trunk lid panel to Rear combination light (Longitudinal direction)	7.0±1.0 mm (0.28±0.04 in)
(D)	Trunk lid panel to Rear fender panel	4.0±1.0 mm (0.16±0.04 in)
(E)	Rear fender panel to Fuel lid	3.5±0.5 mm (0.14±0.02 in)
(F)	Rear fender panel to Rear bumper	0.3 — 2.2 mm (0.01 — 0.09 in)

4. REAR (WAGON MODEL)

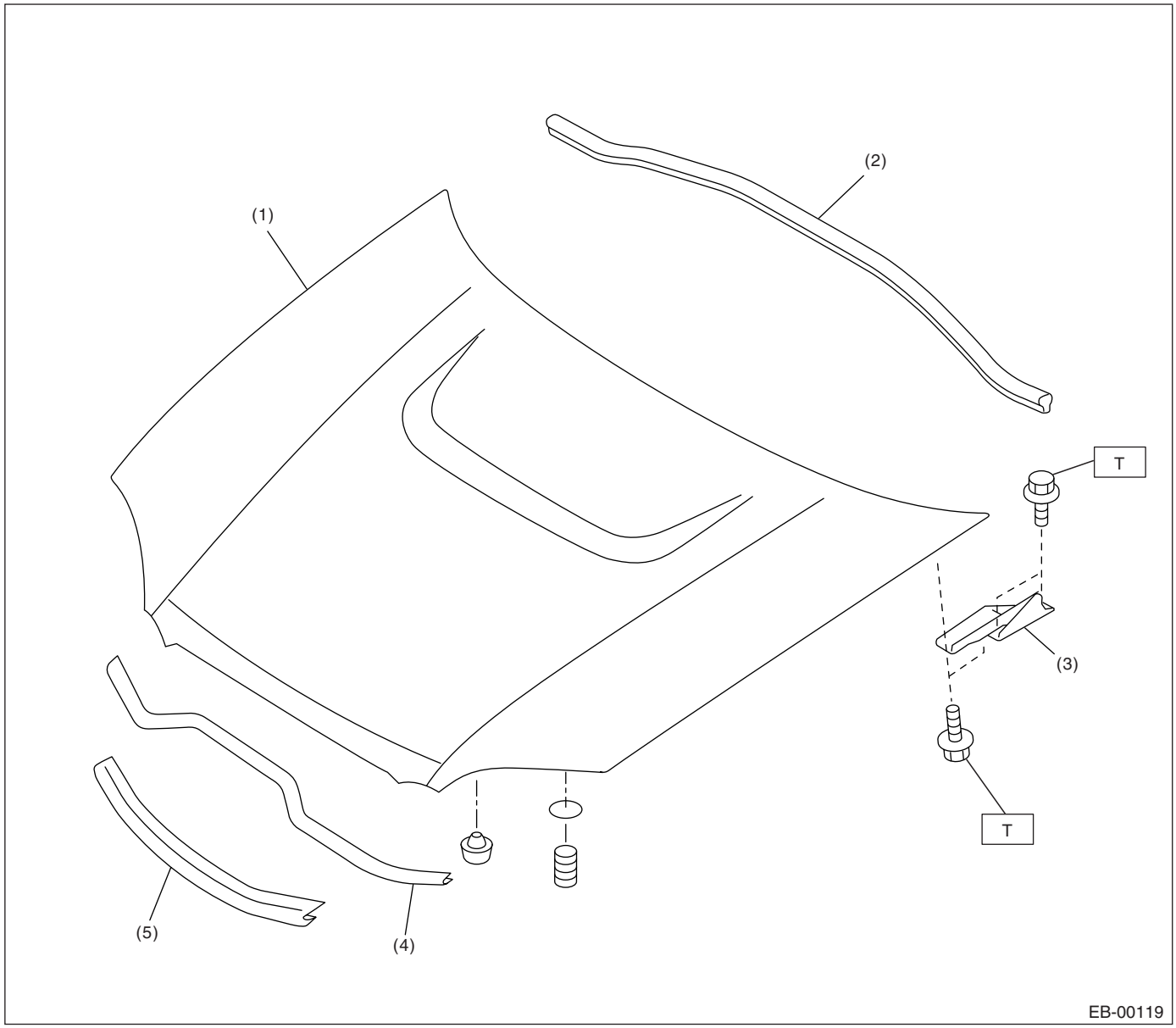


(1) Rear gate panel
(2) Rear bumper
(3) Rear combination light
(4) Roof panel
(5) Rear gate glass
(6) Rear quarter glass
(7) Rear fender panel
(8) Fuel lid

Section	Part	Standard
(A)	Rear gate panel to Rear bumper	8.3±1.5 mm (0.33±0.06 in)
(B)	Rear gate panel to Rear combination light (Lateral direction)	5.0±1.0 mm (0.20±0.04 in)
(C)	Rear gate panel to Rear combination light (Longitudinal direction)	6.0±1.0 mm (0.24±0.04 in)
(D)	Roof panel to Rear gate panel	6.1 — 7.6 mm (0.24 — 0.30 in)
(E)	Rear gate glass to Rear quarter glass	6.0±1.5 mm (0.24±0.06 in)
(F)	Rear fender panel to Fuel lid	3.5±0.5 mm (0.14±0.02 in)
(G)	Rear fender panel to Rear bumper	0.3 — 2.2 mm (0.01 — 0.09 in)

B: COMPONENT

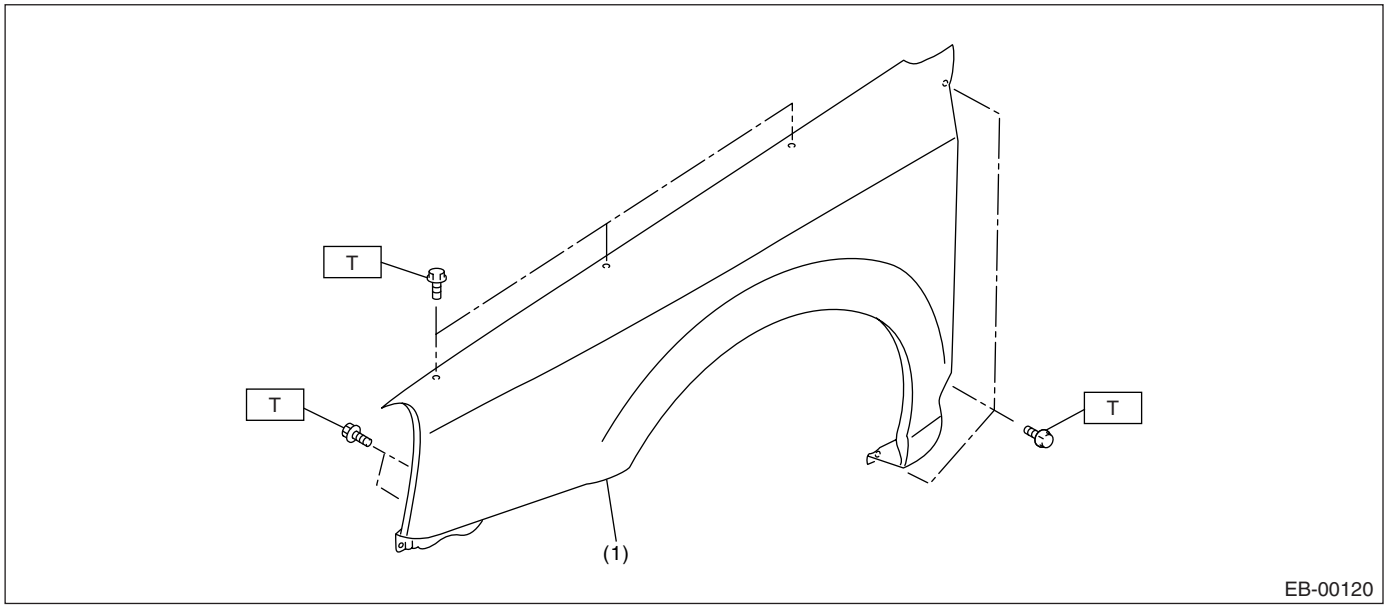
1. FRONT HOOD



(1) Front hood
(2) Seal (Front panel)
(3) Hinge
(4) Seal (Intake duct) (Turbo model)
(5) Seal (Hood)

Tightening torque: N·m (kgf-m, ft-lb)
T: 24.5 (2.5, 18.1)

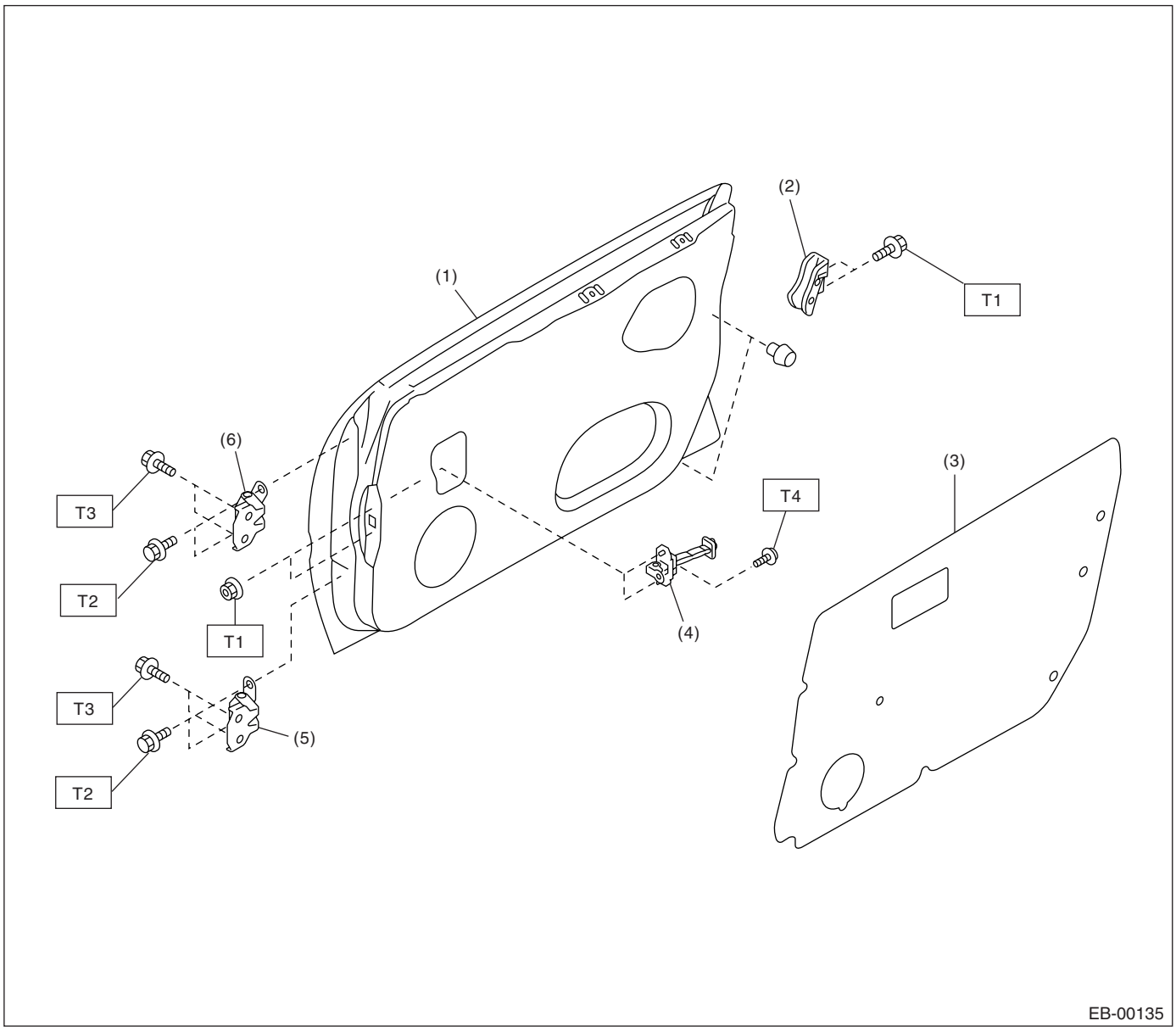
2. FRONT FENDER PANEL



(1) Front fender panel

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.4 (0.75, 5.5)

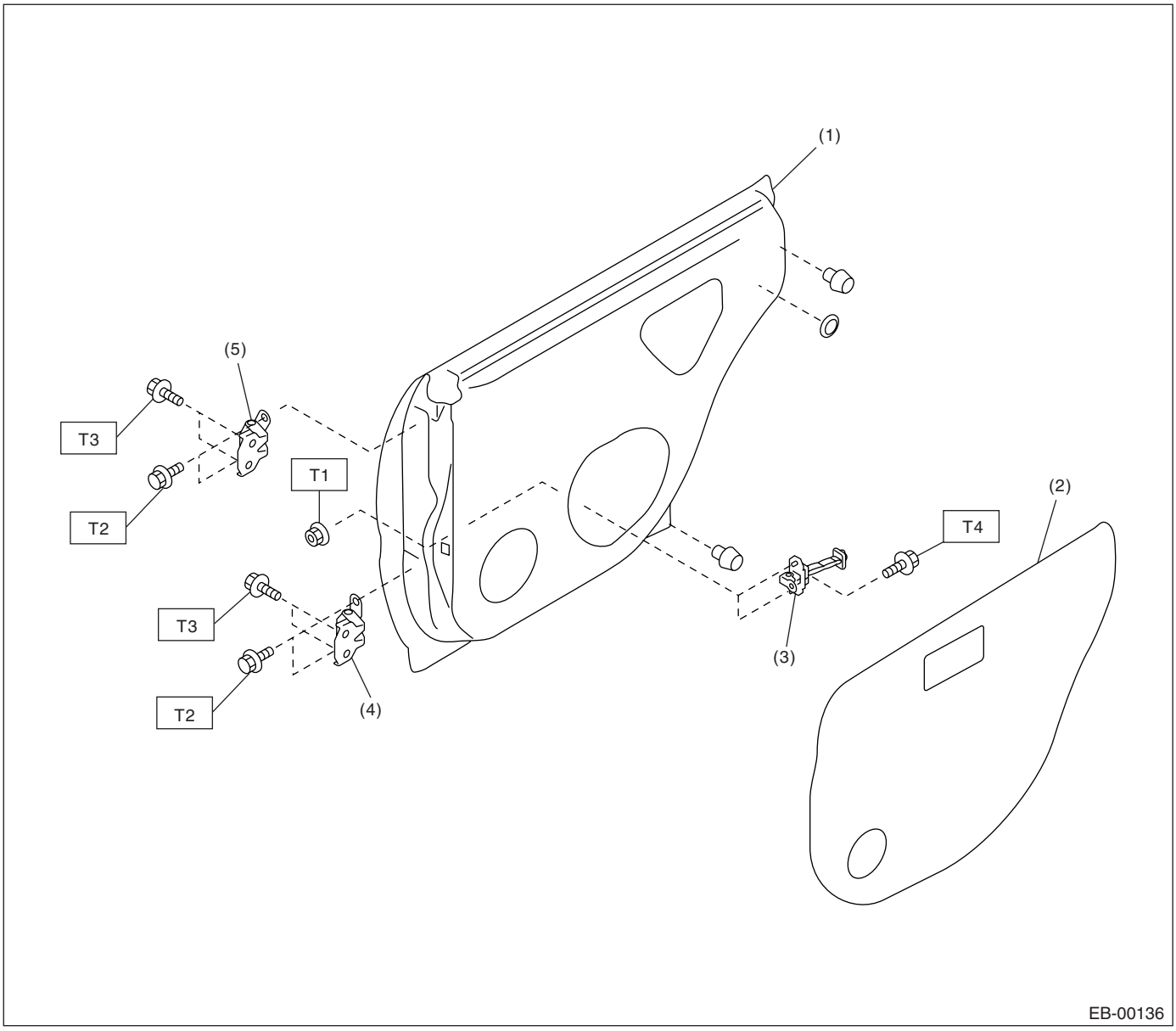
3. FRONT DOOR PANEL



(1)	Front door panel	(4)	Checker
(2)	Guide	(5)	Lower hinge
(3)	Sealing cover	(6)	Upper hinge

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.5)
T2: 24.5 (2.5, 18.1)
T3: 29.4 (3.0, 21.7)
T4: 32.3 (3.3, 23.8)

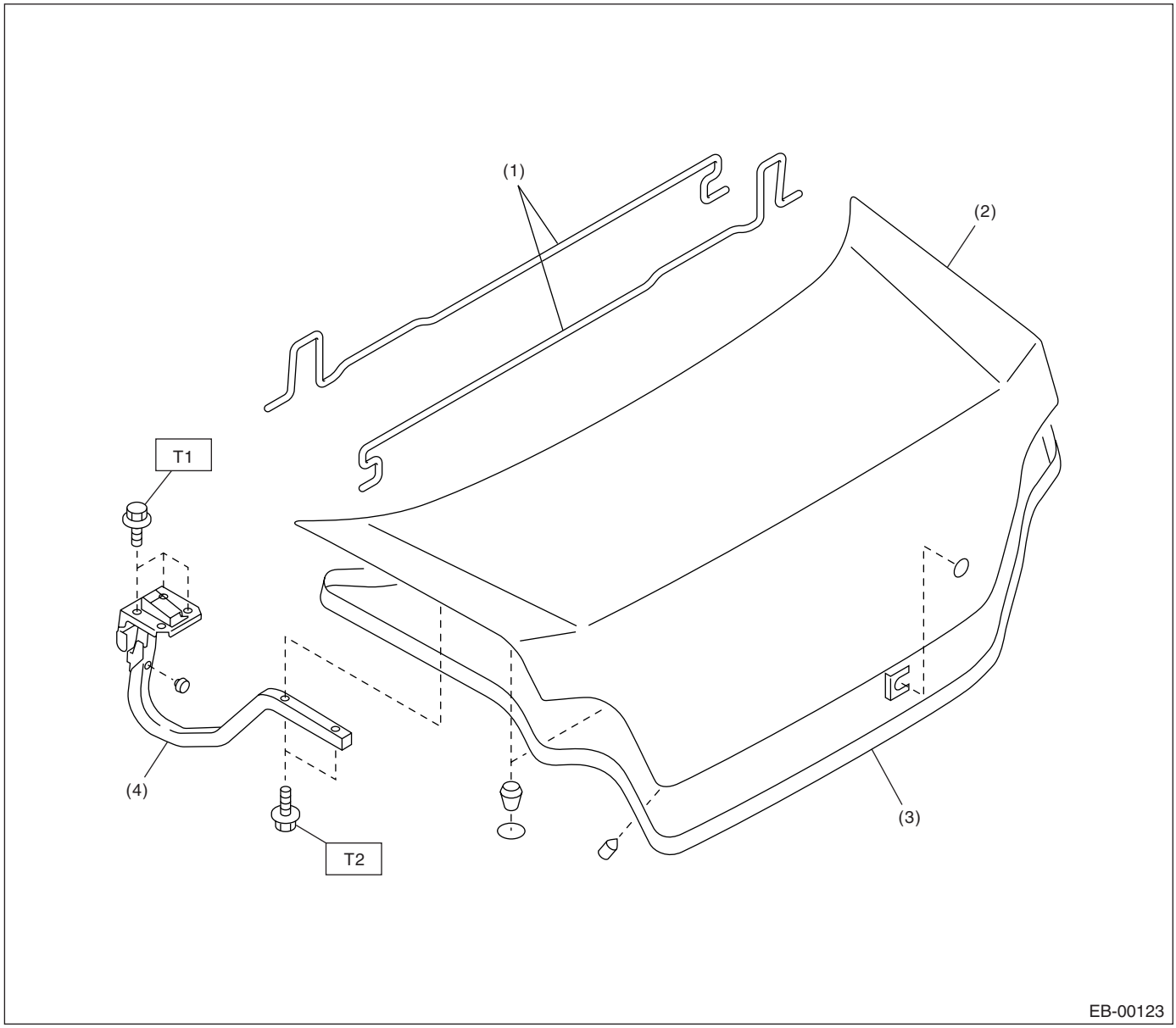
4. REAR DOOR PANEL



(1) Rear door panel
(2) Sealing cover
(3) Checker
(4) Lower hinge
(5) Upper hinge

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.5)
T2: 24.5 (2.5, 18.1)
T3: 29.4 (3.0, 21.7)
T4: 32.3 (3.3, 23.8)

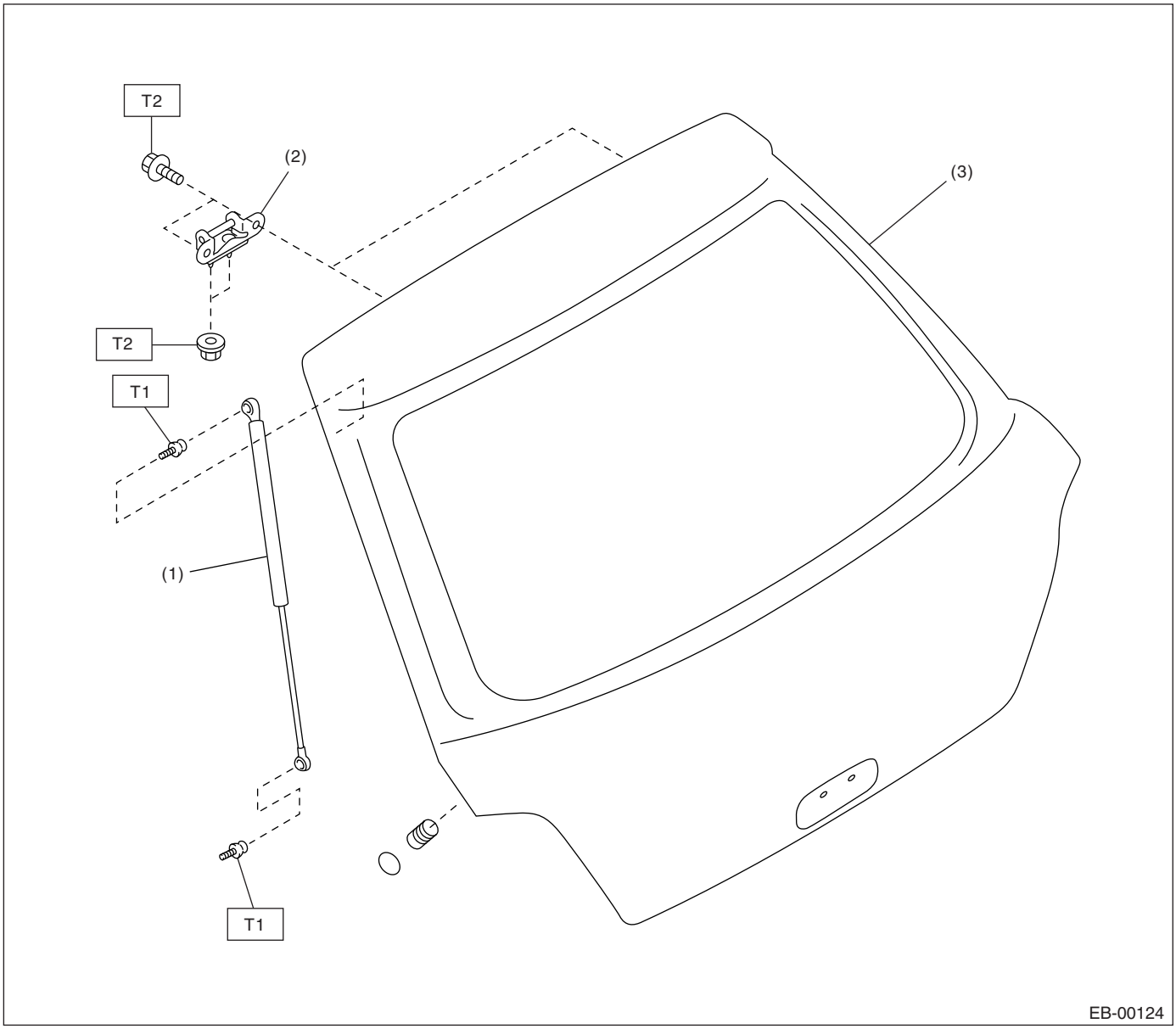
5. TRUNK LID PANEL



(1) Torsion bar
(2) Trunk lid panel
(3) Weatherstrip
(4) Hinge ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 14 (1.43, 10.3)

6. REAR GATE PANEL



(1) Rear gate damper stay
(2) Hinge
(3) Rear gate panel

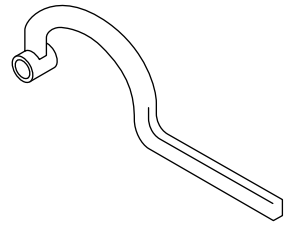
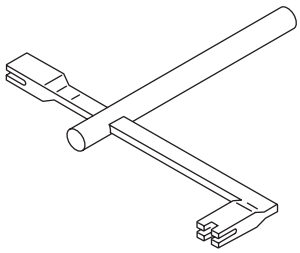
Tightening torque: N·m (kgf-m, ft-lb)
T1: 19.6 (2.0, 14.5)
T2: 24.5 (2.5, 18.1)

C: CAUTION

- Exterior body panels are heavy. Do not drop and damage the panels. During removal and installation, do not damage the panel painting surface.
- While removing the mounting bolts, using assistance devices such as a support jack will help support the panel.
- Be careful not to lose small parts.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925610000	925610000	WRENCH	Used for removing and installing door hinge.
 ST-927780000	927780000	REMOVER	Used for removing and installing trunk torsion bar.

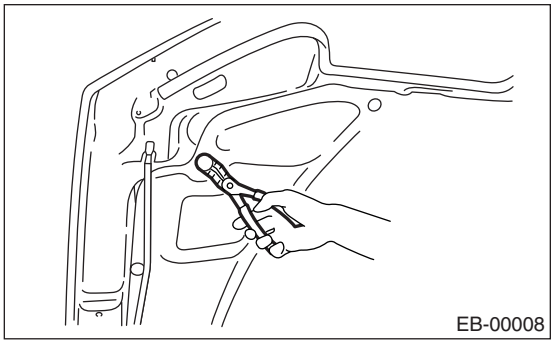
2. GENERAL TOOL

TOOL NAME	REMARKS
Support Jack	Used for supporting door panel.

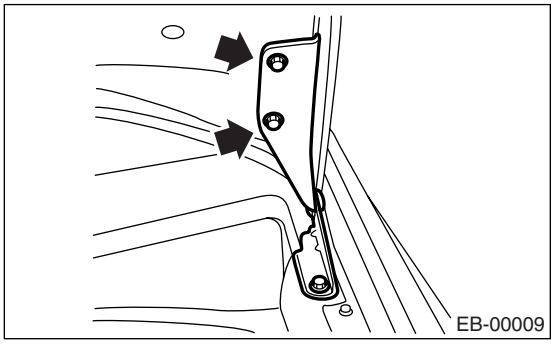
2. Front Hood Panel

A: REMOVAL

1) Open the front hood to remove washer nozzles.
2) Release the clips to remove hood insulator.



3) Remove the bolts to remove the front hood from hinges.



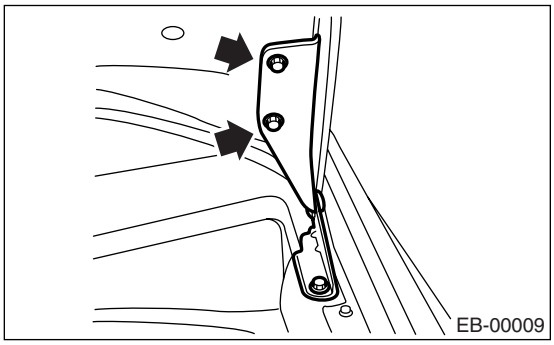
B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the clearance between front hood panel and front fender panel. Clearance must be equal at both sides.

Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)

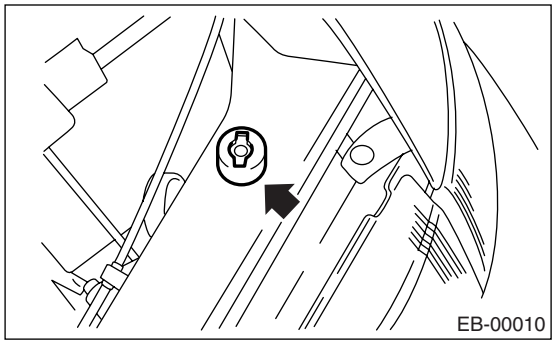
C: ADJUSTMENT

1) Use the hinge mounting holes to align the front hood longitudinally and laterally.



2) Adjust the height at front end of hood. <Ref. to SL-41, ADJUSTMENT, Front Hood Lock Assembly.>

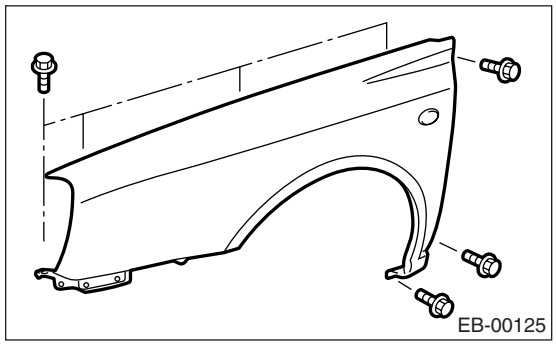
3) Rotate the hood buffer to adjust lateral height.



3. Front Fender Panel

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the side sill spoilers. <Ref. to EI-36, Side Sill Spoiler.> (Model with side sill spoiler)
3) Remove the front bumper face. <Ref. to EI-23, REMOVAL, Front Bumper.>
4) Remove the mud guard. <Ref. to EI-32, REMOVAL, Mud Guard.>
5) Loosen the bolts to remove front fender panel.



B: INSTALLATION

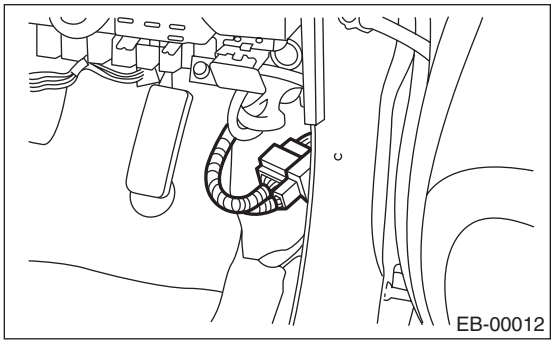
1) Install in the reverse order of removal.
2) When the front fender panel is installed, clearance between front fender panel and front hood panel must be equal.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.5 ft-lb)

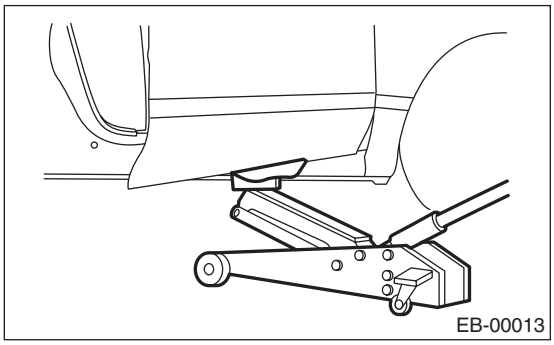
4. Front Door Panel

A: REMOVAL

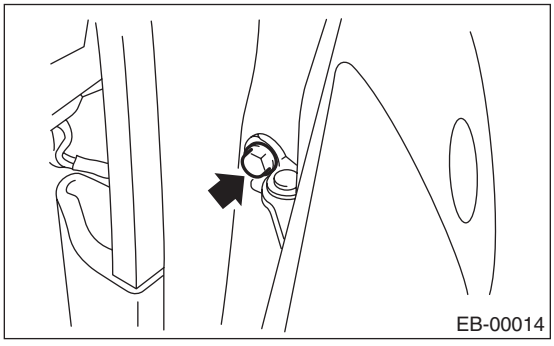
1) Disconnect the ground cable from battery.
2) Remove the front door trim. <Ref. to EI-39, REMOVAL, Front Door Trim.>
3) Remove the outer mirror assembly. <Ref. to GW-17, REMOVAL, Outer Mirror Assembly.>
4) Remove the front door glass. <Ref. to GW-10, REMOVAL, Front Door Glass.>
5) Remove the front door regulator and motor. <Ref. to GW-14, REMOVAL, Front Regulator and Motor Assembly.>
6) Remove the front door latch assembly. <Ref. to SL-30, REMOVAL, Front Door Latch Assembly.>
7) Remove the front outer handle. <Ref. to SL-29, REMOVAL, Front Outer Handle.>
8) Remove the front pillar lower trim to disconnect the connector from body harness.


EB-00012

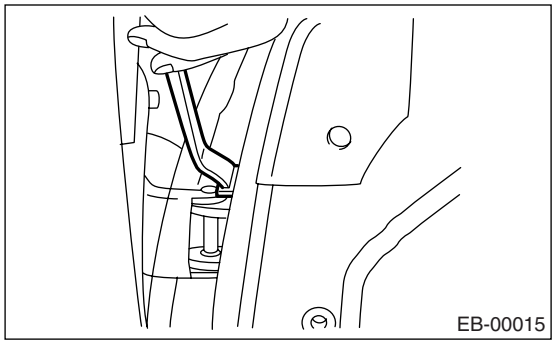
9) Put a wooden block on jack and place the jack under front door panel. Support the front door with the jack to protect it from damage.


EB-00013

10) Remove the checker bolts.


EB-00014

11) Remove the door-side bolts for upper and lower hinges to remove the front door panel.


EB-00015

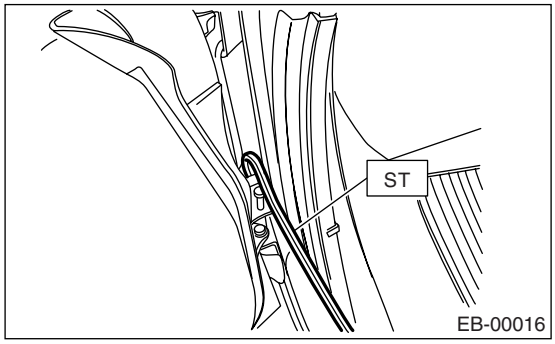
B: INSTALLATION

1) Install in the reverse order of removal.
2) Apply grease to the sliding area of door hinges.

Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to EB-8, FRONT DOOR PANEL, COMPONENT, General Description.>

C: ADJUSTMENT

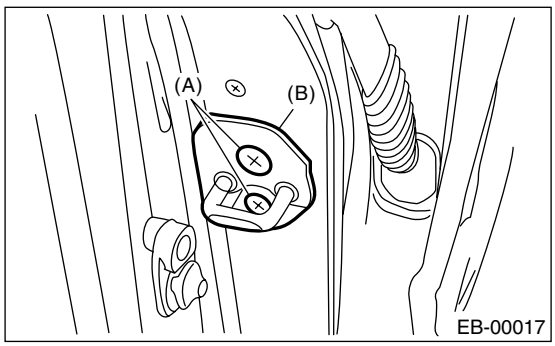
1) Using the ST, loosen the body-side bolts of upper and lower hinges to align the position of front door panel longitudinally and vertically.
ST 925610000 DOOR HINGE WRENCH



EB-00016

2) Loosen the screw (A) and tap striker (B) using a plastic hammer to adjust striker to align the position of front door panel laterally at the rear end.

CAUTION:
Do not use an impact wrench. Welding area on the striker nut plate is easily broken.

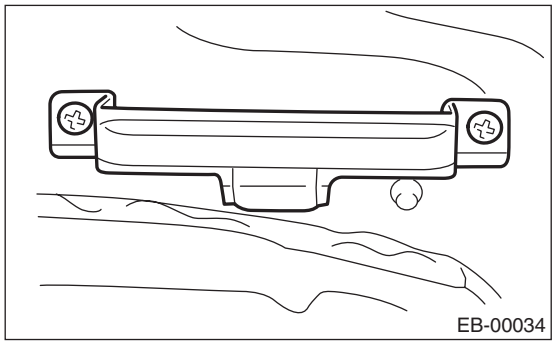


EB-00017

5. Front Sealing Cover

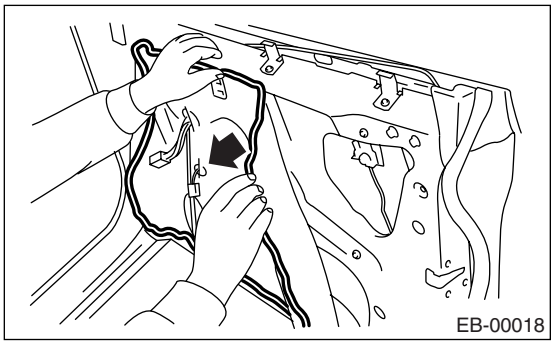
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front door trim. <Ref. to EI-39, REMOVAL, Front Door Trim.>
3) Remove the front speaker. <Ref. to ET-6, REMOVAL, Front Speaker.>
4) Remove the door trim bracket.


EB-00034

5) Remove the sealing cover.

NOTE:
• Carefully remove the butyl tape. Excessive force will easily break the cover.
• If the cover gets broken, replace it with a new one.


EB-00018

B: INSTALLATION

1) Install in the reverse order of removal.
2) When replacing the sealing cover, use the butyl tape.
3) Press the butyl tape-applied area firmly to prevent any floating on surface.

Butyl tape:
3M8626 or equivalent

NOTE:
• Apply a uniform bead of butyl tape.
• Attach the sealing cover, keeping it from becoming wrinkled.
• Breaks in the bead will allow water leakage and contamination.

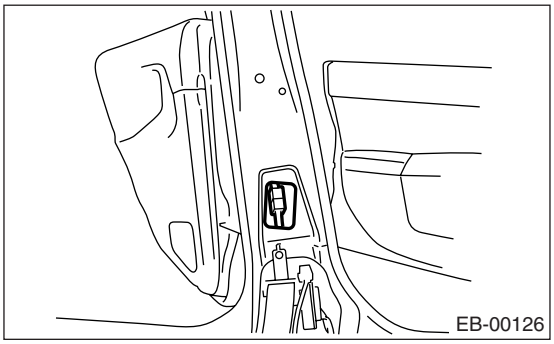
C: INSPECTION

If the sealing cover is damaged, replace it with a new one.

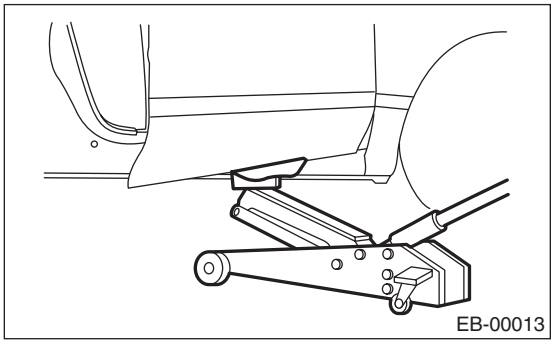
6. Rear Door Panel

A: REMOVAL

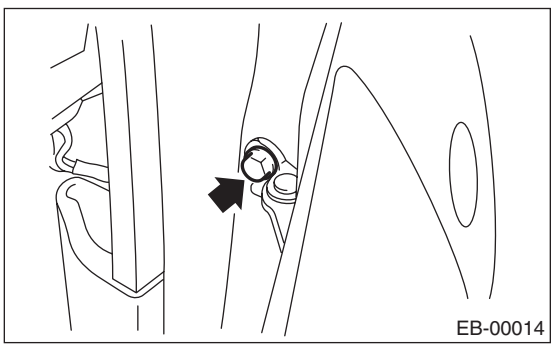
1) Disconnect the ground cable from battery.
2) Remove the rear door trim. <Ref. to EI-40, REMOVAL, Rear Door Trim.>
3) Remove the rear door glass. <Ref. to GW-20, REMOVAL, Rear Door Glass.>
4) Remove the rear door regulator and motor assembly. <Ref. to GW-22, REMOVAL, Rear Regulator and Motor Assembly.>
5) Remove the rear door latch. <Ref. to SL-32, REMOVAL, Rear Inner Remote.>
6) Remove the rear outer handle. <Ref. to SL-33, REMOVAL, Rear Outer Handle.>
7) Remove the center pillar lower trim. <Ref. to EI-49, REMOVAL, Lower Inner Trim.>
8) Disconnect the connector of door harness.


EB-00126

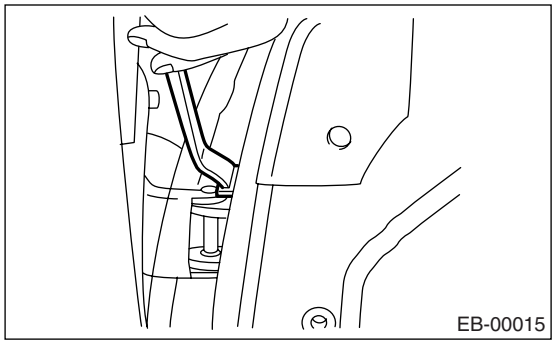
9) Put a wooden block on the jack and place the jack under the rear door. Support the rear door with jack to protect it.


EB-00013

10) Remove the checker bolts.


EB-00014

11) Remove the door-side bolts for upper and lower hinges to remove the rear door panel.


EB-00015

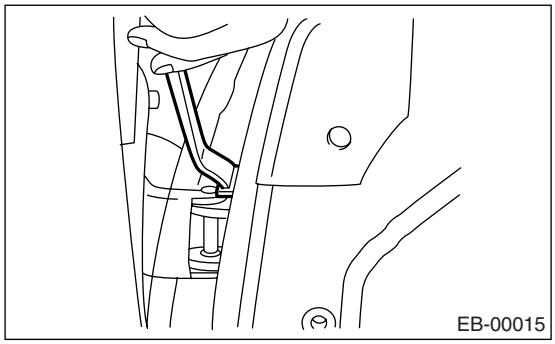
B: INSTALLATION

1) Install in the reverse order of removal.
2) Apply grease to the sliding area of door hinges.

Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to EB-9, REAR DOOR PANEL, COMPONENT, General Description.>

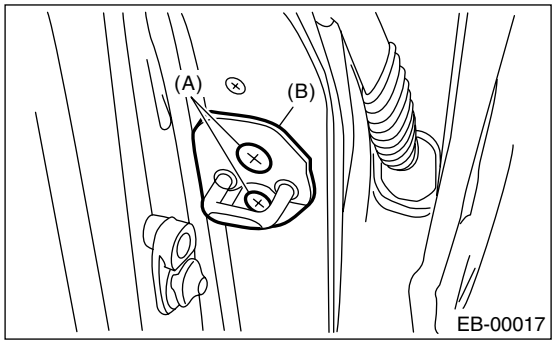
C: ADJUSTMENT

1) Open the rear door, and then loosen the door-side bolts of upper and lower hinges to align the position of rear door panel longitudinally and vertically.


EB-00015

2) Loosen the screw (A), and then tap striker (B) using plastic hammer to adjust striker to align the position of rear door panel laterally at the rear end.

CAUTION:
Do not use an impact wrench. The welding area on the striker nut plate is easily broken.

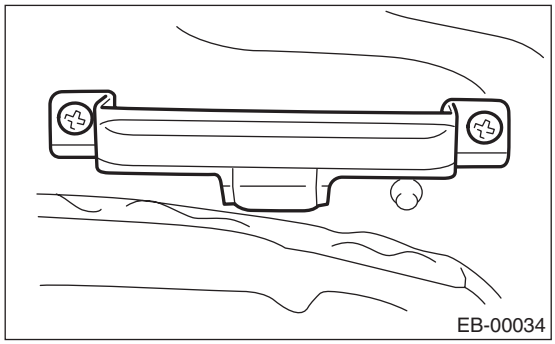


EB-00017

7. Rear Sealing Cover

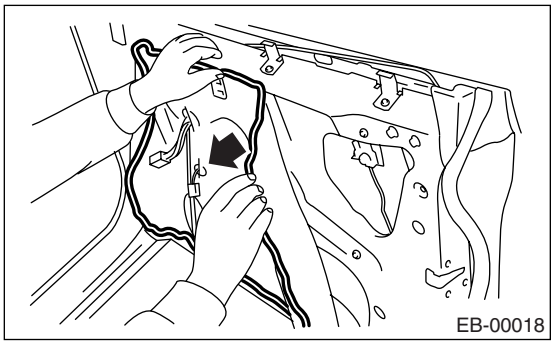
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear door trim. <Ref. to EI-40, REMOVAL, Rear Door Trim.>
3) Remove the rear speaker. <Ref. to ET-8, REMOVAL, Rear Speaker.>
4) Remove the door trim bracket.



5) Remove the sealing cover.

NOTE:
• Carefully remove the butyl tape. Excessive force will easily break the cover.
• If the cover gets broken, replace it with a new one.



B: INSTALLATION

1) Install in the reverse order of removal.
2) When replacing the sealing cover, use butyl tape.
3) Press the butyl tape-applied area firmly to prevent any floating on surface.

Butyl tape:
3M8626 or equivalent

NOTE:
• Apply an uniform bead of butyl tape.
• Attach the sealing cover, keeping it from becoming wrinkled.
• Breaks in the bead will allow water leakage and contamination.

C: INSPECTION

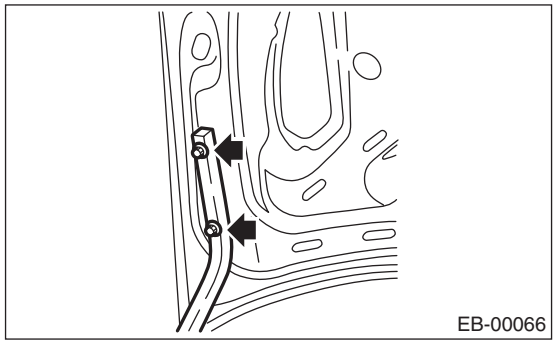
If the sealing cover is damaged, replace it with a new one.

8. Trunk Lid Panel

A: REMOVAL

1. TRUNK LID

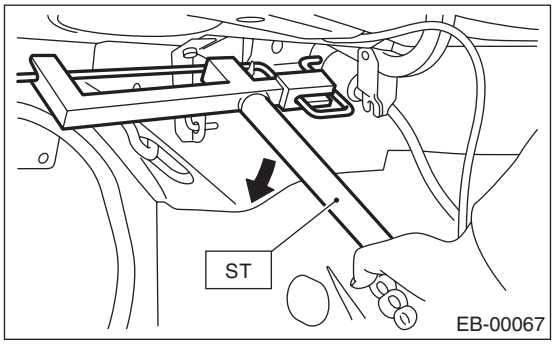
1) Open the trunk lid.
2) Disconnect the trunk lid connector.
3) Loosen the trunk lid mounting bolts to remove the trunk lid from hinges.



2. TORSION BAR

1) Open the trunk lid.
2) Using the ST, remove the torsion bar from hinge link.
ST 927780000 REMOVER

CAUTION:
During removal and installation, carefully handle the torsion bar, because it will generate reactive force.



3) Remove the right/left torsion bars.

CAUTION:
Be careful not to get hit by the trunk lid, because the trunk lid will slam shut after the torsion bar is removed.

B: INSTALLATION

1. TRUNK LID

1) Install in the reverse order of removal.
2) Install the trunk lid with uniform clearance.

Tightening torque:
14 N·m (1.43 kgf-m, 10.3 ft-lb)

2. TORSION BAR

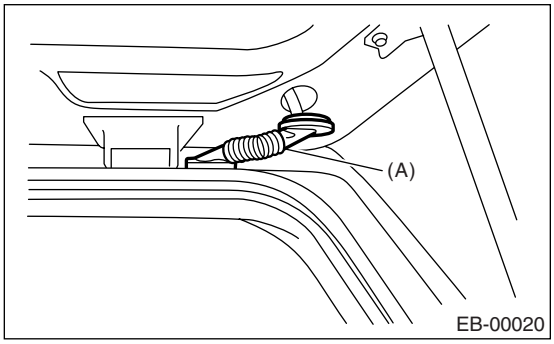
1) Install in the reverse order of removal.
2) Apply grease to the rotating area of hinges and mating surface of torsion bar.

9. Rear Gate Panel

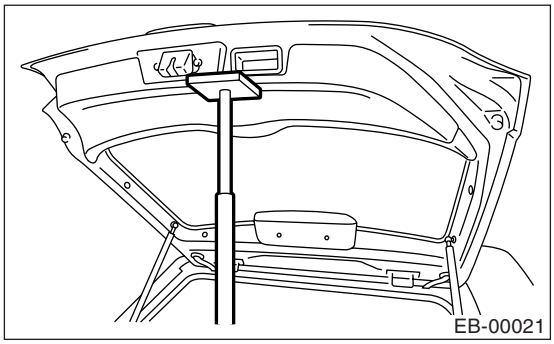
A: REMOVAL

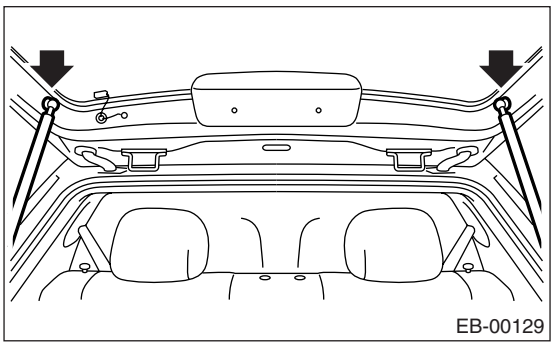
1. REAR GATE PANEL

1) Disconnect the ground cable from battery.
2) Open the rear gate.
3) Remove the rear gate outer handle. <Ref. to SL-36, REMOVAL, Rear Gate Outer Handle.>
4) Remove the rear gate latch assembly. <Ref. to SL-37, REMOVAL, Rear Gate Latch Assembly.>
5) Remove the rear wiper. <Ref. to WW-16, REMOVAL, Rear Wiper Motor.>
6) Disconnect the connectors of rear wiper, rear defogger and other lighting devices.
7) Disconnect the washer hose.
8) Remove the rubber duct (A) connection, and then pull out the harness and washer hose from rear gate.



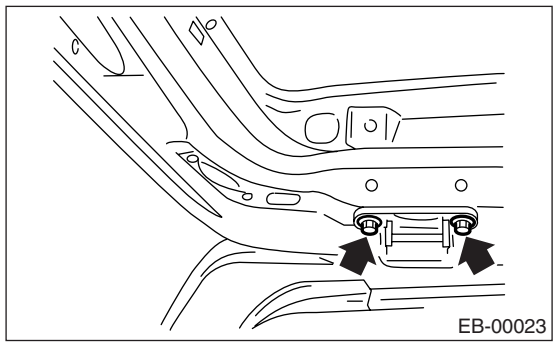
9) Using a support, support the rear gate while removing the rear gate damper stay mounting bolts.





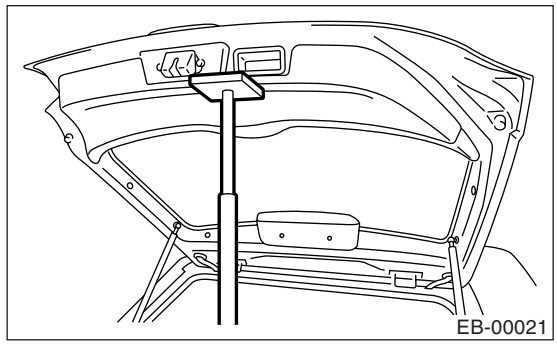
CAUTION:
When the rear gate is released, it may hit and damage the body. To prevent this, place a shop cloth between the body and gate.

10) Loosen the rear gate bolts to remove rear gate.



2. REAR GATE DAMPER STAY

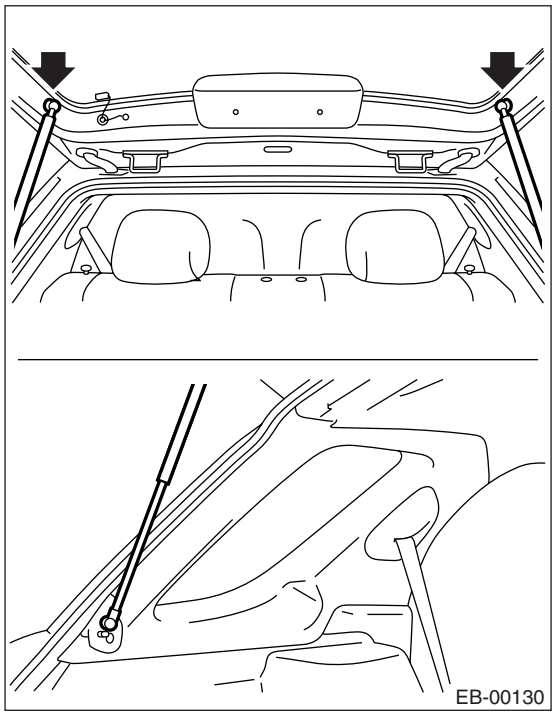
1) Open the rear gate. Use a jack to support the rear gate.



NOTE:
After the rear gate damper stay is removed, the rear gate cannot stay open. Supporting the rear gate with a jack, remove the bolts.

CAUTION:
- **Do not damage the piston rods and oil seals.**
- **Never disassemble the cylinders: They contain gas.**

2) Loosen the bolts to remove the rear gate damper stay from rear gate.



B: INSTALLATION

1. REAR GATE PANEL

1) Install in the reverse order of removal.
2) Install the rear gate panel with uniform clearance to the body.
Refer to COMPONENT of General Description for tightening torque. <Ref. to EB-11, REAR GATE PANEL, COMPONENT, General Description.>

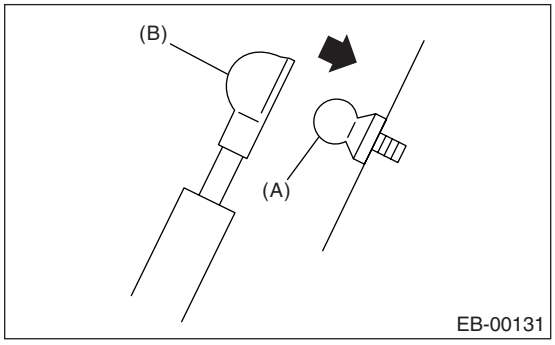
CAUTION:
Do not damage the painted surfaces of body and rear gate panel.

2. REAR GATE DAMPER STAY

1) Install the mounting bolt (A) to the rear gate and body.

Tightening torque:
19.6 N·m (2.0 kgf-m, 14.5 ft-lb)

2) Firmly install the rear gate damper stay (B) to mounting bolt (A).



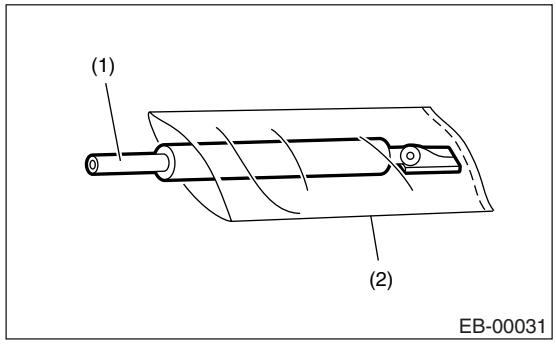
NOTE:
After supporting the rear gate with a jack, start operation.

C: DISPOSAL

1. REAR GATE DAMPER STAY

CAUTION:
Gas is colorless, odorless, and harmless. However, gas pressure may spray the cutting powder or oil. Be sure to wear dust-resistant goggles.

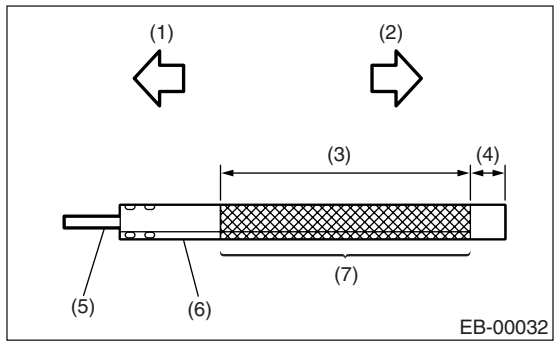
1) Cover with a vinyl case as shown in the figure.



(1) Rear gate damper stay
(2) Vinyl sack

NOTE:
Prevent the vinyl case from being caught by drill cutting edge

2) Lift the body side slightly with piston rods fully extended, and secure the body side on vise stand. Drill a hole in 2 to 3 mm (0.08 to 0.12 in) diameter at a point 10 to 200 mm (0.39 to 7.87 in) from door side, and bleed the rear gate damper stay completely.



(1) Body side
(2) Door side
(3) 190 mm (7.48 in)
(4) 10 mm (0.39 in)
(5) Piston rod
(6) Cylinder
(7) Portion to be drilled

CRUISE CONTROL SYSTEM

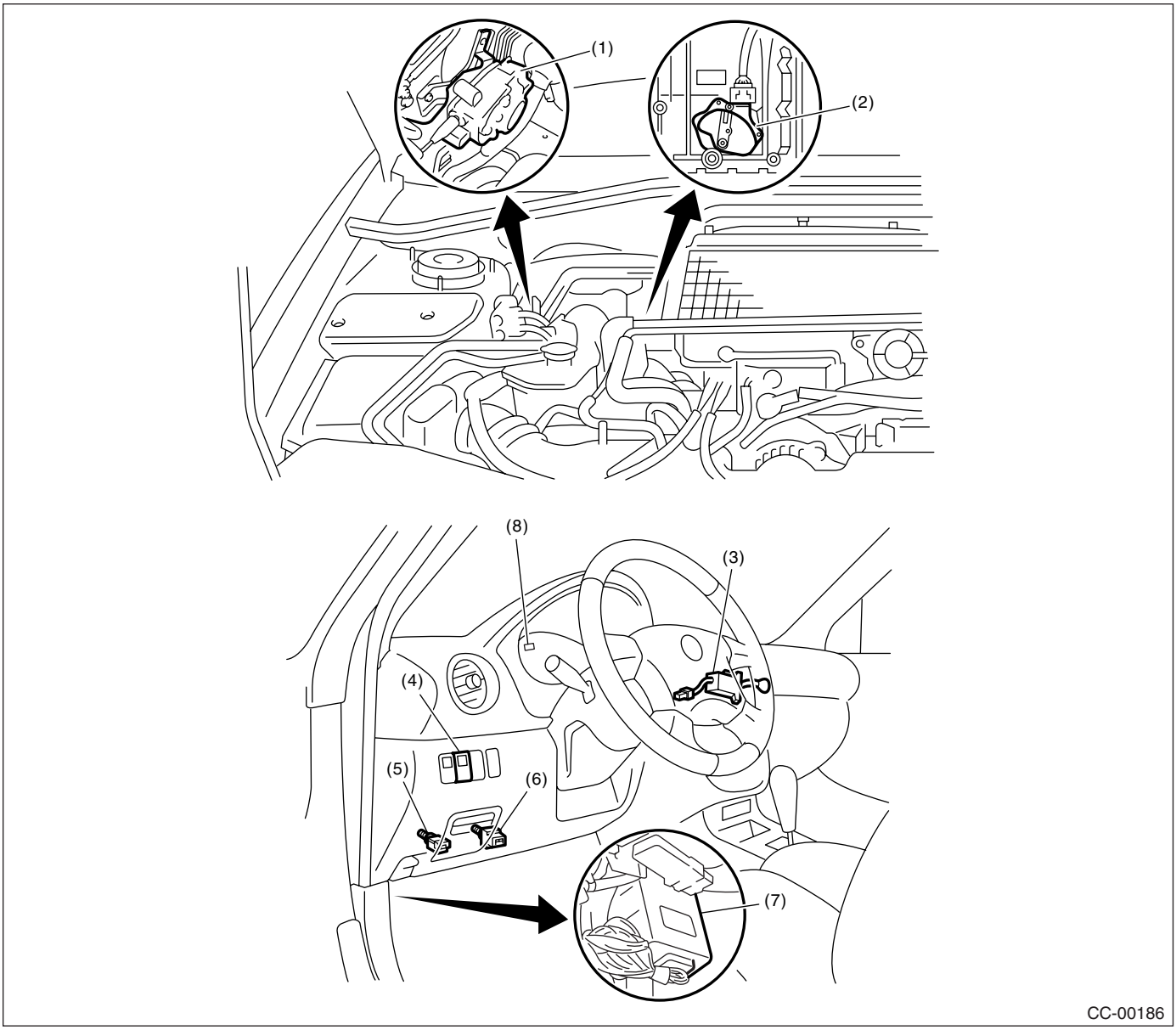
CC

Page

1. General Description 2
2. Actuator 4
3. Cruise Control Module 5
4. Cruise Control Main Switch 6
5. Cruise Control Command Switch 7
6. Stop and Brake Switch 8
7. Clutch Switch 9
8. Inhibitor Switch 10

1. General Description

A: COMPONENT



(1) Actuator
(2) Inhibitor switch (AT model)
(3) Cruise control command switch
(4) Cruise control main switch
(5) Clutch switch (MT model)
(6) Stop and brake switch
(7) Cruise control module
(8) Cruise indicator light and cruise set indicator light

B: CAUTION

• Before disassembling or reassembling parts, always disconnect the battery ground cable. When repairing the radio, control module and other parts with memory functions, make note of the memory before disconnecting the battery ground cable. All memory will be erased.
• Reassemble parts in the reverse order of disassembly unless otherwise indicated.
• Adjust parts to specifications specified in this manual.
• Connect the connectors and hoses securely during reassembly.
• After reassembly, ensure functional parts operate properly.

C: PREPARATION TOOL

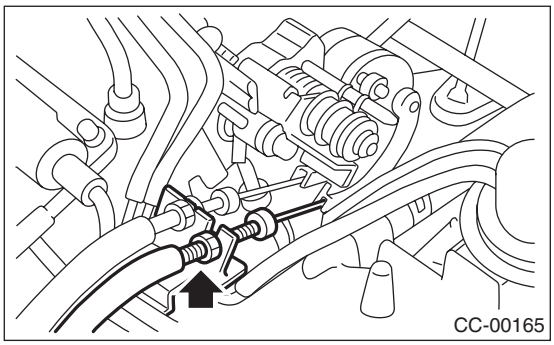
TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Actuator

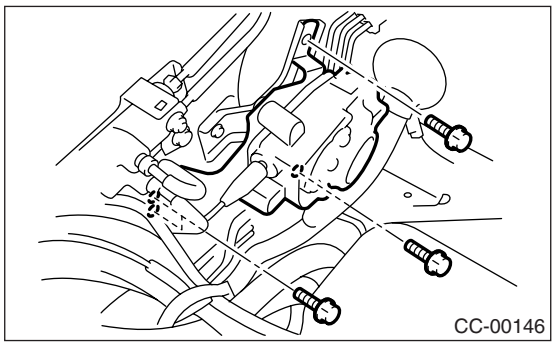
A: REMOVAL

CAUTION:
• Be careful not to apply excessive load to the wire cable when adjusting and/or installing; otherwise, the actuator may be deformed or damaged.
• Do not bend the cable sharply with a radius less than 100 mm (3.94 in); otherwise, cable may bend permanently, resulting in poor performance.
• When installing the cable, be careful not to sharply bend or pinch the inner cable; otherwise, the cable may break.

1) Disconnect the ground cable from battery.
2) Remove the clip bands from cruise control cable.
3) Loosen the nut which secures cruise control cable end to throttle cam, and then remove the cable from throttle cam.


CC-00165

4) Remove the actuator attaching bolts.
5) Remove the actuator while disconnecting the connector.

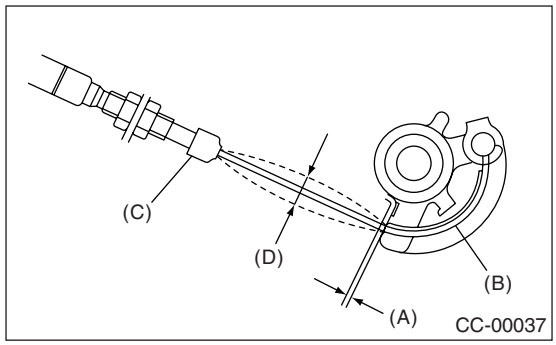

CC-00146

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)
Cable end nut:
12 N·m (1.2 kgf-m, 8.7 ft-lb)

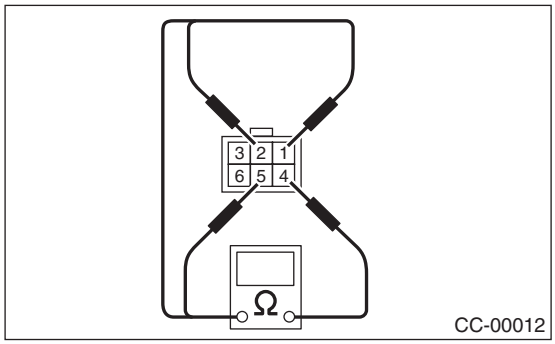
NOTE:
(A): Must be adjusted when the cable end outer is fixed in place, so that gap between throttle cam and lever is 0 — 1 mm (0 — 0.04 in), otherwise, inner cable deflection (D) is 1 — 8 mm (0.039 — 0.315 in) when the throttle cable is installed.
(Must be attached while the throttle cam is being pulled by wire cable.)
(B): Must be coated evenly on the cam end inner connection.
(C): Cover must be inserted securely, until tip of cable touches cover stopper.



CC-00037

C: INSPECTION

Measure the cruise control actuator resistance.



CC-00012

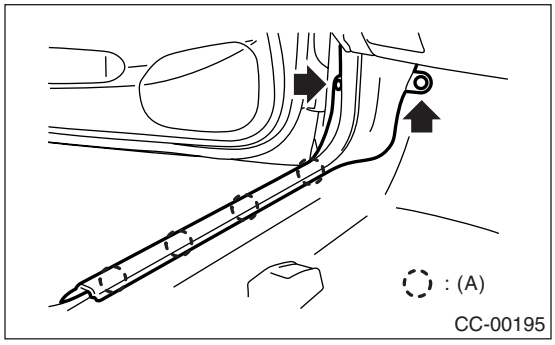
Terminal No.	Standard value
4 and 1	Approx. 5 Ω
4 and 2	Approx. 5 Ω
4 and 5	Approx. 5 Ω
3 and 6	Approx. 39 Ω

If NG, replace the cruise control actuator.

3. Cruise Control Module

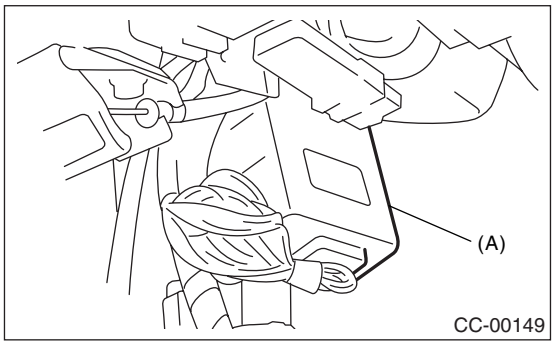
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the side sill front cover.



(A) Hook pawl

3) Disconnect the connector from cruise control module.
4) Remove the bolt, then detach the cruise control module (A).



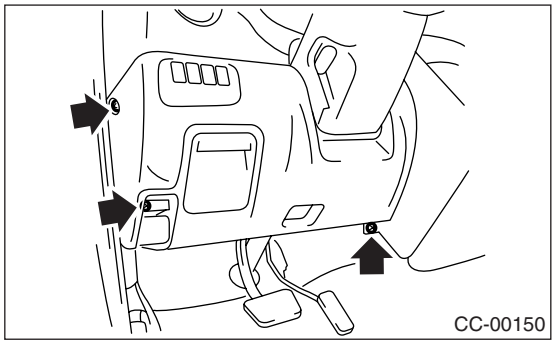
B: INSTALLATION

Install in the reverse order of removal.

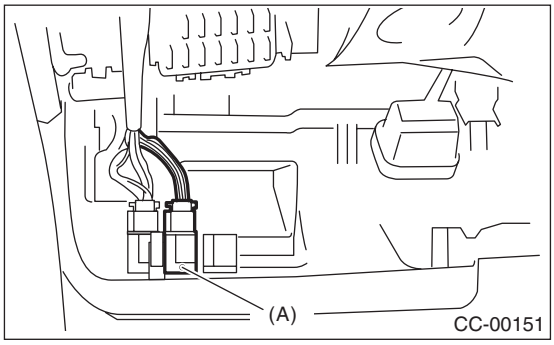
4. Cruise Control Main Switch

A: REMOVAL

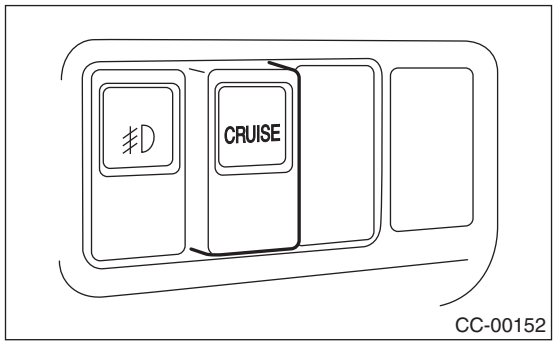
1) Disconnect the ground cable from battery.
2) Remove the screws and clip from instrument panel lower cover.
3) Remove the instrument panel lower cover.



4) Disconnect the connector from cruise control main switch.



5) Remove the main switch by pushing it outward.

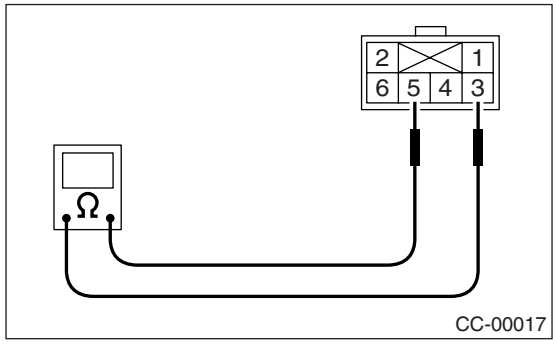


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the cruise control main switch resistance.



Switch position	Terminal No.	Standard value
OFF	3 and 5	More than 1 MΩ
ON	3 and 5	Less than 1 Ω

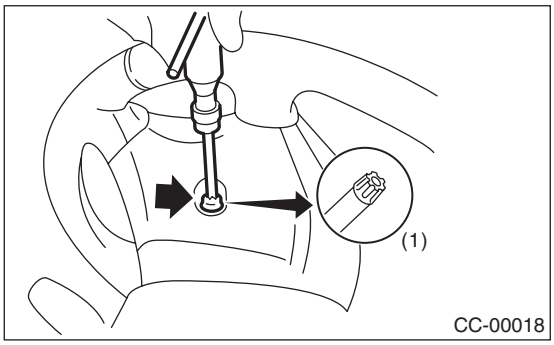
If NG, replace the cruise control main switch.

5. Cruise Control Command Switch

A: REMOVAL

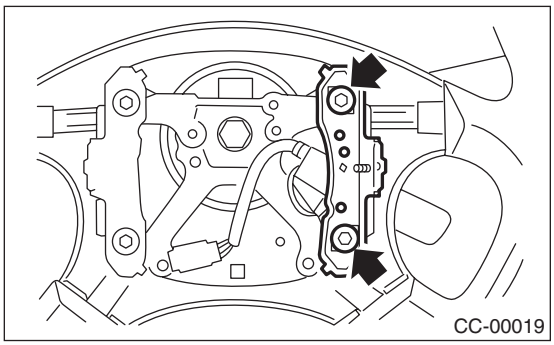
WARNING:
Before servicing, be sure to read the notes in the AB section for proper handling of the driver's airbag module. <Ref. to AB-3, CAUTION, General Description.>

1) Set the front wheels in straight ahead position.
2) Turn the ignition switch to OFF.
3) Disconnect the ground cable from battery and wait for at least 20 seconds before starting work.
4) Using the TORX® BIT T30 (Tamper resistant type), loosen the two TORX® bolts which secure driver's airbag module.

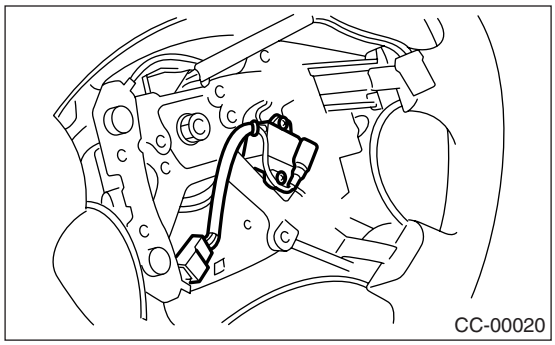


(1) TORX® BIT T30

5) Disconnect the airbag module connector on back of airbag module.
6) Remove the horn switch from steering wheel as shown.



7) Disconnect the horn and cruise control command switch connector, then remove the cruise control command switch.

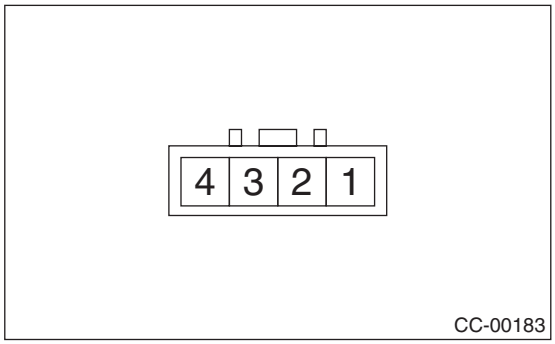


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the cruise control command switch resistance.



Switch	Position	Terminal No.	Standard value
CANCEL	ON	1 (+) and 2 (–)	Less than 1 Ω
	ON	1 (+) and 3 (–)	Less than 1 Ω
SET/COAST	OFF	1 and 2	More than 1 MΩ
	ON	1 and 2	Less than 1 Ω
RESUME/ ACCEL	OFF	1 and 3	More than 1 MΩ
	ON	1 and 3	Less than 1 Ω

If NG, replace the cruise control command switch.

6. Stop and Brake Switch

A: REMOVAL

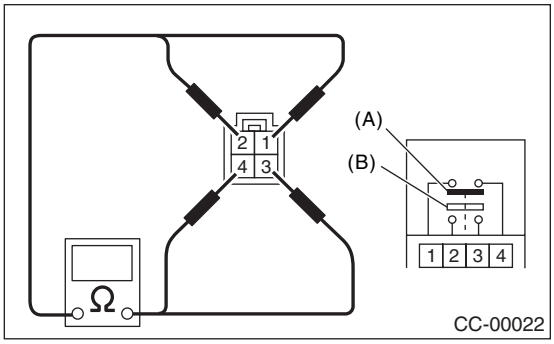
1) Disconnect the ground cable from battery.
2) Disconnect the connector from stop and brake switch, and then remove the switch. <Ref. to BR-52, REMOVAL, Stop Light Switch.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the brake switch (A) and stop light switch (B) resistance.



Switch	Pedal	Terminal No.	Standard value
Brake	Released	1 and 4	Less than 1 Ω
	Depressed	1 and 4	More than 1 MΩ
Stop light	Released	2 and 3	More than 1 MΩ
	Depressed	2 and 3	Less than 1 Ω

If NG, replace the stop and brake switch.

7. Clutch Switch

A: REMOVAL

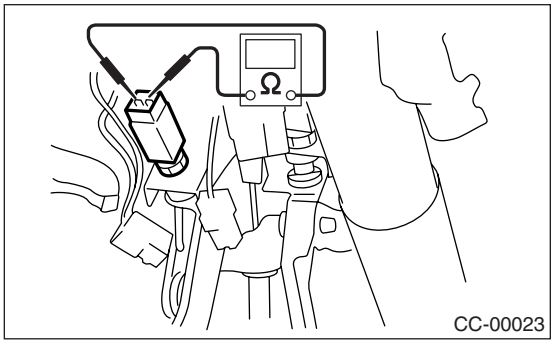
1) Disconnect the ground cable from battery.
2) Disconnect the connector from clutch switch, and then remove the switch. <Ref. to CL-25, DISASSEMBLY, Clutch Pedal.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the clutch switch resistance.



Switch	Pedal	Terminal No.	Standard value
Clutch	Released	1 and 2	Less than 1 Ω
	Depressed	1 and 2	More than 1 MΩ

If NG, replace the clutch switch.

8. Inhibitor Switch

A: REMOVAL

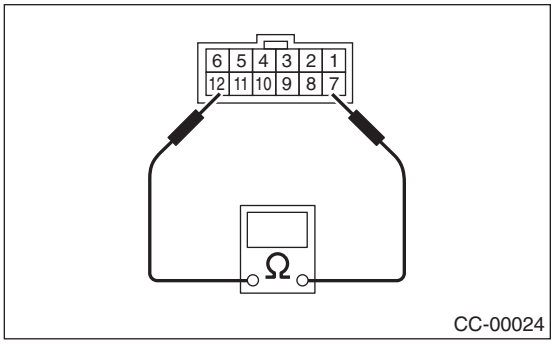
1) Disconnect the ground cable from battery.
2) Disconnect the connector from inhibitor switch, and then remove the switch. <Ref. to 4AT-46, REMOVAL, Inhibitor Switch.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the inhibitor switch resistance.



Selector lever position	Terminal No.	Standard value
P	7 and 12	Less than 1 Ω
N		Less than 1 Ω
Except P and N		More than 1 MΩ

If NG, replace the inhibitor switch.

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

CC(diag)

Page

1. Basic Diagnostic Procedure 2
2. General Description 3
3. Electrical Components Location....5
4. Cruise Control Module I/O Signal....6
5. Subaru Select Monitor....8
6. Diagnostic Procedure with Symptom 10
7. List of DTC 28
8. Diagnostic Procedure with DTC 30

1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**START DIAGNOSIS.** 1) Perform the pre-inspection. <Ref. to CC(diag)-4, INSPECTION, General Description.> 2) Check the cruise control main switch operation.	Is the cruise control main switch turned ON?	Go to step **2.**	Go to symptom 1. <Ref. to CC(diag)-10, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
2	**PREPARE SUBARU SELECT MONITOR.**	Is the select monitor available?	Go to step **3.**	Go to step **4.**
3	**PERFORM CRUISE CANCEL CONDITIONS DIAGNOSIS.** Perform the cruise cancel conditions diagnosis. <Ref. to CC(diag)-8, Subaru Select Monitor.>	Are any DTC indicated?	Go to "List of DTC". <Ref. to CC(diag)-28, List of DTC.>	Go to step **4.**
4	**CHECK CRUISE CONTROL SET OPERATION.** Check the cruise control set operation.	Can the cruise control be set while driving at 40 km/h (25 MPH)?	Go to step **5.**	Go to symptom 2. <Ref. to CC(diag)-10, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
5	**CHECK VEHICLE SPEED IS HELD WITHIN SET SPEED.** Make sure the vehicle speed is held within set speed.	Is the vehicle speed held within set speed ±3 km/h (±2 MPH)?	Go to step **6.**	Go to symptom 3. <Ref. to CC(diag)-10, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
6	**CHECK RESUME/ACCEL OPERATION.** Check the RESUME/ACCEL operation.	Does the vehicle speed increase or return to set speed after RESUME/ACCEL switch has been pressed?	Go to step **7.**	Go to symptom 4. <Ref. to CC(diag)-10, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
7	**CHECK SET/COAST OPERATION.** Check the SET/COAST operation.	Does the vehicle speed decrease after SET/COAST switch has been pressed?	Go to step **8.**	Go to symptom 5. <Ref. to CC(diag)-10, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
8	**CHECK CANCEL OPERATION.** Check the CANCEL operation.	Is the cruise control released after CANCEL switch has been pressed?	Go to step **9.**	Go to symptom 6. <Ref. to CC(diag)-10, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
9	**CHECK CRUISE CONTROL RELEASE OPERATION.** Check the cruise control release operation.	Is the cruise control released after brake pedal has been depressed?	Go to step **10.**	Go to symptom 7. <Ref. to CC(diag)-10, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
10	**CHECK CRUISE CONTROL RELEASE OPERATION.** Check the cruise control release operation.	Is the cruise control released after clutch pedal has been depressed? (MT model)	Finish the diagnostics.	Go to symptom 8. <Ref. to CC(diag)-10, SYMPTOM CHART, Diagnostic Procedure with Symptom.>

2. General Description

A: CAUTION

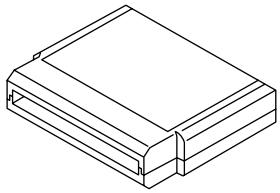
1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the cruise control module and cruise control command switch.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the cruise control module and cruise control command switch.

B: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA230	24082AA230	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

2. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit T ester	Used for measuring resistance, voltage and ampere.

C: INSPECTION

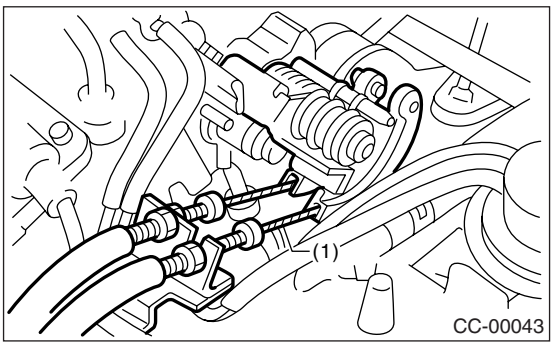
1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

Standard voltage:
12 V, or more

Specific gravity:
Above 1.260

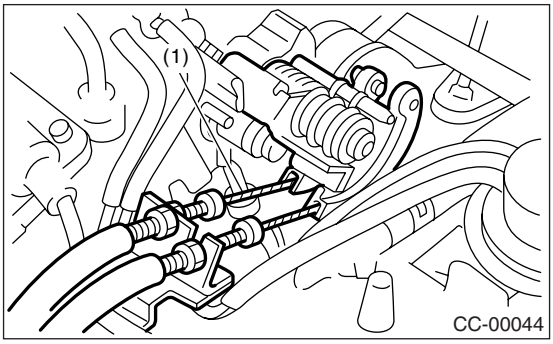
2. CRUISE CONTROL CABLE



(1) Cruise control cable

Check the cruise control cable installation.
If NG, install the cable securely.

3. ACCELERATOR CABLE



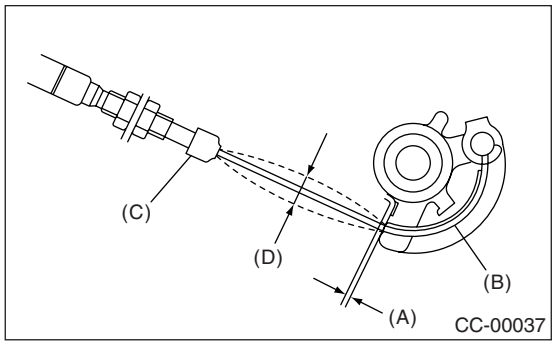
(1) Accelerator cable

Check the movement of accelerator cable when the cruise control throttle is moved by hand.
If NG, check the throttle cam.

4. THROTTLE CAM

Check that the throttle cam moves smoothly.
If NG, repair the throttle cam.

5. CABLE FREE PLAY



Check that the throttle cam-to-lever clearance (A) or cable (B) deflection amount (D) is within specifications.

Throttle cam-to-lever clearance:
0 — 1 mm (0 — 0.04 in)

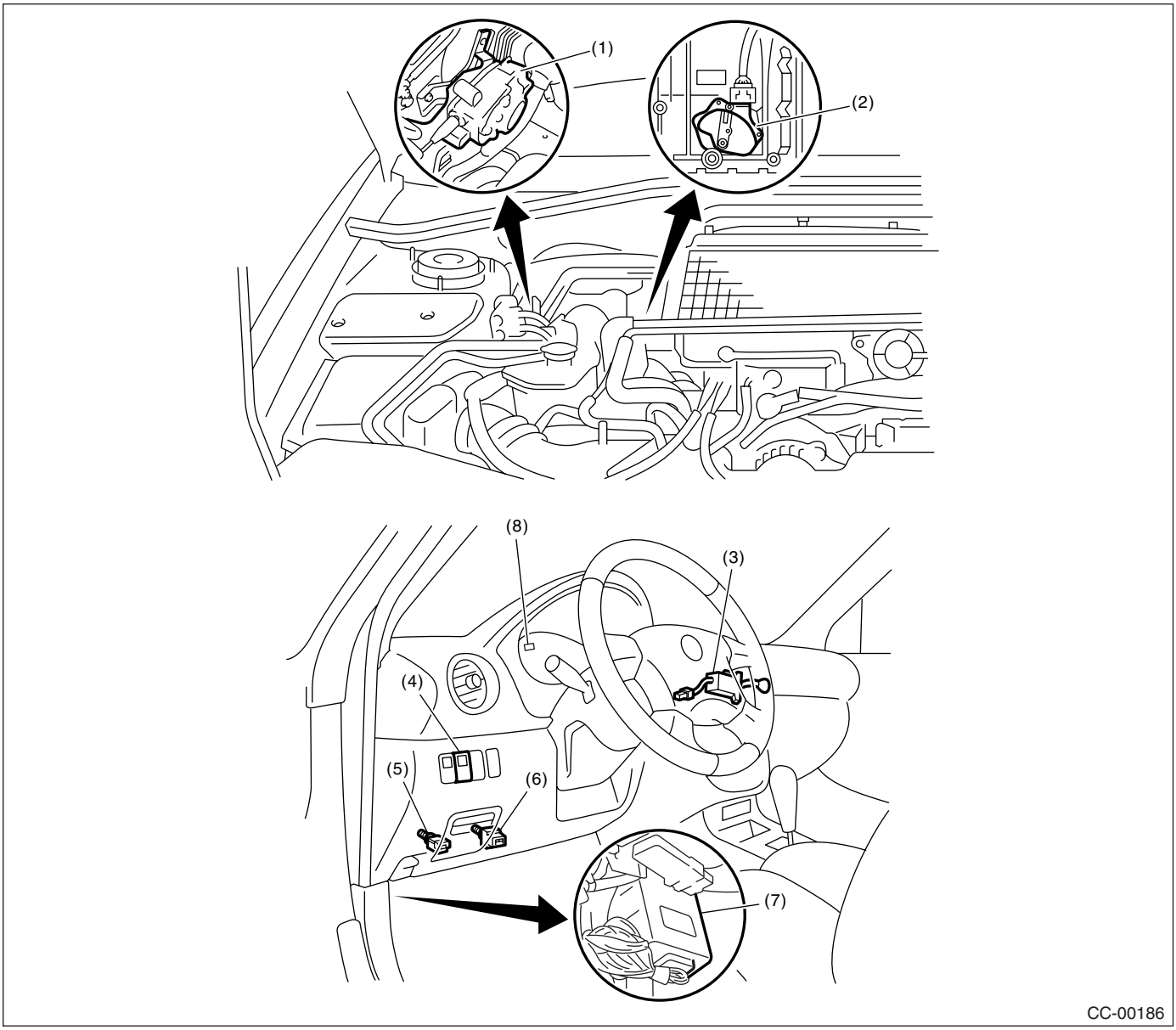
Inner cable deflection:
1 — 8 mm (0.04 — 0.31 in)

If NG, adjust the clearance with the adjust nut.

NOTE:
Check that the cap (C) is positioned in the groove.

3. Electrical Components Location

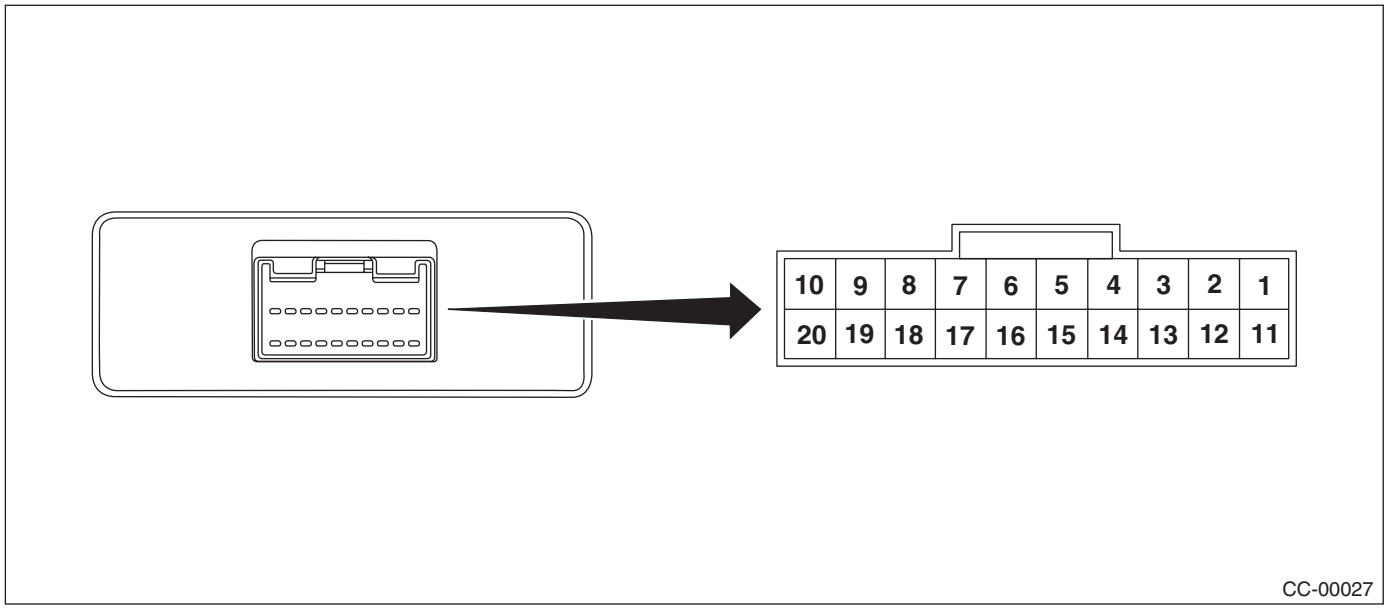
A: LOCATION



(1) Actuator
(2) Inhibitor switch (AT model)
(3) Cruise control command switch
(4) Cruise control main switch
(5) Clutch switch (MT model)
(6) Stop and brake switch
(7) Cruise control module
(8) Cruise indicator light and cruise set indicator light

4. Cruise Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



Content	Terminal No.	Measuring conditions and I/O signals (ignition switch ON and engine idling)
Cruise indicator light	1	• Battery voltage is present when main switch is turned OFF. • “0” volt is present when main switch is turned ON.
Cruise set indicator light	3	• “0” volt is present when cruise control is set and operated. • Battery voltage is present when cruise control is not set and not operated.
Inhibitor switch (AT model)	4	• Battery voltage is present when selector lever is other than “P” or “N” position. • “0” volt is present when selector lever is set to “P” or “N” position.
Motor B	5	• ON-and-OFF (“0”-and-battery voltage) operation is alternately repeated while cruise control is operating. • “0” volt is present when main switch is turned OFF.
Ground	6	—
Motor A	7	• ON-and-OFF (“0”-and-battery voltage) operation is alternately repeated while cruise control is operating. • “0” volt is present when main switch is turned OFF.
RESUME/ACCEL switch	9	• Battery voltage is present when command switch is turned to RESUME/ACCEL position. • “0” volt is present when command switch is released.
SET/COAST switch	10	• Battery voltage is present when command switch is turned to SET/COAST position. • “0” volt is present when command switch is released.
Main power supply	11	• Battery voltage is present when ignition switch is turned ON. • “0” volt is present when ignition switch is turned OFF.
Ignition switch	12	• Battery voltage is present when ignition switch is turned ON. • “0” volt is present when ignition switch is turned OFF.
Motor C	13	• ON-and-OFF (“0”-and-battery voltage) operation is alternately repeated while cruise control is operating. • “0” volt is present when main switch is turned OFF.
Motor clutch	14	• ON-and-OFF (“0”-and-battery voltage) operation is alternately repeated while cruise control is operating. • “0” volt is present when vehicle is stopped.
Cruise control main switch	15	• Battery voltage is present during pressing the cruise control main switch. • “0” volt is present when main switch is turned OFF.

Content	Terminal No.	Measuring conditions and I/O signals (ignition switch ON and engine idling)
Brake switch	16	Leave clutch pedal released (MT model), while cruise control main switch is turned ON. Then check that; • Battery voltage is present when brake pedal is released. • "0" volt is present when brake pedal is depressed. Additionally only in MT model, keep the cruise control main switch to ON and leave brake pedal released. Then check that; • Battery voltage is present when clutch pedal is released. • "0" volt is present when clutch pedal is depressed.
Data link connector	17	—
Data link connector	18	—
Vehicle speed sensor (MT model) TCM (AT model)	19	Lift-up the vehicle until all four wheels are raised off ground, and then rotate any wheel manually. Approx. "5" and "0" volt pulse signals are alternately input to cruise control module.
Stop light switch	20	Turn ignition switch to OFF. Then check that; • Battery voltage is present when brake pedal is depressed. • "0" volt is present when brake pedal is released.
NOTE: Voltage at terminals 5, 7, 13 and 14 cannot be checked unless vehicle is driving by cruise control operation.		

B: WIRING DIAGRAM

<Ref. to WI-72, WIRING DIAGRAM, Cruise Control System.>

5. Subaru Select Monitor

A: OPERATION

1. GENERAL

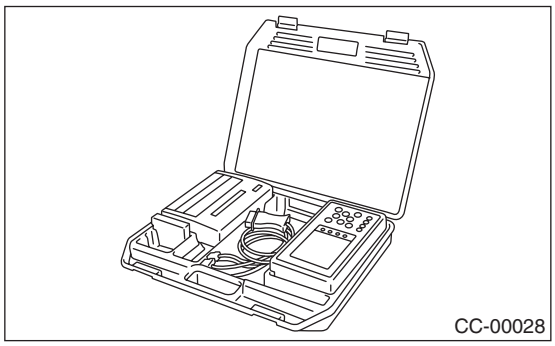
The on-board diagnosis function of the cruise control system uses the Subaru Select Monitor.
The on-board diagnosis function operates in two categories, which are used depending on the type of problems;
1) Cruise cancel conditions diagnosis:
(1) This category of diagnosis requires actual vehicle driving in order to determine the cause, (as when cruise speed is cancelled during driving although cruise cancel condition is not entered).
(2) Cruise control module memory stores the cancel condition (Code No.) which occurred during driving. When there are plural cancel conditions (Code No.), they are shown on the Subaru Select Monitor.

CAUTION:
• The cruise control memory stores not only the cruise "cancel" which occurred (although "cancel" operation is not entered by the driver), but also the "cancel" condition input by the driver.
• The content of memory is cleared when ignition switch or cruise main switch is turned OFF.

2) Real-time diagnosis:
The real-time diagnosis function is used to determine whether or not the input signal system is in good order, according to signal emitted from switches, sensors, etc.
(1) Vehicle cannot be driven at cruise speed because problem occurs in the cruise control system or its associated circuits.
(2) Monitor the signal conditions from switches and sensors.

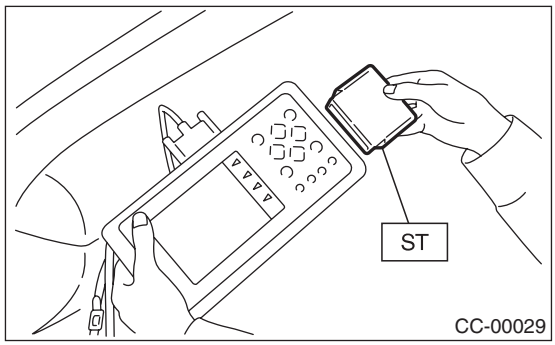
2. CRUISE CANCEL CONDITIONS DIAGNOSIS

1) Prepare the Subaru Select Monitor kit.


CC-00028

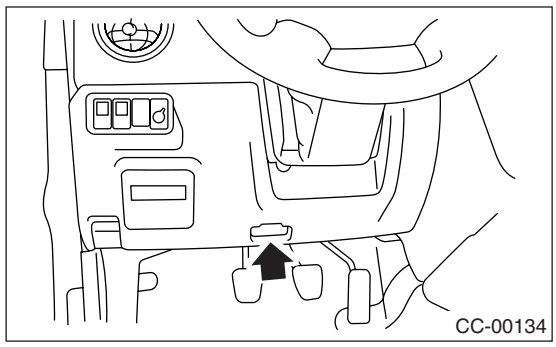
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor. <Ref. to CC(diag)-3, SPECIAL TOOLS, PREPARATION TOOL, General Description.>

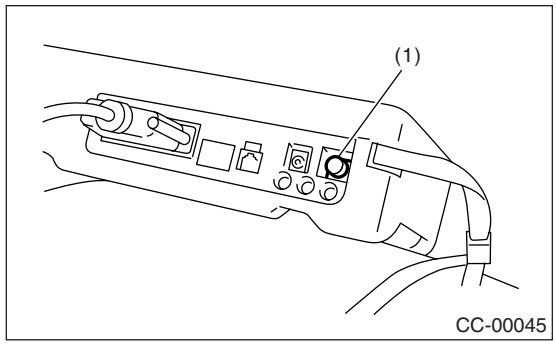


CC-00029

4) Connect the Subaru Select Monitor to data link connector.
(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).


CC-00134

(2) Connect the diagnosis cable to data link connector.
5) Start the engine and turn the cruise control main switch to ON.
6) Turn the Subaru Select Monitor switch to ON.



CC-00045

(1) Power switch

7) On the Main Menu display screen, select the {All System Diagnosis} and press [YES] key.

NOTE:
The DTC is also shown in the {Each System Check} mode. This mode is called up on the Cruise Control Diagnosis screen by selecting the item {Cancel Code(s) Display}.

8) Drive the vehicle at least 40 km/h (25 MPH) with cruise speed set.
9) If the cruise speed is canceled itself (without doing any cancel operations), a DTC will appear on select monitor display.

CAUTION:
• A DTC will also appear when cruise cancel is effected by driver. Do not confuse.
• Have a co-worker ride in the vehicle to assist in diagnosis during driving.

NOTE:
DTC will be cleared by turning the ignition switch or cruise control main switch to OFF.

3. REAL-TIME DIAGNOSIS

1) Connect the select monitor.
2) Turn the ignition switch and cruise control main switch to ON.
3) Turn the Subaru Select Monitor switch to ON.
4) On the Main Menu display screen, select the {Each System Check} and press [YES] key.
5) On the System Selection Menu display screen, select the {Cruise Control} and press [YES] key.
6) Press the [YES] key after displayed the information of engine type.
7) On the Cruise Control Diagnosis display screen, select the {Current Data Display & Save} and press [YES] key.
8) Make sure that normal indication is displayed when controls are operated as indicated below:
• Depress/release the brake pedal. (Stop light switch and brake switch turn ON.)
• Turn ON the “SET/COAST” switch.
• Turn ON the “RESUME/ACCEL” switch.
• Depress/release the clutch pedal. (MT model)
• Set the selector lever to P or N. (AT model)

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For details concerning DTCs, refer to the List of DTC. <Ref. to CC(diag)-28, List of DTC.>

6. Diagnostic Procedure with Symptom

A: SYMPTOM CHART

Symptom		Repair area	Reference
1	Cruise control main switch is not turned to ON.	(1) Check the power supply.	<Ref. to CC(diag)-12, CHECK POWER SUPPLY, Diagnostic Procedure with Symptom.>
		(2) Check the cruise control main switch.	<Ref. to CC(diag)-14, CHECK CRUISE CONTROL MAIN SWITCH, Diagnostic Procedure with Symptom.>
2	Cruise indicator light does not illuminate.	(1) Check the cruise indicator light.	<Ref. to CC(diag)-16, CHECK CRUISE INDICATOR LIGHT, Diagnostic Procedure with Symptom.>
		(2) Check the cruise set indicator light.	<Ref. to CC(diag)-18, CHECK CRUISE SET INDICATOR LIGHT, Diagnostic Procedure with Symptom.>
3	Cruise control cannot be set.	(1) Check the SET/COAST switch.	<Ref. to CC(diag)-20, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with Symptom.>
		(2) Check the stop light switch and brake switch.	<Ref. to CC(diag)-22, CHECK STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostic Procedure with Symptom.>
		(3) Check the clutch switch (MT model).	<Ref. to CC(diag)-24, CHECK CLUTCH SWITCH (MT MODEL), Diagnostic Procedure with Symptom.>
		(4) Check the inhibitor switch (AT model).	<Ref. to CC(diag)-26, CHECK INHIBITOR SWITCH (AT MODEL), Diagnostic Procedure with Symptom.>
		(5) Check the vehicle speed sensor.	<Ref. to CC(diag)-31, DTC 22 VEHICLE SPEED SENSOR, Diagnostic Procedure with DTC.>
		(6) Check the motor drive system.	<Ref. to CC(diag)-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostic Procedure with DTC.>
		(7) Check the motor clutch drive system.	<Ref. to CC(diag)-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostic Procedure with DTC.>
4	Vehicle speed is not held within set speed ±3 km/h (±2 MPH).	(1) Check the vehicle speed sensor.	<Ref. to CC(diag)-31, DTC 22 VEHICLE SPEED SENSOR, Diagnostic Procedure with DTC.>
		(2) Check the motor drive system.	<Ref. to CC(diag)-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostic Procedure with DTC.>
		(3) Check the motor clutch drive system.	<Ref. to CC(diag)-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostic Procedure with DTC.>
5	Vehicle speed does not increase or does not return to set speed after RESUME/ ACCEL switch has been pressed.	(1) Check the RESUME/ ACCEL switch.	<Ref. to CC(diag)-20, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with Symptom.>
		(2) Check the motor drive system.	<Ref. to CC(diag)-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostic Procedure with DTC.>
		(3) Check the motor clutch drive system.	<Ref. to CC(diag)-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostic Procedure with DTC.>
6	Vehicle speed does not decrease after SET/COAST switch has been pressed.	(1) Check the SET/COAST switch.	<Ref. to CC(diag)-20, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with Symptom.>
		(2) Check the motor drive system.	<Ref. to CC(diag)-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostic Procedure with DTC.>
		(3) Check the motor clutch drive system.	<Ref. to CC(diag)-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostic Procedure with DTC.>
7	Cruise control is not released after CANCEL switch has been pressed.	(1) Check the CANCEL switch.	<Ref. to CC(diag)-20, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with Symptom.>
		(2) Check the motor drive system.	<Ref. to CC(diag)-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostic Procedure with DTC.>
		(3) Check the motor clutch drive system.	<Ref. to CC(diag)-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostic Procedure with DTC.>

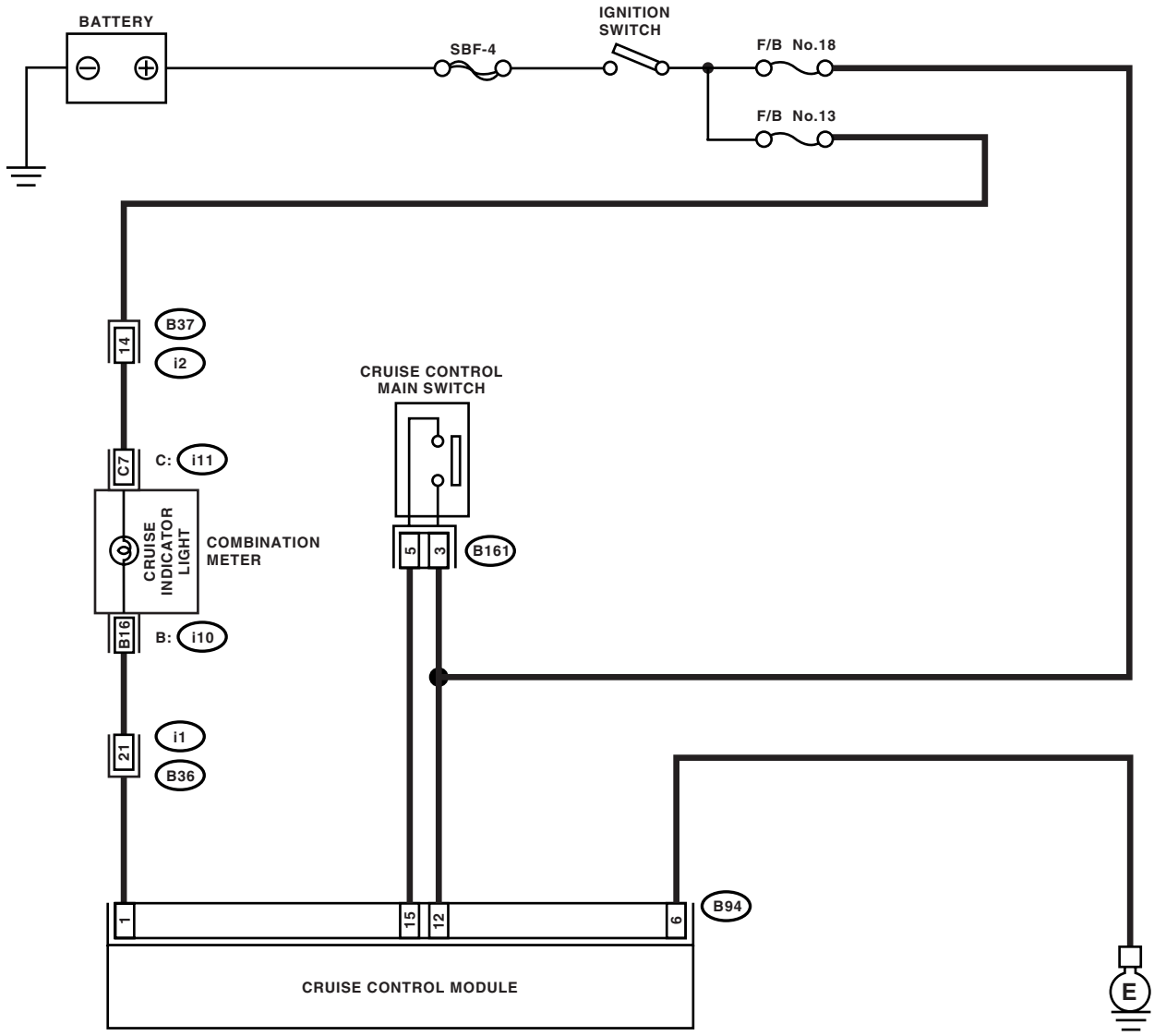
Symptom		Repair area	Reference
8	Cruise control is not released after brake pedal has been depressed.	(1) Check the stop light switch and brake switch.	<Ref. to CC(diag)-22, CHECK STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostic Procedure with Symptom.>
		(2) Check the motor drive system.	<Ref. to CC(diag)-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostic Procedure with DTC.>
		(3) Check the motor clutch drive system.	<Ref. to CC(diag)-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostic Procedure with DTC.>
9	Cruise control is not released after clutch pedal has been depressed (MT model).	(1) Check the clutch switch.	<Ref. to CC(diag)-24, CHECK CLUTCH SWITCH (MT MODEL), Diagnostic Procedure with Symptom.>
		(2) Check the motor drive system.	<Ref. to CC(diag)-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostic Procedure with DTC.>
		(3) Check the motor clutch drive system.	<Ref. to CC(diag)-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostic Procedure with DTC.>

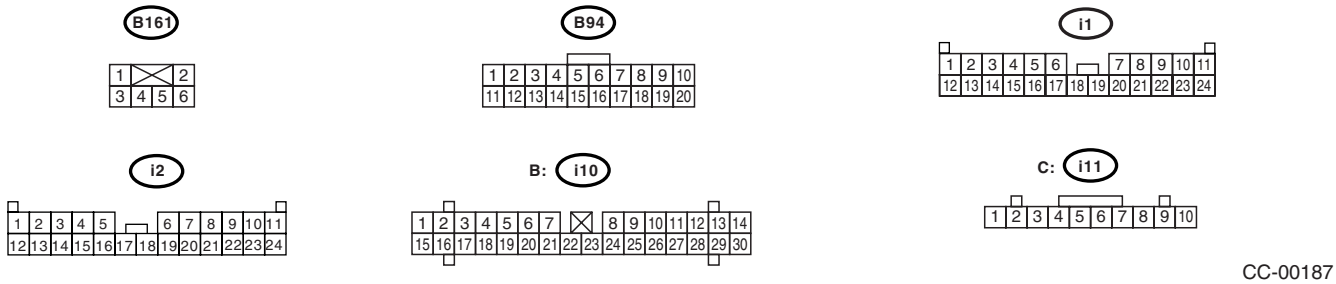
B: CHECK POWER SUPPLY

TROUBLE SYMPTOM:

Cruise control is not turned to ON.

WIRING DIAGRAM:





CC-00187

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the cruise control module harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B94) No. 12 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	• Check the fuse No. 18 (in fuse & relay box). • Check the harness for open or short between cruise control module and fuse & relay box.
2	**CHECK GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B94) No. 6 — Chassis ground:***	Is the resistance less than 10 Ω?	Power supply and ground circuit are OK.	Repair the harness.

C: CHECK CRUISE CONTROL MAIN SWITCH

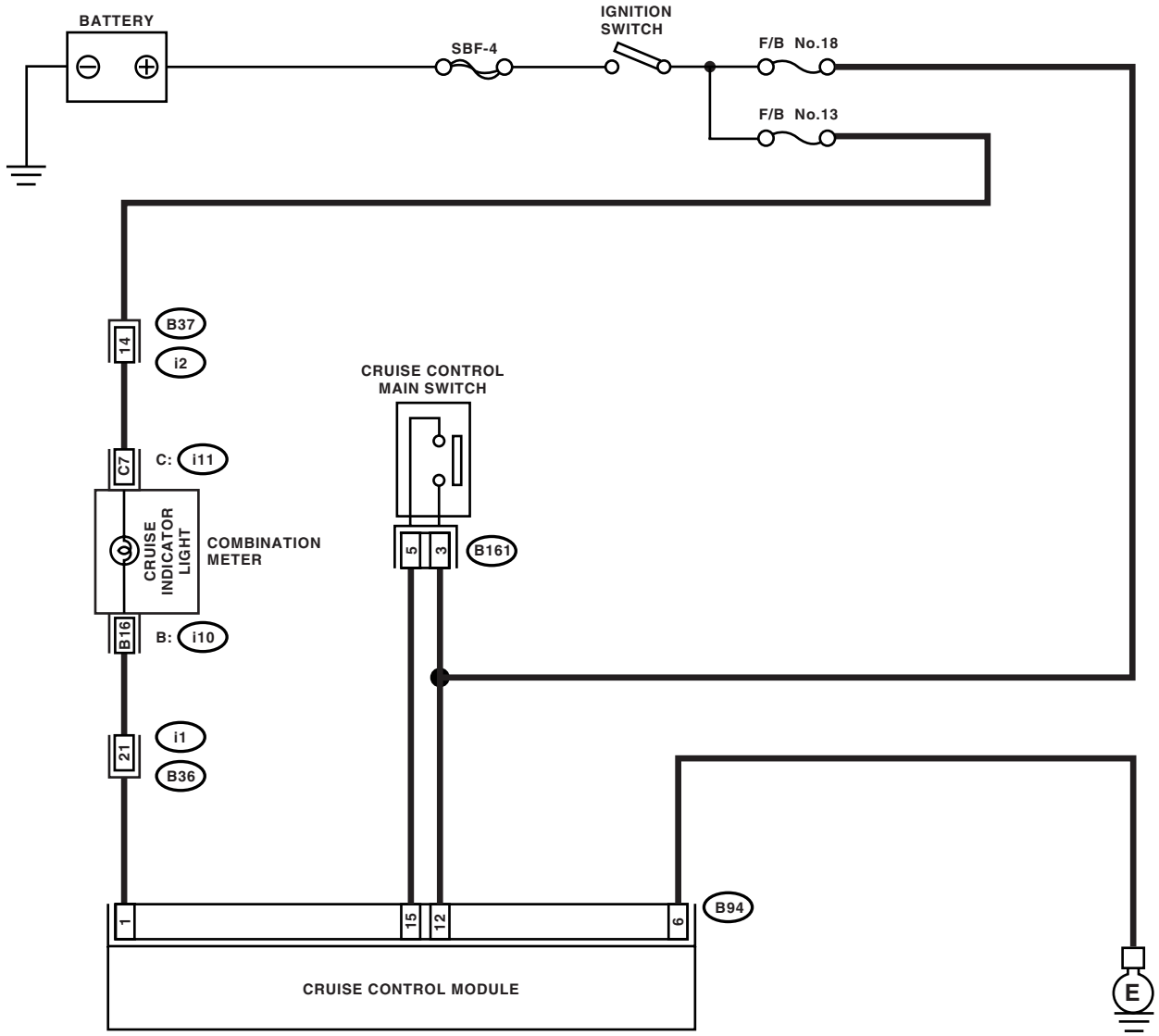
TROUBLE SYMPTOM:

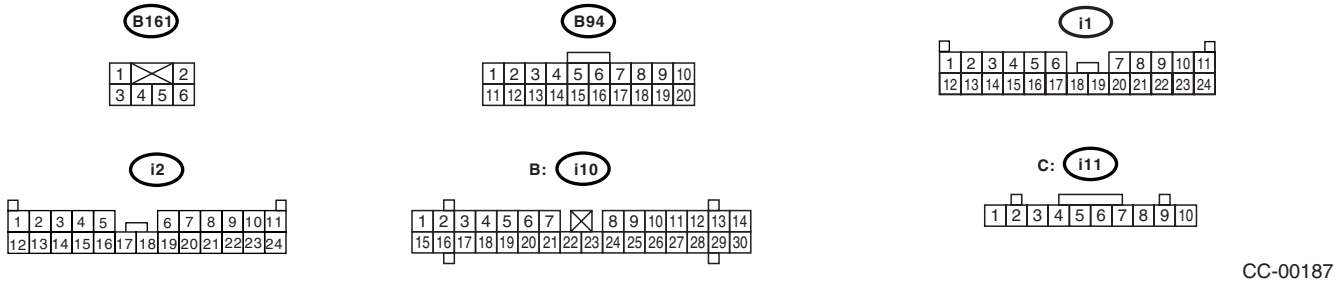
Cruise control main switch is not turned to ON and cruise control cannot be set.

NOTE:

When the main relay (built-in cruise control module) operates, the main switch circuit is in normal condition.
The main relay operation can be checked by hearing the operation sound.
This operation sound will be heard when the ignition switch and cruise control main switch is turned to ON.

WIRING DIAGRAM:





CC-00187

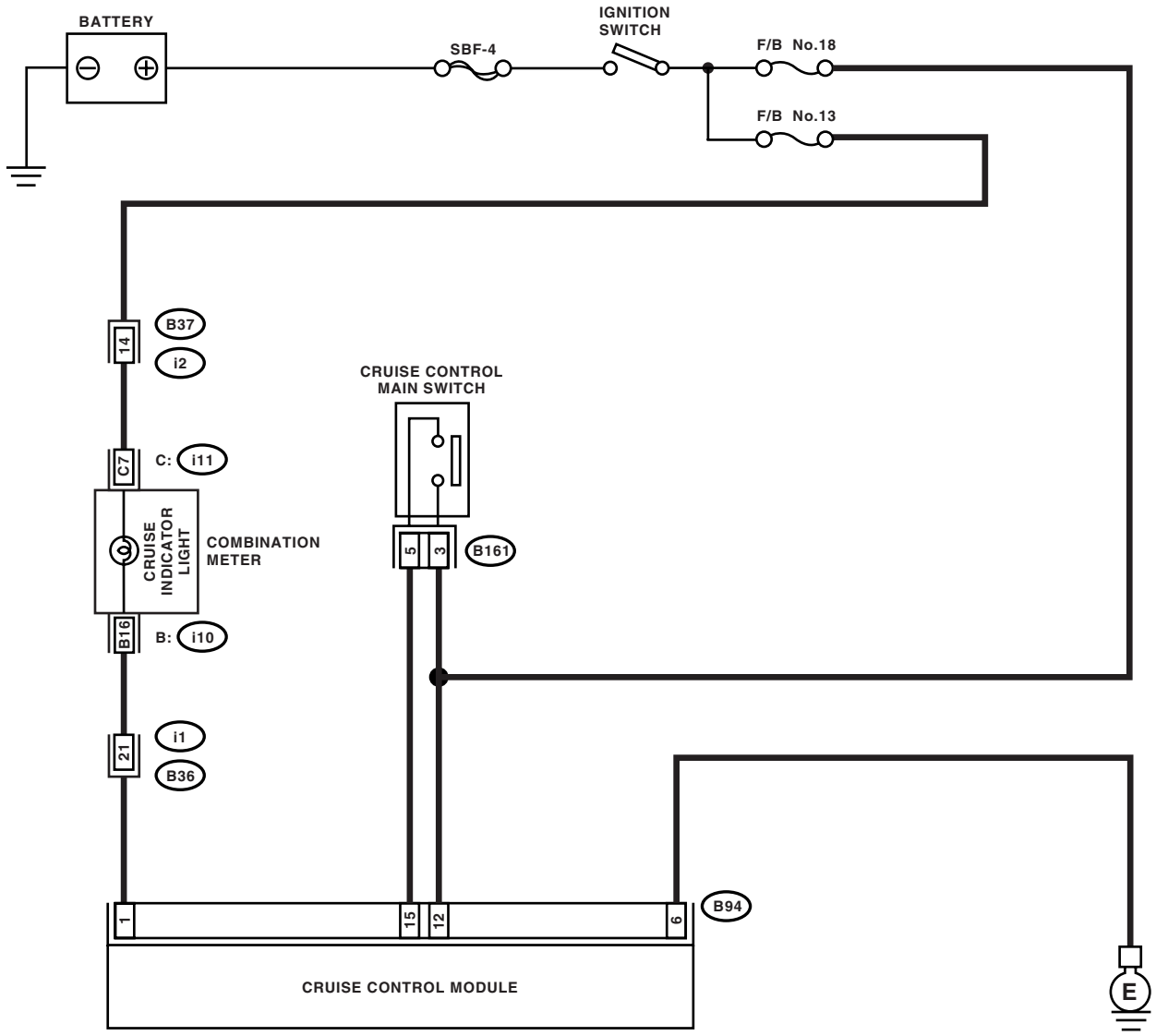
	Step	Check	Yes	No
1	**CHECK CRUISE CONTROL MAIN SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the cruise control main switch harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B161) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	• Check the fuse No. 18 (in fuse & relay box). • Check the harness for open or short between cruise control main switch and fuse & relay box.
2	**CHECK CRUISE CONTROL MAIN SWITCH CIRCUIT.** 1) Turn the ignition switch OFF. 2) Disconnect the cruise control module harness connector. 3) Measure the resistance between cruise control module harness connector terminal and cruise control main switch harness connector terminal. ***Connector & terminal*** ***(B94) No. 15 — (B161) No. 5:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**CHECK CRUISE CONTROL MAIN SWITCH.** Remove and check the cruise control main switch. <Ref. to CC-6, Cruise Control Main Switch.>	Is the cruise control main switch OK?	Replace the cruise control module.	Replace the cruise control main switch.

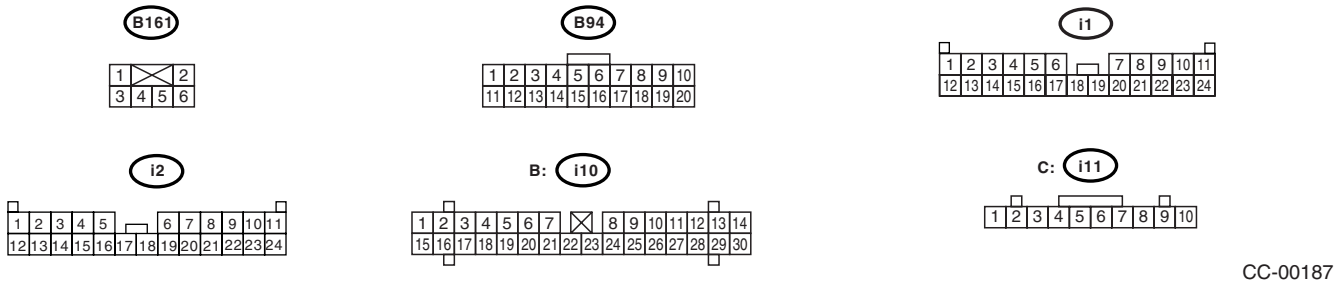
D: CHECK CRUISE INDICATOR LIGHT

TROUBLE SYMPTOM:

Cruise control can be set, but cruise indicator light does not illuminate.

WIRING DIAGRAM:





CC-00187

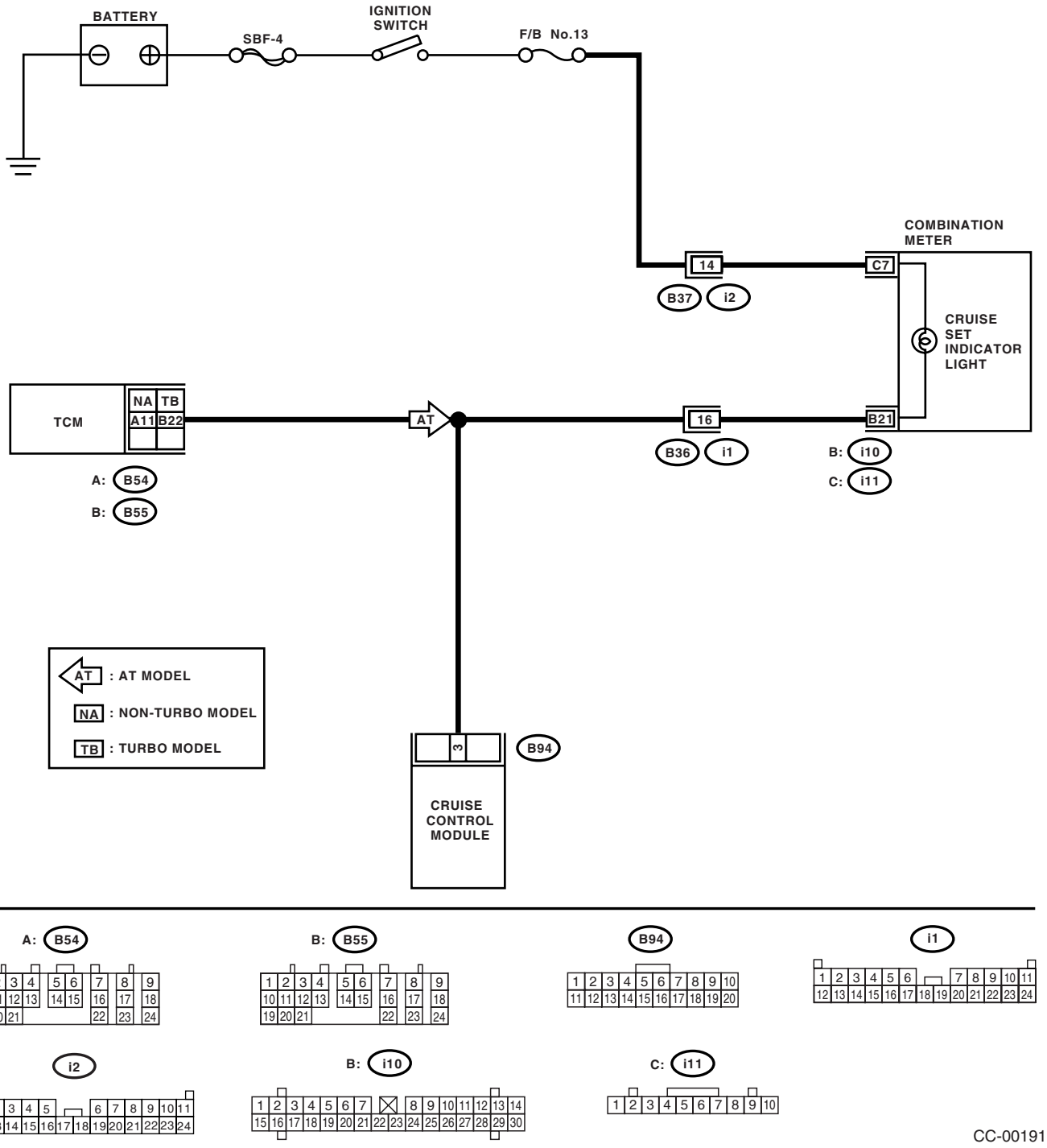
	Step	Check	Yes	No
1	**CHECK CRUISE INDICATOR LIGHT CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(i11) No. 7 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	• Check the fuse No. 13 (in fuse & relay box). • Check the harness for open or short between combination meter and fuse & relay box.
2	**CHECK CRUISE INDICATOR LIGHT CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the cruise control module harness connector. 3) Measure the resistance between cruise control module harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***(B94) No. 1 — (i10) No. 16:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**CHECK CRUISE INDICATOR LIGHT CIRCUIT.** Ground the cruise control module harness connector terminal with a suitable wire. ***Connector & terminal*** ***(B94) No. 1 — Chassis ground:***	Does the cruise indicator light illuminate?	Replace the cruise control module.	Check the cruise indicator light bulb in combination meter, and replace it if malfunction occurred. No malfunction found, replace the printed circuit of combination meter.

E: CHECK CRUISE SET INDICATOR LIGHT

TROUBLE SYMPTOM:

Cruise control can be set, but cruise set indicator light does not illuminate.

WIRING DIAGRAM:



CC-00191

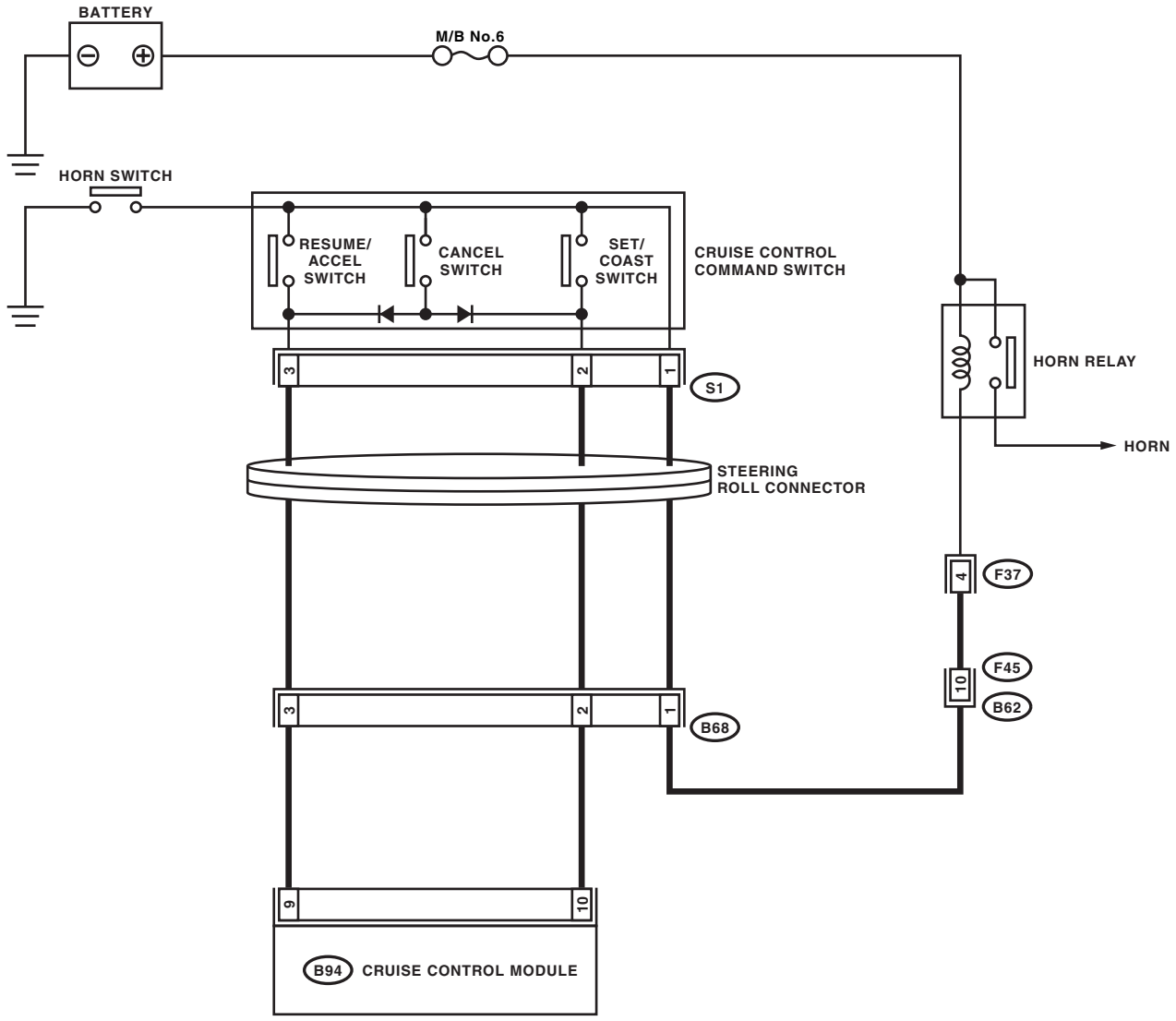
	Step	Check	Yes	No
1	**CHECK CRUISE SET INDICATOR LIGHT CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter harness connector. 3) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(i11) No. 7 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	• Check the fuse No. 13 (in fuse & relay box). • Check the harness for open or short between combination meter and fuse & relay box.
2	**CHECK CRUISE SET INDICATOR LIGHT CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the cruise control module harness connector. 3) Measure the resistance between cruise control module harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***(i10) No. 21 — (B94) No. 3:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**CHECK CRUISE SET INDICATOR LIGHT CIRCUIT.** Ground the cruise control module harness connector terminal with a suitable wire. ***Connector & terminal*** ***(B94) No. 3 — Chassis ground:***	Does the cruise set indicator light illuminate?	Replace the cruise control module.	Check the cruise set indicator light bulb in combination meter, and replace it if malfunction occurred. No malfunction found, replace the printed circuit of combination meter.

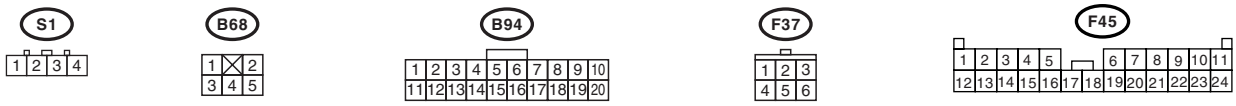
F: CHECK CRUISE CONTROL COMMAND SWITCH

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:





CC-00188

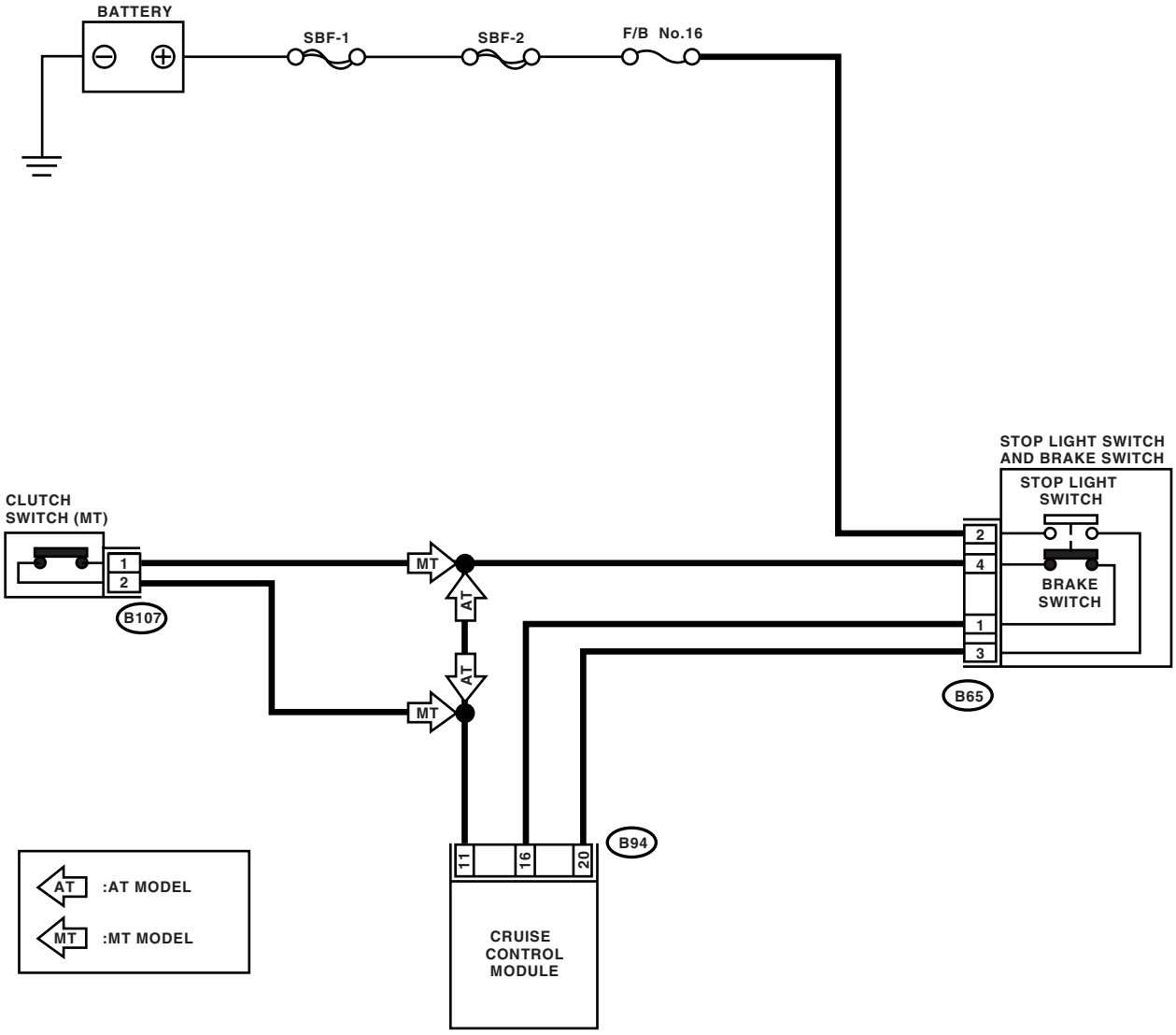
	Step	Check	Yes	No
1	**CHECK SET/COAST SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the cruise control module harness connector. 3) Measure the voltage between harness connector terminal and chassis ground when SET/COAST switch is pressed and not pressed. ***Connector & terminal*** ***(B94) No. 10 (+) — Chassis ground (−):***	Is the voltage 0 V when SET/COAST switch is not pressed? Is the voltage more than 10 V when SET/COAST switch is pressed?	Go to step **2.**	Go to step **4.**
2	**CHECK RESUME/ACCEL SWITCH CIRCUIT.** Measure the voltage between harness connector terminal and chassis ground when RESUME/ACCEL switch is pressed and not pressed. ***Connector & terminal*** ***(B94) No. 9 (+) — Chassis ground (−):***	Is the voltage 0 V when RESUME/ACCEL switch is not pressed? Is the voltage more than 10 V when RESUME/ACCEL switch is pressed?	Go to step **3.**	Go to step **4.**
3	**CHECK CANCEL SWITCH CIRCUIT.** Measure the voltage between harness connector terminal and chassis ground when CANCEL switch is pressed and not pressed. ***Connector & terminal*** ***(B94) No. 9 (+) — Chassis ground (−):*** ***(B94) No. 10 (+) — Chassis ground (−):***	Is the voltage 0 V when CANCEL switch is not pressed? Is the voltage more than 10 V when CANCEL switch is pressed?	Cruise control command switch circuit is OK.	Go to step **4.**
4	**CHECK POWER SUPPLY FOR COMMAND SWITCH.** Check the horn operation.	Does the horn sound?	Go to step **5.**	• Check the fuse No. 6 (in main fuse box). • Check the horn relay. <Ref. to COM-3, HORN RELAY, INSPECTION, Horn System.> • Check the harness for open or short between cruise control command switch and fuse & relay box.
5	**CHECK CRUISE CONTROL COMMAND SWITCH.** Remove and check the cruise control command switch. <Ref. to CC-7, Cruise Control Command Switch.>	Is the cruise control command switch OK?	Check the harness between cruise control command switch and cruise control module.	Replace the cruise control command switch.

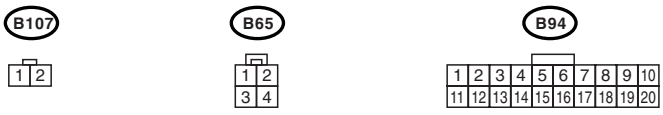
G: CHECK STOP LIGHT SWITCH AND BRAKE SWITCH

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:





CC-00033

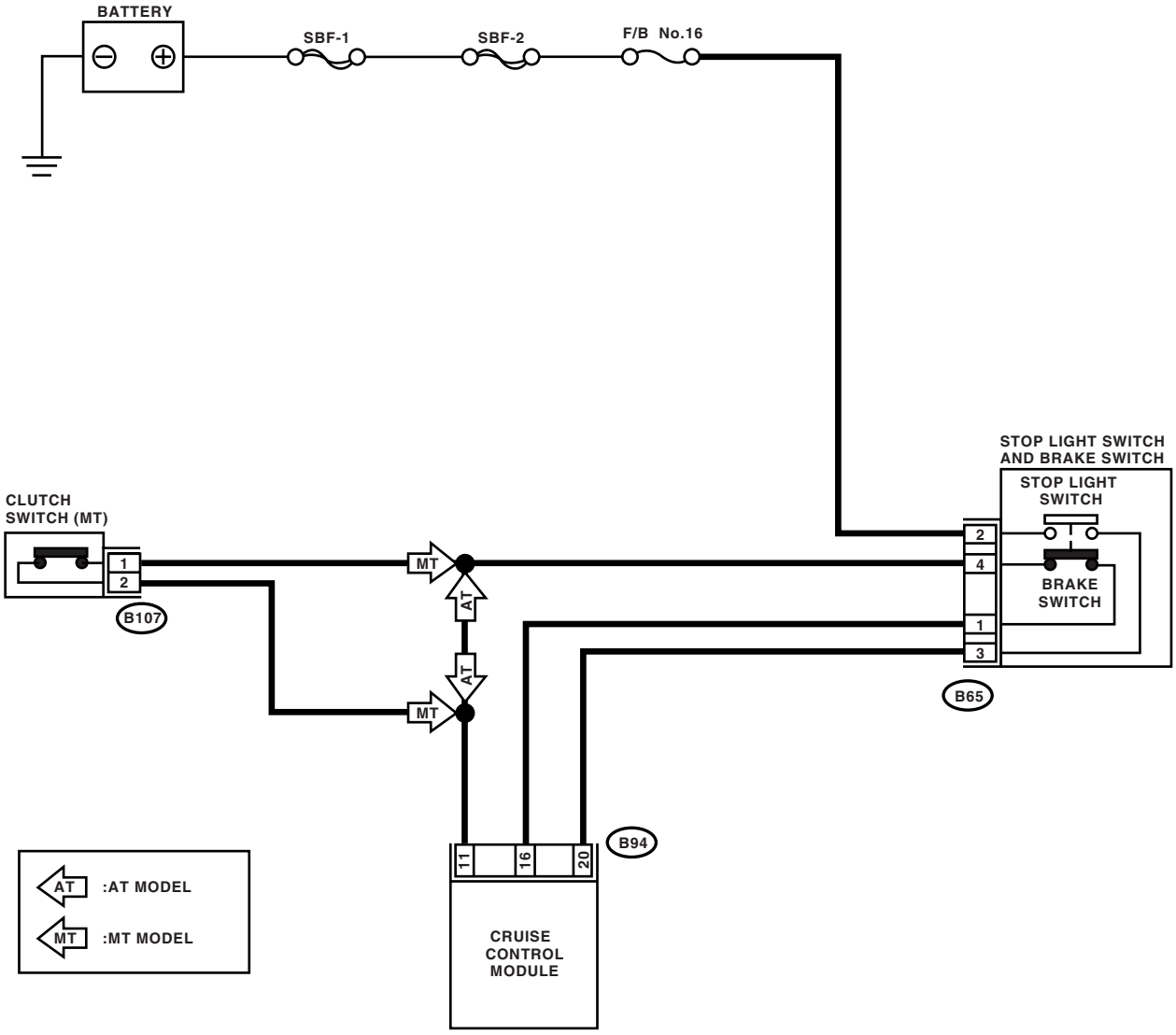
	Step	Check	Yes	No
1	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the stop light switch and brake switch harness connector. 3) Turn the ignition switch to ON. 4) Turn the cruise control main switch to ON. 5) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B65) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	• Check the fuse No. 16 (in fuse & relay box). • Check the harness for open or short between stop light/brake switch and fuse & relay box.
2	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B65) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	• Check the harness for open or short between stop light/brake switch and cruise control module (AT model). • Check the clutch switch and circuit (MT model).
3	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** 1) Turn the cruise control main switch and ignition switch to OFF. 2) Disconnect the cruise control module harness connector. 3) Measure the resistance between cruise control module harness connector terminal and stop light switch and brake switch harness connector terminal. ***Connector & terminal*** ***(B94) No. 20 — (B65) No. 3:*** ***(B94) No. 16 — (B65) No. 1:***	Is the resistance less than 10 Ω?	Go to step **4.**	Repair the harness.
4	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH.** Remove and check the stop light switch and brake switch. <Ref. to CC-8, Stop and Brake Switch.>	Are the stop light switch and brake switch OK?	Stop light switch and brake switch circuit are OK.	Replace the stop light switch and brake switch.

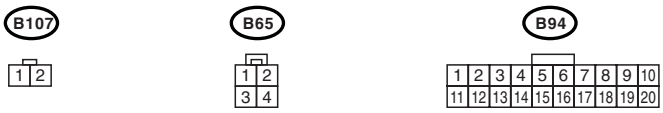
H: CHECK CLUTCH SWITCH (MT MODEL)

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:





CC-00033

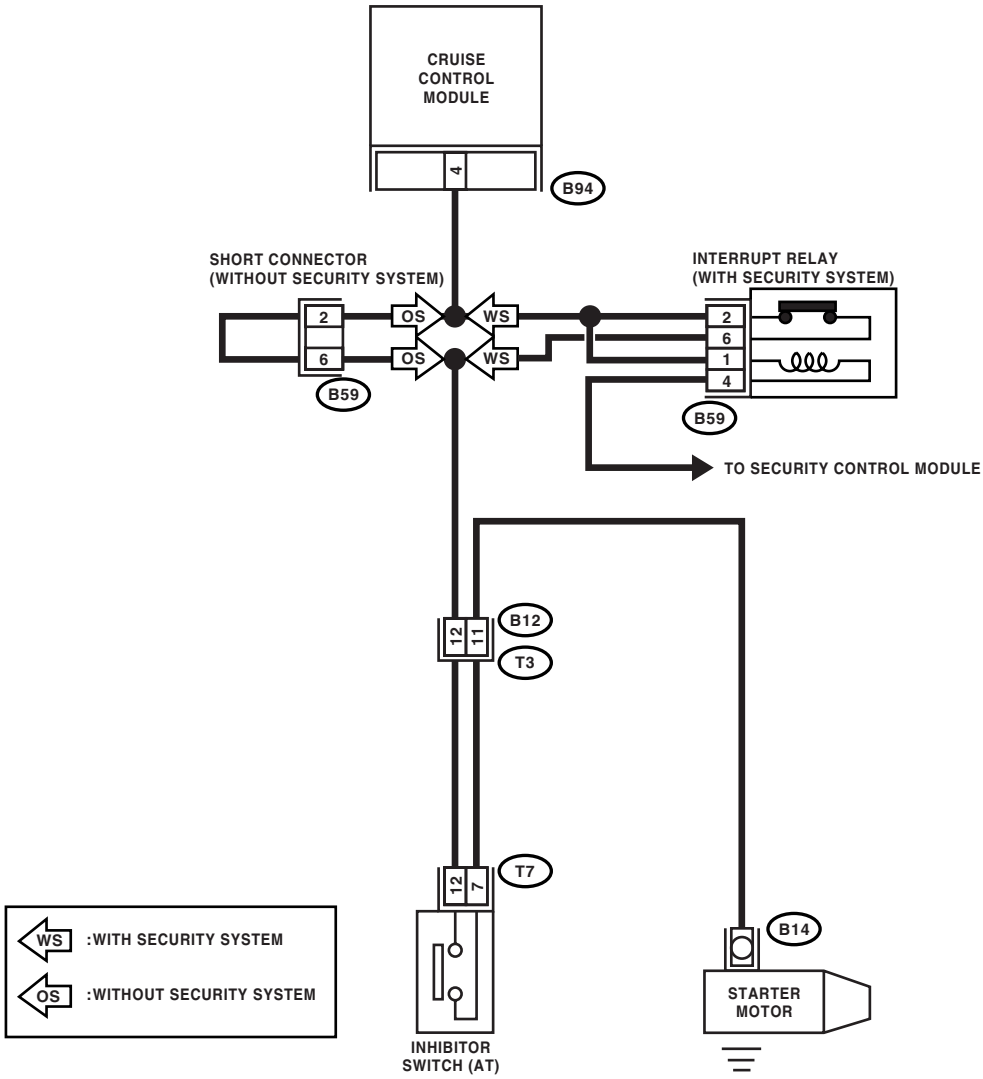
	Step	Check	Yes	No
1	**CHECK CLUTCH SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the clutch switch harness connector. 3) Turn the ignition switch to ON. 4) Turn the cruise control main switch to ON. 5) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B107) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open or short between clutch switch and cruise control module.
2	**CHECK CLUTCH SWITCH CIRCUIT.** 1) Turn the cruise control main switch and ignition switch to OFF. 2) Disconnect the stop light switch and brake switch harness connector. 3) Measure the resistance between clutch switch harness connector terminal and stop light switch and brake switch harness connector terminal. ***Connector & terminal*** ***(B107) No. 1 — (B65) No. 4:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**CHECK CLUTCH SWITCH.** Remove and check the clutch switch. <Ref. to CC-9, Clutch Switch.>	Is the clutch switch OK?	Clutch switch circuit is OK.	Replace the clutch switch.

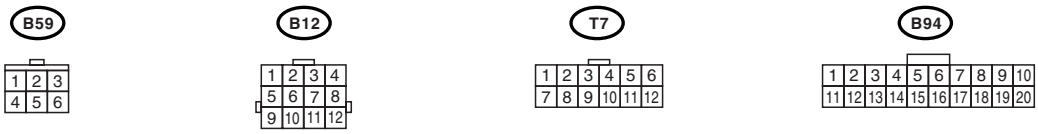
I: CHECK INHIBITOR SWITCH (AT MODEL)

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:





CC-00189

	Step	Check	Yes	No
1	**CHECK INHIBITOR SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the inhibitor switch harness connector. 3) Turn the ignition switch to ON. 4) Turn the cruise control main switch to ON. 5) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(T7) No. 12 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open or short between inhibitor switch and cruise control module.
2	**CHECK INHIBITOR SWITCH CIRCUIT.** 1) Turn the cruise control main switch and ignition switch to OFF. 2) Disconnect the starter motor harness connector. 3) Measure the resistance between inhibitor switch harness connector terminal and chassis ground. ***Connector & terminal*** ***(T7) No. 7 — (B14) No. 1:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**CHECK INHIBITOR SWITCH.** Remove and check the inhibitor switch. <Ref. to CC-10, Inhibitor Switch.>	Is the inhibitor switch OK?	Inhibitor switch circuit is OK.	Replace the inhibitor switch.

7. List of DTC

A: LIST

DTC	Item	Contents of diagnosis	Reference
21	Inner relay is seized.	Cruise control module inner relay is seized when main switch is OFF.	<Ref. to CC(diag)-30, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostic Procedure with DTC.>
22	Vehicle speed sensor	Vehicle speed signal changes more than 10 km/h (6 MPH) within 350 ms.	<Ref. to CC(diag)-31, DTC 22 VEHICLE SPEED SENSOR, Diagnostic Procedure with DTC.>
24	Cruise control module is abnormal.	Two vehicle speed values stored in cruise control module memory are not the same.	<Ref. to CC(diag)-30, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostic Procedure with DTC.>
25	Cruise control module is abnormal.	Two output values stored in cruise control module memory are not the same.	<Ref. to CC(diag)-30, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostic Procedure with DTC.>
28	Wiring harness opened.	Open wiring harness circuit is detected via control module relay when main switch is ON.	<Ref. to CC(diag)-33, DTC 28 WIRING HARNESS OPENED, Diagnostic Procedure with DTC.>
35	Motor drive system is abnormal.	• Motor output circuit is open or shorted. • Motor drive circuit is open or shorted.	<Ref. to CC(diag)-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostic Procedure with DTC.>
36	Trouble of motor turning speed	Motor turning speed is low.	<Ref. to CC(diag)-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostic Procedure with DTC.>
37	Motor clutch drive system is abnormal.	• Motor clutch output circuit is open or shorted. • Motor clutch drive circuit is open or shorted.	<Ref. to CC(diag)-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostic Procedure with DTC.>
38	Motor drive shaft does not engage properly.	Motor drive gear engagement is not properly adjusted.	<Ref. to CC(diag)-38, DTC 38 MOTOR DRIVE SHAFT DOES NOT ENGAGE PROPERLY, Diagnostic Procedure with DTC.>
39	Motor is overloaded.	Current flows through motor more frequently than under normal conditions.	<Ref. to CC(diag)-38, DTC 39 MOTOR IS OVERLOADED, Diagnostic Procedure with DTC.>

DTC	Item	Contents of diagnosis	Reference
2A	Cruise control module is abnormal.	Cruise control module self-diagnosis function senses abnormality.	<Ref. to CC(diag)-30, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostic Procedure with DTC.>

8. Diagnostic Procedure with DTC

A: DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM

DIAGNOSIS:

- Poor welding of built-in relay of cruise control module.
- Failure of built-in CPU RAM of cruise control module.

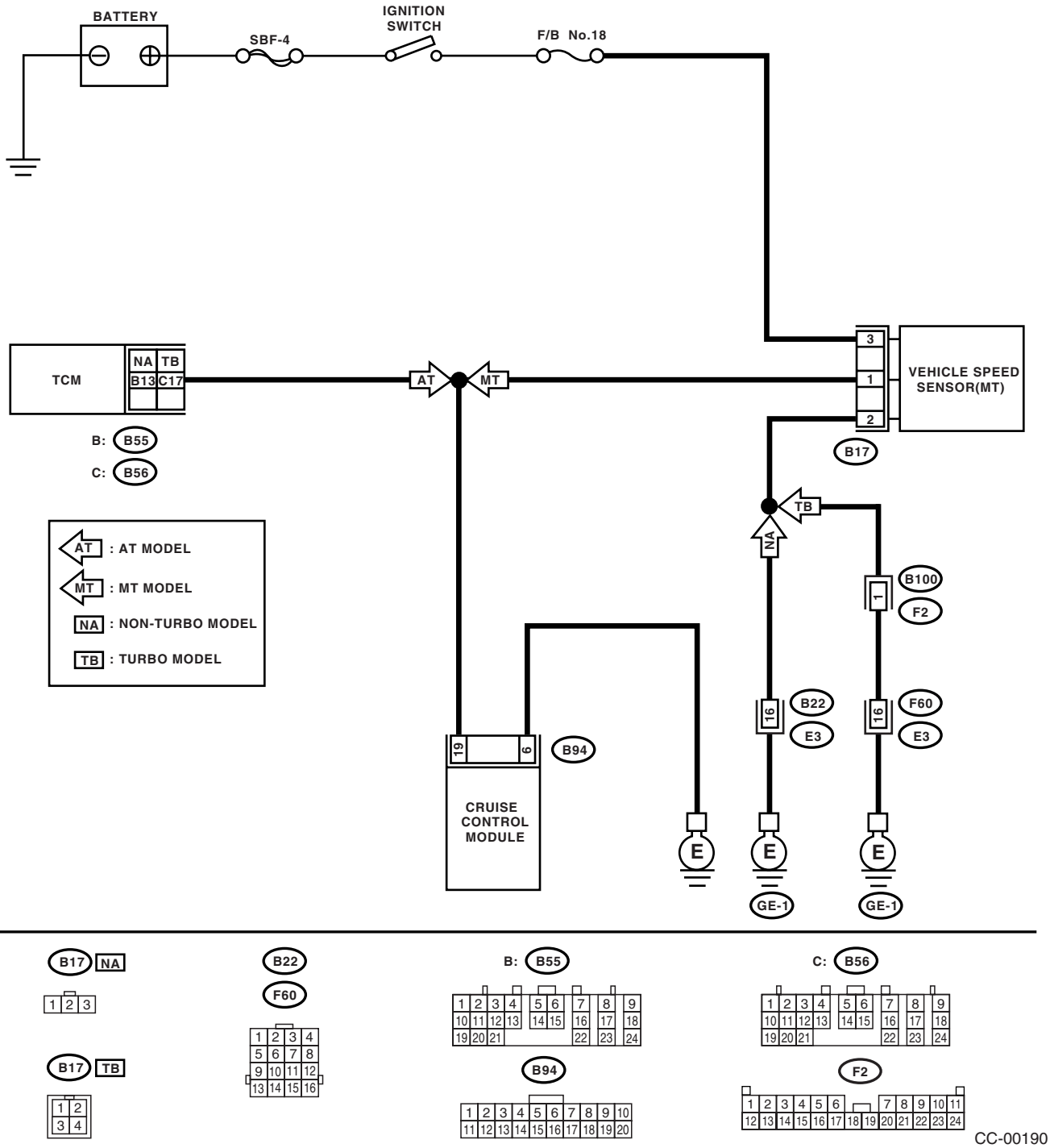
TROUBLE SYMPTOM:

- Cruise control is canceled and memorized cruise speed is also canceled.
- Once cruise control is canceled, cruise control cannot be set until the ignition switch and cruise control main switch turns OFF, and then turns ON again.

NOTE:
Check input/output signal and vehicle speed signal with select monitor. When signals are in good condition, failure is in cruise control module. (Check the power supply and ground conditions of cruise control module.)

B: DTC 22 VEHICLE SPEED SENSOR

DIAGNOSIS:
Disconnection or short circuit of vehicle speed sensor system.
TROUBLE SYMPTOM:
Cruise control cannot be set. (Cancelled immediately.)
WIRING DIAGRAM:



CC-00190

	Step	Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the transmission type MT?	Go to step **2.**	Go to step **6.**
2	**CHECK HARNESS BETWEEN BATTERY AND VEHICLE SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from vehicle speed sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between vehicle speed sensor harness connector terminal and chassis ground. ***Connector & terminal*** ***(B17) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Check the harness for open or short between fuse and vehicle speed sensor.
3	**CHECK HARNESS BETWEEN CRUISE CONTROL MODULE AND VEHICLE SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from cruise control module. 3) Measure the resistance between vehicle speed sensor harness connector terminal and cruise control module harness connector terminal. ***Connector & terminal*** ***(B17) No. 1 — (B94) No. 19:***	Is the resistance less than 10 Ω?	Go to step **4.**	Repair the harness.
4	**CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ENGINE GROUND.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between vehicle speed sensor harness connector terminal and engine ground. ***Connector & terminal*** ***(B17) No. 2 — Engine ground:***	Is the resistance less than 10 Ω?	Go to step **5.**	Repair the harness.
5	**CHECK VEHICLE SPEED SENSOR.** 1) Connect the harness connector to vehicle speed sensor. 2) Lift-up the vehicle and support with safety stands. 3) Drive the vehicle at speed greater than 20 km/h (12 MPH). **Warning:** **Be careful not to be caught up by the running wheels.** 4) Measure the voltage between cruise control module harness connector terminal and chassis ground. ***Connector & terminal*** ***(B94) No. 19 (+) — Chassis ground (−):***	Is the voltage less than 1 V ←→ more than 5 V?	Replace the cruise control module. <Ref. to CC-5, Cruise Control Module.>	Replace the vehicle speed sensor.

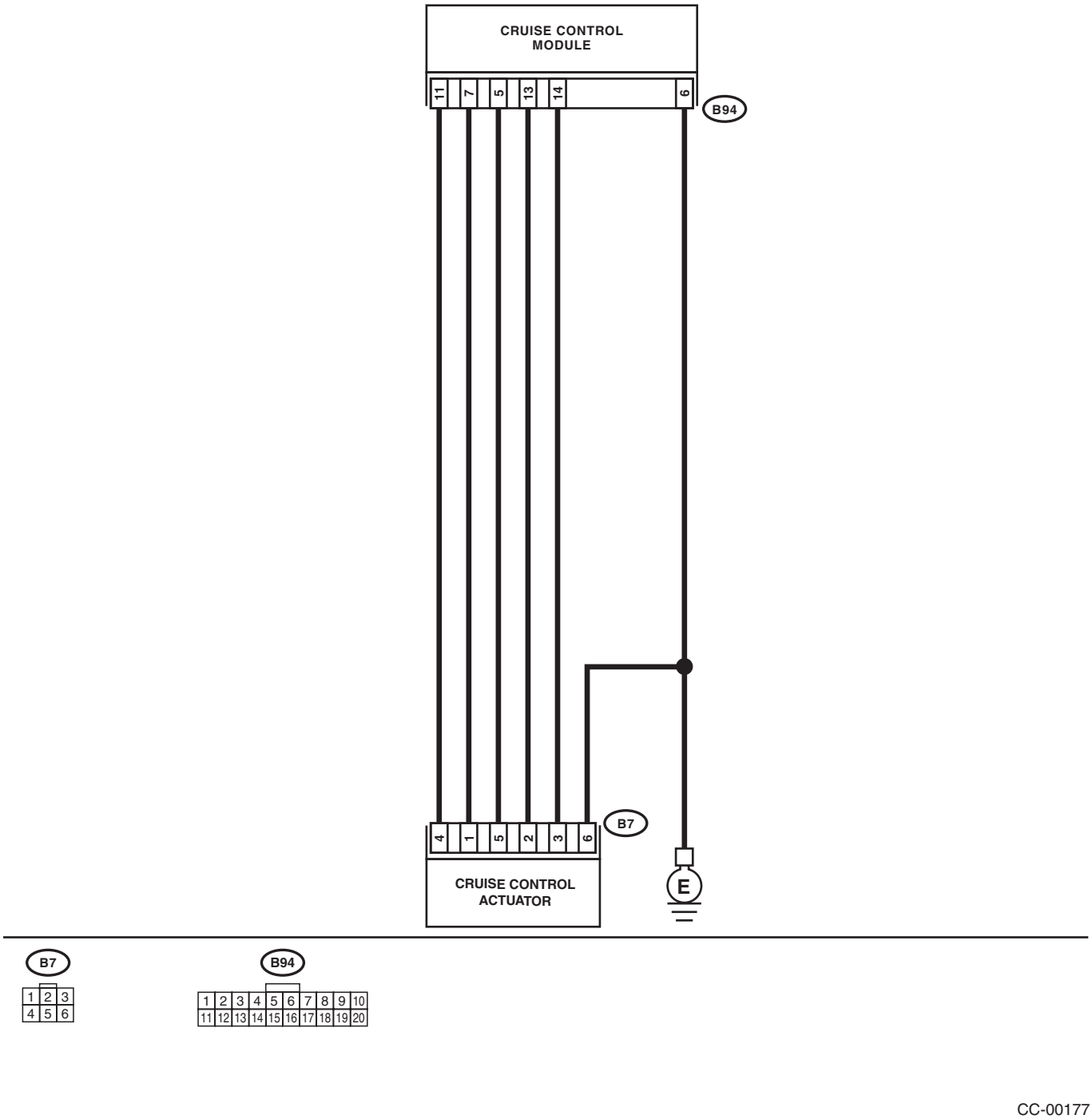
	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN CRUISE CONTROL MODULE AND TRANSMISSION CONTROL MODULE.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from transmission control module and cruise control module. 3) Measure the resistance between cruise control module harness connector terminal and transmission control module harness connector terminal. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B94) No. 19 — (B55) No. 13:*** ***TURBO MODEL*** ***(B94) No. 19 — (B56) No. 17:***	Is the resistance less than 10 Ω?	Go to step **7.**	Repair the harness.
7	**CHECK TRANSMISSION CONTROL MODULE.** 1) Connect the harness connector to transmission control module. 2) Lift-up the vehicle and support with safety stands. 3) Drive the vehicle faster than 10 km/h (6 MPH). **Warning:** **Be careful not to be caught by the running wheels.** 4) Measure the voltage between transmission control module harness connector terminal and chassis ground. ***Connector & terminal*** ***NON-TURBO MODEL*** ***(B55) No. 13 (+) — Chassis ground (−):*** ***TURBO MODEL*** ***(B56) No. 17 (+) — Chassis ground (−):***	Is the voltage less than 1 V ⟷ more than 5 V?	Replace the cruise control module. <Ref. to CC-5, Cruise Control Module.>	Replace the transmission control module. <Ref. to 4AT-67, Transmission Control Module (TCM).>

C: DTC 28 WIRING HARNESS OPENED

	Step	Check	Yes	No
1	**CHECK BATTERY.** Measure the battery specific gravity of electrolyte.	Is the battery specific gravity more than 1.260?	Go to step **2.**	Charge or replace the battery. Go to step **2.**
2	**CHECK FUSES, CONNECTORS AND HARNESSES.** Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.	Is there anything unusual about the appearance of main fuse, fuse, harness, connector and grounding?	Repair or replace the faulty parts.	End of inspection.

D: DTC 35 AND 36 ACTUATOR MOTOR

DIAGNOSIS:
Open or poor contact of cruise control actuator motor.
TROUBLE SYMPTOM:
Cruise control cannot be set. (Cancelled immediately.)
WIRING DIAGRAM:



CC-00177

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from cruise control actuator. 3) Turn the ignition switch to ON. 4) Turn the cruise control main switch to ON. 5) Measure the voltage between cruise control actuator harness connector terminal and chassis ground. ***Connector & Terminal*** ***(B7) No. 4 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open or short between cruise control module and cruise control actuator.
2	**CHECK GROUND CIRCUIT OF ACTUATOR.** 1) Turn the ignition switch and cruise control main switch to OFF. 2) Measure the resistance between cruise control actuator harness connector terminal and chassis ground. ***Connector & Terminal*** ***(B7) No. 6 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**MEASURE RESISTANCE OF ACTUATOR.** Measure the resistance of cruise control actuator motor. ***Terminals*** ***No. 4 — No. 1:*** ***No. 4 — No. 2:*** ***No. 4 — No. 5:***	Is the resistance approx. 5 Ω?	Go to step **4.**	Replace the cruise control actuator. <Ref. to CC-4, Actuator.>
4	**CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE.** 1) Disconnect the harness connector from cruise control module. 2) Measure the resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal. ***Connector & terminal*** ***(B7) No. 1 — (B94) No. 7:***	Is the resistance less than 10 Ω?	Go to step **5.**	Repair the harness.
5	**CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE.** Measure the resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal. ***Connector & terminal*** ***(B7) No. 5 — (B94) No. 5:***	Is the resistance less than 10 Ω?	Replace the cruise control module. <Ref. to CC-5, Cruise Control Module.>	Repair the harness.

E: DTC 37 ACTUATOR MOTOR CLUTCH

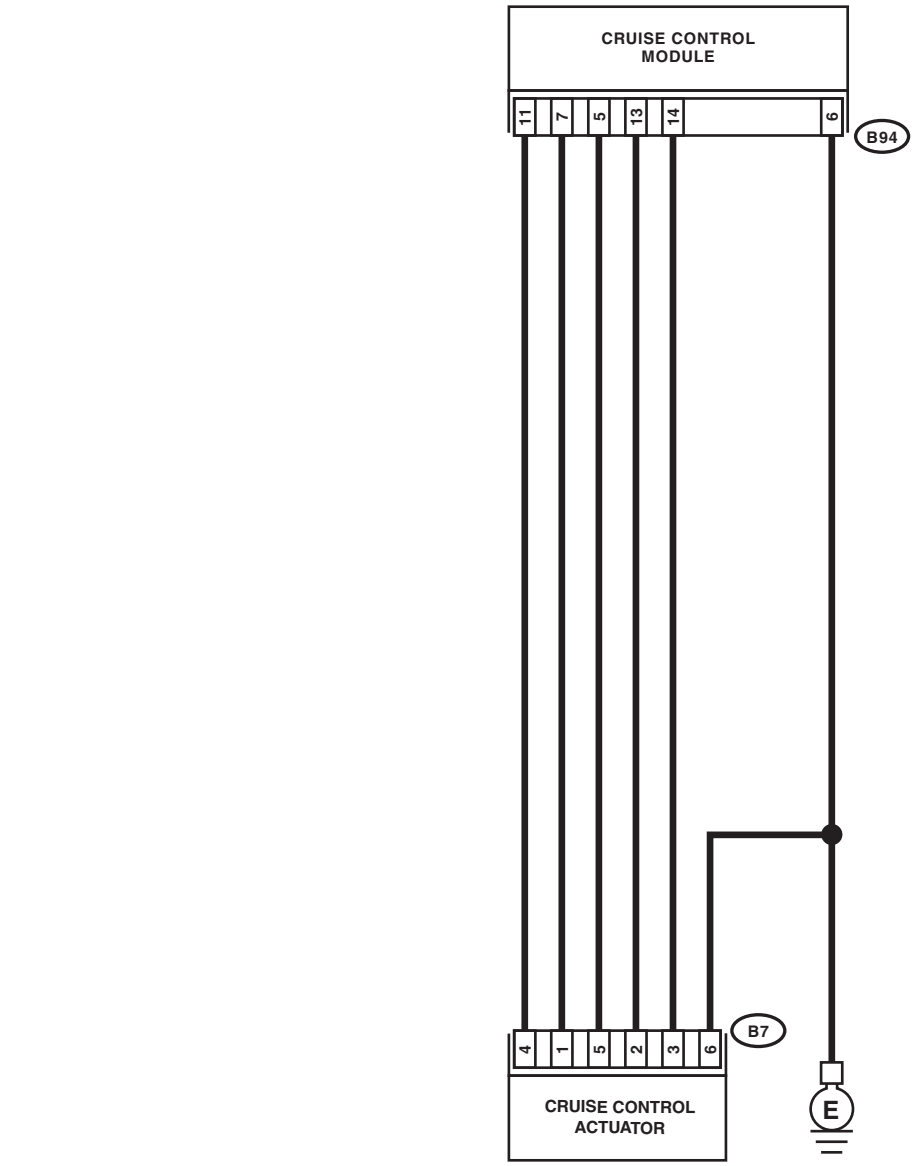
DIAGNOSIS:

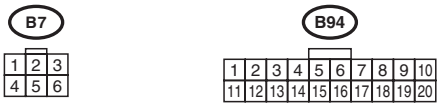
Open or poor contact of cruise control actuator motor clutch.

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:





CC-00177

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from cruise control actuator. 3) Turn the ignition switch to ON. 4) Turn the cruise control main switch to ON. 5) Measure the voltage between cruise control actuator harness connector terminal and chassis ground. ***Terminals*** ***(B7) No. 4 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open or short between cruise control module and cruise control actuator.
2	**CHECK GROUND CIRCUIT OF ACTUATOR.** 1) Turn the ignition switch and cruise control main switch to OFF. 2) Measure the resistance between cruise control actuator harness connector terminal and chassis ground. ***Terminals*** ***(B7) No. 6 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**MEASURE RESISTANCE OF ACTUATOR CLUTCH.** Measure the resistance of cruise control actuator clutch. ***Terminals*** ***No. 3 — No. 6:***	Is the resistance approximately 39 Ω?	Go to step **4.**	Replace the cruise control actuator. <Ref. to CC-4, Actuator.>
4	**CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE.** 1) Disconnect the harness connector from cruise control module. 2) Measure the resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal. ***Connector & terminal*** ***(B7) No. 2 — (B94) No. 13:***	Is the resistance less than 10 Ω?	Go to step **5.**	Repair the harness.
5	**CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE.** Measure the resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal. ***Connector & terminal*** ***(B7) No. 3 — (B94) No. 14:***	Is the resistance less than 10 Ω?	Replace the cruise control module. <Ref. to CC-5, Cruise Control Module.>	Repair the harness.

F: DTC 38 MOTOR DRIVE SHAFT DOES NOT ENGAGE PROPERLY

	Step	Check	Yes	No
1	**CHECK ACTUATOR MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from cruise control actuator. 3) Remove the cruise control actuator from mounting bracket. 4) Pull the cable by hand to check for looseness or status of inner gear engagement.	Are foreign particles caught in the inner gear or does inner gear engage and disengage improperly?	Replace the cruise control actuator. <Ref. to CC-4, Actuator.>	Check the cruise control cable adjustment.<Ref. to CC(diag)-4, CABLE FREE PLAY, INSPECTION, General Description.>

G: DTC 39 MOTOR IS OVERLOADED

	Step	Check	Yes	No
1	**CHECK THE OPERATING CURRENT TO ACTUATOR MOTOR.** 1) Connect the Subaru Select Monitor to data link connector. 2) Try to drive the vehicle while operating the cruise control system. 3) Measure the operation current to the cruise control actuator motor. ***Connector & terminal*** ***(B7) No. 4 (+) — Chassis ground (−):***	Is the current more than 10 A?	Replace the cruise control module. <Ref. to CC-5, Cruise Control Module.>	Check the power supply circuit. <Ref. to CC(diag)-12, CHECK POWER SUPPLY, Diagnostic Procedure with Symptom.>

CRUISE CONTROL SYSTEM

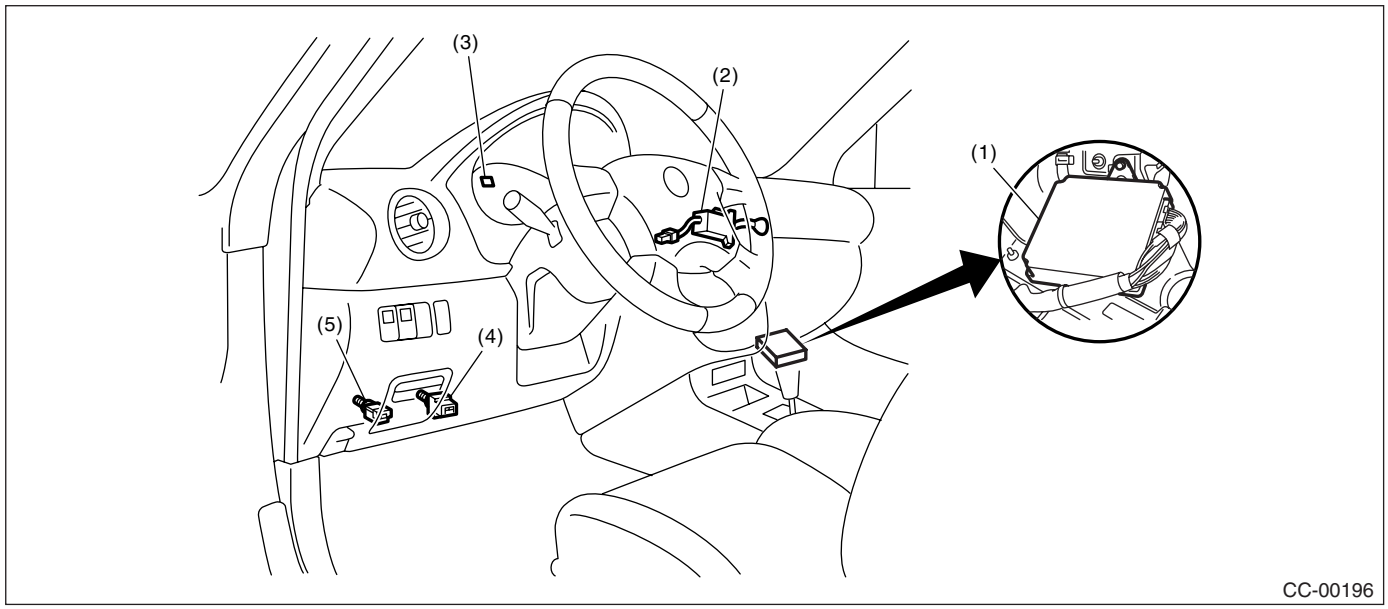
CC(STi)

Page

1. General Description 2
2. Cruise Control Module 3
3. Cruise Control Command Switch 4
4. Stop Light and Brake Switch 5
5. Clutch Switch 6
6. Neutral Position Switch 7

1. General Description

A: COMPONENT



(1) Engine control module (ECM)
(2) Cruise control command switch (with built-in main switch)
(3) Cruise indicator light & cruise set indicator light
(4) Stop light and brake switch
(5) Clutch switch

B: CAUTION

• Before disassembling or reassembling parts, always disconnect the battery ground cable. When repairing the radio, control module and other parts with memory functions, make note of the memory before disconnecting the battery ground cable. All memory will be erased.
• Reassemble parts in the reverse order of disassembly unless otherwise indicated.
• Adjust parts to specifications specified in this manual.
• Connect the connectors and hoses securely during reassembly.
• After reassembly, ensure functional parts operate properly.

C: PREPARATION TOOL

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Cruise Control Module

A: NOTE

Engine Control Module (ECM) controls cruise control system.

B: REMOVAL

<Ref. to FU(STi)-40, REMOVAL, Engine Control Module (ECM).>

C: INSTALLATION

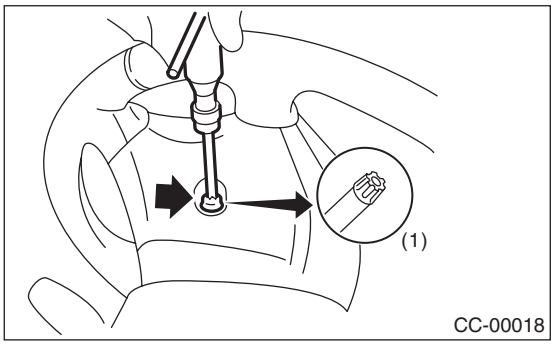
<Ref. to FU(STi)-40, INSTALLATION, Engine Control Module (ECM).>

3. Cruise Control Command Switch

A: REMOVAL

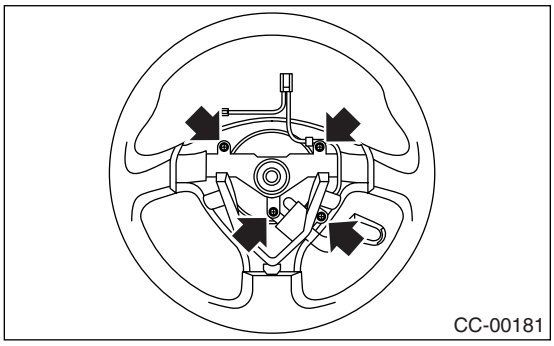
WARNING:
Before servicing, be sure to read the notes in the AB section for proper handling of the driver's airbag module. <Ref. to AB-3, CAUTION, General Description.>

1) Set the front wheels in straight ahead position.
2) Turn the ignition switch to OFF.
3) Disconnect the ground cable from battery and wait for at least 20 seconds before starting work.
4) Using the TORX® BIT T30 (Tamper resistant type), loosen the two TORX® bolts which secure driver's airbag module.

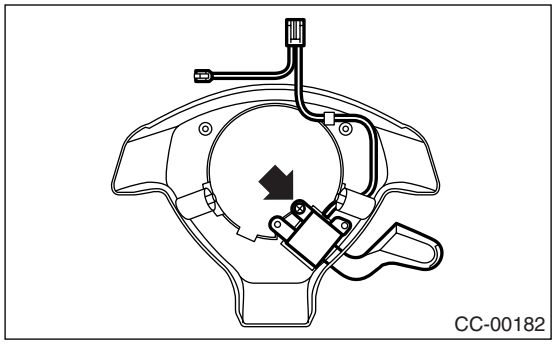


(1) TORX® BIT T30

5) Disconnect the airbag module connector on back of airbag module.
6) Remove the steering wheel. <Ref. to PS-16, REMOVAL, Steering Wheel.>
7) Remove four screws, and then remove the lower cover from steering wheel.



8) Remove the screw, and then remove the cruise control command switch from lower cover.

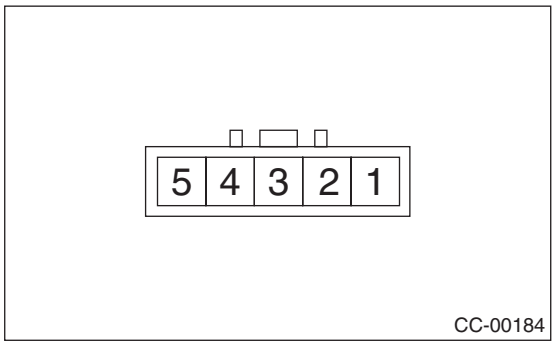


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the cruise control command switch resistance.



Switch	Position	Terminal No.	Standard value
CANCEL	ON	1 (+) and 2 (–)	Less than 1 Ω
	ON	1 (+) and 3 (–)	Less than 1 Ω
SET/COAST	OFF	1 and 3	More than 1 MΩ
	ON	1 and 3	Less than 1 Ω
RESUME/ ACCEL	OFF	1 and 2	More than 1 MΩ
	ON	1 and 2	Less than 1 Ω
MAIN SWITCH	OFF	5 and 4	More than 1 MΩ
	ON	5 and 4	Less than 1 MΩ

If NG, replace the cruise control command switch.

4. Stop Light and Brake Switch

A: REMOVAL

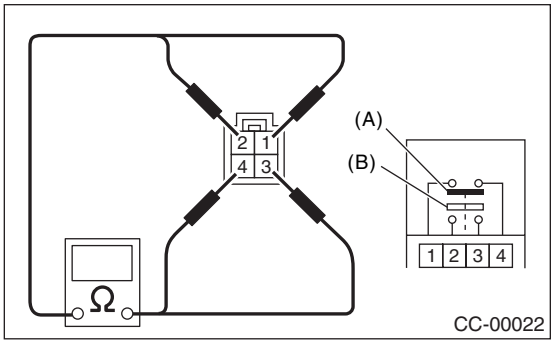
1) Disconnect the ground cable from battery.
2) Disconnect the connector from stop light and brake switch, and then remove the switch. <Ref. to BR-52, REMOVAL, Stop Light Switch.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the brake switch (A) and stop light switch (B) resistance.



Switch	Pedal	Terminal No.	Standard value
Brake	Released	1 and 4	Less than 1 Ω
	Depressed	1 and 4	More than 1 MΩ
Stop light	Released	2 and 3	More than 1 MΩ
	Depressed	2 and 3	Less than 1 Ω

If NG, replace the stop light and brake switch.

5. Clutch Switch

A: REMOVAL

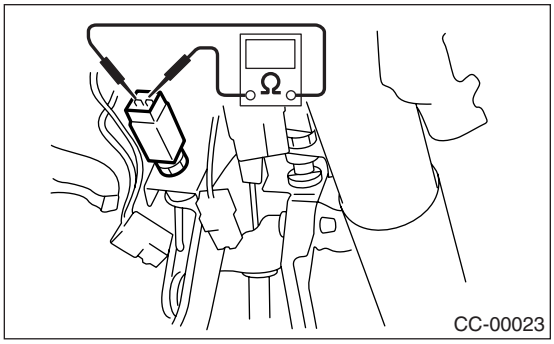
1) Disconnect the ground cable from battery.
2) Disconnect the connector from clutch switch, and then remove the switch. <Ref. to CL-25, DISASSEMBLY, Clutch Pedal.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the clutch switch resistance.



Switch	Pedal	Terminal No.	Standard value
Clutch	Released	1 and 2	Less than 1 Ω
	Depressed	1 and 2	More than 1 MΩ

If NG, replace the clutch switch.

6. Neutral Position Switch

A: REMOVAL

<Ref. to 6MT-45, REMOVAL, Neutral Position Switch.>

B: INSTALLATION

<Ref. to 6MT-45, INSTALLATION, Neutral Position Switch.>

C: INSPECTION

<Ref. to 6MT-46, INSPECTION, Neutral Position Switch.>

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

CC(STi)(diag)

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5.	Subaru Select Monitor	8
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7.	List of DTC	15
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1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**CHECK MALFUNCTION INDICATOR LIGHT.** Check the malfunction indicator light illuminates.	Does the malfunction indicator light illuminate?	Go to step **5.**	Go to step **2.**
2	**CHECK CRUISE INDICATOR LIGHT.** Check the cruise indicator light blinks.	Does the cruise indicator light blink?	Go to step **5.**	Go to step **3.**
3	**CHECK CRUISE CONTROL MAIN SWITCH OPERATION.** Check the cruise control main switch operation. (Check the cruise indicator light illuminates.)	Is the cruise control main switch set to on? (Does the cruise indicator light illuminate?)	Go to step **4.**	Go to symptom 1. <Ref. to CC(STi)(diag)-10, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
4	**CHECK CRUISE CONTROL SET OPERATION.** Check the cruise control set operation.	Can the cruise control be set while driving at 40 km/h (25 MPH)?	Go to step **6.**	Go to step **5.**
5	**PERFORM CRUISE CONTROL CANCEL CONDITION DIAGNOSIS.** Perform the cruise control cancel condition diagnosis.	Are any DTC indicated?	Go to “List of DTC”. <Ref. to CC(STi)(diag)-15, List of DTC.>	Go to symptom 2. <Ref. to CC(STi)(diag)-10, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
6	**CHECK CRUISE SET INDICATOR LIGHT.** Check the cruise set indicator light illuminates.	Does the cruise set indicator light illuminate?	Go to step **7.**	Go to symptom 3. <Ref. to CC(STi)(diag)-10, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
7	**CHECK VEHICLE SPEED IS HELD WITHIN SET SPEED.** Make sure the vehicle speed is held within set speed.	Is the vehicle speed held within set speed ±3 km/h (±2 MPH)?	Go to step **8.**	Go to symptom 4. <Ref. to CC(STi)(diag)-10, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
8	**CHECK RESUME/ACCEL OPERATION.** Check the RESUME/ACCEL switch operation.	Does the vehicle speed increase or return to set speed after RESUME/ACCEL switch has been pressed?	Go to step **9.**	Go to symptom 5. <Ref. to CC(STi)(diag)-10, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
9	**CHECK SET/COAST OPERATION.** Check the SET/COAST switch operation.	Does the vehicle speed decrease after SET/COAST switch has been pressed?	Go to step **10.**	Go to symptom 6. <Ref. to CC(STi)(diag)-10, SYMPTOM CHART, Diagnostic Procedure with Symptom.>

	Step	Check	Yes	No
10	**CHECK CANCEL OPERATION.** Check the CANCEL switch operation.	Is the cruise control released after CANCEL switch has been pressed?	Go to step **11.**	Go to symptom 7. <Ref. to CC(STi)(diag)-10, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
11	**CHECK CRUISE CONTROL RELEASE OPERATION.** Check the cruise control release operation.	Is the cruise control released after brake pedal has been depressed?	Go to step **12.**	Go to symptom 8. <Ref. to CC(STi)(diag)-10, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
12	**CHECK CRUISE CONTROL RELEASE OPERATION.** Check the cruise control release operation.	Is the cruise control released after clutch pedal has been depressed?	Go to step **13.**	Go to symptom 9. <Ref. to CC(STi)(diag)-10, SYMPTOM CHART, Diagnostic Procedure with Symptom.>
13	**CHECK CRUISE CONTROL RELEASE OPERATION.** Check the cruise control release operation.	Is the cruise control released after shifting to neutral position?	Finish the diagnosis.	Go to symptom 10. <Ref. to CC(STi)(diag)-10, SYMPTOM CHART, Diagnostic Procedure with Symptom.>

2. General Description

A: CAUTION

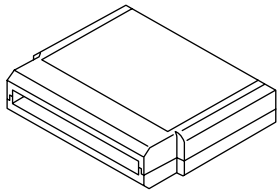
1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the cruise control command switch.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the cruise control command switch.

B: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA220	24082AA220	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

2. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit T ester	Used for measuring resistance, voltage and ampere.

C: INSPECTION

1. BATTERY

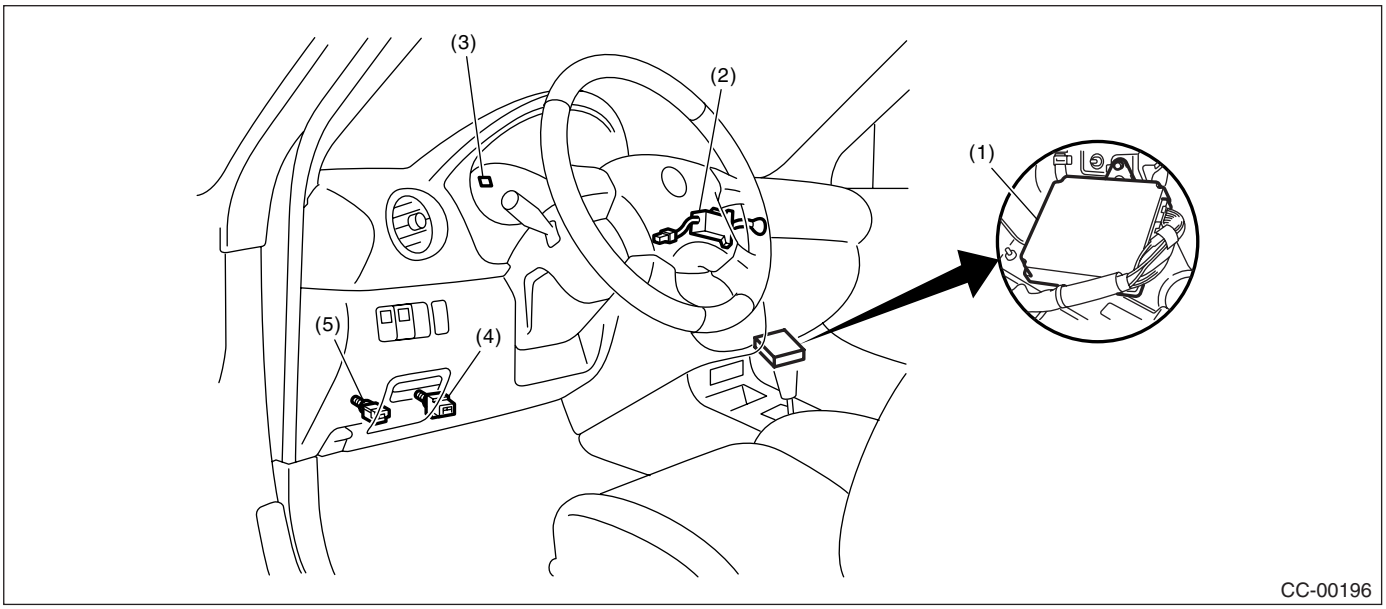
Measure the battery voltage and specific gravity of electrolyte.

Standard voltage:
12 V, or more

Specific gravity:
Above 1.260

3. Electrical Components Location

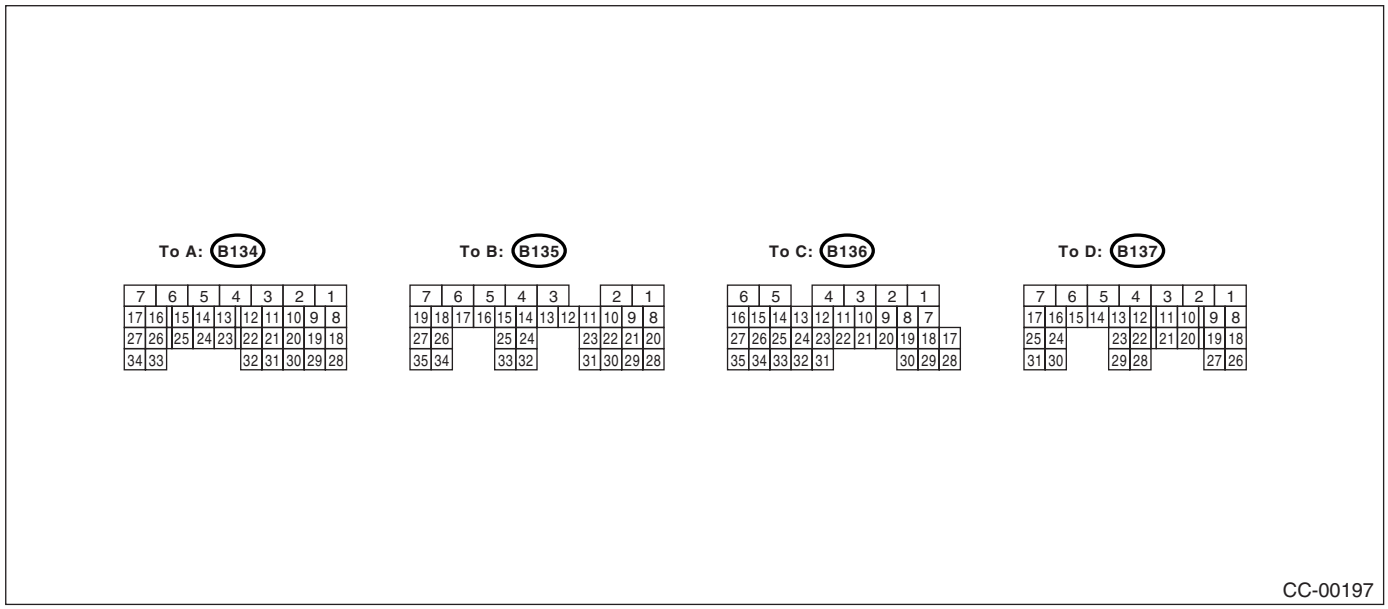
A: LOCATION



(1) Engine control module (ECM)
(2) Cruise control command switch (with built-in main switch)
(3) Cruise indicator light & cruise set indicator light
(4) Stop light and brake switch
(5) Clutch switch

4. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



Content		Terminal No.	Measuring conditions and I/O signals (ignition switch ON and engine idling)
Clutch switch		A1	• Battery voltage is present when the clutch pedal is released. • “0” volt is present when the clutch pedal is depressed.
Cruise set indicator light		A16	(Press the main switch and drive the vehicle at 40 km/h (25 MPH) or more.) • Battery voltage is present when the set switch is turned to OFF. • “0” volt is present when the set switch is turned to ON.
Cruise indicator light		A15	• Battery voltage is present when the main switch is turned to OFF. • “0” volt is present when the main switch is turned to ON.
Main power supply	VB (CONTROL 1) VB (CONTROL 2)	B6 B5	• Battery voltage is present when the main power supply is turned to ON. • “0” volt is present when the main power supply is turned to OFF.
Vehicle speed signal		B27	Lift-up the vehicle until all four wheels are raised off the ground, and then rotate any wheel manually. Approx. “5 V” and “0 V” pulse signals are alternately input to ECM.
SET/COAST switch		C11	• Battery voltage is present when the command switch is turned to SET/COAST position. • “0” volt is present when the command switch is released.
RESUME/ACCEL switch		C10	• Battery voltage is present when the command switch is turned to RESUME/ACCEL position. • “0” volt is present when the command switch is released.
Brake switch 1 (Brake switch)		C9	• Battery voltage is present when the brake pedal is released. • “0” volt is present when the brake pedal is depressed.
Brake switch 2 (Stop light switch)		C8	• Battery voltage is present when the brake pedal is depressed. • “0” volt is present when the brake pedal is released.
Main switch		C7	• Battery voltage is present while the main switch is depressed or is turned to ON. • “0” volt is present when the main switch is turned to OFF.
Ground	GND (CONTROL 1) GND (CONTROL 2)	D2 D1	—
Ignition switch		D15	• Battery voltage is present with the ignition switch is turned to ON. • “0” volt is present when the ignition switch is turned to OFF.
Neutral switch		D9	• Battery voltage is present when the shift lever is in anywhere except neutral position. • “0” volt is present when the shift lever is in neutral position.

B: WIRING DIAGRAM

<Ref. to WI-72, WIRING DIAGRAM, Cruise Control System.>

5. Subaru Select Monitor

A: OPERATION

1. GENERAL

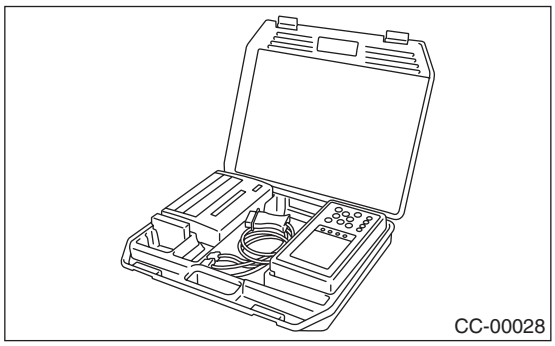
The on-board diagnosis function of the cruise control system uses the Subaru Select Monitor.
The on-board diagnosis function operates in two categories, which are used depending on the type of problems;
1) Cruise cancel conditions diagnosis:
(1) This category of diagnosis requires actual vehicle driving in order to determine the cause, (as when cruise speed is cancelled during driving although cruise cancel condition is not entered).
(2) Cruise control memory of ECM stores the cancel condition (Code No.) which occurred during driving. When there are plural cancel conditions (Code No.), they are shown on the Subaru Select Monitor.

CAUTION:
• The cruise control memory stores not only the cruise "cancel" which occurred (although "cancel" operation is not entered by the driver), but also the "cancel" condition input by the driver.
• The content of memory is cleared when ignition switch or cruise main switch is turned OFF.

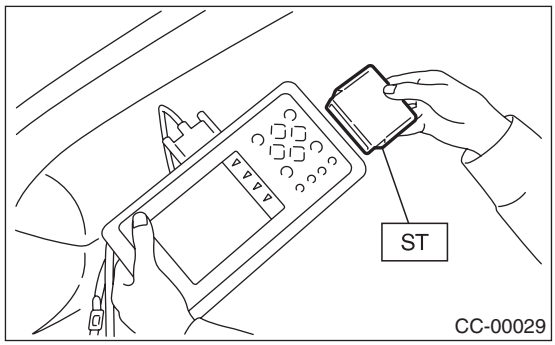
2) Real-time diagnosis:
The real-time diagnosis function is used to determine whether or not the input signal system is in good order, according to signal emitted from switches, sensors, etc.
(1) Vehicle cannot be driven at cruise speed because problem occurs in the cruise control system or its associated circuits.
(2) Monitor the signal conditions from switches and sensors.

2. CRUISE CANCEL CONDITIONS DIAGNOSIS

1) Prepare the Subaru Select Monitor kit.

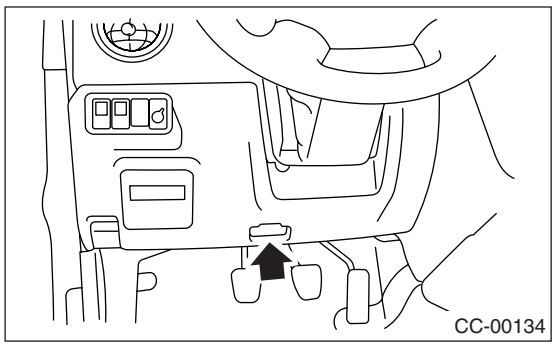

CC-00028

2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to CC(STi)(diag)-4, SPECIAL TOOLS, PREPARATION TOOL, General Description.>

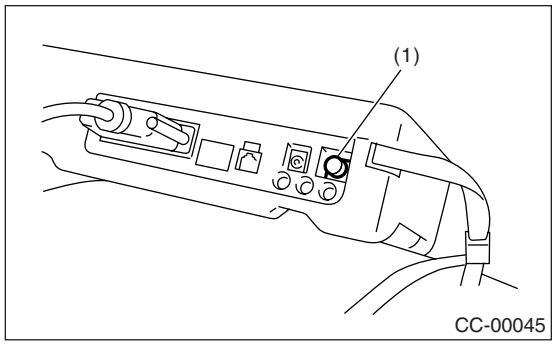


CC-00029

4) Connect the Subaru Select Monitor to data link connector.
(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).


CC-00134

(2) Connect the diagnosis cable to data link connector.
5) Start the engine and turn the cruise control main switch to ON.
6) Turn the Subaru Select Monitor switch to ON.



CC-00045

(1) Power switch

7) On the Main Menu display screen, select the {2. Each System Diagnosis} and press [YES] key.
Select the {Engine} on the System Selection display screen and press [YES] key. Press [YES] key after the engine type displayed.
8) Drive the vehicle at least 40 km/h (25 MPH) with cruise speed set.

9) If the cruise speed is canceled itself (without doing any cancel operations), a DTC will appear on select monitor display after {Cancel Code(s) Display} is selected on the Engine Diagnosis display screen and [YES] key is pressed.

CAUTION:
• A DTC will also appear when cruise cancel is effected by driver. Do not confuse.
• Have a co-worker ride in the vehicle to assist in diagnosis during driving.

NOTE:
DTC will be cleared by turning the ignition switch or cruise control main switch to OFF.

3. REAL-TIME DIAGNOSIS

1) Connect the select monitor.
2) Turn the ignition switch and cruise control main switch to ON.
3) Turn the Subaru Select Monitor switch to ON.
4) On the Main Menu display screen, select the {2. Each System Check} and press [YES] key.
5) On the System Selection display screen, select the {Engine} and press [YES] key.
6) Press the [YES] key after the information of engine type displayed.
7) On the Engine Diagnosis display screen, select the {Current Data Display & Save} and press [YES] key.
8) Make sure that normal indication is displayed when controls are operated as indicated below:
• Depress/release the brake pedal. (Stop light switch and brake switch turn ON.)
• Turn ON the “SET/COAST” switch.
• Turn ON the “RESUME/ACCEL” switch.
• Turn ON the “CANCEL” switch. (The “SET/COAST” and “RESUME/ACCEL” switch are turned ON at same time.)
• Depress/release the clutch pedal.
• Set the shift lever to except for neutral position.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For details concerning DTCs, refer to the List of DTC. <Ref. to CC(STi)(diag)-15, List of DTC.>

6. Diagnostic Procedure with Symptom

A: SYMPTOM CHART

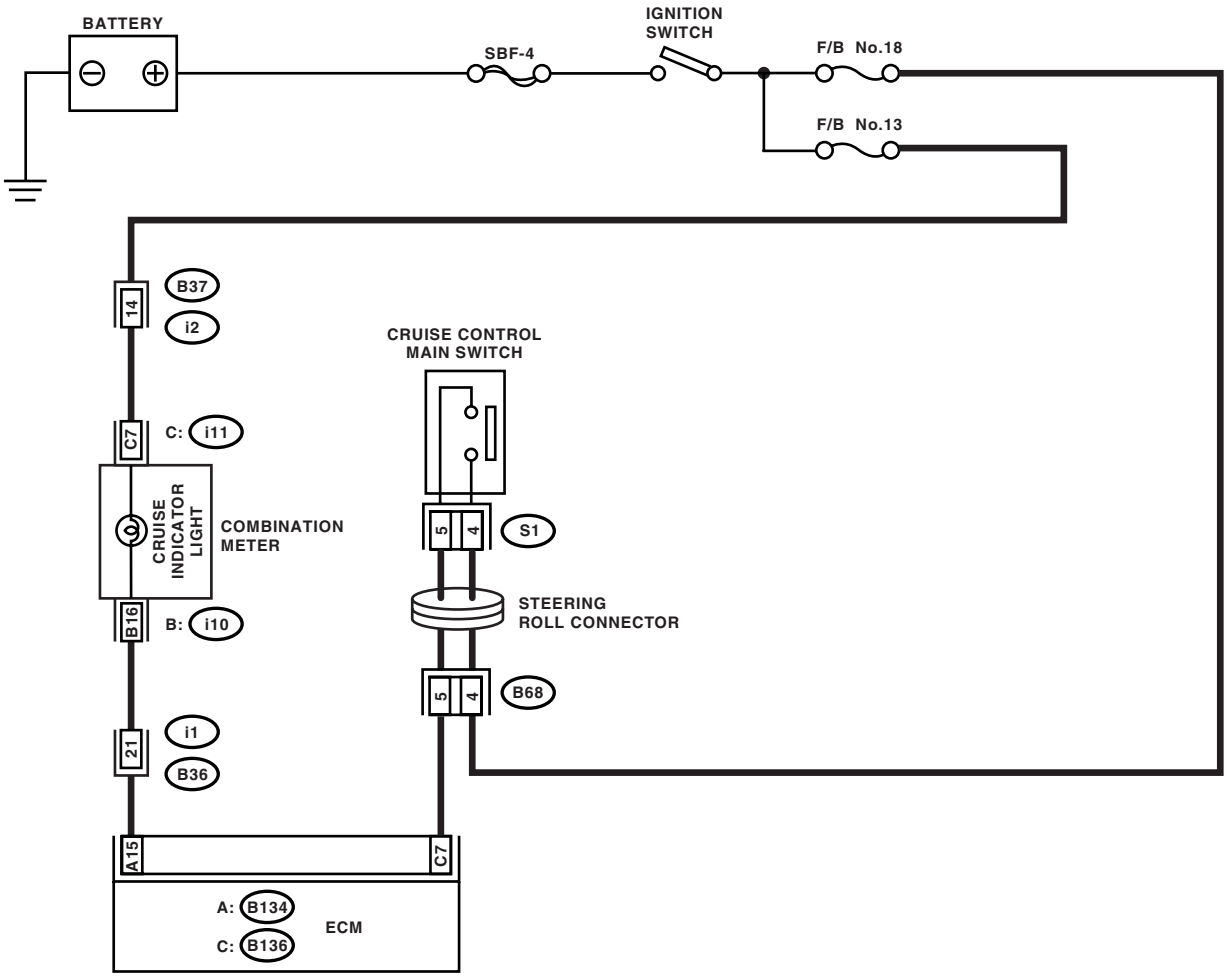
Symptom		Repair area	Reference
1	Cruise control main switch is not turned to ON. (Cruise indicator light does not illuminate)	(1) Check the cruise indicator light.	<Ref. to CC(STi)(diag)-11, CHECK CRUISE INDICATOR LIGHT, Diagnostic Procedure with Symptom.>
		(2) Check the cruise control command switch.	<Ref. to CC(STi)(diag)-17, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with DTC.>
2	Cruise control cannot be set.	(1) Check the cruise control command switch	<Ref. to CC(STi)(diag)-17, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with DTC.>
		(2) Check the stop light switch and brake switch.	<Ref. to CC(STi)(diag)-19, DTC 12 AND 25 STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostic Procedure with DTC.>
		(3) Check the clutch switch.	<Ref. to CC(STi)(diag)-21, DTC 13 CLUTCH SWITCH, Diagnostic Procedure with DTC.>
		(4) Check the neutral switch.	<Ref. to CC(STi)(diag)-23, DTC 14 NEUTRAL POSITION SWITCH, Diagnostic Procedure with DTC.>
		(5) Check the vehicle speed sensor.	<Ref. to CC(STi)(diag)-27, DTC 22 AND 32 VEHICLE SPEED SENSOR, Diagnostic Procedure with DTC.>
3	Cruise set indicator light does not illuminate.	Check the cruise set indicator light.	<Ref. to CC(STi)(diag)-13, CHECK CRUISE SET INDICATOR LIGHT, Diagnostic Procedure with Symptom.>
4	Vehicle speed is not held within set speed ±3 km/h (±2 MPH).	Check the vehicle speed sensor.	<Ref. to CC(STi)(diag)-27, DTC 22 AND 32 VEHICLE SPEED SENSOR, Diagnostic Procedure with DTC.>
5	Vehicle speed does not increase or does not return to set speed after RESUME/ ACCEL switch has been pressed.	Check the RESUME/ACCEL switch.	<Ref. to CC(STi)(diag)-17, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with DTC.>
6	Vehicle speed does not decrease after SET/COAST switch has been pressed.	Check the SET/COAST switch.	<Ref. to CC(STi)(diag)-17, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with DTC.>
7	Cruise control is not released after CANCEL switch has been pressed.	Check the CANCEL switch.	<Ref. to CC(STi)(diag)-17, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with DTC.>
8	Cruise control is not released after the brake pedal has been depressed.	Check the stop light switch and brake switch.	<Ref. to CC(STi)(diag)-19, DTC 12 AND 25 STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostic Procedure with DTC.>
9	Cruise control is not released after the clutch pedal has been depressed.	Check the clutch switch.	<Ref. to CC(STi)(diag)-21, DTC 13 CLUTCH SWITCH, Diagnostic Procedure with DTC.>
10	Cruise control is not released after shifting to neutral position.	Check the neutral switch.	<Ref. to CC(STi)(diag)-23, DTC 14 NEUTRAL POSITION SWITCH, Diagnostic Procedure with DTC.>

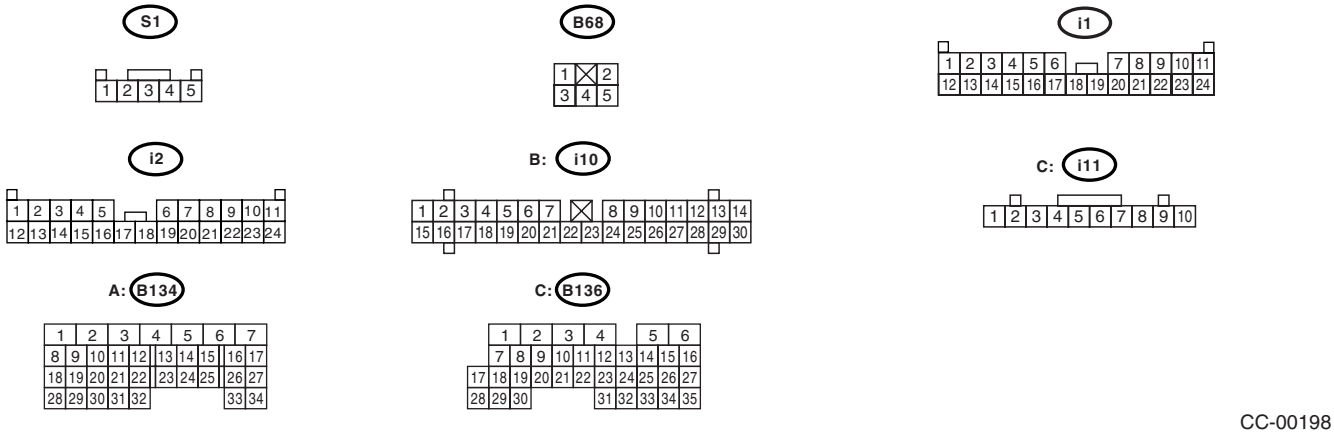
B: CHECK CRUISE INDICATOR LIGHT

TROUBLE SYMPTOM:

Cruise control can be set, but cruise indicator light does not illuminate.

WIRING DIAGRAM:





CC-00198

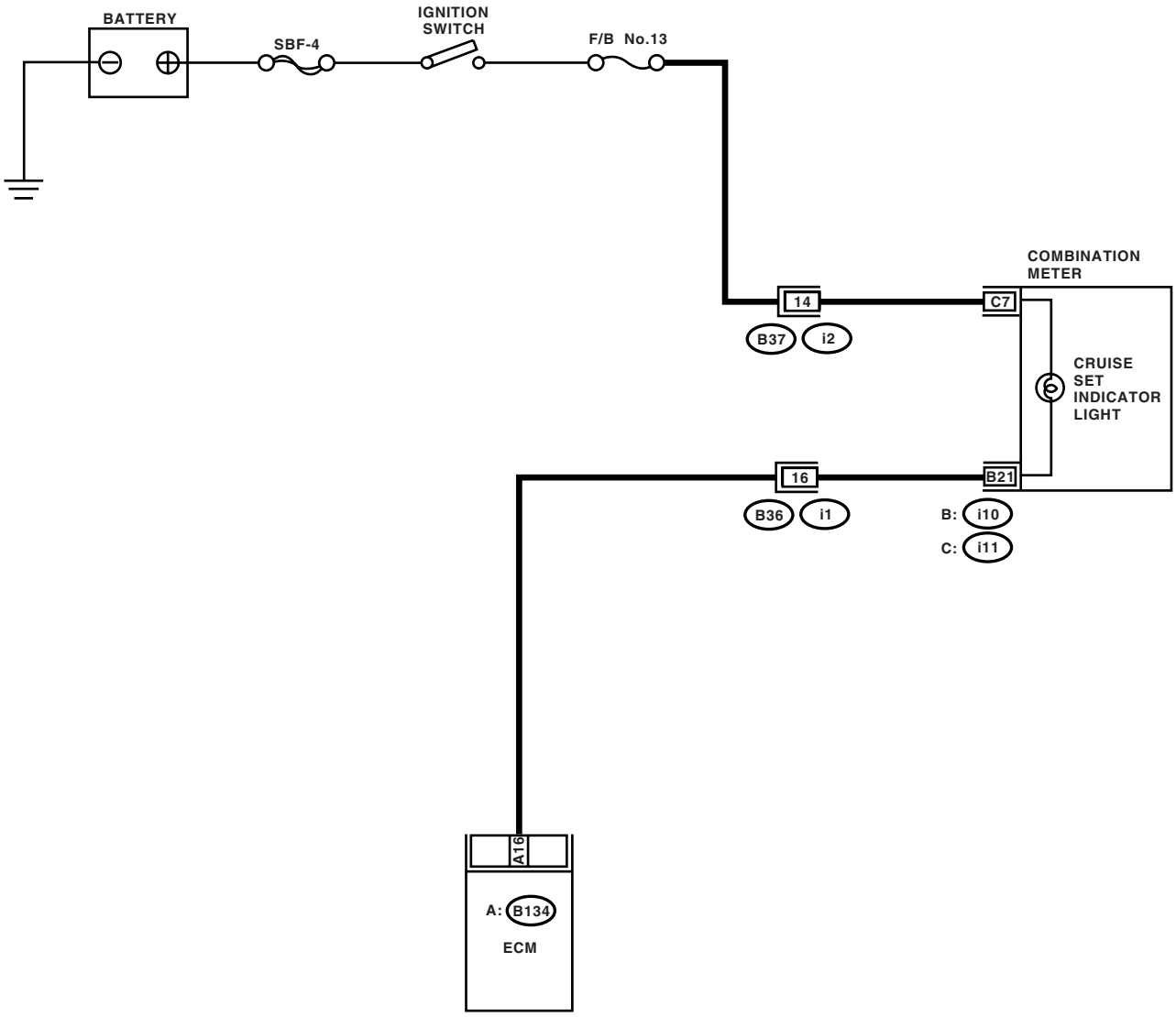
	Step	Check	Yes	No
1	**CHECK CRUISE INDICATOR LIGHT CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(i11) No. 7 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	• Check the fuse No. 13 (in fuse & relay box). • Check the harness for open or short between combination meter and fuse & relay box.
2	**CHECK CRUISE INDICATOR LIGHT CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM harness connector. 3) Measure the resistance between ECM harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***(B134) No. 15 — (i10) No. 16:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**CHECK CRUISE INDICATOR LIGHT CIRCUIT.** Ground the ECM harness connector terminal with a suitable wire. ***Connector & terminal*** ***(B134) No. 15 — Chassis ground:***	Does the cruise indicator light illuminate?	Check the poor contact of ECM connector.	Replace the meter main assembly.

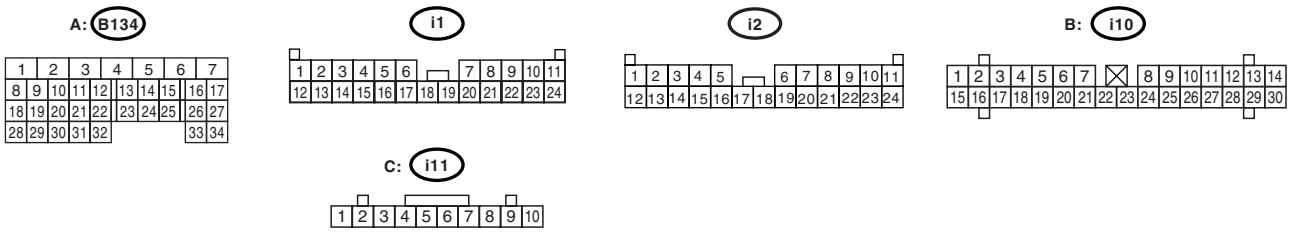
C: CHECK CRUISE SET INDICATOR LIGHT

TROUBLE SYMPTOM:

Cruise control can be set, but cruise set indicator light does not illuminate.

WIRING DIAGRAM:





CC-00199

	Step	Check	Yes	No
1	**CHECK CRUISE SET INDICATOR LIGHT CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter harness connector. 3) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(i11) No. 7 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	• Check the fuse No. 13 (in fuse & relay box). • Check the harness for open or short between combination meter and fuse & relay box.
2	**CHECK CRUISE SET INDICATOR LIGHT CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM harness connector. 3) Measure the resistance between ECM harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***(i10) No. 21 — (B134) No. 16:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**CHECK CRUISE SET INDICATOR LIGHT CIRCUIT.** Ground the ECM harness connector terminal with a suitable wire. ***Connector & terminal*** ***(B134) No. 16 — Chassis ground:***	Does the cruise set indicator light illuminate?	Check the poor contact of ECM connector.	Replace the meter main assembly.

7. List of DTC

A: LIST

DTC	Item	Contents of diagnosis	Reference
11	Main switch	Cruise control is released after the main switch of cruise control command switch is turned to OFF.	This DTC is indicated without operating the main switch. <Ref. to CC(STi)(diag)-17, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with DTC.>
12	Stop and brake switch	Cruise control is released after the stop light switch or brake switch is turned to ON.	This DTC is indicated without depressing the brake pedal. <Ref. to CC(STi)(diag)-19, DTC 12 AND 25 STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostic Procedure with DTC.>
13	Clutch switch	Cruise control is released after the clutch switch is turned to ON.	This DTC is indicated without depressing the clutch pedal. <Ref. to CC(STi)(diag)-21, DTC 13 CLUTCH SWITCH, Diagnostic Procedure with DTC.>
14	Neutral switch	Cruise control is released after the neutral switch is turned to ON.	This DTC is indicated without shifting to neutral position. <Ref. to CC(STi)(diag)-23, DTC 14 NEUTRAL POSITION SWITCH, Diagnostic Procedure with DTC.>
15	Cancel switch	Cruise control is released after the cancel switch is turned to ON.	This DTC is indicated without operating the cancel switch. <Ref. to CC(STi)(diag)-17, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with DTC.>
16	Ignition switch	Cruise control is released after the ignition switch is turned to OFF.	This DTC is indicated without operating the ignition switch. <Ref. to CC(STi)(diag)-25, DTC 16 IGNITION SWITCH, Diagnostic Procedure with DTC.>
21	Cruise control switch is abnormal when the ignition switch is turned to ON.	Each switch of cruise control command switch has already been ON when the ignition switch is turned to ON.	This DTC is indicated without operating the main switch. <Ref. to CC(STi)(diag)-17, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with DTC.>

DTC	Item	Contents of diagnosis	Reference
22	Vehicle speed variation is abnormal.	Abnormality of vehicle speed variation is detected.	<Ref. to CC(STi)(diag)-27, DTC 22 AND 32 VEHICLE SPEED SENSOR, Diagnostic Procedure with DTC.>
23	Engine-related sensor is abnormal.	Abnormality related to engine is detected.	<Ref. to EN(STi)(diag)-2, Basic Diagnostic Procedure.>
24	Cruise control-related switch is abnormal.	Abnormality of command switch is detected. (Open circuit is detected when continuing to be ON for an extremely long time [approx. two minutes].)	This DTC is indicated with normal operation. <Ref. to CC(STi)(diag)-17, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with DTC.>
25	Brake switch input circuit is abnormal.	Abnormality of brake switch input circuit in ECM is detected.	<Ref. to CC(STi)(diag)-19, DTC 12 AND 25 STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostic Procedure with DTC.>
26	Engine speed signal.	• Abnormal increase of engine speed is detected. • Gear is shifted to neutral, 1st or reverse position.	Cruise with more than 2nd shift position.
32	Out of vehicle speed range of cruise control operation.	• Vehicle speed becomes under the control limit during cruise driving. • Set operation is conducted out of vehicle speed range for setting • RESUME operation is conducted without vehicle speed memory.	This DTC is also indicated when increasing the speed to the cruise set available vehicle speed and conducting the set operation again. <Ref. to CC(STi)(diag)-27, DTC 22 AND 32 VEHICLE SPEED SENSOR, Diagnostic Procedure with DTC.>
33	Prohibition of WAIT after acceleration operation.	Vehicle speed becomes over the control limit during cruise driving.	This DTC is indicated when running at the high speed which is not suitable for cruise control. In this case, conduct the cruise set operation again after decreasing the speed to the cruise set available vehicle speed.
34	Prohibition when accelerator position is continued to be large.	Vehicle is driven at the higher speed than set vehicle speed for an extremely long time (approx. 10 minutes) during cruise driving.	This DTC is indicated when running for a long time at the higher speed than cruise set available vehicle speed by accelerator operation. In this case, release the cruise set.
35	Prohibition when vehicle speed feedback is impossible.	During cruise driving, set vehicle speed cannot be maintained for some reasons such as sharp upslope, parking brake and engine output abnormal decrease.	This DTC is indicated when the driving condition is not suitable for cruise control. Conduct the cruise set operation again after clearing the estimated reasons.

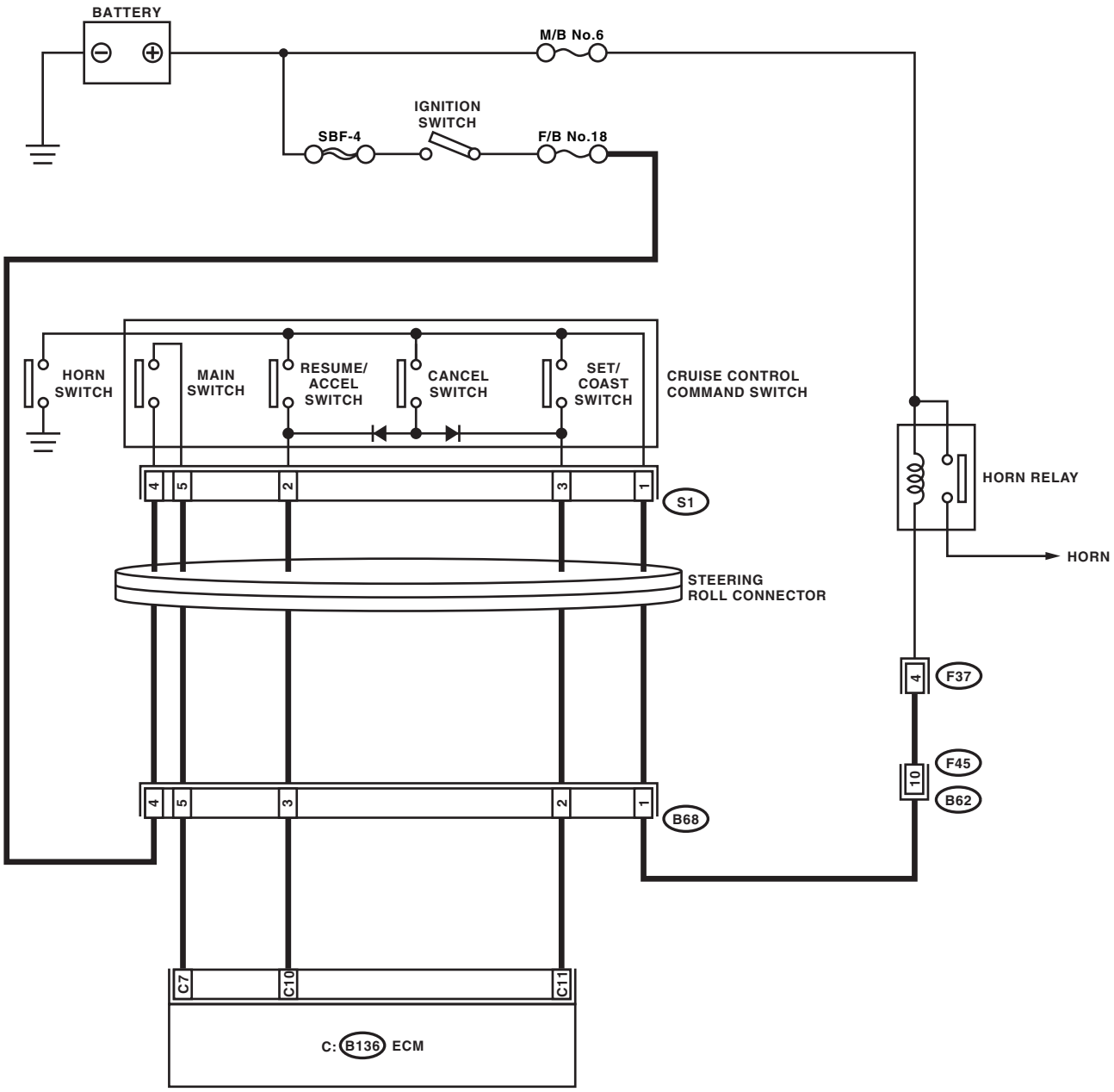
8. Diagnostic Procedure with DTC

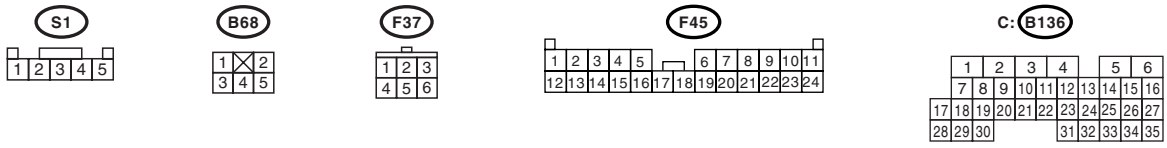
A: DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH

TROUBLE SYMPTOM:

- Cruise control cannot be set. (Cancelled immediately.)
- Cruise control cannot be released.

WIRING DIAGRAM:





CC-00200

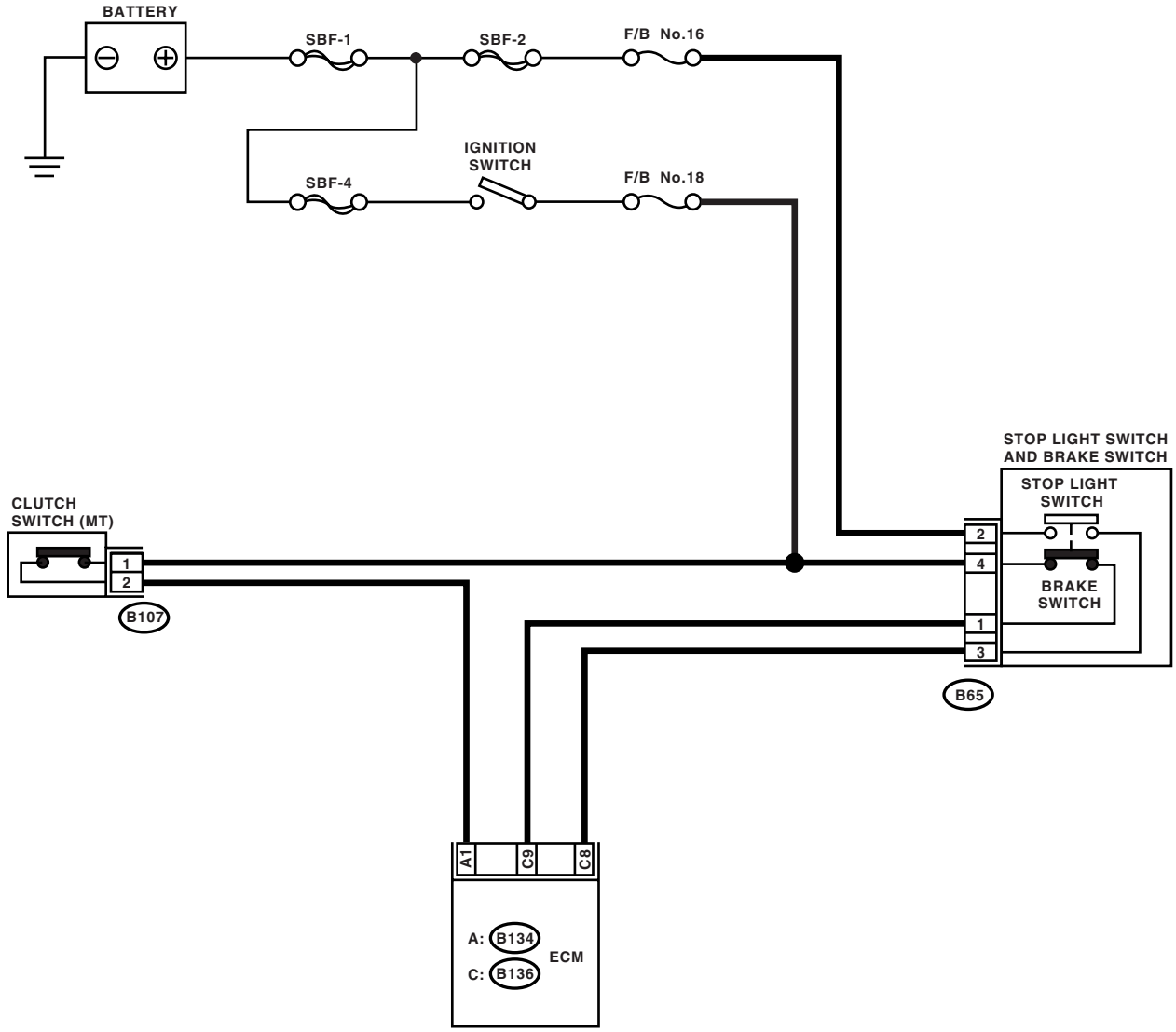
	Step	Check	Yes	No
1	**CHECK CRUISE CONTROL MAIN SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground when the main switch is pressed and is not pressed. ***Connector & terminal*** ***(B136) No. 7 (+) — Chassis ground (–):***	Is the voltage 0 V when the main switch is not pressed? Is the voltage more than 10 V when the main switch is pressed?	Go to step **2.**	• Check the fuse No. 18 (in fuse & relay box). • Check the harness for open or short between cruise control command switch and fuse & relay box. If no malfunction is found after checking above, Go to step **6.**
2	**CHECK SET/COAST SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM harness connector. 3) Measure the voltage between harness connector terminal and chassis ground when SET/COAST switch is pressed and not pressed. ***Connector & terminal*** ***(B136) No. 11 (+) — Chassis ground (–):***	Is the voltage 0 V when SET/COAST switch is not pressed? Is the voltage more than 10 V when SET/COAST switch is pressed?	Go to step **3.**	Go to step **5.**
3	**CHECK RESUME/ACCEL SWITCH CIRCUIT.** Measure the voltage between harness connector terminal and chassis ground when RESUME/ACCEL switch is pressed and not pressed. ***Connector & terminal*** ***(B136) No. 10 (+) — Chassis ground (–):***	Is the voltage 0 V when RESUME/ACCEL switch is not pressed? Is the voltage more than 10 V when RESUME/ACCEL switch is pressed?	Go to step **4.**	Go to step **5.**
4	**CHECK CANCEL SWITCH CIRCUIT.** Measure the voltage between harness connector terminal and chassis ground when CANCEL switch is pressed and not pressed. ***Connector & terminal*** ***(B136) No. 10 (+) — Chassis ground (–):*** ***(B136) No. 11 (+) — Chassis ground (–):***	Is the voltage 0 V when CANCEL switch is not pressed? Is the voltage more than 10 V when CANCEL switch is pressed?	Cruise control command switch circuit is OK.	Go to step **5.**
5	**CHECK POWER SUPPLY FOR COMMAND SWITCH.** Check the horn operation.	Does the horn sound?	Go to step **6.**	• Check the fuse No. 6 (in main fuse box). • Check the horn relay. <Ref. to COM-3, HORN RELAY, INSPECTION, Horn System.> • Check the harness for open or short between cruise control command switch and fuse & relay box.
6	**CHECK CRUISE CONTROL COMMAND SWITCH.** Remove and check the cruise control command switch. <Ref. to CC(STi)-4, Cruise Control Command Switch.>	Is the cruise control command switch OK?	Check the harness between cruise control command switch and ECM.	Replace the cruise control command switch.

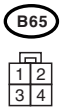
B: DTC 12 AND 25 STOP LIGHT SWITCH AND BRAKE SWITCH

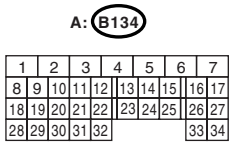
TROUBLE SYMPTOM:

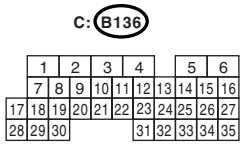
- Cruise control cannot be set.
- Cruise control cannot be released.

WIRING DIAGRAM:









CC-00201

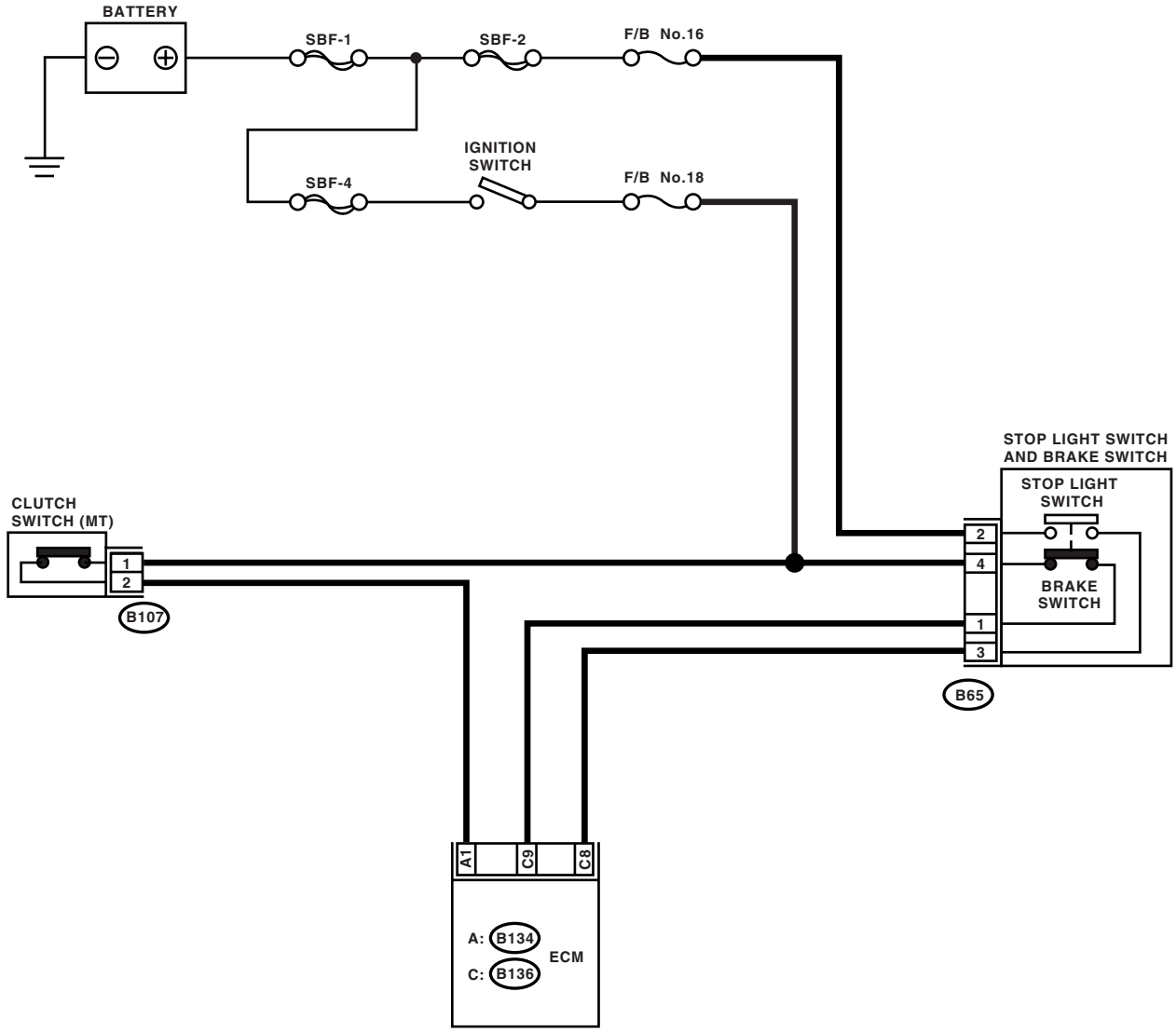
	Step	Check	Yes	No
1	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the stop light switch and brake switch harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B65) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	• Check the fuse No. 16 (in fuse & relay box). • Check the harness for open or short between stop light/brake switch and fuse & relay box.
2	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B65) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	• Check the fuse No. 18 (in fuse & relay box). • Check the harness for open or short between stop light/brake switch and fuse & relay box. • Check the clutch switch and circuit.
3	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM harness connector. 3) Measure the resistance between ECM harness connector terminal and stop light switch and brake switch harness connector terminal. ***Connector & terminal*** ***(B136) No. 8 — (B65) No. 3:*** ***(B136) No. 9 — (B65) No. 1:***	Is the resistance less than 10 Ω?	Go to step **4.**	Repair the harness.
4	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH.** Remove and check the stop light switch and brake switch. <Ref. to CC(STi)-5, Stop Light and Brake Switch.>	Are the stop light switch and brake switch OK?	Stop light switch and brake switch circuit are OK.	Replace the stop light switch and brake switch.

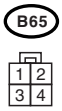
C: DTC 13 CLUTCH SWITCH

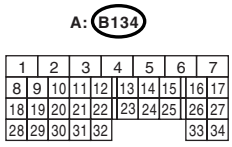
TROUBLE SYMPTOM:

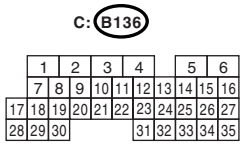
- Cruise control cannot be set.
- Cruise control cannot be released.

WIRING DIAGRAM:









CC-00201

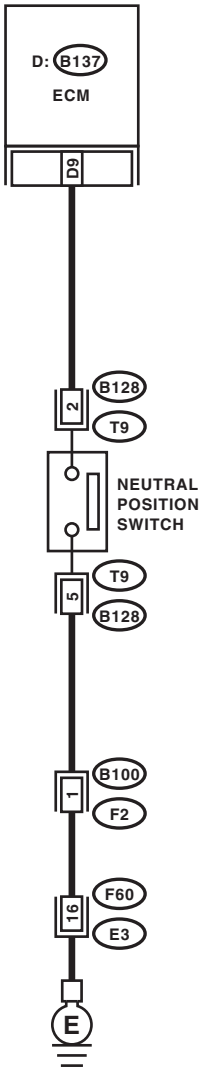
	Step	Check	Yes	No
1	**CHECK CLUTCH SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the clutch switch harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B107) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	• Check the fuse No. 18 (fuse & relay box). • Check the harness for open or short between clutch switch and fuse & relay box.
2	**CHECK CLUTCH SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM harness connector. 3) Measure the resistance between clutch switch harness connector terminal and ECM harness connector terminal. ***Connector & terminal*** ***(B107) No. 2 — (B134) No. 1:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**CHECK CLUTCH SWITCH.** Remove and check the clutch switch. <Ref. to CC(STi)-6, Clutch Switch.>	Is the clutch switch OK?	Clutch switch circuit is OK.	Replace the clutch switch.

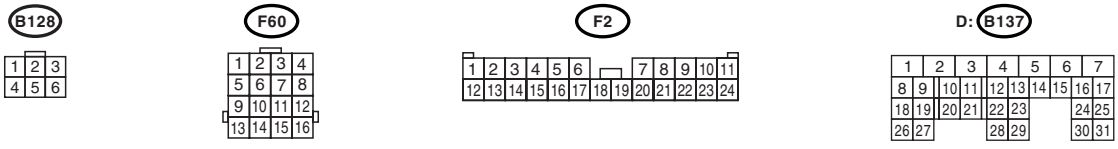
D: DTC 14 NEUTRAL POSITION SWITCH

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:





CC-00202

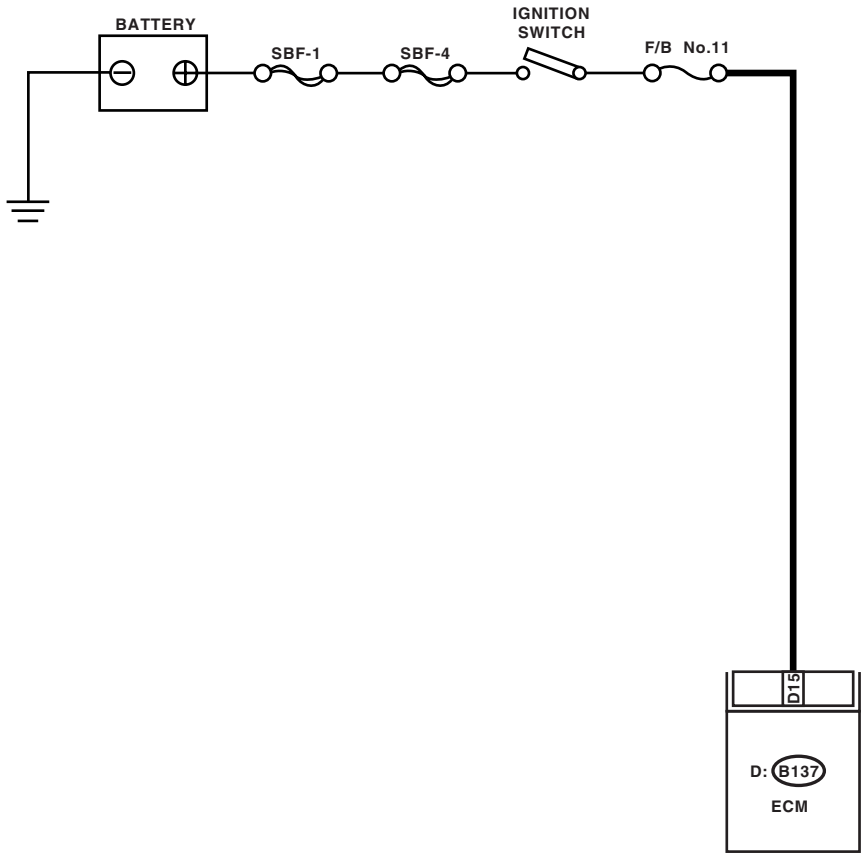
	Step	Check	Yes	No
1	**CHECK NEUTRAL POSITION SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the neutral position switch harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B128) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open or short between neutral position switch and ECM.
2	**CHECK NEUTRAL POSITION SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between neutral position switch harness connector terminal and chassis ground. ***Connector & terminal*** ***(B128) No. 5 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**CHECK NEUTRAL POSITION SWITCH.** Remove and check the neutral position switch. <Ref. to CC(STi)-7, Neutral Position Switch.>	Is the neutral position switch OK?	Neutral position switch circuit is OK.	Replace the neutral position switch.

E: DTC 16 IGNITION SWITCH

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:



D: B137

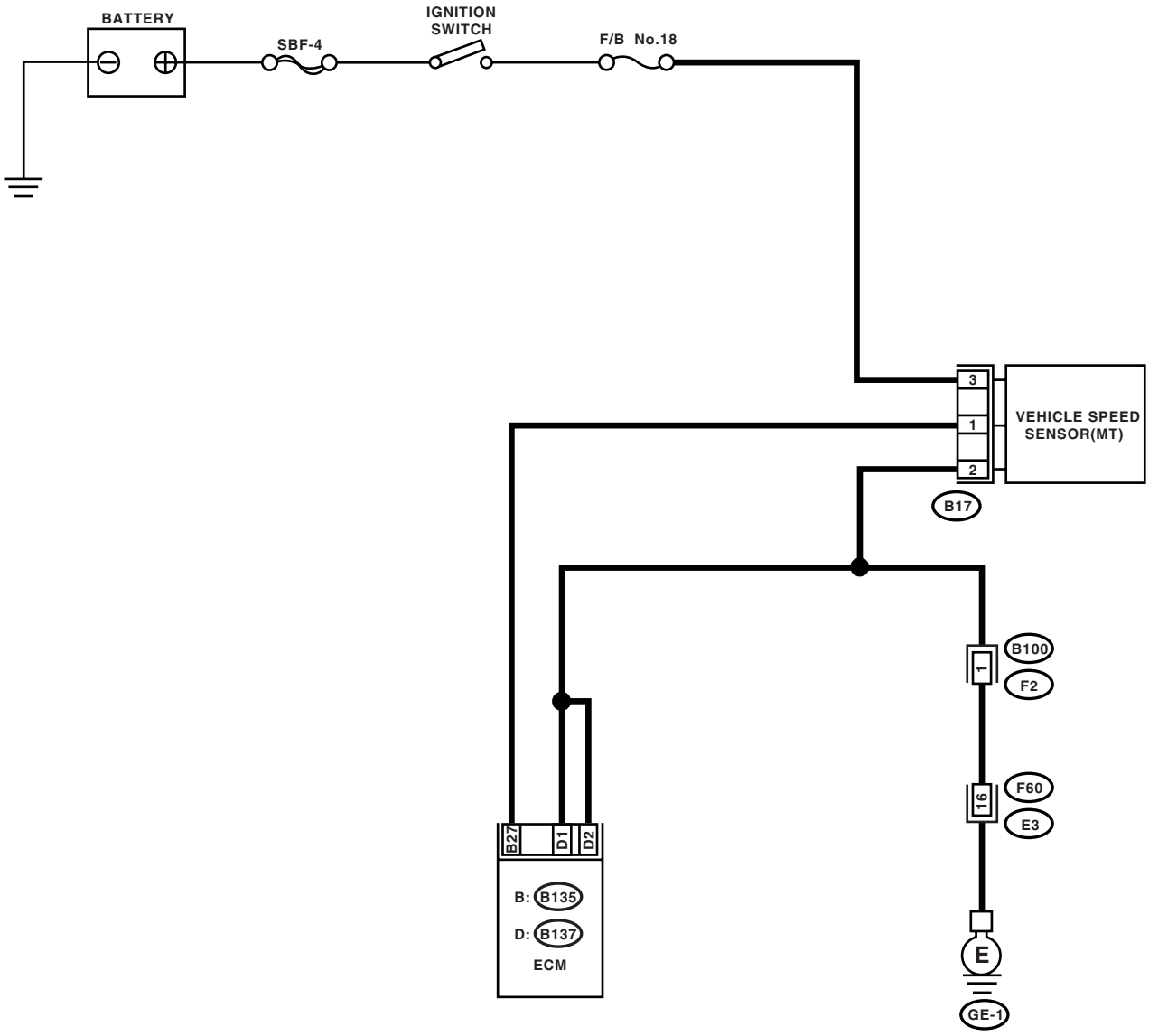
1	2	3	4	5	6	7			
8	9	10	11	12	13	14	15	16	17
18	19	20	21	22	23			24	25
26	27			28	29			30	31

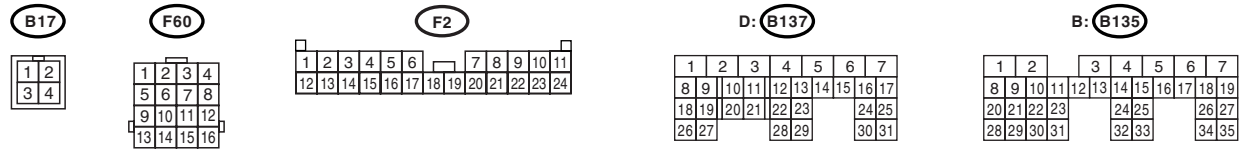
CC-00203

	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B137) No. 15 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Check the poor contact of ECM connector.	• Check the fuse No. 11 (fuse & relay box). • Check the harness for open or short between ignition switch and ECM.

F: DTC 22 AND 32 VEHICLE SPEED SENSOR

DIAGNOSIS:
Disconnection or short circuit of vehicle speed sensor system.
TROUBLE SYMPTOM:
Cruise control cannot be set. (Cancelled immediately.)
WIRING DIAGRAM:





CC-00204

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN BATTERY AND VEHICLE SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from vehicle speed sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between vehicle speed sensor harness connector terminal and chassis ground. ***Connector & terminal*** ***(B17) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open or short between fuse and vehicle speed sensor.
2	**CHECK HARNESS BETWEEN ECM AND VEHICLE SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from ECM. 3) Measure the resistance between vehicle speed sensor harness connector terminal and ECM harness connector terminal. ***Connector & terminal*** ***(B17) No. 1 — (B135) No. 27:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ENGINE GROUND.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between vehicle speed sensor harness connector terminal and engine ground. ***Connector & terminal*** ***(B17) No. 2 — Engine ground:***	Is the resistance less than 10 Ω?	Go to step **4.**	Repair the harness.
4	**CHECK VEHICLE SPEED SENSOR.** 1) Connect the harness connector to vehicle speed sensor. 2) Lift-up the vehicle and support with safety stands. 3) Drive the vehicle at speed greater than 20 km/h (12 MPH). **Warning:** **Be careful not to be caught up by the running wheels.** 4) Measure the voltage between ECM harness connector terminal and chassis ground. ***Connector & terminal*** ***(B135) No. 27 (+) — Chassis ground (–):***	Is the voltage less than 1 V ←→ more than 5 V?	Check the poor contact of ECM connector.	Replace the vehicle speed sensor.

OPTION PARTS

OP

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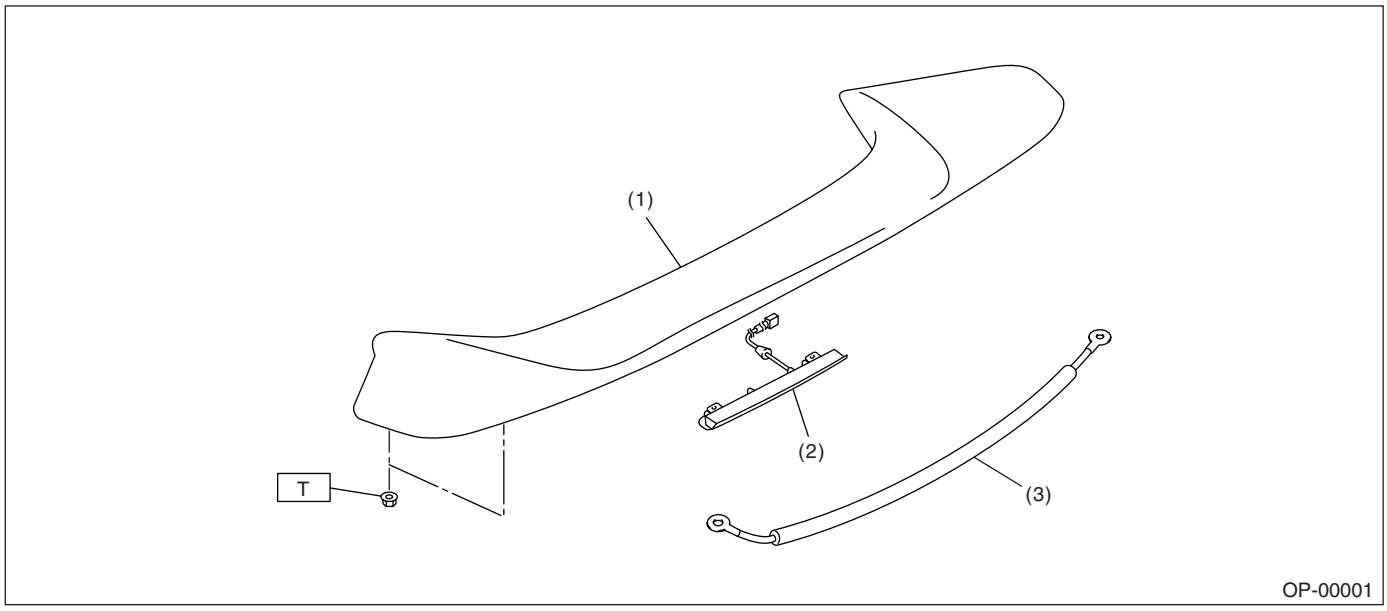
2. Rear Spoiler 5
3. Crossbar 6
4. Trailer Hitch 7
5. Rear Differential Protector 8

1. General Description

A: COMPONENT

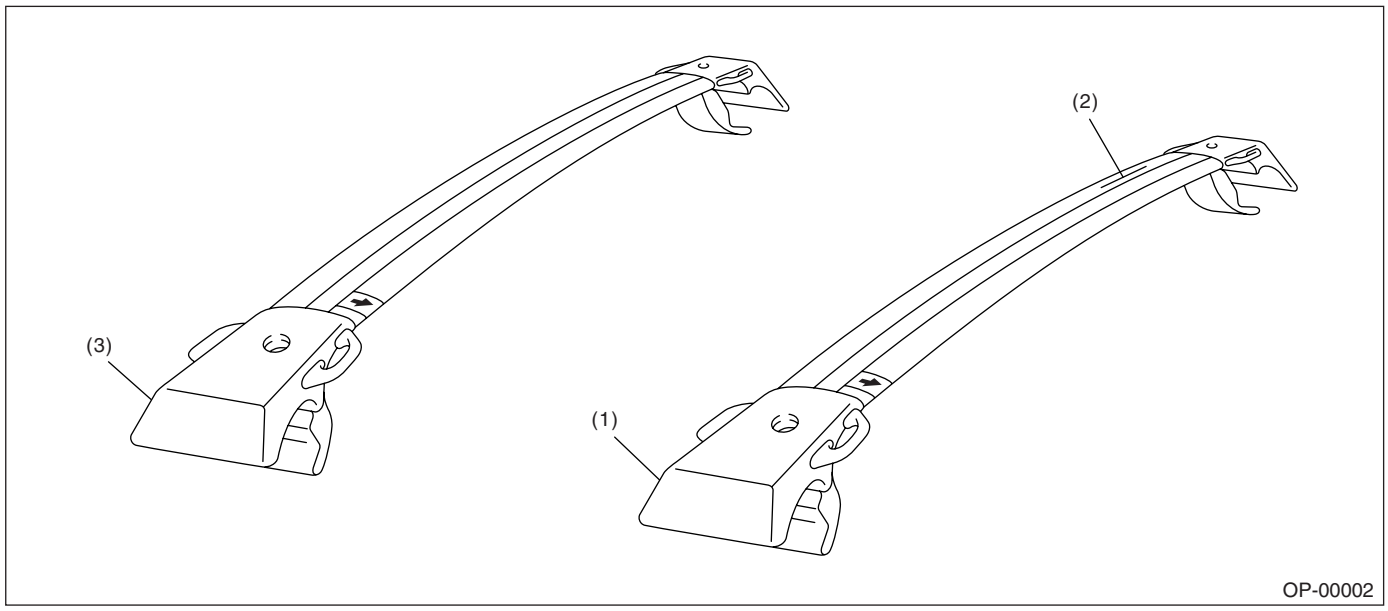
1. REAR SPOILER



(1) Rear spoiler
(2) High mounted stop light
(3) Retention cable

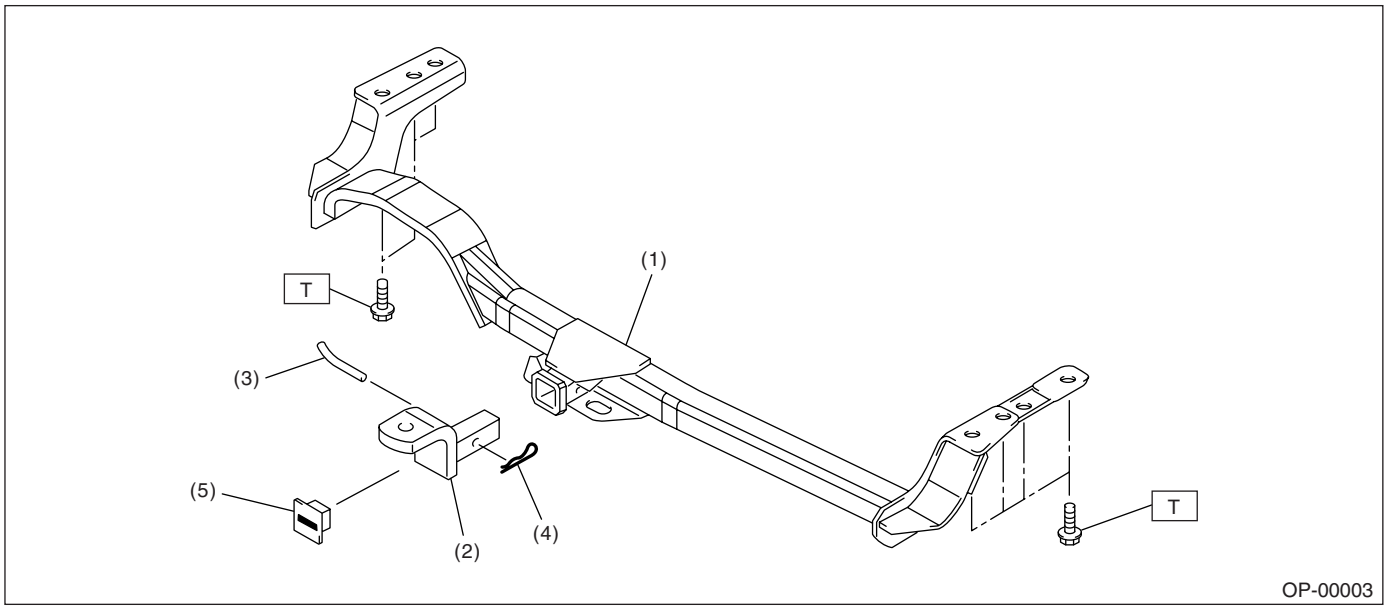
Tightening torque: N·m (kgf-m, ft-lb)
T: 7.4 (0.75, 5.46)

2. CROSSBAR



(1) Front crossbar
(2) Caution label (Front crossbar)
(3) Rear crossbar

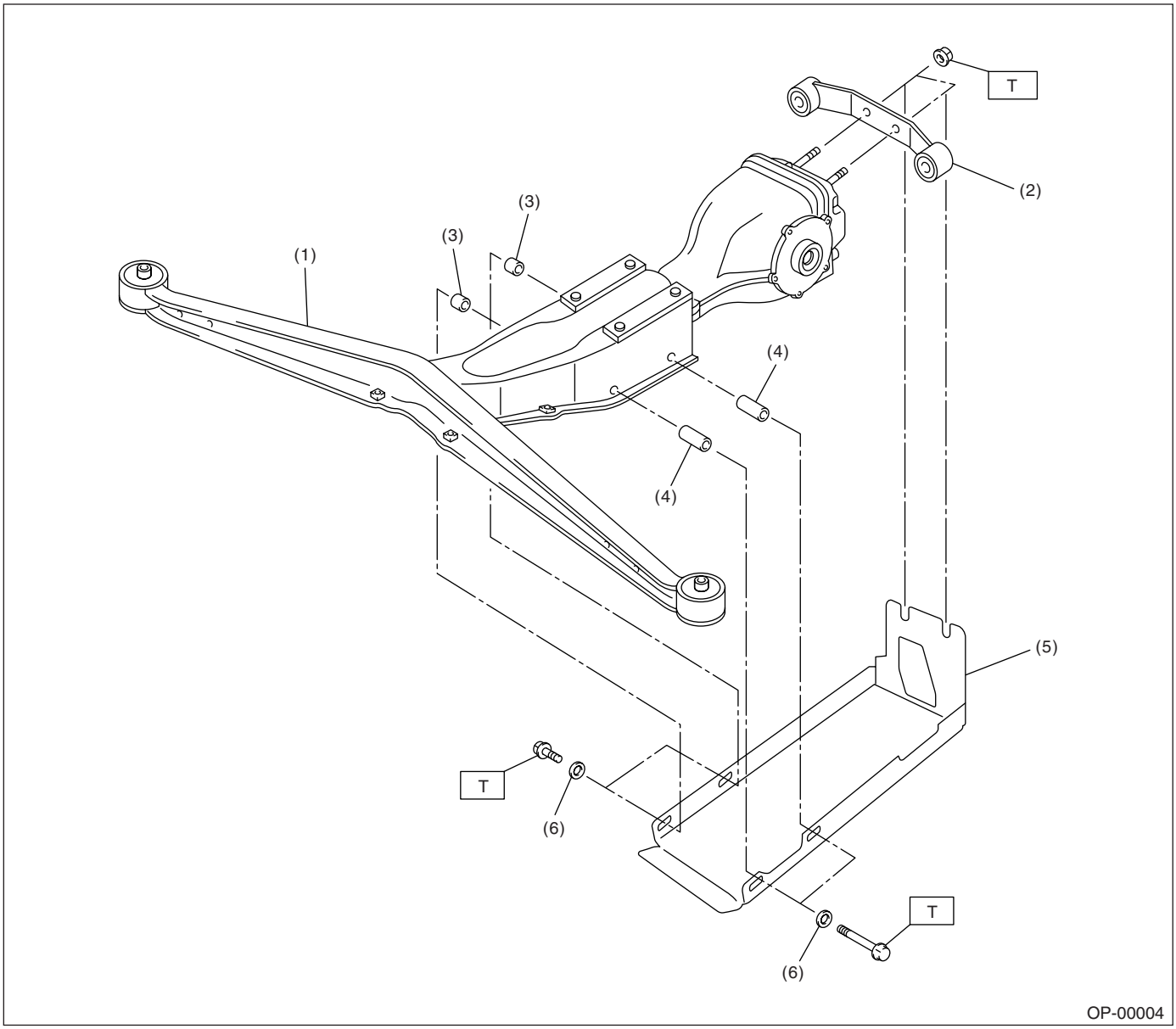
3. TRAILER HITCH



(1) Receiver hitch
(2) Ball mount
(3) Ball mount pin
(4) Ball mount clip
(5) Receiver cover

Tightening torque: N·m (kgf-m, ft-lb)
T: 95 (9.7, 70)

4. REAR DIFFERENTIAL PROTECTOR



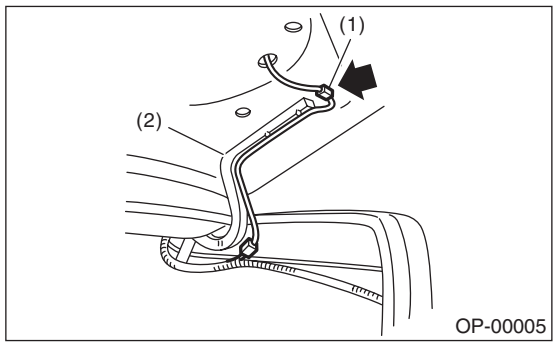
(1) Differential front member
(2) Differential rear member
(3) Spacer (Short)
(4) Spacer (Long)
(5) Rear differential protector
(6) Washer

Tightening torque: N·m (kgf-m, ft-lb)
T: 70 (7.1, 51.6)

2. Rear Spoiler

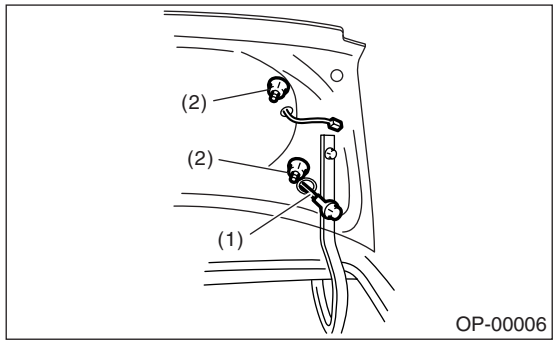
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Open the trunk lid.
3) Disconnect the connector of high mounted stop light.



(1) Connector
(2) Trunk hinge

4) Remove the retention cable with the trunk hinge lower side bolt.
5) Remove the mounting nuts of rear spoiler.



(1) Retention cable
(2) Mounting nut

6) Remove the rear spoiler with retention cable.

CAUTION:
Pay attention to avoid damage during removal or installation.

B: INSTALLATION

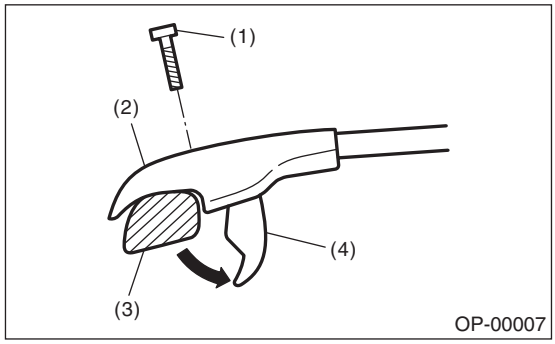
Install in the reverse order of removal.

Tightening torque:
Rear spoiler to trunk lid
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)
Retention cable to trunk hinge
13.7 N·m (1.4 kgf-m, 10.1 ft-lb)

3. Crossbar

A: REMOVAL

1) Remove the TORX® bolt T30 from each end support.
2) Rotate the lower clamp of each end support about 90° downward to remove the crossbar.



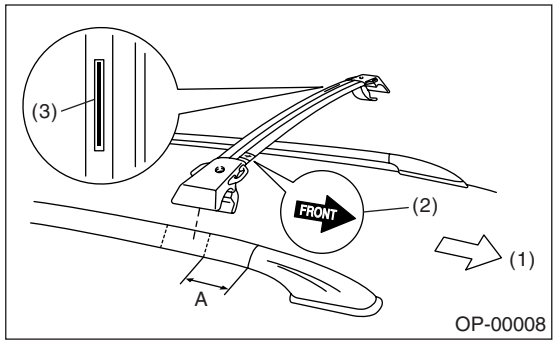
(1) TORX® bolt T30
(2) End support
(3) Roof rail
(4) Lower clamp

CAUTION:
Pay attention to avoid damage to the roof panel during removal or installation.

B: INSTALLATION

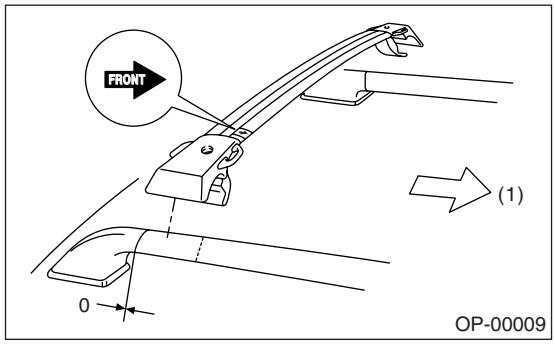
1) Rotate the lower clamp of each end support about 90° downward.
2) Set the front crossbar so that front direction mark on the right side top face of crossbar point in the direction of vehicle front.
3) Place the crossbar end support at position 76.2 mm (3 in) behind the joint of front roof rail support and roof rail.

Length A:
76.2 mm (3 in)



(1) Front of vehicle
(2) Front direction mark
(3) Caution label (Front crossbar)

4) Set the rear crossbar so that front direction mark on the right side top face of crossbar point in the direction of vehicle front.
5) Place the crossbar end support on a joint of rear roof rail support and roof rail.



(1) Front of vehicle
(2) Front direction mark

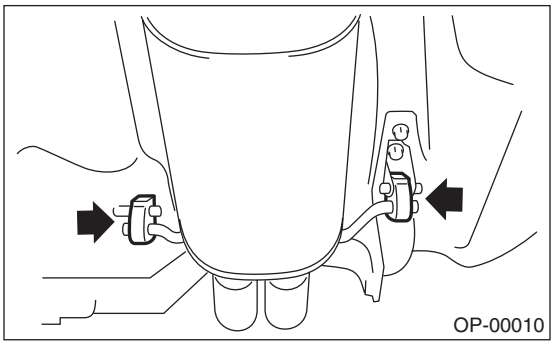
6) Tighten the end support and clamp using TORX® bolt T30.

4. Trailer Hitch

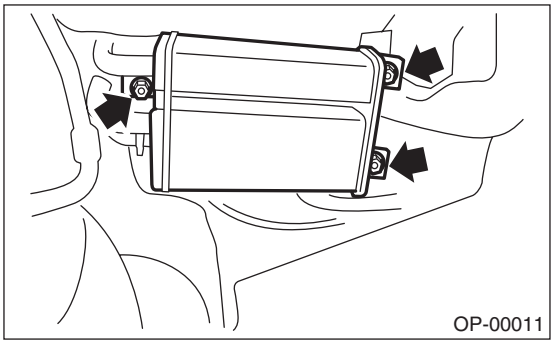
A: REMOVAL

CAUTION:
Because the trailer hitch is heavy, two people are required to remove it.

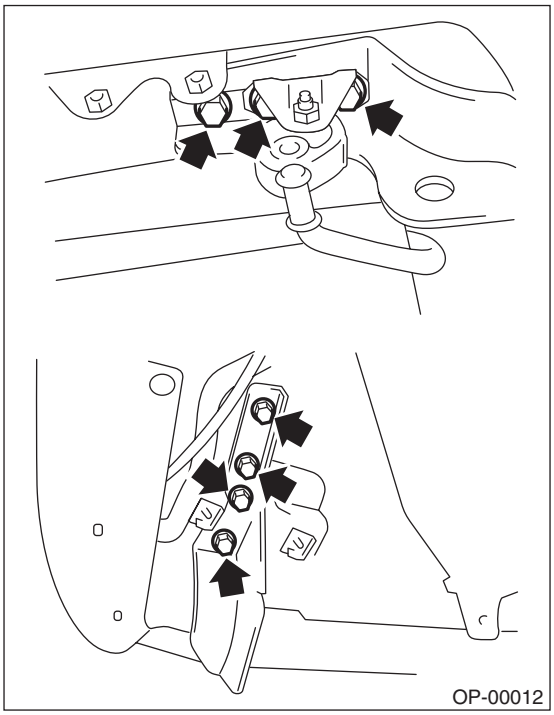
1) Lift-up the vehicle.
2) Remove the cushion rubber from body.



3) Remove the three nuts and canister.



4) Remove the trailer hitch installation bolts.



5) Remove the trailer hitch while lowering exhaust pipe.

B: INSTALLATION

CAUTION:
Because the trailer hitch is heavy, two people are required to install it.

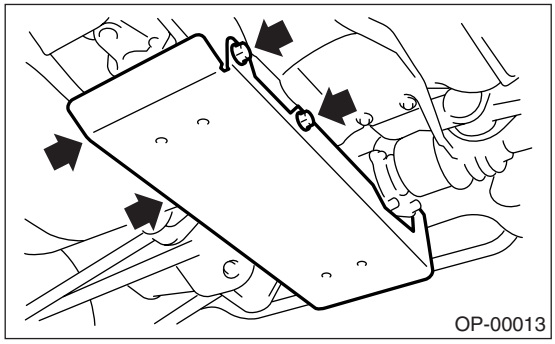
Install in the reverse order of removal.

Tightening torque:
Trailer hitch to body:
95 N·m (9.7 kgf-m, 70 ft-lb)
Canister:
23 N·m (2.3 kgf-m, 17 ft-lb)

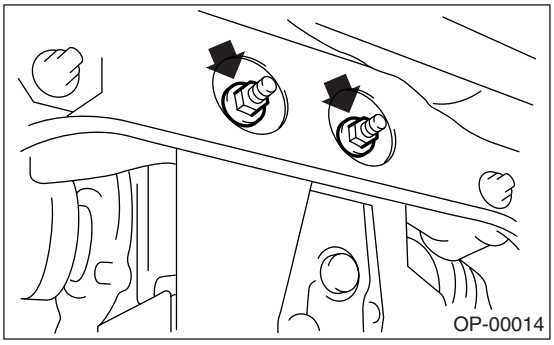
5. Rear Differential Protector

A: REMOVAL

1) Remove the rear exhaust pipe and muffer.
2) Remove the differential front member installation bolts.



3) Loosen the nuts until the rear differential protector can be removed.

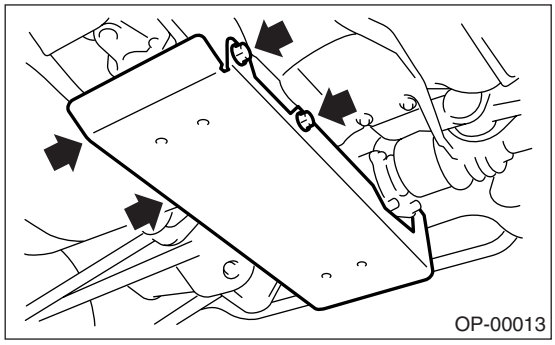


4) Remove the rear differential protector.

B: INSTALLATION

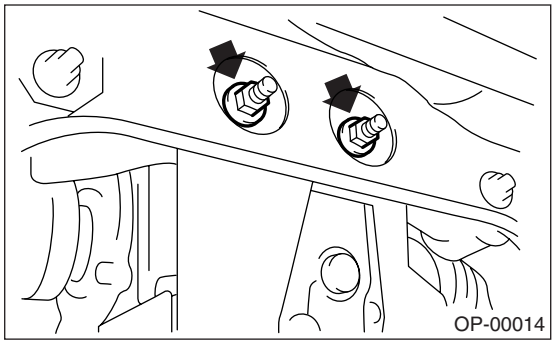
Install in the reverse order of removal.

Tightening torque:
70 N·m (7.1 kgf-m, 51.6 ft-lb)



NOTE:
Install the protector between the nuts and differential rear member.

Tightening torque:
70 N·m (7.1 kgf-m, 51.6 ft-lb)



WIRING SYSTEM SECTION

WIRING SYSTEM WI

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

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

FUJI HEAVY INDUSTRIES LTD. G1870BE8

WIRING SYSTEM

WI

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1. Basic Diagnostics Procedure

A: BASIC PROCEDURES

1. GENERAL DESCRIPTION

The most important purpose of diagnostics is to determine which part is malfunctioning quickly, to save time and labor.

2. IDENTIFICATION OF TROUBLE SYMPTOM

Determine what the problem is based on the symptom.

3. PROBABLE CAUSE OF TROUBLE

Look at the wiring diagram and check system's circuit. Then check the switch, relay, fuse, ground, etc.

4. LOCATION AND REPAIR OF TROUBLE

1) Using the diagnostics narrow down the causes.
2) If necessary, use a voltmeter, ohmmeter, etc.
3) Before replacing certain component parts (switch, relay, etc.), check the power supply, ground, for open wiring harness, poor connectors, etc. If no problems are encountered, check the component parts.

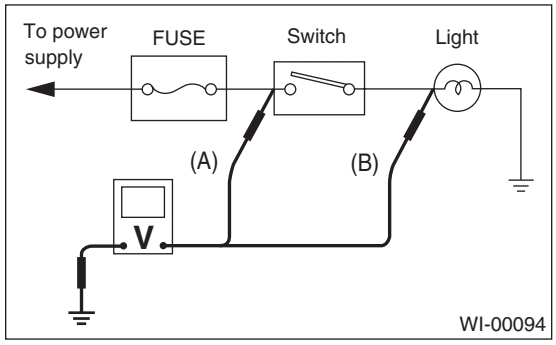
5. SYSTEM OPERATION CHECK

After repairing, ensure that the system operates properly.

B: BASIC INSPECTION

1. VOLTAGE MEASUREMENT

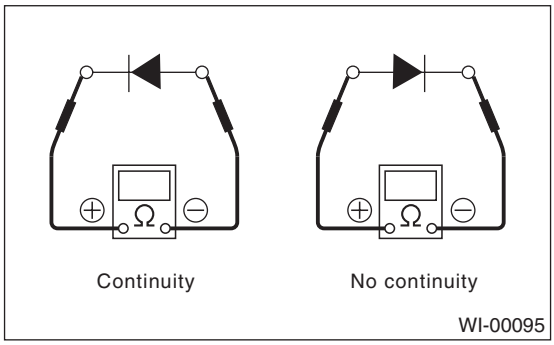
1) Using a voltmeter, connect the negative lead to a good ground point or negative battery terminal and the positive lead to the connector or component terminal.
2) Contact the positive probe of the voltmeter on connector (A).
The voltmeter will indicate a voltage.
3) Shift the positive probe to connector (B). The voltmeter will indicate no voltage.



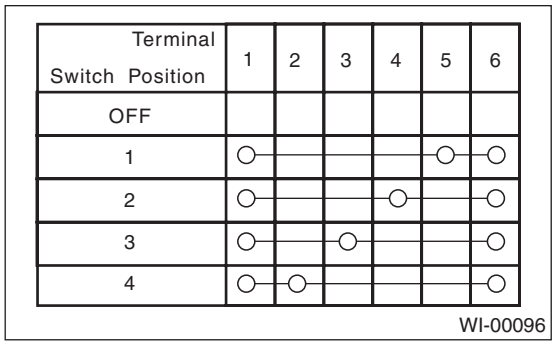
4) With test set-up held as it is, turn the switch ON. The voltmeter will indicate a voltage and, at the same time, the light will come on.
5) The circuit is in good order. If a problem such as a lamp failing to light occurs, use the procedures outlined above to track down malfunction.

2. CIRCUIT CONTINUITY CHECKS

1) Disconnect the battery cable or connector so there is no voltage between check points.
Contact the two leads of an ohmmeter to each of the check points.
If the circuit has diodes, reverse the two leads and check again.
2) Use an ohmmeter to check for the diode continuity. When contacting the negative lead to diode positive side and positive lead to negative side, there should be continuity.
When contacting the two leads in reverse, there should be no continuity.



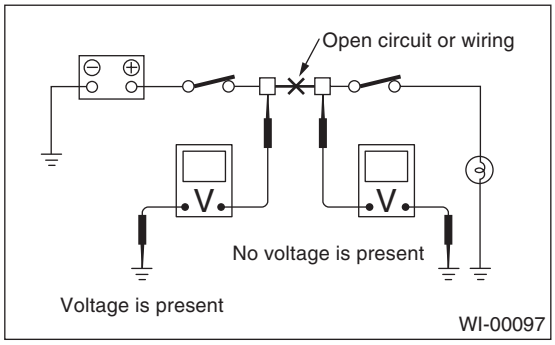
3) Symbol "❍ — ❍" indicates that continuity exists between two points or terminals. For example, when a switch position is "3", continuity exists among terminals 1, 3 and 6, as shown in table below.



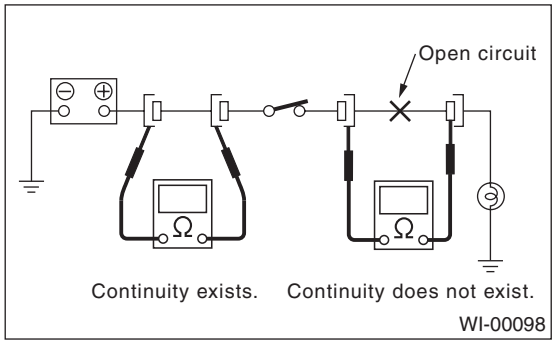
3. HOW TO DETERMINE AN OPEN CIRCUIT

1) Voltmeter Method:
An open circuit is determined by measuring the voltage between respective connectors and ground using a voltmeter, starting with the connector closest to power supply. The power supply must be turned ON so that current flows in the circuit. If volt-

age is not present between a particular connector and ground, the circuit between that connector and previous connector is open.

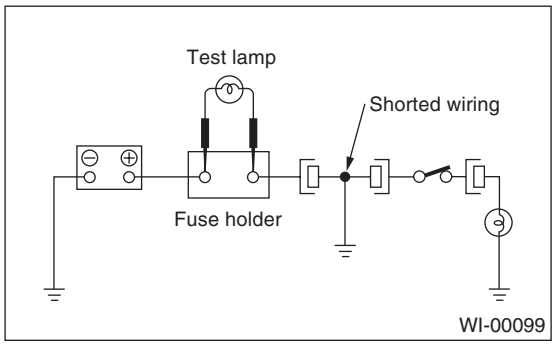


2) Ohmmeter method:
Disconnect all connectors affected, and check the continuity in wiring between adjacent connectors. When the ohmmeter indicates “infinite”, the wiring is open.

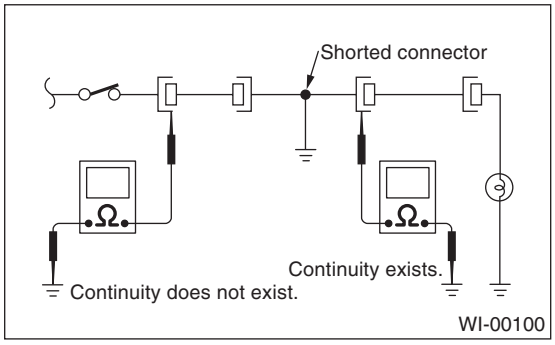


4. HOW TO DETERMINE A SHORT CIRCUIT

1) Test lamp method:
Connect a test lamp (rated at approx. 3 watts) in place of the blown fuse and allow current to flow through the circuit. Disconnect one connector at a time from the circuit, starting with the one located farthest from power supply. If the test lamp goes out when a connector is disconnected, the wiring between that connection and next connector (farther from the power supply) is shorted.



2) Ohmmeter method:
Disconnect all affected connectors, and check the continuity between each connector and ground. When the ohmmeter indicates continuity between a particular connector and ground, that the connector is shorted.

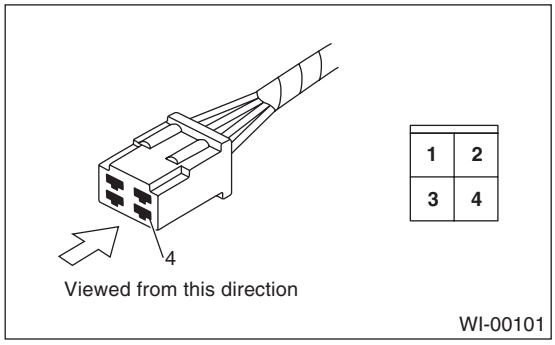


C: HOW TO READ WIRING DIAGRAMS

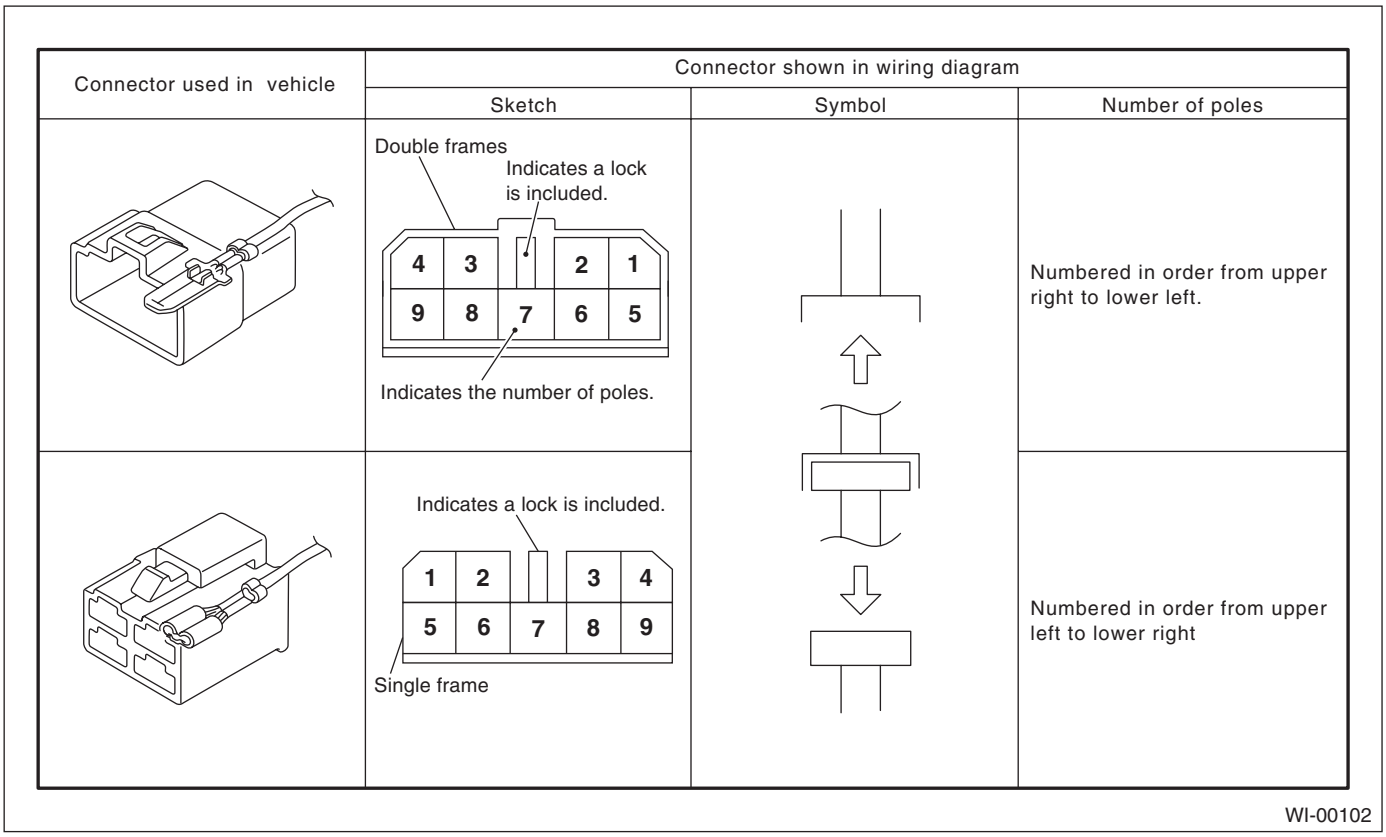
1. WIRING DIAGRAM

The wiring diagram of each system is illustrated so that you can understand the path through which electric current flows from battery.
Sketches and codes are used in the diagrams. They should read as follows:

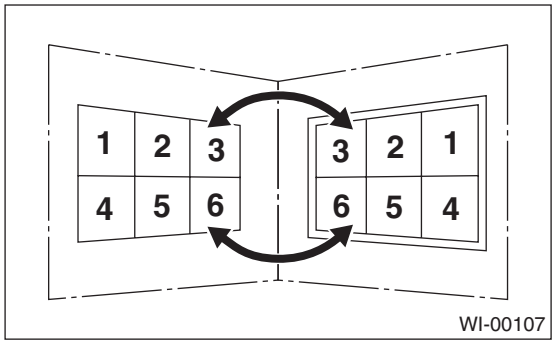
- Each connector and its terminal position are indicated by a sketch of the connector in a disconnected state which is viewed from front.



• The number of poles or pins, presence of a lock, and pin number of each terminal are indicated in the sketch of each connector. In the sketch, the highest pole number refers to the number of poles which connector has. For example, the sketch of connector shown in the figure indicates the connector has 9 poles.



• When one set of connectors is viewed from the front side, the pole numbers of one connector are symmetrical to those of other. When these two connectors are connected as a unit, the poles which have the same number are joined.



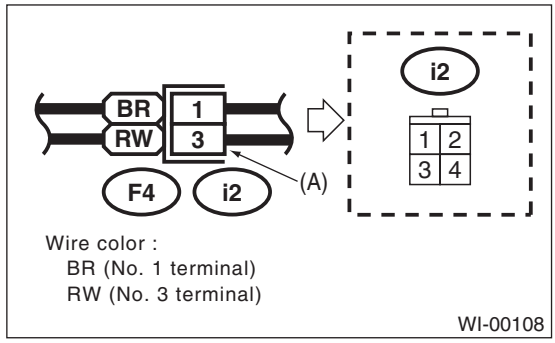
• Electrical wiring harness:

The connectors are numbered along with the number of poles, external colors, and mating connections in accompanying list.

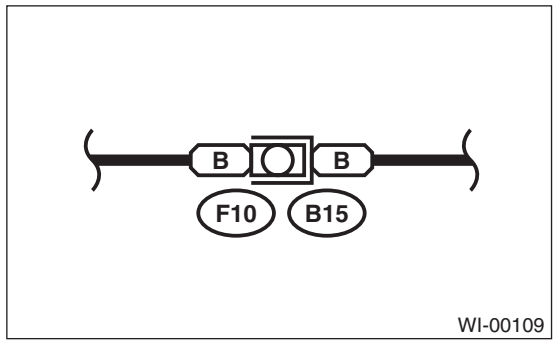
• The sketch of each connector in the wiring diagram usually shows (A) side of the connector. The relationship between wire color, terminal number and connector is described in figure.

NOTE:

A wire which runs in one direction from a connector terminal sometimes may have a different color from that which runs in the other direction from that terminal.

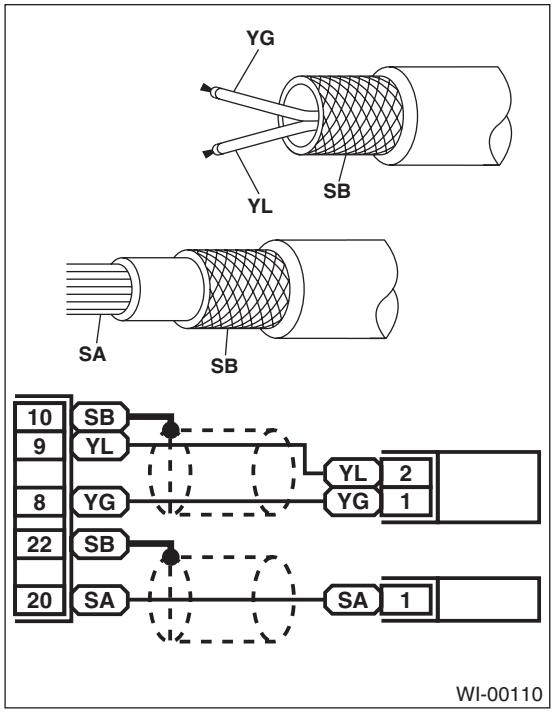


• In wiring diagram, connectors which have no terminal number refer to one-pole types. Sketches of these connectors are omitted intentionally.

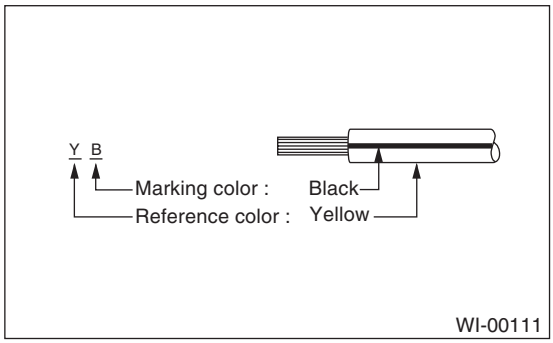


• The following color codes are used to indicate the colors of the wires used.

Color code	Color
L	Blue
B	Black
Y	Yellow
G	Green
R	Red
W	White
Br	Brown
Lg	Light green
Gr	Gray
P	Pink
Or	Orange
Lb	Light Blue
V	Violet
SA	Sealed (Inner)
SB	Sealed (Outer)



• The wire color code, which consists of two letters (or three letters including Br or Lg), indicates the standard color (base color of the wire covering) by its first letter and stripe marking by its second letter.



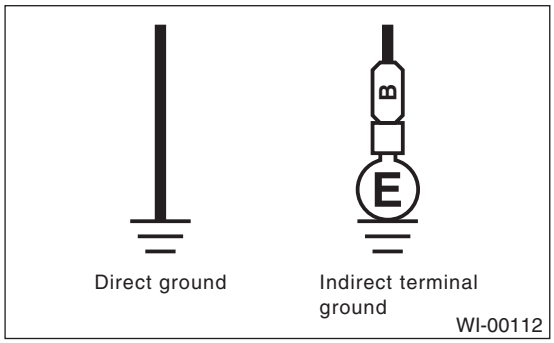
• The table lists the nominal sectional areas and allowable currents of wires.

CAUTION:
When replacing or repairing a wire, be sure to use the same size and type of wire which was originally used.

NOTE:
• The allowable current in the table indicates tolerable amperage of each wire at an ambient temperature of 40°C (104°F).
• The allowable current changes with ambient temperature. Also, it changes if a bundle of more than two wires is used.

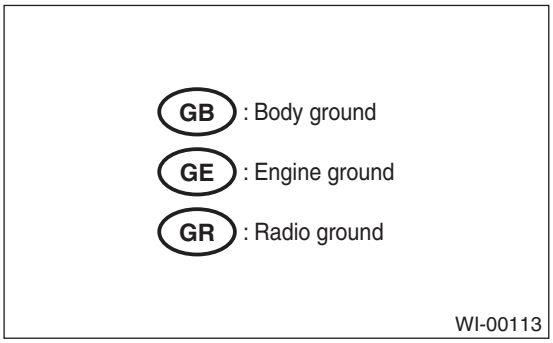
Nominal sectional area mm^2	No. of strands/ strand diameter	Outside diameter of finished wiring mm	Allowable current Amps/ 40°C (104°F)
0.3	7/0.26	1.8	7
0.5	7/0.32	2.2 (or 2.0)	12
0.75	30/0.18	2.6 (or 2.4)	16
0.85	11/0.32	2.4 (or 2.2)	16
1.25	16/0.32	2.7 (or 2.5)	21
2	26/0.32	3.1 (or 2.9)	28
3	41/0.32	3.8 (or 3.6)	38
5	65/0.32	4.6 (or 4.4)	51
8	50/0.45	5.5	67

• Each unit is directly grounded to the body or indirectly grounds through a harness ground terminal. Different symbols are used in the wiring diagram to identify the two grounding systems.



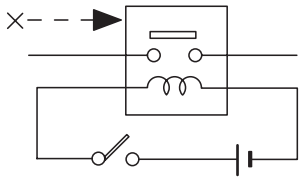
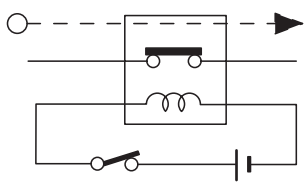
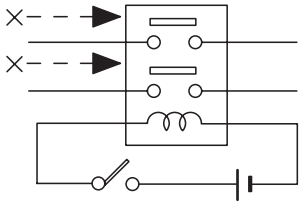
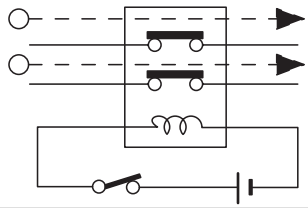
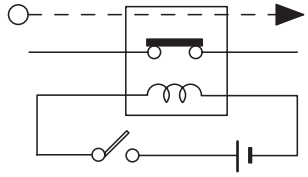
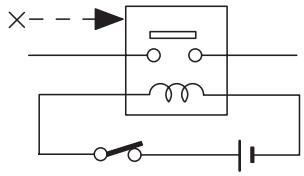
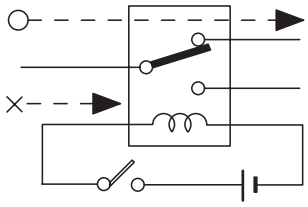
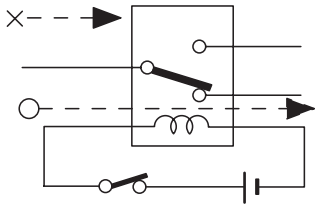
• The ground points shown in the wiring diagram refer to the following:

NOTE:
All wiring harnesses are provided with a ground point which should be securely connected.



- Relays are classified as normally-open or normally-closed.

The normally-closed relay has one or more contacts.
The wiring diagram shows the relay mode when energizing circuit is OFF.

Relay type		Energizing circuit OFF	Energizing circuit ON
Normally-open type	4-pole		
	6-pole		
Normally-closed type	4-pole		
Mixed type	6-pole		

Key to symbols:

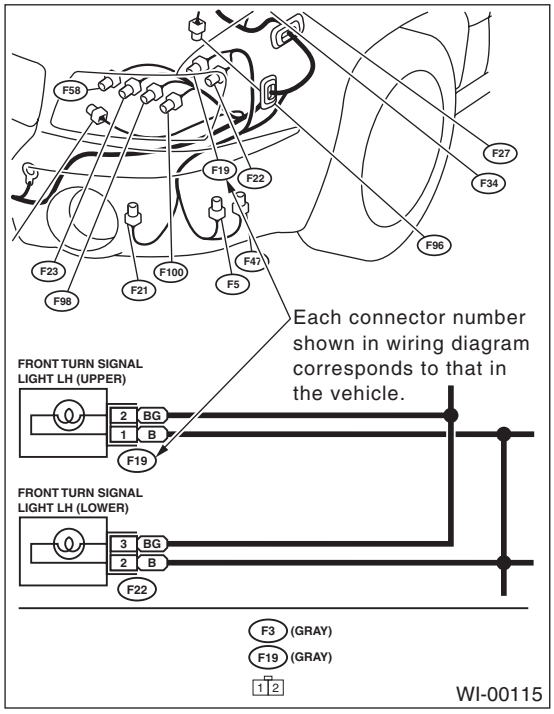
○ ⟶ : Current flows.

× ⟶ : Current does not flow.

WI-00114

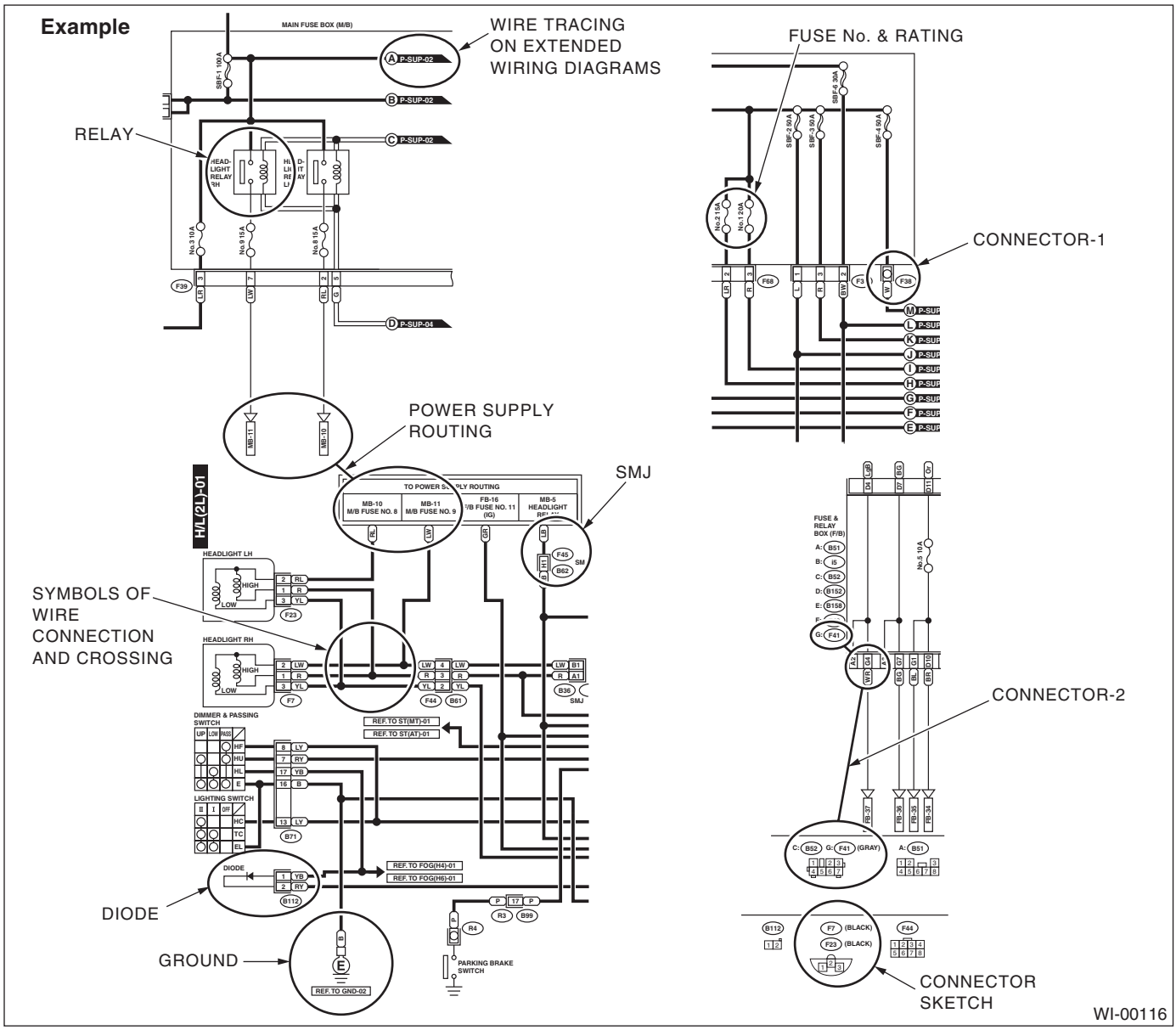
• Each connector number shown in the wiring diagram corresponds to that in wiring harness. The location of each connector in actual vehicle is determined by reading the first character of the connector (for example, a “F” for F8, “i” for i16, etc.) and type of wiring harness.
The first character of each connector number refers to the area or system of the vehicle.

Symbol	Wiring harness and cord
F	Front wiring harness
B	Bulkhead wiring harness
E	Engine wiring harness
T	Transmission cord, Rear oxygen sensor cord
D	Door cord LH & RH, Rear door cord LH & RH, Rear gate cord
i	Instrument panel wiring harness
R	Rear wiring harness, Fuel tank cord, Roof cord, Trunk lid cord
AB	Airbag wiring harness



D: SYMBOLS IN WIRING DIAGRAMS

A number of symbols are used in each wiring diagram to easily identify parts or circuits.



1. RELAY

A symbol used to indicate a relay.

2. CONNECTOR-1

The sketch of the connector indicates one-pole types.

3. WIRING CONNECTION

Some wiring diagrams are indicated in foldouts for convenience. Wiring destinations are indicated where necessary by corresponding symbols (as when two pages are needed for clear indication).

4. FUSE No. & RATING

The “FUSE No. & RATING” corresponds with that used in fuse box (main fuse box, fuse and joint box).

5. CONNECTOR-2

- Each connector is indicated by a symbol.
- Each terminal number is indicated in the corresponding wiring diagram in an abbreviated form.
- For example, terminal number “G4” refers to No. 4 terminal of connector (G: F41) shown in the connector sketch.

6. CONNECTOR SKETCH

• Each connector sketch clearly identifies the shape and color of a connector as well as terminal locations. Non-colored connectors are indicated in natural color.
• When more than two types of connector number are indicated in a connector sketch, it means that the same type connectors are used.

7. GROUND

Each grounding point can be located easily by referring to the corresponding wiring harness.

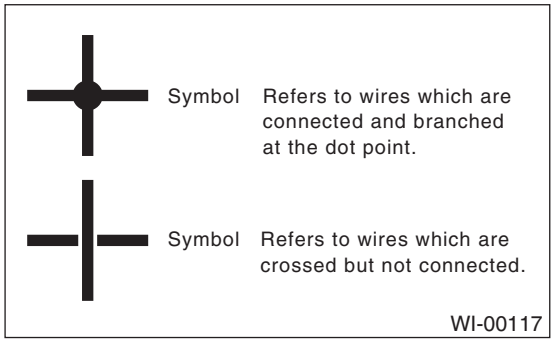
8. DIODE

A symbol is used to indicate a diode.

9. WIRE TRACING ON EXTENDED WIRING DIAGRAMS

For a wiring diagram extending over at least two pages, a symbol (consisting of the same characters with arrows), facilitates wire tracing from one page to the next.
A ←→ A, B ←→ B

10.SYMBOLS OF WIRE CONNECTION AND CROSSING



11.POWER SUPPLY ROUTING

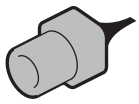
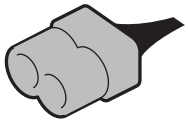
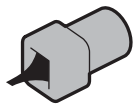
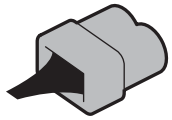
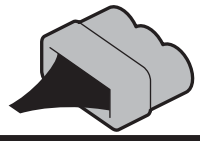
A symbol is used to indicate the power supply in each wiring diagram.
“MB-5”, “MB-6”, etc., which are used as power-supply symbols throughout the text, correspond with those shown in POWER SUPPLY ROUTING in the wiring diagram.
Accordingly, using the POWER SUPPLY ROUTING and wiring diagrams permits service personnel to understand the entire electrical arrangement of a system.

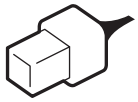
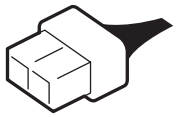
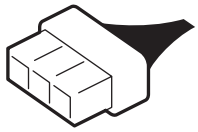
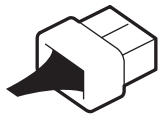
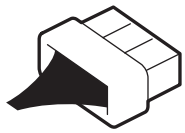
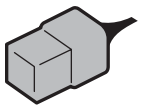
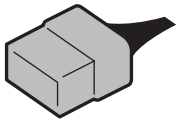
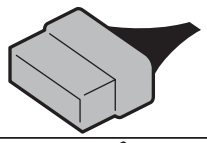
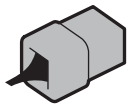
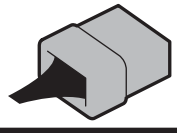
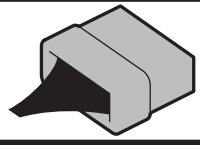
12.CLASSIFICATION BY SPECIFICATION

When the wiring diagrams differ according to vehicle specifications, the specification difference is described by using abbreviations.

E: CONNECTOR SYMBOL IN WIRING HARNESS

Main symbols of connector (in wiring harness) are indicated in below.

	Female		
	Pole: From 1 to 8	Pole: From 9 to 20	Pole: More than 21
Water proof type			
	Male		
			
			

	Female		
	Pole: From 1 to 8	Pole: From 9 to 20	Pole: More than 21
Standard type			
			
	Male		
			
			

WI-02445

F: ABBREVIATION IN WIRING DIAGRAMS

Abbreviation	Full name
ABS	Antilock Brake System
ACC	Accessory
A/C	Air Conditioning
AD	Auto Down
AT	Automatic Transmission
AU	Auto Up
+B	Battery
DN	Down
E	Ground
F/B	Fuse & Joint Box
FL1.5	Fusible link 1.5 mm^2
IG	Ignition
Illumi.	Illumination
LH	Left Hand
Lo	Low
M	Motor
M/B	Main Fuse Box
MG	Magnet
Mi	Middle
OP	Optional Parts
PASS	Passing
RH	Right Hand
SBF	Slow Blow Fuse
ST	Starter
SW	Switch
UP	Up
WASH	Washer

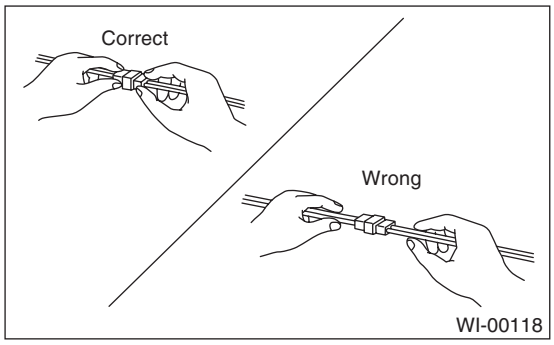
2. Working Precautions

A: PRECAUTIONS WHEN WORKING WITH THE PARTS MOUNTED ON THE VEHICLE

1) When working under a vehicle which is jacked-up, always be sure to use safety stands.
2) The parking brake must always be applied during working. Also, in automatic transmission models, keep the select lever set to P (Parking) range.
3) Be sure the workshop is properly ventilated when running the engine. Further, be careful not to touch the belt or fan while the engine is operating.
4) Be careful not to touch hot metal parts, especially the radiator and exhaust system immediately after the engine has been shut off.

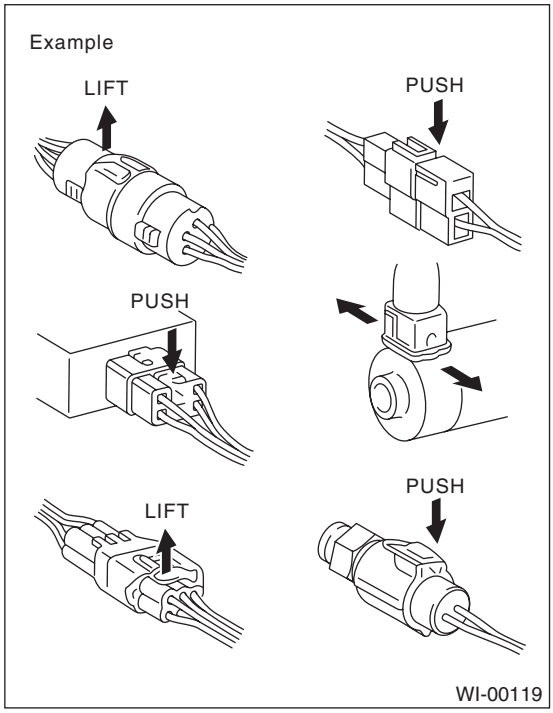
B: PRECAUTIONS IN TROUBLE DIAGNOSIS AND REPAIR OF ELECTRIC PARTS

1) The battery cable must be disconnected from battery's (–) terminal, and the ignition switch must be set to OFF position, unless otherwise required by the diagnostics.
2) Securely fasten the wiring harness with clamps and slips so that the harness does not interfere with body end parts or edges and bolts or screws.
3) When installing the parts, be careful not to catch them on the wiring harness.
4) When disconnecting a connector, do not pull the wires, but pull while holding the connector body.

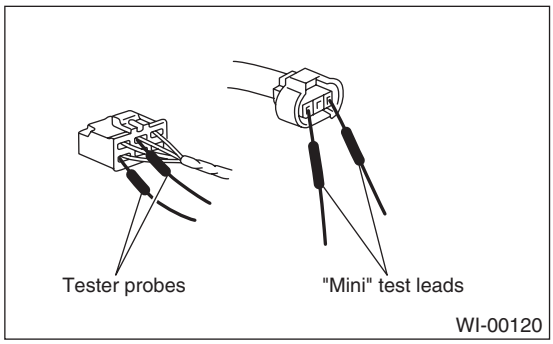


5) Some connectors are provided with a lock. One type of such a connector is disconnected by pushing the lock, and the other, by moving the lock up. In either type the lock shape must be identified before attempting to disconnect the connector.

To connect, insert the connector until it snaps and confirm that it is tightly connected.



6) When checking continuity between connector terminals, or measuring the voltage across the terminal and ground, always contact tester probe(s) on terminals from the wiring connection side. If the probe is too thick to gain access to the terminal, use "mini" test leads.
To check water-proof connectors (which are not accessible from the wiring side), contact test probes on the terminal side being careful not to bend or damage terminals.



7) Sensors, relays, electrical unit, etc., are sensitive to strong impacts.
Handle them with care so that they are not dropped or mishandled.

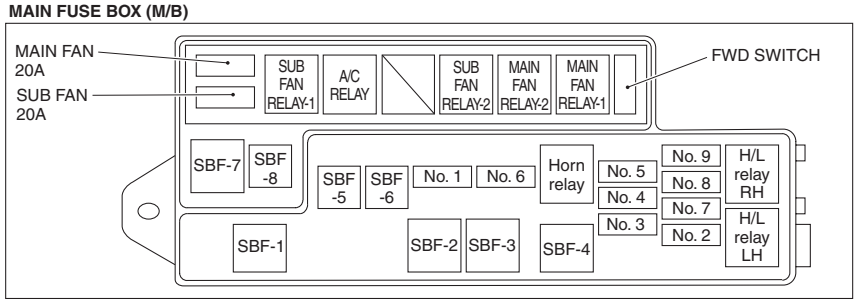
3. Power Supply Routing

A: WIRING DIAGRAM

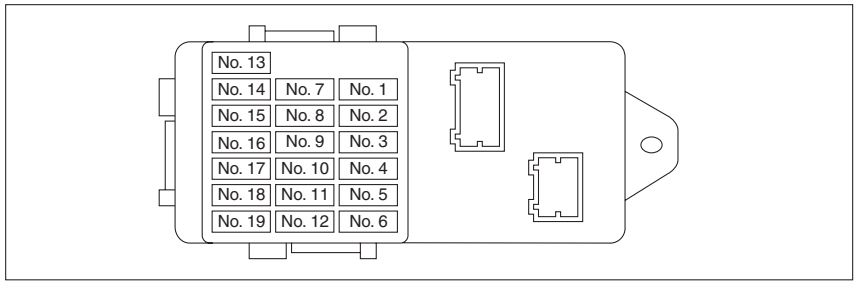
P-SUP-01

P-SUP-01

MAIN FUSE BOX (M/B)

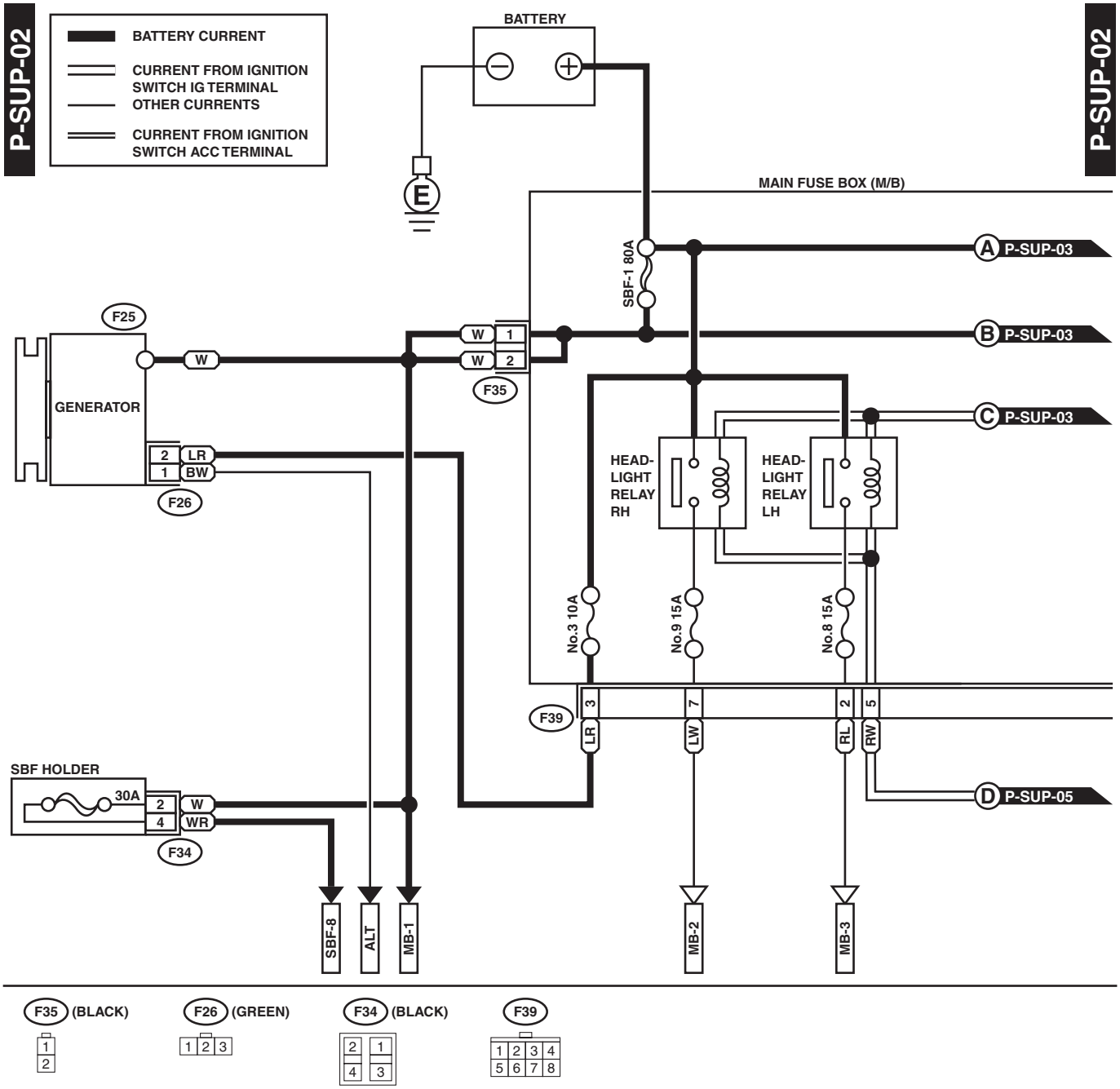


FUSE & RELAY BOX (F/B)

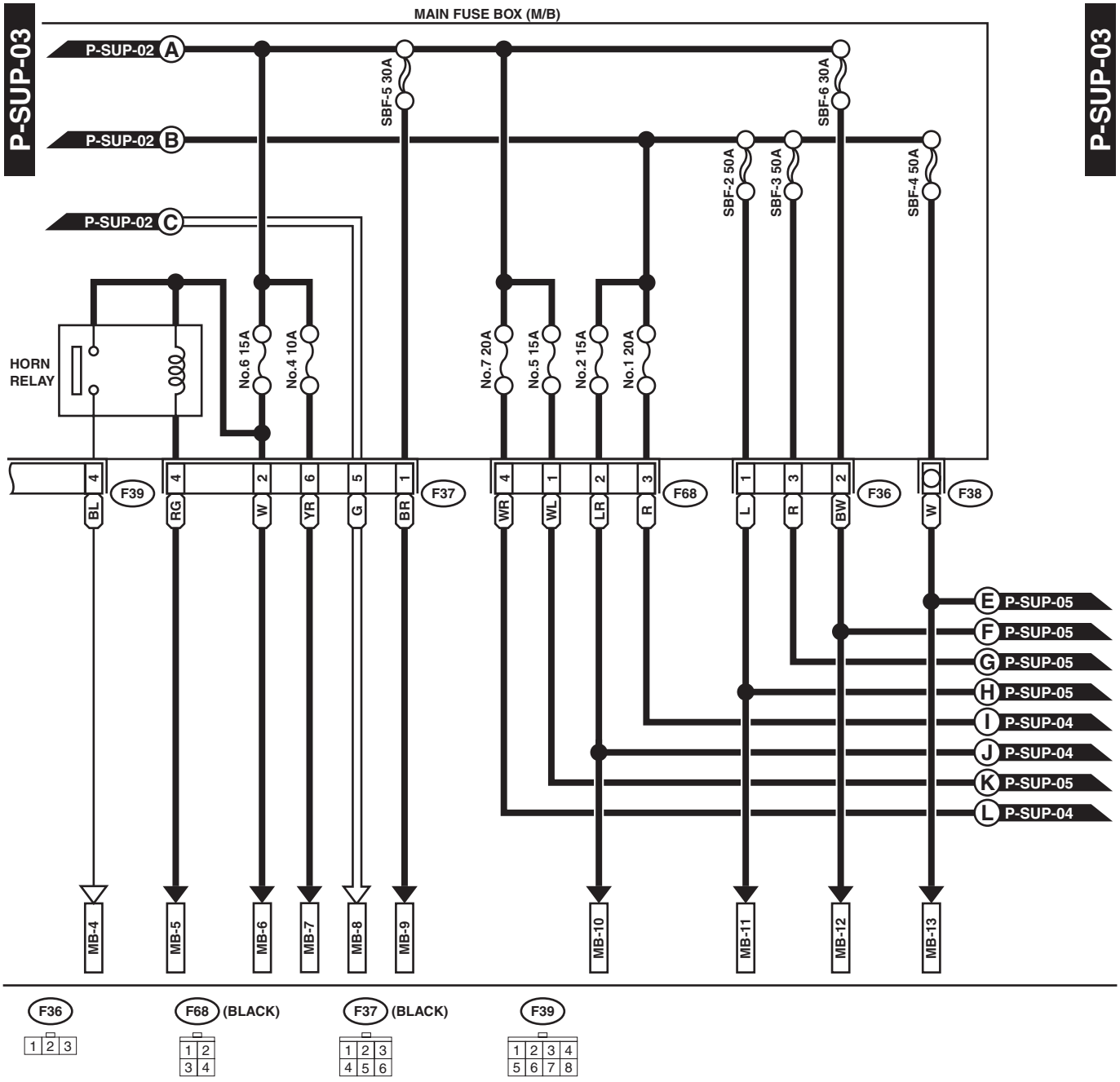


WI-02167

Power Supply Routing

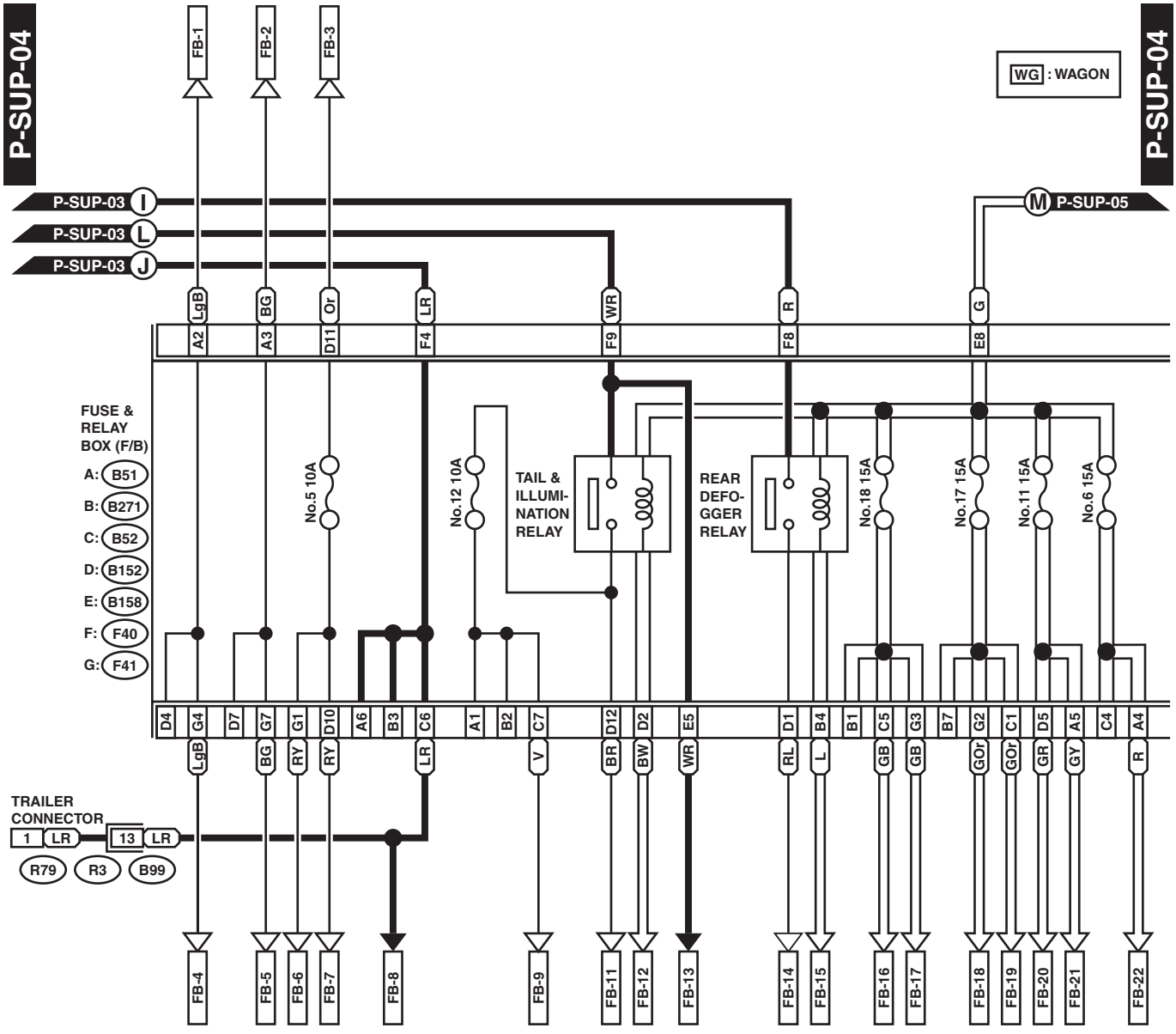


WI-02785

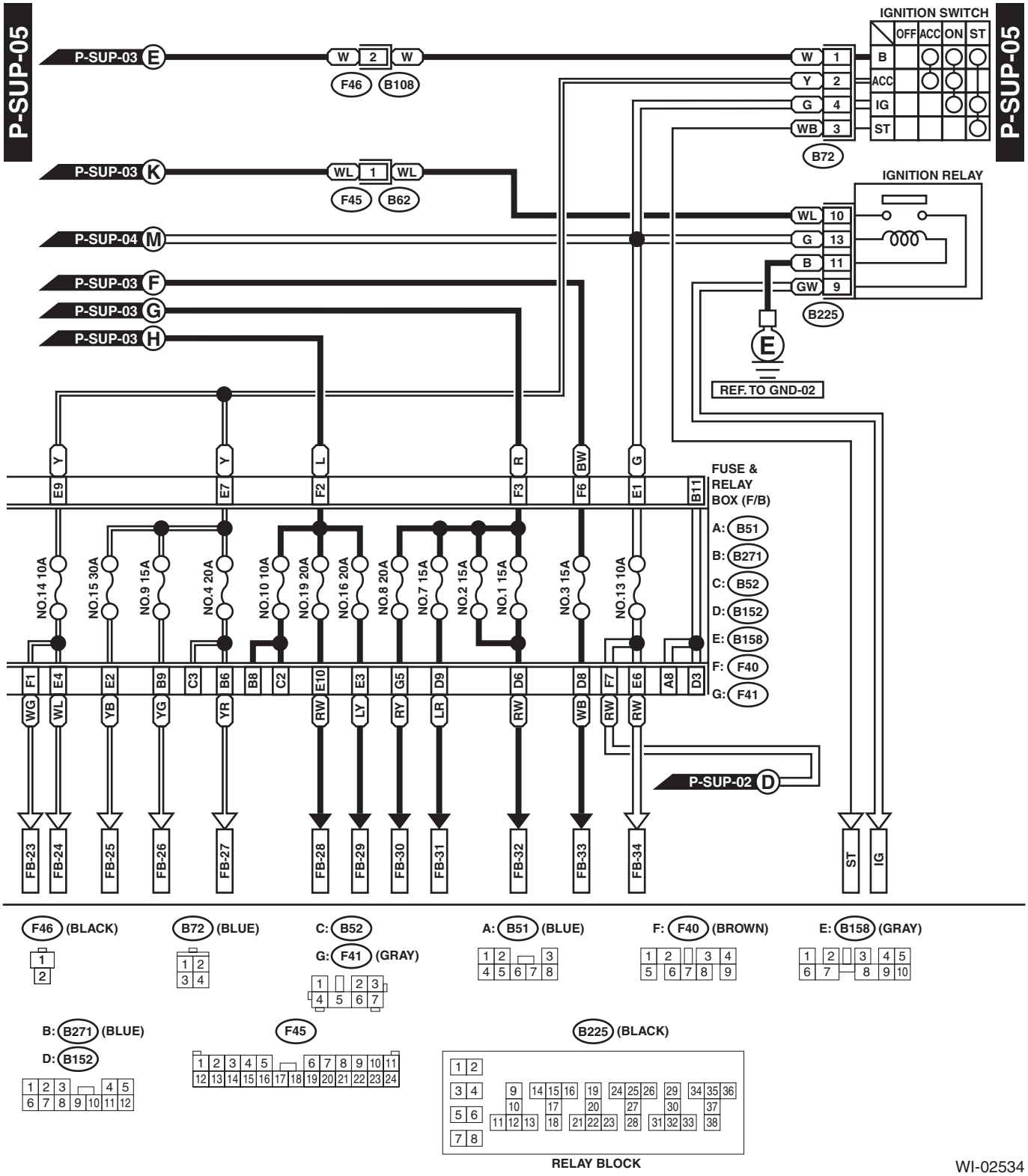

P-SUP-03
MAIN FUSE BOX (M/B)
P-SUP-02 A
P-SUP-02 B
P-SUP-02 C
SBF-5 30A
SBF-6 30A
SBF-2 50A
SBF-3 50A
SBF-4 50A
HORN RELAY
No.6 15A
No.4 10A
No.7 20A
No.5 15A
No.2 15A
No.1 20A
F39
F37
F68
F36
F38
BL
RG
W
YR
G
BR
WR
WL
LR
R
L
R
BW
W
E P-SUP-05
F P-SUP-05
G P-SUP-05
H P-SUP-05
I P-SUP-04
J P-SUP-04
K P-SUP-05
L P-SUP-04
MB-4
MB-5
MB-6
MB-7
MB-8
MB-9
MB-10
MB-11
MB-12
MB-13
F36
F68 (BLACK)
F37 (BLACK)
F39

WI-02168

Power Supply Routing



WI-02533


P-SUP-05
P-SUP-05
P-SUP-03 E
P-SUP-03 K
P-SUP-04 M
P-SUP-03 F
P-SUP-03 G
P-SUP-03 H
F46
B108
F45
B62
IGNITION SWITCH
OFF ACC ON ST
B
ACC
IG
ST
W 1
Y 2
G 4
WB 3
B72
IGNITION RELAY
WL 10
G 13
B 11
GW 9
B225
E
REF. TO GND-02
FUSE & RELAY BOX (F/B)
A: B51
B: B271
C: B52
D: B152
E: B158
F: F40
G: F41
NO.14 10A
NO.15 30A
NO.9 15A
NO.4 20A
NO.10 10A
NO.19 20A
NO.16 20A
NO.8 20A
NO.7 15A
NO.2 15A
NO.1 15A
NO.3 15A
NO.13 10A
P-SUP-02 D
FB-23
FB-24
FB-25
FB-26
FB-27
FB-28
FB-29
FB-30
FB-31
FB-32
FB-33
FB-34
ST
IG
F46 (BLACK)
B72 (BLUE)
C: B52
G: F41 (GRAY)
A: B51 (BLUE)
F: F40 (BROWN)
E: B158 (GRAY)
B: B271 (BLUE)
D: B152
F45
B225 (BLACK)
RELAY BLOCK

WI-02534

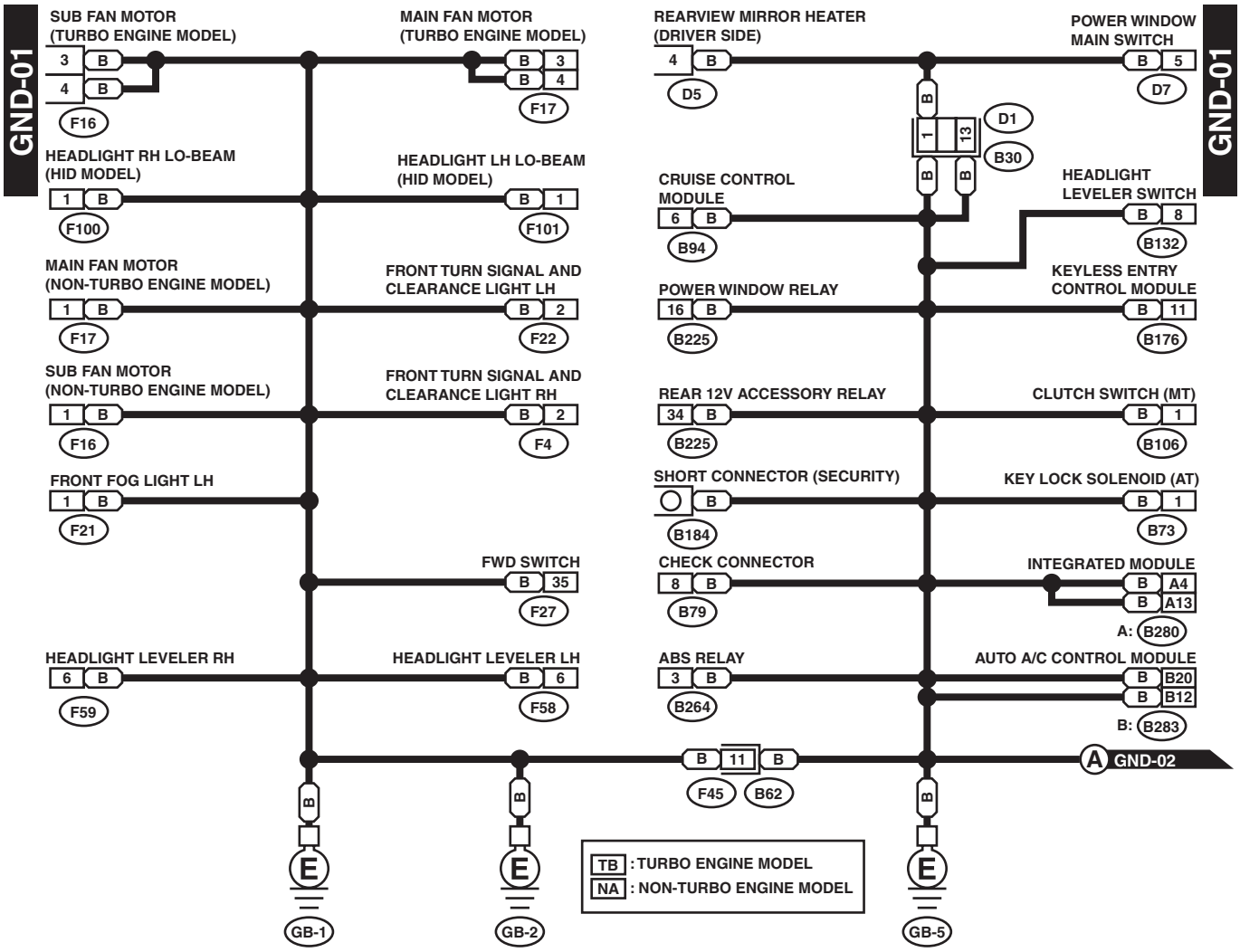
No.	Load
MB-1	Air conditioning relay holder (Fuse)
MB-2	Combination meter Headlight RH
MB-3	Headlight LH
MB-4	Horn
MB-5	Cruise control sub switch Horn switch Keyless entry control module Security horn relay Electric control throttle relay
MB-6	Hazard switch Key warning switch
MB-7	Transmission control module Driver's control center differential relay
MB-8	Daytime running light control module Diode (Daytime running light)
MB-9	Data link connector Engine control module Fuel pump relay Main relay
MB-11	Fuse (Rear 12 V accessory)
MB-12	Power window circuit breaker
MB-13	Relay holder
SBF-8	ABS control module
IG	Hazard switch Power window relay
ST	Engine control module (AT) Interrupt relay
FB-1	Combination meter Hazard switch Rear turn signal light RH Trailer connector Turn signal switch
FB-2	Combination meter Hazard switch Rear turn signal light LH Trailer connector Turn signal switch
FB-3	Parking switch
FB-4	Front turn signal light RH
FB-5	Front turn signal light LH
FB-6	Front clearance light LH Front clearance light RH
FB-7	License plate light Tail light LH Tail light RH Trailer connector

No.	Load
FB-8	Clock Auto air conditioning control module Combination meter Integrated module Key illumination light (Turbo engine model) Keyless entry control module Radio Room light Security control module Security horn relay Spot light
FB-9	Clock Combination meter Illumination light Integrated module
FB-11	Parking switch
FB-12	Engine control module Lighting switch
FB-13	Parking switch
FB-14	Mirror heater relay Rear defogger Rear defogger switch
FB-15	Integrated module Engine control module
FB-16	ABS relay Back-up light switch (MT) Check connector Cruise control main switch Cruise control module Daytime running light control module Daytime running light relay High-beam relay (Daytime running light) Inhibitor switch (AT) Keyless entry control module Security control module Vehicle speed sensor (MT) Wiper deicer relay Wiper deicer timer
FB-17	Main fan relay (Non-turbo engine model) Main fan relay-1 (Turbo engine model) Main fan relay-2 (Turbo engine model)
FB-18	Air conditioning relay Sub fan relay (Non-turbo engine model) Sub fan relay-1 (Turbo engine model) Sub fan relay-2 (Turbo engine model) Air conditioning pressure switch
FB-19	Air conditioning switch Auto air conditioning module Blower fan motor relay

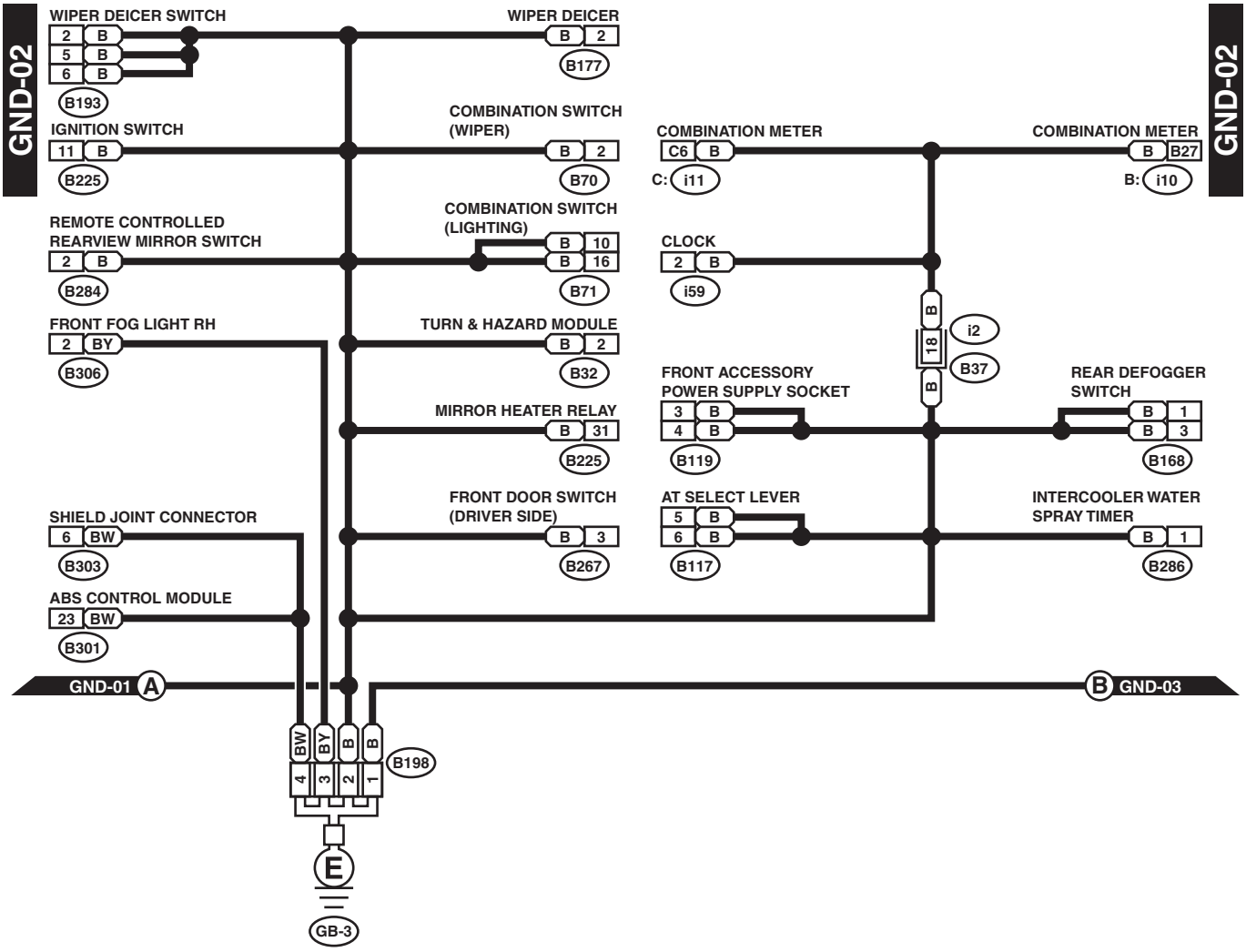
No.	Load
FB-20	Engine control module Fuel pump relay Ignition coil & ignitor Ignition coil No. 1 (Turbo engine model) Ignition coil No. 2 (Turbo engine model) Ignition coil No. 3 (Turbo engine model) Ignition coil No. 4 (Turbo engine model) Integrated module Transmission control module Driver's control center differential control unit Driver's control center differential relay
FB-21	Airbag control module
FB-22	Airbag control module
FB-23	Rear washer motor
FB-24	Rear wiper intermittent module (Wagon) Rear wiper motor (Wagon)
FB-25	Combination switch Front washer motor Front wiper motor
FB-26	Clock Auto air conditioner control module Radio
FB-27	Compass mirror Front accessory power supply socket Integrated module Rear 12 V accessory relay Remote controlled rearview mirror switch Intercooler water spray switch Intercooler water spray timer
FB-28	Mirror heater relay Wiper deicer relay
FB-29	Stop light switch
FB-30	ABS control module
FB-31	Front fog light relay
FB-32	Blower fan motor relay
FB-33	Integrated module
FB-34	Combination meter

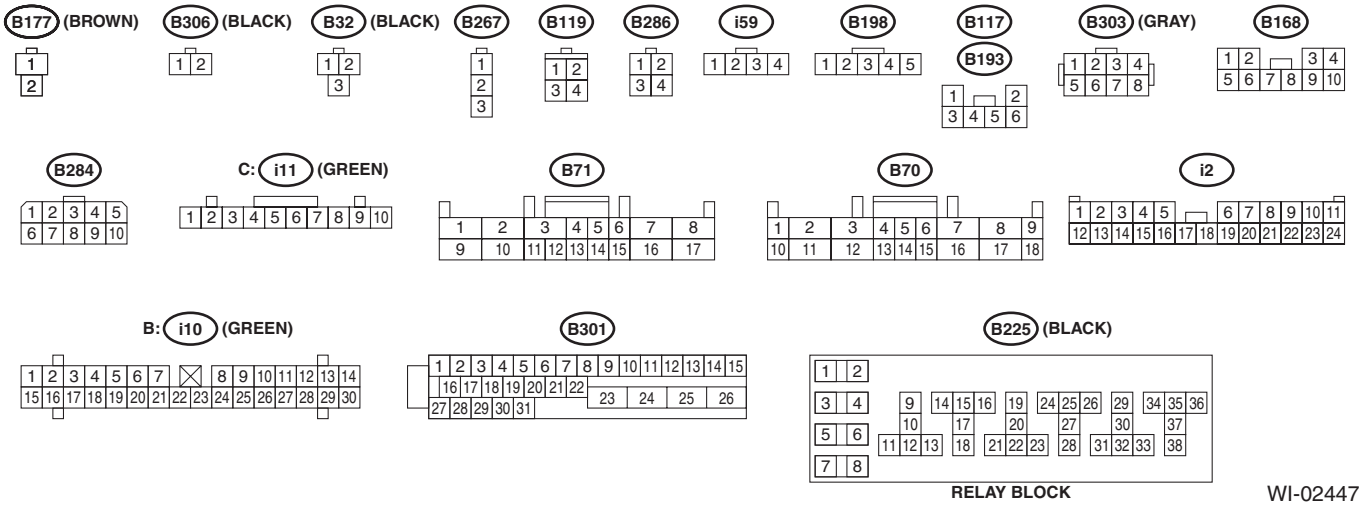
4. Ground Distribution

A: WIRING DIAGRAM



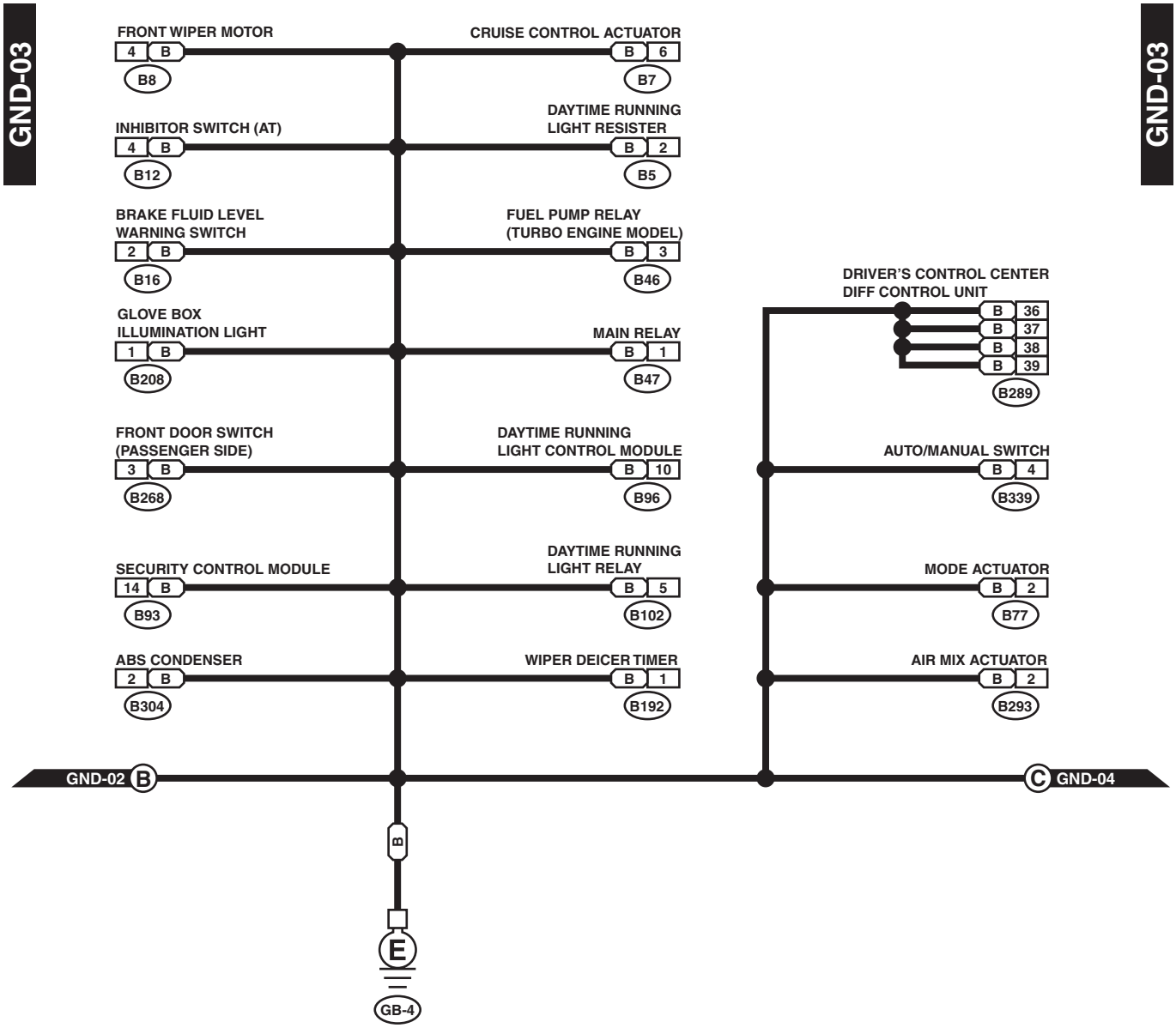
WI-02446


GND-02
WIPER DEICER SWITCH
2 B
5 B
6 B
B193
WIPER DEICER
B 2
B177
IGNITION SWITCH
11 B
B225
COMBINATION SWITCH (WIPER)
B 2
B70
COMBINATION METER
C6 B
C: i11
COMBINATION METER
B B27
B: i10
GND-02
REMOTE CONTROLLED REARVIEW MIRROR SWITCH
2 B
B284
COMBINATION SWITCH (LIGHTING)
B 10
B 16
B71
CLOCK
2 B
i59
B
18
i2
B37
B
FRONT FOG LIGHT RH
2 BY
B306
TURN & HAZARD MODULE
B 2
B32
FRONT ACCESSORY POWER SUPPLY SOCKET
3 B
4 B
B119
REAR DEFOGGER SWITCH
B 1
B 3
B168
MIRROR HEATER RELAY
B 31
B225
FRONT DOOR SWITCH (DRIVER SIDE)
B 3
B267
AT SELECT LEVER
5 B
6 B
B117
INTERCOOLER WATER SPRAY TIMER
B 1
B286
SHIELD JOINT CONNECTOR
6 BW
B303
ABS CONTROL MODULE
23 BW
B301
GND-01 A
B GND-03
BW
BY
B
B
4
3
2
1
B198
E
GB-3


B177 (BROWN)
B306 (BLACK)
B32 (BLACK)
B267
B119
B286
i59
B198
B117
B193
B303 (GRAY)
B168
B284
C: i11 (GREEN)
B71
B70
i2
B: i10 (GREEN)
B301
B225 (BLACK)
RELAY BLOCK

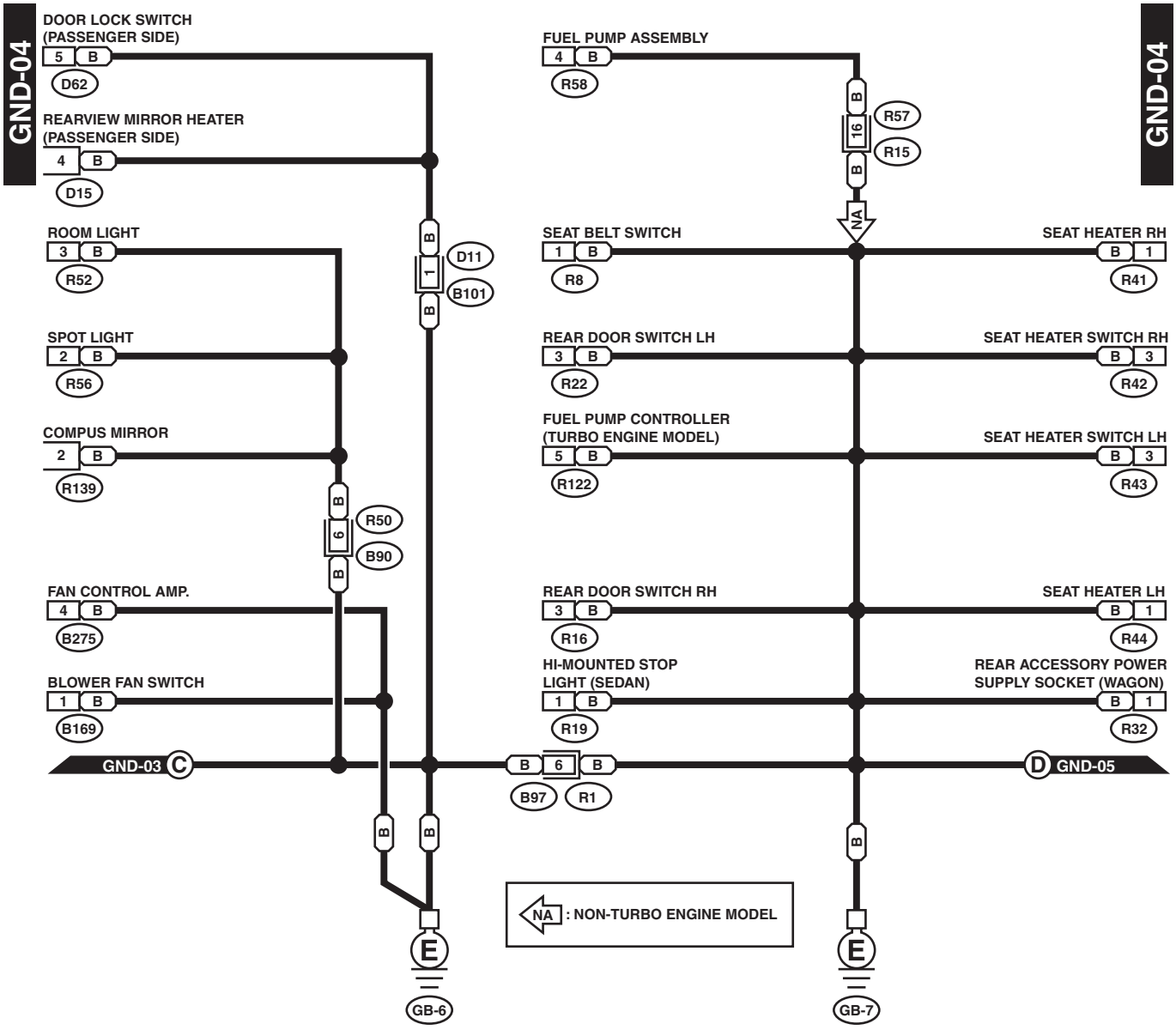
WI-02447

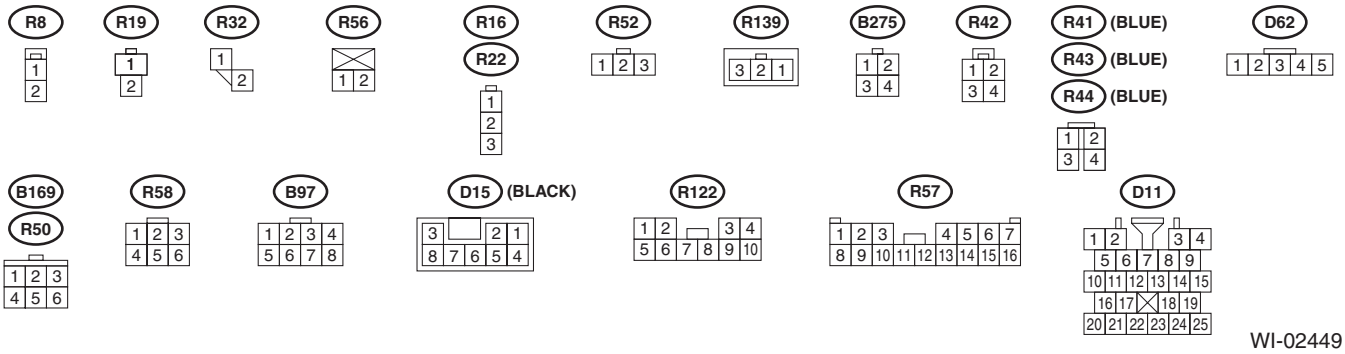
Ground Distribution



WI-02448

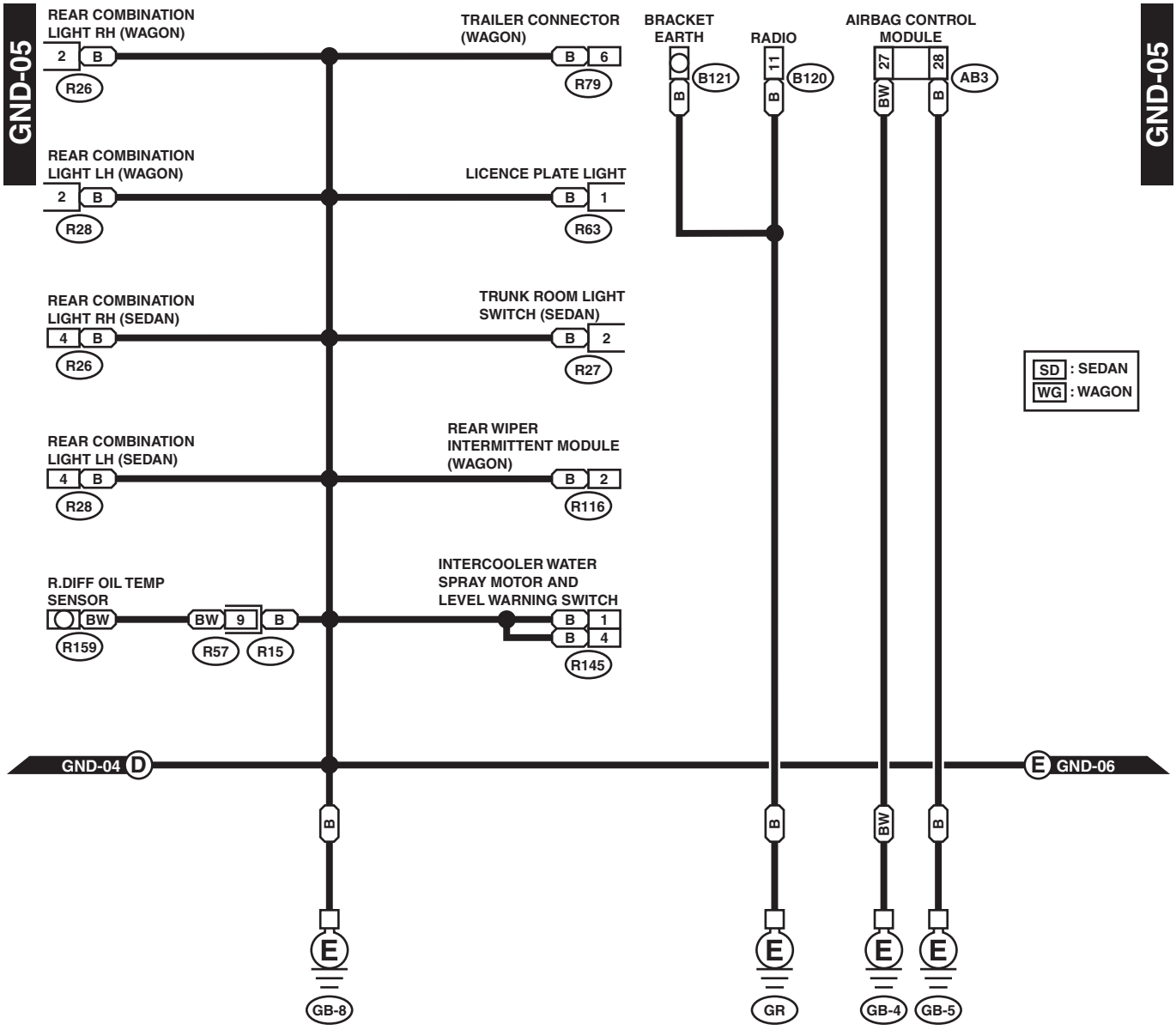
Ground Distribution





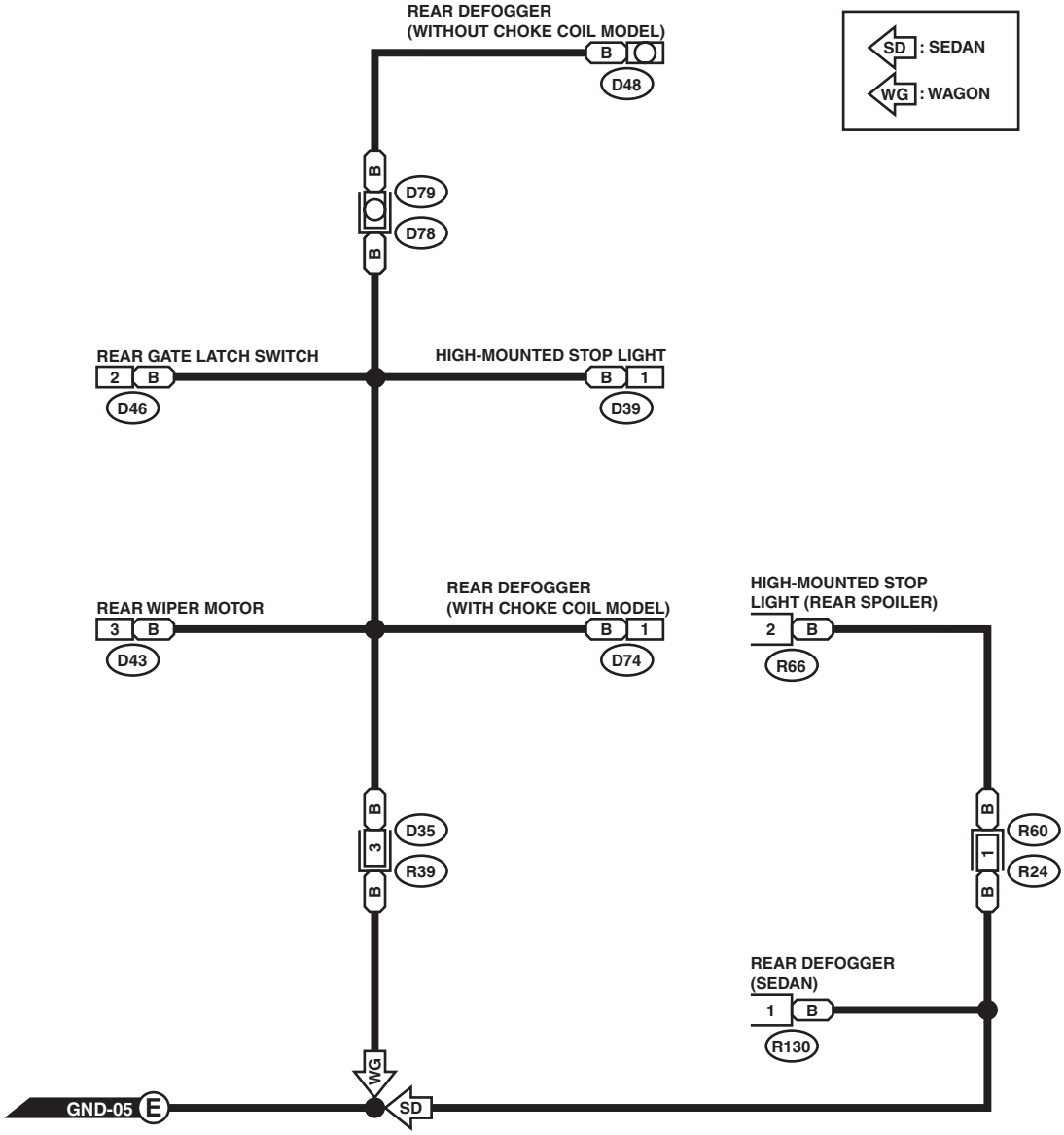
WI-02449

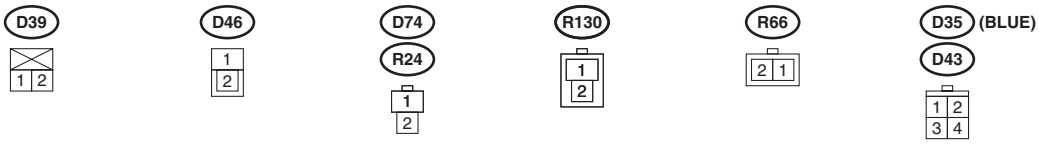
Ground Distribution



WI-02535

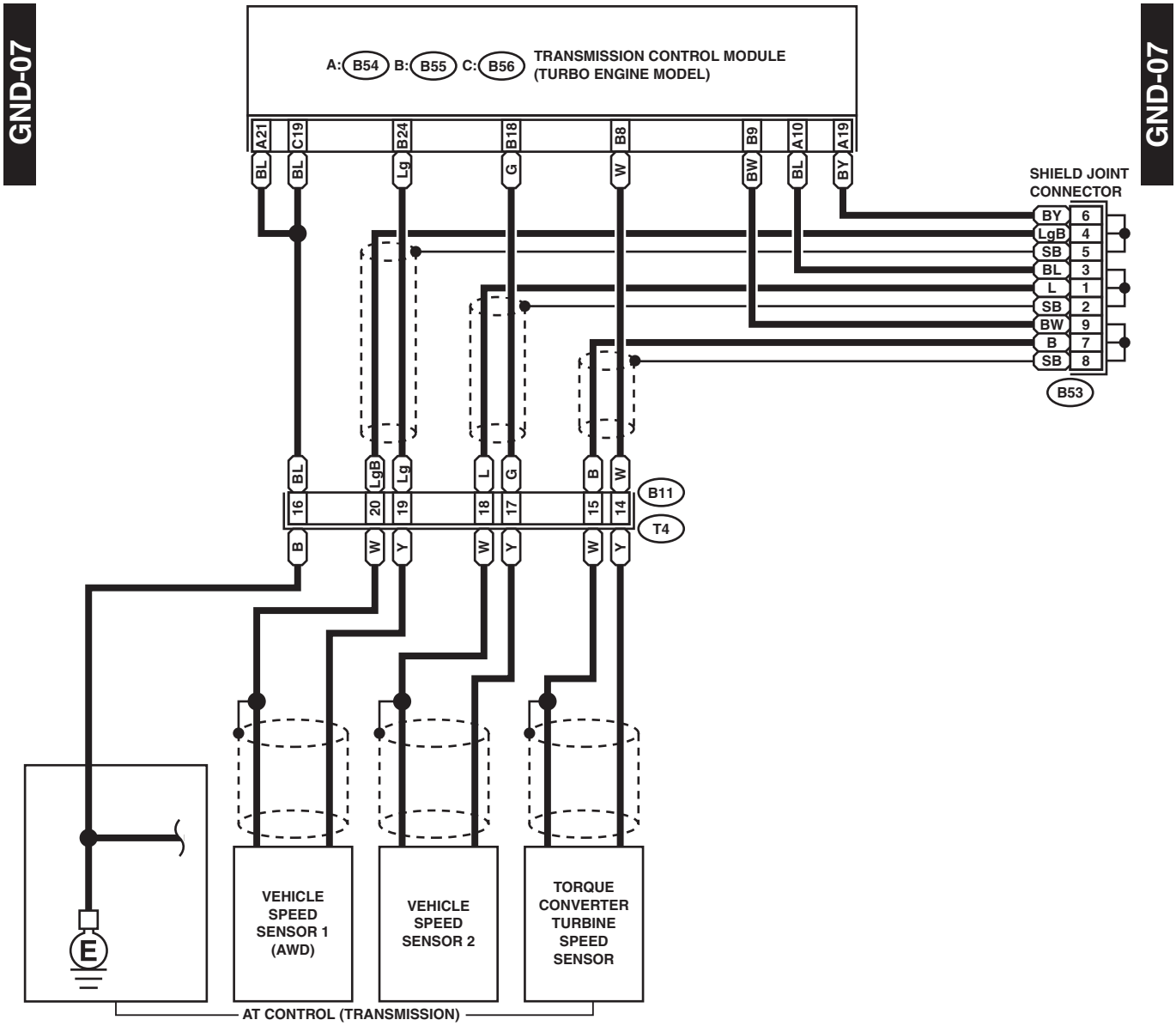
GND-06

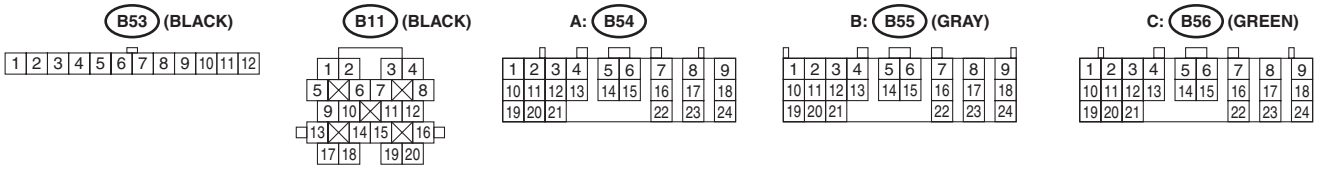




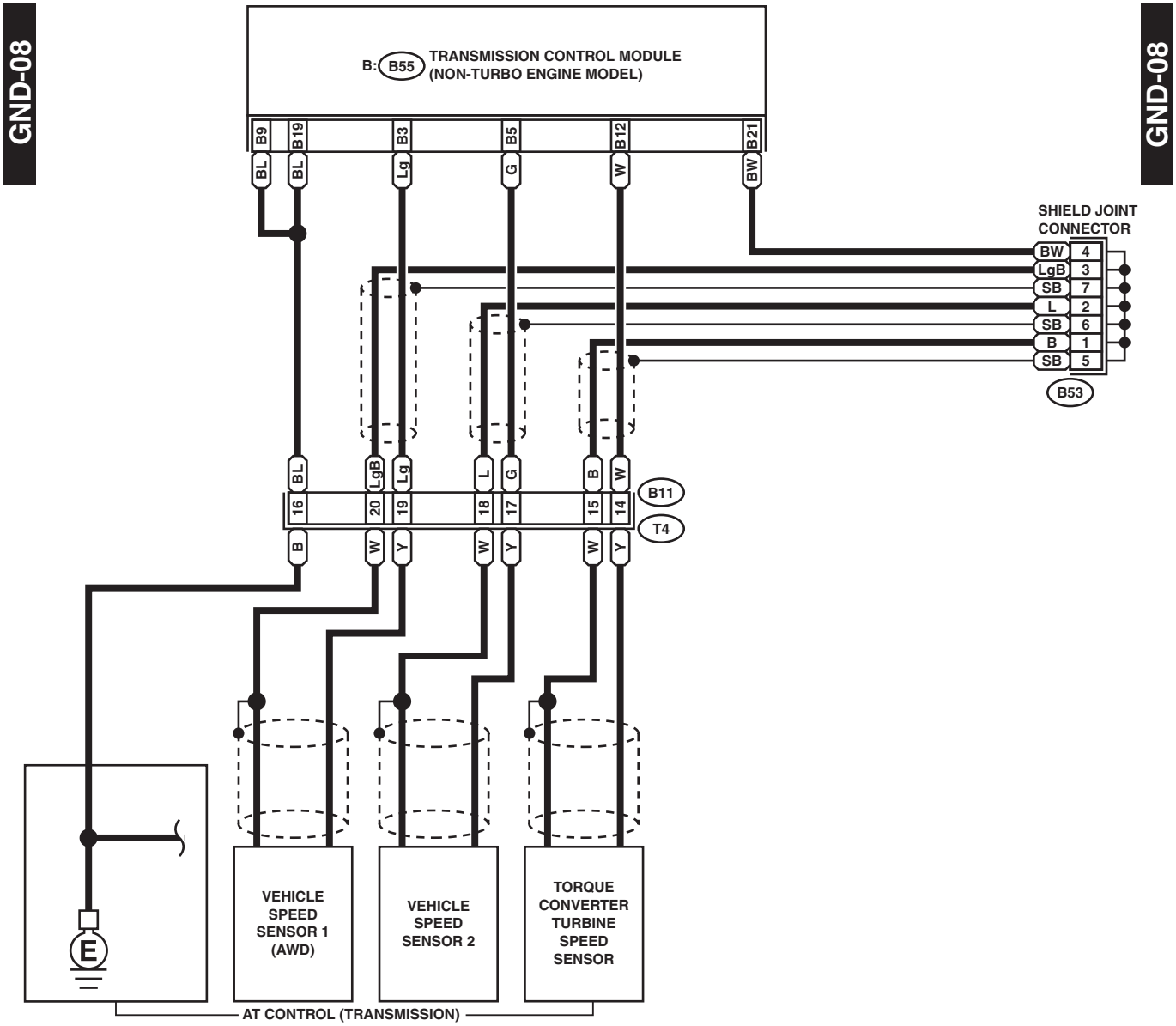
WI-02450

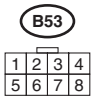
Ground Distribution

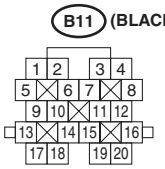


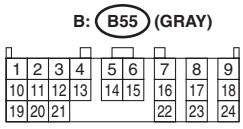


WI-01099

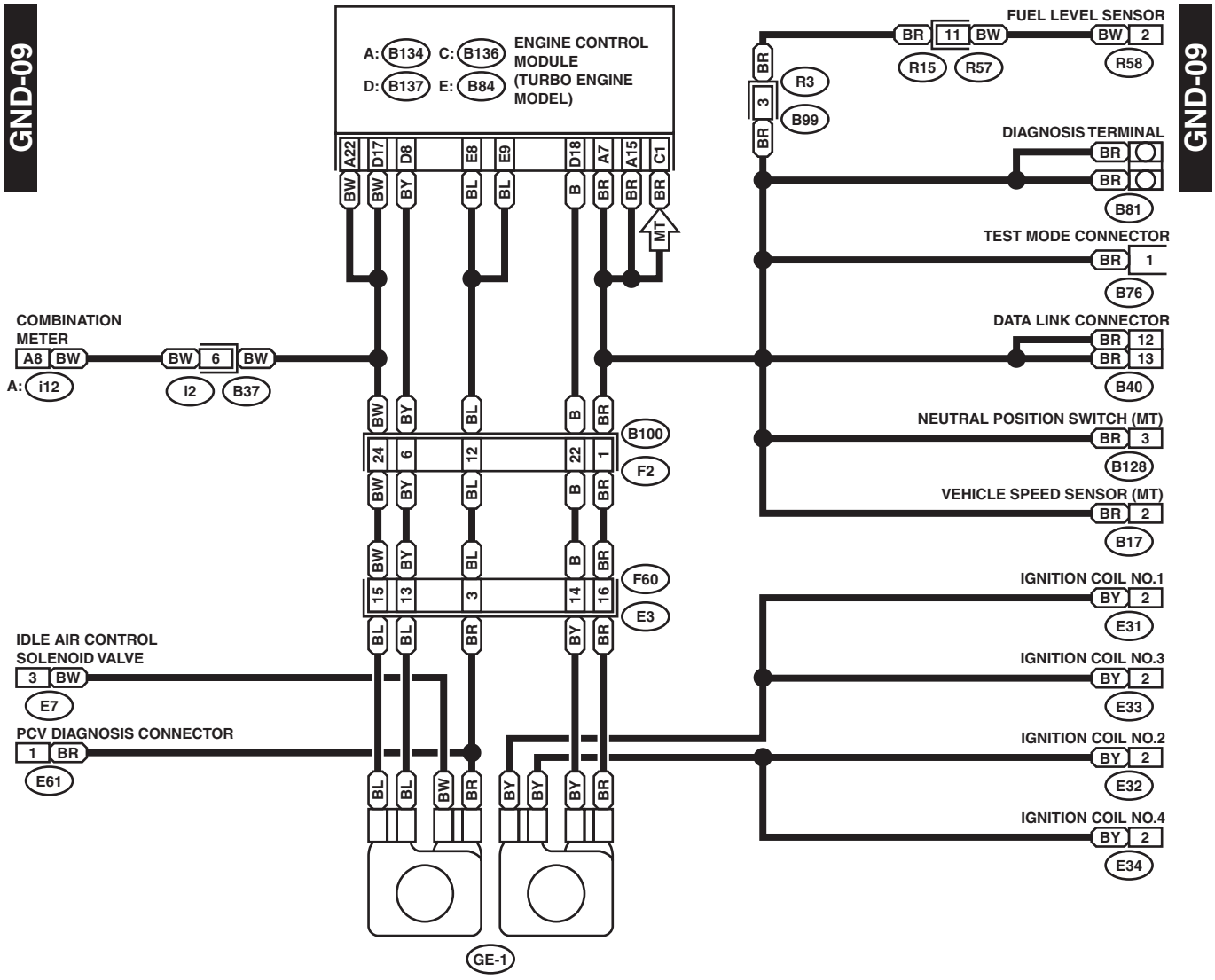

GND-08
GND-08
B: B55 TRANSMISSION CONTROL MODULE (NON-TURBO ENGINE MODEL)
B9
B19
B3
B5
B12
B21
BL
BL
Lg
G
W
BW
SHIELD JOINT CONNECTOR
BW 4
LgB 3
SB 7
L 2
SB 6
B 1
SB 5
B53
BL
LgB
Lg
L
G
B
W
16
20
19
18
17
15
14
B11
T4
B
W
Y
W
Y
W
Y
VEHICLE SPEED SENSOR 1 (AWD)
VEHICLE SPEED SENSOR 2
TORQUE CONVERTER TURBINE SPEED SENSOR
E
AT CONTROL (TRANSMISSION)

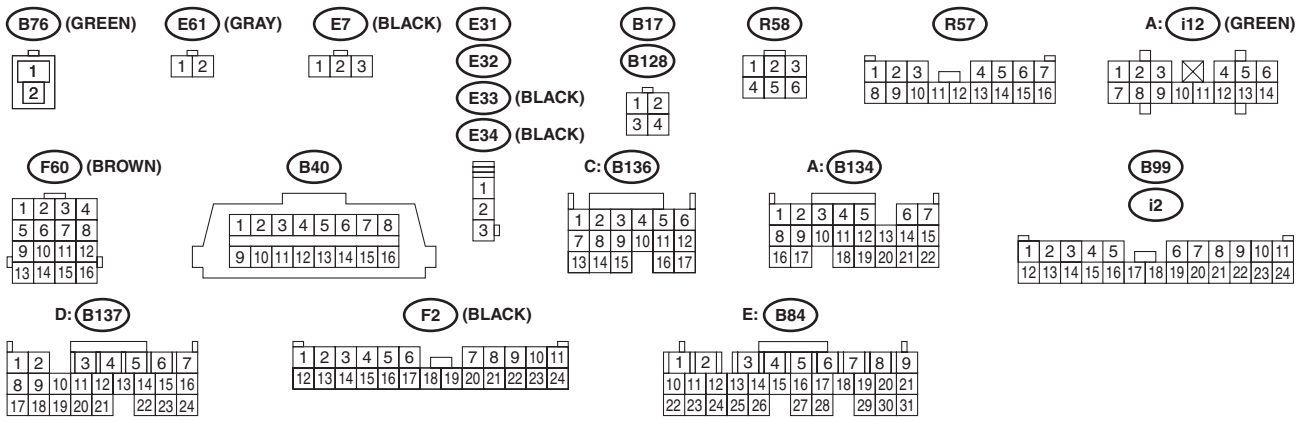

B53
1 2 3 4
5 6 7 8


B11 (BLACK)
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20

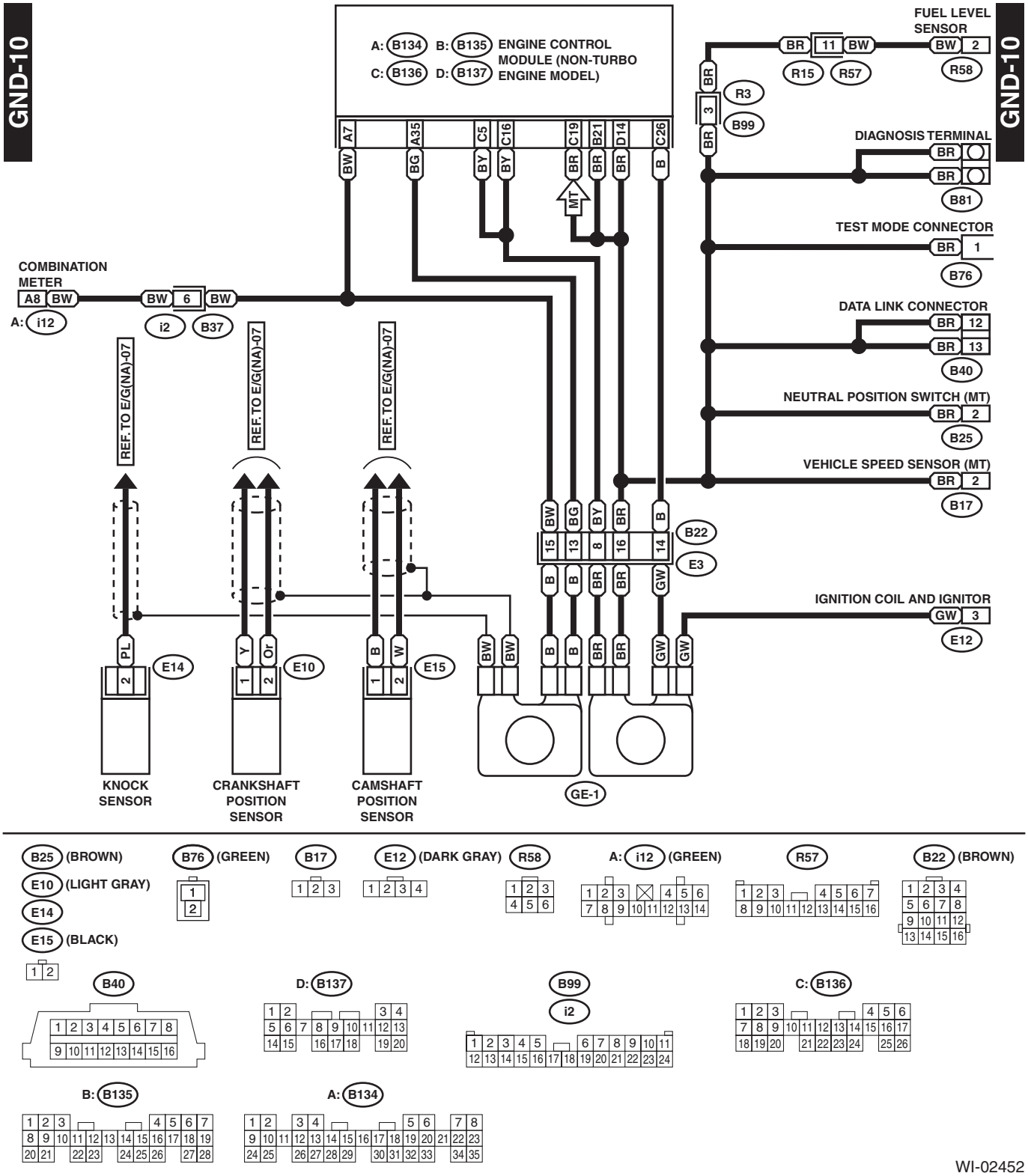

B: B55 (GRAY)
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18
19 20 21 22 23 24

WI-01100


GND-09
GND-09
A: B134 C: B136
D: B137 E: B84
ENGINE CONTROL MODULE (TURBO ENGINE MODEL)
A22 D17 D8 E8 E9 D18 A7 A15 C1
BW BW BY BL BL B BR BR BR
MT
FUEL LEVEL SENSOR
BR 11 BW
BW 2
R15 R57
R58
BR
R3
3
BR
B99
DIAGNOSIS TERMINAL
BR
BR
B81
TEST MODE CONNECTOR
BR 1
B76
DATA LINK CONNECTOR
BR 12
BR 13
B40
NEUTRAL POSITION SWITCH (MT)
BR 3
B128
VEHICLE SPEED SENSOR (MT)
BR 2
B17
IGNITION COIL NO.1
BY 2
E31
IGNITION COIL NO.3
BY 2
E33
IGNITION COIL NO.2
BY 2
E32
IGNITION COIL NO.4
BY 2
E34
COMBINATION METER
A8 BW
A: i12
BW 6 BW
i2 B37
B100
F2
F60
E3
IDLE AIR CONTROL SOLENOID VALVE
3 BW
E7
PCV DIAGNOSIS CONNECTOR
1 BR
E61
GE-1

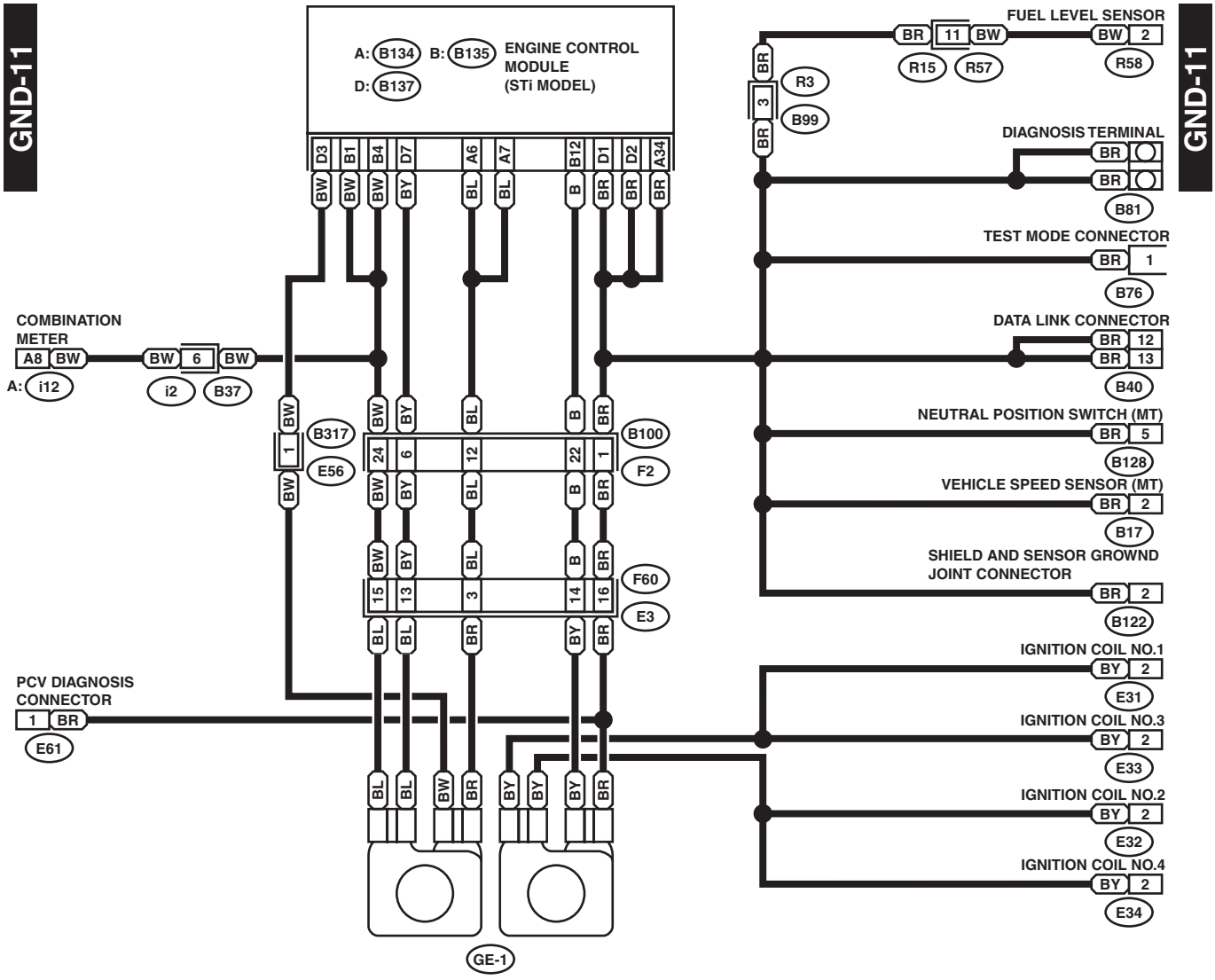

B76 (GREEN)
E61 (GRAY)
E7 (BLACK)
E31
E32
E33 (BLACK)
E34 (BLACK)
B17
B128
R58
R57
A: i12 (GREEN)
F60 (BROWN)
B40
C: B136
A: B134
B99
i2
D: B137
F2 (BLACK)
E: B84

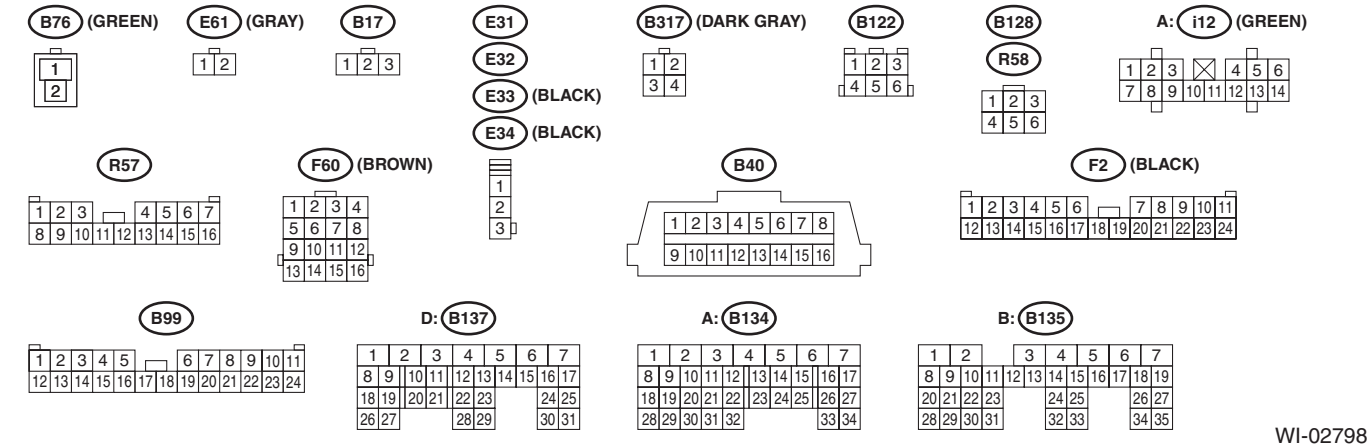
WI-02451


GND-10
GND-10
A: B134 B: B135 ENGINE CONTROL MODULE (NON-TURBO ENGINE MODEL)
C: B136 D: B137
A7 A35 C5 C16 C19 B21 D14 C26
BW BG BY BY BR BR BR B
MT
FUEL LEVEL SENSOR
BR 11 BW
BW 2
R15 R57
R58
BR
R3
3
BR
B99
DIAGNOSIS TERMINAL
BR
BR
B81
TEST MODE CONNECTOR
BR 1
B76
DATA LINK CONNECTOR
BR 12
BR 13
B40
NEUTRAL POSITION SWITCH (MT)
BR 2
B25
VEHICLE SPEED SENSOR (MT)
BR 2
B17
COMBINATION METER
A8 BW
A: i12
BW 6 BW
i2 B37
REF. TO E/G(NA)-07
REF. TO E/G(NA)-07
REF. TO E/G(NA)-07
15 13 8 16 14
BW BG BY BR B
B22
E3
B B BR BR GW
IGNITION COIL AND IGNITOR
GW 3
E12
PL Y Or B W BW BW B B BR BR GW GW
2 1 2 1 2
E14 E10 E15
KNOCK SENSOR
CRANKSHAFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
GE-1

B25 (BROWN)
E10 (LIGHT GRAY)
E14
E15 (BLACK)
B76 (GREEN)
B17
E12 (DARK GRAY)
R58
A: i12 (GREEN)
R57
B22 (BROWN)
B40
D: B137
B99
i2
C: B136
B: B135
A: B134

WI-02452

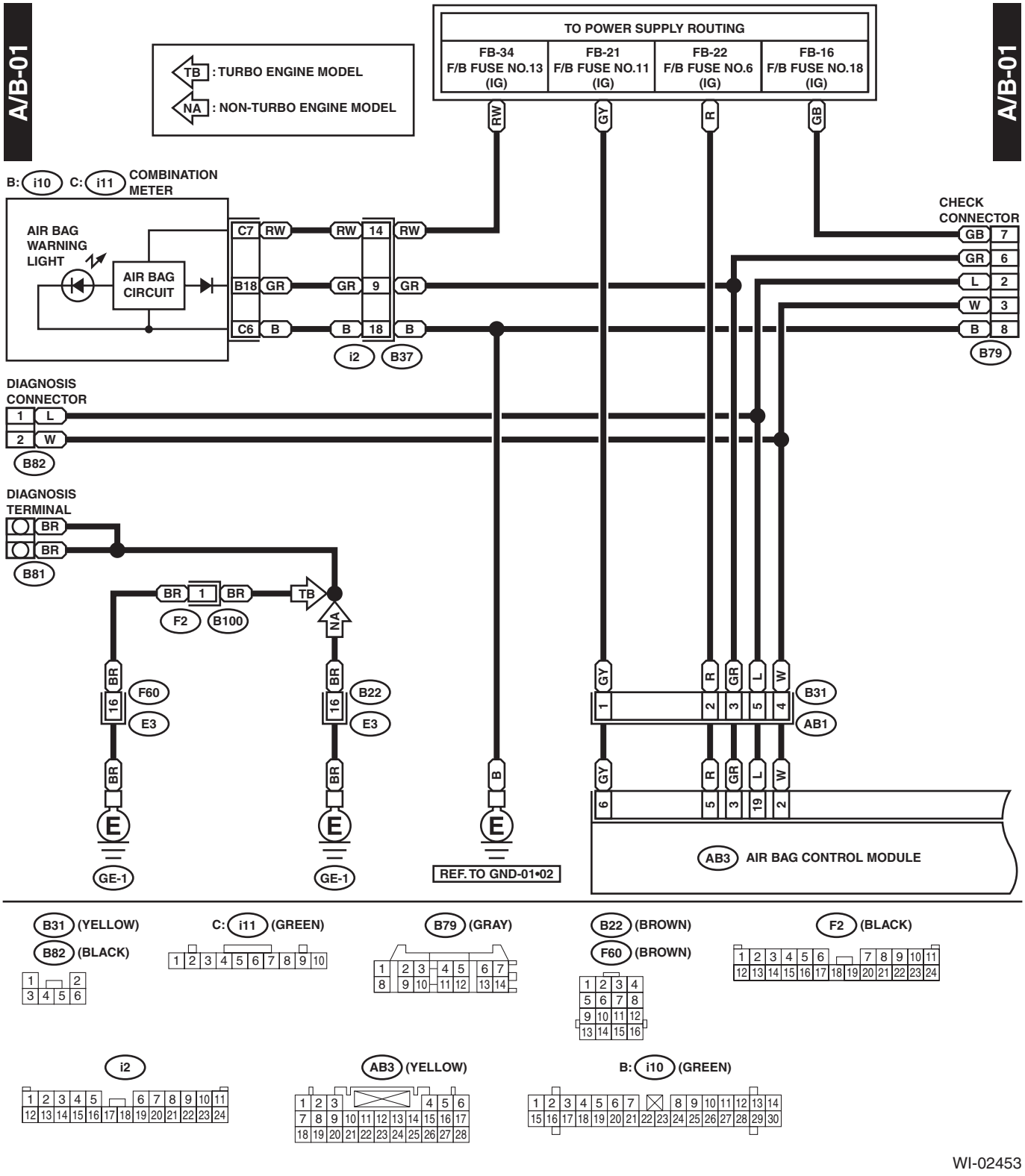

GND-11
GND-11
A: B134
B: B135
D: B137
ENGINE CONTROL MODULE (STi MODEL)
FUEL LEVEL SENSOR
R15
R57
R58
R3
B99
DIAGNOSIS TERMINAL
B81
TEST MODE CONNECTOR
B76
DATA LINK CONNECTOR
B40
COMBINATION METER
A: i12
i2
B37
B317
E56
B100
F2
NEUTRAL POSITION SWITCH (MT)
B128
VEHICLE SPEED SENSOR (MT)
B17
SHIELD AND SENSOR GROWND JOINT CONNECTOR
B122
F60
E3
IGNITION COIL NO.1
E31
IGNITION COIL NO.3
E33
IGNITION COIL NO.2
E32
IGNITION COIL NO.4
E34
PCV DIAGNOSIS CONNECTOR
E61
GE-1


B76 (GREEN)
E61 (GRAY)
B17
E31
E32
E33 (BLACK)
E34 (BLACK)
B317 (DARK GRAY)
B122
B128
R58
A: i12 (GREEN)
R57
F60 (BROWN)
B40
F2 (BLACK)
B99
D: B137
A: B134
B: B135

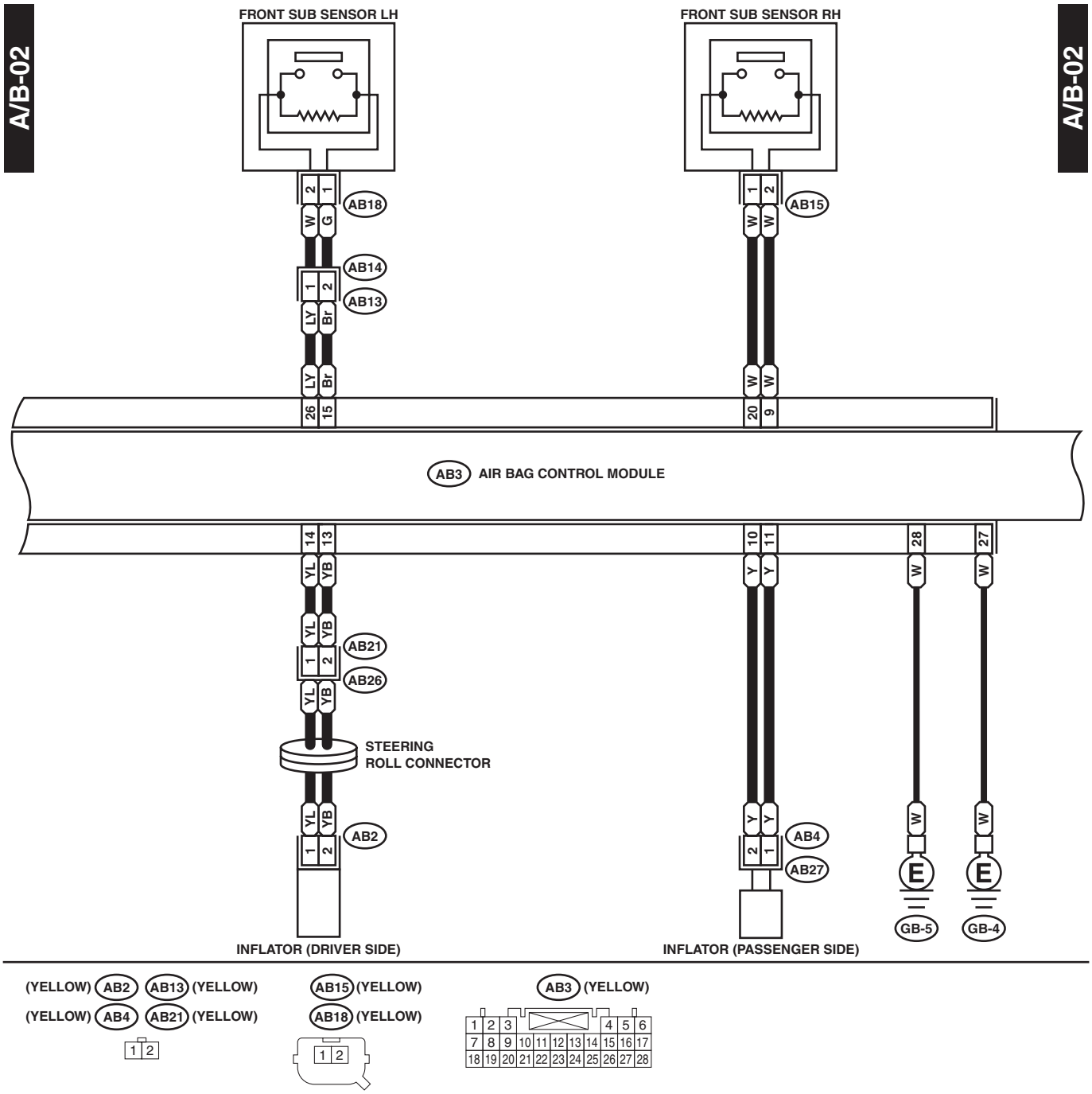
WI-02798

5. Airbag System

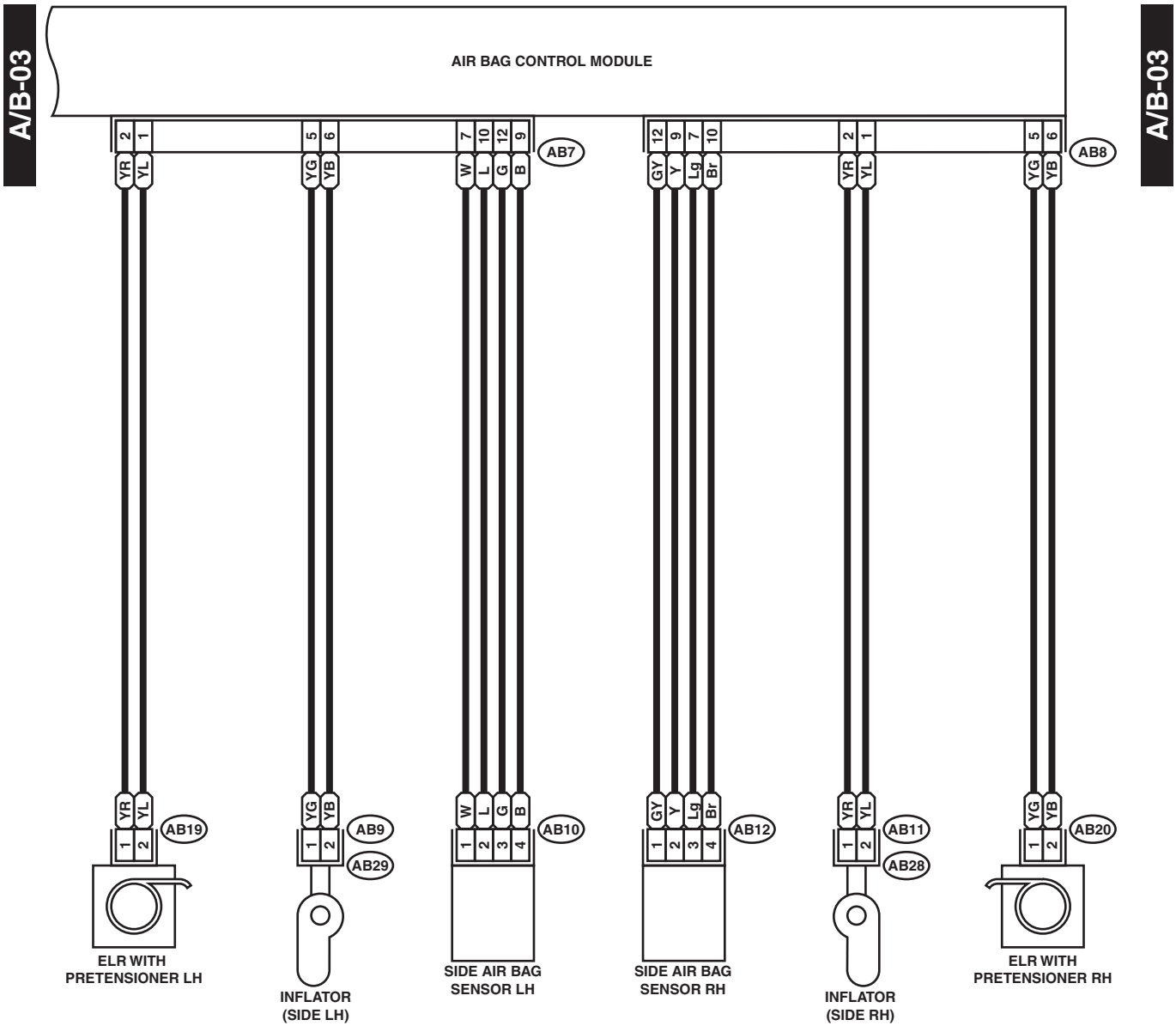
A: WIRING DIAGRAM



WI-02453


A/B-02
A/B-02
FRONT SUB SENSOR LH
FRONT SUB SENSOR RH
AB18
AB14
AB13
AB15
AB3 AIR BAG CONTROL MODULE
AB21
AB26
STEERING
ROLL CONNECTOR
AB2
AB4
AB27
GB-5
GB-4
INFLATOR (DRIVER SIDE)
INFLATOR (PASSENGER SIDE)
(YELLOW) AB2 AB13 (YELLOW)
(YELLOW) AB4 AB21 (YELLOW)
AB15 (YELLOW)
AB18 (YELLOW)
AB3 (YELLOW)

WI-02772

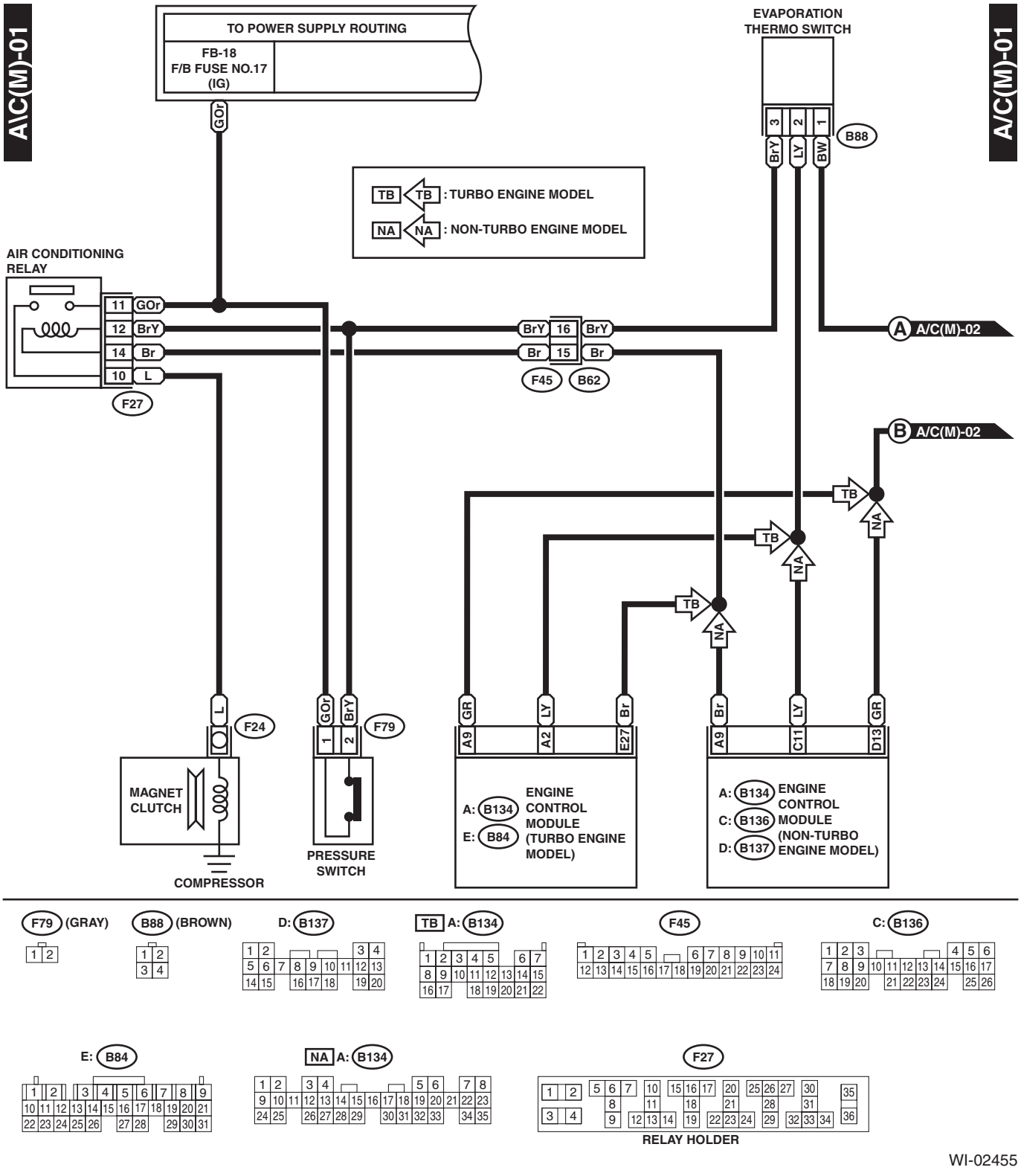

A/B-03
AIR BAG CONTROL MODULE
A/B-03
AB7
AB8
YR
YL
YG
YB
W
L
G
B
GY
Y
Lg
Br
AB19
AB9
AB29
AB10
AB12
AB11
AB28
AB20
ELR WITH PRETENSIONER LH
INFLATOR (SIDE LH)
SIDE AIR BAG SENSOR LH
SIDE AIR BAG SENSOR RH
INFLATOR (SIDE RH)
ELR WITH PRETENSIONER RH
AB9 (YELLOW)
AB11 (YELLOW)
AB19 (BLACK)
AB20 (BLACK)
AB10 (YELLOW)
AB12 (YELLOW)
AB7 (YELLOW)
AB8 (YELLOW)

WI-02454

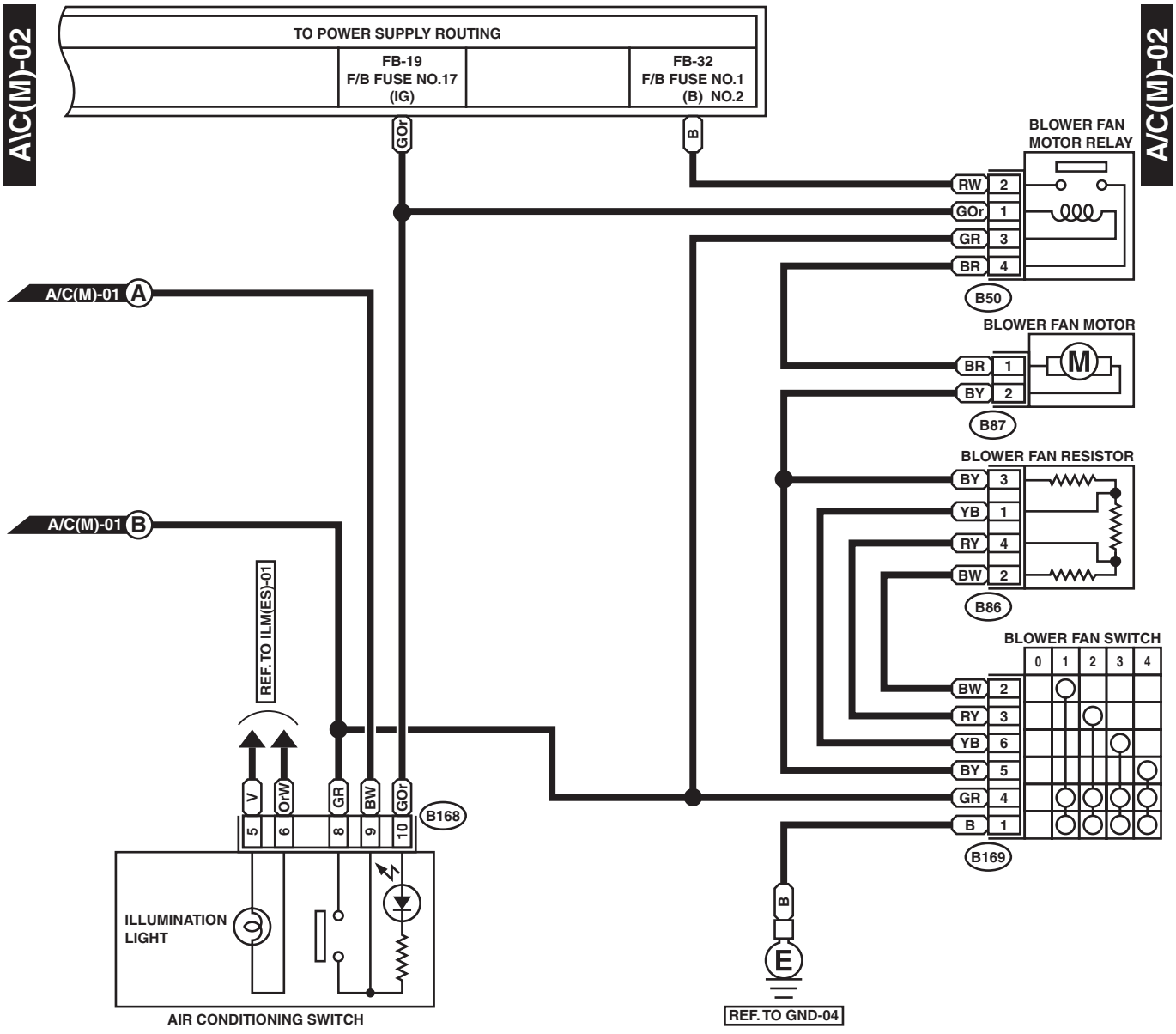
6. Air Conditioning System

A: WIRING DIAGRAM

1. MANUAL A/C MODEL

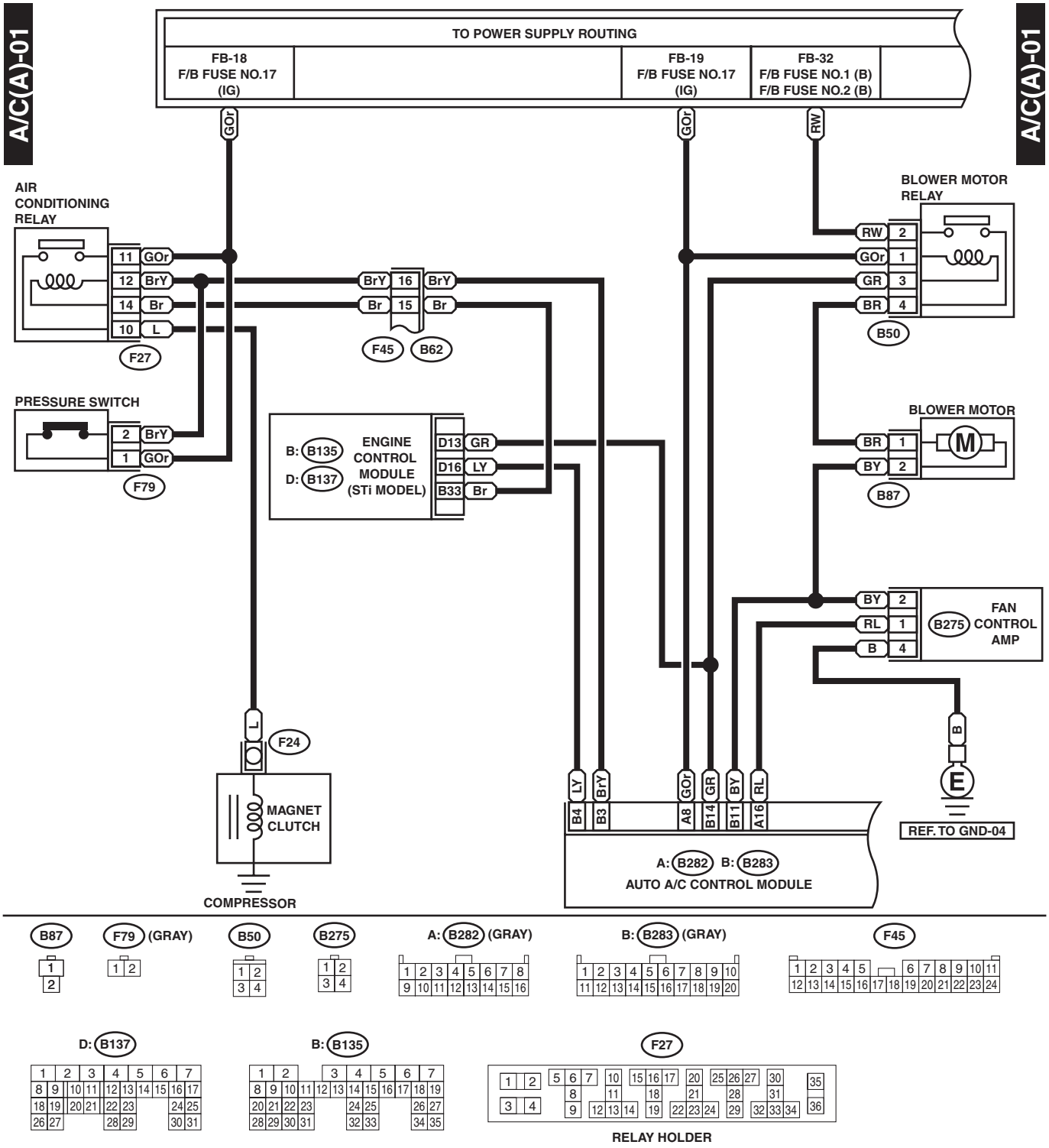


WI-02455

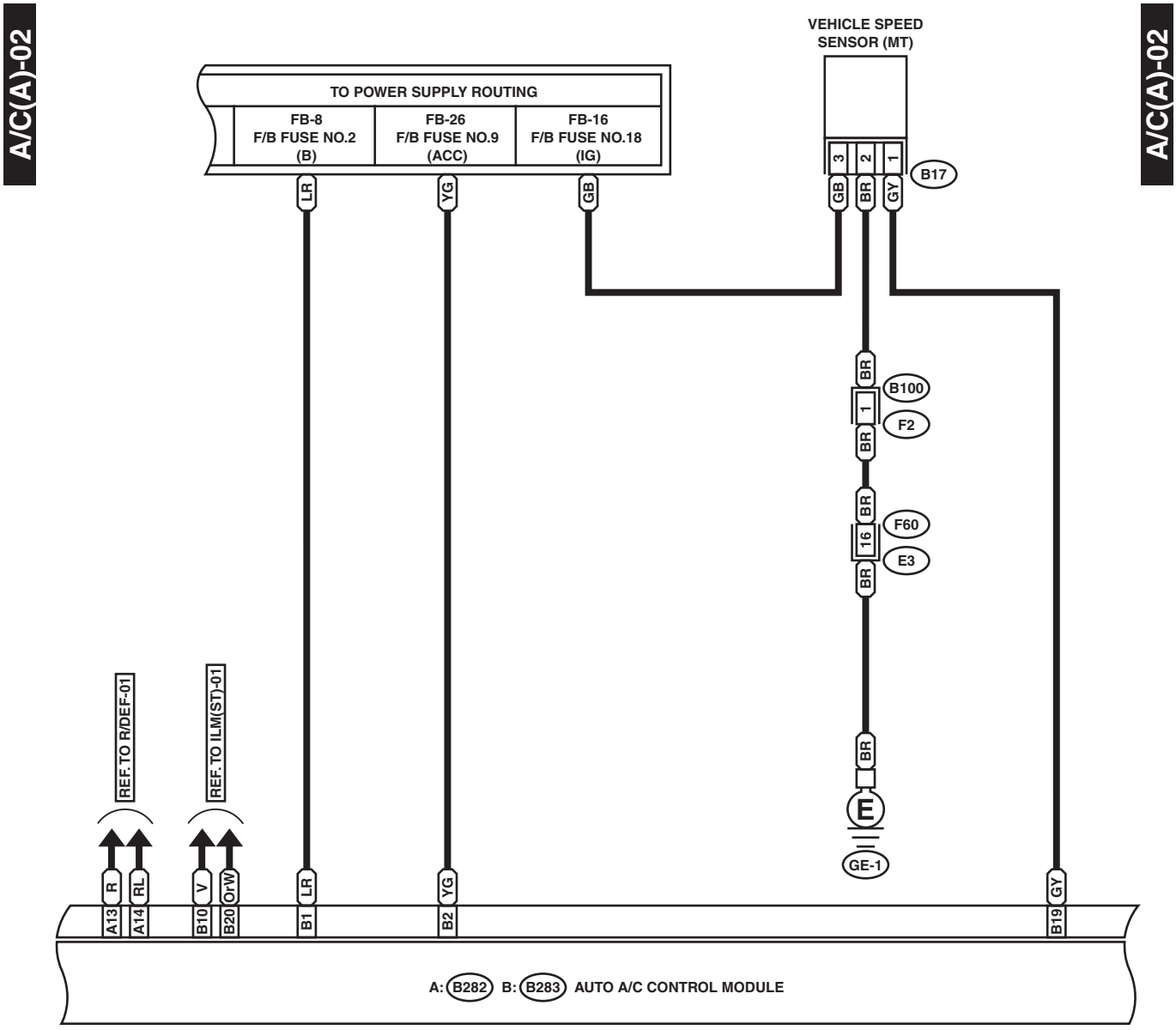

A/C(M)-02
TO POWER SUPPLY ROUTING
FB-19
F/B FUSE NO.17
(IG)
FB-32
F/B FUSE NO.1
(B) NO.2
GOr
B
A/C(M)-02
BLOWER FAN
MOTOR RELAY
RW 2
GOr 1
GR 3
BR 4
B50
A/C(M)-01 A
BLOWER FAN MOTOR
BR 1
BY 2
M
B87
BLOWER FAN RESISTOR
BY 3
YB 1
RY 4
BW 2
B86
A/C(M)-01 B
REF. TO ILM(ES)-01
BLOWER FAN SWITCH
0 1 2 3 4
BW 2
RY 3
YB 6
BY 5
GR 4
B 1
B169
V
OrW
GR
BW
GOr
5 6 8 9 10
B168
ILLUMINATION
LIGHT
AIR CONDITIONING SWITCH
B
E
REF. TO GND-04
B87
B50
B86 (BROWN)
B169
B168

WI-02778

2. AUTO A/C MODEL



WI-02786



B17

1	2	3

F60 (BROWN)

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

A: B282 (GRAY)

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

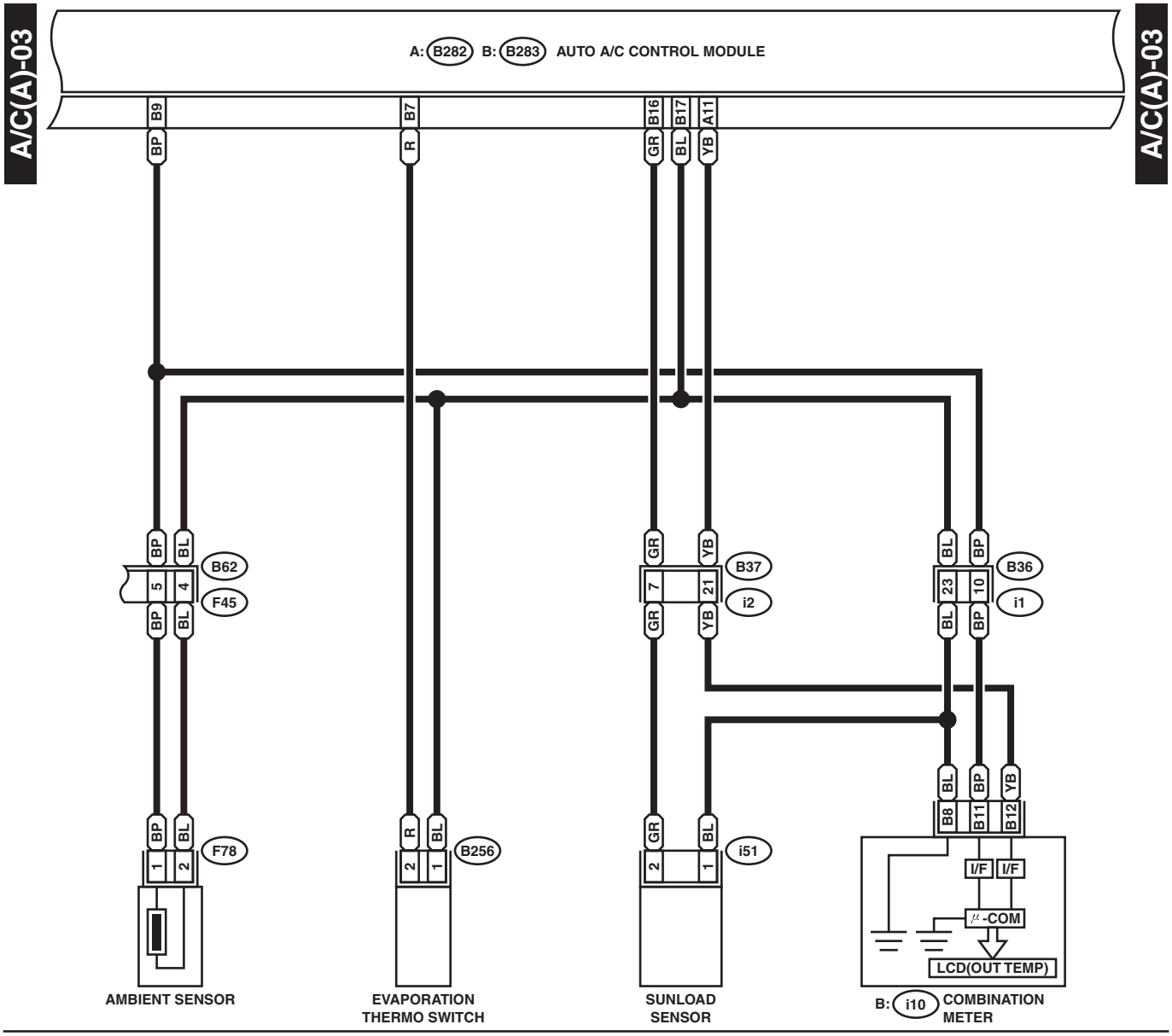
B: B283 (GRAY)

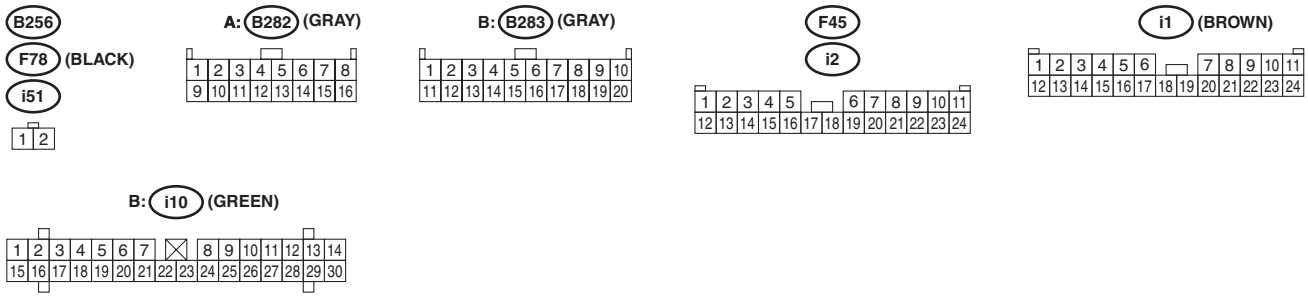
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

F2 (BLACK)

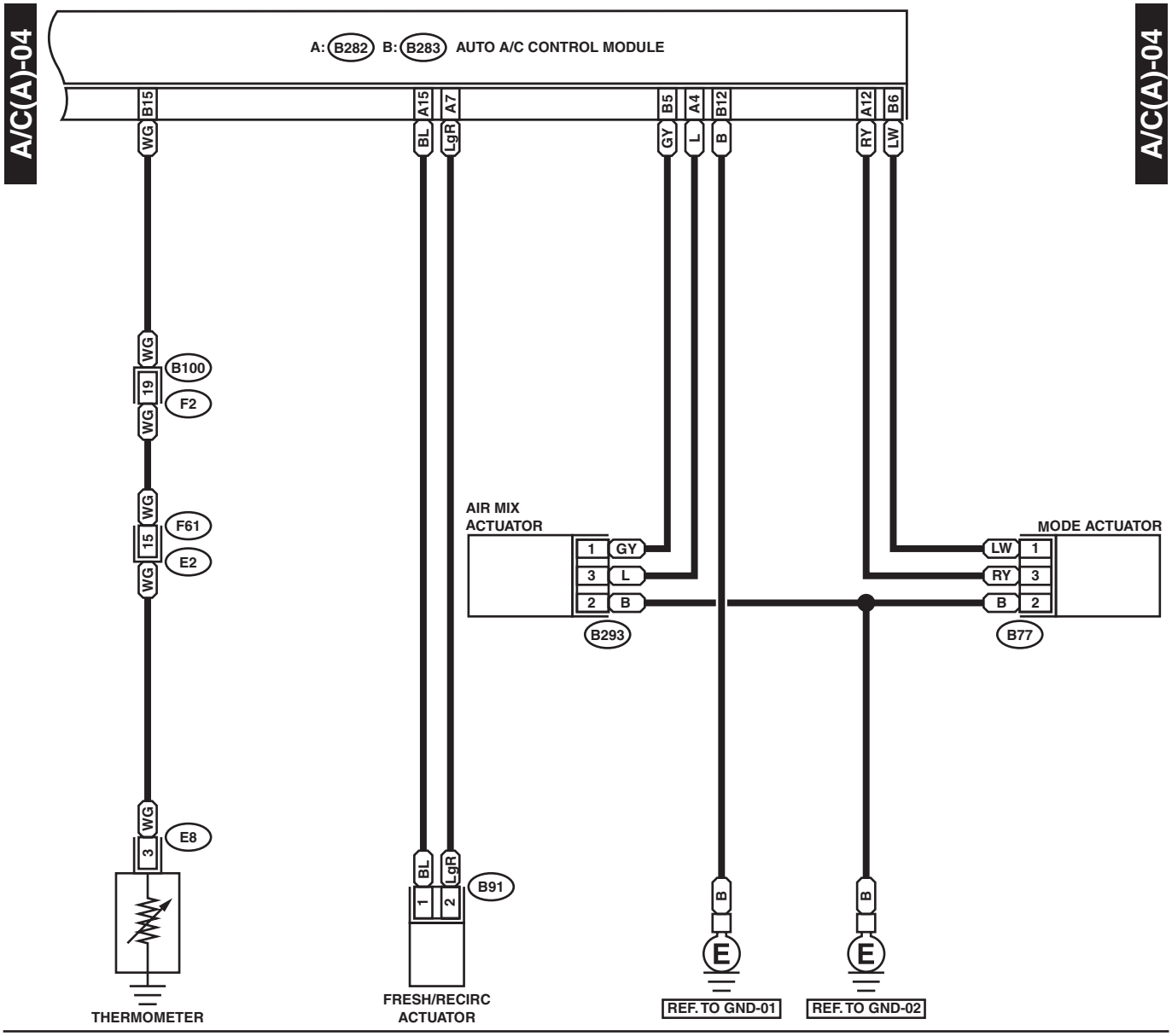
1	2	3	4	5	6		7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22	23	24

WI-02789


A/C(A)-03
A: B282 B: B283 AUTO A/C CONTROL MODULE
A/C(A)-03
B9 BP
B7 R
B16 GR
B17 BL
A11 YB
B62
F45
5 4
BP BL
B37
i2
7 21
GR YB
B36
i1
23 10
BL BP
F78
1 2
BP BL
B256
2 1
R BL
i51
2 1
GR BL
B8 B11 B12
BL BP YB
I/F I/F
μ-COM
LCD(OUT TEMP)
AMBIENT SENSOR
EVAPORATION THERMO SWITCH
SUNLOAD SENSOR
B: i10 COMBINATION METER


B256
F78 (BLACK)
i51
A: B282 (GRAY)
B: B283 (GRAY)
F45
i2
i1 (BROWN)
B: i10 (GREEN)

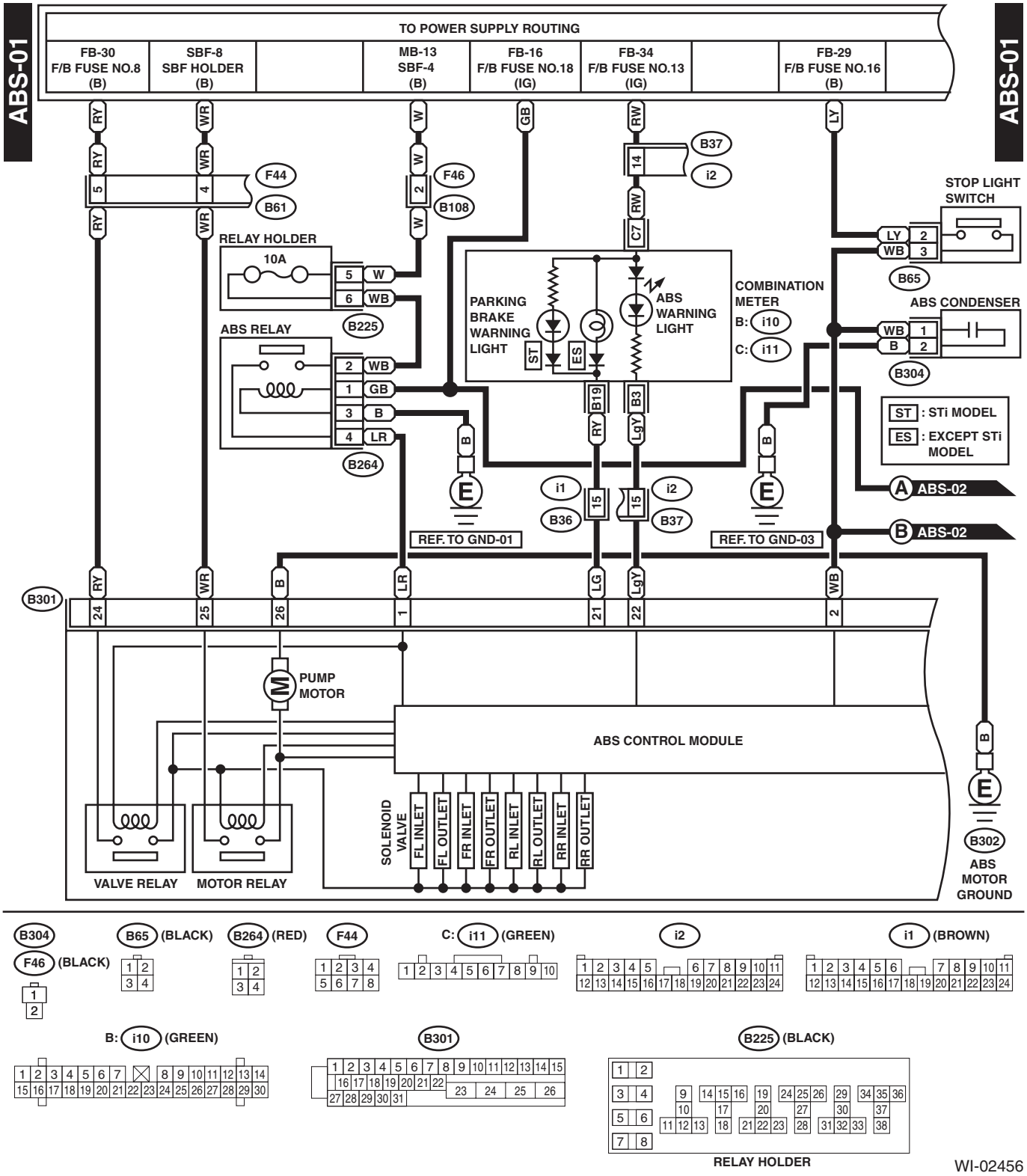
WI-02790


A/C(A)-04
A/C(A)-04
A: B282 B: B283 AUTO A/C CONTROL MODULE
B15
A15
A7
B5
A4
B12
A12
B6
WG
BL
LgR
GY
L
B
RY
LW
B100
19
F2
F61
15
E2
E8
3
AIR MIX ACTUATOR
1 GY
3 L
2 B
B293
MODE ACTUATOR
LW 1
RY 3
B 2
B77
B91
1
2
THERMOMETER
FRESH/RECIRC ACTUATOR
REF. TO GND-01
REF. TO GND-02
B77
B293
E8 (LIGHT GRAY)
B91 (BLACK)
A: B282 (GRAY)
F61 (BLACK)
B: B283 (GRAY)
F2 (BLACK)

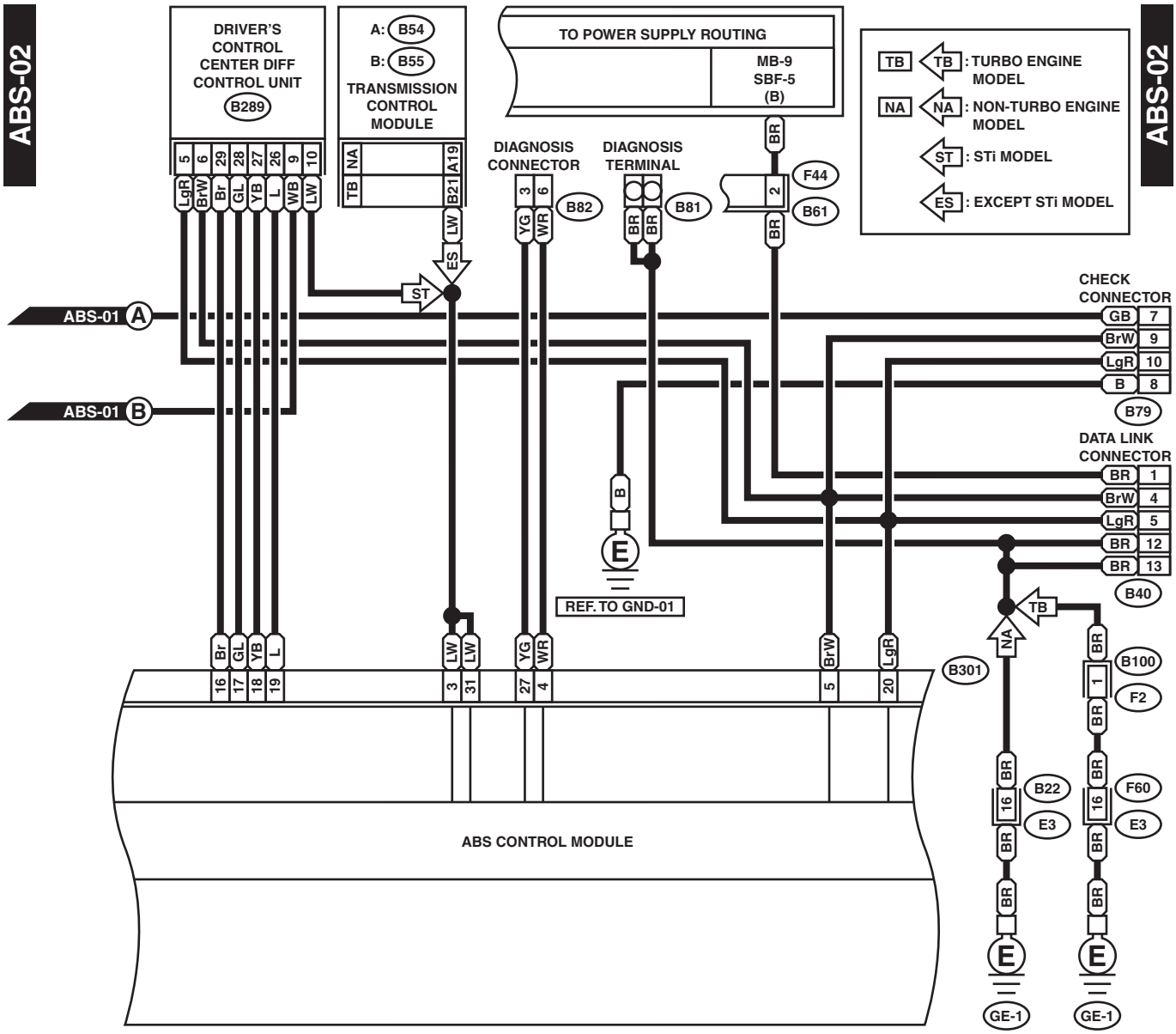
WI-02791

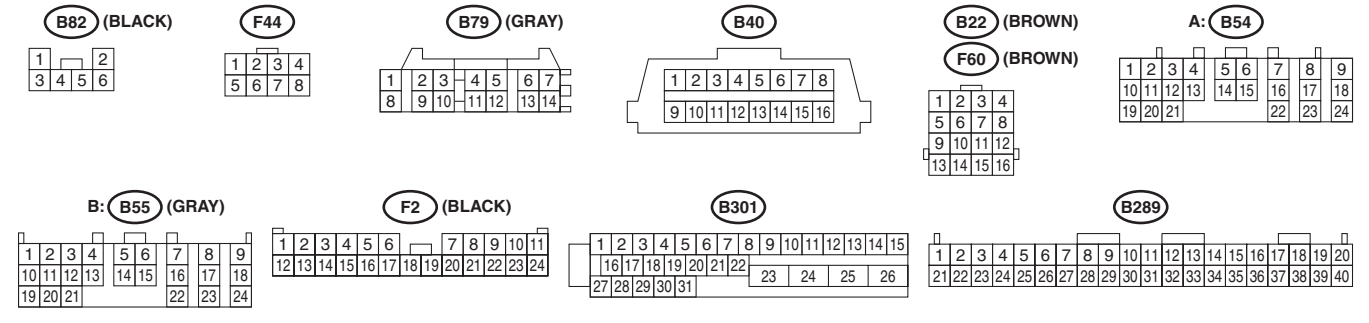
7. Anti-lock Brake System

A: WIRING DIAGRAM

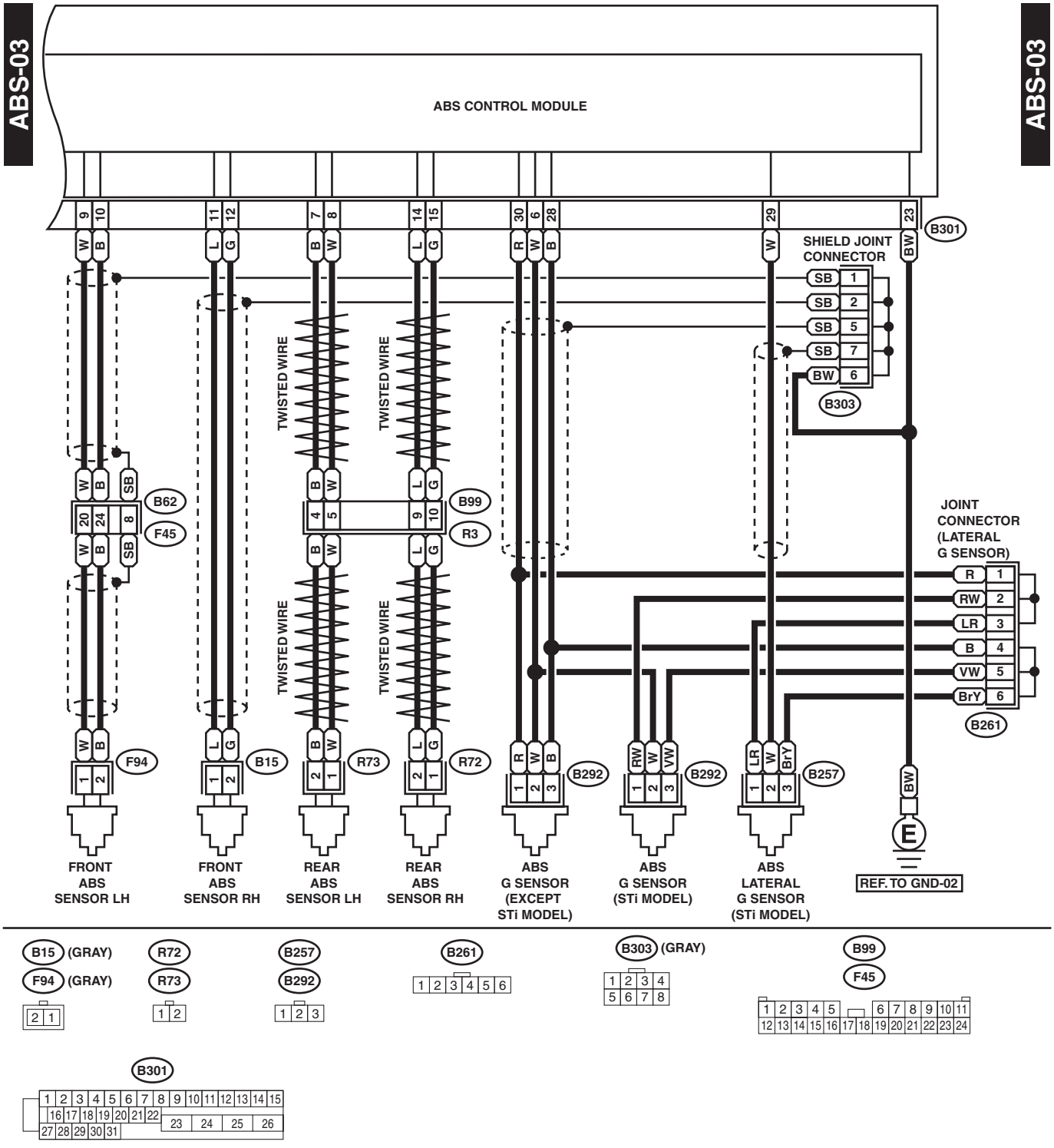


WI-02456


ABS-02
DRIVER'S CONTROL CENTER DIFF CONTROL UNIT
B289
A: B54
B: B55
TRANSMISSION CONTROL MODULE
TO POWER SUPPLY ROUTING
MB-9 SBF-5 (B)
TB : TURBO ENGINE MODEL
NA : NON-TURBO ENGINE MODEL
ST : STi MODEL
ES : EXCEPT STi MODEL
DIAGNOSIS CONNECTOR
DIAGNOSIS TERMINAL
B82
B81
F44
B61
CHECK CONNECTOR
B79
DATA LINK CONNECTOR
B40
REF. TO GND-01
ABS-01 A
ABS-01 B
B301
B100
F2
B22
F60
E3
ABS CONTROL MODULE
GE-1


B82 (BLACK)
F44
B79 (GRAY)
B40
B22 (BROWN)
F60 (BROWN)
A: B54
B: B55 (GRAY)
F2 (BLACK)
B301
B289

WI-02457

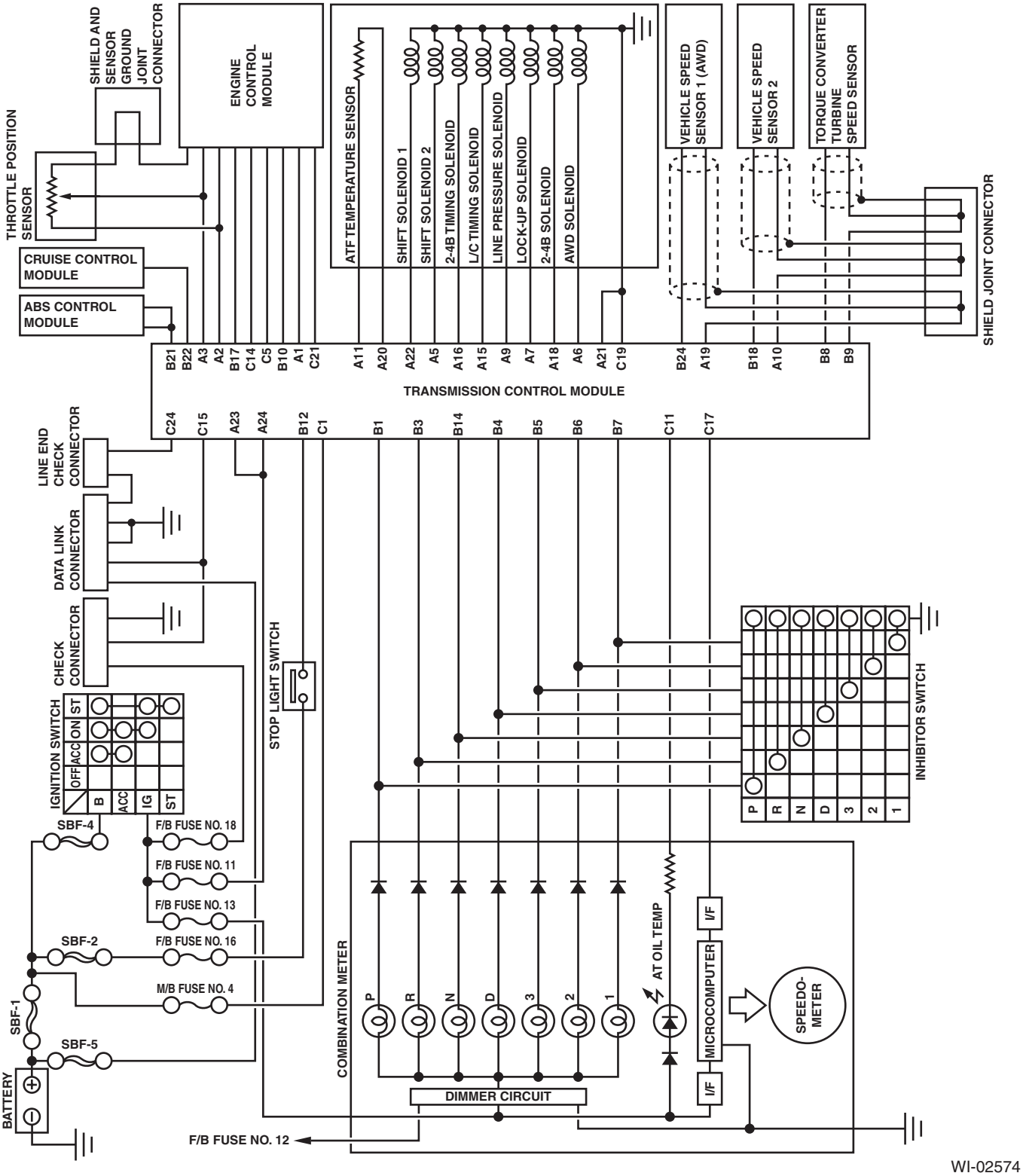

ABS-03
ABS CONTROL MODULE
ABS-03
B301
SHIELD JOINT CONNECTOR
SB 1
SB 2
SB 5
SB 7
BW 6
B303
TWISTED WIRE
TWISTED WIRE
B62
F45
B99
R3
JOINT CONNECTOR (LATERAL G SENSOR)
R 1
RW 2
LR 3
B 4
VW 5
BrY 6
B261
F94
B15
R73
R72
B292
B292
B257
FRONT ABS SENSOR LH
FRONT ABS SENSOR RH
REAR ABS SENSOR LH
REAR ABS SENSOR RH
ABS G SENSOR (EXCEPT STi MODEL)
ABS G SENSOR (STi MODEL)
ABS LATERAL G SENSOR (STi MODEL)
REF. TO GND-02
B15 (GRAY)
F94 (GRAY)
R72
R73
B257
B292
B261
B303 (GRAY)
B99
F45
B301

WI-02799

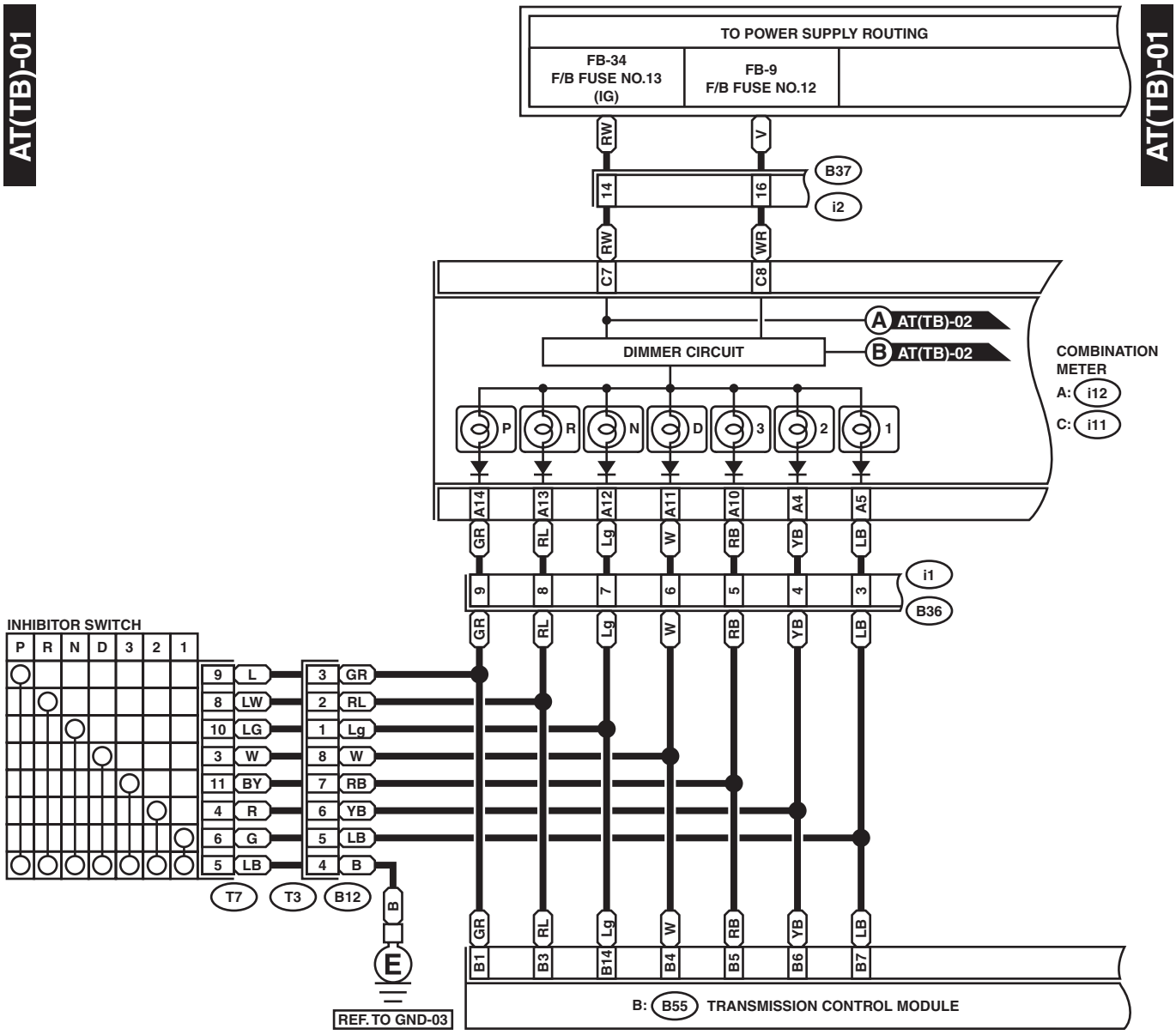
8. AT Control System

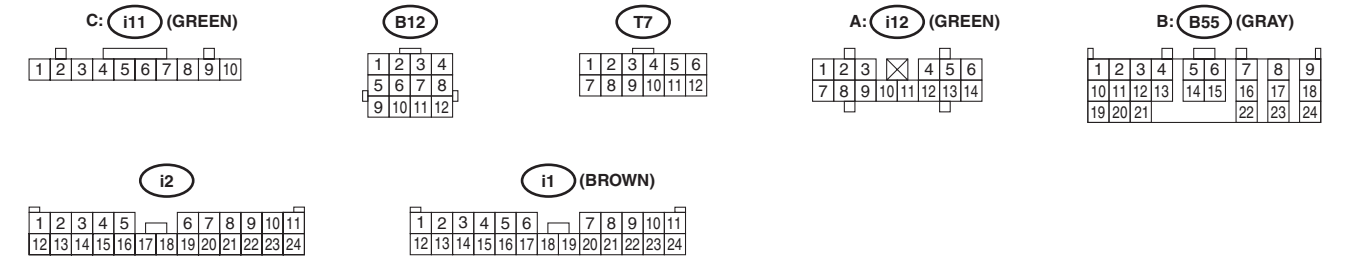
A: WIRING DIAGRAM

1. TURBO MODEL

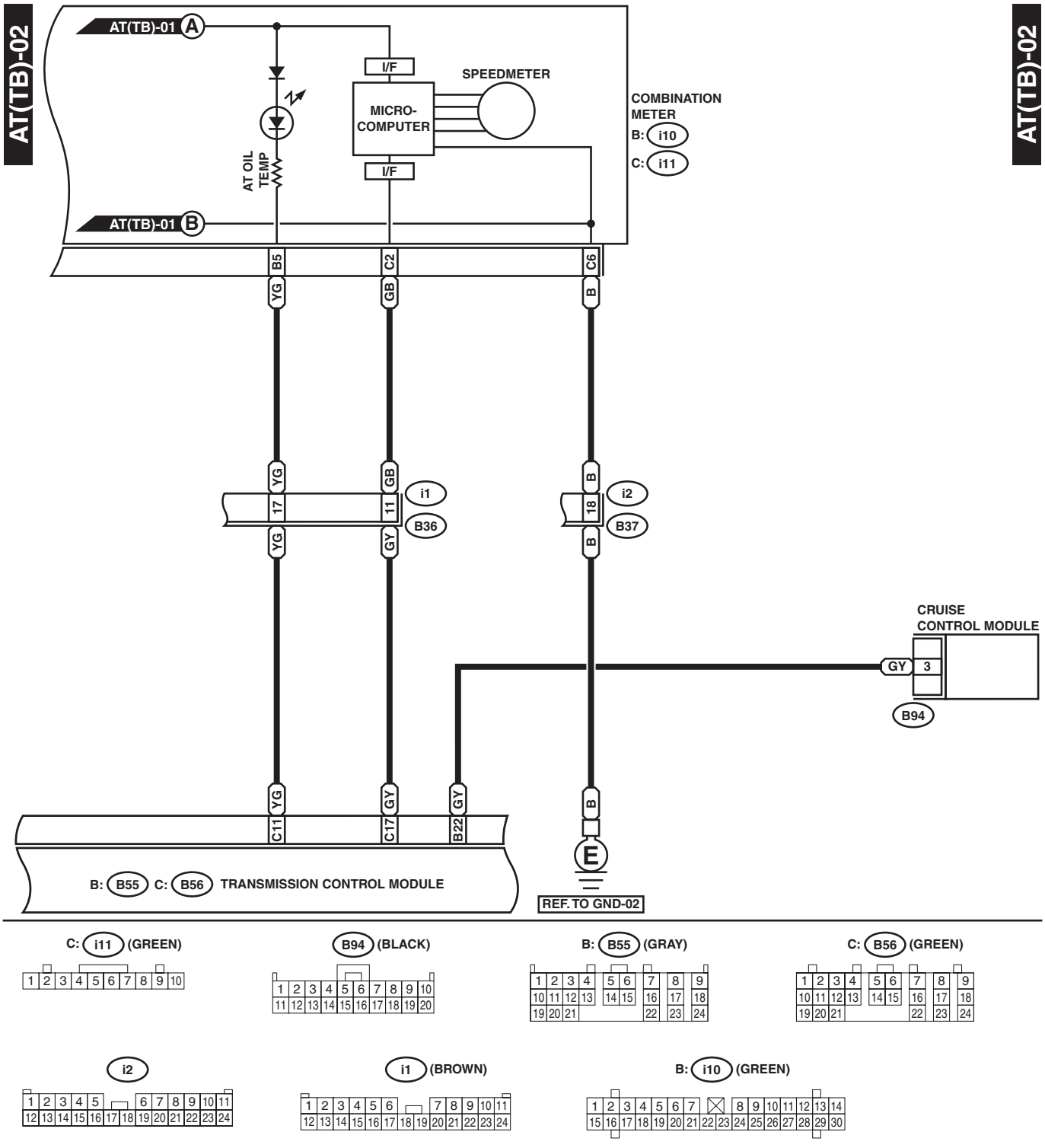


WI-02574

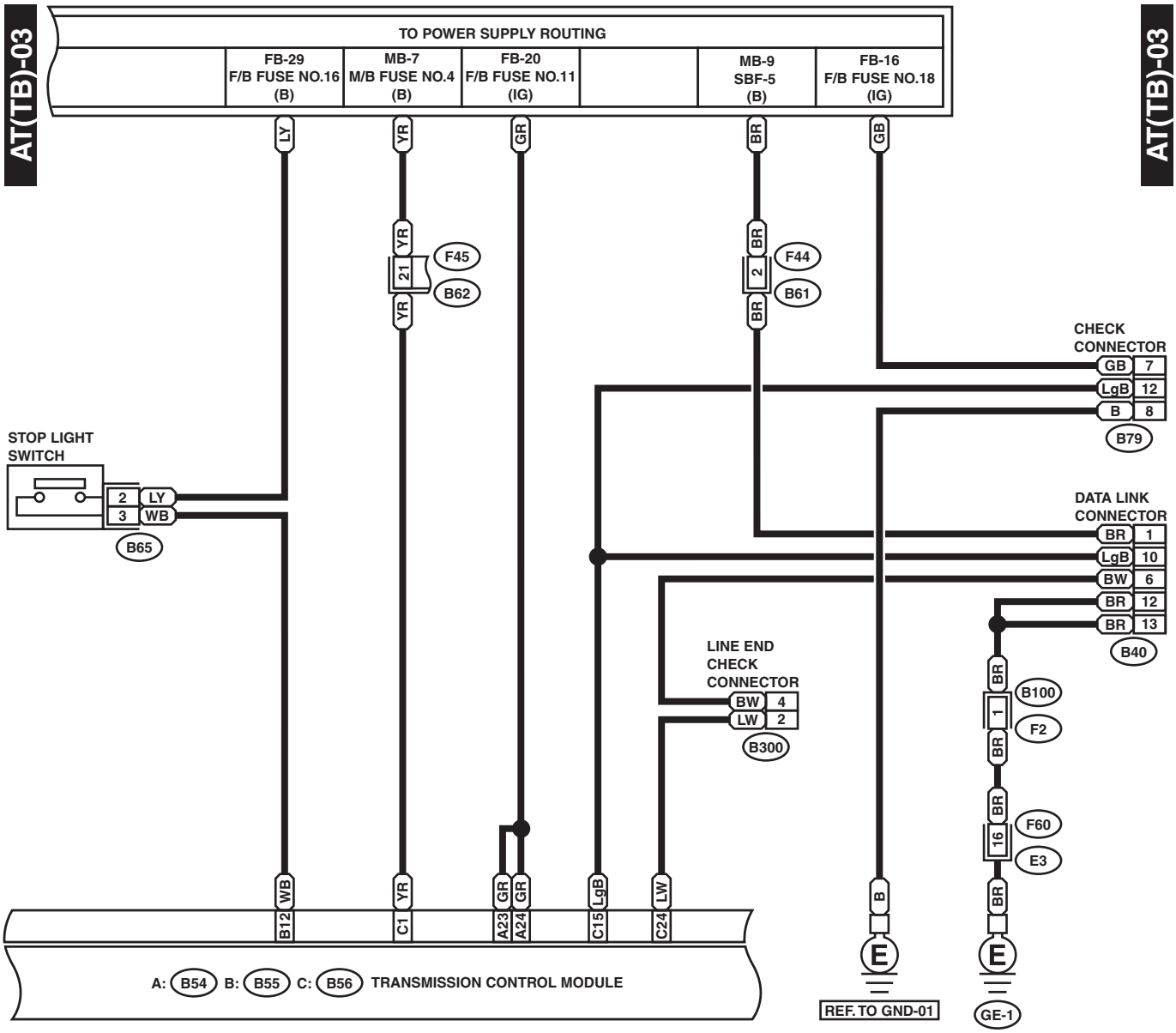

AT(TB)-01
AT(TB)-01
TO POWER SUPPLY ROUTING
FB-34
F/B FUSE NO.13
(IG)
FB-9
F/B FUSE NO.12
RW
V
B37
14
16
i2
RW
WR
C7
C8
A AT(TB)-02
DIMMER CIRCUIT
B AT(TB)-02
COMBINATION METER
A: i12
C: i11
P
R
N
D
3
2
1
A14
A13
A12
A11
A10
A4
A5
GR
RL
Lg
W
RB
YB
LB
i1
B36
9
8
7
6
5
4
3
INHIBITOR SWITCH
P R N D 3 2 1
9 L
8 LW
10 LG
3 W
11 BY
4 R
6 G
5 LB
3 GR
2 RL
1 Lg
8 W
7 RB
6 YB
5 LB
4 B
T7
T3
B12
B
E
REF. TO GND-03
B1
B3
B14
B4
B5
B6
B7
B: B55 TRANSMISSION CONTROL MODULE

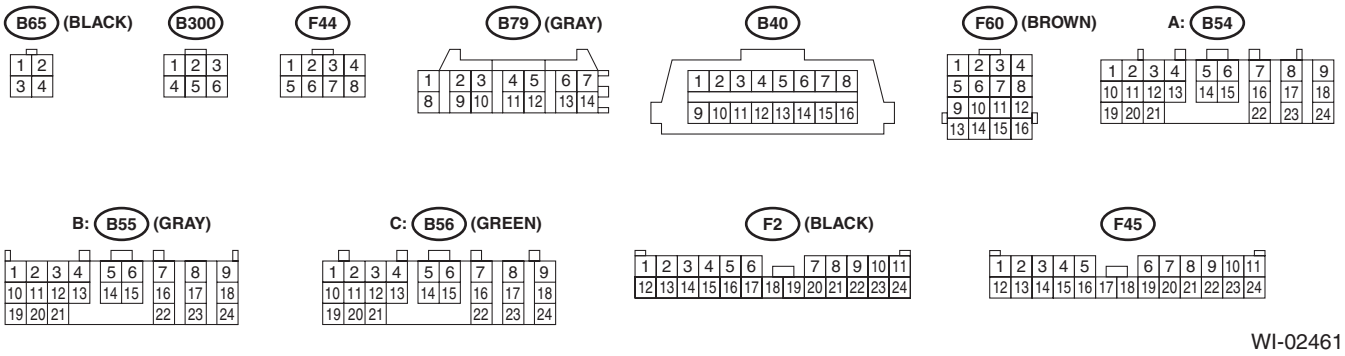

C: i11 (GREEN)
B12
T7
A: i12 (GREEN)
B: B55 (GRAY)
i2
i1 (BROWN)

WI-02459

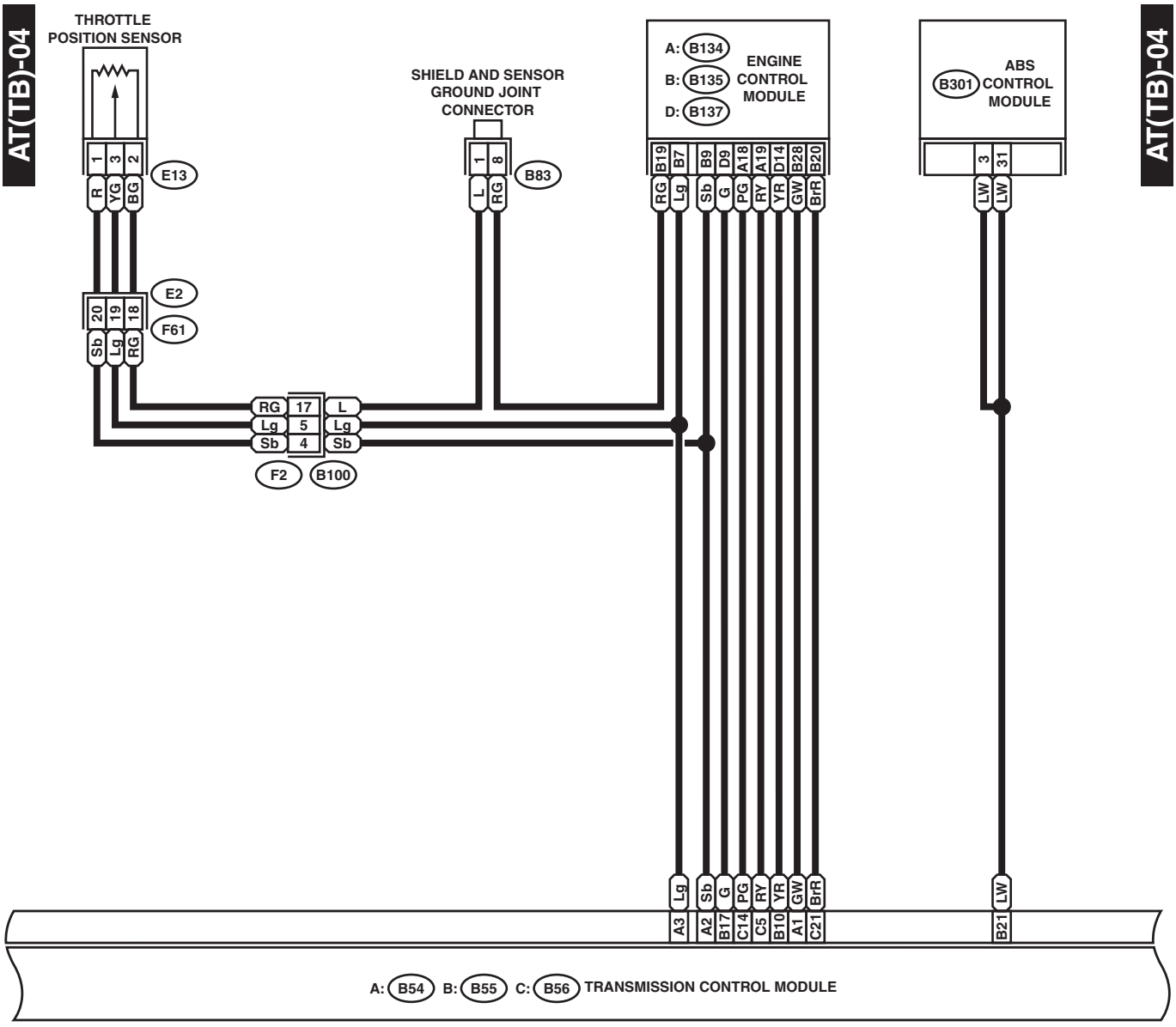

AT(TB)-02
AT(TB)-01 A
AT(TB)-01 B
I/F
SPEEDMETER
MICRO-COMPUTER
I/F
AT OIL TEMP
COMBINATION METER
B: i10
C: i11
B5
C2
C6
YG
GB
B
YG
GB
B
17
11
18
i1
B36
i2
B37
YG
GY
B
CRUISE CONTROL MODULE
GY
3
B94
YG
GY
GY
B
C11
C17
B22
E
B: B55 C: B56 TRANSMISSION CONTROL MODULE
REF. TO GND-02
C: i11 (GREEN)
B94 (BLACK)
B: B55 (GRAY)
C: B56 (GREEN)
i2
i1 (BROWN)
B: i10 (GREEN)

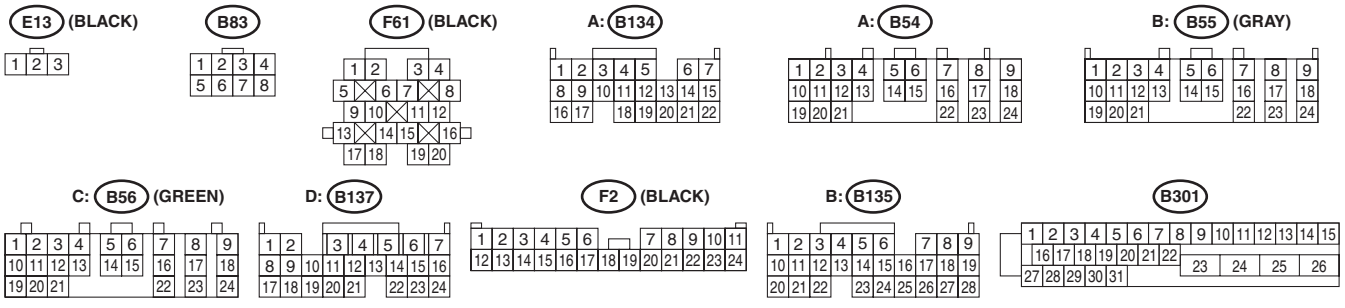
WI-02460


AT(TB)-03
AT(TB)-03
TO POWER SUPPLY ROUTING
FB-29 F/B FUSE NO.16 (B)
MB-7 M/B FUSE NO.4 (B)
FB-20 F/B FUSE NO.11 (IG)
MB-9 SBF-5 (B)
FB-16 F/B FUSE NO.18 (IG)
LY
YR
GR
BR
GB
F45
B62
F44
B61
CHECK CONNECTOR
GB 7
LgB 12
B 8
B79
STOP LIGHT SWITCH
2 LY
3 WB
B65
DATA LINK CONNECTOR
BR 1
LgB 10
BW 6
BR 12
BR 13
B40
LINE END CHECK CONNECTOR
BW 4
LW 2
B300
B100
F2
F60
E3
B12 WB
C1 YR
A23 GR
A24 GR
C15 LgB
C24 LW
B
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE
REF. TO GND-01
GE-1

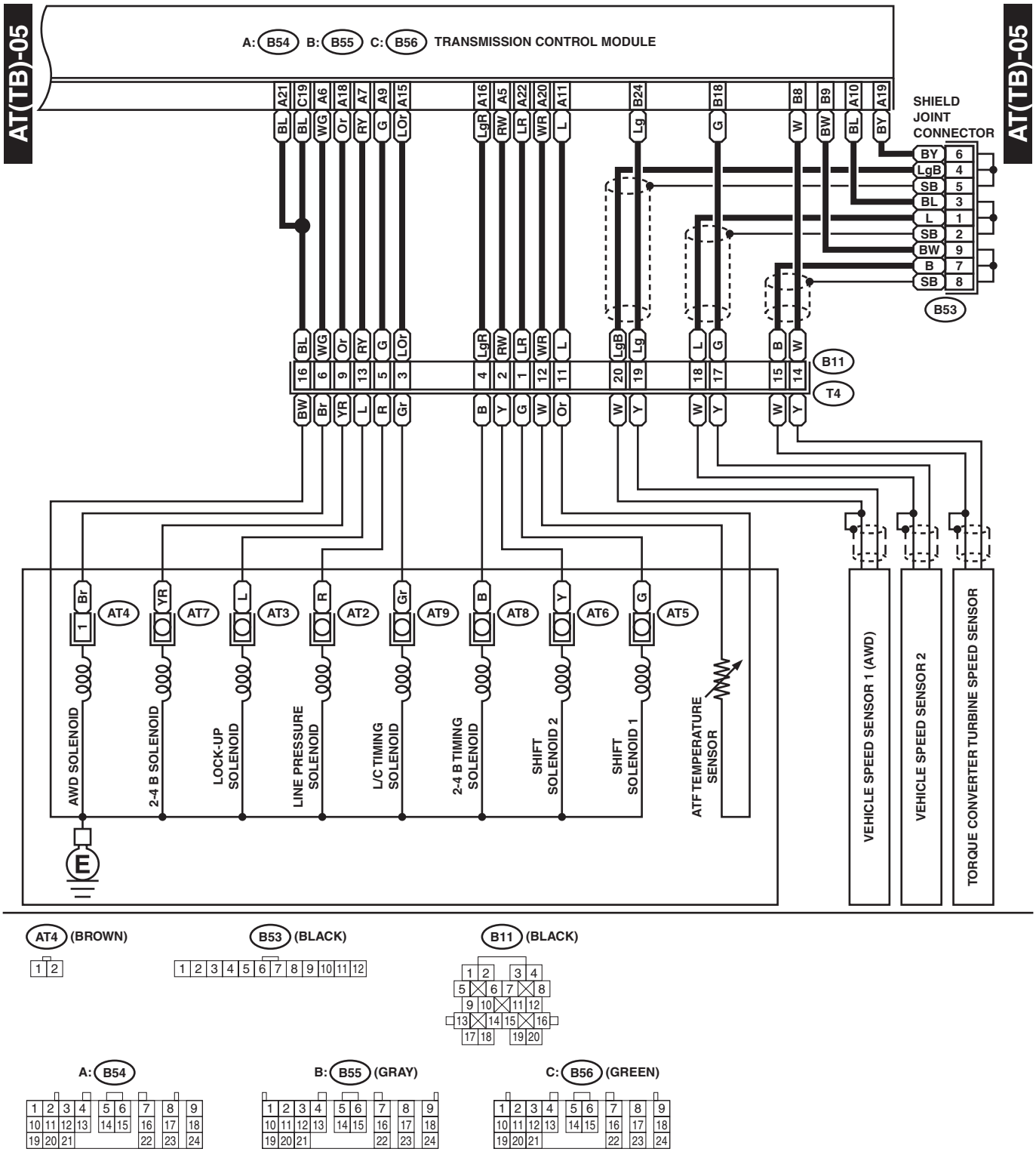

B65 (BLACK)
B300
F44
B79 (GRAY)
B40
F60 (BROWN)
A: B54
B: B55 (GRAY)
C: B56 (GREEN)
F2 (BLACK)
F45

WI-02461


AT(TB)-04
THROTTLE POSITION SENSOR
E13
1 3 2
R YG BG
E2
F61
20 19 18
Sb Lg RG
SHIELD AND SENSOR GROUND JOINT CONNECTOR
B83
1 8
L RG
A: B134
B: B135
D: B137
ENGINE CONTROL MODULE
B19 B7 B9 D9 A18 A19 D14 B28 B20
RG Lg Sb G PG RY YR GW BrR
B301
ABS CONTROL MODULE
3 31
LW LW
AT(TB)-04
RG 17 L
Lg 5 Lg
Sb 4 Sb
F2
B100
Lg Sb G PG RY YR GW BrR
A3 A2 B17 C14 C5 B10 A1 C21
LW
B21
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE

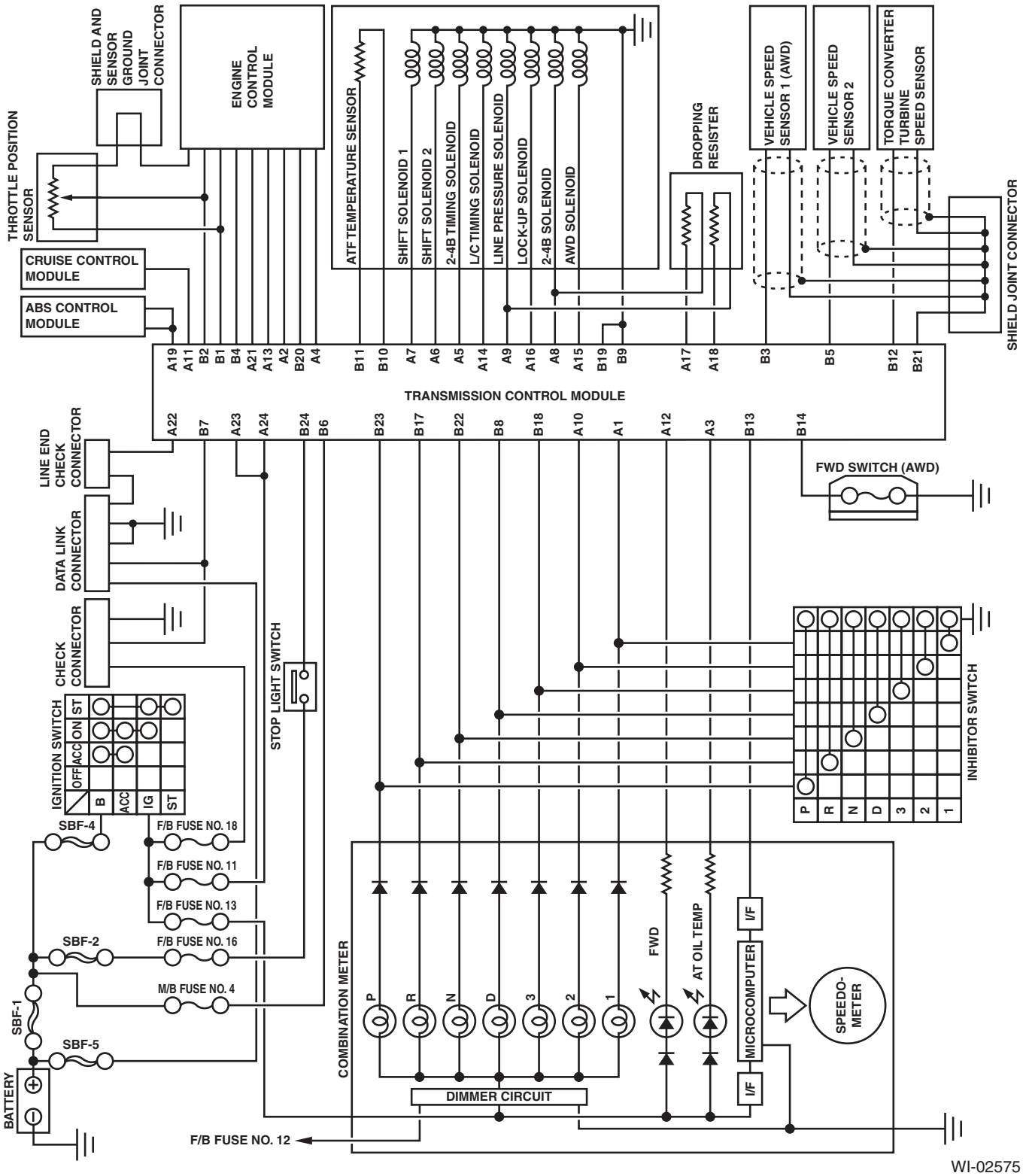

E13 (BLACK)
B83
F61 (BLACK)
A: B134
A: B54
B: B55 (GRAY)
C: B56 (GREEN)
D: B137
F2 (BLACK)
B: B135
B301

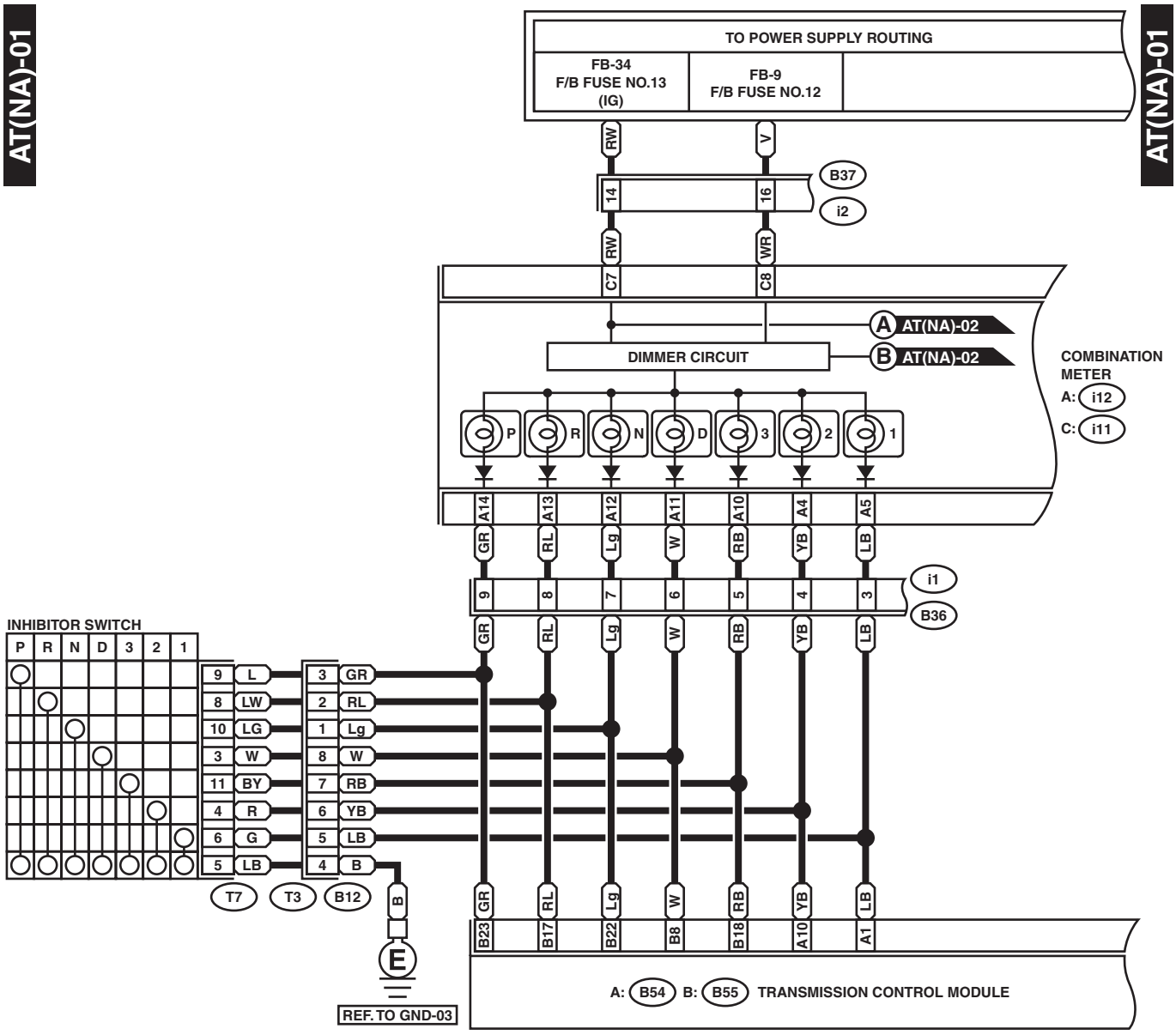
WI-02462


AT(TB)-05
AT(TB)-05
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE
SHIELD JOINT CONNECTOR
B53
B11
T4
AT4
AT7
AT3
AT2
AT9
AT8
AT6
AT5
AWD SOLENOID
2-4 B SOLENOID
LOCK-UP SOLENOID
LINE PRESSURE SOLENOID
L/C TIMING SOLENOID
2-4 B TIMING SOLENOID
SHIFT SOLENOID 2
SHIFT SOLENOID 1
ATF TEMPERATURE SENSOR
VEHICLE SPEED SENSOR 1 (AWD)
VEHICLE SPEED SENSOR 2
TORQUE CONVERTER TURBINE SPEED SENSOR
AT4 (BROWN)
B53 (BLACK)
B11 (BLACK)
A: B54
B: B55 (GRAY)
C: B56 (GREEN)

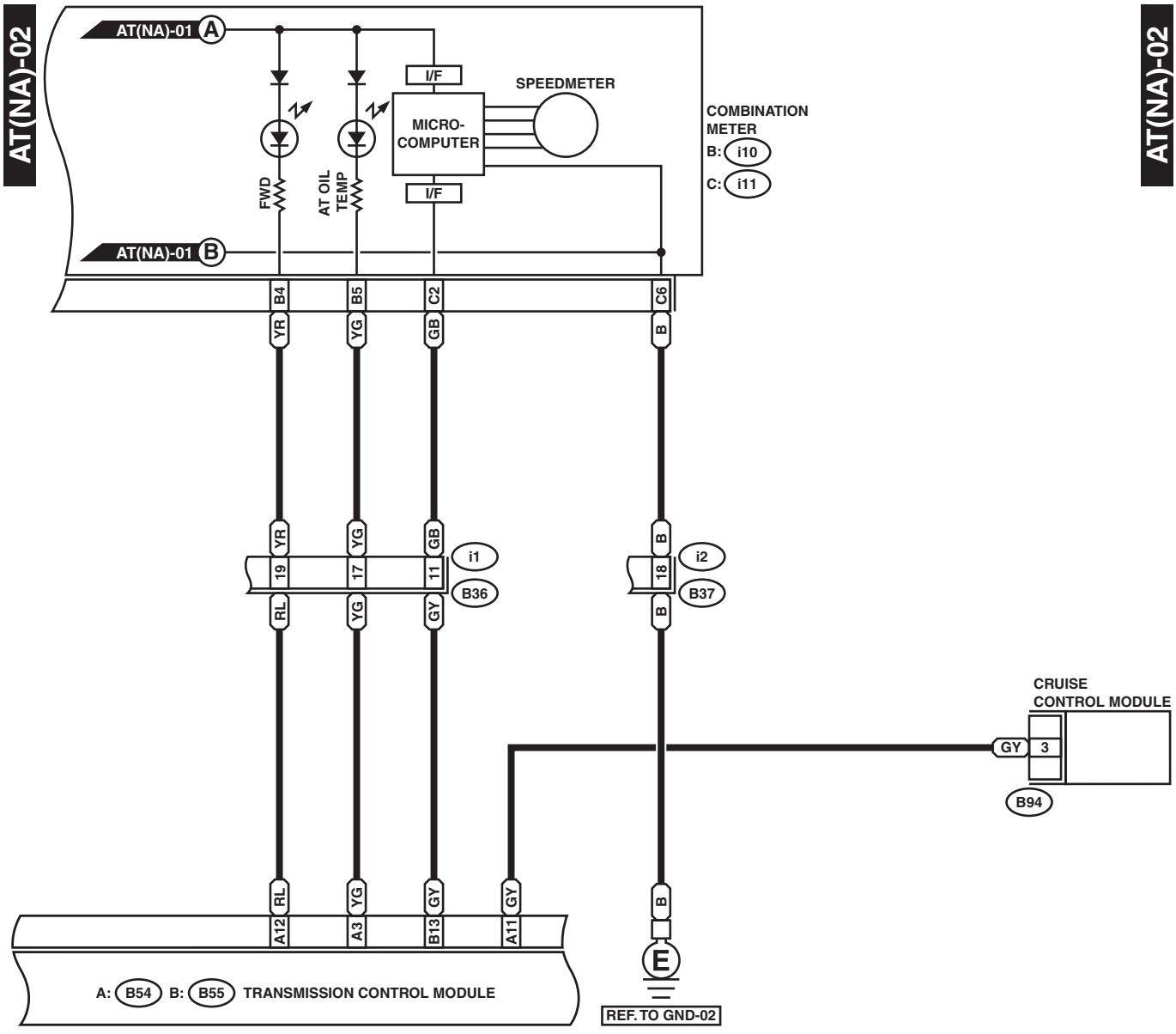
WI-02171

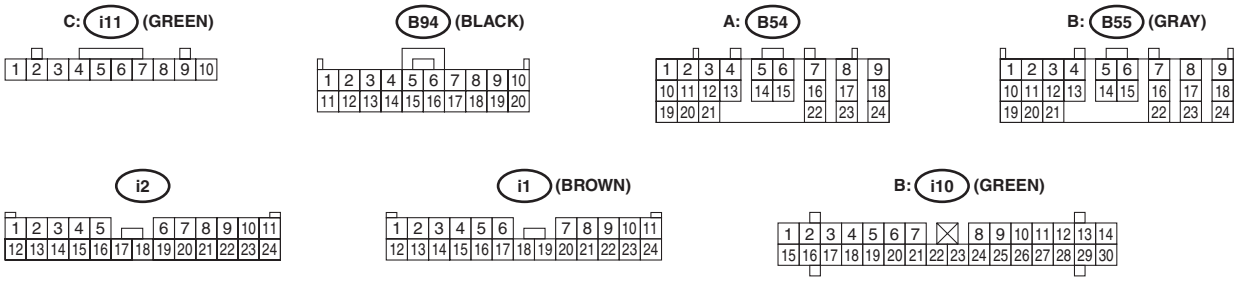
2. NON-TURBO MODEL



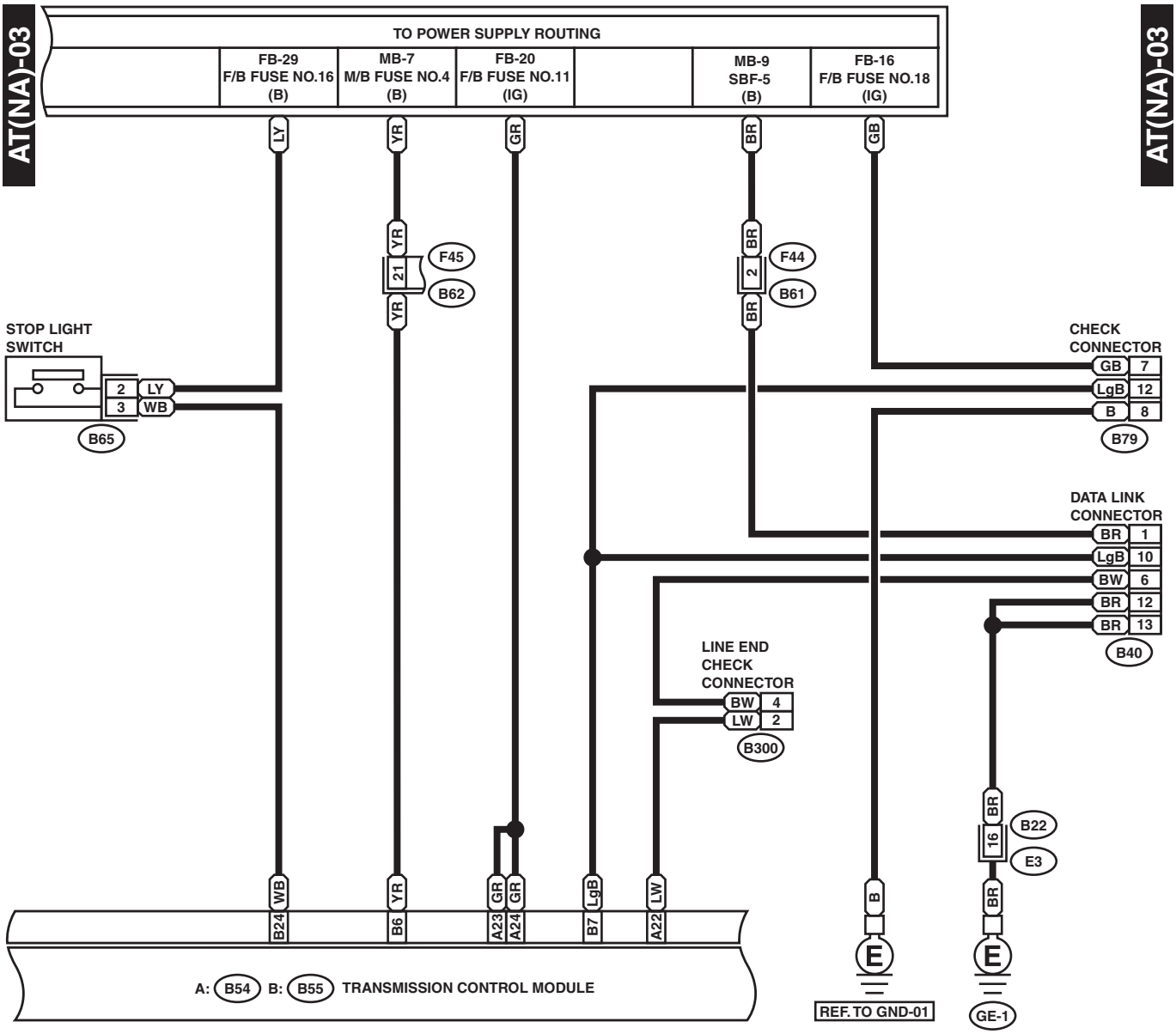

AT(NA)-01
AT(NA)-01
TO POWER SUPPLY ROUTING
FB-34
F/B FUSE NO.13
(IG)
FB-9
F/B FUSE NO.12
RW
V
B37
14
16
i2
RW
WR
C7
C8
A AT(NA)-02
DIMMER CIRCUIT
B AT(NA)-02
COMBINATION METER
A: i12
C: i11
P
R
N
D
3
2
1
A14
A13
A12
A11
A10
A4
A5
GR
RL
Lg
W
RB
YB
LB
9
8
7
6
5
4
3
i1
B36
INHIBITOR SWITCH
P R N D 3 2 1
9 L
8 LW
10 LG
3 W
11 BY
4 R
6 G
5 LB
3 GR
2 RL
1 Lg
8 W
7 RB
6 YB
5 LB
4 B
T7
T3
B12
B
E
REF. TO GND-03
B23
B17
B22
B8
B18
A10
A1
A: B54 B: B55 TRANSMISSION CONTROL MODULE
C: i11 (GREEN)
B12
T7
A: i12 (GREEN)
A: B54
i2
B: B55 (GRAY)
i1 (BROWN)

WI-02463

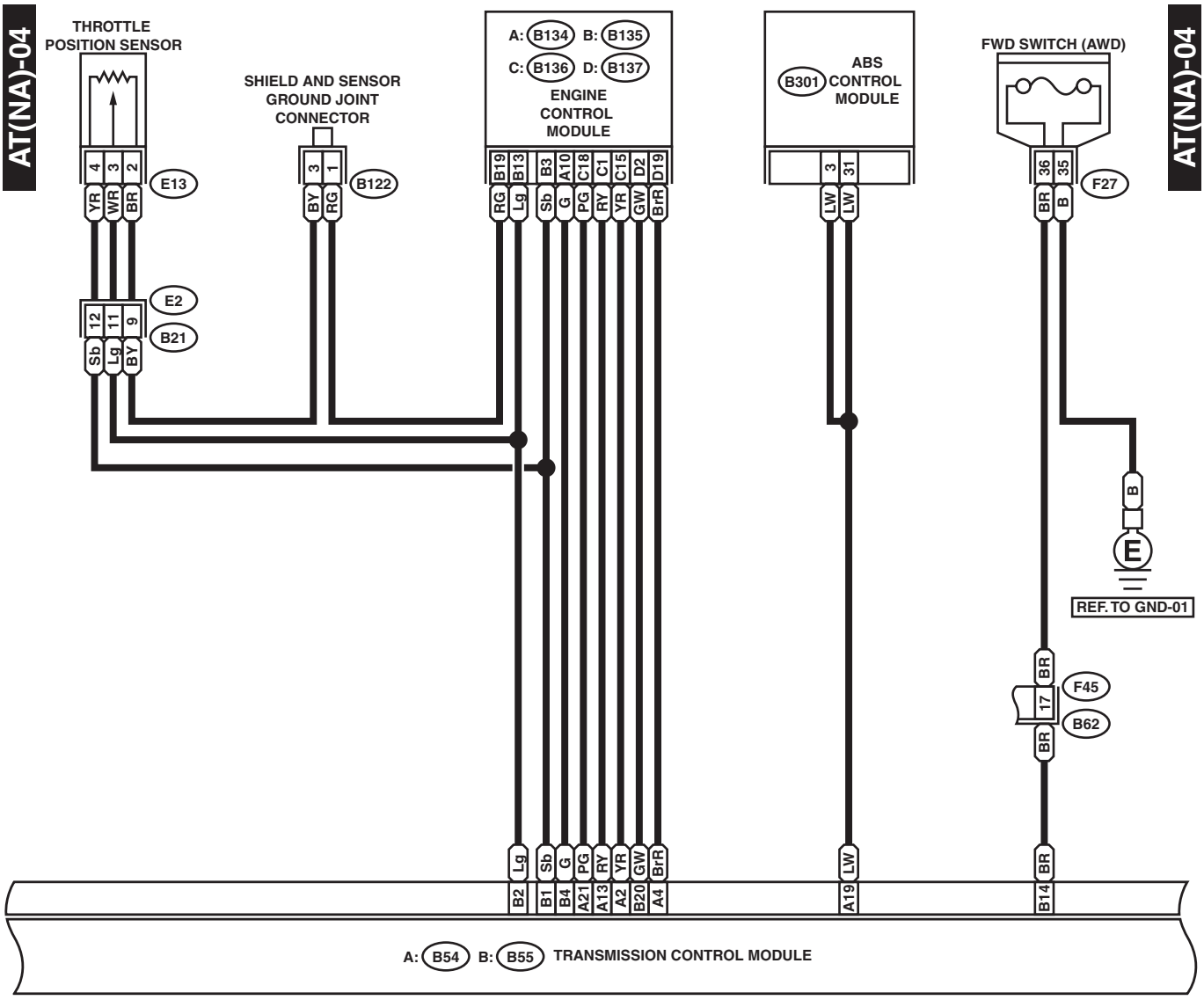

AT(NA)-02
AT(NA)-01 A
I/F
SPEEDMETER
MICRO-
COMPUTER
COMBINATION
METER
B: i10
C: i11
FWD
AT OIL
TEMP
I/F
AT(NA)-01 B
B4
B5
C2
C6
YR
YG
GB
B
i1
i2
19
17
11
18
B36
B37
RL
YG
GY
B
CRUISE
CONTROL MODULE
GY
3
B94
A12
A3
B13
A11
A: B54 B: B55 TRANSMISSION CONTROL MODULE
E
REF. TO GND-02

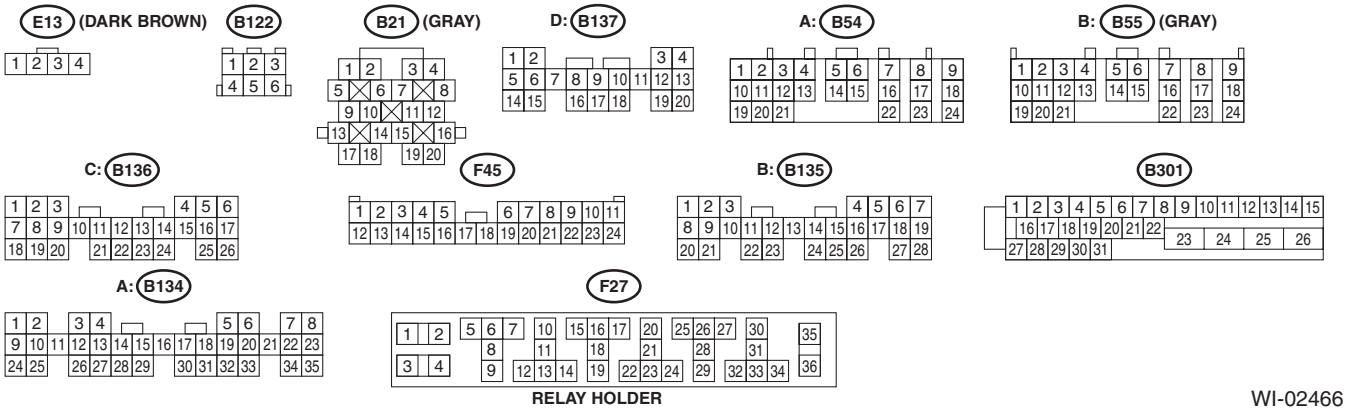

C: i11 (GREEN)
B94 (BLACK)
A: B54
B: B55 (GRAY)
i2
i1 (BROWN)
B: i10 (GREEN)

WI-02464

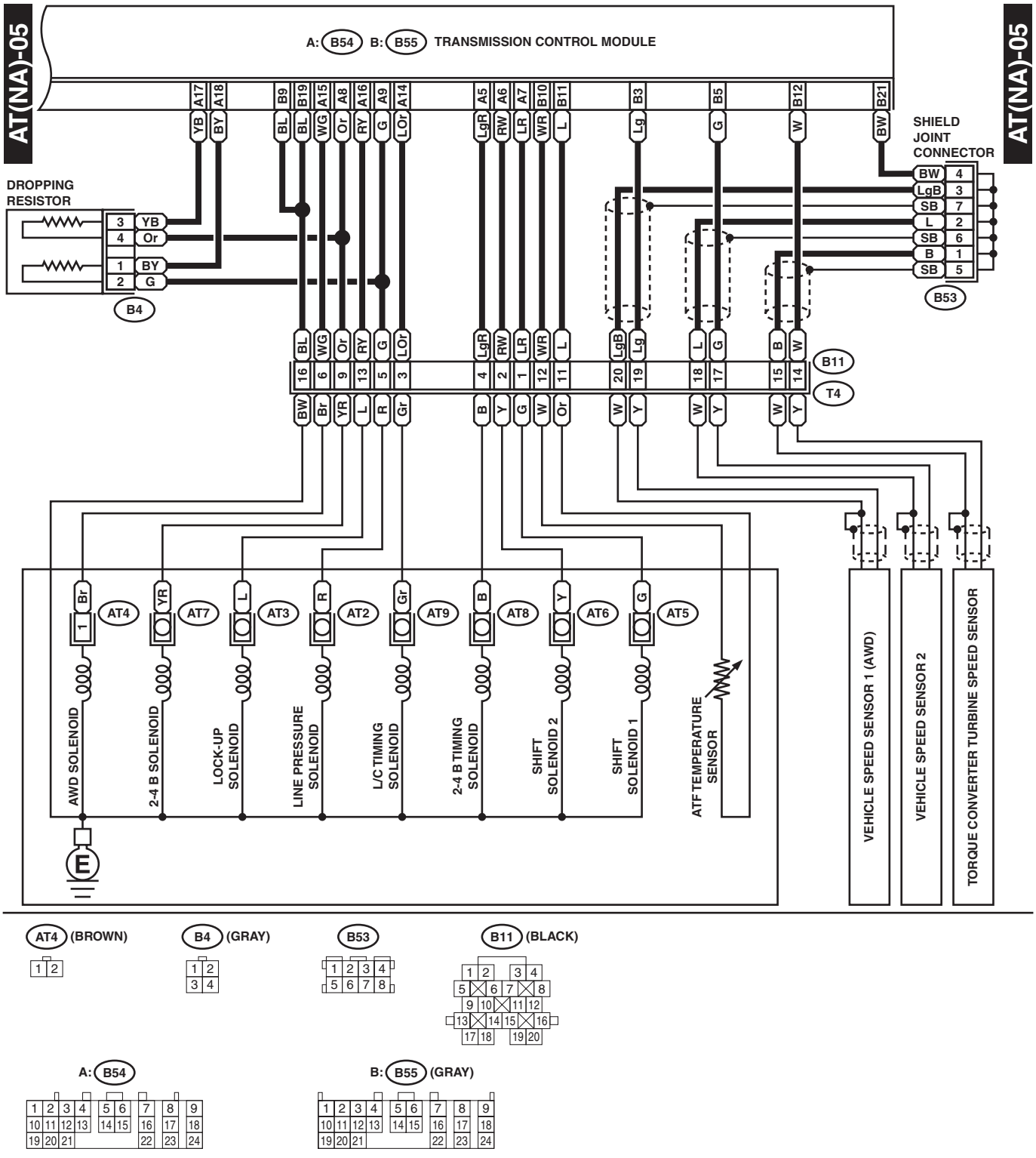

AT(NA)-03
AT(NA)-03
TO POWER SUPPLY ROUTING
FB-29 F/B FUSE NO.16 (B)
MB-7 M/B FUSE NO.4 (B)
FB-20 F/B FUSE NO.11 (IG)
MB-9 SBF-5 (B)
FB-16 F/B FUSE NO.18 (IG)
LY
YR
GR
BR
GB
F45
B62
F44
B61
STOP LIGHT SWITCH
B65
CHECK CONNECTOR
B79
DATA LINK CONNECTOR
B40
LINE END CHECK CONNECTOR
B300
B22
E3
WB
LgB
LW
B
B24
B6
A23
A24
B7
A22
A: B54 B: B55 TRANSMISSION CONTROL MODULE
REF. TO GND-01
GE-1
B65 (BLACK)
B300
F44
B79 (GRAY)
B22 (BROWN)
B40
A: B54
B: B55 (GRAY)
F45

WI-02465


AT(NA)-04
THROTTLE POSITION SENSOR
E13
4 3 2
YR WR BR
SHIELD AND SENSOR GROUND JOINT CONNECTOR
B122
3 1
BY RG
A: B134 B: B135
C: B136 D: B137
ENGINE CONTROL MODULE
B19 B13 B3 A10 C18 C1 C15 D2 D19
RG Lg Sb G PG RY YR GW BrR
B301
ABS CONTROL MODULE
3 31
LW LW
FWD SWITCH (AWD)
F27
36 35
BR B
E2
B21
12 11 9
Sb Lg BY
B
REF. TO GND-01
F45
17
B62
BR
Lg Sb G PG RY YR GW BrR
B2 B1 B4 A21 A13 A2 B20 A4
LW
A19
BR
B14
A: B54 B: B55 TRANSMISSION CONTROL MODULE


E13 (DARK BROWN)
B122
B21 (GRAY)
D: B137
A: B54
B: B55 (GRAY)
C: B136
F45
B: B135
B301
A: B134
F27
RELAY HOLDER

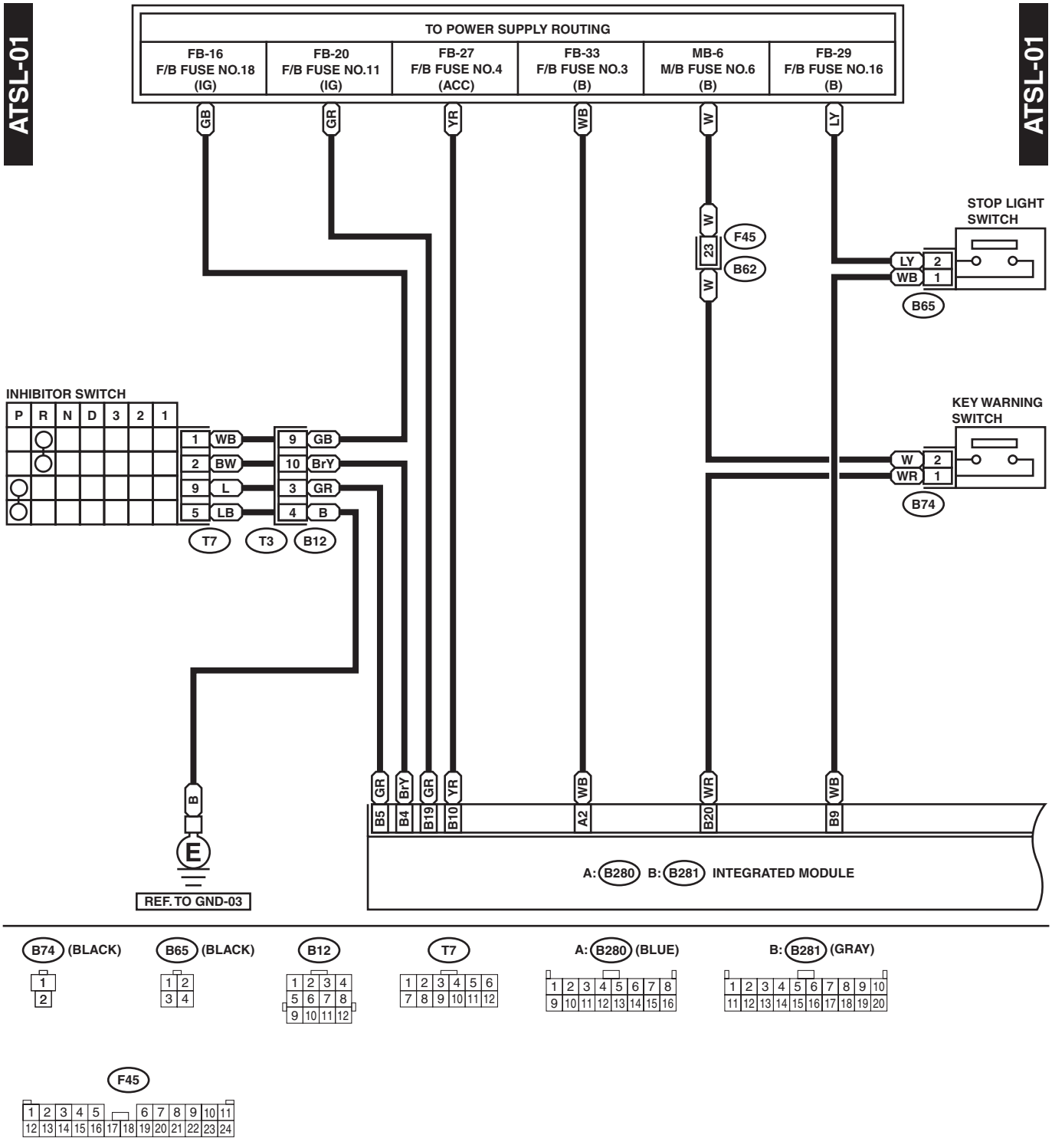
WI-02466


AT(NA)-05
A: B54 B: B55 TRANSMISSION CONTROL MODULE
AT(NA)-05
SHIELD JOINT CONNECTOR
DROPPING RESISTOR
B4
B53
B11
T4
AWD SOLENOID
2-4 B SOLENOID
LOCK-UP SOLENOID
LINE PRESSURE SOLENOID
L/C TIMING SOLENOID
2-4 B TIMING SOLENOID
SHIFT SOLENOID 2
SHIFT SOLENOID 1
ATF TEMPERATURE SENSOR
VEHICLE SPEED SENSOR 1 (AWD)
VEHICLE SPEED SENSOR 2
TORQUE CONVERTER TURBINE SPEED SENSOR
AT4 (BROWN)
B4 (GRAY)
B53
B11 (BLACK)
A: B54
B: B55 (GRAY)

WI-01117

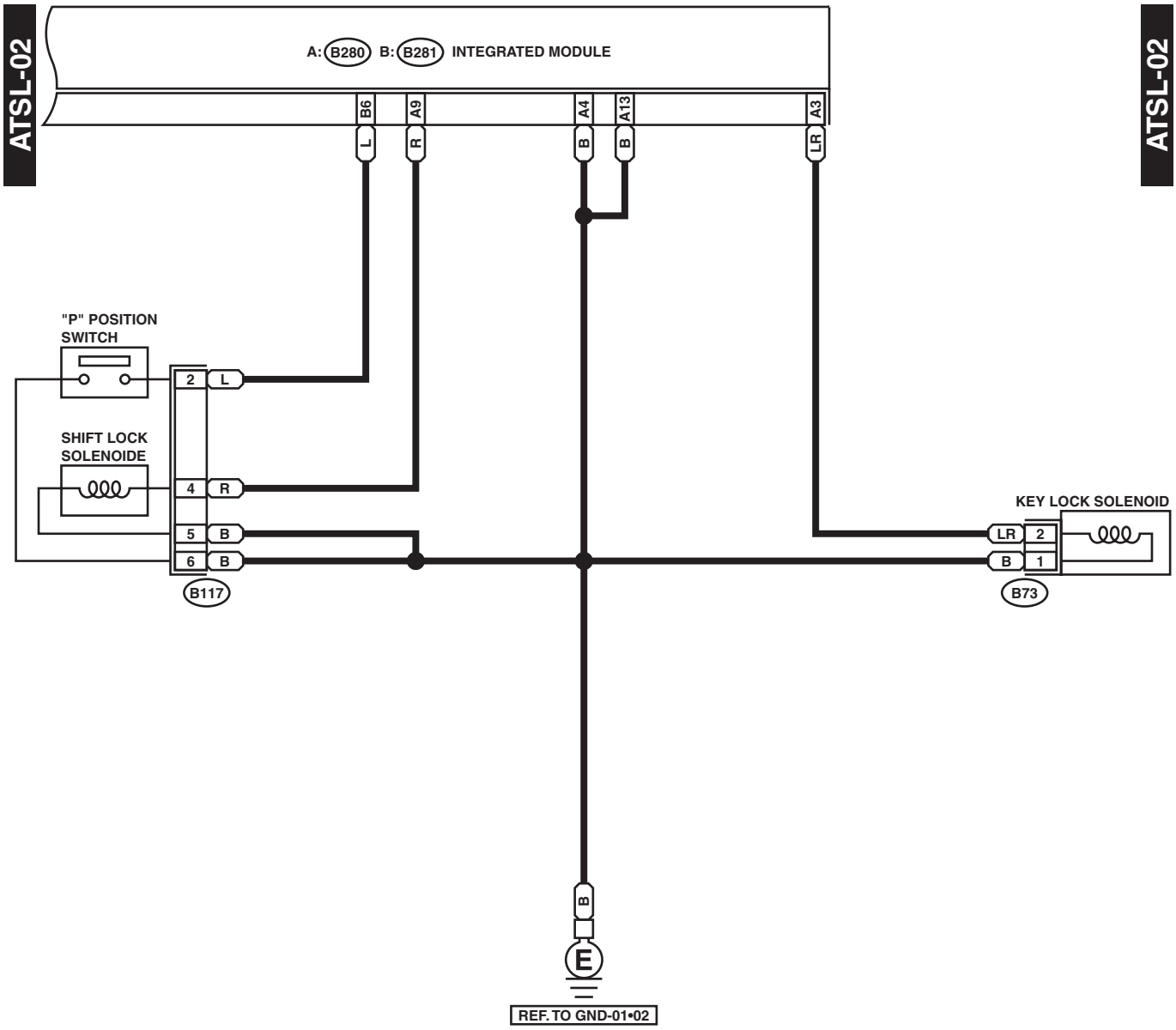
9. AT Shift Lock Control System

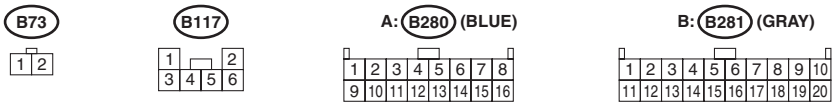
A: WIRING DIAGRAM



WI-02826

AT Shift Lock Control System

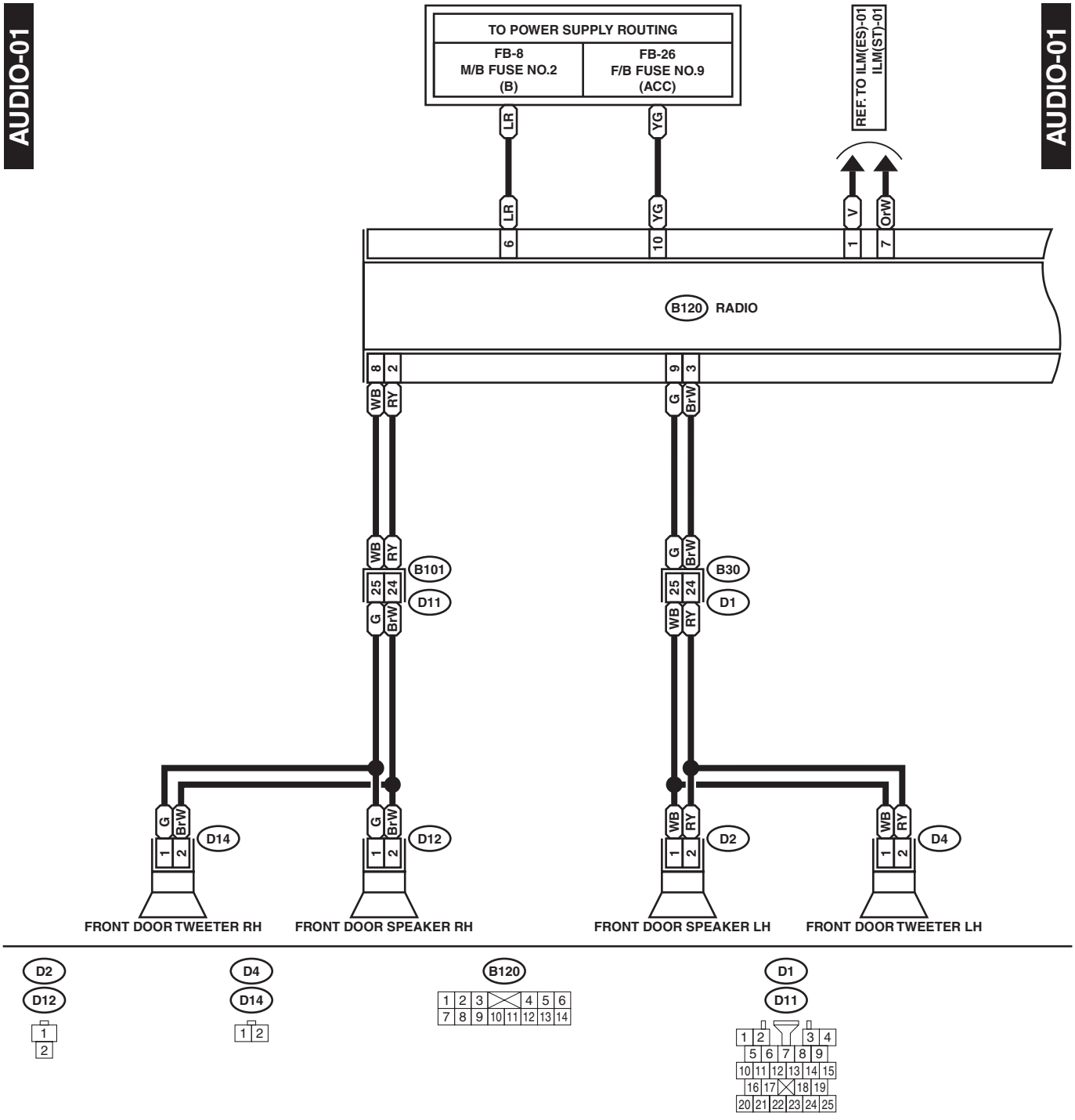




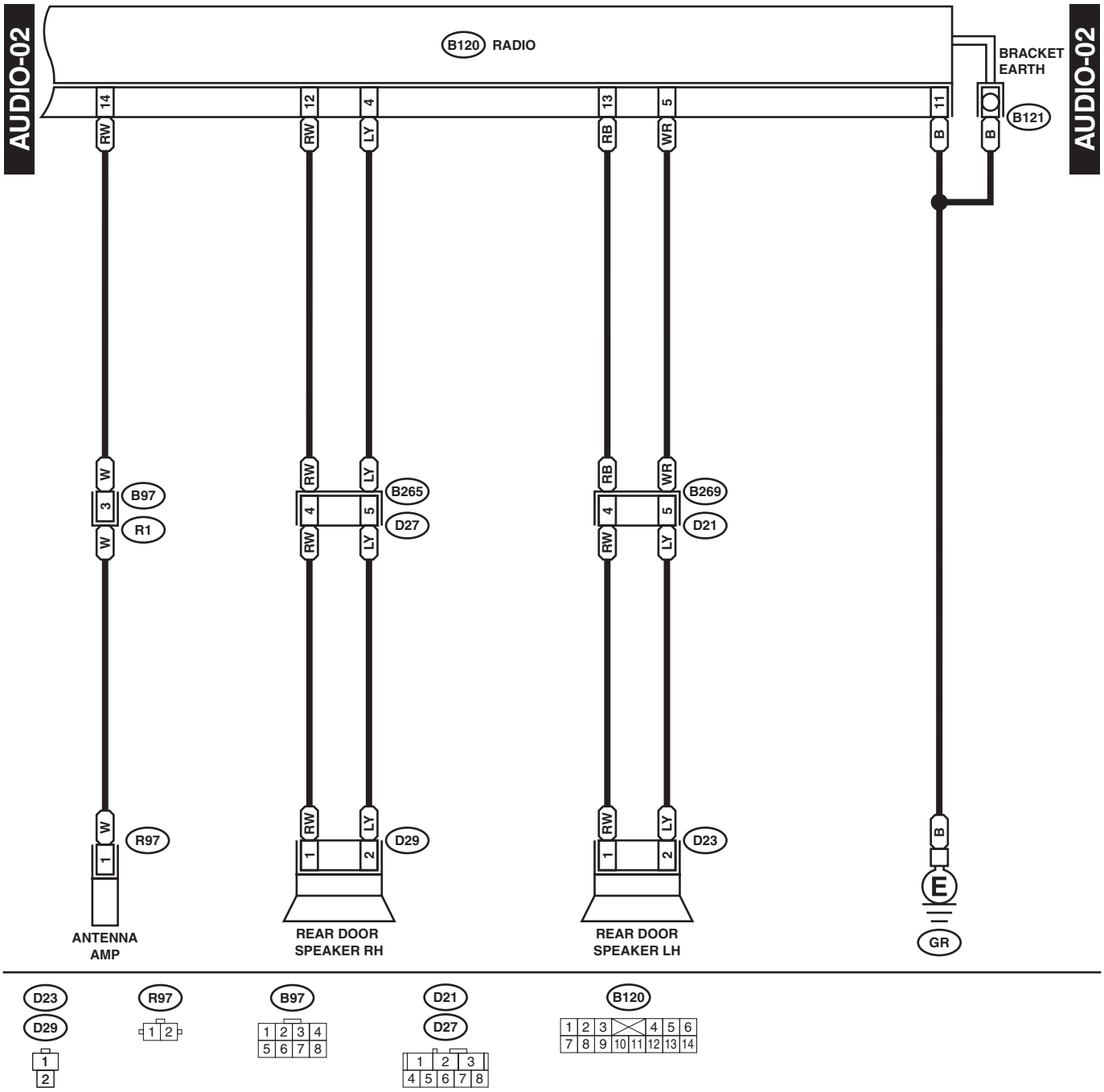
WI-02787

10.Audio System

A: WIRING DIAGRAM



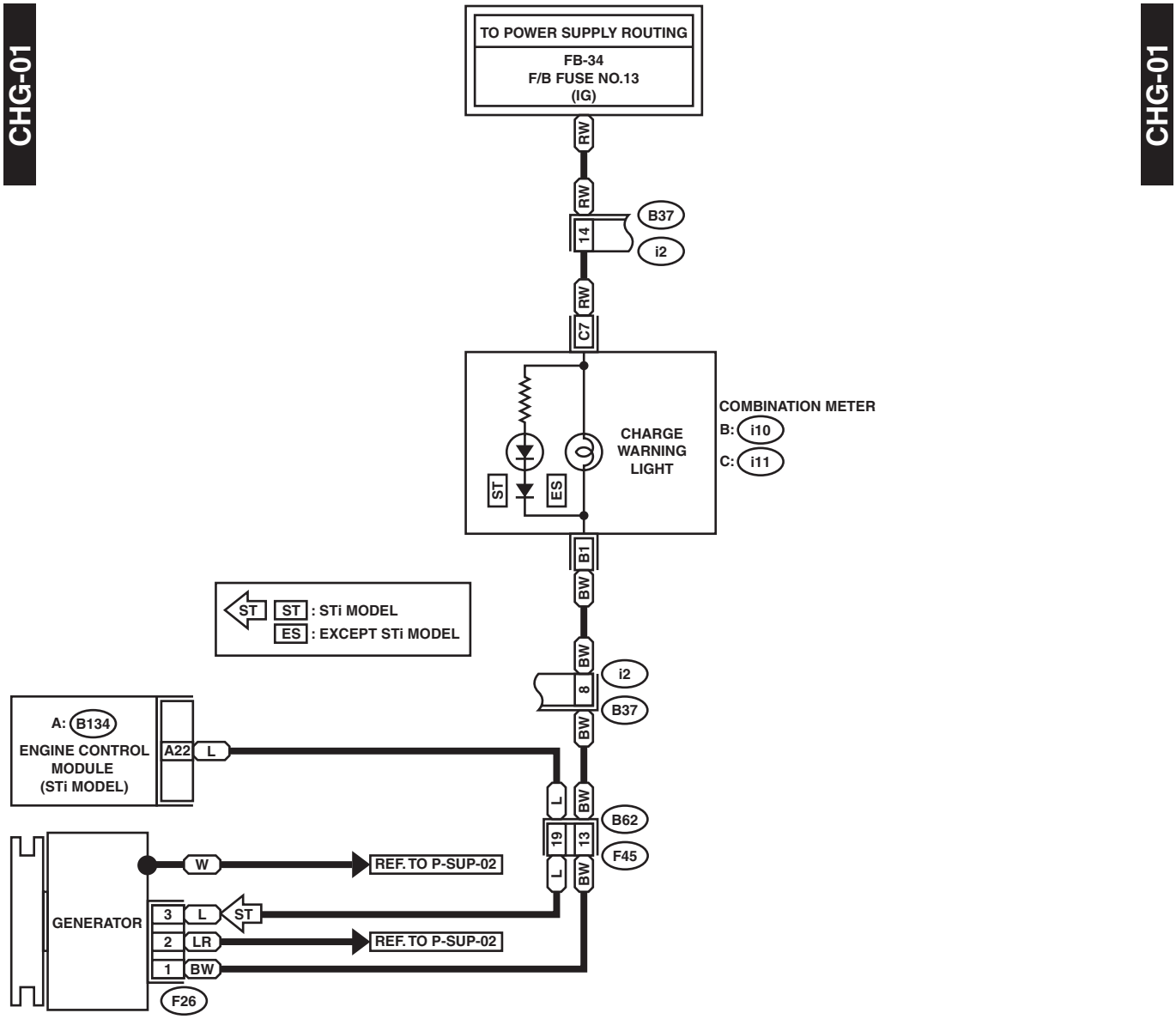
WI-02779

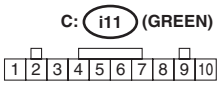

AUDIO-02
AUDIO-02
B120 RADIO
BRACKET EARTH
B121
14
12
4
13
5
11
RW
RW
LY
RB
WR
B
B
W
3
B97
R1
W
RW
LY
4
5
B265
D27
RW
LY
RB
WR
4
5
B269
D21
RW
LY
W
1
R97
RW
LY
1
2
D29
RW
LY
1
2
D23
B
E
GR
ANTENNA AMP
REAR DOOR SPEAKER RH
REAR DOOR SPEAKER LH
D23
D29
R97
B97
D21
D27
B120

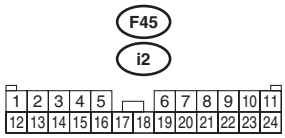
WI-02780

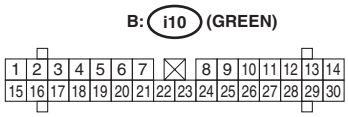
11.Charging System

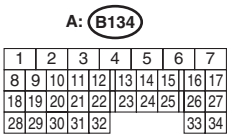
A: WIRING DIAGRAM







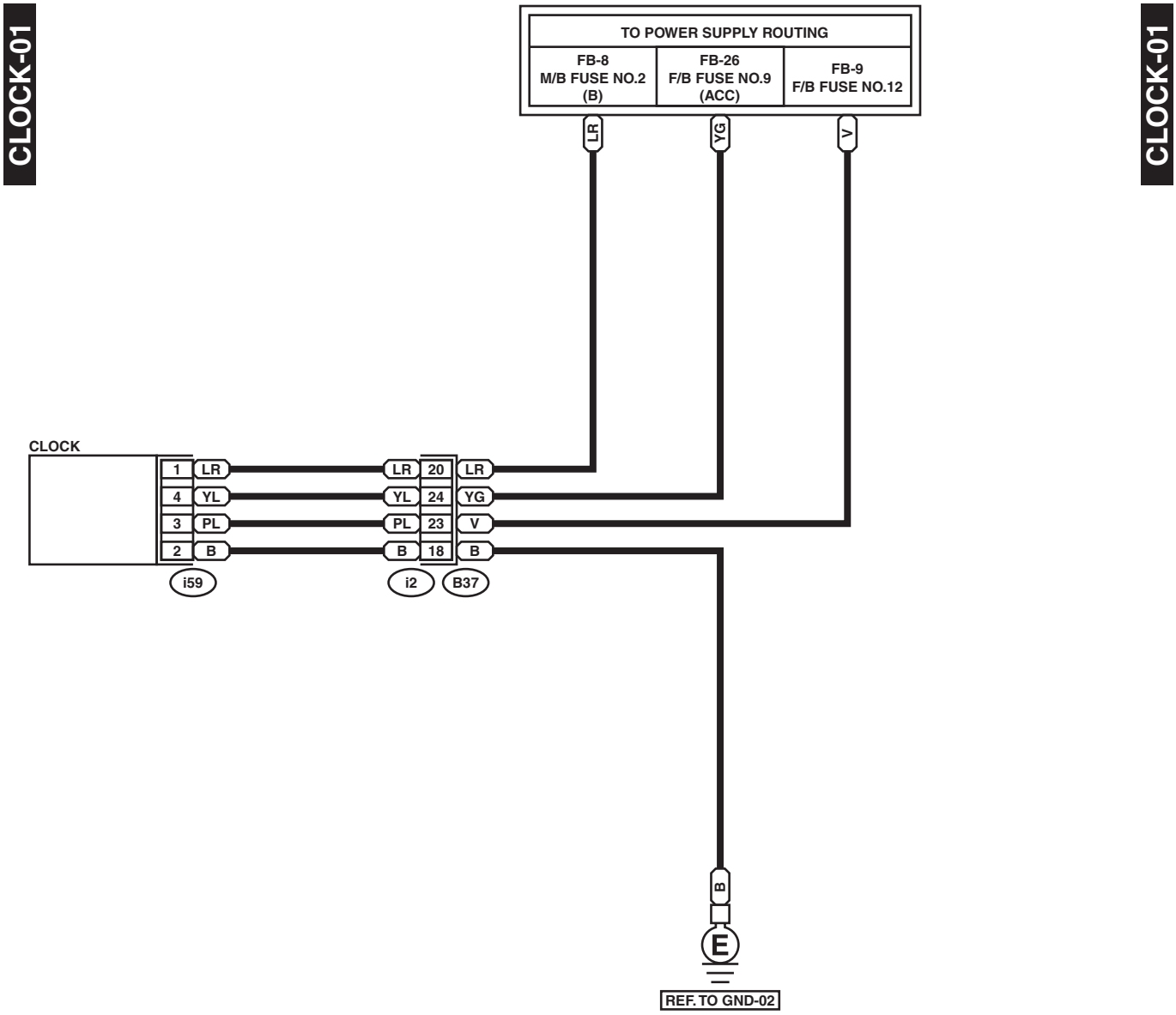


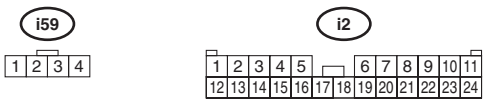


WI-02467

12.Clock System

A: WIRING DIAGRAM





WI-02468

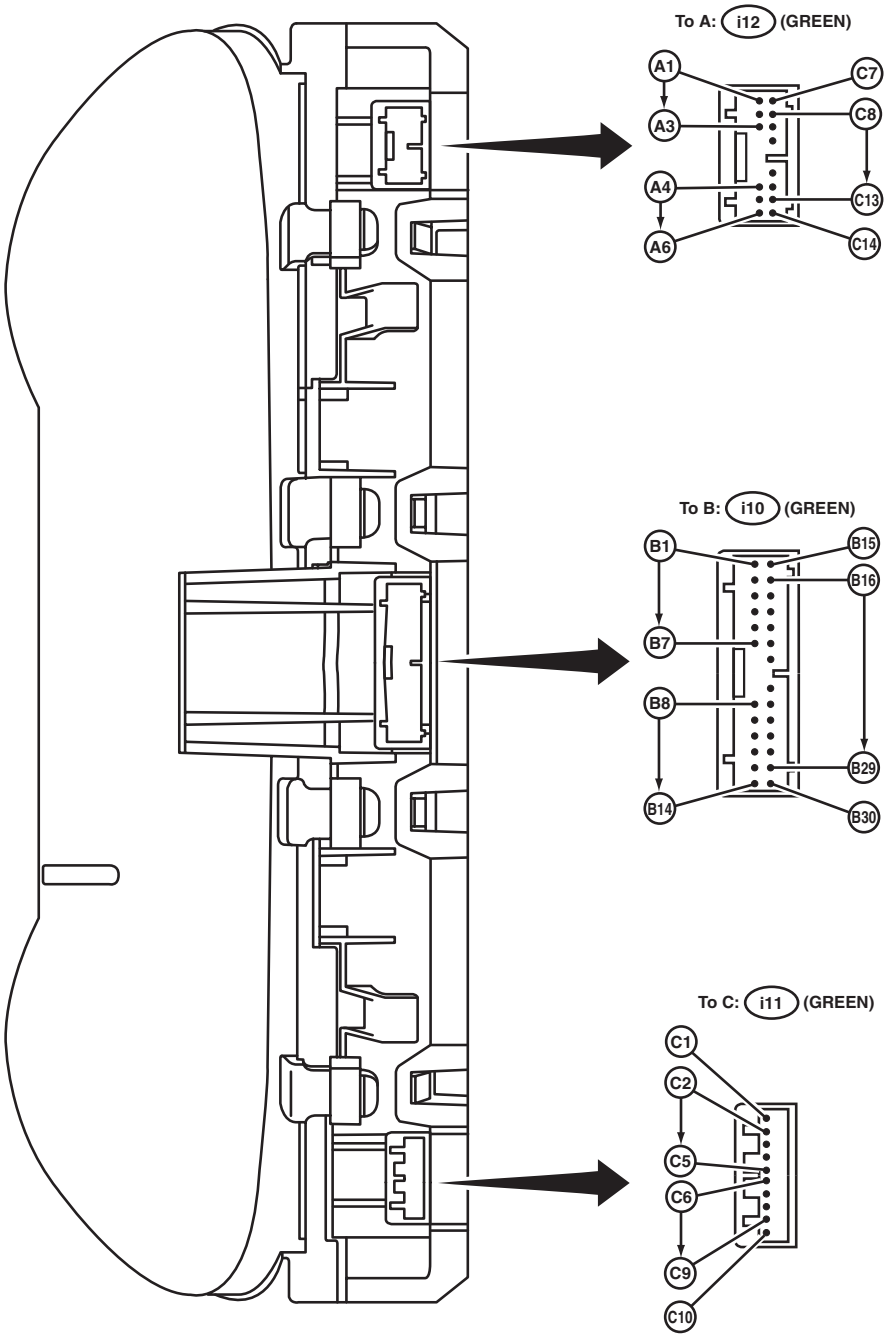
13.Combination Meter

A: WIRING DIAGRAM

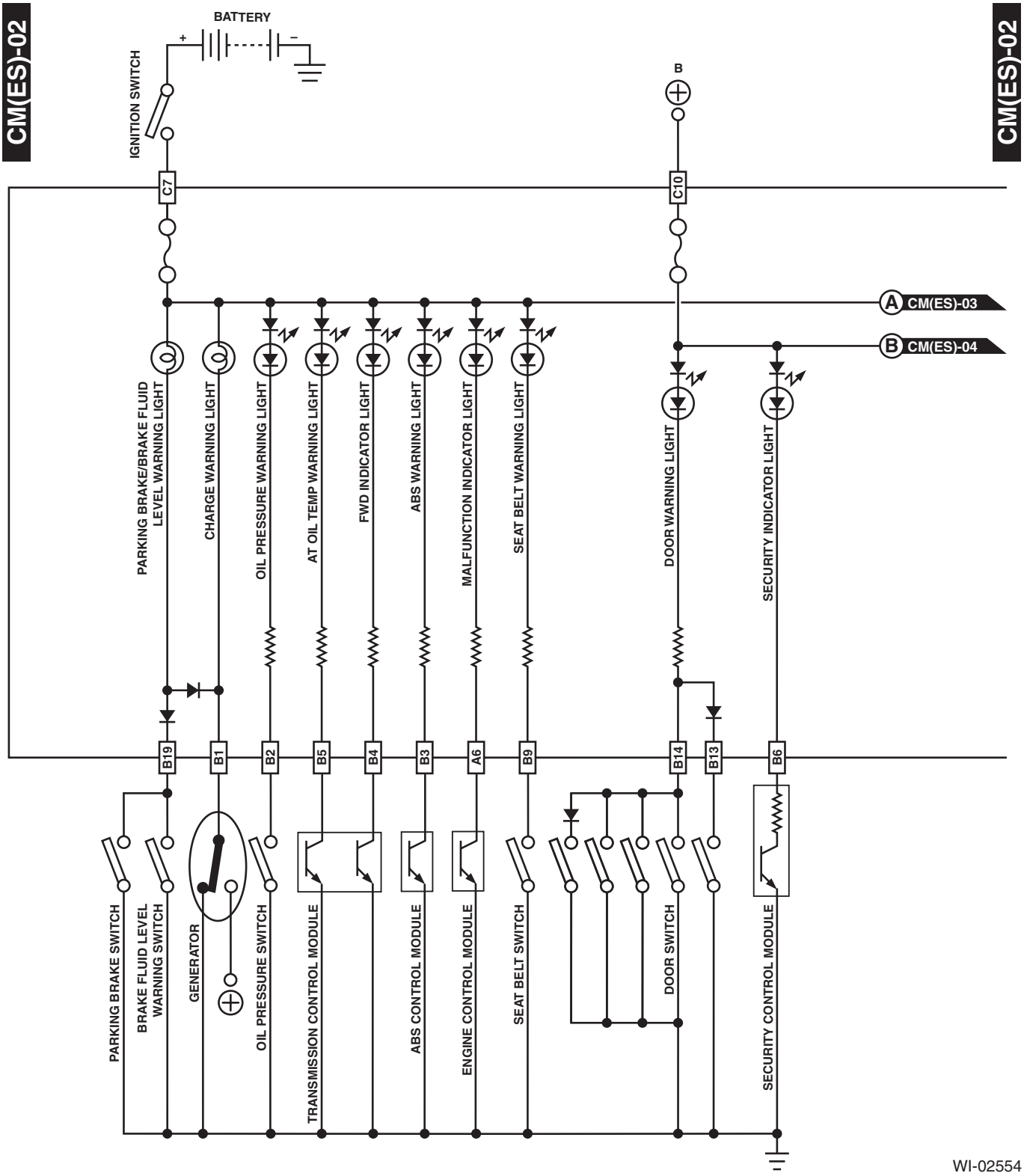
1. EXCEPT FOR STi MODEL

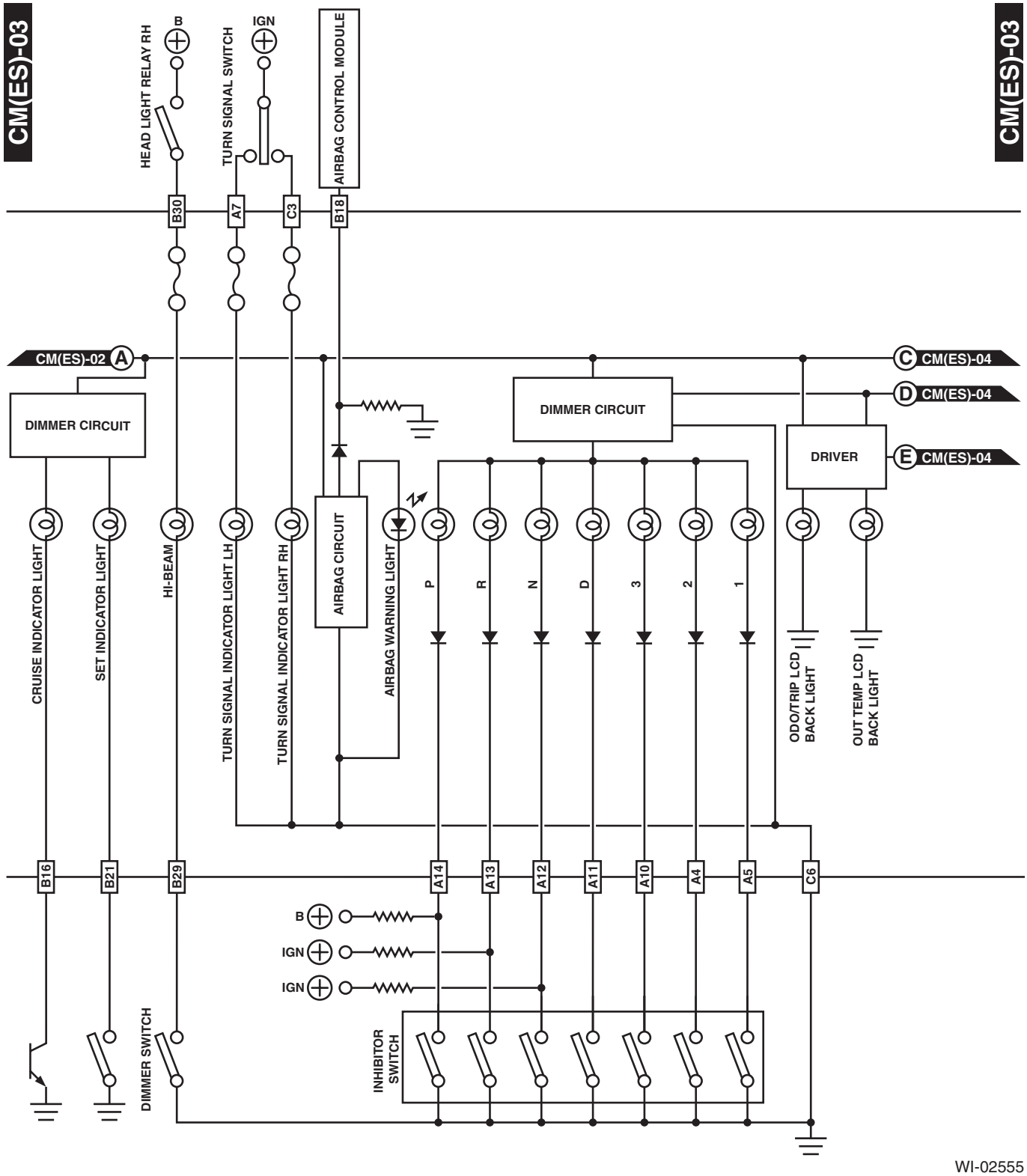
CM(ES)-01

CM(ES)-01

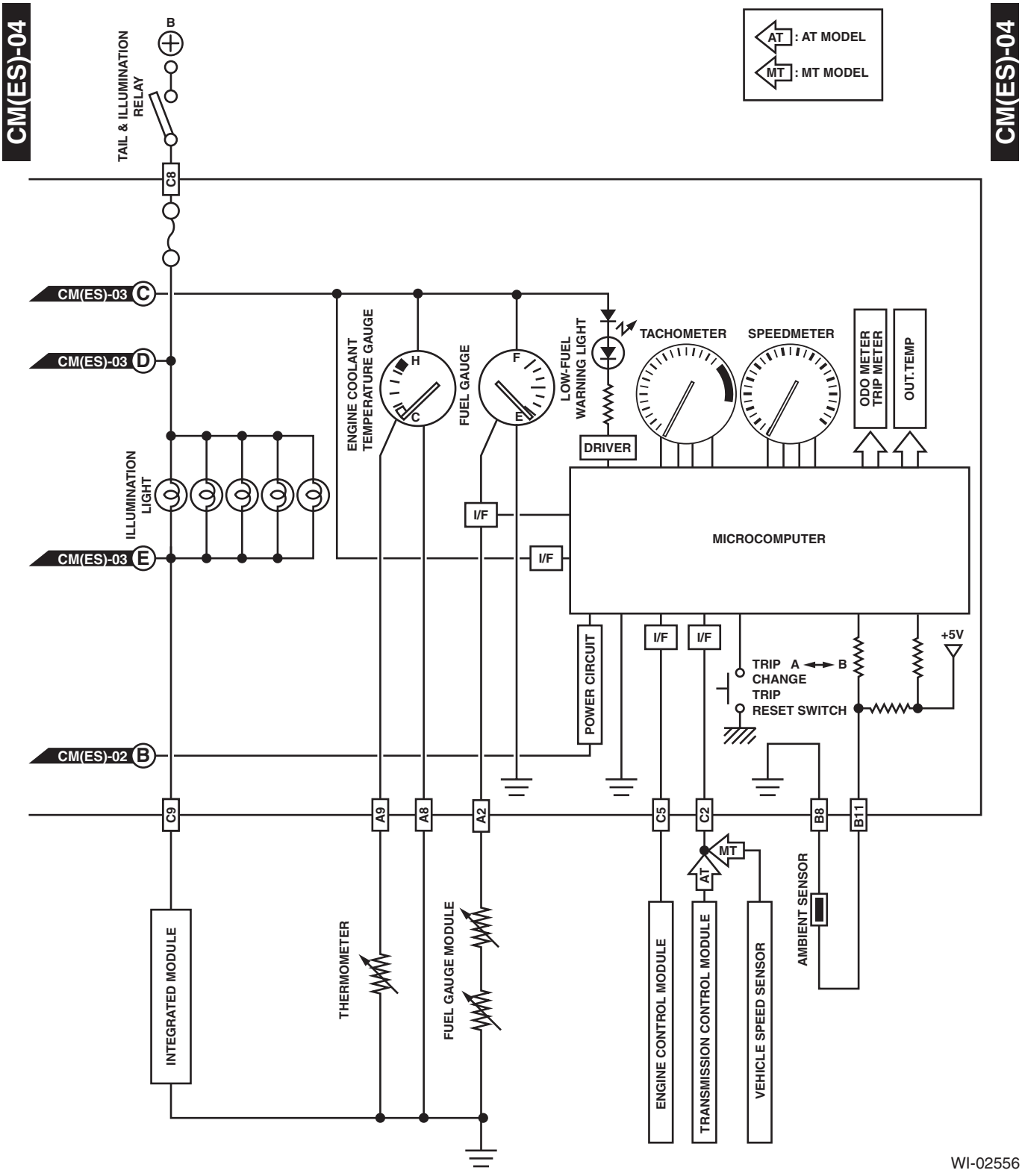


WI-02773


CM(ES)-02
CM(ES)-02
BATTERY
+
–
IGNITION SWITCH
C7
B
C10
A CM(ES)-03
B CM(ES)-04
PARKING BRAKE/BRAKE FLUID LEVEL WARNING LIGHT
CHARGE WARNING LIGHT
OIL PRESSURE WARNING LIGHT
AT OIL TEMP WARNING LIGHT
FWD INDICATOR LIGHT
ABS WARNING LIGHT
MALFUNCTION INDICATOR LIGHT
SEAT BELT WARNING LIGHT
DOOR WARNING LIGHT
SECURITY INDICATOR LIGHT
B19
B1
B2
B5
B4
B3
A6
B9
B14
B13
B6
PARKING BRAKE SWITCH
BRAKE FLUID LEVEL WARNING SWITCH
GENERATOR
OIL PRESSURE SWITCH
TRANSMISSION CONTROL MODULE
ABS CONTROL MODULE
ENGINE CONTROL MODULE
SEAT BELT SWITCH
DOOR SWITCH
SECURITY CONTROL MODULE
WI-02554


CM(ES)-03
CM(ES)-03
HEAD LIGHT RELAY RH
B
IGN
TURN SIGNAL SWITCH
AIRBAG CONTROL MODULE
B30
A7
C3
B18
CM(ES)-02 A
C CM(ES)-04
D CM(ES)-04
E CM(ES)-04
DIMMER CIRCUIT
DIMMER CIRCUIT
DRIVER
CRUISE INDICATOR LIGHT
SET INDICATOR LIGHT
HI-BEAM
TURN SIGNAL INDICATOR LIGHT LH
TURN SIGNAL INDICATOR LIGHT RH
AIRBAG CIRCUIT
AIRBAG WARNING LIGHT
P
R
N
D
3
2
1
ODO/TRIP LCD BACK LIGHT
OUT TEMP LCD BACK LIGHT
B16
B21
B29
A14
A13
A12
A11
A10
A4
A5
C6
B
IGN
IGN
DIMMER SWITCH
INHIBITOR SWITCH

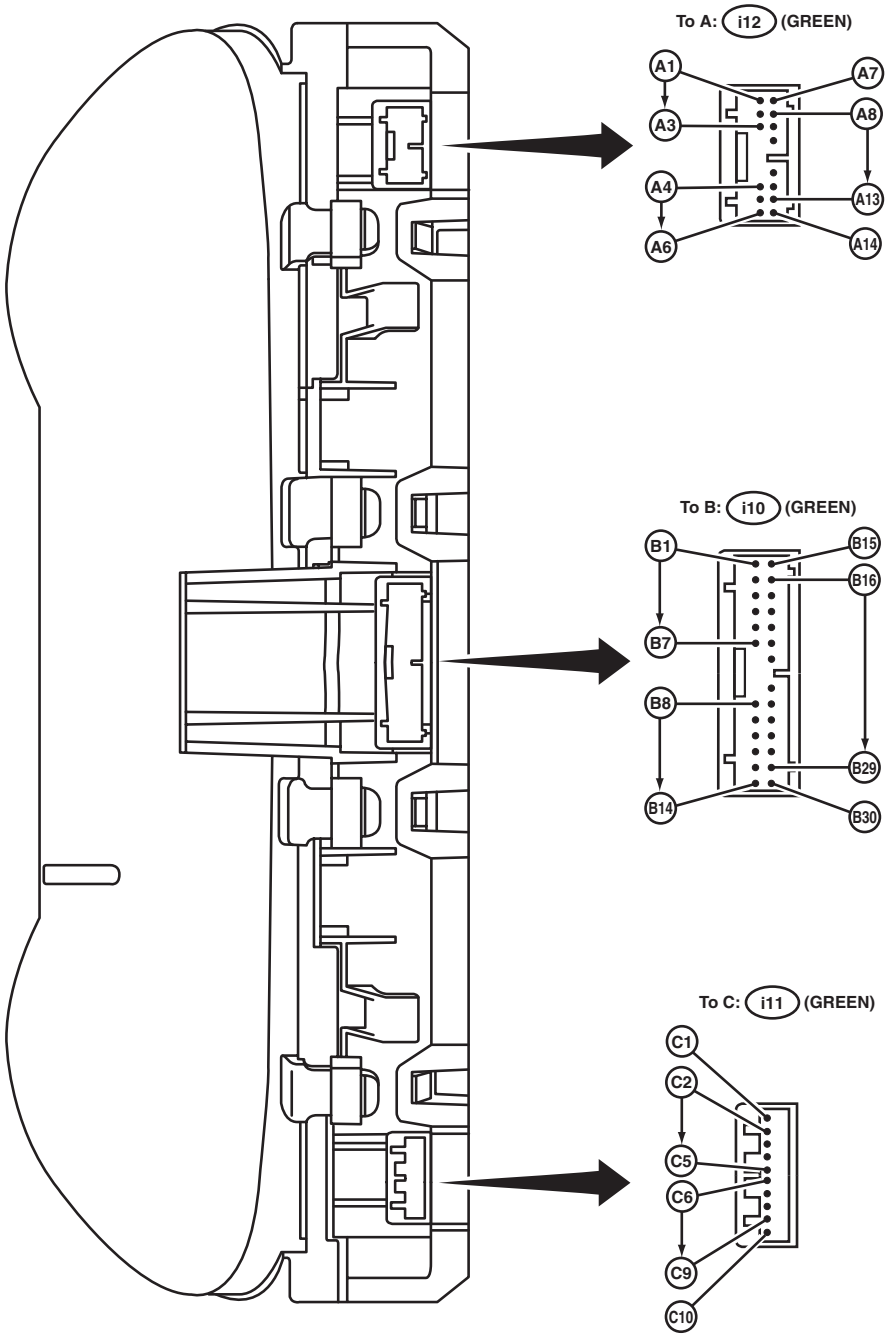
WI-02555


CM(ES)-04
CM(ES)-04
AT : AT MODEL
MT : MT MODEL
B
TAIL & ILLUMINATION RELAY
C8
CM(ES)-03 C
CM(ES)-03 D
CM(ES)-03 E
CM(ES)-02 B
ILLUMINATION LIGHT
ENGINE COOLANT TEMPERATURE GAUGE
H
C
FUEL GAUGE
F
E
LOW-FUEL WARNING LIGHT
DRIVER
TACHOMETER
SPEEDMETER
ODO METER TRIP METER
OUT.TEMP
I/F
I/F
MICROCOMPUTER
POWER CIRCUIT
I/F
I/F
+5V
TRIP A ↔ B CHANGE
TRIP RESET SWITCH
C9
A9
A8
A2
C5
C2
B8
B11
MT
AT
INTEGRATED MODULE
THERMOMETER
FUEL GAUGE MODULE
ENGINE CONTROL MODULE
TRANSMISSION CONTROL MODULE
VEHICLE SPEED SENSOR
AMBIENT SENSOR
WI-02556

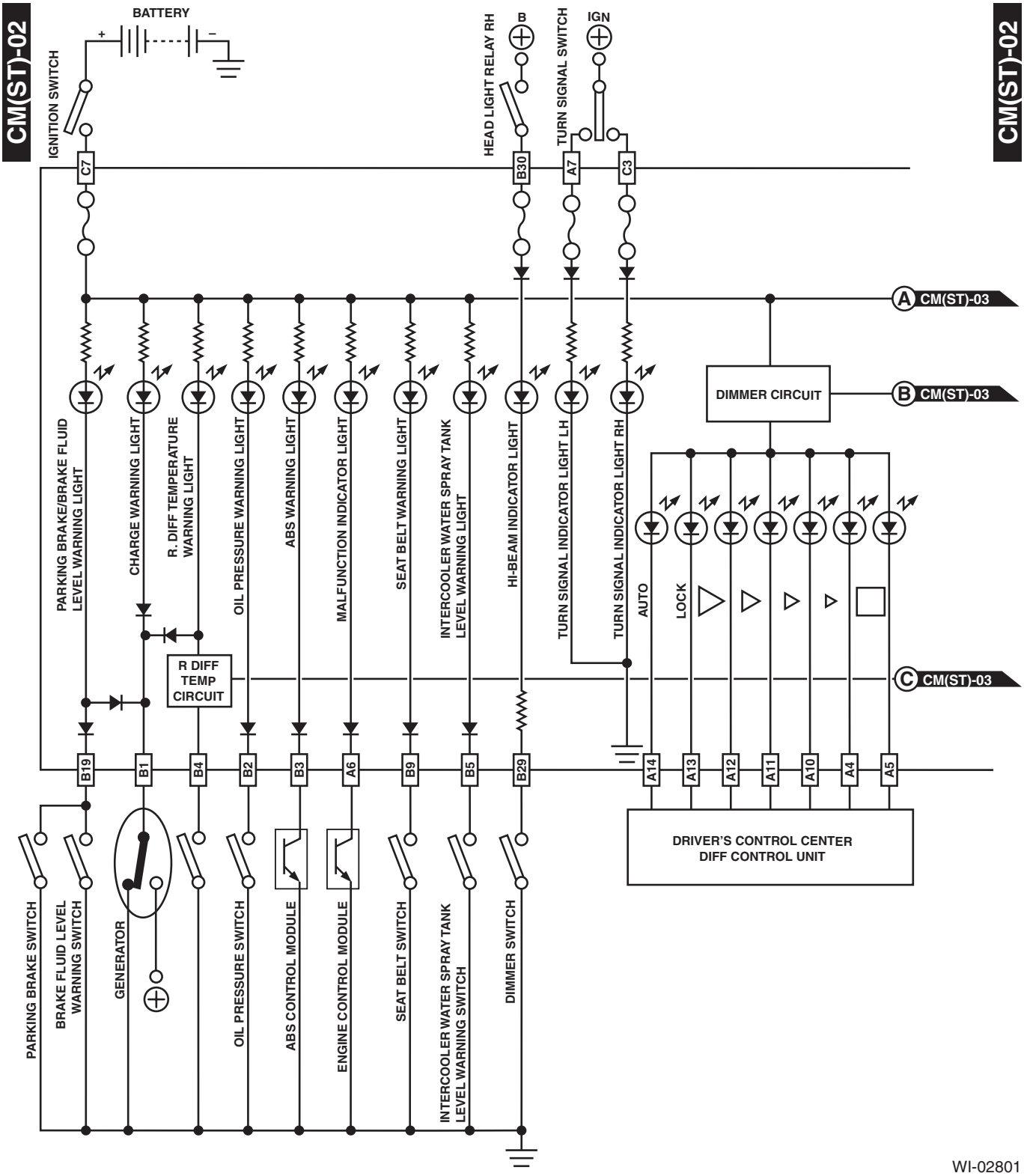
2. STi MODEL

CM(ST)-01

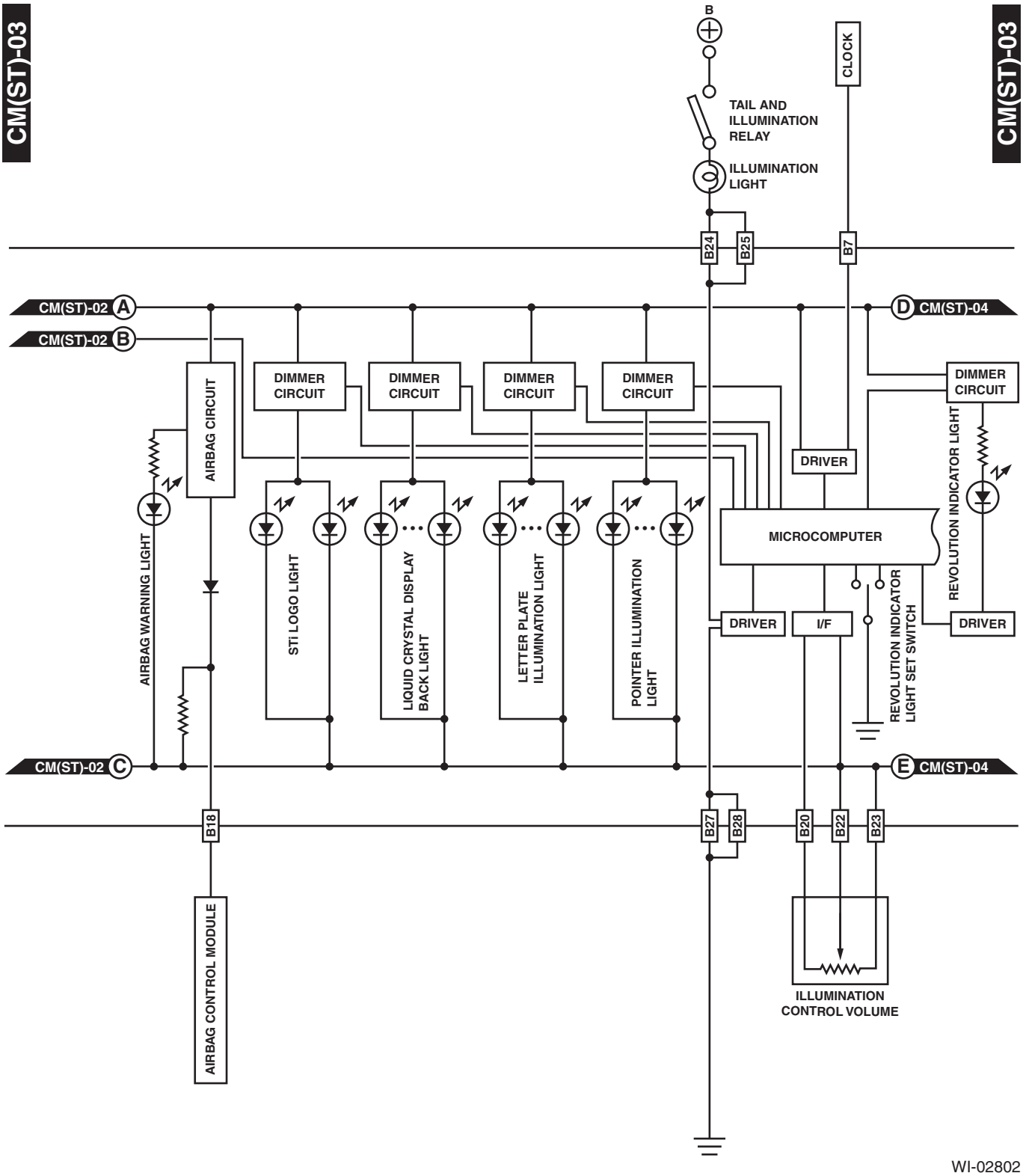
CM(ST)-01



WI-02800

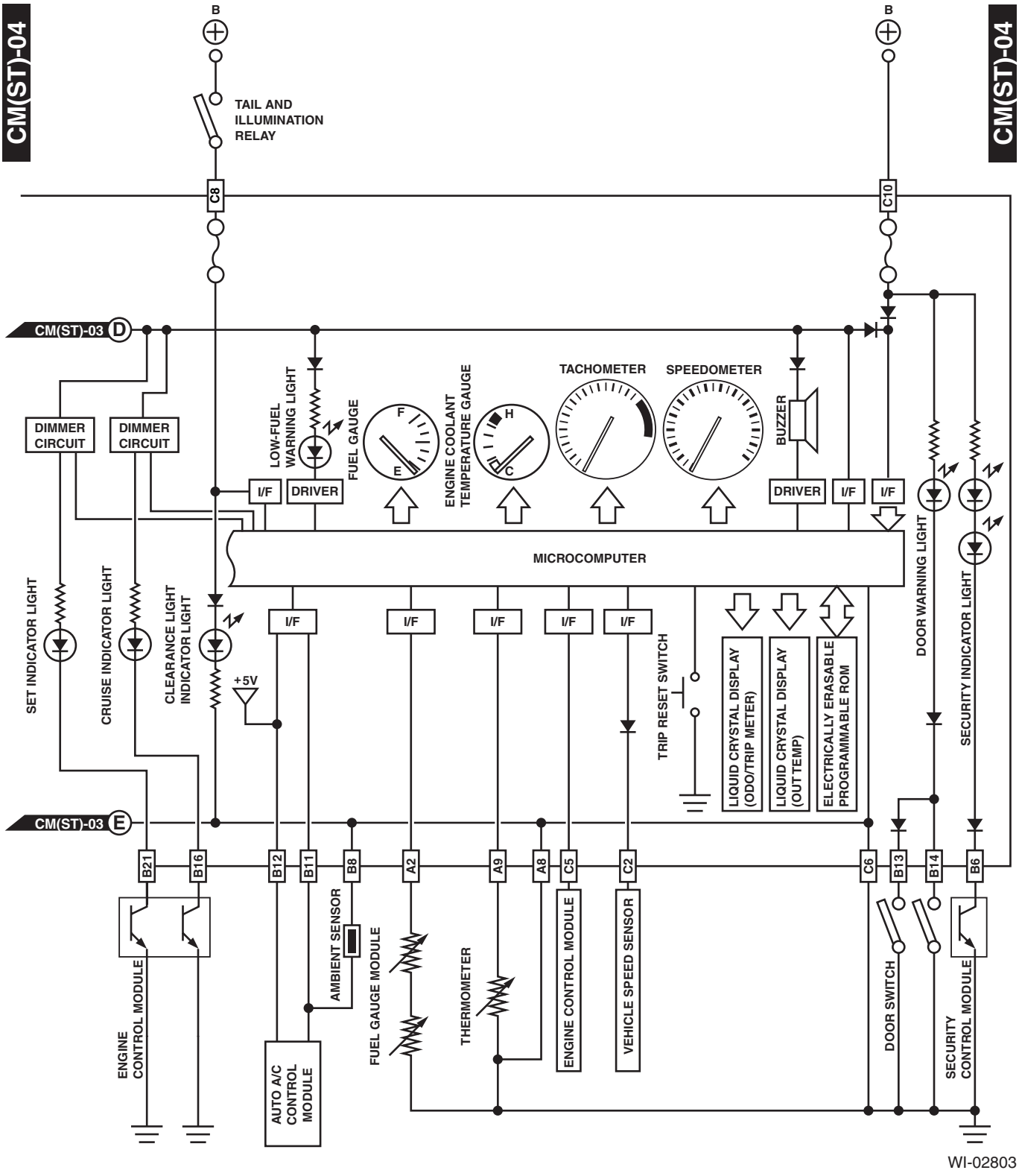

CM(ST)-02
CM(ST)-02
BATTERY
IGNITION SWITCH
HEAD LIGHT RELAY RH
B
IGN
TURN SIGNAL SWITCH
C7
B30
A7
C3
A CM(ST)-03
B CM(ST)-03
C CM(ST)-03
DIMMER CIRCUIT
PARKING BRAKE/BRAKE FLUID LEVEL WARNING LIGHT
CHARGE WARNING LIGHT
R. DIFF TEMPERATURE WARNING LIGHT
OIL PRESSURE WARNING LIGHT
ABS WARNING LIGHT
MALFUNCTION INDICATOR LIGHT
SEAT BELT WARNING LIGHT
INTERCOOLER WATER SPRAY TANK LEVEL WARNING LIGHT
HI-BEAM INDICATOR LIGHT
TURN SIGNAL INDICATOR LIGHT LH
TURN SIGNAL INDICATOR LIGHT RH
AUTO
LOCK
R DIFF TEMP CIRCUIT
B19
B1
B4
B2
B3
A6
B9
B5
B29
A14
A13
A12
A11
A10
A4
A5
DRIVER'S CONTROL CENTER DIFF CONTROL UNIT
PARKING BRAKE SWITCH
BRAKE FLUID LEVEL WARNING SWITCH
GENERATOR
OIL PRESSURE SWITCH
ABS CONTROL MODULE
ENGINE CONTROL MODULE
SEAT BELT SWITCH
INTERCOOLER WATER SPRAY TANK LEVEL WARNING SWITCH
DIMMER SWITCH

WI-02801


CM(ST)-03
CM(ST)-03
B
CLOCK
TAIL AND ILLUMINATION RELAY
ILLUMINATION LIGHT
B24
B25
B7
CM(ST)-02 A
CM(ST)-02 B
D CM(ST)-04
AIRBAG CIRCUIT
DIMMER CIRCUIT
DIMMER CIRCUIT
DIMMER CIRCUIT
DIMMER CIRCUIT
DIMMER CIRCUIT
DRIVER
REVOLUTION INDICATOR LIGHT
AIRBAG WARNING LIGHT
STi LOGO LIGHT
LIQUID CRYSTAL DISPLAY BACK LIGHT
LETTER PLATE ILLUMINATION LIGHT
POINTER ILLUMINATION LIGHT
MICROCOMPUTER
DRIVER
I/F
REVOLUTION INDICATOR LIGHT SET SWITCH
DRIVER
CM(ST)-02 C
E CM(ST)-04
B18
B27
B28
B20
B22
B23
AIRBAG CONTROL MODULE
ILLUMINATION CONTROL VOLUME

WI-02802

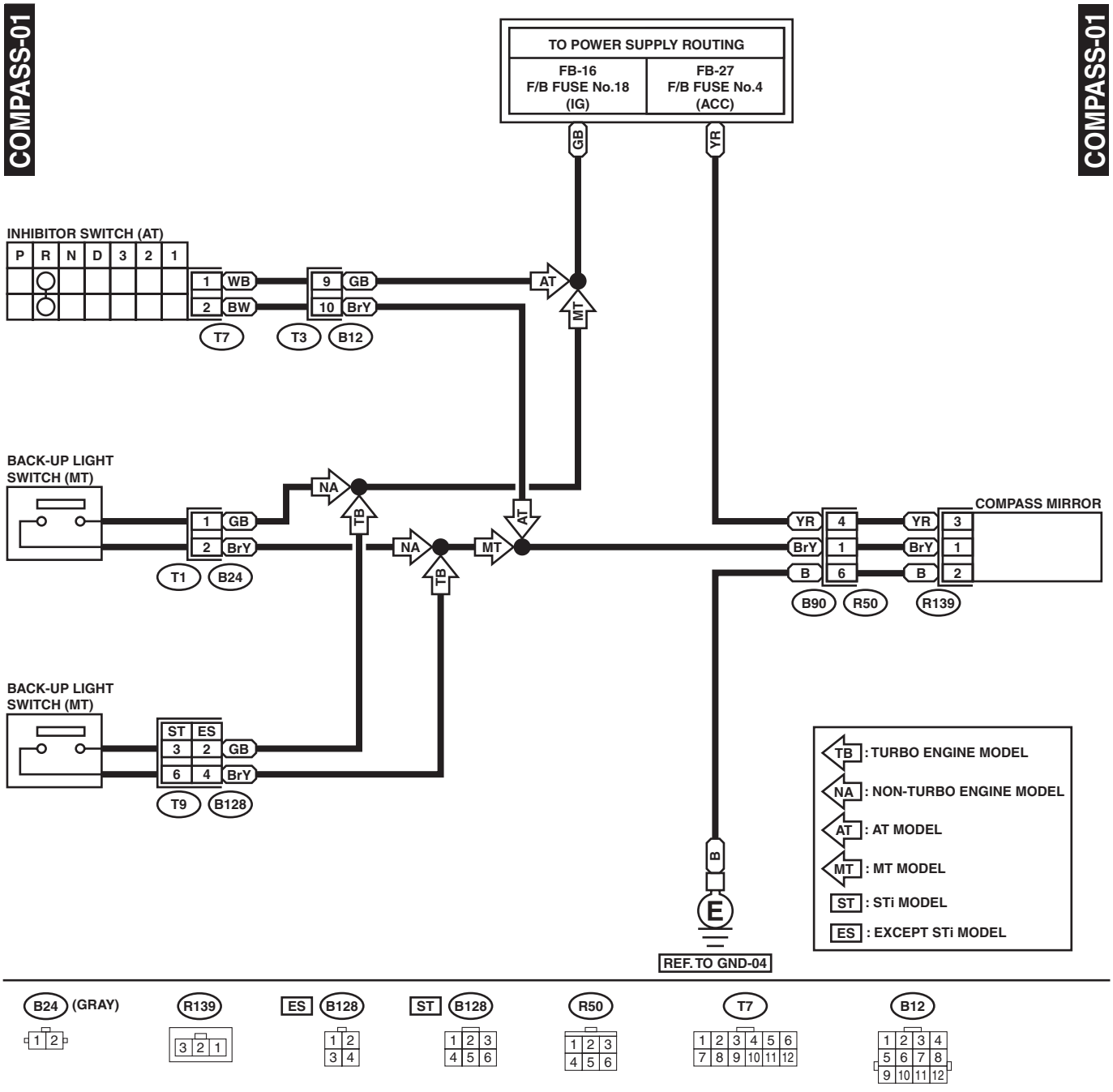
Combination Meter



WI-02803

14.Compass Mirror System

A: WIRING DIAGRAM

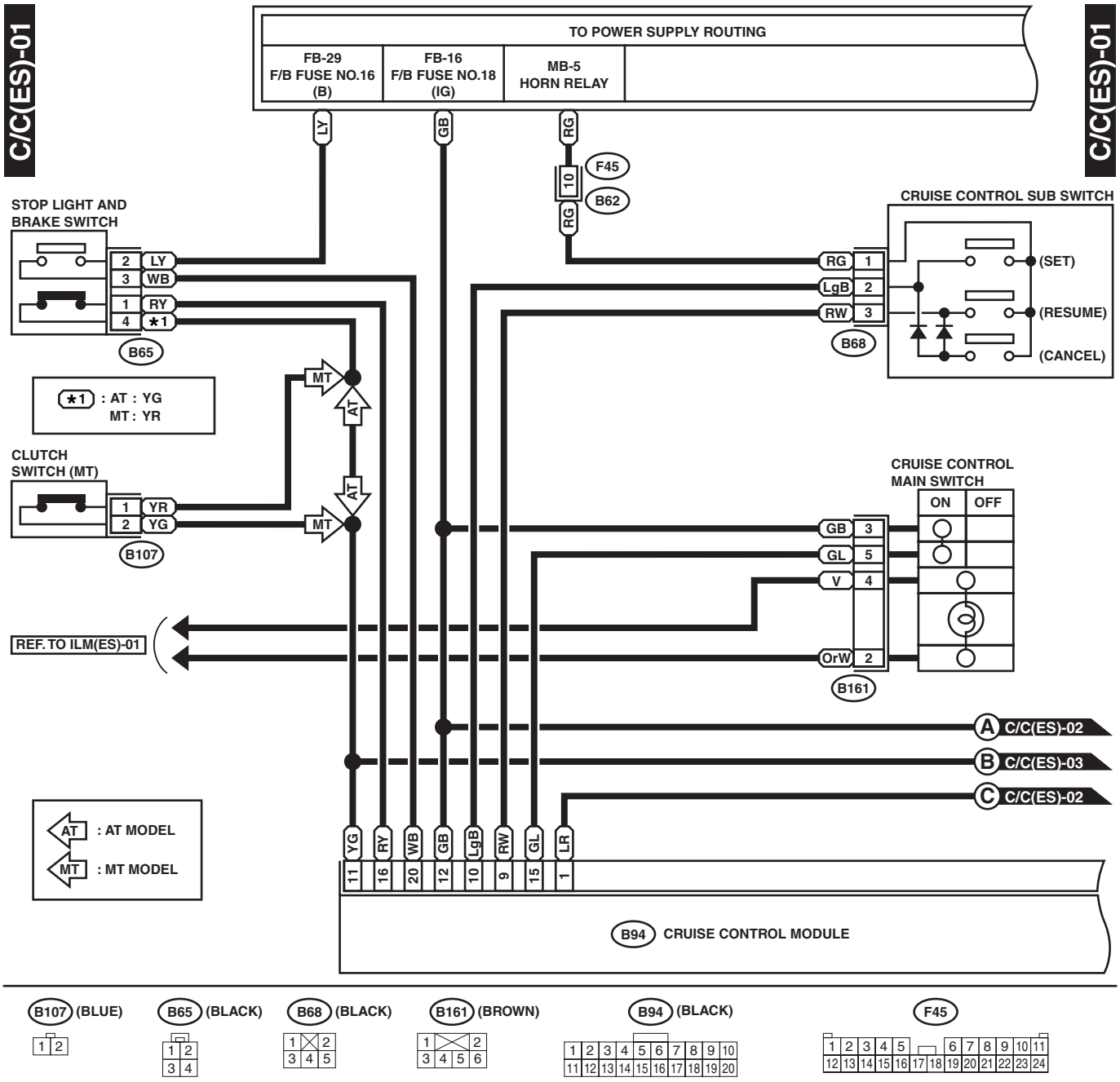


WI-02781

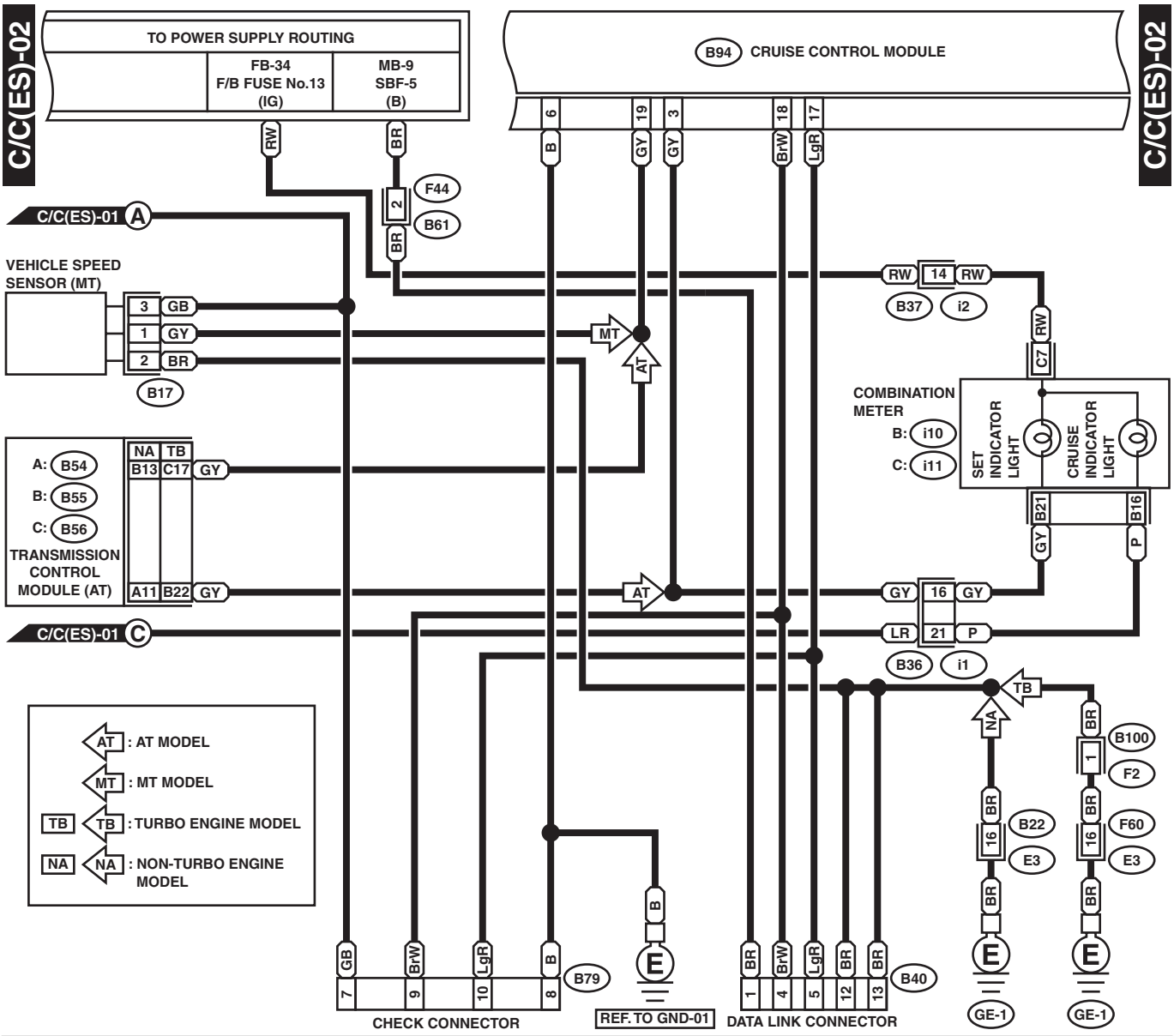
15.Cruise Control System

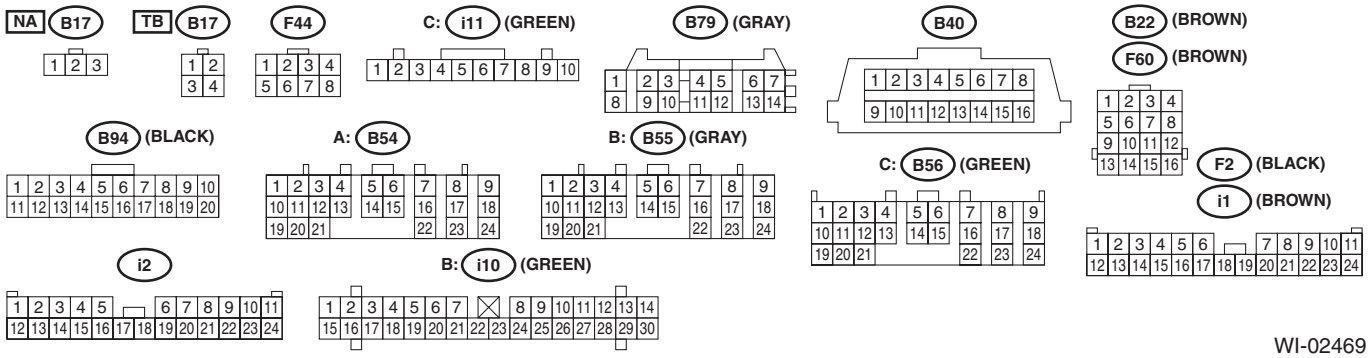
A: WIRING DIAGRAM

1. EXCEPT FOR STi MODEL

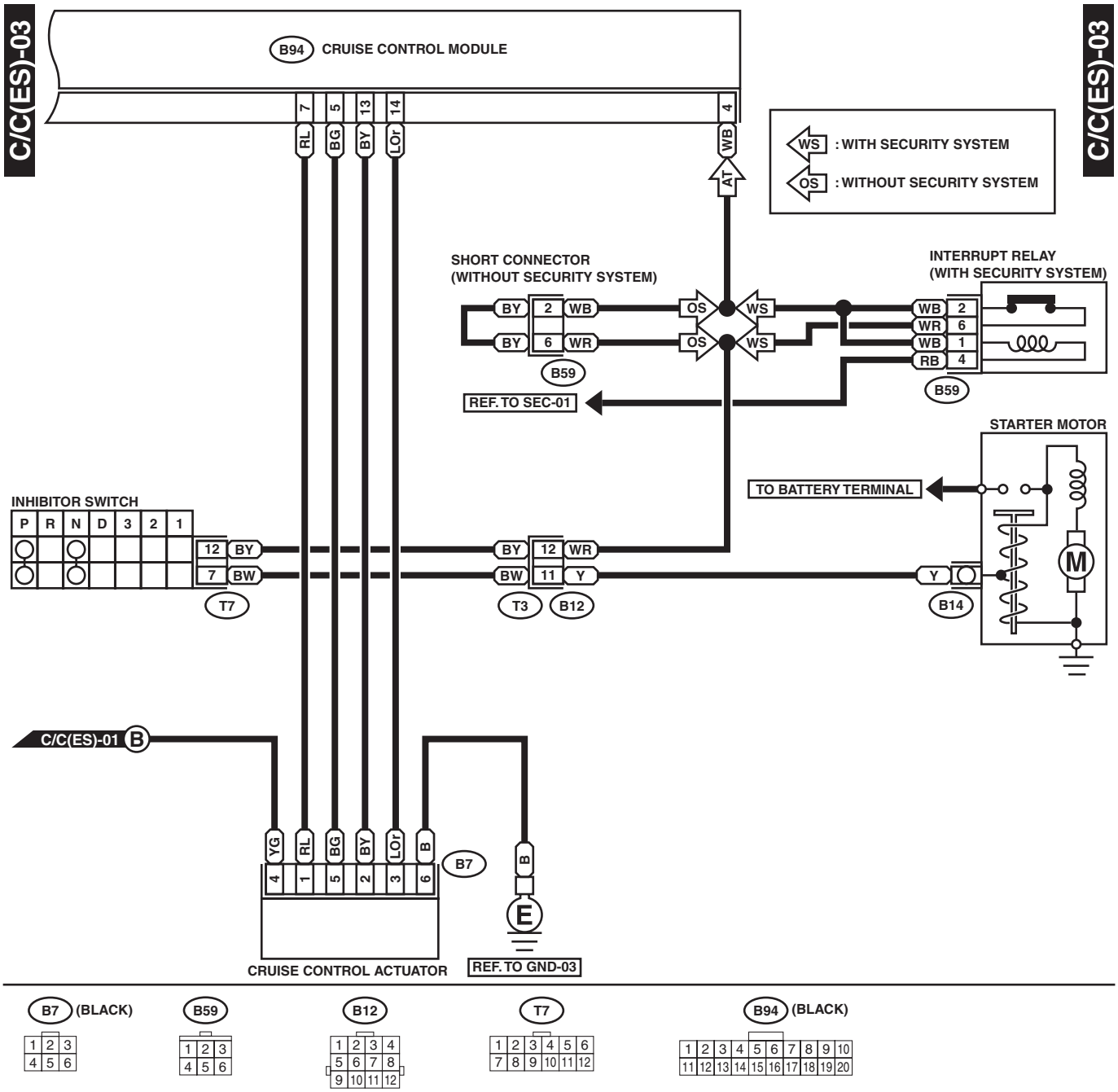


WI-02774


C/C(ES)-02
TO POWER SUPPLY ROUTING
FB-34
F/B FUSE No.13
(IG)
MB-9
SBF-5
(B)
B94 CRUISE CONTROL MODULE
C/C(ES)-02
RW
BR
F44
B61
C/C(ES)-01 A
VEHICLE SPEED SENSOR (MT)
3 GB
1 GY
2 BR
B17
MT
AT
RW 14 RW
B37 i2
C7
COMBINATION METER
B: i10
C: i11
SET INDICATOR LIGHT
CRUISE INDICATOR LIGHT
B21
B16
GY
P
A: B54
B: B55
C: B56
TRANSMISSION CONTROL MODULE (AT)
NA TB
B13 C17 GY
A11 B22 GY
GY 16 GY
C/C(ES)-01 C
LR 21 P
B36 i1
AT : AT MODEL
MT : MT MODEL
TB : TURBO ENGINE MODEL
NA : NON-TURBO ENGINE MODEL
B100
F2
B22
E3
F60
E3
GE-1
GE-1
CHECK CONNECTOR
B79
REF. TO GND-01
DATA LINK CONNECTOR
B40


NA B17
TB B17
F44
C: i11 (GREEN)
B79 (GRAY)
B40
B22 (BROWN)
F60 (BROWN)
B94 (BLACK)
A: B54
B: B55 (GRAY)
C: B56 (GREEN)
F2 (BLACK)
i1 (BROWN)
i2
B: i10 (GREEN)

WI-02469



B7 (BLACK)

1	2	3
4	5	6

B59

1	2	3
4	5	6

B12

1	2	3	4	
5	6	7	8	
9	10	11	12	

T7

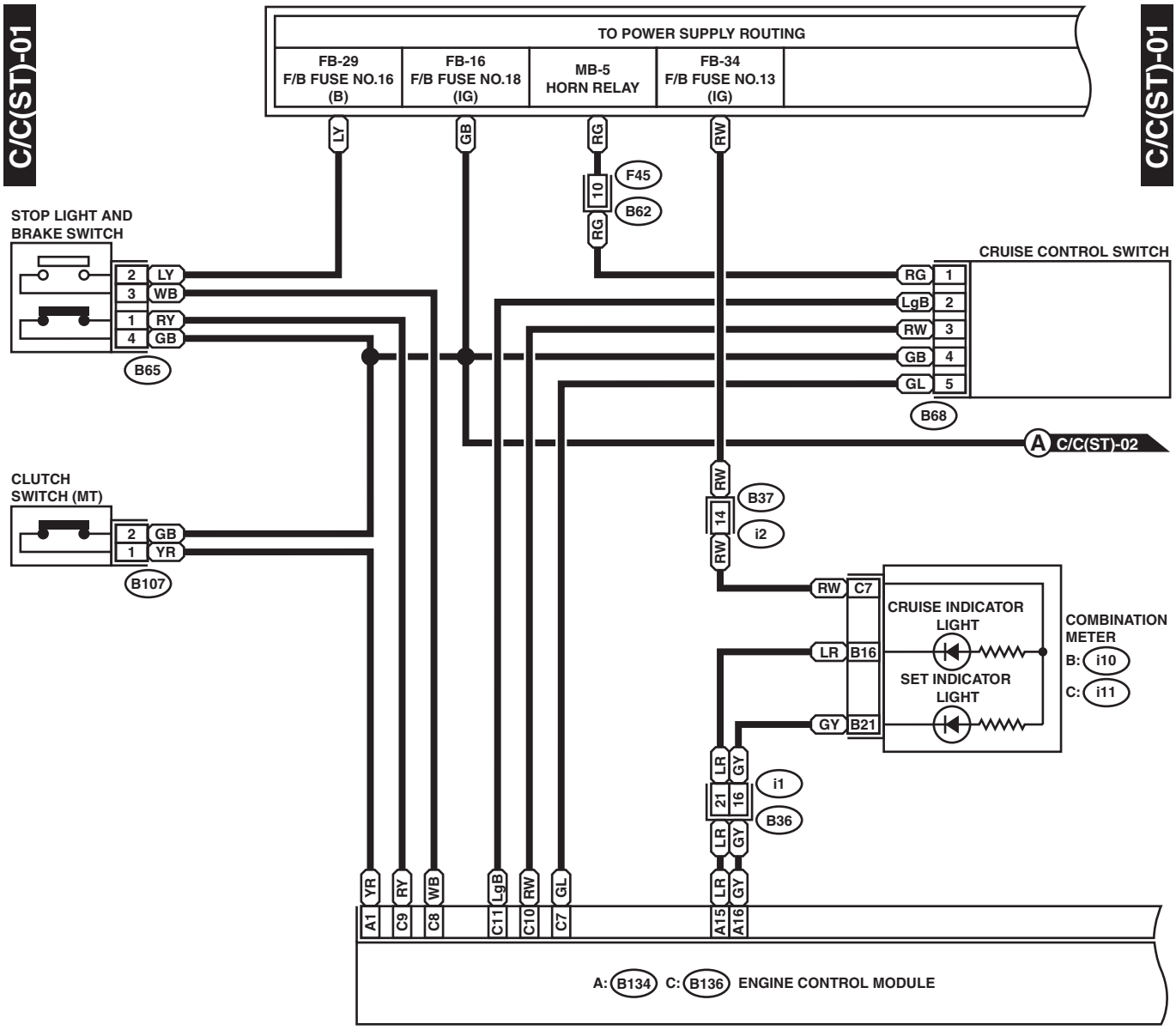
1	2	3	4	5	6	
7	8	9	10	11	12	

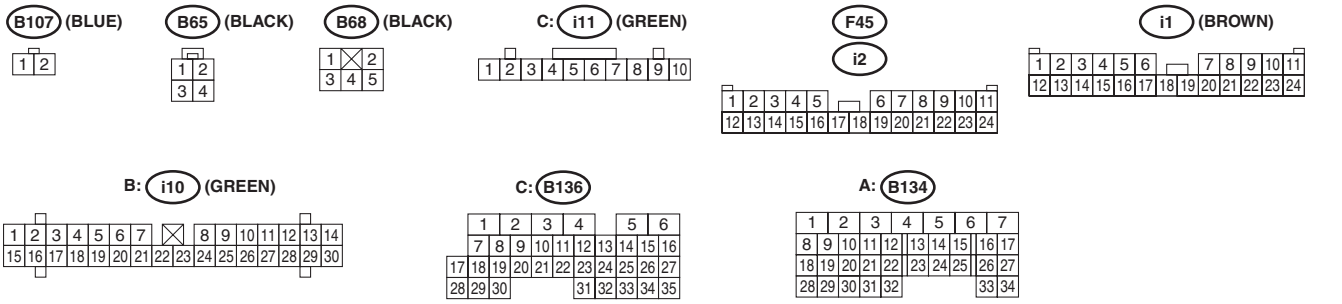
B94 (BLACK)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

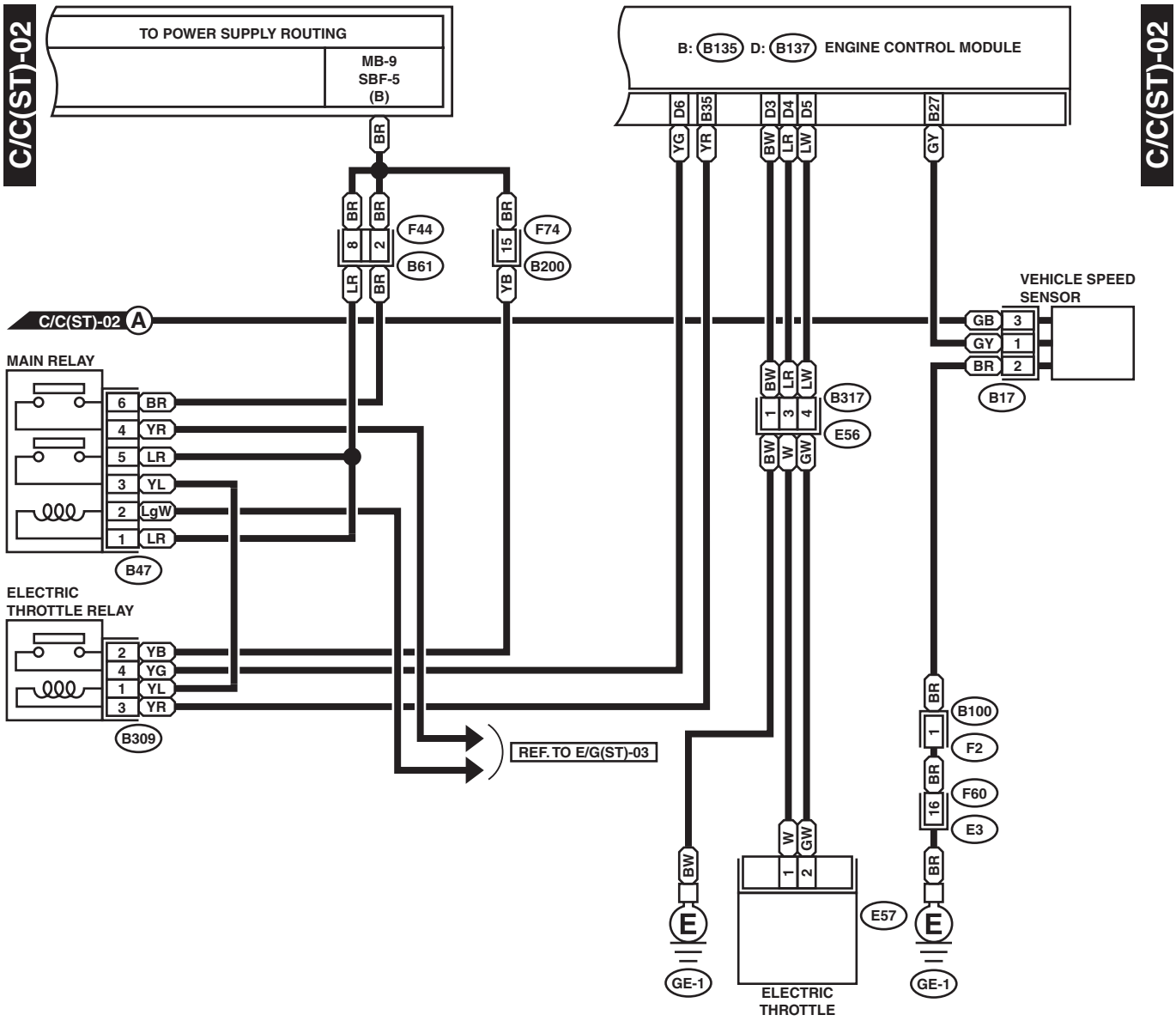
WI-02782

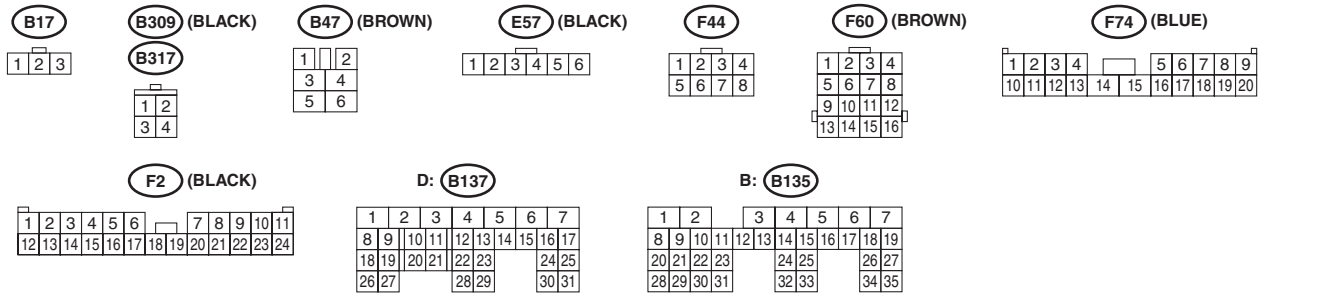
2. STi MODEL





WI-02804

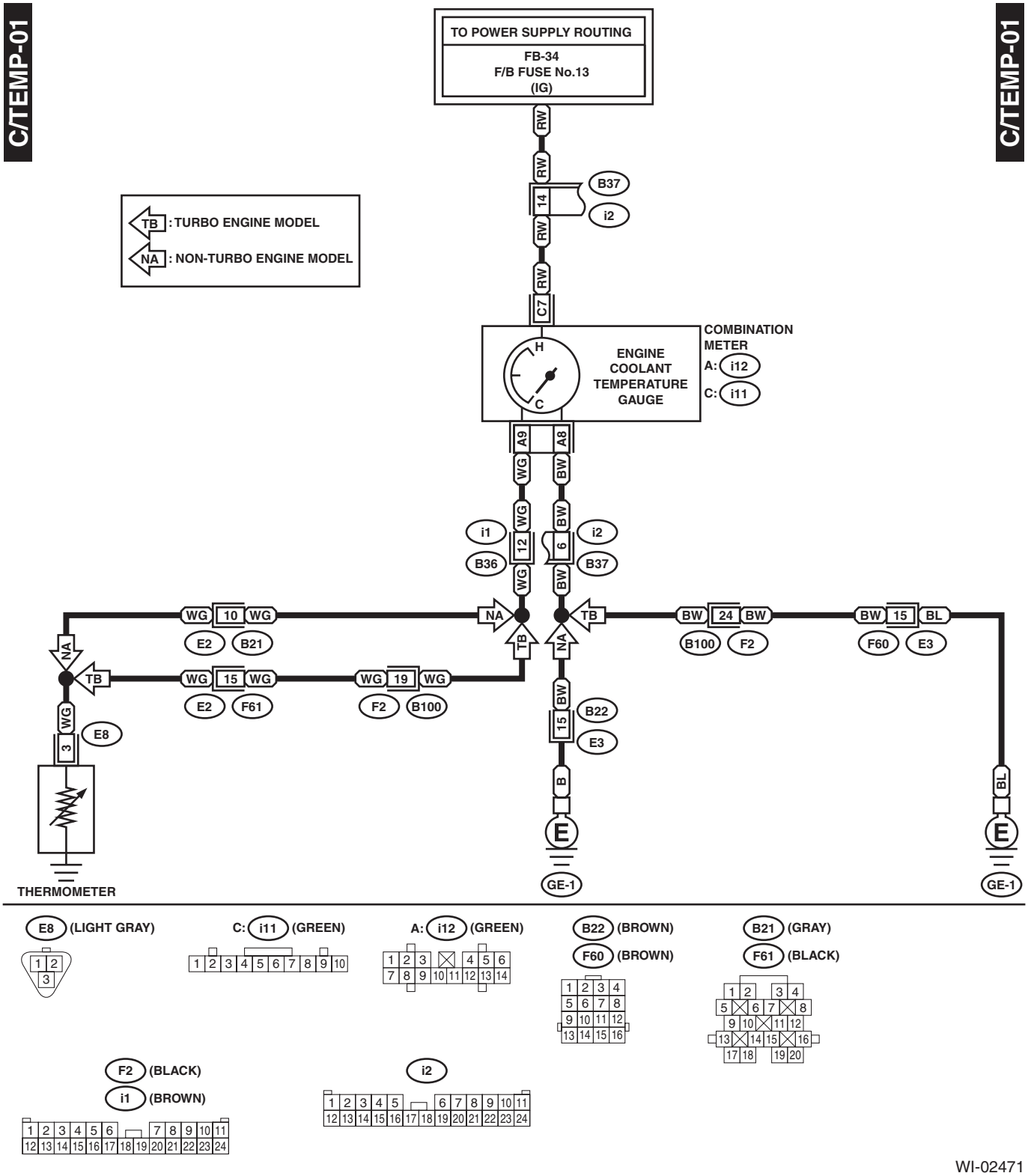

C/C(ST)-02
TO POWER SUPPLY ROUTING
MB-9
SBF-5
(B)
B: B135 D: B137 ENGINE CONTROL MODULE
D6
B35
D3
D4
D5
B27
YG
YR
BW
LR
LW
GY
BR
F44
B61
F74
B200
15
YB
C/C(ST)-02 A
VEHICLE SPEED SENSOR
GB
GY
BR
B17
MAIN RELAY
6 BR
4 YR
5 LR
3 YL
2 LgW
1 LR
B47
B317
E56
W
GW
ELECTRIC THROTTLE RELAY
2 YB
4 YG
1 YL
3 YR
B309
REF. TO E/G(ST)-03
B100
F2
F60
E3
E57
E
GE-1
ELECTRIC THROTTLE


B17
B309 (BLACK)
B317
B47 (BROWN)
E57 (BLACK)
F44
F60 (BROWN)
F74 (BLUE)
F2 (BLACK)
D: B137
B: B135

WI-02805

16.Engine Coolant Temperature Gauge System

A: WIRING DIAGRAM

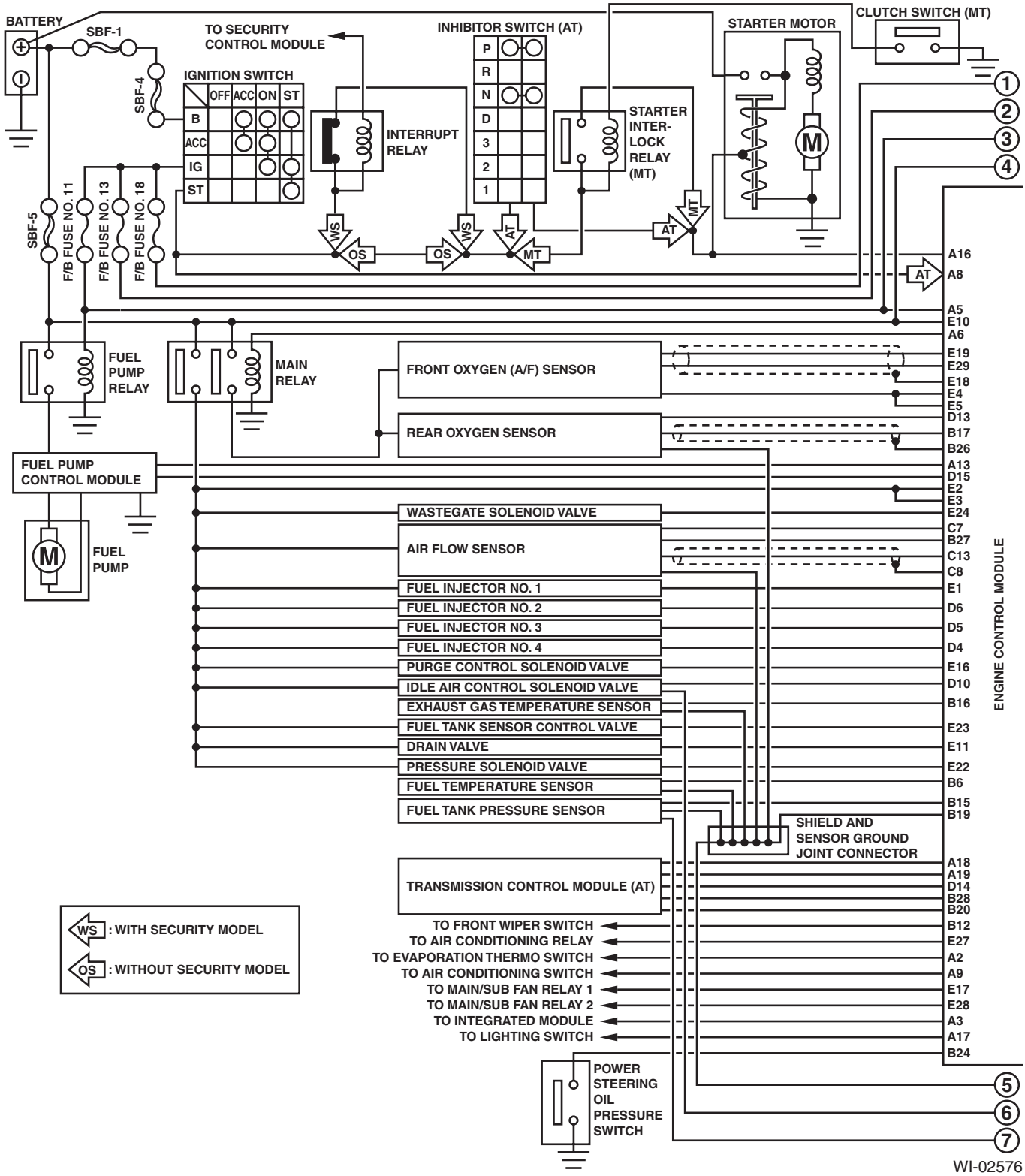


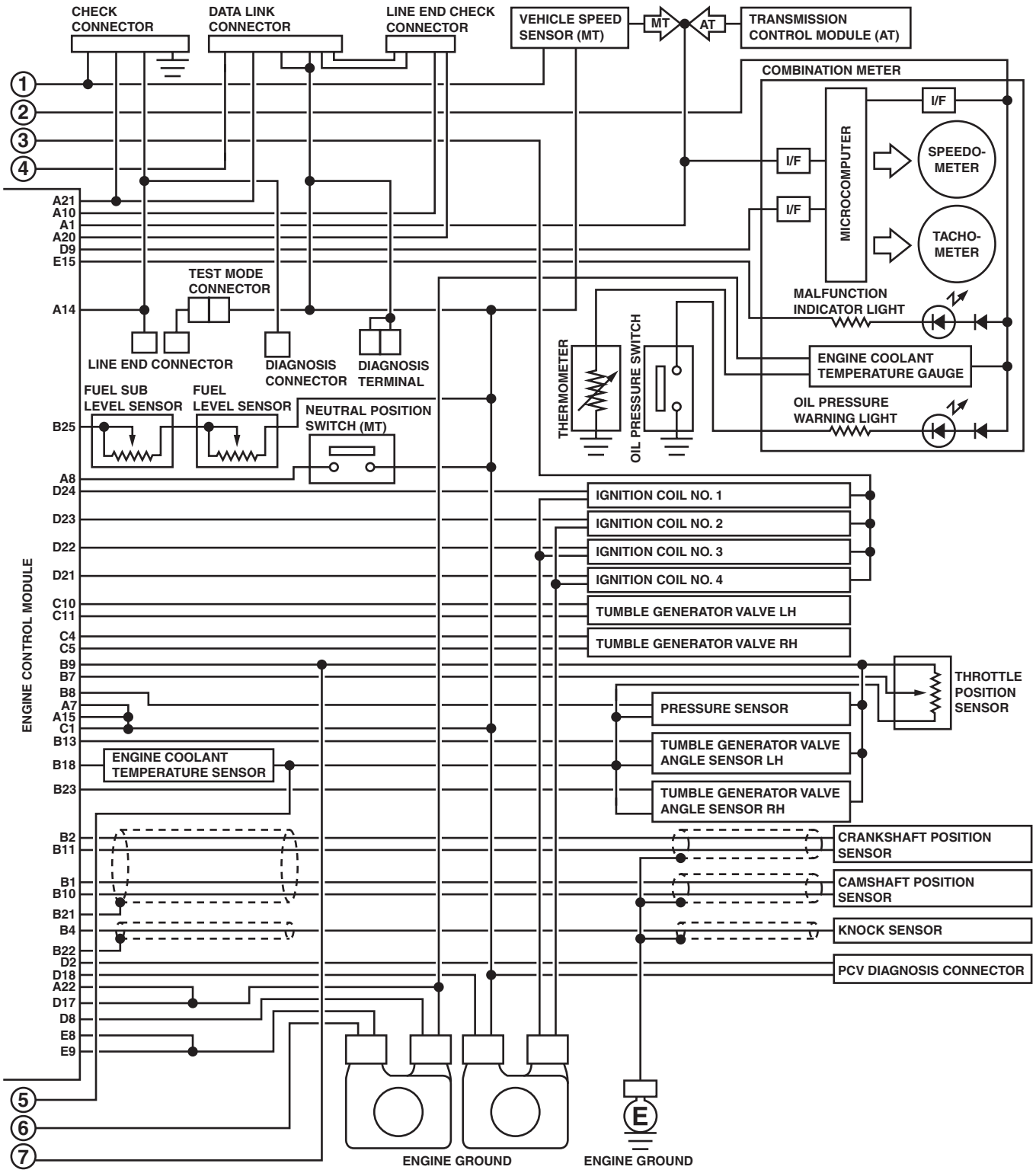
WI-02471

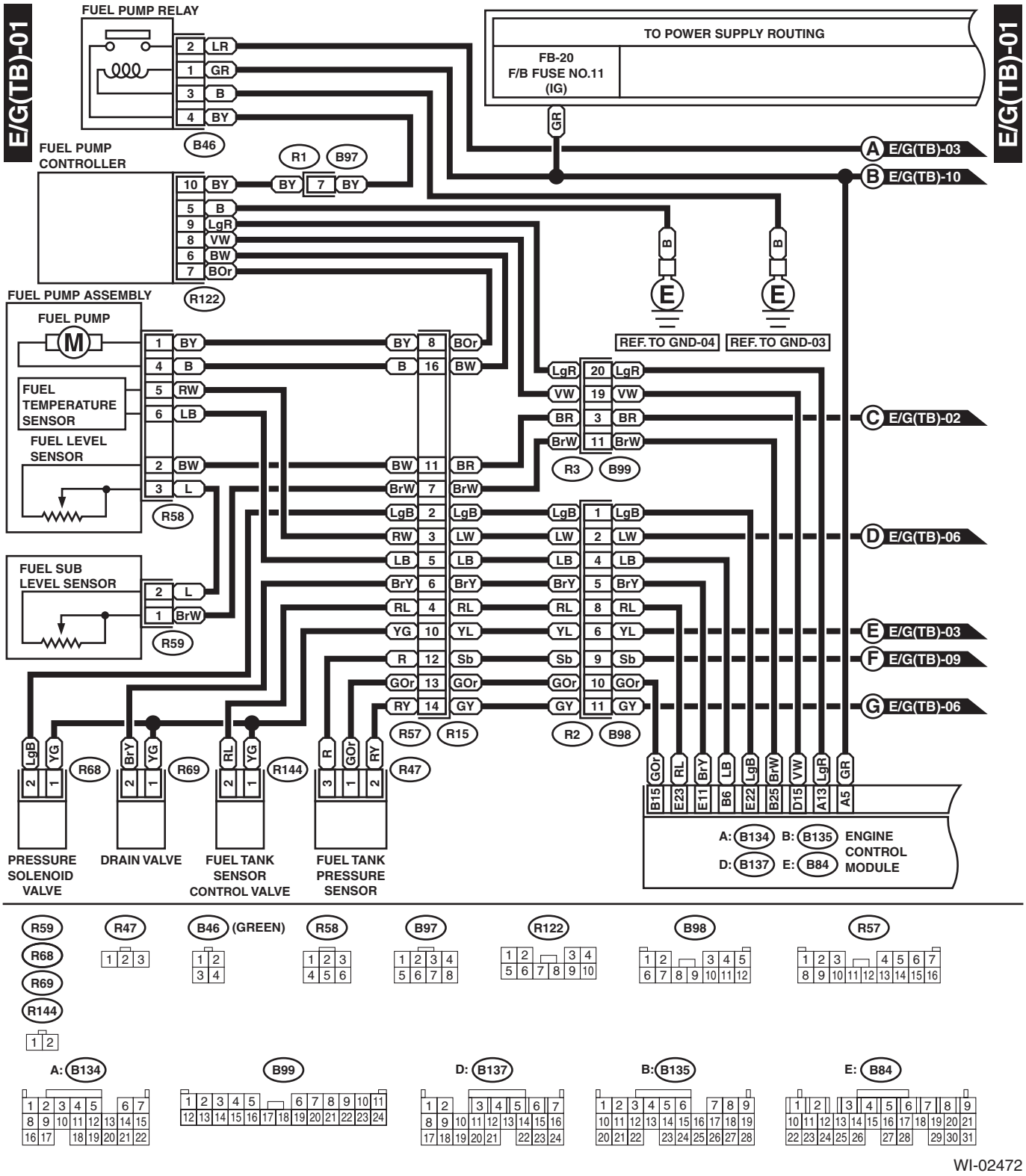
17.Engine Electrical System

A: WIRING DIAGRAM

1. TURBO MODEL

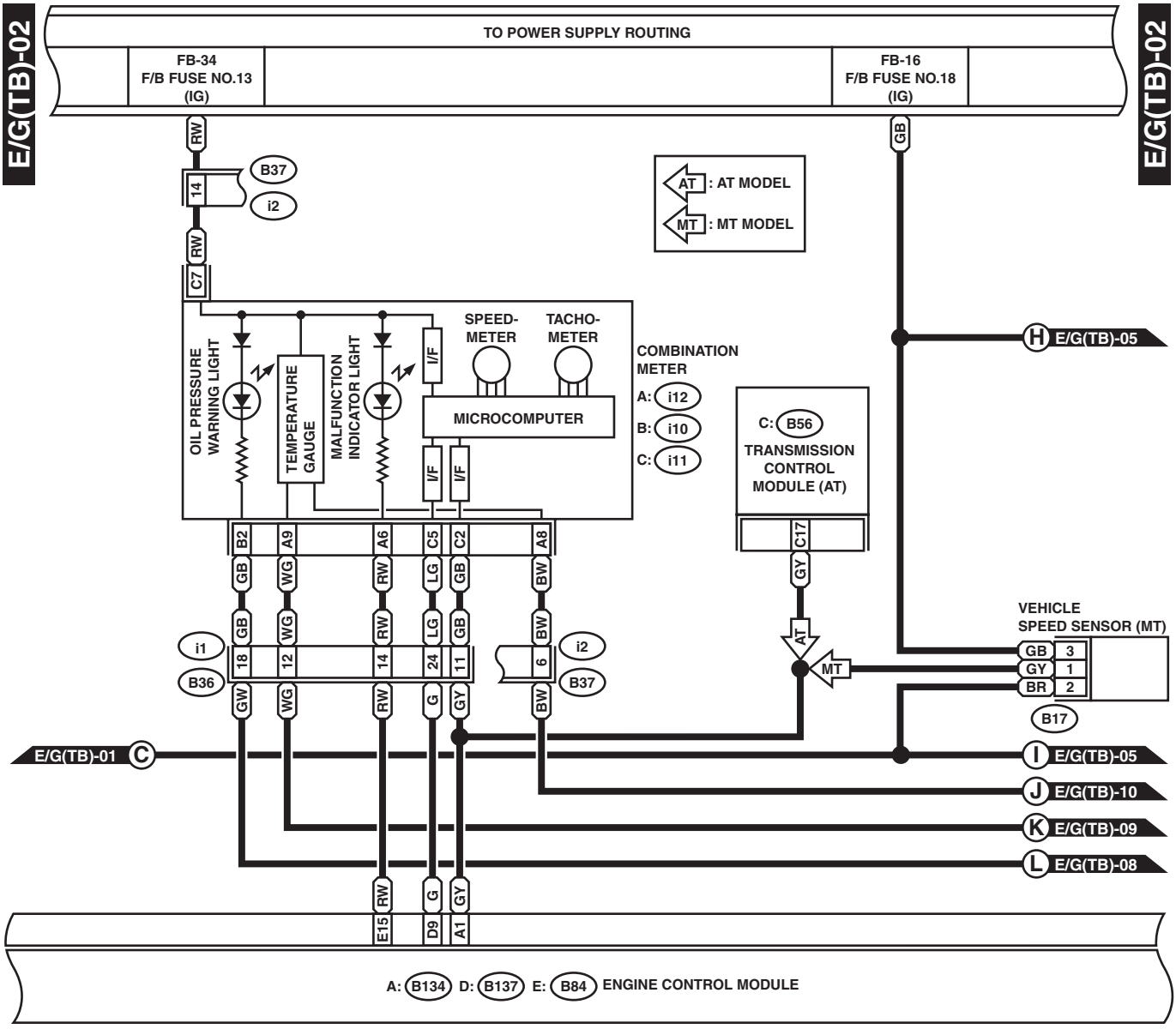


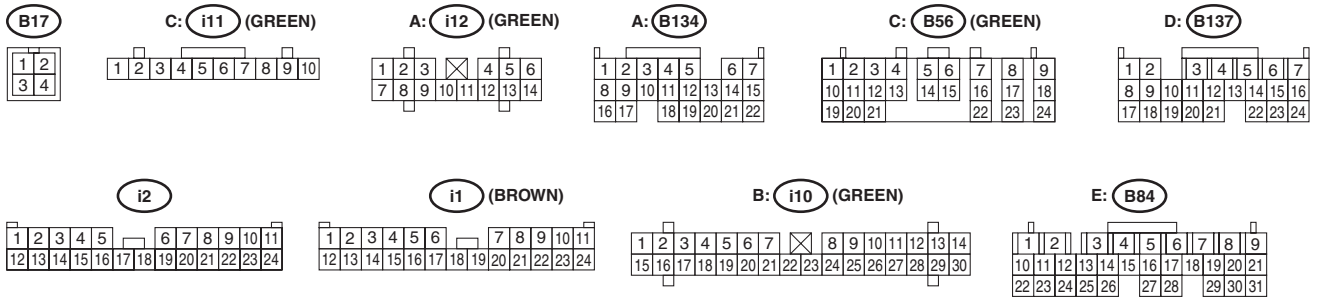

CHECK CONNECTOR
DATA LINK CONNECTOR
LINE END CHECK CONNECTOR
VEHICLE SPEED SENSOR (MT)
MT
AT
TRANSMISSION CONTROL MODULE (AT)
COMBINATION METER
I/F
MICROCOMPUTER
SPEEDO-METER
TACHO-METER
MALFUNCTION INDICATOR LIGHT
ENGINE COOLANT TEMPERATURE GAUGE
OIL PRESSURE WARNING LIGHT
THERMOMETER
OIL PRESSURE SWITCH
TEST MODE CONNECTOR
LINE END CONNECTOR
DIAGNOSIS CONNECTOR
DIAGNOSIS TERMINAL
FUEL SUB LEVEL SENSOR
FUEL LEVEL SENSOR
NEUTRAL POSITION SWITCH (MT)
ENGINE CONTROL MODULE
IGNITION COIL NO. 1
IGNITION COIL NO. 2
IGNITION COIL NO. 3
IGNITION COIL NO. 4
TUMBLE GENERATOR VALVE LH
TUMBLE GENERATOR VALVE RH
THROTTLE POSITION SENSOR
PRESSURE SENSOR
TUMBLE GENERATOR VALVE ANGLE SENSOR LH
TUMBLE GENERATOR VALVE ANGLE SENSOR RH
ENGINE COOLANT TEMPERATURE SENSOR
CRANKSHAFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
KNOCK SENSOR
PCV DIAGNOSIS CONNECTOR
ENGINE GROUND
ENGINE GROUND
WI-02577


E/G(TB)-01
FUEL PUMP RELAY
TO POWER SUPPLY ROUTING
FB-20
F/B FUSE NO.11
(IG)
B46
FUEL PUMP
CONTROLLER
R1
B97
R122
FUEL PUMP ASSEMBLY
FUEL PUMP
FUEL
TEMPERATURE
SENSOR
FUEL LEVEL
SENSOR
R58
FUEL SUB
LEVEL SENSOR
R59
REF. TO GND-04
REF. TO GND-03
A E/G(TB)-03
B E/G(TB)-10
C E/G(TB)-02
D E/G(TB)-06
E E/G(TB)-03
F E/G(TB)-09
G E/G(TB)-06
R3
B99
R57
R15
R2
B98
R68
R69
R144
R47
PRESSURE
SOLENOID
VALVE
DRAIN VALVE
FUEL TANK
SENSOR
CONTROL VALVE
FUEL TANK
PRESSURE
SENSOR
A: B134
B: B135
D: B137
E: B84
ENGINE
CONTROL
MODULE

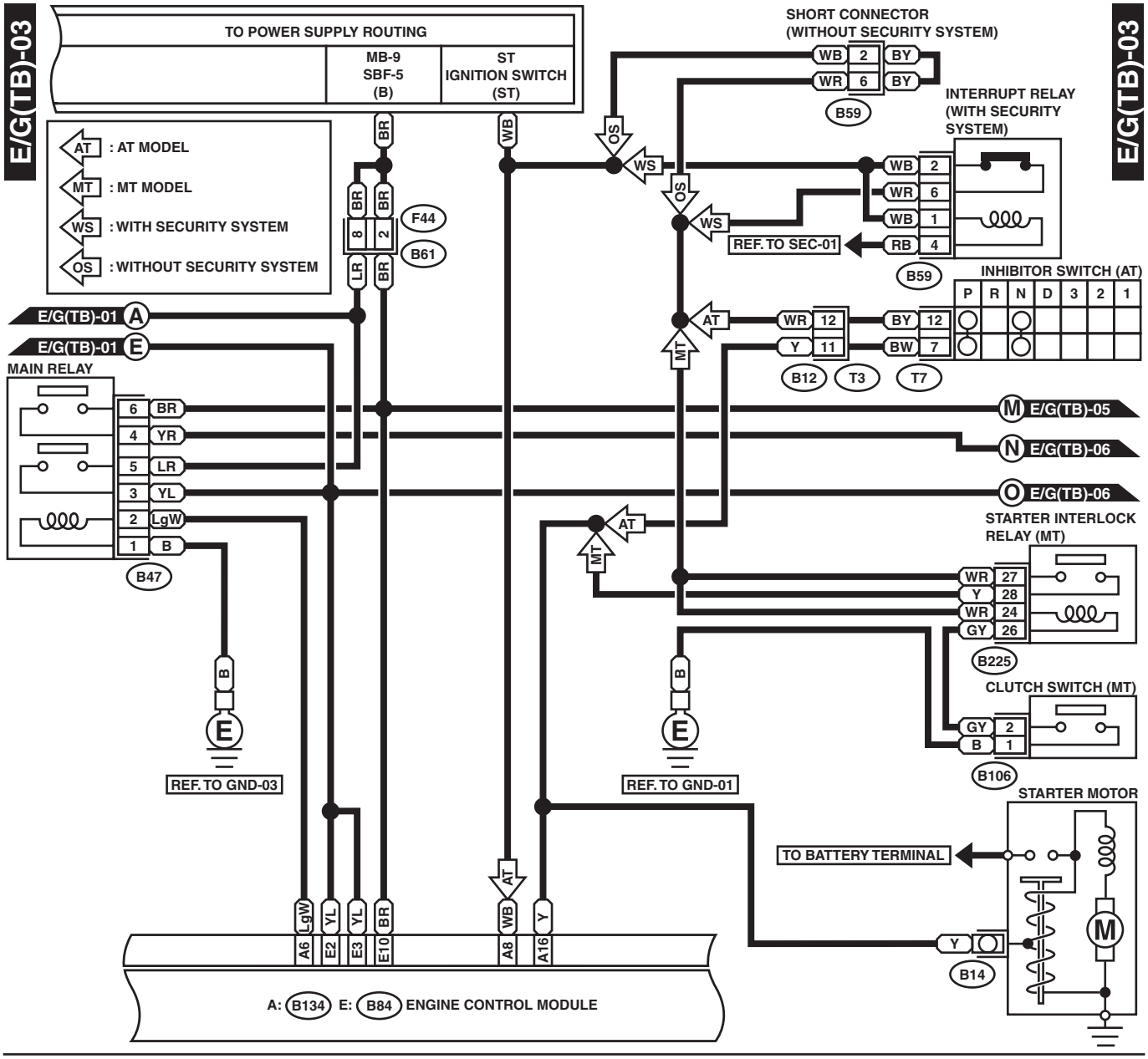
R59
R68
R69
R144
R47
B46 (GREEN)
R58
B97
R122
B98
R57
A: B134
B99
D: B137
B: B135
E: B84

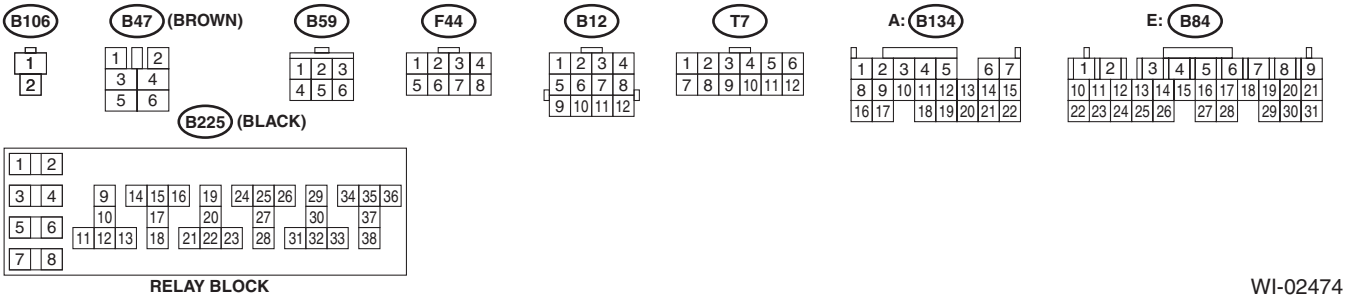
WI-02472


E/G(TB)-02
TO POWER SUPPLY ROUTING
FB-34
F/B FUSE NO.13
(IG)
FB-16
F/B FUSE NO.18
(IG)
E/G(TB)-02
AT : AT MODEL
MT : MT MODEL
B37
i2
C7
OIL PRESSURE WARNING LIGHT
TEMPERATURE GAUGE
MALFUNCTION INDICATOR LIGHT
I/F
SPEED-METER
TACHO-METER
MICROCOMPUTER
COMBINATION METER
A: i12
B: i10
C: i11
C: B56
TRANSMISSION CONTROL MODULE (AT)
C17
H E/G(TB)-05
VEHICLE SPEED SENSOR (MT)
GB 3
GY 1
BR 2
B17
i1
B36
i2
B37
E/G(TB)-01 C
I E/G(TB)-05
J E/G(TB)-10
K E/G(TB)-09
L E/G(TB)-08
E15
D9
A1
A: B134 D: B137 E: B84 ENGINE CONTROL MODULE


B17
C: i11 (GREEN)
A: i12 (GREEN)
A: B134
C: B56 (GREEN)
D: B137
i2
i1 (BROWN)
B: i10 (GREEN)
E: B84

WI-02473

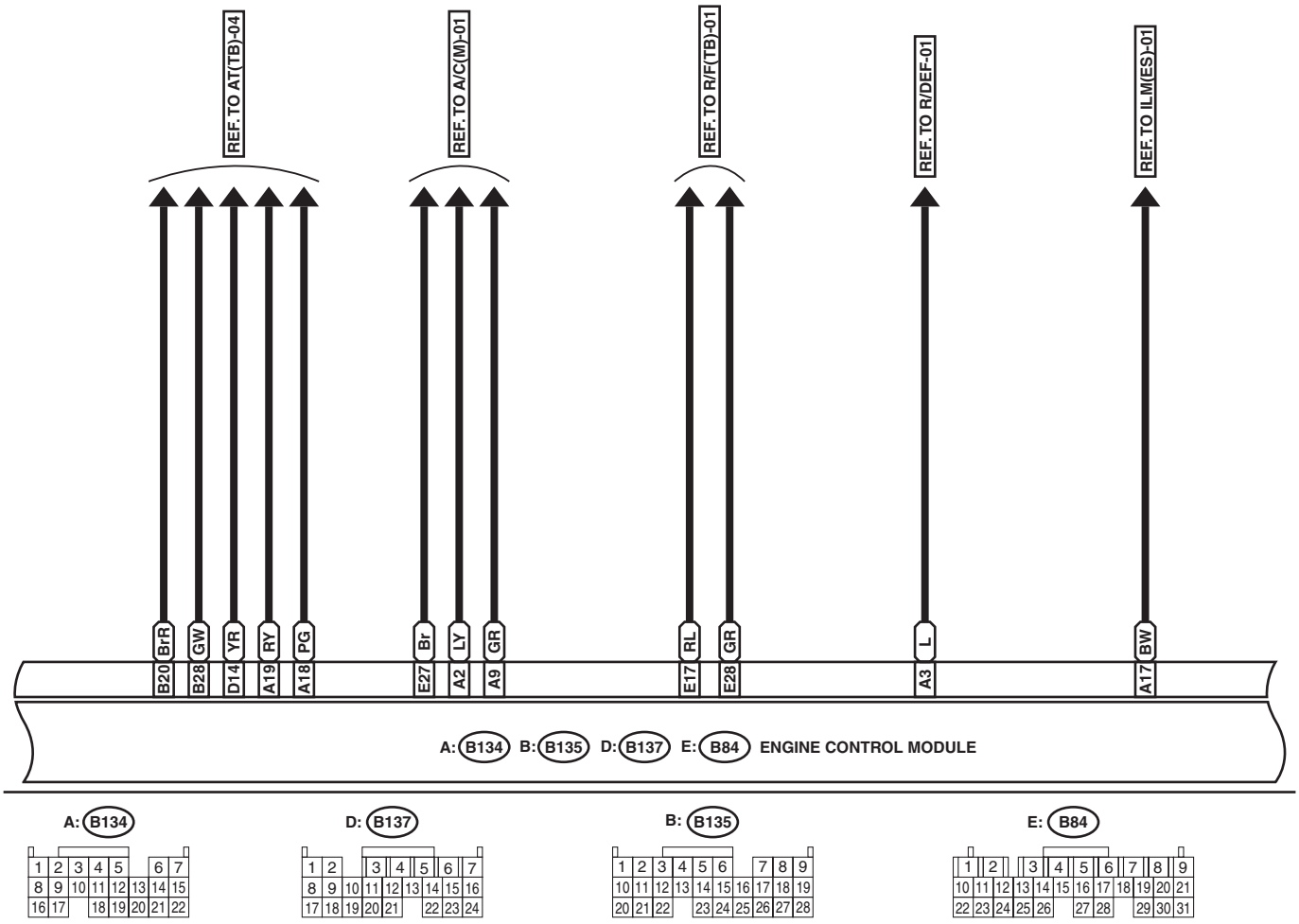

E/G(TB)-03
TO POWER SUPPLY ROUTING
MB-9
SBF-5
(B)
ST
IGNITION SWITCH
(ST)
AT : AT MODEL
MT : MT MODEL
WS : WITH SECURITY SYSTEM
OS : WITHOUT SECURITY SYSTEM
SHORT CONNECTOR
(WITHOUT SECURITY SYSTEM)
INTERRUPT RELAY
(WITH SECURITY
SYSTEM)
REF. TO SEC-01
INHIBITOR SWITCH (AT)
P R N D 3 2 1
E/G(TB)-01 A
E/G(TB)-01 E
MAIN RELAY
M E/G(TB)-05
N E/G(TB)-06
O E/G(TB)-06
STARTER INTERLOCK
RELAY (MT)
CLUTCH SWITCH (MT)
STARTER MOTOR
TO BATTERY TERMINAL
REF. TO GND-03
REF. TO GND-01
A: B134 E: B84 ENGINE CONTROL MODULE
B59
B61
F44
B12
T3
T7
B47
B225
B106
B14


B106
B47 (BROWN)
B59
F44
B12
T7
A: B134
E: B84
B225 (BLACK)
RELAY BLOCK

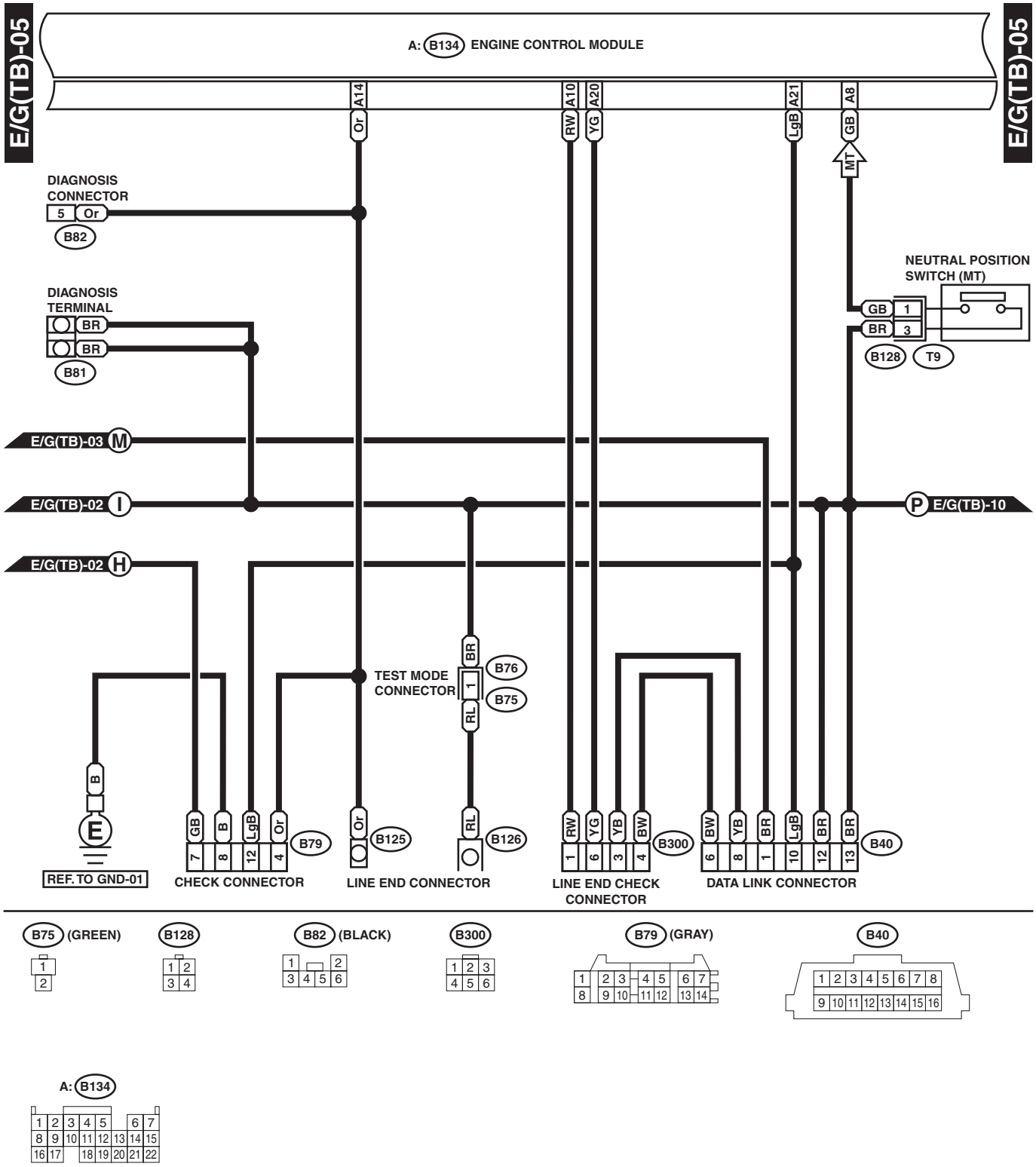
WI-02474

E/G(TB)-04

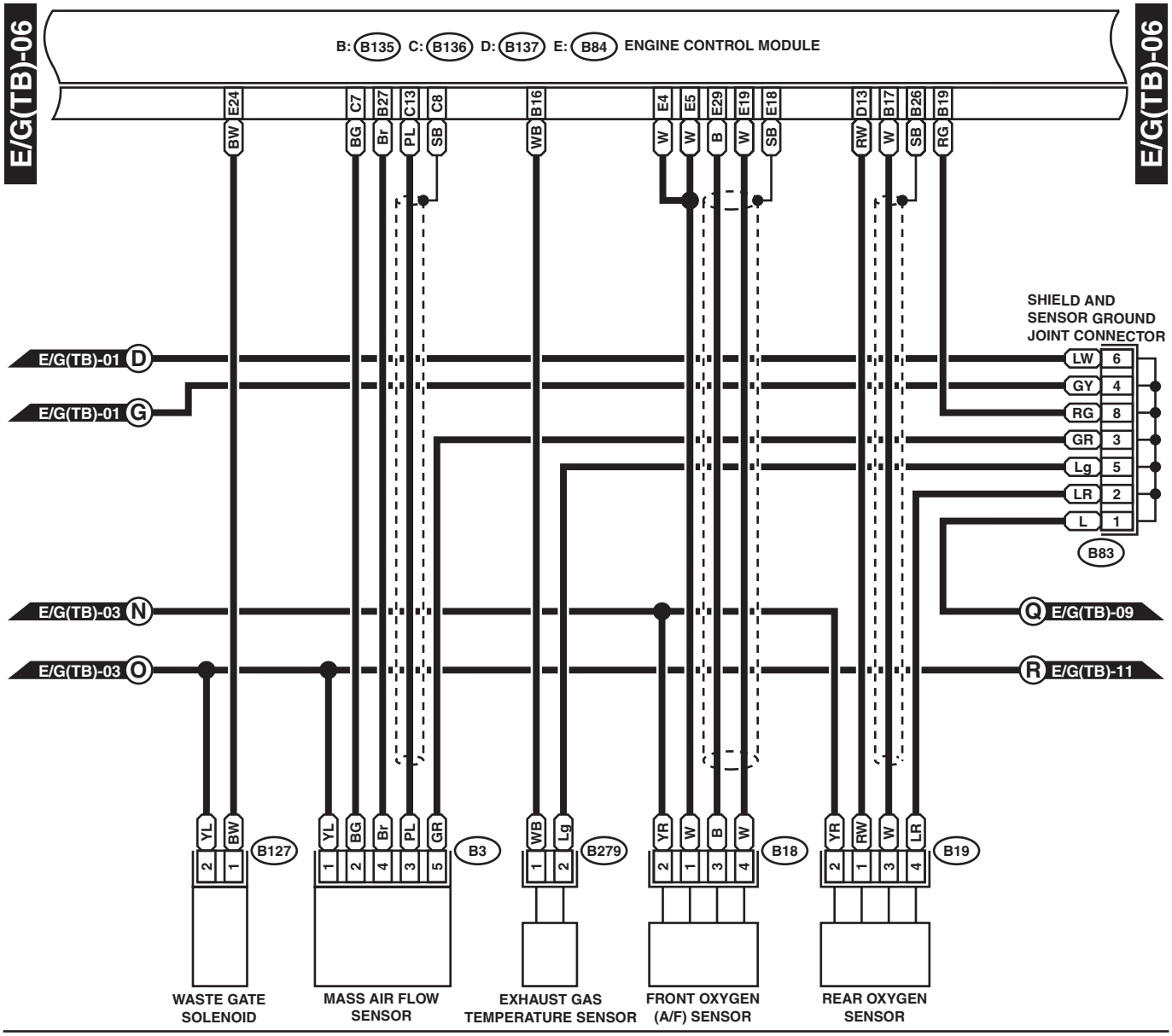
E/G(TB)-04

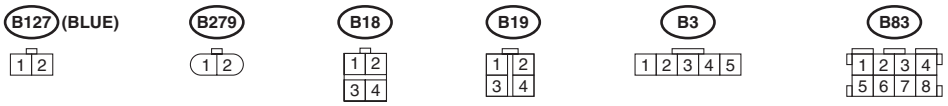


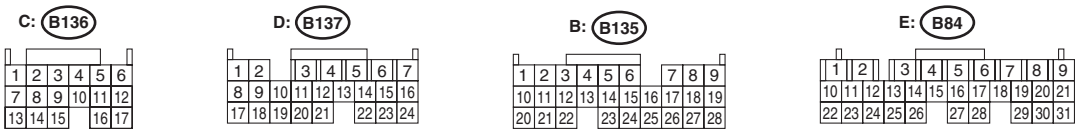
WI-02475


E/G(TB)-05
A: B134 ENGINE CONTROL MODULE
E/G(TB)-05
A14
A10
A20
A21
A8
Or
RW
YG
LgB
GB
MT
DIAGNOSIS CONNECTOR
5 Or
B82
DIAGNOSIS TERMINAL
BR
BR
B81
NEUTRAL POSITION SWITCH (MT)
GB 1
BR 3
B128
T9
E/G(TB)-03 M
E/G(TB)-02 I
E/G(TB)-02 H
P E/G(TB)-10
TEST MODE CONNECTOR
BR
RL
1
B76
B75
B
E
REF. TO GND-01
GB
B
LgB
Or
7
8
12
4
B79
CHECK CONNECTOR
Or
B125
LINE END CONNECTOR
RL
B126
RW
YG
YB
BW
1
6
3
4
B300
LINE END CHECK CONNECTOR
BW
YB
BR
LgB
BR
BR
6
8
1
10
12
13
B40
DATA LINK CONNECTOR
B75 (GREEN)
1
2
B128
1 2
3 4
B82 (BLACK)
1 2
3 4 5 6
B300
1 2 3
4 5 6
B79 (GRAY)
1 2 3 4 5 6 7
8 9 10 11 12 13 14
B40
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
A: B134
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15
16 17 18 19 20 21 22

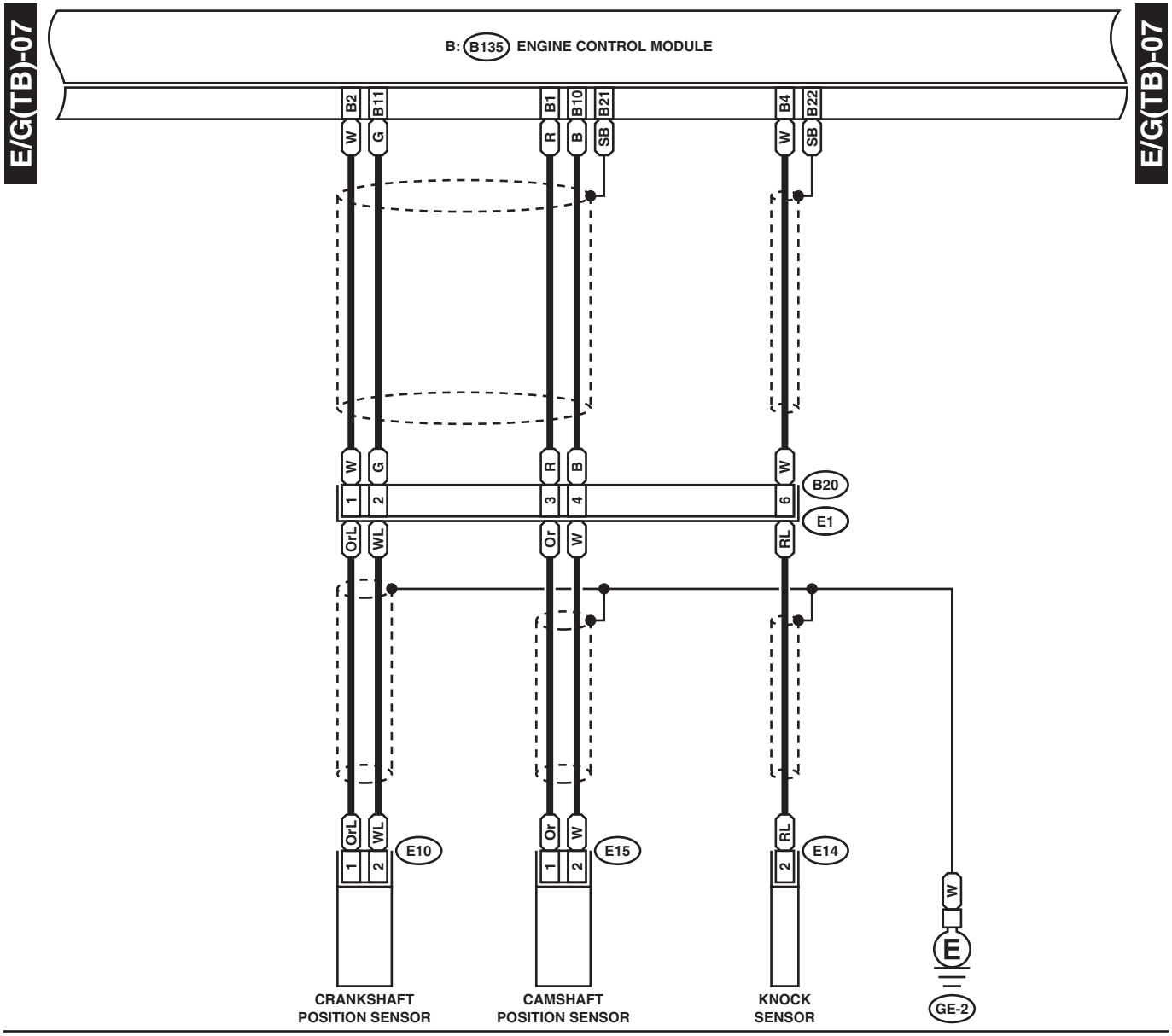
WI-02788


E/G(TB)-06
B: B135 C: B136 D: B137 E: B84 ENGINE CONTROL MODULE
E/G(TB)-06
E24 C7 B27 C13 C8 B16 E4 E5 E29 E19 E18 D13 B17 B26 B19
BW BG Br PL SB WB W W B W SB RW W SB RG
SHIELD AND SENSOR GROUND JOINT CONNECTOR
LW 6
GY 4
RG 8
GR 3
Lg 5
LR 2
L 1
B83
E/G(TB)-01 D
E/G(TB)-01 G
E/G(TB)-03 N
E/G(TB)-03 O
Q E/G(TB)-09
R E/G(TB)-11
YL BW B127
YL BG Br PL GR B3
WB Lg B279
YR W B W B18
YR RW W LR B19
WASTE GATE SOLENOID
MASS AIR FLOW SENSOR
EXHAUST GAS TEMPERATURE SENSOR
FRONT OXYGEN (A/F) SENSOR
REAR OXYGEN SENSOR


B127 (BLUE)
B279
B18
B19
B3
B83

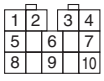

C: B136
D: B137
B: B135
E: B84

WI-02476

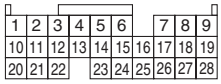


E10 (LIGHT GRAY)
E14 (LIGHT GRAY)
E15 (LIGHT GRAY)

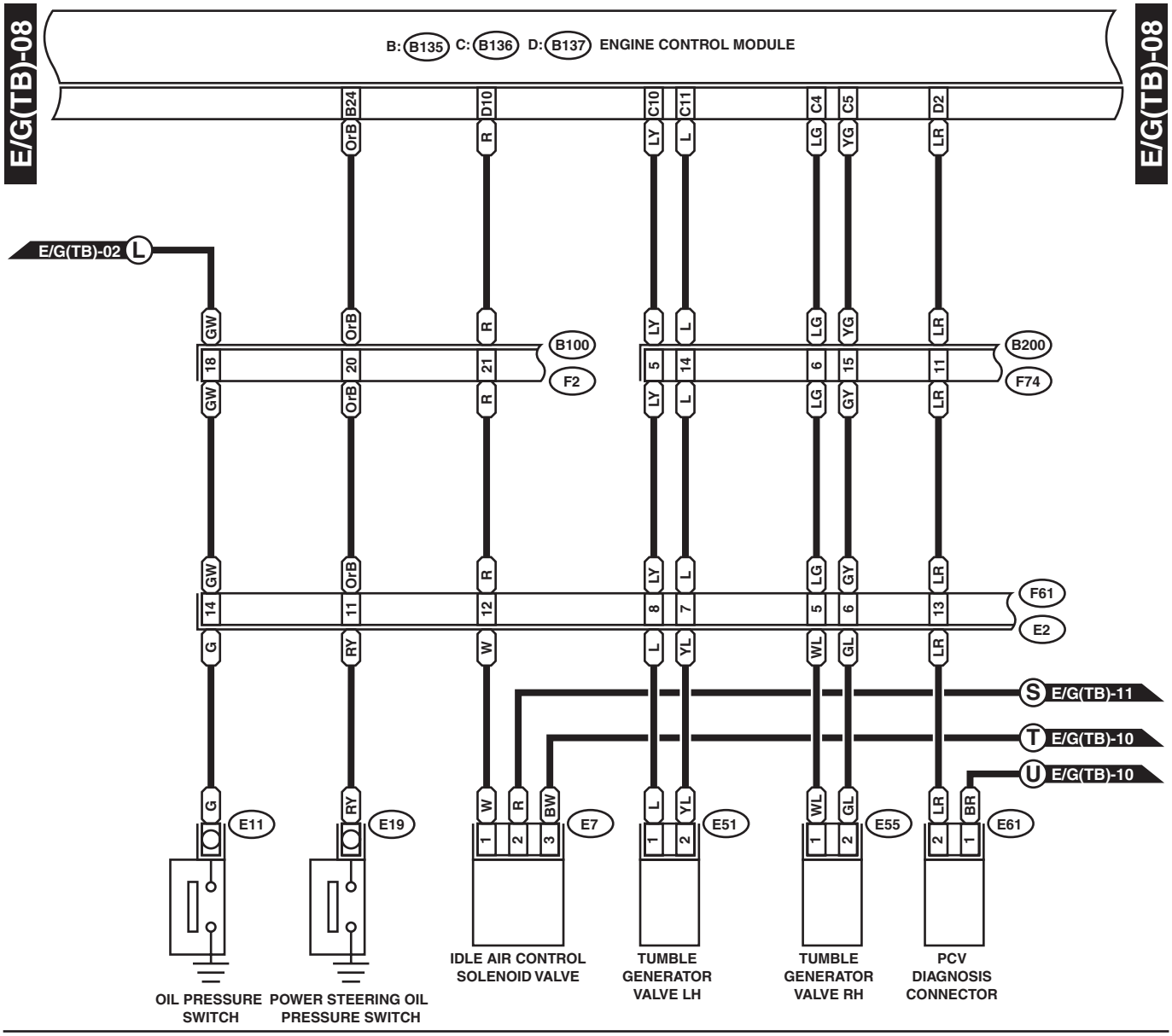
B20 (LIGHT GRAY)

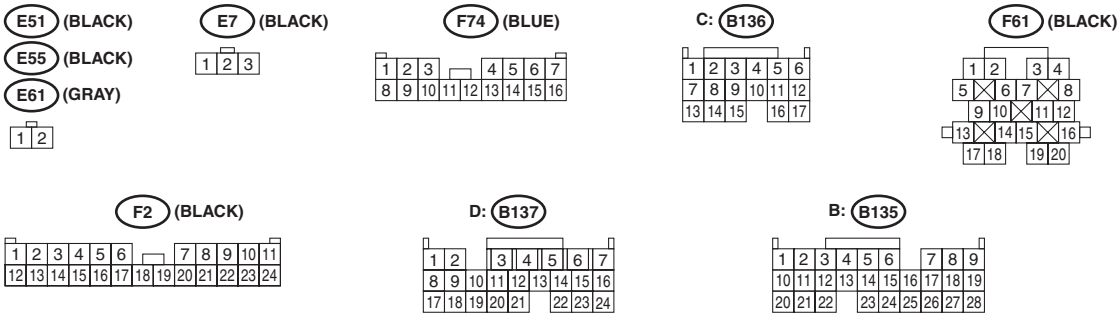


B: B135

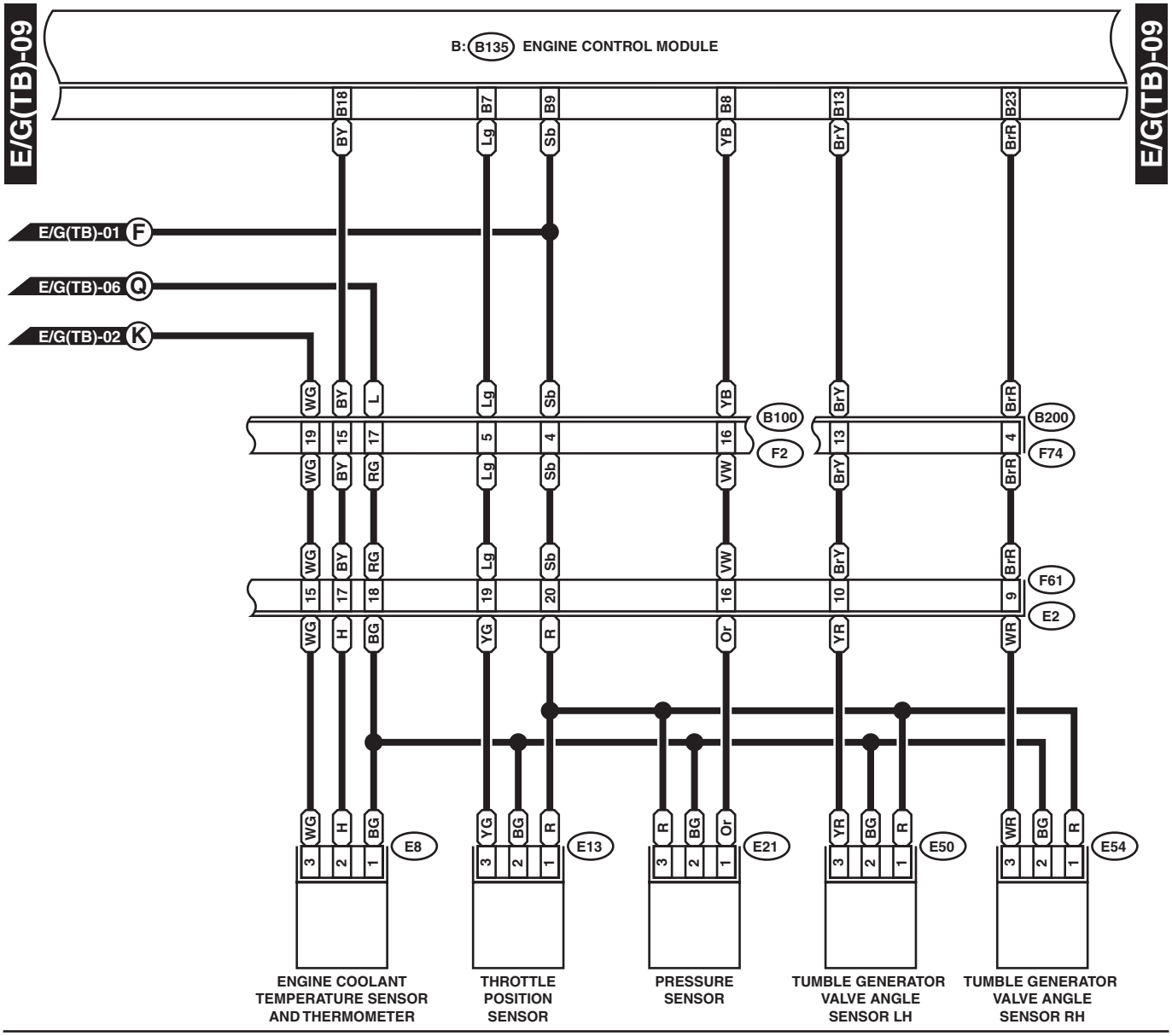


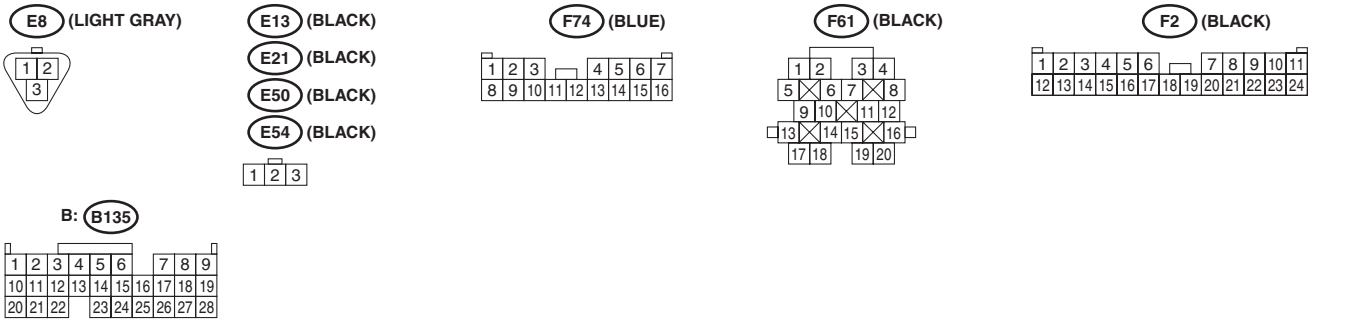
WI-02477


E/G(TB)-08
B: B135 C: B136 D: B137 ENGINE CONTROL MODULE
E/G(TB)-08
B24 D10 C10 C11 C4 C5 D2
OrB R LY L LG YG LR
E/G(TB)-02 L
GW OrB R LY L LG YG LR
B100
F2
B200
F74
18 20 21 5 14 6 15 11
GW OrB R LY L LG GY LR
GW OrB R LY L LG GY LR
F61
E2
14 11 12 8 7 5 6 13
G RY W L YL WL GL LR
S E/G(TB)-11
T E/G(TB)-10
U E/G(TB)-10
G RY W R BW L YL WL GL LR BR
E11 E19 E7 E51 E55 E61
1 2 3 1 2 1 2 2 1
OIL PRESSURE SWITCH
POWER STEERING OIL PRESSURE SWITCH
IDLE AIR CONTROL SOLENOID VALVE
TUMBLE GENERATOR VALVE LH
TUMBLE GENERATOR VALVE RH
PCV DIAGNOSIS CONNECTOR

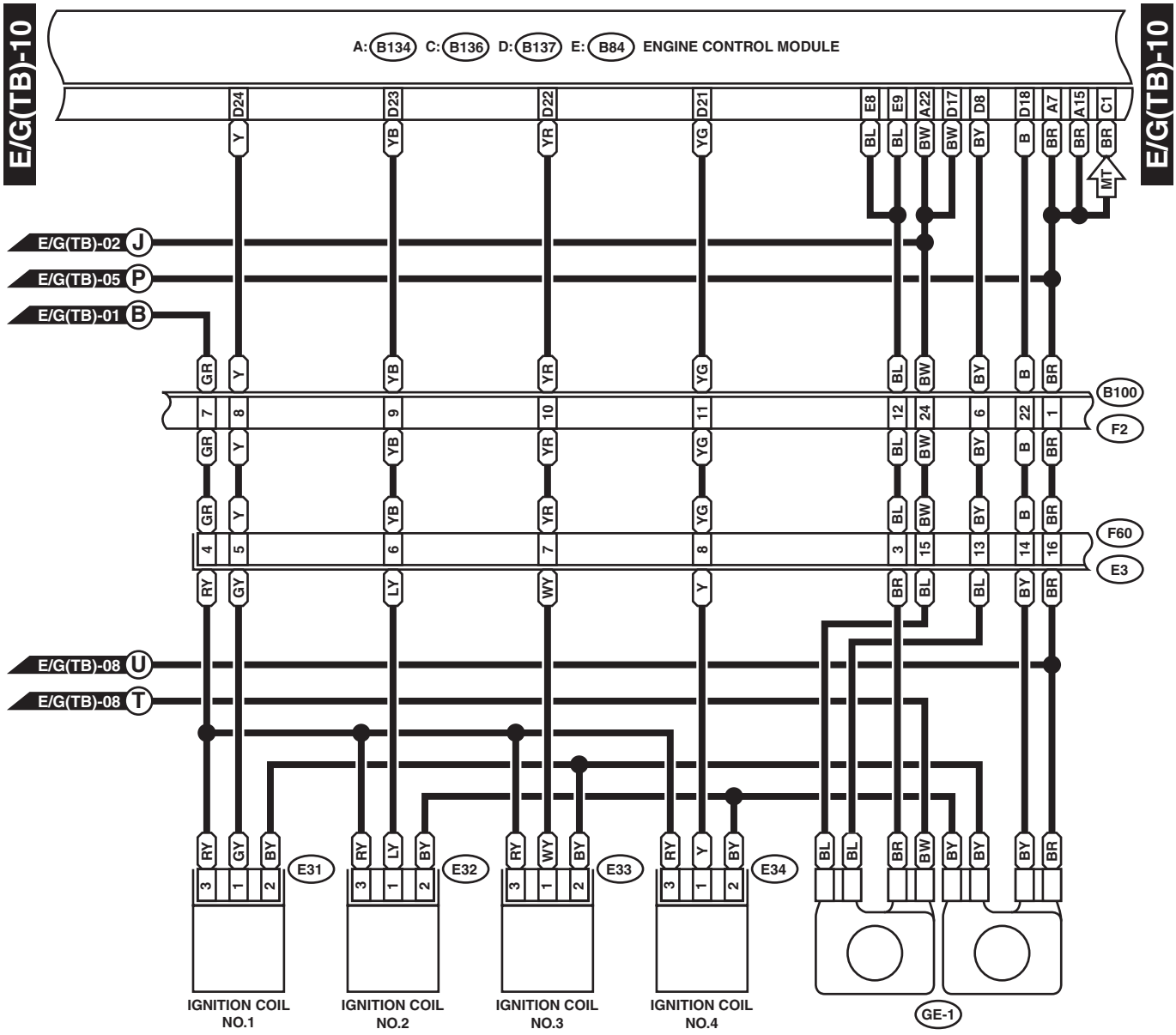

E51 (BLACK)
E55 (BLACK)
E61 (GRAY)
1 2
E7 (BLACK)
1 2 3
F74 (BLUE)
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16
C: B136
1 2 3 4 5 6
7 8 9 10 11 12
13 14 15 16 17
F61 (BLACK)
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
F2 (BLACK)
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22 23 24
D: B137
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24
B: B135
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27 28

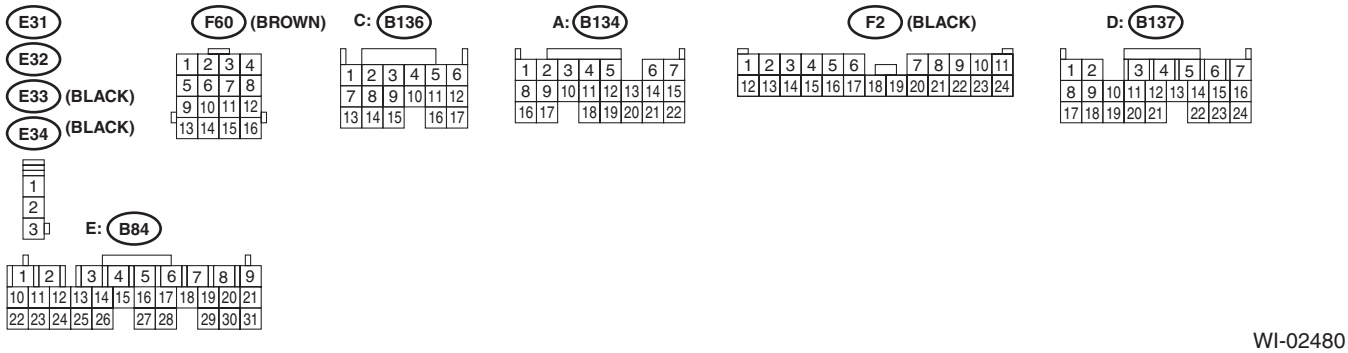
WI-02478


E/G(TB)-09
B: B135 ENGINE CONTROL MODULE
E/G(TB)-09
B18 B7 B9 B8 B13 B23
BY Lg Sb YB BrY BrR
E/G(TB)-01 F
E/G(TB)-06 Q
E/G(TB)-02 K
WG BY L Lg Sb YB BrY BrR
B100
B200
F2
F74
WG BY RG Lg Sb VW BrY BrR
WG BY RG Lg Sb VW BrY BrR
F61
E2
WG H BG YG R Or YR WR
E8
E13
E21
E50
E54
ENGINE COOLANT TEMPERATURE SENSOR AND THERMOMETER
THROTTLE POSITION SENSOR
PRESSURE SENSOR
TUMBLE GENERATOR VALVE ANGLE SENSOR LH
TUMBLE GENERATOR VALVE ANGLE SENSOR RH

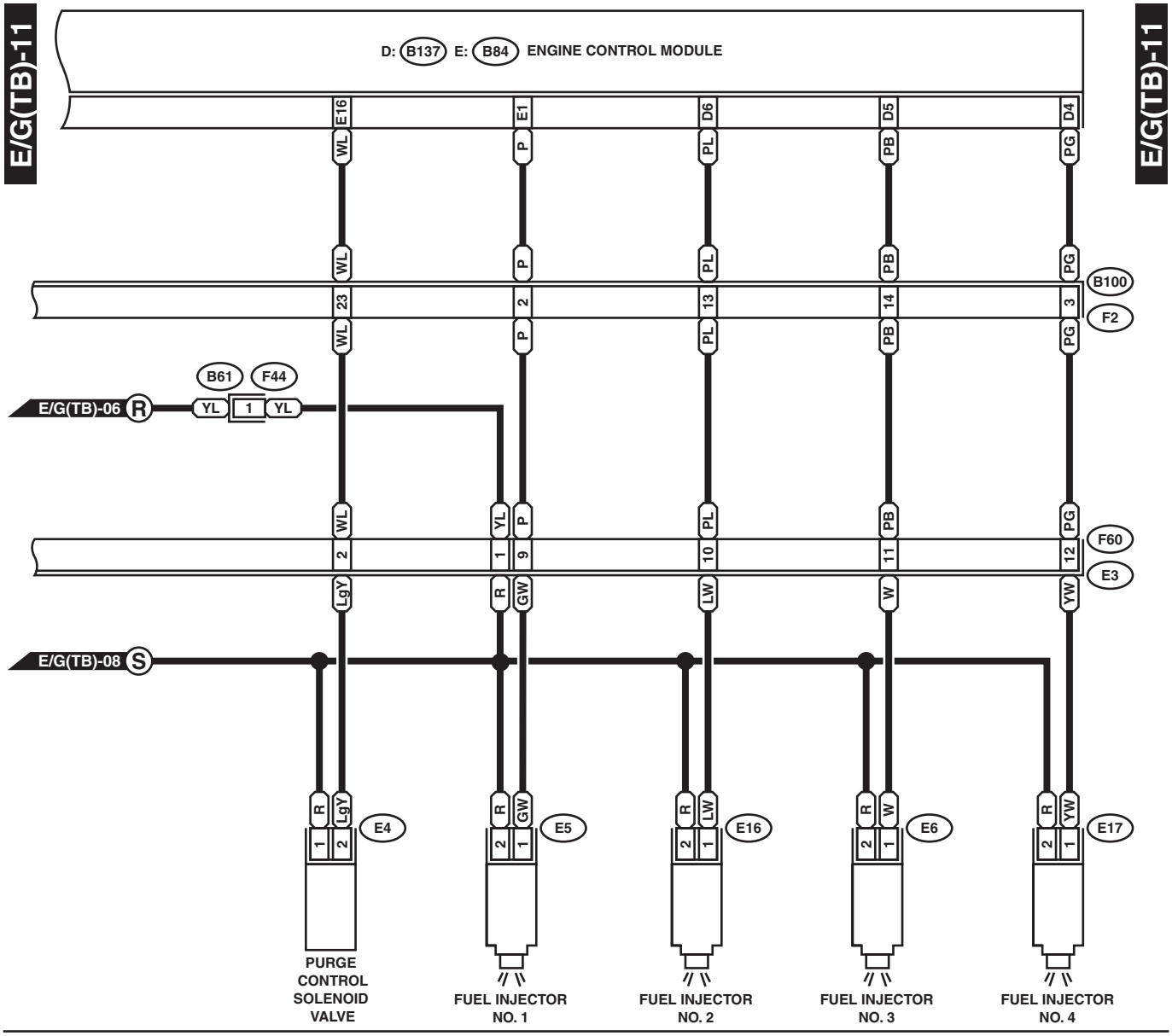

E8 (LIGHT GRAY)
E13 (BLACK)
E21 (BLACK)
E50 (BLACK)
E54 (BLACK)
F74 (BLUE)
F61 (BLACK)
F2 (BLACK)
B: B135

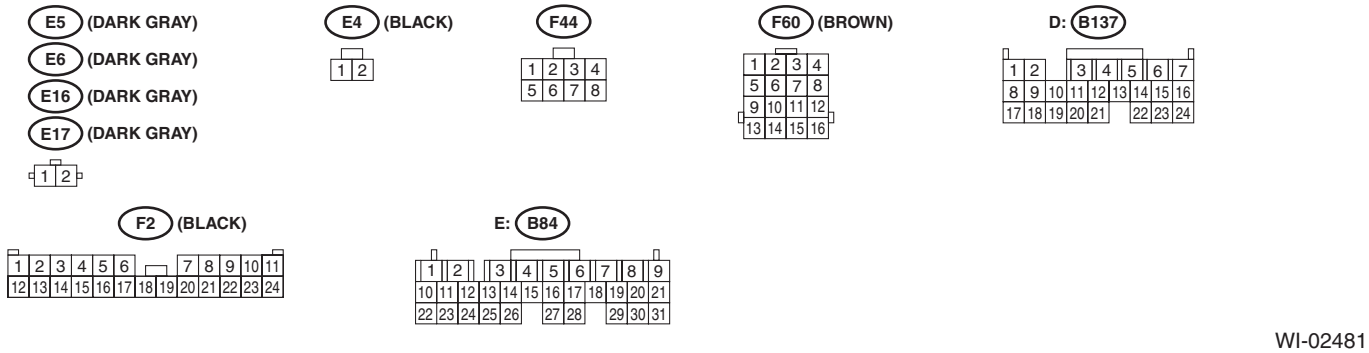
WI-02479


E/G(TB)-10
A: B134 C: B136 D: B137 E: B84 ENGINE CONTROL MODULE
E/G(TB)-10
D24 D23 D22 D21 E8 E9 A22 D17 D8 D18 A7 A15 C1
Y YB YR YG BL BL BW BW BY B BR BR BR
MT
E/G(TB)-02 J
E/G(TB)-05 P
E/G(TB)-01 B
GR Y YB YR YG BL BW BY B BR
B100
F2
F60
E3
E/G(TB)-08 U
E/G(TB)-08 T
RY GY LY WY Y BR BL BL BY BR
RY GY BY E31
RY LY BY E32
RY WY BY E33
RY Y BY E34
BL BL BR BW BY BY BY BR
IGNITION COIL NO.1
IGNITION COIL NO.2
IGNITION COIL NO.3
IGNITION COIL NO.4
GE-1


E31
E32
E33 (BLACK)
E34 (BLACK)
F60 (BROWN)
C: B136
A: B134
F2 (BLACK)
D: B137
E: B84

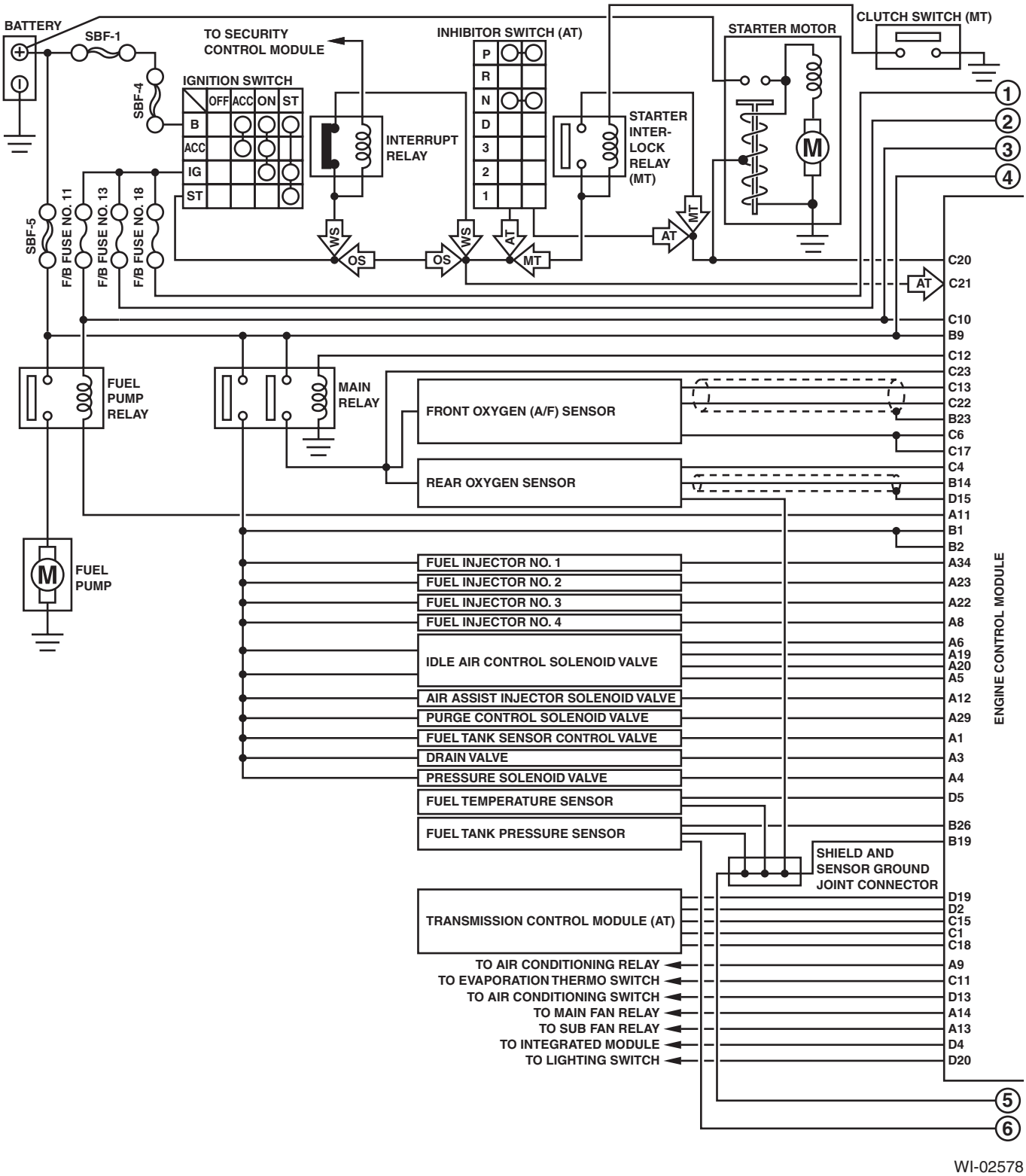
WI-02480


E/G(TB)-11
E/G(TB)-11
D: B137 E: B84 ENGINE CONTROL MODULE
E16
E1
D6
D5
D4
WL
P
PL
PB
PG
B100
F2
23
2
13
14
3
B61
F44
E/G(TB)-06 R
YL
1
YL
F60
E3
2
1
9
10
11
12
LgY
R
GW
LW
W
YW
E/G(TB)-08 S
E4
E5
E16
E6
E17
PURGE CONTROL SOLENOID VALVE
FUEL INJECTOR NO. 1
FUEL INJECTOR NO. 2
FUEL INJECTOR NO. 3
FUEL INJECTOR NO. 4

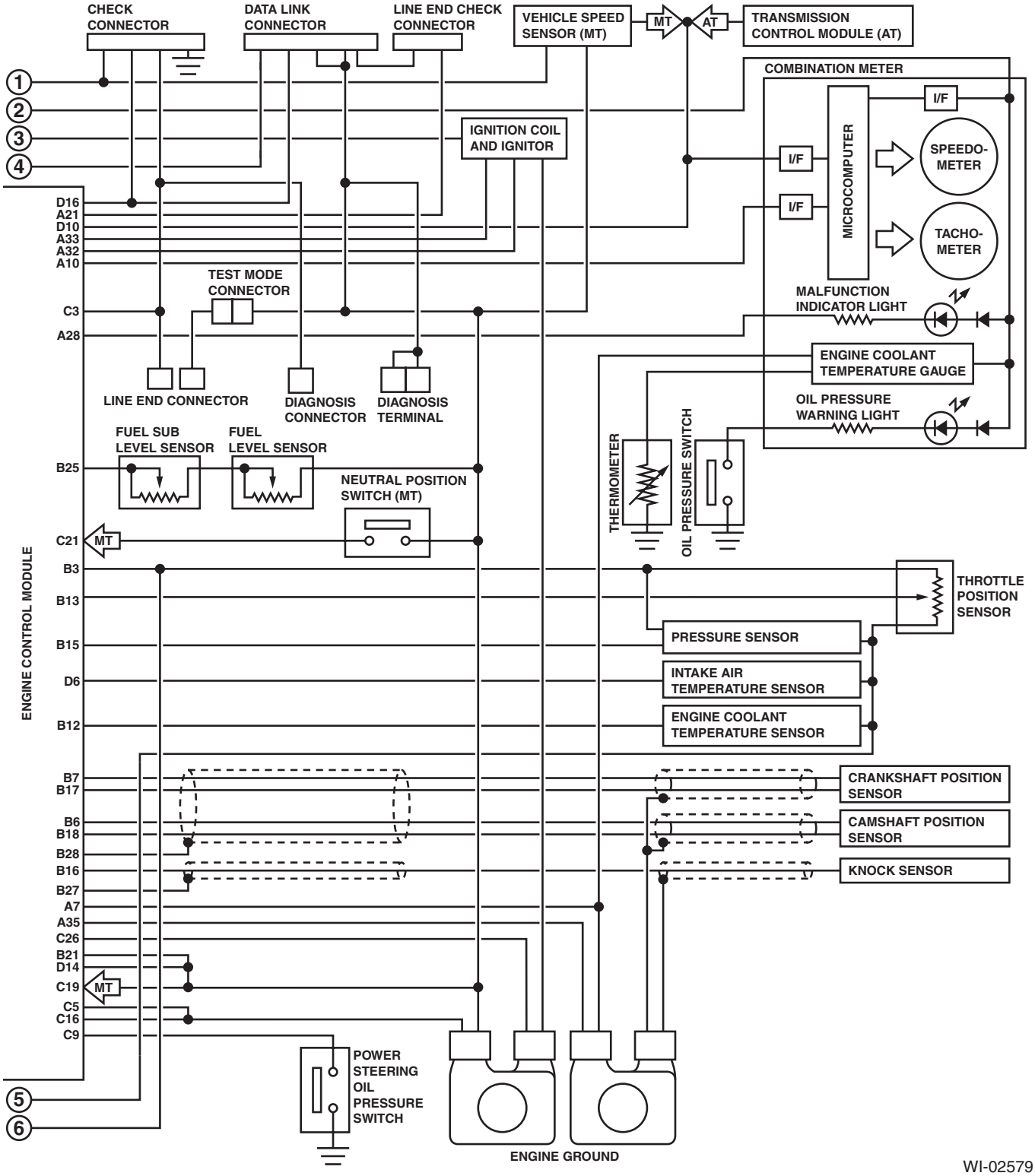

E5 (DARK GRAY)
E6 (DARK GRAY)
E16 (DARK GRAY)
E17 (DARK GRAY)
E4 (BLACK)
F44
F60 (BROWN)
D: B137
F2 (BLACK)
E: B84

WI-02481

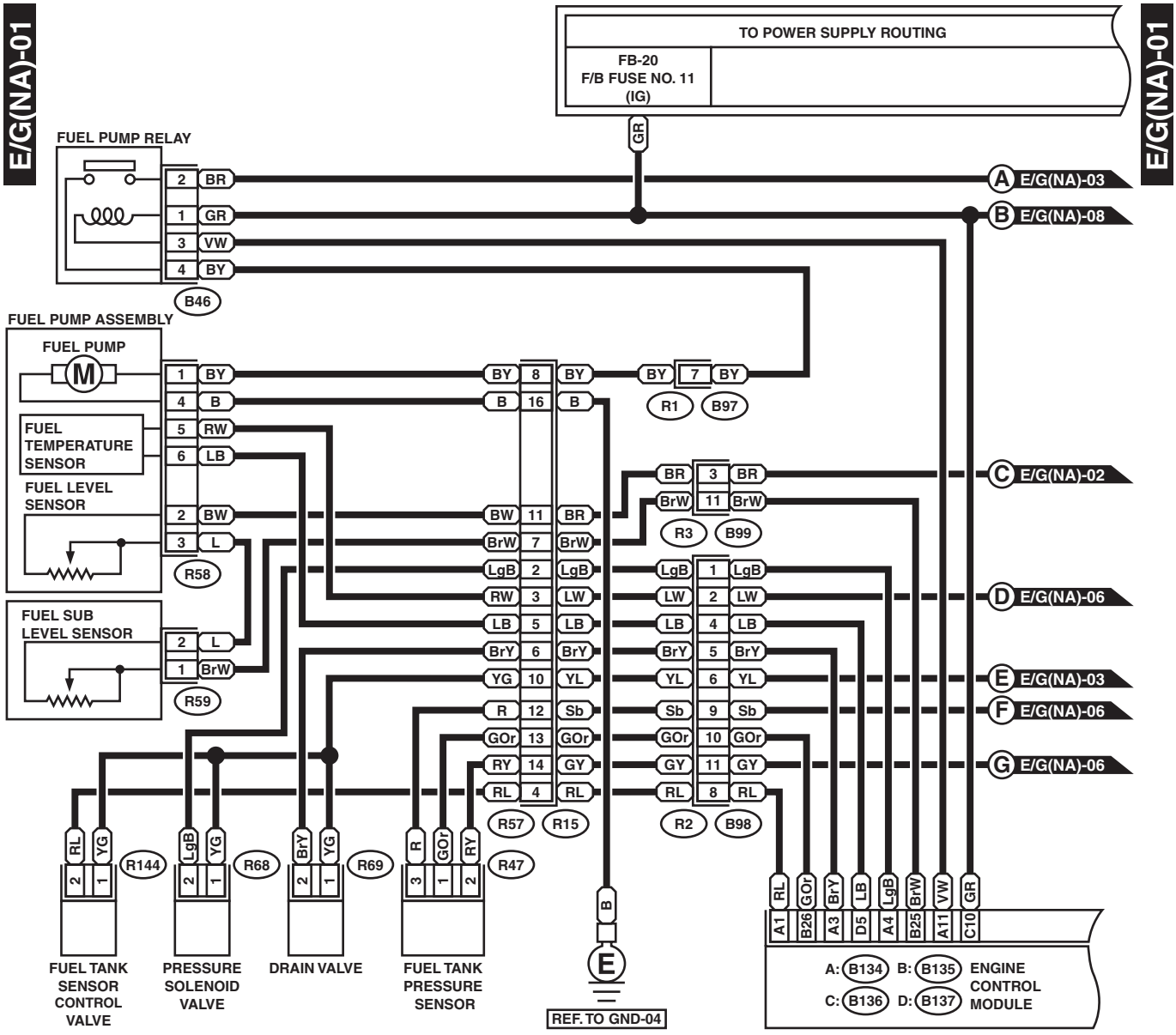
2. SOHC MODEL

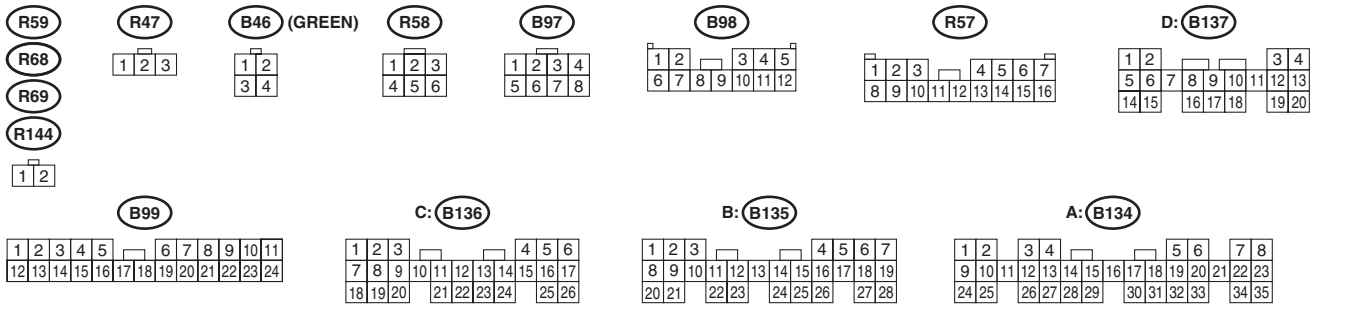


WI-02578

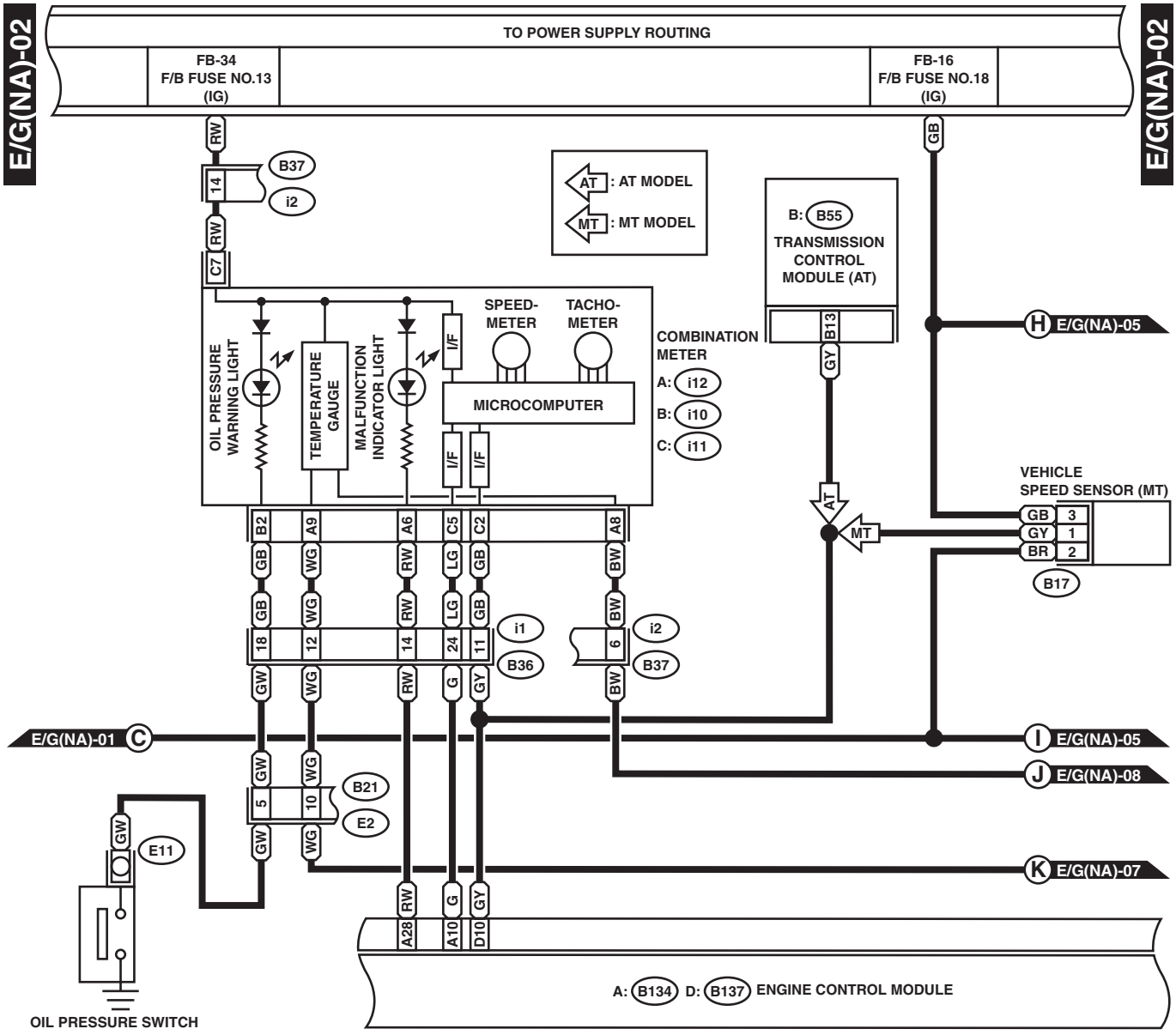

CHECK CONNECTOR
DATA LINK CONNECTOR
LINE END CHECK CONNECTOR
VEHICLE SPEED SENSOR (MT)
MT
AT
TRANSMISSION CONTROL MODULE (AT)
COMBINATION METER
I/F
MICROCOMPUTER
SPEEDO-METER
TACHO-METER
MALFUNCTION INDICATOR LIGHT
ENGINE COOLANT TEMPERATURE GAUGE
OIL PRESSURE WARNING LIGHT
IGNITION COIL AND IGNITOR
TEST MODE CONNECTOR
LINE END CONNECTOR
DIAGNOSIS CONNECTOR
DIAGNOSIS TERMINAL
FUEL SUB LEVEL SENSOR
FUEL LEVEL SENSOR
NEUTRAL POSITION SWITCH (MT)
THERMOMETER
OIL PRESSURE SWITCH
ENGINE CONTROL MODULE
THROTTLE POSITION SENSOR
PRESSURE SENSOR
INTAKE AIR TEMPERATURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR
CRANKSHAFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
KNOCK SENSOR
POWER STEERING OIL PRESSURE SWITCH
ENGINE GROUND
1
2
3
4
5
6
D16
A21
D10
A33
A32
A10
C3
A28
B25
C21
B3
B13
B15
D6
B12
B7
B17
B6
B18
B28
B16
B27
A7
A35
C26
B21
D14
C19
C5
C16
C9

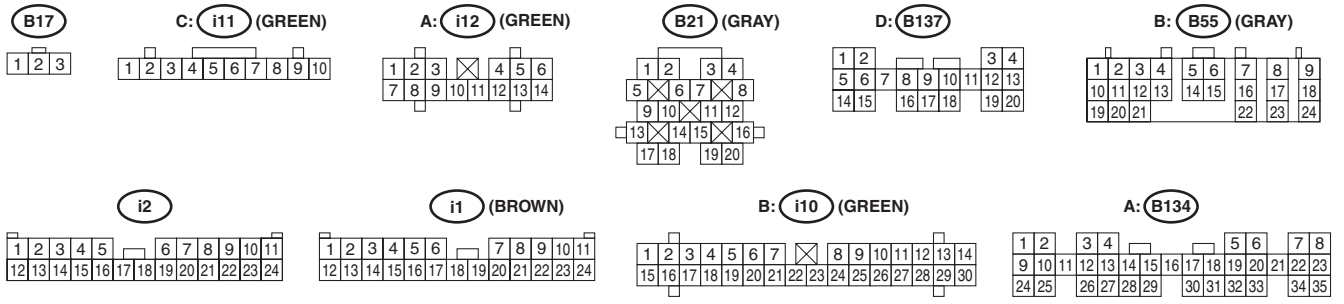
WI-02579


E/G(NA)-01
E/G(NA)-01
TO POWER SUPPLY ROUTING
FB-20
F/B FUSE NO. 11
(IG)
GR
FUEL PUMP RELAY
2 BR
1 GR
3 VW
4 BY
B46
A E/G(NA)-03
B E/G(NA)-08
FUEL PUMP ASSEMBLY
FUEL PUMP
M
1 BY
4 B
5 RW
6 LB
FUEL TEMPERATURE SENSOR
FUEL LEVEL SENSOR
2 BW
3 L
R58
FUEL SUB LEVEL SENSOR
2 L
1 BrW
R59
BY 8 BY
B 16 B
BY 7 BY
R1
B97
BR 3 BR
BrW 11 BrW
R3
B99
C E/G(NA)-02
BW 11 BR
BrW 7 BrW
LgB 2 LgB
RW 3 LW
LB 5 LB
BrY 6 BrY
YG 10 YL
R 12 Sb
GOr 13 GOr
RY 14 GY
RL 4 RL
R57
R15
LgB 1 LgB
LW 2 LW
LB 4 LB
BrY 5 BrY
YL 6 YL
Sb 9 Sb
GOr 10 GOr
GY 11 GY
RL 8 RL
R2
B98
D E/G(NA)-06
E E/G(NA)-03
F E/G(NA)-06
G E/G(NA)-06
RL YG R144
LgB YG R68
BrY YG R69
R GOr RY R47
FUEL TANK SENSOR CONTROL VALVE
PRESSURE SOLENOID VALVE
DRAIN VALVE
FUEL TANK PRESSURE SENSOR
B
E
REF. TO GND-04
RL GOr BrY LB LgB BrW VW GR
A1 B26 A3 D5 A4 B25 A11 C10
A: B134 B: B135 ENGINE CONTROL MODULE
C: B136 D: B137

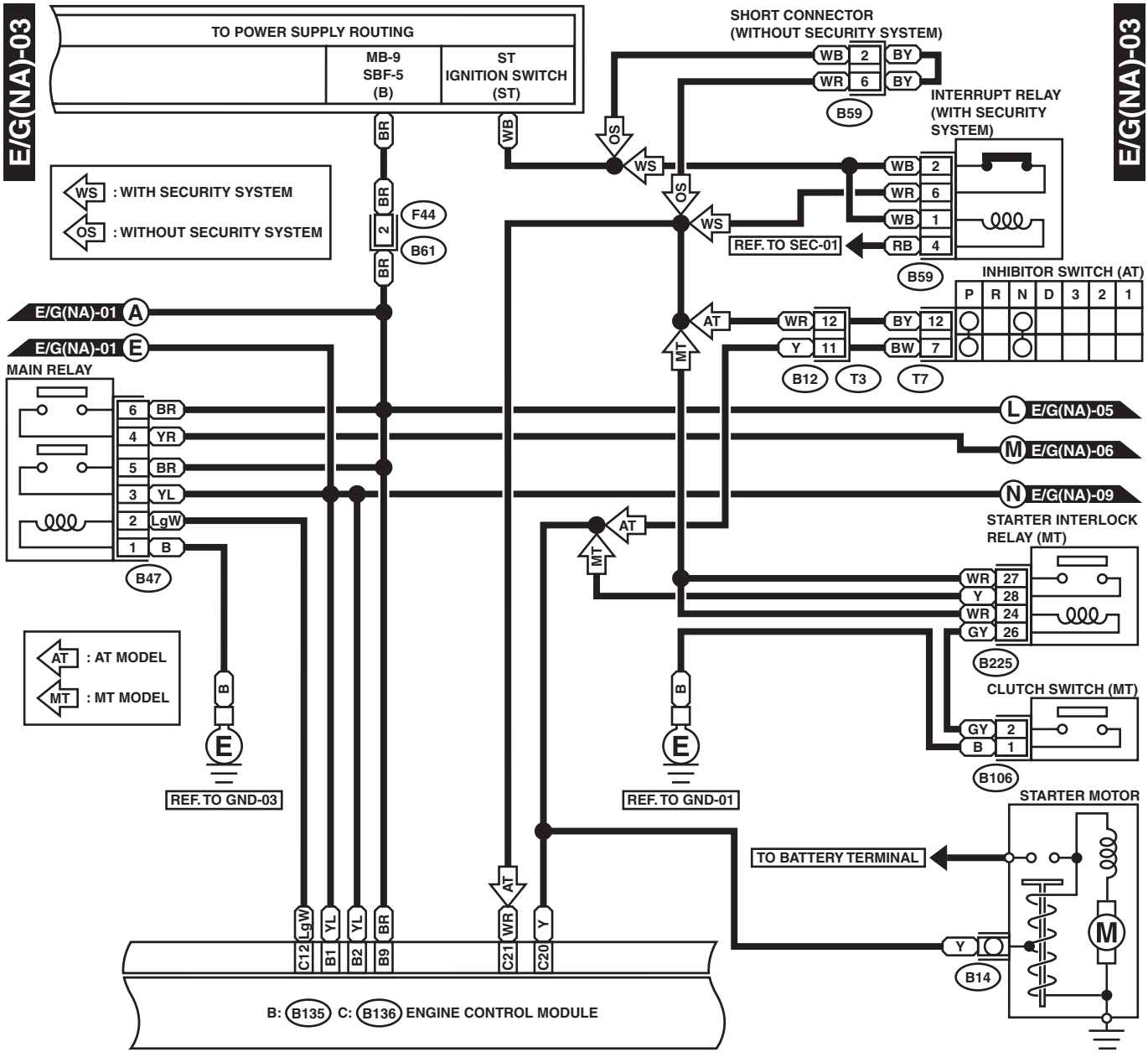

R59
R68
R69
R144
R47
B46 (GREEN)
R58
B97
B98
R57
D: B137
B99
C: B136
B: B135
A: B134

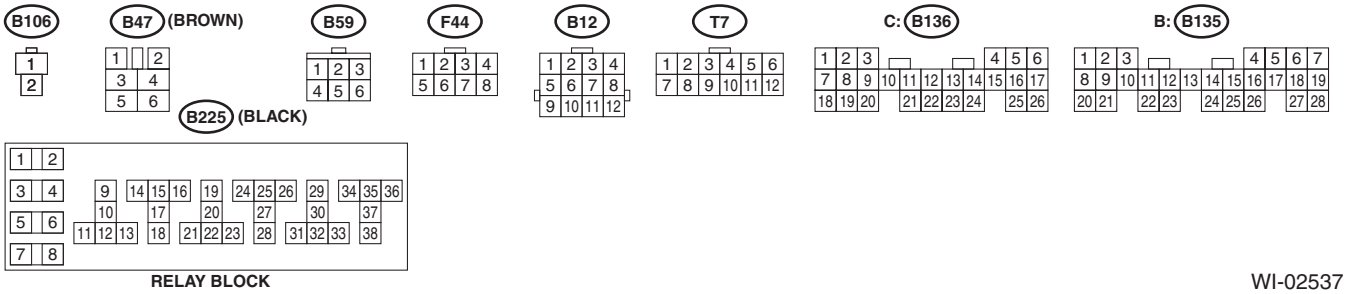
WI-02536


E/G(NA)-02
TO POWER SUPPLY ROUTING
FB-34
F/B FUSE NO.13
(IG)
FB-16
F/B FUSE NO.18
(IG)
E/G(NA)-02
AT : AT MODEL
MT : MT MODEL
B37
i2
B: B55
TRANSMISSION CONTROL MODULE (AT)
SPEED-METER
TACHO-METER
COMBINATION METER
A: i12
B: i10
C: i11
OIL PRESSURE WARNING LIGHT
TEMPERATURE GAUGE
MALFUNCTION INDICATOR LIGHT
I/F
MICROCOMPUTER
H E/G(NA)-05
VEHICLE SPEED SENSOR (MT)
B17
i1
B36
E/G(NA)-01 C
I E/G(NA)-05
J E/G(NA)-08
B21
E2
E11
K E/G(NA)-07
OIL PRESSURE SWITCH
A: B134 D: B137 ENGINE CONTROL MODULE


B17
C: i11 (GREEN)
A: i12 (GREEN)
B21 (GRAY)
D: B137
B: B55 (GRAY)
i2
i1 (BROWN)
B: i10 (GREEN)
A: B134

WI-02482

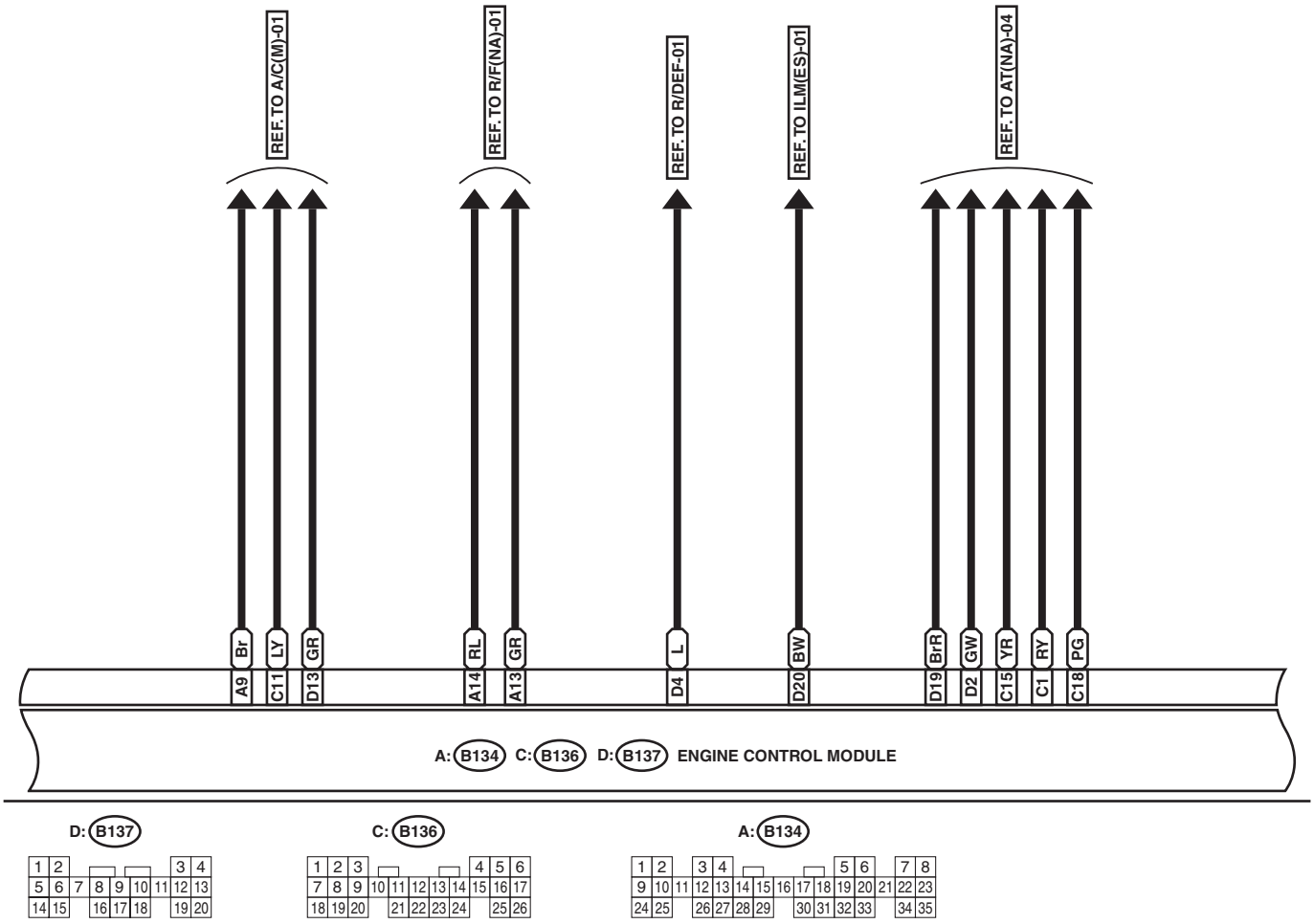

E/G(NA)-03
TO POWER SUPPLY ROUTING
MB-9
SBF-5
(B)
ST
IGNITION SWITCH
(ST)
WS : WITH SECURITY SYSTEM
OS : WITHOUT SECURITY SYSTEM
SHORT CONNECTOR
(WITHOUT SECURITY SYSTEM)
INTERRUPT RELAY
(WITH SECURITY
SYSTEM)
B59
F44
B61
REF. TO SEC-01
INHIBITOR SWITCH (AT)
P R N D 3 2 1
E/G(NA)-01 A
E/G(NA)-01 E
MAIN RELAY
B12
T3
T7
E/G(NA)-05
E/G(NA)-06
E/G(NA)-09
STARTER INTERLOCK
RELAY (MT)
B225
CLUTCH SWITCH (MT)
B106
B47
AT : AT MODEL
MT : MT MODEL
REF. TO GND-03
REF. TO GND-01
STARTER MOTOR
TO BATTERY TERMINAL
B14
B: B135 C: B136 ENGINE CONTROL MODULE


B106
B47 (BROWN)
B225 (BLACK)
B59
F44
B12
T7
C: B136
B: B135
RELAY BLOCK

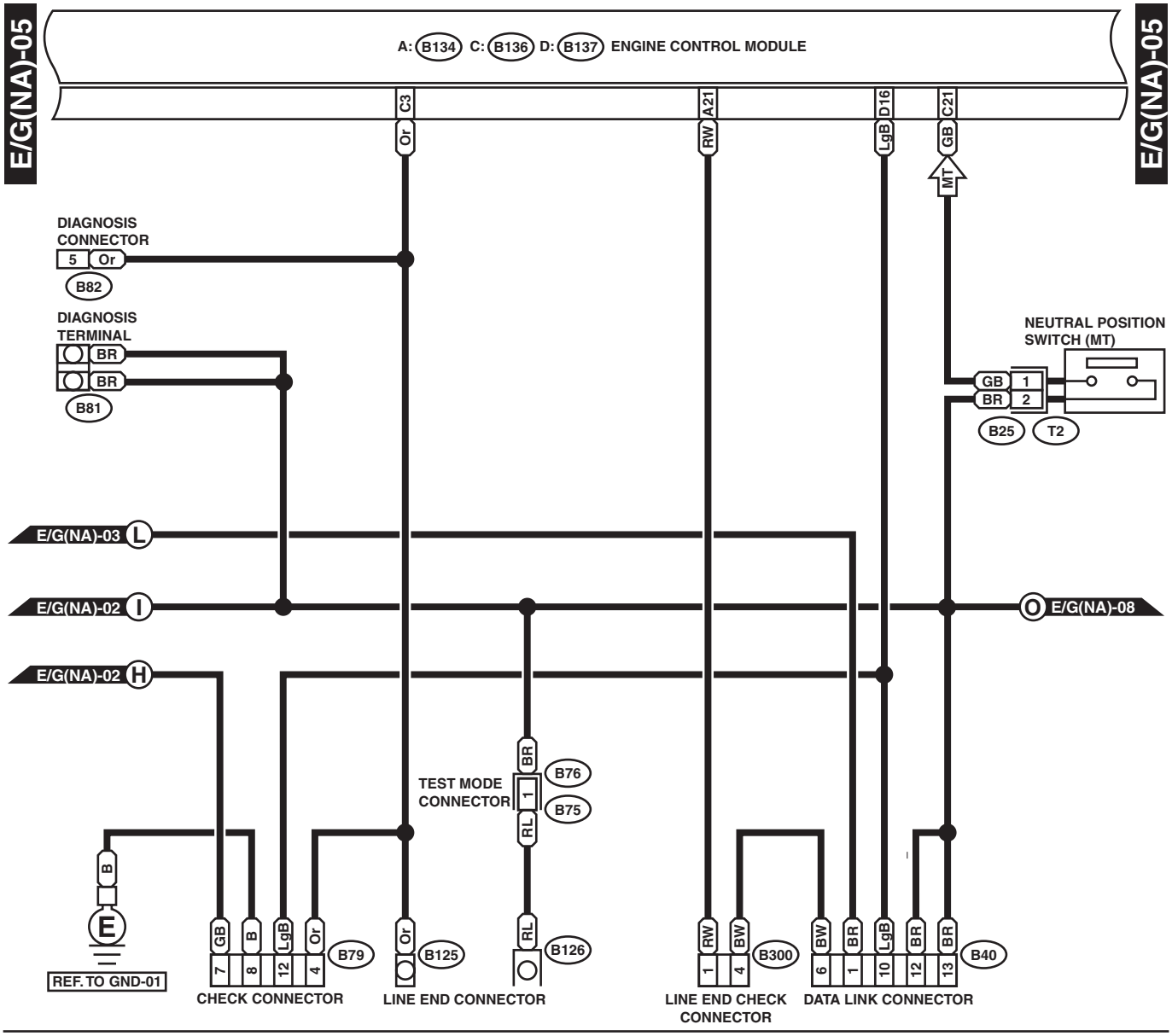
WI-02537

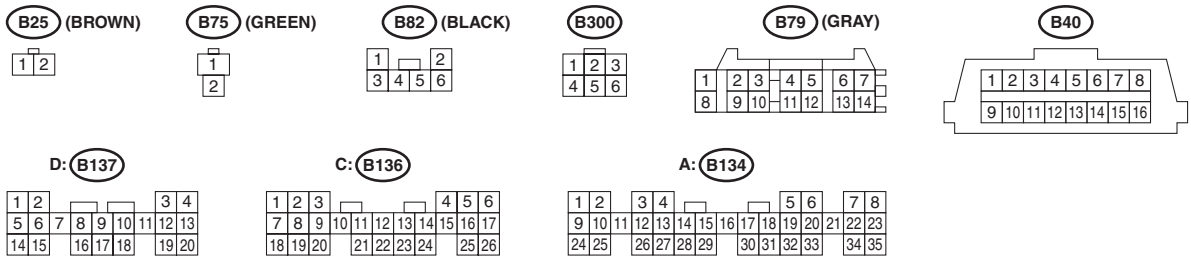
E/G(NA)-04

E/G(NA)-04



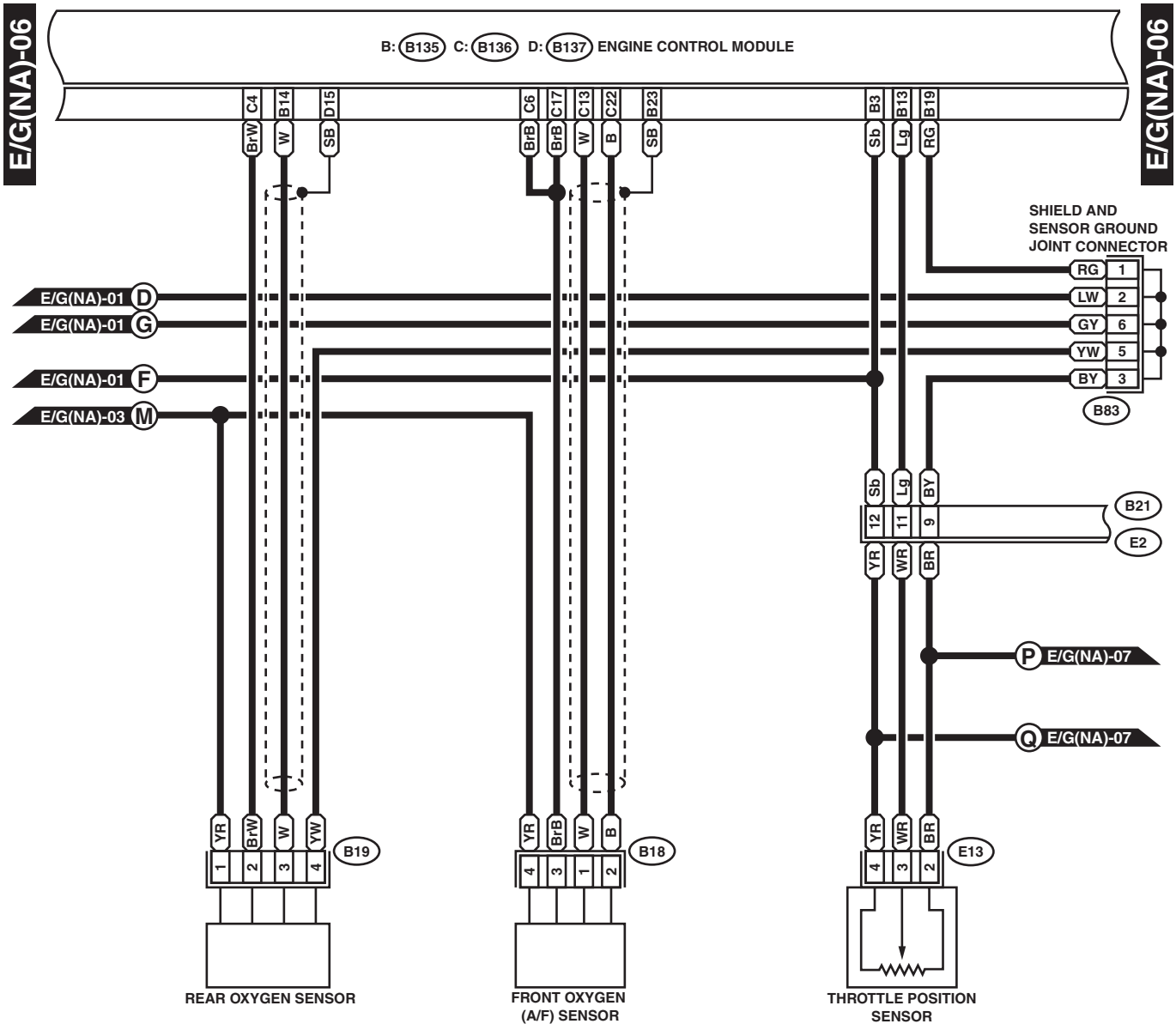
WI-02538

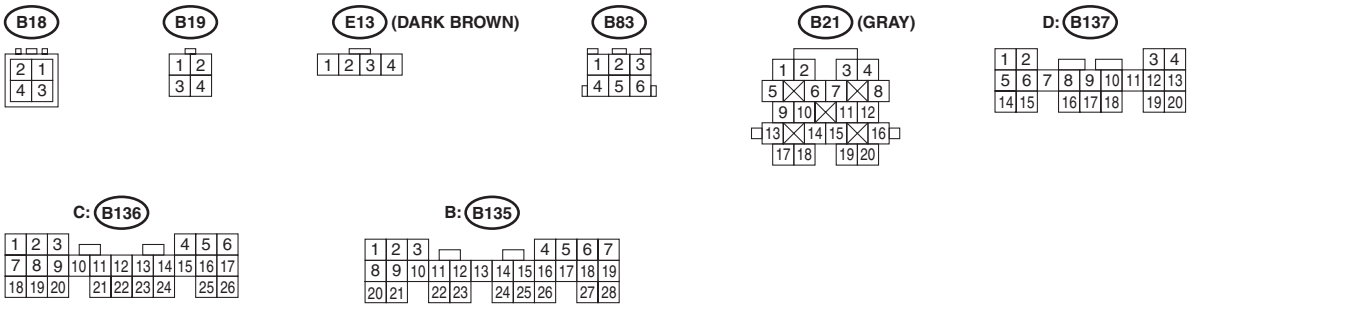

E/G(NA)-05
A: B134 C: B136 D: B137 ENGINE CONTROL MODULE
E/G(NA)-05
C3
A21
D16
C21
Or
RW
LgB
GB
MT
DIAGNOSIS CONNECTOR
5 Or
B82
DIAGNOSIS TERMINAL
BR
BR
B81
NEUTRAL POSITION SWITCH (MT)
GB 1
BR 2
B25
T2
E/G(NA)-03 L
E/G(NA)-02 I
E/G(NA)-08 O
E/G(NA)-02 H
TEST MODE CONNECTOR
BR
1
RL
B76
B75
B
E
REF. TO GND-01
GB
B
LgB
Or
7
8
12
4
B79
CHECK CONNECTOR
Or
B125
LINE END CONNECTOR
RL
B126
RW
BW
1
4
B300
LINE END CHECK CONNECTOR
BW
BR
LgB
BR
BR
6
1
10
12
13
B40
DATA LINK CONNECTOR


B25 (BROWN)
1 2
B75 (GREEN)
1
2
B82 (BLACK)
1 2
3 4 5 6
B300
1 2 3
4 5 6
B79 (GRAY)
1 2 3 4 5 6 7
8 9 10 11 12 13 14
B40
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16

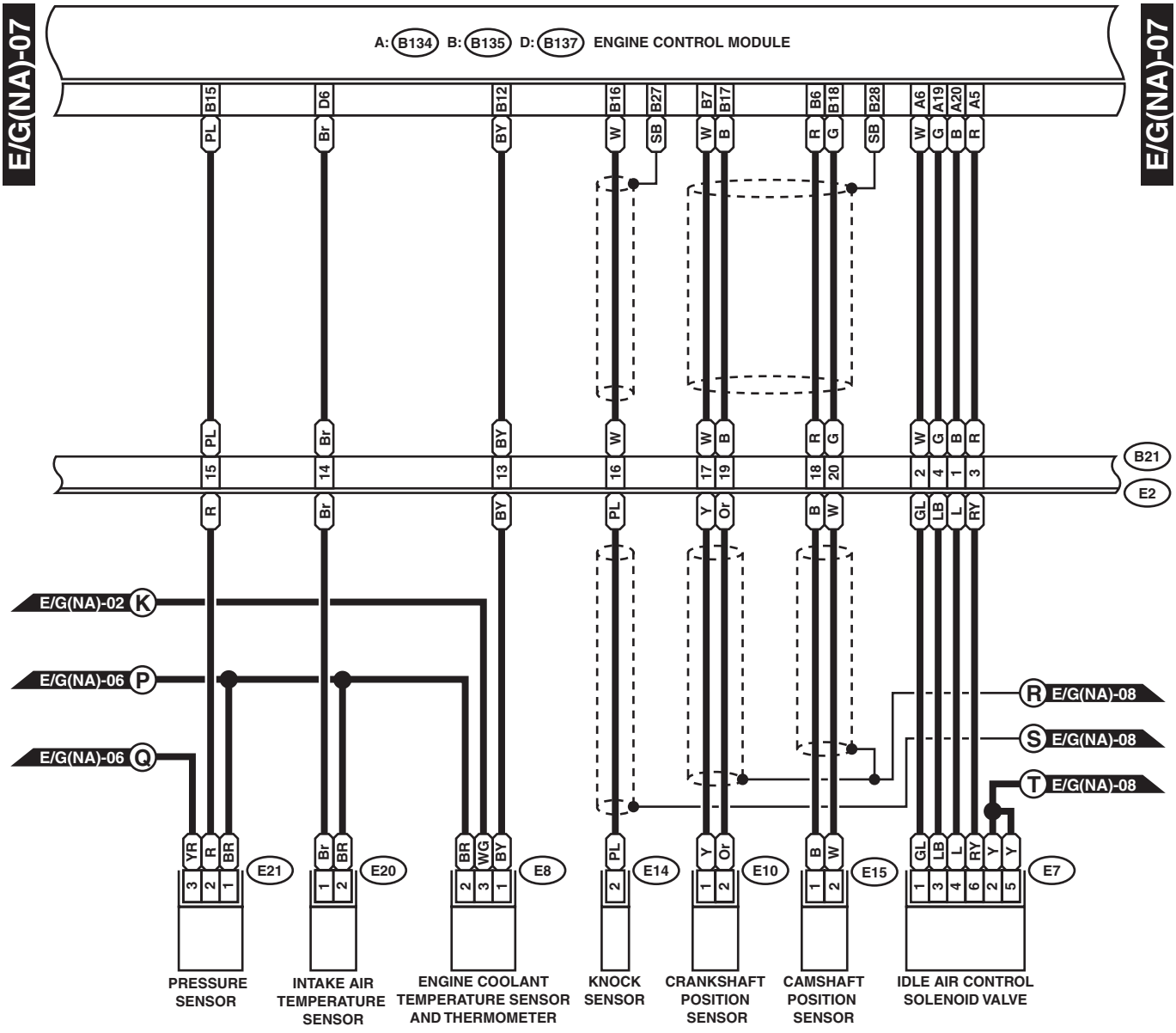
D: B137
1 2 3 4
5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20
C: B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25 26
A: B134
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
24 25 26 27 28 29 30 31 32 33 34 35

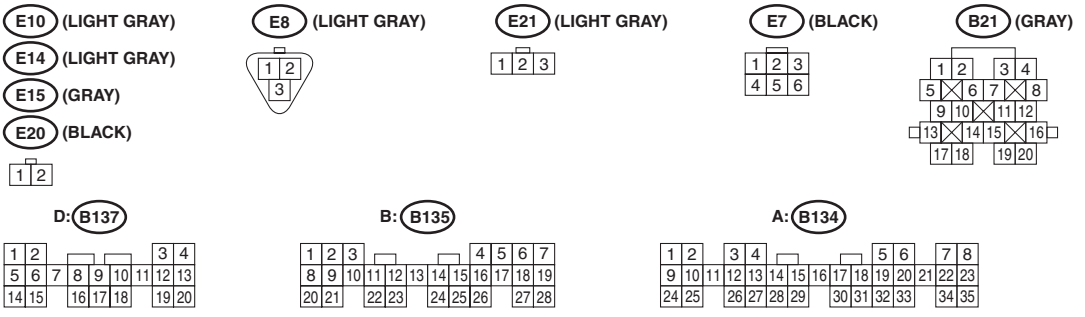
WI-02539


E/G(NA)-06
E/G(NA)-06
B: B135 C: B136 D: B137 ENGINE CONTROL MODULE
C4 B14 D15 C6 C17 C13 C22 B23 B3 B13 B19
BrW W SB BrB BrB W B SB Sb Lg RG
SHIELD AND SENSOR GROUND JOINT CONNECTOR
RG 1
LW 2
GY 6
YW 5
BY 3
B83
E/G(NA)-01 D
E/G(NA)-01 G
E/G(NA)-01 F
E/G(NA)-03 M
Sb Lg BY
12 11 9
B21
E2
YR WR BR
P E/G(NA)-07
Q E/G(NA)-07
YR BrW W YW
1 2 3 4
B19
YR BrB W B
4 3 1 2
B18
YR WR BR
4 3 2
E13
REAR OXYGEN SENSOR
FRONT OXYGEN (A/F) SENSOR
THROTTLE POSITION SENSOR

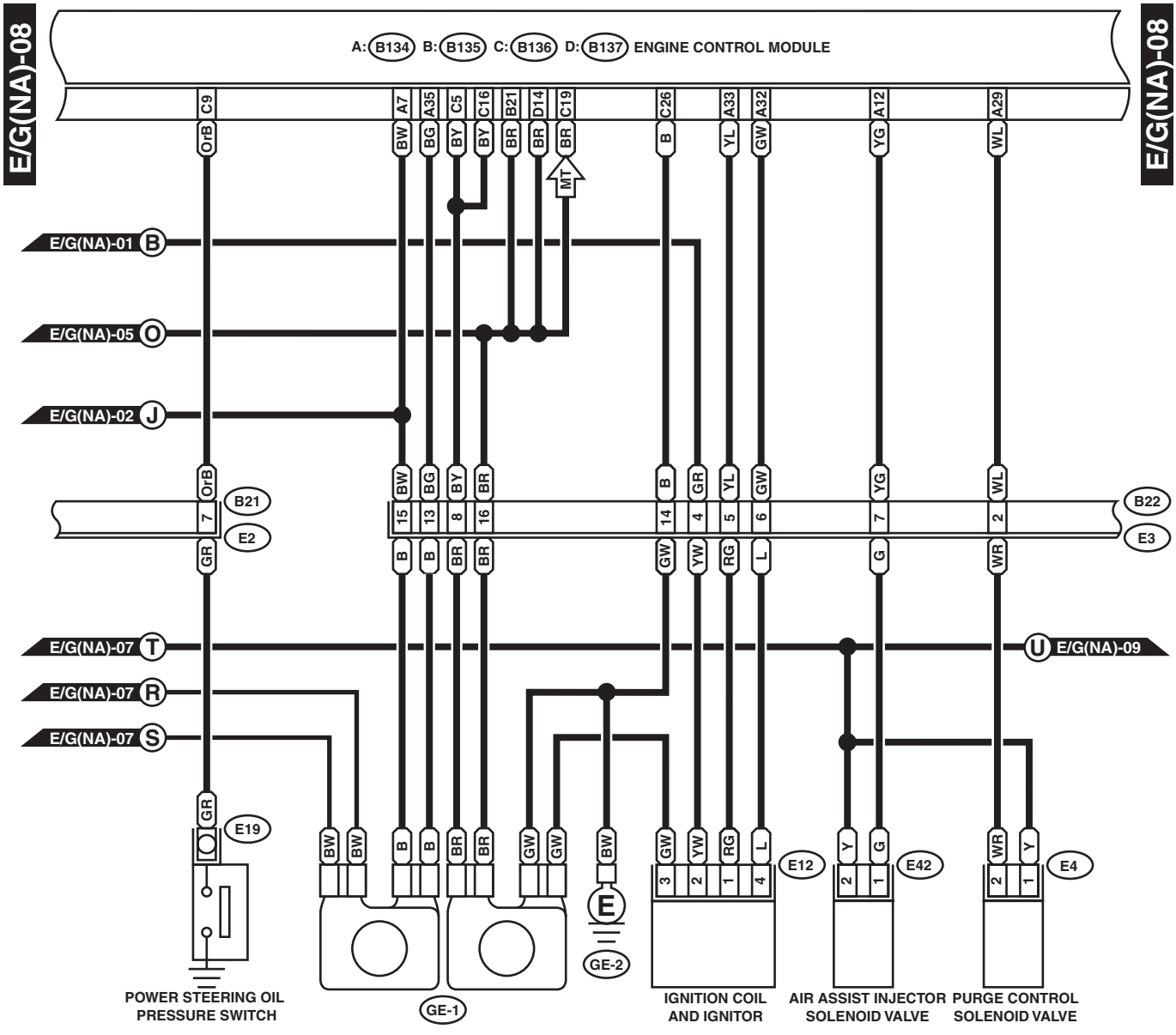

B18
B19
E13 (DARK BROWN)
B83
B21 (GRAY)
D: B137
C: B136
B: B135

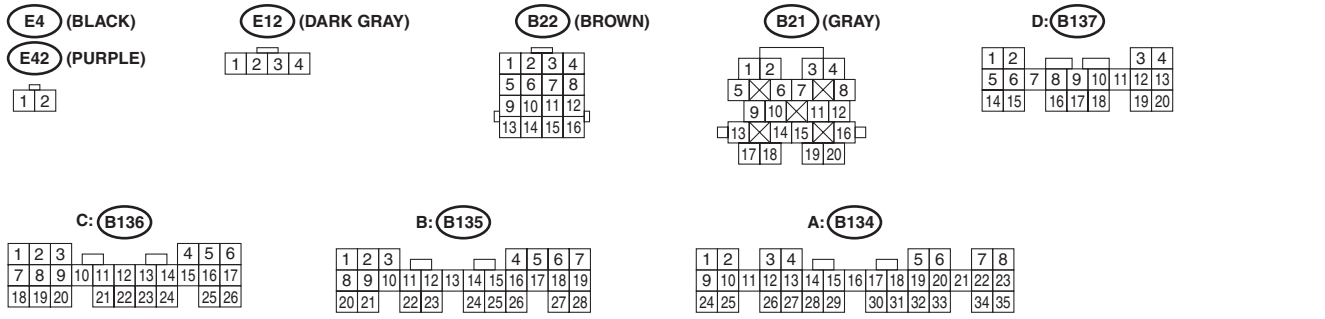
WI-02483


E/G(NA)-07
A: B134 B: B135 D: B137 ENGINE CONTROL MODULE
E/G(NA)-07
B15 D6 B12 B16 B27 B7 B17 B6 B18 B28 A6 A19 A20 A5
PL Br BY W SB W B R G SB W G B R
B21
E2
15 14 13 16 17 19 18 20 2 4 1 3
R Br BY PL Y Or B W GL LB L RY
E/G(NA)-02 K
E/G(NA)-06 P
E/G(NA)-06 Q
R E/G(NA)-08
S E/G(NA)-08
T E/G(NA)-08
YR R BR E21
Br BR E20
BR WG BY E8
PL E14
Y Or E10
B W E15
GL LB L RY Y Y E7
PRESSURE SENSOR
INTAKE AIR TEMPERATURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR AND THERMOMETER
KNOCK SENSOR
CRANKSHAFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
IDLE AIR CONTROL SOLENOID VALVE

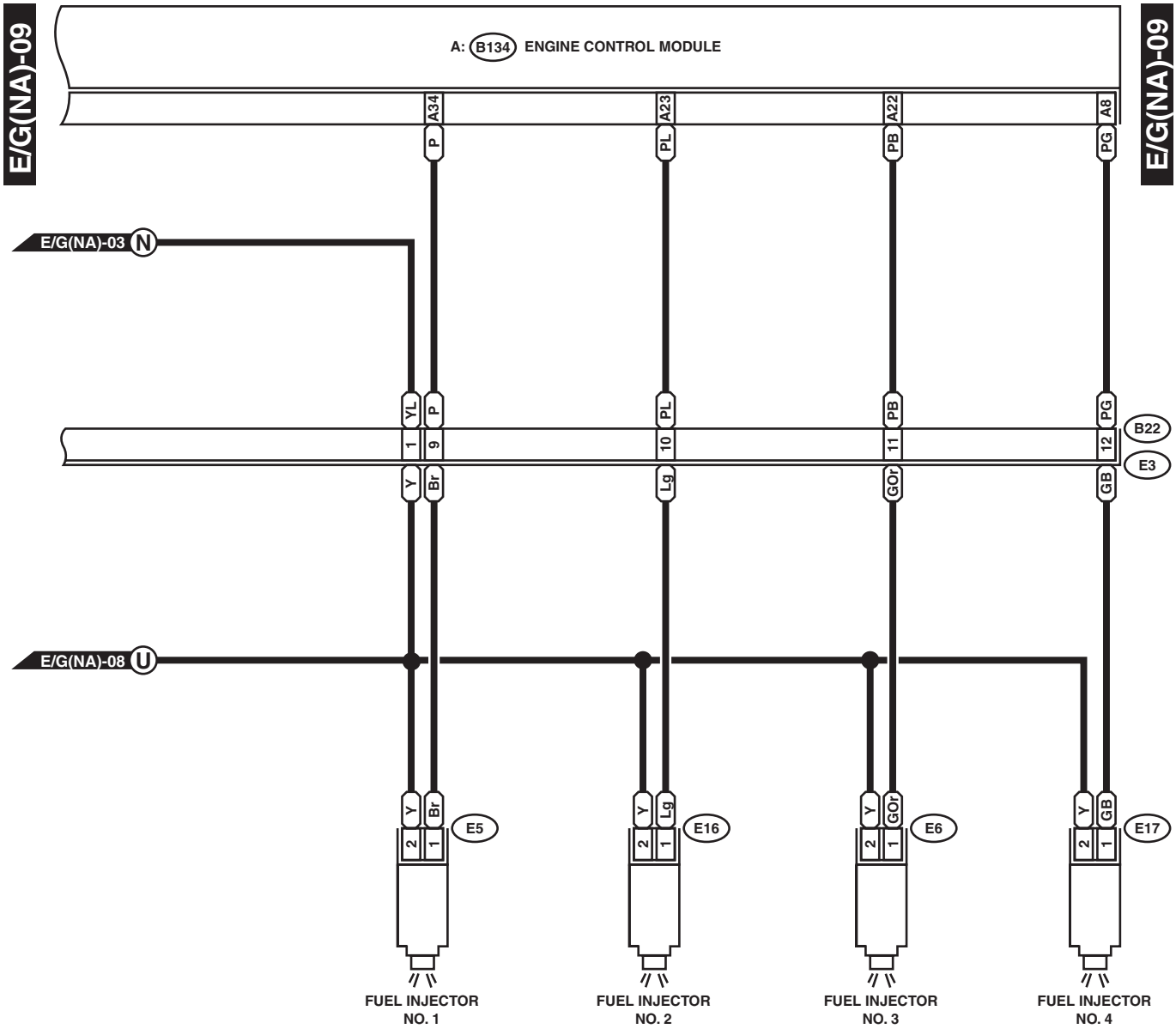

E10 (LIGHT GRAY)
E14 (LIGHT GRAY)
E15 (GRAY)
E20 (BLACK)
E8 (LIGHT GRAY)
E21 (LIGHT GRAY)
E7 (BLACK)
B21 (GRAY)
D: B137
B: B135
A: B134

WI-02484


E/G(NA)-08
A: B134 B: B135 C: B136 D: B137 ENGINE CONTROL MODULE
E/G(NA)-08
E/G(NA)-01 B
E/G(NA)-05 O
E/G(NA)-02 J
B21
E2
B22
E3
E/G(NA)-07 T
E/G(NA)-07 R
E/G(NA)-07 S
U E/G(NA)-09
E19
E12
E42
E4
GE-1
GE-2
POWER STEERING OIL PRESSURE SWITCH
IGNITION COIL AND IGNITOR
AIR ASSIST INJECTOR SOLENOID VALVE
PURGE CONTROL SOLENOID VALVE

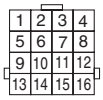

E4 (BLACK)
E42 (PURPLE)
E12 (DARK GRAY)
B22 (BROWN)
B21 (GRAY)
D: B137
C: B136
B: B135
A: B134

WI-02485

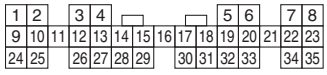


E5 (LIGHT GRAY)
E6 (LIGHT GRAY)
E16 (LIGHT GRAY)
E17 (LIGHT GRAY)

B22 (BROWN)

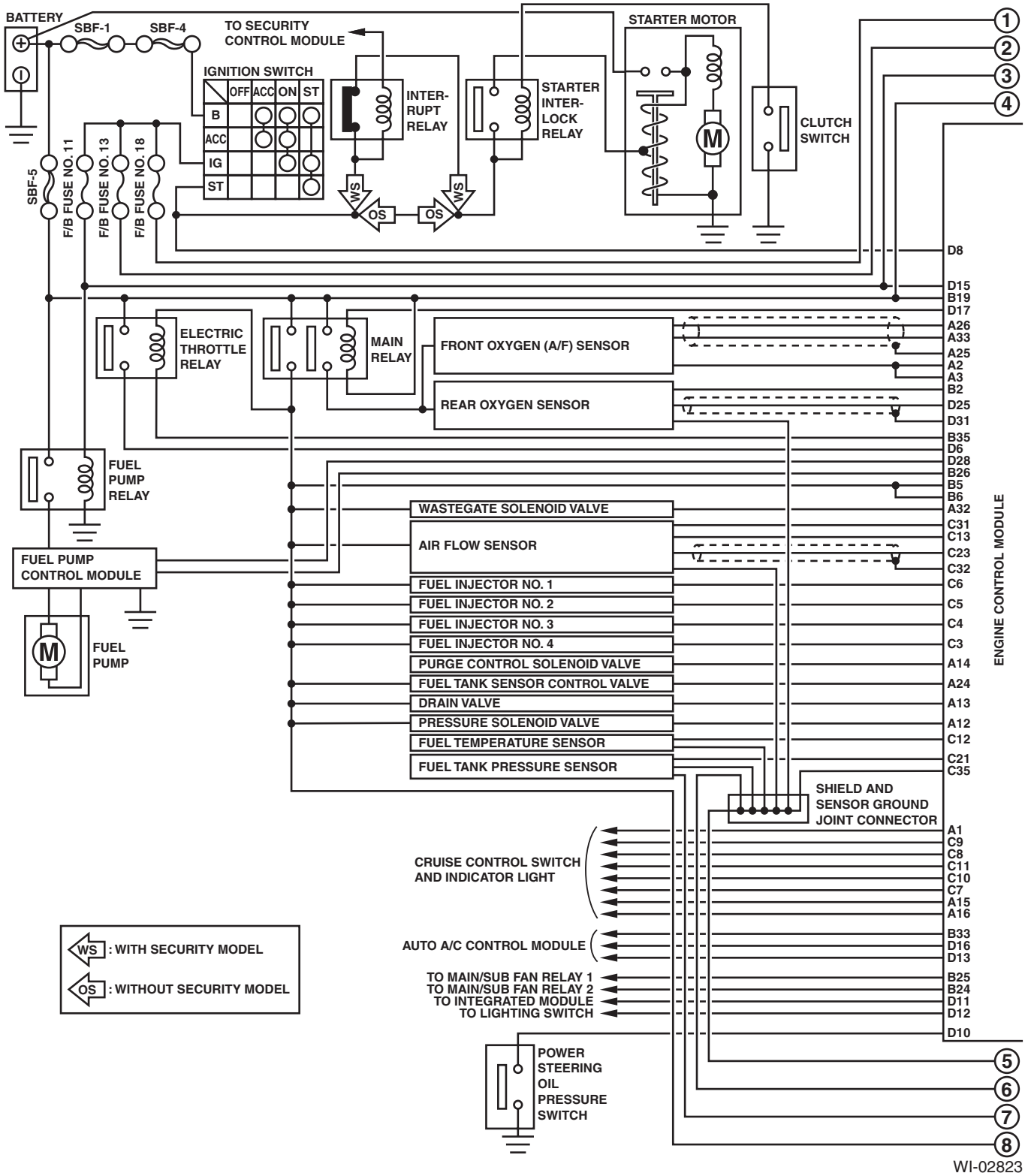


A: B134

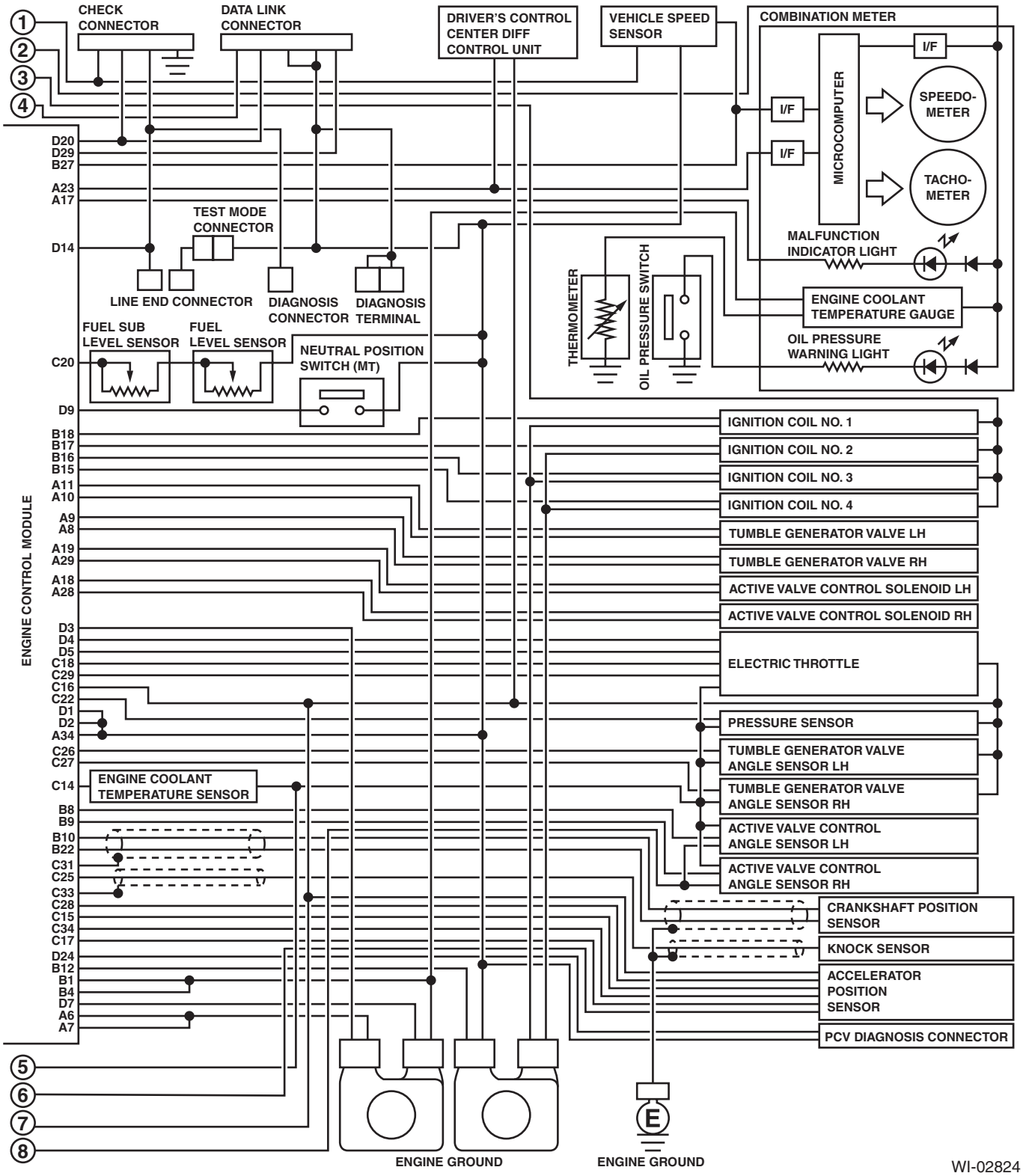


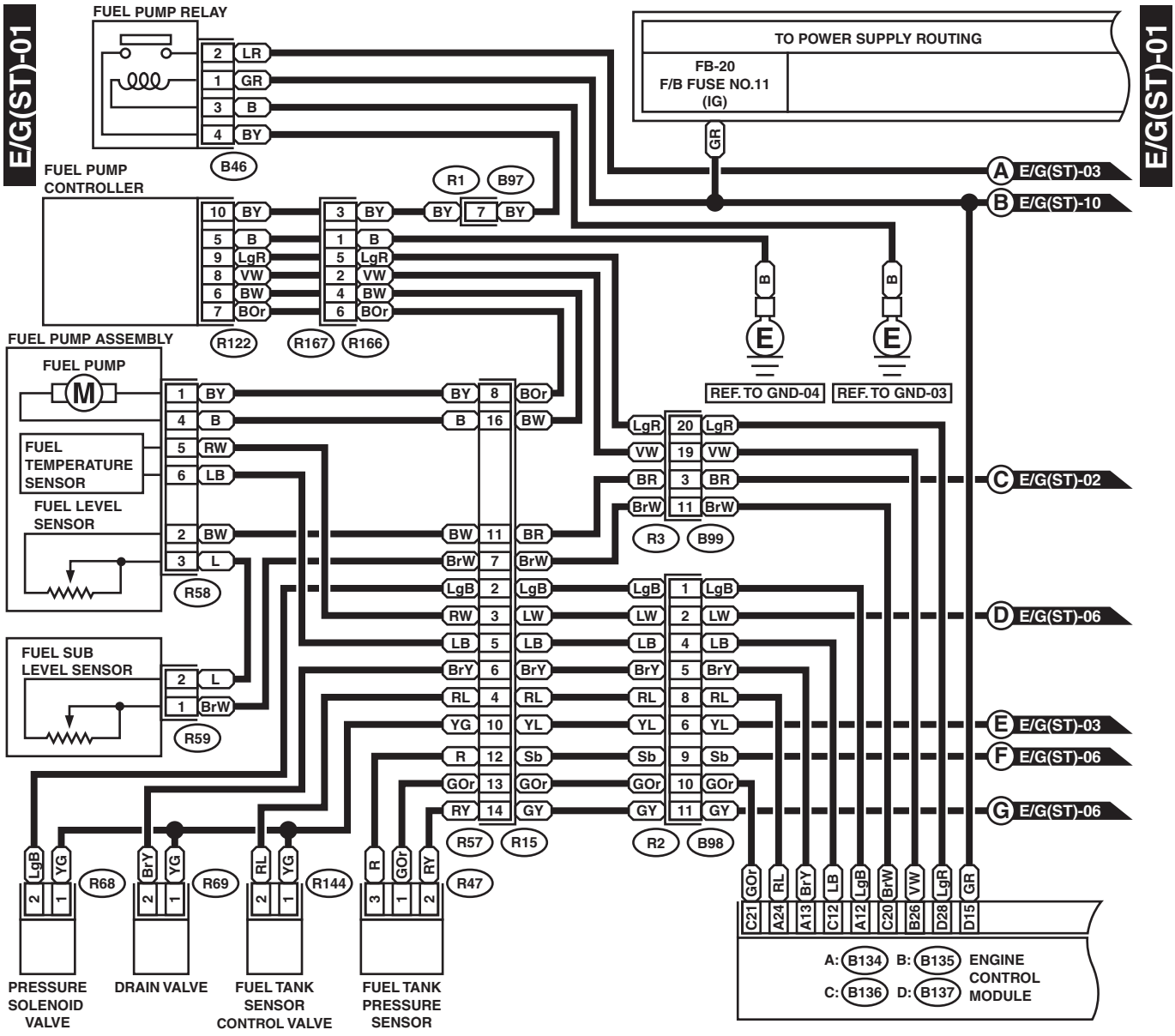
WI-02540

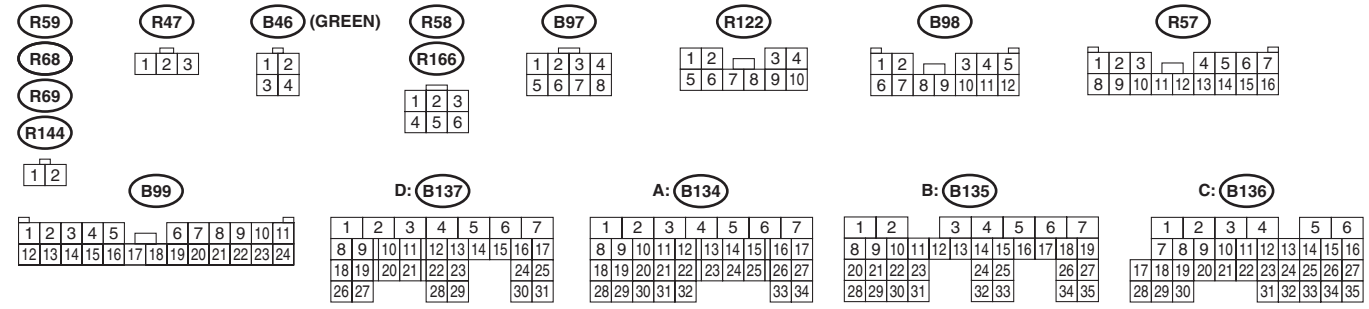
3. STi MODEL



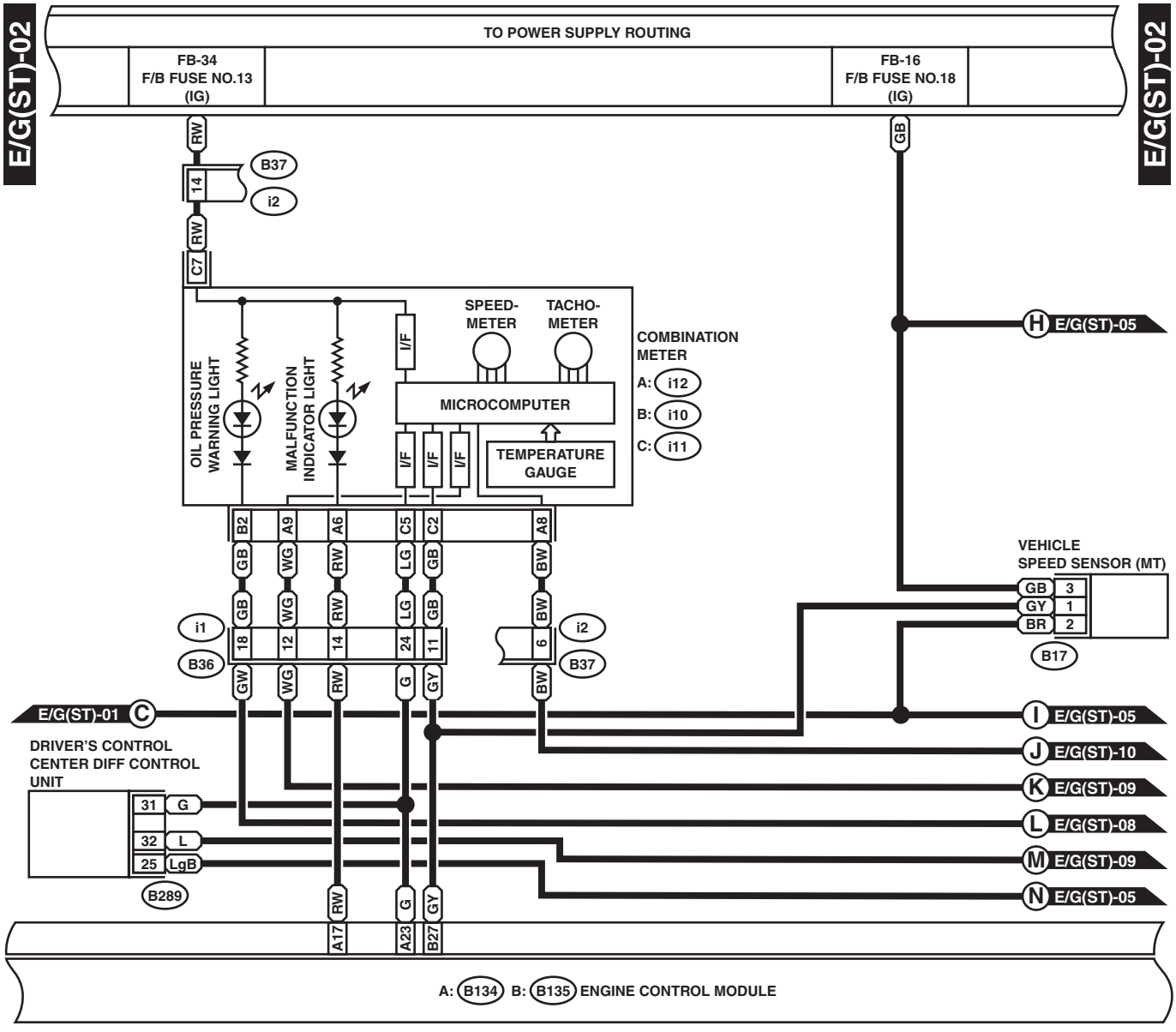
WI-02823

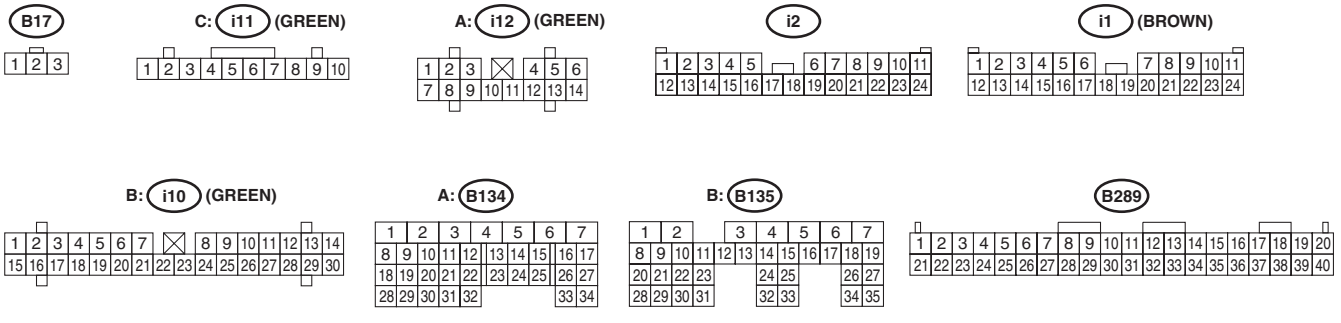

CHECK CONNECTOR
DATA LINK CONNECTOR
DRIVER'S CONTROL CENTER DIFF CONTROL UNIT
VEHICLE SPEED SENSOR
COMBINATION METER
I/F
MICROCOMPUTER
SPEEDO-METER
TACHO-METER
MALFUNCTION INDICATOR LIGHT
ENGINE COOLANT TEMPERATURE GAUGE
OIL PRESSURE WARNING LIGHT
THERMOMETER
OIL PRESSURE SWITCH
TEST MODE CONNECTOR
LINE END CONNECTOR
DIAGNOSIS CONNECTOR
DIAGNOSIS TERMINAL
FUEL SUB LEVEL SENSOR
FUEL LEVEL SENSOR
NEUTRAL POSITION SWITCH (MT)
ENGINE CONTROL MODULE
IGNITION COIL NO. 1
IGNITION COIL NO. 2
IGNITION COIL NO. 3
IGNITION COIL NO. 4
TUMBLE GENERATOR VALVE LH
TUMBLE GENERATOR VALVE RH
ACTIVE VALVE CONTROL SOLENOID LH
ACTIVE VALVE CONTROL SOLENOID RH
ELECTRIC THROTTLE
PRESSURE SENSOR
TUMBLE GENERATOR VALVE ANGLE SENSOR LH
TUMBLE GENERATOR VALVE ANGLE SENSOR RH
ACTIVE VALVE CONTROL ANGLE SENSOR LH
ACTIVE VALVE CONTROL ANGLE SENSOR RH
ENGINE COOLANT TEMPERATURE SENSOR
CRANKSHAFT POSITION SENSOR
KNOCK SENSOR
ACCELERATOR POSITION SENSOR
PCV DIAGNOSIS CONNECTOR
ENGINE GROUND
ENGINE GROUND
WI-02824


E/G(ST)-01
FUEL PUMP RELAY
TO POWER SUPPLY ROUTING
FB-20
F/B FUSE NO.11
(IG)
B46
FUEL PUMP CONTROLLER
R1
B97
R122
R167
R166
FUEL PUMP ASSEMBLY
FUEL PUMP
FUEL TEMPERATURE SENSOR
FUEL LEVEL SENSOR
R58
FUEL SUB LEVEL SENSOR
R59
REF. TO GND-04
REF. TO GND-03
R3
B99
R2
B98
R57
R15
R68
R69
R144
R47
PRESSURE SOLENOID VALVE
DRAIN VALVE
FUEL TANK SENSOR CONTROL VALVE
FUEL TANK PRESSURE SENSOR
A: B134
B: B135
C: B136
D: B137
ENGINE CONTROL MODULE
A E/G(ST)-03
B E/G(ST)-10
C E/G(ST)-02
D E/G(ST)-06
E E/G(ST)-03
F E/G(ST)-06
G E/G(ST)-06

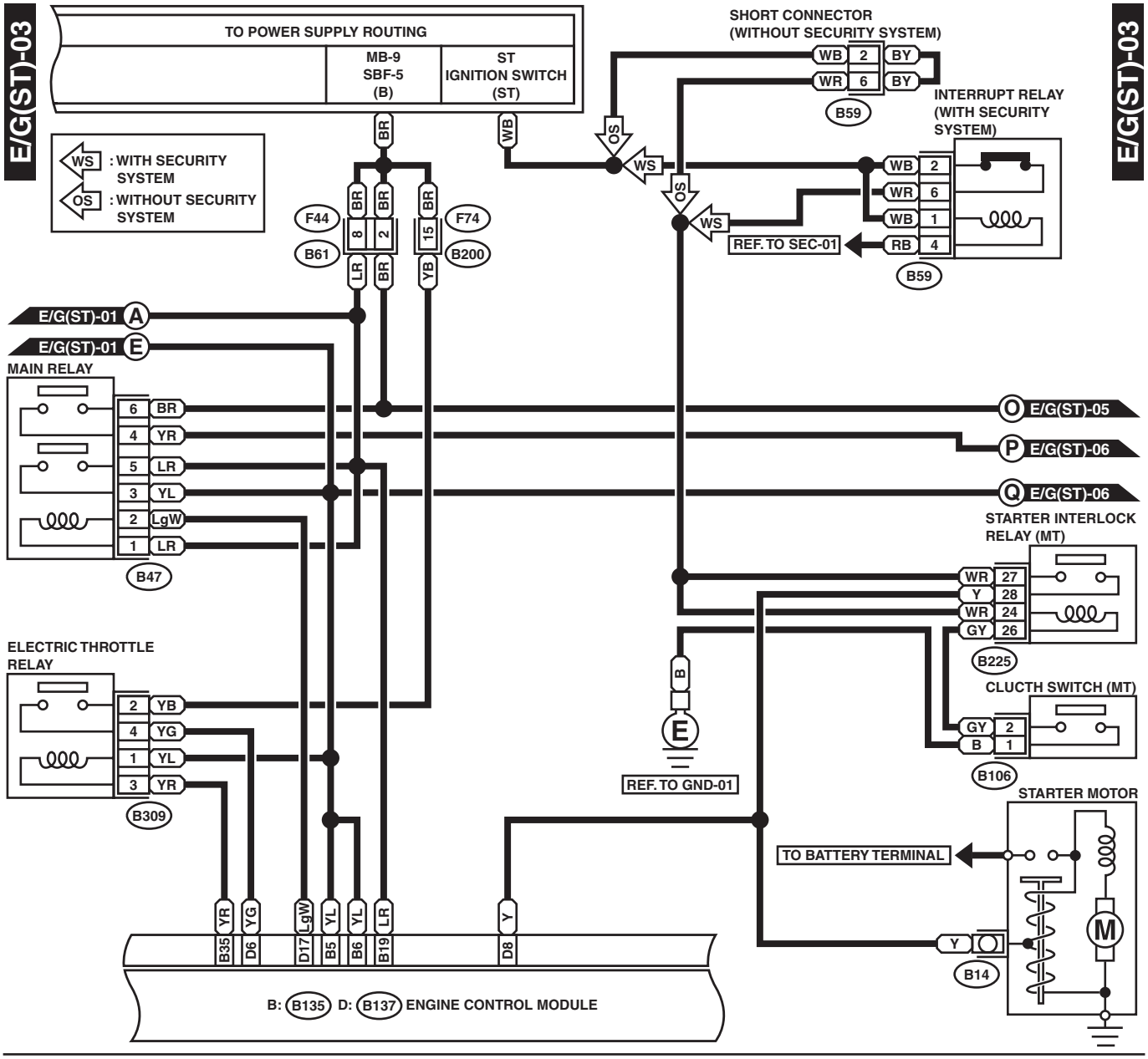

R59
R68
R69
R144
R47
B46 (GREEN)
R58
R166
B97
R122
B98
R57
B99
D: B137
A: B134
B: B135
C: B136

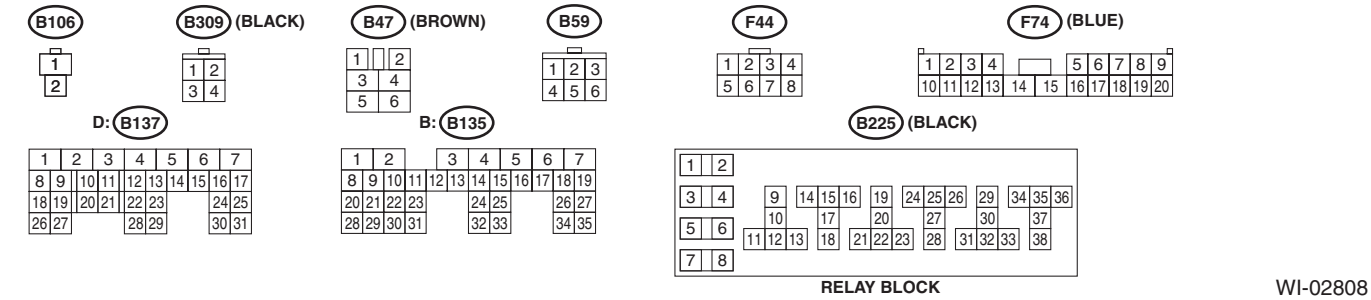
WI-02806


E/G(ST)-02
TO POWER SUPPLY ROUTING
FB-34
F/B FUSE NO.13
(IG)
FB-16
F/B FUSE NO.18
(IG)
E/G(ST)-02
RW
B37
14
i2
RW
C7
SPEED-
METER
TACHO-
METER
COMBINATION
METER
A: i12
B: i10
C: i11
I/F
OIL PRESSURE
WARNING LIGHT
MALFUNCTION
INDICATOR LIGHT
MICROCOMPUTER
I/F
I/F
I/F
TEMPERATURE
GAUGE
H E/G(ST)-05
B2
A9
A6
C5
C2
A8
GB
WG
RW
LG
GB
BW
VEHICLE
SPEED SENSOR (MT)
GB 3
GY 1
BR 2
B17
i1
B36
18
12
14
24
11
6
i2
B37
GW
WG
RW
G
GY
BW
E/G(ST)-01 C
I E/G(ST)-05
J E/G(ST)-10
K E/G(ST)-09
L E/G(ST)-08
M E/G(ST)-09
N E/G(ST)-05
DRIVER'S CONTROL
CENTER DIFF CONTROL
UNIT
31 G
32 L
25 LgB
B289
RW
G
GY
A17
A23
B27
A: B134 B: B135 ENGINE CONTROL MODULE


B17
1 2 3
C: i11 (GREEN)
1 2 3 4 5 6 7 8 9 10
A: i12 (GREEN)
1 2 3 4 5 6
7 8 9 10 11 12 13 14
i2
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22 23 24
i1 (BROWN)
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22 23 24
B: i10 (GREEN)
1 2 3 4 5 6 7 8 9 10 11 12 13 14
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
A: B134
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34
B: B135
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35
B289
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

WI-02807

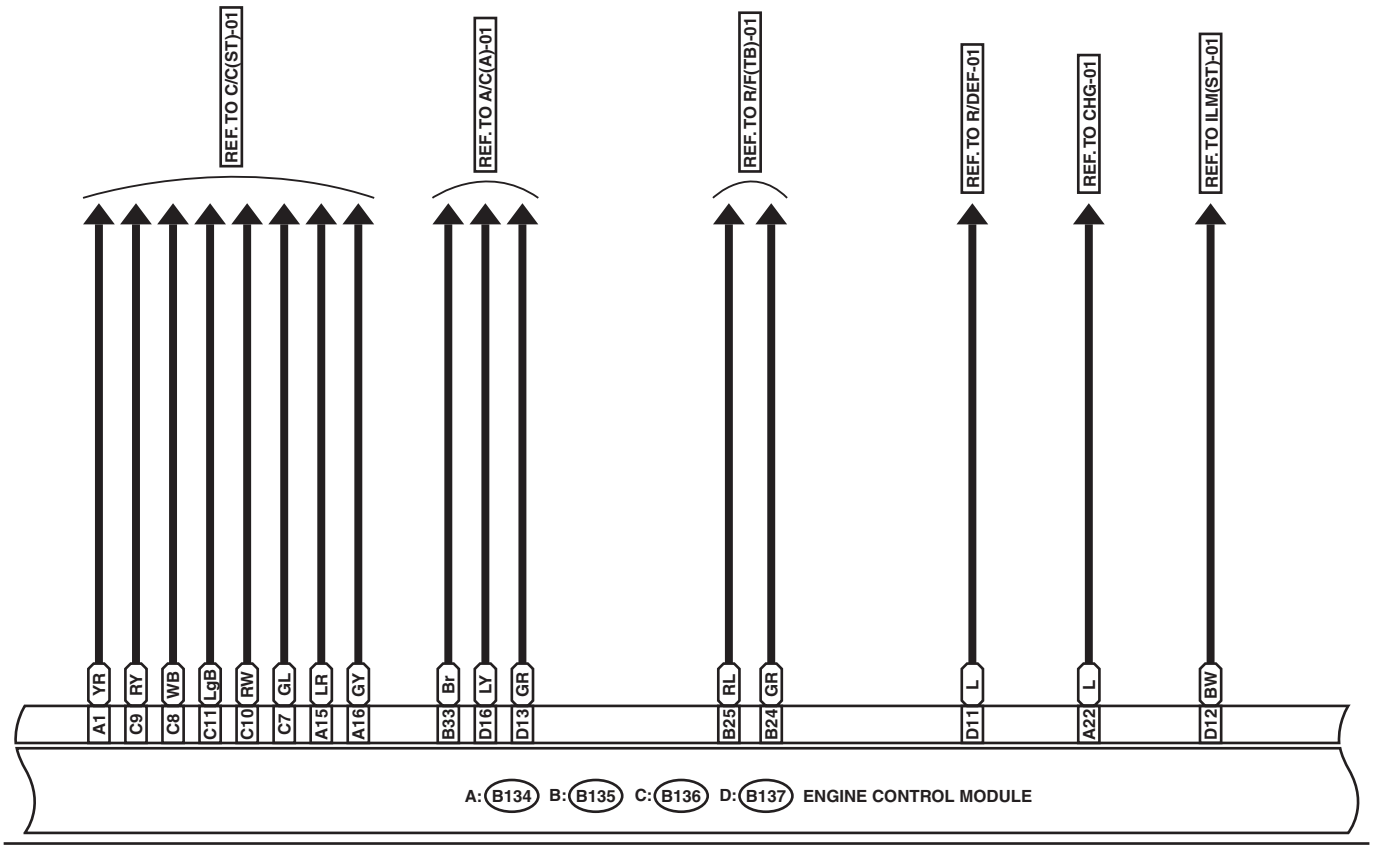

E/G(ST)-03
TO POWER SUPPLY ROUTING
MB-9
SBF-5
(B)
ST
IGNITION SWITCH
(ST)
WS : WITH SECURITY SYSTEM
OS : WITHOUT SECURITY SYSTEM
SHORT CONNECTOR
(WITHOUT SECURITY SYSTEM)
INTERRUPT RELAY
(WITH SECURITY SYSTEM)
B59
F44
B61
F74
B200
REF. TO SEC-01
E/G(ST)-01 A
E/G(ST)-01 E
MAIN RELAY
B47
E/G(ST)-05
E/G(ST)-06
E/G(ST)-06
STARTER INTERLOCK RELAY (MT)
B225
CLUCTH SWITCH (MT)
B106
ELECTRIC THROTTLE RELAY
B309
REF. TO GND-01
STARTER MOTOR
TO BATTERY TERMINAL
B14
B: B135 D: B137 ENGINE CONTROL MODULE

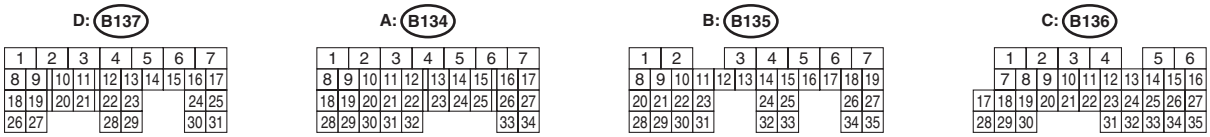

B106
B309 (BLACK)
B47 (BROWN)
B59
F44
F74 (BLUE)
D: B137
B: B135
B225 (BLACK)
RELAY BLOCK

WI-02808

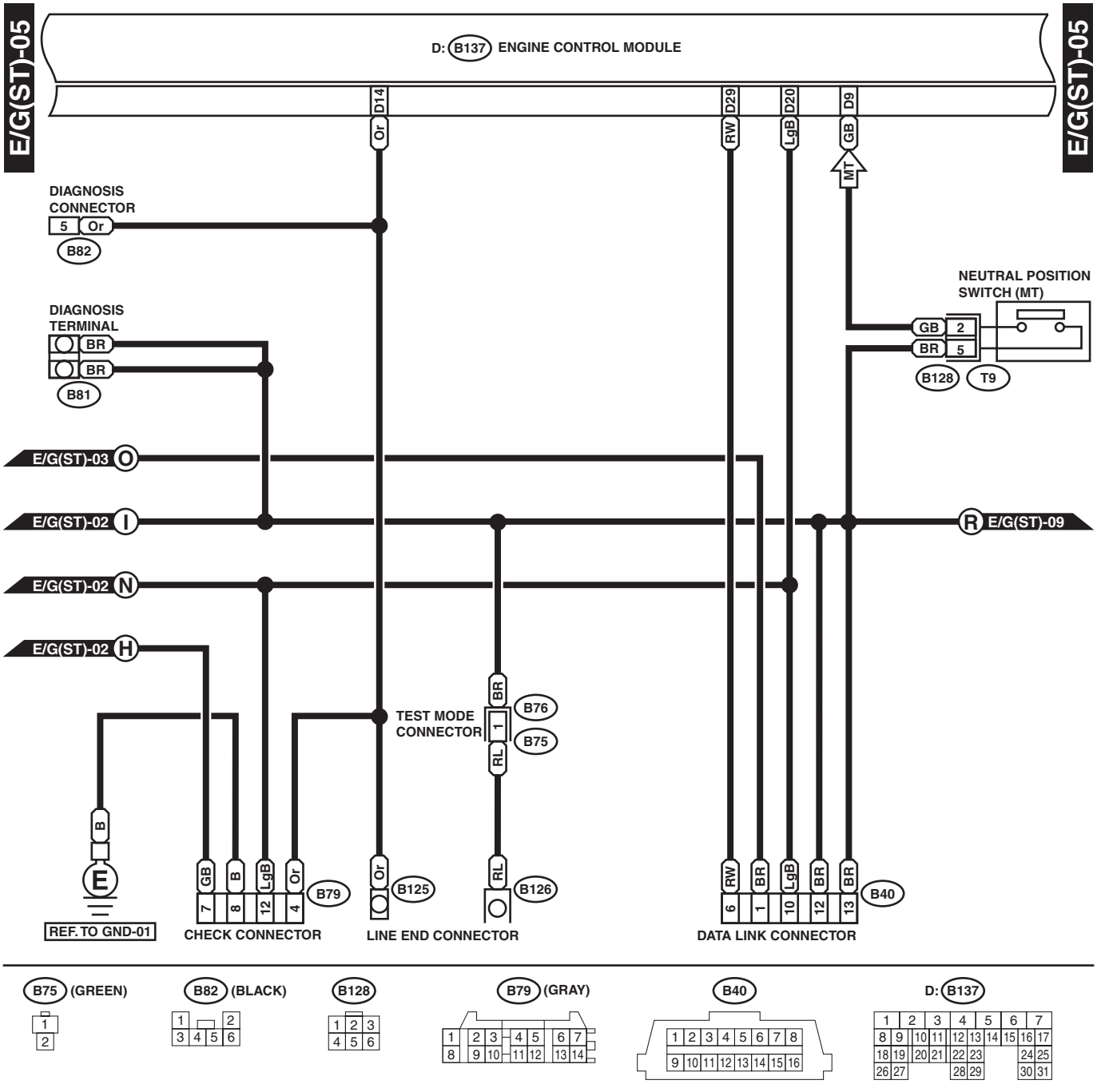
E/G(ST)-04

E/G(ST)-04



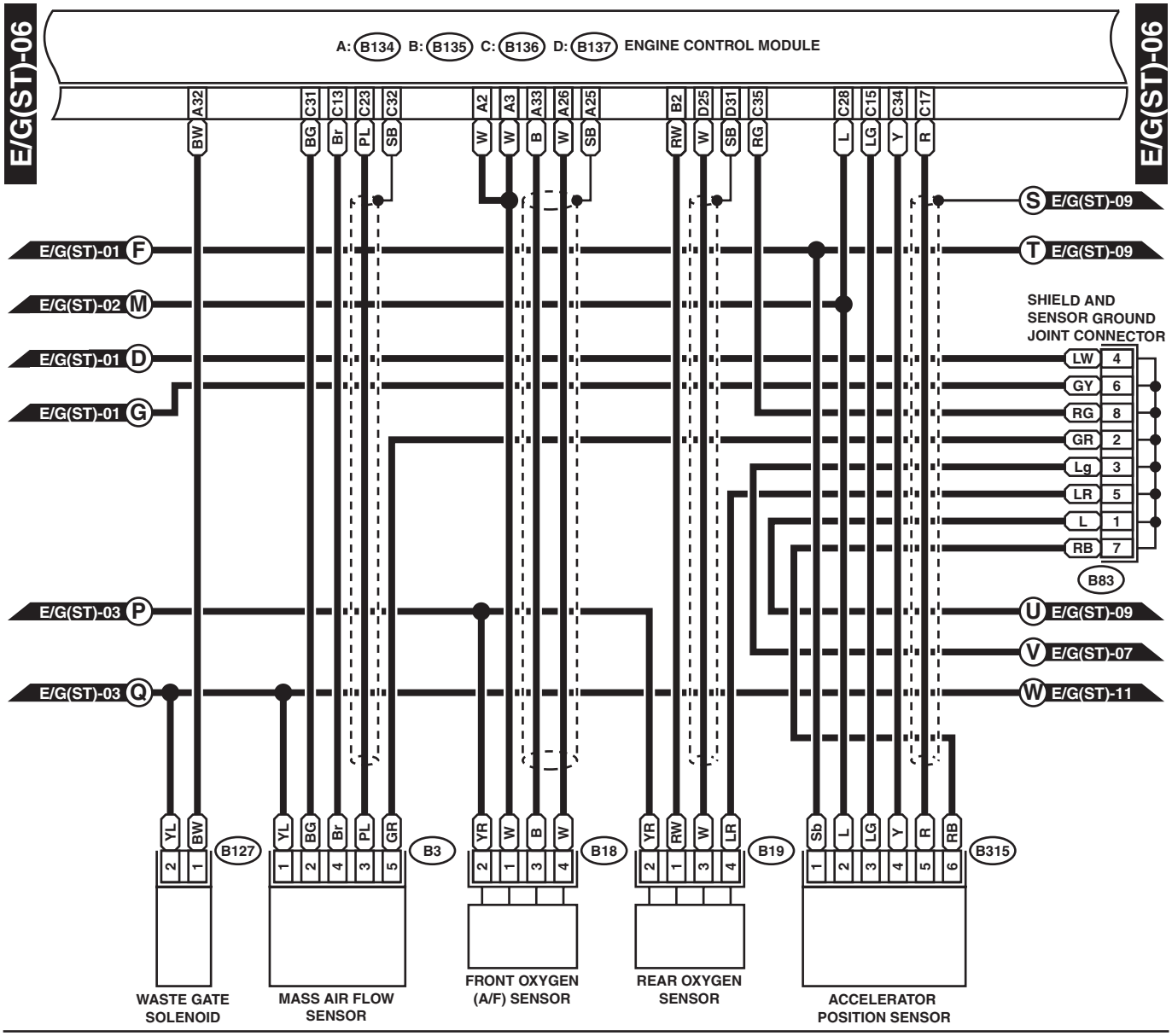


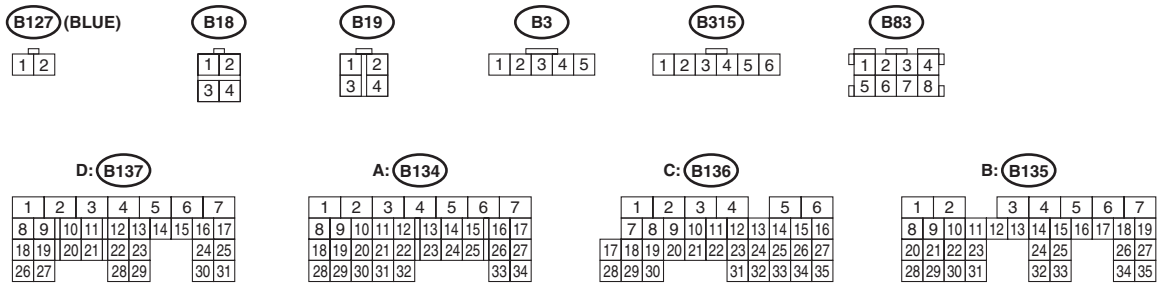
WI-02809


E/G(ST)-05
D: B137 ENGINE CONTROL MODULE
E/G(ST)-05
D14
D29
D20
D9
Or
RW
LgB
GB
MT
DIAGNOSIS CONNECTOR
5 Or
B82
DIAGNOSIS TERMINAL
BR
BR
B81
NEUTRAL POSITION SWITCH (MT)
GB 2
BR 5
B128
T9
E/G(ST)-03 O
E/G(ST)-02 I
E/G(ST)-02 N
E/G(ST)-02 H
R E/G(ST)-09
TEST MODE CONNECTOR
BR
RL
1
B76
B75
B
E
REF. TO GND-01
GB
B
LgB
Or
7
8
12
4
B79
CHECK CONNECTOR
Or
B125
LINE END CONNECTOR
RL
B126
RW
BR
LgB
BR
BR
6
1
10
12
13
B40
DATA LINK CONNECTOR

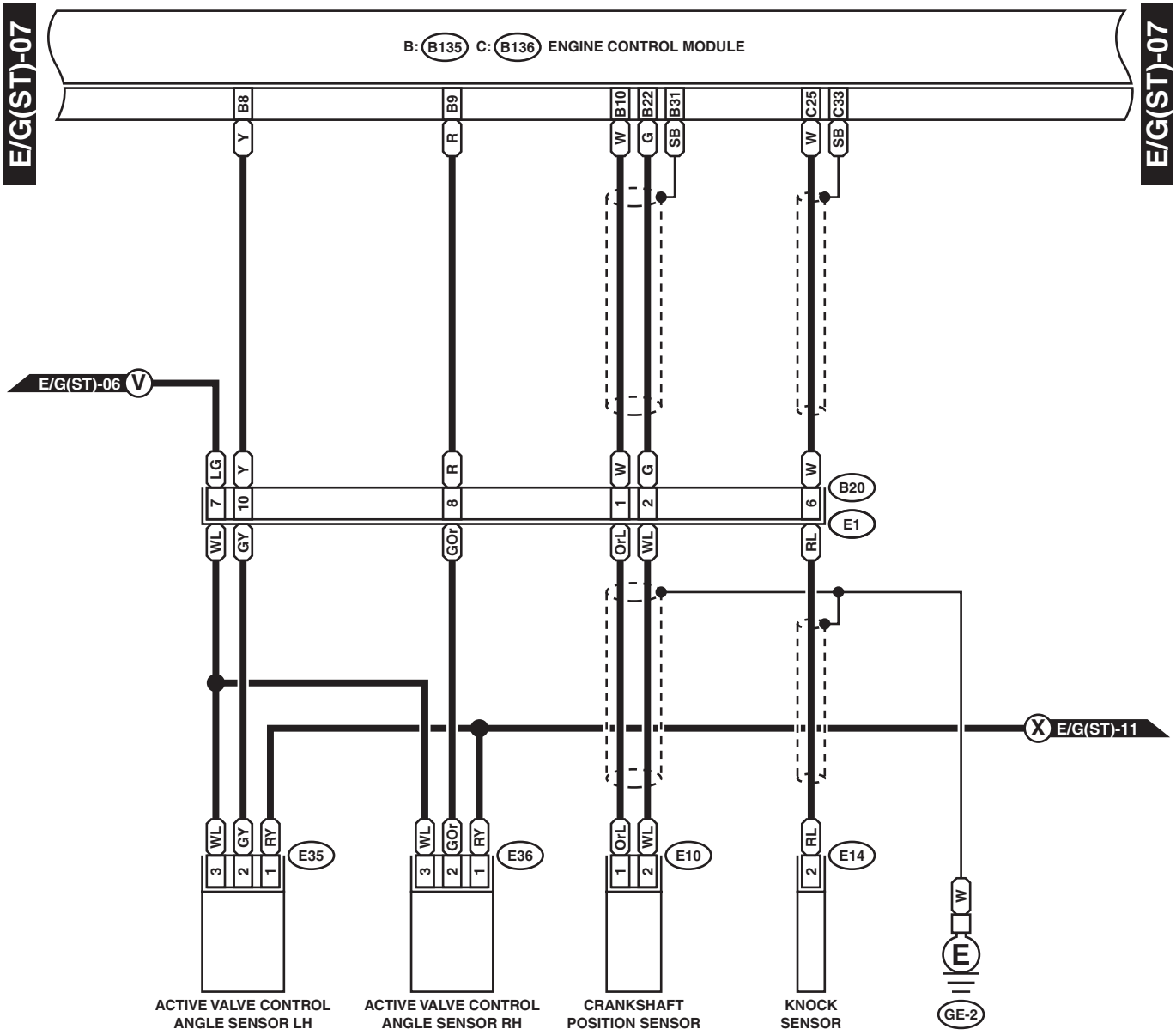
B75 (GREEN)
B82 (BLACK)
B128
B79 (GRAY)
B40
D: B137

WI-02810

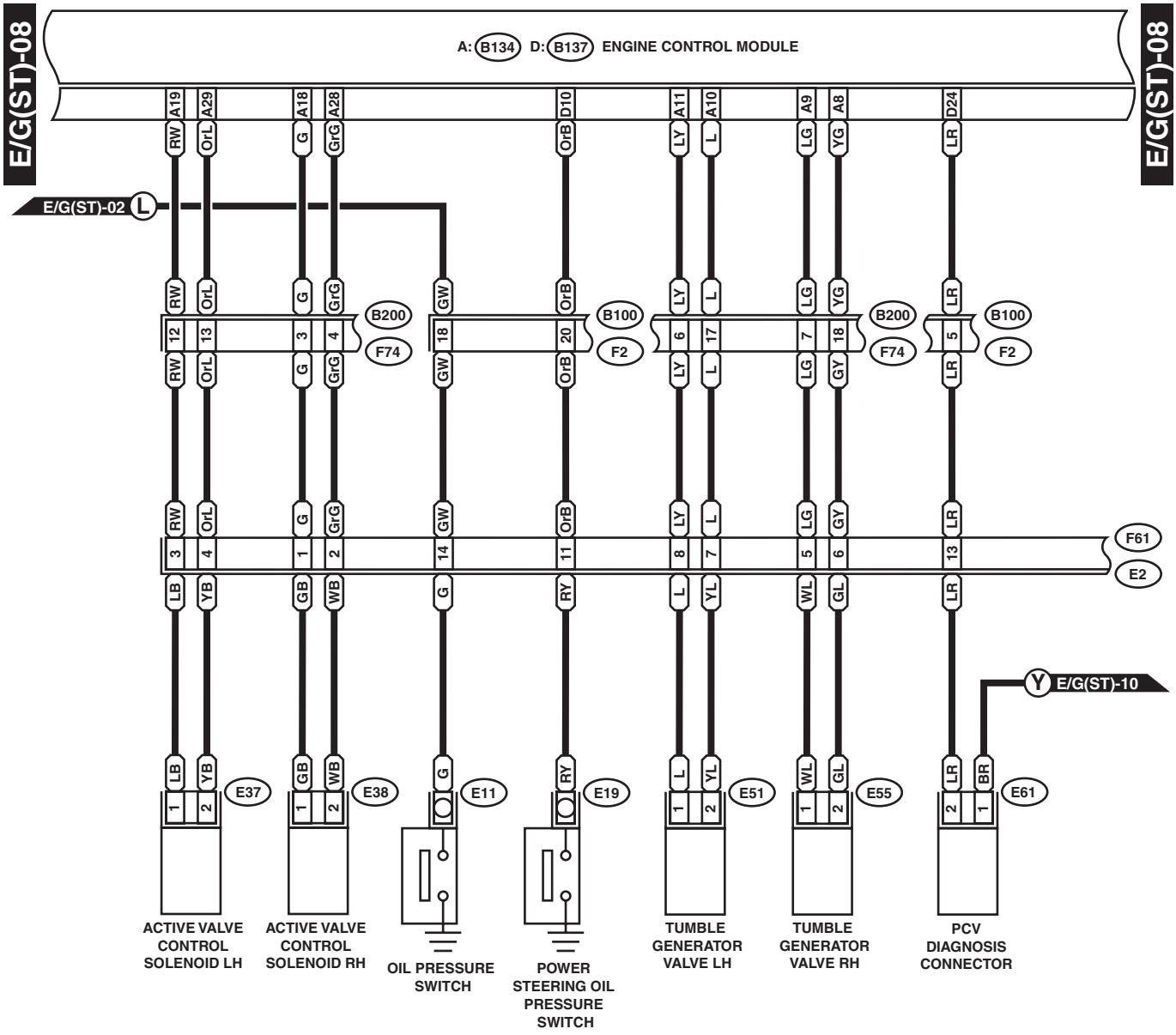

E/G(ST)-06
A: B134 B: B135 C: B136 D: B137 ENGINE CONTROL MODULE
E/G(ST)-06
A32 BW
C31 BG
C13 Br
C23 PL
C32 SB
A2 W
A3 W
A33 B
A26 W
A25 SB
B2 RW
D25 W
D31 SB
C35 RG
C28 L
C15 LG
C34 Y
C17 R
S E/G(ST)-09
E/G(ST)-01 F
T E/G(ST)-09
E/G(ST)-02 M
SHIELD AND SENSOR GROUND JOINT CONNECTOR
E/G(ST)-01 D
LW 4
GY 6
RG 8
GR 2
Lg 3
LR 5
L 1
RB 7
E/G(ST)-01 G
B83
E/G(ST)-03 P
U E/G(ST)-09
V E/G(ST)-07
E/G(ST)-03 Q
W E/G(ST)-11
YL BW B127
YL BG Br PL GR B3
YR W B W B18
YR RW W LR B19
Sb L LG Y R RB B315
WASTE GATE SOLENOID
MASS AIR FLOW SENSOR
FRONT OXYGEN (A/F) SENSOR
REAR OXYGEN SENSOR
ACCELERATOR POSITION SENSOR

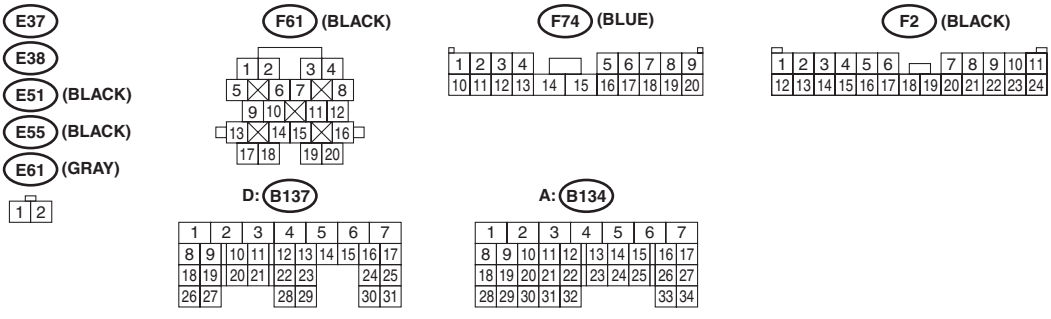

B127 (BLUE)
B18
B19
B3
B315
B83
D: B137
A: B134
C: B136
B: B135

WI-02811

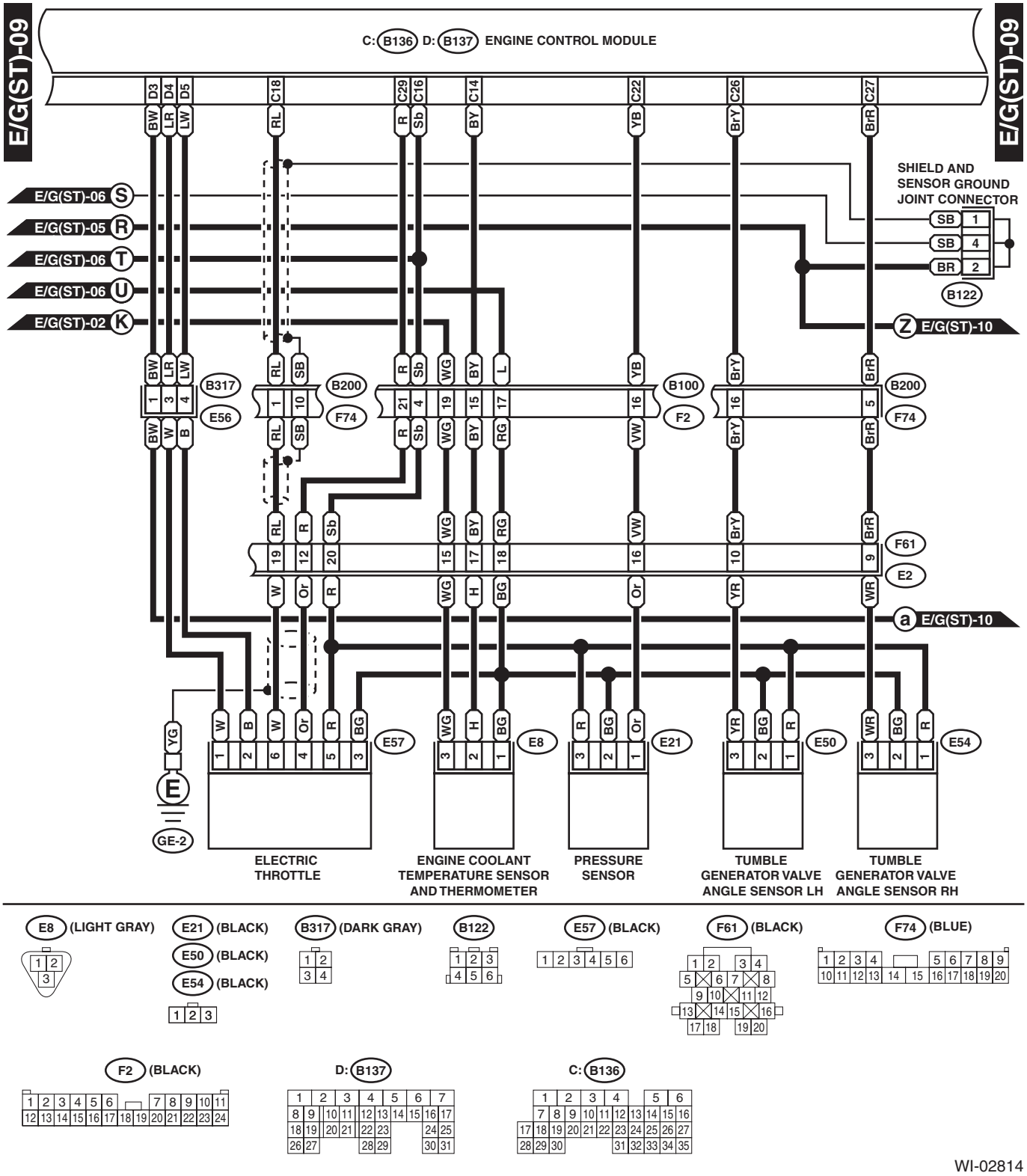

E/G(ST)-07
E/G(ST)-07
B: B135 C: B136 ENGINE CONTROL MODULE
B8
B9
B10
B22
B31
C25
C33
Y
R
W
G
SB
W
SB
E/G(ST)-06 V
LG
Y
R
W
G
W
B20
E1
WL
GY
GOr
OrL
WL
RL
X E/G(ST)-11
WL
GY
RY
E35
WL
GOr
RY
E36
OrL
WL
E10
RL
E14
W
E
GE-2
ACTIVE VALVE CONTROL ANGLE SENSOR LH
ACTIVE VALVE CONTROL ANGLE SENSOR RH
CRANKSHAFT POSITION SENSOR
KNOCK SENSOR
E10 (LIGHT GRAY)
E14 (LIGHT GRAY)
E35 (LIGHT GRAY)
E36 (LIGHT GRAY)
B20 (LIGHT GRAY)
B: B135
C: B136

WI-02812


E/G(ST)-08
A: B134 D: B137 ENGINE CONTROL MODULE
E/G(ST)-08
E/G(ST)-02 L
A19 A29 A18 A28 D10 A11 A10 A9 A8 D24
RW OrL G GrG OrB LY L LG YG LR
B200 B100 B200 B100
F74 F2 F74 F2
F61
E2
Y E/G(ST)-10
LB YB GB WB G RY L YL WL GL LR BR
E37 E38 E11 E19 E51 E55 E61
ACTIVE VALVE CONTROL SOLENOID LH
ACTIVE VALVE CONTROL SOLENOID RH
OIL PRESSURE SWITCH
POWER STEERING OIL PRESSURE SWITCH
TUMBLE GENERATOR VALVE LH
TUMBLE GENERATOR VALVE RH
PCV DIAGNOSIS CONNECTOR

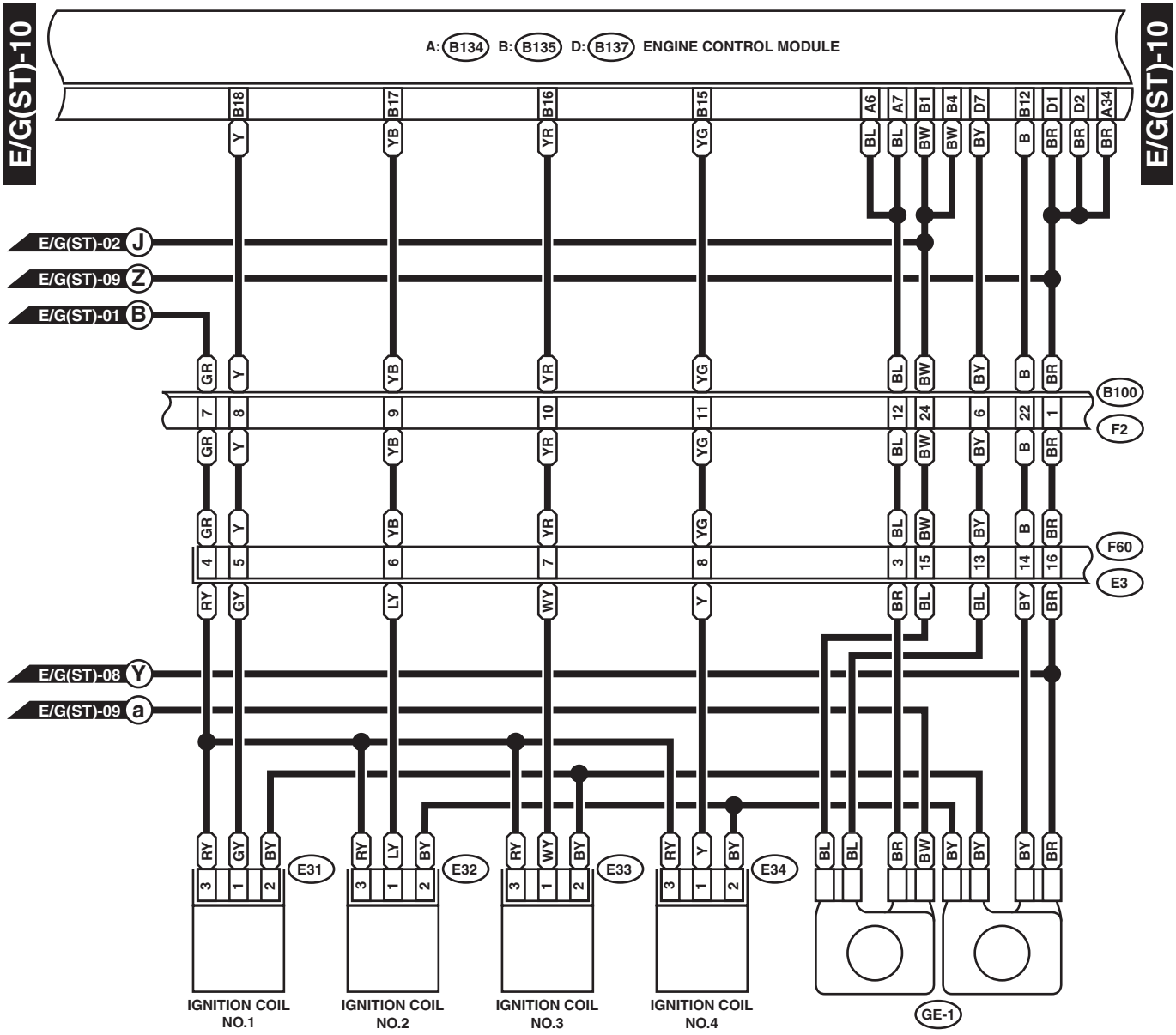

E37
E38
E51 (BLACK)
E55 (BLACK)
E61 (GRAY)
F61 (BLACK)
F74 (BLUE)
F2 (BLACK)
D: B137
A: B134

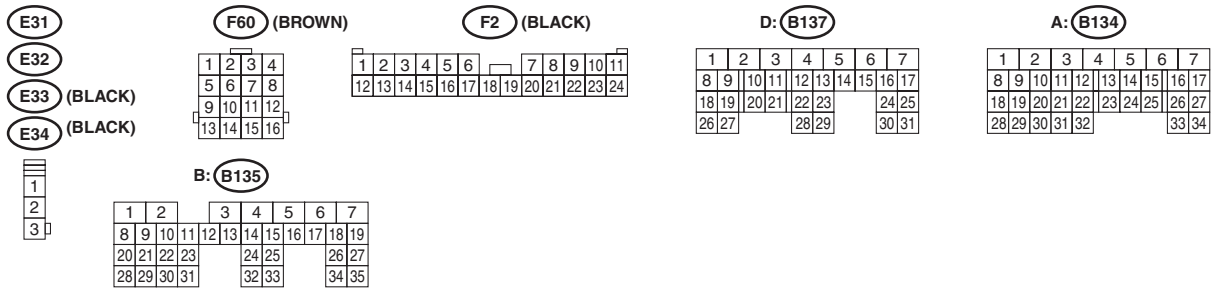
WI-02813


E/G(ST)-09
C: B136 D: B137 ENGINE CONTROL MODULE
E/G(ST)-09
D3 D4 D5 C18 C29 C16 C14 C22 C26 C27
BW LR LW RL R Sb BY YB BrY BrR
SHIELD AND SENSOR GROUND JOINT CONNECTOR
SB 1
SB 4
BR 2
B122
E/G(ST)-06 S
E/G(ST)-05 R
E/G(ST)-06 T
E/G(ST)-06 U
E/G(ST)-02 K
Z E/G(ST)-10
B317
E56
B200
F74
B100
F2
B200
F74
F61
E2
a E/G(ST)-10
YG
E
GE-2
E57
E8
E21
E50
E54
ELECTRIC THROTTLE
ENGINE COOLANT TEMPERATURE SENSOR AND THERMOMETER
PRESSURE SENSOR
TUMBLE GENERATOR VALVE ANGLE SENSOR LH
TUMBLE GENERATOR VALVE ANGLE SENSOR RH

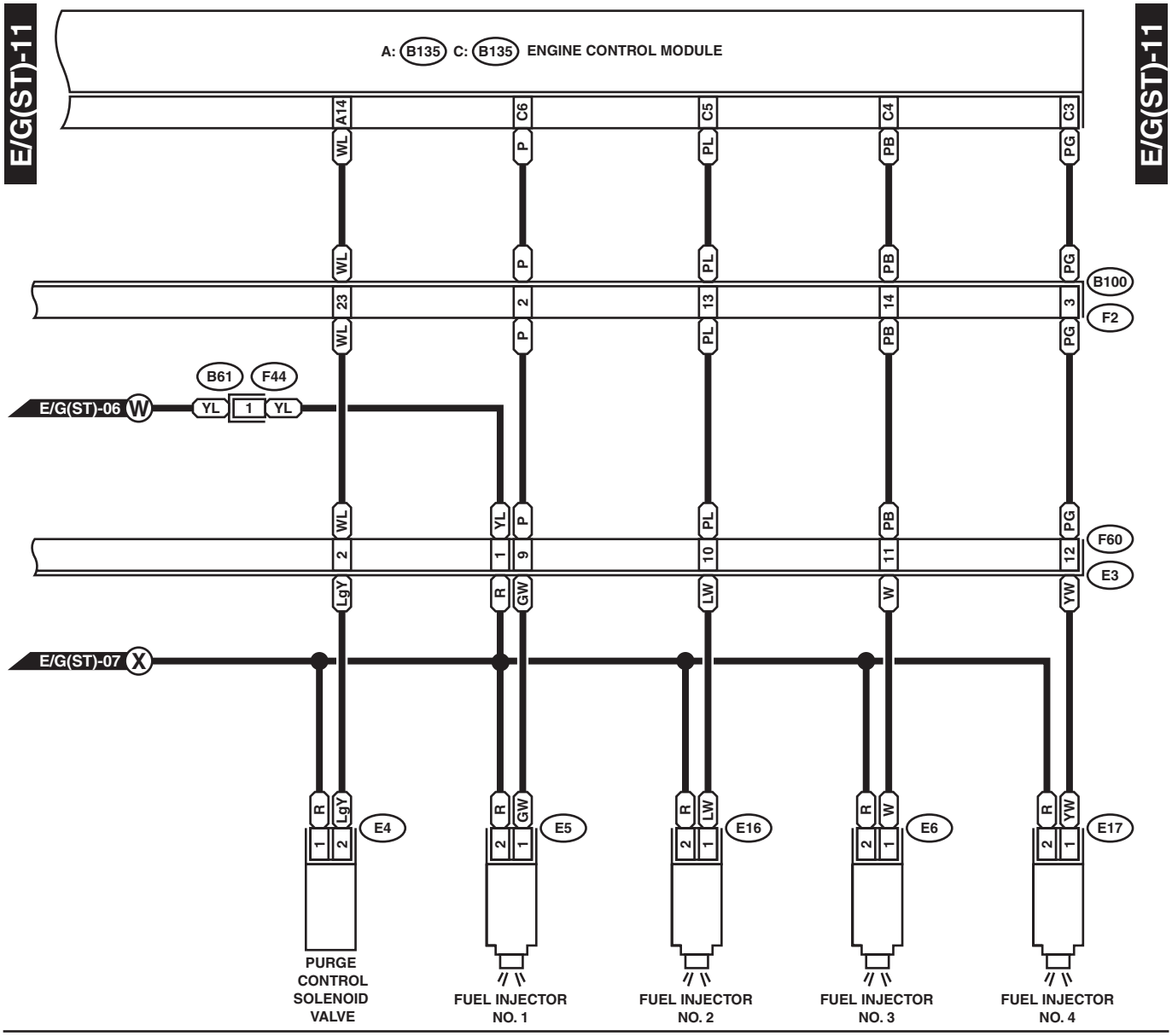
E8 (LIGHT GRAY)
E21 (BLACK)
E50 (BLACK)
E54 (BLACK)
B317 (DARK GRAY)
B122
E57 (BLACK)
F61 (BLACK)
F74 (BLUE)
F2 (BLACK)
D: B137
C: B136

WI-02814


E/G(ST)-10
A: B134 B: B135 D: B137 ENGINE CONTROL MODULE
E/G(ST)-10
B18 B17 B16 B15 A6 A7 B1 B4 D7 B12 D1 D2 A34
Y YB YR YG BL BL BW BW BY B BR BR BR
E/G(ST)-02 J
E/G(ST)-09 Z
E/G(ST)-01 B
GR Y YB YR YG BL BW BY B BR
B100
7 8 9 10 11 12 24 6 22 1
F2
GR Y YB YR YG BL BW BY B BR
GR Y YB YR YG BL BW BY B BR
F60
4 5 6 7 8 3 15 13 14 16
E3
RY GY LY WY Y BR BL BL BY BR
E/G(ST)-08 Y
E/G(ST)-09 a
RY GY BY E31
RY LY BY E32
RY WY BY E33
RY Y BY E34
BL BL BR BW BY BY BY BR
IGNITION COIL NO.1
IGNITION COIL NO.2
IGNITION COIL NO.3
IGNITION COIL NO.4
GE-1


E31
E32
E33 (BLACK)
E34 (BLACK)
F60 (BROWN)
F2 (BLACK)
D: B137
A: B134
B: B135

WI-02815

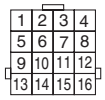


E5 (DARK GRAY)
E6 (DARK GRAY)
E16 (DARK GRAY)
E17 (DARK GRAY)

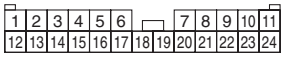
E4 (BLACK)

F44

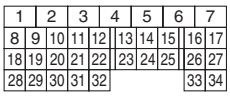
F60 (BROWN)



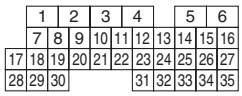
F2 (BLACK)



A: B134



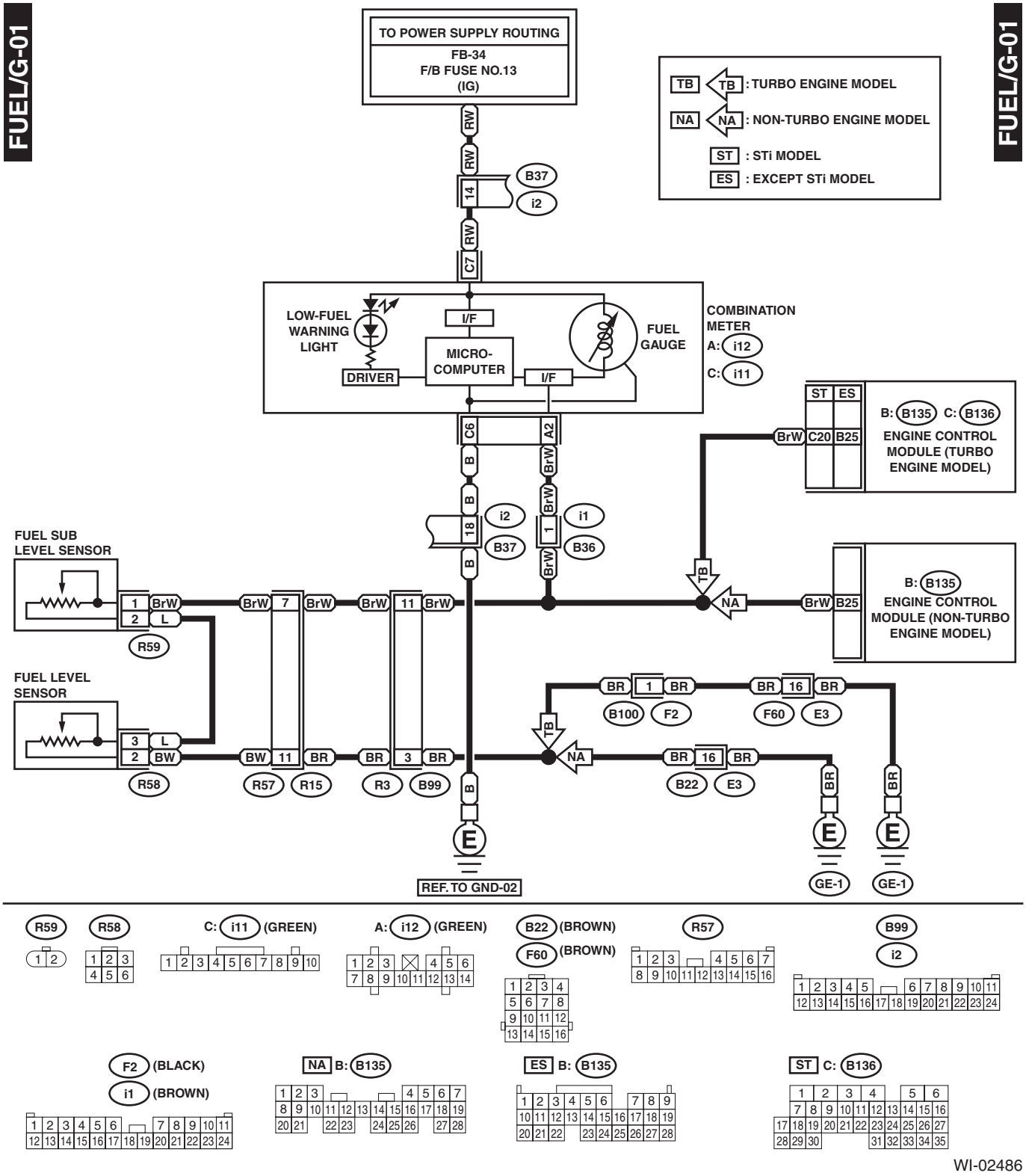
C: B136



WI-02816

18.Fuel Gauge System

A: WIRING DIAGRAM

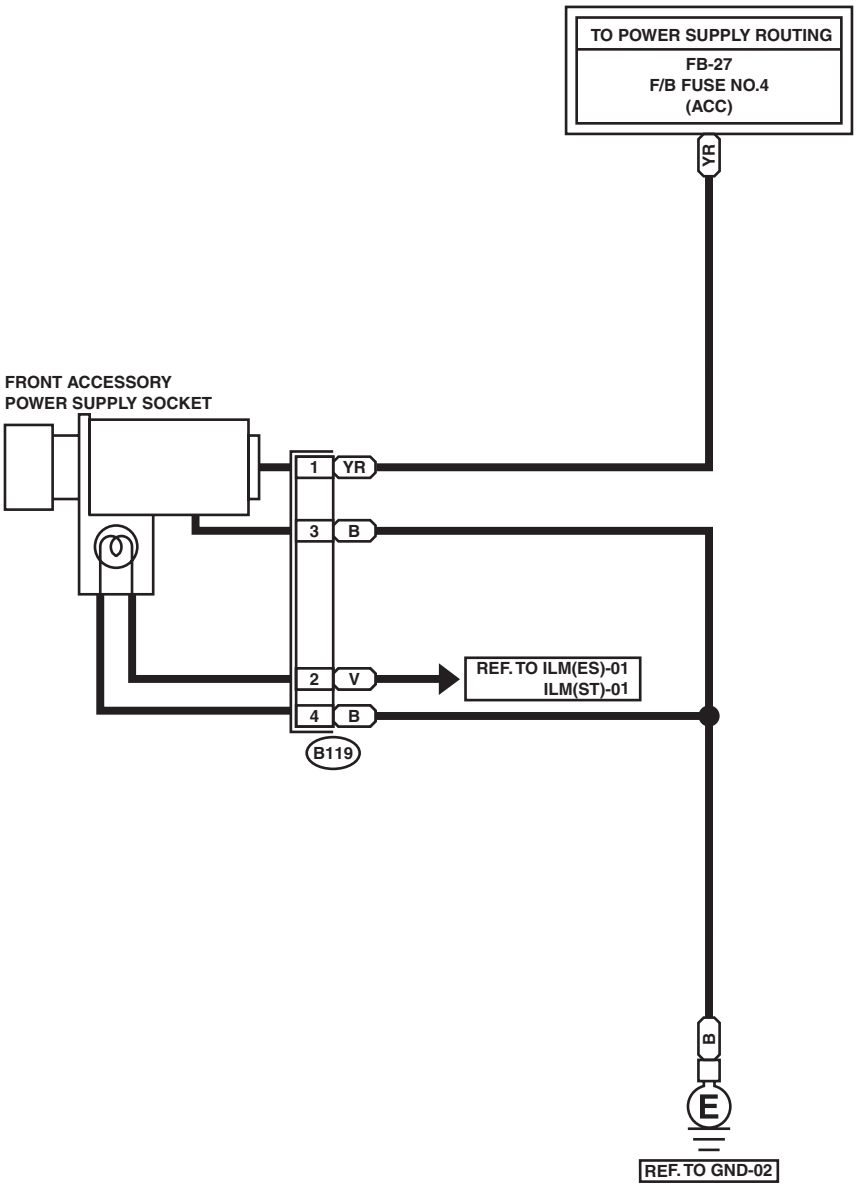


WI-02486

19.Front Accessory Power Supply System

A: WIRING DIAGRAM

FAPS-01

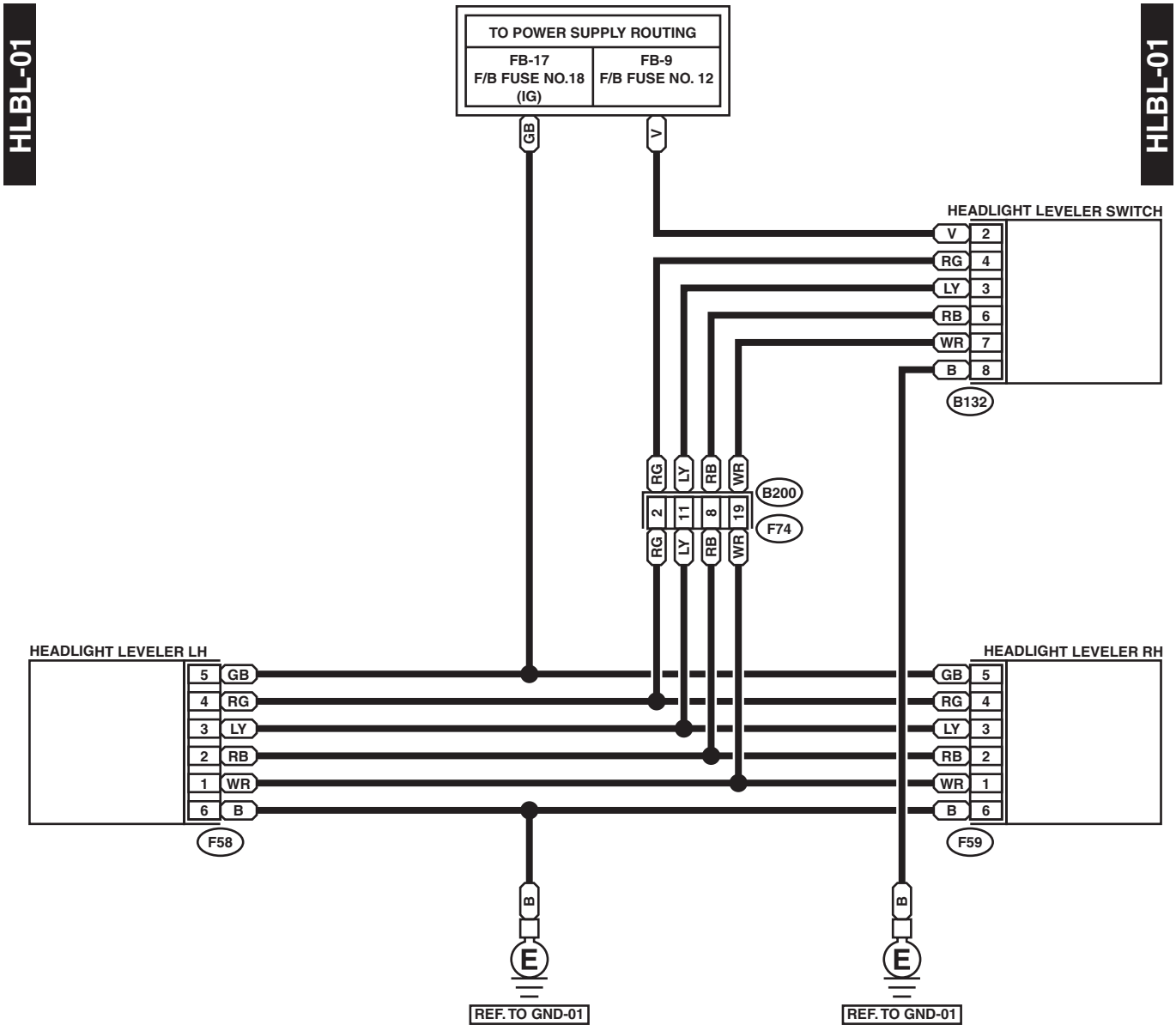


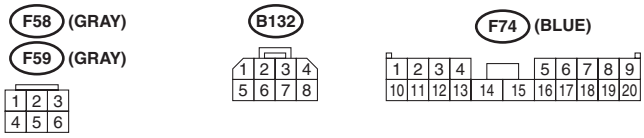
FAPS-01

WI-02783

20.Headlight Beam Leveler System

A: WIRING DIAGRAM

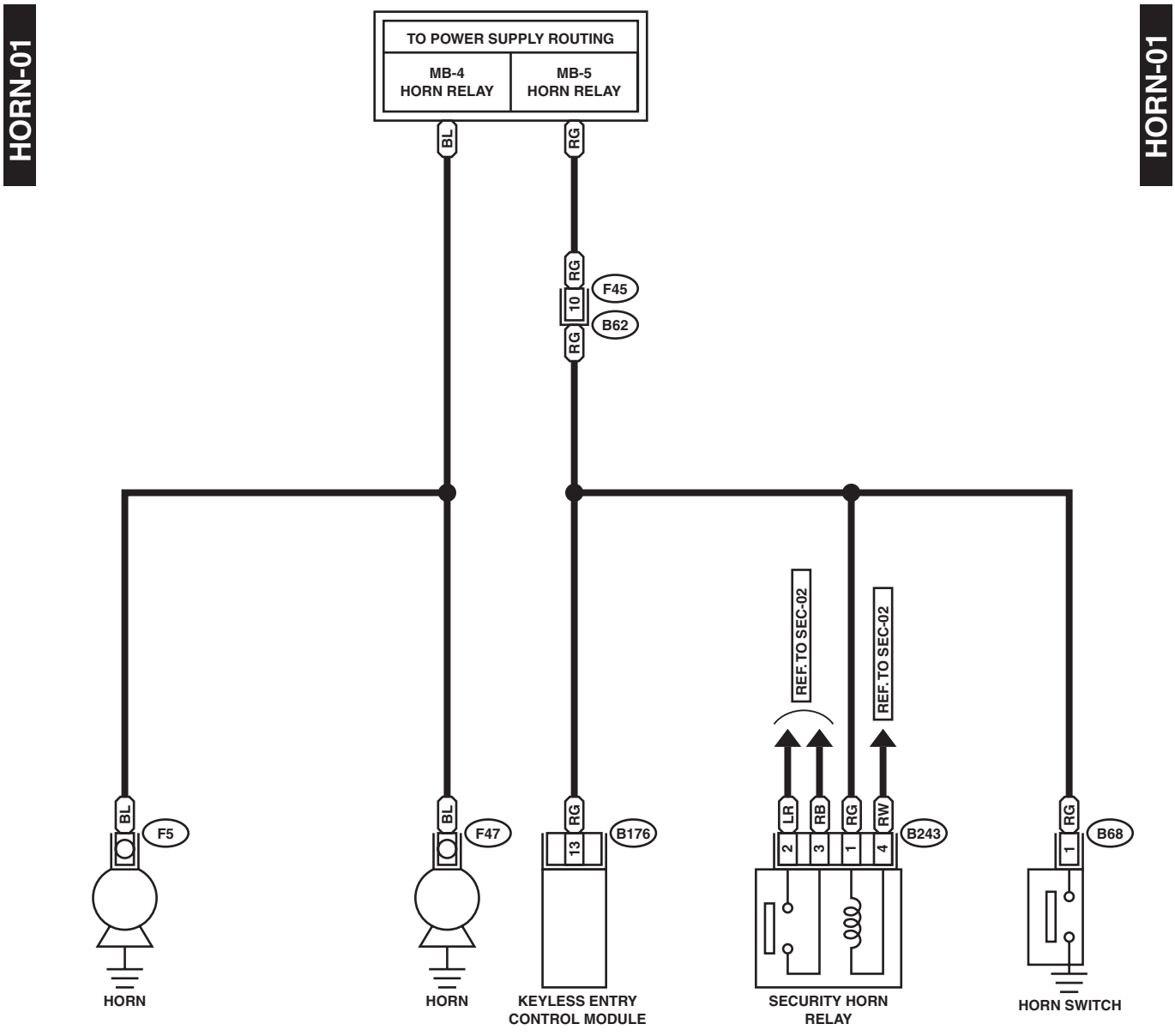




WI-02979

21.Horn System

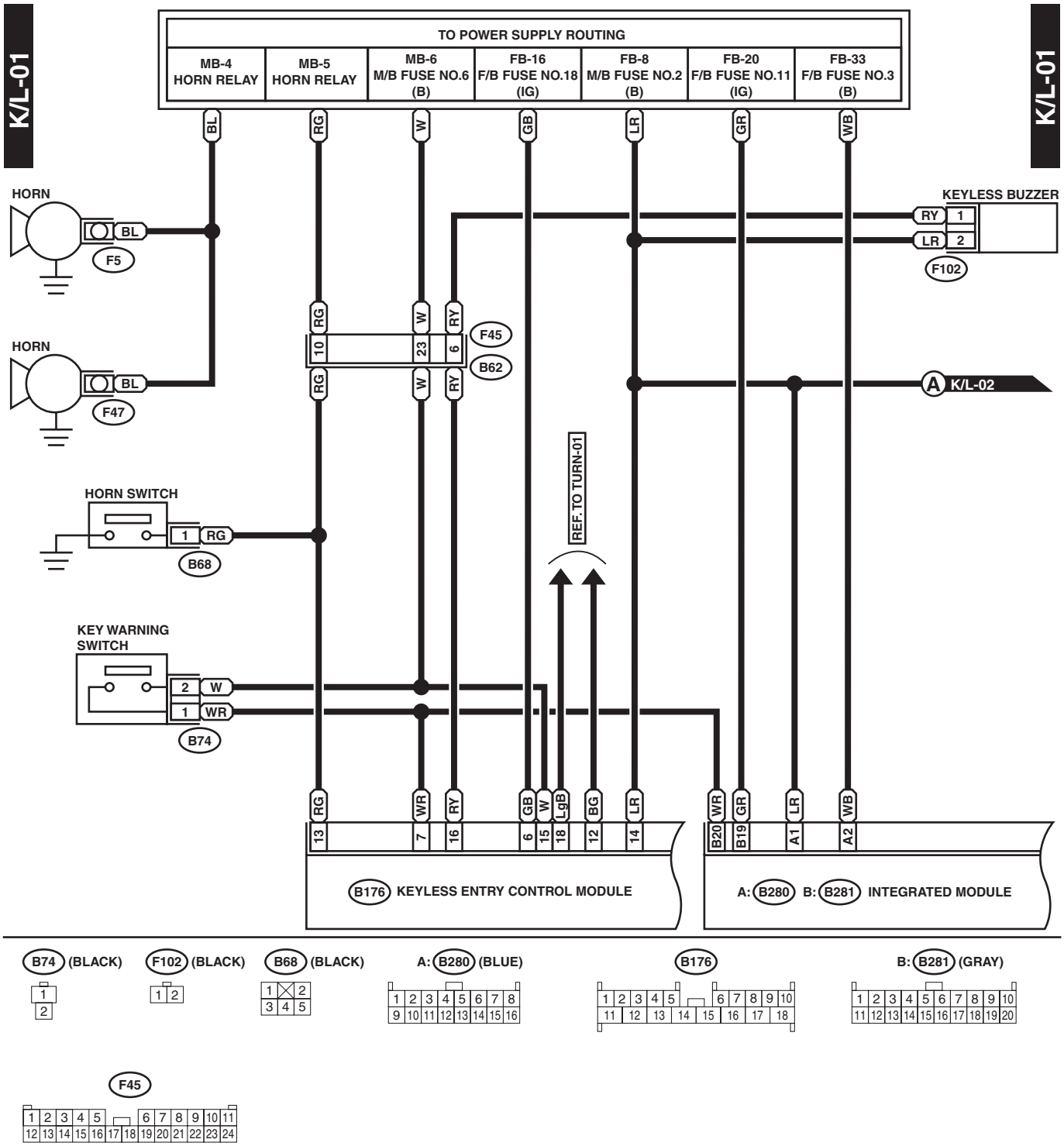
A: WIRING DIAGRAM



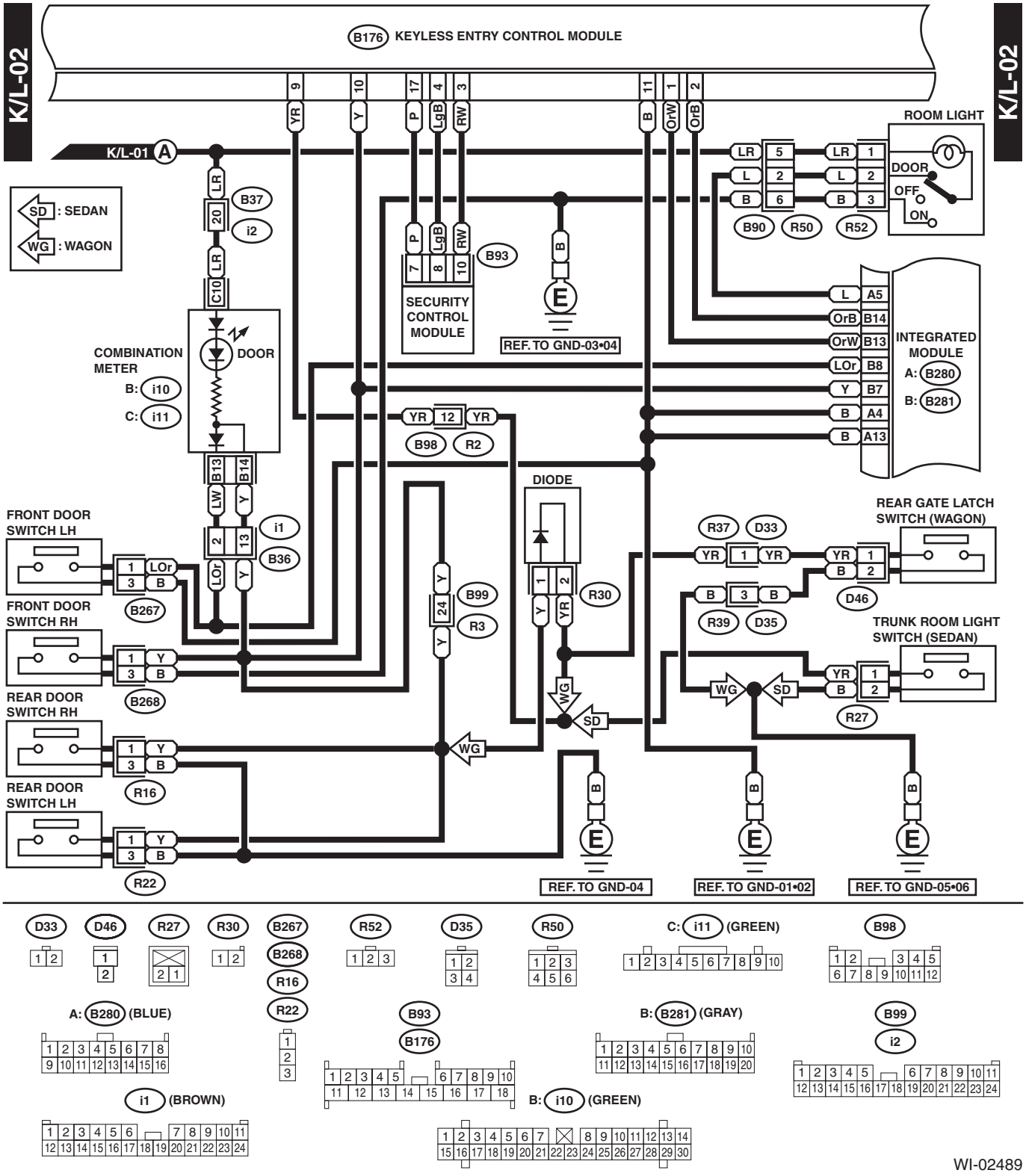
WI-02487

22.Keyless Entry System

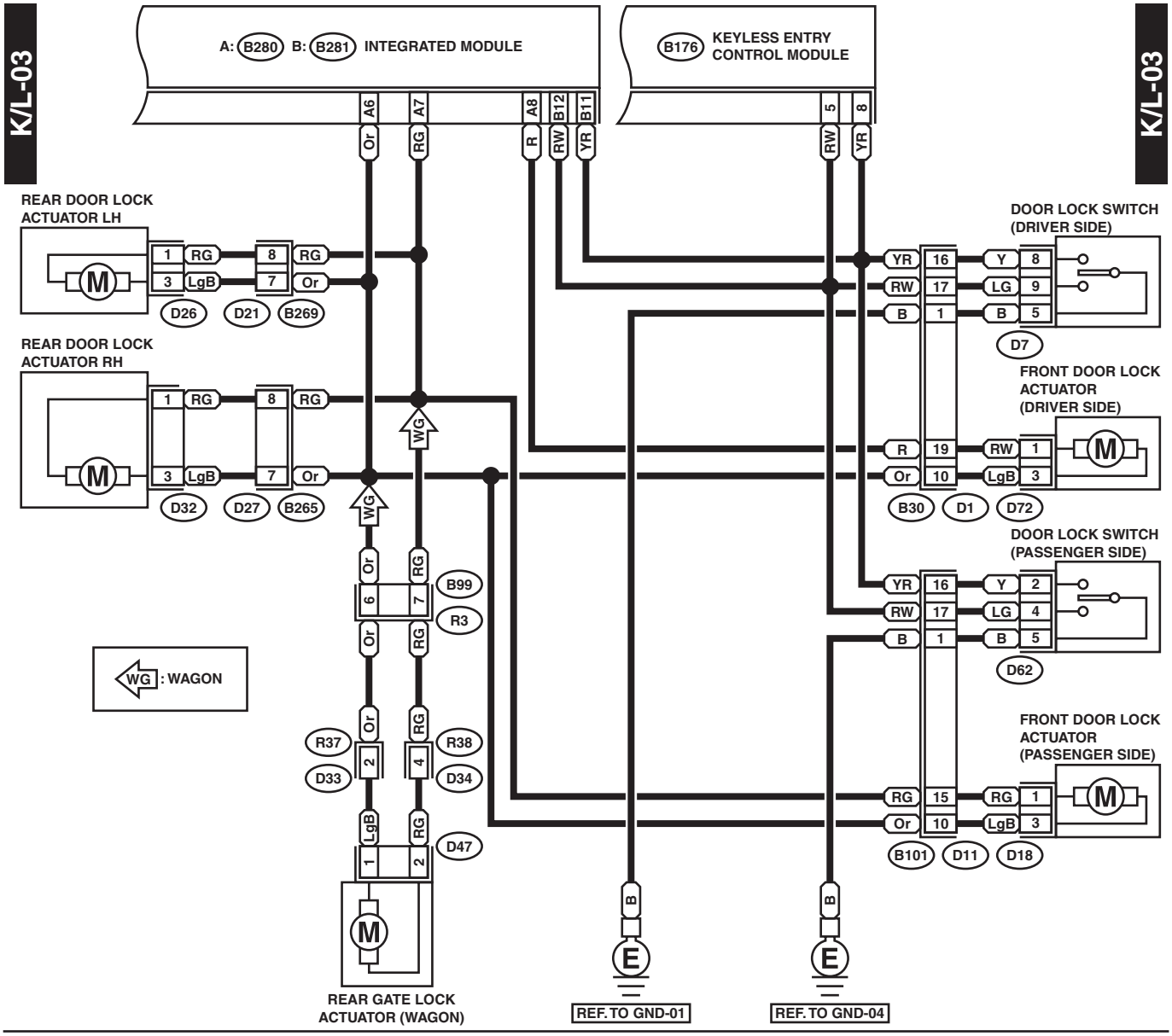
A: WIRING DIAGRAM

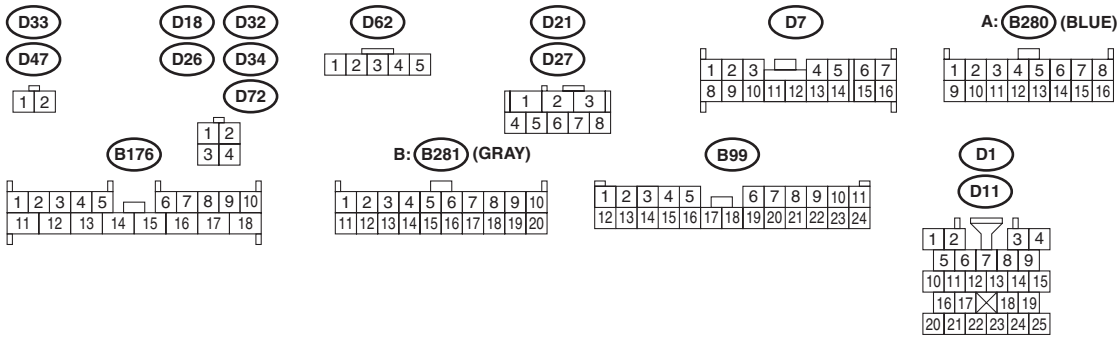


WI-02488


K/L-02
K/L-02
B176 KEYLESS ENTRY CONTROL MODULE
9 YR
10 Y
17 P
4 LgB
3 RW
11 B
1 OrW
2 OrB
K/L-01 A
ROOM LIGHT
DOOR
OFF
ON
LR 5
L 2
B 6
LR 1
L 2
B 3
B90
R50
R52
SD : SEDAN
WG : WAGON
LR 20 B37
i2
LR C10
COMBINATION METER
B: i10
C: i11
DOOR
B13 B14
LW Y i1
2 13 B36
SECURITY CONTROL MODULE
P LgB RW
7 8 10 B93
B
REF. TO GND-03•04
L A5
OrB B14
OrW B13
LOr B8
Y B7
B A4
B A13
INTEGRATED MODULE
A: B280
B: B281
YR 12 YR
B98 R2
DIODE
1 2 R30
Y YR
FRONT DOOR SWITCH LH
1 LOr
3 B
B267
FRONT DOOR SWITCH RH
1 Y
3 B
B268
REAR DOOR SWITCH RH
1 Y
3 B
R16
REAR DOOR SWITCH LH
1 Y
3 B
R22
LOr Y
Y 24 B99
R3
WG
SD
R37 D33
YR 1 YR
B 3 B
R39 D35
REAR GATE LATCH SWITCH (WAGON)
YR 1
B 2
D46
TRUNK ROOM LIGHT SWITCH (SEDAN)
YR 1
B 2
R27
B
REF. TO GND-04
REF. TO GND-01•02
REF. TO GND-05•06
D33
D46
R27
R30
B267
B268
R16
R22
R52
D35
R50
C: i11 (GREEN)
B98
A: B280 (BLUE)
B93
B176
B: B281 (GRAY)
B99
i2
i1 (BROWN)
B: i10 (GREEN)

WI-02489

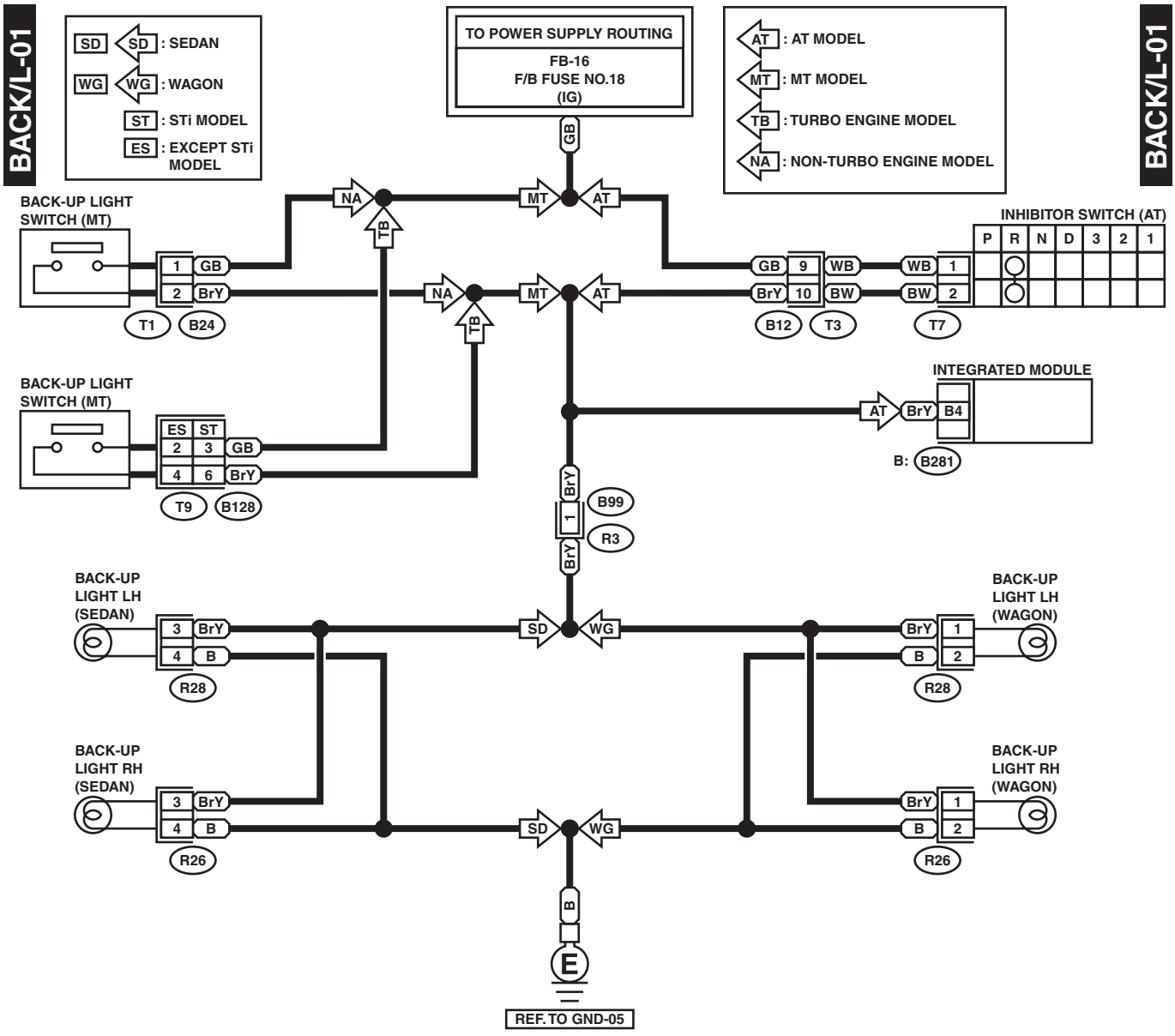

K/L-03
K/L-03
A: B280 B: B281 INTEGRATED MODULE
B176 KEYLESS ENTRY CONTROL MODULE
REAR DOOR LOCK ACTUATOR LH
REAR DOOR LOCK ACTUATOR RH
DOOR LOCK SWITCH (DRIVER SIDE)
FRONT DOOR LOCK ACTUATOR (DRIVER SIDE)
DOOR LOCK SWITCH (PASSENGER SIDE)
FRONT DOOR LOCK ACTUATOR (PASSENGER SIDE)
WG : WAGON
REAR GATE LOCK ACTUATOR (WAGON)
REF. TO GND-01
REF. TO GND-04

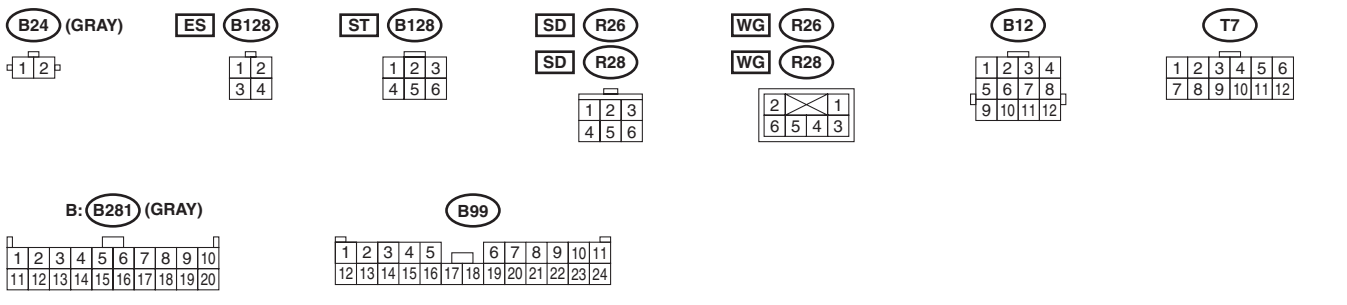

A: B280 (BLUE)
B: B281 (GRAY)

WI-02490

23.Back-up Light System

A: WIRING DIAGRAM



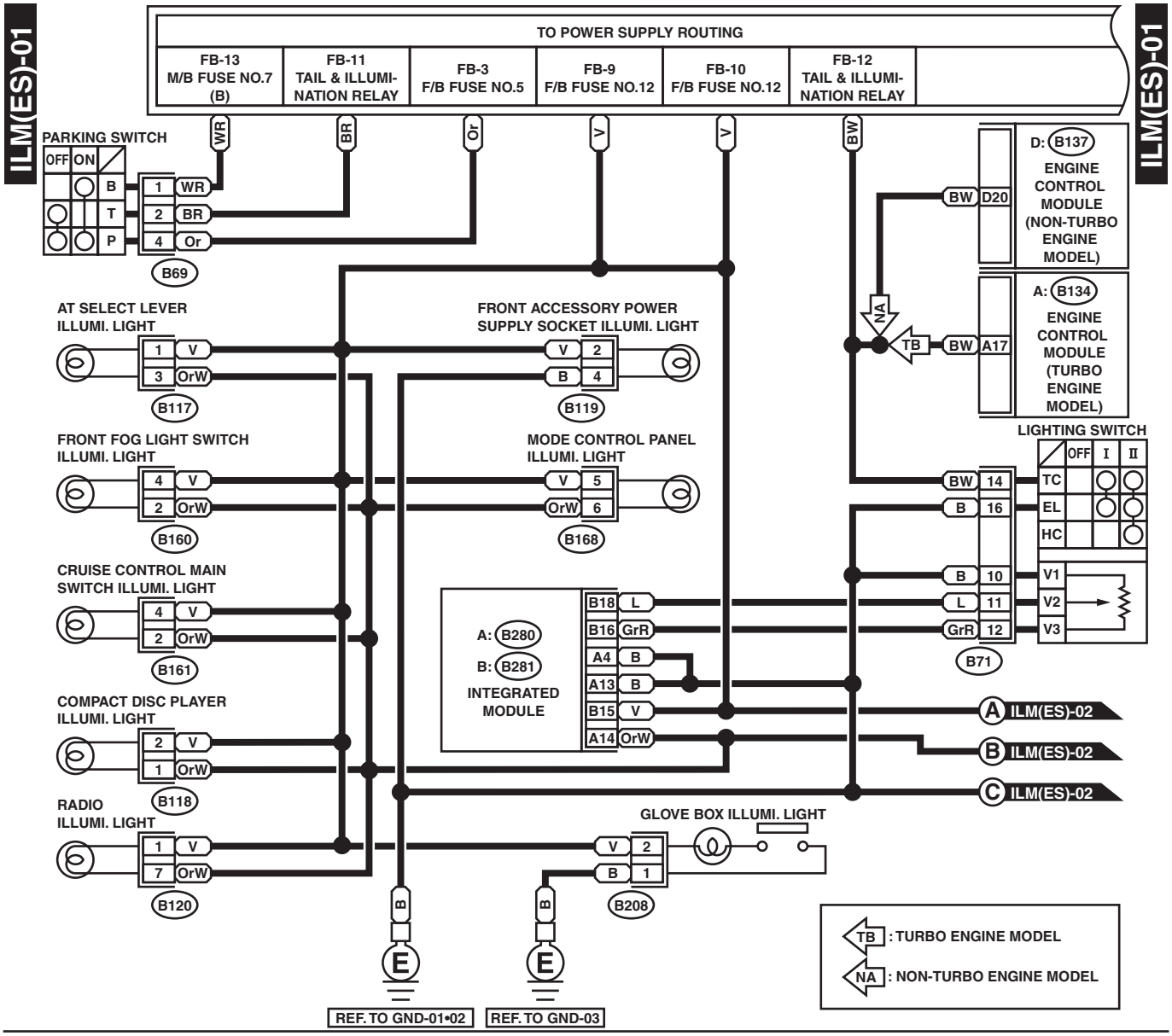


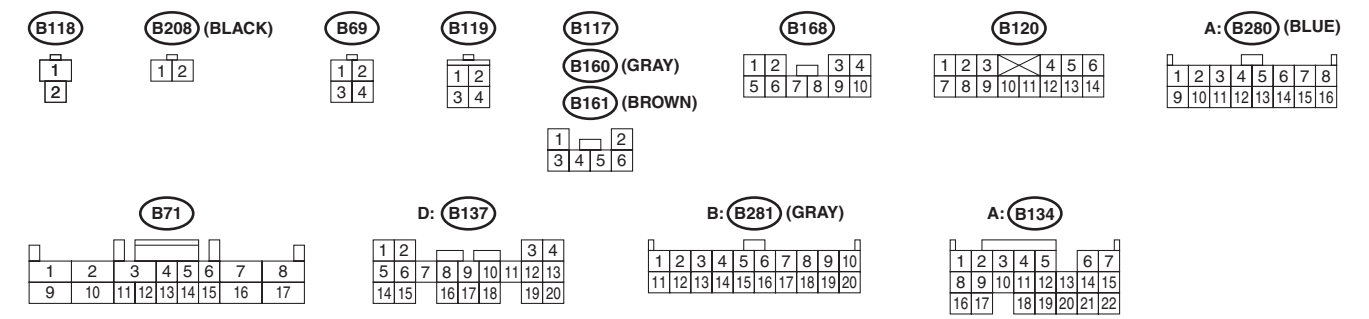
WI-02541

24.Clearance Light and Illumination Light System

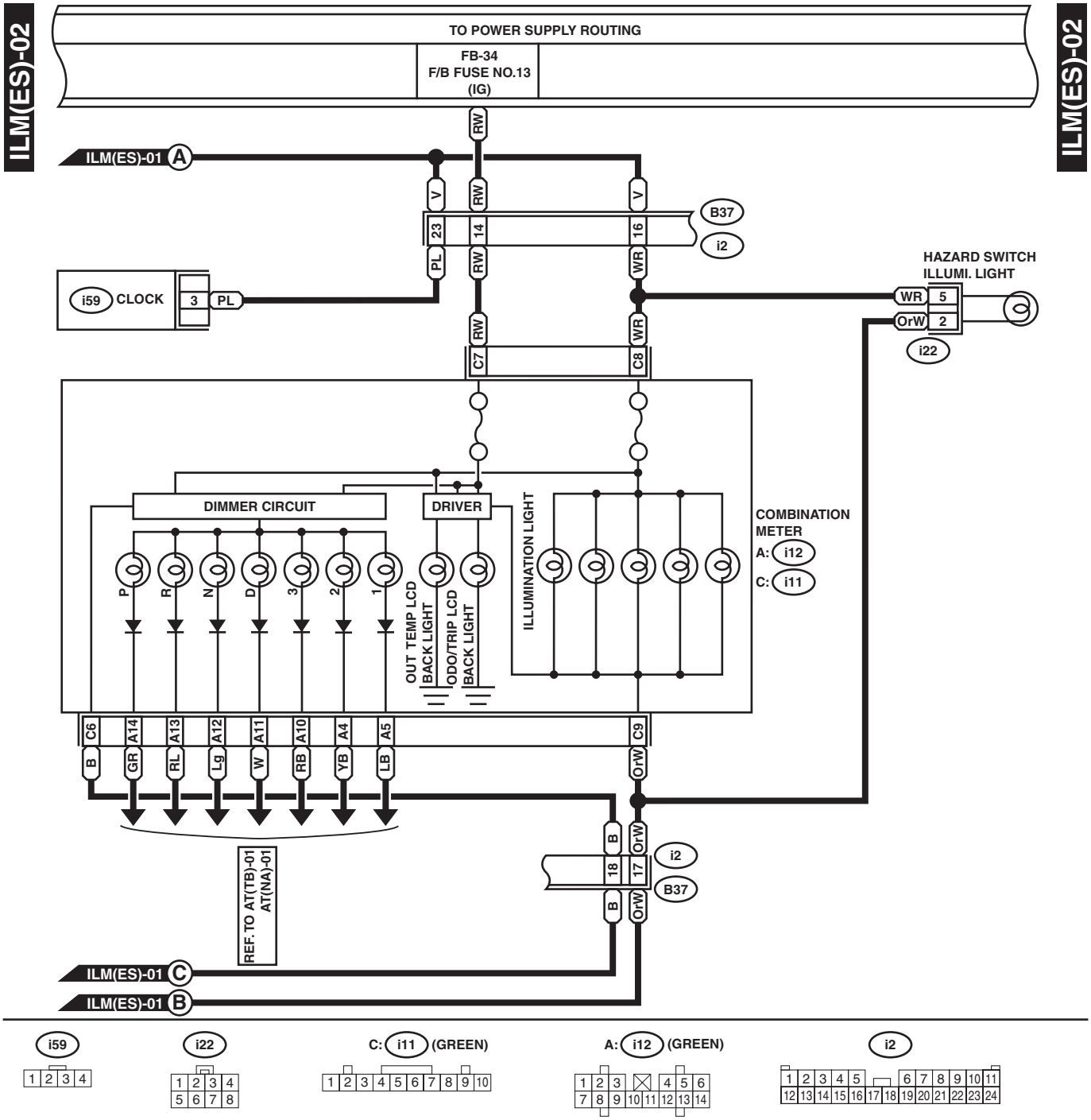
A: WIRING DIAGRAM

1. EXCEPT FOR STi MODEL



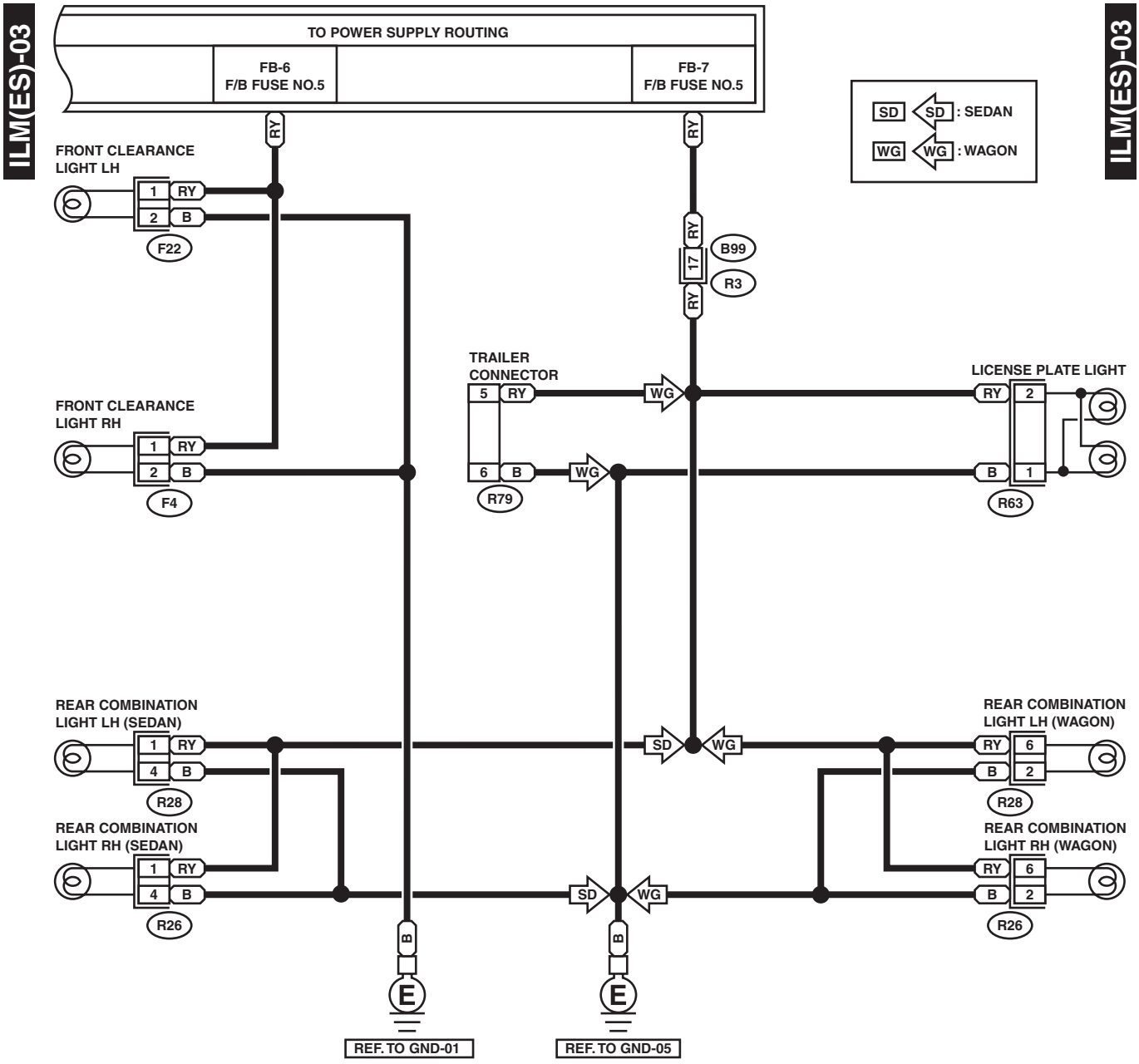


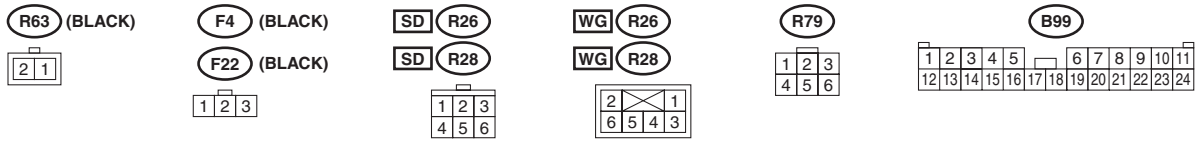
WI-02491


ILM(ES)-02
ILM(ES)-02
TO POWER SUPPLY ROUTING
FB-34
F/B FUSE NO.13
(IG)
ILM(ES)-01 A
RW
V
RW
V
B37
23
14
16
i2
PL
RW
WR
HAZARD SWITCH
ILLUMI. LIGHT
i59 CLOCK
3
PL
WR
5
OrW
2
i22
RW
WR
C7
C8
DIMMER CIRCUIT
DRIVER
ILLUMINATION LIGHT
COMBINATION
METER
A: i12
C: i11
P
R
N
D
3
2
1
OUT TEMP LCD
BACK LIGHT
ODO/TRIP LCD
BACK LIGHT
C6
A14
A13
A12
A11
A10
A4
A5
C9
B
GR
RL
Lg
W
RB
YB
LB
OrW
B
OrW
18
17
i2
B37
B
OrW
REF. TO AT(TB)-01
AT(NA)-01
ILM(ES)-01 C
ILM(ES)-01 B

i59
1 2 3 4
i22
1 2 3 4
5 6 7 8
C: i11 (GREEN)
1 2 3 4 5 6 7 8 9 10
A: i12 (GREEN)
1 2 3 4 5 6
7 8 9 10 11 12 13 14
i2
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22 23 24

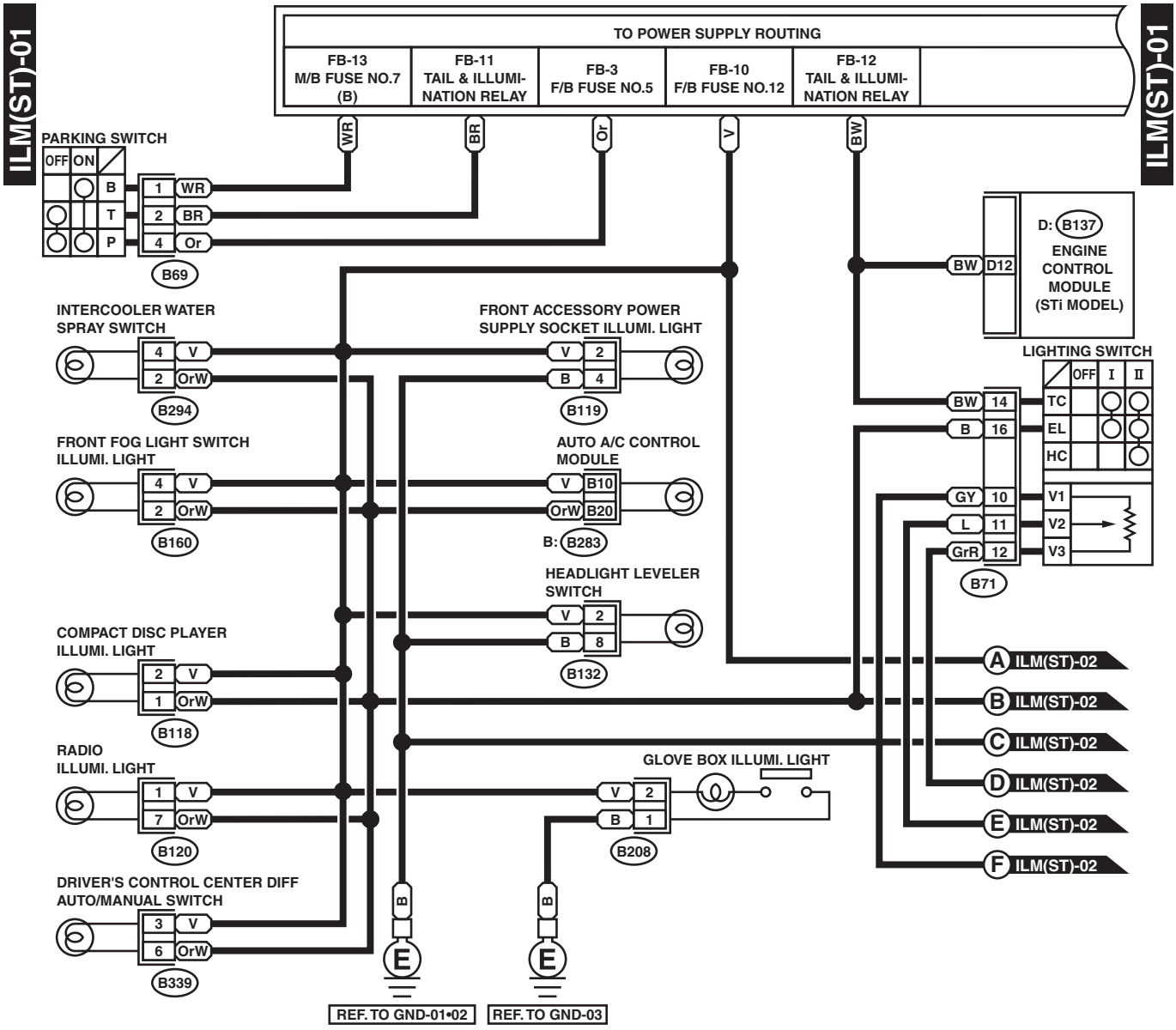
WI-02492

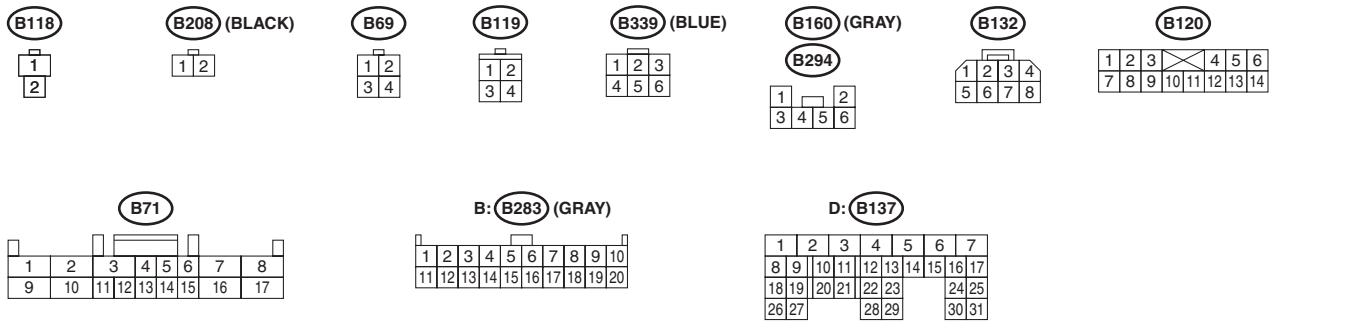

ILM(ES)-03
ILM(ES)-03
TO POWER SUPPLY ROUTING
FB-6
F/B FUSE NO.5
FB-7
F/B FUSE NO.5
SD : SEDAN
WG : WAGON
FRONT CLEARANCE
LIGHT LH
F22
FRONT CLEARANCE
LIGHT RH
F4
TRAILER
CONNECTOR
R79
B99
R3
LICENSE PLATE LIGHT
R63
REAR COMBINATION
LIGHT LH (SEDAN)
R28
REAR COMBINATION
LIGHT RH (SEDAN)
R26
REAR COMBINATION
LIGHT LH (WAGON)
R28
REAR COMBINATION
LIGHT RH (WAGON)
R26
REF. TO GND-01
REF. TO GND-05


R63 (BLACK)
F4 (BLACK)
F22 (BLACK)
SD R26
SD R28
WG R26
WG R28
R79
B99

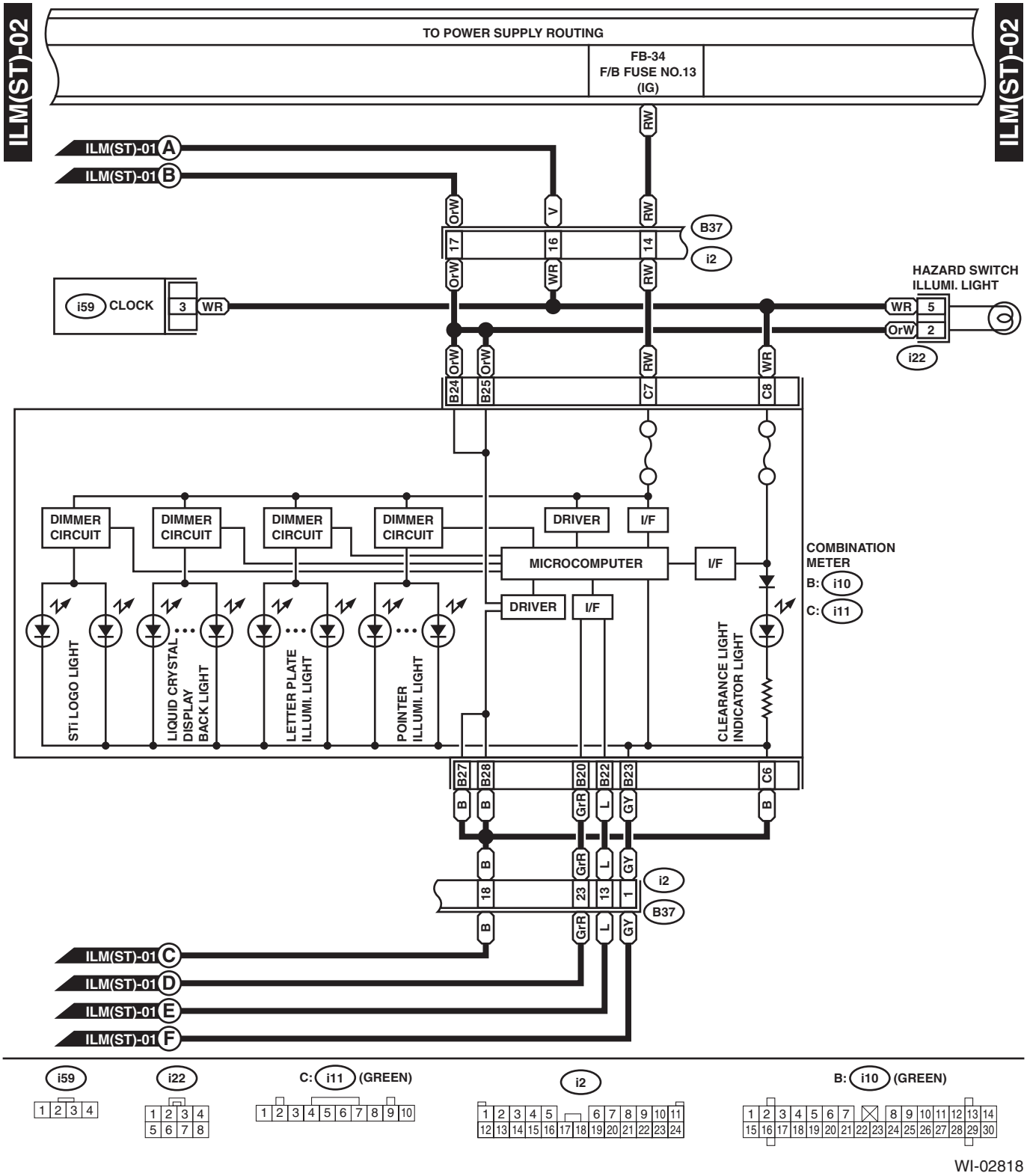
WI-02493

2. STi MODEL



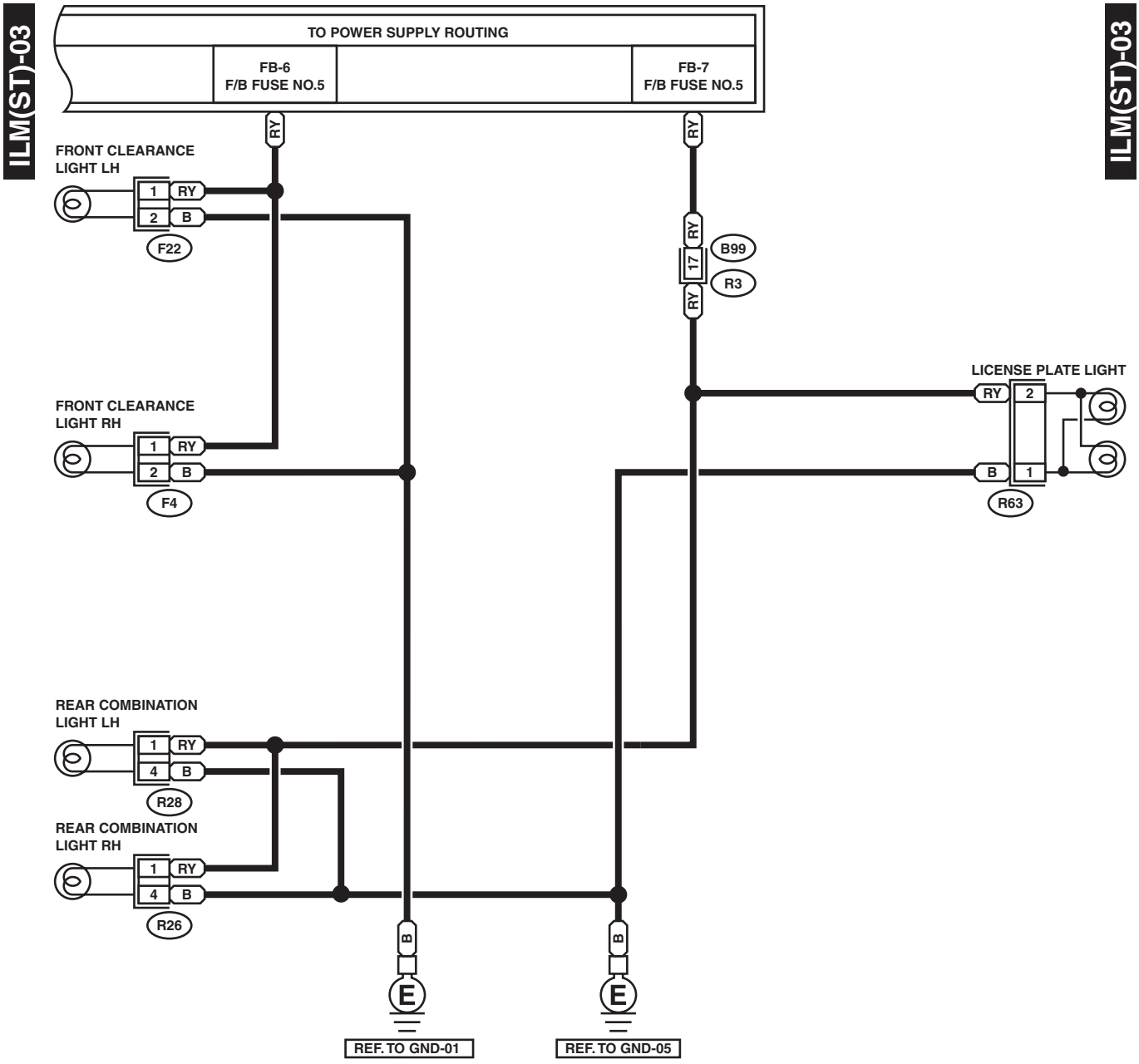


WI-02817


ILM(ST)-02
ILM(ST)-02
TO POWER SUPPLY ROUTING
FB-34
F/B FUSE NO.13
(IG)
RW
ILM(ST)-01 A
ILM(ST)-01 B
OrW
V
RW
B37
17
16
14
i2
OrW
WR
RW
HAZARD SWITCH
ILLUMI. LIGHT
i59 CLOCK
3
WR
WR
5
OrW
2
i22
OrW
OrW
RW
WR
B24
B25
C7
C8
DIMMER CIRCUIT
DIMMER CIRCUIT
DIMMER CIRCUIT
DIMMER CIRCUIT
DRIVER
I/F
MICROCOMPUTER
I/F
COMBINATION METER
B: i10
C: i11
DRIVER
I/F
STI LOGO LIGHT
LIQUID CRYSTAL DISPLAY BACK LIGHT
LETTER PLATE ILLUMI. LIGHT
POINTER ILLUMI. LIGHT
CLEARANCE LIGHT INDICATOR LIGHT
B27
B28
B20
B22
B23
C6
B
B
GrR
L
GY
B
B
GrR
L
GY
18
23
13
1
i2
B37
B
GrR
L
GY
ILM(ST)-01 C
ILM(ST)-01 D
ILM(ST)-01 E
ILM(ST)-01 F

i59
1 2 3 4
i22
1 2 3 4
5 6 7 8
C: i11 (GREEN)
1 2 3 4 5 6 7 8 9 10
i2
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22 23 24
B: i10 (GREEN)
1 2 3 4 5 6 7 8 9 10 11 12 13 14
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

WI-02818

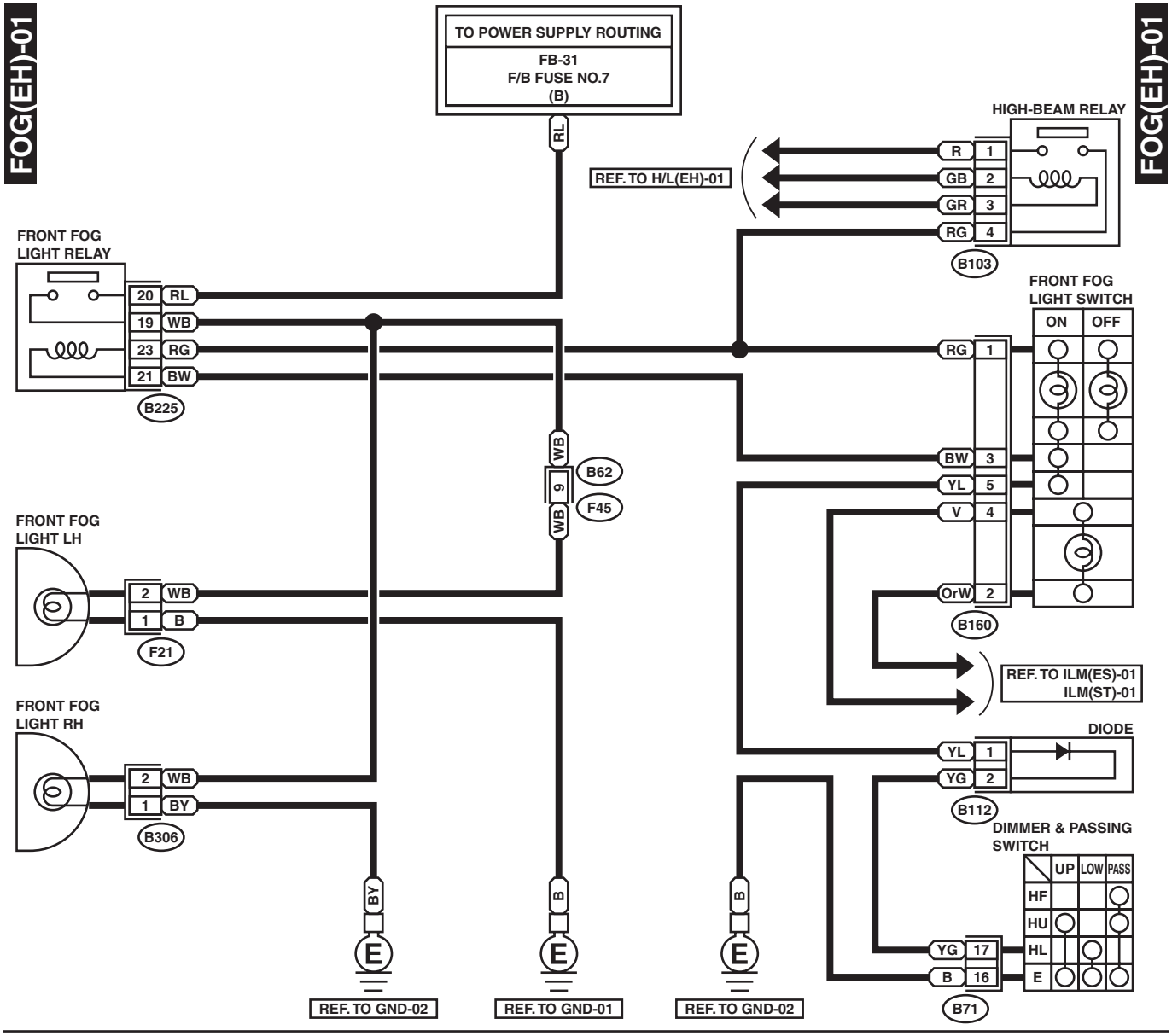

ILM(ST)-03
ILM(ST)-03
TO POWER SUPPLY ROUTING
FB-6
F/B FUSE NO.5
FB-7
F/B FUSE NO.5
RY
FRONT CLEARANCE
LIGHT LH
1
2
RY
B
F22
FRONT CLEARANCE
LIGHT RH
F4
17
B99
R3
LICENSE PLATE LIGHT
2
1
R63
REAR COMBINATION
LIGHT LH
4
R28
REAR COMBINATION
LIGHT RH
R26
E
REF. TO GND-01
REF. TO GND-05
R63 (BLACK)
F4 (BLACK)
F22 (BLACK)
R26
R28
B99

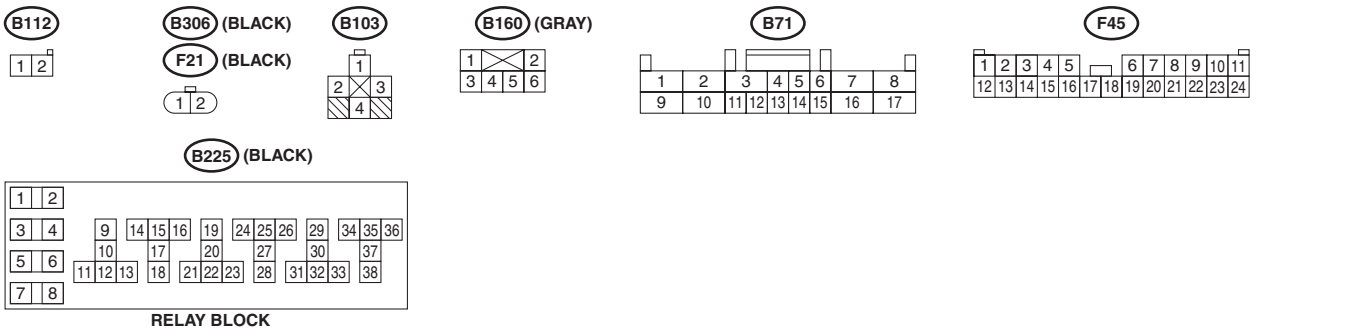
WI-02819

25.Front Fog Light System

A: WIRING DIAGRAM

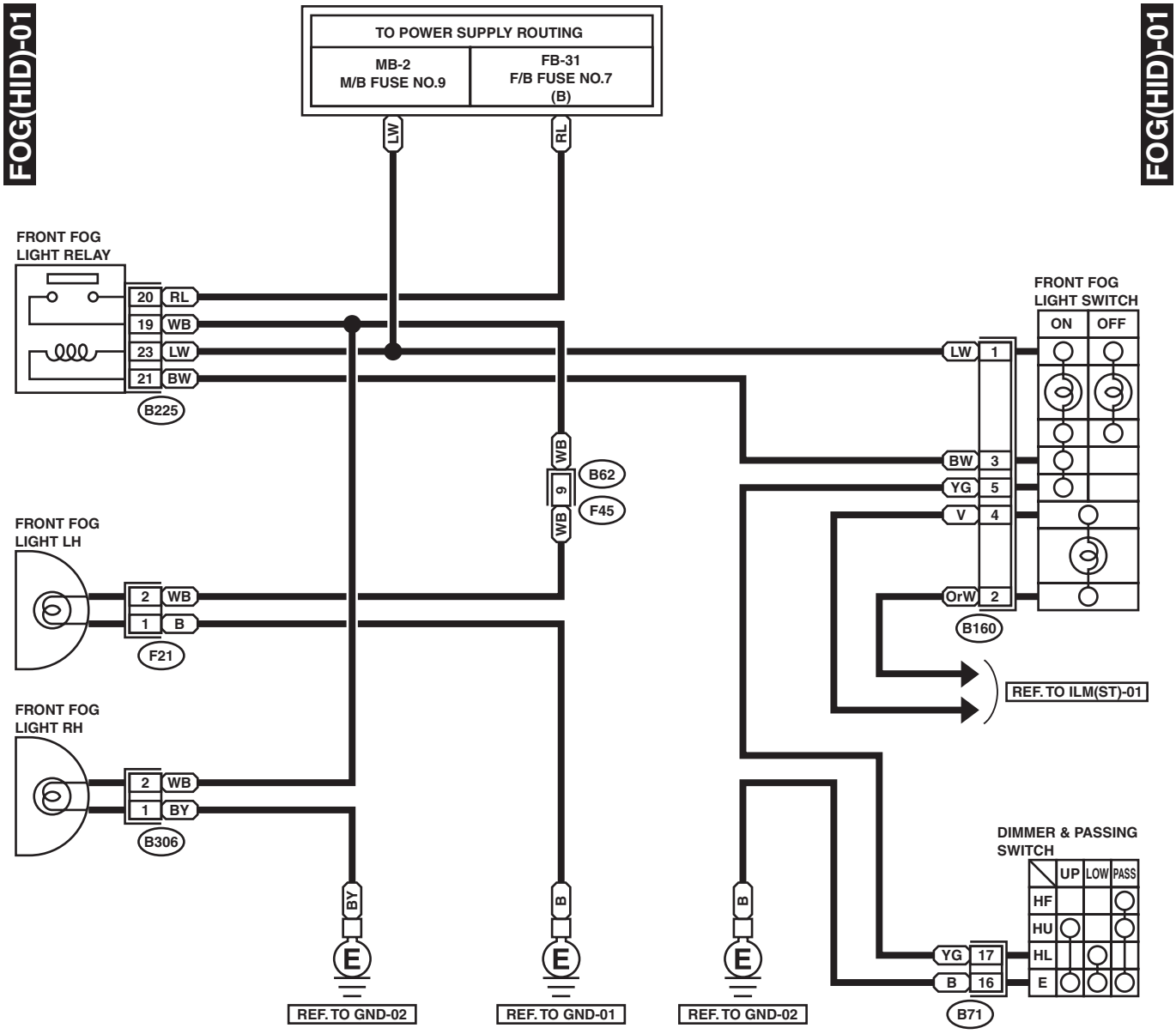
1. MODEL WITHOUT HID

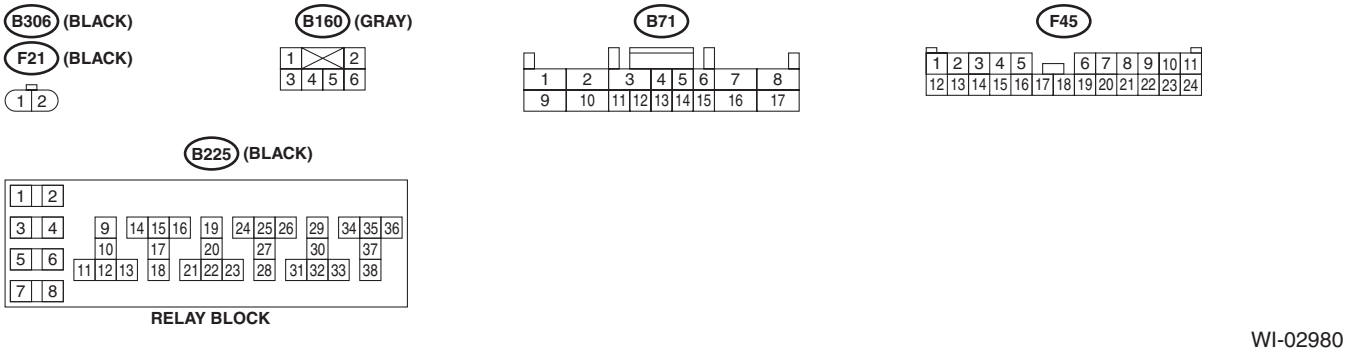




WI-02494

2. MODEL WITH HID



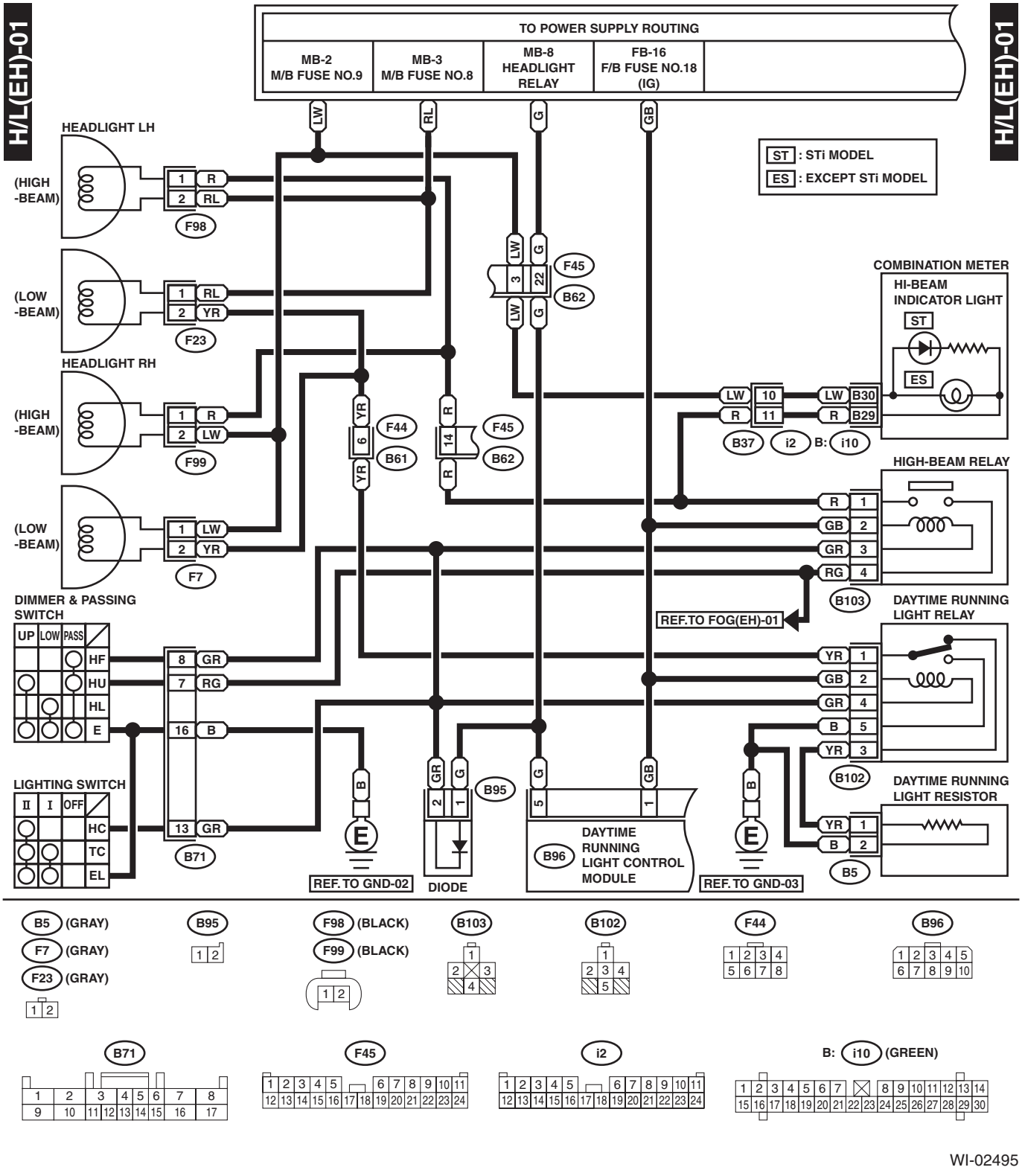


WI-02980

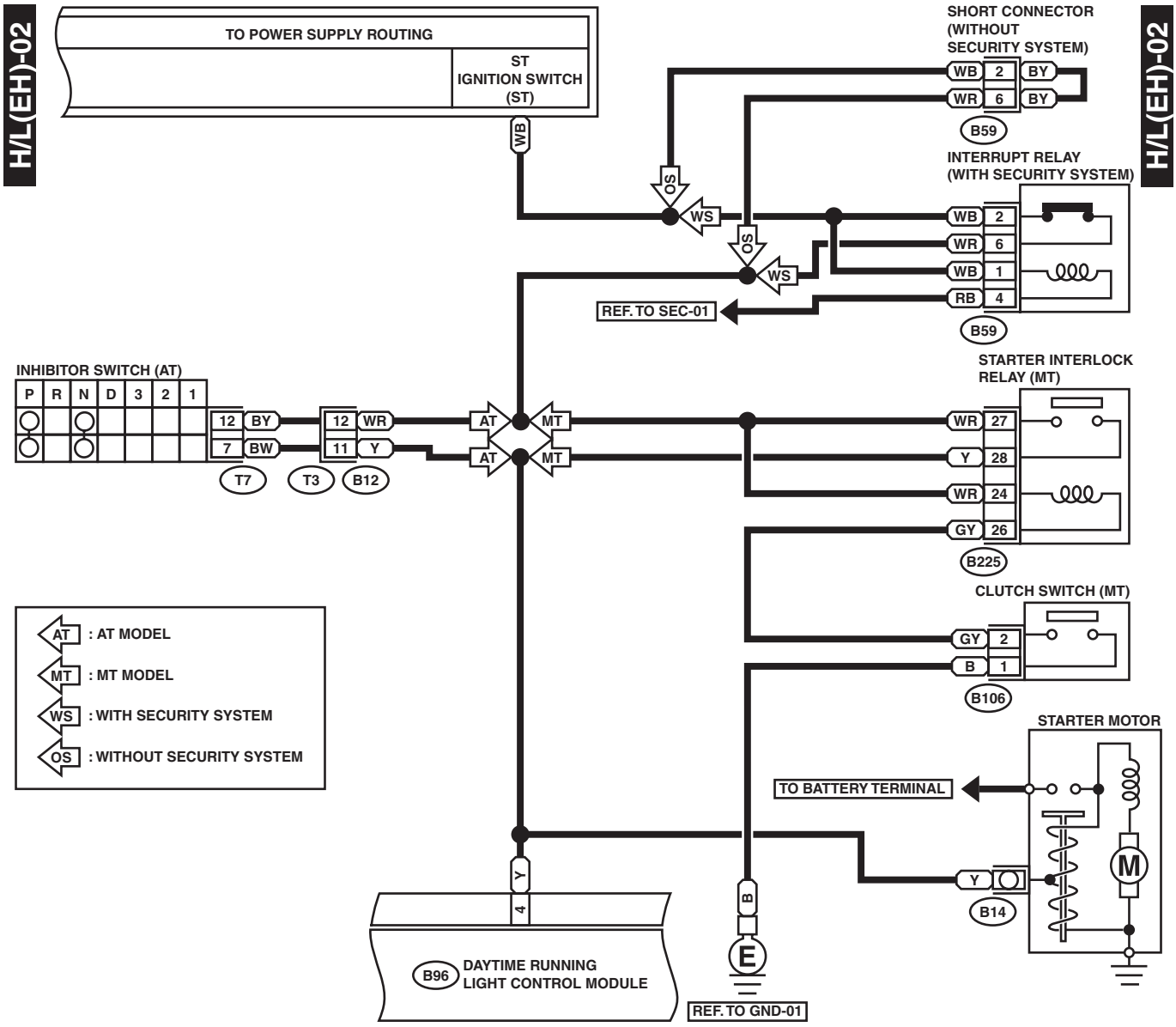
26.Headlight System

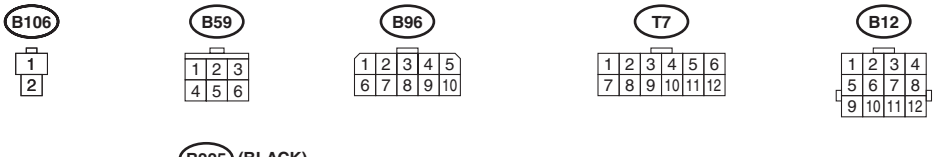
A: WIRING DIAGRAM

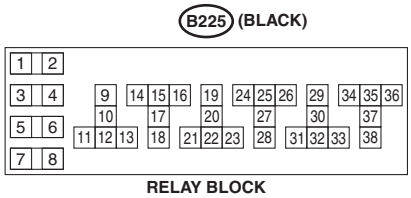
1. MODEL WITHOUT HID



WI-02495

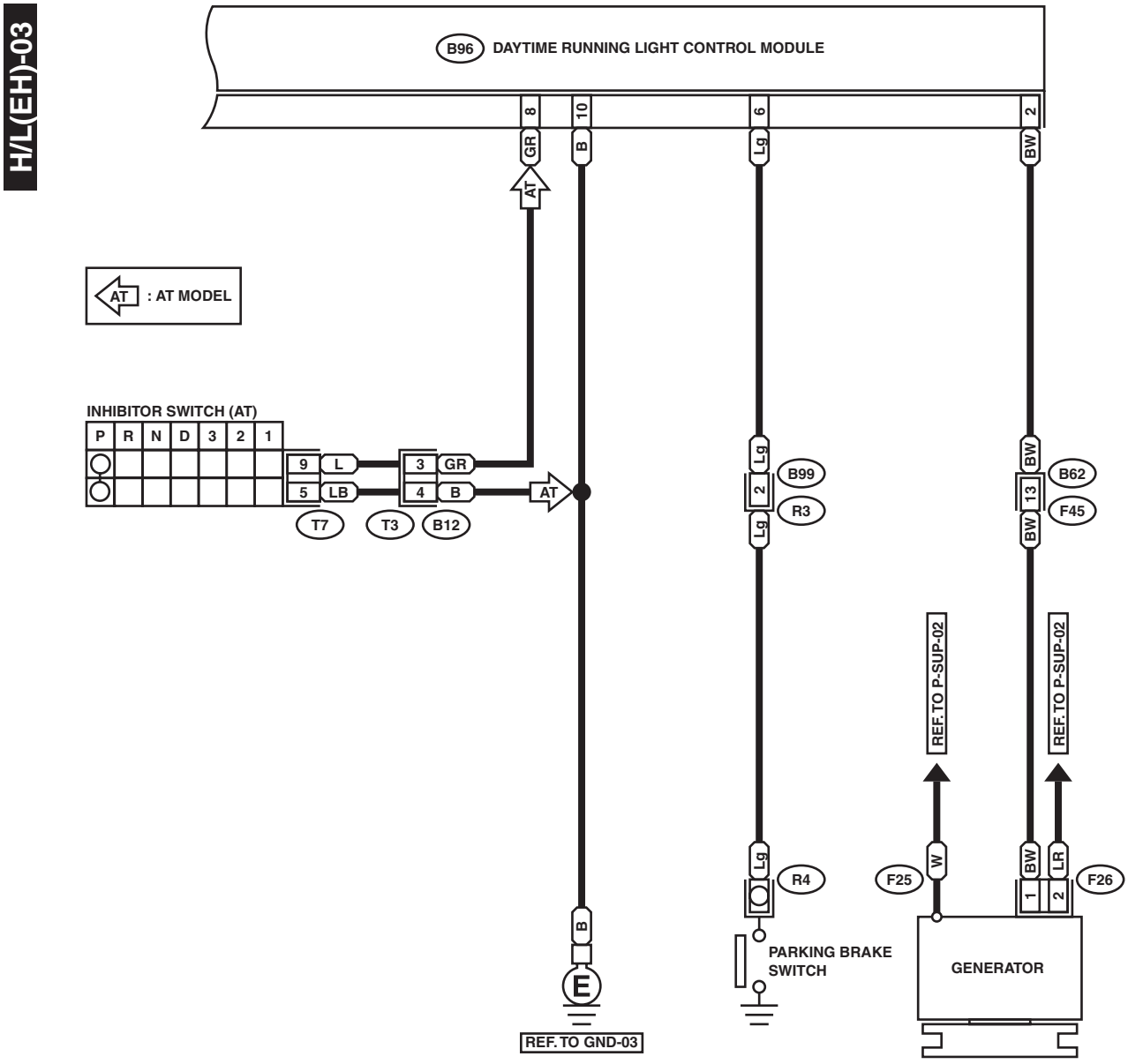

H/L(EH)-02
TO POWER SUPPLY ROUTING
ST
IGNITION SWITCH
(ST)
WB
SHORT CONNECTOR
(WITHOUT
SECURITY SYSTEM)
WB 2 BY
WR 6 BY
B59
INTERRUPT RELAY
(WITH SECURITY SYSTEM)
OS
WS
WB 2
WR 6
WB 1
RB 4
REF. TO SEC-01
B59
INHIBITOR SWITCH (AT)
P R N D 3 2 1
12 BY
7 BW
T7
12 WR
11 Y
T3
B12
AT
MT
STARTER INTERLOCK
RELAY (MT)
WR 27
Y 28
WR 24
GY 26
B225
CLUTCH SWITCH (MT)
GY 2
B 1
B106
STARTER MOTOR
TO BATTERY TERMINAL
M
Y
B14
AT : AT MODEL
MT : MT MODEL
WS : WITH SECURITY SYSTEM
OS : WITHOUT SECURITY SYSTEM
Y
4
B96
DAYTIME RUNNING
LIGHT CONTROL MODULE
B
E
REF. TO GND-01
H/L(EH)-02

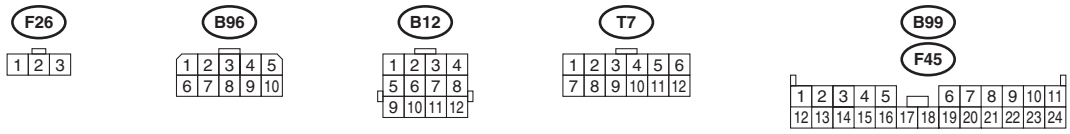

B106
B59
B96
T7
B12


B225 (BLACK)
RELAY BLOCK

WI-02496

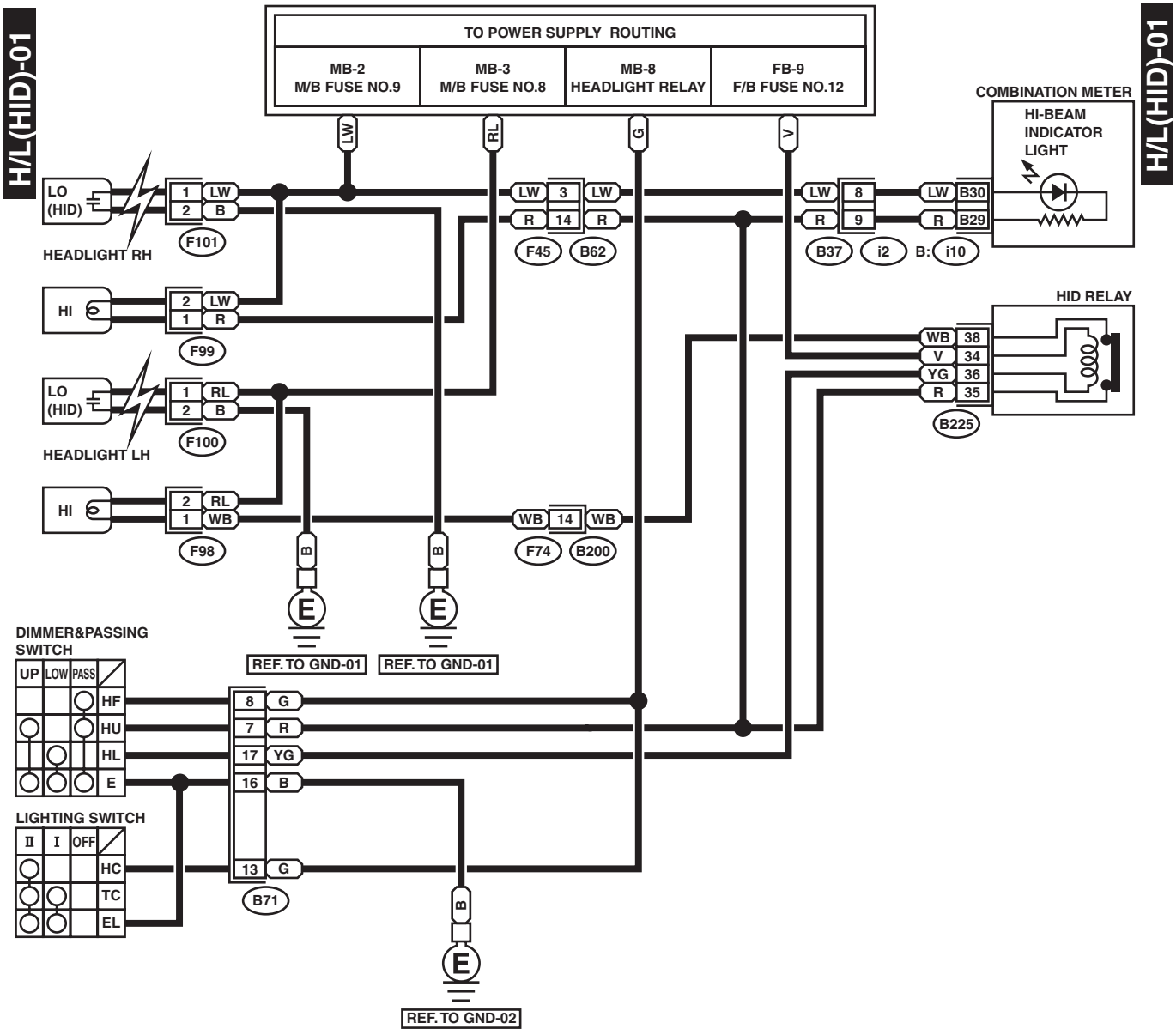
H/L(EH)-03

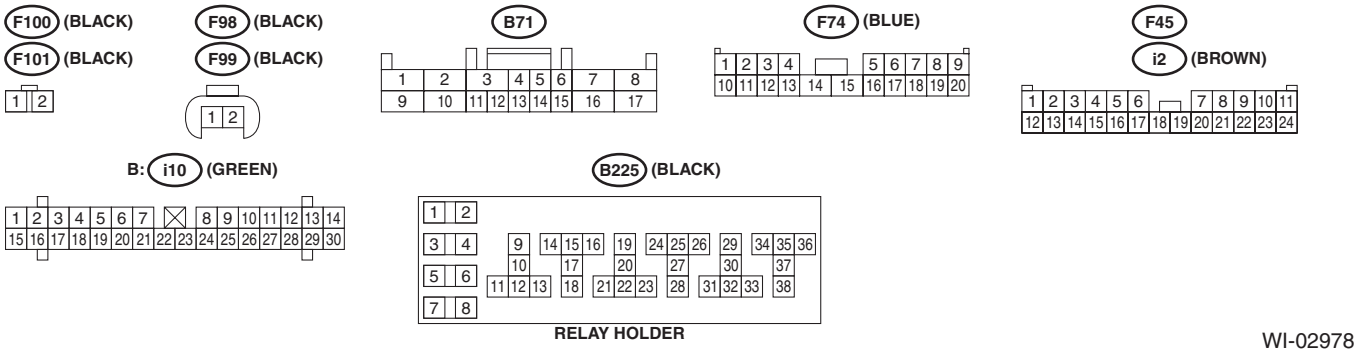




WI-02981

2. MODEL WITH HID

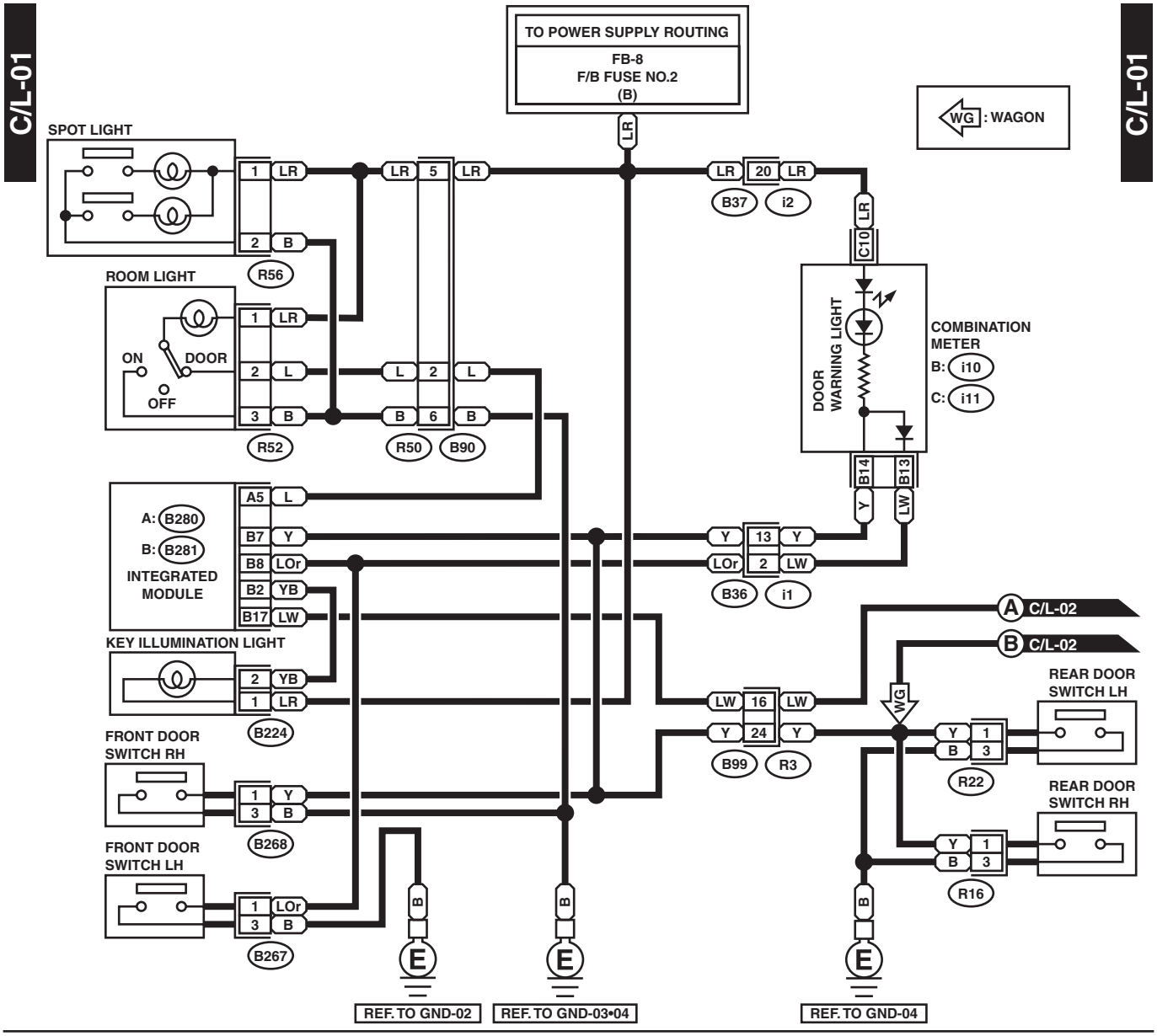


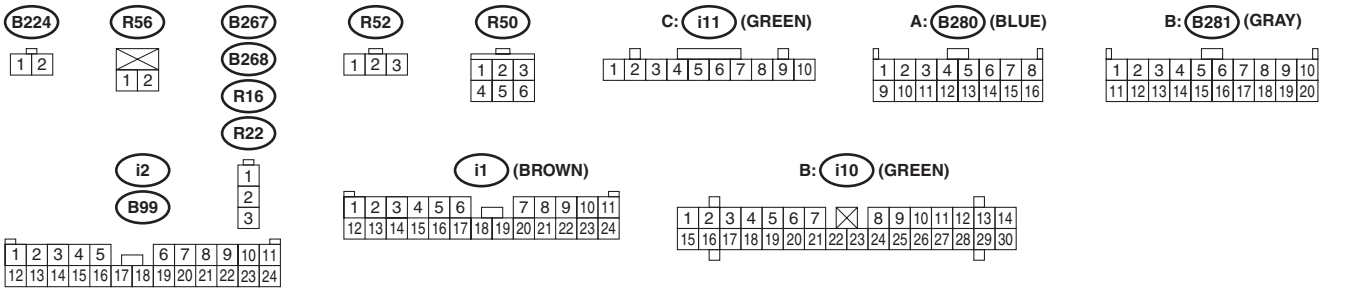


WI-02978

27.In Compartment Light System

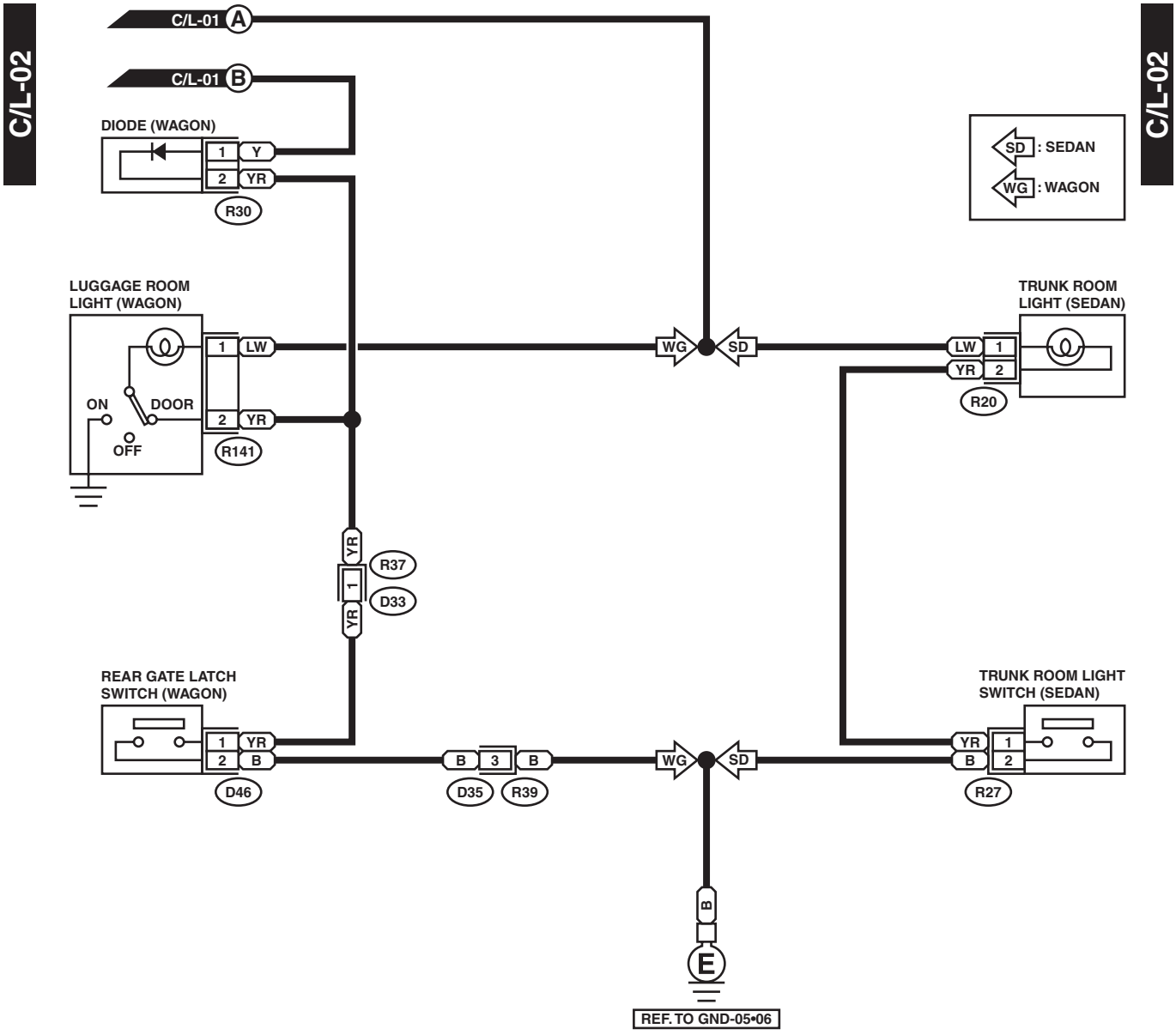
A: WIRING DIAGRAM

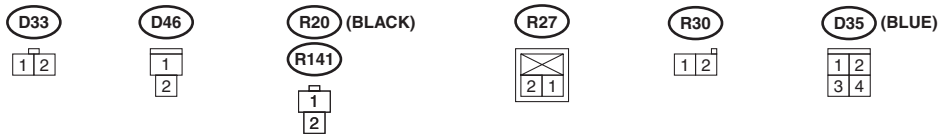




WI-02497

In Compartment Light System

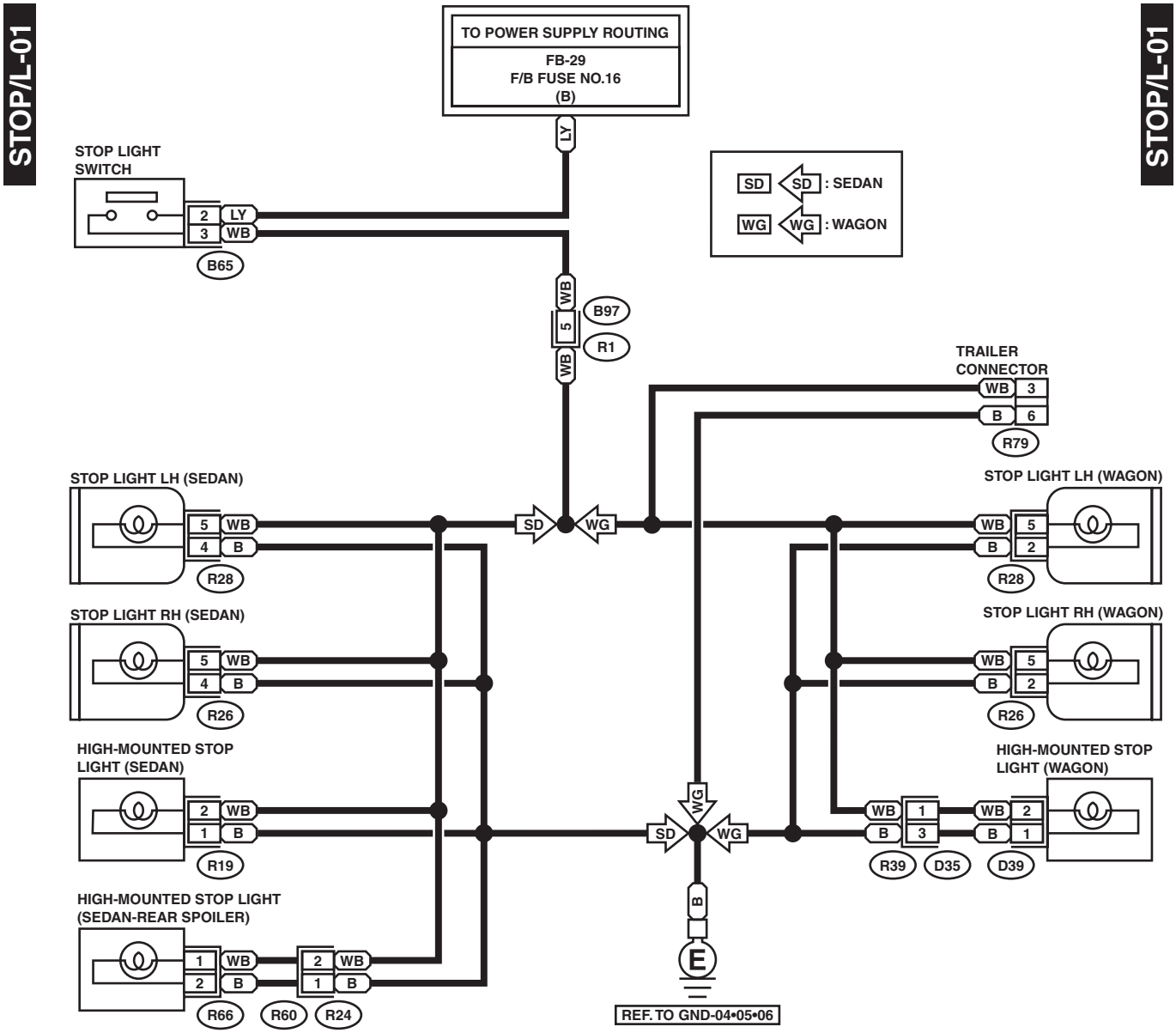




WI-02498

28.Stop Light System

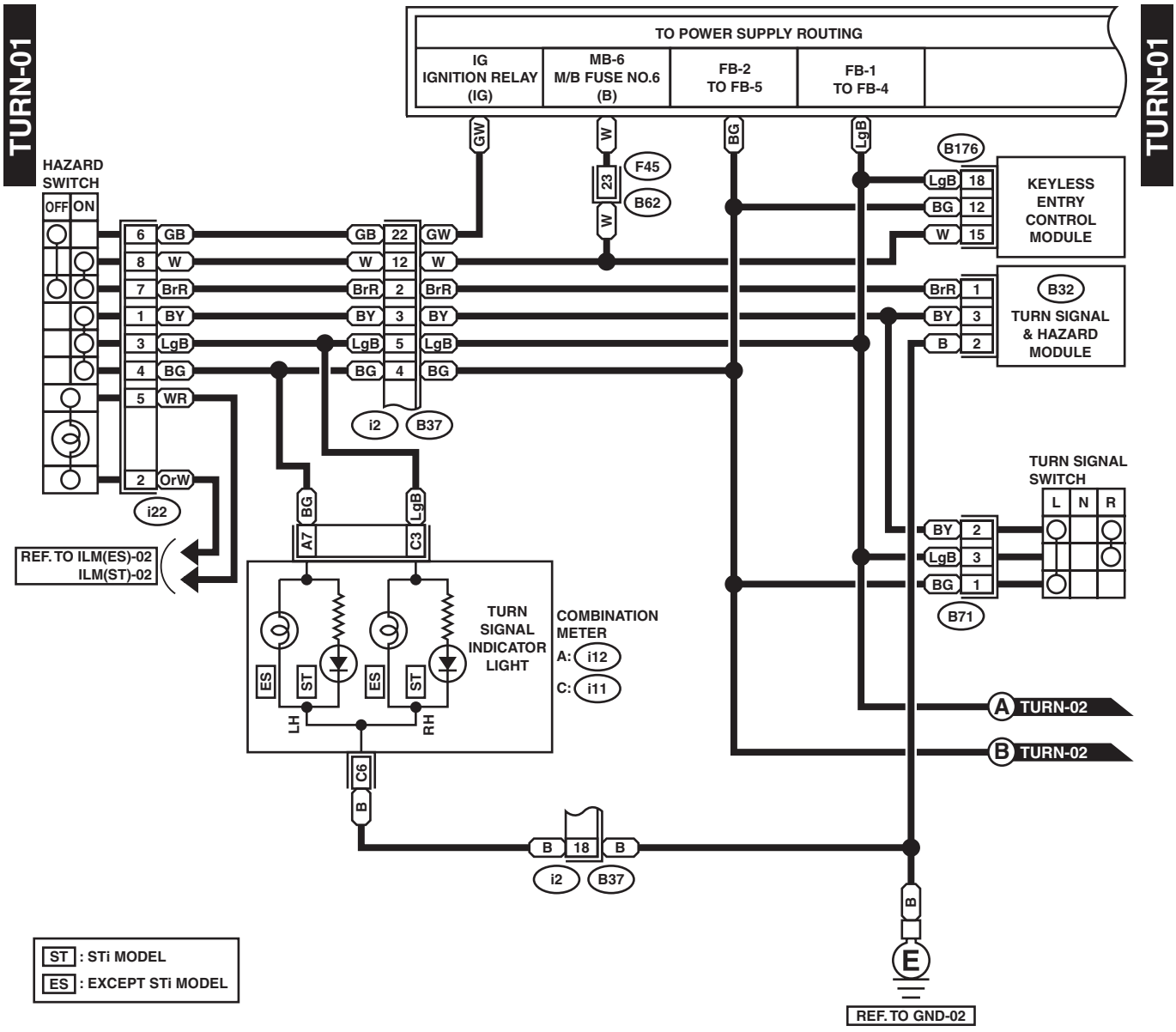
A: WIRING DIAGRAM

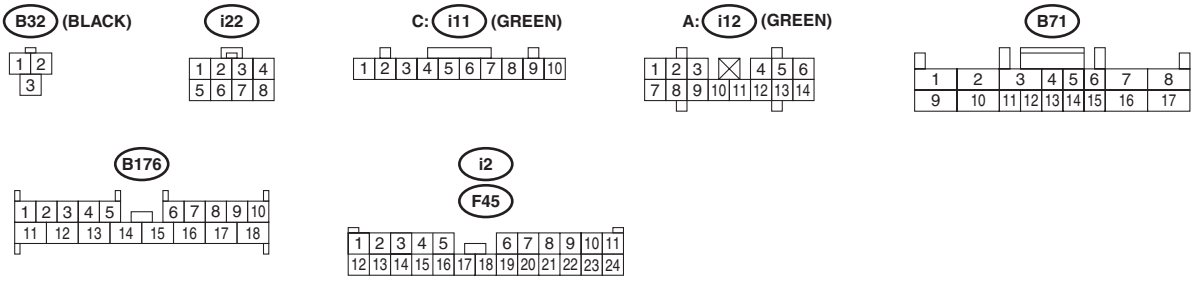


WI-02542

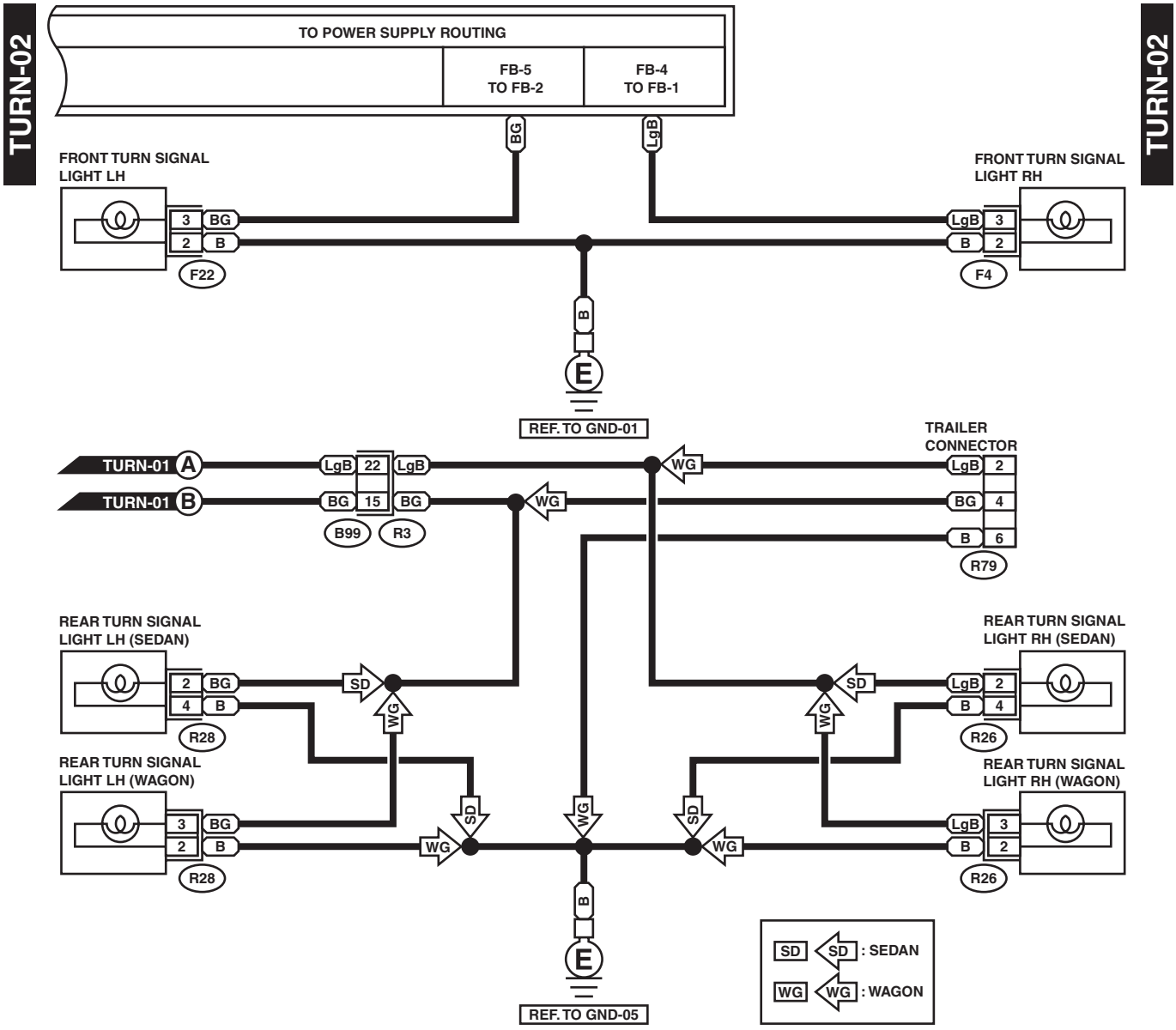
29.Turn Signal Light and Hazard Light System

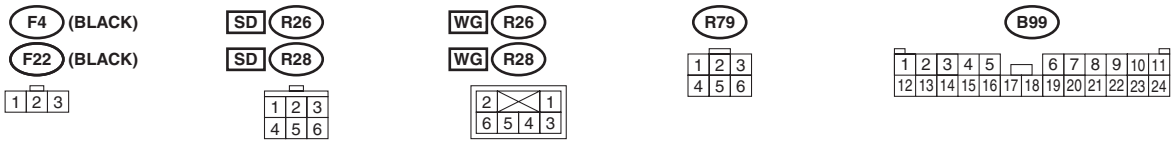
A: WIRING DIAGRAM





WI-02499

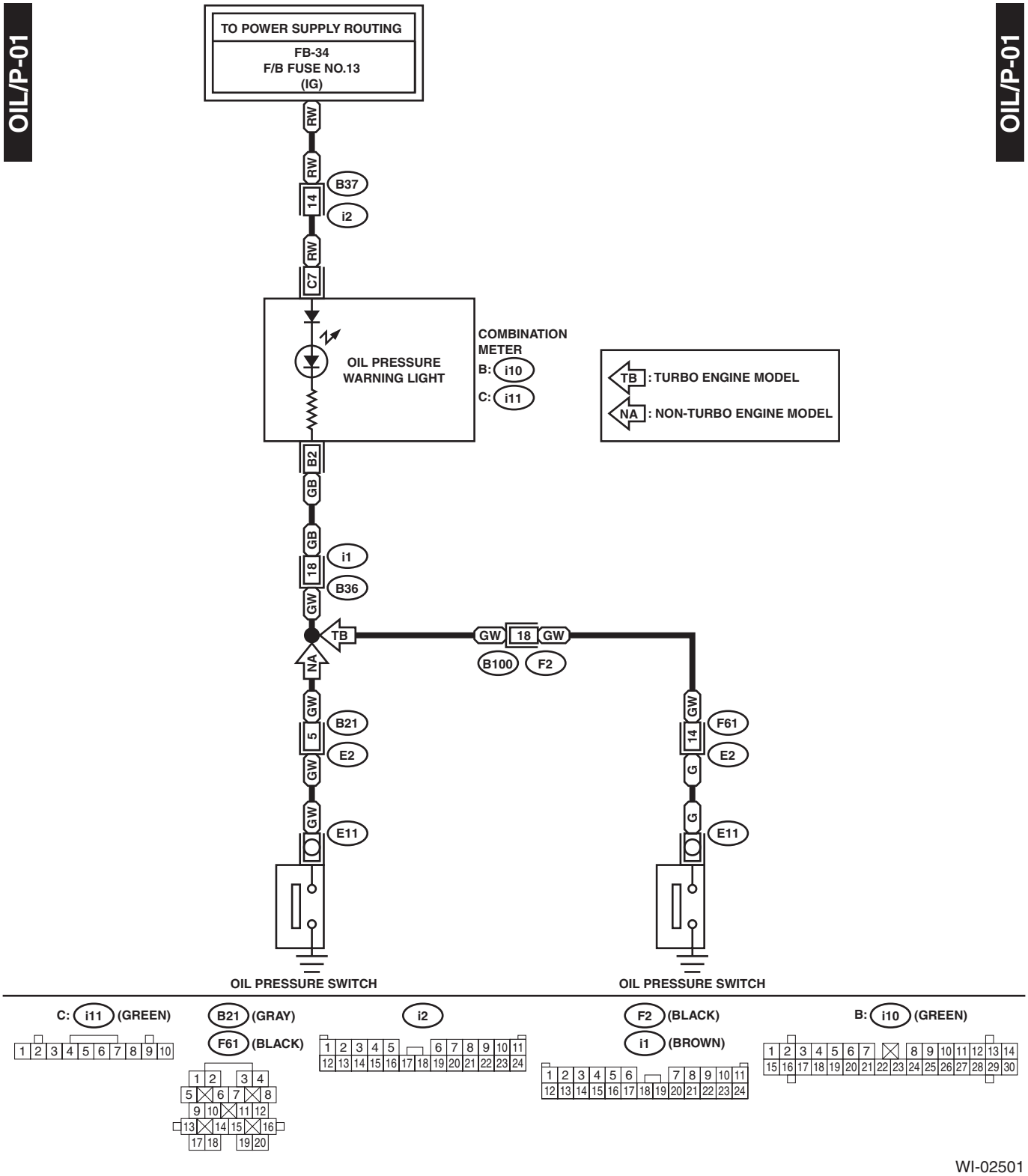

TURN-02
TURN-02
TO POWER SUPPLY ROUTING
FB-5
TO FB-2
FB-4
TO FB-1
BG
LgB
FRONT TURN SIGNAL
LIGHT LH
FRONT TURN SIGNAL
LIGHT RH
3 BG
2 B
F22
LgB 3
B 2
F4
B
E
REF. TO GND-01
TRAILER
CONNECTOR
TURN-01 A
TURN-01 B
LgB 22 LgB
BG 15 BG
B99
R3
WG
LgB 2
BG 4
B 6
R79
REAR TURN SIGNAL
LIGHT LH (SEDAN)
REAR TURN SIGNAL
LIGHT RH (SEDAN)
2 BG
4 B
R28
SD
WG
LgB 2
B 4
R26
REAR TURN SIGNAL
LIGHT LH (WAGON)
REAR TURN SIGNAL
LIGHT RH (WAGON)
3 BG
2 B
R28
LgB 3
B 2
R26
B
E
REF. TO GND-05
SD SD : SEDAN
WG WG : WAGON


F4 (BLACK)
F22 (BLACK)
SD R26
SD R28
WG R26
WG R28
R79
B99

WI-02500

30.Oil Pressure Warning Light System

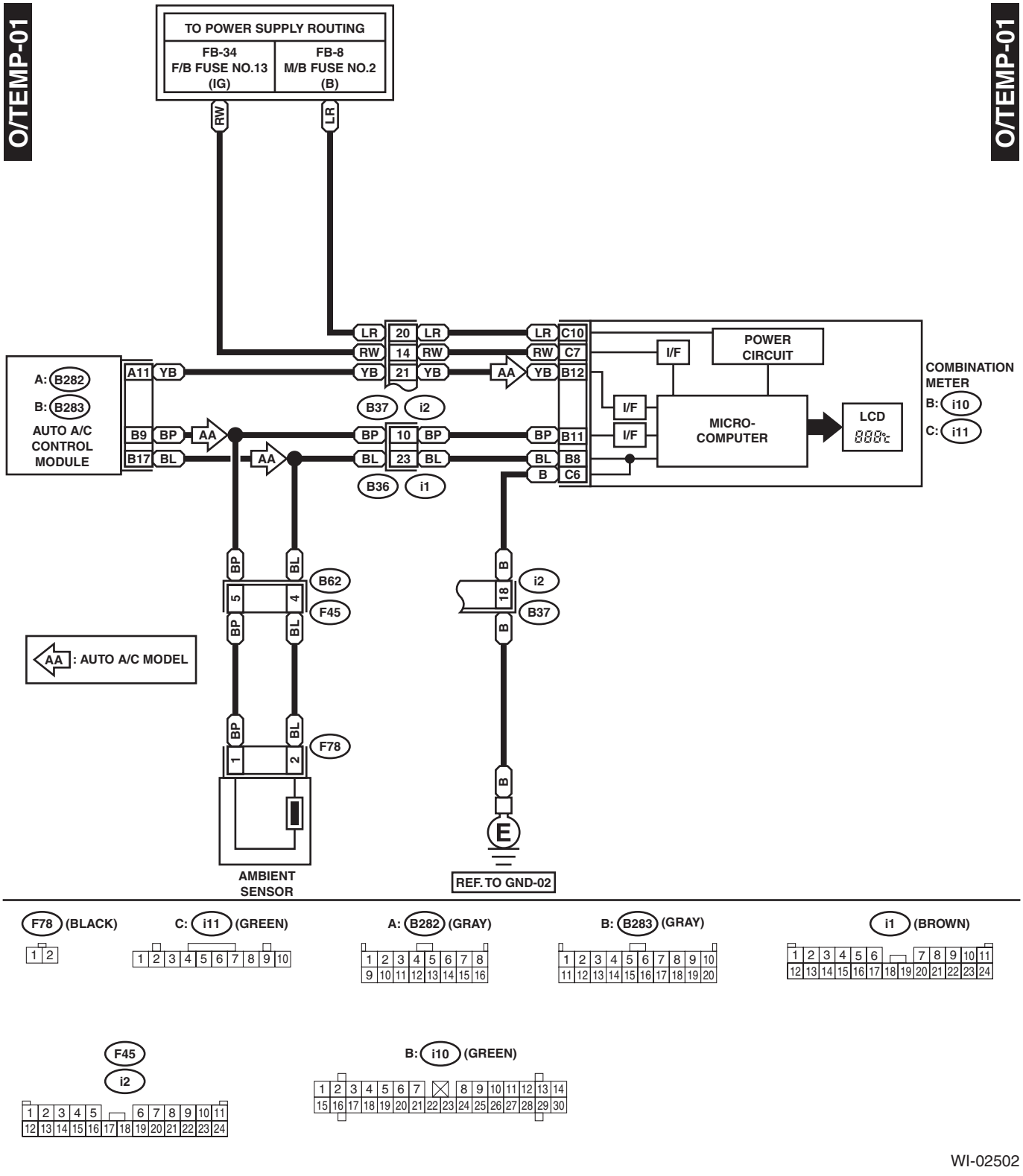
A: WIRING DIAGRAM



WI-02501

31.Outside Temperature Display System

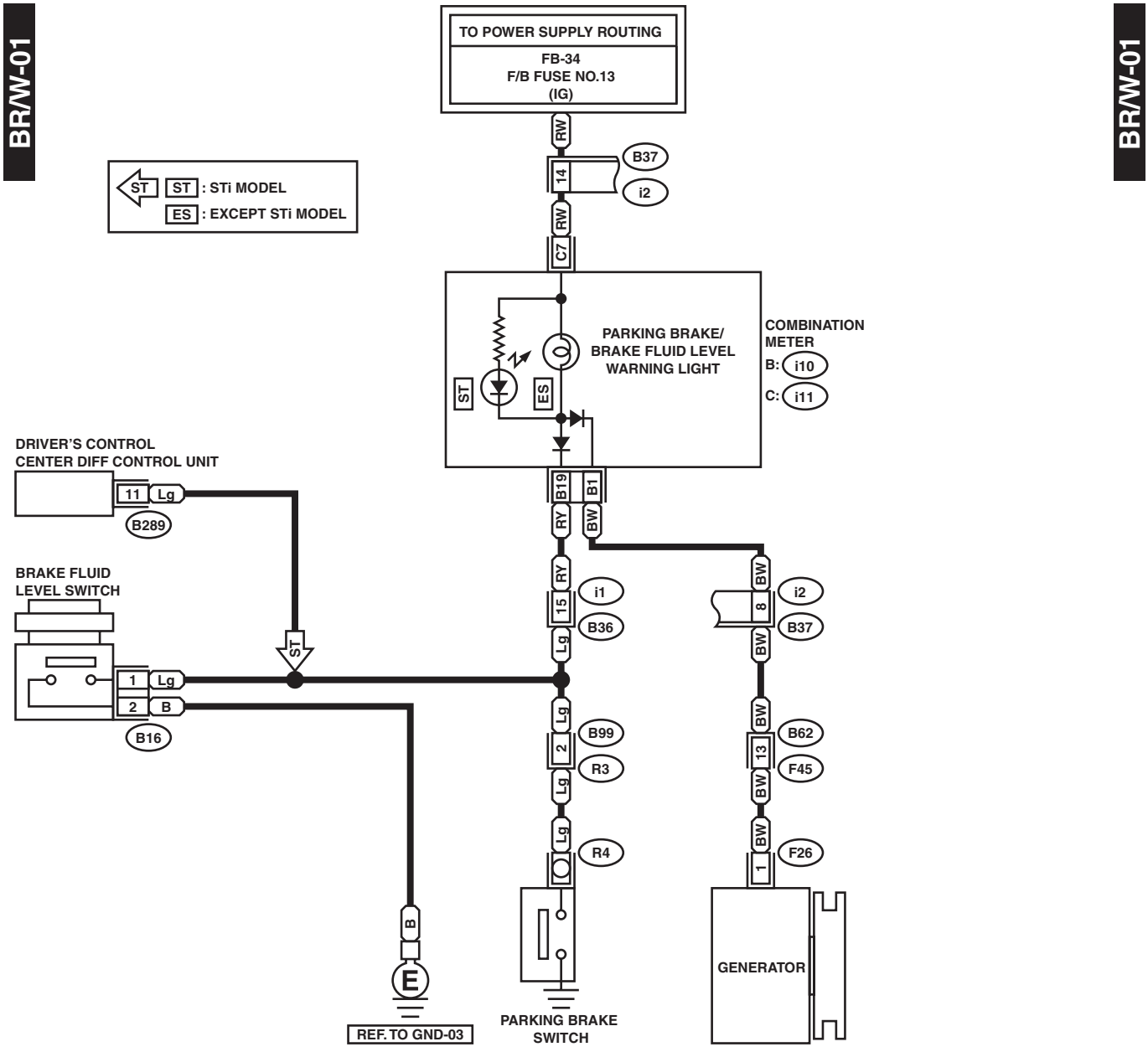
A: WIRING DIAGRAM

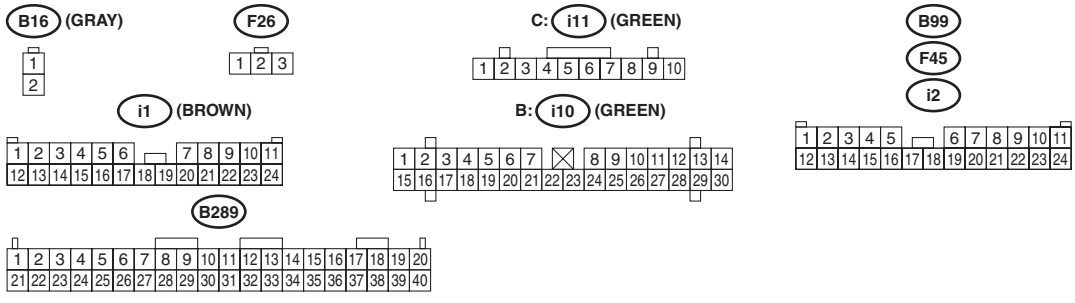


WI-02502

32.Parking Brake and Brake Fluid Level Warning System

A: WIRING DIAGRAM

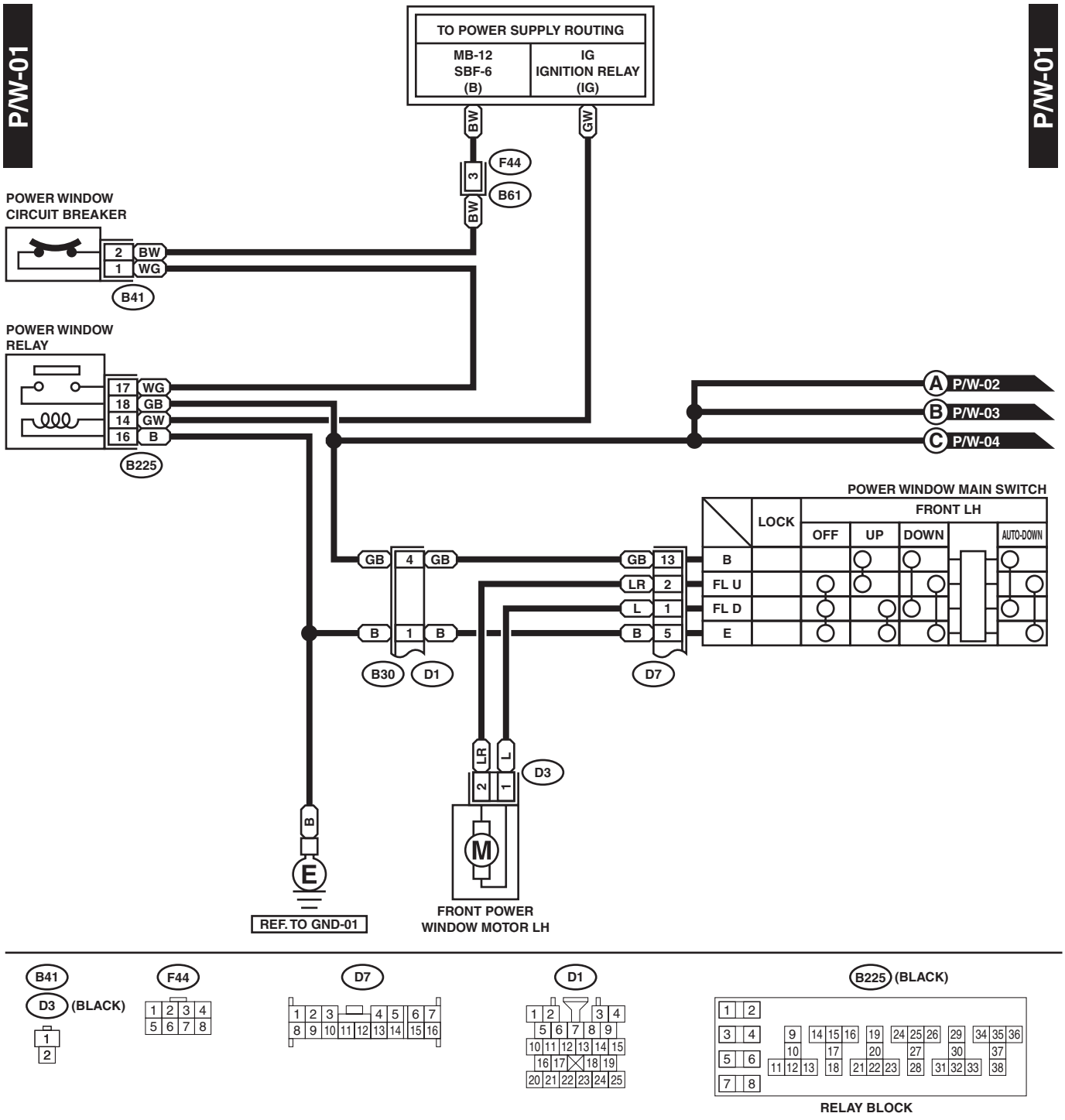




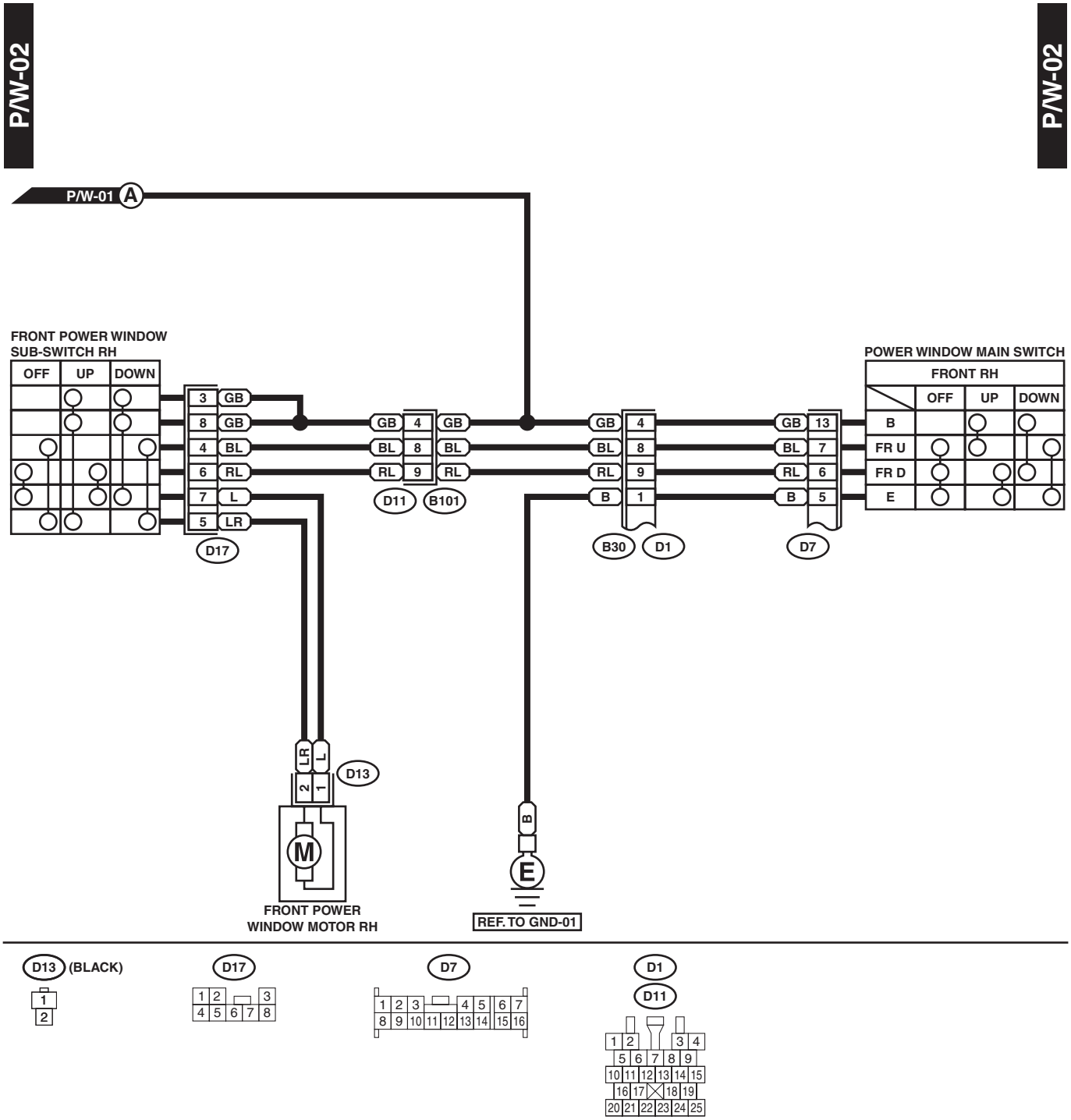
WI-02503

33.Power Window System

A: WIRING DIAGRAM



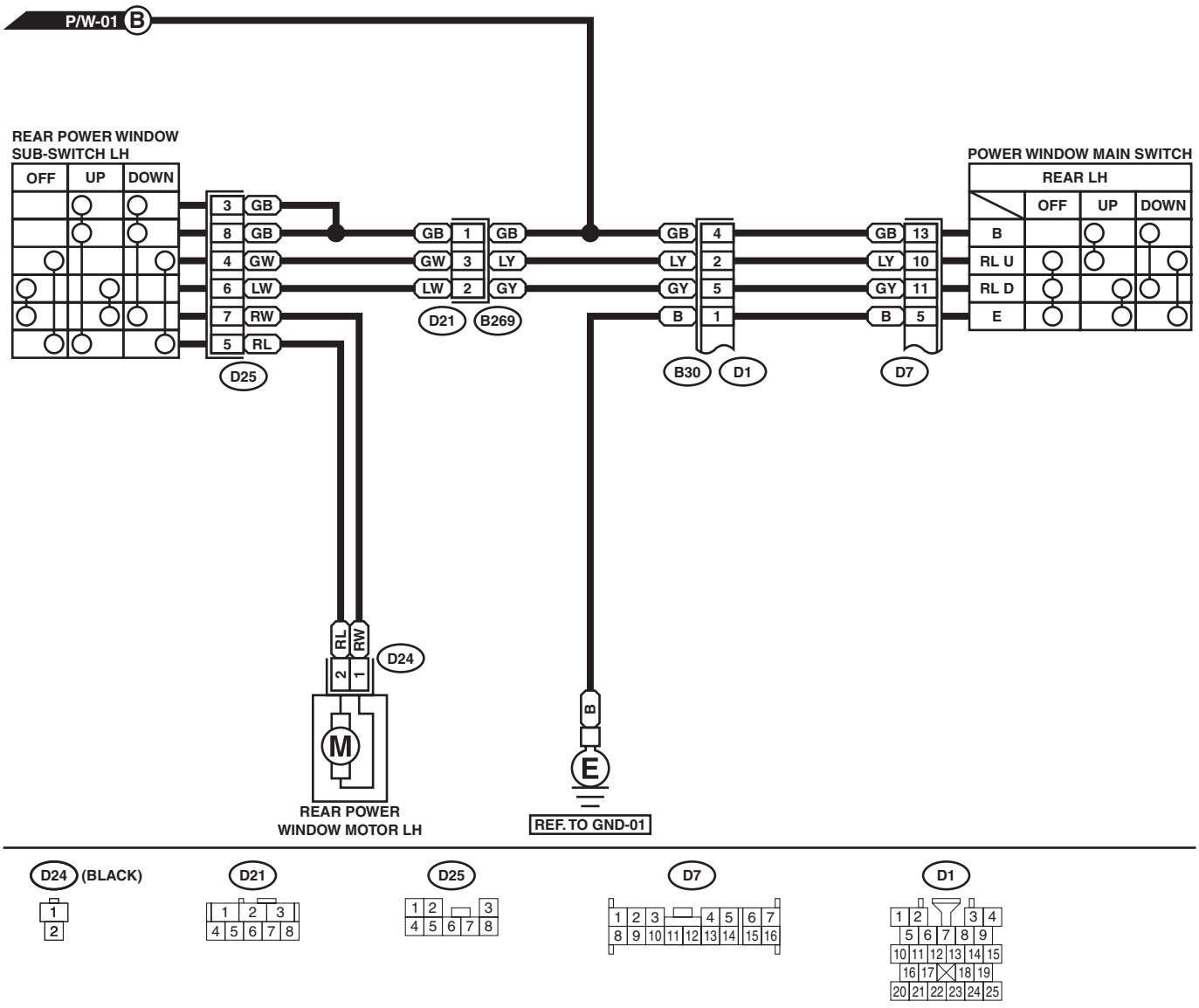
WI-02543


P/W-02
P/W-02
P/W-01 A
FRONT POWER WINDOW SUB-SWITCH RH
OFF
UP
DOWN
3 GB
8 GB
4 BL
6 RL
7 L
5 LR
D17
GB 4 GB
BL 8 BL
RL 9 RL
D11
B101
GB 4
BL 8
RL 9
B 1
B30
D1
GB 13
BL 7
RL 6
B 5
D7
POWER WINDOW MAIN SWITCH
FRONT RH
OFF
UP
DOWN
B
FR U
FR D
E
LR
L
2
1
D13
M
FRONT POWER WINDOW MOTOR RH
B
E
REF. TO GND-01
D13 (BLACK)
1
2
D17
1 2 3
4 5 6 7 8
D7
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16
D1
D11
1 2 3 4
5 6 7 8 9
10 11 12 13 14 15
16 17 18 19
20 21 22 23 24 25

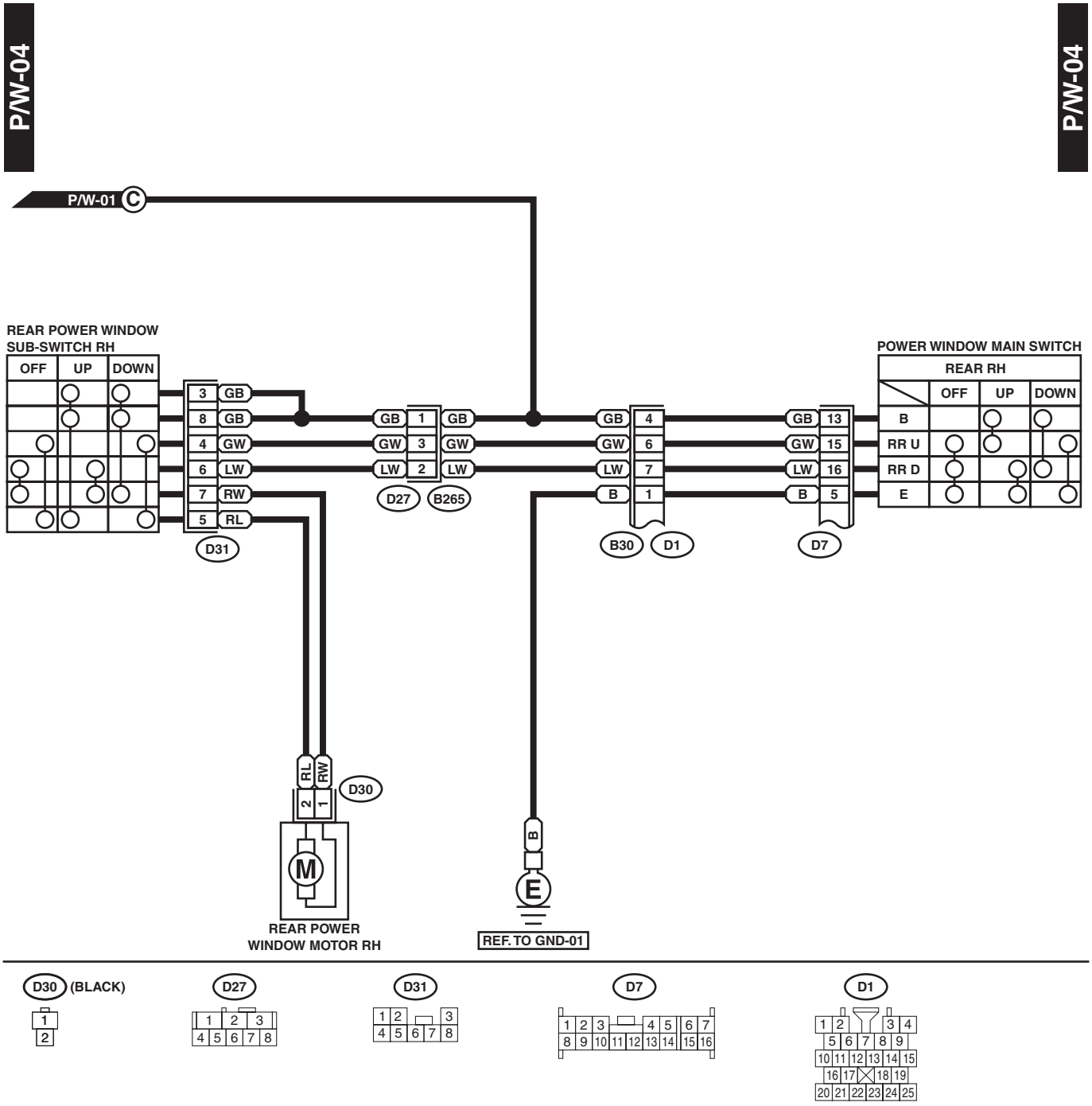
WI-02187

P/W-03

P/W-03



WI-02504

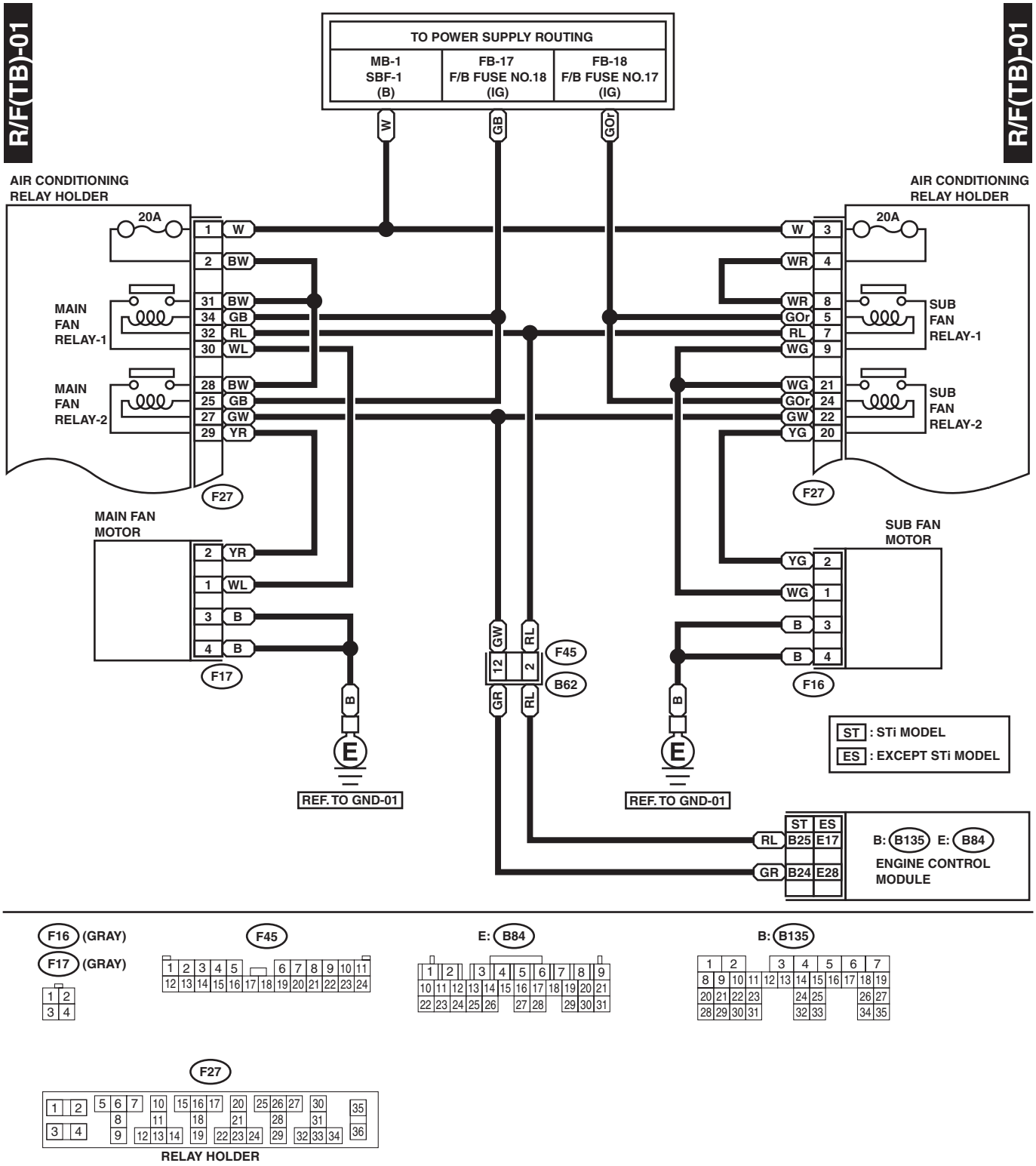

P/W-04
P/W-04
P/W-01 C
REAR POWER WINDOW SUB-SWITCH RH
OFF
UP
DOWN
3 GB
8 GB
4 GW
6 LW
7 RW
5 RL
D31
GB 1 GB
GW 3 GW
LW 2 LW
D27
B265
GB 4
GW 6
LW 7
B 1
B30
D1
GB 13
GW 15
LW 16
B 5
D7
POWER WINDOW MAIN SWITCH
REAR RH
OFF
UP
DOWN
B
RR U
RR D
E
RL
RW
2
1
D30
M
REAR POWER WINDOW MOTOR RH
B
E
REF. TO GND-01
D30 (BLACK)
D27
D31
D7
D1

WI-02505

34.Radiator Fan System

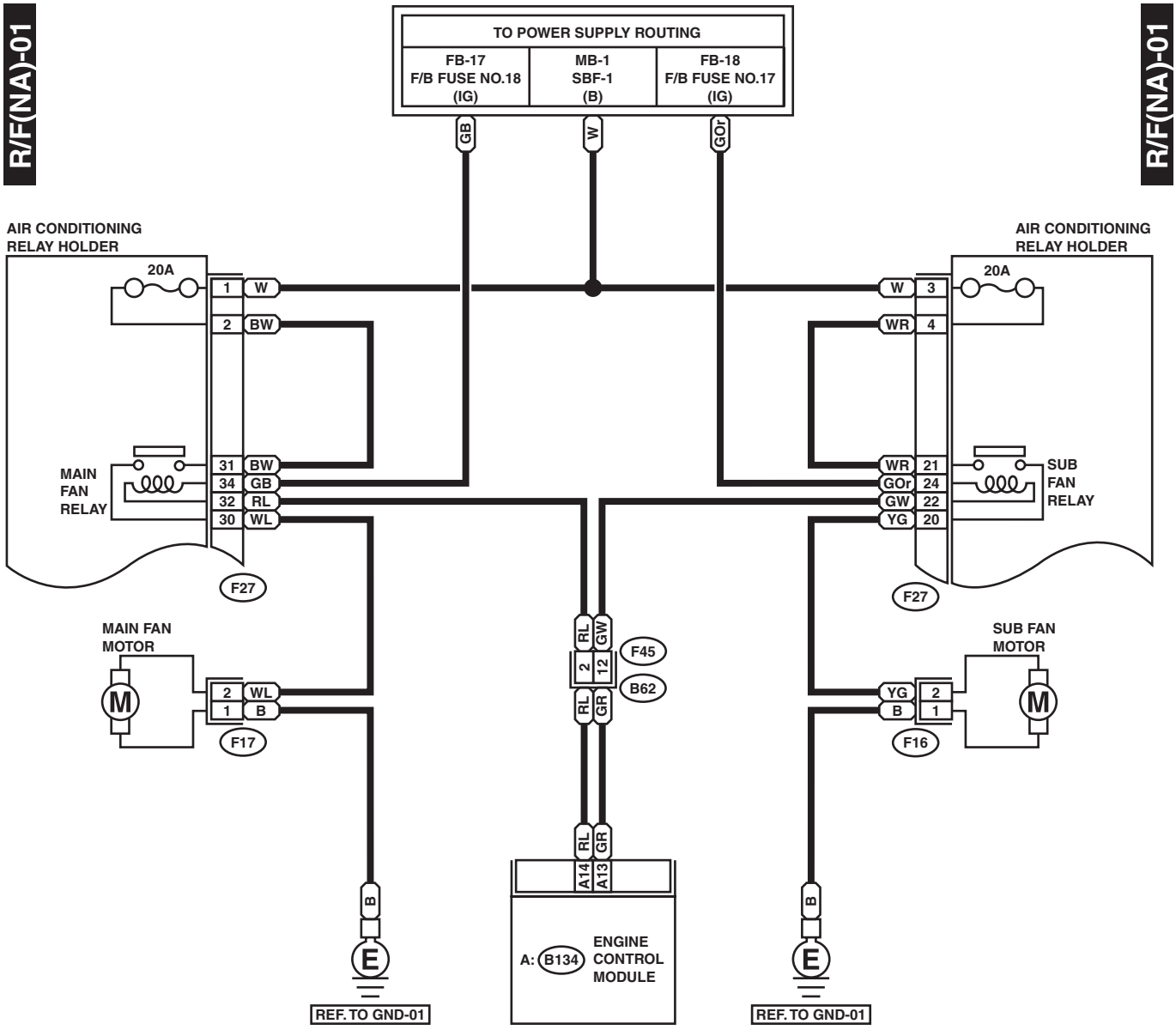
A: WIRING DIAGRAM

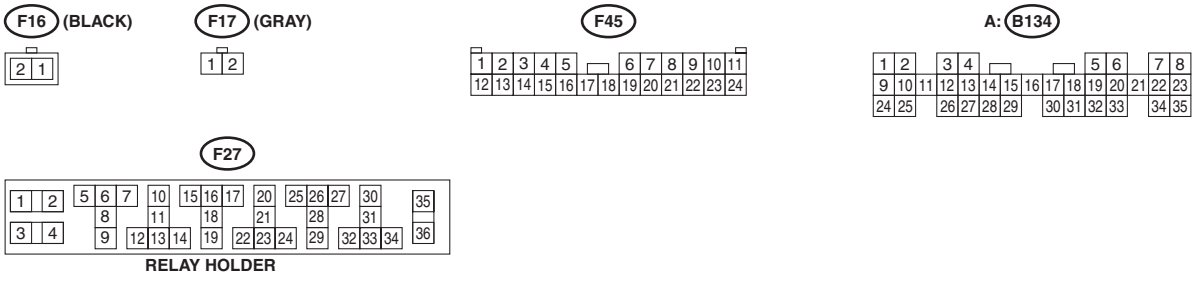
1. TURBO ENGINE MODEL



WI-02506

2. NON-TURBO ENGINE MODEL



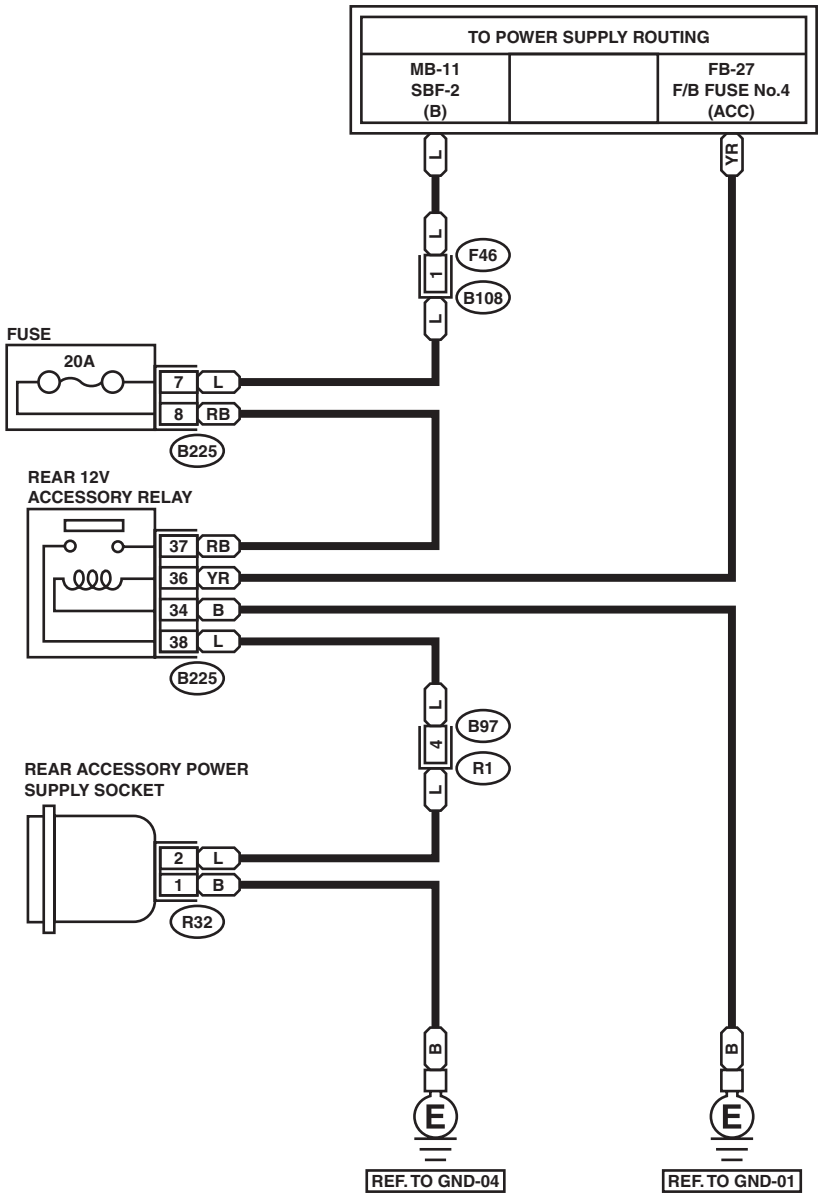


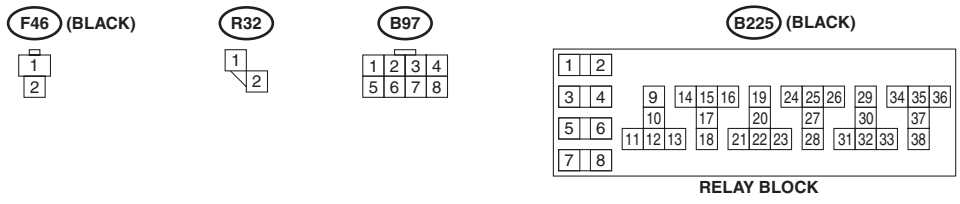
WI-02507

35.Rear Accessory Power Supply System

A: WIRING DIAGRAM

RAPS-01



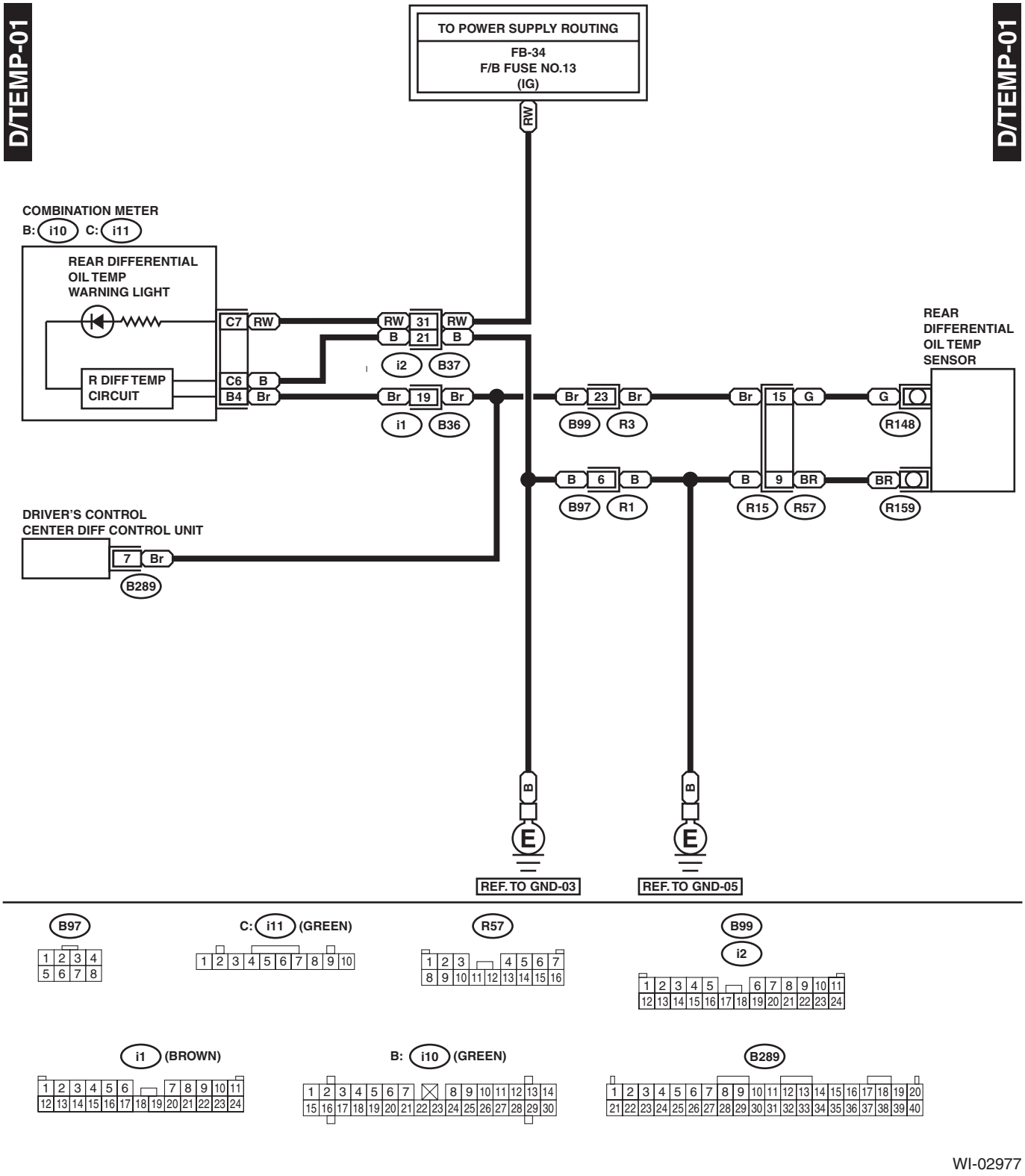


RAPS-01

WI-02544

36.Rear Differential Oil Temperature Warning Light System

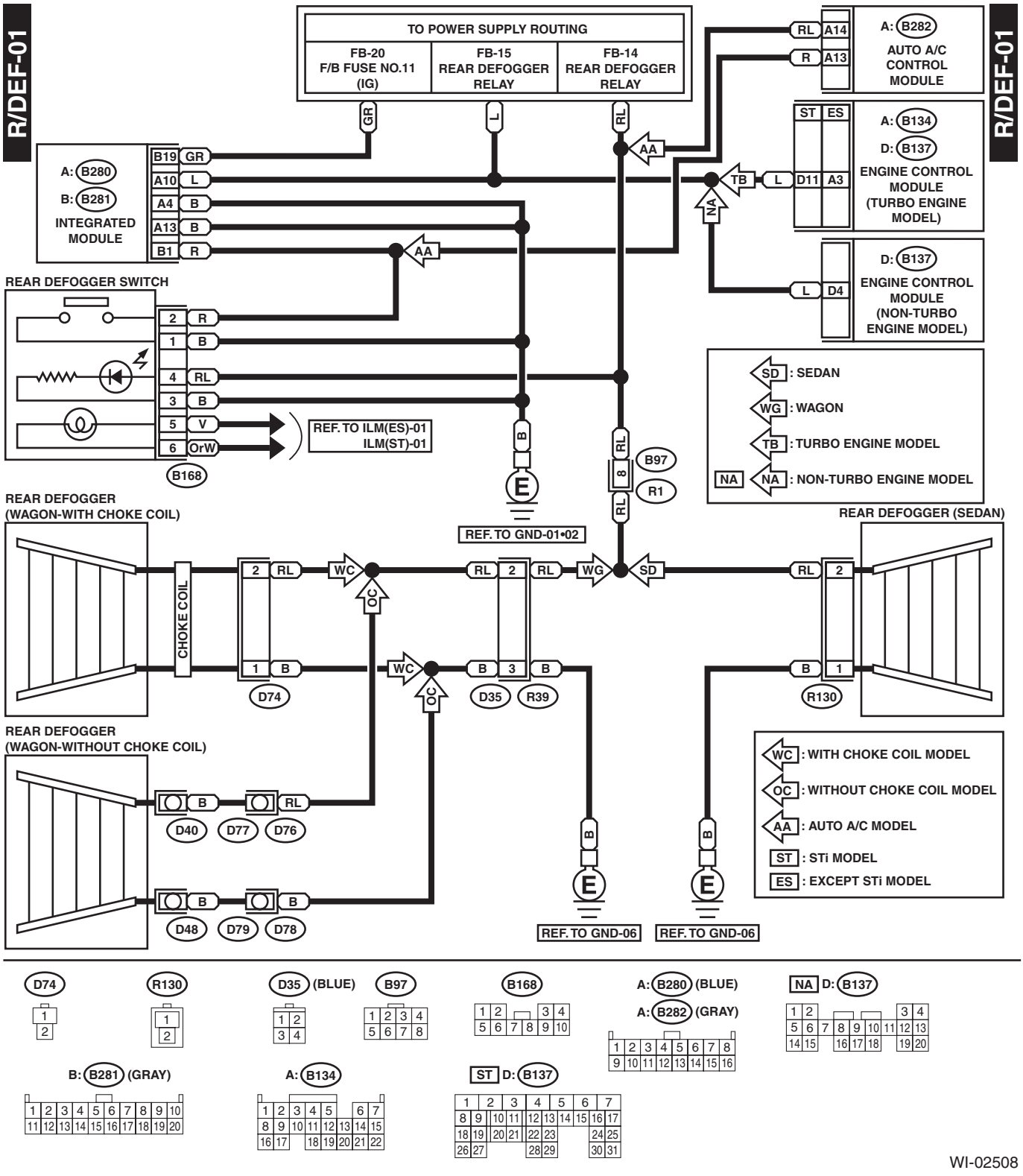
A: WIRING DIAGRAM



WI-02977

37.Rear Window Defogger System

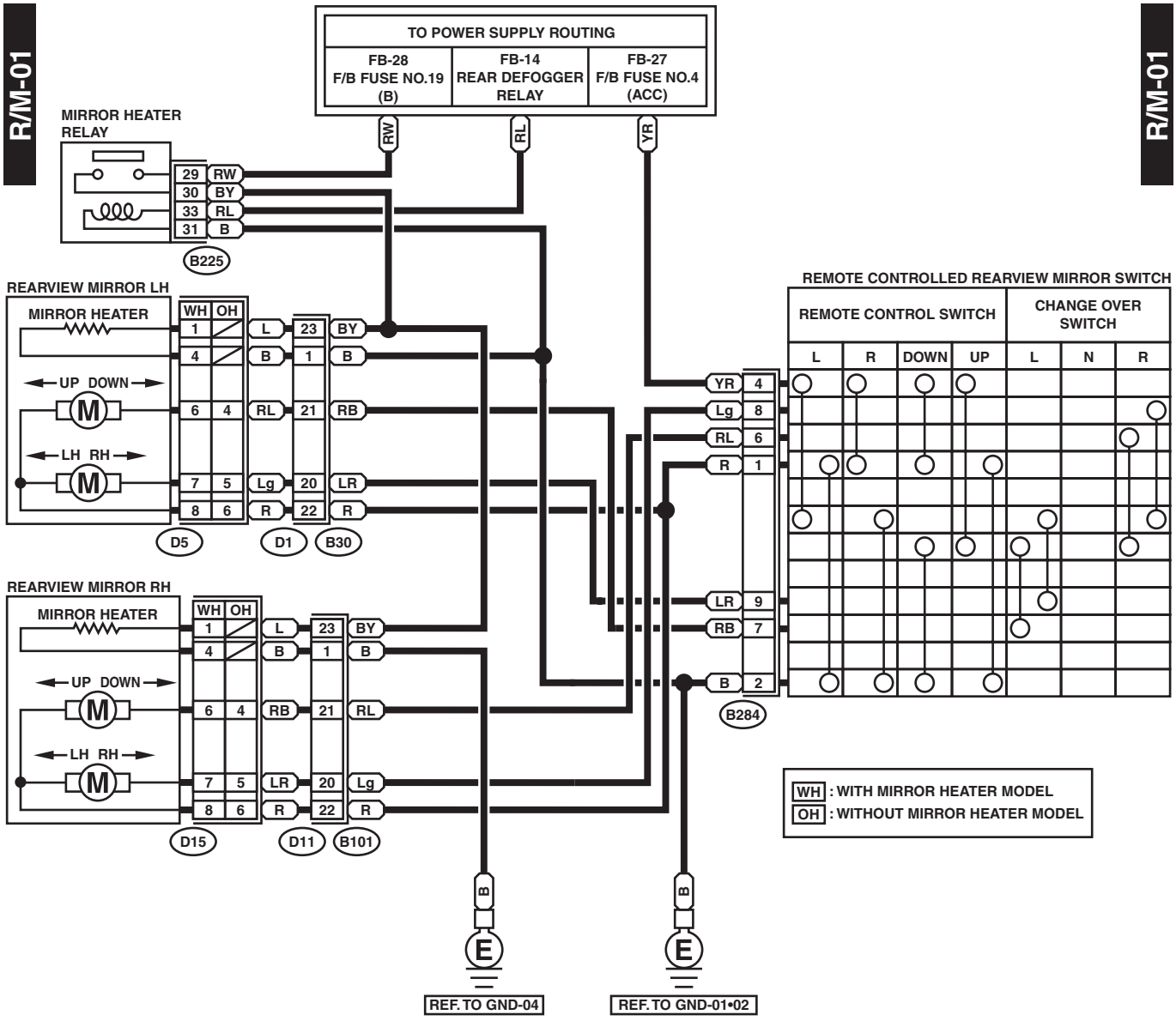
A: WIRING DIAGRAM

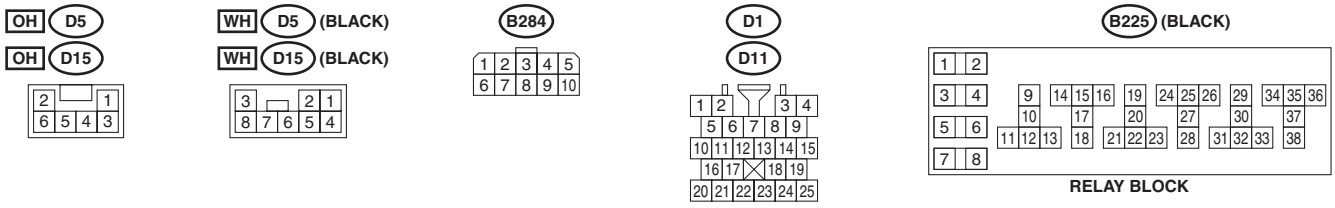


WI-02508

38.Remote Controlled Rearview Mirror System

A: WIRING DIAGRAM

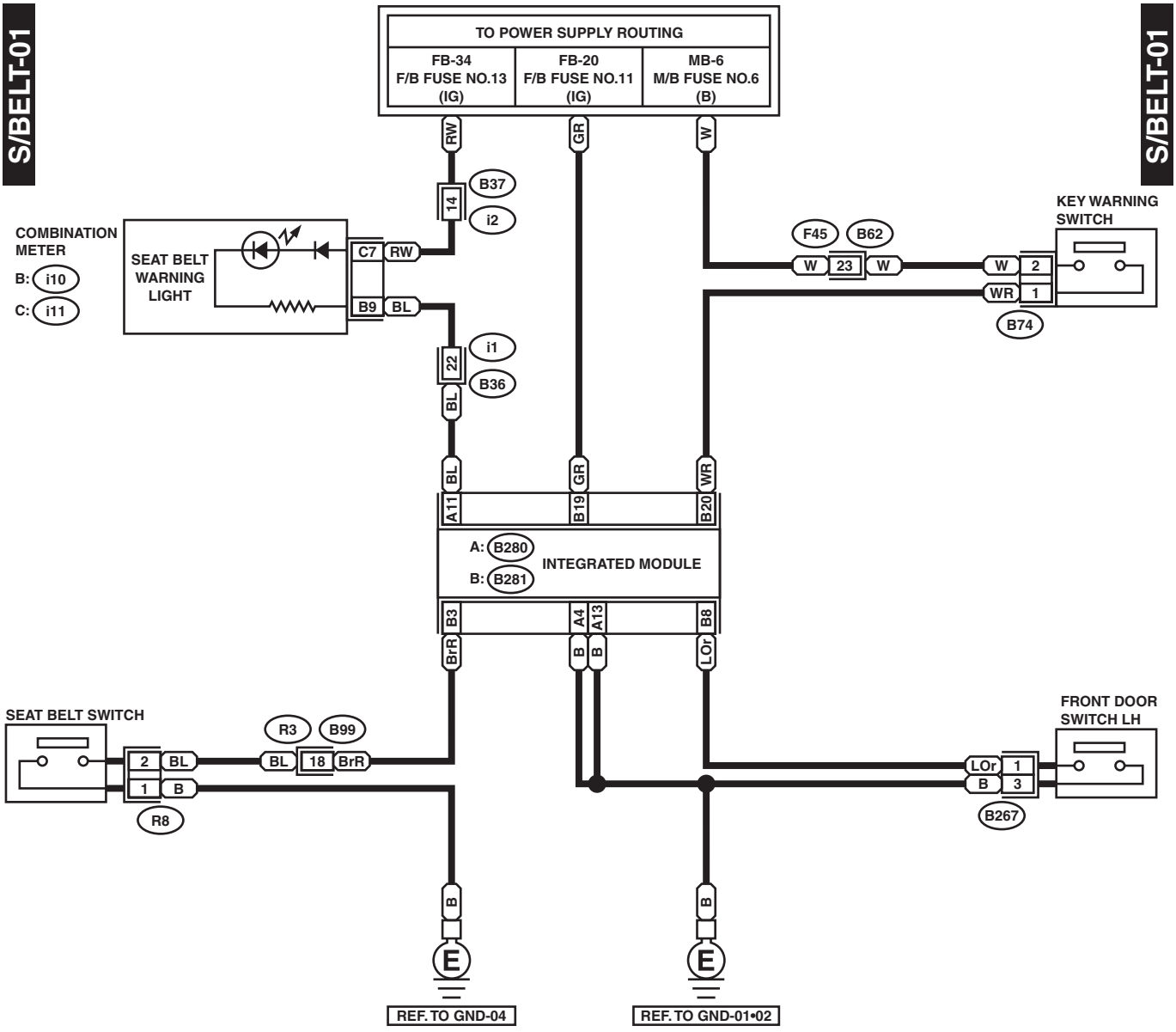


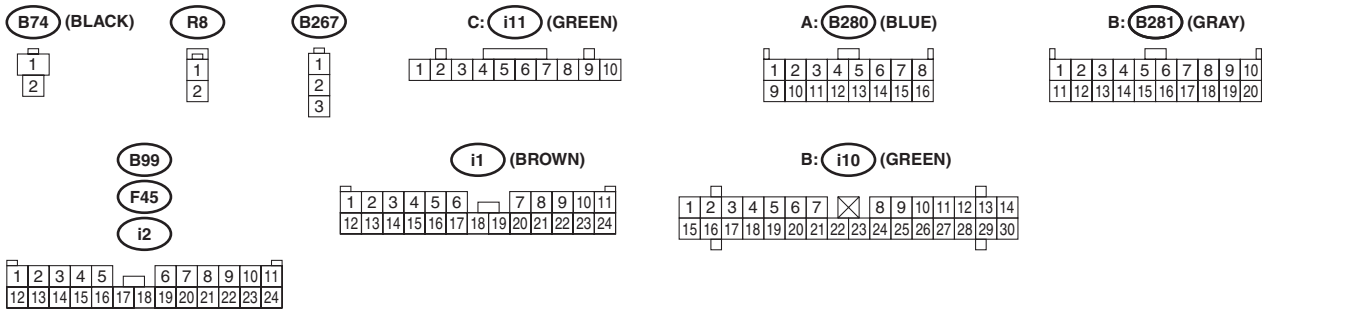


WI-02545

39.Seat Belt Warning System

A: WIRING DIAGRAM

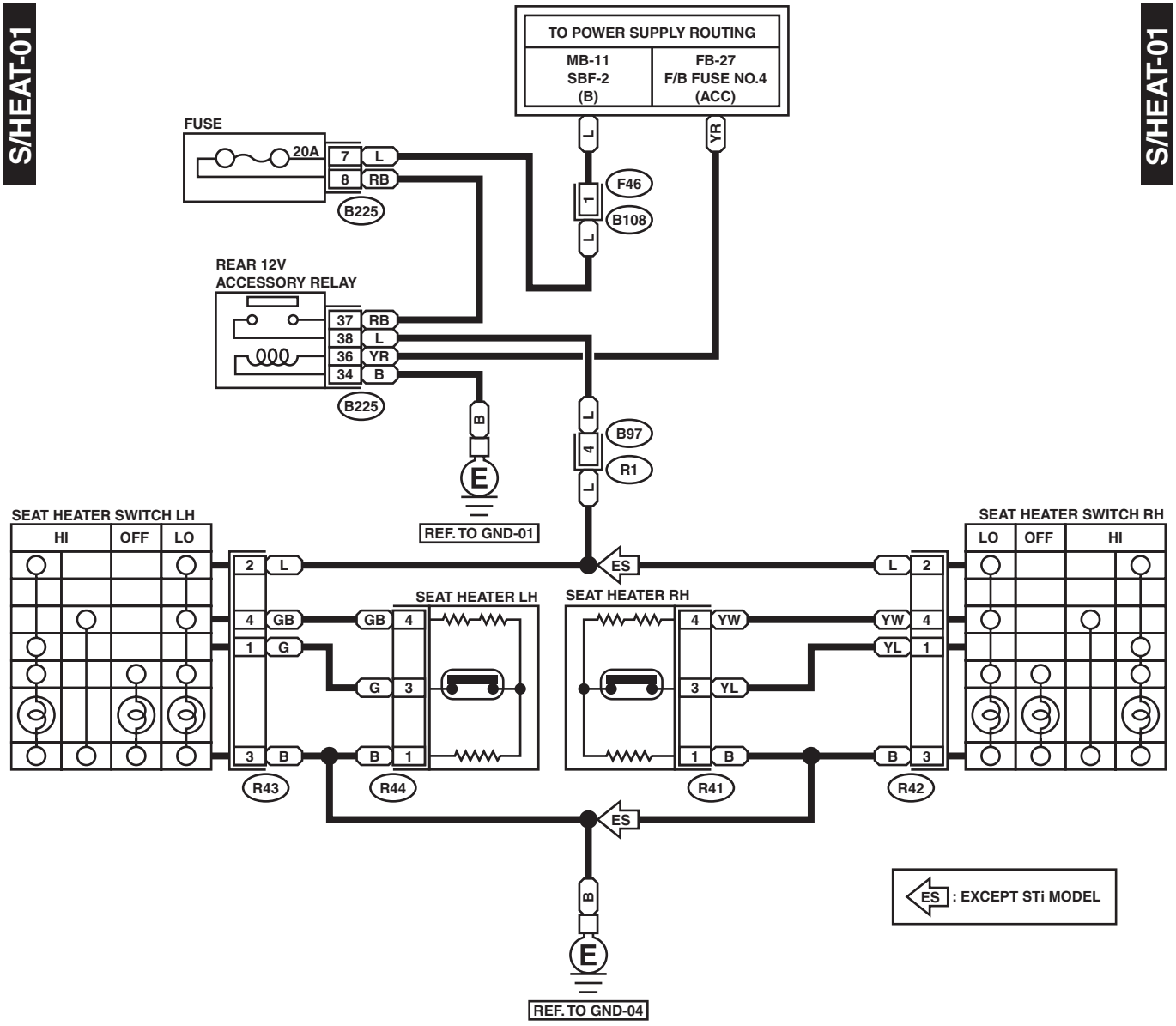


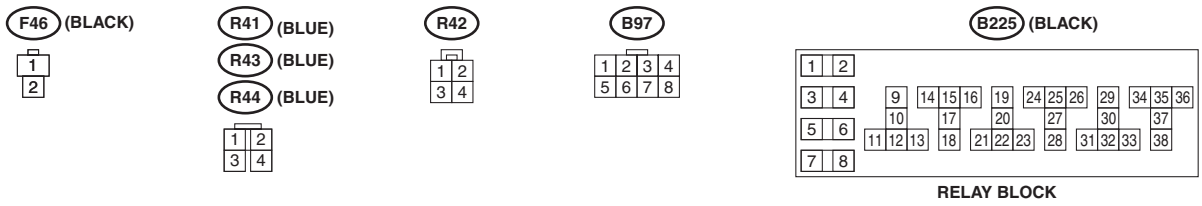


WI-02509

40.Seat Heater System

A: WIRING DIAGRAM

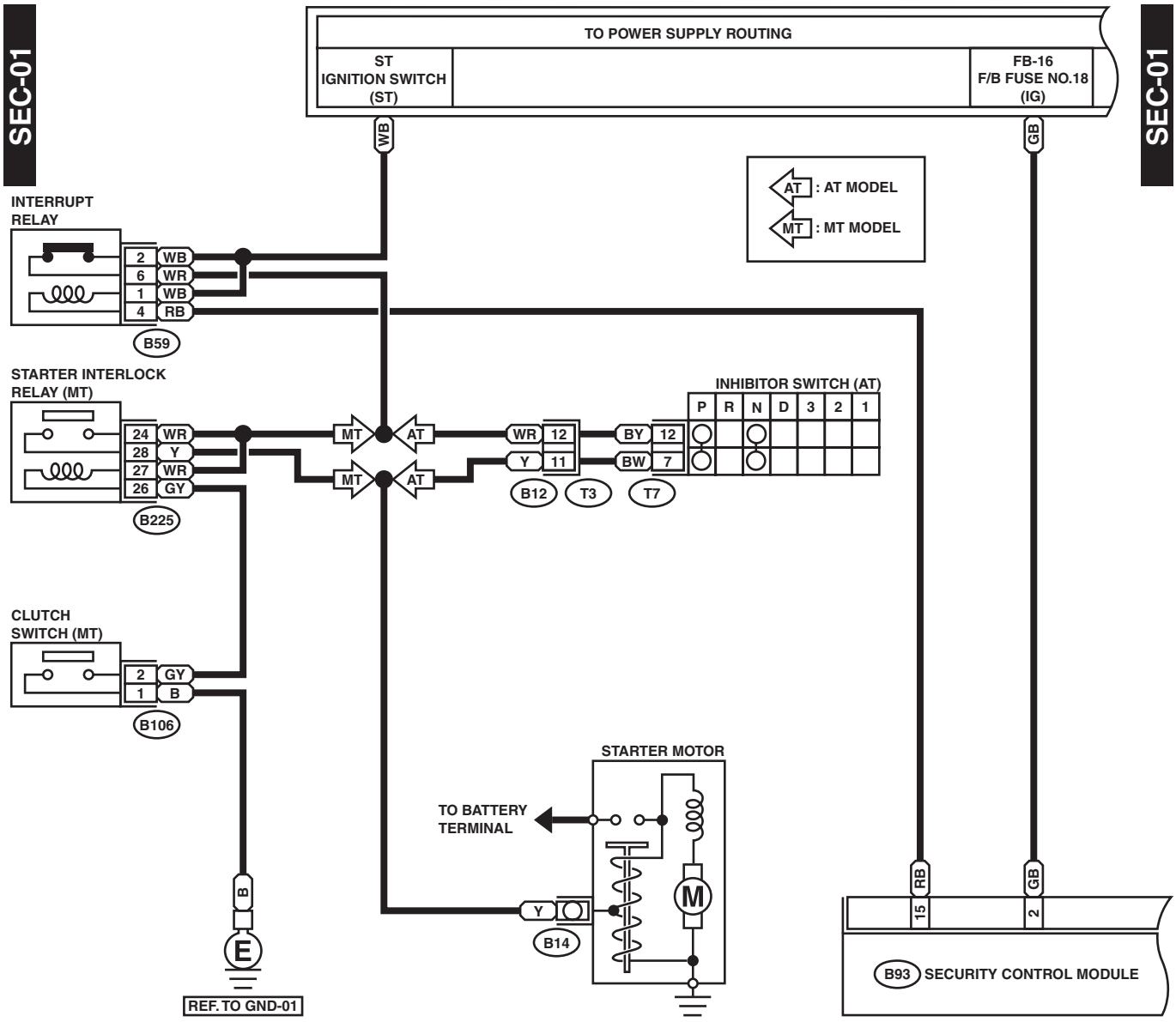


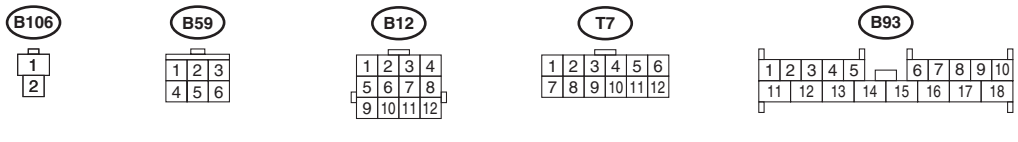


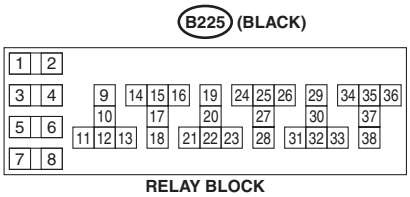
WI-02510

41.Security System

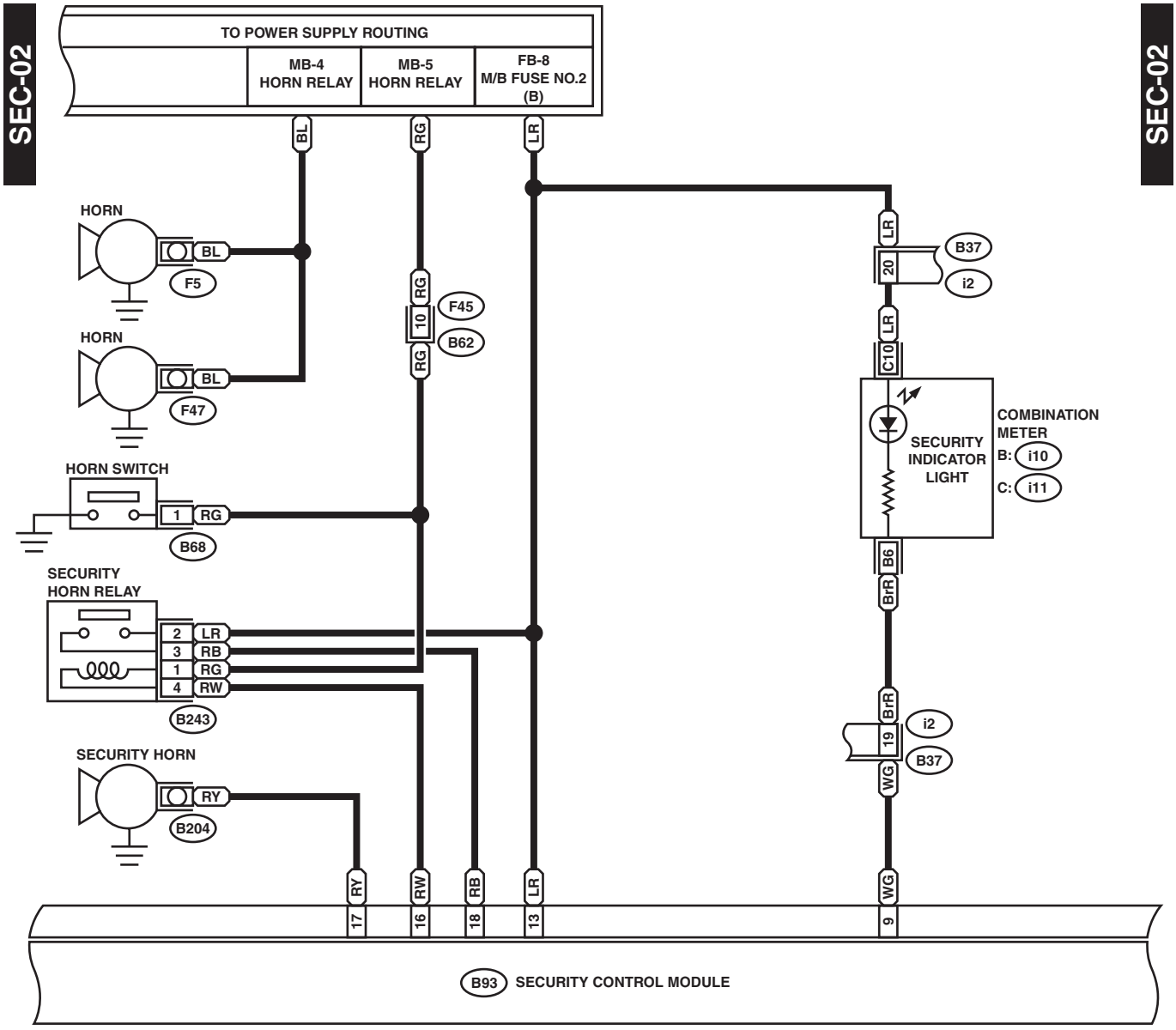
A: WIRING DIAGRAM

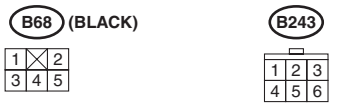




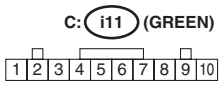


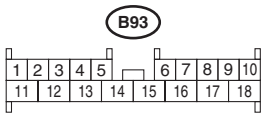
WI-02511

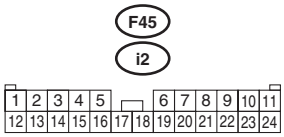

SEC-02
SEC-02
TO POWER SUPPLY ROUTING
MB-4 HORN RELAY
MB-5 HORN RELAY
FB-8 M/B FUSE NO.2 (B)
BL
RG
LR
HORN
BL
F5
HORN
BL
F47
RG
10
F45
B62
RG
HORN SWITCH
1
RG
B68
SECURITY HORN RELAY
2
LR
3
RB
1
RG
4
RW
B243
SECURITY HORN
RY
B204
LR
20
B37
i2
LR
C10
COMBINATION METER
SECURITY INDICATOR LIGHT
B: i10
C: i11
B6
BrR
BrR
19
i2
B37
WG
RY
RW
RB
LR
WG
17
16
18
13
9
B93 SECURITY CONTROL MODULE

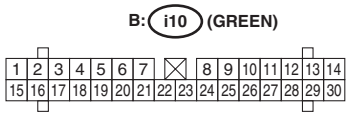

B68 (BLACK)

B243

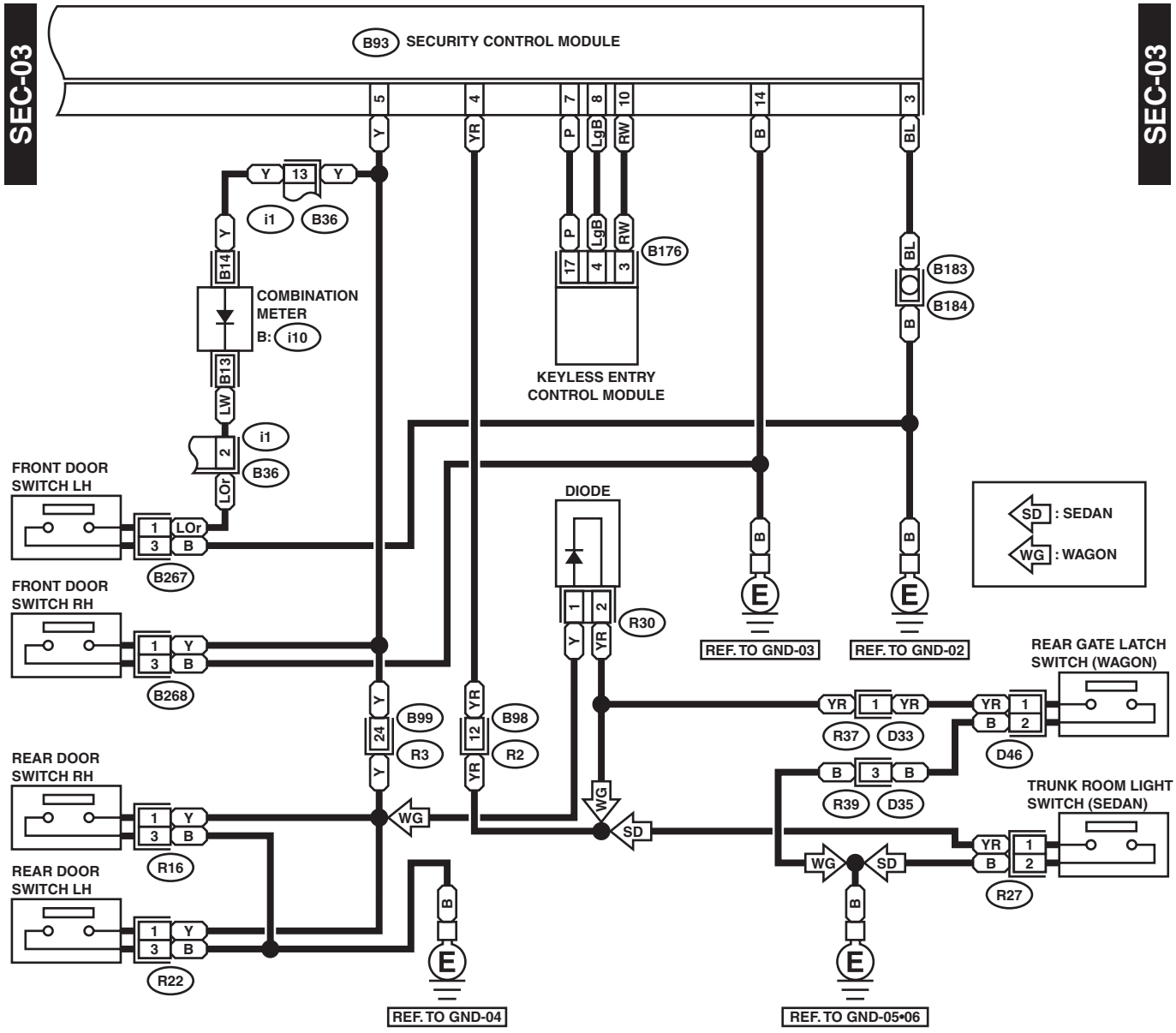

C: i11 (GREEN)


B93


F45
i2


B: i10 (GREEN)

WI-02512

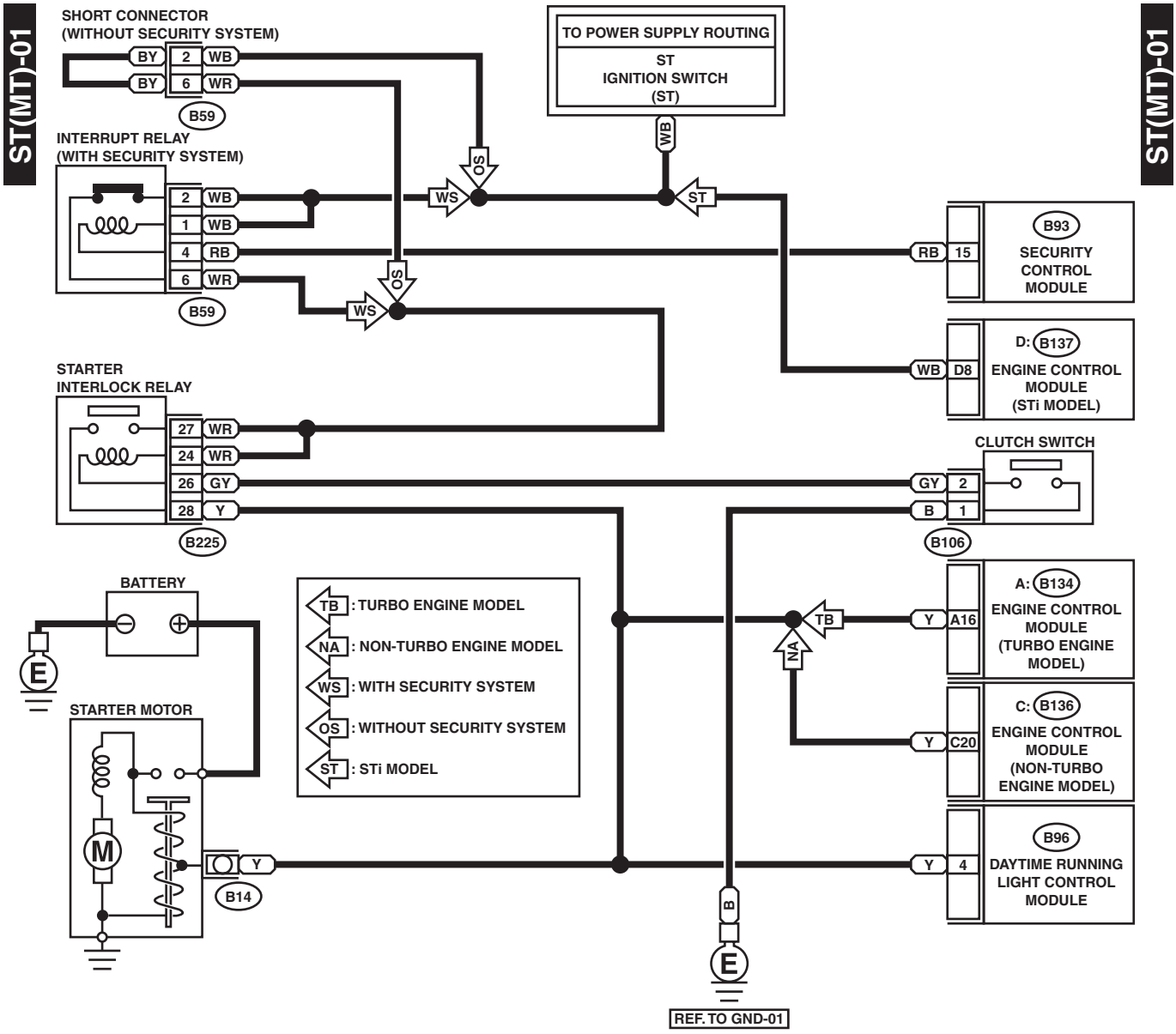

SEC-03
SEC-03
B93 SECURITY CONTROL MODULE
5 4 7 8 10 14 3
Y YR P LgB RW B BL
Y 13 Y
i1 B36
B14
COMBINATION METER
B: i10
B13
LW
i1
2
B36
LOr
FRONT DOOR SWITCH LH
1 LOr
3 B
B267
FRONT DOOR SWITCH RH
1 Y
3 B
B268
REAR DOOR SWITCH RH
1 Y
3 B
R16
REAR DOOR SWITCH LH
1 Y
3 B
R22
P LgB RW
17 4 3
B176
KEYLESS ENTRY CONTROL MODULE
BL
B183
B184
B
DIODE
1 2
R30
Y YR
B99
24
R3
B98
12
R2
WG
SD
REF. TO GND-03
REF. TO GND-02
REF. TO GND-04
REF. TO GND-05•06
SD : SEDAN
WG : WAGON
REAR GATE LATCH SWITCH (WAGON)
YR 1 YR
B 2
R37 D33
D46
B 3 B
R39 D35
TRUNK ROOM LIGHT SWITCH (SEDAN)
R27
D33 R27 R30 D46 B267 B268 R16 R22
D35 (BLUE) B98 B93
B176 B99 i1 (BROWN) B: i10 (GREEN)

WI-02513

42.Starter System

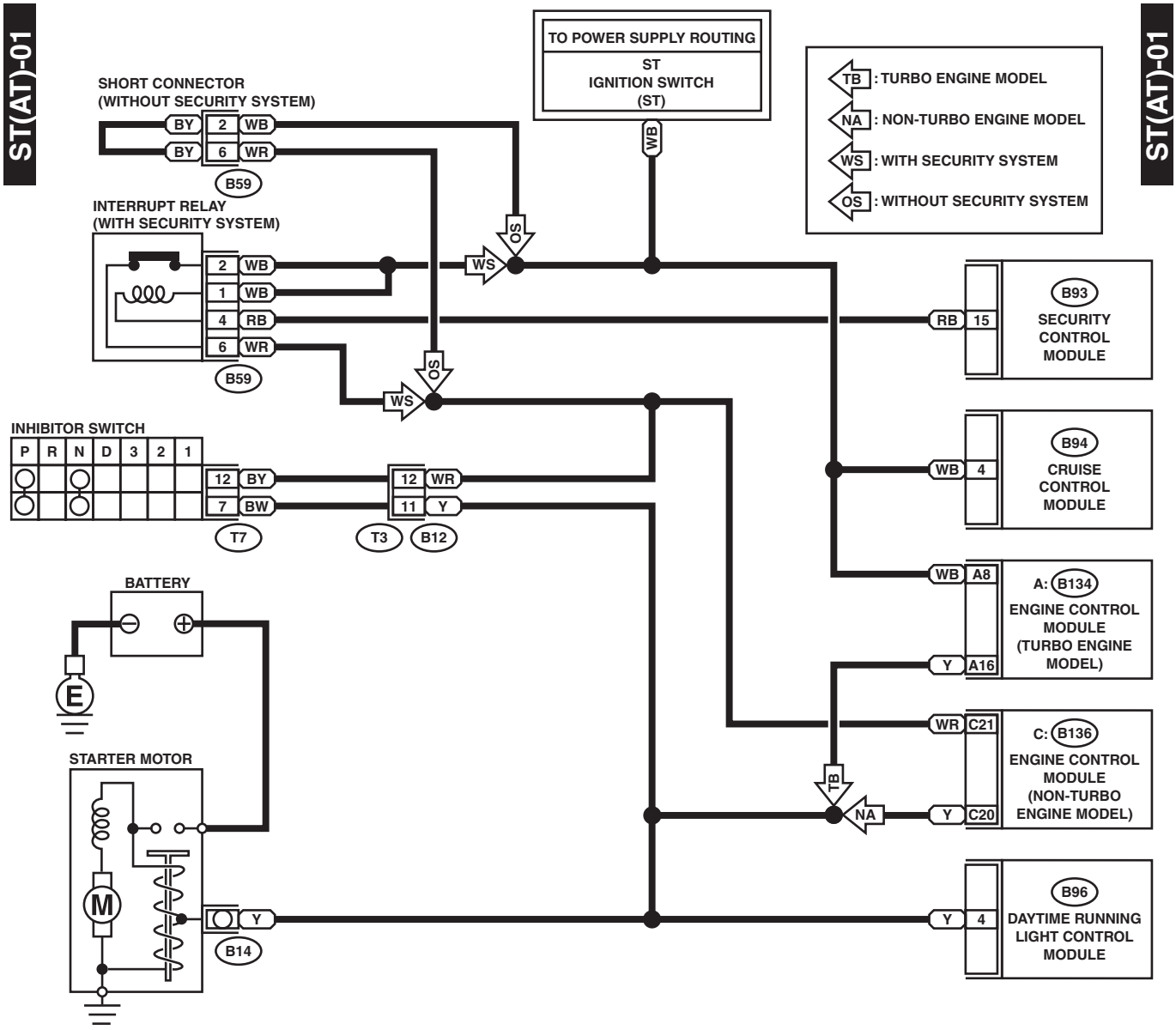
A: WIRING DIAGRAM

1. MT MODEL



WI-02546

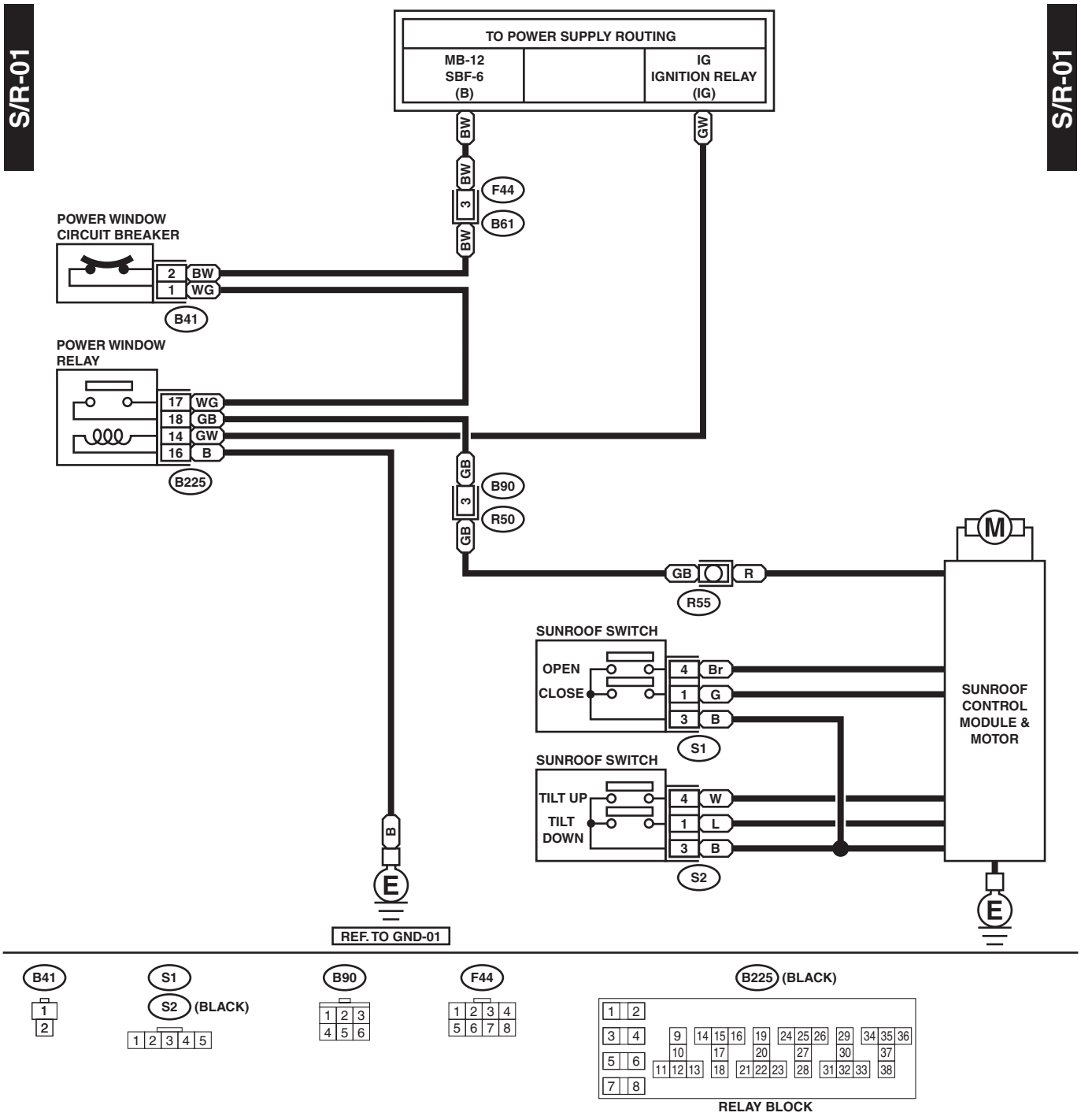
2. AT MODEL



WI-01172

43.Sunroof System

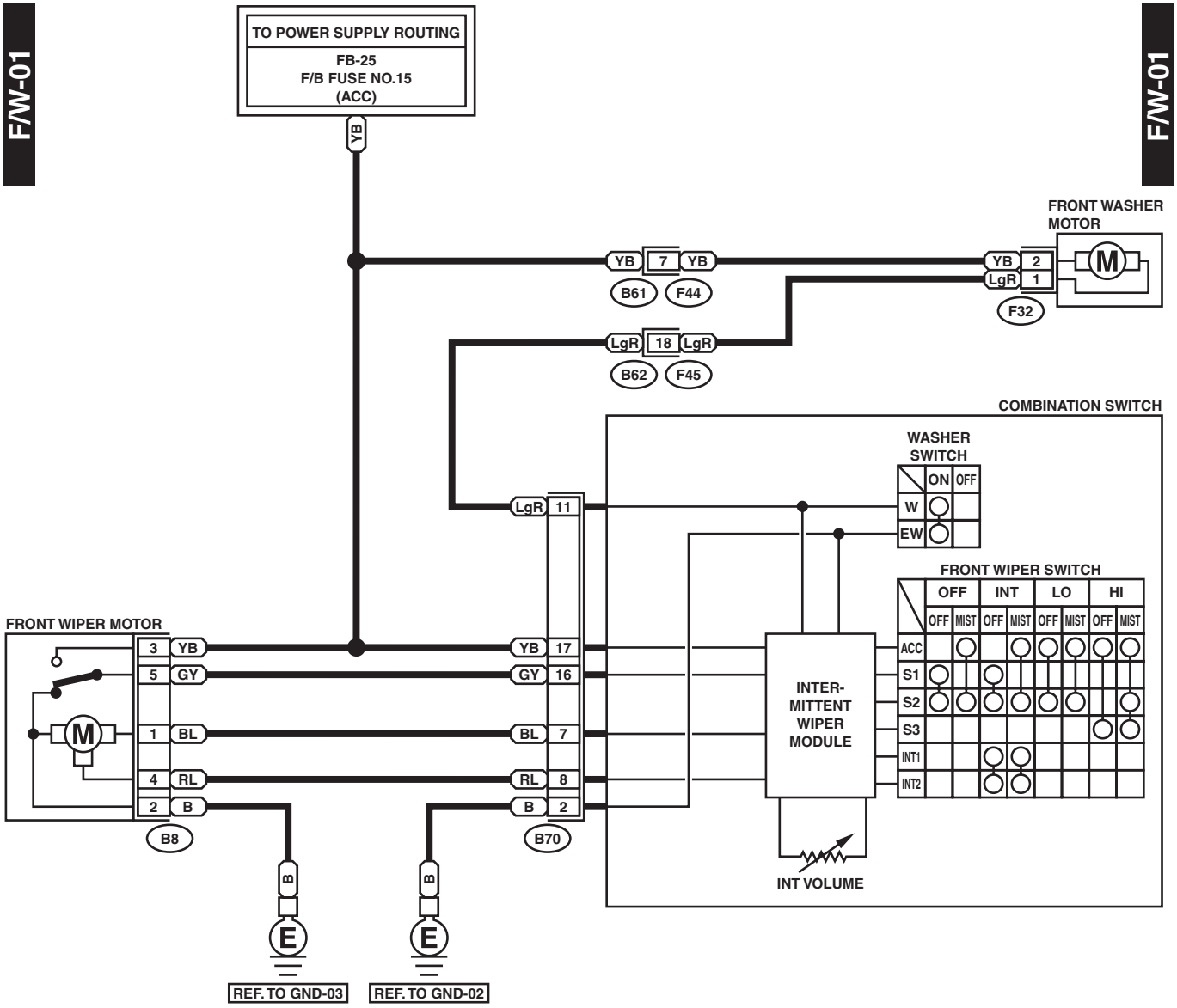
A: WIRING DIAGRAM

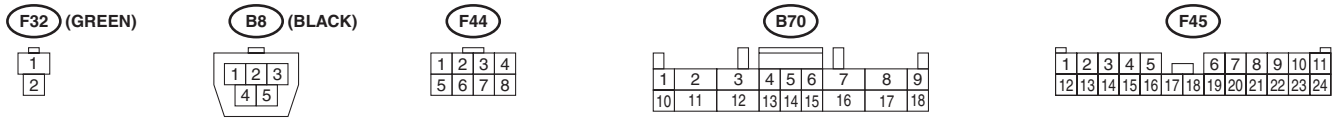


WI-02514

44.Wiper and Washer System (Front)

A: WIRING DIAGRAM

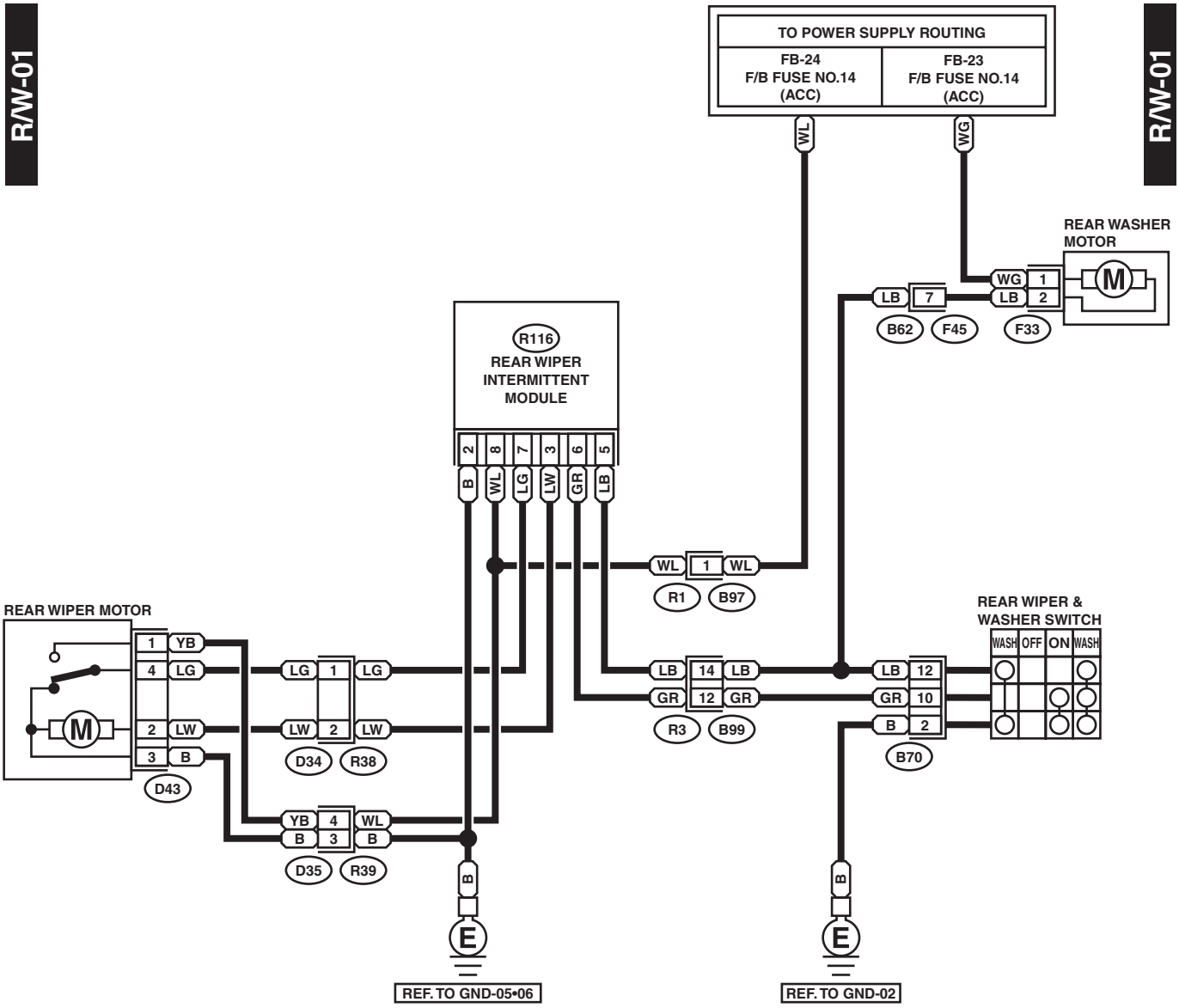


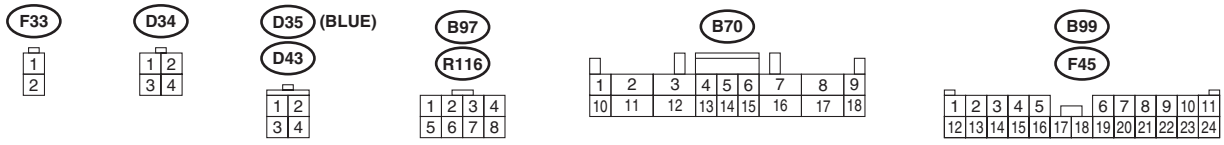


WI-02515

45.Wiper and Washer System (Rear)

A: WIRING DIAGRAM

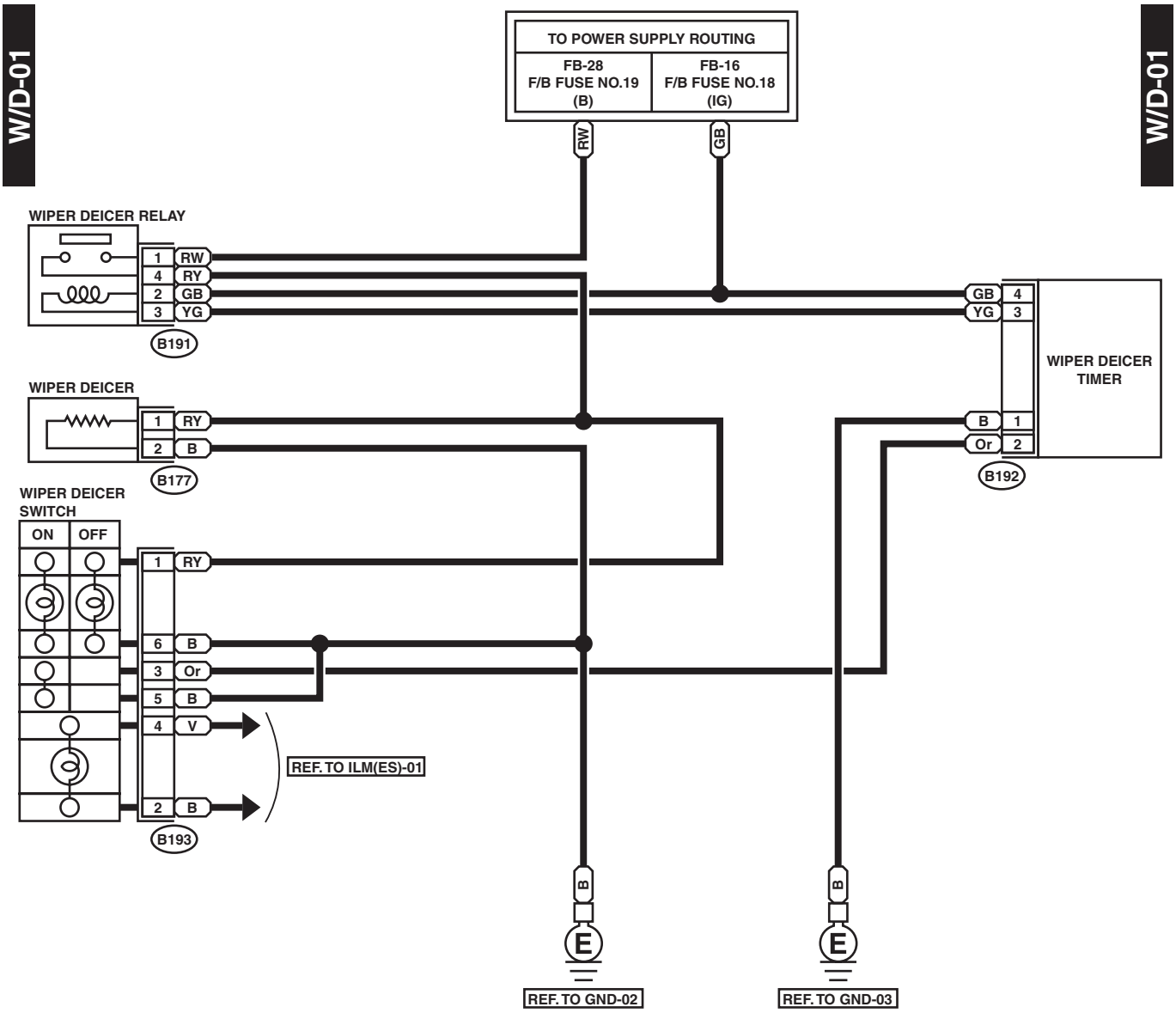


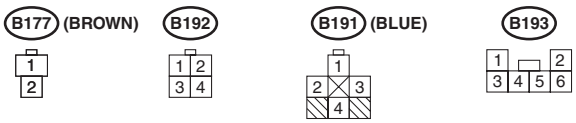


WI-02827

46.Wiper Deicer System

A: WIRING DIAGRAM

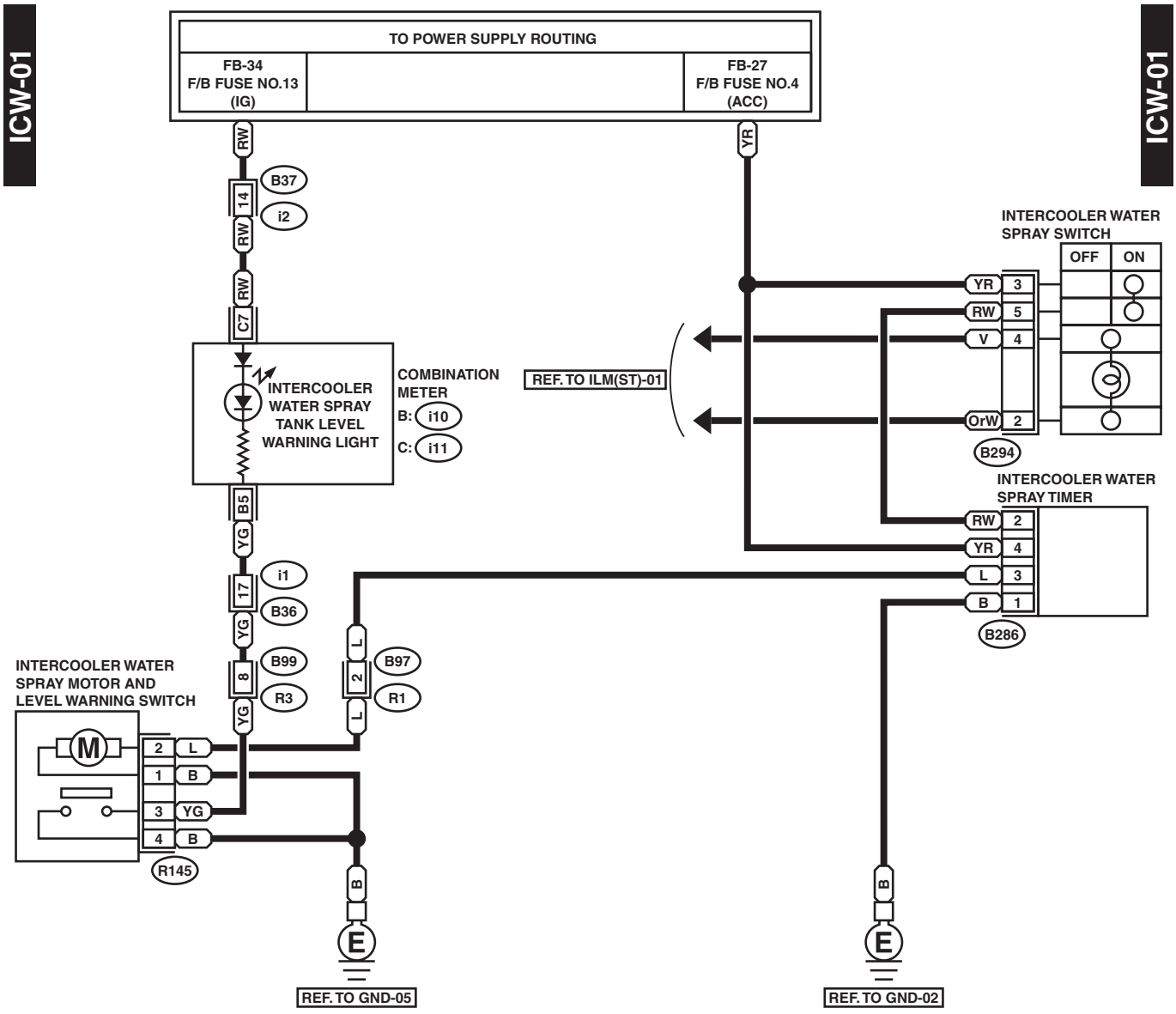


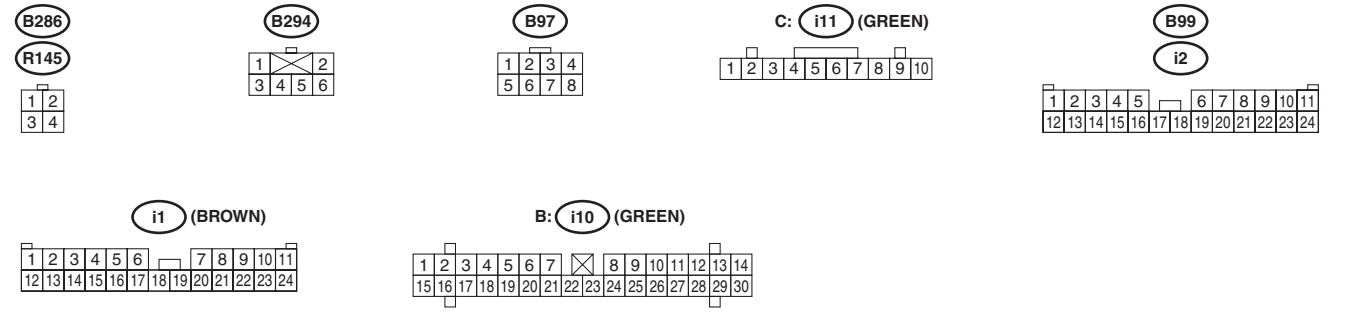


WI-02777

47.Intercooler Water Spray System

A: WIRING DIAGRAM

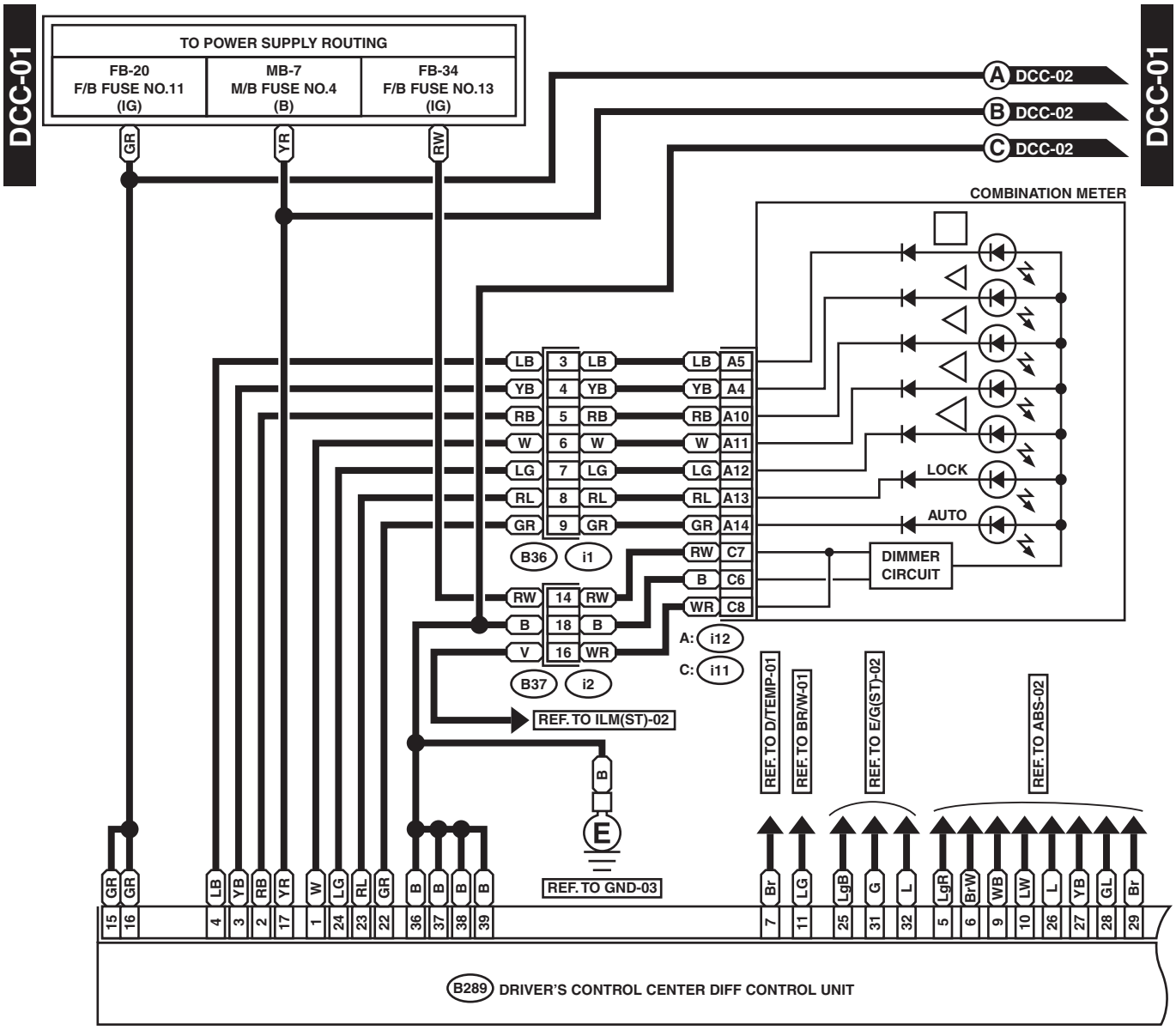


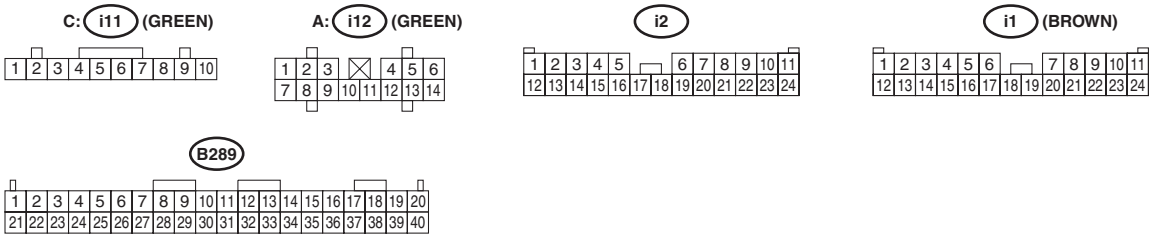


WI-02820

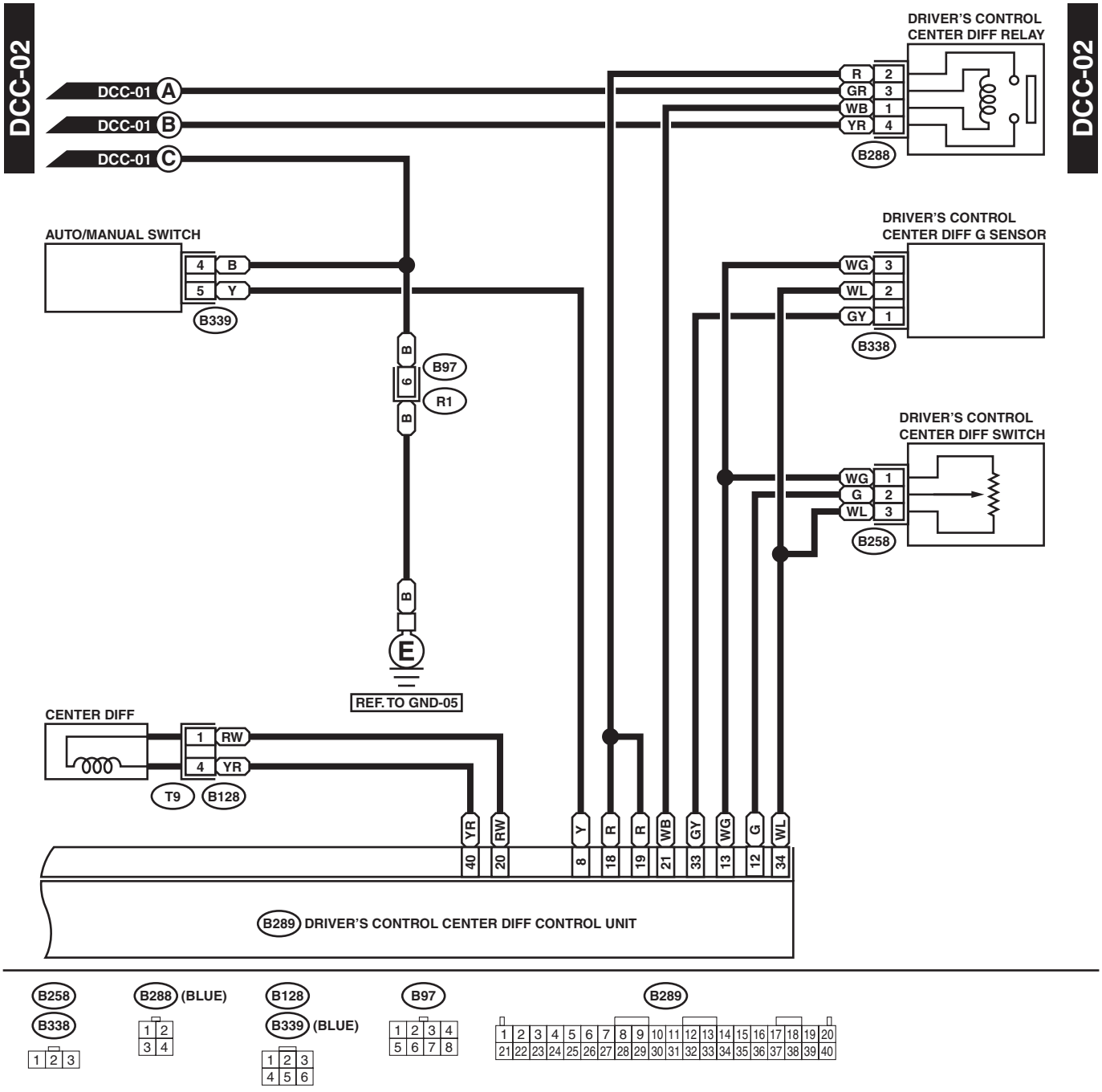
48.Driver's Control Center Differential Control System

A: WIRING DIAGRAM





WI-02821

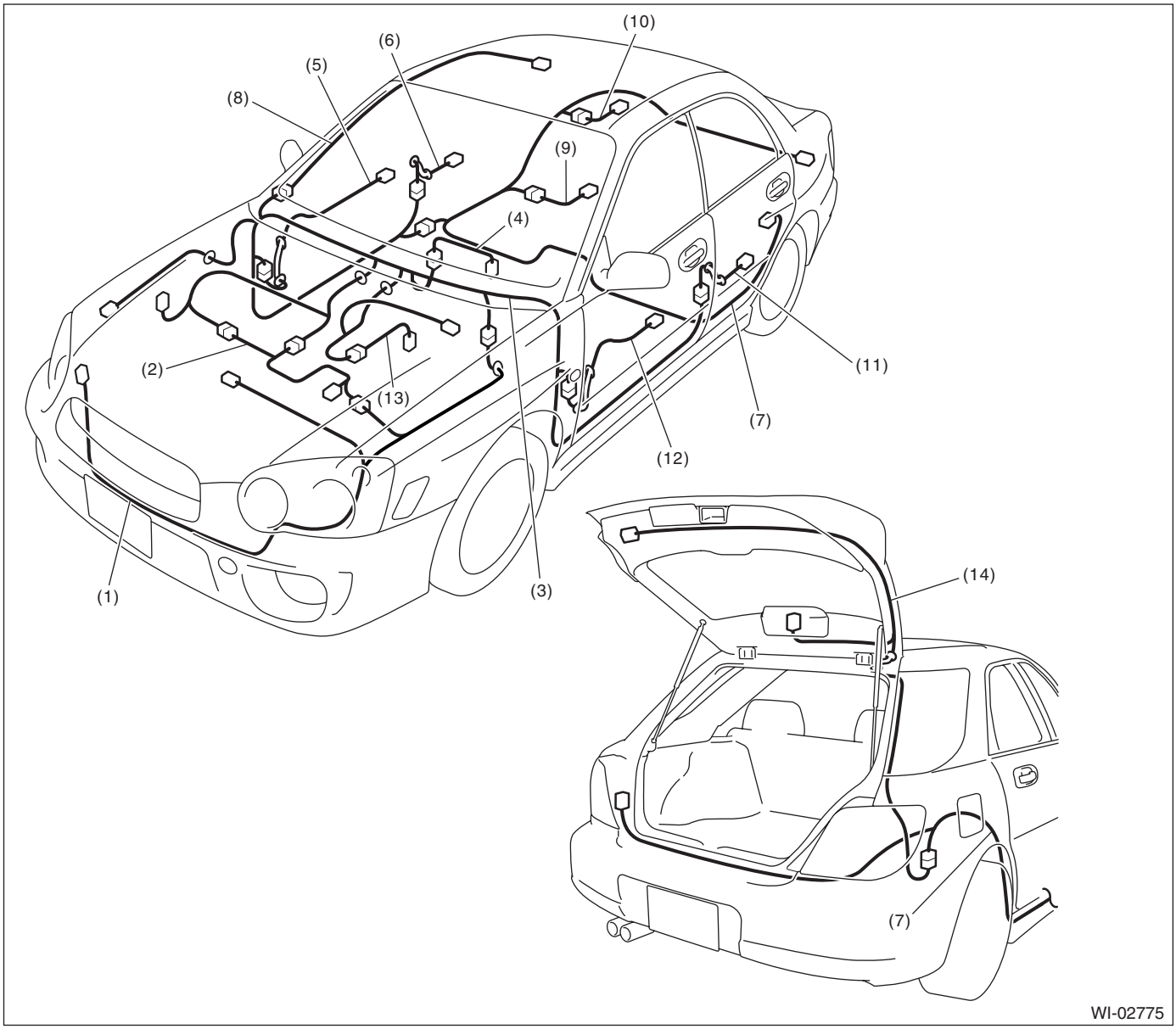

DCC-02
DCC-01 A
DCC-01 B
DCC-01 C
DRIVER'S CONTROL CENTER DIFF RELAY
R 2
GR 3
WB 1
YR 4
B288
DCC-02
AUTO/MANUAL SWITCH
4 B
5 Y
B339
DRIVER'S CONTROL CENTER DIFF G SENSOR
WG 3
WL 2
GY 1
B338
B 6 B
B97
R1
DRIVER'S CONTROL CENTER DIFF SWITCH
WG 1
G 2
WL 3
B258
B
E
REF. TO GND-05
CENTER DIFF
1 RW
4 YR
T9
B128
YR 40
RW 20
Y 8
R 18
R 19
WB 21
GY 33
WG 13
G 12
WL 34
B289 DRIVER'S CONTROL CENTER DIFF CONTROL UNIT

B258
B338
1 2 3
B288 (BLUE)
1 2
3 4
B128
B339 (BLUE)
1 2 3
4 5 6
B97
1 2 3 4
5 6 7 8
B289
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

WI-02822

49.Harness Components Location

A: LOCATION



(1) Front wiring harness
(2) Engine wiring harness
(3) Bulkhead wiring harness
(4) Instrument panel wiring harness
(5) Front door cord RH
(6) Rear door cord RH
(7) Rear wiring harness
(8) Roof cord
(9) Fuel tank cord
(10) Rear gate cord
(11) Trunk lid cord
(12) Front door cord LH
(13) Transmission cord
(14) Rear door cord LH

50.Front Wiring Harness

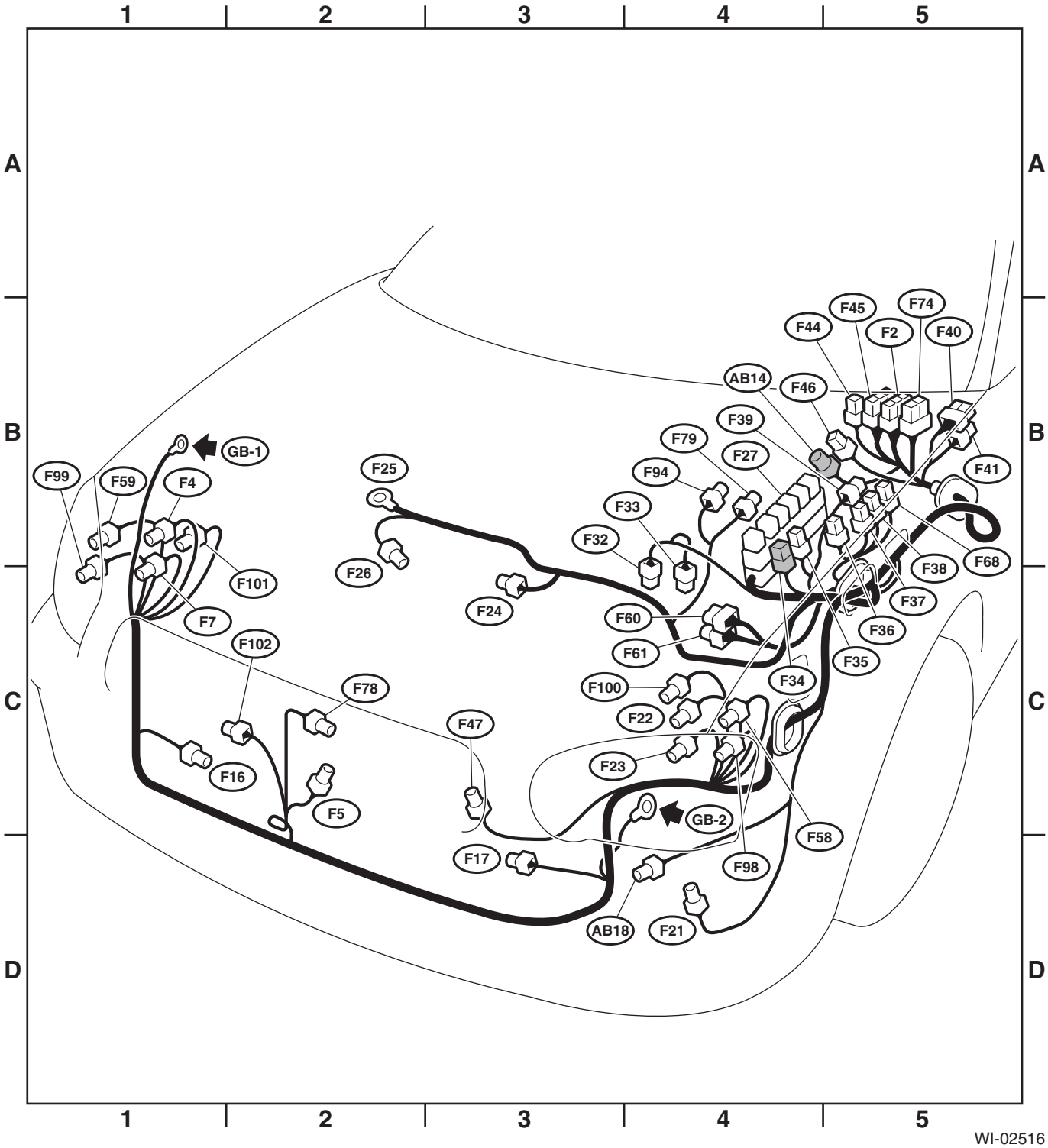
A: LOCATION

• Front Wiring Harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
F2	24	Black	B-5	B100	Bulkhead wiring harness
F4	3	Black	B-1		Front Clearance light RH and front turn signal light RH
F5	1	Black	C-2		Horn
F7	2	Gray	B-1		Headlight RH (Low beam)
F16	2	Black	C-1		Sub fan motor (Non-turbo model)
	4	Gray	C-1		Sub fan motor (Turbo model)
F17	2	Gray	D-3		Radiator main fan motor (Non-turbo model)
	4	Gray	D-3		Radiator main fan motor (Turbo model)
F21	2	Black	D-4		Front fog light LH
F22	3	Black	C-4		Front Clearance light LH and front turn signal light LH
F23	2	Gray	C-4		Headlight LH (Low beam)
F24	1	Gray	C-3		A/C compressor
F25	1	★	B-2		Generator
F26	3	Green	B-2		
F27	36	★	B-4		A/C relay holder
F32	2	Green	C-4		Front washer motor
F33	2	★	C-4		Rear washer motor
F34	4	Black	B-4		SBF holder
F35	2	Black	B-4		Main fuse box (M/B)
F36	3	★	B-5		
F37	6	★	B-5		
F38	1	★	B-5		
F39	8	★	B-5		
F40	9	Brown	B-5		Fuse and relay box (F/B)
F41	7	Gray	B-5		
F44	8	★	B-5	B61	Bulkhead wiring harness
F45	24	★	B-5	B62	Bulkhead wiring harness
F46	2	Black	B-5	B108	Bulkhead wiring harness
F47	1	★	C-3		Horn
F58	6	Gray	C-4		Headlight leveler LH
F59	6	Gray	B-1		Headlight leveler RH
F60	16	Brown	C-4	E3	Engine wiring harness (Turbo model)
F61	20	Black	C-4	E2	Engine wiring harness (Turbo model)
F68	4	Black	B-5		Main fuse box (M/B)
F74	16	★	B-5	B200	Bulkhead wiring harness (Except for STi model)
	20	★	B-5	B200	Bulkhead wiring harness (For STi model)
F78	2	Black	C-2		Ambient sensor
F79	2	Gray	B-4		A/C pressure switch
F94	2	Gray	B-4		ABS front sensor
F98	2	Black	C-4		Headlight LH (High beam)
F99	2	Black	C-1		Headlight RH (High beam)
F100	2	Black	C-4		Headlight ballast LH (Model with HID)
F101	2	Black	B-1		Headlight ballast RH (Model with HID)
F102	2	Black	C-2		Keyless buzzer
★: Non-colored					

• Front Sub Sensor Harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
AB14	2	Yellow	B-4	AB13	Airbag wiring harness
AB18	2	Yellow	D-4		Front sub sensor



51.Bulkhead Wiring Harness (In Engine Room)

A: LOCATION

1. TURBO ENGINE MODEL

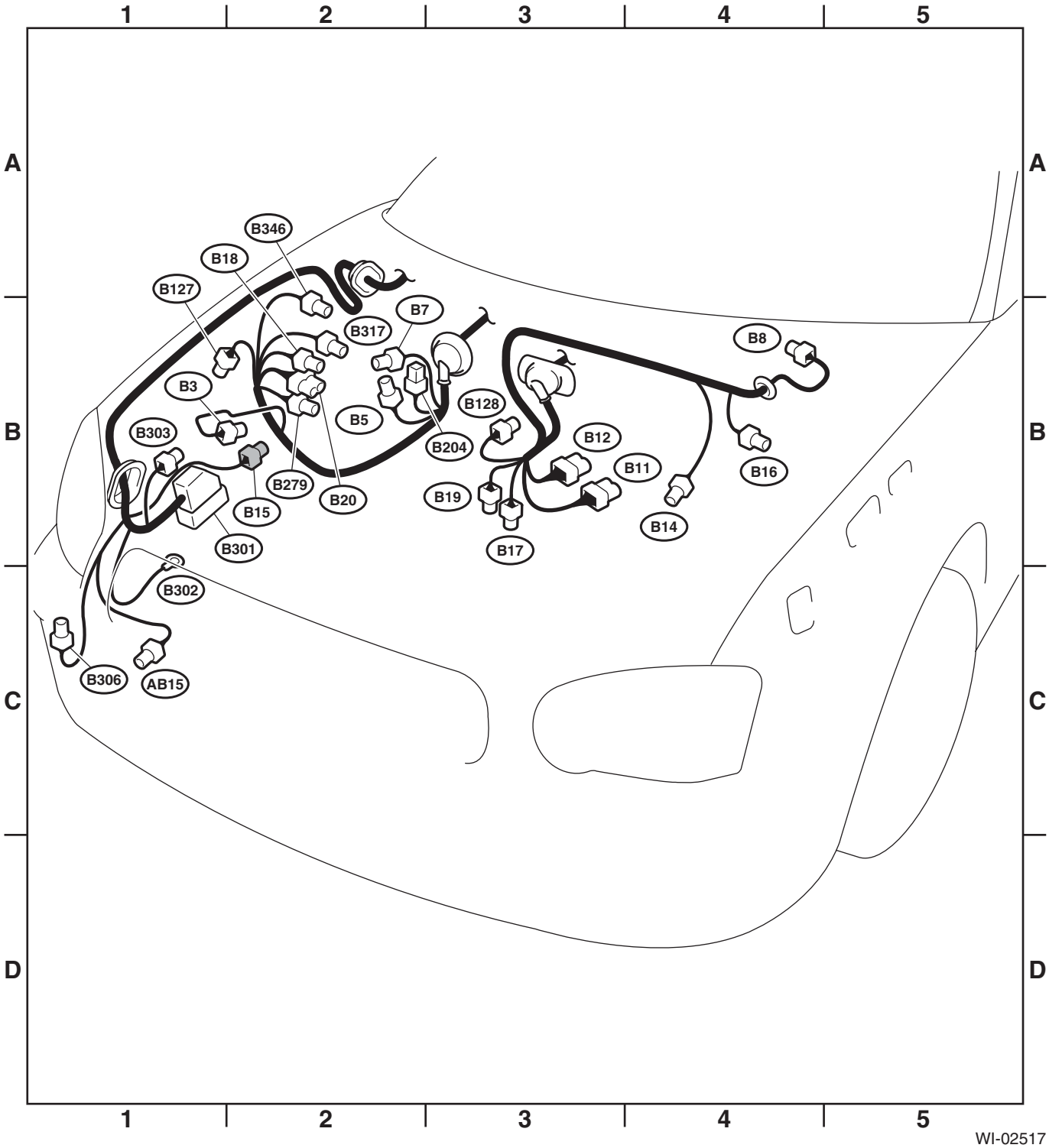
• Bulkhead Wiring Harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B3	5	★	B-2		Mass air flow meter
B5	2	Gray	B-2		Resistor (Daytime running light)
B7	6	Black	B-2		Cruise control actuator (Except for STi model)
B8	5	★	B-4		Front wiper motor
B11	20	Black	B-3	T4	Transmission code (AT model)
B12	12	★	B-3	T3	
B14	1	Black	B-4		Starter (Magnet)
B15	2	Gray	B-2		ABS front sensor RH
B16	2	Gray	B-4		Brake fluid level switch
B17	4	Black	B-3		Vehicle speed sensor (MT) (Except for STi model)
	3	★	B-3		Vehicle speed sensor (MT) (STi model)
B18	4	★	B-2		Front oxygen (A/F) sensor
B19	4	★	B-3	T5	Rear oxygen sensor cord
B20	10	Brown	B-2	E1	Engine wiring harness
B127	2	Blue	B-2		Wastegate solenoid
B128	4	★	B-3	T9	Transmission code (MT) (Except for STi model)
	6	★	B-3	T9	Transmission code (MT) (STi model)
B204	1	★	B-2		Security horn
B279	2	Gray	B-2		Exhaust temperature sensor (Except for STi model)
B301	31	★	B-1		ABS control module
B302	1	★	B-1		ABS motor ground
B303	8	Gray	B-1		Shield joint connector (ABS)
B306	2	Black	C-1		Front fog light RH
B317	4	Gray	B-2	E56	Engine wiring harness
B346	2	★	B-2		Sensor solenoid
★: Non-colored					

• Airbag Wiring Harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
AB15	2	Yellow	C-1		Front sub sensor RH

Bulkhead Wiring Harness (In Engine Room)



2. NON-TURBO ENGINE MODEL

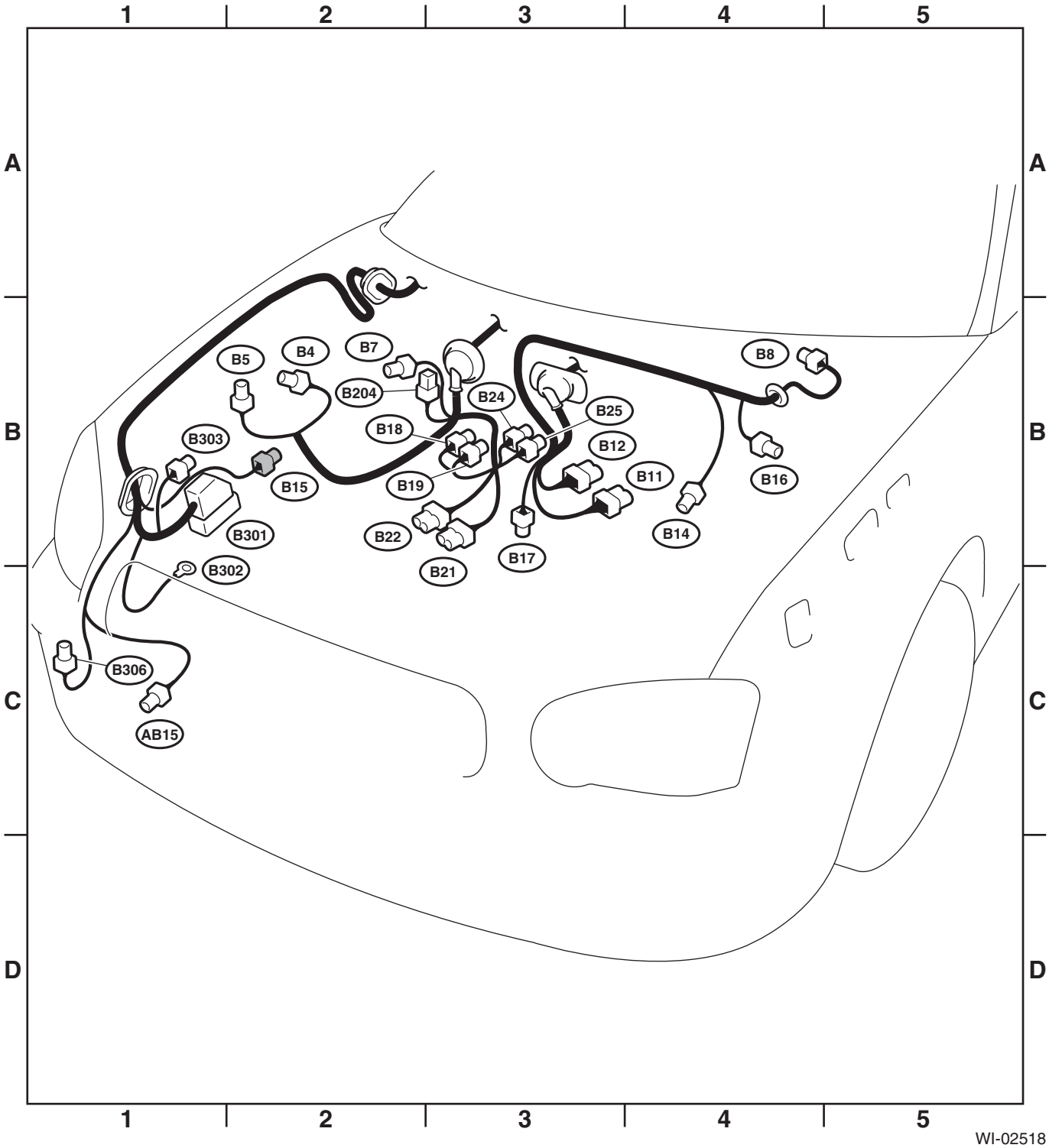
• Bulkhead Wiring Harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B4	4	Gray	B-2		AT dropping resistor
B5	2	Gray	B-2		Resistor (Daytime running light)
B7	6	Black	B-2		Cruise control actuator
B8	5	★	B-4		Front wiper motor
B11	20	Black	B-3	T4	Transmission code (AT model)
B12	12	★	B-3	T3	
B14	1	Black	B-2		Starter (Magnet)
B15	2	Gray	B-2		ABS front sensor RH
B16	2	Gray	B-4		Brake fluid level switch
B17	3	★	B-3		Vehicle speed sensor (MT model)
B18	4	★	B-3		Front oxygen (A/F) sensor
B19	4	★	B-3	T5	Rear oxygen sensor cord
B21	20	Gray	B-3	E2	Engine wiring harness
B22	16	★	B-3	E3	
B24	2	Gray	B-3		Back-up light switch (MT model)
B25	2	Brown	B-3		Neutral switch (MT model)
B204	1	★	B-2		Security horn
B301	31	★	B-1		ABS control module
B302	1	★	B-1		ABS motor ground
B303	8	Gray	B-1		Shield joint connector (ABS)
B306	2	Black	C-1		Front fog light RH
★: Non-colored					

• Airbag Wiring Harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
AB15	2	Yellow	C-1		Front sub sensor RH

Bulkhead Wiring Harness (In Engine Room)



52.Bulkhead Wiring Harness (In Compartment)

A: LOCATION

• Bulkhead Wiring Harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B30	25	★	C-1	D1	Front door cord LH
B31	6	Yellow	D-1		SRS (Airbag) harness
B32	3	Black	B-1		Turn & hazard module
B36	24	Brown	B-3	i1	Instrument panel wiring harness
B37	24	★	B-3	i2	
B40	16	★	C-3		Data link connector
B41	2	★	C-1		Power window circuit breaker
B42	5	★	A-1		Power window relay (Relay block)
B46	4	Green	B-5		Fuel pump relay
B47	6	Brown	B-5		Main relay
B50	4	★	C-1		Blower fan relay
B51	8	Blue	C-1		Fuse & relay box (F/B)
B52	7	★	C-1		
B53	12	★	C-2		Shield joint connector (AT turbo model)
	8	★	C-2		Shield joint connector (AT non-turbo model)
B54	24	★	B-2		Transmission control module
B55	24	Gray	B-2		
B56	24	Green	B-2		Transmission control module (Turbo engine model)
B59	6	★	B-3		Interrupt relay (Security)
B61	8	★	B-2	F44	Front wiring harness
B62	24	★	B-2	F45	
B65	5	Black	B-2		Stop & brake switch
B68	5	Black	C-3		Cruise control sub switch & horn switch (Roll connector)
B69	4	★	C-3		Combination switch
B70	18	★	C-3		
B71	17	★	C-3		
B72	4	Blue	B-3		Ignition switch
B73	2	★	B-3		Key lock solenoid
B74	2	Black	C-3		Key warning switch
B75	2	Green	C-2	B76	Test mode connector
B76	2	Green	C-2	B75	
B77	3	★	B-4		Mode actuator
B79	14	Gray	C-3		Check connector
B81	1×2	★	C-2		Diagnosis terminal (Ground)
B82	6	Black	C-2		Diagnosis connector
B83	8	★	C-5		Shield & sensor ground joint connector (Turbo engine model)
	6	★	C-5		Shield & sensor ground joint connector (Non-turbo engine model)
B84	31	★	B-4		Engine control module (Turbo engine model)
B86	4	Brown	B-4		Blower motor resistor
B87	2	★	B-4		Blower motor
B88	4	Brown	B-4		Evaporation thermoswitch
B90	6	★	B-5	R50	Roof cord
B93	18	★	B-4		Security control module
B94	20	Black	C-4		Cruise control module
B95	2	★	B-4		Diode (Daytime running light)
B96	10	★	B-5		Daytime running light control module
B100	24	Black	B-1	F2	Front wiring harness
B101	25	★	B-5	D11	Front door cord RH
B102	5	★	B-5		Daytime running light relay
B103	5	★	B-5		High-beam relay (Daytime running light)
B106	2	★	B-2		Clutch switch (MT model)
B107	2	Blue	B-2		Clutch switch (Cruise control)
B108	2	Black	B-1	F96	Front wiring harness
B112	2	★	B-3		Diode (Front fog light)
B117	6	★	C-4		AT select lever
B118	2	★	B-4		CD player illumination light
B119	4	★	C-4		Front accessory power supply socket
B120	14	★	B-4		Radio
B121	1	Black	B-4		Audio bracket ground
B122	6	★	C-5		Joint connector (STi model)
B125	1	Green	B-5	B126	Line end connector
B126	1	Green	B-5	B125	
B132	8	★	C-1		Headlight leveler switch
B134	22	★	B-4		Engine control module (Turbo engine model)
	28	★	C-4		Engine control module (Non-turbo engine model)
	34	★	C-4		Engine control module (STi model)

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B135	28	★	B-4		Engine control module (Turbo engine model)
	20	★	B-4		Engine control module (Non-turbo engine model)
	35	★	B-4		Engine control module (STi model)
B136	17	★	B-4		Engine control module (Turbo engine model)
	26	★	B-4		Engine control module (Non-turbo engine model)
	35	★	B-4		Engine control module (STi model)
B137	24	★	C-4		Engine control module (Turbo engine model)
	35	★	B-4		Engine control module (Non-turbo engine model)
	31	★	B-4		Engine control module (STi model)
B152	12	★	C-1		Fuse & relay box (F/B)
B158	10	Gray	C-1		
B160	6	Gray	C-1		Front fog light switch
B161	6	Brown	C-1		Cruise control switch
B168	10	★	C-4		Mode control panel
B169	6	★	C-4		Blower fan switch
B176	18	★	C-1		Keyless entry control module
B177	2	Brown	B-1		Wiper deicer
B183	1	★	D-1		Joint connector (Keyless entry)
B184	1	★	D-1		
B191	4	Blue	B-5		Wiper deicer relay
B192	4	★	B-5		Wiper deicer timer
B193	6	★	C-1		Wiper deicer switch
B198	5	★	C-5		Ground joint connector
B200	16	Blue	B-2	F74	Front wiring harness (Except for STi model)
	20	Blue	B-2	F74	Front wiring harness (STi model)
B208	2	Black	B-5		Glove box light
B224	2	★	B-3		Key illumination light (Turbo engine model)

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B225	8	Black	C-2		Fuse (Relay block)
	5	Black	C-2		Ignition relay (Relay block)
	5	Black	C-2		Power window relay (Relay block)
	5	Black	C-2		Front fog light relay (Relay block)
	5	Black	C-2		Starter interlock relay (Relay block)
	5	Black	C-2		Mirror heater relay (Relay block)
	5	Black	C-2		Rear 12 V accessory relay (Relay block)
	5	★	C-2		HID relay (Relay block)
B243	6	★	B-3		Security horn relay
B256	2	★	B-4		Evaporator sensor
B257	3	★	C-5		ABS lateral G sensor (STi model)
B258	3	★	D-4		Driver's control center differential switch
B261	6	★	C-5		Shield joint connector (STi model)
B264	4	Red	C-1		ABS relay
B271	12	Blue	C-1		F/B
B275	4	★	B-4		Fan control amplifier
B280	16	Blue	C-3		Integrated module
B281	20	Gray	C-3		
B282	16	Gray	C-4		Auto A/C control module
B283	20	Gray	C-4		
B284	10	★	D-5		Remote control rear view mirror switch
B286	4	★	B-5		Intercooler water spray timer
B288	4	Blue	C-1		Driver's control center differential relay
B289	40	★	B-3		Driver's control center differential control unit
B292	3	★	D-5		ABS G sensor
B293	3	Gray	B-4		Air mix actuator
B294	6	★	C-1		Intercooler water spray switch
B300	6	★	C-2		Line end check connector
B304	2	★	B-5		ABS condenser
B309	4	Black	B-5		Electric control throttle relay
B315	6	★	B-3		Accelerator position sensor
B338	3	★	C-5		Driver's control center differential G sensor
B339	6	Blue	C-4		Auto/manual switch

★: Non-colored

Bulkhead Wiring Harness (In Compartment)

• Airbag Wiring Harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
AB1	6	Yellow	D-1	B31	Bulkhead wiring harness
AB3	28	Yellow	C-4		Airbag control module
AB4	2	Yellow	B-5		Inflator (Passenger's seat)
AB21	2	Yellow	C-3	AB26	Inflator (Driver's seat)

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53.Engine Wiring Harness and Transmission Cord

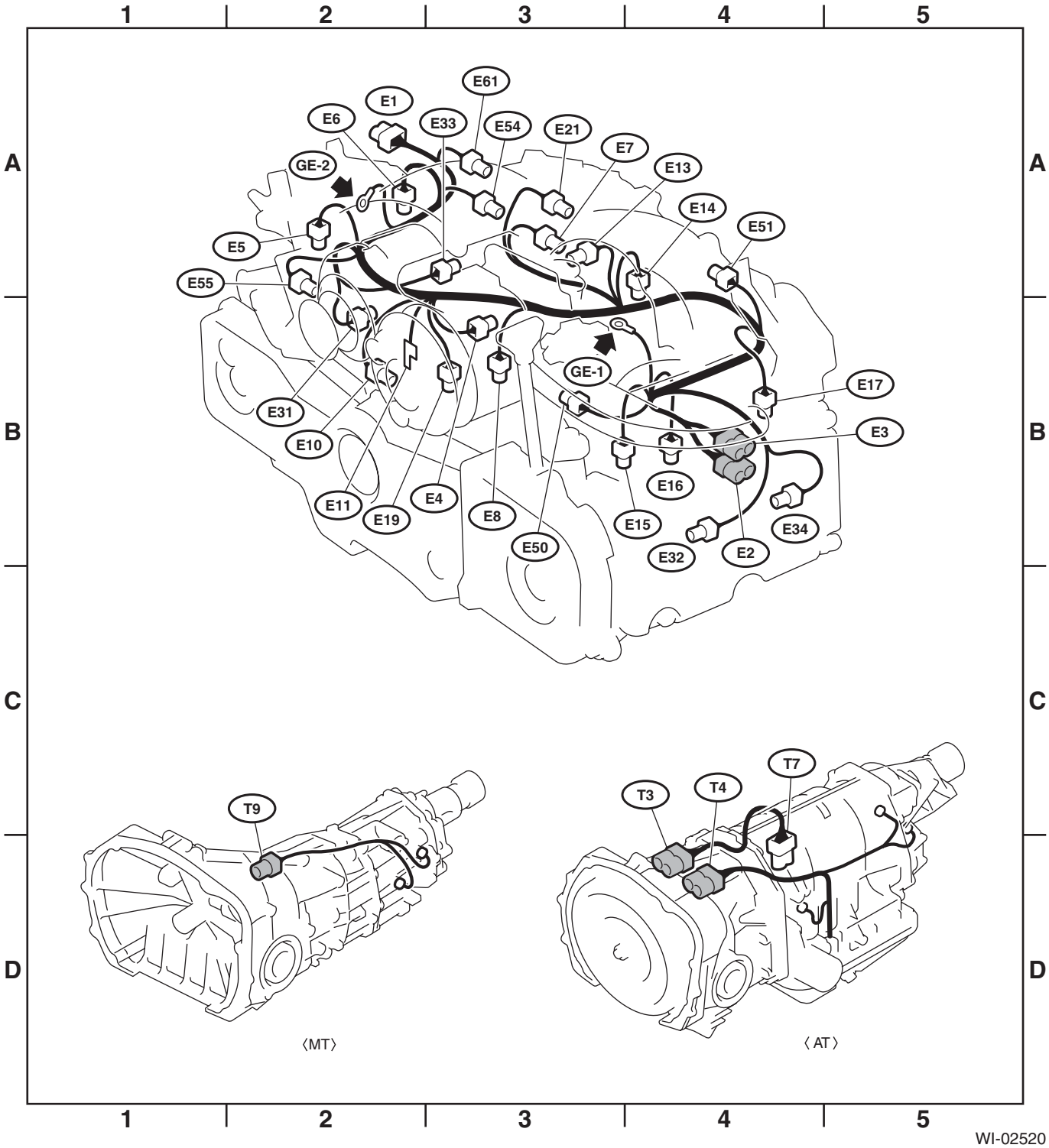
A: LOCATION

1. TURBO MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
E1	10	Light gray	A-2	B20	Bulkhead wiring harness
E2	20	Black	B-4	F61	Front wiring harness
E3	16	Brown	B-4	F60	
E4	2	Black	B-3		Purge control solenoid
E5	2	Dark gray	A-2		Fuel injector No. 1
E6	2	Dark gray	A-2		Fuel injector No. 3
E7	3	Black	A-3		Idle speed control solenoid valve
E8	3	Light gray	B-3		Engine coolant temperature sensor and thermometer
E10	2	Light gray	B-2		Crankshaft position sensor
E11	1	★	B-2		Oil pressure switch
E13	3	Black	A-3		Throttle position sensor
E14	2	Light gray	A-4		Knock sensor
E15	2	Light gray	B-4		Camshaft position sensor
E16	2	Dark gray	B-4		Fuel injector No. 2
E17	2	Dark gray	B-4		Fuel injector No. 4
E19	1	Light gray	B-3		Power steering oil pressure switch
E21	3	Black	A-3		Absolute manifold pressure sensor
E31	3	★	B-2		Ignition coil No. 1
E32	3	★	B-4		Ignition coil No. 2
E33	3	Black	A-3		Ignition coil No. 3
E34	3	Black	B-4		Ignition coil No. 4
E50	3	Black	B-3		Tumble generator valve position sensor LH
E51	2	Black	A-4		Tumble generator valve LH
E54	3	Black	A-3		Tumble generator valve position sensor RH
E55	2	Black	A-2		Tumble generator valve RH
E61	2	Dark gray	A-3		PCV diagnosis connector
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
T3	12	★	D-4	B12	Bulkhead wiring harness (AT model)
T4	20	Black	D-4	B11	
T7	12	★	D-4		Inhibitor switch (AT model)
T9	4	★	D-2	B128	Bulkhead wiring harness (MT model)
★: Non-colored					

Engine Wiring Harness and Transmission Cord

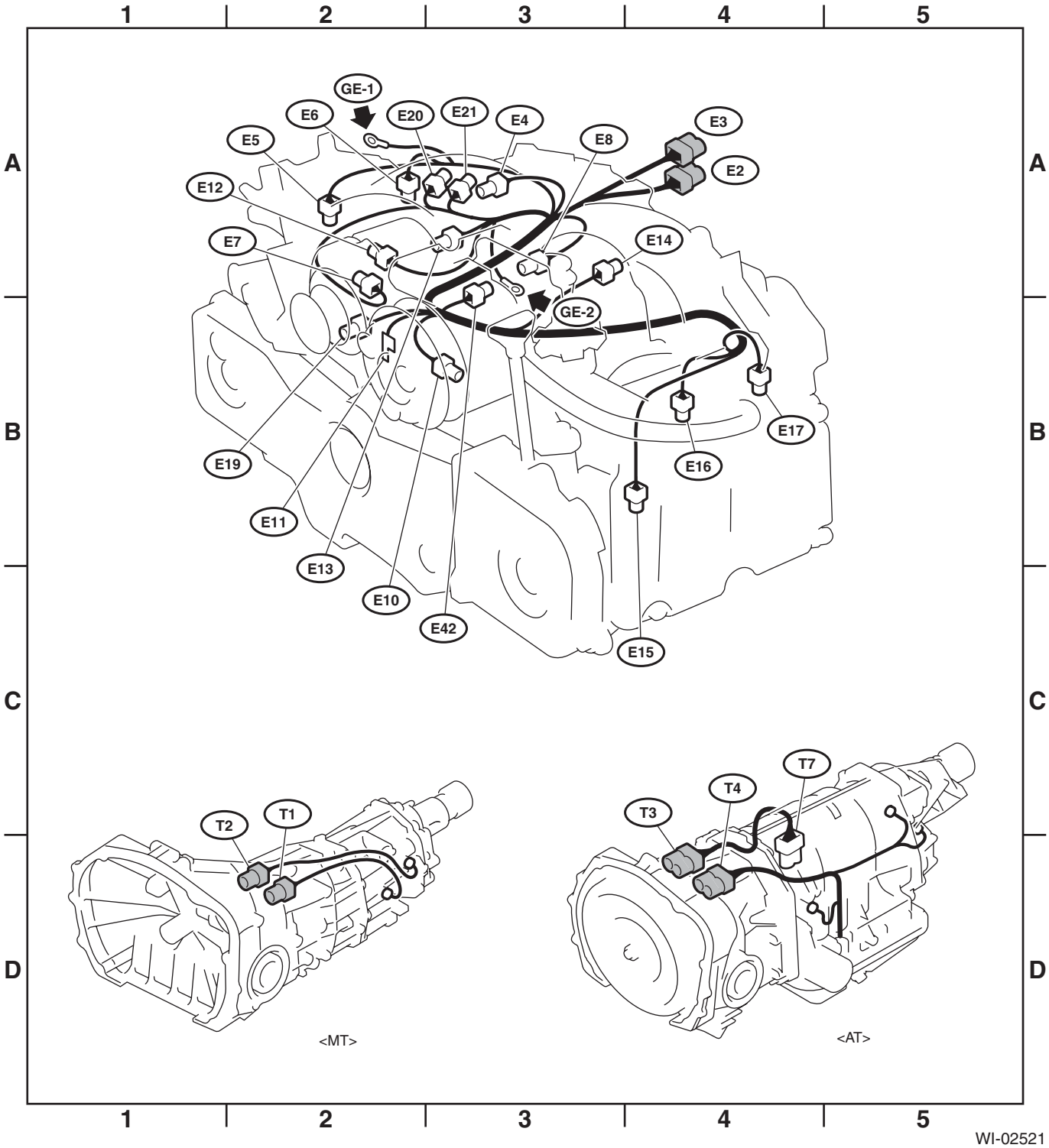


2. NON-TURBO MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
E2	20	Light gray	A-4	B21	Front wiring harness
E3	16	Brown	A-4	B22	
E4	2	Black	A-3		Purge control solenoid valve
E5	2	Dark gray	A-2		Fuel injector No. 1
E6	2	Dark gray	A-2		Fuel injector No. 3
E7	3	Black	A-2		Idle speed control solenoid valve
E8	3	Light gray	A-3		Engine coolant temperature sensor and thermometer
E10	2	Light gray	B-3		Crankshaft position sensor
E11	1	★	B-2		Oil pressure switch
E12	4	Dark gray	A-2		Ignition coil and ignitor
E13	3	Dark brown	A-3		Throttle position sensor
E14	2	Light gray	A-3		Knock sensor
E15	2	Light gray	B-4		Camshaft position sensor
E16	2	Dark gray	B-4		Fuel injector No. 2
E17	2	Dark gray	B-4		Fuel injector No. 4
E19	1	Light gray	B-2		Power steering oil pressure switch
E20	2	Black	A-3		Intake air temperature sensor
E21	3	Black	A-3		Pressure sensor
E42	2	Purple	A-3		Air assist injector solenoid valve
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
T1	2	Gray	D-2	B24	Bulkhead wiring harness (MT model)
T2	2	Brown	D-2	B25	
T3	12	★	D-4	B12	Bulkhead wiring harness (AT model)
T4	20	Black	D-4	B11	
T7	12	★	D-4		Inhibitor switch (AT model)
★: Non-colored					

Engine Wiring Harness and Transmission Cord

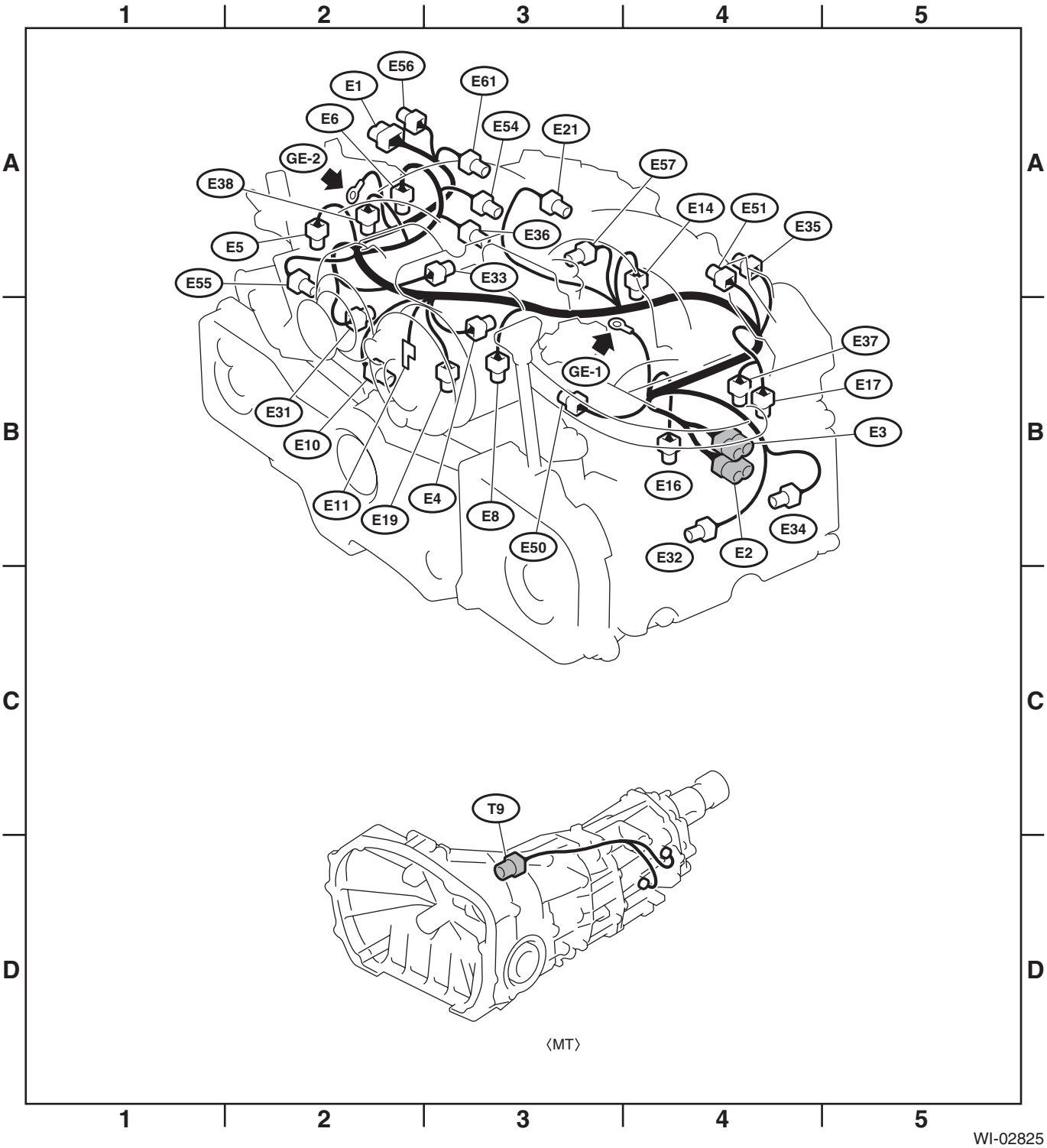


3. STi MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
E1	10	Light gray	A-2	B20	Bulkhead wiring harness
E2	20	Black	B-4	F61	Front wiring harness
E3	16	Brown	B-4	F60	
E4	2	Black	B-3		Purge control solenoid valve
E5	2	Light gray	A-2		Fuel injector No. 1
E6	2	Light gray	A-2		Fuel injector No. 3
E8	3	Light gray	B-3		Engine coolant temperature sensor and thermometer
E10	2	Light gray	B-2		Crankshaft position sensor
E11	1	★	B-2		Oil pressure switch
E14	2	Brown	A-4		Knock sensor
E16	2	Light gray	B-4		Fuel injector No. 2
E17	2	Light gray	B-4		Fuel injector No. 4
E19	1	Light gray	B-3		Power steering oil pressure switch
E21	3	Black	A-3		Pressure sensor
E31	3	★	B-2		Ignition coil No. 1
E32	3	★	B-4		Ignition coil No. 2
E33	3	Black	A-3		Ignition coil No. 3
E34	3	Black	B-4		Ignition coil No. 4
E35	3	Light gray	A-4		Active valve control camshaft position sensor LH
E36	3	Light gray	A-3		Active valve control camshaft position sensor RH
E37	2	★	B-4		Active valve control solenoid valve LH
E38	2	★	A-2		Active valve control solenoid valve RH
E50	3	Black	B-3		Tumble generator valve angle sensor LH
E51	2	Black	A-4		Tumble generator valve LH
E54	3	Black	A-3		Tumble generator valve angle sensor RH
E55	2	Black	A-2		Tumble generator valve RH
E56	4	Dark gray	A-2	B317	Bulkhead wiring harness
E57	6	Black	A-3		Electric control throttle
E61	2	Dark gray	A-3		PCV diagnosis connector
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
T9	6	★	D-2	B128	Bulkhead wiring harness
★: Non-colored					

Engine Wiring Harness and Transmission Cord

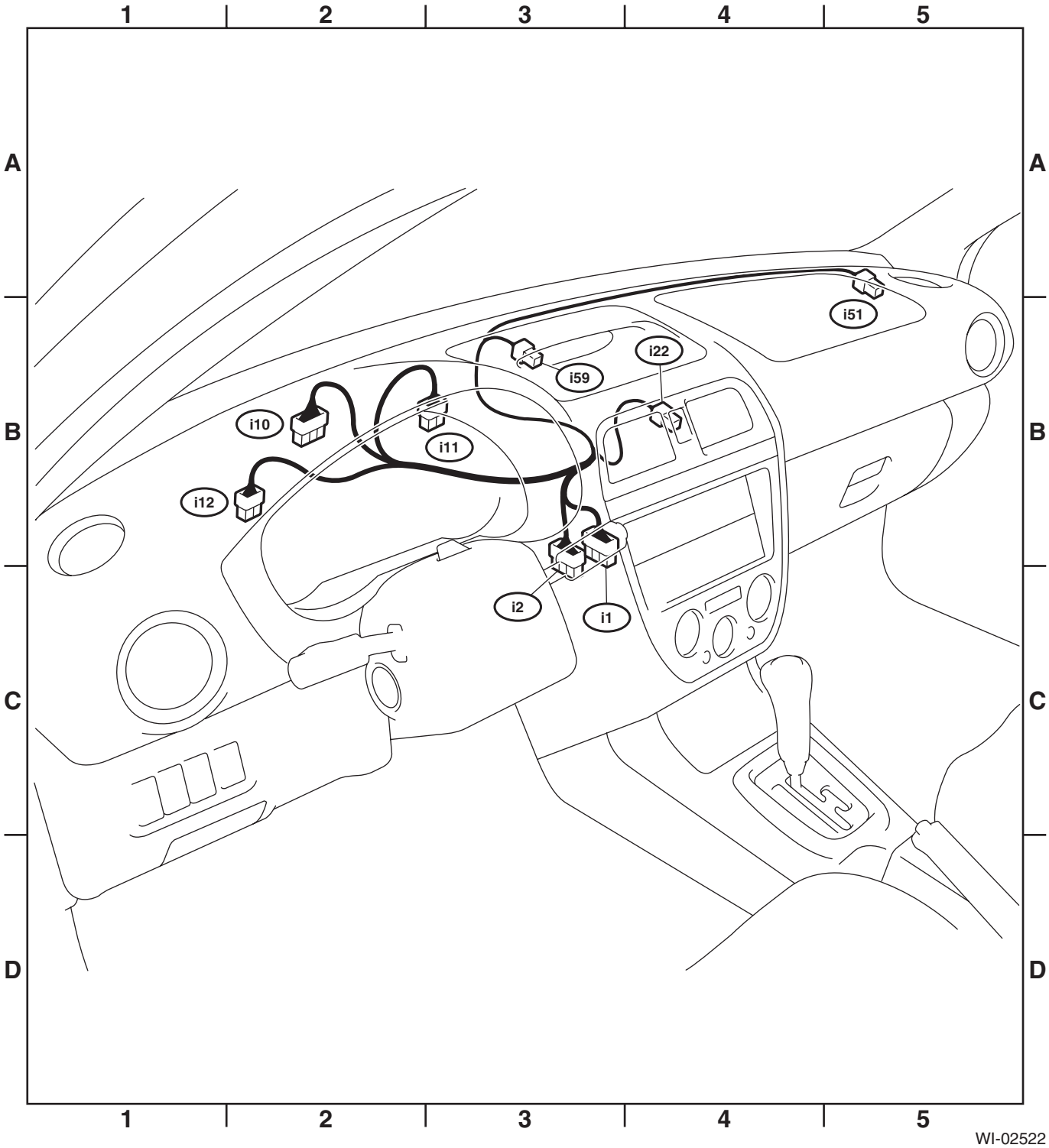


54.Instrument Panel Wiring Harness

A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
i1	24	Brown	B-3	B36	Bulkhead wiring harness
i2	24	★	B-3	B37	
i10	30	Green	B-2		Combination meter
i11	10	Green	B-3		
i12	14	Green	B-2		
i22	8	★	B-4		Hazard switch
i51	2	★	B-3		Sunload sensor
i59	4	★	B-3		Clock
★: Non-colored					

Instrument Panel Wiring Harness



55.Rear Wiring Harness, Bulkhead Wiring Harness, Roof Cordand Fuel Tank Cord

A: LOCATION

• Rear Wiring Harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R1	8	★	B-2	B97	Bulkhead wiring harness
R2	12	★	B-1	B98	
R3	24	★	B-2	B99	
R4	1	★	B-3		Parking brake switch
R8	2	★	C-4		Seat belt switch
R15	16	★	B-3	R57	Fuel tank cord
R22	3	★	B-5		Rear door switch LH
R41	4	Blue	B-2		Seat heater RH
R42	4	★	B-3		Seat heater switch RH
R43	4	Blue	B-3		Seat heater switch LH
R44	4	Blue	C-4		Seat heater LH
R72	2	★	B-3		Rear ABS sensor RH
R73	2	★	B-5		Rear ABS sensor LH
R97	2	★	B-5		Antenna amp. (Sedan model)
★: Non-colored					

• Bulkhead Wiring Harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B97	8	★	B-2	R1	Rear wiring harness
B98	12	★	B-1	R2	
B99	24	★	B-2	R3	
B265	8	★	A-2	D27	Rear door cord RH
B267	3	★	C-4		Front door switch LH
B268	3	★	B-2		Front door switch RH
B269	4	★	B-5	D21	Rear door cord LH
★: Non-colored					

• Roof Cord

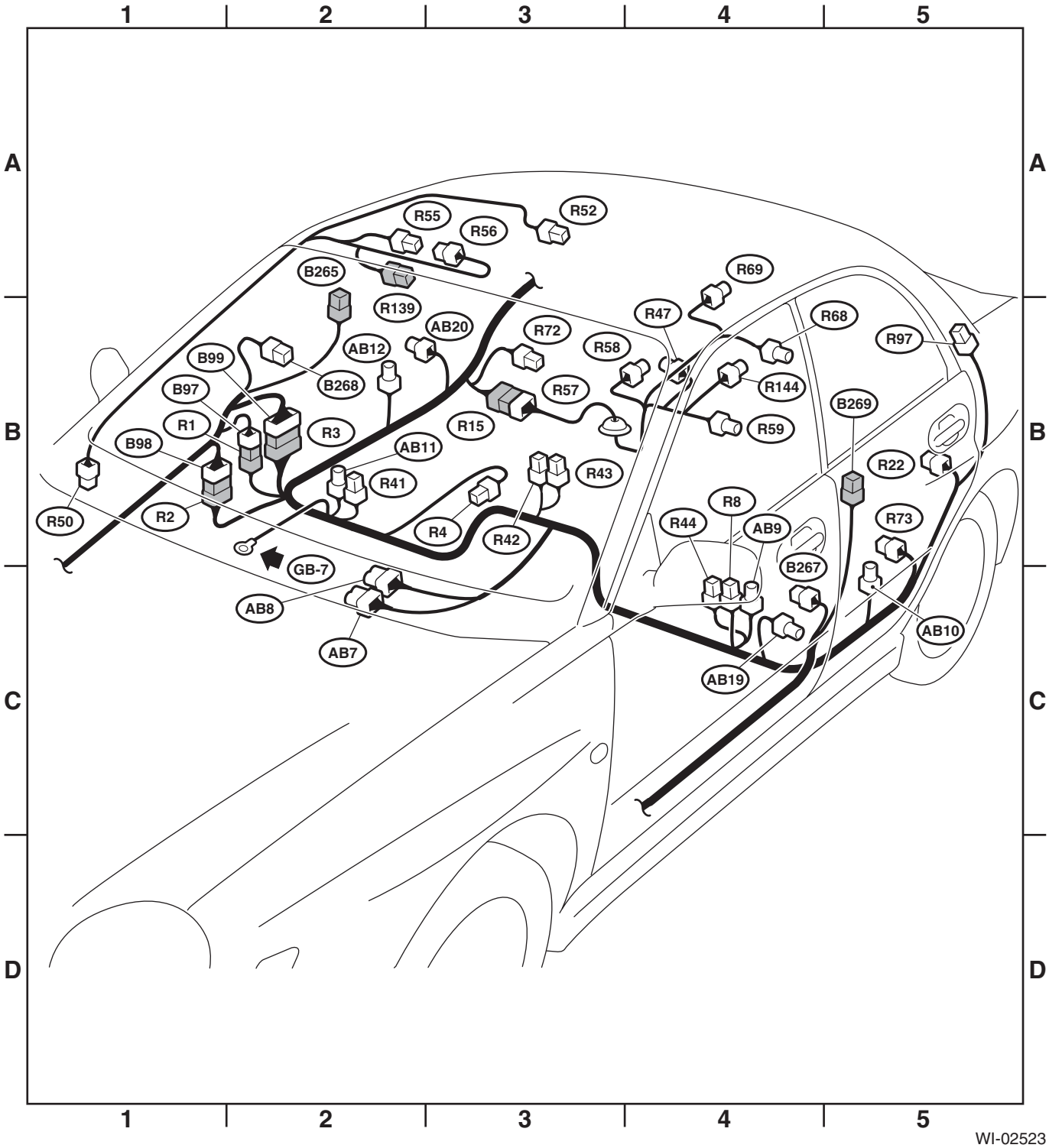
Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R50	6	★	B-1	B90	Bulkhead wiring harness
R52	3	★	A-3		Room light
R55	1	Gray	A-2		Sunroof
R56	2	★	A-3		Spot light
R139	3	★	A-2		Compass mirror
★: Non-colored					

• Fuel Tank Cord

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R47	3	★	B-4		Fuel tank pressure sensor
R57	16	★	B-3	R15	Rear wiring harness
R58	6	★	B-4		Fuel pump
R59	2	★	B-4		Fuel sub level sensor (Turbo model)
R68	2	★	B-4		Pressure control solenoid valve
R69	2	★	B-4		Drain valve
R144	2	★	B-4		Fuel tank sensor control valve
★: Non-colored					

• Airbag Wiring Harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
AB7	12	Yellow	C-2		Airbag control module
AB8	12	Yellow	C-2		Airbag control module
AB9	2	Yellow	C-4		Seat airbag module LH
AB10	4	Yellow	C-5		Side sensor LH
AB11	2	Yellow	B-2		Seat airbag module RH
AB12	4	Yellow	B-2		Side sensor RH
AB19	2	Black	C-4		Pretensioner LH
AB20	2	Black	B-3		Pretensioner RH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R68
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R144
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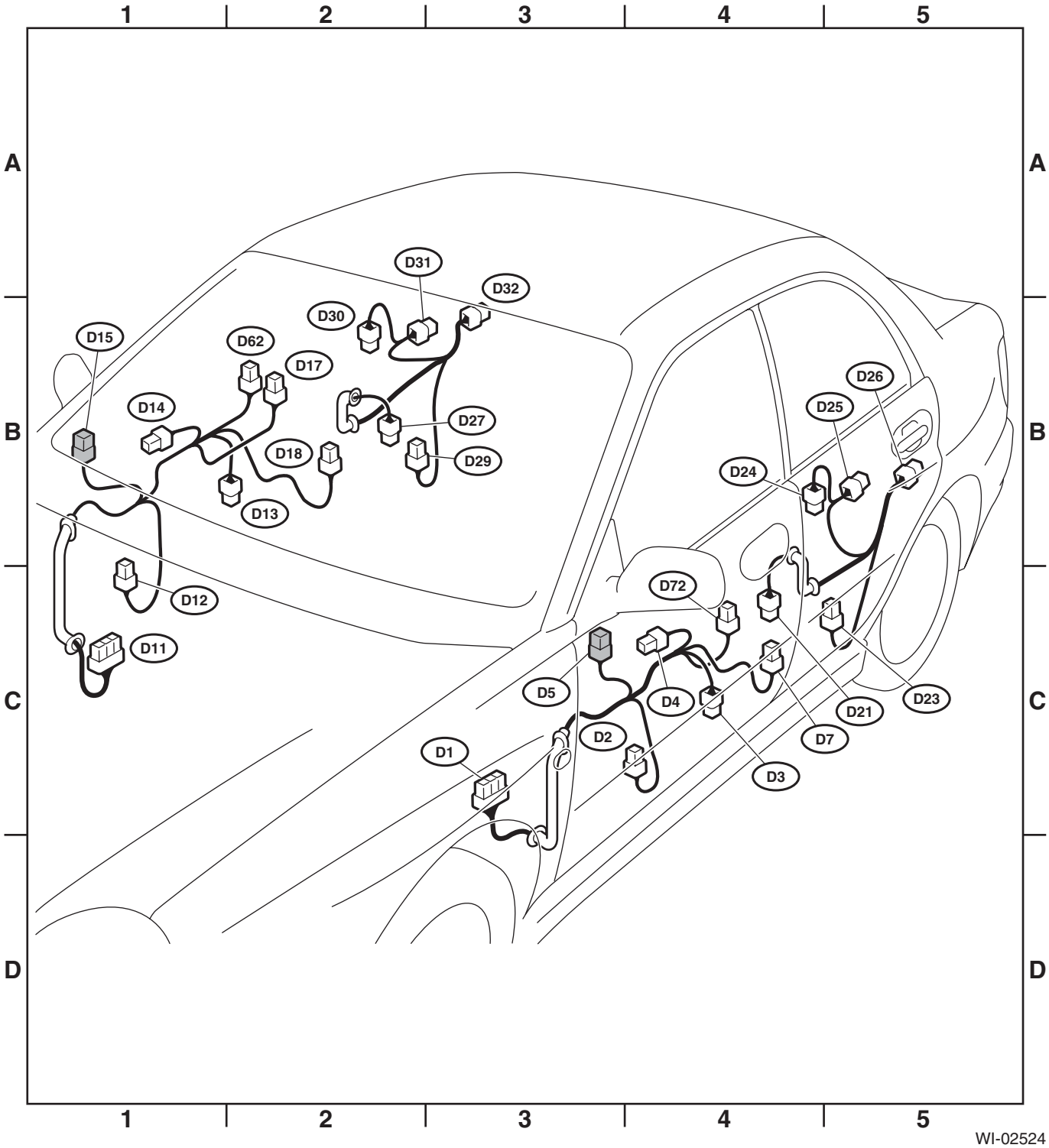
R15
R59
B98
AB11
R22
R41
R43
R50
R2
R4
R42
R8
R44
AB9
R73
GB-7
B267
AB8
AB10
AB7
AB19
WI-02523

56.Door Cord

A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
D1	25	★	C-3	B30	Bulkhead wiring harness
D2	2	★	C-4		Front door speaker (Driver side)
D3	2	Black	C-4		Front power window motor (Driver side)
D4	2	Black	C-4		Front door tweeter (Driver side)
D5	6	★	C-3		Remote control rearview mirror LH (Without mirror heater)
	8	Black	C-3		Remote control rearview mirror LH (With mirror heater)
D7	16	★	C-4		Power window main switch
D11	25	★	C-1	B101	Bulkhead wiring harness
D12	2	★	C-1		Front door speaker RH
D13	2	Black	B-2		Front power window motor RH
D14	2	★	B-1		Front door tweeter RH
D15	6	★	B-1		Remote control rearview mirror RH (Without mirror heater)
	8	Black	B-1		Remote control rearview mirror RH (With mirror heater)
D17	8	★	B-2		Front power window sub switch RH
D18	4	★	B-2		Front door lock actuator RH
D21	8	★	C-4	B269	Bulkhead wiring harness
D23	2	★	C-5		Rear door speaker LH
D24	2	Black	B-4		Rear power window motor LH
D25	8	★	B-5		Rear power window sub switch LH
D26	4	★	B-5		Rear door lock actuator LH
D27	8	★	B-2	B265	Bulkhead wiring harness
D29	2	★	B-2		Rear door speaker RH
D30	2	Black	B-2		Rear power window motor RH
D31	8	★	B-2		Rear power window sub switch RH
D32	4	★	B-3		Rear door lock actuator RH
D62	5	★	B-2		Front door lock switch RH
D72	4	★	C-4		Front door lock actuator LH
★: Non-colored					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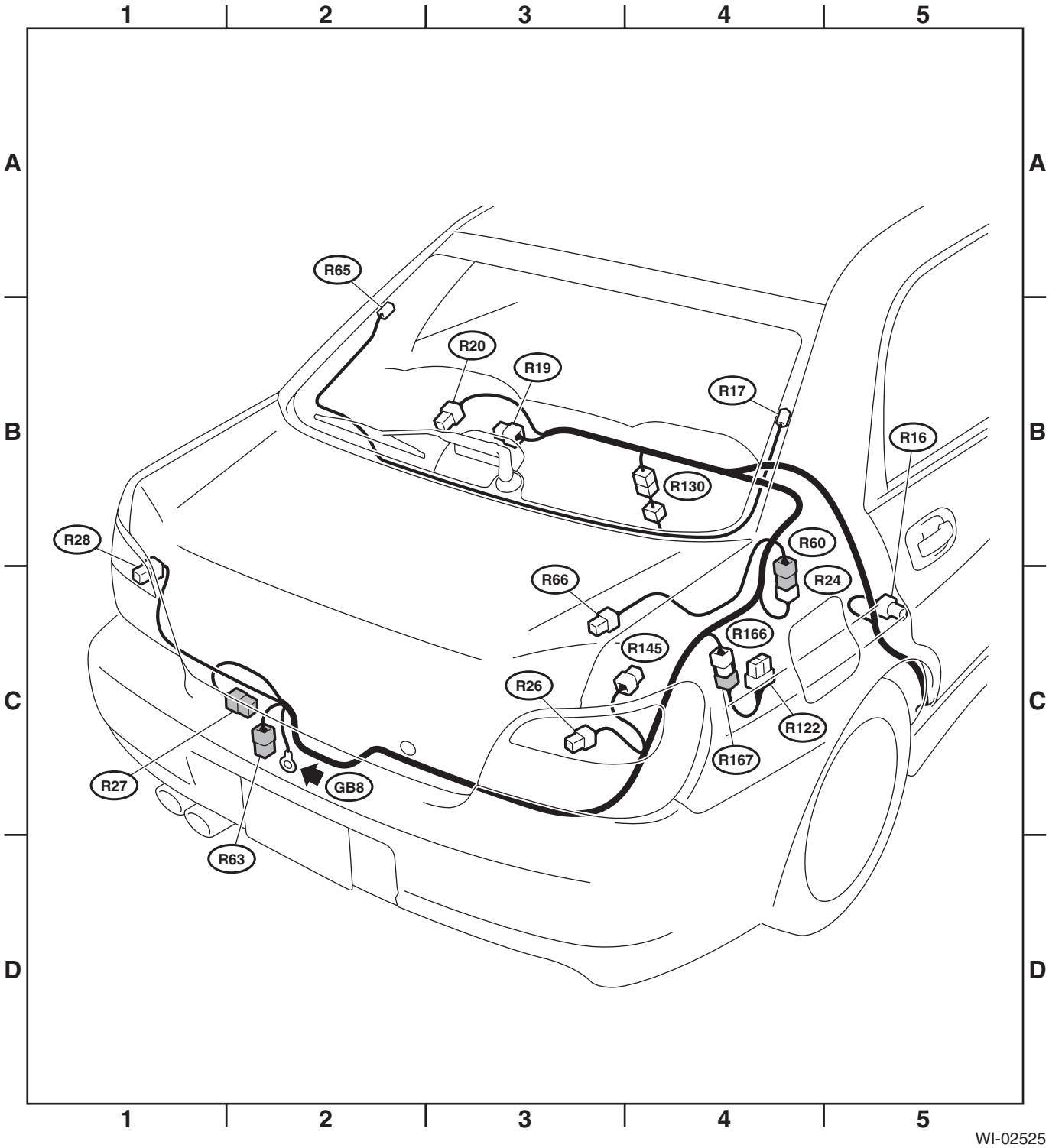
WI-02524

57.Rear Wiring Harness and Trunk Lid Cord

A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R16	3	★	C-5		Rear door switch RH
R17	1	Black	B-4		Rear defogger
R19	2	★	B-3		High-mounted stop light
R20	2	Black	B-3		Trunk room light
R24	2	★	C-4	R60	Trunk lid cord
R26	6	★	C-3		Rear combination light RH
R27	2	★	C-2		Trunk room light switch
R28	6	★	C-1		Rear combination light LH
R60	2	★	B-4	R24	Rear wiring harness
R63	2	Black	C-2		License plate light
R65	1	Black	B-2		Rear defogger
R66	2	★	C-3		High-mounted stop light (Rear spoiler)
R122	10	Black	C-4		Fuel pump control module (Turbo Model)
R130	2	★	B-4		Rear defogger choke coil
R145	4	★	C-4		Intercooler water spray motor
R166	6	★	C-4	R167	Fuel pump control module harness (STi model)
R167	6	★	C-4	R166	Rear wiring harness (STi model)
★: Non-colored					

Rear Wiring Harness and Trunk Lid Cord



58.Rear Wiring Harness and Rear Gate Cord

A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R16	3	★	C-5		Rear door switch RH
R26	6	★	C-4		Rear combination light RH
R28	6	★	C-1		Rear combination light LH
R30	2	★	C-3		Diode (Luggage room light)
R32	2	★	C-3		Accessory power supply socket
R37	2	★	C-4	D33	Rear gate cord
R38	4	★	C-4	D34	Rear gate cord
R39	4	Blue	C-4	D35	Rear gate cord
R63	2	Black	C-2		License plate light
R79	6	★	D-3		Trailer connector
R97	2	★	C-1		Antenna amp.
R116	8	★	C-4		Rear wiper intermittent module
R122	10	Black	C-4		Fuel pump control module (Turbo Model)
R141	2	★	C-3		Luggage room light
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
D33	2	★	C-4	R37	Rear wiring harness
D34	4	★	C-4	R38	Rear wiring harness
D35	4	Blue	C-4	R39	Rear wiring harness
D39	2	★	B-3		High-mounted stop light
D40	1	★	B-3		Rear defogger (Without choke coil)
D43	4	★	A-2		Rear wiper motor
D46	2	★	A-2		Rear gate latch switch
D47	2	★	A-3		Rear gate lock actuator cord
D48	1	★	B-2		Rear defogger (Without choke coil)
D74	2	★	A-4		Rear defogger choke coil
D76	1	★	A-3	D77	Rear defogger cord (Without choke coil)
D77	1	★	A-3	D76	Rear gate code
D78	1	Black	A-2	D79	Rear defogger cord (Without choke coil)
D79	1	Black	A-2	D78	Rear gate code
★: Non-colored					

Rear Wiring Harness and Rear Gate Cord